SOUTH DAKOTA

Environmental Assessment for New Managed Haying and Grazing Provisions for Some Conservation Reserve Program Lands

Farm Service Agency

FINAL
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COVER PAGE

Proposed Action: The United States Department of Agriculture (USDA) Commodity Credit Corporation (CCC) proposes to change the allowable frequency of managed haying and grazing on certain Conservation Reserve Program (CRP) lands in South Dakota. Farm Service Agency (FSA) administers CRP on behalf of the CCC. On September 26, 2006, a legal settlement was signed between the National Wildlife Federation and FSA that limited the frequency of haying on CRP lands to once every ten years and grazing to once every five years in the State of South Dakota; with a suspension of haying and grazing during the primary nesting season (May 1 to August 1). The settlement stipulated that if a change to the frequency of haying and grazing or the primary nesting season (PNS) dates is desired, then an Environmental Assessment would be prepared that identifies the potential environmental and socioeconomic impacts of such a change. This Environmental Assessment evaluates the potential impacts of two action alternatives against the baseline of the lawsuit as described under Alternative A. Alternative B would allow haying and grazing to occur on authorized lands once every five years, and maintain the settlement terms definition of the PNS period. Alternative C would allow managed haying and grazing once every three years, but shorten PNS dates to May 1 to July 1.

Type of Document: Environmental Assessment

Lead Agency: United States Department of Agriculture

Sponsoring Agency: Farm Service Agency

Further Information: For further information, contact Matthew Ponish, Environmental Compliance Manager, USDA FSA CEPD, Stop 0513, 1400 Independence Ave., SW, Washington, D.C. 20250-0513, (202) 720-6853, or by email at Matthew.Ponish@wdc.usda.gov

Comments: This Environmental Assessment is prepared in accordance with USDA Farm Service Agency National Environmental Policy Act implementation procedures found in 7 Code of Federal Regulations 799, as well as the National Environmental Policy Act of 1969, Public Law 91-190, and 42 U.S. Code 4321-4347, 1 January 1970, as amended.

Farm Service Agency will provide a public comment period prior to any decision. A copy of this Environmental Assessment can be reviewed at http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecrc&topic=nep-cd or at: http://public.geo-marine.com.

Written comments regarding this assessment may be submitted to:
South Dakota Managed Haying and Grazing Comments, c/o Geo-Marine Incorporated, 2713 Magruder Boulevard, Suite D, Hampton, Virginia 23666,

or online at: http://public.geo-marine.com

Comments are due within 30 calendar days of publication of this document.

EXECUTIVE SUMMARY

BACKGROUND

The United States Department of Agriculture (USDA) Commodity Credit Corporation (CCC) oversees the Conservation Reserve Program (CRP), the Federal government's largest private land environmental improvement program. Farm Service Agency (FSA) administers CRP on behalf of the CCC. CRP is a voluntary program authorized by the Food Security Act of 1985, as amended, that supports the implementation of long term conservation measures designed to improve the quality of ground and surface waters, control soil erosion, and enhance wildlife habitat on environmentally sensitive agricultural land.

In exchange for annual rental payments and cost-share assistance, producers take lands out of agricultural production and establish approved resource conserving covers (conservation practices or CPs) to accomplish the goals of CRP: improve water quality, control erosion, and enhance wildlife habitat. The land is enrolled in long-term contracts of ten to 15 years. Prior to contract approval, a site-specific conservation plan must be developed by the USDA Natural Resource Conservation Service (NRCS) or a Technical Service Provider (TSP) following the NRCS Field Office Technical Guide (FOTG).

PURPOSE AND NEED FOR THE PROPOSED ACTION

On September 25, 2006, a legal settlement was signed between the National Wildlife Federation (National office and various state offices) and the FSA that mandated allowable frequencies for managed haying and grazing on CRP lands in some states and established Primary Nesting Season (PNS) dates during which no haying or grazing could occur. The settlement applies to new contracts, including re-enrollments, signed after September 25, 2006, or existing contracts that had not had any managed haying and grazing approved prior to that date. The settlement stipulated that if a state wanted to change these mandated terms, an Environmental Assessment (EA) would have to be developed to address the potential impacts associated with managed haying and grazing.

The State Technical Committee and the National Office of FSA propose to change the settlement provisions for managed haying and grazing in the State of South Dakota. The need for these proposed changes are to (1) meet the requirements of the lawsuit, (2) effectively manage CRP covers and improve their performance, and (3) make CRP an attractive program to landowners. Managed haying and grazing has been an important and attractive component of CRP for landowners, many of which have established haying and grazing into their farming operations and improved their CRP fields in the process.

ELIGIBLE LAND

To be eligible for enrollment in CRP, lands are required to meet cropland or marginal pastureland eligibility criteria in accordance with policy set forth by the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) and detailed in the FSA Handbook: Agricultural Resource Conservation Program for State and County Offices (USDA/FSA 2003a). Eligible cropland must be planted or considered planted to an agricultural commodity during four of the six crop-years from 1996 to 2001 (as of the 2002 Farm Bill), and must be physically and legally capable of being planted in a normal manner to an agricultural commodity as determined by the County Committee. In addition, eligible cropland must fall into one or more of the following secondary categories:

- Cropland for a field or a portion of a field where the weighted average Erodibility Index (EI) for the three predominant soils on the acreage offered is eight or greater;
- Land currently enrolled in CRP scheduled to expire September 30 of the fiscal year the acreage is offered for enrollment; and
- Cropland located within a National- or State-designated Conservation Priority area.

HAYING AND GRAZING PROVISIONS

The 2002 Farm Bill allowed producers to implement managed haying and grazing on CRP lands with certain practices to improve the quality and performance of the CRP cover. The practice must be fully established for at least one year prior to haying and grazing. Eligible conservation practices (CP) for managed haying and grazing are:

- CP 1: Introduced grasses and legumes
- CP 2: Permanent native grasses
- CP 4B: Permanent wildlife habitat (corridors)(limited to non-easement lands)
- CP 4D: Permanent wildlife habitat (limited to non-easement lands)
- CP 10: Vegetative cover – grass-already established
- CP 18B: Permanent covers reducing salinity (limited to non-easement lands)
- CP 18C: Permanent salt tolerant covers (limited to non-easement lands)

Managed haying and grazing is not authorized for any other CRP practices, land enrolled in useful life easements, or land within 120 feet of a permanent body of water. Prior to implementing managed haying and grazing, a producer must submit a request to the local FSA office and obtain a modified conservation plan. The allowable frequency of haying and grazing varies by state, but can be no more frequent than one out of every three years.

Managed haying and grazing cannot occur on the same acreage in the same year and cannot be conducted on the same acreage used for emergency haying and grazing in the same year. A producer implementing managed haying and grazing is assessed a 25 percent payment reduction of their annual rental rate for the year in which haying or grazing occurs. Managed haying is allowed on 50 percent of a CRP field or contiguous fields for a single period of up to 90 days. Managed grazing is allowed on 100 percent of a field at up to 75 percent of the stocking rate established by the NRCS for a single period of 120 days or two 60-day periods. Managed haying and grazing must be complete by September 30.

PRIMARY NESTING SEASON

Managed haying and grazing is not allowed during the Primary Nesting Season (PNS). The PNS is established by the State Technical Committee to protect nesting birds and other important wildlife and varies by state. The State Technical Committee typically consists of representatives from local FSA offices, NRCS, and State wildlife, game and fish departments. The PNS is established to allow sufficient time for nesting and chick rearing periods for grassland birds important to the State. These seasons typically last approximately three to four months during the spring and summer.

PROPOSED ACTION

The Proposed Actions to change the allowable frequencies of managed haying and grazing for the State. Currently in the State under the settlement, managed haying is allowed once every ten years and managed grazing is allowed once every five years; and the PNS is May 1 to August 1. Prior to the settlement, managed haying and grazing was allowed every three years and the PNS was the same. Alternative B would allow haying and grazing to occur on authorized lands once every five years, and maintains the settlement terms definition of the PNS period. Alternative C would allow managed haying and grazing once every three years and shorten PNS dates to May 1 to July 1.

NO ACTION ALTERNATIVE

Alternative A, is carried forward in this EA in accordance with 40 Code of Federal Regulations (CFR) 1502.14(d) to represent the environmental baseline against which to compare the other alternatives. Alternative A would allow managed haying and grazing provisions to continue as they are currently administered in the State.

AFFECTED ENVIRONMENT

The geographic scope of this analysis are the lands enrolled in CRP within the State of South Dakota, Managed haying and grazing is a component of the CRP associated with certain practices. The effects associated with implementing these practices were analyzed in a Final Programmatic Environmental Impact Statement (PEIS) for the Conservation Reserve Program (USDA/FSA 2003b) and some resource areas have been eliminated based on that environmental evaluation. The affected lands are further limited to those enrolled in CRP under the conservation covers authorized for managed haying and grazing. Resource areas potentially affected by this proposed action and analyzed in detail in this EA include:

- Biological Resources
- Water Quality
- Soil Resources
- Air Quality
- Socioeconomics

Biological resources encompass vegetation, wildlife, and protected species. For this analysis, water resources are limited to surface water quality, and air quality is limited to carbon sequestration.

ENVIRONMENTAL CONSEQUENCES

The environmental consequences from the proposed actions and the Alternative A are addressed in this EA and summarized in the table below.

Table ES-1. Summary of Environmental Consequences.

Resource	Alternative A	Alternative B	Alternative C
Biological Resources *Vegetation, Wildlife, and Protected Species*	Potential benefits to vegetation of managed haying and grazing, in general, would be similar to those described for Alternative B; however, they would occur less frequently, which would be outside the recommended disturbance intervals for maintaining grassland health and vigor. Thatch would accumulate which would potentially increase vegetation densities that would threaten the vegetative structure and productivity of the vegetative stand. Alternative A would provide more benefit for large mammals that are primarily browsers and not grazers by allowing woody vegetation encroachment in grasslands. The longer frequency interval is not as beneficial for antelope that graze, as the frequency of harvesting would not provide optimal improvements of the grass and forb component of the vegetative stand. Species diversity may be reduced for small mammals with the longer intervals between managed haying and grazing; however, the greater coverage may reduce direct mortality rates and provide for longer periods for numbers of small mammals to recover.	Under Alternative B, vegetation would likely be enhanced through increased plant stand health and vigor, increased productivity of grassland plants, and reduced accumulation of thatch. Frequencies of managed haying and grazing once every five years are within the historic disturbance regimes on the Great Plains that are shown to rejuvenate grasslands. Impacts of Alternative B would be less beneficial for large mammals that are browsers than Alternative A, but is better for grazers by increasing the productivity of grassland plants resulting in improved forage quality. The frequency of Alternative B maintains early successional environments such as grasslands, which positively impacts small mammals by maintaining optimal habitat. This alternative increases small mammal diversity. Direct impacts to swift fox would be minimal. Managed haying and grazing would maintain open grasslands and increase abundance and diversity of swift fox prey species.	Under Alternative C, managed haying and grazing would occur once every three years and the PNS would be from May 1 to July 1. A shortened PNS would allow managed haying and grazing to occur one month earlier. Cutting dormant cool season grasses close to the end of the shortened PNS would diminish the health and vigor of these plants. Benefits to large mammals that graze would be optimal under this alternative. The increased haying frequency of once every three years would help maintain the productivity and vigor of grasslands. Large mammal browsers would not likely benefit under this alternative. The change in PNS would not likely impact large mammals as they would likely have completed fawning/calving prior to July. Potential indirect impacts to small mammals would be the same as those described for Alternative B. The change in the PNS would not likely affect small mammals of South Dakota as most breed in spring and have litters in the early summer.

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Biological Resources *Vegetation, Wildlife, and Protected Species*	The effects of this alternative would reduce the diversity in vegetation structure allowing tall vegetation to regain dominance that would in turn, reduce habitat quality for swift fox and potential prey species for eastern hog-nosed snakes that depend on changes to vegetation. The frequency of disturbance would not be as effective in maintaining open patches favored by these animals. However, the lined snake would benefit from the increased protective cover of taller vegetation. The needs of the majority of nesting grassland bird species that benefit from the recommended historic disturbance regimes on the Great Plains would not be met. The overall indirect impact for a majority of the bird species being analyzed would be negative. Managed haying and grazing frequencies under this alternative would result in less potential to directly affect the reproductive success of many grassland birds. The 1% estimated mortality rate to northern bobwhite would be reduced to once every ten years under this alternative which is more beneficial for reproductive success of this species. Under the lower frequency of managed haying and grazing, diversity of vegetative	The frequencies for managed haying and grazing under Alternative B would likely improve the habitat used by the eastern hog-nosed snakes' prey species. The lined snake would be exposed to predators at a greater frequency than Alternative A. Indirect impact to the majority of the bird species analyzed in this EA would be positive over time. The magnitude of direct impacts to the reproductive success of grassland bird species is not entirely clear because field studies have not been conducted. Managed haying has the most potential to directly affect the reproductive success of grassland birds. The northern bobwhite would potentially have one of the greatest exposures to direct impacts since an estimated 48% of its peak breeding period is not encompassed by Alternative B PNS. The 1% estimated mortality rate to northern bobwhite would increase to once every five years under this alternative which is less beneficial for reproductive success of this species than Alternative A. Positive benefits from managed haying and grazing of vegetation would also benefit amphibians and reptiles by increasing the diversity in structure and creating or maintaining microsites.	Potential impacts to swift fox and eastern hog-nosed snake would be similar to those of Alternative B. The shorter PNS would not likely result in a change to any of the effects on these species. Indirect impacts to grassland birds would be the same as described for Alternative B; however, ground-nesting grassland birds would have greater exposure to direct impacts because the PNS would cover less of their actual peak breeding season. An estimated 78% of the northern bobwhite breeding season would not be encompassed by the PNS period of Alternative C. Their mortality rate would increase to two percent every three years under this alternative. The change in the PNS would not likely result in a decrease or addition of any effects described for Alternative B on amphibians and reptiles because they breed in early spring. Impacts to amphibians and reptiles would likely be the same as under Alternative B but at more frequent intervals.

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Biological Resources *Vegetation, Wildlife, and Protected Species*	structure would not be maintained, thereby limiting the potential for maintaining microsites for reptiles and amphibians. Longer managed haying and grazing intervals translates into a reduction in the amount of manure, reducing the food source for invertebrates. This would potentially result in minor reductions of invertebrate abundance and diversity; however, impacts to invertebrates would not be significant. A site specific evaluation would be performed to determine if there are any protected species present or suspected of being present. If such species are potentially present informal consultation with the U.S. Fish and Wildlife Service (USFWS) would occur during the site specific environmental evaluation to ensure the protection of these species. Formal consultation with USFWS would be completed in the event a practice may affect a listed species. If negative impacts to listed species are identified, it is not likely the land would be approved for managed haying or grazing.	Positive benefits from managed haying and grazing to vegetation would also benefit invertebrates by increasing the structural diversity and productivity of the grassland plants. Increased frequencies of grazing would provide more food sources for manure dependent invertebrates. No negative impacts to invertebrates would occur. A site specific evaluation would be performed to determine if there are any protected species present or suspected of being present. If protected species are present or suspected of being present, informal consultation with the USFWS would occur during the site specific environmental evaluation to ensure the protection of these species. Formal consultation with USFWS would be completed in the event a practice may affect a listed species. If negative impacts to listed species are identified, it is not likely the land would be approved for the managed haying or grazing.	Impacts to invertebrates would most likely be the same as described for Alternative B since managed haying and grazing would commence after the period of greatest species richness for invertebrates. This alternative's increased frequency improves habitat for many invertebrates and contributes to increasing their diversity. Increased frequency of grazing would provide more food sources for invertebrates. A site specific evaluation would be performed to determine if there are any protected species present or suspected of being present. If protected species are present or suspected of being present, informal consultation with the USFWS would occur during the site specific environmental evaluation to ensure the protection of these species. Formal consultation with USFWS would be completed in the event a practice may affect a listed species. If negative impacts to listed species are identified, it is not likely the land would be approved for the managed haying or grazing.

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Water Resources *Surface Water, Quality*	Under Alternative A, direct impacts to surface water quality are minimized by restricting managed haying and grazing to no closer than 120 ft of a permanent surface water body and confining livestock with fencing. Indirect impacts to water quality can occur from soil loss. Vegetative cover reduces the potential for soil erosion, sedimentation and nutrient indirect deposition into nearby water bodies. Little negative impact on the plant community occurs except during haying or grazing periods. Alternative A would allow longer intervals of vegetation recovery between these activities than the action alternatives, especially beneficial if precipitation is not ideal the following growing season.	Direct negative effects to surface water quality are minimized under Alternative B, as managed haying and grazing would occur once every five years. Although the vegetative height would be altered, the requirement for leaving a five inch stubble height would remain thereby leaving vegetative cover in place and allowing vegetation to recover before frost. The vegetative cover would continue to reduce potential soil erosion, sedimentation and nutrient deposition into nearby water bodies; therefore, water quality should remain the same as Alternative A.	Direct impacts from managed haying and grazing would be the same as described for Alternative B. Additionally, changing the PNS to occur 31 days earlier would not affect soil erosion on warm season conservation covers. Cutting dormant cool season grasses close to the end of the shortened PNS of this alternative could harm the health and vigor of these plants. Any loss of vegetative cover could lead to increased sedimentation of nearby surface waters through soil erosion.
Soil Resources	Potential direct impacts to soil include altering soil surface roughness, soil biomass, and soil consolidation. However, limiting the stocking rate to 75% of determined total capacity, the total number of days that haying or grazing may take place, and employing Best Management Practices (BMPs) to ensure adequate dispersion of livestock minimize this potential. Alternative A would not indirectly increase soil erosion since it has been found that haying or grazing would have little impact on the plant	The direct impacts of Alternative B on soil would be similar to Alternative A and may be minimized by employing the same BMPs. The indirect impact of managed haying and grazing under this alternative's frequency is more beneficial for maintaining the health and vigor of grasslands, limiting the potential for increasing soil erosion through vegetative loss. In the case of soil biomass, benefits may be realized as dead biomass is added to the soil and negative impacts of thatch accumulation are controlled by more frequent	Impacts from managed haying and grazing for Alternative C would be similar to those described in Alternative B, except is more beneficial for maintaining early successional grassland environments. However, cutting dormant cool season grasses close to the end of the shortened PNS would harm the health and vigor of these plants. Any loss of vegetative cover could lead to increased soil erosion. Direct impacts of haying or grazing on soil compaction under Alternative C would be similar to those described for the other alternatives, but at a more frequent interval

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Soil Resources	community except during the haying or grazing period. Although the vegetative height would be altered, the requirement for leaving a five inch stubble height would maintain vegetative cover in place and regrowth of between four and eight inches by the frost period would be expected under normal precipitation conditions. This vegetative cover would continue to reduce potential soil erosion. Longer intervals between managed haying and grazing allow more time for vegetative recovery than the action alternatives, especially if vegetation recovery was hindered during periods of less than ideal precipitation conditions. Direct impacts of haying or grazing under Alternative A on soil could include increased compaction from machinery and concentrating livestock in a confined space, however, BMPs employed to ensure a light to moderate stocking rate and adequate distribution of animals would minimize this potential.	disturbance. If less than ideal precipitation conditions arise between periods of harvesting, the increased frequency of Alternative B would reduce the potential recovery period more than Alternative A; however, BMPs would be utilized to reduce impacts through maintain adequate ground cover or litter.	

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Air Quality *Carbon Sequestration*	Under Alternative A, older or dead plant materials would be removed less frequently than the action alternatives. Older or dead plants produce lower rates of photosynthesis, which results in less CO2 exchange and a reduction in carbon sequestration. Less frequent grazing lowers the level of animal waste (manure and urine). Manure and urine add nitrogen to the soil resulting in increased plant growth. Manure and urine also affect soil microbes which directly affect carbon cycling and the rate of sequestration. Actual carbon sequestration rates would vary under Alternative A depending on local conditions, however, it would result in a net increase in carbon accumulation and a reduction in atmospheric carbon, thereby improving air quality, helping mitigate other carbon emissions, and providing a negligible positive impact on global warming.	Photosynthesis efficiency is greatest during the early vegetative growth stage resulting in greater carbon sequestration. Implementing Alternative B would increase the rate at which vegetation is hayed or grazed which would induce early vegetative re-growth of plants and sequestering greater quantities of carbon than would be found on un-grazed or un-hayed lands, while maintaining the health and vigor of the vegetative stand.	Impacts from managed haying and grazing for Alternative C would be similar to those described in Alternative B.
Socioeconomics	A baseline condition was established by using data from 2004 to 2006. It was determined that approximately 32% of CRP eligible practice acres were economically viable for grazing and 41% of CRP eligible practice acres were economically viable for hay production. Under Alternative A, managed haying and grazing acreage would increase by 3.5 times over baseline, but 1.4 times less than Alternative B, and 2.43 times less than Alternative C. It could create	A baseline economic analysis established that 32% of CRP lands eligible for managed grazing are economically viable and 41% are viable for managed hay production in the State. Implementation of Alternative B would generate a small positive increase in beef and hay production. The economy as a whole would also experience a small positive increase from allowing managed haying and grazing to occur once every	A baseline economic analysis established that 32% of CRP lands eligible for managed grazing are economically viable and 41% are viable for managed hay production in the State. Implementation of Alternative C would generate a larger positive increase in beef and hay production than either Alternatives A or C. The economy as a whole would also experience a small positive increase from allowing

Table ES-1. Summary of Environmental Consequences (cont'd).

Resource	Alternative A	Alternative B	Alternative C
Socioeconomics	positive benefits for the beef cattle producers by increasing the value of their produce by at least 0.7%.	five years and would create additional opportunities to farm services providers, e.g., custom farming operations. Managed haying and grazing acreage would increase approximately 1.46 times over Alternative A, but 1.6 times less than Alternative C This would generate a 0.4% increase over the total value of beef production and a 1.3% increase over the total value of hay production. The economy is estimated to see an approximately 0.04% increase.	managed haying and grazing to occur once every five years and would create additional opportunities to farm services providers, e.g., custom farming operations. Managed haying and grazing acreage would increase approximately 2.43 times over Alternative A. This results in a substantial increase which would generate a 1.0% increase over the total value of beef production and a 3.0% increase over the total value of hay production. The economy is estimated to see an approximately 0.1% increase.

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ACRONYMS and ABBREVIATIONS

ACS	American Community Survey
ARMS	Agricultural Resource Management System
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BMP	Best Management Practice
BNA	Birds of North America
CAA	Clean Air Act
CCC	Commodity Credit Corporation
CEAP	Conservation Effect Assessment Program
CEC	Commission for Environmental Cooperation
CEQ	Council on Environmental Quality
CEPD	Conservation and Environmental Programs Division
CFR	Code of Federal Regulations
CH4	Methane
CO	Carbon Monoxide
CO2	Carbon Dioxide
COC	County Committees
COMET-VR	The Voluntary Reporting of Greenhouse Gases Carbon Management Evaluation Tool
CP	Conservation Practice
CRP	Conservation Reserve Program
CSRA	Carbon Sequestration Rural Appraisal
CSU	Colorado State University
CWA	Clean Water Act
DAFP	Deputy Administrator for Farm Programs
DO	Dissolved Oxygen
EA	Environmental Assessment
EI	Erodibility Index
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ESA	Endangered Species Act
FAPRI	Food and Agricultural Policy Research Institute
Farm Bill	Farm Security and Rural Investment Act of 2002
FCB	Fecal Coliform Bacteria
FE	Federally Endangered
FOTG	Field Office Technical Guide
FSA	Farm Service Agency

ACRONYMS and ABBREVIATIONS (cont'd)

FT	Federally Threatened
GAP	Gap Analysis Program
HEL	Highly Erodible Land
KSU	Kansas State University
lbs/ac	Pounds per acre
lbs/ac/yr	Pounds Per Acre Per Year
MHG	Managed Haying and Grazing
MHI	Median Household Income
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistic Service
NEPA	National Environmental Policy Act
NGDP	Nominal State Gross Domestic Product
NMFWA	National Military Fish and Wildlife Association
N2O	Nitrous oxide
NO2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
NWF	National Wildlife Federation
O3	Ozone
PARC	Partners in Amphibian and Reptile Conservation
Pb	Lead
PCI	Per Capita Income
PEIS	Programmatic Environmental Impact Statement
PM	Particulate Matter
PNS	Primary Nesting Season
ROI	Region of Influence
RUSLE	Revised Universal Soil Loss Equation
SCS	Soil Conservation Service
SDCWCP	South Dakota's Comprehensive Wildlife Conservation Plan
SDDENR	South Dakota Department of Environment and Natural Resources
SDGAP	South Dakota Gap Analysis Program
SDGFPC	South Dakota Game, Fish and Parks Commission
SDSU	South Dakota State University
SER	State Ecological Region
SIP	State Implementation Plan
SO2	Sulfur Dioxide

ACRONYMS and ABBREVIATIONS (cont'd)

SOC	Soil Organic Carbon
SOM	Soil Organic Matter
STC	State Committee
TES	Threatened and Endangered Species
TMDL	Total Maximum Daily Load
TSP	Technical Service Provider
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDL	U.S. Department of Labor
USDOI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOR	Visual Obstruction Readings

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 CONSERVATION RESERVE PROGRAM

The United States Department of Agriculture (USDA) Commodity Credit Corporation (CCC) oversees the Conservation Reserve Program (CRP), the Federal government's largest private land environmental improvement program. Farm Service Agency (FSA) administers CRP on behalf of the CCC. CRP is a voluntary program authorized by the Food Security Act of 1985, as amended, that supports the implementation of long term conservation measures designed to improve the quality of ground and surface waters, control soil erosion, and enhance wildlife habitat on environmentally sensitive agricultural land.

In exchange for annual rental payments and cost-share assistance, producers take lands out of agricultural production and establish approved resource conserving covers (conservation practices or CPs) to accomplish the goals of CRP: improve water quality, control erosion, and enhance wildlife habitat. The land is enrolled in long-term contracts of ten to15 years. Prior to contract approval, a site-specific conservation plan must be developed by the USDA National Resources Conservation Service (NRCS) or a Technical Service Provider (TSP) following the NRCS Field Office Technical Guide (FOTG).

Eligible Land

To be eligible for enrollment in CRP, lands are required to meet cropland or marginal pastureland eligibility criteria in accordance with policy set forth by the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) and detailed in the FSA Handbook: Agricultural Resource Conservation Program for State and County Offices (USDA/FSA 2003a). Eligible cropland must be planted or considered planted to an agricultural commodity during four of the six crop-years from 1996 to 2001 (as of the 2002 Farm Bill), and must be physically and legally capable of being planted in a normal manner to an agricultural commodity as determined by the County Committee. In addition, eligible cropland must fall into one or more of the following secondary categories:

- Cropland for a field or a portion of a field where the weighted average Erodibility Index (EI) for the three predominant soils on the acreage offered is eight or greater (highly erodible soils);
- Land currently enrolled in CRP scheduled to expire September 30 of the fiscal year the acreage is offered for enrollment; and
- Cropland located within a National- or State-designated Conservation Priority area.

1.1.1 Contract Maintenance, Management and Fire Prevention

CRP participants must maintain the CRP cover in accordance with their conservation plan to control erosion, noxious weeds, rodents, insects, etc. Specific maintenance activities, timing, and duration are developed in consultation with NRCS or TSP and may consist of mowing, burning, and/or spraying. Periodic mowing and mowing for cosmetic purposes is prohibited.

Mid-contract management activities must be a part of the conservation plan and designed to ensure plant diversity and wildlife benefits, while ensuring protection of soil and water resources. Management activities are site specific and must occur before the end of year six of a ten year contract, or the end of year nine of a 15 year contract. Appropriate management is developed with NRCS or TSP and can include light disking, inter-seeding, and other components applicable to the practice installed.

Participants must also manage CRP land for potential fire hazards. Firebreaks may be installed around CRP and must meet NRCS Practice Code 394 standards and be included in the conservation plan. Barren firebreaks are only allowed around high-risk areas such as transportation corridors, rural communities, or adjacent farmsteads.

1.2 HAYING AND GRAZING PROVISIONS

The 2002 Farm Bill allowed producers to implement managed haying and grazing on CRP lands with certain practices to improve the quality and performance of the CRP cover. The practice must be fully established for at least one year prior to haying and grazing. Eligible conservation practices for managed haying and grazing are any of the following:

- CP 1: Introduced grasses and legumes
- CP 2: Permanent native grasses
- CP 4B: Permanent wildlife habitat (corridors)(limited to non-easement lands)
- CP 4D: Permanent wildlife habitat (limited to non-easement lands)
- CP 10: Vegetative cover – grass-already established
- CP 18B: Permanent covers reducing salinity (limited to non-easement lands)
- CP 18C: Permanent salt tolerant covers (limited to non-easement lands)

Managed haying and grazing is not authorized for any other CRP practices, land enrolled in useful life easements, or land within 120 feet of a permanent body of water. Prior to implementing managed haying and grazing, a producer must submit a request to the local FSA office and obtain a modified conservation plan. The allowable frequency of haying and grazing varies by state, but can be no more frequent than one out of every three years.

Managed haying and grazing cannot occur on the same acreage in the same year and cannot be conducted on the same acreage used for emergency haying and grazing in the same year. A producer implementing managed haying and grazing is assessed a 25 percent payment reduction of their annual rental rate for the year in which haying or grazing occurs. Managed haying is allowed on 50 percent of a CRP field or contiguous fields for a single period of up to 90 days. Managed grazing is allowed on 100 percent of a field at up to 75 percent of the stocking rate established by the NRCS for a single period of 120 days or two 60-day periods. Managed haying and grazing must be complete by September 30.

1.3 PRIMARY NESTING SEASON

Managed haying and grazing is not allowed during the primary nesting season (PNS). The PNS is established by the State Technical Committee to protect nesting birds and other important wildlife and varies by state. The State Technical Committee typically consists of representatives from local FSA offices, NRCS, and State wildlife, game and fish departments. The PNS is established to allow sufficient time for nesting and chick rearing periods for grassland birds important to the State. These seasons typically last approximately three to four months during the spring and summer.

1.4 PURPOSE AND NEED

On September 25, 2006, a legal settlement was signed between the National Wildlife Federation (NWF) (National office and various state offices) and the FSA that mandated allowable frequencies for managed haying and grazing on CRP lands in some states and established PNS dates during which no haying or grazing could occur. The settlement applies to new contracts, including re-enrollments, signed after September 25, 2006, or existing contracts that had not had any managed haying and grazing approved prior to that date. The settlement stipulated that if a state wanted to change these mandated terms, an Environmental Assessment (EA) would have to be developed to address the potential impacts associated with managed haying and grazing.

The State Technical Committee and the National Office of FSA propose to change the settlement provisions for managed haying and grazing in the State. The need for these proposed changes are to (1) meet the requirements of the lawsuit, (2) effectively manage CRP covers and improve their performance, and (3) make CRP an attractive program to landowners. Managed haying and grazing has been an important and attractive component of CRP for landowners, many of which have established haying and grazing into their farming operations and improved their CRP fields in the process.

1.5 THE PROPOSED ACTION

The proposed action is to change the allowable frequencies of managed haying and grazing for the State. Currently in the State under the settlement, managed haying is allowed once every ten years and managed grazing is allowed once every five years; and the PNS is May 1 to August 1 (Table 1.6-1). Prior to the settlement, managed haying and grazing was allowed every three years and the PNS was the same.

1.6 REGULATORY COMPLIANCE

This EA is prepared to satisfy the requirements of the National Environmental Policy Act (NEPA; Public Law 91-190, 42 U.S. Code [USC] 4321 et seq.); implementing regulations adopted by the Council on Environmental Quality (CEQ; 40 Code of Federal Regulations [CFR] 1500-1508);

Table 1.6-1. Managed Haying and Grazing Frequencies and Primary Nesting Season for South Dakota.

	Pre-Settlement	Settlement Terms
Managed Haying	1/3	1/10
Managed Grazing	1/3	1/5
Primary Nesting Season	May 1-August 1	May 1-August 1

*1/*n* Once out of every *n* years

and FSA implementing regulations, Environmental Quality and Related Environmental Concerns – Compliance with NEPA (7 CFR 799). The intent of NEPA is to protect, restore, and enhance the human environment through well-informed Federal decisions. A variety of laws, regulations, and Executive Orders apply to actions undertaken by Federal agencies and form the basis of the analysis presented in this EA.

1.7 COOPERATING AGENCIES

The development of this EA was a collaborative effort between FSA (lead agency), NRCS, and the U.S. Fish and Wildlife Service (USFWS). Each agency provided input on the development of alternatives to address in this EA as well as comments on internal and public versions of this EA to ensure adequate coverage and analysis of environmental resources.

1.8 ORGANIZATION OF THE EA

This EA assesses the potential impacts of the Proposed Actions and the Alternatives, including Alternative A on potentially affected environmental and economic resources. Chapter 1.0 provides background information relevant to the Proposed Action, and discusses its purpose and need. Chapter 2.0 describes the Proposed Action and Alternatives. Chapter 3.0 describes the existing conditions (i.e., the baseline conditions against which potential impacts of the Proposed Action and alternatives are measured) for each of the potentially affected resources. Chapter 4.0 describes potential environmental consequences on these resources. Chapter 5.0 describes potential cumulative impacts and irreversible and irretrievable resource commitments. Chapter 6.0 discusses mitigation measures utilized to reduce or eliminate impacts to protected resources. Chapter 7.0 lists the preparers of this document. Chapter 8.0 contains a list of the persons and agencies contacted during the preparation of this document and Chapter 9.0 contains references.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

FSA proposes to change the managed haying and grazing provisions in South Dakota. These changes would adjust the allowable frequency of managed haying and grazing. Alternative A is included in this analysis to serve as an environmental baseline. This alternative would allow managed haying and grazing to continue under the current provisions (settlement terms).

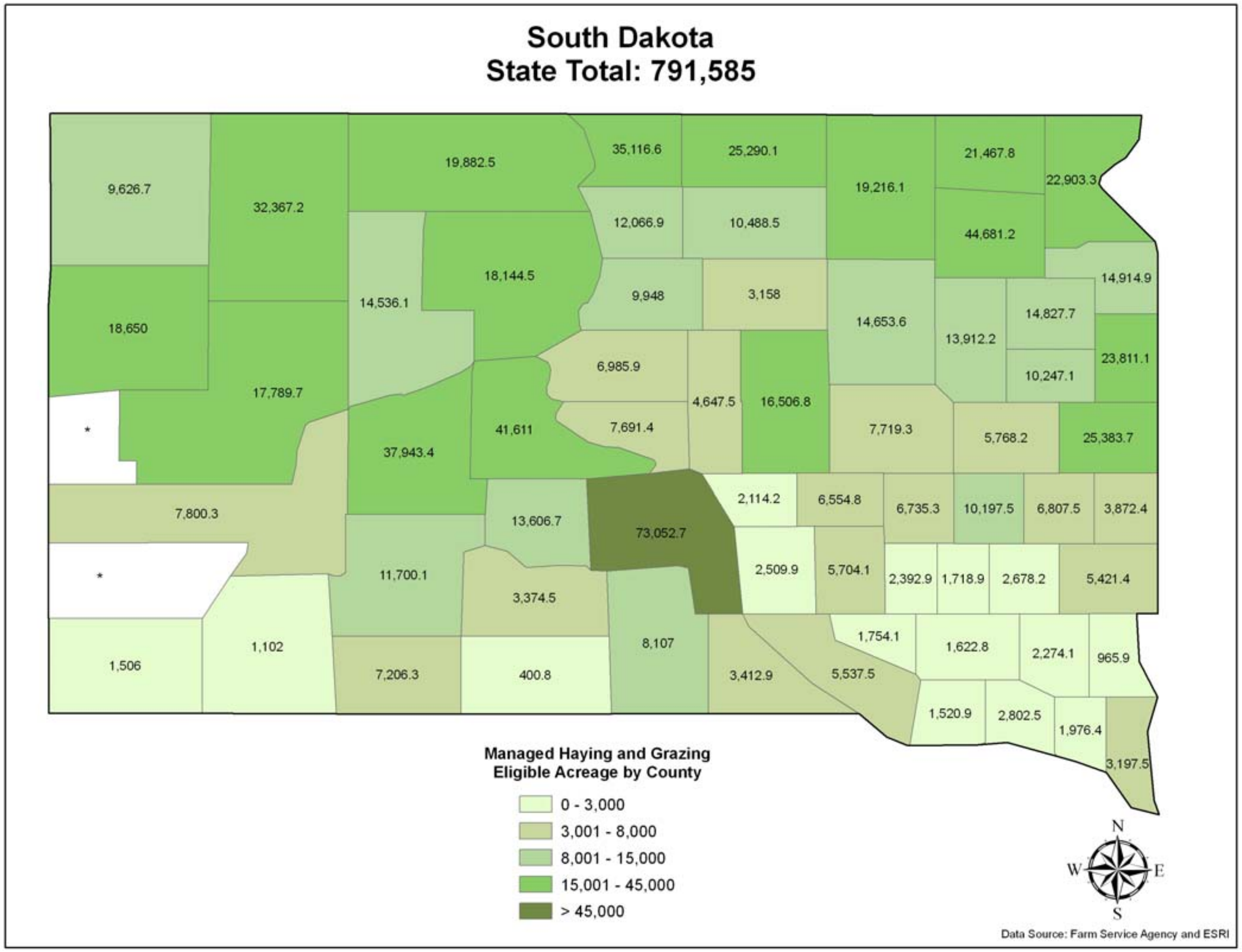
As of August 31, 2008, South Dakota had nearly 1.3 million acres enrolled in the CRP. Table 2.1-1 lists the number of CRP acres eligible for managed haying and grazing in South Dakota by the specific CP authorized for these activities. The majority of the eligible acres (48.2 percent) are enrolled in CP10, vegetative cover – grass-already established. Figure 2.1-1 depicts the State of South Dakota with the number of acres eligible for managed haying and grazing by county. The figure shows that most of the lands eligible for managed haying and grazing are spread throughout the State.

Table 2.1-1. Acreage Eligible for Managed Haying and Grazing by Practice in South Dakota.

Conservation Practice		South Dakota Acres in Practice	Total Acres in Practice
1	Introduced grasses and legumes	104,025.7	1,680,008.7
2	Permanent native grasses	187,103.3	5,488,997.7
4B	Permanent wildlife habitat (corridors)(limited to non-easement lands)	75.9	4,123.9
4D	Permanent wildlife habitat (limited to non-easement lands)	106,715.3	1,131,866.9
10	Vegetative cover – grass-already established	381,406.2	9,653,665.5
18B	Permanent covers reducing salinity (limited to non-easement lands)	4,344.6	125,623.1
18C	Permanent salt tolerant covers (limited to non-easement lands)	8,220.2	118,422.5
Total Eligible for Managed Haying and Grazing		791,891.2	18,202,708.3

Source: USDA/FSA 2008a, August CRP Summary Report

Figure 2.1-1. CRP Acreage Eligible for Managed Haying and Grazing.



(*Data not available due to privacy restrictions required by the Farm Security and Rural Investment Act of 2002)

2.2 DEVELOPMENT OF ALTERNATIVES

A public scoping meeting and a 30-day public comment period were held prior to development of this EA to determine viable options for implementing the proposed changes to managed haying and grazing provisions for the State. The issues and concerns identified during scoping were assessed by the State Technical Committee, FSA National Office, NRCS, and USFWS to develop the alternatives for adjusting the managed haying and grazing provisions. Table 2.2-1 and the following sections outline the alternatives that will be carried forward in this analysis.

Table 2.2-1. Alternatives to be Addressed in the EA.

	Alternative A*	Alternative B*	Alternative C*
Managed Haying Frequency	1/10	1/5	1/3
Managed Grazing Frequency	1/5	1/5	1/3
Primary Nesting Season	May 1-August 1	May 1-August 1	May 1- July 1

*1/*n* Once out of every *n* years

2.2.1 No Action - Alternative A

Alternative A is carried forward in this EA in accordance with 40 CFR 1502.14(d) to represent the environmental baseline against which to compare the other alternatives. Alternative A would allow managed haying and grazing provisions to continue as they are currently administered in South Dakota. Currently, haying can occur once every ten years and grazing can occur once every five years; the PNS is currently defined as May 1 to August 1.

2.2.2 Proposed Action - Alternative B

Alternative B would allow managed haying and grazing to occur once every five years, while keeping the PNS at May 1 to August 1. This alternative would increase the frequency of managed haying to once every five years; yet leave the managed grazing frequency and PNS at settlement terms.

2.2.3 Proposed Action - Alternative C

Based upon comments received from the public scoping process, FSA decided to evaluate an alternative that would allow managed haying and grazing to revert back to what it was prior to the settlement and as well as decreasing the PNS. The beneficial and adverse impacts of changing the haying and grazing frequency to once in three years and PNS dates to May 1 to July 1 are evaluated under Alternative C.

2.2.4 Resources Eliminated from Analysis

CEQ regulations (40 CFR 1501.7) state that the lead agency shall identify and eliminate from detailed study the issues that are not important or that have been covered by prior environmental review, narrowing the discussion of these issues in the document to a brief presentation of why they would not have a dramatic effect on the human or natural environment. Managed haying and grazing is a component of the CRP associated with certain practices. The effects associated with implementing these practices were analyzed in a Final Programmatic Environmental Impact Statement (PEIS) for the Conservation Reserve Program (USDA/FSA 2003b) and some resource areas may be eliminated based on that environmental evaluation. This analysis will focus on the potential effects of adjusting the provisions of managed haying and grazing on CRP land. For this proposed action the following resource areas have been eliminated from detailed analysis:

2.2.4.1 Noise

Implementing Alternative B or alternative would not permanently increase ambient noise levels at or adjacent to the project area. Slight increases in noise levels associated with haying would be minor, temporary, and would cease once haying was complete. This equipment noise would not be any different than what is normally experienced on farmland.

2.2.4.2 Cultural Resources

Prior to enrollment into CRP, site-specific environmental evaluation to identify cultural resources must be completed. Since managed haying and grazing can only occur on CRP fields, an impact to cultural resources is not expected.

2.2.4.3 Wetlands, Groundwater, Floodplains, Sole Source Aquifers

Water resources for this analysis have been restricted to surface water quality. Managed haying and grazing on CRP land would not create different or additional impacts than those described in the CRP PEIS for wetlands, groundwater, floodplains, or sole source aquifers (USDA/FSA 2003b).

2.2.4.4 Coastal Zones and Barriers

The proposed action and alternatives would occur within the interior U.S.; therefore, coastal zones would not be affected.

2.2.4.5 National Natural Landmarks

Managed haying and grazing would occur on privately owned CRP lands only. There is no potential for this activity to occur on National Natural Landmarks.

2.2.4.6 Prime and Unique Farmland

Managed haying and grazing occurs on CRP land that has already been taken out of agricultural production; therefore, prime and unique farmland would not be affected.

2.2.4.7 Environmental Justice

Managed haying and grazing is voluntary and can only occur on lands already enrolled in CRP. An assessment of environmental justice concerns associated with CRP was conducted in the CRP PEIS (USDA/FSA 2003b), and these concerns are not expected to be different with this proposed action.

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3.0 AFFECTED ENVIRONMENT

3.1 BIOLOGICAL RESOURCES

3.1.1 Definition of the Resource

Biological resources include plant and animal species and the habitats in which they occur. For this analysis, biological resources are divided into the following categories: vegetation; wildlife; protected species and their critical habitat. Vegetation and wildlife refer to the plant and animal species, both native and introduced, which characterize a region. For this analysis, noxious weeds are not discussed since CRP contracts require conservation plans that include control of such species. Protected species are those federally designated as threatened or endangered and protected by the Endangered Species Act (ESA). Critical habitat is designated by USFWS as essential for the recovery of threatened and endangered species (TES), and like those species, is protected under ESA.

This section contains information regarding South Dakota's vegetation, wildlife and protected species. South Dakota is defined by four main land regions; Drift Prairie, Dissected Till Plains, Great Plains, and Black Hills. The majority of eastern South Dakota is covered by the drift prairie. This land was carved out by glaciers, creating low hills and glacial lakes. The dissected till plains occupy the southeastern corner of South Dakota. This area was also formed by glacial activity, leaving an area of rolling hills, traversed by several streams. The western two-thirds of South Dakota are dominated by the Great Plains, which are separated from the Drift Prairie by the James River Basin. This area is made up of the Coteau de Missouri Hills and the Badlands. The southwestern edge of South Dakota is comprised of the Black Hills

The Commission for Environmental Cooperation (CEC) Ecoregion Level I map (CEC 1997) was used to identify major ecoregions within South Dakota to organize and evaluate the biological resources of South Dakota in context with the managed haying and grazing on CRP lands. Ecoregions are areas of relatively homogenous soils, vegetation, climate, and geology, each with associated wildlife adapted to that region. South Dakota consists of two CEC Level I ecoregions, Great Plains and Northwestern Forested Mountains. Potentially affected wildlife species were identified by consulting South Dakota's Comprehensive Wildlife Conservation Plan (SDCWCP, South Dakota Game, Fish and Parks Commission [SDGFPC] 2006). The SDCWCP is the result of a coordinated effort by natural resource managers, specialists, and the public to identify and rank species and areas within the state that are in need of conservation. Mammals, reptiles, and amphibians identified by the SDCWCP were then categorized by ecoregion in relation to the CEC Level I. The SDCWCP provided information regarding the general wildlife found in the ecoregions. Grassland bird species to be evaluated were identified by reviewing the Northern Prairie Research Center document *Effects of Management Practices on Grassland Birds* (Johnson et al. 2004) which contains literature syntheses on North American grassland birds. Game species and protected species were identified for the state.

Scientific names for plant and wildlife species discussed in this document are provided in Appendix A.

3.1.2 Affected Environment

3.1.2.1 Vegetation

Climate greatly affects vegetation type and the health and vigor of plants. The average length of the growing season, or freeze-free period, in South Dakota ranges from 228 days west of the Missouri River, 229 days for the far southern counties, 200 days for the far northern counties, and 204 days for counties east of the Missouri River (SDSU 2008a). Average annual precipitation ranges between 23 inches in the southeast to 18 inches in the northwest with two-thirds to three quarters of the rain falling between April and September (HPRCC 2008).

The vegetation in the two ecoregions contained within South Dakota is structurally very different. The Great Plains ecoregion is dominated by grass species while the Northwestern Forested Mountains contain a mixture of trees, shrubs, and grasses. Most of the current CRP lands in South Dakota are found within the Great Plains ecoregion with very little CRP in the Northwestern Forested Mountains ecoregion.

Great Plains Ecoregion

The Great Plains ecoregion of South Dakota contain tallgrass, mixed-grass, and shortgrass prairie. The mixed-grass prairie is a transition zone between tallgrass and shortgrass prairies, thus it is comprised of many species characteristic of other prairie types. Native warm season grasses are a dominant component of these grassland prairies and provide a greater benefit to wildlife (USDA/NRCS 1999a). Warm season grasses are generally perennial bunch grasses and peak growth occurs from June through August. Cool season grasses actively grow during cooler temperatures and are tolerant of cold temperatures. Table 3.1-1 identifies those species considered to be warm season and cool season grasses that potentially occur on CRP practices in South Dakota. These prairies have historically experienced a natural disturbance at an interval of three to five years in the form of fire. However, through settling and development of these prairies this historical disturbance has been suppressed (Umbanhowar 1996).

Tallgrass Prairie

The tallgrass prairie plant community is dominated by four common, grass species: big bluestem, indiangrass, switchgrass, and little bluestem. All four species are prevalent in mesic sites while big bluestem and indiangrass are most common on drier sites. Floodplains and bottomlands with mesic loamy soils are often dominated by switchgrass and big bluestem. While tallgrass prairie has been eliminated over much of the Great Plains Ecoregion, it extends across the Flint Hills Uplands, Osage Cuesta, the Glaciated Region, Chautauqua Hills, the Cherokee Lowlands and the Ozark Plateau of South Dakota. The western expanse of the tall grass prairie is dominated by grasses, while the eastern range is a mixture of prairie, woodlands, and forest. Natural fires have maintained this plant community type limiting the growth of woody plant species and favoring grass and forb species. In fire-protected valleys and bluffs, some woody shrub and trees species occur with cottonwood and willow in wet areas, and oak and hickory in dry areas.

Table 3.1-1. Cool and Warm Season Grass Species Potentially Occurring on CRP Fields in South Dakota.

GRASS SPECIES	
Cool Season	**Warm Season**
Bromegrass, meadow	Bermuda
Bromegrass, smooth	Bluestem, big
Fescue, tall	Buffalograss
Foxtail, creeping	Cordgrass, prairie
Green needlegrass	Crabgrass
Orchardgrass	Gamagrass, eastern
Red top	Grama, blue
Ryegrass, perennial/annual	Grama, sideoats
Small grains	Indiangrass
Timothy	Lovegrass, sand
Wheatgrass, crested	Millet, 'pearl'
Wheatgrass, intermediate	Reed canarygrass

Mixed-grass Prairie

As a transition zone, the mixed-grass prairie has a diverse species composition. Little bluestem and sideoats grama dominate many of the plant associations within this zone Little bluestem, western wheatgrass, tall dropseed, and sideoats grama dominate many of the plant associations within this zone. A large portion of the mixed-grass prairie in South Dakota has been converted to other land uses, especially crop land and introduced pasture. Fire suppression, heavy year-round grazing, introduced grasses and forbs, and the expansion of eastern redcedar are all factors influencing the change in species composition for this region.

Short-grass Prairie

Shortgrass prairie is comprised of several herbaceous plant associations with the dominant grass species being from the grama grass genera. Typically blue grama grass, buffalo grass, and western wheatgrass plant associations are found on well drained soils or rocky slopes. Blue grama/hairy grama dominate loamy or sandy soils; blue grama/buffalograss dominates clay soils. Livestock grazing, row crop farming, fire and climate are the primary factors influencing this conservation region.

Northwestern Forested Mountains Ecoregion

The Northwestern Forested Mountains ecoregion encompasses the Black Hills of southwest South Dakota. Ponderosa pine is the predominant tree; however, spruce may be found at higher elevations, as well as various hardwoods including aspen, bur oak, and birch. The understory is composed of a variety of vegetation, including buffaloberry, bearberry, Oregon grape, chokecherry and American black currant. Indian paintbrush, Missouri goldenrod, Mariposa lily, death camas and prairie smoke are all found in the wet meadows in the foothills, while the grasslands are found in the drier, treeless areas. Common grasses include little bluestem, buffalo grass, and wheat grass.

CRP Practices

The CRP practices that are eligible for managed haying and grazing have been planted with a variety of species dependent upon the conservation goal of the management applied to the field. These CPs include permanent native grasses, grasses already established, permanent wildlife habitat, and permanent covers to reduce salinity and permanent salt tolerant covers. Table 3.1-2 presents those species that are typically utilized for the respective CRP practices.

Table 3.1-2. Grass Species Typically Used For CRP Practices.

GRASS SPECIES	INTRODUCED LEGUME SPECIES
Bermuda	Alfalfa
Bluestem, Big	Birdsfoot Trefoil
Bluestem, Caucasian	Crownvetch
Bluestem, Little	Milkvetch Cicer
Bluestem, Sand	Red Clover
Bluestem, Yellow	Sweet Clover
Bromegrass, Meadow	White Clover
Bromegrass, Smooth	
Buffalograss	**NATIVE FORB SPECIES**
Canada Wildrye	False Sunflower
Fescue, Tall	Grayhead Prairie Coneflower
Foxtail, Creeping	Illinois Bundleflower
Gamagrass, Eastern	Maximilian Sunflower
Grama, Blue	Pitcher Sage
Grama, Sideoats	Prairie Coneflower
Green Needlegrass	Purple Prairieclover
Indiangrass	Roundhead Lespedeza
Lovegrass, Sand	Showy Partridgepea
Orchardgrass	Thickspike Gayfeather
Red Top	Other Native Forb Sources
Reed Canarygrass	
Sacaton, Alkali	
Sand Dropseed	
Sandreed, Prairie	
Switchgrass	
Timothy	
Wheatgrass, Crested	
Wheatgrass, Intermediate	
Wheatgrass, Pubescent	

Table 3.1-2. Grass Species Typically Used For CRP Practices (cont'd).

GRASS SPECIES	
Wheatgrass, Tall	
Wheatgrass, Western	
Wildrye, Russian	
Wildrye, Virginia	

Source: *Partial Source List of Grasses, Legumes, Native Forbs, and Wetland Plant Materials for South Dakota, Kansas and Oklahoma. USDA/*NRCS 1997 Plant Materials OK-16

3.1.2.2 Wildlife

South Dakota encompasses a wide array of habitat types that support a diverse wildlife population encompassing 625 vertebrate species (South Dakota Gap Analysis Program (SDSU 1997).

Mammals

South Dakota has 96 native species of mammals including one marsupial, ten insectivores (shrews and moles), 12 chiroptera (bats), five (lagomorphs) rabbits, 41 rodents, 21 carnivores, and seven artiodactyls (mule deer, white-tailed deer, elk, pronghorn, goat, and sheep). Two carnivores are now extirpated from, or thought to be extirpated from, the state: gray wolf and black-footed ferret. Two mammal species have been introduced to South Dakota; the house mouse and Norway rat. Ten native mammals, including three bat species, are in need of conservation according to the SDCWCP (Table 3.1-3).

Table 3.1-3. Mammal Species with Greatest Conservation Needs According to Ecoregion.

Great Plains Ecoregion	Northwestern Forested Mountains Ecoregion
Black-footed Ferret	Bear Lodge Meadow Jumping Mouse
Swift Fox	Northern Flying Squirrel
Franklin's Ground Squirrel	Fringe-tailed Myotis
Richardson's Ground Squirrel	Northern Myotis
Northern River Otter	Northern River Otter
Northern Myotis	
Fringed-tailed Myotis	
Townsend's big-eared bat	

Birds

It is estimated that South Dakota has 353 species of birds that breed, migrate, and/or winter in the state (SDGAP 1997). Sixty grassland bird species occur in South Dakota (Vickery et al. 1999) (Table 3.1-4).

Table 3.1-4. Grassland Bird Species that Occur in South Dakota.

Waterfowl	Barn Owl	Loggerhead Shrike
Northern Pintail	Long-eared Owl	Eastern Bluebird
Mallard	***Goatsuckers***	Mountain Bluebird
Blue-winged Teal	Common Nighthawk	Clay-colored sparrow
Green-winged Teal	Common Poorwill	Vesper Sparrow
Gadwall	***Wading birds***	Grasshopper Sparrow
American Widgeon	American Bittern	Savannah Sparrow
Northern Shoveler	***Dove***	Henslow's Sparrow
Upland game birds	Mourning Dove	Baird's Sparrow
Ring-necked Pheasant	***Shorebirds***	Le Conte's Sparrow
Greater Prairie-Chicken	Upland Sandpiper	Sprague's Pipit
Sharp-tailed Grouse	Long-billed Curlew	Lark Sparrow
Northern Bobwhite	Marbled Godwit	Brewer's Blackbird
Gray Partridge	Killdeer	Brown-headed Cowbird
Hawks and falcons	Willet	McCown's Longspur
Northern Harrier	Wilson's Snipe	Dickcissel
Swainson's Hawk	Wilson's Phalarope	Chestnut-collared Longspur
Ferruginous Hawk	***Passerines***	Bobolink
American Kestrel	Horned Lark	Lark Bunting
Merlin	Sedge Wren	Eastern Meadowlark
Prairie Falcon	Common Yellowthroat	Western Kingbird
Owls	Red-winged blackbird	Eastern Kingbird
Short-eared Owl	Western Meadowlark	
Burrowing Owl	Say's Phoebe	

Each grassland bird species has unique habitat requirements but general requirements are provided in Table 3.1-5. These are the basic requirements that should be evaluated when management of birds is being considered (USDA/NRCS 1999a).

Table 3.1-5. Grassland nesting Bird Habitat Requirements.

Habitat Component	Habitat Requirements
General	• Grasslands, crop/grassland/forb-mixed communities, prairies, meadows, hayfields, grazed pastures and rangelands, reverted agricultural fields, idle pastures and old fields, utility and roadway right-of-ways and other strip habitats, coastal grasslands, and other open herbaceous habitats.
Food	• Insects and other invertebrates • Fruits, seeds, and cultivated crops: wild berries, weed seeds, exotic grass seeds, seeds of sedges, corn, oats, wheat, barley, other small grain crops • Native grasses seeds: big bluestem, little bluestem, switchgrass, Indiangrass, green needlegrass, western wheatgrass, side-oats grama
Grassland obligate species	• Mixture of short, medium, and tall grass areas in large, unbroken grassland blocks with less than 5% woody vegetation cover. Native grasses provide optimal conditions, but introduced cool season grasses may also provide suitable habitats for many grassland birds.
Minimum Habitat size	• Minimum size of suitable nesting and breeding habitat required to support a breeding population of grassland birds varies among species. Depending on species habitat objectives, minimum habitat size may range from as little as 10 acres to as much as 500 acres or more. For grassland bird management, at least 40 acres of grassland should be available unless adjacent to larger grass habitat blocks.
Source: USDA/NRCS 1999a	

Grassland birds also vary in habitat preferences based on vegetation structure. Common grassland birds in South Dakota and their preferred vegetation association are presented in Table 3.1-6 (USDA/NRCS 1999a).

Table 3.1-6. Preferred Habitat of Grassland Birds in South Dakota.

Species	Preferred Grassland Growth Form			Avoids Woody Vegetation
	Short	Medium	Tall	
Upland sandpiper	x	x		x
Greater prairie-chicken	x	x		x
Sharp-tailed grouse	x			
Ring-necked pheasant		x	x	
Northern harrier			x	x
Short-eared owl		x		
Horned lark	x			x
Sedge wren			x	
Bobolink		x		
Eastern meadowlark		x		
Chestnut-collared longspur	x	x		
McCown's longspur	x			
Vesper sparrow	x			
Savannah sparrow	x	x		x
Grasshopper sparrow	x			x
Henslow's sparrow		x	x	x
Dickcissel		x	x	
Lark bunting	x	x		
American bittern			x	x
Blue-winged teal	x	x		x
Common yellowthroat		x	x	
Green-winged teal		x	x	
Mallard		x	x	
Mourning dove		x	x	
Northern pintail		x	x	
Red-winged blackbird		x		
Northern bobwhite	x			

Amphibians and Reptiles

Amphibians and reptiles in South Dakota include salamanders, toads, frogs, turtles, lizards, and snakes, totaling 49 species (SDSU 2008b). There are 11 amphibian and reptile species of greatest conservation need in the Great Plains ecoregion and one reptile of greatest conservation need in the Northwestern Forested Mountains ecoregion according to the SDCWCP.

Game Species

Game species in South Dakota include large game, furbearers, upland game birds, migratory game bird, and waterfowl. Table 3.1-7 presents the groups of hunted species that will be analyzed in relation to the potential effects on them due to managed haying and grazing on eligible CRP lands.

Invertebrates

A wide diversity of terrestrial insects exists on grasslands. Adequate inventory and distribution information is unavailable for predicting status and trends for most invertebrates (Mac et al. 1998). Limited information on the insect species of South Dakota indicates that the following insect orders may be affected to some extent by changed grazing and haying practices: Lepidoptera, Orthoptera, Ephemeroptera, Collembola, Odonata, and Hemiptera. Although these orders cover a large number of species in South Dakota (181 species of Orthoptera alone in the northern great plains; Fauske 2002) and widely varying life cycles, most are active through the summer months from as early as April into October and later in some cases. There are, additionally, one endangered species listed for the state of South Dakota; the American burying beetle (also federally endangered [FE]) is active from April through September (USDOI/USFWS 1991).

3.1.3 Protected Species

Federal and State listed species are protected at the Federal level by the Endangered Species Act (ESA) and at the State level by the South Dakota statutes ST 34A-8-1-13 and CL 34A-8-1-13. In South Dakota, seven wildlife species are considered endangered or threatened by the USFWS in accordance with the ESA. Fourteen species are considered endangered or threatened by the State of South Dakota. Only one plant species, the Western prairie fringed orchid (*Platanthera praeclara*) is classified as threatened by USFWS.

Critical habitat designations as defined by ESA for one species, the piping plover occurs in the State. South Dakota prairie alkali wetlands and surrounding shoreline; river channels and associated sandbars and islands; and reservoirs and inland lakes and their sparsely vegetated shorelines, peninsulas, and islands. Areas within 120 feet of a waterbody have been excluded for managed haying and grazing, therefore these areas will not be impacted.

Twenty-three species considered federal or state endangered may occur on CRP fields in South Dakota that are eligible for managed haying and grazing (Table 3.1-8).

Table 3.1-7. Grouping of Game Species to be Analyzed for Potential Effects.

Mammals	**Birds**
Big Game	*Waterfowl/Waterbirds*
Elk	Ducks
Mule deer	Geese
White-tailed deer	Rails
Pronghorn antelope	Coots
Bighorn sheep	Mergansers
Small Game	*Upland Gamebirds*
Rabbits/hares	Woodcock
Squirrels	Wilson's snipe
Opossum	Ring-necked pheasant
Furbearers	Turkey
Raccoon	Quail
Red fox	Sharp-tailed grouse
Gray fox	Greater prairie-chicken
Bobcat	Lesser prairie-chicken
Badger	*Migratory Birds*
Long-tailed weasel	Mourning dove
Striped skunk	American crow
Mink	
Spotted Skunk	
Least weasel	
Beaver	
Muskrat	
Mountain lion	
Coyote	
Black-tailed jackrabbit	
White-tailed jackrabbit	

Table 3.1-8. Federal and State Protected Species of South Dakota.

Species	Federal Status	State Status
Mammals		
Black-footed ferret	Endangered	Endangered
Gray wolf	Endangered	
Swift fox		Endangered
Northern river otter		Threatened
Birds		
American dipper		Threatened
Eskimo curlew	Endangered	Endangered
Interior least tern	Endangered	Endangered
Whooping crane	Endangered	Endangered
Bald eagle	Delisted	Threatened
Piping plover	Threatened	Threatened
Peregrine falcon	Delisted	Endangered
Amphibians and Reptiles		
Eastern hognose snake		Threatened
False map turtle		Threatened
Lined snake		Endangered
Invertebrates		
American burying beetle	Endangered	Endangered
Plants		
Western Prairie Fringed Orchid	Threatened	Threatened

3.2 WATER RESOURCES

3.2.1 Definition of the Resource

Water resources within the United States are protected by the Clean Water Act (CWA) (33 USC 26 parts 1251 et seq., 2000). The Act is jointly enforced by EPA and the U.S. Army Corps of Engineers, with final authority resting with the EPA. The Act was created to protect stream and wetland water quality. It established the basic structure for regulating discharges of pollutants into the waters of the United States It gave EPA authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters. The CWA made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. In conjunction with this broad goal, the 404b(1) guidelines require that all projects avoid or minimally impact waters of the U.S. Waters of the U.S. include rivers, streams, estuaries, coastal waters, and wetlands (wet meadows, swamps, bogs, etc.).

3.2.2 Affected Environment

3.2.2.1 Surface Water Quality

This section characterizes existing water resources, focusing on water quality statewide and highlighting impaired and notable waterbodies. Information for this section was compiled from data assessments prepared by the EPA Water Quality Criteria Program and the South Dakota's Department of Environment and Natural Resources (SDDENR). South Dakota has 14 river basins: Bad, Belle Fourche, Big Sioux, Cheyenne, Grand, James, Little Missouri, Minnesota, Missouri, Moreau, Niobrara, Red, Vermillion, and White. These basins consist of 95,130 miles of streams and 570 lakes, which encompass 204,987 acres.

The Bad basin drains 3,151 square miles and includes six counties in the west-central region of the state (SDDENR 2008). Historically, there is a lack of consistent river flow in this basin. There are often low flow conditions in the lower reaches of the Bad River. One stretch of river and three lakes have been assessed as Category 5 – impaired.

The Belle Fourche basin drains approximately 3,200 square miles and lies in the western portion of the state (SDDENR 2008). There are four counties that are part of the basin. Fourteen stretches of river and two lakes have been assessed as Category 5 – impaired.

The Big Sioux basin drains approximately 4,280 square miles in South Dakota and an additional 3,000 square miles in Minnesota and Iowa (SDDENR 2008). This large basin includes 17 counties in the eastern portion of the state and the lower reaches of the Big Sioux River form the border with Iowa. A total of 30 stretches of river and 14 lakes in the basin have been assessed as Category 5 – impaired.

The Cheyenne basin drains approximately 16,500 square miles and nine counties in the southwestern portion of the state (SDDENR 2008). Twenty-six stretches of river and nine lakes in the basin have been assessed as Category 5 – impaired.

The Grand basin drains 5,680 square miles of northwest South Dakota and southwest North Dakota and includes five counties in South Dakota (SDDENR 2008). Six stretches of river and three lakes have been assessed as Category 5 – impaired.

The James basin covers parts of 23 counties in southeast South Dakota. This basin reaches from the northern to southern borders of the state and drains approximately 12,000 square miles of east-central South Dakota (SDDENR 2008). Fourteen stretches of river and nine lakes have been assessed as Category 5 – impaired.

The Little Missouri basin is located in the northwestern corner of South Dakota, is composed of two counties, and drains only 605 square miles in the state (SDDENR 2008). The Little Missouri River enters from Montana and leaves South Dakota to North Dakota. There is only one water quality monitoring site in the South Dakota portion of this basin, located on the Missouri River.

There are no assessment or implementation projects needed, since the Little Missouri River has no impairments.

The Minnesota basin drains 1,572 square miles of northeast South Dakota (SDDENR 2008). It encompasses six counties. One stretch of river has been assessed as Category 5 – impaired.

The Missouri basin includes 30 counties from north-central to southeastern South Dakota (SDDENR 2008). The Missouri River enters the state from North Dakota and receives flow from the Grand, Moreau, Cheyenne, Bad, White, James, Vermillion, Niobrara, and Big Sioux River Basins while in South Dakota. Five stretches of river and 11 lakes have been assessed as Category 5 – impaired.

The Moreau basin drains 5,037 square miles from seven counties in the northwest portion of South Dakota (SDDENR 2008). Five stretches of river and one reservoir have been assessed as Category 5 – impaired.

The Niobrara basin drains three counties and approximately 2,000 square miles in the south-central part of South Dakota (SDDENR 2008). One stretch of river and one lake have been assessed as Category 5 – impaired.

The Red basin includes two counties in the northeastern corner of South Dakota. The basin drains only 600 square miles of the state (SDDENR 2008). There are no impaired rivers, and one lake assessed as Category 5 – impaired.

The Vermillion basin drains 13 counties and 2,652 square miles of southeastern South Dakota (SDDENR 2008). There are two stretches of river and four lakes assessed as Category 5 – impaired.

The White basin includes eight counties of the southern border area of South Dakota (SDDENR 2008). The total drainage area for the basin is 8,250 square miles. Six stretches of river and zero lakes have been assessed as Category 5 – impaired.

Water Quality Assessment Programs

There are eight programs in South Dakota that target various aspects of surface water quality monitoring. These are administered by SDDENR's Water Quality Program.

Major causes of nonsupport of stream contamination include agricultural nonpoint sources and natural origin. The major cause of lake contamination is primarily due to agricultural nonpoint source pollution. The majority of impaired mileage for streams is a result of total suspended solids, fecal coliform, and water temperature (SDDENR 2008). The majority of impaired acreage for lakes is a result of excessive nutrients, algae, and siltation (SDDENR 2008).

3.3 SOIL RESOURCES

3.3.1 Definition of the Resource

Soil taxonomy was established to classify soils according to the relationship between soils and the factors responsible for their character (USDA/NRCS 1999b). Soil taxonomy has ordered soils into four levels of classification, the highest being the soil order. For the purposes of this analysis, soil resources include all soil orders within the State of South Dakota.

3.3.2 Affected Environment

The affected environment for soil orders includes the entire state of South Dakota. A large area of South Dakota, found mostly in the southwestern part of the state, has been classified by the NRCS as part of the Western Great Plains Range and Irrigated Region. The dominant soils in this region are Entisols and Mollisols, although Alfisols, Aridisols, Inceptisols, and Vertisols are markedly present as well. The main soil resource concerns in the region are overgrazing and wind and water erosion (USDA/NRCS 2006a).

Two sizable areas of South Dakota, in the north in the western half of the state and running from north to south in the eastern half of the state, have been classified by NRCS as part of the Northern Great Plains Spring Wheat Region, in which the predominant soils are Mollisols. Major soil resource concerns in this region include reduced nutrient content, increasing salinity, and wind and water erosion (USDA/NRCS 2006a).

An area in eastern South Dakota, along the Minnesota and Iowa borders, has been classified by NRCS as part of the Central Feed Grains and Livestock Region. In this region, the dominant soils are Alfisols, Entisols, Inceptisols, or Mollisols. The major soil resource concern in the region is water erosion (USDA/NRCS 2006a).

The section below provides a more detailed description of each soil order within the state excerpted from *The Nature and Property of Soils* by Nyle C. Brady (1990) and *Soil Taxonomy. A Basic System of Soil Classification for Making and Interpreting Soil Surveys* by NRCS (1999b).

3.3.3 Soil Orders

Alfisols

Alfisols are moist mineral soils having no mollic epipedon or oxic or spodic horizons (Brady 1990). They have gray to brown surface horizons, medium- to high-base status, and contain an illuvial horizon in which silicate clays have accumulated (Brady 1990). Alfisols are formed in cool to hot humid areas but are also found in the semiarid tropics (Brady 1990). Most often Alfisols are developed under native deciduous forests, although in some cases grass is the native vegetation (Brady 1990). In general, Alfisols are productive soils (Brady 1990). In the United States these soils rank favorably with the Mollisols and Ultisols in their productivity (Brady 1990).Alfisols within South Dakota are found on the western side of the state.

Aridisols

Aridisols are dry soils which are characterized by a generally light colored, low in organic matter, ochric epipedon (Brady 1990). Calium carbonate, gypsum, soluble salts, and sodium commonly accumulate in these soils (Brady 1990). Conventional crop production generally cannot be carried out in Aridisols due to low moisture during most of the year, except in areas with groundwater or irrigation (Brady 1990). Even in areas with groundwater, Aridisols are not often productive for crops to due to the accumulation of soluble salts to levels that most crop plants cannot tolerate (Brady 1990). However, in carefully managed areas with irrigation, Aridisols may be highly productive. Andisols were identified in the NRCS soils database for a very small area of South Dakota (USDA/NRCS 1999b).

Entisols

Entisols are weakly developed mineral soils without natural genetic (subsurface) horizons or with only the beginnings of such horizons (Brady 1990). The only features common to all soils of the order are the virtual absence of diagnostic horizons and the mineral nature of the soils (USDA/NRCS 1999b). Soils of this order are found in a wide variety of environmental conditions (Brady 1990). The agricultural productivity of Entisols varies greatly depending upon their location and properties (Brady 1990). With adequate fertilization and a controlled water supply, some Entisols are quite productive; in fact, Entisols developed on alluvial floodplains are among the world's most productive soils (Brady 1990). However, restrictions on the depth, clay content, or water balance of most Entisols limit the intensive use of large areas of these soils (Brady 1990). Entisols are found scattered throughout the western half of South Dakota, with a small area of Entisols in the southwest part of the State.

Inceptisols

The central concept of Inceptisols is that of soils of humid and subhumid regions that have altered horizons that have lost bases or iron and aluminum but retain some weatherable minerals (USDA/NRCS 1999b). The order of Inceptisols includes a wide variety of soils which in some areas are soils with minimal development, while in other areas they are soils with diagnostic horizons that merely fail the criteria of the other soil orders (USDA/NRCS 1999b). The horizons of Inceptisols are thought to form quickly and result mostly from the alteration of parent materials (Brady 1990). These soils range from very poorly drained to excessively drained (USDA/NRCS 1999b). Inceptisols commonly occur on landscapes that are relatively active, such as mountain slopes, where erosional processes are actively exposing unweathered materials, and river valleys, where relatively unweathered sediments are being deposited (USDA/NRCS 1999b).There is considerable variability in the natural productivity of Inceptisols (Brady 1990). Inceptisols occur in small areas of South Dakota, with the largest area occurring in the southwest quadrant of the State.

Mollisols

Mollisols commonly are the very dark colored, base-rich, mineral soils of the steppes (USDA/NRCS 1999b). Many of these soils developed under grass at some time, although many apparently were forested at an earlier time (USDA/NRCS 1999b). This soil order characterizes a larger land area in the United States than any other soil order and includes one of the world's most important agricultural soils (Brady 1990). In frigid or warmer areas where slopes are not too steep, Mollisols are used mainly for small grain in the drier regions and maize (corn) or soybeans in the warmer, humid regions (USDA/NRCS 1999b). Mollisols are found throughout much of

South Dakota, particularly in the eastern half of the state and in the north on western part of the State.

Vertisols

The Vertisols order of mineral soils is characterized by a high content (>30 percent) of sticky or swelling-and-shrinking-type clays to a depth of 1m, which in dry seasons causes the soils to develop deep, wide cracks (Brady 1990). A significant amount of material from the upper part of the profile may slough off into the cracks, giving rise to a partial "inversion" of the soil (Brady 1990). Vertisols make up a relatively homogeneous order because of the amounts and kinds of clay common to them (USDA/NRCS 1999b). Vertisols are found mostly in subhumid to semiarid environments and where the average soil temperatures are higher than 8°C (Brady 1990). These soils generally are sticky in the wet season and hard in the dry season, so they require special cultivation practices regardless of whether modern equipment or traditional implements, such as a hoe or bullock-drawn plow, are used (USDA/NRCS 1999b). Despite their limitations, Vertisols are widely tilled, but the yields are generally low (Brady 1990). Vertisols are found scattered throughout central and western South Dakota.

3.4 AIR QUALITY (CARBON SEQUESTRATION)

3.4.1 Definition of the Resource

The Clean Air Act (CAA) requires the maintenance of National Ambient Air Quality Standards (NAAQS). NAAQS, developed by the EPA to protect public health, establish limits for six criteria pollutants: ozone (O3), nitrogen dioxide (NO2), carbon monoxide (CO), sulfur dioxide (SO2), lead (Pb), and inhalable particulates (course particulate matter greater than 2.5 micrometers and less than ten micrometers in diameter [PM_{10}] and fine particles less than 2.5 micrometers in diameter [$PM_{2.5}$]). The CAA requires states to achieve and maintain the NAAQS within their borders. Each state may adopt requirements stricter than those of the national standard. Each state is required by EPA to develop a State Implementation Plan (SIP) that contains strategies to achieve and maintain the national standard of air quality within the State. Areas that violate air quality standards are designated as non-attainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants. The CRP PEIS (USDA/FSA 2003b) evaluated the effects of the program on air quality. This EA tiers from the CRP PEIS and limits the analysis of air quality to the impacts of managed haying and grazing on carbon sequestration, the aspect of air quality with the most potential to be affected by the alternatives considered.

3.4.2 Affected Environment

3.4.2.1 Carbon Sequestration

Air quality in the broadest sense is the atmosphere's capability to sustain healthy life directly through respiration of living organisms and indirectly by buffering the earth from extreme temperature variations. As scientists and the public became more concerned with climate change and the impact that human derived air pollutants were having on global temperature, the EPA identified carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) as the key greenhouse gases effecting warming temperatures. While each of these gases occurs naturally in the atmosphere, human activity has significantly increased the concentration of these gases since the beginning of the industrial revolution. The level of human produced gases accelerated even more so after the end of the Second World War, when industrial and consumer consumption flourished. With the advent of the industrial age, there has been an increase 36 percent in the concentration of CO2, 148 percent in CH4, and 18 percent inNO2 (USDOI/EPA 2008).

Since carbon dioxide and methane are two of the key gases most responsible for the "Greenhouse Effect," scientists and policy makers are interested in carbon gases and how they may be removed from the atmosphere and stored. The process of carbon moving from atmosphere to the earth and back is referred to as the carbon cycle. Simplified components of the carbon cycle are (1) conversion of atmospheric carbon to carbohydrates through the process of photosynthesis, (2) the consumption of carbohydrates and respiration of CO2, (3) the oxidation of organic carbon creating CO2, and (4) the return of the CO2 to the atmosphere. Carbon can be stored in four main pools other than the atmosphere: (1) the earth's crust, (locked up in fossil fuels and sedimentary rock deposits) (2) the oceans where CO2 is dissolved and marine life creates calcium carbonate shells, (3) in soil organic matter (SOM), and (4) within all living and dead organisms that have not been converted to SOM. These pools can store or sink carbon for long periods, as in the case of carbon stored in sedimentary rock and in the oceans. Conversely, carbon may be held for as short a period as the life span of an individual organism. Humans can affect the carbon cycle through activities such as the burning of fossil fuels, deforestation, or releasing soil organic carbon (SOC) through land disturbing activities.

The process of storing of carbon in the ecosystem is called carbon sequestration. Carbon sequestration includes storing carbon in trees, plants and grasses (biomass) in both the above ground and the below ground plant tissues, and in the soil. Soil carbon can be found in the bodies of microorganisms (fungi, bacteria, etc.), in non-living organic matter, and attached to inorganic minerals in the soil.

Currently, the carbon cycle is skewed with more carbon being released to the atmosphere than being removed from the atmosphere. It is estimated that atmospheric carbon is increasing at a rate of 6.1 gigatons per year. Kansa State University (KSU) researchers state that approximately 61 to 62 gigatons of carbon are released back into the atmosphere each year from the oxidation of SOM while approximately 60 gigatons of carbon are sequestered in the soil from the atmosphere. This leads to a net gain of approximately one to two gigatons of carbon per year into the atmosphere. This increase exacerbates the problem of carbon gases and their affect on global temperatures (Rice 2002).

Soil organic carbon is primarily lost to the atmosphere through the oxidation of SOM exposed to the air through land tillage operations. Soil erosion is another potential source of carbon loss. The total amount of carbon stored in the soil as organic carbon is estimated to be about equal to the sum of the carbon in the atmosphere and in all plant and animal life combined. Soil capacity to sequester carbon plays a significant role in reducing greenhouse gases.

Soil carbon is exchanged between the soil and the atmosphere in a cycle that is overwhelmingly driven by photosynthesis. Soil carbon increases cation exchange capacity, water holding capacity, and the structural stability of clays and silt containing soils. Soil organic matter buffers the soil from major swings in pH. The amount of carbon stored in the soil depends on the balance between the addition of carbon (plant tissue) and the loss of carbon back to the atmosphere through mineralization and oxidation as well as microbial respiration. Of the carbon returned to the soil as plant residue, about five to 15 percent becomes tied up in the bodies of organisms and 60 to 75 percent is respired as CO2 back to the atmosphere. Only ten-25 percent is converted to SOM. Increasing photosynthesis rates will result in more carbon sequestration; however, increasing carbon fixation alone is not enough as carbon must be fixed in long-lived pools.

Soil carbon losses can be lessened through reductions in soil disturbance (reduced tillage), vegetative cover fertilization, irrigation, improved grazing practices and proper haying. Vegetative cover fertilization increases biomass and subsequently increases total photosynthesis activity. Irrigation results in more biomass and photosynthesis activity in areas of insufficient rainfall for maximum vegetative growth. Improved grazing practices that do not stunt plant growth by the excessive loss of leaf area and subsequent reduction in stored carbohydrates can induce new leaf growth, which have a higher photosynthesis efficiency than older leaves. Proper haying can have a similar positive effect on carbon sequestration if the haying does not stress the vegetation by removal of excessive leaf tissue, damage the apical meristem or result in excessive removal of stored energy reserves. More frequent forage removal keeps plants from reaching a slower growth phase associated with leaf maturation (Gifford and Marshall 1973). Approximately 50 percent of the SOC has been lost over the last 100 years due to soil cultivation practices (Rice 2002). In general, tillage disturbances decrease SOC, permanent grass increases SOC, and the use of legumes increases SOC even more (Bremer et al. 2002).

Individuals can implement management and conservation practices that enhance carbon sequestration on their own properties; however, carbon sequestration needs to take place at the landscape scale to have an impact on greenhouse CO2 reduction. Large scale agricultural sector adoption of carbon sequestration practices can significantly offset CO2 emissions caused by fossil fuel burning. CRP contract lands provide the optimal conditions for landscape level ecosystem carbon sequestration to occur. The total carbon sequestration potential of United States cropland is estimated to be 170 million tons of carbon per year (USDA/ERS 2004).

For CRP, current literature documents carbon sequestration rates derived from modeled simulations. Modeling estimates indicate rates of carbon sequestration for the western and central United States are less than 90 to 360 pounds per acre per year (lbs/ac/yr) of SOM and 220 to 1200 lbs/ac/yr of total below ground carbon, including roots. Some estimates suggest that about 450 and 580 lbs/ac/yr below ground carbon are sequestered under the CRP as SOC in the 0-2 and 0-4 inch depths, respectively. Research reported in 1994 at five sites across Texas, Kansas, and South Dakota indicated that 710 and 980 lbs/ac/yr of SOC were sequestered in the 0-6 and 0- 47 inch depths under CRP (Follet 2002). The USDA funded study conducted by the Food and Agricultural Policy Research Institute (FAPRI) of the University of Missouri-Columbia, reported an average gain of soil carbon rate of 1400 lbs/ac/yr. Using a conservative value of 220 pounds per acre (lbs/ac) of SOC the South Dakota managed haying and grazing eligible acres would result in the addition of 3,599 tons of sequestered carbon each year.

The potential for carbon sequestration is generally correlated positively with increasing rainfall. It follows that the potential for carbon sequestration in South Dakota increases from west to east. Soil texture impacts the carbon sequestration potential of the land. Finer textured soils can sequester more carbon than coarse textured soils; therefore, sandy soils have a lower potential for carbon sequestration than finer textured soils. Landscape position influences the location of the fine textured soils and the moisture regime. Silt and clay fractions of the soil (the fines) tend to be found at the lower position in the landscape. These areas are found along floodplains. These same areas of the landscape typically have more available water for plant utilization, generally resulting in an environment with a higher carbon sequestration potential than lands found higher in the landscape.

Soils inherently have a fixed capacity for carbon sequestration. All other things being equal, the greatest potential for increased carbon sequestration rates is on lands that have been mismanaged and therefore experienced excessive depletion of stored soil carbon (Conant 2008). Soils falling into the highly erodible land (HEL) category, which is necessary for enrollment into CRP, often fit this description. Given the potential for carbon sequestration in HEL soils and the large acreage of CRP lands, the CRP program offsets significant levels of carbon emissions resulting in cleaner air, and consequently, contributes to the reduction of global warming.

3.5 SOCIOECONOMICS

3.5.1 Definition of the Resource

Socioeconomic analyses generally include detailed investigations of the prevailing population, income, and employment conditions of a community or Region of Influence (ROI). The socioeconomic conditions of a ROI could be affected by changes in the rate of population growth, changes in the demographic characteristics of a ROI, or changes in employment within the ROI caused by the implementation of the action alternatives.

Socioeconomic resources within this document include total population, rural population, total number of farms, and acreage eligible for the managed haying and grazing provisions within the State. These areas identify the components essential to describe the broad-scale demographic and economic components of the statewide effected agricultural population. Information in this section is being tiered from the 2003 Final Programmatic Environmental Impact Statement (PEIS) for the CRP and updated as necessary for a complete evaluation (USDA/FSA 2003b). Additionally, outdoor recreational activities within the State are being identified as to their overall monetary and non-monetary societal benefits.

3.5.2 Affected Environment

3.5.2.1 General Population Characteristics

Population

South Dakota had a population of approximately 750,000 persons in 2000 with approximately 51.9 percent (390,000 persons) living in urban areas (U.S. Department of Commerce, U.S. Census Bureau [USDC/USCB] 2002). Of the population living in rural areas, 16.0 percent (58,000 persons) lived on farms. The 2006 American Community Survey (ACS) (USDC/USCB 2006) indicated that the population of South Dakota had increased approximately 4.3 percent between 2000 and 2006.

Personal Income and Earnings

Economic characteristics from the 2006 ACS indicate a median household income (MHI) of $35,282 (84.0 percent of the nationwide MHI) and a per capita income (PCI) of $17,562 (81.4 percent of the nationwide PCI), both slightly lower than the nationwide levels. Table 3.5-1 illustrates data from the Bureau of Economic Analysis (BEA) for earnings by place of work between 2001 and 2006. The BEA defines earnings as the sum of three components of personal income-wage and salary disbursements, supplements to wages and salaries, and proprietors' income. Personal income across the state has increased approximately 23.6 percent between 2001 and 2006 at an average annual rate of approximately of 4.3 percent (USDC/BEA 2008a). Farm proprietors' income has fluctuated widely during the period, while nonfarm proprietors' income has increased at an average annual rate of 5.4 percent. Likewise, farm household earnings have also fluctuated. The agriculture and forestry support activities earnings have maintained a growth in earnings at an average annual rate of 4.6 percent.

Employment

The Bureau of Labor Statistics (BLS) compiles current and historic data on the labor force, the number of persons employed, the number of persons unemployed, and the unemployment rate. Between 2000 and 2007, the State increased the total nonfarm labor force by approximately 2.7 percent to approximately 520,000 persons (U.S. Department of Labor [USDL]/BLS 2008b). During this period the labor force grew at an average annual rate of approximately 0.5 percent per year. The unemployment rate increased 0.3 percentage points to 3.0 percent in 2007 (USDL/BLS 2008b). This was a decline from the higher levels between 2002 and 2005, when the unemployment rate was between 3.1 and 3.7 percent.

Table 3.5-1. Personal Income and Earnings for Selected Categories in the State of South Dakota from 2001-2006.

Earning Measures	2001	2002	2003	2004	2005	2006
	($0,000) unless otherwise indicated					
Personal income	20,429,499	20,595,878	22,385,746	23,853,345	24,615,707	25,254,517
Population (persons)	758,852	761,995	766,882	774,129	780,046	788,467
Per capita personal income (dollars)	26,922	27,029	29,191	30,813	31,557	32,030
Farm proprietors' income	714,835	130,852	1,145,183	1,287,032	1,012,785	288,066
Nonfarm proprietors' income	1,807,195	1,824,274	1,907,948	2,110,744	2,270,102	2,346,529
Farm earnings	863,497	266,025	1,243,882	1,434,282	1,161,926	436,293
Nonfarm earnings	13,832,156	14,461,630	15,122,143	16,116,870	16,943,848	17,860,246
Agriculture and forestry support activities	74,448	69,800	73,031	79,957	85,336	92,449

Note: BEA definitions

Farm Earnings are comprised of the net income of sole proprietors, partners and hired laborers arising directly from the current production of agricultural commodities, either livestock or crops. It includes net farm proprietors' income and the wages and salaries, pay-in-kind, and supplements to wages and salaries of hired farm laborers; however, specifically excludes the income of non-family farm corporations.

Source: USDC/BEA 2008a. Adapted from Table CA05N - Personal Income and Detailed Earnings by Industry – South Dakota

The BEA also tracks employment characteristics at the farm and nonfarm levels. Table 3.5-2 illustrates the employment levels between 2001 and 2006 for the State. These data indicate a continuing loss of farm employment during this period, while nonfarm employment has increased since 2001.

3.5.2.2 General Agricultural Characteristics

The National Agricultural Statistic Service (NASS) estimated that there were approximately 31,300 farms with approximately 43.7 million acres of land in farms in the State in 2007 (USDA/NASS 2008a). The FSA 2007 Annual Summary of the CRP detailed that there were 14,817 South Dakota farms (47.3 percent of the total number of farms) with 1.6 million acres (approximately 3.7 percent of the total land in agriculture) in CRP practices (USDA/FSA 2008b).

As detailed previously, there are a subset of accepted practices that are eligible for inclusion under the managed haying and grazing provisions. As of September 2008, there were approximately 0.8 million acres of CRP eligible practices in the State (USDA/FSA 2008a). Data also indicates that approximately 83,000 acres enrolled in managed haying and grazing contracts

Table 3.5-2. Farm/Nonfarm Employment in the State of South Dakota between 2001 – 2006.

Type of Employment	2001	2002	2003	2004	2005	2006
Total	517,285	519,394	518,248	529,965	542,401	555,921
Farm	37,337	37,301	35,076	36,164	36,067	35,892
Nonfarm	479,948	482,093	483,172	493,801	506,334	520,029

Source: USDC/BEA 2008b – Adapted from Table CA25N – Total Employment by Industry – South Dakota

on eligible CRP acreage in South Dakota were enrolled in managed haying and grazing activities between 2004 and 2006 (USDA/FSA 2008c). The total acreage in these activities accounted for approximately 6.2 percent of total CRP acreage in 2008.

In 2007, the State produced an estimated $5.3 billion in value of production in field and miscellaneous crops on approximately 16.5 million acres (USDA/NASS 2008b). Table 3.5-3, from the South Dakota Annual Statistics Bulletin 2008, indicates the various ranking for agricultural products produced in the State. Based on the 2002 Agricultural Census, the State was ranked as the 21st largest state in terms of total agricultural products sold with a value of $3.8 billion (USDA/NASS 2008c). In 2006, that cash receipts for agricultural products were in excess of $5.1 billion, ranking South Dakota as the 19th largest producer in the United States (USDA/NASS 2008c). In terms of nominal state gross domestic product (NGDP) the agricultural industry generated on average between 2004 to 2006, $2.0 billion to the South Dakota NGDP, approximately 6.4 percent of the total (USDC/BEA 2008c). Crop and livestock production accounted for approximately $1.9 billion (6.1 percent of the total South Dakota NGDP). The agricultural industry had an average rank of six out of 19 major industry groups in South Dakota in terms of contribution to the NGDP.

South Dakota ranked as the 8th largest state in all cattle inventory in the United States in 2007, with approximately 3.7 million head (USDA/NASS 2008c). South Dakota was the fifth largest state for beef cows that calved with 1.6 million head, and the seventh largest producer in terms of cattle on feed in all feedlots (0.4 million head) in 2007 (USDA/NASS 2008c). In 2007, there were approximately 16,700 cattle operations in the State (USDA/NASS 2008g). This was a decline of approximately 12.1 percent from 2002 (USDA/NASS 2008g). Approximately 49.1 percent of the operations (8,200 operations) had between 100-499 head of cattle per operation (USDA/NASS 2008g) in 2007. The next largest category was operations that had less than 50 head of cattle (24.0 percent). The primary decline between 2002 to 2007 in cattle operations occurred in the 50-99 head category with a decline of approximately 26.5 percent (USDA/NASS 2008g). Only larger scale operations saw an increased in the number of operations.

In 2007, approximately 3.8 million acres were harvested for hay with an average production of 2.0 tons per acre (USDA/NASS 2008b). Approximately 7.5 million tons of hay were produced in 2007 with an estimated value of production at $698 million, ranking South Dakota as the third

Table 3.5-3. South Dakota 2007 Agricultural Facts.

Rank	Commodity & Date	Number ('000)	Unit	% of US Total
3	All Hay	7,500.0	tons	7.0
2	Alfalfa Hay	5,100.0	tons	5.0
7	All Other Hay	2,500.0	tons	3.2
8	All Cattle & Calves, 01 January 2008	3,700.0	head	3.8
5	Beef Cows that Calved	1,644.0	head	5.1
7	Cattle/Calves on Feed – All Feedlots	400.0	head	2.3
5	All Sheep and Lambs	355.0	head	5.9
1	Bison, 31 December 2002	40.2	head	17.3

Source*:* USDA/NASS 2002, USDA/NASS 2007, USDA/NASS 2008c. 2008 South Dakota Annual Statistics Bulletin. USDA/NASS 2008d, USDA/NASS 2008e, USDA/NASS 2008f,

largest hay producer in the United States. The USDA/NASS (2008c) estimates that the average value per acre of pastureland in the state was $420 in 2007 with an average rental rate $13.80 per acre depending upon the region. Cropland was valued at an average of $1,700 per acre for irrigated lands and $1,240 per acre for nonirrigated lands (USDA/NASS 2008c). The average rent per acre for nonirrigated cropland was $56.50 (USDA/NASS 2008c).

The 2003 National Resources Inventory indicated that the State contained approximately 24.5 million acres of private grazing lands (USDA/NRCS 2007a). Private grazing fees have increased from $18.00 to $23.00 per head during the period from 2003 to 2007 (27.8 percent increase) while grazing fees per animal unit have increased approximately 24.3 percent from $16.90 to $21.00 per animal unit (USDA/NASS 2008c).

3.5.2.3 General Outdoor Recreation Characteristics

In 2008, the U.S. Fish and Wildlife Service published the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Department of Interior [USDOI] and USDC 2008). Surveys were conducted at national and state levels. The 2006 Survey found that approximately 600,000 South Dakota residents and nonresidents older than 16 participated in fishing, hunting, or wildlife watching activities. It was estimated that 300,000 persons either fished, hunted, or both and that 400,000 persons took part in wildlife watching activities. These participants spent approximately $550 million on wildlife related recreation in the State. Anglers spent on average $971 per person with an average trip expenditure of $35 per day. Hunters spent on average $1,075 per person with an average per trip expenditure of $68 per day. Wildlife watching participants spent on average $418 per person with an average per trip expenditure per day of $94. The 2006 survey indicated that the majority of hunters (56 percent) participated in hunting activities on private lands alone. Approximately 24 percent of hunters hunted on a combination of public and private lands, and 16 percent hunted on public land alone. The 2006 survey indicated that the majority of hunters (78 percent) participated in hunting activities for small game, while about 39 percent of the hunters participated in big game hunting with hunting migratory birds at a lesser extent (17 percent). Data indicates that a subset of hunters hunted more than one class of game during the year.

Big game species in South Dakota include turkey, antelope, deer, mountain lion, elk, bighorn sheep and mountain goat. Small game species include pheasants, grouse, partridge rabbit, and squire. Migratory waterfowl include a wide list of species, including goose, swan, and duck.

Southwick Associates, Inc. and D.J. Case & Associates (Southwick 2008) undertook a survey of 4,000 CRP randomly selected participants throughout the United States to understand how CRP acreage was being used for recreational purposes. A response rate of 74 percent was recorded for these surveys. Southwick (2008) found that 57 percent of the respondents allowed some portion of their CRP acreage to be used for recreational purposes. Within those that allowed their CRP acreage to be used for recreational purposes, the most common uses were hunting (89 percent), wildlife viewing (44 percent), hiking (23 percent), fishing (seven percent), and various other recreational uses. Ten percent of the affirmative CRP participants received income from the recreational use of their CRP acreage. Other conclusions of the study found that CRP enrollment has an indirect effect in determining whether to lease property for recreational purposes. Southwick (2008) found that on average, CRP participants received $1.90 per acre before enrollment. After enrollment that average increased to $6.13 per acre. Southwick (2008) extrapolated this result to indicate that if all CRP acreage was used to generate recreational income, the approximately 36.0 million acres would generate $28.9 million. Without CRP, Southwick (2008) estimates that value to be approximately $7.6 million, approximately $21 million less than the CRP enrollment.

Sullivan et al. (2004) indicated that CRP wildlife related practices in the Northern Plains was estimated to generate approximately $63 million in nonmarket benefits to wildlife at an average benefit of $7.00 per acre. This was built on the general idea that CRP practices associated with permanent and temporary wildlife habitat factors generated a more favorable environment for both game and non-game species. Sullivan et al. (2004) indicated that the Northern Plains contained approximately 26.2 percent of the total CRP acreage, but 44.5 percent of the CRP acreage enrolled in wildlife practices. Sullivan et al. (2004) indicated that the estimated wildlife benefits included approximately $33 million per year for wildlife viewing and $30 million per year in pheasant hunting.

4.0 ENVIRONMENTAL CONSEQUENCES

Impacts to biological resources would be considered significant if implementation of an action removed land with unique vegetation characteristics, reduced wildlife populations to a level of concern, or resulted in an incidental take of a protected species or critical habitat.

4.1 BIOLOGICAL RESOURCES

4.1.1 Vegetation

4.1.1.1 Background and Methodology

Environmental consequences to vegetation were determined qualitatively by compiling existing data from a sample of CRP fields eligible for managed haying and grazing, and extrapolating the data on a state wide level. Three counties within South Dakota were selected to provide a representative description of the diversity in agricultural production, climate, wildlife habitat, topography and other landscape characteristics within the State, namely Brown, Day, and Lyman counties. These counties encompass the CEC Level 1 ecoregions described in Chapter 3. Ten CRP fields in each county were selected by USDA FSA/NRCS county personnel that represent the diversity of the CRP fields in the county. The vegetation data was collected along with the data utilized by the socioeconomic analysis, the methodology of which is presented in detail in Appendix C. Data on current species of grass cover present, age of stand, condition of stand, and percent of forage that is removable were provided by USDA FSA county offices. For those fields where haying and/or grazing options exhibit the potential for implementation of managed haying and grazing, the impact of the change in quantity, quality and diversity of the vegetative cover is estimated based upon the haying or grazing management parameters of the alternatives (e.g. frequency and duration of haying and grazing) and the NRCS Technical Guides for conservation practice standards, forage harvest management, and prescribed grazing.

The Great Plains grasslands have a well-documented history of grazing by native herbivores (Holechek et al. 1989; Milchunas and Laurenroth 1993) and periodic large-scale disturbances (such as wildfire) occurring at an average frequency of once every three to five years (Umbanhower 1996). Physiological adaptations in grasses resulting from grazing pressure include higher proportion of stemless shoots, greater delay in elevation of apical buds, sprouting more freely from basal buds after defoliation, and higher ratios of vegetative to reproductive stems (Holechek et al. 1989). Growth for these plants is actually stimulated by defoliation and will increase the vigor of the plant (Holechek et al. 1989). However, heavy grazing can be detrimental to plants and plant communities. Possible positive effects due to light to moderate grazing are presented in Table 4.1-1 for forage plants.

The timing of vegetative removal from range plants is important as well. Most range plants can withstand defoliation during the dormant periods when plants are inactive; at the onset of growth

Table 4.1-1. Possible Positive Effects Of Light To Moderate Grazing On Range Plant Physiology.

Heavy Grazing	Light to Moderate Grazing
Decreased photosynthesis	Increased photosynthesis
Reduced carbohydrate storage	Increased tillering
Reduced root growth	Reduced shading
Reduced seed production	Reduced transpiration losses
Reduced ability to compete with ungrazed plants	Inoculation of plant parts with growth-promoting substances
Reduced mulch accumulation. This decreases soil water infiltration and retention. Mulch is also necessary to prevent soil erosion.	Reduction of excessive mulch accumulations that may physically and chemically inhibit vegetative growth. Excessive mulch can provide habitat for pathogens and insects that can damage forage plants.

Source: Holechek et al. 1989

as conditions will continue for growth; and during active growth. A critical time for plants is from floral initiation through the seed development post bloom, generally from early May to mid-July, when plants have high energy requirements for seed production (Holechek et al. 1989).

If the vigor of a plant stand is reduced there is greater potential for desirable plants, identified by the conservation practice, to be replaced by invasive species. In some areas, undesirable species encroach upon CRP lands. Haying to manage woody plant encroachment is practical if conducted every three years, otherwise woody plants become too large at any other interval to allow future haying (Bidwell, personal communication). Grazing alone cannot control woody plant encroachment without overgrazing the native plants (Bidwell and Weir 2002; Weir et al. 2007). The recommended approach for controlling woody plant encroachment involves burning followed by grazing (Bidwell and Weir 2002; Weir et al. 2007). Light to moderate defoliation as discussed above would improve range plants abilities to compete against invasive species.

There are many factors that affect forage quality, including leaf to stem ratio, maturity stage at harvest, and cool season (C3) vs. warm season (C4) grass species. As noted above, light to moderate grazing increases forage quality by increasing the proportion of stemless shoots. In South Dakota, both warm and cool season plants are planted on CRP land. Cool season species generally have higher digestibility and more crude protein for grazers than warm season species. Due to differences in leaf anatomy, warm season grasses convert sunlight into plant material more efficiently than cool season grasses, but their leaves contain a higher proportion of highly lignified, less digestible tissue. Hay quality is lowest in mid July for cool season plants, begins to increase with the onset of growth in September, and continues to increase until winter dormancy. Warm season plants shift from producing leaves to flowering about July 10. Substantial re-growth of warm season plants can occur after July 10 to provide fall and winter cover. However, if grazing is allowed from July 10 until frost, substantial cover would be lost unless light stocking rates and threshold heights are prescribed and maintained. The later beyond July 10 hay is cut, the less fall and winter cover would be present. The NRCS Practice Code 511 Forage Harvest Management requires that a minimum stubble height of five inches remain at the end of the growing season.

A key variable in assessing wildlife habitat is structure. One measure of habitat structure that can be derived from year-end data is height. The other components of habitat structure such as density (stems/unit area), canopy cover (percent ground cover, percent canopy cover, etc.), and diversity (heterogeneity) cannot be derived from end of season standing crop. However, the list of species planted in each CRP field can be considered an index to plant diversity. As the number of plant species increase, the compositional and structural diversity increase.

As noted in Table 4.1-1, mulch or thatch build up (accumulation of dead plant matter) can be a problem on some CRP fields, but usually not to the degree that the conservation cover fails entirely. Accumulation of thatch has been managed through mid-contract management practices and reduced by the use of prescribed burning and disking in some states (Kansas Department of Wildlife and Parks [KDWP] 2008a). Grazing has been documented to help reduce thatch (USDA/NRCS 2006b). Excessive thatch physically and chemically inhibits vegetative growth, harbors plant pathogens, reduces the success of plants naturally re-seeding and interseeding management efforts, inhibits water infiltration to soil, makes it difficult to control noxious weeds and insect pests, and contributes to the potential for catastrophic fire. Retention of some mulch is beneficial for retaining soil moisture and ameliorating the effects of cold temperatures on plant roots, but studies have shown accumulations of more than 10 cm are detrimental (USDA/NRCS 2006c).

Preferred Alternative – Alternative B

The results of the vegetation data analysis suggest that haying and grazing once every five years in accordance with NRCS conservation practice standards would have long term benefits on the plant community with few negative effects. The removal of plant material through haying or grazing will stimulate plant vigor of warm season plants. The loss of vegetation would be a short term impact which would, when adequate leaf area is reserved, recover through plant re-growth following haying or the removal of livestock if there is sufficient time and precipitation prior to frost. The minimal five-inch stubble heights mandated by NRCS Practice Code 511 Forage Harvest Management increases the likelihood of plant survival and long-term viability. However, the later cutting or grazing occurs, the less time is available for re-growth. CRP fields dominated by cool season plants would not produce any additional cover after they have been cut. To meet specific habitat requirements for nesting species of concern, timing of haying and grazing to allow for sufficient re-growth must be considered for adequate cover to be present for the following grassland bird nesting season. This is provided for in NRCS guidance for managing forage harvests.

Some differences in habitat structure and hay/forage quality would occur depending on whether a field is hayed or grazed. Haying would result in a uniform structure, whereas grazing would likely result in greater structural habitat diversity, particularly by grazing at a light stocking rate rather than rotational grazing with internal fencing. Grazing without internal fencing but with a partial field burn (patch burning, e.g.. burn 1/3 of the field per year) would also increase structural habitat diversity (Bidwell and Weir 2002; Weir et al. 2007). Because of variation in both the amount and timing of precipitation, vegetation height would vary from year to year. To meet specific habitat requirements for nesting species of concern, flexibility to remove cattle from the field when residue height reaches a minimum threshold is needed and is provided by NRCS Practice Code 511 Forage Harvest Management and NRCS Practice Code 528 Prescribed Grazing.

In summary, managed haying and grazing on eligible CRP practices under Alternative B would likely enhance vegetation through increased plant health, vigor and productivity of range plants, and reduced accumulation of mulch (thatch). The anticipated responses from plants would result in maintaining the desired species composition in accordance with the goals of the conservation plan. The frequency of haying or grazing once every five years is within the historical period of three to five years for disturbance (Umbanhower 1996) that rejuvenates grasslands.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Under Alternative C, managed haying and grazing would occur once every three years, and the recognized PNS would be May1 to July 1; ending one month earlier compared to the other alternatives.

Alternative C would produce similar effects to vegetation described for Alternative B (increased diversity in structure, increased vigor of grassland plants, and reduced accumulation of mulch) although the defoliation would occur more frequently. The increase in frequency remains in the three to five year interval that has been identified as the historic natural interval to improve the health and vigor of the conservation practice. The shortened PNS would permit haying or grazing to occur one month earlier. Cutting dormant cool season grasses close to the end of the shortened PNS may diminish the health and vigor of these plants.

No Action – Alternative A

The potential benefits to vegetation comprising the CPs eligible for managed haying and grazing in general would be the same as described for Alternatives B & C; however, they will occur at a less frequent interval (once in ten years for haying; once every five years for grazing) that is outside the recommended disturbance intervals for maintaining grassland health and vigor. Under the current provisions for managed haying and grazing, thatch accumulations could increase to densities that threaten the health and vigor of the vegetative stand. These intervals also allow woody species to become established in areas where they are unwanted, and achieve increased growth, thus preventing future haying.

4.1.2 Wildlife

4.1.2.1 Background and Methodology

Recently, USDA has sponsored, under the Conservation Effects Assessment Project (CEAP), a series of quantitative studies estimating wildlife response to USDA conservation programs (USDA/NRCS 2008a), including specifically native and non-native CRP grassland conservation covers (Riffell et al. 2006; USDA/NRCS 2007b, 2008b). A broader review of fish and wildlife response to Farm Bill conservation practices was recently undertaken in a series of papers published by the Wildlife Society in partnership with the CEAP, including several concerning grasslands (Jones-Farrand et al. 2007; Haufler and Ganguli 2007). The latter provides a useful summary of the issues surrounding estimating the benefits of CRP to wildlife, including: the potential impacts of planting particular conservation practices and vegetation management, how problems with existing datasets have structured analyses, and the complexity of addressing the habitat needs of many different types of wildlife that are often conflicting. The major conclusions are: (1) design conservation plans for individual priority wildlife species for specific lands best suited to meet that particular species' need; (2) the benefits for a particular species benefit will depend in part on the management of surrounding sites as well, and (3) the benefits of grassland establishment and management are location- and species-specific, hence, in order to benefit the most wildlife with the CRP program, the timing and frequency of management actions should be planned to create and maintain diversity of grassland successional stages over large areas.

No quantitative studies of the effects on wildlife of various frequencies of haying and grazing conducted on particular types of vegetative stands have been conducted to date. In the absence of specific quantitative studies, this analysis qualitatively assesses the impacts of varying frequencies of managed haying and grazing on wildlife, using the best available data. The analysis focuses on wildlife most likely to inhabit the CRP lands eligible for managed haying and grazing, and their predicted responses (negative/positive) to the alternatives' managed haying and grazing provisions. The data collected have been organized in matrices that are included in the appendices of this EA, referred to individually in the sections below.

Potential effects include indirect (effects associated with alterations to the vegetation), direct (effects associated with reproductive success and mortality of individuals and populations), and cumulative (effects over time and due to other or foreseeable actions) impacts, which also could occur over the short- or long-term. Potential cumulative impacts are addressed in Chapter 5. Changes in vegetation structure relate to changes in cover for wildlife, most importantly, cover associated with reproduction success (nesting and rearing young), and food sources (Klute 1994; Horn and Koford 2000; Hughes et al. 2000; Madden et al. 2000). The results of the vegetation impact analysis in Section 4.1.1 is relied upon to assess indirect impacts to wildlife. Direct impacts to wildlife are related to mortality sustained by individual animals from conflicts with machinery, and the direct impacts of machinery on nesting and rearing of young (Labisky 1957; Gates 1965; Calverley and Sankowski 1995; Renner et al. 1995; Reynolds et al. 2000). Ground-nesting grassland birds are particularly susceptible to direct impacts of haying, and less so to grazing (USDA/NRCS 2006c). Very few studies quantify the mortality impacts of haying or grazing on grassland birds (as discussed further below), much less present data that can be extrapolated to a statewide population. In the absence of comprehensive data, this analysis of direct impacts on grassland birds assesses what percentage of the analyzed grassland bird species' peak reproductive season is encompassed by the PNS as established in the NWF lawsuit settlement, which is unchanged in Alternative B. The most exposed species is then analyzed as the worst case scenario. A principal assumption of the analysis is that percent of nesting season exposed equates percentage of mortality. It is argued that assessing the potential magnitude of the impact on grassland bird habitat provides a proximate measurement of potential mortality. Then, based upon certain additional assumptions, the impact of the alternatives is quantified on a statewide basis by assessing the percent of available habitat that may be hayed under both of the alternatives analyzed, and the percentage of exposed nesting season. A detailed description of the methodology employed is provided in the grassland bird section below.

4.1.2.2 Large Mammals

Large mammals in South Dakota that are likely to occur in CRP lands include bighorn sheep, mountain goats, pronghorn antelope, elk, mule deer, white-tailed deer, and mountain lion. Potential impacts to these species were evaluated using existing literature, with the analysis organized in matrices (Appendix D1 and D2 Game Species Matrix). In general, the indirect effects of grazing on large mammal species can be negative if wildlife must compete with livestock for forage, primarily in the late summer and winter (Coe et al. 2001). Elk and deer are browsers and not grazers, therefore, the benefits of maintaining early successional environments like grasslands do not extend to these species. Pronghorn antelope diets are more compatible with cattle; however, if stocking rates are set too high, cattle will shift to consuming forbs thus competing directly with pronghorn antelope (Hall 1985). NRCS Practice Code 328 Prescribed Grazing that applies to managed grazing requires the stocking rate include ruminant wildlife, therefore reducing the competition. Managed grazing limits the stocking rate to 75 percent of the calculated NRCS stocking rate, further reducing any impact.

Potential benefits of grazing include removal of unpalatable old plant growth. Haying and grazing conducted at a time that allows plant re-growth can improve forage by stimulating growth of forbs and removal of old growth of grasses (Clark et al. 1998a, c).

Pronghorn antelope fawn from May to June with fawns remaining in their birthing areas for the following three weeks. When fawning, does seek areas with greater shrub cover in depressions or areas with taller grass and forbs. Above average fawning success in Colorado was attributed to the diverse habitat available (shrub component and depressions) and grass and forb height of 9.8 inches (Howard 1995). Another study concluded the highest use of CRP fields by pronghorn occurs during the early summer and winter (Coe et al. 2001).

Elk habitat varies seasonally, but primarily contains grasslands interspersed with forests providing large amount of edges. In the summer, elk seek woodland cover with open meadows and grasslands with limited human activity. Winter ranges are generally wooded areas lower providing protection. Elk calve late May to early June on summer ranges, and it is recommended that calving areas not be disturbed from May 1 to July 1 (USDA/NRCS 1999c).

Mule deer are found in the extreme western portions of South Dakota and white-tailed deer are throughout the State (USDA/Soil Conservation Service 1978; USDA/NRCS 2006c) Both deer are browsers; however white-tailed deer are relatively more adaptable to disturbances. Deer are dependent upon forest and shrub landscapes for escape and thermal cover during severe winter periods. The birthing period for deer begins in May and can extend into August (Snyder 1991).

It is not likely that there will be significant losses from direct impacts of haying and grazing on large mammals. Large mammals are highly mobile and can move out of harm's way. Pronghorn antelope and elk birthing periods would conclude prior to haying or grazing activities. Deer could possibly be birthing as haying or grazing is initiated, but deer are strongly associated with riparian areas and other densely shrub covered areas rather than open areas associated with CRP fields. Individual young may collide with haying equipment, but it is not likely to occur at a level that will result in an impact to a population. However, in an attempt to minimize such collisions it is recommended that haying activities be initiated in the middle of the field rather than the edges, allowing time for mobile wildlife species to move into the protective cover

Fence construction would likely occur on many CRP fields to confine livestock. It is recommended that fencing follow the guidelines set forth in NRCS Practice Code 328 Fence to ensure travel of large mammals is not inhibited. These guidelines include consideration of spacing of the top and bottom wires to provide adequate movement of wildlife and the use of a smooth wire on top to allow deer to jump without harm.

Preferred Alternative – Alternative B

Alternative B would increase the frequency of managed haying and grazing to once every five years. The potential for indirect impacts of the Proposed Action on large mammals rests on changes to vegetation that may be related to the frequency of managed haying and grazing. As discussed in the vegetation section, positive benefits of haying and grazing to vegetation derived from the proposed frequency that also benefits pronghorn antelope is an increase in the productivity of grassland plants resulting in improved forage quality. These benefits do not extend to large mammals that are browsers, as the Alternative B frequency would reduce woody vegetation encroachment in grasslands.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Alternative C would be manage haying and grazing conduct once every three years, with a PNS reduced to May 1 to July 1. As mentioned in Alternative B, most large mammals of South Dakota are browsers and would therefore receive little benefit from the increase in grass plant productivity, unless the conservation practice contained a shrub and forb component. The frequency of once every three years would help maintain the productivity and vigor of grasslands that is beneficial for pronghorn antelope. The change in PNS would not likely impact large mammals as pronghorn antelope, elk, and deer would likely have completed fawning/calving prior to July.

No Action – Alternative A

The No Action alternative is likely to have similar benefits for large mammals. Under this alternative haying would be permitted once in ten years while grazing would be conducted every five years. The PNS would be May 1 to August 1. This longer interval between disturbances, may allow for shrubs to invade grassland areas resulting in a possible food supply for browsers. However, the potential to improve the forb component of the vegetative stand would be reduced.

4.1.2.3 Small Mammals

Small mammals are important component of the grassland ecosystem, primarily due to their intermediate trophic position and high dispersal abilities (Colorado State University 2008). Prairie rodents are omnivorous consuming significant numbers of arthropods, while rabbits and other small mammals are the most important prey of hawks, eagles, owls and coyotes. Small mammals that consume vegetation or seeds alter the vegetation structure and disperse seeds. Burrowing small mammals enhance the soil by providing burrows influencing hydrology and refuges for other small animals as well as moving soil and soil nutrients.

The general composition of grassland small mammal communities is determined primarily by structural attributes of the habitat (Grant et al. 1982). Indirect effects of mowing and grazing will likely result in a change in abundance and diversity of some small mammal species in the response to their requirements for a mosaic landscape (Yarnell et al. 2007; Clark et al. 1998b). Deer mice and jackrabbits may increase following haying or grazing, while voles and cottontails may decrease since they require more cover (Rickel 2005a). As long as weather patterns and other factors are favorable, grassland should be able to recover within a year of treatment; and herbivorous litter-dwellers such as voles re-established themselves in tallgrass prairie one year after grazing (Grant et al. 1982). Species that do not favor reduced cover will find refuge in non-mowed areas. Predators will likely have higher access to prey, though in one study evaluating differences between grazed and ungrazed areas the effect of predators in a grazed area did not have a significant effect on small mammals (Torre et al. 2007).

Haying and grazing are unlikely to extirpate vole species from the affected area as a study of control methods for voles found that plowing was the only effective method to remove the animals from a treated area; mowing was not (Jacob 2003), though mowed strips (six centimeters high) were an effective barrier to movement of voles (Cole 1978).

Diversity is widely used as criteria to assess conservation potential and ecological value (Hall and Willig 1994). One study that compared species diversity and composition of small mammals between CRP grasslands and native shortgrass prairie found small mammal diversity on CRP grassland declined after the third year (Hall and Willig 1994). The authors concluded that this was to be expected in an environment in which species have evolved around frequent (every one-to-three years), large-scale disturbances such as fire (Umbanhower 1996; Denslow 1985; Loucks et al. 1985). Thus, they suggested to restore small mammal species composition on CRP lands grazing or fire-induced disturbances should be considered (Hall and Willig 1994), based on the potential for declining diversity on older vegetative stands. When seeking to restore small mammal species composition on CRP lands, grazing or fire-induced distributions should be considered (Hall and Willig 1994). Therefore, Alternative C would result in potential would result in beneficial impacts to small mammal diversity and composition.

Small mammal mortality would likely occur likely during the haying or grazing due to collisions with vehicles or trampling by livestock. The method in which haying would be permitted (only 50 percent of a field in a single year) would provide some reduction in direct impacts as there would be remaining habitat for small mammals to escape. Similarly, the reduced stocking rate (75 percent of the NRCS recommendations) will reduce to some degree the potential impact from trampling. Another technique to reduce direct impacts from haying involves raising the mower blade height to six-12 inches or higher (National Military Fish and Wildlife Association [NMFWA 2002]). With the management presented and the restrictions on the program, it is not anticipated that direct impacts by the action alternatives to small mammals would be significant.

Preferred Alternative – Alternative B

The Proposed Action would increase the frequency of managed haying and grazing to once every five years. The potential for indirect impacts of the Alternative B on small mammals is dependent upon changes to vegetation that may be related to the frequency of managed haying and grazing. As discussed in the vegetation section, positive benefits of haying and grazing to vegetation derived from the proposed frequency that also benefits small mammals are an increase in diversity in structure and increase productivity of grassland plants which correlates to an increase in small mammal diversity. It is likely that with the mentioned management there would be minimal negative indirect impact to small mammals coupled with a potential increase in the diversity of the small mammal population as a result of Alternative B.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

The Proposed Action would increase the frequency to once every three years for managed haying and grazing, but the PNS would be reduced to May 1 to July 1. Disturbance at this frequency is recommended by Hall and Willig (1994) for restoring small mammal diversity on CRP fields. The change in the PNS would not likely affect small mammals of South Dakota as most breed in spring and have litters in the early summer, and with the recommended management, mortality due to collisions would be reduced.

No Action - Alternative A

The No Action alternative with longer intervals between managed haying and grazing would likely reduce species diversity of small mammals as occurs in older vegetative stands. This is undesirable because small mammals serve many roles in the grassland ecosystem, such as prey and predator.

4.1.2.4 Conservation Species

Potential impacts of managed haying and grazing to Conservation species were evaluated using existing literature and are organized in a matrices (Appendix D3 and D4 Conservation Matrix). Four conservation species, black-footed ferret, swift fox, eastern hognose snake, and the lined snake were identified as potentially inhabiting CRP fields. The black-footed ferret is a federal listed endangered species and is addressed below in the Federal Listed Species section.

Swift fox prefer shortgrass prairies with flat to gently rolling terrain that offer good potential den sites for shelter and protection and may be found on CRP lands. Although grasslands are the preferred habitat for Swift foxes, studies in Kansas found Swift fox inhabiting agricultural landscapes (Sovada et al. 1998). Managed haying and grazing may benefit Swift foxes by increasing the diversity and accessibility of prey items within their habitats. Swift fox are opportunistic omnivorous foragers. The majority of their diet is composed of small mammals, arthropods, and birds. Changes in vegetation structure and composition would likely have minimal impacts on the Swift fox because of its ability to adapt to changes in prey. Mortality due to collisions with farm machinery or destruction of young would not likely result in a negative impact as they tend to be nocturnal and produce litters in the spring.

The eastern hognose snake is found throughout a range of habitats, including open meadows, agricultural fields, sand hills and forested habitats. Changes in prey abundance would potentially increase due to the increase in small mammal diversity. However, as noted in the small mammal section of this report, small mammals varied in response to haying and grazing, but generally abundance of small mammals returned the year after haying and grazing. Additionally, management for haying presented for small mammals would further reduce the potential impacts to the eastern hognose snake.

Within South Dakota, the lined snake is found within the far southeastern reaches throughout grasslands, pastures, prairies, woodland edges, and city parks. Essentially a snake of the open grassland prairie and sparsely wooded flatlands this species is most prevalent near decomposing surface debris that provides shelter or rocky expanses where surface shelter is plentiful (Werler and Dixon 2000). The species forages for earthworms and other small at nightfall or when daytime temperatures are more moderate. The potential for direct impacts of haying or grazing on the lined snake is dependent upon the changes in vegetation that may be altered by these proposed actions. Haying or grazing that removes vegetative cover would have a negative indirect impact on this species as harvesting would remove protective cover from predators and alter soil moisture

Preferred Alternative – Alternative B

The Proposed Action would increase the frequency of managed haying and grazing to once every five years. The potential indirect impacts of the Proposed Action on species such as, the swift fox would be associated with the predicted change in vegetation structure and may be beneficial since haying and grazing activities at this frequency would maintain open grasslands. Direct impacts would be minimal since it would be unlikely that swift fox would occupy the field prior to managed haying and grazing.

The potential for indirect impacts of Alternative B on the eastern hognose snake depends on changes to vegetation that may be related to the frequency of managed haying and grazing. As discussed in the vegetation and small mammals sections, positive benefits of haying and grazing to vegetation derived from the proposed frequency that also benefit potential prey species would be an increase in structure diversity and productivity. Haying and grazing at this frequency would likely maintain the diverse habitats for the eastern hognose snake.

The lined snake is very limited in its distribution throughout South Dakota, only being found within the very southeastern counties. Removal of protective vegetative cover would be more frequent under this alternative than the No Action alternative, indirectly resulting in a negative effect on this species.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Under Alternative C, managed haying and grazing would be allowed once in three years and the PNS would be reduced to May 1 to July 1. This frequency increase would result in the similar vegetative structure changes that were described for Alternative B and thus would have similar impacts on conservation species. The change in PNS would not likely affect these species as most have reproduced prior to the end of the proposed PNS

No Action– Alternative A

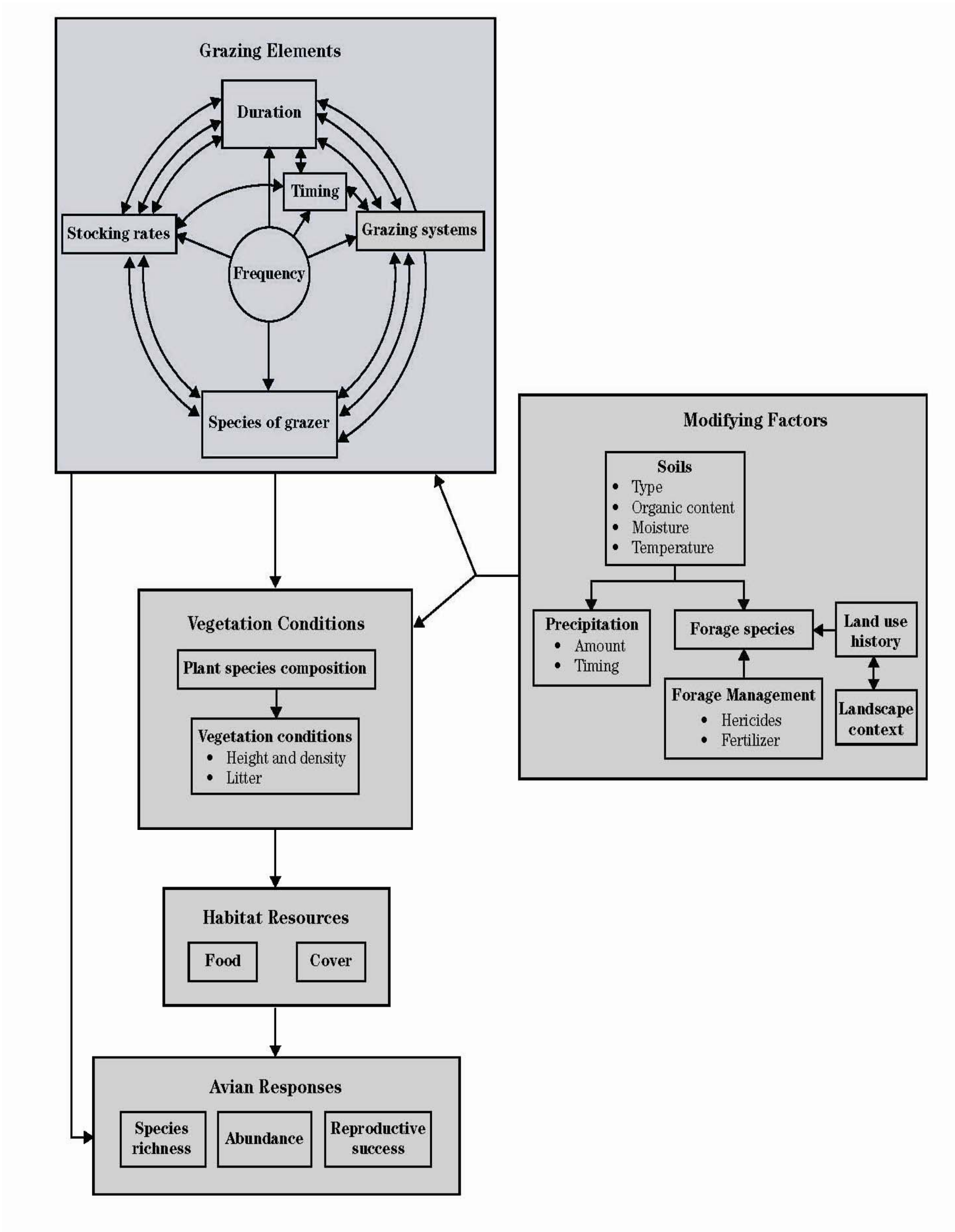
The No Action alternative with longer intervals between managed haying and grazing would reduce the diversity in vegetation structure allowing tall vegetation to regain dominance. This would reduce habitat quality for swift fox that prefer low to medium height vegetation and potentially reduce the prey species they prefer. The Eastern hognose snake that prefer low to medium height vegetation would also lose habitat. This frequency of disturbance (haying and grazing) would not be as effective in maintaining the open patches favored by these animals. The lined snake would have greater protective cover from predators under this alternative.

4.1.2.5 Birds

Grazing and haying produce indirect and direct impacts to grassland bird species. Indirect impacts are related to vegetation changes as a result of the haying or grazing and include altering the food abundance (seeds, insects), foraging site conditions (food availability); and cover for protection (thermal), escape, or breeding (courtship, nests) (USDA/NRCS 1999a). The manure from grazing animals attracts insects and increases their diversity, which are food sources for grassland birds. Direct impacts from haying or grazing potentially affect the presence of bird species (avoidance [Grandfors et al. 1996; Warner et al. 2000]), possibly the reproductive success (destruction of nests, eggs, or young [Grandfors et al. 1996; Lokemoen and Beiser 1979; Wooley et al. 1982]; increase in predation [Best et al. 1997; Horn and Koford 2000; Lokemoen and Beiser 1979]; increase in brood parasites [Grandfors et al. 1996]), and individual collisions with farm equipment and vehicles (Wooley et al. 1982; USDA 2006).

Grassland bird species respond to habitat manipulations (e.g., grazing, haying, mowing) in a variety of ways (reviews by Saab et al. 1995; Johnson et al. 2004; Ryan et al. 1998) based on many factors (Figure 4.1-1). For example, sedge wren avoid recently mowed CRP fields (preferring idled CRP habitat), but savannah sparrow abundance increases the year after haying (Horn and Koford 2000). Thus, changing the managed haying and grazing frequencies in South Dakota will likely have a variety of impacts on grassland birds both positive and negative.

Figure 4.1-1. Grazing Effects on Avian Populations Including Factors That May Modify Avian Responses (Extracted from NRCS 2006).



Methodology and Results for Indirect Impacts of Haying and Grazing

The indirect impacts associated with the action and the No Action alternatives on grassland bird species in South Dakota would result principally from changes in vegetation. The vegetation analysis concluded that changes to vegetation would be primarily to the structure (refer to section 4.1.1). Because haying is only permitted on a maximum of 50 percent of a field and the stocking rate for grazing is permissible only up to 75 percent of the NRCS stocking rate, the resulting plant community would potentially consist of a mosaic landscape.

Grassland bird species (obligate and facultative) of South Dakota were identified and evaluated by reviewing existing literature and predicting their response to haying or grazing (Appendix D5). The evaluation was based on a single (or periodic, but not annual) haying or grazing event. Based on the vegetation analysis, except for excess thatch accumulation and woody vegetation encroachment, little impact would occur on the plant community outside of the year the haying or grazing occurs, therefore potential effects on grassland birds is likely to be similar to a single year event as analyzed. Predicted responses were categorized as follows based on changes to vegetation and habitat:

- ***Potential for negative impacts*** include species that appear to avoid all recently grazed habitats;
- ***Potential for short-term negative but long-term positive impacts*** includes species that avoid recently disturbed habitat, but also avoid the older, densely vegetated habitat that CRP produces in the absence of periodic disturbance;
- ***Potential for short-term and long-term positive impacts*** includes birds that require a mosaic of successional stages in close proximity created by periodic disturbance, prefer shorter vegetation created by disturbance, or are associated with grazing;
- ***Potential positive impacts*** for grazing tolerant/dependent species which require very short grass with bare ground and are associated with heavily grazed grasslands; and
- ***Unknown impacts*** includes species where empirical information is lacking.

Thirty-four species were identified as species likely to nest in CRP fields of South Dakota. Six species were classified with potential for negative impacts, 13 species with potential for short-term negative but long-term positive impacts, ten species as potential for short-term and long term positive impacts, nine species considered grazing tolerant/dependent, and two unknown (Table 4.1-2). Results indicate that a majority (29 of 37) of nesting species would mostly have a positive long term response.

Methodology and Results for Direct Impacts of Haying and Grazing

The managed haying and grazing program in South Dakota would be conducted outside of the NWF lawsuit settlement terms PNS (May 15 to August 1) in two of the three Alternatives (Alternatives A and B), but the PNS would be shortened to end July 15 by Alternative C.

Table 4.1-2. Predicted Impacts to Grassland Bird Species Likely to Nest on CRP Lands in South Dakota for the Following Breeding Season after Haying or Grazing.

Potential for Negative Impacts	
Potential for Negative Impacts	
Mallard	Sharp-tailed Grouse
American Bittern	Common Yellowthroat
Ring-necked Pheasant	Clay-colored Sparrow
Potential for Short-term Negative but Long-term Positive Impacts	
Blue-winged Teal	Baird's Sparrow
Greater Prairie-Chicken	Le Conte's Sparrow
Northern Harrier	Dickcissel
Short-eared Owl	Bobolink
Sedge Wren	Red-winged Blackbird
Vesper Sparrow	Henslow's Sparrow
Grasshopper Sparrow	
Potential for Short-and Long-term Positive Impacts	
Mourning Dove	McCown's Longspur
Northern Bobwhite Quail	Chestnut-collared Longspur
Upland Sandpiper	Eastern Meadowlark
Horned Lark	Western Meadowlark
Savannah Sparrow	Swainson's Hawk
Potentially positive impacts for grazing tolerant/dependent species	
Mourning Dove	Lark Bunting
Horned Lark	McCown's Longspur
Vesper Sparrow	Chestnut-collared Longspur
Common Nighthawk	Swainson's Hawk
Common Poorwill	
Unknown Impacts	
Green-winged Teal	Northern Pintail

Estimates of peak breeding dates for species likely to nest on CRP fields in South Dakota were determined using the peak breeding activity dates in the Birds of North America (BNA) accounts (Cornell Lab of Ornithology) (Table 4.1-3). Precocial species (hatchlings leave nest shortly after hatching) peak breeding period was determined using the beginning and end "egg" time period. For atricial species (hatchlings with an extended nesting period) the peak breeding time was determined using the beginning of "egg" period and end of "young" time period to capture the time period when the young birds are vulnerable to trampling or haying. Most estimate

Table 4.1-3. Peak Breeding Periods and Related Exposure for Potentially Nesting Grassland Birds in South Dakota.

Common Name	Peak Breeding	Percent Exposed by Settlement PNS	
		Alt. A & B	Alt C.
Mallard	15 April - 15 July	0%	33%
Blue-winged Teal	15 May - 20 July	8%	29%
Northern Pintail	5 April - 10 July	0%	36%
Green-winged Teal	1 May - 15 July	0%	19%
Ring-necked Pheasant	15 April - 20 July	5%	37%
Sharp-tailed Grouse	25 April - 25 June	0%	10%
Greater Prairie-Chicken	10 April - 10 July	0%	33%
Northern Bobwhite	10 May - 15 Sept	48%	78%
American Bittern	15 April - 31 July	15%	43%
Northern Harrier	20 April - 10 Sept	40%	57%
Upland Sandpiper	10 May - 10 June	0%	0%
Mourning Dove	15 May - 31 August	44%	56%
Short-eared Owl	1 April - 31 May	0%	50%
Horned Lark	15 May - 10 July	0%	0%
Sedge Wren	5 June - 20 July	11%	42%
Common Yellowthroat	25 May - 15 July	0%	27%
Vesper Sparrow	15 May - 25 July	14%	34%
Lark Bunting	20 May - 30 June	0%	0%
Savannah Sparrow	10 June - 20 Aug	27%	70%
Grasshopper Sparrow	5 June - 31 July	29%	54%
Henslow's Sparrow	20 May - 31 July	22%	42%
McCown's Longspur	10 May - 5 Aug	24%	40%
Chestnut-collared Longspur	10 May - 31 July	20%	37%
Dickcissel	25 May - 25 July	16%	39%
Bobolink	20 May - 30 June	0%	0%
Red-winged Blackbird	15 April - 31 July	15%	43%
Eastern Meadowlark	10 May - 5 Aug	24%	40%
Western Meadowlark	10 May - 5 Aug	24%	40%

Table 4.1-3. Peak Breeding Periods and Related Exposure for Potentially Nesting Grassland Birds in South Dakota (cont'd).

Common Name	Peak Breeding	Percent Exposed by Settlement PNS	
Baird's Sparrow	10 June – 15 Aug	21%	68%
Le Conte's Sparrow	1 June – 15 Aug	19%	60%
Swainson's Hawk	15 April – 25 July	23%	23%
Common Nighthawk	20 April – 25 Aug	28%	52%
Common Poorwill	25 April – 30 Aug	30%	62%
Clay-colored Sparrow	1 June – 31 July	0%	50%

peak breeding periods do not adequately correspond with the defined PNS, thus leaving a portion of the estimated peak breeding time period exposed for certain species to direct impacts from haying or grazing. The percentage of exposure is based on the length of time beyond the defined PNS that the estimated peak breeding period for a particular species extends, as it is not anticipated that haying or grazing will occur prior to May 1. The PNS for Alternatives A and B (May 1 to August 1) exposes the peak breeding periods by an estimated range of 0 percent to 48 percent, while the PNS defined in Alternative C (May 1 to July 1) exposes peak breeding periods by an estimated range of 0 percent to 78 percent (see Table 4.1-3).

The potential effects of the exposed peak breeding periods are of more concern and not known. To determine the magnitude of the potential effects would require field studies and extensive modeling. It is not reasonable to anticipate that re-nesting would occur at a rate to nullify the potential impact that would likely be incurred by some species (e.g., northern bobwhite exposure loss of 78 percent) (see Table 4.1-3). The method in which haying would be permitted (only 50 percent of a field in a single year) would provide some reduction in the direct impacts as there would be some remaining habitat for nesting. Similarly, the reduced stocking rate (75 percent of the NRCS recommendations) will reduce the impact to some degree; still the net effect to a species is unknown. However, eligible CRP fields for managed haying and grazing is an estimated four percent of the total grassland habitat within the state of South Dakota calculated from the data provided by the Gap Analysis Program (GAP) (Smith et al. 2002). The only way to completely avoid this direct impact is to extend the proposed PNS further (September 15) to include the entire peak breeding for all species likely to nest on CRP fields in South Dakota.

The frequency of the action alternatives is within the recommendations (once every three – five years [Johnson et al. 2004]) for maintaining early successional grasslands that benefits most grassland bird species, except for those species in the negative impact category (Table 4.1-2). Therefore, the overall indirect impact would be positive over time for a majority of the bird species analyzed.

Preferred Alternative – Alternative B

The magnitude of the potential direct impacts of Alternative B to the reproductive success of grassland bird species and their specific population numbers is not entirely clear, as no detailed field studies have been conducted measuring impacts of the frequencies of haying or grazing on grassland bird populations. However, it is argued that assessing the potential magnitude of the impact on grassland bird habitat provides a proximate measurement. The activity with the most potential to directly impact the reproductive success of grassland birds is haying. This analysis evaluates the direct impacts of haying on the northern bobwhite, found in the southern third of the State at the northern edge of its range. Out of the grassland bird species evaluated in this assessment, the northern bobwhite sparrow would potentially have the greatest exposure to direct impacts since an estimated 48 percent of its peak breeding period is not encompassed by the No Action PNS period. It was calculated that all CRP acres eligible for participation in managed haying and grazing contribute to four percent of the possible overall grassland habitat available in South Dakota. If habitat acres of CRP lands eligible for haying are four percent of available habitat within the state, and only 50 percent of that may be hayed once every five years, and assuming haying is possible on all eligible CRP acreage in any single year, then two percent of available habitat may be hayed. If 48 percent of northern bobwhites' peak nesting is exposed by the definition of the No Action PNS, then once every five years an estimated one percent (two of 48 percent) mortality could occur. These calculations were conducted using total grassland acres provided by South Dakota GAP analysis (Smith et al. 2002). This analysis is based upon the assumptions that: northern bobwhites are equally distributed across South Dakota; the SD GAP acres were the best available data for estimating total habitat acres; the impacts to reproduction are distributed evenly across the peak breeding period; and haying could occur on 50 percent of the CRP fields across South Dakota within any given single year. If only economically viable eligible acreage is hayed as discussed in Section 4.5, the mortality rate is reduced to 0.1 percent once every five years.

As noted previously, excessive thatch accumulations can occur on older grasslands. Thatch can negatively impact brood rearing habitat requirements for certain grassland birds as it makes it difficult for chicks to travel (USDA/NRCS 2006b; KDWP 2008a). Managed grazing at intervals that mimic historic disturbance regimes on the Great Plains of three to five years removes the older vegetation, alleviating this problem (USDA/NRCS 2006b; KDWP 2008a).

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

The frequency of the Proposed Action would allow haying once in three years and grazing once in three years, but the PNS would be reduced to May 1 to July 1. Indirect impacts to grassland birds would be the same as for Alternative B. However, breeding grassland birds would have greater exposure to direct impacts since the defined PNS would cover less of their actual peak breeding periods. Northern bobwhite would potentially have the greatest exposures to direct impacts since an estimated 78 percent of its peak breeding period is not encompassed by the Alternative C PNS period. Using total and CRP grassland availability for northern bobwhites as for Alternative B, an estimated two percent (two percent of 78 percent) mortality could occur every three years for this species. If only economically viable eligible acreage is hayed, potential mortality would be reduced to 0.4 percent. Other grassland birds such as bobolink would experience no different effects from Alternative C compared to Alternative B

No Action - Alternative A

The frequency of the No Action is once every ten years for haying and once every five years for grazing. This frequency of disturbance of haying to grassland vegetation is not within the recommendations of once every three – five years as proposed by Johnson et al. (2004) and the frequency of grazing would be at the end of the recommended interval. Thus, the needs of the majority of nesting grassland bird species that benefit from the recommended disturbance regime would not be met. Only the few species in the negative impact category (see Table 4.1.2) would benefit from a less frequent interval. Therefore, the overall indirect impact would be negative for a majority of the bird species as analyzed.

The potential direct impacts associated with the No Action Alternative are unclear insofar as it is reasonable to assume that haying or grazing at a lower frequency would result in less potential impact on the reproductive success of many grassland birds. Again, in an attempt to evaluate the magnitude of the impact from haying on ground nesting grassland birds the northern bobwhite is considered. Using the calculations above, the estimated potential impact to one percent mortality of northern bobwhite would be reduced to once every ten years under this alternative, which is more beneficial for reproductive success of northern bobwhite. If only economically viable eligible acreage is hayed as discussed in Section 4.5, the mortality rate is reduced to 0.1 percent once every ten years.

4.1.2.6 Amphibians and Reptiles

Grasslands that have been hayed or grazed may be used more frequently because the variable habitat structure provides more microsites (i.e., sunning and shading spots) for the herptofauna (Partners in Amphibian and Reptile Conservation [PARC] 2008). Additionally, some reptiles and amphibians, especially members of the genus *Phrynosoma,* may benefit from grazing due to the reduction of dense vegetation increasing the open areas for foraging (Pianka 1966; Fair and Henke 1997). By increasing the native vegetation, the invertebrate population may increase, indirectly increasing the herptofauna that may forage upon them (PARC 2008). Herptofauna need various stages of vegetative succession within their habitat which historically was achieved through natural disturbance regimes (USDA/NRCS 2005a).

Populations may experience short term losses the year that haying or grazing occurs as a result of trampling from livestock, crushing, and fatalities from agricultural equipment, and increased predation due to increased exposure. Due to their limited mobility, most herptofauna are not fast enough to move out of the way of potential danger. However, these potential impacts would not significantly impact breeding and reproduction of amphibians because amphibians generally breed in early spring and lay eggs in wetlands and other aquatic habitats and then move to terrestrial areas to winter. Managed haying and grazing is not permitted within 120 feet of a water body, thus protecting the breeding areas associated with amphibians. Reptiles will breed in a variety of habitats, including uplands, riparian areas, and in the soil, thus it is anticipated that there will be some loss to resident reptiles.

The potential for direct impacts by haying can be reduced by raising the mower blade height to 6-12 inches or higher (NMFWA 2002). Other techniques that may be implemented to reduce negative impacts to herptofauna include: (1) hay during cooler (< 50F) periods of the day and overcast or during the hottest (> 85F) period of the day when herptofauna seek shade; (2) ensure at least 8-12 inches of vegetation is remaining after haying; (3) practice patch mowing; (4) practice low livestock densities to limit overgrazing; (5) ensure adequate vegetation surrounding waterbodies; and (6) do not allow livestock access to suitable herptofauna waterbodies (PARC 2008). Additional management includes initiate mowing at the center of a treatment area, progressively mowing out from the center to allow wildlife to flee in all directions and not become trapped to one side. To reduce the area impacted by the mowers tires, effort should be made to follow the outermost tire track of a previous pass which will reduce animal mortality and soil compaction. The highest potential for mortality due to site management occurs during spring and fall migrations to and from breeding or wintering habitats (USDA/NRCS 2006d).

Conservation species of herptofauna in South Dakota are not likely to be impacted by managed haying or grazing on CRP lands, since species of concern are affiliated with waterbodies or marshy areas.

Preferred Alternative – Alternative B

The Proposed Action would increase the frequency of managed haying and grazing to once in five years. The potential for indirect impacts of the Proposed Action on amphibians and reptiles is directly connected to changes to vegetation that may be related to the frequency of managed haying and grazing. As discussed in the vegetation section, positive benefits of haying and grazing to vegetation derived from the proposed frequency that also benefits amphibians and reptiles are an increase in diversity in structure providing microsites which can be maintained with the proposed frequencies. It is likely that with the mentioned mitigation there would be no negative impact to amphibians and reptiles.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

The Proposed Action would be conducted at the a higher frequency than Alternative B, with managed haying and grazing once in three years, and the PNS would be reduced to May 1 to July 1. The change in PNS would not likely result in a impact on amphibians or reptiles of South Dakota as these species breed in early spring. The vegetative changes that would be anticipated at this frequency that would benefit amphibians and reptiles would be the increase in structure diversity and creation of microsites. At the proposed frequency, the vegetative stand would be capable of maintaining the structural diversity.

No Action - Alternative A

Potential impacts described for the Proposed Action would be similar to the No Action. This alternative would result in less potential impacts as the frequency of haying or grazing would be every ten and five years respectively. At the lower frequencies, the microsites may not be maintained, limiting the benefit of the change in structure.

4.1.2.7 Invertebrates

Invertebrate community studies have indicated that the diversity of invertebrates is often related to plant species diversity, structural diversity, patch size, and density (Jonas et al. 2002; McIntyre and Thompson 2003; Burge et al. 1993). Species richness in invertebrate communities appears to be greatest in mid to late June in temperate regions of the United States (Jonas et al. 2002; Burke and Goulet 1998). Total biomass of invertebrates has been documented to be significantly greater in grazed pastures compared to ungrazed CRP fields (Klute 1994) with the greater forb coverage being the contributing factor.

Haying and grazing activities would be initiated after the period of greatest species richness for invertebrates (mid to late June); therefore, a large number of invertebrate species would not be affected. Potential indirect impacts from haying on invertebrates results from creating a uniform plant height and removes smaller topographical features, such as grass tussocks (Morris 2000). This will result in a decrease in plant structural diversity and thus a potential decrease in invertebrate diversity. Grazing however would not result in a uniform height of plants resulting in minimal impact to insect diversity. The manure from grazing animals attracts beneficial insect invertebrates (Purvis and Curry 1984; Reinecke and Krapu 1986) and grazing has been shown to increase insect abundance and diversity (Klute 1994).

Direct impacts to invertebrates from haying include insect mortality, particularly for egg or larval stages (Di Giulio et al. 2001). Impacts to invertebrates from grazing include destruction of potential nest sites, existing nests and contents, direct trampling of invertebrates and removal of food resources (Sugden 1985).

Haying impacts to invertebrates can be reduced if the haying occurs when flowers are not in bloom, haying is conducted in a manner that would produce a mosaic of vegetation patches, and a single area is not hayed more than once a year (Di Giulo et al. 2001). Additional management includes the use of a flushing bar on a mower/swather, haying at a minimum of 12-16 inches, haying at a reduced speed (<8 mph), and avoiding night haying. Grazing impacts can be mitigated by using moderate to light stocking levels and permitting a long recovery period.

Pollinator invertebrate species include butterflies, moths, bees and wasps, beetles and flies. This group of invertebrates is a critical component of the grassland ecosystem as well as crop production. Two primary habitat needs for pollinators include a diverse native plant community and egg laying or nesting sites. It is suggested by The Xerces Society for Invertebrate Conservation (The Xerces Society for Invertebrate Conservation 2008), when managing for vegetation heterogeneity the following management should be considered to minimize damage to pollinators. Disturbance practices should be implemented only every two to three years in rotation and, ideally, on only 30 percent or less of the overall site allowing for habitat heterogeneity and providing opportunities for recolonization of non-treated habitat. For example, managers could mow or burn a small portion of the habitat (less than one-third of the site each year or two) on a three to six year cycle. Alternatively, they could treat one-fifth of the site each year, on a five-year cycle. In addition, when possible, disturbance practices should be implemented when most pollinators are inactive, such as from late fall to early spring.

Preferred Alternative – Alternative B

Alternative B would increase the frequency of managed haying and grazing once every five years. The potential for indirect impacts of this alternative on invertebrates rests on changes to vegetation that may be related to the frequency of managed haying and grazing. As discussed in the vegetation section, positive benefits of haying and grazing to vegetation derived from the proposed frequency that also benefits invertebrates are an increase in the structural diversity and productivity of grassland plants. This frequency is slightly longer than the recommend period by Xerces, but the vegetation benefits would be achieved through managed haying and grazing based on the vegetation analysis. Implementing the described management practices would reduce the direct impacts on invertebrates, thus it is likely that there would be no negative impact to invertebrates.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Under this alternative managed haying and grazing would be allowed once in three years and the PNS would be reduced to May 1 to July 1. Impacts to invertebrates would likely be the same as under Alternative B since haying and grazing activities would still commence after the period of greatest species richness for invertebrates (mid to late June).

No Action - Alternative A

Potential for indirect impacts of the No Action on invertebrates is determined by the changes to the vegetation, primarily vegetation structure. Potential changes in vegetation structure would be the same for the No Action as for the action alternatives; however they will occur at a less frequent interval (once in ten years for haying; once every five years for grazing) that is outside the recommended disturbance intervals for maintaining grassland health and vigor. Therefore, maximum benefit to invertebrates would not be achieved. Longer intervals between grazing periods would reduce the amount of manure as a food source for invertebrates, which would potentially result in minor reductions of invertebrate abundance and diversity. The No Action alternative would not likely result in a significant impact to invertebrates.

4.1.2.8 Federal and State Listed Species

Black-footed ferret, whooping crane, and American burying beetle are considered endangered by the USFWS and the SDGFPC that prefer habitats described as what would potentially occur on CRP fields. Federally threatened fringed western prairie orchid plants may also be present. Site-specific inventories would be conducted to identify whether these protected species are present and consultation undertaken with USFWS in accordance with ESA. If it is determined a protected species may be impacted by the proposed activity, it is not likely managed haying or grazing would be authorized.

Black-footed ferrets prefer open shortgrass prairies with sparse vegetation. They are closely associated with prairie dogs; therefore if there are no prairie dogs on a CRP field it would be highly unlikely for a black-footed ferret to be present. Fields with prairie dog colonies would not likely be considered for managed haying or grazing due to their presence, resulting in no potential impact to the black-footed ferret.

The whooping crane is a migrant through South Dakota and utilizes shores, waterways, islands, and peninsulas. Managed haying and grazing would not occur within 120 feet of waterways; therefore, these areas would not be impacted.

The American burying beetle potentially occurs on CRP fields that are eligible for managed haying and grazing. However, it is not anticipated that the activities will negatively impact this beetle because it does not appear to be limited by soil or vegetation (USDOI/USFWS 2008a) and it feeds on carrion. The American burying beetle winters underground, is nocturnal and lives only one year. Because the beetle is not dependent upon soil or vegetation characteristics it is not likely to be indirectly affected by the alternatives analyzed. Its nocturnal behavior will provide protection from direct impacts due to collisions or trampling.

Western prairie fringed orchid habitats are being converted to cropland placing the species in peril. Conclusive data are unavailable to demonstrate positive or negative effects on the orchid from fire and overgrazing (Sather 1991). Haying would directly impact the orchid if it was present. Any action that repeatedly removes seed from orchid populations, such as grazing or haying, would likely to result in eventual decline of the species (Sather 1991).Managed haying and grazing would potentially impact this species, therefore where known populations occur the USFWS should be consulted prior to any activity.

Preferred Alternative – Alternative B

Black-footed ferrets and whooping cranes would are not likely to occur in CRP fields eligible for managed haying or grazing, incurring no impact to the species.

Based on the habitat and life cycle of the American burying beetle it would not likely be impacted either indirectly or directly by Alternative B. There is the possibility of an increased food supply (direct mortalities of other wildlife), which would potentially with a greater frequency. This alternative would not negatively impact this species.

The Proposed Action would increase the frequency of managed haying and grazing once every five years. Western prairie fringed orchid would potentially incur negative impacts from any frequency of haying or grazing. Areas where there is a known population of fringed western prairie orchid requires consultation with the USFWS prior to implementation of managed haying or grazing.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Under this alternative managed haying and grazing would be allowed once in three years and the PNS would be reduced to May 1 to July 1. Impacts to invertebrates would likely be the same as under Alternative B since haying and grazing activities would still commence after the period of greatest species richness for invertebrates (mid to late June).

No Action – Alternative A

Similar to Alternative B, this alternative would have a longer period between disturbances which would not likely result in any negative impacts on the American burying beetle.

4.2 WATER RESOURCES

4.2.1 Surface Water

Impacts to water resources would be considered significant if implementation of the action alternatives resulted in changes to water quality, threatened or damaged unique hydrologic characteristics, or violated established laws or regulations.

4.2.1.1 Background and Methodology

As stated by the University of Missouri's FAPRI and the USDA FSA: "Water Quality is affected by soil and nutrients transported off the field in water. Both field and buffer practices affect these processes" (FAPRI/FSA 2007).

FAPRI/FSA research indicates "across all assessed soil types, the amount of soil moving off the field in runoff is 99 percent lower for CRP conservation cover than for crop production that might otherwise occur" (FAPRI/FSA 2007). These reduced amounts of soil erosion also correlate to reduced nitrogen and phosphorus (overall losses are 95 percent lower and 86 percent lower respectively when comparing CRP and without CRP scenarios) (FAPRI/FSA 2007). Aside from covering highly erodible soils with conserving vegetative stands, the CRP often creates buffers between water bodies and actively farmed fields. Buffer actions also reduce sediment and nutrients helping to avoid water quality impacts from agricultural practices.

Haying and grazing in general has the potential to directly and indirectly effect surface water quality. Livestock having access to surface water bodies may pollute water with nutrients mobilized by damage to streambanks and vegetation from trampling, and the addition of manure. However, managed haying and grazing provisions limit these activities to no closer than 120 ft of a permanent surface water body and these areas are fenced to confine livestock, minimizing this potential. The primary potential of haying and grazing to effect water quality rests in possible increased soil erosion caused by loss of vegetation which could lead to increased sedimentation of surface water. In addition, soil compaction from livestock can lead to excessive runoff, if not controlled. Potential negative effects on water quality not directly related to the frequency of haying and grazing are currently addressed by NRCS Conservation Practice Standards and are included within the Conservation Plan prepared for specific lands, prior to managed haying and grazing being approved. Measures to eliminate, minimize or mitigate any potential impacts to a less than significant level include restricting livestock access to surface water bodies, designing an appropriate stocking rate, limiting haying to 50 percent of a field in any given year, ensuring adequate measures are taken so that vegetation recovers prior to frost, ensuring livestock are adequately dispersed to prevent soil compaction and concentration of excess nutrients that could runoff into surface water. These measures are described in greater detail in Chapter 6: Mitigation.

The state of South Dakota has identified impaired waterbodies as described in Section 3.2.2.1. The addition of pollutants from haying and grazing activities could add to further impairment of these waterbodies which would be a significant impact. However, since the managed haying and grazing provisions limit these activities within 120 feet of any permanent surface water body and livestock is confined by fencing, further impairment of the listed water bodies would not occur. Changing the frequency of managed haying and grazing activities would not impact impaired water bodies in the state.

For this analysis, the potential impacts of managed haying and grazing frequencies on vegetation and soils that may lead to diminished water quality form the basis for the water quality impact assessment. Since the vegetation and soil impact analyses are qualitative, this analysis is as well. Under managed haying and grazing activities, impacts to surface water would most likely result from changes to rates of erosion, sedimentation, and nutrient loading from manure.

Preferred Alternative – Alternative B

Alternative B intends to alter the frequency of these actions from once in ten years for managed haying and once in five years for managed grazing to once every five years for haying and grazing. As noted in Section 4.1.1 Vegetation, haying or grazing once in five years little impact on the plant community except during the haying or grazing period. Therefore, although the vegetative cover height will be altered (between two and eight-inch minimum cutting for most grasses and legumes), and given the provisions require a minimum five inch stubble height remains, vegetative cover will remain in place (and exhibit regrowth between four and eight inches by the frost period) (USDA/NRCS 2008c). This vegetative cover would continue to reduce the potential for soil erosion and subsequent sedimentation and nutrient deposition into nearby waterbodies. Overall, even though haying and grazing frequency would increase in frequency compared to Alternative A, the potential impact on water quality would be expected to be similar to Alternative A.

Therefore, implementation of Alternative B would maintain reductions in overall sedimentation and nutrient loading into the fourteen South Dakota river basins gained by enrolling agricultural lands into CRP.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Alternative C would implement the managed haying and grazing practices on a once in three year frequency for both. As noted in Section 4.1.1 Vegetation, this alternative is still likely to maintain vegetative cover that minimizes the potential for soil erosion that can lead to sedimentation of nearby surface water bodies. Overall, even though haying and grazing frequency would increase compared to the Alternative A, water quality should remain the same as with Alternative A.

Additionally, Alternative C would change the PNS date from May 1-August 1 to May 1-July 1. Although haying and grazing would occur 31 days earlier when compared to the other alternatives, this shift in timing will not affect water quality. Warm season vegetative cover would remain the same and may even increase since grasses and other cover would have an additional 31 days to grow before the frost. Cutting of dormant cool season grasses near the end of the shortened PNS of this alternative could diminish the health and vigor of these plants. Any loss of vegetative cover could lead to increased soil erosion which may deposit into nearby surface water bodies.

Therefore, implementation of Alternative C would maintain reductions in overall sedimentation and nutrient loading into South Dakota river basins.

No Action – Alternative A

Alternative A would continue to implement the managed haying and grazing practices on a once in ten and once in five year frequency respectively. As discussed above, the impacts of managed haying and grazing has little negative impact on the plant community except during the haying or grazing period. This vegetative cover will continue to reduce the potential for soil erosion and subsequent sedimentation and nutrient deposition into nearby waterbodies. The longer intervals between managed haying or grazing under the current provisions would allow longer periods than the action alternatives for vegetation to recover after harvesting, especially if precipitation is not ideal the following growing season.

4.3 SOIL RESOURCES

Significant impacts to soils would occur if implementation of an action resulted in permanently increasing erosion and stream sedimentation, or affected unique soil conditions.

4.3.1 Background and Methodology

In order to measure soil loss the USDA has developed the Universal Soil Loss Equation (recently revised; RUSLE). This equation is A = RKLSCP and takes into account rainfall/runoff (R), soil erodibility (K), slope length (L), slope steepness (S), cover management (C), and supporting practices (P).

Changing the frequency of managed haying or grazing would not cause changes to any factor except the cover management factor.

- Rainfall/runoff (R) would remain the same regardless of changing the frequency intervals of managed haying and grazing.
- Soil erodibility is independent of management; therefore, it would remain the same with or without changes to frequency intervals.
- Slope length and slope steepness will not be altered as a result of increasing the frequency of haying or grazing.
- Supporting practices such as contouring and terracing will remain the same with or without changing frequency intervals.

Therefore, a qualitative discussion of changes to the cover management factor will be used to determine impacts. This discussion will include alterations to each subfactor associated with cover management as noted below.

Cover Management Factor (c) and Subfactors

The cover management equation is:

$C = c_c g_c s_r r_h s_b s_c s_m$

Where:

C = daily cover management factor

c_c = daily canopy subfactor

g_c = daily ground (surface) cover subfactor

s_r = daily soil surface roughness subfactor

r_h = daily ridge height subfactor

s_b = daily soil biomass subfactor

s_c = daily soil consolidation subfactor

s_m = daily antecedent soil moisture subfactor.

The daily canopy subfactor refers to the height and percent coverage of the daily canopy and how it affects water drop impact energy. A higher canopy allows water drops to collect and fall from a greater height increasing water drop energy. The gradient of canopy (location and density of canopy material) affects how waterdrops interact and the energy they maintain. Finally, canopy shape (triangle, inverted triangle, rectangle, etc.) affects what percent of the surface is covered by the canopy.

The ground cover subfactor includes the cover directly in contact with the soil surface that primarily affects rain drop impact and soil runoff. Ground cover can help with infiltration, slowing runoff and can reduce rain drop impact energy. Of note – canopy over ground cover is considered to be non-effective and is given no credit.

The soil surface roughness subfactor is based on random roughness created by mechanical disturbance. It usually ranges from zero to three inches. Increased roughness generally creates depressions and weather resistant clods, increases infiltration, and increases hydraulic roughness that slows runoff.

The ridge height subfactor takes into account the height and orientation of ridges. The higher the ridges the more surface area available for soil erosion. Additionally, when ridges are oriented parallel to the overland flow path, rill-interill erosion will be increased.

The soil biomass subfactor estimates how soil biomass affects rill-interill erosion. Live root biomass helps reduce soil erosion in several ways: produce exudates, increases infiltration through transpiration, and mechanically holds the soil in place. Additionally, dead biomass and buried residue can also mechanically hold the soil in place.

The soil consolidation subfactor measures how loose the soil is depending upon soil disturbance. Soils that have been tilled, etc., have a higher susceptibility to erosion.

The antecedent soil moisture subfactor is only used when the Universal Soil Loss Equation is applied to the Northwest Wheat and Range Region; therefore, it is not applicable to this State.

Preferred Alternative – Alternative B

The soils in a large area of the southwestern part of the state, in areas in the north and in the western half of the State, and running from north to south in the eastern half of the State are particularly susceptible to wind and water erosion In Eastern South Dakota, along the Minnesota and Iowa borders is particularly susceptible to water erosion as well. The implementation of Alternative B would allow these soils to be subject to managed haying and grazing on a once every five years basis for both, rather than a once in ten and once in five year basis, respectively, as under Alternative A. This increase in frequency may alter the following factors:

Because the conservation cover (grass, forbs, legumes, etc.) planted as part of the CRP practices eligible for managed haying and grazing will not change if Alternative B is implemented, only the canopy height would be affected. In grasslands, altering the canopy height from approximately six to 12 inches to a minimum of five inches (a minimum five inch canopy height must remain after haying or grazing) results in a relatively short interval during which canopy height will be shortened (from haying/grazing to regrowth), providing less canopy cover. In upland wildlife habitat conservation covers, provisions ensuring adequate leaf area of woody shrubs and trees for recovery within the growing season ensure the canopy is preserved. However, canopy cover over groundcover is given no credit in assessing soil erodibility. Therefore, for most conservation covers, this subfactor will not be a factor in soil loss.

1. Groundcover on conservation covers that are primarily grasses and legumes will be close to 100 percent except in areas where a certain amount of bare ground is required in order to target the needs of certain grassland bird species. Regardless of the percentage of existing grassland surface, groundcover will be minimally affected by haying and grazing actions, especially since practice standards require a five inch stubble height remains after either activity. Haying will reduce the canopy cover, but leave the groundcover. Grazing may also temporarily reduce groundcover through hoof action where livestock concentrate. However, both of these effects would be localized, temporary and minimal.

2. As with groundcover, soil surface roughness may be minimally affected during haying and grazing in areas where equipment or livestock hooves alter the soil surface. In most cases, hooves and mechanical equipment may increase random roughness by creating depressions from tires and hooves throughout fields.

3. Any existing ridges across CRP lands should not be affected by an increased frequency of haying or grazing activities. Haying or grazing activities should not create or destroy any existing ridges as hay is harvested or livestock graze fields. Therefore, the ridge height subfactor will not be affected by implementation of Alternative B.

4. Live biomass in soils will not be affected by implementation of more frequent haying and grazing routines. Dead biomass may be increased, particularly during haying, as some cut hay is lost during the harvesting process. Also, dead biomass may accumulate on soil

surfaces as a layer of thatch. However, the increased frequency of disturbance associated with Alternative B would adequately control thatch accumulation under average conditions.

5. Soil consolidation should remain unaffected by an increase in haying or grazing frequency. Because neither haying nor grazing require tilling or other soil disturbance actions (aside from minimal disturbance due to equipment or livestock hooves), the soil consolidation factor will be minimally affected by implementation of Alternative B.

An increase in haying or grazing frequency over Alternative A may alter cover management subfactors of groundcover, soil surface roughness, soil biomass, and soil consolidation. In most cases, these would be short term, localized adverse effects. In the case of soil biomass benefits may be realized as dead biomass is added to the soil and negative impacts of thatch accumulation are controlled by more frequent disturbance. If less than ideal precipitation conditions arise between periods of harvesting, the increased frequency of Alternative B reduces the potential recovery period more than Alternative A. In order to help reduce or avoid adverse affects, mitigation measures in Chapter 6 require the development of a conservation plan prior to any managed haying or grazing. Portions of this conservation plan would place maximum haying and grazing limits and include BMPs to help reduce soil erosion. BMPs include, but are not limited to, measures to maintain adequate ground cover, litter, and canopy and reduce soil compaction.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Alternative C would implement the managed haying and grazing practices on a one in three year frequency for each. As noted in Section 4.1.1 Vegetation, haying or grazing will have little impact on the plant community except during the haying or grazing period. Therefore, impacts of Alternative C on soil resources is similar to those of Alternative B for most conservation covers. However, cutting dormant cool season grasses close to the end of the shortened PNS may impair the health and vigor of these plants. Any loss of vegetative cover could potentially lead to increased soil erosion. Additionally, an increase in haying or grazing frequency over Alternative A may alter cover management sub-factors of groundcover, soil surface roughness, soil biomass, and soil consolidation. In most cases these will be minimal adverse effects, and in the case of soil biomass it may even be benefit as dead biomass is added to the soil and negative impacts of thatch accumulation are controlled by more frequent disturbance.

If less than ideal precipitation conditions arise between periods of harvesting, the increased frequency of the Alternative C reduces the potential recovery period more than the Alternative A. In order to help reduce or avoid adverse affects, mitigation measures in Chapter 6 require the development of a conservation plan prior to any managed haying or grazing. Portions of this conservation plan would place maximum haying and grazing limits and include BMPs to help reduce soil erosion. BMPs include, but are not limited to measures to maintain adequate ground cover, litter, and canopy and reduce soil compaction.

No Action – Alternative A

Alternative A would continue to implement the managed haying and grazing practices on a once in ten and once in five year frequency respectively. Alternative A is expected to help minimize soil erosion within the project area, since land would be planted in a conservation cover crop. Reduced haying and grazing frequencies will even further reduce affects on cover management subfactors soil surface roughness and soil consolidation. The longer intervals between managed haying or grazing under the current provisions would allow longer periods than the action alternatives for vegetation to recover after harvesting, especially if precipitation is not ideal the following growing season.

4.4 AIR QUALITY (CARBON SEQUESTRATION)

Impacts to air quality would be deemed significant if implementation of an action reduced the rate of carbon sequestration to below pre-CRP practice levels or resulted in more CO2 release to the atmosphere than which is sequestered.

4.4.1 Background and Methodology

Carbon sequestration changes depend on a number of factors. The dynamics involve a wide variety of factors some of which are only partially understood. More research across the State on many more sites, soil types, management regimes, landscapes and temperature/precipitation regimes is necessary before there is sufficient detail to inform decision makers on an as complex as carbon sequestration (Paul 2008). In general it can be stated that taking land out of cultivation is and implementing improved management will result in a net increase in carbon sequestration levels and that the annual rate of increase continues for decades (Conant 2001). Scientist also attributes a major portion of the total carbon sequestered on agricultural lands to the CRP program (Ogle 2008).

Scientists have not measured the carbon sequestration levels specifically for the alternatives examined in this EA. Logic would lead to the conclusion that the difference in carbon sequestration levels achieved by the alternatives presented in this EA is much less than the level of carbon sequestration achieved by either alternative over conventional farming. One can conclude that the alternatives result in a net increase in carbon sequestration over traditional crop production practices and both would make a significant reduction in agricultural carbon emissions.

The NRCS provides to the public a carbon sequestration decision support tool called "COMET-VR". COMET-VR stands for The Voluntary Reporting of Greenhouse Gases-Carbon Management Evaluation Tool. This tool utilizes information obtained from the Carbon Sequestration Rural Appraisal (CSRA) and the dynamic carbon sequestration model "Century" developed at Colorado State University (CSU) to simulate carbon acquisition rates based on a variety of management practices. The model accommodates the most common agricultural land uses, tillage methods, and soil types found in of each county and state. It also allows simulations of CRP activities (grass and legume cover and 100 percent grass cover). The model does not allow one to select the practices of haying and mowing on CRP at the frequency and intensity identified in the alternatives proposed in this EA.

Two simulations were run using COMET-VR to examine the carbon sequestration rates resulting from changes in land management practices in Lyman County in South Dakota on an upland loam soil with no irrigation

Simulation 1.

The first simulation assumes the land was grazed prior to 1970 and then intensively farmed from 1970 to 1999. The second scenario assumes the land was grazed prior to 1970 and then moderately grazed between 1970 and 1999. The lands in each scenario were then modeled for carbon accumulation assuming the following practices were applied to the land since 2000; (1) annual haying of grass/legume stand, (2) moderate intensity grazing on 100 percent grass stand, (3) grass stand with no haying or grazing, and (4) grass/legume stand with no haying or grazing. The latter two practices equate to CRP rangelands.

Pre-1970 Intensive Tillage, Winter Wheat-Milo Rotation

1970- Through 1990s Grassland, Moderate Grazing

Use Since 2000

	Grass-Legume Hay	Moderate Grazing	100% Grass Cover	Grass/Legume
Lbs C Ac/Yr	400	100	80	400

The results of this run indicate that all four land management practices result in an increase in carbon sequestration. There is very little difference between a 100 percent grass stand that is moderately grazed and the CRP grass land. The largest increase in soil C were from the practices that involved a mix of grasses and legumes. The addition of legumes to grasslands is necessary for significant carbon sequestration. A review of 165 studies dealing with pasture and rangeland responses to elevated atmospheric CO2 levels concluded that legumes dramatically respond to CO2 levels and resulting in significantly more fixed nitrogen that improves the soil carbon to nitrogen ratio which in turn resulted in more carbon sequestration (Campbell et al. 2000).

Simulation 2.

The second simulation assumes the land was intensively tilled and producing winter wheat-milo in rotation. All other factors are the same as in the first scenario.

Pre-1970 Intensive Tillage, Winter Wheat-Milo Rotation

1970 through 1990s Intensive Tillage, Winter Wheat-Milo Rotation

Use Since 2000

	Grass-Legume Hay	Moderate Grazing	100% Grass Cover	Grass/Legume
Lbs C Ac/Yr	0.0	20	60	500

In this simulation, resulted in significantly more pounds of carbon sequestered for the CRP practices versus the haying and grazing practices. The grass/legume CRP practice had more than a nine fold increase over the 100 percent grass CRP practice. The significance of the legumes in the vegetative cover is very clear. Less clear are the results of the haying and grazing runs for Scenario 2. It is unclear why COMET-VR runs show no changes in carbon accumulation for a hayed field of grass and legumes. The 20 lbs of accumulated carbon for the grazed grass field is small and can be interpreted as no significant addition of carbon to the soil. It appears the program assumes the cutting frequency and grazing pressure of this scenario is excessive and results in stressed vegetation. The large differences in the results of Scenario 1 and 2 for haying and grazing are significant.

In order to better simulate the alternatives discussed in this EA, the results of the two scenarios were manipulated to achieve a ten yr carbon sequestration rate. The derived ten year response was then divided by ten in order to achieve an annual carbon sequestration rate for each practice. For example from Simulation 1, using Alternative A, grazing once every five years the response is calculated as follows:

- SOC for one year grazed = 100 lbs/ac
- SOC for four years not grazed = 320 lbs/ac (80 lbs x 4 yrs)
- Total SOC for five years = 420 lbs/ac (100 lbs + 320 lbs)
- Total SOC for ten years = 840 lbs/ac (480 lbs x 2)
- **Average annual SOC rate = 84.0 lbs/ac (840 lbs/10yrs), result**

Adjusted Average Lbs Carbon/Ac/Yr (COMET-VR)

Alternative Practices	Simulation 1	Simulation 2
Alternative B (Grazing 1/5)	84.0	52.0
Alternative B (Haying 1/5)	400.0	400.0
Alternative C (Grazing 1/3)	85.8	46.0
Alternative C (Haying 1/3)	396.0	330.0
No Action-Alternative A (Grazing 1/5)	84.0	52.0
No Action-Alternative A (Haying 1/10)	400.0	450.0

The most notable difference in the adjusted averages for the three alternatives is the increase in soil carbon acquisition where you have legumes in the haying vegetation cover. The presence of legumes in the plant mix increased the level of carbon accumulation five to eight fold over the pure grass stand. It is important to note that both alternatives result in a net increase in SOC which would imply both practices sequester carbon thereby reducing atmospheric CO2 resulting in improved air quality

Preferred Alternative – Alternative B

During the early growing season, grazing reduces net carbon exchange relative to the reduction in green leaf area, but as the growing season progresses on the grazed area, regrowth produces younger leaves that have apparent higher photosynthesis efficiency. This is supported by the fact that the net CO_2 exchange efficiency was greatest in grasslands when grazing utilization was highest, even though the leaf area was greater in the un-grazed area. This result is attributed to the reduction in plant respiration induced by the reduction in leaf surface area. The response of grasses to grazing suggests that eliminating grazing entirely in natural grasslands can either increase or decrease the rate of carbon sequestration; however, not at a significant level. Alternative B would result in a net increase in SOC and a reduction in atmospheric carbon resulting in better air quality and a negligible positive impact on global warming.

Modeling Alternative B resulted in a net increase in soil carbon ranging from 52 to 400 lbs per acre per year. This equates to the removal of between 0.01 and .73 tons of CO_2 removed from the atmosphere per acre each year. This alternative would remove between 79,189 tons and 578,080 tons of CO_2 from the atmosphere statewide. Alternative B alternative would have a beneficial impact on air quality.

Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Modeling Alternative C resulted in a net increase in soil carbon ranging from 46 to 396 lbs of C/ac/yr. This equates to the removal of 0.08 to 0.73 tons of CO_2 per acre per year from the atmosphere. If this alternative was applied state wide on all eligible managed haying and grazing acreage it would remove between 63,351 and 578,080 tons of CO_2 from the atmosphere. This would reduce air pollution and be a beneficial impact.

No Action - Alternative A

Modeling Alternative A resulted in a net increase in carbon accumulation. The accumulated C ranged from 52 to 450 lbs C/ac/ye. This equates to the removal of between 0.10 and .83 tons of CO_2 removed from the atmosphere per acre each year. This alternative would remove between 79,189 and 657,270 tons of CO_2 from the atmosphere statewide. Alternative A would have a beneficial impact on air quality.

Less frequent removal of older (and dead) plant material results in lower rates of photosynthesis. Lower photosynthesis rates results in less CO_2 exchange and a reduction in carbon sequestration. Less frequent grazing results in a lower level of animal waste (manure and urine) being added to the soil. Manure and urine add nitrogen to the soil resulting in increased plant growth. The addition of manure and urine also affect the microbial community dynamics. Soil microbes directly affect carbon cycling and the rate of carbon sequestration. Lower levels of manure and urine would suppress carbon cycling compared to the action alternatives. The actual rate of carbon sequestration rate for Alternative A varies; however, it would result in a net increase in carbon accumulation and a reduction in atmospheric carbon. Therefore, this practice would improve air quality, help mitigate for other carbon emissions and provide a negligible positive impact on global warming.

4.5 SOCIOECONOMICS

A significant impact to socioeconomic conditions can be defined as a change that is outside the normal or anticipated range of those conditions that would flow through the remainder of the economy and community creating substantial adverse effects. For small percentage changes in individual attributes, it would be unlikely that the changes would result in significant impacts at the total level of statewide analysis. Changes to the statewide economy of greater than agriculture's normal contribution could be considered significant, as this could affect the general economic climate of other industries on a much greater scale.

Additional changes in demographic trends, such as population movements, would be considered significant if a substantial percentage of the population were to enter or leave a particular area based on the changing economic conditions associated with the alternatives, rather than projected changes or changes generated by economic activities as a whole.

Also, biological changes associated with managed haying and grazing activities that affect other species, such as ground-nesting species has ancillary effects to outdoor recreation for both consumptive uses like hunting and non-consumptive uses such as wildlife watching. These effects can create both monetary and non-monetary changes, such as less expenditure for outdoor activities.

4.5.1 Background and Methodology

In order to determine the economic impacts associated with the alternatives, a primary data collection and analysis procedure was developed. Primary data collection included obtaining data about specific fields throughout the State. The state was divided into ecological regions based upon the CEC Level 1 typology (CEC 1997); within each ecological region, three counties were chosen to provide a representative description of the diversity in agricultural production, climate, wildlife habitat, topography and other landscape characteristics. Within each of the chosen counties, ten CRP fields were selected by FSA/NRCS county personnel that represent the diversity of the CRP fields in the county. This diversity included availability of water on site, fencing, conservation cover type, and diversity of fields within close proximity in the landscape.

This assessment methodology to determine the potential economic impact was developed from production budgets and changes in producer income using IMPLAN™ software. From the information collected, alternative managed haying and grazing frequency can be analyzed to estimate the net returns from engaging in these practices. These budgets can then be used to determine the probability of producers adopting the managed haying and grazing practices, the increases in outputs and incomes, effects on local, regional and national prices and the economic impacts in the local, regional and national economies.

A full description of this methodology and results are included in Appendix C.

4.5.2 Baseline Conditions Analysis

Based on the previously described analysis methodology, a baseline condition for managed haying and grazing activities in South Dakota was determined using data from 2004 to 2006. A sample size of ten representative fields per county from Brown, Day, and Lyman counties was used. It was found that approximately 31.5 percent of CRP eligible practice acres were economically viable for grazing and 41.1 percent of CRP eligible practice acres were economically viable for hay production.

Economic viability was determined to be at least a $5.00 return per acre over per acre costs minus a 25 percent CRP rental rate reduction per acre. In the samples, an average rental rate per acre for the county was determined and used as one of the costs to determine per acre return. From the sample, 20 out of the 40 fields were determined not to have an economic return of greater than $5.00 per acre for hay production. The primary limiting factor for viable hay production was a limited amount of forage available for hay. For the grazing analysis, 26 out of 40 fields were determined not to have a return of greater than $5.00 per acre. The primary limiting factor for economic viability for grazing was the availability of water within the field and fencing for livestock. If there was no water within close proximity or within the field, the field was determined not to be economically viable for grazing due to the potential costs associated with getting water to the livestock. When the sample data was extrapolated to countywide and then statewide using expansion factors at each level, it was found that slightly over 25 percent of acreage could produce an economically viable return per acre for both hay production and beef production.

Within the sample, approximately 43.6 pounds of beef per acre were produced on economically grazable acres and 0.9 tons of hay per acre was produced on economically hayable acres. Average return per acre for each activity (hay or graze) was calculated for each sample county (Table 4.5-1). The average rental rate for CRP acres was $42.24 in 2007; a 25 percent rental rate reduction would be $10.56 per acre. As can be observed in Table 4.5-1, the average 25 percent rental rate reduction in two of the sample counties was less than the economic value of the product generated off each acre of managed haying or grazing activities.

When extrapolated statewide, only 7.7 percent of eligible CRP acres over three years (2004-2006) were used for managed haying and grazing activities. In practice, it was estimated that only 4.4 percent of total CRP acres that were economically viable for grazing were grazed (approximately 8,800 acres), while only 6.7 percent of total CRP acres that were economically viable for hay production were used for hay production (approximately 74,000 acres). The estimated maximum amount of managed grazing activities based on these conditions would be approximately 31.5 percent of economically viable acreage, while managed haying activities could occur on approximately 41.1 percent of the economically viable acreage.

Table 4.5-1. Average Return per Acre with a 25 Percent Rental Rate Reduction on CRP Acreage.

County	Average Return ($/acre)		Average Cots ($/acre)	Average 25% Rental Rate Reduction ($/acre)
	Hay Production	Stocker Cattle	Hay Production	Hay Production & Grazing
Brown	8.89	2.21	31.12	45.17
Day	18.54	11.79	32.11	45.53
Lyman	22.02	15.14	31.23	33.32

Note:

Average Return for Hay Production = Average Revenue –Average Cost – Average 25 percent Rental Rate Reduction
Average Return for Stocker Cattle = Average Revenue – Average 25 percent Rental Rate Reduction

4.5.3 Preferred Alternative – Alternative B

Alternative B allows managed haying and grazing once every five years on authorized CPs with no change to the PNS. The analysis for this alternative was based on a maximum adoption scenario of managed haying and grazing activities on eligible CPs for enrolled CRP acreage. Individual operator adoption of these practices would be based on numerous personal, local, and regional factors, which would likely indicate that the adoption rate would be less than the maximum values calculated under this analysis.

4.5.3.1 General Population Characteristics

Sullivan et al. (2004) looked at the rural economic trends following implementation of the CRP. The data period observed was from 1985 to 2000 as a long term look at trends with 1985 to 1992 being used to identify any short term trends. Sullivan et al. (2004) did find that in the short term counties having a high level of CRP enrollment in distinctly rural areas tended to experience downward trends in local population and employment, though the significance of these trends varied. They found that there was no significant correlation between CRP enrollment and negative population changes, but did find evidence of correlation with CRP enrollment and job loss in the short term. In the long term, there was no evidence for any correlation on these factors. Sullivan et al. (2004) found that counties with small agricultural service centers experienced sharp reductions in demand for farm-related business services and products as farmland was retired; however, over the long term, the studies indicated that the rural economies were adaptable enough to adjust to the changing markets.

Since managed haying and grazing would occur on currently enrolled acreage in the short term, it is anticipated that there would be no substantial changes in population, personal income and off-farm earnings, or employment based on the baseline data. In the longer term, this alternative could create additional opportunities to farm services providers (e.g., custom farming operations) at the regional level as more producers take advantage of the managed haying and grazing activities. As additional acreage is enrolled in the managed haying and grazing activities, custom haying operators would find new opportunities for their services. The longer term effects would require a widespread adoption of managed haying and grazing activities closer to the maximum levels as illustrated in Table 4.5-2 to generate new opportunities for the entry of new providers.

4.5.3.2 Managed Haying and Grazing Enrollment and Agricultural Production Value Changes

Analysis of this alternative revealed that the maximum annual percentage of use for managed haying and grazing activities would be approximately 14.5 percent of the economically viable acreage (6.3 percent of managed grazing and 8.2 percent of managed haying). This determination of economically viable acreage indicates that the 25 percent rate reduction would be less than the economic value of the product generated off each acre of managed haying or grazing activities. This would equate to approximately 54,000 acres using managed grazing activities and 92,000 acres using managed haying. These activities are estimated to produce approximately $6.8 million additional beef production value (0.4 percent increase) and $5.3 million in hay production value (1.3 percent increase). For the statewide economy, the use of these CRP acres for managed haying and grazing activities would produce an estimated additional $4.5 million from beef production (0.02 percent increase) and $8.8 million from hay production (0.03 percent increase) rippling throughout the rest of the state economy. A comparison of the alternatives and the baseline conditions is illustrated in Table 4.5-2.

If Alternative B frequencies are utilized and the maximum amount of enrolled acreage authorized for managed haying and grazing activities, the managed haying and grazing activity acreage would increase by more than 4.3 times over the baseline conditions, and 1.46 times more than Alternative A, but 1.6 times less than Alternative C. This would be a substantial increase over the baseline conditions, which would generate a marked positive increase over the total value of beef production and a small positive increase over the total value of hay production given the assumptions of the methodology. The total value of beef production would increase approximately 0.4 percent and the value of hay production would increase by approximately 1.3 percent over Alternative A. Implementation of this alternative would have a change in value to the economy as a whole of $8.8 million compared to a No Action change in value of $4.42 million.

4.5.3.3 Outdoor Recreation

In general, biological conditions that enhance habitats for wildlife increase the overall societal value for these species. Implementing the Alternative B would result in positive benefits, both monetary and non-monetary, if there were additional opportunities for outdoor recreation activities. If managed haying and grazing activities provide vegetation disturbance similar to natural occurrences, there should be varied positive habitat effects for both game and non-game species. In general, CRP practices have been found to create positive net societal benefits for a variety of media (i.e., water quality improvements, wildlife habitat, reduced erosion and sediment transport) (Sullivan et al. 2004). An increase in game species could increase

Table 4.5-2. Comparison of the Baseline Conditions and the Alternatives.

Parameter	Baseline Conditions Average Annual 2004-2006	Alternative A	Alternative B	Alternative C
Managed Grazing Activities (Beef Production)				
Maximum Percent Economically Viable Acres	0.34%	6.30%	6.30%	10.50%
Maximum Number of Acres	2,934	53,704	53,704	89,507
Additional Pounds of Beef	127,787	2,339,051	2,339,051	7,378,603
Additional Beef Value	$134,176.39	$2,456,003.35	$2,456,003.35	$7,747,533.54
Percent Change in Beef Value	0.02%	0.44%	0.44%	0.99%
Economy-wide Value Change	$248,301.53	$4,544,982,97	$4,544,982,97	$14,337,280.10
Percent Economy-wide Value Change	0.0009%	0.0164%	0.0164%	0.0518%
Managed Haying Activities (Hay Production)				
Maximum Percent Economically Viable Acres	2.2%	4.11%	8.22%	13.71%
Maximum Number of Acres	24,727	45,768	91,535	152,559
Additional Tons of Hay	21,994	40,708	81,417	140,763
Additional Hay Value	$1,429,580.68	$2,646,037.79	$5,292,075.58	49,149,595.20
Percent Change in Hay Value	0.35%	0.66%	1.31%	2.99%
Economy-wide Value Change	$2,388,227.67	$4,420,415.55	$8,840,831.10	$15,285,122.92
Percent Economy-wide Value Change	0.00862%	0.0160%	0.0319%	0.05525

the monetary benefits associated with consumptive uses at local (i.e., farm hunting leases) and regional (i.e., sporting goods dealers) levels. Additionally, an increase in non-game species could create both monetary (i.e., wildlife watching, contributions to conservation measures) and non-monetary benefits (i.e., the societal benefits associated with existence values). Overall, enhancement of wildlife habitat would generate small positive values to local and regional communities.

As described in Section 4.1 a maximum mortality rate of approximately one percent of northern bobwhite in any single year would be expected if all available eligible acreage was hayed within the State at the allowable 50 percent rate. As a worst-case scenario this mortality rate would be experienced once every five years under Alternative B. However, based on the economically hayable acreage, only 8.2 percent of the eligible acreage would be expected to be hayed in any one year by selecting this alternative. This would then indicate a very low percentage of potential mortality for the northern bobwhite (approximately 0.4 percent of the total population per year), based on rational economic decision making, which is within the range of the worst-case scenario. As such, it would be unlikely that there would be measurable adverse socioeconomic effect from the use of managed haying practice outside the PNS associated with outdoor recreation.

4.5.4 Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Alternative C proposes to allow both managed haying and grazing to occur on authorized CPs once every three years with a change in the PNS to May 1 to July 1. The analysis for this alternative is based on a maximum adoption scenario of managed haying and grazing activities on eligible CPs for enrolled CRP acreage. Individual operator adoption of these practices would be based on numerous personal, local, and regional factors, which would likely indicate that the adoption rate would be less than the maximum values calculated under this analysis.

4.5.4.1 General Population Characteristics

Similar to Alternative B, there would be small positive benefits anticipated from selecting the Alternative C. The benefits associated with selecting Alternative C would be anticipated to be slightly higher than Alternative B. This would be dependent on the level of adoption of managed haying and grazing activities at the regional levels. If managed haying and grazing activities were adopted at the maximum level, as indicated in Table 4.5-2, then there would more than likely be opportunities for new service providers to enter the marketplace, thereby generating net positive benefits to the economy.

4.5.4.2 Managed Haying and Grazing Enrollment and Agricultural Production Value Changes

Analysis of the existing provisions for managed haying and grazing revealed that the maximum annual percentage of use for managed haying and grazing activities would be approximately 24.2 percent of the economically viable acreage (10.5 percent of managed grazing and 13.7 percent of managed haying). This determination of economically viable acreage indicates that the 25 percent rate reduction would be less than the economic value of the product generated off each acre of managed haying or grazing activities. This would equate to approximately 90,000 acres using managed grazing activities and 153,000 acres using managed haying activities. These activities are estimated to produce approximately $7.7 million additional beef production value (1.0 percent increase over no CRP use) and $9.1 million in hay production value (three percent increase). For the statewide economy the use of these CRP acres for managed haying and grazing activities would produce an estimated additional $14.3 million from beef production (0.05 percent increase) and $15.3 million from hay production (0.06 percent increase) rippling throughout the rest of the state economy. A comparison of the alternatives and the baseline conditions is illustrated in Table 4.5-2.

If the Alternative C frequencies are utilized, and the maximum amount of acreage became enrolled in managed haying and grazing activities, the actively managed hayed and grazed acreage would increase and 8.75 times over baseline and 2.43 times over the No Action alternative. This would be a substantial increase over the baseline conditions, which would generate a small positive increase over the total value of beef production and hay production given the assumptions of the methodology. The total value of beef production would increase approximately 1.0 percent and the value of hay production would increase by approximately 3.0 percent over Alternative A production values. Implementation of this alternative would have a change in value to the economy as a whole of $29.5 million compared to a No Action change in value of $8.92 million.   As with any CRP program, the effects vary by location and region.

4.5.4.3 Outdoor Recreation

In general, biological conditions that enhance habitats for wildlife increase the overall societal value for these species. Implementing Alternative C would result in positive benefits, both monetary and non-monetary, if there were additional opportunities for outdoor recreation activities, similar to Alternative B. Overall, enhancement of wildlife habitat would generate small positive values to local and regional communities.

As described in Section 4.1, a maximum mortality rate of approximately one percent of northern bobwhite in any single year would be expected if all available eligible acreage was hayed within the State at the allowable 50 percent rate. As a worst-case scenario this mortality rate would be experienced once every three years under Alternative C. However, based on the economically hayable acreage, only 13.7 percent of the eligible acreage would be expected to be hayed in any one year by selecting this alternative. This would then indicate a very low percentage of potential mortality for the northern bobwhite (approximately 0.4 percent of the total population per year), based on rational economic decision making, which is within the range of the worst-case scenario. As such, it would be unlikely that there would be measurable adverse socioeconomic effect from the use of managed haying practice outside the PNS associated with outdoor recreation activities dependent upon ground nesting bird species.

4.5.5 No Action - Alternative A

Under Alternative A, eligible CRP practices would continue to be managed based on the NWF lawsuit settlement agreement of September 25, 2006. The potential for a measurable adverse socioeconomic effect from using the managed haying practice outside of the PNS would be even less than Alternative B, as it would occur once every ten years.

4.5.5.1 General Population Characteristics

Similar to Alternative B, there would be small positive benefits anticipated from selecting Alternative A. Though the benefits would be anticipated to be less than Alternative B, benefits could still accrue in the longer term. This would be dependent on the level of adoption of managed haying and grazing activities at the regional levels. If managed haying and grazing activities were adopted at the maximum level, as indicated in Table 4.5-2, then there would more than likely be opportunities for new service providers to enter the marketplace, thereby generating net positive benefits to the economy.

4.5.5.2 Managed Haying and Grazing Enrollment and Agricultural Production Value Changes

Analysis of the existing provisions for managed haying and grazing activities revealed that the maximum annual percentage for these activities would be approximately 10.4 percent of the economically viable acreage (6.3 percent of managed grazing and 4.1 percent of managed haying). This determination of economically viable acreage indicates that the 25 percent rate reduction would be less than the economic value of the product generated off each acre of managed haying or grazing activities. This would equate to approximately 54,000 acres using managed grazing activities and 46,000 acres using managed haying activities. These activities are estimated to produce approximately $2.5 million additional beef production value (0.4 percent increase) and $2.6 million in hay production value (0.7 percent increase). For the statewide economy the use of these CRP acres for managed haying and grazing activities would produce an estimated additional $4.5 million from beef production (0.02 percent increase) and $4.4 million from hay production (0.02 percent increase) rippling throughout the rest of the State economy.

If Alternative A were selected and the maximum eligible acreage was subject to managed haring and grazing, the actively hayed and grazed acreage would increase by 3.5 times over the baseline conditions, but would be 1.46 times less than Alternative B, and 2.43 times less than Alternative C. This would be a substantial increase over the baseline conditions, which would generate a small positive increase over the total value of beef production and hay production given the assumptions of the methodology. The total value of either product would increase between 0.7 to 0.7 percent over the production value excluding managed haying and grazing acreage. Implementation of this alternative would have change in value to the economy as a whole of $8.9 million compared to a baseline value of $2.54 million. As with any CRP program, the effects vary by location and region.

4.5.5.3 Outdoor Recreation

In general, biological conditions that enhance habitats for wildlife increase the overall societal value for these species. Implementing Alternative A would result in positive benefits, both monetary and non-monetary, if there were additional opportunities for outdoor recreation activities, similar to the action alternatives. Overall, enhancement of wildlife habitat would generate small positive values to local and regional communities.

Similar to Alternative B, the worst case scenario of northern bobwhite mortality would be approximately one percent; however, this would only occur once every ten years. Based on the economically hayable acreage, only 4.1 percent of the eligible acreage would be expected to be hayed in any one year by selecting this alternative. This would then indicate a very low percentage of potential mortality for the northern bobwhite of approximately 0.1 percent once every ten years, based on rational economic decision making.

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5.0 CUMULATIVE IMPACTS

5.1 INTRODUCTION

CEQ regulations stipulate that the cumulative effects analysis within a EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such other actions." Cumulative effects most likely arise when a relationship exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time tend to have potential for cumulative effects.

Managed haying and grazing allows producers to harvest hay or allow grazing of specific practice acreage at express intervals while maintaining the CRP cover to fulfill its intended conservation purposes. In this EA, the affected environment for cumulative impacts are lands eligible for enrollment in CRP with conservation practices that allow managed haying and grazing. For the purposes of this analysis, other Federal and State conservation programs pertaining to haying and grazing of privately held conservation lands are the primary sources of information used in identifying past, present, and reasonably foreseeable actions.

5.2 OTHER FEDERAL AND STATE HAYING AND GRAZING PROGRAMS ON CONSERVATION LANDS

In addition to managed haying and grazing, there are other types of grazing authorized on CRP lands. Additionally, there are Federal and State conservation and assistance programs that allow producers to hay and graze on private lands. Table 5.2-1 summarizes these Federal and State conservation and assistance programs. The primary purposes for allowing haying and grazing on CRP and privately held conservation lands are vegetation maintenance to enable the conservation cover to fulfill its intended purposes most effectively and economically, and to supplement livestock feed or provide emergency feed during natural disasters.

Federal haying and grazing related programs on privately held conservation lands are voluntary and enrollment cannot be predicted. Under CRP provisions, and all other Federal conservation programs, no producer can receive duplicate Federal payments for the same conservation activity on the same lands, and there is typically a cap on the amount one producer can receive for each program. Further, no other CRP harvesting or grazing may occur on managed hayed or grazed CPs outside of the established frequency interval, except emergency haying and grazing, and no CRP lands may have both managed haying and grazing conducted on the same field in the same season. ***Therefore, with few exceptions, there is limited potential for geographical overlapping of multiple programs or temporal convergence of multiple programs on CRP lands in the same year.***

Table 5.2-1. Federal and State Conservation and Assistance Programs.

Program	Summary
Grassland Reserve Program (FSA/NRCS/USFS)	This program conserves vulnerable grasslands from conversion to cropland or other uses by helping maintain viable ranching operations. Participants voluntarily limit future use of the land while retaining the right to conduct common grazing practices; produce hay; conduct fire rehabilitation; and construct firebreaks and fences. Participants may enter into permanent or thirty-year easements, leases, rental, or restoration contracts.
The Conservation of Private Grazing Land (NRCS)	This program provides technical assistance to individuals who own private grazing lands and managers of grazing lands. It offers opportunities to conserve and enhance grazing land resources to protect the lands from soil erosion, conserve water and provide habitat for wildlife. In addition, this program utilizes grazing lands as a source of biomass energy and raw materials for industrial products.
Conservation Security Program (NRCS)	This program provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private working lands. Lands included under this program include working cropland, grassland, prairie land, improved pasture, and range land. Also included is forested land that is an incidental part of an agriculture operation.
Emergency Haying and Grazing (FSA)	Authorization may be granted for haying and grazing on CRP lands to provide relief to ranchers in areas affected by drought or other natural disaster. Authorization comes through the National FSA office or from the State office for drought relief. Emergency haying and grazing may not be conducted during the PNS and requires an annual rental payment reduction of 10 percent.
Modification to CRP Contract for Critical Feed (FSA)	Initiated on June 2, 2008, this modification is only authorized through 2008. A subsequent lawsuit and injunction on this program permits only three categories of users who were approved and invested significant funds in preparation to hay or graze after the PNS on lands enrolled in the same CPs as authorized for managed haying and grazing (1, 2, 4B, 4D, 10, 18B & 18C) to allow for critical feed use. Critical feeding restarts the managed haying and grazing waiting period. Primary differences from managed haying and grazing are: no payment reduction is assessed but imposes a $75 administrative fee, can also graze only 75% of a field at 100% of the NRCS stocking rate, and must be complete by certain dates depending on user category.

Table 5.2-1. Federal and State conservation and Assistance Programs (cont'd).

Program	Summary
General Hunting Access (Walk-In Areas), South Dakota Game, Fish, and Parks Commission (SDGFPC)	Provides incentives to landowners possessing in excess of 80 acres of CRP land containing "high quality permanent cover" to open their private lands to hunters. Landowners may hay or graze their private CRP land with approval by the U.S. government.

Federal Actions

5.2.1.1 Emergency Haying and Grazing

The primary exception is emergency haying and grazing administered by FSA. Emergency haying and grazing is generally intended for periods of drought or excessive moisture of such magnitude that livestock producers nationally or across wide-ranging areas are faced with culling of herds or livestock losses. It is generally not authorized for situations where livestock producers suffer inconveniences in forage availability or prices, because of less than ideal production or over-utilization of acreage not under CRP contract. Authorization for emergency haying or grazing is granted if either the Deputy Administrator for Farm Programs (DAFP) or FSA State Committee (STC) determine it is warranted and the FSA Conservation and Environmental Programs Division (CEPD) concurs. FSA county committees (COC) may request emergency haying or grazing on a county by county basis if evidence demonstrates a 40 percent or greater loss in normal hay and pasture production has occurred, and:

- drought conditions and/or precipitation levels indicate an average of 40 percent or greater loss of normal precipitation for the four most recent months, plus the days in the current month before the date of request; or
- excessive moisture conditions and/or precipitation levels indicate an average of 140 percent or greater increase in normal precipitation during the four most recent consecutive months, plus the days in the current month before the date of request.

The COC must submit written monthly reviews of conditions in the county and the basis used to determine whether continued haying or grazing is warranted. ***Emergency haying and grazing must end by September 30, unless determined otherwise as noted below.*** Emergency haying and grazing may not be approved during the PNS. Emergency haying and grazing is only authorized on the same CPs that are eligible for managed haying and grazing, require a prior written request by the applicant, and modification of the conservation plan to include haying or grazing that must be site specific and reflect the local wildlife needs and concerns. Further restrictions apply as follows:

- designation for emergency grazing may be for up to 90 calendar days, not to exceed September 30;
- one 30-calendar-day extension may be authorized, not to exceed September 30;

- designation for emergency haying may be for up to 60 calendar days, not to exceed September 30;
- emergency haying extensions are not authorized;
- emergency grazing extension up to 15 calendar days may be authorized because of flooding, not to exceed September 30;
- emergency grazing shall leave at least 25 percent of each field or contiguous CRP fields ungrazed for wildlife, or graze not more than 75 percent of the stocking rate determined by NRCS or TSP;
- shall leave at least 50 percent of each field or contiguous fields unhayed for wildlife;
- shall not hay or graze the same acreage; and
- haying is limited to one cutting.

Acreage ineligible for emergency haying or grazing include useful life easements, any land within 120 ft of a stream or other permanent water body, and any land enrolled in a CP not authorized for emergency haying and grazing. At least 25 percent of the contracts authorized for emergency haying or grazing shall be spot checked by the COC ten days prior to the end date for the authorized activity. Emergency haying and grazing may occur any year before or after managed haying and grazing. Finally, managed haying and grazing may not be undertaken on acreage that was harvested under emergency provisions until the established frequency interval under managed provisions expires.

5.2.2 State Actions

The SDGFPC has one program that involves CRP lands that is directly related to managed haying and grazing (SDGFPC 2008) (see Table 5.2-1).

General Hunting Access (Walk-In Areas)

The Walk-in Area Program is to provide hunters with access to private land. The program provides landowners with liability assurances and fees for allowing unlimited public hunting. In order to qualify, landowners must have at least 80 acres of high quality permanent cover, primarily CRP. The SDGFPC will pay landowners a base of $1 per acre; in addition, if the cover is left undisturbed during the contract year an additional $5 per acre will be paid. In the event the cover is mowed or grazed in the contract year, the additional $5/acre will be recouped. This program is only available to certain counties in eastern South Dakota. This option may also be available to landowners in counties of western South Dakota based on assessment and approval from the local Wildlife Conservation Officer and the Regional Review Team. The SDGFPC also offers a CRP retention bonus which will pay an up-front $1/acre for each hunting season remaining in the landowners CRP contract.

5.3 CUMULATIVE EFFECTS ANALYSIS

In this EA, the affected environment for cumulative impacts are those privately held or Tribal lands that are currently enrolled or eligible for enrollment in conservation practices that allow haying and grazing. For the purposes of this analysis, the goals and plans of Federal and State programs authorizing haying or grazing on privately held conservation lands are the primary sources of information used in identifying past, present, and reasonably foreseeable actions. Cumulative impacts are assessed for the analyzed resources under all of the alternatives analyzed. Table 5.3-1 summarizes cumulative effects.

5.3.1 Preferred Alternative – Alternative B

Alternative B would increase the interval to once every five years for managed haying and once every three years for managed grazing, while maintaining the same PNS as Alternative A. Long-term benefits to vegetation, wildlife, water quality, soils, carbon sequestration (air quality) and socioeconomic resources are expected from implementation of Alternative B. The mosaic of successional environments that meet most wildlife habitat needs would increase in diversity under Alternative B, since rejuvenation of the vegetative cover through managed haying and grazing would occur at more frequent intervals over the life of the CRP contract. More frequent management of the CRP vegetative stand with managed haying or grazing lessens the need for employing management techniques that have the potential for more negative impacts (such as use of herbicides and pesticides) and are more costly. Managed haying and grazing at the frequency of Alternative B, and in accordance with established USDA conservation practice provisions, standards, and guidelines, are expected to ensure the maximum health and vigor of the conservation cover, preserve wildlife habitat, benefit water quality, soil, and carbon sequestration while providing the CRP participant socioeconomic benefits.

The direct effects of managed haying and grazing on vegetation consists of vegetation removal through these harvesting activities. This direct effect is limited to one hay cutting and no more than a 120 day period for grazing in a single growing season, and is thus short-term and localized. Under Alternative B, this effect would occur once every five years for haying and grazing. The vegetation analysis presented in this EA concluded there is no significant negative effect to vegetation from Alternative B. If emergency haying or grazing is conducted on the same acreage hayed or grazed under managed provisions the previous year, and the existing conservation plan does not include haying and grazing plans, then a new conservation plan is developed that takes into account current resource conditions prior to approval of the activity. If the existing conservation plan includes provisions for haying and grazing, it should have a contingency plan for drought or excessive moisture. Even with a conservation plan, written approval prior to emergency haying and grazing is still required. If the resource conditions do not permit the conservation plan to be implemented as constituted, it would be modified, or the activity would not be approved by NRCS/FSA. Operators are required to monitor resource conditions during the activity to ensure either haying or grazing would not have unacceptable negative impacts to environmental resources. Under Alternative B, once emergency haying or grazing is concluded, managed haying or grazing is not authorized again for another three years. ***Provided these established provisions, standards, and guidelines are followed, there is no cumulative direct adverse effect on vegetation expected under Alternative B.***

Direct effects on wildlife occur from conflicts with haying machinery or trampling by grazing livestock that may result in mortality. This direct effect is limited to one hay cutting and no more than a 120 day period for grazing in a single growing season, and is localized to the specific field on which the activity takes place. As stated previously, there are no quantitative studies of wildlife mortality related to varying frequencies of intervals between haying and grazing on particular CRP conservation covers that are eligible for these harvesting activities. Most quantitative studies conducted to date center on impacts to ground nesting birds. Under managed haying and grazing provisions, neither activity may take place during the PNS as established in Alternative B; however, this period has been shown to not encompass the entire peak nesting and brood rearing season for several species of grassland birds. Haying has more potential to directly impact mortality than grazing; previous studies of mortality impacts of grazing on grassland birds are largely anecdotal and utilized simulated or artificial nests (USDA/NRCS 2006). As summarized in *Migratory Bird Responses to Grazing* (Ibid.), the literature is conflicting, however, clearly the per acre stocking rate would be an important factor, as would the presence of species that nest in high densities.

To represent the worst case possible, the mortality analysis conducted in this assessment selected the ground nesting grassland bird with the greatest portion of its peak nesting and brood rearing period not protected from haying by the defined PNS. A mortality rate of one percent for northern bobwhite was calculated if 50 percent (the maximum specified in current provisions) of all South Dakota CRP acreage eligible for managed haying was in fact hayed in the same year. This mortality rate would occur under this alternative once every five years and is not considered significant. If the decision to hay is made on an economically rational basis, the acreage viable for managed haying is even less, and the mortality rate is calculated at 0.4 percent.

It is not possible to predict how often or where emergency haying or grazing may be conducted. Emergency haying or grazing can occur any year following managed haying and grazing. Emergency haying in response to excess moisture has more potential to be conducted on land that was hayed under managed provisions the previous year than emergency haying in response to drought: the conservation cover previously hayed followed by drought conditions has not likely recovered adequately to be hayed again. It is most likely that other land not hayed the previous season would be utilized. It is not possible to predict how much acreage may be approved for haying or grazing under emergency provisions. Therefore, this cumulative impact analysis is expansive by assessing impacts on all CRP acreage eligible for emergency haying or grazing. Since the eligible acreage under emergency haying and grazing is the same as that under managed provisions, and only 50 percent of a field may be hayed under emergency provisions as well, similar assumptions to those made to assess the impacts of the managed haying provisions are made to assess potential cumulative grassland bird mortality. Again, the northern bobwhite is selected to represent the worst case possible. If emergency haying is conducted the year after managed haying on the same land, then a two percent mortality rate for the northern bobwhite caused by both managed and emergency haying is possible over a two year period. Haying under managed provisions may not resume on land that was hayed under emergency procedures until another five years would lapse, an interval over which populations of grassland birds would recover. ***No cumulative negative effect to grassland bird mortality is expected under Alternative B.***

Direct impacts on other types of wildlife populations are more difficult to assess with existing data. As presented in Chapter 4 of this document, most other types of wildlife are not significantly negatively affected on a population level. Conflicts with large mammals are expected to be minimal since they easily avoid the machinery associated with haying and livestock, and standard provisions and guidelines do not permit haying or grazing in seasonal calving or birthing areas. Smaller animals such as small mammals (rabbits, voles etc.), amphibians, or reptiles may experience direct mortality impacts, but these are expected to be minimal and not negatively affected on a population level. Direct effects of haying and grazing to invertebrate mortality has been more closely studied, however, it is difficult to extrapolate the data to reproductive success. However, many studies have also shown that particularly grazing increases abundance and diversity of invertebrates.

Assuming that managed haying and grazing is conducted in accordance with all applicable established USDA conservation practice provisions, standards and guidelines, ***the key to minimizing potential for indirect negative effects from managed haying and grazing to vegetation, wildlife, water, soil and carbon sequestration is adapting the conservation plan to take into account resource conditions just prior to authorizing either activity to proceed.*** Most of the time, the reduced stocking rate for grazing, minimal stubble height limits to ensure adequate vegetative recovery before frost, limiting haying to 50 percent of the CRP field to ensure habitat is available the following year, and precluding either activity within 120 ft of a permanent surface water body are adequate measures to protect these resources. However, if not enough precipitation follows the conclusion of managed haying and grazing to enable the recovery of the vegetation by the next growing season, the health and vigor of the plant stand and vegetative structure providing habitat for wildlife may be damaged. Operators are required to monitor resource conditions during haying or grazing to ensure either activity would not have unacceptable negative impacts to environmental resources. In the event a conservation cover fails due to the actions of the operator, the operator is required to re-establish it, or all payments received under the CRP must be re-paid to the government.

The potential for drought after either managed haying or grazing has been completed cannot be predicted. Since CRP lands eligible for managed haying and grazing are approximately four percent of available habitat within the State, the potential impacts are not likely to reach a significant magnitude statewide. Drought over large areas would cause declines in all wildlife habitat, and many species' reproductive success is correlated with adequate precipitation (for example, see George et al. 1992; Niemuth et al. 2008). Studies have shown that in areas where little quality habitat exists for wildlife, the potential benefits of habitat found on CRP lands are more pronounced (for example, see Riffell et al. 2006). It follows, then, that the potential negative effects on wildlife associated with declining habitat quality on CRP lands could be more amplified in these settings at a local scale, but is not likely to reach a significant magnitude.

Emergency haying and grazing would be authorized after conditions four months prior to the proposed activity are severe enough to meet the required provisions. Before haying or grazing under emergency provisions would be approved for specific land, the condition of resources on the land would be assessed and the conservation plan designed to take these conditions into account. It is not likely that land hayed under managed provisions the previous year would be hayed the following year under emergency provisions, minimizing the potential for cumulative indirect negative effects from emergency haying. Emergency grazing may occur on land that was grazed the previous year under managed provisions, but at least 25percent of the field must be ungrazed or the stocking rate can only be a maximum 75 percent, minimizing the potential for cumulative indirect negative impacts to environmental resources. ***Therefore, no cumulative negative indirect effect to vegetation, wildlife, water, soils, or carbon sequestration (air quality) is expected under Alternative B.***

The socioeconomic analysis of Alternative B concludes managed haying and grazing under these provisions in the State has a small positive socioeconomic impact. Emergency haying and grazing would be slightly more economically beneficial since the payment reduction is ten percent rather than the 25 percent under managed provisions, but this is not expected to be significant. ***No cumulative negative impact to the socioeconomy of South Dakota is expected under Alternative B.***

5.3.2 Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Alternative C would increase the frequency of managed haying to once in three years, and would reduce the PNS to May 1 to July 1. I The benefits to warm season conservation covers from Alternative C would be similar to Alternative B, but would be more successful at maintaining grassland environments by minimizing woody vegetative encroachment. However, dormant cool season grasses cut close to the end of the shortened PNS of this alternative would diminish the health and vigor of these plants. ***Providing harvesting of dormant cool season grasses near the end of the PNS is not undertaken, no cumulative negative effect to vegetation is expected under Alternative C.***

Indirect impacts to grassland birds would be the same as for Alternative B. However, breeding grassland birds would have greater exposure to direct impacts since the defined PNS would cover less of their actual peak breeding periods. Northern bobwhite would potentially have the greatest exposures to direct impacts since an estimated 78 percent of its peak breeding period is not encompassed by the Alternative C PNS period. Using total and CRP grassland availability for northern bobwhite as for Alternative B, an estimated two percent (2 percent of 78 percent) mortality could occur every three years for this species, effectively doubling potential mortality compared to Alternative B. Other grassland birds such as bobolink would experience no different effects from Alternative C compared to Alternative B. If emergency haying is conducted the year after managed haying on the same land, then a two percent mortality rate for the northern bobwhite caused by both managed and emergency haying is possible over a two year period for the entire State. The earliest managed haying could resume on the same land hayed or grazed under emergency provisions is three years. ***No cumulative negative effect to grassland bird mortality is expected under Alternative C.***

The shorted PNS period allows for two additional weeks of haying and grazing over that of Alternative B. These two weeks is expected to increase the value of beef production and hay production over that of Alternative B. However, this increase is not expected to be significant. ***No cumulative negative impact to the socioeconomy of South Dakota is expected under Alternative C.***

5.3.3 No Action - Alternative A

Alternative A allows managed haying once every 10 years and managed grazing once every five years, except during the PNS period extending from May 1 to Aug 1.

Continuation of Alternative A provisions would not maximize grassland health and vigor since the disturbance frequency for managed haying and grazing is not frequent enough. The majority of wildlife habitat needs are met by diversity in successional environments (plant stand structure and composition) that create a mosaic landscape. Over time, CRP fields that have not had adequate rejuvenation management accumulate thatch. Thatch can inhibit vegetative growth, reduces self-seeding, harbors plant pathogens, makes it difficult to control noxious weeds and insect pests, is difficult to penetrate with machinery for mid-contract management tasks, can reduce moisture filtration to the soil, and is fuel for catastrophic wildfires. Inadequate disturbance enables succession to advance through woody plant encroachment into areas where these species are undesired, and prevents lower impact management techniques that are also more cost efficient. Although managed haying and grazing at the frequency of Alternative A is not significant on a Statewide scale, it can be quite significant to individual farm operators.

The direct effect of Alternative A managed haying and grazing to vegetation is similar to the Alternative B, except the impacts would occur once every 10 years for haying and once every five years for grazing. The assessment of direct impacts to vegetation under the Alternative A concluded no significant negative impacts would occur as the established conservation practice provisions, standards, and guidelines, if followed, ensure vegetation recovery. Emergency haying or grazing may follow managed haying or grazing on the same lands as early as the next year. A conservation plan would be developed or the existing conservation plan would be modified to take into account the condition of resources on the land prior to authorizing the activity to proceed. After emergency haying and grazing, under Alternative A the soonest managed haying would be allowed on the same lands is ten years and for grazing five years, and again, the resource conditions would be evaluated at that time and the conservation plan modified accordingly prior to authorizing either activity under the managed provisions. Vegetation would still have adequate time to recover prior to managed haying or grazing. ***Therefore, no cumulative negative direct effect to vegetation is expected under Alternative A.***

The direct effect of managed haying and grazing on grassland bird mortality is expected to occur at a lower frequency under Alternative A in comparison the other alternatives analyzed. Under the worst case scenario analyzed for managed haying based upon the northern bobwhite, one percent mortality would occur once every 10 years. The mortality rate is expected to be even less (reduced to 0.1 percent) since the total number of CRP acres that are economically viable to hay statewide is much less, and the chance that all would be hayed in the same year is even less.

If emergency haying follows managed haying on the same lands the year after haying under managed provisions, then a maximum two percent mortality rate would be expected over a two year period. This scenario is also not likely to happen if the emergency is drought related, as the vegetative stand hayed the year before would not produce enough for another harvest. The soonest managed haying could be conducted again on the same land would be another 10 years. ***Therefore, no cumulative negative direct effect to grassland bird mortality is expected under Alternative A.***

Similar to Alternative B, no cumulative negative indirect effect to vegetation, wildlife, water, soils, or carbon sequestration (air quality) is expected under the No Action alternative if the conservation plan adapts to take into account resource conditions on the land just prior to either managed or emergency haying or grazing, and if all established applicable conservation practice provisions, standards, and guidelines are followed. If these conditions are met, vegetation would recover adequately to serve its conservation purpose between managed haying and grazing and emergency haying and grazing episodes. ***No cumulative negative indirect effect to vegetation, wildlife, water, soils, or carbon sequestration (air quality) is expected under Alternative A.***

The socioeconomic analysis of Alternative A concludes managed haying and grazing under these provisions in the State has no significant positive or negative socioeconomic impact on a statewide scale. Emergency haying and grazing would be slightly more economically beneficial since the payment reduction is 10 percent rather than the 25 percent under managed provisions, but this is not expected to be significant. ***No cumulative negative impact to the socioeconomy of South Dakota is expected under Alternative A.***

5.3.4 Unavoidable Impacts of the Alternatives

5.3.4.1 Preferred Alternative – Alternative B

Unavoidable impacts of haying and grazing under Alternative B are expected from direct mortality effects on wildlife. Representative probabilistic quantitative studies of potential mortality impacts to wildlife from haying or grazing are lacking. However, because CRP lands are not the only habitat available for wildlife, and managed haying and grazing may take place once every five years as provided for in Alternative B, the impact is not expected to be significant.

In addition, vegetation removal through harvesting by haying or grazing under Alternative B would unavoidably impact vegetation once every five years for haying and grazing. If the conservation plan adapts to take into account resource conditions on the land just prior to managed haying or grazing, and if all established applicable conservation practice provisions, standards, and guidelines are followed, this impact would not be significant.

The incremental contribution of impacts of Alternative B, when considered in combination with other past, present, and reasonably foreseeable actions, are expected to result in long-term positive impacts to vegetation, wildlife, surface waterbodies, soil, carbon sequestration, and socioeconomic resources.

5.3.4.2 Modification of Haying and Grazing Frequency and PNS Dates – Alternative C

Unavoidable impacts of haying and grazing under Alternative C will be similar to those of Alternative B. However, because the PNS period of Alternative C is one month shorter than the other alternatives, mortality of groundnesting birds is expected to increase. The shorter PNS period would not encompass an estimated 708percent of northern bobwhite peak breeding season. Based on Alternative B total and CRP grassland availability, an estimated two percent mortality could occur every three years.

5.3.4.3 No Action – Alternative A

Similar to the Proposed Action alternative, unavoidable impacts of haying and grazing under the No Action alternative are expected from direct mortality effects on certain wildlife and direct removal of vegetation through harvesting by managed haying or grazing. However, at the reduced frequency of Alternative A, these impacts are not expected to be significant.

The incremental contribution of impacts of Alternative A, when considered in combination with other past, present, and reasonably foreseeable actions, are expected to result in long-term positive impacts to vegetation, wildlife, surface waterbodies, soil, carbon sequestration and socioeconomic resources, however, the net benefits are less than Alternative B.

5.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitments of resources which would be involved should an action be implemented. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources has on future generations. Irreversible effects primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. For the action alternatives analyzed, no irreversible or irretrievable resource commitments are expected.

Table 5.4-1. Cumulative Effects Matrix.

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
Biological Resources *Vegetation, Wildlife, and Protected Species*	Long-term positive impacts to vegetation, wildlife and protected species are expected to result from the activities identified, which would establish vegetative communities and create habitat for wildlife; however, past and present actions would not be as beneficial to the biological resources as Alternative B.	Under Alternative B, long-term benefits to vegetation, wildlife and protected species are expected to occur. This alternative mimics the historic disturbance frequency of wildfire and grazing herds of buffalo on the Great Plains, which rejuvenate grasslands and provide mosaics of wildlife habitat in different successional stages that provides a more beneficial environment for biological resources.	The long-term benefits of Alternative C would be similar to those of Alternative B except for grassland birds. Since the PNS period is one month shorter, ground-nesting grassland birds may have an increased mortality due to impacts with machinery. Further, if cool season grasses are cut close to the end of the PNS of this alternative, their health and vigor may be diminished.	Continued enrollment of farmland in programs which would restore habitat is expected to benefit biological resources. Future haying or grazing under both managed or emergency procedures would not significantly impact vegetation, wildlife, or protected species if the established conservation practice provisions, standards, and guidelines are followed, and the conservation plan is adapted to resource conditions on the land just prior to engaging in either activity.	Long-term benefits to biological resources are expected to result from CRP lands that aim to restore vegetative covers that provide wildlife habitat.
Water Resources *Surface Water Quality*	Direct negative impacts to surface water quality are minimized by past and present provisions of managed haying and grazing since either activity is not allowed closer than 120 ft from a permanent surface	Similar to Alternative A, Alternative B direct negative effects to surface water quality are minimized through adherence to established provisions, standards, and guidelines and use of BMPs that maintain the vegetative cover over	Both direct and indirect impacts to water quality of Alternative C would be similar to Alternative B for warm season conservation covers. However, cutting cool season grasses close to the end of the shorter PNS of this alternative may	Continued enrollment of farmland in conservation programs is expected to have positive impacts to water quality similar to those described for Alternative B. Future haying or grazing under both managed or emergency procedures	Positive long-term cumulative impacts to surface water quality are expected to result from and other past, present, and reasonably foreseeable actions, and from the action alternatives analyzed.

Table 5.4-1. Cumulative Effects Matrix (cont'd).

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
Water Resources *Surface Water Quality*	water body and livestock must be confined with fencing. Indirect impacts to water quality that can occur from vegetative cover loss causing soil erosion and increased sedimentation into nearby water bodies are minimized by employment of BMPs that maintain over the long-term vegetative covers. Alternative A would allow longer intervals of vegetation recovery between these activities than the other alternatives, especially beneficial if precipitation is not ideal the following growing season.	the long-term. Although the recovery period between episodes of haying and grazing is shorter that the present provisions, no significant impact to water quality is expected from implementation of Alternative B.	diminish the health and vigor of these species. Reduction of the vegetative cover could lead to increased sedimentation of surface waters through increased soil erosion.	would not significantly impact vegetation, wildlife, or protected species if the established conservation practice provisions, standards, and guidelines are followed, and the conservation plan is adapted to resource conditions on the land just prior to engaging in either activity.	
Soil Resources	Alternative A actions of managed haying and grazing do not directly or indirectly negatively affect soil resources when the established conservation provisions, standards, and guidelines are followed	The impacts of Alternative B on soil would be similar to Alternative A and may be minimized by employing the same BMPs. The indirect impact of managed haying and grazing	Impacts to soil resources from Alternative C would be similar to Alternative B for warm season conservation covers. However, cutting cool season grasses close to the end of the shorter PNS of	Continued enrollment of agricultural lands in CRP and establishing long-term vegetative covers benefits soil resources. Future haying or grazing under both managed or emergency procedures	Positive long-term cumulative impacts to soil resources would be expected to result from Alternative B and other past, present, and reasonably foreseeable actions.

Table 5.4-1. Cumulative Effects Matrix (cont'd).

Table 5.4-1. Cumulative Effects Matrix (cont'd.)

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
Resource	**Alternative A**	**Alternative B**	**Alternative C**	**Future Actions**	**Cumulative Effects**
Soil Resources	and BMPs are employed to minimize impacts. Limiting the stocking rate to 75% of determined total capacity and the total number of days that haying or grazing may take place, and employing BMPs to ensure adequate dispersion of livestock minimize this potential. Long-term maintenance of the vegetative cover minimizes potential for increased soil erosion that may lead to increased sedimentation of nearby waters.	under this alternative's frequency has been found to maximize the health and vigor of the vegetative cover, limiting the potential for increasing soil erosion through vegetative loss. Alternative B would reduce the potential recovery period more than Alternative A; however, BMPs would be utilized to reduce impacts through maintenance of adequate ground cover or litter.	this alternative would diminish the health and vigor of these species. This could result in increased soil erosion if vegetative cover is lost. Otherwise, the provisions, standards, and guidelines as described under Alternative B would minimize adverse impacts to soil.	would not significantly impact soil resources if the established conservation practice provisions, standards, and guidelines are followed, and the conservation plan is adapted to resource conditions on the land just prior to engaging in either activity.	

Table 5.4-1. Cumulative Effects Matrix (cont'd).

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
Air Quality –*Carbon Sequestration*	Past and present actions of managed haying and grazing would result in carbon sequestration, but less than Alternative B.	Under Alternative B, more frequent grazing promotes increased photosynthesis through regrowth which produces younger leaves that have an apparent higher	Impacts to air quality under Alternative C would be identical to those of Alternative B for warm season conservation covers. However, cutting cool season grasses near the	Continued enrollment of CRP lands and managed haying and grazing is expected to have positive impacts to air quality and carbon sequestration. Future haying or	Positive long-term impacts to air quality resources are expected to result from Alternative B and other past, present, and reasonably foreseeable actions.

Table 5.4-1. Cumulative Effects Matrix (cont'd.)

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
Air Quality –*Carbon Sequestration*		photosynthesis efficiency rate that sequesters more carbon.	end of the shorter PNS period of this alternative that results in diminishing the health and vigor of these species could result in reduced carbon sequestration.	grazing under both managed or emergency procedures would continue carbon sequestration benefits if the established conservation practice provisions, standards, and guidelines are followed, and the conservation plan is adapted to resource conditions on the land just prior to engaging in either activity.	
Socioeconomics	Past and present managed haying and grazing would result in	The socioeconomic analysis of Alternative B concludes managed	Managed haying and grazing under the provisions of	Continued enrollment of CRP lands and managed haying and	Positive long-term impacts to socioeconomic

Table 5.4-1. Cumulative Effects Matrix (cont'd).

Resource	Alternative A	Alternative B	Alternative C	Future Actions	Cumulative Effects
	no significant positive or negative socioeconomic impacts, but can benefit individual operators. The lower frequency of managed haying and grazing would not offer the benefits as the action alternatives	haying and grazing under these provisions in the State has a small positive socioeconomic impact.	Alternative C has socioeconomic impacts similar to those of Alternative B. However, with haying and grazing allowed one month earlier under Alternative C, the value of beef and hay production is estimated to be greater.	grazing is expected to have positive socioeconomic. Future haying or grazing under both managed and emergency procedures would continue to have positive socioeconomic benefits.	recourses are expected to result from the alternatives analyzed and other past, present, and reasonably foreseeable actions.

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6.0 MITIGATION MEASURES

6.1 INTRODUCTION

The purpose of mitigation is to avoid, minimize, or eliminate negative impacts on affected resources to some degree. CEQ Regulations (40 CFR 1508.20) state that mitigation includes:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

6.2 ROLES AND RESPONSIBILITIES

CEQ Regulations state that all relevant reasonable mitigation measures that could improve a project should be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies. This serves to alert agencies or officials who can implement these extra measures, and will encourage them to do so. The lead agency for Alternative B is FSA.

6.3 MITIGATION RECOMMENDATIONS

There are no expected major negative impacts associated with implementation of Alternative B. Prior to installation of CPs, producers must complete site specific environmental analysis which would reveal any protected resources on or adjacent to the proposed enrolled lands. In those site specific instances where a wetland, threatened or endangered species, or a cultural resource may be present, consultation with the appropriate regulatory agency would identify specific avoidance, minimization, or mitigation measures required to eliminate or reduce the negative impacts to those sensitive resources.

Prior to implementing managed haying or grazing, a Conservation Plan must be developed that is in compliance with NEPA and all other applicable federal and state laws and regulations. This plan must be completed by qualified individuals either employed at NRCS or an NRCS-certified TSP. The qualified conservationist will use information from ecological site descriptions, trend determinations, similarity index determinations, assessments of the health of the conservation lands and other information (climatic conditions, appropriate stocking rate) to assist the CRP land manager to ***design a plan for managed haying and grazing on authorized CPs that would not defeat the purposes of the CRP contract.***

These plans require several site-specific inventories, measures to meet specific objectives, the methods and BMPs to control or mitigate impacts, and contingency and monitoring plans. The field numbers, locations, and acreage must be identified. The plan states that no managed haying or grazing may occur during the PNS, may not occur within 120 ft of a permanent water body, or in the case of haying, is limited to 50 percent of the field over a period no longer than 90 days, and in the case of grazing, is limited to a maximum 120 days that may be in two 60 day periods. A resource assessment must be conducted that identifies resources present (i.e., vegetative cover, water sources, soils) and their condition, existing structures (fences, natural barriers), and facilities (location of gates, watering areas), accompanied with a site plan as appropriate. An assessment of forage suitability must be completed, identifying the key forage species and associated acreage. The forage quantity and quality will be estimated and documented, and if grazing is proposed, the type of livestock and ruminant wildlife (deer, elk) identified, and the estimated stocking rate calculated in accordance with the NRCS FOTG. ***The 75 percent stocking rate is the maximum allowed for managed grazing; if resource conditions do not support the maximum, a lower, appropriate stocking rate would be calculated and implemented.*** Animal Inventory will document the number and type of ruminant wildlife estimated to utilize the area proposed for grazing, and the livestock that would be grazing. In addition, ***if resource conditions do not support haying the maximum 50 percent of a CRP field, then a lower appropriate rate would be calculated and implemented.***

Other NRCS Conservation Practice Standards must be adhered to and specific guidance incorporated into the Conservation Plan that includes mitigation measures. Practice Code 511 Forage Harvest Management stipulates criteria to improve or maintain stand life, plant vigor, and plant diversity. Vegetation must be cut only at a stage of maturity or harvest interval range that will provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and/or reproduction to occur without loss of plant vigor. Further, re-seeding annuals must only be cut or harvested at a stage of maturity and frequency that ensures production of viable seed and ample carryover of hard seed to maintain desired plant stand diversity. For managed haying and grazing, a minimum five inch stubble height must remain at conclusion of the activity, however, if particular plants require more of the plant to remain (such as warm season grasses), then the appropriate minimum will be defined as such in the Conservation Plan. Requirements for specific plant species have been developed on a county level in South Dakota. As an example, Appendix F presents the forage harvest requirements in Hand County for plant species consisting of warm and cool season grasses and legumes for grass-related CPs (USDA/NRCS 2004). The planned or allowable degree of use for browse species differs from grass species. The degree of use applies to the annual growth of twigs and leaves within reach of animals. If deciduous browse species are used during the dormant season, the degree of use suggested applies to annual twig growth only. Guidance on the suitability of forage by species grown in dryland conditions includes estimates of the plant species productivity, the suitability as forage, minimum years a plant must be established prior to suitability for forage, fertilizer needs, soil acidity needs, and drought tolerance is provided. In accordance with managed haying and grazing provisions, authorized CPs must be established a minimum one year prior to scheduling these activities.

Wildlife habitat and corridors (CP4D, CP4B) guidance for implementation are found in NRCS Practice Code 645 Upland Wildlife Habitat Management. Under these CPs authorized for managed haying and grazing, certain wildlife species, guilds, suites, or ecosystems are targeted for conservation. The grazing plan developed for these CPs must have wildlife management as the primary objective. The Conservation Plan requires habitat evaluation and appraisal to identify habitat-limiting factors, and have developed habitat evaluation tools to achieve habitat conditions for particular species, such as bobwhite quail, the prairie chicken, or ring-neck pheasants. Further, biological technical notes and assessment worksheets offer additional guidance. Application of this practice code alone, or in combination with other supporting and facilitating practices such as grazing and prescribed burns, result in a conservation system to meet the goals of the conservation plan. Managed haying and grazing is restricted during critical periods such as the PNS, brood rearing, deer fawning and elk calving seasons.

Management components of the grazing plan specify the schedule and number of days when managed haying and grazing can be conducted. Criteria that maintain or improve water quality and quantity (other than limiting grazing to within no more than 120 ft of a permanent surface water body) include: (1) maintain adequate ground cover and plant density to ensure adequate filtering capacity of the vegetation; and (2) employ BMPs to minimize concentrated livestock areas that ensure animal offal is dispersed. The latter would include siting any supplemental livestock feeding, handling, and watering facilities and gates in such a manner to ensure adequate dispersion of animals. This would also assist in reducing potential soil erosion and compaction, which could lead to excess runoff. To maintain soil condition, measures to ensure adequate ground cover, litter, and canopy to maintain or improve infiltration and organic content would be stipulated in the plan. Fencing must be used to control grazing animals' access to other areas adjacent to the grazed field and protect permanent surface water bodies. Fencing may be designed in accordance with Practice Code 328 to minimize impacts to wildlife while serving its purpose to confine livestock. These latter measures include altering the height of the top and bottom wires, and making them smooth rather than barbed. When haying, starting in the middle of the field and proceeding in parallel back and forth would enable certain wildlife time needed to temporarily relocate to adjacent areas in advance of machinery. Also, use of a flushing bar would reduce the potential for injuring or killing certain wildlife.

To protect forbs and legumes that benefit native pollinators and other wildlife and provide insect food sources for grassland nesting birds, spraying or other control of noxious weeds would be done on a "spot treatment" basis in accordance with NRCS Practice Code 595. All methods of plant and insect pest management must comply with Federal, State, and local regulations.

Site specific environmental evaluation of lands to be enrolled in CRP in conjunction with either informal or formal consultation with the appropriate USFWS office would protect species included on the TES and critical habitat lists. If potential negative impacts of managed haying and grazing on listed species are identified, it is not likely the land would be approved for these activities.

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APPENDIX A

SOUTH DAKOTA VEGETATION AND WILDLIFE SCIENTIFIC NAMES

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South Dakota Vegetation and Wildlife Scientific Names

COMMON NAMES	SCIENTIFIC NAMES
PLANTS	
Alfalfa	*Medicago sativa*
Alkali Sacaton	*Sporobolus airoides*
Bermuda	*Cynodon* spp.
Big bluestem	*Andropogon gerardii*
Birdsfoot trefoil	*Lotus corniculatus*
Blue grama	*Bouteloua gracilis*
Buffalograss	*Bouteloua dactyloides*
Canada wildrye	*Elymus canadensis*
Crabgrass	*Digitaria*
Creeping foxtail	*Alopecurus arundinaceus*
Crested wheatgrass	*Agropyron cristatum*
Crownvetch	*Coronilla varia*
Eastern gamagrass	*Tripsacum dactyloides*
False Sunflower	*Heliopsis helianthoides*
Grayhead prairie coneflower	*Ratibida pinnata*
Green needlegrass	*Nassella viridula*
Illinois bundleflower	*Desmanthus illinoensis*
Indiangrass	*Sorghastrum nutans*
Intermediate wheatgrass	*Thinopyrum intermedium*
Little bluestem	*Schizachyrium scoparium*
Maximilian sunflower	*Desmanthus illinoensis*
Meadow bromegrass	*Bromus riparius*
Milkvetch Cicer	*Astragalus cicer*
Orchard grass	*Dactylis glomerata*
Pearl Millet	*Pennisetum glaucum*
Pitcher sage	*Salvia azurea var. grandiflora*
Prairie coneflower	*Rudbeckia fulgida var. palustris*
Prairie cordgrass	*Spartina pectinata*
Prairie sandreed	*Calamovilfa longifolia*
Pubescent wheatgrass	*Agropyron trichophorum*
Purple prairieclover	*Dalea purpurea*
Reed canarygrass	*Phalaris arundinacea*
Red clover	*Trifolium pratense*
Red Top	*Agrostis palustris*
Roundhead Lespedeza	*Lespedeza capitata*
Russian wildrye	*Psathyrostachys junceus*
Ryegrass	*Lolium perenne*
Sand Bluestem	*Andropogon hallii*
Sand dropseed	*Sporobolus cryptandrus*
Sand lovegrass	*Eragrostis trichodes*
Showy partridgepea	*Chamaecrista fasciculata var. fasciculata*

South Dakota Vegetation and Wildlife Scientific Names (cont'd)

COMMON NAMES	SCIENTIFIC NAMES
Sideoats grama	*Bouteloua curtipendula*
Smooth bromegrass	*Bromus inermis*
Sweet clover	*Melilotus officinalis/alba*
Switchgrass	*Panicum virgatum*
Tall Fescue	*Schedonorus phoenix*
Tall Wheatgrass	*Thinopyrum ponticum*
Thickspike gayfeather	*Liatris pycnostachya*
Timothy	*Phleum* spp.
Virginia wildrye	*Elymus virginicus*
Western prairie fringed orchid	*Platanthera praeclara*
Western wheatgrass	*Pascopyrum smithii*
White clover	*Trifolium repens*
Yellow bluestem	*Bothriochloa ischaemum var. ischaemum*
MAMMALS	
Badger	*Taxidea taxus*
Beaver	*Castor canadensis*
Bighorn sheep	*Ovis canadensis*
Black bear	*Ursus americanus*
Black-footed ferret	*Mustela nigripes*
Black-tailed jackrabbit	*Lepus californicus*
Black-tailed prairie dog	*Cynomys ludovicianus*
Bobcat	*Felis rufus*
Coyote	*Canis latrans*
Elk	*Cervus elaphus*
Franklin's ground squirrel	*Spermophilus franklinii*
Fringe-tailed myotis	*Myotis thysanodes pahasapensis*
Gray fox	*Urocyon cinerage*
Gray wolf	*Canis lupus*
House mouse	*Mus musculus*
Least weasel	*Mustela nivalis*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Mountain Lion	*Felis concolor*
Mule deer	*Odocoileus hemionus*
Muskrat	*Ondratra zibethicus*
Northern myotis	*Myotis septentrionalis*
Northern river otter	*Lutra Canadensis*
Norway rat	*Rattus norvegicus*
Opossum	*Didelphis virginiana*
Pronghorn antelope	*Antilocarpra americana*
Raccoon	*Procyon lotor*
Red fox	*Vulpes vulpes*
Richardson's ground squirrel	*Spermophilus richardsonii*

South Dakota Vegetation and Wildlife Scientific Names (cont'd)

COMMON NAMES	SCIENTIFIC NAMES
Spotted Skunk	*Spilogale putorius*
Striped Skunk	*Mephitis mephitis*
Swift fox	*Vulpes velox*
Townsend's big-eared bat	*Plecotus townsendii*
White-tailed deer	*Odocoileus virginianus*
BIRDS	
American bittern	*Botaurus lentiginosus*
American crow	*Corvus brachyrhynchos*
American kestrel	*Falco sparverius*
American wigeon	*Anas americana*
Bald eagle	*Haliaeetus leucocephalus*
Blue-winged teal	*Anas discors*
Bobolink	*Dolichonyx oryzivorus*
Brown-headed cowbird	*Molothrus ater*
Burrowing owl	*Athene cinicularia*
Cassin's kingbird	*Tyrannus vociferans*
Cassin's sparrow	*Zacatonero de Cassin*
Chestnut-colored longspur	*Calcarius ornatus*
Common nighthawk	*Chordeiles minor*
Common poorwill	*Phalaenoptilus nuttallii*
Common yellowthroat	*Geothlypis trichas*
Dickcissel	*Spiza americana*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eskimo curlew	*Numenius borealis*
Ferruginous hawk	*Buteo regalis*
Gadwall	*Anas strepera*
Gray Partridge	*Perdix perdix*
Grasshopper sparrow	*Ammodramus savannarum*
Greater prairie-chicken	*Tympanuchus cupido*
Green-winged teal	*Anas crecca*
Gyrfalcon	*Falco rusticolus*
Henslow's sparrow	*Ammodramus henslowii*
Horned lark	*Eremophila alpestris*
Interior least tern	*Sterna antillarum*
Killdeer	*Charadrius vociferus*
Lark bunting	*Calamospiza melanocorys*
Lark sparrow	*Chondestes grammacus*
Le Conte's sparrow	*Ammodramus leconteii*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius americanus*
Long-eared owl	*Asio otus*
Mallard	*Anas platyrhynchos*
Marbled godwit	*Limosa fedoa*

South Dakota Vegetation and Wildlife Scientific Names (cont'd)

COMMON NAMES	SCIENTIFIC NAMES
McCown's longspur	*Calcarius mccownii*
Merlin	*Falco columbarius*
Mountain bluebird	*Sialia currucoides*
Mountain plover	*Charadrius montanus*
Mourning dove	*Zenaida macroura*
Northern bobwhite quail	*Colinus virginianus*
Northern harrier	*Circus cyaneus*
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Peregrine falcon	*Falco peregrinus*
Piping plover	*Charadrius melodus*
Prairie falcon	*Falco mexicanus*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-necked pheasant	*Phasianus colchicus*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Sedge wren	*Cistothorus platensis*
Sharp-tailed grouse	*Tympanuchus phasianellus*
Short-eared owl	*Asio flammeus*
Swainson's hawk	*Buteo swainsoni*
Upland sandpiper	*Bartramia longicauda*
Vesper sparrow	*Pooecetes gramineus*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Swainson's hawk	*Buteo swainsoni*
Whooping crane	*Grus americana*
Wild turkey (eastern)	*Meleagris gallopavo silvestris*
Wild turkey (Merriam's)	*Meleagris gallopavo merriami*
Wild turkey (Rio Grande)	*Meleagris gallopavo intermedia*
Willet	*Tringa semipalmata*
Wilson's phalarope	*Steganopus tricolor*
Wilson's snipe	*Gallinago delicata*
AMPHIBIANS AND REPTILES	
False map turtle	*Graptemys pseudogeographica*
Lined snake	*Tropidoclonion lineatum*
Eastern hognose snake	*Heterodon platirhinos*
INSECTS	
American burying beetle	*Nicrophorus americanus*

APPENDIX B

WATER QUALITY DATA TABLES

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Table 1: Impaired Waters in South Dakota	
Waterbody	**Impairment**
Bad Basin	
Freeman Lake	Nitrates, Cond., TDS, FCB, Selenium, Eutrophic
Murdo Dam	TDS
Waggoner Lake	Eutrophic
Bad River (Stanley County line to mouth)	TDS
Belle Fourche Basin	
Mirror Lake East	Temp
Mirror Lake West	Temp
Bear Butte Creek (Headwaters to Strawberry Creek)	Temp
Bear Creek Butte (Strawberry Creek to mouth)	Temp
Belle Fourche River (Wy border to near Fruitdale)	FCB, TSS
Horse Creek (Indian Creek to Mouth)	Cond.
Redwater River (Wy border to US HWY 85)	Temp
Spearfish Creek (Annie Creek to McKinley Gultch)	pH (high)
Spearfish Creek (McKinley Gultch to Cleopatra Creek)	pH (high)
Strawberry Creek (Headwaters to mouth)	pH (high & low), Cadmium, Copper, Zinc
West Strawberry Creek (headwaters to mouth)	Temp., FCB
Whitewood Creek (Whitetail Summit to Gold Run Creek)	Temp.
Whitewood Creek (Deadwood Creek to Spruce Gultch)	FCB
Whitewood Creek (Sandy Creek to I-90)	pH (high)
Whitewood Creek (I-90 to Crow Creek)	pH (high)
Willow Creek (near Vale, SD)	Cond.
Big Sioux Basin	
Lake Albert	pH (high), Eutrophic
Lake Alvin	Eutrophic
Bitter Lake	Hg in fish
Blue Dog Lake	FCB, Eutrophic
Brant Lake	Eutrophic
Bullhead Lake	pH (high), Eutrophic
Lake Campbell	Eutrophic
Covell Lake	Eutrophic
East Oakwood Lake	Eutrophic
Lake Madison	Eutrophic
Lake Norden	Eutrophic
Pelican Lake	pH (high)
Roy Lake	Eutrophic
South Red Iron Lake	Eutrophic
School Lake	Eutrophic
Lake St. John	Eutrophic
Twin Lakes/W. Hwy 81	Hg in fish
West Oakwood Lake	Eutrophic
Beaver Creek (Big Sioux River to S9,T98N,R49W)	FCB

Table 1: Impaired Waters in South Dakota (cont'd)	
Waterbody	**Impairment**
Beaver Creek (Split Rock Creek to SD-MN border)	FCB, TSS
Big Sioux River (SE of Ortley to lake Kampaska)	DO
Big Sioux River (Lake Kampaska to Willow Creek)	Nitrates
Big Sioux River (Willow Creek to Stray Horse Creek)	Nitrates, FCB
Big Sioux River (Stray Horse Creek to near Volga)	TSS
Big Sioux River (Near Dell Rapids to below Baltic	FCB
Big Sioux River (Below Baltic to Skunk Creek)	FCB
Big Sioux River (Skunk Creek to diversion return)	FCB
Big Sioux River (Diversion return to SF WWTF)	FCB
Big Sioux River (SF WWTF to above Brandon)	FCB
Big Sioux River (Above Brandon to Nine Mile Creek)	FCB
Big Sioux River (Nine Mile Creek to near Fairview)	FCB
Big Sioux River (Fairview to near Alcester)	FCB, TSS
Big Sioux River (Near Alcester to Indian Creek)	FCB, TSS
Big Sioux River (Indian Creek to mouth)	FCB, TSS
Brule Creek (Big Sioux River to conf. of E and W forks)	FCB, TSS
East Brule Creek (conf. with Brule Creek to S3,T95N,R49W)	FCB, TSS
Flandreau Creek (big Sioux River to MN border)	FCB
Hidewood Creek (Big Sioux River to US HWY 77)	FCB
Jack Moore Creek (Big Sioux River to S33,T107N,R49W)	FCB
North Deer Creek (Six Mile Creek to US HWY 77)	FCB
Peg Munky Run (Big Sioux River toS17,T113N,R50W)	FCB
Pipestone Creek (Split Rock Creek to MN border)	FCB
Skunk Creek (Brandt Lake to mouth)	FCB
Split Rock Creek (at Corson, SD)	FCB
Spring Creek (Big Sioux River to S22,T109,R47W)	FCB
Stray Horse Creek (Big Sioux river to S26,T116N,R51W)	FCB
Union Creek (Big Sioux River to conf. with E and W forks)	FCB, TSS
Willow Creek (Big Sioux River to S7,T117N,R50W)	FCB
Cheyenne Basin	
Angostura Reservoir	Sulfates, TDS
Center Lake	pH (high), Temp., Eutrophic
Cold Brook Reservoir	Temp.
Curlew Lake	Eutrophic
Horsethief Lake	pH (high), Temp.
Legion Lake	pH (high)
New Wall Lake	Eutrophic
Sheridan Lake	DO, pH (high), Temp., Eutrophic
Sylvan Lake	pH (high), Temp, Eutrophic
Battle Creek (Near Horsethief Lake to Teepee Gulch Creek)	Temp.
Battle Creek (Teepee Gulch Creek to SD HWY 79)	Temp.
Beaver Creek (Wy border to mouth)	Cond., TDS, Salinity, FCB

Table 1: Impaired Waters in South Dakota (cont'd)	
Waterbody	**Impairment**
Cheyenne River (Wy border to Beaver)	Cond., TDS, Salinity
Cheyenne River (Beaver Creek to Angostura Reservoir)	TDS, Salinity, Cond.
Cheyenne River (Angostura Reservoir to Rapid Creek)	TSS
Cheyenne River (Rapid Creek to Belle Fourche River)	FCB, TSS
Cheyenne River (Belle Fourche River to Bull Creek)	FCB, TSS
Cheyenne river (Bull Creek to mouth)	FCB, TSS
Elk Creek (Near Roubaix, Rapid City, and Elm Springs, SD)	Temp.
Fall river (Hot Springs to mouth)	Temp.
French Creek (Headwaters to Custer)	DO
Grace Coolidge Creek (Headwaters to Battle Creek)	Temp.
Grizzly Bear Gulch (near Keystone, SD)	Temp.
Hat Creek (Near Edgemont, SD)	Cond.
Highland Creek (Wind Cave Natl. Park and near Pringle, SD)	pH (high), Temp.
Horsehead Creek (At Oelrichs)	Cond.
Hot Brook Creek (Headwaters to mouth)	Temp.
Rapid Creek (Pactola reservoir to Lower Rapid City)	Temp.
Rapid Creek (Lower Rapid City to RC WWTF)	FCB
Rapid Creek (RC WWTF to above Farmingdale)	FCB
Rapid Creek (Above Farmingdale to mouth)	FCB
North Fork Rapid Creek (Above mouth)	Temp.
Spring Creek (Headwaters to Sheridan Lake)	Temp., FCB
Spring Creek (Sheridan Lake to SD HWY 79)	Temp.
Victoria Creek (Near Rapid City, SD)	Temp.
Grand Basin	
Flat creek Dam	Eutrophic
Lake Isabel	pH (high), Hg in fish, Eutrophic
Shadehill Reservoir	Salinity, TDS
Grand River (Shadehill Reservoir to Corson County line)	pH (high), Salinity
Grand River (Corson County Line to Bullhead	Salinity, TDS
Grand River (Bullhead to mouth)	Salinity, FCB, Temp.,TSS
Grand River, North Fork (ND border to Shadehill Reservoir)	Salinity, Cond.
Grand River, South Fork (Jerry Creek to Skull Creek)	Salinity, TSS
Grand River, South Fork (Skull Creek to Shadehill Reservoir)	Salinity, TSS
James Basin	
Beaver Lake	Eutrophic
Bierman Lake	Eutrophic
Lake Byron	Eutrophic
Lake Carthage	Eutrophic
Cottonwood Lake	Eutrophic
Lake Faulkton	pH (high), Eutrophic

Table 1: Impaired Waters in South Dakota (cont'd)	
Waterbody	**Impairment**
Jones Lake	pH (high), Eutrophic
Lake Louise	pH (high)
Loyalton Dam	Eutrophic
Mina Lake	Eutrophic
Ravine Lake	Eutrophic
Richmond Lake	Eutrophic
Rosehill Lake	Eutrophic
Rosette Lake	Eutrophic
Twin Lakes	Eutrophic
Wilmarth Lake	Eutrophic
Dawson Creek (James River to Lake Henry)	FCB
Firesteel Creek (West Fork Firesteel Creek to mouth)	TDS, Temp.
James River (ND border to Mud Lake Reservoir)	pH (high)
James River (Mud Lake Reservoir)	pH (high)
James River (Columbia Road Reservoir)	DO
James River (US HWY 12 to Mud Creek)	DO
James River (Sand Creek to I-90)	TSS
James River (I-90 to Yankton County line)	TSS
James River (Yankton County line to mouth)	FCB, TSS
Moccasin Creek (Headwaters to Aberdeen)	FCB
Moccasin Creek (Aberdeen to Warner)	DO, Ammonia, pH (high)
Pierre Creek (James River to S11,T102N,R58W)	FCB
Turtle Creek (Hand County line to)	pH (high)
Wolf Creek (Just above Wolf Creek Colony to the mouth)	TSS
Little Missouri Basin	
None	
Minnesota Basin	
Lake Hendricks	Eutrophic
South Fork Whetstone (Lake Farley to mouth)	DO
Missouri Basin	
Academy Lake	Eutrophic
Lake Andes	DO, Eutrophic
Brakke Dam	Eutrophic
Burke Lake	DO, pH (high), Eutrophic
Byre Lake	Eutrophic
Lake Campbell	Eutrophic
Corsica Lake	DO, pH (high), Eutrophic
Cottonwood Lake	Eutrophic
Dante Lake	Eutrophic
Geddes Lake	Eutrophic
Lake Hurley	Hg in fish
Platte Lake	Eutrophic
Lake Pocasse	Eutrophic

Table 1: Impaired Waters in South Dakota (cont'd)	
Waterbody	**Impairment**
Roosevelt Lake	Hg in fish
Sully Dam	Eutrophic
Choteau Creek (Wagner to mouth)	TSS
Emanuel Creek (Lewis and Clark Lake to S20,T94N,R60W)	FCB, TSS
Ponca Creek (Gregory to near St. Charles)	FCB, TSS
Slaughter Creek (Missouri River to headwaters)	TDS, Cond.
Spring Creek (US HWY 83 to mouth)	DO, TSS
Moreau Basin	
Dewberry Dam	Eutrophic
Moreau River (Headwaters to near Iron Lightning)	Salinity, TSS
Moreau River (Iron Lightning to Green Grass)	Salinity, TSS
Moreau River (Green Grass to mouth)	Salinity, FCB, TSS
South Fork Moreau River (Alkali Creek to Mouth)	Cond.
Thunder Butte Creek (Headwaters to mouth)	DO
Niobrara Basin	
Rahn Lake	Eutrophic
Keya Paha River (Keya Paha to NB border)	FCB, TSS
Red Basin	
Lake Traverse	Eutrophic
White Lake	Eutrophic
Vermillion Basin	
East Vermillion Lake	Eutrophic
Silver Lake	Eutrophic
Swan Lake	Silt, Eutrophic
Whitewood Lake	Eutrophic
North Island Lake	Hg in fish
Long Creek (Vermillion River to HWY 44)	FCB
Vermillion River (Baptist Creek to mouth)	TSS
White Basin	
Lake Creek (Above and below refuge near Tuthill, SD)	Temp.
Little White River (Rosebud Creek to mouth)	TSS
White River (NB border to Interior)	TSS
White River (Interior to Black Pipe Creek)	FCB, TSS
White River (Black Pipe Creek to Oak Creek)	FCB, TSS
White river (Oak Creek to mouth)	FCB, TSS

*This table only includes assessed waters.
Grayed entries are EPA category 4A, "Water impaired but has an approved TMDL."
All others are EPA category 5, "Water impaired/requires a TMDL."
Source: SDDENR 2008

Cond. - Specific Conductance

Table 1: Impaired Waters in South Dakota (cont'd)	
Waterbody	**Impairment**

DO - Dissolved Oxygen
FCB - Fecal Coliform Bacteria
Hg in fish - Mercury in fish
TDS - Total Dissolved Solids
Temp. - Temperature
TSS - Total Suspended Solids

APPENDIX C:

SOUTH DAKOTA SOCIOECONOMICS ANALYSIS TABLES

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CRP Haying and Grazing Environmental Assessments of 13 States:
Data Needs and Analysis Format
Socioeconomic and Environmental Components
Michael R. Dicks and Terrance Bidwell

OVERVIEW

Major components of the environmental assessments will include the environmental impacts and the socio-economic impacts of implementation of the managed haying and grazing provision of the Conservation Reserve Program (CRP). The impacts will stem from the development of permitted and required management practices for the haying and grazing and the economic opportunity that may be provided.

Thirteen states have been identified for inclusion in the analysis including New Mexico, Texas, Oklahoma, Kansas, Wyoming, Nebraska, South Dakota, North Dakota, Montana, Idaho, Utah, Oregon and Washington. The overall effort objective will be to attempt to assess the effect of moving from non-use to prescribed haying or grazing on farm, local and regional economic activity, environmental quality, wildlife habitat and market (e.g. recreation) and non-market (e.g. visual) amenities. Two different procedures are possible depending on data availability and ability of U.S. Department of Agriculture (USDA) personnel to assist with data collection. The best analysis method will rely on **primary data** collection from a sample of CRP fields. The alternative method would be to rely on historic haying and grazing or **secondary data**. The first method provides the best set of data for both the environmental and socioeconomic analysis while the second method will provide sufficient data for the socio-economic analysis, but may limit the ability to accurately measure the environmental impacts. The following collection and analysis procedures represent general procedures to assist in deciding which procedure to choose. Of course a third alternative is to use secondary where possible to reduce the need for primary data. The limiting factor is gathering sufficient data to measure the changes in environmental factors. The socio-economic analysis can use either the primary or secondary data equally. The main constraint to the o socio-economic analysis is to arrive at a measure of the amount of haying and grazing likely to occur and the change in associated farm income.

PRIMARY DATA COLLECTION

Data Collection Procedure

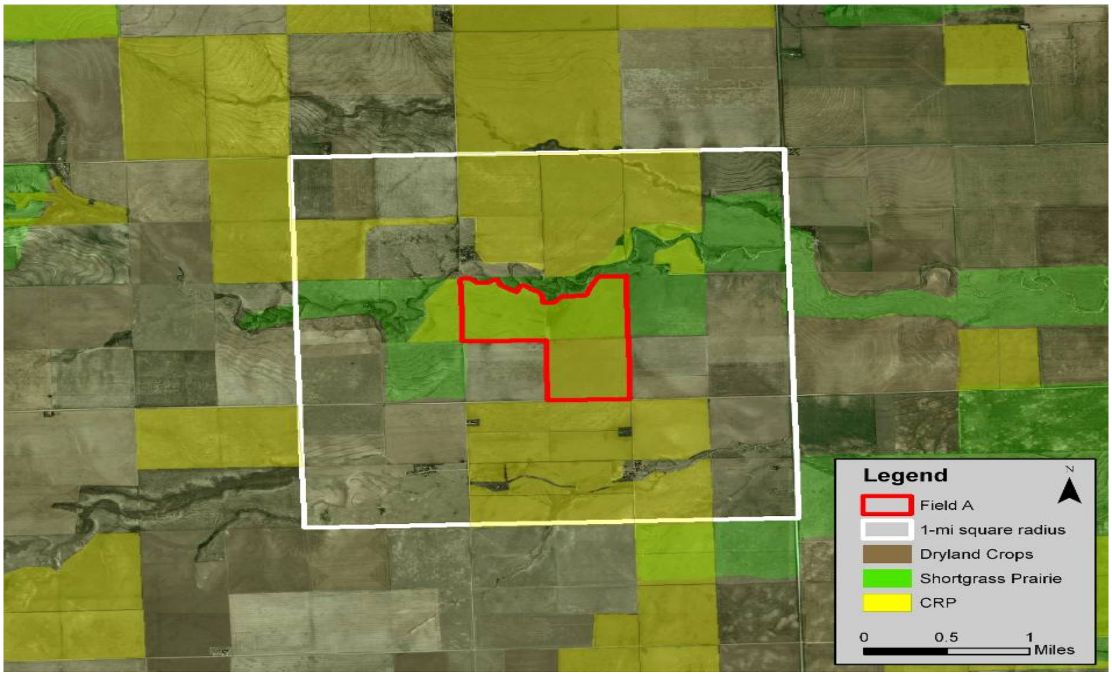
Each state will be disaggregated into ecological regions. For each State Ecological Region (SER), three counties will be identified that provide a representative description of the diversity in agricultural production, climate, wildlife habitat, topography and other landscape characteristics. For each county in each state ecological region 10 CRP fields will be selected by Farm Services Agency (FSA) /Natural Resources Conservation Service (NRCS) county personnel that represent the diversity of the CRP fields in the county. This diversity includes availability of water on site, fencing, cover type, and diversity of fields within close proximity in the landscape. A data information sheet (below) is completed on each CRP field, in each county, in each SER.

The socio-economic impact assessment is straightforward and is developed from production budgets and changes in producer income. The resource economic impact is more complicated and more difficult to arrive at quantitatively. Few of the natural resources impacts (e.g. change in water or air quality, wildlife habitat, or soil quality) have no economic measures and thus are often discussed in terms of physical quantity changes or qualitative changes.

However, the NRCS has developed Resource Conservation Technical Guides to assist producers in the management of resources in agricultural production activities to minimize the adverse impacts of production on the various resources. Constraining the haying and grazing activity on CRP land to these management schemes should minimize any adverse impacts on the local resources.

OSU- Research Hay vs. Grazing Management							
Your Name			County, State		CRP- Field ID		
Legal Description of CRP field							
Field Location							
Acreage		Shape i.e. square/irregular			Perimeter in Feet		
Fence	Y N	Type of Fence			Any Cross Fencing?		Y N
Water Available	Y N	Type of Water Source			Distance t		
Used for Grazing?		Y N	Which Months Available f				
Used for Haying?			Which Months Available f				
Details/Restrictions							
Estimated Capacity for Grazing (given in # of animal units)							
Types of Grass Present							
Remarks/Additional Information:							
Additional Items to Include				For Questions Please Contact			
GIS photo map of field							
Soil Map							
EQIP Cost share sheets for the county				Dr. Mike Dicks	email: michael.dicks@okstate.edu		

A GIS map of the field within a 3 square mile area showing land use on surrounding tracts, a soil map of the CRP field and a county EQIP cost share sheet will also be provided.



Each field will have an expansion factor representing the total acres of CRP in the county and the total acres of CRP in the SER.

From the information we can develop prescribed haying and grazing management schemes and estimate the net returns from engaging in the prescribed practices. These budgets can be used to determine the probability of producers adopting the prescribed practices, the increases in outputs and incomes, effects on local, regional and national prices and the economic impacts in the local, regional and national economies.

Specific Data Needs

1. CRP field data
    a. Current species of grasses
    b. Age of stand
    c. Condition of stand
    d. Pounds of forage harvestable (grazing or haying)
    e. Availability of water on site or distance to nearest source
    f. Proximity of cattle operations
        i. Type (cow calf/stocker)
    g. Common protein supplementation practice
    h. Haying and grazing restrictions
        i. Months available
        ii. Percent of forage removable
        iii. Nutrient needs
    i. Water availability/limitation
        i. Hauling distance
    j. Fencing needs
        i. Type
        ii. Perimeter (straight line or creek)
    k. Include a map identifying the field(or GIS coordinates of the field -both would be preferable)
2. County data
    a. Number of CRP fields

   b. Total Acres of CRP
   c. Total acres of cropland
   d. Total Acres of hay production and quantity
      i. Average tons of production
   e. Total number of cattle
      i. Average pounds of production
3. SER data
   a. Number of CRP fields
   b. Total Acres of CRP
   c. Total acres of cropland
   d. Total Acres of hay production and quantity
      i. Average tons of production
   e. Total number of cattle
      i. Average pounds of production
4. State data
   a. Number of CRP fields
   b. Total Acres of CRP
   c. Total acres of cropland
   d. Total Acres of hay production and quantity
      i. Average tons of production
   e. Total number of cattle
      i. Average pounds of production
5. General
   a. NRCS management schemes from the technical guides

Analytic Procedure

Farm Level Impacts

CRP Field Selection

The CRP fields to be used to generate the information required for the analysis should be selected by the USDA FSA County Executive Director in cooperation with counterparts from the county NRCS. Fields should be selected as representative of the size, shape, cover type, and ecological conditions of the CRP fields in the county. While 10 fields may not provide a statistically valid sample in most counties, proper selection of representative fields can provide a good measure of the relative magnitude of the potential impacts from changing management practices and can be accomplished within the budget constraints of the environmental assessment.

The counties selected within the state can be determined by the USDA/FSA and NRCS state personnel based upon the same criteria used to select the fields within counties. A minimum of three counties per state is required to ensure that the diversity between counties is captured. If possible more than one county per ecological region could be identified and used in the analysis.

Weighting of Acres

Analysis will be based on the data collected from 30 specific and actual CRP fields (3 counties X 10 fields per county). These fields will be weighted by the percent of CRP acres represented. A county expansion factor will be determined for each field by dividing the total CRP acres in the county by the acres in the specific CRP field. A state expansion factor will be determined for each county by dividing the total CRP acres in the state by the CRP acres in the county. Because the fields will be used to evaluate the implications of specific potential haying and grazing management schemes, the selection of these fields as "representative" of the diversity of CRP fields in each county and the diversity of each county in the state is extremely important.

Haying and Grazing Management Practices

For each of the CRP fields a haying and/or grazing management scheme will be developed based on the NRCS Technical Guides and the limitations imposed by this study (e.g. frequency and duration of haying and grazing).

Budgets

Production budgets will be developed for haying and/or grazing activities for each field. A standard set of haying equipment will be used across all sites and the value of the output will be based upon local markets including the potential negative price impacts of increased hay output.

The grazing activity budget will assume management of a stocker operation and will include the annualized cost of fencing (two-strand electric) or water delivery systems where required. For any required management activities (e.g. fencing) costs will be based upon the local Environmental Quality Incentives Program (EQIP) cost-share sheets. These sheets provide the local conservation committees estimate of the cost of specific practices in their district.

We will assume that the alternative production activity must provide a return that is at least $5.00 per acre greater than the per acre reduction in the annual rental payment for the field to be considered as exhibiting the potential for implementing the haying or grazing options.

For those fields where the haying and/or grazing options exhibit the potential for implementation, we will estimate the impact of the change in quantity, quality and diversity of the vegetative cover. These changes may induce a change in associated resource attributes including surface and ground water quality and quantity, soil quality and movement, wildlife habitat (and hence wildlife species diversity and quantity), air quality.

Local Impacts

The degree to which the haying and grazing activities are implemented on CRP acres will increase the local output of hay and cattle. Because we have restricted the haying and grazing activities to only those fields that provide a positive economic gain, the implementation of these activities will have a positive impact on producer's incomes and the local economies. The impact of this change in producer income on the local economy can be measured using IMPLAN, and input-output model widely used for analyses of this type in the United States. More difficult to assess is the change in economic activity associated with changes in recreation activities (e.g. hunting, bird watching), environmental quality or visual amenities. However, we can identify as positive or negative the change in wildlife habitat and potential air and water quality from changing land use patterns.

Impacts on Non-participating producers

The use of CRP fields to produce additional tons of hay or pounds of beef may affect local, regional or national markets. The extent of this impact will depend on how large of an output increase is generated by the use of CRP fields relative to current levels of output. Hay markets are particularly sensitive to local conditions since the cost of transport excludes broader market impacts except in period of great scarcity such as occurs with droughts. Price elasticities have been developed and are well documented that can be used to anticipate price impacts associated with output changes in regional and national markets.

Secondary Data Collection

Data Collection Procedure

The prescribed haying and grazing option has been available to CRP contract holders since 2002. USDA/FSA will have a contract file that indicates the payments received annually and thus will indicate a 25 percent payment reduction in a year when the haying or grazing option was elected. Using this data a much larger set of CRP fields could be identified and the total number of haying and grazing acres as a percent of total CRP acres in each county could be easily determined to establish the potential participation rate in the prescribed haying and grazing activity.

From the CRP contract file it is possible to collect information on cover type and previous crop yields. Using National Agriculture Statistics Services (NASS) county data for hay production and stocking rates could be changes in output and incomes could be estimated to determine farm, local and regional level changes in income and economic activity. However, this procedure will require a number of assumptions that may be easily challenged with respect to the environmental impacts. These impacts depend on the changes to fields within the context of the overall landscape and efforts that do not include the landscape concept have and will continue to be challenged.

The benefits of using this approach is that rather than working with a sample of fields as in the primary data approach it will be possible to use the population of CRP fields for the analysis.

Specific Data Needs

1. County data
    a. Number of CRP fields
    b. Total Acres of CRP
    c. Total acres of cropland
    d. Total Acres of hay production and quantity
        i. Average tons of production
    e. Total number of cattle
        i. Average pounds of production
    f. Average rental rate
2. State data
    a. Number of CRP fields
    b. Total Acres of CRP
    c. Total acres of cropland
    d. Total Acres of hay production and quantity
        i. Average tons of production
    e. Total number of cattle

        i. Average pounds of production

3. General
    a. NRCS management schemes from the technical guides

Analytic Procedure

Farm Level impacts

Determination of Land Use Decision

Aggregate data on the number of contracts and acres of CRP haying and grazing are available by county for 2002 through 2007. Using USDA/ERS Agricultural Resource Management System (ARMS) data contains costs and returns for these both haying and livestock production activities. The FSA haying and grazing data can be used to measure the potential use of total county CRP lands for haying or grazing. The percent of land hayed or grazed under the current program is indicative of the percent of land facing infrastructure constraints (e.g. fencing, water) that are cost prohibitive with the current haying and grazing restrictions (e.g. one in three year use, stocking rate, time activity is allowed).

Change in Farm Income

The use of the haying and grazing options requires a 25 percent reduction in the annual CRP rental rate. The ARMS data can be used to provide a projected net income from the hay and livestock production enterprise and thus the resulti*ng change in net income.*

Local Impacts

The degree to which the haying and grazing activities are implemented on CRP acres will increase the local output of hay and cattle. Economic activity will increase due to the production activities (e.g. required purchase of inputs and output services) and may increase or decrease according to the net change in income (e.g. increased income from production, reduced income from loss of 25 percent of annual rental payment). The impact of this change in producer income on the local economy can be measured using IMPLAN, and input-output model widely used for analyses of this type in the United States. More difficult to assess is the change in economic activity associated with changes in recreation activities (e.g. hunting, bird watching), environmental quality or visual amenities. Because we have not collected any field level data in this approach there is little that can be said about any positive or negative change in wildlife habitat or air and water quality from changing land use patterns.

Impacts on Non-participating producers

The use of CRP fields to produce additional tons of hay or pounds of beef may affect local, regional, or national markets. The extent of this impact will depend on how large of an output increase is generated by the use of CRP fields relative to current levels of output. Hay markets are particularly sensitive to local conditions since the cost of transport excludes broader market impacts except in period of great scarcity such as occurs with droughts. Price elasticities have been developed and are well documented that can be used to anticipate the price impacts associated with output changes in regional markets.

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South Dakota Socioeconomics Summary Report

Main points

Eligible Acres - Those CRP acres with a CP that allows landowner the option of the managed haying and grazing practive.
Economically Feasable Acres - Those CRP acres that are eligible and can be hayed or grazed with a positive net return (including the 25% rental rate reduction cost).
Potential Acres - Those CRP acres that are eligible and economically feasable with landowners that are likely to participate in the managed haying and grazing.

This State has a very low percent of eligible acreage in comparison to other states. This has reduced the amount of acreage potentially hayed or grazed by up to one-third.

67.60%	**Percent of CRP acres eligible for H&G**	From the haying and grazing file this is the percent of acres with a CP (cover and practice) that is eligible to be hayed or grazed.
27.70	**2006 State GDP (in billions)**	State Economic Growth, USDC/BEA, BEA 08-24.
	County and Field Data Summary	
72.80%	**Percent of CRP acres that are economically grazeable**	Precent of Acres from field level that have a poistive net return to grazing.
95.05%	**Percent of CRP acres that are economically hayable**	Precent of Acres from field level that have a poistive net return to haying.
43.55	**pounds of beef per acre of economically grazeable acres**	Average (weighted) pounds of beef produced from economically grazeable acres.
0.89	**tons of hay per acre on economically hayable acres**	Average (weighted) tons of hay produced from economically hayable acres.
45.73	**value of beef per acre of economically grazeable acres**	Current price value of per acre beef produced.
57.81	**value of hay per acre on economically hayable acres**	Current price value of per acre hay produced.
	Aggregate Data Summary	
1.03%	**percent of economically grazeable acres current grazed**	total 2004-2006 acres grazed as a percent of total acres economically grazable.
6.66%	**percent of economically hayable acres currently hayed**	total 2004-2006 acres hayed as a percent of total acres economically hayable.
852539	**total maximum state CRP acres economically grazeable**	Total CRP acres in the state that could be grazed.
1113025	**total maximum state CRP acres economically hayable**	Total CRP acres in the state that could be hayed.
31.50%	**maximum percent of CRP acres likely to be grazed**	This assumes that although there are econmically grazable and hayable acres. not all landowners will elect to participate in the option. Historically, the
41.12%	**maximum percent of CRP acres likely to be hayed**	maximum particiaption rate for voluntary conservation programs has been less than 2/3rds of those elegible.

Scenario A	**MH: 1/10 MG: 1/5 PNS: 1MAY-1AUG**	
6.30%	**maximum annual percent of economically grazeable acres**	The percent of acreage potentially available that can be grazed each year under the scenario constraints.
4.11%	**maximum annual percent of economically hayable acres**	The percent of acreage potentially available that can be hayedeach year under the scenario constraints.
53704	**maximum annual economically grazeable CRP acres**	The total state acreage potentially available that can be grazed each year under the scenario constraints.
45768	**maximum annual economically hayable CRP acres**	The total state acreage potentially available that can be hayedeach year under the scenario constraints.
2339051	**Maximum Pounds of beef produced**	Total annual state beef productionproduced on potentially available acres.
40708	**maximum tons of hay produced**	Total annual state hay production produced on potentially available acres.
$2,456,003	**maximum value of beef produced**	Total annual state value of beef production on potentially available acres.
$2,646,038	**maximum value of hay produced**	Total annual state value of beef production on potentially available acres.
0.44%	**Potential Increase in state value of beef production**	Total annual state value of beef production on potentially available acres as a percent of total annual state beef production on all lands.
0.66%	**Potential Increase in state value of hay production**	Total annual state value of hay production on potentially available acres as a percent of total annual state beef production on all lands.
$4,544,983	**Potential Increase in economy-wide impacts from beefproduciton on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase in beef output.
$4,420,416	**Potential Increase in economy-wide impacts fromhay production on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase inhay output.
0.0164%	**Potential percent increase in economy-wide impacts from beef production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).
0.0160%	**Potential percent increase in economy-wide impacts from hay production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).

South Dakota Socioeconomics Summary Report (cont'd)

Scenario B	**MH: 1/5 MG: 1/5 PNS: 1MAY-1AUG**	
6.30%	**maximum annual percent of economically grazeable acres**	The percent of acreage potentially available that can be grazed each year under the scenario constraints.
8.22%	**maximum annual percent of economically hayable acres**	The percent of acreage potentially available that can be hayedeach year under the scenario constraints.
53704	**maximum annual economically grazeable CRP acres**	The total state acreage potentially available that can be grazed each year under the scenario constraints.
91535	**maximum annual economically hayable CRP acres**	The total state acreage potentially available that can be hayedeach year under the scenario constraints.
2339051	**Maximum Pounds of beef produced**	Total annual state beef productionproduced on potentially available acres.
81417	**maximum tons of hay produced**	Total annual state hay production produced on potentially available acres.
$2,456,003	**maximum value of beef produced**	Total annual state value of beef production on potentially available acres.
$5,292,076	**maximum value of hay produced**	Total annual state value of beef production on potentially available acres.
0.44%	**Potential Increase in state value of beef production**	Total annual state value of beef production on potentially available acres as a percent of total annual state beef production on all lands.
1.31%	**Potential Increase in state value of hay production**	Total annual state value of hay production on potentially available acres as a percent of total annual state beef production on all lands.
$4,544,983	**Potential Increase in economy-wide impacts from beefproduciton on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase in beef output.
$8,840,831	**Potential Increase in economy-wide impacts fromhay production on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase inhay output.
0.0164%	**Potential percent increase in economy-wide impacts from beef production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).
0.0319%	**Potential percent increase in economy-wide impacts from hay production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).
Scenario C	**MH: 1/3 MG: 1/3 PNS: 1MAY-1JUL**	
10.50%	**maximum annual percent of economically grazeable acres**	The percent of acreage potentially available that can be grazed each year under the scenario constraints.
13.71%	**maximum annual percent of economically hayable acres**	The percent of acreage potentially available that can be hayedeach year under the scenario constraints.
89507	**maximum annual economically grazeable CRP acres**	The total state acreage potentially available that can be grazed each year under the scenario constraints.
152559	**maximum annual economically hayable CRP acres**	The total state acreage potentially available that can be hayedeach year under the scenario constraints.
7378603	**Maximum Pounds of beef produced**	Total annual state beef productionproduced on potentially available acres.
140763	**maximum tons of hay produced**	Total annual state hay production produced on potentially available acres.
$7,747,534	**maximum value of beef produced**	Total annual state value of beef production on potentially available acres.
$9,149,595	**maximum value of hay produced**	Total annual state value of beef production on potentially available acres.
0.99%	**Potential Increase in state value of beef production**	Total annual state value of beef production on potentially available acres as a percent of total annual state beef production on all lands.
2.99%	**Potential Increase in state value of hay production**	Total annual state value of hay production on potentially available acres as a percent of total annual state beef production on all land.s
$14,337,280	**Potential Increase in economy-wide impacts from beefproduciton on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase in beef output.
$15,285,123	**Potential Increase in economy-wide impacts fromhay production on CRP**	Total value of state output from the direct, indirect and induced impacts of the potential increase inhay output.
0.0518%	**Potential percent increase in economy-wide impacts from beef production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).
0.0552%	**Potential percent increase in economy-wide impacts from hay production on CRP**	Size of the increased value of state output from the potential haying and grazing as a precent of total state output (state GDP).

South Dakota Socioeconomics Summary Statistics

													Hay							
South Dakota (Fixed)	Managed Haying Acres**	Managed Grazing Acres**	CRP ACRES	Total Acres Sampled	ACRES GRAZED	ACRES HAYED	Wheat Output	BEEF Output lbs/acre	HAY Output tons/acre	Wheat Yields-Avg	Total County Harvested Acres-Hay	Hay Yield	Total County Hay Production (tons)	Sample total wheat output (bu)	Sample total economic beef output	Sample total economic hay output	Total County Wheat Acres	Total County Wheat Production	Total County Hay Acres	Total County Hay Production
AURORA	475.5		13,236.60								45333	1.61	73167				25500	1379333.333		
BEADLE	970.8		18,793.10								78333	2.19	171867				66233.333	3264000		
BENNETT	184.3		8,200.80								81667	1.25	102033				50150	1477500		
BON HOMME	103.9	0.0	6,829.90								42667	2.54	108200				13766.667	680333.3333		
BROOKINGS	1,995.8	97.5	21,378.60								33667	2.94	99100				15000	838666.6667		
BROWN	1,538.5	70.1	77,160.70	929.8	113.5	753		104.10844	0.82		64667	2.19	141667	0	11816.30769	620.025	67000	3294000	64666.667	141666.6667
BRULE	54.6		7,686.90								55000	1.57	86533				46066.667	2030333.333		
BUFFALO	0.0		2,770.80								19667	1.36	26667				11166.667	441333.3333		
BUTTE	1,407.5	2309.4	18,151.30								74667	1.88	140133				12200	336500		
CAMPBELL	5,166.7	3.4	45,491.60								40000	1.74	69767				52200	2432000		
CHARLES MIX	84.0	88.0	15,254.90								107333	2.07	222000				73833.333	3955000		
CLARK	2,993.2	137.0	30,155.20								45000	2.15	96567				47433.333	2359333.333		
CLAY	77.8		6,496.70								17667	3.92	69267				1300	90000		
CODINGTON	1,255.4		21,557.70								40000	2.89	115467				42850	2330000		
CORSON	1,090.7	102.5	20,722.70								108333	1.18	127733				101900	2451000		
CUSTER	0.0		0.00								17000	1.19	20267				2500	64000		
DAVISON	163.7		7,855.70								35333	2.59	91367				17866.667	925333.3333		
DAY	4,244.2	531.2	60,724.00	1060.2	905.6	1060.2		0	0.96		50000	2.38	119100	10263.1	0	1018.4177	72700	3949000	50000	119100
DEUEL	2,159.7	283.6	22,331.60								36667	2.69	98467				20366.667	1146666.667		
DEWEY	1,020.1		19,729.20								84000	1.09	91633				29400	824000		
DOUGLAS	255.8		6,748.60								28667	2.19	62800				21966.667	1273333.333		
EDMUNDS	1,386.9		16,616.90								48000	1.67	79967				84966.667	3647000		
FALL RIVER	0.0		1,731.50								14667	1.84	26967				6000	143500		
FAULK	813.8	0.0	6,183.40								58333	1.88	109467				71100	3032000		
GRANT	2,673.6	17.2	12,792.60								41667	2.60	108133				41433.333	2252333.333		
GREGORY	131.1	49.8	5,157.50								128333	1.52	195600				26333.333	1067333.333		
HAAKON	3,305.9	707.0	38,894.70								89333	1.08	96300				106700	3411000		
HAMLIN	806.2	52.3	10,549.50								23667	2.72	64300				18900	1090000		
HAND	2,412.2	61.8	22,493.80								130000	1.49	193933				120066.67	5007000		
HANSON	83.8		5,982.80								13000	2.54	32967				10000	505500		
HARDING	1,330.7		8,694.60								64333	0.76	48867				23700	485666.6667		
HUGHES	285.5		14,241.60								23667	1.25	29567				85933.333	2885666.667		
HUTCHINSON	48.3		13,507.60								33667	2.76	93000				22200	1141000		
HYDE	546.7		7,585.40								42000	1.37	57333				69200	2602333.333		
JACKSON	1,742.9	17.9	10,592.40								60667	1.09	65967				20200	355000		
JERAULD	447.6		11,876.60								42667	1.77	75633				24566.667	983000		
JONES	1,505.7		14,439.20								82333	1.11	91200				44050	1450000		
KINGSBURY	1,052.1		10,612.40								41000	2.73	111933				38133.333	2105666.667		
LAKE	379.4	156.8	9,705.20								17000	3.48	59133				4600	244000		
LAWRENCE			0.00								33333	1.16	38533				200	4000		
LINCOLN			6,154.50								13333	3.67	48933				5050	148000		
LYMAN	2,947.4		82,231.20	1579.9	1579.9	1579.9		64.169548	0.97		87000	1.02	88667	44237.2	101381.4692	1536.822	115633.33	4335666.667	87000	88666.66667
MCCOOK	330.7		8,984.90								39667	2.35	93100				20500	1218000		

South Dakota Socioeconomics Summary Statistics (cont'd)

											Hay									
South Dakota (Fixed)	Managed Haying Acres**	Managed Grazing Acres**	CRP ACRES	Total Acres Sampled	ACRES GRAZED	ACRES HAYED	Wheat Output	BEEF Output lbs/acre	HAY Output tons/acre	Wheat Yields-Avg	Total County Harvested Acres-Hay	Hay Yield	Total County Hay Production (tons)	Sample total wheat output (bu)	Sample total economic beef output	Sample total economic hay output	Total County Wheat Acres	Total County Wheat Production	Total County Hay Acres	Total County Hay Production
MCPHERSON	4,685.2		33,372.20								19000	2.88	54767				1700	71000		
MARSHALL	2,111.7	608.5	37,379.70								113333	1.71	193300				43300	2073000		
MEADE	925.1	34.0	18,192.10								211667	0.97	205800				46400	1303333.333		
MELLETTE	300.0		3,746.00								54333	1.07	58267				20466.667	650000		
MINER	407.6	42.9	18,231.50								28667	2.23	63867				16533.333	845666.6667		
MINNEHAHA	517.4	30.0	9,444.70								37333	3.25	121267				800	48000		
MOODY	894.0		11,640.60								18667	3.44	64200				3200	215000		
PENNINGTON	222.2	1841.6	8,435.80								68333	0.99	67600				60366.667	1807666.667		
PERKINS	2,282.1	216.9	35,275.70								105667	0.91	95900				90150	2273000		
POTTER	1,004.8		18,594.10								28333	1.72	48733				129133.33	5485666.667		
ROBERTS	1,879.1	63.4	45,338.30								64000	2.24	143200				70250	3708500		
SANBORN	1,035.6		19,246.70								58667	2.06	121067				6900	424500		
SHANNON	35.4		905.90								18667	1.20	22400				18166.667	612666.6667		
SPINK	1,548.8	109.6	30,786.10								69333	2.49	172567				117166.67	6083000		
STANLEY	4,612.8	125.0	42,726.10								40667	1.13	46133				88000	2491333.333		
SULLY	1,098.6		15,231.40								27667	1.18	32633				204533.33	7772333.333		
TODD	0.0		486.50								94667	1.02	96567				7450	222000		
TRIPP	853.8		15,146.90								210333	1.33	280367				83200	3364333.333		
TURNER	89.5		8,909.10								26333	3.11	82000				4700	317666.6667		
UNION	40.0		6,336.50								11000	4.02	44200				66600	2467000		
WALWORTH	712.3	55.3	18,850.00								53000	1.59	84200				3100	192000		
YANKTON	201.7		7,639.70								34000	3.45	117267				53800	1574000		
ZIEBACH	1,250.6	989.2	14,799.00								39667	1.10	43733							
Totals	74,181.0	8,801.9	1,171,019.5	3,569.9	2,599.0	3,393.1					3666666	1.6918182	6203333	54500.3	113197.7769	3175.2647	2886783.3	117657000	201666.67	349433.3333
Percent	6.33%	0.75%			0.7280316	0.95					49.42865			15.266618	43.55435819	0.889454803		40.75712875		1.732727273
State expansion factor			328.0258551										403216666.7							
County Expansion factor								Hay adjustment index			1.0241805									
		Brown	83.0					wheat adjustment index			0.3745754									
		Day	57.3																	
		Lyman	52.0																	
	0.0211158	0.0025055																		

APPENDIX D

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLANDS

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING

SOUTH DAKOTA SPECIES OF GREATEST CONSERVATION NEED

SOUTH DAKOTA GRASSLAND BIRDS

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POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
MAMMALS			
Ungulates			
Bighorn sheep	*Ovis canadensis*	Y	Primarily an alpine dweller, but may also utilize deserts, grasslands, shrublands, and woodlands.
Elk	*Cervus elephus* or *Cervus canadensis* (*C. elephus* in some sources, *C. elephus* now refers to the European species in current literature)	Y	Primarily feeds in alpine pastures, marshes, meadows, riparian river bottoms, clear cuts, brushy areas, and forest edges. Wooded hillsides are the preferred habitat in summer, grasslands in winter. Grazes, but may also feed on forbs, willow, and aspen if grass is not available.
Mountain goat	*Oreamnos americanus*	N	Alpine species. While it may utilize alpine meadows, this species preference is for alpine and subalpine habitat at the timberline or above, usually near cliffs, talus, or rockslides.
Mule deer	*Odocoileus hemionus*	Y	Riparian, cropland/hedgerow, deserts, forests, grasslands, old fields, savannas, and shrublands. Often associated with successional vegetation, especially near agricultural lands.
Pronghorn antelope	*Antilocapra americana*	Y	Deserts, grasslands, sagebrush plains, and foothills.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		Potentially Present on lands under CRP Practices?	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
White-tailed deer	*Odocoileus virginianus*	Y	Habitat preference of prairie and lightly wooded riparian bottomlands, especially woodlands interspersed with grasslands and pastures.
Large Carnivores			
Mountain lion (cougar, puma)	*Felis concolor* (*Puma concolor*)	Y?	Primarily inhabits mountainous or remote areas, but may also be found in woodlands, riparian areas, swamps, shrublands, canyons, and deserts, and may utilize other habitats as immigration corridors.
Furbearers			
Badger	*Taxidea taxus*	Y	Scrub, rangeland, and grasslands.
Beaver	*Castor canadensis*	N	Riparian habitats.
Black-tailed jackrabbit	*Lepus californicus*	Y	Grasslands and rangelands.
Black-tailed prairie dog	*Cynomys ludovicianus*	Y	Inhabits shortgrass prairies and grasslands.
Bobcat	*Lynx rufus*	N	Inhabits forested wetlands, riparian areas, talus slopes, woodlands, forests, shrublands, deserts, and old fields.
Coyote	*Canis latrans*	Y	Croplands, desert, urban areas, deserts, forests, old fields, prairies, rangelands, savannas, grasslands, and shrublands.
Fox	.	Y	Inhabits open and semi-open habitats and will utilize open woodlands.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Franklin's ground squirrel	*Spermophilus franklinii*	Y	Inhabits tallgrass and midgrass prairies, riparian areas, croplands, grasslands, forest fields, roadsides and railroad rights-of-way, and fields.
Gopher (ground squirrels/prairie dogs)		Y	Inhabits tallgrass and midgrass prairies, riparian areas, croplands, grasslands, forest fields, roadsides and railroad rights-of-way, and fields.
Gray fox	*Urocyon cinereoargenteus*	Y	Usually avoids open areas, preferring woods or shrubland and broken country. May be found in grasslands, rangeland, shrublands, riparian regions, and cropland.
Ground squirrels	.	Y	Inhabits tallgrass and midgrass prairies, riparian areas, croplands, grasslands, forests, fields, roadsides and railroad rights-of-way, alpine meadows, savanna, woodlands, steppe, and tundra.
Jackrabbits/hares	.	Y	Desert, scrub, rangeland, forests, meadows, and grasslands.
Least weasel	*Mustela nivalis*	Y	Wetlands, riparian areas, alpine habitats, cropland, grasland, old fields, shrublands, tundra, and woodlands.
Long-tailed weasel	*Mustela frenata*	Y	Inhabits bog, wetlands, brushland, open woodlands, forests croplands, old fields, and grasslands.
Mink	*Mustela (Neovison) vison*	N	Riparian and forested wetlands.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Muskrat	*Ondatra zibethicus*	N	Riparian habitats.
Opossum	*Didelphis virginiana*	Y	Preference is for wooded riparian habitats, but may be found in other riparian areas, cropland, forests, shrublands, and old fields.
Porcupine	*Erethizon dorsatum*	Y	Inhabits forested wetlands, woodlands, and forests, but may also use grasslands and corridors when dispersing, and is found in deserts and shrublands in some parts of its range.
Prairie dogs	*Cynomys* spp.	Y	Inhabits prairies and grasslands.
Rabbits/cottontail rabbits	.	Y	Forests, meadows, old fields, grasslands, shrublands, agricultural fields.
Red fox	*Vulpes vulpes*	Y	Inhabits open and semi-open habitats and will utilize open woodlands.
Richardson's ground squirrel	*Spermophilus richardsonii*	Y	Inhabits grasslands, fields, and croplands.
Ermine (short-tailed weasel, stoat)	*Mustela erminea*	Y	Prefers riparian woodlands with dense cover, but may also be found in alpine habitats, croplands, forests, grasslands, old fields, and shrublands.
Spotted skunk	*Spilogale putorius*	Y	Prefers forest edges and woodlands, but may use corridors during dispersal.
Squirrels (gray, red, and fox)	.	N	Arboreal species.
Striped skunk	*Mephitis mephitis*	Y	Primarily a forest edge species, however may use corridors during dispersal.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Thirteen-lined ground squirrel	*Spermophilus (Citellus) tridecemlineatus*	Y	Inhabits grasslands and plains.
Weasels	.	Y	Inhabits bog, wetlands, brushland, open woodlands, forests croplands, old fields, and grasslands.
White-tailed jackrabbit	*Lepus callotis*	Y	Preference for grasslands and plains.
Woodchuck	Marmota monax	Y	Preference for open country, grasslands, pastures, meadows, and old fields. May also utilize open forests and woodlands, stony or rocky areas, and shrublands or rangelands.
Yellow-bellied marmot	*Marmota flaviventris*	Y	Forest and meadow dweller, especially where mosaic of forest, meadow, and rock occur. Also inhabits forests openings, grasslands, and alpine regions.
BIRDS			
Waterfowl			
American wigeon	*Anas americana*	Y	Upland nesting duck species.
Blue-winged teal	*Anas discors*	Y	Upland nesting duck species.
Bufflehead	*Bucephala albeola*	N	Breeds in US, but as a cavity nester in wooded areas close to water. Feeds and rests in riparian areas and wetlands. Does not use CRP land.
Canvasback	*Aythya valisineria*	N	Nests in dense vegetation in wetlands and riparian areas, also feeds and rests in riparian and wetland areas.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Ducks		Y	Many species nest in cropland, grasslands, old fields, pastures, and rangeland.
Gadwall	*Anas strepera*	Y	Upland nesting duck species.
Goose (brant, Canada, Ross's, white-fronted, snow)	*Branta bernicla, B. canadensis, B. hutchinsii, Chen rossii, Anser albifrons,* and *C. caerulescens*	Y	Non-breeding Ross' goose, greater white-fronted goose, cackling goose, and snow goose are resident in US, but do not breed in US. Migrants, resting birds, and resident birds will graze in grasslands and pastures, feed on grain fields, and foraging for insects, grass, shoots, and seeds in fields, pastures, and grasslands. Breeding and non-breeding populations of Canada goose are present in the US; nests are usually built in riparian areas or wetlands. Canada goose feed on grasses, sprouts, grains, clover, invertebrates, and riparian and aquatic plants in parks, fields, marshes, grasslands, and pastures.
Green-winged teal	*Anas crecca*	Y	Upland nesting duck species.
Lesser scaup	*Aythya affinis*	Y	Upland nesting duck species.
Mallard	*Anas platyrhynchos*	Y	Upland nesting duck species.
Mergansers		Y	Hooded and common mergansers are cavity nesters, but young must travel to brood rearing areas. Red-breasted merganser nests in riparian areas and

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
			wetlands.
Northern pintail	*Anas aacuta*	Y	Upland nesting duck species.
Redhead	*Aythya Americana*	N	Nests in dense vegetation in wetlands and riparian areas, also feeds and rests in riparian and wetland areas.
Ring-necked duck	*Aythya collaris*	N	Nests in dense vegetation in wetlands and riparian areas, also feeds and rests in riparian and wetland areas.
Swans		N	Mute swan (*Cygnus olor*) is an exotic. Trumpeter swan (*Cygnus buccinator*) nests in the US. Tundra swan (*Cygnus columbianus*) does not nest in the US, but migrates through the US and may be a nonbreeding resident in the US. Trumpter swans are riparian and wetland feeders and nesters. Tundra swans are riaparian and wetland feeders and may nest as far as a half-mile from water, but do not nest in US.
Wigeon		Y	Upland nesting duck species.
Wood duck	*Aix sponsa*	Y?	Cavity nesters, but young must travel to brood rearing areas.
Rails/Coots			
American coot	*Fulica americana*	N	Inhabits wetlands and riparian areas.

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Upland Gamebirds			
Northern bobwhite quail	*Colinus virginianus*	Y	Inhabits and feeds in riparian areas, croplands, grasslands, pastures, fallow land, old fields, woodlands, savanna, and rangelands.
Chukar	*Alectoris chukar*	Y	Preference is for open and flat habitats, such as plateaus, sage steppe, deserts, and grasslands, as well as rocky hillsides and mountain slopes and foothills.
Gray partridge	*Perdix perdix*	Y	Inhabits grasslands, old fields, savanna, pastures, steppe and pastures. Nests in grasslands, hayfields or in grain fields.
Greater prairie chicken	*Tympanuchus cupido*	Y	Feeds in and nests in grassland habitats.
Ring-necked pheasant	*Phasianus colchicus*	Y	Feeds in and nests in grassland habitats and cropland.
Ruffed grouse	*Bonasa umbellus*	Y	Inhabits forests, woodlands, and riparian areas. May use old fields.
Sage grouse	*Centrocercus urophasianus*	Y	Inhabits deserts, savannas, grasslands, and shrublands. Depends on sagebrush.
Sharp-tailed grouse	*Tympanuchus phasianellus*	Y	Inhabits riparian areas, croplands, grasslands, shrublands, and woodlands.
Wild Turkey (eastern, Merriam's, Rio Grande)	*Meleagris gallopavo*	Y	Habitats include croplands, grasslands, forests, old fields, shrublands, and woodlands.
Shorebirds and Waterbirds			

POTENTIAL GAME SPECIES FOUND ON SOUTH DAKOTA CRP GRASSLAND

South Dakota Game Species		**Potentially Present on lands under CRP Practices?**	
Common Name	**Scientific Name**	**Y/N**	**Comment/Justification**
Sandhill crane	*Grus canadensis*	Y	Inhabits and feeds in bogs and wetlands, croplands, grasslands, and tundra.
Wilson's (common) snipe	*Gallinago delicata* (*G. gallinago*)	N	Inhabits wetlands and riparian areas.
Doves/Pigeons			
Doves and pigeons (mourning dove, Eurasian collared dove, band-tailed pigeon, white-winged dove)	*Zenaida macroura*, *Streptopelia decaocto*, *Patagioenas fasciata*, and *Z. asiatica*	Y	Habitats include deserts, old fields, forests, woodlands, grasslands, shrublands, savanna, and old fields.
Other Birds			
American crow	*Corvus brachyrhynchos*	Y	Inhabits and feeds in open or partially open country, agricultural lands, orchards, riparian areas, and grasslands.

Total Species in State

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SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING

Common Name	Scientific Name	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Bighorn sheep	*Ovis canadensis*	Predator evasion tactics involve bighorn sheep utilizing escape cover in the form of rough, broken, and steep ground. Grazing should be limited especially where grazed pasture is close to broken ground the sheep may utilize. Bighorns do not compete well with livestock, grazing in sheep habitat not recommended.	Restrict grazing to areas where this species is not located, light rotational grazing near broken land, or no grazing allowed, especially during late summer. Controlled grazing can improve habitat quality, but only if at controlled low levels.	Anderson and Scherzinger 1975; Bailey 1980; Clark et al. 2000; NatureServe 2008	Forage can be improved through selected haying as haying can be used to maintain younger growth of grasses and forbs, improving the nutrition. Mowing would allow the sheep clear sightlines for predators.	Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	Bailey 1980; Clark et al. 1998a, 1998b
Elk	*Cervus elephus*	Possible increased competition for food resources. Cattle compete with elk, especially during late summer.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed, especially during late summer. Spring grazing can improve habitat quality, but only if at low levels.	Anderson and Scherzinger 1975; Clark et al. 2000; Coe et al. 2001; NatureServe 2008	Early spring clipping improves forage for elk on winter range. If mowed, grazing must not be allowed in the growing season following.	For use as elk winter range, recommend spring mowing followed by no grazing by cattle during growing season.	Clark et al. 1998a, 1998b
Mule deer	*Odocoileus hemionus*	Possible increased competition for food resources, grazing may expose fawns to predation. Cattle compete with mule deer for food, especially during late summer.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed, especially during late summer and when fawns are being born.	Coe et al. 2001; NatureServe 2008	Deer forage can be improved through selected haying as haying can be used to maintain younger growth of grasses and forbs, improving the nutrition for deer, especially during late summer.	Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	Clark et al. 1998a, 1998b; USDOI/ USGS 2008
Pronghorn antelope	*Antilocapra americana*	Mostly a browser in the winter, but feed on herbaceous plants and grasses, particularly in the summer. Grazing not incompatible with pronghorn needs as long as cattle feed primarily on grasses. If cattle begin to feed heavily on forbs, direct competition between cattle and pronghorn result. Moderate livestock grazing may remove unpalatable older growth, improving forage for pronghorn.	Restrict grazing to areas where cattle may over utilize forbs, moderate rotational grazing may improve forage. Pronghorn incompatable with sheep as diets are similar and direct competition can result.	Hall 1985; NatureServe 2008; Rickel 2005a	Abundant grasses and forbs during late gestation and early lactation important for fawn survival.	Hay CRP during after lacation, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	NatureServe 2008; Rickel 2005a

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	Scientific Name	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
White-tailed deer	*Odocoileus virginianus*	Possible increased competition for food resources, but species also browses. Rotational grazing by cattle in managed grasslands can improve nutrition as grazing will increase new growth and nutritional content for deer species, especially for late summer nutrition.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed, especially during late summer.	Loft et al. 1987, 1991; NatureServe 2008; USFWS 1983, 2008b	Limited effects to the species as its distribution is limited to mostly ripiarian corridors. CRP use is likely limited, but may be utilized as travel corridors where present. Deer forage can be improved through selected haying as haying can be used to maintain younger growth of grasses and forbs, improving the nutrition for deer, especially during late summer.	Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	Clark et al. 1998a, 1998b; USDOI/ USGS 2008; USDOI/USFWS 1983, 2008b
Mountain lion (cougar, puma)	*Felis concolor* (*Puma concolor*)	Primary prey is deer in the western US, particularly mule deer, but may prey on cattle, sheep, and horses. Rodents and lagomorphs make up the bulk of other prey consumed. This species is is also known to scavenge livestock, leading to an inflated status as a species prone to depredation among ranchers and farmers.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed, especially where this species has been feeding on cervids to prevent conflicts with livestock producers. Generally, management practices which promote prey □vailability in cougar habitat may prove beneficial.	Ackerman et al. 1984; Beir et al. 2008; Yáñez at al. 1986	Limited effects to the species as its distribution is limited to mostly broken ground, remote areas, and extensive cover.	Generally, management practices which promote prey □vailability in cougar habitat may prove beneficial. Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields and to promote preferred prey species.	Ackerman et al. 1984; NatureServe 2008
Badger	*Taxidea taxus*	Badgers feed heavily upon burrowing rodents, especially prairie dogs, which are grazing-tolerant, but compete directly with livestock for grasses and forbs. This often leads to prairie dogs being controlled or locally extirpated. Where badgers are tolerated they often provide rodent control.	Badgers would increase forage available to cattle.	Rickel 2005b; NatureServe 2008	Prefers open brushland and rangeland with limited groundcover.	Haying probably not incompatible with badger management.	Rickel 2005b; NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	Scientific Name	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Black-tailed jackrabbit	*Lepus californicus*	Black-tailed jackrabbit can contribute to overgrazing if populations are in competition with cattle.	Restrict grazing to areas where this species is not located, carefully monitored rotational grazing, or no grazing allowed.	Rickel 2005b	Haying removes visual cover, which impoves habitat suitabilty for jackrabbits. Haying does not typically affect forbs which jackrabbits may feed on.	Haying probably not incompatible with jackrabbit/hare management.	Rickel 2005b
Black-tailed prairie dog	*Cynomys ludovicianus*	Grazing can serve to expand the habitat utilized by prairie dogs. Preference by these species is for shortgrass prairie and prairie dogs will clip grasses to keep the vertical growth short. Burrowing owls utilize prairie dog burrows extensively; allowing or encouraging prairie dogs to expand their towns may directly benefit burrowing owls.	Grazing probably not incompatible with prairie dog management.	Desmond et al. 2000; Putten and Miller 1999; Truett et al. 2001; Winter et al. 2002	Haying not likely to directly affect this species and may allow expansion of suitable habitat.	Haying probably not incompatible with prairie dog management.	Putten and Miller 1999; Truett et al. 2001
Bobcat	*Lynx rufus*	Feeds primarily on small mammals, especially lagomorphs. Will also eat birds, other vertebrates, and occasionally carrion.	Grazing not incompatable with bobcat management as grazing may improve habitat for rabbit species, increasing the bobcat's food supply. Restrict grazing during calving, as bobcats may take small livestock.	Lariviere and Walton 1997; Peterson 2000; NatureServe 2008; Rickel 2005b	May prey more on ground nesting species if they are exposed by haying.	Moderate haying probably not incompatable with bobcat management as haying would expose prey species. Careful haying may improve the habitat of prey species.	Dickson 2003; NatureServe 2008; Rickel 2005b
Coyote	*Canis latrans*	Control of coyotes can lead to a decrease in rodent species richness and diversity, but also an increase of overall numbers of some rodents and lagomorphs, including those that compete directly with livestock for forage. Coyotes have been known to prey on livestock, but most livestock and big game animals taken have been the young, old, ill, or injured.	Grazing not incompatable with coyote management as long as livestock are not placed on CRP land when coyotes could prey on them, such as during calving or while calves are small.	Bekoff 1977; Henke and Bryant 1999; NatureServe 2008	Not affected by open brushland and rangeland with limited groundcover.	Haying probably not incompatible with coyote management.	NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Fox	.	Most foxes are opportunist omnivores and will eat birds, insects, rodents, fruits, reptiles, crops, and carrion. Grazing would only affect fox if prey species were adversely affected or a loss of habitat incurred.	Moderate grazing probably not incompatible with fox management. Restrict grazing, moderate rotational grazing, or no grazing.	NatureServe 2008	Can inhabit open brushland, grasslands, and rangeland with limited groundcover. May prey more on ground nesting species if they are exposed by haying.	Haying probably not incompatible with fox management.	NatureServe 2008
Franklin's ground squirrel	*Spermophilus franklinii*	This species prefers vegetation taller than 30cm, and where vegetation is dense and coarse.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed. Where grazing occurs, vegetation must not be excessivly thinned.	Choromanski-Norris et al. 1989; Ostroff and Finck 2003; NatureServe 2008	This species avoids mowed areas until vegetation regrows.	Limit haying activity to certain quantities, maintain height of remaining vegetation to 30 cm to provide cover.	Choromanski-Norris et al. 1989; NatureServe 2008
Gopher (ground squirrels/prairie dogs)	.	See prairie dog or ground squirrel listings. Preferences and impacts differ.					
Gray fox	*Urocyon cinereoargenteus*	Feeds primarily on small mammals such as rodents and lagomorphs in the winter, fruits, insects, and plant matter in the summer.	Moderate grazing probably not incompatible with fox management. Restrict grazing, moderate rotational grazing, or no grazing.	Fritzell and Haroldson 1982; NatureServe 2008	Preference is for wooded or brushy areas with cover.	Haying probably not incompatible with fox management.	Fritzell and Haroldson 1982; NatureServe 2008
Ground squirrels	.	Generally, preference for taller, denser, grassland vegetation.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed. Where grazing occurs, vegetation must not be excessivly thinned.	Choromanski-Norris et al. 1989; Michener 2008; Michener and Koeppl 1985; NatureServe 2008; Ostroff and Finck 2003; Pizzimenti and Hoffman 1973	Some species may avoid mowed areas if cover is too short.	Limit haying activity to certain quantities, maintain height of remaining vegetation to provide cover.	Choromanski-Norris et al. 1989; Michener 2008; Michener and Koeppl 1985; NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Jackrabbits/hares	.	Good range condition will allow the highest jackrabbit density, but overgrazing by livestock may concentrate jackrabbits artificially. Jackrabbits typically consume less grass and more forbs than cattle, unless the range is overused and the cattle feed more heavily on forbs. Direct completion between cattle and jackrabbits occurs most often in the spring, but moderate livestock grazing is not incompatible with jackrabbits/hares.	Moderate grazing probably not incompatible with jackrabbit/hare management. Restrict grazing, moderate rotational grazing, or no grazing.	Rickel 2005b	Haying removes visual cover, which impoves habitat suitabilty for jackrabbits/hares. Haying does not typically affect forbs which jackrabbits/hares may feed on.	Haying not incompatible with jackrabbit/hare management.	Rickel 2005b
Least weasel	*Mustela nivalis*	Grazing would likely only affect least weasels if prey species were adversely affected or a loss of habitat incurred. Population levels may decrease during periods of grazing as this species may require dense vegetation for protection.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed.	Grant et al. 1982; NatureServe 2008	Predators include various other carnivores, raptors, and possibly snakes. Haying may remove essential cover. Population levels may decrease as a result of habitat loss or degradation or loss of prey species.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	Grant et al. 1982; NatureServe 2008
Long-tailed weasel	*Mustela frenata*	Feeds primarily on small mammals, occasionally birds, other small vertebrates, and insects. Grazing would likely only affect long-tailed weasels if prey species were adversely affected or a loss of habitat incurred. Population levels may decrease during periods of grazing as this species may require dense vegetation for protection from larger predators.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed.	Grant et al. 1982; NatureServe 2008	Predators include various other carnivores, raptors, and possibly snakes. Haying may remove essential cover. Population levels may decrease as a result of habitat loss or degradation or loss of prey species.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	Grant et al. 1982; NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	*Scientific Name*	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Opossum	*Didelphis virginiana*	Plastic food behavior. Diet includes invertebrates, small vertebrates, fruits and grains, carrion, and garbage. Grazing would likely only affect opossum if prey species were adversely affected or a loss of habitat incurred. Population levels may decrease during periods of grazing as this species may require overhead cover for protection from raptors.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed.	McManus 1974; NatureServe 2008	Haying may remove essential cover. Population levels may decrease as a result of habitat loss or degradation or loss of prey species.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	McManus 1974; NatureServe 2008
Porcupine	*Erethizon dorsatum*	While primarily feeding on the inner bark of coniferous trees, porcupines will also feed on acorns, buckbrush (Ceanothus spp.), fungus, prickly pear, and mistletoe, as well as herbaceous food sources such as alfalfa. Mistletoe and/or the bark of coniferous trees are vitally important food substances for this species. As little overlap in diet between porcupines and livestock occurs, and grazing will not affect the mature trees this species prefers, grazing will likely have little effect on this species.	Grazing probably not incompatible with porcupine management.	BISON-M 2008: NatureServe 2008; Woods 1973	Haying may remove essential cover from predators, which include eagles and owls, wolves, foxes, coyotes, dogs, many members of the weasel family (Mustelidae), mountain lions, bobcat, lynx, and bears. Population levels may decrease as a result of exposure. Individuals may also be killed by mowers.	Haying probably not incompatable with porcupine management, limit height of remaining vegetation to provide cover. Avoid haying on overcast days, near dawn or dusk, as this crepuscular species may be feeding in the field rather than resting in a tree or rock pils, and is too slow to escape the machinery.	BISON-M 2008: NatureServe 2008; Woods 1973
Prairie dogs	*Cynomys* spp.	Grazing can serve to expand the habitat utilized by prairie dogs. Preference by these species is for shortgrass prairie and prairie dogs will clip grasses to keep the vertical growth short. Burrowing owls utilize prairie dog burrows extensively; allowing or encouraging prairie dogs to expand their towns may directly benefit burrowing owls.	Grazing probably not incompatible with prairie dog management.	Desmond et al. 2000; Putten and Miller 1999; Truett et al. 2001; Winter et al. 2002	Haying not likely to directly affect this species and may allow expansion of suitable habitat.	Haying probably not incompatible with prairie dog management.	Putten and Miller 1999; Truett et al. 2001

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	*Scientific Name*	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Rabbits/cottontail rabbits	.	Cottontail density is increased where rabbits are not in direct completion with cattle for grasses, but cottontails do not usually contribute to overgrazing.	Moderate grazing not incompatible with rabbit management.	Rickel 2005b	Preference for succulent new growth, particularly of grasses and forbs. As successional vegetation is utilized by rabbits, careful haying may improve rabbit habitats.	Spring haying may destroy rabbit nests, delay until young are mobile. Haying should leave enough cover to allow cover from predators, especially aerial predators.	Dickson 2003; NatureServe 2008; Rickel 2005b
Red fox	*Vulpes vulpes*	Red foxes feed on carrion, birds, insects, fruit, reptiles, and small mammals such as rodents and lagomorphs. Grazing would only affect fox if prey species were adversely affected or a loss of habitat incurred.	Moderate grazing probably not incompatible with fox management. Restrict grazing, moderate rotational grazing, or no grazing.	NatureServe 2008	Can inhabit open brushland, grasslands, and rangeland with limited groundcover. May prey more on ground nesting species if they are exposed by haying.	Haying probably not incompatible with fox management.	NatureServe 2008
Richardson's ground squirrel	*Spermophilus richardsonii*	Preference grassland vegetation and open habitats.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed. Moderate grazing probably not incompatible with management. Where grazing occurs, vegetation must not be excessivly thinned.	Michener 2008; Michener and Koeppl 1985	Haying not likely to directly affect this species and may allow expansion of suitable habitat.	Haying probably not incompatible with prairie dog management.	Leary et al. 1998; Michener 2008; NatureServe 2008
Ermine (short-tailed weasel, stoat)	*Mustela erminea*	Grazing would likely only affect weasels if prey species were adversely affected or a loss of habitat incurred. Population levels may decrease during periods of grazing as this species may require dense vegetation for protection from larger predators.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed.	Grant et al. 1982; NatureServe 2008	Predators include various other carnivores, raptors, and possibly snakes. Haying may remove essential cover. Population levels may decrease as a result of habitat loss or degradation or loss of prey species.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	Grant et al. 1982; NatureServe 2008
Spotted skunk	*Spilogale putorius*	Grazing may result in a decrease in population levels as a result of habitat loss.	Do not allow grazing, or restrict it to specific areas, create travel corridors, or rotational grazing.	NatureServe 2008	Population levels may decrease as a result of habitat loss.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Thirteen-lined ground squirrel	*Spermophilus* (*Citellus*) *tridecemlineatus*	This species is an omnivore with a major portion (36-61%) of its diet from animal matter, primarily insects. The remainder of the diet is mostly grasses, sedges, shrubs, seeds, and forbs. Some grazing is beneficial to this species; populations have increased in normally grazed fields, but overgrazed conditions can reduce density.	Moderate grazing probably not incompatible with thirteen-lined ground squirrel management. Restrict grazing, moderate rotational grazing, or no grazing.	BISON-M 2008; Flake 1973; Streubel and Fitzgerald 1978	Haying in moderation may not affect this species as it prefers more open landscapes, however if too extreme will expose it to predation.This species prefers shorter vegetation and will utilize mown fields to hunt insects. Vegetation height should not be taller than what this species to see over when sitting erect. Some escape cover from aerial and mammalian predators may need to be provided; predators include raptors, felids (cat species), badgers, weasels, coyotes, and snakes.	Haying probably not incompatible with thirteen-lined ground squirrel management.	Evans 1951; Streubel and Fitzgerald 1978
White-tailed jackrabbit	*Lepus callotis*	Occasional grazing may benefit these jackrabbits since they prefer open grassland habitat. Overgrazing may impact species negatively.	Moderate grazing probably not inmpatabile with jackrabbit management. Restrict grazing to rotational grazing to control woody-species, or no grazing allowed.	Rickel 2005b	Haying removes visual cover, which is preferred by jackrabbits, and does not typically affect forbs.	Haying probably not incompatible with jackrabbit management.	Rickel 2005b
Woodchuck	*Marmota monax*	Selectively feed on forbs over grasses, particularly alfalfa and clover. Direct competition for forbs, and to a lesser extent, grasses, may cause population declines. However, moderate grazing by cattle may make low growing forbs more available.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed. Spring grazing can improve habitat quality, but only if at low levels; some grazing is not incompatable with woodchuck management, but only if cattle do not over-utilize forbs.	Fall 1971; Frase and Hoffmann 1980; Swihart 1990, 1991; Thill and Martin1986	Forage can be improved through selected haying as haying can be used to maintain younger growth of grasses and forbs, improving the nutrition.	Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	Clark et al. 2000; Fall 1971; Frase and Hoffmann 1980; Swihart 1990, 1991; Thill and Martin1986

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Yellow-bellied marmot	*Marmota flaviventris*	Moderate grazing which inhibits the growth of perennial grasses and increases forbs may support populations of marmots, but heavier grazing which removes more of the available forage may have detrimental effects, particularly when marmots are preparing for hibernation. Predators of marmots include bears, golden eagles, wolves, coyote, badgers, bobcats, owls, and hawks, management for marmots would help support these species.	Restrict grazing to areas where this species is not located, rotational grazing, or no grazing allowed, especially when this species is preparing for hibernation in late summer (hibernation commences in August). Spring grazing can improve habitat quality, but only if at low levels. Some grazing is not incompatable with marmot management, but only if cattle do not over-utilize forbs.	Collopy 1983; Frase and Hoffmann 1980; Mace and Jonkel 1986; Stallman and Holmes 2002; Thill and Martin 1986; Whitaker 2001	Forage can be improved through selected haying as haying can be used to maintain younger growth of grasses and forbs, improving the nutrition.	Hay CRP during appropriate periods, allowing for new growth in spring. Periodic haying can be utilized as part of the long-term management of CRP fields.	Clark et al. 2000; Frase and Hoffmann 1980; Stallman and Holmes 2002; Thill and Martin 1986
American wigeon	*Anas americana*	Upland nesting duck species. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Nest predation increases in hayed fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	*Scientific Name*	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Blue-winged teal	*Anas discors*	Upland nesting duck species. Nests preferentially in undisturbed fields. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect impacts on nesting upland ducks. Teal hens nest by preference in unmown fields and suffer less predation in unmown fields. Nesting success is very poor in mown fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000
Ducks		As a whole, ducks that nest in grasslands or rangelands are negatively impacted by grazing, primarily due to a loss of nesting cover. Cavity nesting species also benefit from cover as the young may need to travel long distances to brood rearing habitat.	Grazing has less of an impact than haying, but still recommend rotational or very light grazing, or no grazing allowed, as best nest success is typically in undisturbed habitats.	Alsop 2001; Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; Maisonneuve et al. 2000; McKinnon and Duncan 1999; NatureServe 2008; Reynolds 2000	Haying generally has negative direct and indirect effects on nesting ducks. Most species which utilize grasslands or rangelands typically nest by preference in unmown fields and suffer less predation in unmown fields. Nesting success is typically lower in mown fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying.	Alsop 2001; Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; Maisonneuve et al. 2000; McKinnon and Duncan 1999; NatureServe 2008; Reynolds 2000
Gadwall	*Anas strepera*	Upland nesting duck species. Nests preferentially in undisturbed fields. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Gadwall hens nest by preference in unmown fields and suffer less predation in unmown fields. Nesting success is very poor in mown fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Goose (brant, Canada, Ross', white-fronted, snow)	*Branta bernicla, B. canadensis, B. hutchinsii, Chen rossii, Anser albifrons, and C. caerulescens*	Geese preferentially feed in grazed or mowed fields, as well as in agricultural fields.	Moderate grazing probably not incompatible with goose management, but may compete with livestock for grasses. Restrict grazing, moderate rotational grazing, or no grazing.	Alsop 2001; Ely 1992; Grieb 1970; NatureServe 2008; Pochop et al. 1999	Geese preferentially feed in grazed or mowed fields, as well as in agricultural fields.	Haying probably not incompatible with goose management, as geese preferentially feed on short grasses in open fields, such as golf corses, lawns, and hayed fields.	Alsop 2001; Ely 1992; Grieb 1970; NatureServe 2008; Pochop et al. 1999
Green-winged teal	*Anas crecca*	Upland nesting duck species. Nests preferentially in undisturbed fields. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Teal hens nest by preference in unmown fields and suffer less predation in unmown fields. Nesting success is very poor in mown fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000
Lesser scaup	*Aythya affinis*	May nest in undisturbed fields.	Rotational, very light grazing, or no grazing. Maintain nesting cover.	Duebbert and Lokemoen 1976; Higgins 1977; NatureServe 2008; Reynolds 2000	Vegetative cover should be left to hide hens than nest in grasslands or under shrubs.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying.	Duebbert and Lokemoen 1976; Higgins 1977; NatureServe 2008; Reynolds 2000
Mallard	*Anas platyrhynchos*	Upland nesting duck species. Nests preferentially in undisturbed fields. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Mallard hens nest by preference in unmown fields and suffer less predation in unmown fields. Nesting success is very poor in mown fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

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Mergansers	.	Young of cavity nesting mergansers must travel to brood rearing areas.	Grazing should leave enough cover to allow cover for mobile young from predators.	Alsop 2001; NatureServe 2008	Haying not likely to directly affect this species.	Haying may destroy young, delay until young are at brood rearing habitiats. Haying should leave enough cover to allow cover from predators.	NatureServe 2008
Northern pintail	*Anas aacuta*	Upland nesting duck species. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Pintail will nest in disturbed fields, but nest predation increases in hayed fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000
Wigeon		Upland nesting duck species. Grazing has less of an impact than haying, but grazing can negatively effect nesting ducks due to loss of nesting cover which leads to increased predation.	Rotational and/or very light grazing. Best nest success is on ungrazed land. Early cover must be established for late nesting and re-nesting ducks, as well as maintenance until young have left the nesting areas for brood rearing areas.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000	Haying has negative direct and indirect effects on nesting upland ducks. Nest predation increases in hayed fields.	Haying must leave enough stubble for nesting species and must occur after young have moved to brood-rearing areas. Best recommendation for nesting ducks is no haying, followed by: entire fields left undisturbed; unmown blocks ≥ 25% of the field left undisturbed; unmown blocks > 10% of the field; narrow alternating strips left undisturbed; areas near brush left undisturbed (deters crows but not other predators).	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; McKinnon and Duncan 1999; Reynolds 2000
Wood duck	*Aix sponsa*	Young must travel to brood rearing areas, sometimes as much as several kilometers.	Grazing should leave enough cover to allow cover for mobile young from predators.	Alsop 2001; NatureServe 2008	Haying not likely to directly affect this species.	Haying may destroy young, delay until young are at brood rearing habitiats. Haying should leave enough vegetation to allow cover from predators.	NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	***Scientific Name***	**Predicted Response to Grazing 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**	**Predicted Response to Haying 1/5 or 1/3 Outside PNS**	**Recommendations**	**Citation(s)**
Northern bobwhite quail	*Colinus virginianus*	Grazing can negatively effect nesting due to loss of nesting cover which leads to increased predation.	Alternate grazing pressure when grazing is used to have patchy areas of heavy and light grazing use to allow forb growth in several seral stages. Maintain nesting cover and refuge cover in other patches.	NatureServe 2008; Taylor et al. 1999	Bobwhite nest in areas that were not mowed the previous year and interior of hayfields not used as mowing encourages growth of grasses that are too thick for broods to move through.	Mow after broods have hatched and young are mobile. Suggest some areas be left unmowed during haying to provide areas with both older nesting cover and the litter they prefer for nesting and to provide areas for brood rearing. Land should be patchy with several stages of seral development for bobwhite, which may not be conducive for mowing.	NatureServe 2008; Taylor et al. 1999
Chukar	*Alectoris chukar*	Chukar respond positively to light to moderate grazing, as long as cover from predators is sufficient. Chukar are highly mobile and can use heavily grazed areas as well, so chukar are unlikely to be affected negatively by grazing for adult survival. Nesting and brood rearing require cover however.	Grazing probably not incompatible with chukar management as long as grazing is deferred during brood rearing. Recommend rotational grazing with deferred areas.	Holechek 1981; Holechek et al. 1982; Knight et al. 1979	Feeds heavily on seeds in all seasons, especially grass seeds.	Haying probably not incompatible with chukar management, especially as this species also dwells in rough and broken country which may preclude the ability to hay these regions. If chukar are utilizing an area, suggest deferred portions for production of seeds and grass leaves for chukar. Avoid haying areas where broods may be present.	Knight et al. 1979
Gray partridge	*Perdix perdix*	Requires nesting cover and cover in fields in winter. Feeds on grasses.	Very light grazing can help maintain feeding habitat and forage quality. Rotational grazing, restricted grazing, or no grazing allowed.	Knight et al. 1979; Mendel and Peterson 1983	Stubble provides winter cover for partridge. Stubble height should be high enough for the birds to find shelter in the stubble if woody or shrubby areas are not available. Permanent cover strips 10-20 m wide should be undisturbed to provide additional shelter.	Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover. Hay CRP during appropriate periods, allowing for new growth in spring and leaving enough cover for wintering birds.	Mendel and Peterson 1983

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

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Greater prairie chicken	*Tympanuchus cupido*	Excessive grazing pressure reduces habitat quality and removes cover. Grazing that alters tall and mid-grass community structures to shortgrass community structures should be avoided. Limited periodic grazing can increase production of forbs and mid level grassing, affecting short-term nesting, but can produce long term improvements to quality of nesting and brood rearing habitat. Grazing to reduce woody vegetation can have long-term benefits, but nesting cover must be maintained.	Grazing may have a negative effect on nest success. Light to moderate grazing in rotation every 3-5 years is probably not detrimental over the long term. Very light rotational grazing or no grazing. Maintain cover.	Hagen et al. 2004; NatureServe 2008; Niemuth 200; Schroeder and Baydack 2001	Cover is required for protection from predation, especially during nesting and brood-rearing. Expect short term effects as nests and broods will be exposed to predators.	Haying may have a negative effect on nest success. Haying should leave enough cover to allow cover from predators, and haying should be done only after broods are reared.	Hagen et al. 2004; NatureServe 2008; Niemuth 200; Schroeder and Baydack 2001
Ring-necked pheasant	*Phasianus colchicus*	Excessive grazing pressure reduces habitat quality and removes cover. Grazing that alters tall and mid-grass community structures to shortgrass community structures should be avoided. Limited periodic grazing can increase production of forbs and mid level grassing, affecting short-term nesting, but can produce long term improvements to quality of nesting and brood rearing habitat. CRP habitats provide the most benefit to this species.	Light to moderate grazing in rotation every 3-5 years is probably not detrimental over the long term. Very light rotational grazing or no grazing. Maintain cover.	Hagen et al. 2004; King and Savidge 1995; NatureServe 2008; Schroeder and Baydack 2001;Warner and Etter 1989	Haying can negatively affect nesting by indirect means where nest cover is required to avoid predation, to direct means, by which nests and females suffer mortality from machinery. Cumulative losses of fallow and undisturbed fields concentrate pheasants to the point where nesting pheasants suffer even more mortality. Later haying increases the loss of adult females as they are less likely to abandon nests as incubation progresses. Additionally, pheasants rarely re-nest where nests have been destroyed and success is lower for pheasants attempting to re-nest in stubble.	Haying may have a negative effect on nest success. Haying should leave enough vegetation to allow cover from predators, and haying should be done only after broods are reared.	NatureServe 2008; Warner and Etter 1989

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

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Ruffed grouse	*Bonasa umbellus*	Requires openings for breeding and night roosting. Opening with vertical cover are used as brood-rearing habitats. Displaying males are probably not affected by grazing, but avoid grazing in brood rearing habitats to the extent that vertical cover is lost.	Rotational grazing, restricted grazing, or no grazing allowed.	Dessecker and McAuley 2001; Stauffer and Peterson 1985	Roosts in fields and pastures at night. Vertical cover required for brood rearing.	Haying should leave enough cover to allow cover from predators, and haying should be done only after broods are reared. Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover.	Dessecker and McAuley 2001; Stauffer and Peterson 1985
Sage grouse	*Centrocercus urophasianus*	Grouse habitat improves with light and rotational grazing, but livestock can cause nest abandonment. Sheep will cause shift towards more open grasslands, while cattle will cause a shift towards forbs.	Very light grazing, rotational grazing, or no grazing allowed. Graze cattle rather than sheep to improve forage for grouse. Graze after young have hatched to prevent trampling and abandonment. Prevent damage to sagebrush in nesting areas.	Beck and Mitchell 2000; Klebenow 1969; NatureServe 2008	Vertical cover required for brood rearing and protection from predation. As grouse typically nest in and under sagebrush, which precludes mowing, haying is unlikley to affect this species.	Haying probably not incompatible with grouse management as long as nesting sagebrush habitat is left intact.	Beck and Mitchell 2000; NatureServe 2008
Sharp-tailed grouse	*Tympanuchus phasianellus*	Grazing can negatively effect nesting due to loss of nesting cover which leads to increased predation.	Very light rotational grazing or no grazing. Maintain cover or at least 13 cm in height.	Manzer and Hannon 2005	Vertical cover required for brood rearing and protection from predation.	Haying should leave enough cover to allow cover from predators, and haying should be done only after broods are reared. Limit haying activity to certain quantities, limit height of remaining vegetation to provide cover. Recommend 13cm height minimum in strips or patches larger than 50m wide.	Manzer and Hannon 2005
Wild Turkey (eastern, Merriam's, Rio Grande)	*Meleagris gallopavo*	Grazing can negatively effect nesting turkeys due to loss of nesting cover which leads to increased predation.	Grazing may have a negative effect on nest success. Light to moderate grazing in rotation every 3-5 years is probably not detrimental over the long term. Very light rotational grazing or no grazing. Maintain cover.	Cooper and Ginnett 2000; NatureServe 2008	Haying can negatively affect nesting by indirect means where nest cover is required to avoid predation.	Haying may have a negative effect on nest success. Haying should leave enough vegetation to allow cover from predators, and haying should be done only after broods are reared.	Cooper and Ginnett 2000; NatureServe 2008

SOUTH DAKOTA GAME SPECIES PREDICTED RESPONSE TO MANAGED HAYING AND GRAZING (cont'd)

Common Name	*Scientific Name*	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Doves and pigeons (mourning dove, Eurasian collared dove, band-tailed pigeon, white-winged dove)	*Zenaida macroura*, S*treptopelia decaocto, Patagioenas fasciata, and Z. asiatica*	Preference for nesting is tall, sparse bunchgrass; habitat is little ground cover, but tall vertical cover.	Light to moderate grazing in rotation every 5 or more years is probably not detrimental over the long term.	Hughes at al. 2000	Haying would remove tall vegetative cover that doves nest beween.	Haying may have a negative effect on nest success.	Hughes at al. 2000
American crow	*Corvus brachyrhynchos*	Grazing practices that expose prey are beneficial. Crows feed on bird eggs, lizards, small mammals, carrion, and insects.	Grazing probably not incompatible with crow management.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; Manzer and Hannon 2005; McKinnon and Duncan 1999; Reynolds 2000	Haying exposes prey species.	Haying probably not incompatible with crow management.	Duebbert and Lokemoen 1976; Higgins 1977; Kantrud 1993; Luttschwager et al. 1994; Manzer and Hannon 2005; McKinnon and Duncan 1999; Reynolds 2000

SOUTH DAKOTA SPECIES OF GREATEST CONSERVATION NEED

South Dakota Conservation Species		Potentially Present on lands under CRP Practices?							
Common Name	***Scientific Name***	**CP1**	**CP2**	**CP4B**	**CP4D**	**CP10**	**CP18B**	**CP18C**	**Comment/Justification**
MAMMALS									
Carnivores									
Kit fox	*Vulpes macrotis*	N	N	N	N	N	N	N	lives in desert, semi arid habitat
Swift fox	*Vulpes Velox*	Y	Y	Y	Y	Y	N	N	Prefers shortgrass prairie, western mixed-grass prairie
Black-footed ferret	*Mustela nigripes*	Y	Y	Y	Y	Y	Y	Y	associated with prairie dog towns; open level sparse grass areas
Northern river otter	*Lontra canadensis*	N	N	N	N	N	N	N	Associated with rivers and streams with sloughs and backwater areas, marshes, lakes and ponds
REPTILES									
Blanding's turtle	*Emydoidea blandingii*	N	N	N	N	N	N	N	Prefers sandhills, fens, proximity to water, freshwater marshes, northern cordgrass wet prairie, small tributaries, sandhills prairies (upland habitat), marshes and oxbows in eastern portion of the State
Eastern hognose snake	*Heterondon platirhinos*	Y	Y	Y	Y	Y	Y	Y	Found in heavily wooded areas, prairies, and grasslands; however, prefer sandy or loamy soil in which to burrow.
Lined snake	*Tropidoclonium lineatum*	N	N	N	N	N	N	N	prefers undisturbed prairie or woodland/prairie edge species
False map turtle	*Graptemys pseudogeographica*	N	N	N	N	N	N	N	Lakes, Ponds, large Rivers and drown Forests

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SOUTH DAKOTA GRASSLAND BIRDS

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
ANSERIFORMES												
Gadwall	*Anas strepera*	Facultative	YES	Moderately Intolerant			Possibly Positive	Needs periodical disturbance	WMH	Possibly Positive	Needs periodical disturbance	WMH
American wigeon	*Anas americana*	Facultative	YES				Unknown			Unknown		
Mallard	*Anas platyrhynchos*	Facultative	YES	Moderately Intolerant			Possibly Negative	Effects unclear, but known to prefer tall, dense grass with structural diversity	Luttschwager et al. 1994; Williams et al. 1999; BNA	Possibly Negative	Effects unclear, but known to prefer tall, dense grass with structural diversity	Luttschwager et a. 1994; Williams et al. 1999; BNA
Blue-winged teal	*Anas discors*	Facultative	YES	Moderately Intolerant			Possibly Positive	Needs periodical disturbance	WMH	Possibly Positive	Needs periodical disturbance	WMH
Northern shoveler	*Anas clypeata*	Facultative	YES				Unknown			Unknown		
Northern pintail	*Anas acuta*	Facultative	YES	Moderately Tolerant			Positive	Needs periodical disturbance	WMH	Positive	Needs periodical disturbance	WMH
Green-winged teal	*Anas crecca*	Facultative	Possible				Unknown			Unknown		
GALLIFORMES												
Gray partridge	*Perdix perdix*	Facultative	Possible				Unknown		BNA	Unknown		BNA
Ring-necked pheasant	*Phasianus colchicus*	Facultative	YES				Possibly Negative	Impacts of MHG unknown, but does prefer tall dense grass	BNA	Possibly Negative	Impacts of MHG unknown, but does prefer tall dense grass	BNA
Sharp-tailed grouse	*Tympanuchus phasianellus*	Obligate	YES	Moderately Intolerant	Negative	Positive	Possibly Negative	Native grasslands should not be mowed or grazed if they are to be managed for grouse. Instead, fire should be used to maintain a vigorous subclimax condition (Kirsch et al. 1973). Fire and livestock-grazing may be used to maintain appropriate vegetative condition over the long term, although areas lightly or moderately grazed may be of limited importance to grouse (Kirsch et al. 1973, 1978).	BNA	Possibly Negative	Native grasslands should not be mowed or grazed if they are to be managed for grouse. Instead, fire should be used to maintain a vigorous subclimax condition (Kirsch et al. 1973). Fire and livestock-grazing may be used to maintain appropriate vegetative condition over the long term, although areas lightly or moderately grazed may be of limited importance to grouse (Kirsch et al. 1973, 1978).	BNA
Greater prairie-chicken	*Tympanuchus cupido*	Obligate	YES	Moderately Tolerant	Positive (courtship) Negative (Nesting)	Positive	Possibly Positive from some disturbance every 3 (coolseason) to 5 (warm season) years	Recent field studies by Toepfer (unpublished data) and co-workers indicated optimal nesting values of CRP plantings are attained in 2-4 yr, thus supporting Kirsch et al. (1973) and Westemeier (above). This could vary, however, depending on whether cool-season or warm-season seeding mixtures are used in CRP plantings. Kimmel et al. (1994) noted that cool-season grass plantings lose value as nesting cover sooner than warm-season grass plantings in terms of litter buildup and reduced VOR's, and that they should be rejuvenated more often (every 3-5 yr) than warm-season plantings.	Johnson et al. 2004	Unclear - Positive from some disturbance every 3 (coolseason) to 5 (warm season) years	Recent field studies by Toepfer (unpublished data) and co-workers indicated optimal nesting values of CRP plantings are attained in 2-4 yr, thus supporting Kirsch et al. (1973) and Westemeier (above). This could vary, however, depending on whether cool-season or warm-season seeding mixtures are used in CRP plantings. Kimmel et al. (1994) noted that cool-season grass plantings lose value as nesting cover sooner than warm-season grass plantings in terms of litter buildup and reduced VOR's, and that they should be rejuvenated more often (every 3-5 yr) than warm-season plantings.	Johnson et al. 2004

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Northern bobwhite	*Colinus virginianus*	Facultative	YES	Moderately Tolerant	Negative	Positive	Positive	Frequent vegetation disturbance (every 1–5 yr) from prescribed fire and/or mechanical disturbances is essential for maintaining abundant (≥6.6 bobwhite/ha) populations (Stoddard 1931, Landers and Mueller 1986) in forest habitats. In rangeland habitats, low- to moderate-intensity grazing is beneficial, especially during years of good rainfall (Guthery 1986).	BNA	Possibly Positive	Frequent vegetation disturbance (every 1–5 yr) from prescribed fire and/or mechanical disturbances is essential for maintaining abundant (≥6.6 bobwhite/ha) populations (Stoddard 1931, Landers and Mueller 1986) in forest habitats. In rangeland habitats, low-to moderate-intensity grazing is beneficial, especially during years of good rainfall (Guthery 1986).	BNA
CICONIIFORMES												
American bittern	*Botaurus lentiginosus*	Facultative	YES	Moderately Intolerant	Negative	Positive	Possibly Negative	AVOIDS grazed CRP	Johnson et al. 2004	Negative	AVOIDS Hayed CRP	Johnson et al. 2004
FALCONIFORMES												
Northern harrier	*Circus cyaneus*	Obligate	YES	Moderately Tolerant	Negative	Positive	Possibly Positive	Do not used heavily grazed areas. Mowing, burning, or grazing is recommended every 3-5 yr to maintain habitat for small mammal prey (Leman and Clausen 1984, Kaufman et al. 1990).	Johnson et al. 2004	Possibly Positive	Do not used heavily grazed areas. Mowing, burning, or grazing is recommended every 3-5 yr to maintain habitat for small mammal prey (Leman and Clausen 1984, Kaufman et al. 1990).	Johnson et al. 2004
Swainson's hawk	*Buteo swainsoni*	Obligate	Nest in Trees, Forage Only		Negative	Positive	Unknown		Johnson et al. 2004	Unknown		Johnson et al. 2004
Ferruginous hawk	*Buteo regalis*	Obligate	Potentially	Highly Tolerant	Negative	Positive	Positive	Moderate to heavy grazing outside PNS	Johnson et al. 2004; Saab 1995	Positive		Johnson et al. 2004
American kestrel	*Falco sparverius*	Facultative					Unknown		BNA			BNA
Merlin	*Falco columbarius*	Facultative	No				Positive	Moderate grazing to maintain mosiac	Johnson et al. 2004	?? Possibly similar to grazing		Johnson et al. 2004
Prairie falcon	*Falco mexicanus*	Facultative	No		Negative	Positive	Unknown - Possibly Positive			??		
CHARADRIIFORMES												
Killdeer	*Charadrius vociferus*	Facultative	Unlikely	Highly Tolerant	Positive	Negative	Positive	Prefers sparse cover	Ryan et al. 1998; Saab 1995	Positive	Prefers sparse cover	Ryan et al. 1998
Willet	*Tringa semipalmata*	Facultative	Unlikely	Highly Tolerant	Positive	Negative	Positive	Previously grazed or mowed. But not during PNS.	Johnson et al. 2004	??? Positive outside PNS	???	Johnson et al. 2004
Upland sandpiper	*Bartramia longicauda*	Obligate	Occasionally	Moderately Tolerant	Negative	Positive	Positive	Forages in grazed, but nests in tall veg. Must leave some idle each year for nesting.	Johnson et al. 2004; Saab 1995	Possible Positive	Forages in grazed, but nests in tall veg. Must leave some idle each year for nesting.	Johnson et al. 2004
Long-billed curlew	*Numenius americanus*	Obligate		Moderately Tolerant	Neutral	Positive	Positive	Grazing can be beneficial if it provides suitably short vegetation, particularly during the pre-laying period (Bicak et al. 1982, Cochran and Anderson 1987). Timing and intensity of grazing treatments should be adjusted according to local climate and habitat characteristics (Bicak et al. 1982, Bock et al. 1993).	Johnson et al. 2004; Saab 1995	Positive	Haying can be used to provide the short vegetation preferred by nesting curlews, but should be timed so that short vegetation is available early in the season and active nests are not damaged (Cochran and Anderson 1987)	Johnson et al. 2004

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Marbled godwit	*Limosa fedoa*	Obligate	Potentially	Highly Tolerant	Positive	Negative/None	Positive	Graze shortgrass or mixed-grass pastures at moderate to heavy intensities. Graze at heavy intensities in summer or late winter .	Johnson et al. 2004	Positive	Late summer - fall haying	Johnson et al. 2004
Wilson's snipe	*Gallinago delicata*	Facultative	Unlikely				Positive	Prefers short vegetation	BNA	Positive	A rotary chopper was used to reduce summer growth of vegetation to provide close-cropped condition preferred by snipe. Disk plowing was less effective and more expensive.	BNA
Wilson's phalarope	*Phalaropus tricolor*	Facultative	Occasionally	Moderately Intolerant	Negative	Positive	Positive	Moderate to heavy grazing outside PNS	Johnson et al. 2004	Positive		Johnson et al. 2004
COLUMBIFORMES												
Mourning dove	*Zenaida macroura*	Facultative	YES	Highly Tolerant			Possible Positive	Management practices that produce sparse overall cover but tall vegetation height may increase mourning dove nest success in CRP fields.	BNA: Saab 1995	Possibly Positive	Management practices that produce sparse overall cover but tall vegetation height may increase mourning dove nest success in CRP fields.	BNA
STRIGIFORMES												
Barn owl	*Tyto alba*	Facultative	No				Unknown, Effect relative only to prey		BNA	Unknown, Effect relative only to prey		BNA
Burrowing owl	*Athene cunicularia*	Obligate	Potentially	Highly Tolerant	Positive	? / None	Positive	Prefers heavily grazed sites	Johnson et al. 2004; Saab 1995	Positive	Prefers heavily grazed sites	Johnson et al. 2004
Long-eared owl	*Asio otus*	Obligate	Nest in Trees		Negative	Positive	Unknown, Effect relative only to prey	Bosakowski et al. (1989b) suggested that preservation of grassland and marshes and planting of conifers near open habitats would be important management actions for Long-eared Owl in New Jersey. In West, maintenance of healthy riparian stands in Long-eared Owl range would undoubtedly be beneficial.	BNA	Unknown, Effect relative only to prey	Bosakowski et al. (1989b) suggested that preservation of grassland and marshes and planting of conifers near open habitats would be important management actions for Long-eared Owl in New Jersey. In West, maintenance of healthy riparian stands in Long-eared Owl range would undoubtedly be beneficial.	BNA
Short-eared owl	*Asio flammeus*	Obligate	YES	Moderately Intolerant	Negative	Positive	Positive	in tallgrass areas, burning, mowing, or grazing every 2-5 yr is recommended to maintain habitat for small mammal prey (Leman and Clausen 1984, Kaufman et al. 1990).	Johnson et al. 2004	Positive	in tallgrass areas, burning, mowing, or grazing every 2-5 yr is recommended to maintain habitat for small mammal prey (Leman and Clausen 1984, Kaufman et al. 1990).	Johnson et al. 2004
CAPRIMULGIFORMES												
Common nighthawk	*Chordeiles minor*	Facultative	Unknown	Highly Tolerant			Unknown		BNA	Unknown		BNA
Common poorwill	*Phalaenoptilus nuttallii*	Facultative	Unknown				Positive	Nesting and roosting habitat may potentially be improved by cattle grazing, which keeps grass short.	BNA	Unknown		BNA
PASSERIFORMES												
Say's phoebe	*Sayornis saya*	Facultative	Unlikely, ledge or cavity		?	?	Unknown		BNA	Unknown	No specific management guidelines suggested. No known management effort directed at this species.	BNA
Western kingbird	*Tyrannus verticalis*	Facultative	Trees		Negative	Negative	Possibly Negative	Negative if reduces woody vegetation	BNA	Unknown	Negative if reduces woody vegetation	BNA
Eastern kingbird	*Tyrannus tyrannus*	Facultative	Trees		Negative	Negative	Possibly Negative	Negative if reduces woody	BNA	Unknown	Negative if reduces woody vegetation	BNA

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
								vegetation				
Loggerhead shrike	*Lanius ludovicianus*	Facultative	Potentially	Moderately Tolerant	Neutral	Positive	Positive	Light grazing to prevent woody vegetation from dominating, but not eliminate.	Johnson et al. 2004	NEUTRAL	Prevent woody vegetation from dominating but not eliminate it.	Johnson et al. 2004
Horned lark	*Eremophila alpestris*	Obligate	Rarely	Highly Tolerant			Positive	Prefers heavily grazed sites	Johnson et al. 2004; Saab 1995	Neutral-Positive YEAR AFTER	Horned Larks rarely use hay fields.	Johnson et al. 2004; Johnson 2005
Sedge wren	*Cistothorus platensis*	Obligate	YES	Moderately Intolerant	Negative	Positive	Possibly Positive	Only as needed to prevent woody encroachment	Johnson et al. 2004	Possibly Positive/ Negative year after	Decrease First Year After; Mow every 3-4 yr to maintain grass vigor.	Johnson et al. 2004; Johnson 2005
Eastern bluebird	*Sialia sialis*	Facultative	secondary cavity nester				Unknown, Possibly Neutral		BNA	Unknown, Possibly Neutral		BNA
Mountain bluebird	*Sialia currucoides*	Facultative	secondary cavity nester		Negative	Positive	Unknown, Possibly Neutral		BNA	Unknown, Possibly Neutral		BNA
Sprague's pipit	*Anthus spragueii*	Obligate	Potentially	Moderately Tolerant	Negative	Positive	Possibly Negative	Only light grazing	Johnson et al. 2004; Saab 1995	Negative	Will avoid grassland mowed previous year.	Johnson et al. 2004
Common yellowthroat	*Geothlypis trichas*	Facultative	YES	Moderately Intolerant			Negative	Prefers brush	BNA; Saab 1995	Unknown, Possibly Negative	Prefers brush; avoid year after	BNA; Johnson 2005
Clay-colored sparrow	*Spizella pallida*	Facultative	YES	Moderately Intolerant	Negative	Positive	Possibly Positive	Light to moderate grazing on mixed-grass prairie may Clay-colored Sparrows by providing foraging areas of sparser cover, particularly if shrub cover is retained (Owens and Myres 1973, Kantrud 1981, Kantrud and Kologiski 1982, Dale 1983, Huber and Steuter 1984, Arnold and Higgins 1986, Messmer 1990, Bock et al. 1993, Knapton 1994, Anstey et al. 1995, Saab et al. 1995). Avoid heavy grazing which removes ground cover (Kantrud 1981, Kantrud and Kologiski 1982, Dale 1983).	Johnson et al. 2004	Negative	In Saskatchewan, Clay-colored Sparrows preferred idle grasslands to haylands mowed either annually or periodically (about every 3-8 yr) (Dale et al. 1997).	Johnson et al. 2004; Johnson 2005
Vesper sparrow	*Pooecetes gramineus*	Obligate	Rarely	Highly Tolerant	Postive	None	Possibly Positive		Johnson et al. 2004; Saab 1995	Positive; Possibly Negative Year After	Decrease First Year After; Mow every 3-4 yr to maintain grass vigor.	Johnson et al. 2004; Johnson 2005
Lark sparrow	*Chondestes grammacus*	Facultative	Rarely	Highly Tolerant			Positive	Avoid heavy grazing during summer; permit moderate to heavy grazing during winter when grass > 30 cm tall.	Johnson et al. 2004; Saab 1995	???		

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Lark bunting	*Calamospiza melanocorys*	Obligate	Common	Highly Tolerant	Negative	Positive	Positive	In shortgrass habitats, do not implement heavy grazing during the summer (Giezentanner 1970, Wiens 1973, Ryder 1980). In Colorado, Lark Buntings did not use heavily summer-grazed areas, but would use heavily winter-grazed areas for breeding (Ryder 1980). In shortgrass areas, lightly graze or graze during winter, provided that vegetative cover and height are not greatly reduced (Giezentanner 1970). Allow heavy grazing in vegetation >30 cm tall to provide the shorter, sparser habitat preferred by Lark Buntings (Finch et al. 1987).	Johnson et al. 2004	POSSIBLY Positive; Positive YEAR AFTER	Delay mowing of hayfields until after the breeding season to prevent destruction of nests. Hayland may be an important habitat for Lark Buntings; hayland was preferred over uncultivated grassland in Saskatchewan (Maher 1974), and in Kansas hayland supported higher nest success than stubble fields (Wilson 1976).	Johnson et al. 2004; Johnson 2005
Savannah sparrow	*Passerculus sandwichensis*	Obligate	Common	Moderately Tolerant	Negative	Positive	Positive from LIGHT; Negative from Heavy Grazing	Light grazing (leaving ≥40% vegetation cover ≥25 cm tall) can be used to create the intermediate vegetation height and density preferred by Savannah Sparrows (Herkert 1991a).	Johnson et al. 2004; Saab 1995	Positive; esp Year After	Prefers previously cut fields	Johnson et al. 2004; Johnson 2005
Grasshopper sparrow	*Ammodramus savannarum*	Obligate	Common	Moderately Tolerant	Negative	Positive	Positive	Graze areas of tall, dense vegetation to provide diverse grass heights and densities (Skinner 1974, Kantrud 1981, Whitmore 1981). A rotational system may be most beneficial (Skinner 1974, Berkey et al.1993). Berkey et al. (1993) suggested that short-term (2-4 wk in May) grazing in North Dakota may be detrimental to Grasshopper Sparrow populations. Graze native, tallgrass CRP fields to improve the breeding habitat by reducing vegetative height, and by increasing canopy and forb coverage and invertebrate biomass (Klute 1994).Use various grazing systems (e.g., early-season, deferred [after 15 July], and continuous grazing of native grasslands, and spring-grazing [late April to early June] of tame grasslands) to maintain a mosaic of grassland types (Prescott and Wagner 1996). By allowing tame pastures to be grazed in spring, suitable habitat is maintained in the tame pastures for Grasshopper Sparrows, and grazing in native pastures can be deferred (Prescott and Wagner 1996). In arid western regions, maintain relatively dense grasslands by curtailing grazing and burning activities (Bock and Webb 1984, Bock and Bock 1987).	Johnson et al. 2004	Positive; Decrease Year After	In Missouri, mowing on a 1-3 yr rotation provided vegetation heights (<30 cm) suitable for Grasshopper Sparrows (Swengel 1996). Interval between management depends on grassland type, as mesic prairie regains litter more rapidly (1-3 yr) than dry prairie (4-6 yr), and sooner in southern than northern prairie (Swengel 1996).	Johnson et al. 2004; Johnson 2005

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Baird's sparrow	*Ammodramus bairdii*	Obligate	YES	Moderately Intolerant	Negative	Positive	Positive from Moderate; Negative from Heavy Grazing	Prevent overgrazing in pastures utilized by Baird's Sparrows. Graze using a deferred rotational system to ensure that only part of the range is grazed during the growing season (Messmer, 1990, Berkey et al. 1993, Mahon 1995). Use a complementary system when grazing cannot be restricted to winter, i.e., graze seeded range during the growing season, and native grasses in fall or winter (Mahon 1995). Grazing tame pastures in spring allows native pastures to be deferred, which improves habitat in the native pastures for Baird's Sparrows (Prescott and Wagner 1996).	Johnson et al. 2004	Positive	May avoid first year after cut.	Johnson et al. 2004
Henslow's sparrow	*Ammodramus henslowii*	Obligate	YES	Moderately Intolerant	Negative	Positive	Possibly Positive if LIGHT	In Missouri, provide idle or lightly grazed grasslands. Light grazing was defined as grazing pressure that left >40% vegetative cover at 25 cm (Skinner 1982, Skinner et al. 1984).	Johnson et al. 2004	Possibly Positive	Implement conservation haying (one annual cut after mid-July) on a 2-3 yr rotation. May avoid first year after cut.	Johnson et al. 2004
Le Conte's sparrow	*Ammodramus leconteii*	Obligate	YES	Moderately Intolerant	Negative	Positive	UNCLEAR		Johnson et al. 2004	Possibly Positive; Negative Year After	Avoid annual mowing, which can destroy nests and reduce dense litter needed for nesting (Murray 1969, Lowther 1996, Dale et al. 1997). In Saskatchewan, dense cover can be maintained by mowing some fields in alternate years while leaving others idle for at least 3 yr (Dale et al. 1997). Grasslands mowed at longer (2-9 yr) intervals also may be suitable (Renken and Dinsmore 1987).	Johnson et al. 2004; Johnson 2005
McCown's longspur	*Calcarius mccownii*	Obligate	Potentially	Highly Tolerant	Positive	Negative	Positive	Graze areas where grass is too tall or thick for breeding McCown's Longspurs (Giezentanner 1970 a, b; Stewart 1975; Kantrud and Kologiski 1982). McCown's Longspurs did not breed on idle mixed-grass in Saskatchewan, and preferred heavily grazed pastures over lightly or moderately grazed pastures (Felske 1971). Protect vegetation that is already sparse and short from overgrazing (Oberholser 1974), especially in areas of low precipitation (Ryder 1980).	Johnson et al. 2004; Saab 1995	???		Johnson et al. 2004

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Chestnut-collared longspur	*Calcarius ornatus*	Obligate	Potentially	Highly Tolerant	Positive	Negative	Positive	In mixed-grass prairie, graze at moderate to heavy intensity. Graze moister areas to increase diversity and patchiness and reduce tall, thick vegetation (Ryder 1980, Kantrud and Kologiski 1982). Messmer (1990) reported highest densities on pastures grazed using a twice-over rotation system, rather than areas grazed using season-long or short-duration systems. In shortgrass prairie, graze at light to moderate intensity; avoid overgrazing (Strong 1971, Bock et al. 1993, Anstey et al. 1995).	Johnson et al. 2004; Saab 1995	Positive; especially Year After	In mixed-grass areas, mow to improve habitat by decreasing vegetation height and density (Owens and Myres 1973, Stewart 1975). Annual mowing was more beneficial than periodic mowing (once every 3 yr) in northern mixed-grass prairie (Dale et al. 1997).	Johnson et al. 2004; Johnson 2005
Dickcissel	*Spiza americana*	Obligate	Common	Moderately Tolerant	Negative	Positive	Positive from Moderate; Negative from Heavy Grazing	Moderate grazing outside PNS to create mosaic. Do not burn & graze same areas.	Johnson et al. 2004; Saab 1995	Positive; Decrease Year After	Mow on 3 - 5 year interval outside PNS	Johnson et al. 2004; Johnson 2005
Bobolink	*Dolichonyx oryzivorus*	Obligate	YES	Moderately Tolerant	Negative	Positive	POSSIBLY Positive from LIGHT Grazing	Lightly graze areas where Bobolinks have exhibited positive responses to this treatment; heavy or moderate grazing may negatively affect Bobolink populations (Kantrud 1981).	Johnson et al. 2004; Saab 1995	Positive; Decrease Year After	Provide hayland areas, and mow as late as possible. In Nebraska, Bobolinks occurred more frequently in native hayland than pastures (Helzer 1996). Kantrud (1981) found Bobolink densities to be highest in hayland mowed the previous year, with lightly grazed areas containing the second highest density. Dale et al. (1997) found that Bobolink abundance in Saskatchewan was higher in annually or periodically mowed tame hayland than in native grassland. Delay mowing until after 15 July, by which time at least 70% of nestlings will have fledged in years of normal breeding phenology (Dale et al. 1997). To maintain dense cover in idle haylands, mow some fields in alternate years while leaving others idle for at least 3 yr. Divide large fields in half, with each half being mowed in alternate years, thus ensuring productivity of hay and of birds.	Johnson et al. 2004; Johnson 2005
Red-winged blackbird	*Agelaius phoeniceus*	Facultative	YES				Negative (Mod/Heavy), Possible Positive (light)		Saab 1995	Positive; Decrease Year After		Horn and Koford 2000

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Eastern meadowlark	*Sturnella magna*	Obligate	YES	Moderately Tolerant			Positive from Moderate; Negative from Heavy Grazing	Allow moderate grazing where the average height of currently grazed grassland vegetation is 20.3-30.4 cm to enhance both avian species and plant height diversity (Skinner 1975, Skinner et al. 1984). To maintain plant vigor, do not graze warm-season grasses to <25 cm tall during the growing season in tallgrass prairie. Use a rotational system of grazing on two or more grazing units to provide a diversity of plant heights. Grazing management decisions that attempt to Positive Eastern Meadowlark populations also must consider soil-type/grazing interactions (Baker and Guthery 1990). In Texas, grazing intensity had little effect on the structure of ground cover on clay soils; however, on sandy soils, reduced grazing intensity increased vegetation cover. Amount of bare ground varied according to whether soils were moderately or heavily grazed.	Johnson et al. 2004; Saab 1995	Positive	Optimal mowing frequency may be every 3-5 yr in late summer, involving some kind of raking to reduce the litter layer (Hays and Farmer 1990).	Johnson et al. 2004
Western meadowlark	*Sturnella neglecta*	Obligate	YES	Moderately Tolerant	Negative	Positive	Positive from Moderate; Negative from Heavy Grazing	On CRP fields that have been seeded to tallgrass species, use grazing to improve the breeding habitat by reducing vegetation height, and by increasing canopy and forb coverage and invertebrate biomass (Klute 1994). Within shortgrass prairie, protect dry areas from grazing, and graze wet areas to increase species diversity and patchiness (Ryder 1980). Graze tame pastures in the spring to allow native pastures to recover from grazing; this improves habitat in the native pastures for Western Meadowlarks (Prescott and Wagner 1996).	Johnson et al. 2004	Positive	Mow hayfields in late summer (after 15 July) on a 3-5 yr rotational basis to maintain grass quality and improve habitat for the following year (Dale et al. 1997). Mowing of CRP fields should not be done more than every 3-5 yr, should be done in late summer, and should be followed by raking to reduce and loosen litter (Hays and Farmer 1990).	Johnson et al. 2004
Brewer's blackbird	*Euphagus cyanocephalus*	Facultative	Possible, if water	Moderately Tolerant			NEUTRAL / Positive	Field comparisons between ungrazed riparian habitats and riparian zones subjected to livestock grazing showed neither a significant degradation nor beneficial effect of grazing on Brewer's occupancy (Warkentin and Reed 1999). This contrasts with suggestion by Bock et al. (1993), based on general literature evaluation, that livestock grazing might positively affect the species.	BNA	Unknown		BNA

SOUTH DAKOTA GRASSLAND BIRDS (cont'd)

Common Name	Scientific Name	Grassland Status	Nests in CRP	Grazing Tolerance	Response to Annual Grazing	Response to Periodic Grazing	Predictated Response to Grazing 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendation	Citation(s)
Brown-headed cowbird	*Molothrus ater*	Facultative	YES **	Highly Tolerant			Positive	Attracted to agricultural and grazing activities. Unclear how much changes would Positive.	Johnson et al. 2004	???? Or No Effect		Johnson et al. 2004
Total Species in State												

SC: State Species of Greatest Conservation Need

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APPENDIX E

FEDERALLY LISTED SPECIES IN SOUTH DAKOTA

FEDERALLY LISTED SPECIES' RESPONSE TO MANAGED HAYING AND GRAZING

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FEDERALLY LISTED SPECIES IN SOUTH DAKOTA

South Dakota TES		**Federal USFWS Status**	**State Status**	**Potentially Present on lands under CRP Practices?**							
Common Name	**Scientific Name**			**CP1**	**CP2**	**CP4B**	**CP4D**	**CP10**	**CP18B**	**CP18C**	**Comment/Justification**
MAMMALS											
Carnivores											
Black-footed ferret	*Mustela nigripes*	FE	*SE*	Y	Y	Y	Y	Y	Y	Y	associated with prairie dog towns; open level sparse grass areas
Gray wolf	*Canis lupus*	FE		N	N	N	N	N	N	N	inhabits forested areas
River otter	*Lutra canadensis*		*ST*	N	N	N	N	N	N	N	aquatic
Swift fox	*Vulpes velox*		*ST*	Y	Y	Y	Y	Y	N	N	prefers shortgrass prairie, western mixed-grass prairie
REPTILES											
Eastern hognose snake	*Heterondon platirhinos*		*ST*	Y	Y	Y	Y	Y	N	N	found in heavily wooded areas, prairies, and grasslands, however, prefer sandy or loamy soil in which to burrow.
False map turtle	*Graptemys pseudogeographica*		*ST*	N	N	N	N	N	N	N	lakes, ponds, large rivers and drown Forests
Lined snake	*Tropidoclonion lineatum*		*SE*	Y	Y	Y	Y	Y	N	N	inhabits grassland/herbaceous, savanna, suburban/orchard, and riparian areas
INVERTEBRATES											
American burying beetle	*Nicrophorus americanus*	FE		Y	Y	Y	Y	Y	Y	Y	no direct affiliation with soil or vegetation
BIRDS											
American dipper	*Cinclus mexicanus*		*ST*	N	N	N	N	N	N	N	riparian
Bald eagle	*Haliaeetus leucocephalus*		*ST*	N	N	N	N	N	N	N	prefers areas with large bodies of water
Eskimo curlew	*Numenius borealis*	FE	*SE*	N	N	N	N	N	N	N	does not breed in the prairies, but do forage there during their migration
Interior least tern	*Sterna antillarum*	FE	*SE*	N	N	N	N	N	N	N	requires large shorelines along rivers, lakes, etc.
Osprey	*Pandion haliaetus*		*ST*	N	N	N	N	N	N	N	aquatic
Peregrine falcon	*Falco peregrinus*		*SE*								see grassland birds matrix
Piping plover	*Charadrius melodus*	FT	*ST*	N	N	N	N	N	N	N	sandy upper beaches, especially where scattered grass tufts are present, and sparsely vegetated shores and islands of shallow lakes, ponds, rivers, and impoundments
Whooping crane	*Grus americana*	FE	SE	Y	Y	Y	Y	Y	Y	Y	may use CRP during migration.
PLANTS											
Western fringed prairie orchid	*Platanthera praeclara*	FT		Y	Y	Y	Y	Y	N	N	associated with wetlands, bogs, damp areas as well as mesic areas and tallgrass prairies.

FEDERALY LISTED SPECIES' RESPONSE TO MANAGED HAYING AND GRAZING

Common Name	Scientific Name	Predicted Response to Grazing 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)	Predicted Response to Haying 1/5 or 1/3 Outside PNS	Recommendations	Citation(s)
Black-footed ferret	*Mustela nigripes*	dependent upon prairie dog towns, grazing may create habitat for prairie dogs	allow 1/5 or 1/3 grazing	1,4	dependent upon prairie dog towns, grazing may create habitat for prairie dogs	allow 1/5 or 1/3 haying	1,4
Swift fox	*Vulpes velox*	in moderation, grazing may benefit swift fox as prefer short grass prairies, however if too extreme will reduce their food source	allow moderate grazing every 3 to 5 years, ensuring appropriate rotation schedules	1, 2	in moderation, may benefit swift fox as prefer more open landscapes, however if too extreme will affect their food source	limit haying to a specific height, and ensure appropriate rotation schedules	1, 2
Eastern hognose snake	*Heterondon platirhinos*	grazing may increase habitat quality, as they prefer more open areas with sand and gravel patches	graze every 3 years to ensure quality habitat	1	haying may increase habitat quality, as they prefer more open areas with sand and gravel patches	hay every 3 years to ensure quality habitat	1
Lined snake	*Tropidoclonion lineatum*	moderate grazing is unlikely to affect this species. It hides under rocks, logs, and other cover during the day in grasslands and other habitats. This species tolerates and even thrives on moderate habitat modification	allow moderate grazing every 3 to 5 years	1, 3	Haying 1/5 or 1/3 is unlikely to affect this species. It hides under rocks, logs, and other cover during the day in grasslands and other habitats. This species tolerates and even thrives on moderate habitat modification	allow 1/5 or 1/3 haying	1, 3
American burying beetle	*Nicrophorus americanus*	not limited by soil or vegetation, feeds on carrion	allow moderate grazing every 3 to 5 years	6	not limited by soil or vegetation, feeds on carrion	allow 1/5 or 1/3 haying	6
Whooping Crane	*Grus americana*	moderate grazing is unlikely to affect this species; however, intensive agriculture has been listed as a possible threat to this species	allow moderate grazing; perhaps limit it to 1/5	1	moderate haying could have minor to no effect on this species as it is only passing through during migration	allow 1/5 or 1/3 haying	1
Western prairie fringed orchid	*Platanthera praeclara*	main threat is conversion to cropland, overgrazing is a threat	moderate grazing, avoidance	5	intensive mowing is detrimental	do not permit when present	5

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APPENDIX F

FORAGE HARVEST MANAGEMENT TABLE

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South Dakota Forage Harvest Recommendations Based on Approximate Growth Stage, Cutting Height, and Minimum Plant Regrowth Before Killing Frost

TABLE 1. HAYLAND MANAGEMENT

SPECIES	*WHEN TO CUT*	*MINIMUM STUBBLE HEIGHT*	*OPTIMUM REGROWTH BEFORE KILLING FROST*
Creeping foxtail *Intermediate wheatgrass* *Pubescent wheatgrass* *Smooth bromegrass* *Tall wheatgrass* *Western wheatgrass* *Meadow bromegrass* *Bluegrass*	*1st cutting - Medium to full head* *Latter cuttings - when new basal sprouts appear, or regrowth reaches appropriate cutting heights (12"-15")*	*3 inches*	*6 inches*
Slender wheatgrass	*Early Head*	*3 inches*	*6 inches*
Crested wheatgrass *Green neadlegrass* *Orchardgrass*	*Boot to early heading or when regrowth is 14-20 inches*	*3 inches*	*6 inches*
Reed Canarygrass	*1st cutting - early boot* *Latter cuttings - when new basal sprouts appear, or regrowth reaches appropriate cutting heights (12"-15")*	*3 inches*	*6 inches*
Big & Sand bluestem *Indiangrass* *Switchgrass*	*Early boot to boot stage*	*6 inches*	*10 inches*
Alfalfa	*1st cutting - late bud to early flower* *Latter cuttings - 1/4 bloom*	*2 inches*	*8 inches*

Boot - most heads in upper leaf sheath but prior to emergence
Early Head - tips of heads emerging on not more than 10 percent of stems
Medium Head - about 50 percent of the heads emerged or emerging
Full Head - most heads fully emerged but prior to any flowering

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