

South Dakota Wildlife Action Plan

Formatting Note: This document is formatted to print on 8½ by 11 inch paper with the exception of some figures and tables that are sized 11 by 17 inches. The larger format is necessary to adequately illustrate detail on certain complex figures and to display comparison data for the 18 major land resources areas in South Dakota.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	viii
Acknowledgements	xv
List of Tables	xvi
List of Figures	xix
List of Appendices	xxiv
List of Acronyms	xxv
Plan Organization - Where to Find Key Elements	xxvii
Chapter 1 Introduction	1
1.1 BACKGROUND	2
1.2 SUMMARY OF PLAN UPDATES AND CHANGES	4
Incorporation of Wildlife Action Plan Best Practices	5
1.3 KEY ELEMENTS	6
1.4 GOALS	6
1.5 SPECIES OF GREATEST CONSERVATION NEED - OVERVIEW	7
1.6 CONSERVATION STRATEGIES - OVERVIEW	7
Chapter 2 Species of Greatest Conservation Need	8
2.1. CONSERVATION GOALS FOR SPECIES OF GREATEST CONSERVATION NEED	9
2.2 SPECIES PROFILE DESCRIPTION	17
2.3 CASE STUDIES	22
Chapter 3 Native Ecosystem Diversity – Terrestrial and Riparian-Wetland Ecosystems	24
3.1 CONSERVATION STRATEGY	24
Application	26
3.2 ECOREGIONS – MAJOR LAND RESOURCE AREAS	27
3.3 NATURAL DISTURBANCE PROCESSES	29

South Dakota Wildlife Action Plan

Climate.....	30
Fire.....	32
Grazing.....	34
Black-tailed Prairie Dogs.....	36
Beaver.....	37
Flood Events.....	39
3.4 ECOLOGICAL SITES.....	40
Terrestrial Systems.....	41
Riparian-Wetland Systems.....	44
3.5 DISTURBANCE STATES.....	58
Terrestrial Systems.....	59
Grass-Shrub Ecosystems.....	59
Forest Ecosystems.....	61
Riparian-Wetland Systems.....	62
3.6 NATIVE ECOSYSTEM PLANT COMMUNITY DESCRIPTIONS.....	64
Chapter 4 Aquatic Systems.....	66
4.1 AQUATIC GOALS AND OBJECTIVES.....	66
4.2 AQUATIC CONSERVATION STRATEGY.....	67
Application of the Strategy.....	67
A Systematic Approach to Conservation.....	68
4.3 AQUATIC DIVERSITY – CLASSIFICATION OF RIVERINE ECOSYSTEMS.....	68
Levels 1-3: Zone, Subzone, and Region.....	70
Level 4: Aquatic Subregions.....	71
Level 5: Ecological Drainage Units (EDUs).....	72
Level 6: Aquatic Ecological System Types (AES-Types).....	77
Level 7: Valley Segment Types (VSTs).....	80
Data Limitations.....	80
4.4 AQUATIC SPECIES OF GREATEST CONSERVATION NEED.....	81

South Dakota Wildlife Action Plan

Species Richness.....	83
Limitations of Species Distributional Data.....	86
4.5 WATERSHED OWNERSHIP/STEWARDSHIP STATUS	86
Limitations of Ownership/Stewardship Data.....	87
Chapter 5 Conservation Challenges	88
5.1 TERRESTRIAL SYSTEMS	88
Introduction.....	88
Direct Conversion of Native Ecosystems	90
Alteration of Native Ecosystems	93
<i>Natural disturbance processes</i>	93
<i>Nonnative species</i>	94
<i>Climate Change</i>	95
5.2 RIPARIAN-WETLAND SYSTEMS	103
Direct Conversion of Native Ecosystems	103
Alteration of Native Ecosystems	105
<i>Natural Disturbance Processes</i>	106
<i>Nonnative species</i>	107
<i>Climate Change</i>	109
5.3 SPECIES-LEVEL CONSERVATION CHALLENGES	113
Habitat Related	113
Climate Change.....	120
Non-habitat Related - Overview	120
5.4 AQUATIC SYSTEMS	128
Direct alteration/conversion of ecosystems	128
Indirect alteration and/or suppression of historical disturbance processes	128
Indirect alteration caused by human activities.....	129
Climate Change.....	129
Human Stressor Index (HSI).....	133
5.5 CONSERVATION CHALLENGES SUMMARY - TERRESTRIAL AND AQUATIC SYSTEMS.....	137

South Dakota Wildlife Action Plan

Chapter 6 Conservation Actions	140
6.1 REPRESENTATION GOALS	142
6.2 WEB-TOOL FOR SHARING INFORMATION ON SPECIES OF GREATEST CONSERVATION NEED	146
6.3 CONSERVATION OPPORTUNITY AREAS - OVERVIEW	146
Why Aquatic and Terrestrial COAs Were Developed Separately	147
6.4 TERRESTRIAL CONSERVATION OPPORTUNITY AREAS	147
6.5 AQUATIC CONSERVATION OPPORTUNITY AREAS	159
Conservation Strategy	159
Assessment Criteria	159
Walking through the Aquatic Conservation Strategy and Assessment Process	160
Discussion	166
6.6 CONSERVATION ACTIONS SUMMARY: TERRESTRIAL AND AQUATIC SYSTEMS	168
Chapter 7 Agency Coordination, Cooperator Interactions, and Public Involvement	172
7.1 PUBLIC INVOLVEMENT AND PARTNERSHIP PROCESS	172
7.2 COORDINATION WITH OTHER AGENCIES AND TRIBES	173
7.3 PUBLIC PARTICIPATION OPPORTUNITIES	174
7.4 REVIEW OF DRAFT SOUTH DAKOTA WILDLIFE ACTION PLAN	175
7.5 UNDERSTANDING SOUTH DAKOTA CITIZENS – WILDLIFE VALUES	176
Chapter 8 Monitoring and Inventory, Research, and Adaptive Management	180
8.1 MONITORING AND RESEARCH NEEDS FOR TERRESTRIAL NATIVE ECOSYSTEM DIVERSITY	180
Ecoregion or Landscape Level Monitoring and Research	180
Ecosystem or Community Level Monitoring and Research	182
Adaptive Management	187
Adaptive Management for Native Ecosystem Diversity	188
8.2 MONITORING AND RESEARCH NEEDS FOR AQUATIC ECOSYSTEMS	188
Ecoregion or Landscape Level Monitoring and Research	189
Ecosystem or Community Level Monitoring and Research	189
8.3. MONITORING, INVENTORY, AND RESEARCH PROGRAMS AND NEEDS FOR WILDLIFE	189

South Dakota Wildlife Action Plan

Adaptive Management for Species Diversity	192
Adaptive Management for Wildlife Action Plan Revision	192
Chapter 9 Review Schedule and General Framework.....	195
References Cited	196
APPENDIX A. SOUTH DAKOTA GAME, FISH AND PARKS LETTER OF INTENT TO REVISE SOUTH DAKOTA WILDLIFE ACTION PLAN AND U.S. FISH AND WILDLIFE SERVICE RESPONSE LETTER... 207	
APPENDIX B. SUMMARY OF SUGGESTIONS FROM ASSOCIATION OF FISH AND WILDLIFE AGENCIES (AFWA 2012) INCORPORATED INTO THE SOUTH DAKOTA WILDLIFE ACTION PLAN REVISION. . 210	
APPENDIX C. SPECIES PROFILES FOR SPECIES OF GREATEST CONSERVATION NEED. 212	
APPENDIX D. SPECIES CODES USED IN SOUTH DAKOTA WILDLIFE ACTION PLAN. 326	
APPENDIX E. SUMMARY OF AQUATIC AND TERRESTRIAL SPECIES-LEVEL MONITORING PROGRAMS IN SOUTH DAKOTA, AS OF 2013..... 329	
APPENDIX F. LIST OF STATE WILDLIFE GRANT-FUNDED PROJECTS CONDUCTED IN SOUTH DAKOTA, AS OF 2013..... 340	
APPENDIX G. SPECIES-LEVEL RESEARCH AND SURVEY NEEDS IDENTIFIED DURING SOUTH DAKOTA WILDLIFE ACTION PLAN REVISION TO ADDRESS CONSERVATION CHALLENGES. 373	
APPENDIX H. SPECIES-LEVEL RESEARCH AND SURVEY NEEDS IDENTIFIED DURING THE SOUTH DAKOTA WILDLIFE ACTION PLAN REVISION BY HABITAT TYPES OR GEOGRAPHICAL AREAS. 378	
APPENDIX I. SPECIES-LEVEL RESEARCH AND SURVEY NEEDS IDENTIFIED DURING SOUTH DAKOTA WILDLIFE ACTION PLAN REVISION FOR TERRESTRIAL ANIMAL SPECIES GROUPS..... 383	
APPENDIX J. SPECIES-LEVEL RESEARCH AND SURVEY NEEDS IDENTIFIED DURING THE SOUTH DAKOTA WILDLIFE ACTION PLAN REVISION FOR AQUATIC ANIMAL SPECIES GROUPS..... 404	
APPENDIX K. SPECIES-LEVEL SPECIES- OR HABITAT-SPECIFIC RESTORATION NEEDS..... 425	
APPENDIX L. ASSESSMENT METHODS, DATA SOURCES, AND PRODUCTS FOR TERRESTRIAL, RIPARIAN, AND WETLAND SYSTEMS 429	
APPENDIX M. DESCRIPTIONS OF WILDLIFE ACTION PLAN WEB TOOLS..... 439	
APPENDIX N. PAST, PRESENT, AND FUTURE CLIMATES FOR SOUTH DAKOTA – OBSERVED CLIMATIC VARIATION FROM 1895-2010 AND PROJECTED CLIMATE CHANGE TO 2099. AUTHORS DR. MARK A. COCHRANE AND CHRISTOPHER J. MORAN (EXECUTIVE SUMMARY). ... 445	
APPENDIX O. CLIMATE CHANGE VULNERABILITY ASSESSMENT OF AQUATIC SPECIES OF GREATEST CONSERVATION NEED IN SOUTH DAKOTA. AUTHOR DR. ANDREW BURGESS (EXECUTIVE SUMMARY)..... 446	
APPENDIX P. LIST OF CONSERVATION INITIATIVES IN SOUTH DAKOTA, AS OF 2013..... 447	

South Dakota Wildlife Action Plan

APPENDIX Q. SEPARATION DISTANCES USED IN DEVELOPING TERRESTRIAL CONSERVATION OPPORTUNITY AREA SPECIES RICHNESS DATA LAYER.	463
APPENDIX R. TERRESTRIAL CONSERVATION OPPORTUNITY ACREAGES BY ECOSITE TYPE USING 10% REPRESENTATION GOAL.....	482
APPENDIX S. EXISTING FEDERAL, STATE AND PRIVATE PROGRAMS TO ASSIST COLLABORATIVE EFFORTS AND INDIVIDUAL LANDOWNERS IN MAINTAINING AND RESTORING ECOSYSTEM DIVERSITY IN SOUTH DAKOTA.	492
APPENDIX T. DESCRIPTIONS OF AQUATIC CONSERVATION OPPORTUNITY AREAS (COAs) BY ECOLOGICAL DRAINAGE UNIT (EDU) AND ASSOCIATED MAPS.....	497
APPENDIX U. AQUATIC SPECIES OF GREATEST CONSERVATION NEED WITH ASSOCIATED CONSERVATION OPPORTUNITY AREAS (COA) AND TOTAL NUMBER OF ACRES CONTAINED WITHIN A COA.....	521
APPENDIX V. LAND AND RESOURCE AGENCIES, UNIVERSITIES, AND TRIBES CONTACTED DURING WILDLIFE ACTION PLAN REVISION.....	531
APPENDIX W. COMMENTS RECEIVED DURING PLAN REVIEW PERIOD (MAY 7 – JUNE 6, 2014) AND ASSOCIATED RESOLUTION OF SUGGESTED INPUT.	534

South Dakota Wildlife Action Plan

ACKNOWLEDGEMENTS

South Dakota Wildlife Action Plan Science Team:

Eileen Dowd Stukel, SDGFP
Jon Haufler, EMRI
Casey Heimerl, SDGFP
Silka Kempema, SDGFP
John Lott, SDGFP
Carolyn Mehl, EMRI
Dave Ode, SDGFP
Chelsey Pasbrig, SDGFP
Chad Switzer, SDGFP
Nathan Baker, Andrew Burgess, and Ruth Howell also assisted.



Outreach Team:

Larry Gigliotti
Cynthia Longmire
Eileen Dowd Stukel
Casey Heimerl
Silka Kempema
Dave Ode
Chelsey Pasbrig
Chad Switzer

SDGFP GIS Staff:

Christopher Marsh
Chelsea Krause
Heather Berg
David Freidel

This plan benefited from the assistance of Anna Schmidt and Michael Cotter, USFWS; Rick Schneider and Kristal Stoner, Nebraska Game and Parks Commission; the late David Willis, South Dakota State University; and the participation of SDGFP Wildlife Division staff, a variety of species and taxonomic experts, and representatives of conservation organizations, government agencies, universities, and tribes.

The Plains and Prairies Landscape Conservation Cooperative provided funds for climate change analysis work conducted at South Dakota State University.

This project was funded in part by federal funding through State Wildlife Grant T-48-R-1, Study #2457, administered through the U.S. Fish and Wildlife Service.

Cover photo by D. J. Ode

Preferred Citation:

South Dakota Department of Game, Fish and Parks. 2014. South Dakota Wildlife Action Plan. Wildlife Division Report 2014-03. South Dakota Department of Game, Fish and Parks, Pierre.

South Dakota Wildlife Action Plan

LIST OF TABLES

Table 1-1	Location of key elements within the South Dakota Wildlife Action Plan and description of 2014 updates to these elements, where applicable.
Table 2-1	List of species of greatest conservation need as updated for the 2014 South Dakota Wildlife Action Plan.
Table 2-2	Description of sources used in species of greatest conservation need distribution maps.
Table 3-1	Number of acres representing the 18 Major Land Resource Areas occurring in South Dakota.
Table 3-2	Number of acres representing each of the terrestrial ecological sites occurring within each of the eighteen South Dakota’s Major Land Resource Areas.
Table 3-3	Description of the hydrogeomorphic classes identified for wetland and riparian ecological sites of South Dakota (as definitions modified from NRCS 2008 and Brinson et al. 1995). Due to current mapping limitations, the Slope Hydrogeomorphic Class is not represented in the 2014 South Dakota Wildlife Action Plan mapping efforts.
Table 3-4	Seven hydrology sub-classes utilized for wetland and riparian ecological sites of South Dakota. Due to current mapping limitations, the seep/saturated hydrology subclass is not represented in the 2014 South Dakota Wildlife Action Plan mapping efforts (based on Cowardin et al. 1979 and Stewart and Kantrud (1971).
Table 3-5	Seven vegetation zones identified by Stewart and Kantrud (1971, 1972) and used in the wetland and riparian ecological sites of South Dakota to help describe vegetation communities by hydrological subclass. Due to current mapping limitations, the Fen vegetation zone is not represented in 2014 mapping efforts.
Table 3-6	Number of acres representing the hydrogeomorphic classes in South Dakota.
Table 3-7	Number of acres representing riparian and wetland ecological sites, or the combination of hydrogeomorphic class and their hydrology sub-class, for each of the Major Land Resource Areas occurring in South Dakota.
Table 3-8	Number of individually mapped depression and lacustrine ecological sites for each of the Major Land Resource Areas in South Dakota.
Table 3-9	Expected combined influence of historical bison grazing, fire frequency, and black-tailed prairie dog on creating eight vegetation disturbance states on grass-shrub ecological sites in South Dakota.
Table 3-10	Disturbance states (Table 3-9 ; Figure 3-16) believed to have historically occurred in South Dakota for each grass-shrub ecological site by Major Land Resource Area. The projected historical relative abundance of these disturbance states are further characterized as

South Dakota Wildlife Action Plan

	“common” and “rare”.
Table 3-11	Example of a plant community description developed for the clayey ecological site – disturbance state A for Major Land Resource Area (MLRA) 53B. The climate change effect information is described in a later section. MFRI = mean fire return interval.
Table 4-1	Hierarchical framework, with basic descriptions, used for classifying and mapping riverine ecosystems in the MOGAP Project. Hierarchy is adapted after the classification hierarchies of Frissell et al. 1986, Pflieger 1989, Maxwell et al. 1995, Seelbach et al. 1997, and Higgins et al. 2005. Note: Levels in red account for the levels used in South Dakota’s selection process for identifying Conservation Opportunity Areas (COAs).
Table 4-2	Descriptions of Ecological Drainage Units (EDUs) in the Missouri River Basin of South Dakota.
Table 4-3	Descriptions of Missouri River Basin Aquatic Ecological System (AES)-Types in South Dakota.
Table 4-4	List of aquatic species of greatest conservation need (SGCN) developed for the South Dakota Wildlife Action Plan.
Table 4-5	List of the geographic information system (GIS) coverages, their sources, and percent coverage obtained or created to account for local and watershed ownership/stewardship in South Dakota.
Table 5-1	Percent direct conversion (both agriculture and urban development) for each terrestrial ecological site and Major Land Resource Area in South Dakota. Reddish shade highlights those sites where direct conversion of native ecosystems is $\geq 60\%$, yellow highlights those sites where native ecosystem loss is $\geq 30\%$ and $< 60\%$; and green highlights those sites where native ecosystem loss is $< 30\%$.
Table 5-2	Results of change in annual and seasonal temperature and precipitation values when comparing recent conditions to the projected 2070 to 2099 period.
Table 5-3	Percent direct conversion (both agriculture and urban development) for each riparian and wetland ecological site and Major Land Resource Area in South Dakota. Reddish shade indicates those ecological sites that have \geq to 60% conversion, yellow shading indicates $\geq 30\%$ to 59% conversion, and green shading indicates $< 30\%$ direct conversion.
Table 5-4	South Dakota species of greatest conservation need and their relationship to the native ecosystem diversity strategy and/or the aquatic gap analysis strategy used in the South Dakota Wildlife Action Plan to improve or maintain habitat for a respective species.
Table 5-5	Expected effects of climate change on native ecosystems and habitat of species of greatest conservation need in South Dakota and suggested mitigation actions where

South Dakota Wildlife Action Plan

	possible impacts are identified.
Table 5-6	Expected effects of climate change on aquatic species of greatest conservation need (SGCN) in South Dakota.
Table 5-7	List of the geographic information system (GIS) coverages and their sources obtained or created to identify existing and potential future stressors to the aquatic species of greatest conservation need in South Dakota.
Table 5-8	Nine stressor metrics included in the human stressor index (HSI) and the specific criteria used to define the four relative ranking categories for each metric used to calculate the HSI for each aquatic ecological system (AES) unit.
Table 6-1	Proposed representation goals (i.e. 10% of historical native ecosystem diversity) to meet coarse filter and biodiversity objectives on each terrestrial ecological site, by Major Land Resource Area in South Dakota. High restoration priority should be given to those sites highlighted by reddish shade, where direct native ecosystem loss is $\geq 60\%$; moderate priority to those sites highlighted by yellow where native ecosystem loss is $\geq 30\%$ and $<60\%$; and low priority to those sites highlighted by green where native ecosystem loss is $<30\%$.
Table 6-2	Proposed representation goals (i.e. 10% of historical native ecosystem diversity) to meet coarse filter and biodiversity objectives on each riparian and wetland ecological site, by Major Land Resource Area in South Dakota. High restoration priority should be given to those sites highlighted by reddish shade, where direct native ecosystem loss is $\geq 60\%$; moderate priority to those sites highlighted by yellow where native ecosystem loss is $\geq 30\%$ and $<60\%$; and low priority to those sites highlighted by green where native ecosystem loss is $<30\%$.
Table 6-3	Plant and animal species data sources used in terrestrial conservation opportunity area identification.
Table 6-4	Protected lands data sources for terrestrial conservation opportunity area identification.
Table 7-1	Descriptions of the four wildlife value orientations (measured in 2012 for SD residents).
Table 8-1	Priority monitoring and research needs identified for the landscape level of the ecosystem diversity component of the South Dakota Wildlife Action Plan.
Table 8-2	Priority monitoring and research needs identified for the ecosystem level of the ecosystem diversity component of the South Dakota Wildlife Action Plan.
Table 8-3	Landscape- and ecosystem-level needs identified during the South Dakota Wildlife Action Plan revision.

South Dakota Wildlife Action Plan

LIST OF FIGURES

Figure 2-1	Description of species of greatest conservation need distribution map terminology.
Figure 2-2	Example of information provided in each species of greatest conservation need profile.
Figure 3-1	Map of Major Land Resource Areas for South Dakota (USDA NRCS 2006).
Figure 3-2	Location of primary ecological systems in South Dakota.
Figure 3-3	Location of primary terrestrial – grass-shrub and forested – ecological sites in South Dakota. Riparian-wetland-aquatic systems are lumped into one category for the purpose of this map.
Figure 3-4	Location of riparian-wetland hydrogeomorphic classes in South Dakota.
Figure 3-5	Location of riparian-wetland ecological sites or the combination of hydrogeomorphic class and hydrology subclasses, in South Dakota.
Figure 3-6	Depressional-Ephemeral Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class- ephemeral sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-7	Depressional-Temporary Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class- temporary sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-8	Depressional-Seasonal Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class- seasonal sub-class (as adapted from Stewart and Kantrud 1971.)
Figure 3-9	Depressional-Semipermanent Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class- semipermanent sub-class (Stewart and Kantrud 1971).
Figure 3-10	Depressional-Permanent Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class-permanent sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-11	Depressional-Intermittent Ecological Site. Typical vegetation zones under average precipitation conditions for the depressional class-intermittent sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-12	Lacustrine-Permanent Ecological Site. Typical vegetation zones under average precipitation conditions for the lacustrine class–permanent subclass (as adapted from Stewart and Kantrud 1971).

South Dakota Wildlife Action Plan

Figure 3-13	Lacustrine-Intermittent Ecological Site. Typical vegetation zones under average precipitation conditions for the lacustrine class -intermittent subclass (as adapted from Stewart and Kantrud 1971).
Figure 3-14	Riverine-Permanent Ecological Site. Typical vegetation zones under average precipitation conditions for the riverine class-permanent sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-15	Riverine-Intermittent Ecological Site. An example of vegetation zones that might occur under average precipitation conditions for the riverine class-intermittent sub-class (as adapted from Stewart and Kantrud 1971).
Figure 3-16	State and transition model framework to identify historically occurring disturbance states for terrestrial grass-shrub ecosystems of South Dakota, as influenced by the natural disturbance regimes of bison grazing, fire, and prairie dog colonization. Disturbance states A, B, C, G, and H were much more common historically and disturbance states D, E, and F are considered less common in South Dakota historically.
Figure 4-1	Map showing Levels 4-7 of the Missouri River Gap Analysis Project Aquatic Ecological Classification hierarchy in South Dakota (Annis et al. 2010).
Figure 4-2	Map showing the boundaries of the five aquatic subregions of South Dakota, including the Upper Minnesota River basin, which lies outside of the Missouri River drainage.
Figure 4-3	Map showing the boundaries of the twelve ecological drainage units (EDUs) of South Dakota, including the Upper Minnesota River drainage from the Mississippi River basin.
Figure 4-4	Boundaries of the 21 aquatic ecological system types (AES-Types) delineated for South Dakota.
Figure 4-5	Map showing the six stream size classes used in the classification of valley segment types (VSTs) for South Dakota.
Figure 4-6	Sample map defining confirmed and probable distributional records at the AES and HUC_8 boundary levels, respectively.
Figure 4-7	Map of overall species richness (fish, mussels, aquatic invertebrates, and aquatic turtles) for SGCN for aquatic ecological system (AES) units.
Figure 4-8	Map of fish species richness for species of greatest conservation need by aquatic ecological system (AES) units.
Figure 4-9	Map of mussel species richness for species of greatest conservation need by aquatic ecological system (AES) units.
Figure 4-10	South Dakota land ownership/stewardship map with ecological drainage units (EDUs)

South Dakota Wildlife Action Plan

	overlaid.
Figure 5-1	Amount of direct conversion of native terrestrial ecosystems resulting from agriculture and urban development by Major Land Resource Area. The “not converted” category may include native or altered ecosystem conditions.
Figure 5-2	Predicted climate change values for mean annual temperatures by Major Land Resource Area relative to recent conditions.
Figure 5-3	Predicted climate change values for mean annual precipitation by Major Land Resource Area relative to recent conditions.
Figure 5-4	Predicted climate change values for mean winter and spring precipitation by Major Land Resource Area Major Land Resource Area relative to recent conditions.
Figure 5-5	Predicted climate change values for mean growing season precipitation by Major Land Resource Area relative to recent conditions.
Figure 5-6	Predicted climate change values for mean summer precipitation by Major Land Resource Area relative to recent conditions.
Figure 5-7	Predicted climate change values for average July temperatures by Major Land Resource Area relative to recent conditions.
Figure 5-8	Amount of direct conversion of native riparian and wetland ecosystems resulting from agriculture and urban development by Major Land Resource Area. The “not converted” category may include native or altered ecosystem conditions.
Figure 5-9	Comparison of projected climate change for the range of conditions projected for 2021-2050 and 2070-2099 from the downscaled climate change analysis of this report compared to the findings that a 10% increase in spring precipitation is needed to offset effects on wetlands of a 2°C increase in temperature reported by Poiana et al. (1995).
Figure 5-10	Comparison of projected climate change for the range of conditions projected in 2021-2050 and 2070-2099 from the downscaled climate change analysis of this report compared to the findings that a 20% increase in overall precipitation is needed to offset effects on wetlands of a 3°C increase in temperature reported by Johnson et al. (2005), and similar to the relationship reported by Johnson et al. (2010).
Figure 5-11	Map showing the first value in the human stressor index (HSI) for each of the aquatic ecological systems (AESs) in South Dakota. A value of 1 indicates relatively low human disturbance, while a value of 4 indicates a relatively high human disturbance. Only 4 AES polygons received a value of 1.
Figure 5-12	Map showing the last two values in the human stressor index (HSI) for each of the AESs in South Dakota. A value of 9 indicates an extremely low level of cumulative stress. The

South Dakota Wildlife Action Plan

	highest possible value was a 36; however the highest value in South Dakota was 21. The higher the value for the last two digits, the higher the degree of cumulative disturbance.
Figure 5-13	Map showing the cumulative human stressor index (HSI) for each of the AESs in South Dakota. The first number represents the highest value received across all 9 human stressor metrics, while the last two numbers represent the sum of the scores received for each of the 9 metrics.
Figure 6-1	Map of Major land resource areas in South Dakota (USDA NRCS 2006).
Figure 6-2	Map of percentage of public lands and conservation easements within 1-mile hexagon boundaries.
Figure 6-3	Map of large (>1,000 hectares) habitat blocks with limited amounts of human disturbance.
Figure 6-4	Simplified version of National Land Cover Dataset for 2006.
Figure 6-5	Map of terrestrial species richness.
Figure 6-6	Map of terrestrial conservation opportunity areas.
Figure 6-7	Map showing the Cheyenne Ecological Drainage Unit that was selected to meet all elements of the basic conservation strategy developed for the aquatic conservation opportunity area selection process in South Dakota. The figure also shows the seven associated aquatic ecological system-types found within the Cheyenne Ecological Drainage Unit.
Figure 6-8	Map breaking down the assessment criteria for the Clarks Fork Yellowstone River aquatic ecological system-Type, within the Cheyenne Ecological Drainage Unit. Conservation Opportunity Areas were selected by a hierarchy system based on the highest species richness, lowest Human Stressor Index value, and highest percentage of public ownership.
Figure 6-9	Map of two conservation opportunity areas within Clarks Fork Yellowstone River Aquatic Ecological System-Type, Cheyenne Ecological Drainage Unit that were selected to meet all elements of the conservation strategy and assessment process in South Dakota.
Figure 6-10	Map showing the James Ecological Drainage Unit (EDU), the only EDU in South Dakota which contains a single Aquatic Ecological System (AES)-Type (Choteau Creek AES-Type).
Figure 6-11	Map showing the James Ecological Drainage Unit (EDU) broken down by stream classification type: lower, middle, upper.
Figure 6-12	Map of 49 aquatic conservation opportunity areas selected to meet all elements of the aquatic conservation strategy and assessment process across South Dakota.

South Dakota Wildlife Action Plan

Figure 7-1	South Dakota residents' wildlife value orientations measured in 2004 and 2012.
Figure 7-2	Participation in fishing, hunting and/or wildlife viewing trips by South Dakotans sometime during their lifetime (measured in 2012).
Figure 8-1	Adaptive management process (Williams et al. 2009).
Figure 8-2	Iterative cycle of adaptive management process (Williams et al. 2009).
Figure 8-3	Overall results chain and indicators for State Wildlife Action Plan effectiveness (AFWA 2011).

South Dakota Wildlife Action Plan

LIST OF APPENDICES

Appendix A	South Dakota Game, Fish and Parks letter of intent to revise South Dakota Wildlife Action Plan and U. S. Fish and Wildlife Service response letter.
Appendix B	Summary of suggestions from Association of Fish and Wildlife Agencies (AFWA 2012) incorporated into South Dakota Wildlife Action Plan revision.
Appendix C	Species profiles for species of greatest conservation need.
Appendix D	Species codes used in South Dakota Wildlife Action Plan.
Appendix E	Summary of aquatic and terrestrial species-level monitoring programs in South Dakota, as of 2013.
Appendix F	List of State Wildlife Grant-funded projects conducted in South Dakota, as of 2013.
Appendix G	Species-level research and survey needs identified during SDWAP revision to address conservation challenges.
Appendix H	Species-level research and survey needs identified during SDWAP revision by habitat types or geographical areas.
Appendix I	Species-level research and survey needs identified during SDWAP revision for terrestrial animal species groups.
Appendix J	Species-level research and survey needs identified during SDWAP revision for aquatic animal species groups.
Appendix K	Species- or habitat-specific restoration needs.
Appendix L	Assessment methods, data sources, and products for terrestrial, riparian, and wetland systems.
Appendix M	Descriptions of Wildlife Action Plan web tools.
Appendix N	Past, Present, and Future Climates for South Dakota - Observed climatic variation from 1895-2010 and projected climate change to 2099. Authors Dr. Mark A. Cochrane and Christopher J. Moran (Executive Summary).
Appendix O	Climate Change Vulnerability Assessment of Aquatic Species of Greatest Conservation Need In South Dakota. Author Dr. Andrew Burgess (Executive Summary).
Appendix P	List of conservation initiatives in South Dakota, as of 2013.
Appendix Q	Separation distances used in developing terrestrial conservation opportunity area species richness data layer.
Appendix R	Terrestrial conservation opportunity acreages by ecosite type using 10% representation goal.
Appendix S	Existing federal, state and private programs to assist collaborative efforts and individual landowners in maintaining and restoring ecosystem diversity in South Dakota.
Appendix T	Descriptions of aquatic Conservation Opportunity Areas (COAs) by Ecological Drainage Unit (EDU) and associated maps.
Appendix U	Aquatic species of greatest conservation need with associated Conservation Opportunity Areas (COA) and total number of acres contained within a COA.
Appendix V	Land and resource agencies, universities, and tribes contacted during Wildlife Action Plan Revision.
Appendix W	Comments received during Plan review period (May 7 – June 6, 2014) and associated resolution of suggested input.

South Dakota Wildlife Action Plan

LIST OF ACRONYMS

AES - Aquatic Ecological System

AIS – Aquatic Invasive Species

BLM - Bureau of Land Management

C - °Celsius

COA - Conservation Opportunity Area

CREP - Conservation Reserve Enhancement Program

CRP - Conservation Reserve Program

DGCM – Downscaled Global Climate Model

EDU - Ecological Drainage Unit

EMRI – Ecosystem Management Research Institute

EPA - Environmental Protection Agency

ESA – Endangered Species Act

F - °Fahrenheit

FSA – Farm Service Agency

GAP – Gap Analysis Program

GCM – Global Climate Model

GIS – Geographic Information System

GPFHP - Great Plains Fish Habitat Partnership

HAPET - Habitat and Population Evaluation Team

HCPC - Historical Climax Plant Community

HGM – Hydrogeomorphic (system)

HSI - Human Stressor Index

HUC_8 - Eight digit Hydrologic Unit Code

LCC – Landscape Conservation Cooperative

MFRI - mean fire return interval

MLRA – major land resource area

MO - Missouri

MOGAP - National Aquatic Gap Analysis Program of the Missouri River Basin

MS - Mississippi

NGO - non-governmental organization

NGP – Northern Great Plains

NHD - National Hydrography Dataset

South Dakota Wildlife Action Plan

NLCD - National Land Cover Data

NPS - National Park Service

NRCS – Natural Resources Conservation Service

NWI – National Wetlands Inventory

PARC – Partners in Amphibian and Reptile Conservation

PARCA – Priority Amphibian and Reptile Conservation Areas

SDBBA – South Dakota Breeding Bird Atlas

SD DENR - South Dakota Department of Environment and Natural Resources

SD DOT – South Dakota Department of Transportation

SDGFP - South Dakota Game, Fish and Parks

SDNHD - South Dakota National Heritage Database

SDSU – South Dakota State University

SDOU – South Dakota Ornithologists’ Union

SDWAP – South Dakota Wildlife Action Plan

SGCN - Species of Greatest Conservation Need

SOM – soil organic matter

STM - State and transition model

SWG – State Wildlife Grant

TNC – The Nature Conservancy

TRACS – (Wildlife) Tracking and Reporting Actions for the Conservation of Species

USACE – United States Army Corps of Engineers

USEPA – United States Environmental Protection Agency

USFS - United States Forest Service

USFWS - United States Fish and Wildlife Service

USGS - United States Geological Survey

VST - Valley Segment Type

WAP - Wildlife Action Plan

WGA – Western Governors’ Association

WVO - Wildlife Value Orientation

South Dakota Wildlife Action Plan

PLAN ORGANIZATION - WHERE TO FIND KEY ELEMENTS

The following summary identifies the Sections in the South Dakota SDWAP that address the eight key elements required by Congress and briefly describes changes made to these sections for the 2014 update. Sections of the Plan that are described as unchanged were evaluated during the revision process and found to be suitable processes.

The revision process began with an initial contact with the U.S. Fish and Wildlife Service' Wildlife and Sport Fish Restoration Program in Denver, Colorado ([Appendix A](#)).

Table 1-1. Location of key elements within the South Dakota Wildlife Action Plan and description of 2014 updates to these elements, where applicable.

ELEMENT AND SUB-ELEMENT	CHAPTER/SECTION	2014 UPDATE
1 - Species		
Species of greatest conservation need	<ul style="list-style-type: none"> · Chapter 1, Section 1.5 (overview) · Chapter 2 (full list) · Chapter 2, Section 2.1 (conservation goals) · Appendix C (species profiles) · Chapter 4, Section 4.4 (aquatic SGCN review) · Appendix U (supplemental information on Aquatic SGCN associated with COAs) 	<ul style="list-style-type: none"> · Reviewed and revised list (overview section); used new data sources and expert opinions for list development · Description of species profile format, map data sources and case studies to help reader understand where to locate species of greatest conservation need (SGCN) information · Species profile for each SGCN · Relevance of SGCN locations and species richness to aquatic conservation opportunity area selection · Listing of aquatic SGCN associated with conservation opportunity areas (COAs)
2 – Key Habitats		
Descriptions	<ul style="list-style-type: none"> · Chapter 3, Section 3.1-3.6 	<ul style="list-style-type: none"> · Used Major Land Resource Area (MLRA) boundaries as

South Dakota Wildlife Action Plan

	<ul style="list-style-type: none"> · Chapter 4, Sections 4.1-4.3 	<ul style="list-style-type: none"> · terrestrial ecoregion boundaries · Descriptions of natural disturbance processes · Descriptions of ecological sites used for terrestrial and riparian-wetland systems · Developed database of native ecosystem plant community tables · Adapted aquatic classification system from USGS MOGAP project for Missouri River drainage
Locations	<ul style="list-style-type: none"> · Appendix C (species profiles) · Chapter 3, Sections 3.4 and 3.6 · Chapter 4, Section 4.4 · Chapter 6, Section 6.1 · Chapter 6, Sections 6.3-6.5 · Appendices R and T (supplemental information on COAs) 	<ul style="list-style-type: none"> · Current distributions of SGCN · Updated ecological site GIS layers and maps using new data for terrestrial and riparian-wetland ecosystems · Used aquatic SGCN to describe species richness · Representation goals at 10% level identified for terrestrial and riparian-wetland ecosystems · Selected terrestrial conservation opportunity areas to meet representation goal of 10% of ecological sites within each MLRA · Selected aquatic conservation opportunity areas to accommodate the needs of SGCN, using a variety of data sources on habitat, stressors

South Dakota Wildlife Action Plan

		and SGCN predicted and known occurrences
Relative Conditions	<ul style="list-style-type: none"> · Chapter 3, Section 3.6, plus SDGFP web tool to allow users to find lists of recommended plant species matched to ecological sites for restoration potential · Chapter 5, Section 5.4 · Chapter 6, Sections 6.3-6.5 	<ul style="list-style-type: none"> · Updated assessment of ecological sites with new information, including climate change impacts · Descriptions of the aquatic habitat levels within aquatic MOGAP · Terrestrial and aquatic COA identification process included data on intact habitats, protected lands, and relative human stressors
3 – Conservation Challenges		
Causes of concern – terrestrial ecosystems	<ul style="list-style-type: none"> · Chapter 5, Section 5.1 and 5.5 	<ul style="list-style-type: none"> · Updated based on new information, including climate change assessment
Causes of concern – riparian-wetland system	<ul style="list-style-type: none"> · Chapter 5, Section 5.2 and 5.5 	<ul style="list-style-type: none"> · Updated based on new information, including climate change assessment
Causes of concern – aquatic systems	<ul style="list-style-type: none"> · Chapter 5, Section 5.4 and 5.5 	<ul style="list-style-type: none"> · Updated based on new information
Causes of concern – species	<ul style="list-style-type: none"> · Chapter 5, Section 5.3 · Appendix C (species profiles) 	<ul style="list-style-type: none"> · Consideration of climate change impacts · Literature review and update
4 – Conservation Actions		
Conservation goals – representation goals for terrestrial ecosystem diversity	<ul style="list-style-type: none"> · Chapter 6, Section 6.1 and 6.6 · Chapter 6, Section 6.4 	<ul style="list-style-type: none"> · Updated based on key habitat changes and climate change assessment · Identified terrestrial conservation opportunity areas – new approach not

South Dakota Wildlife Action Plan

		found in original Plan
Conservation goals –aquatic SGCN representation through conservation opportunity area identification	<ul style="list-style-type: none"> · Chapter 6, Section 6.5 	<ul style="list-style-type: none"> · New approach not found in original Plan to accommodate the needs of aquatic SGCN and other aspects of aquatic biodiversity
Conservation goals and actions – species	<ul style="list-style-type: none"> · Chapter 2, Section 2.1 · Chapter 5, Section 5.3 · Chapter 6, Section 6.6 · Appendix C (SGCN profiles) · Appendix K (species or habitat restoration needs) 	<ul style="list-style-type: none"> · Mitigation descriptions for climate change impacts to terrestrial and riparian-wetland SGCN · Listing of recommended coordination, management, research, and education practices · Updated for SGCN
Conservation actions – key habitats	<ul style="list-style-type: none"> · Chapter 3, Section 3.6 · Chapter 6, Sections 6.5 · Appendix K (species or habitat restoration needs) 	<ul style="list-style-type: none"> · Updated based on key habitat changes and climate change assessment · Aquatic COA process incorporated emphasis on key habitats needed to accommodate the needs of SGCN and other aspects of aquatic biodiversity
Priorities for implementation	<ul style="list-style-type: none"> · Chapter 6, Section 6.1 · Chapter 6, Section 6.5 · Appendix C (SGCN profiles) 	<ul style="list-style-type: none"> · Emphasis on ecosystem diversity and historical reference for ecosystem restoration for terrestrial and riparian-wetland ecosystems · Aquatic COAs identified to accommodate the needs of aquatic SGCN · Specific research and monitoring priorities contained in SGCN profiles, in addition to identified habitat

South Dakota Wildlife Action Plan

		priorities for ecosystem diversity maintenance and restoration
5 - Monitoring		
Monitoring – terrestrial ecoregions and ecosystems	<ul style="list-style-type: none"> · Chapter 8, Section 8.1 	<ul style="list-style-type: none"> · Updated based on new information
Monitoring – aquatic ecosystems	<ul style="list-style-type: none"> · Chapter 8, Section 8.2 	<ul style="list-style-type: none"> · Added to 2014 revision
Monitoring – species	<ul style="list-style-type: none"> · Chapter 8, Section 8.3 · Appendix E (ongoing monitoring programs) · Appendix C (species profiles) 	<ul style="list-style-type: none"> · Updated based on new information, including State Wildlife Grant project results
Monitoring – effectiveness of strategy	<ul style="list-style-type: none"> · Chapter 2 and Appendix C (species profiles) · Chapter 6, Sections 6.1-6.2 · Chapter 6. Sections 6.3-6.5 	<ul style="list-style-type: none"> · SGCN list as fine-filter approach · Updated based on new information · Addition of terrestrial and aquatic COAs identified as tools for accommodating habitats and SGCN requirements
Priority research, monitoring and survey efforts - species	<ul style="list-style-type: none"> · Chapter 8, Sections 8.3 · Appendix C (species profiles) · Appendices G-K (compiled research and survey needs) 	<ul style="list-style-type: none"> · Reviewed and updated, with input from government agencies, tribes, and species experts
Adaptive management	<ul style="list-style-type: none"> · Chapter 8, Section 8.1-8.3 	<ul style="list-style-type: none"> · Updated based on new information
6 – Strategy Review		
Procedures	<ul style="list-style-type: none"> · Chapter 9 	<ul style="list-style-type: none"> · Reviewed but unchanged

South Dakota Wildlife Action Plan

7 – Coordination		
Plan development, including SGCN list development and review	<ul style="list-style-type: none"> · Chapter 7, Sections 7.1-7.2 · Appendix V (listing of agencies, universities, and tribes contacted during revision process) 	<ul style="list-style-type: none"> · Updated with new staff, new data sources, and updated lists of agency and tribal contacts
Plan implementation	<ul style="list-style-type: none"> · Chapter 7 	<ul style="list-style-type: none"> · Reviewed but unchanged
Plan review and revision	<ul style="list-style-type: none"> · Chapter 9 	<ul style="list-style-type: none"> · Revision interval changed to 10 years · General framework for future revision described
8 – Public Participation		
Plan development	<ul style="list-style-type: none"> · Chapter 7, Sections 7.3-7.4 	<ul style="list-style-type: none"> · More extensive use of SDGFP website; did not use Advisory Group method for revision
Public attitude survey	<ul style="list-style-type: none"> · Chapter 7, Section 7.5 	<ul style="list-style-type: none"> · Conducted attitude survey to continue understanding public’s attitudes about wildlife and native habitats; repeated some question asked during survey conducted during original Plan preparation
Plan implementation	<ul style="list-style-type: none"> · Chapter 7 	<ul style="list-style-type: none"> · More extensive use of SDGFP website during revision and subsequent implementation planned
Plan review and revision	<ul style="list-style-type: none"> · Chapter 9 · Appendix W (public comments and SDGFP responses/resolutions) 	<ul style="list-style-type: none"> · More extensive use of SDGFP website during revision and subsequent implementation planned