Addendum 1. Modified components of South Dakota Wildlife Action Plan as part of minor revision of 2022 to add species of greatest conservation need.

Location in 2014 Plan	Modified item	Addendum page number
Chapter 2, pages 10-16	Table 2-1. List of species of greatest conservation need as updated for the 2014 South Dakota Wildlife Action Plan. Amended during 2022 Minor Revision, with new species highlighted.	3
Chapter 5, pages 115-119	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 project strategy used in the South Dakota Wildlife Action Plan to improve or maintain habitat for a respective species. Amended during 2022 Minor Revision, with new species highlighted.	13
Chapter 5, pages 121-127	Table 5-5. Expected effects of climate change on native ecosystems and habitat of terrestrial and riparian-wetland animal species of greatest conservation need in South Dakota and suggested mitigation actions where possible impacts are identified. Amended during 2022 Minor Revision to add three new species (highlighted).	18
Appendix C, pages 212-325	Appendix C: Species profiles for species of greatest conservation need. New species are highlighted, and species profiles follow.	28
Appendix D, pages 326-328	Appendix D. Species codes used in Wildlife Action Plan. New species and codes are highlighted.	138
Appendix G, pages 374-377	Appendix G. Species-level research and survey needs identified during South Dakota Wildlife Action Plan revision to address conservation challenges. Amended during 2022 Minor Revision with new species where appropriate, highlighted in table.	143
Appendix H, pages 378-382	Appendix H. Species-level research and survey needs identified during the South Dakota Wildlife Action Plan revision by habitat types or geographical areas. Amended during 2022 Minor Revision with new species where appropriate, highlighted in table.	151
Appendix I, pages 383-403	Appendix I. Species-level research and survey needs identified during South Dakota Wildlife Action Plan revision for terrestrial animal species groups. Amended during 2022 Minor Revision with new species where appropriate, highlighted in table.	164

Appendix J, pages 404-424	Appendix J. Species-level research and survey needs identified during the South Dakota Wildlife Action Plan revision for aquatic species groups. Amended during 2022 Minor Revision with new species where appropriate highlighted in table.	196
Appendix J2 (new to the 2022 minor revision)	Appendix J2. Species-level research and survey needs identified during 2022 Minor Revision for plant species of greatest conservation need. (This is a new table. The full table is highlighted to be consistent with other portions of this minor revision)	216
Appendix K, pages 425-428	Species-level species- or habitat-specific restoration needs. Amended during 2022 Minor Revision with new species where appropriate highlighted in table.	220

Table 2-1. List of species of greatest conservation need as updated for the 2014 South Dakota Wildlife Action Plan and previously amended during 2018 Minor Revision, with new species highlighted from 2022 Minor Revision.

Common Name	Scientific Name	Federal Status[a]	State Status[b]	Global Rank[c]	State Rank[d]	2006 SGCN[e]	2006 Eval.[f]	2014 SGCN[g]	2014 Eval.[h]	2022 SGCN[i]	2022 Eval[j]
BIRDS											
American Dipper	*Cinclus mexicanus*		T	G5	S2	Y	1	Y	1		
American Three-toed Woodpecker	*Picoides dorsalis*			G5	S2	Y	3	Y	3		
American White Pelican	*Pelecanus erythrorhynchos*			G4	S2	Y	2	Y	2b		
Baird's Sparrow	*Ammodramus bairdii*			G4	S2	Y	2	Y	2a		
Bald Eagle	*Haliaeetus leucocephalus*			G5	S4	Y	1	Y	1		
Black Tern	*Chlidonias niger*			G4	S3	Y	2	Y	2a		
Black-billed Cuckoo	*Coccyzus erythrophthalmus*			G5	S4	N		N		Y	3
Black-billed Magpie	*Pica hudsonia*			G5	S4	N		N		Y	3
Black-backed Woodpecker	*Picoides arcticus*			G5	S2	Y	3	Y	3		
Bobolink	*Dolichonyx oryzivorus*			G5	S4	N		N		Y	2b
Burrowing Owl	*Athene cunicularia*			G4	S3	Y	3	Y	3		
Chestnut-collared Longspur	*Calcarius ornatus*			G5	S4	Y	2	Y	2a		
Chimney Swift	*Chaetura pelagica*			G4	S4	N		N		Y	3
Clark's Grebe	*Aechmophorus clarkii*			G5	S2					Y	3
Ferruginous Hawk	*Buteo regalis*			G4	S3	Y	3	Y	3		
Golden Eagle	*Aquila chrysaetos*			G5	S3	N		Yes	3		
Grasshopper Sparrow	*Ammodramus savannarum*			G5	S4	N		N		Y	2b
Greater Prairie-Chicken	*Tympanuchus cupido*			G4	S4	Y	2	Y	2a		

Greater Sage-Grouse	*Centrocercus urophasianus*			G3	S2	Y	3	Y	3		
Lark Bunting	*Calamospiza melanocorys*			G5	S5	Y	2	Y	2a		
Le Conte's Sparrow	*Ammodramus leconteii*			G5	S2	Y	3	Y	3		
Least Tern	*Sternula antillarum*		E	G4	S3	Y	1	Y	1		
Lewis's Woodpecker	*Melanerpes lewis*			G4	S2	Y	3	Y	3		
Loggerhead Shrike	*Lanius ludovicianus*			G4	S3	N		N		Y	3
Long-billed Curlew	*Numenius americanus*			G5	S3	Y	2	Y	2a		
Marbled Godwit	*Limosa fedoa*			G5	S5	Y	2	Y	2a		
Merlin	*Falco columbarius*			G5	S2	N		N		Y	3
Northern Goshawk	*Accipiter gentilis*			G5	S2	Y	3	Y	3		
Osprey	*Pandion haliaetus*		T	G5	S3	Y	1	Y	1		
Peregrine Falcon	*Falco peregrinus*		T	G4	S1	Y	1	Y	1		
Pinyon Jay	*Gymnorhinus cyanocephalus*			G3	S3	N		N		Y	3
Piping Plover	*Charadrius melodus*	T	T	G3	S3	Y	1	Y	1		
Red-headed Woodpecker	*Melanerpes erythrocephalus*			G5	S5	N		N		Y	3
Ruffed Grouse	*Bonasa umbellus*			G5	S4	N		Y	3		
Short-eared Owl	*Asio flammeus*			G5	S3	N		N		Y	3
Sprague's Pipit	*Anthus spragueii*			G3	S2	Y	2	Y	2a		
Trumpeter Swan	*Cygnus buccinator*			G4	S3	Y	2	Y	2b		
White-winged Junco	*Junco hyemalis aikeni*			G5T4	S4	Y	2	Y	2b		
Whooping Crane	*Grus americana*	E	E	G1	S1	Y	1	Y	1		
Willet	*Tringa semipalmata*			G5	S5	Y	2	Y	2b		
Wilson's Phalarope	*Phalaropus tricolor*			G5	S4	Y	2	Y	2b		

MAMMALS											
Black-footed Ferret	*Mustela nigripes*	E	E	G1	S1	Y	1	Y	1		
Black Hills Red Squirrel	*Tamiasciurus hudsonicus dakotensis*			G5TNR	SNR	N		Y	2b		
Eastern Red Bat	*Lasiurus borealis*			G3	S3	N		N		Y	3
Franklin's Ground Squirrel	*Poliocitellus franklinii*			G5	S5	Y	2	Y	3		
Fringe-tailed Myotis	*Myotis thysanodes pahasapensis*			G4T3	S2	Y	2	Y	2a		
Little Brown Myotis	*Myotis lucifugus*			G3	S3	N		N		Y	3
Northern Flying Squirrel	*Glaucomys sabrinus*			G5	S3	Y	2	Y	2b		
Northern Hoary Bat	*Lasiurus cinereus*			G3	S3	N		N		Y	3
Northern Myotis	*Myotis septentrionalis*	T		G2	S2	Y	3	Y	3		
North American River Otter	*Lontra canadensis*			G5	S3	Y	1	Y	1		
Plains Spotted Skunk	*Spilogale putorius interrupta*			G4T4	S3	N		Y	3		
Richardson's Ground Squirrel	*Urocitellus richardsonii*			G5	S5	Y	2	Y	2b		
Silver-haired Bat	*Lasionycteris noctivagans*			G3	S3	N		Y	3		
Swift Fox	*Vulpes velox*		T	G3	S3	Y	1	Y	1		
Tricolored Bat	*Perimyotis subflavus*			G3	SNR	N		N		Y	3
Townsend's Big-eared Bat	*Corynorhinus townsendii*			G4	S2	Y	3	Y	3		
AMPHIBIANS AND REPTILES											
Black Hills Redbelly Snake	*Storeria occipitomaculata pahasapae*			G5T4Q	S3	Y	2	Y	2b		
Great Plains Toad	*Anaxyrus cognatus*			G5	S5	N		N		Y	2a
Blanchard's Cricket Frog	*Acris blanchardi*			G5	S2	Y	3	Y	3		

Cope's Gray Treefrog	*Hyla chrysoscelis*			G5	S2	Y	3	Y	3		
Eastern Hognose Snake	*Heterodon platirhinos*		T	G5	S2	Y	1	Y	1		
Northern False Map Turtle	*Graptemys pseudogeographica pseudogeographica*		T	G5T5	S3	Y	1	Y	1		
Plains Hog-nosed Snake	*Heterodon nasicus*			G5	S5	N		N		Y	2a
Great Plains Earless Lizard	*Holbrookia maculata maculata*			G5	S2	Y	3	Y	3		
Smooth Greensnake	*Opheodrys vernalis*			G5	S3	N		N		Y	3
Lined Snake	*Tropidoclonion lineatum*		E	G5	S2	Y	1	Y	1		
Many-lined Skink	*Plestiodon multivirgatus*			G5	S2	Y	3	Y	3		
Northern Prairie Skink	*Plestiodon septentrionalis septentrionalis*			G5T5	S5	N		N		Y	3
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*			G5	S2	N		Y	3		
Greater Short-horned Lizard	*Phrynosoma hernandesi*			G5	S3	Y	3	Y	3		
Midland Smooth Softshell	*Apalone mutica mutica*			G5	S3	Y	3	Y	3		
Western (Ornate) Box Turtle	*Terrapene ornata ornata*			G5	S3	Y	3	Y	3		
TERRESTRIAL INSECTS											
American Burying Beetle	*Nicrophorus americanus*	T		G3	S2	Y	1	Y	1		
Dakota Skipper	*Hesperia dacotae*	T		G2	S2	Y	2	Y	2a		
Great Plains Tiger Beetle	*Amblycheila cylindriformis*			G4	S1	Y	3	Y	3		
Indian Creek Tiger Beetle	*Cicindela nevadica makosika*			G5T1	S1	N		Y	2a		
Iowa Skipper	*Atrytone arogos iowa*			G3T2	S2	Y	3	Y	3		
Little White Tiger Beetle	*Cicindela lepida*			G3	S1	Y	3	Y	3		

Monarch	*Danaus plexippus*	C		G4	SNR	N		Y	3		
Sandy Tiger Beetle	*Cicindela limbata nympha*			G5T4	S4	N		Y	3		
Ottoe Skipper	*Hesperia ottoe*			G3	S2	Y	2	Y	3		
Pahasapa Fritillary	*Speyeria atlantis pahasapa*			G5T3	S2	Y	2	Y	3		
Poweshiek Skipperling	*Oarisma poweshiek*	E		G1	SX	Y	2	Y	2a		
Regal Fritillary	*Speyeria idalia*			G3	S3	Y	3	Y	2a		
GASTROPODS											
Callused Vertigo	*Vertigo arthuri*			G5	SU	Y	3	Y	3		
Cooper's Rocky Mountainsnail	*Oreohelix strigosa cooperi*			G3	SU	Y	2	Y	2a		
Frigid Ambersnail	*Catinella gelida*			G1	SU	y	3	Y	3		
Mystery Vertigo	*Vertigo paradoxa*			G4	SU	Y	3	Y	3		
FISHES											
Banded Killifish	*Fundulus diaphanus*		E	G5	S1	Y	1	Y	1		
Blacknose Shiner	*Notropis heterolepis*		E	G5	S1	Y	1	Y	1		
Blackside Darter	*Percina maculata*			G5	S3	Y	3	Y	3		
Blue Catfish	*Ictalurus furcatus*			G5	S5	N		N		Y	3
Blue Sucker	*Cycleptus elongatus*			G3	S3	N		Y	3		
Burbot	*Lota lota*			G5	S5	N		N		Y	3
Carmine Shiner	*Notropis percobromus*			G5	S2	Y	3	Y	3		
Central Mudminnow	*Umbra limi*			G5	S1	Y	1	Y	3		
Finescale Dace	*Chrosomus neogaeus*		E	G5	S1	Y	1	Y	1		
Flathead Chub	*Platygobio gracilis*			G5	S5	N		N		Y	2a
Hornyhead Chub	*Nocomis biguttatus*			G5	S3	Y	3	Y	3		
Lake Chub	*Couesius plumbeus*			G5	S1	Y	3	Y	3		

Lake Sturgeon	*Acipenser fulvescens*			G3	S2	N		N		Y	3
Logperch	*Percina caprodes*			G5	S2	Y	3	Y	3		
Longnose Sucker	*Catostomus catostomus*		T	G5	S2	Y	1	Y	1		
Mountain Sucker	*Catostomus platyrhynchus*			G5	S3	Y	3	Y	3		
Northern Pearl Dace	*Margariscus nachtriebi*		T	G5	S2	Y	1	Y	1		
Northern Redbelly Dace	*Chrosomus eos*		T	G5	S3	Y	1	Y	1		
Paddlefish	*Polyodon spathula*			G4	S4	N		N		Y	3
Pallid Sturgeon	*Scaphirhynchus albus*	E	E	G2	S2	Y	1	Y	1		
Plains Topminnow	*Fundulus sciadicus*			G4	S4	N		N		Y	2a
Sauger	*Sander canadensis*			G5	S5	N		N		Y	3
Shovelnose Sturgeon	*Scaphirhynchus platorynchus*	T		G4	S3	N		Y	1		
Sicklefin Chub	*Macrhybopsis meeki*	Under review	E	G3	S1	Y	1	Y	1		
Southern Redbelly Dace	*Chrosomus erythrogaster*			G5	S1	Y	3	Y	3		
Sturgeon Chub	*Macrhybopsis gelida*	Under review	T	G3	S3	Y	1	Y	1		
Topeka Shiner	*Notropis topeka*	E		G3	S3	Y	1	Y	1		
Trout-perch	*Percopsis omiscomaycus*			G5	S2	Y	1	Y	3		
FRESHWATER MUSSELS											
Black Sandshell	*Ligumia recta*			G4	S2	N		N		Y	3
Creek Heelsplitter	*Lasmigona compressa*			G5	S2	Y	3	Y	3		
Elktoe	*Alasmidonta marginata*			G4	S1	Y	3	Y	3		
Flat Floater	*Utterbackiana suborbiculata*			G5	S1	N		N		Y	3
Hickorynut	*Obovaria olivaria*			G4	S1	Y	3	Y	3		
Higgins Eye	*Lampsilis higginsii*	E		G1	S1	Y	1	Y	1		

Mapleleaf	*Quadrula quadrula*			G5	S2	Y	3	Y	3		
Pimpleback	*Quadrula pustulosa*			G5	S2	N		Y	3		
Rock Pocketbook	*Arcidens confragosus*			G4	S1	Y	3	Y	3		
Scaleshell	*Leptodea leptodon*	E		G1	S1	Y	1	Y	1		
Yellow Sandshell	*Lampsilis teres*			G5	S2	N		Y	3		
AQUATIC INSECTS											
Dakota Stone	*Perlesta dakota*			G3	SNR	N		Y	2a; 3		
Dot-winged Baskettail	*Epitheca petechialis*			G4	SNR	N		Y	3		
Elusive Clubtail	*Stylurus notatus*			G3	SNR	N		Y	3		
Extraordinary Bow-legged Minnow Mayfly	*Analetris eximia*			G3	SNR	N		Y	3		
PLANTS											
Autumn Willow	*Salix serissima*			G5	S1	N		N		Y	3
Barr's Milkvetch	*Astragalus barrii*			G3	S3	N		N		Y	2a
Big Sagebrush	*Artemisia cana*			G5	SNR	N		N		Y	3
Blue Cohosh	*Caulophyllum thalictroides*			G5	S3	N		N		Y	3
Colorado Birchleaf Mountain-mahogany	*Cercocarpus montanus*			G5	S3	N		N		Y	3
Compass Plant	*Silphium laciniatum*			G5	S3	N		N		Y	3
Dakota Buckwheat	*Eriogonum visheri*			G3	S3	N		N		Y	2a
Downy Paintbrush (downy painted-cup)	*Castilleja sessiliflora*			G5	SNR	N		N		Y	3
Elegant Sedge	*Carex bella*			G5	S1	N		N		Y	3
Fendler's Whitethorn	*Ceanothus fendleri*			G5	S2	N		N		Y	3
Five-point Bishop’s Cap	*Mitella pentandra*			G5	S1	N		N		Y	3
Kalm's Lobelia	*Lobelia kalmii*			G5	S2	N		N		Y	3

Leedy's Roseroot	*Rhodiola integrifolia* ssp. *leedyi*	T		G5T1	S1	N		N		Y	1
Limber Pine	*Pinus flexilis*			G4	S1	N		N		Y	3
Lodgepole Pine	*Pinus contorta*			G5	S2	N		N		Y	3
Loesel's Twayblade	*Liparis loeselii*			G5	S1	N		N		Y	3
Long-leaved Lousewort	*Pedicularis procera*			G4	S2	N		N		Y	3
Marsh Marigold	*Caltha palustris*			G5	SNR	N		N		Y	3
Mountain Huckleberry	*Vaccinium membranaceum*			G5	S2	N		N		Y	3
Nodding Trillium	*Trillium cernuum*			G5	S2	N		N		Y	3
Prairie Dropseed	*Sporobolus heterolepis*			G5	SNR	N		N		Y	3
Prairie Violet	*Viola pedatifida*			G5	SNR	N		N		Y	3
Rydberg's Twinpod	*Physaria brassicoides*			G5	S3	N		N		Y	2a
Sage Willow	*Salix candida*			G5	S1	N		N		Y	3
Sand Lovegrass	*Eragrostis trichodes*			G5	S4	N		N		Y	3
Silver Sagebrush	*Artemisia tridentata*			G5	SNR	N		N		Y	3
Silver-mounded Candleflower	*Cryptantha cana*			G5	S2	N		N		Y	2a
Small Fringed Gentian	*Gentianopsis procera*			G5	S2	N		N		Y	3
Small White Lady's-slipper	*Cypripedium candidum*			G4	S1	N		N		Y	3
Snow Trillium	*Trillium nivale*			G4	S2	N		N		Y	3
Western Prairie Fringed Orchid	*Platanthera praeclara*	T		G3	SH	N		N		Y	1
Woolly Milkweed	*Asclepias lanuginosa*			G4	S2	N		N		Y	3

[a] Federal Status - E= Endangered, a species in danger of extinction throughout all or a significant portion of its range; T = Threatened, a species likely to become endangered in the foreseeable future; C = Candidate for federal listing

[b] State Status - E= Endangered, a species in danger of extinction throughout all or a significant portion of its range in South Dakota; T = Threatened, a species likely to become endangered in the foreseeable future in South Dakota

[c, d] Global/State Rank Definition (applied rangewide for global rank and statewide for state rank; these may change with new information)

G1 S1 = Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 S2 = Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 S3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 of 100 occurrences.
G4 S4 = Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long term concern.
G5 S5 = Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
GU SU = Possibly in peril, but status uncertain, more information needed.
GH SH = Historically known, may be rediscovered.
GX SX = Believed extinct, historical records only.
GNR SNR = Not yet ranked or not ranked at the state level because species is not monitored by SD Natural Heritage Program
_T = Rank of subspecies or variety
_Q = Taxonomic status is questionable, rank may change with taxonomy
SZ = No definable occurrences for conservation purposes, usually assigned to migrants
SP = Potential exists for occurrence in the state, but no occurrences
SR = Element reported for the state but no persuasive documentation
SA = Accidental or casual
Bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N). Example: Ferruginous Hawk (S3B, SZN) indicates an S3 rank in breeding season and SZ in nonbreeding season.

[e]2006 SGCN - SGCN selected for the 2006 SDWAP; "Y" = Yes, “N” = No

[f]2006 Evaluation – criteria for selection as SGCN in 2006 SDWAP
1 = State or Federal listed species for which the State has a mandate for recovery
2 = Species for which SD represents a significant portion of the species overall range
3 = Species that are indicative of or depend upon a declining or unique habitat in SD

[g]2014 SGCN - SGCN selected for the 2014 SD SDWAP; "Y" = Yes, “N” =No
[h]2014 Evaluation = Criteria for selection as SGCN in 2014 SDWAP revision
[i]2022 Minor Revision – SGCN added; "Y" = Yes, “N” =No
[j]2022 Minor Revision = Criteria for selection as SGCN in 2022 minor revision
1 = State or federally listed species for which the state has a mandate for recovery (listed as threatened or endangered);
2a = Species that are regionally or globally imperiled* and for which South Dakota represents an important portion of their remaining range;
2b = Species that are regionally or globally secure* and for which South Dakota represents an important portion of their remaining range; or
3 = Species with characteristics that make them vulnerable, including any of the following:

- are indicative of or depend on a unique or declining habitat in South Dakota;
- require large home ranges/use multiple habitats;
- depend on large habitat patch sizes;

- depend on an ecological process (such as fire) that no longer operates within the historical range of variation;
- are limited in their ability to recover on their own due to low dispersal ability or low reproductive rates;
- have a highly localized or restricted distribution (endemics); or
- concentrate their populations during some time of the year.

*Based, in part, on NatureServe conservation status ranking: http://www.natureserve.org/explorer/index.htm

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 project strategy used in the South Dakota Wildlife Action Plan to improve or maintain habitat for a respective species. Amended during 2022 Minor Revision, with new species highlighted.

Common Name	Native Ecosystem Diversity Strategy		
	Terrestrial	Riparian-Wetland	Aquatic GAP Strategy
BIRDS			
American Dipper		X	X
American Three-toed Woodpecker	X		
American White Pelican		X	X
Baird's Sparrow	X	X	
Bald Eagle	X	X	X
Black Tern		X	
Black-billed Cuckoo	X	X	
Black-billed Magpie	X	X	
Black-backed Woodpecker	X		
Bobolink	X		
Burrowing Owl	X		
Chestnut-collared Longspur	X		
Chimney Swift	X		
Clark's Grebe		X	
Ferruginous Hawk	X		
Golden Eagle	X		
Grasshopper Sparrow	X		
Greater Prairie-Chicken	X	X	
Greater Sage-Grouse	X	X	
Least Tern		X	
Lark Bunting	X		
Le Conte's Sparrow		X	
Lewis's Woodpecker	X		
Loggerhead Shrike	X		
Long-billed Curlew	X	X	
Marbled Godwit	X	X	
Merlin	X		
Northern Goshawk	X		
Osprey	X	X	X
Pinyon Jay	X		
Piping Plover		X	

Red-headed Woodpecker	X	X	
Ruffed Grouse	X	X	
Short-eared Owl	X		
Sprague's Pipit	X		
Trumpeter Swan		X	X
White-winged Junco	X		
Whooping Crane		X	
Willet	X	X	
Wilson's Phalarope	X	X	
GASTROPODS			
Cooper's Rocky mountainsnail	X	X	
Dakota vertigo	X		
frigid ambersnail	X		
mystery vertigo	X		
AMPHIBIANS AND REPTILES			
Black Hills Redbelly Snake			
Great Plains Toad	X	X	X
Blanchard's Cricket Frog		X	X
Cope's Gray Treefrog		X	X
Eastern Hognose Snake	X	X	
Northern False Map Turtle		X	X
Plains Hog-nosed Snake	X	X	
Great Plains Earless Lizard	X	X	
Smooth Greensnake	X	X	
Lined Snake	X		
Many-lined Skink	X		
Northern Prairie Skink	X	X	
Northern Sagebrush Lizard	X		
Greater Short-horned Lizard	X		
Midland Smooth Softshell		X	X
Western (Ornate) Box Turtle	X		
MAMMALS			
Black Hills Red Squirrel	X		
Eastern Red Bat	X	X	
Franklin's Ground Squirrel	X		
Fringe-tailed Myotis	X	X	
Little Brown Myotis	X	X	
Northern Flying Squirrel	X	X	
Northern Hoary Bat	X	X	

Northern Myotis	X	X	
Northern River Otter		X	X
Plains (Eastern) Spotted Skunk	X		
Richardson's Ground Squirrel	X		
Silver-haired Bat	X	X	
Swift Fox	X		
Tricolored Bat	X	X	
Townsend's Big-eared Bat	X	X	
TERRESTRIAL INSECTS			
American Burying Beetle	X	X	
Dakota Skipper	X		
Great Plains Tiger Beetle	X		
Indian Creek Tiger Beetle		X	X
Iowa Skipper	X		
Little White Tiger Beetle	X	X	
Monarch	X		
Northern Sandy Tiger Beetle	X		
Ottoe Skipper	X		
Pahasapa Fritillary	X	X	
Poweshiek Skipperling	X		
Regal Fritillary	X		
AQUATIC INSECTS			
A Mayfly			X
Dakota Stonefly			X
Dot-winged Baskettail			X
Elusive Clubtail – A Dragonfly			X
FRESHWATER MUSSELS			
Black Sandshell			X
Creek Heelsplitter			X
Elktoe			X
Flat Floater			X
Hickorynut			X
Higgins Eye			X
Mapleleaf			X
Pimpleback			X
Rock Pocketbook			X
Scaleshell			X
Yellow Sandshell			X

FISHES			
Banded Killifish			X
Blacknose Shiner			X
Blackside Darter			X
Blue Catfish			X
Blue Sucker			X
Burbot			X
Carmine Shiner			X
Central Mudminnow			X
Finescale Dace			X
Flathead Chub			X
Hornyhead Chub			X
Lake Chub			X
Lake Sturgeon			X
Logperch			X
Longnose Sucker			X
Mountain Sucker			X
Northern Pearl Dace			X
Northern Redbelly Dace			X
Paddlefish			X
Pallid Sturgeon			X
Plains Topminnow			X
Sauger			X
Shovelnose Sturgeon			X
Sicklefin Chub			X
Southern Redbelly Dace			X
Sturgeon Chub			X
Topeka Shiner			X
Trout-perch			X
PLANTS			
Autumn Willow	X	X	
Barr's Milkvetch	X		
Big Sagebrush	X		
Blue Cohosh	X		
Colorado Birchleaf Mountain-mahogany	X		
Compass Plant	X		
Dakota Buckwheat	X		
Downy Paintbrush	X		
Elegant Sedge	X	X	
Fendler's Whitethorn	X		

Five-point Bishop's Cap	X	X	
Kalm's Lobelia		X	
Leedy's Roseroot	X		
Limber Pine	X		
Lodgepole Pine	X		
Loesel's Twayblade		X	
Long-leaved Lousewort	X		
Marsh Marigold		X	X
Mountain Huckleberry	X		
Nodding Trillium	X	X	
Prairie Dropseed	X		
Prairie Violet	X		
Rydberg's Twinpod	X		
Sage Willow		X	
Sand Lovegrass	X		
Silver Sagebrush	X		
Silver-mounded Candleflower	X		
Small Fringed Gentian	X	X	
Small White Lady's-slipper	X	X	
Snow Trillium	X		
Western Prairie Fringed Orchid	X		
Woolly Milkweed	X		

Table 5-5. Expected effects of climate change on native ecosystems and habitat of terrestrial and riparian-wetland animal species of greatest conservation need in South Dakota and suggested mitigation actions where possible impacts are identified. Amended during 2022 Minor Revision to add species (highlighted).

Common Name	Expected Effects	Reason	Possible Mitigation Actions
American Burying Beetle	Neutral	Soil structure appears to be more important than vegetation structure or composition	Not needed
American Dipper	Positive	In-stream flows may increase with increased winter/spring precipitation, improving early-mid nesting season habitat quality and quantity	Not needed
American Three- toed Woodpecker	Positive	Increasing fire frequency and severity will increase habitat; at least for the short-term	Not needed
American White Pelican	Neutral to negative	Neutral on riverine/lacustrine systems; negative on depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Bald Eagle	Neutral	More closely associated with riverine and lacustrine systems	Not needed
Baird's Sparrow	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Black-backed Woodpecker	Positive	Increasing temperatures will lead to increased fire frequency and severity resulting in more habitat for this species, at least for the short-term	Not needed
Black-billed Cuckoo	Neutral	Habitat diversity likely more important than plant composition or vegetative structure.	Not needed
Black-billed Magpie	Negative	Studies suggest the species has low heat tolerance and is restricted	Known key depressional sites should be individually evaluated for possible mitigation actions

		to the Cold Type Steppe Dry Climate	
Blanchard's Cricket Frog	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Black-footed Ferret	Variable	This species is associated with prairie dog and ground squirrel populations; therefore, effect is dependent on applicable rodent species response	See black-tailed prairie dog, Richardson's ground squirrel, and Franklin's ground squirrel for possible actions
Black Hills Redbelly Snake	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Black Hills Red Squirrel	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Black Tern	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Bobolink	Neutral to positive	Associated with both warm (C4) and cool season (C3) grass dominated conditions.	Not needed
Burrowing Owl	Variable	This species is associated with prairie dog and ground squirrel populations; therefore, climate change effect is dependent on their response	See black-tailed prairie dog, Richardson's ground squirrel, and Franklin's ground squirrel for possible actions
Chestnut-collared Longspur	Positive	Prefers warm season grass (C4) dominated conditions	Not needed

Chimney Swift	Uncertain		
Clark's Grebe	Neutral to negative	Neutral on riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Cope's Gray Treefrog	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Cooper's Rocky Mountainsnail	Negative	Increasing temperatures will lead to increased fire frequency and severity, resulting in less habitat for this species	Forest stands that have the best potential for calcareous soils and future moist forest conditions should be protected
Dakota Skipper	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Dakota Vertigo	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Eastern Hognose Snake	Neutral to negative	Prey base: Neutral on riverine/lacustrine systems; negative on depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Eastern Red Bat	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Ferruginous Hawk	Positive	More closely associated with warm season grass (C4) dominated conditions	Not needed

Franklin's Ground Squirrel	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Frigid Ambersnail	Negative	Increasing temperatures will lead to increased fire frequency and severity, resulting in less habitat for this species	Moist forest stands that are associated with limestone talus should be protected from fire or disturbance
Fringe-tailed Myotis	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Golden Eagle	Positive	More closely associated with warm season (C4) dominated conditions	Not needed
Grasshopper Sparrow	Neutral	Associated with both warm (C4) and cool (C3) season grass dominated conditions	Not needed
Great Plains Earless Lizard	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Great Plains Tiger Beetle	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Great Plains Toad	Neutral to negative	Tolerant of dry conditions but rely on heavy rains during breeding season to create ephemeral wetlands	Known key depressional sites should be individually evaluated for possible mitigation actions
Greater Prairie-Chicken	Neutral	Associated with both warm (C4) and cool (C3) season grass dominated conditions	Not needed
Greater Sage-Grouse	Positive	Prefers warm season grass (C4) and shrub dominated conditions	Not needed
Greater Short-horned Lizard	Positive	Prefers warm season grass (C4) and shrub dominated conditions	Not needed

Indian Creek tiger beetle	Neutral	Increased winter/spring precipitation may reduce impacts to intermittent streams	Not needed
Iowa Skipper	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Lark Bunting	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Long-billed Curlew	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Le Conte's Sparrow	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Least Tern	Neutral to negative	Neutral on riverine/lacustrine systems; negative on depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Lewis's Woodpecker	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Lined Snake	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Little Brown Myotis	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Little White Tiger Beetle	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Loggerhead Shrike	uncertain		

Marbled Godwit	Neutral	Associated with both warm (C4) and cool (C3) season grass dominated conditions	Not needed
Many-lined Skink	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Merlin	Neutral	More closely associated with warm season (C4) dominated conditions	Not needed
Midland Smooth Softshell	Neutral	More closely associated with river systems	Not needed
Monarch	Positive	Milkweeds associated with warm season (C4) dominated conditions	Not needed
Mystery Vertigo	Negative	Increasing temperatures will lead to increased fire frequency and severity, resulting in less habitat	Moist forest stands that are associated with limestone or schist substrates should be protected from fire or disturbance
Northern False Map Turtle	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Northern Flying Squirrel	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Northern Goshawk	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Northern Hoary Bat	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition

Northern Myotis	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
North American River Otter	Neutral	More closely associated with riverine and lacustrine systems	Not needed
Northern Prairie Skink	Negative	Temperature and moisture fluctuations negatively impact physiology and behavior	Maintain and restore existing habitats, augment acreages of intact habitat blocks
Northern Sagebrush Lizard	Positive	Increasing temperatures will lead to drier conditions, sparse vegetation, and increasing blowouts on sandy sites	Not needed
Northern Sandy Tiger Beetle	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Osprey	Neutral	More closely associated with riverine and lacustrine systems	Not needed
Ottoe Skipper	Negative	Prefers cool season grass (C3) dominated conditions or mixed- cool/warm (C4) season conditions	Where possible, select for native warm season (C4) grass species that are taller in stature
Pahasapa Fritillary	Negative	Mid-to late summer depressional systems may be impacted	Known key depressional sites should be individually evaluated for possible mitigation actions; beaver ponds should be encouraged
Peregrine Falcon	Neutral	Associated with both warm (C4) and cool (C3) season grass dominated conditions	Not needed
Pinyon Jay	Negative	Increased wildfire mortality of old growth, seed-producing trees, decreased canopy cover,	Implement forest policy to allow ecosystem restoration based on historical reference conditions

		and susceptibility to disease may reduce current and future habitat.	and climate change adjustments for species composition.
Piping Plover	Neutral	More closely associated with riverine and lacustrine systems	Not needed
Plains Hog-nosed Snake	Neutral to negative	Prey base: Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Plains (Eastern) Spotted Skunk	Neutral	Habitat diversity likely more important than plant composition or vegetative structure.	Not needed
Poweshiek Skipperling	Negative	Prefers cool season grass (C3) dominated conditions	Where possible, select for native warm season (C4) grass species that are taller in stature as well as forbs in the sunflower family
Red-headed Woodpecker	Negative	Increasing fire frequency; forest management policies	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Regal Fritillary	Negative	Prefers cool season grass (C3) dominated conditions	Where possible, select for native warm season (C4) grass species that are taller in stature as well as violets and nectar producing forbs
Richardson's Ground Squirrel	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Ruffed Grouse	Positive	Increasing fires will create better aspen regeneration and multiple age-class conditions, at least for the short-term	Not needed

Short-eared Owl	Neutral	Associated with both warm (C4) and cool (C3) season grass dominated conditions	Not needed
Silver-haired Bat	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Smooth Greensnake	Neutral to negative	Prey base: Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Sprague's Pipit	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
Swift Fox	Positive	Prefers warm season grass (C4)/shrub conditions	Not needed
Townsend's Big-eared Bat	Positive	Forages over warm season grass (C4) and shrub conditions	Not needed
Tricolored Bat	Negative	Increasing fire frequency; forest management policies that do not allow adequate thinning will reduce late seral conditions and large trees in the landscape	In forests, implement policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Trumpeter Swan	Neutral to negative	Neutral on riverine/lacustrine systems; negative on depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions

Western (ornate) Box Turtle	Positive	Prefers warm season grass (C4) dominated conditions	Not needed
White-winged Junco	Negative	Increasing fire frequency; forest management policies	Implement forest policy to allow ecosystem restoration based on historical reference conditions and climate change adjustments for species composition
Whooping Crane	Neutral	Prefers riverine systems	Not needed
Willet	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions
Wilson's Phalarope	Neutral to negative	Neutral for riverine/lacustrine systems; negative for depressional systems	Known key depressional sites should be individually evaluated for possible mitigation actions

Appendix C: Species profiles for species of greatest conservation need. Species added during 2022 Minor Revision are highlighted, and species profiles follow.

Terrestrial Species of Greatest Conservation Need

Information on each species can be found in the order listed.

Birds
American Dipper
American Three-toed Woodpecker
American White Pelican
Baird's Sparrow
Bald Eagle
Black Tern
Black-billed Cuckoo
Black-billed Magpie
Black-backed Woodpecker
Bobolink
Burrowing Owl
Chimney Swift
Clark's Grebe
Chestnut-collared Longspur
Ferruginous Hawk
Golden Eagle
Grasshopper Sparrow
Greater Prairie-Chicken
Greater Sage-Grouse
Lark Bunting
Le Conte's Sparrow
Least Tern
Lewis's Woodpecker
Loggerhead Shrike
Long-billed Curlew
Marbled Godwit
Merlin
Northern Goshawk
Osprey
Peregrine Falcon
Pinyon Jay
Piping Plover
Red-headed Woodpecker
Ruffed Grouse
Short-eared Owl
Sprague's Pipit
Trumpeter Swan
White-winged Junco
Whooping Crane
Willet
Wilson's Phalarope

Mammals
Black-footed Ferret
Black Hills Red Squirrel
Eastern Red Bat
Franklin's Ground Squirrel
Fringe-tailed Myotis
Little Brown Myotis
Northern Flying Squirrel
Northern Hoary Bat
Northern Myotis
Northern River Otter
Richardson's Ground Squirrel
Silver-haired Bat
Tricolored Bat
Swift Fox
Townsend's Big-eared Bat

Amphibians and Reptiles
Black Hills Redbelly Snake
Great Plains Toad
Blanchard's Cricket Frog
Cope's Gray Treefrog
Eastern Hognose Snake
Northern False Map Turtle
Plains Hog-nosed Snake
Great Plains Earless Lizard
Smooth Greensnake
Lined Snake
Many-lined Snake
Northern Prairie Skink
Northern Sagebrush Lizard
Greater Short-horned Lizard
Midland Smooth Softshell
Western (Ornate) Box Turtle

Terrestrial Insects
American Burying Beetle
Dakota Skipper
Great Plains Tiger Beetle
Indian Creek Tiger Beetle
Iowa Skipper
Little White Tiger Beetle

Northern Sandy Tiger Beetle
Ottoe Skipper
Pahasapa Fritillary
Poweshiek Skipperling
Regal Fritillary

Gastropods
Cooper's Rocky Mountainsnail
Dakota Vertigo
Frigid Ambersnail
Mystery Vertigo

Aquatic Species of Greatest Conservation Need

Information on each species can be found in the order listed

Fishes
Banded Killifish
Blacknose Shiner
Blackside Darter
Blue Catfish
Blue Sucker
Burbot
Carmine Shiner
Central Mudminnow
Finescale Dace
Flathead Chub
Hornyhead Chub
Hornyhead Chub
Lake Chub
Lake Sturgeon
Logperch
Longnose Sucker
Mountain Sucker
Northern Pearl Dace
Northern Redbelly Dace
Paddlefish
Pallid Sturgeon
Plains Topminnow
Sauger
Shovelnose Sturgeon
Sicklefin Chub
Southern Redbelly Dace
Sturgeon Chub
Topeka Shiner
Trout-perch

Freshwater Mussels
Black Sandshell
Creek Heelsplitter
Elktoe
Flat Floater
Hickorynut
Higgins Eye
Mapleleaf
Pimpleback
Rock Pocketbook
Scaleshell
Yellow Sandshell

Aquatic Insects
Analetris eximia (A Mayfly)
Dakota Stonefly
Dot-winged Baskettail
Elusive Clubtail

Plant Species of Greatest Conservation Need

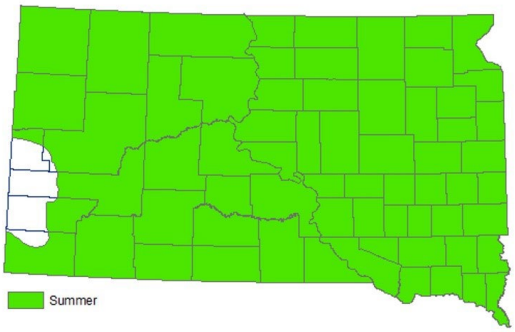
Information on each species can be found in the order listed

Autumn Willow
Barr's Milkvetch
Big Sagebrush
Blue Cohosh
Colorado Birchleaf Mountain-mahogany
Compass Plant
Dakota Buckwheat
Downy Paintbrush
Elegant Sedge
Fendler's Whitethorn
Five-point Bishop's Cap
Kalm's Lobelia
Leedy's Roseroot
Limber Pine
Lodgepole Pine
Loesel's Twayblade
Long-leave Lousewort
Marsh Marigold
Mountain Huckleberry
Nodding Trillium
Prairie Dropseed
Prairie Violet
Rydberg's Twinpod
Sage Willow
Sand Lovegrass
Silver Sagebrush
Silver-mounded Candleflower
Small Fringed Gentian
Small White Lady's-slipper
Snow Trillium
Western Prairie Fringed Orchid
Woolly Milkweed

Description: Slender, long-tailed bird with a red eye ring, long black bill and hunchbacked appearance. Secretive bird that can remain perched motionless for long periods of time.

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S4 (Apparently Secure)



Distribution: Found statewide except for the Black Hills during the breeding season. The second SD Breeding Bird Atlas observed a decline in the species east of the Missouri River compared to the first atlas.

Key Habitat: Dense deciduous shelterbelts and woods, thickets, and shrubs. Also uses riparian areas and wooded areas of neighborhoods and farmstead. Black-billed Cuckoos consume a variety of large insects but strongly prefer caterpillars.

Conservation Challenges:

- Degradation or removal of riparian habitat.
- The species secretive nature makes it difficult to detect during monitoring surveys.
- Pesticide use reducing insect food base.

Conservation Actions:

- Work with agencies, landowners, and industry to reduce pesticide use near habitat and limit or exclude grazing in riparian areas.

Current Monitoring & Inventory Programs (Appendix E):

- North American Breeding Bird Survey

SWG Accomplishments:

- South Dakota Breeding Bird Atlas 2 (T-41)

Priority Research & Monitoring Needs (Appendices G-K):

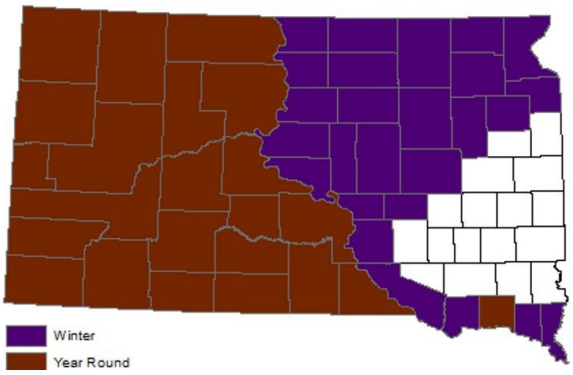
- Develop and implement monitoring protocol to obtain more information on breeding, distribution and population status and trends.
- Determine effects of pesticide use on prey.

Additional Information: SD Wildlife Action Plan criterion 3. This species is listed as a SGCN in North Dakota, Nebraska, Minnesota, and Wyoming. It is also listed by the Midwest Landscape Initiative as a Midwest Species of Greatest Conservation Need. Black-billed Cuckoos are highly dependent on caterpillars as a food resource, which are being negatively impacted by increased pesticide use.

Description: Flashy jay-like bird with a long tail and heavy bill. Primarily black and white in color with wings and tail shining with a blue-green iridescence. Will gather in large numbers to feed on carrion.

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S4 (Apparently Secure)



Distribution: Year-round residents of South Dakota, primarily in the western quarter of the state. Most abundant in the southern Black Hills and the Pine Ridge Escarpment in Oglala Lakota and Bennett counties.

Key Habitat: Open areas with isolated stands of trees or large shrubs, woodlands, grasslands, and riparian woodlands. Nests in dense thickets in trees and shrubs. Abandoned nests are often reused by other species including Merlin.

Conservation Challenges:

- West Nile Virus may be a major factor causing population declines.
- Use of topical insecticides on livestock may be negatively impacting the birds which will glean insects from cattle.
- As a scavenger species, may be susceptible to intentional and unintentional poisoning from food sources.

Conservation Actions:

- Work with agencies and landowners to reduce insecticide use.

Current Monitoring & Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Christmas Bird Count

SWG Accomplishments:

- South Dakota Breeding Bird Atlas 2 (T-41)

Priority Research & Monitoring Needs (Appendices G-K):

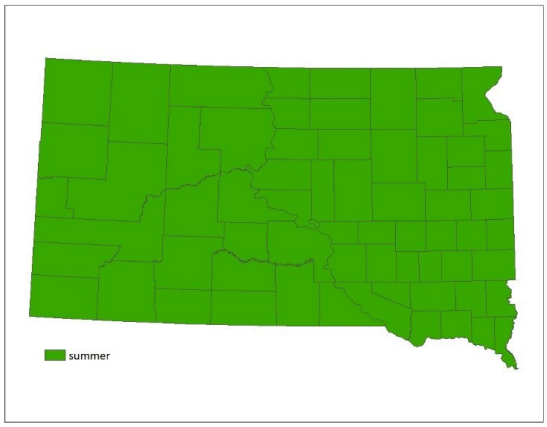
- Monitor population status in the state and investigate causes of population decline.

Additional Information: SD Wildlife Action Plan criterion 3. This species is also listed as a SCGN in Nebraska. Being a scavenger bird make this species highly susceptible to second-hand poisoning through their prey base. The Black-billed Magpie's behavior of gleaning insects from cattle also exposes them to topical insecticides applied to livestock for pest control.

Description: Sexually dimorphic grassland songbird. Breeding male is uniquely black below with white and yellow above; sings a bubbling aerial courtship song. Female and non-breeding male are brownish and sparrow-like.

Protection Status:

- Federal None
- State None
- Global Rank G5 (Secure)
- State Rank S4 (Apparently Secure)



Distribution: Nests in suitable grasslands throughout much of South Dakota; more common east of the Missouri River.

Key Habitats: Variety of grassland types that can provide moderate to tall vegetation height and density: native prairie, meadow, pasture, hayfield, grain fields, and old fields.

Conservation Challenges:

- Grassland, pasture, and hayfield conversion to cropland
- Unfavorable land management including mowing or haying during the nesting season before young have fledged or intensive grazing pressure
- Renewable energy infrastructure
- Invasive woody species

Conservation Actions:

- Restore cropland back to grasslands through programs such as the Conservation Reserve Program
- Maintain and appropriately manage large tracts of existing public grasslands
- Graze and burn in ways that provide preferred vegetative structure
- Delay mowing and haying until after young have fledged
- Limit pesticide use
- Develop and maintain conservation partnerships throughout the range
- Educate about the value of grasslands

Current Monitoring Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Integrated Monitoring in Bird Conservation Regions
- South Dakota Ornithologists' Union (SDOU) Seasonal Bird Observation Report System

SWG Accomplishments:

- South Dakota breeding Bird Atlas 2 (T-41)
- Development of a long-term grassland songbird monitoring program for South Dakota with an emphasis on species of greatest conservation need (T-56)
- Evaluation of the James River Conservation Reserve Enhancement Program in South Dakota (T-59)

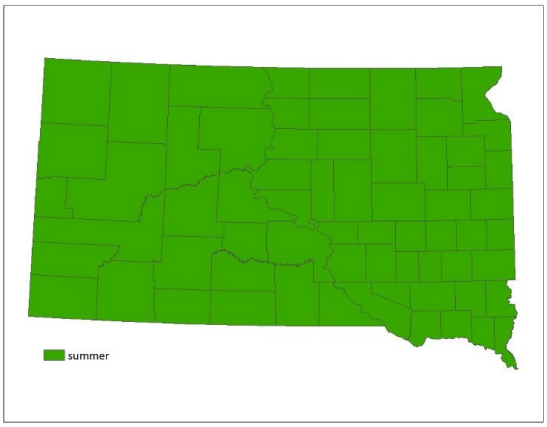
- Upgrade of SDOU's reporting system (T-69)
- Western South Dakota game production area breeding bird inventory and monitoring (T-83)

Priority Research and Monitoring Needs (Appendix G- K):
- Better understanding of life cycle demographics
- Behavior, movements, and concentrations during migration
- Wintering ecology and behavior

Additional Information: South Dakota Wildlife Action Plan criterion 2b. Identified as a Tipping Point Species by the North American Bird Conservation Initiative. These species have lost at least 50% of their breeding population since 1970 and are projected to lose an additional 50% in the next 50 years. Considered a Bird of Conservation Concern by the U. S. Fish and Wildlife Service, a Priority Species by the Prairie Pothole Joint Venture, a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative, and Species of Greatest Conservation Need in Minnesota, Nebraska, North Dakota, and Wyoming.

Existing Recovery Plans and Conservation Strategies Status Reports:
Renfrew, R.B., K.A. Peters, J.R. Herkert, K.R. VanBeek, and T. Will. 2019. A full life cycle conservation plan for Bobolink (*Dolichonyx oryzivorus*). U.S. Fish & Wildlife Service.

Description: Brown, cigar-shaped inhabitant of towns and cities. Observed almost exclusively in flight; wing beats are shallow.



Protection Status:

- Federal none
- State none
- Global Rank G4 (Apparently Secure)
- State Rank S4 (Apparently Secure)

Distribution: Nests throughout South Dakota in suitable habitat; common east of the Missouri River

Key Habitats: Nests almost exclusively in chimneys or other human-made structures with low light. Natural nests placed in caves and hollow trees. Forages for insects while in flight.

Conservation Challenges:

- Loss of natural and artificial nesting habitat through logging of old growth trees and decreasing availability of chimneys as old structures are destroyed, new chimneys are not being constructed or made of materials unsuitable for nesting.
- Chimney cleaning during the nesting season
- Reduced prey availability due to insecticides
- Mortality during migration due to weather extremes

Conservation Actions:

- Preserve or restore existing chimneys and allow access
- Build artificial nesting towers
- Allow nesting in your chimney by removing or not installing chimney caps
- Educate on the importance of chimneys for nesting and as stopover locations during migration

Current Monitoring Inventory Programs (Appendix E) SWG Accomplishments:

- North American Breeding Bird Survey
- South Dakota Ornithologists' Union (SDOU) Seasonal Bird Observation Report System

Priority Research and Monitoring Needs (Appendix G- K):

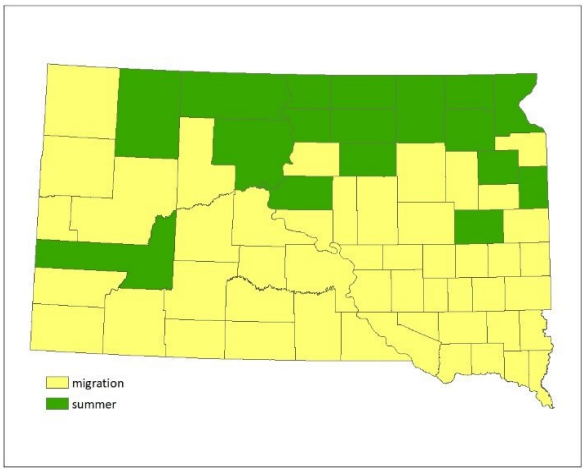
- Many aspects of species ecology, behavior and physiology remain unknown.
- Continue population monitoring through Breeding Bird Survey
- Factors regulating populations, especially the impact of pesticides
- Identify chimneys used for nesting and roosting
- Best design for artificial nesting structures
- Natal dispersal, survival rates of young birds, life-long reproductive rate

Additional Information: South Dakota Wildlife Action Plan criterion 3 - depends on an ecological process that no longer operates within the natural range of variation. Considered a Vulnerable species by the International Union for Conservation of Nature. Identified as a Tipping Point Species by the North American Bird Conservation Initiative. These species have lost at least 50% of their breeding population since 1970 and are projected to lose an additional 50% in the next 50 years. Considered a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative and a Species of Greatest Conservation Need in Minnesota.

Existing Recovery Plans and Conservation Strategies Status Reports:

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2018. COSEWIC assessment and status report on the Chimney Swift *Chaetura pelagica* in Canada 2018. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii+ 63 pp.

Description: Black and white waterbird with a long slender neck and a straight orange bill. White on the face extends above the red eye; amount of white on face used to distinguish from Western Grebe.



Protection Status:

- Federal none
- State none
- Global Rank G5 (Secure)
- State Rank S2 (Imperiled)

Distribution: Breeds primarily in the northeastern corner of the state; less common west of the Missouri River. Migrates statewide.

Key Habitats: Marshes, lakes, and reservoirs with open water to dive for fish and emergent vegetation to protect nesting colonies.

Conservation Challenges:

- Wetland loss and degradation
- Bioaccumulation of environmental contaminants
- Human disturbance at nesting colonies.
- Fluctuating water levels
- Limited prey availability due to winter kill of fish
- Invasive plant species
- Oil spills
- Capture or entanglement on fishing lures, in fishing line and discarded plastics

Conservation Actions:

- Restore and conserve wetlands with suitable habitat
- Improve water quality by reducing contaminant levels
- Educate about appropriate activities near colonial nesting sites or in some instances, protect nesting sites using fencing, postings, etc.

Current Monitoring Inventory Programs (Appendix E):

- North American Breeding Bird Survey

SWG Accomplishments (Appendix F):

- Statewide colonial and semi-colonial waterbird inventory (T-16)
- South Dakota Breeding Bird Atlas 2 (T-41)
- Colonial and semi-colonial waterbird monitoring (T-52)

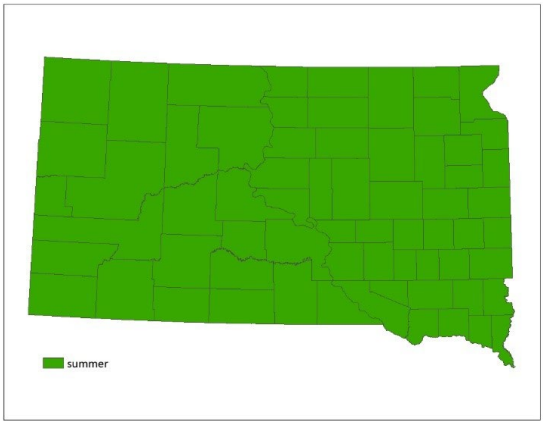
Priority Research and Monitoring Needs (Appendix G- K):

- Continued monitoring of colonial nesting waterbirds
- Identify important nesting sites
- Assess risks to predation and disturbance at colony sites

- Estimate reproduction rates
- Monitor water quality at nesting colonies
- Assess impacts of environmental contaminants and tile drainage on populations

Additional Information: South Dakota Wildlife Action Plan criterion 3 - represents or depends upon a unique or declining habitat. Determined to be a species that has lost at least 50% of its breeding population since 1970 by the North American Bird Conservation Initiative. Ranked as an imperiled breeding species in the state by the Natural Heritage Program. Additional information on the species is needed. Identified as a Species of Greatest Conservation Need in Nebraska and Wyoming.

Description: Small, brown, short-tailed sparrow with a flat head. Buffy chest and white belly are unmarked. Yellow in front of eye and at bend of wing may be visible. Named because of its insect-like song, not its foraging habits.



Protection Status:

- Federal none
- State none
- Global Rank G5 (Secure)
- State Rank S4 (Apparently Secure)

Distribution: Breeder and migrant throughout the state. Abundant in northwestern South Dakota.

Key Habitats: Grasslands with intermediate grass height and density and a moderate to deep litter layer; few if any trees. Prefers large grassland patches.

Conservation Challenges:

- Grassland loss, fragmentation, and degradation
- Land management that does not provide preferred vegetative structure
- Woody vegetation encroachment
- Energy development
- Pesticides

Conservation Actions:

- Burning, haying, or grazing that creates moderate-structure grasslands
- Provide open, grassland areas with preferred vegetative structure that are large enough for breeding and foraging
- Grassland restoration

Current Monitoring Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Integrated Monitoring in Bird Conservation Regions
- South Dakota Ornithologists' Union (SDOU) Seasonal Bird Observation Report System

SWG Accomplishments (Appendix F):

- South Dakota Breeding Bird Atlas 2 (T-41)
- Development of a long-term grassland songbird monitoring program for South Dakota with an emphasis on species of greatest conservation need (T-56)
- Evaluation of the James River Conservation Reserve Enhancement Program in South Dakota (T-59)
- Upgrade of SDOU's reporting system (T-69)
- Western South Dakota game production area breeding bird inventory and monitoring (T-83)

Priority Research and Monitoring Needs (Appendix G- K):

- Demographic information, especially reproductive success
- Function of each Grasshopper Sparrow song

Additional Information: South Dakota Wildlife Action Plan criteria 2b and 3 - depends on large habitat patch sizes or landscapes with large amounts of grassland. Considered a Bird of Conservation Concern by the U. S. Fish and Wildlife Service, a Priority Species by both the Prairie Pothole and Northern Great Plains joint ventures, a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative, and a Species of Greatest Conservation Need in Minnesota and North Dakota. Credible, negative population trend for the South Dakota population based on U. S. Geological Survey Breeding Bird Survey data (1993-2019).

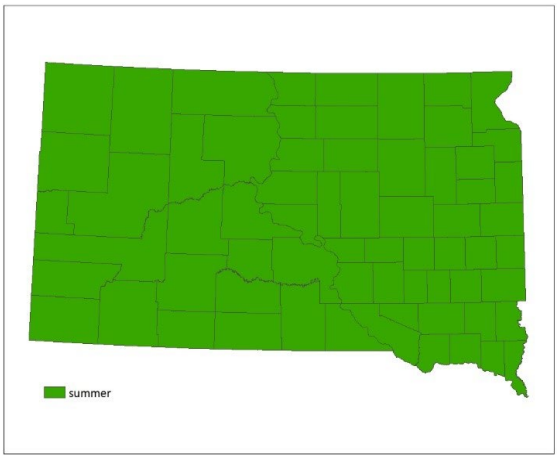
Existing Recovery Plans and Conservation Strategies Status Reports:

Ruth, J.M. 2015. Status Assessment and Conservation Plan for the Grasshopper Sparrow (*Ammodramus savannarum*). Version 1.0 U.S. Fish and Wildlife Service, Lakewood, Colorado. 109 pp.

Description: A large-headed bird that is gray above and white below with a black mask and wings. Bill is short and hooked; used to take a variety of prey (large insects, lizards, small mammals and birds). Impales prey on thorns or barbs.

Protection Status:

- Federal none
- State none
- Global Rank G4 (Apparently Secure)
- State Rank S3 (Vulnerable)



Distribution: Found state-wide in suitable habitat, more common west of the Missouri River. Uncommon migrant. Does not winter in South Dakota.

Key Habitats: Open areas with short vegetation interspersed with trees or shrubs

Conservation Challenges:

- Habitat Loss and degradation
- Pesticides
- Predation
- Limited prey availability
- Vehicle collisions

Conservation Actions:

- Maintain large areas of suitable habitat including areas for nesting, perching, and foraging with adequate prey base
- Limit pesticide use
- Coordinate research efforts to produce comparable results

Current Monitoring Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Integrated Monitoring in Bird Conservation Regions
- South Dakota Ornithologists' Union (SDOU) Seasonal Bird Observation Report System

SWG Accomplishments (Appendix F):

- South Dakota breeding Bird Atlas 2 (T-41)
- Upgrade of SDOU's reporting system (T-69)
- Western South Dakota game production area breeding bird inventory and monitoring (T-83)

Priority Research and Monitoring Needs (Appendix G- K)

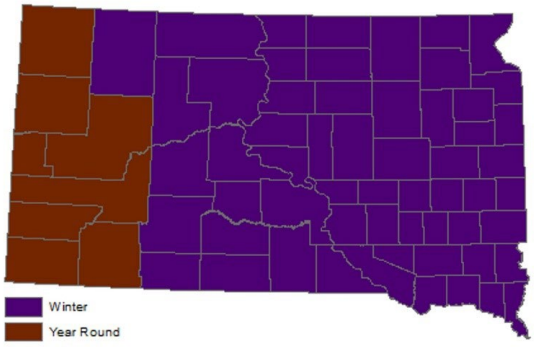
- Determine cause of population decline
- Identify important habitat requirements
- Impact of pesticides, predation, habitat fragmentation
- Evaluate habitat quality including prey availability and foraging success

Additional Information: South Dakota Wildlife Action Plan criterion 3 - represents a unique or declining habitat. Considered Near Threatened by the International Union for Conservation of Nature, a Priority Species by the Northern Great Plains Joint Venture, Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative and Species of Greatest Conservation need in Minnesota, Nebraska, North Dakota, and Wyoming.

Description: Small, stocky falcon with a powerful flight, streaky, dark coloration and lacking the obvious moustache marks characteristic of other falcon species.

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S2 (Imperiled)



Distribution: Merlin breeding occurrence is uncommon to rare in South Dakota, only found in ponderosa pine dominate areas. Considered a rare breeder in the Black Hills, was once a common breeder in the Custer National Forest in Harding County with 44-54 estimated breeding pairs in the 1970s, however during South Dakota's second Breeding Bird Atlas only three pairs were observed. Can be observed throughout the state during the winter months.

Key Habitats: Breeding habitat consists of coniferous or mixed conifer-deciduous stands near grasslands. Does not build its own nest but has been known to reuse abandoned corvid nests. Hunts in open or semi-open areas.

Conservation Challenges:

- Populations appear to be declining in South Dakota but the trends are poorly understood dues to lack of information on nesting locations and reproductive success in the state.
- Disturbance near nest sites, illegal shooting, impacts to prey base.

Conservation Actions:

- Protect nesting sites from human disturbance.

Current Monitoring & Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Christmas Bird Count
- Monitored species in South Dakota Natural Heritage Database
- Inventories of nesting raptors
- Fort Pierre National Grasslands winter raptor surveys

SWG Accomplishments (Appendix F):

- South Dakota Breeding Bird Atlas 2 (T-41)

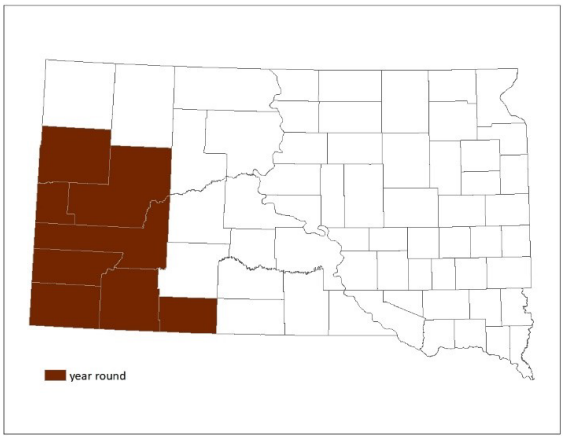
Priority Research & Monitoring Needs (Appendices G-K):

- Research the effects of lead and other contaminants in the ecosystem to raptor populations.
- Identify critical habitats and prey preferences.
- Identify nest sites and monitor breeding success
- Monitor population trends and determine how they are influenced by prey abundance and corvid (Black-billed Magpie) presence for nest site availability.

Additional Information: SD Wildlife Action Plan criterion 3. This species is also listed as an SGCN in Nebraska and Wyoming. Merlin are highly dependent on unoccupied nests constructed by other bird species, particularly Black-billed Magpie in South Dakota, another species experiencing population declines. It also appears that Merlin concentrate their nesting activity in the state primarily to the Custer National Forest region in Harding County.

Description: Extremely social, medium-sized, dusky-blue bird with a white throat; lives in flocks

Protection Status:
- Federal under review
- State none
- Global Rank G3 (Vulnerable)
- State Rank S3 (Vulnerable)



Distribution: A year-round resident with scattered breeding locations in the Black Hills of western South Dakota and southern Pine Ridge Escarpments

Key Habitats: Dry, low elevation Ponderosa Pine woodlands and scrublands interspersed with large amounts of grassland

Conservation Challenges:
- Understudied species
- Habitat loss through management that removes trees, especially those used for nesting or mast-producing individuals, and fire suppression
- Human disturbance at colonial nesting sites

Conservation Actions:
- Identify and protect colonial nesting sites by reducing disturbance through buffers, timing, or avoidance

Current Monitoring Inventory Programs (Appendix E):
- North American Breeding Bird Survey
- Integrated Monitoring in Bird Conservation Regions
- South Dakota Ornithologists' Union (SDOU) Seasonal Bird Observation Report System

SWG Accomplishments (Appendix F):
- South Dakota breeding Bird Atlas 2 (T-41)

Priority Research and Monitoring Needs (Appendix G- K):
- Determine cause of population decline
- Understand habitat requirements for nesting, foraging, and caching
- Study movement and home range
- Estimate productivity, survival, and recruitment
- Investigate the role of land management including tree removal, timber harvest, and fire regimes on population decline

Additional Information: South Dakota Wildlife Action Plan criterion 3 - represents a unique or declining habitat. Considered Vulnerable by the International Union for Conservation of Nature. Identified as a Tipping Point Species by the North American Bird Conservation

Initiative. These species have lost at least 50% of their breeding population since 1970 and are projected to lose an additional 50% in the next 50 years. Identified as a Bird of Conservation Concern by the U. S. Fish and Wildlife Service, and a Species of Greatest Conservation Need in Nebraska. This species has experienced one of the greatest populations declines of any breeding species in the state. Additional information is needed.

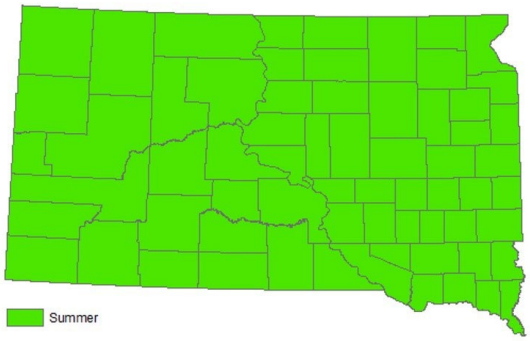
Existing Recovery Plans and Conservation Strategies Status Reports:

Somershoe, S. G., E. Ammon, J. D. Boone, K. Johnson, M. Darr, C. Witt, and E. Duvuvuei. 2020. Conservation Strategy for the Pinyon Jay (*Gymnorhinus cyanocephalus*). Partners in Flight Western Working Group and U.S. Fish and Wildlife Service.

Description: Medium-sized woodpecker with an entirely red head, black back, white belly and white wing patches. One of the most omnivorous woodpeckers, consuming invertebrates, seeds, nuts, and berries.

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S5 (Secure)



Distribution: Found statewide during the breeding season where suitable trees are present for nesting.

Key Habitat: Open deciduous forests with both live and dead large trees. Natural stands of mature deciduous trees in river bottoms and shelterbelts.

Conservation Challenges:

- Loss of standing dead trees required for nesting and food caching due to removal for residential and agricultural development and firewood cutting.
- Loss of mature deciduous forests.
- Increased competition for nest sites from native and non-native bird species.

Conservation Actions:

- Creation or maintenance of snags for nesting and roosting habitat. Work with agencies and landowners to encourage the protection of snags.
- Encourage planting of mast- producing trees such as oak.

Current Monitoring & Inventory Programs (Appendix E):

- North American Breeding Bird Survey

SWG Accomplishments (Appendix F):

- South Dakota Breeding Bird Atlas 2 (T-41)

Priority Research & Monitoring Needs (Appendices G-K):

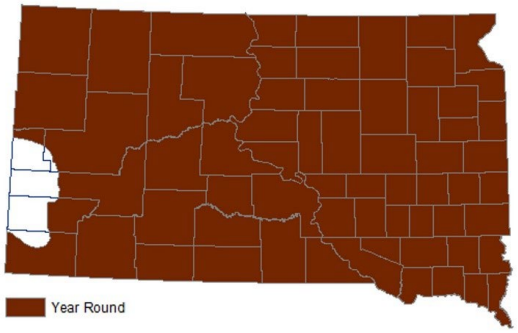
- Monitor population trends and rates of habitat loss and degradation.
- Further identify forest and individual tree structure requirements for breeding habitat.
- Monitor nest success and how it is impacted by competition with other species.

Additional Information: SD Wildlife Action Plan criterion 3. This species is listed as an SCGN in North Dakota, Minnesota, and Iowa. It is also listed by the Midwest Landscape Initiative as a Midwest Species of Greatest Conservation Need. Red-headed Woodpeckers require large, dead trees in open areas for breeding as well as mature forests that provide nut crops. This habitat type has seen a decline due to tree removal for residential and agricultural development.

Description: Medium-sized owl with yellow eyes and small ear tufts. Often diurnal can be observed perched on fence posts or flying over grasslands while hunting.

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S3 (Vulnerable)



Distribution: Found statewide except for the Black Hills in suitable grassland habitats.

Key Habitat: Open grasslands, particularly native prairies. Nest on the ground in uplands. Require large tracts if undisturbed grasslands.

Conservation Challenges:

- This species is considered nomadic, and populations can fluctuate with the abundance of voles, which makes population trends difficult to determine.
- Grassland conversion to croplands is reducing suitable habitat.
- Early haying or mowing destroying nests and young.
- Being a ground nesting bird of open areas, their eggs are highly vulnerable to nest depredation.
- Illegal shooting, poisoning of prey base.

Conservation Actions:

- Work with agencies, landowners and the public to reduce the use of poisons to control prey species and to minimize disturbance in key nesting habitat.
- Reduce livestock grazing intensity in key nesting habitats.

Current Monitoring & Inventory Programs (Appendix E):

- North American Breeding Bird Survey
- Christmas Bird Count

SWG Accomplishments (Appendix F):

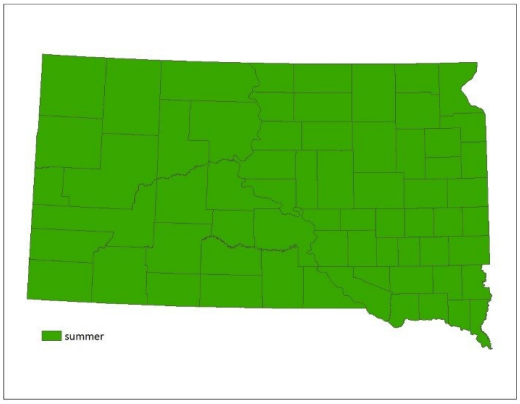
- South Dakota Breeding Bird Atlas 2 (T-41)

Priority Research & Monitoring Needs (Appendices G-K):

- Continue to determine habitat requirements and habitat trends.
- Monitor long-term population trends.
- Determine how management activities affect winter and breeding season prey base.

Additional Information: SD Wildlife Action Plan criterion 3. This species is listed as an SGCN in Iowa, North Dakota, Nebraska, Minnesota, and Wyoming. It is also listed by the Midwest Landscape Initiative as a Midwest Species of Greatest Conservation Need. Short-eared owls are highly dependent on large, uninterrupted tracts of open grasslands for nesting and hunting, making them sensitive to habitat loss.

Description: Medium-sized (4” long) bat with red, orange, or yellow-orange fur and a white shoulder patch



Protection Status:
- Federal none
- State none
- Global Rank G3 (Vulnerable)
- State Rank S3 (Vulnerable)

Distribution: Found throughout South Dakota in appropriate habitat during breeding and migration.

Key Habitats: Wide variety of forested, wooded, and semi-wooded areas.

Conservation Challenges:
- Habitat loss
- Human disturbance
- Wind energy mortality
- Broadcast application of pesticides

Conservation Actions:
- Conservation of riparian areas
- Reduce pesticide use to control important prey species
- Mitigating wind farm mortality

Current Monitoring Inventory Programs (Appendix E):
- North American Bat Monitoring Program
- Monitoring status and trends of Black Hills bats (SDGFP, BatWorks, Wind Cave National Park)

SWG Accomplishments (Appendix F):
- Bat habitat protection and evaluation: implementing and assessing management techniques (T-15)
- Assessment, monitoring, and protection of bat habitats in western South Dakota (T-37)
- Evaluation of artificial bat roost selection and occupancy in South Dakota (T2-8)
- Preliminary investigations into migratory movements of bats in South Dakota (T-49)
- Continued analysis of migratory bat data from South Dakota (T-64)

Priority Research and Monitoring Needs (Appendix G- K):
- Monitor population status and trends
- Reproduction rate, home range, and movement patterns
- Habitat requirements during different life stages including breeding and migration
- Location and use of important habitats during migration
- Better understand how wind energy, pesticide use, and forest management practices in the Black Hills affect populations

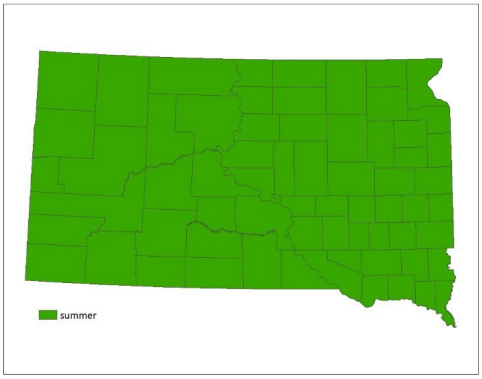
Additional Information: South Dakota Wildlife Action Plan criterion 3 - limited in their ability to recover on their own due to low reproductive rates. Considered a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative and a Species of Greatest Conservation Need in Nebraska and Minnesota.

Existing Recovery Plans and Conservation Strategies Status Reports:

South Dakota Bat Working Group. 2004. South Dakota bat management plan. Wildlife Division Report 2004-08. 89pp.

Tigner, J. and E.D. Stukel, 2003. Bats of the Black Hills: A Description of Status and Conservation Needs. SDGFP. Wildlife Division Report 2003-05.

Description: Little (3.5”) bat that is various shades of dark brown above and light brown below.



Protection Status:

- Federal under review
- State none
- Global Rank G3 (Vulnerable)
- State Rank S3 (Vulnerable)

Distribution: Found throughout South Dakota in appropriate habitat.

Key Habitats: Variable. Habitat must provide roost and foraging sites. Human-made structures that provide warm, dark, and undisturbed areas are commonly used for maternity/nursery roosts, sometimes hollow trees. Hibernacula are found in caves and mines. Forages near water, along the shore or in nearby woodlands.

Conservation Challenges:

- White-nose Syndrome
- Habitat loss
- Human disturbance at maternity/nursery roosts and hibernacula
- Wind energy mortality
- Broadcast application of pesticides

Conservation Actions:

- Conservation of riparian areas
- Reduce pesticides used to control important prey species
- Mitigating wind farm mortality
- Install and maintain bat houses
- Proper exclusion of unwanted roosts from human-made structures that does not result in bat mortality or human-bat interaction
- Educate how to limit or avoid disturbance at hibernacula and maternity/nursery roosts
- Limit the spread of white-nose syndrome

Current Monitoring Inventory Programs (Appendix E):

- North American Bat Monitoring Program
- Monitoring status and trends of Black Hills bats (SDGFP, BatWorks, Wind Cave National Park)

SWG Accomplishments (Appendix F):

- Bat habitat protection and evaluation: implementing and assessing management techniques (T-15)
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Priority Research and Monitoring Needs (Appendix G- K):

- Monitor population status and trends
- Reproduction rate, home range, movement patterns
- Habitat requirements during different life stages including breeding and hibernation
- Better understand how wind energy, pesticide use, white nose syndrome affects populations

Additional Information: Criterion 3 - limited in ability to recover due to low reproductive rates and populations concentrate during multiple times of the year. Considered Endangered by the International Union for Conservation of Nature.

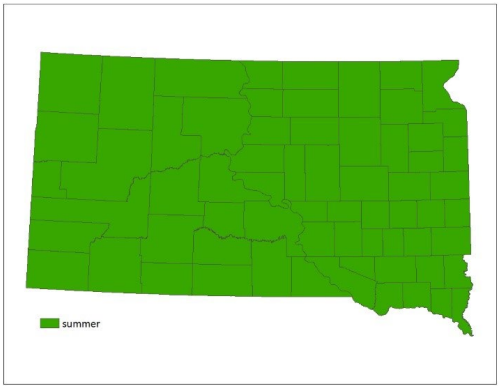
Existing Recovery Plans and Conservation Strategies Status Reports:

COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

South Dakota Bat Working Group. 2004. South Dakota bat management plan. Wildlife Division Report 2004-08. 89 pp.

Tigner, J. and E.D. Stukel, 2003. Bats of the Black Hills: A Description of Status and Conservation Needs. SDGFP. Wildlife Division Report 2003-05.

Description: Large (5-6” long, 16” wingspan), ash-colored bat with a yellow face and shoulder patches



Protection Status:
- Federal none
- State none
- Global Rank G3 (Vulnerable)
- State Rank S3 (Vulnerable)

Distribution: Found throughout South Dakota in appropriate habitat.

Key Habitats: Deciduous or coniferous forests and woodlands; prefers moths, but eats other insects

Conservation Challenges:
- Habitat loss
- Human disturbance
- Wind energy mortality
- Broadcast application of pesticides

Conservation Actions:
- Conservation of riparian areas
- Reduce pesticide use to control important prey species
- Mitigating wind farm mortality

Current Monitoring Inventory Programs (Appendix E):
- North American Bat Monitoring Program
- Monitoring status and trends of Black Hills bats (SDGFP, BatWorks, Wind Cave National Park)

SWG Accomplishments (Appendix F):
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Priority Research and Monitoring Needs (Appendix G- K):
- Monitor population status and trends
- Reproduction rate, home range, movement patterns
- Habitat requirements during different life stages including breeding and migration
- Location and use of important habitats during migration
- Better understand how wind energy, pesticide use, and forest management practices in the Black Hills affect populations

Additional Information: Criterion 3 - limited in ability to recover due to low reproductive rates. Considered a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative and a Species of Greatest Conservation Need in Nebraska and Minnesota.

Existing Recovery Plans and Conservation Strategies Status Reports

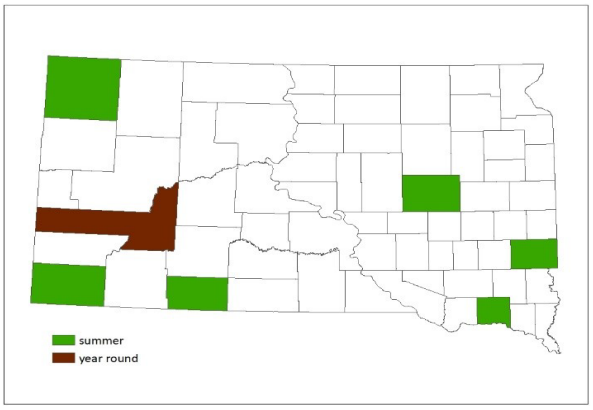
South Dakota Bat Working Group. 2004. South Dakota bat management plan. Wildlife Division Report 2004-08. 89pp.

Tigner, J. and E.D. Stukel, 2003. Bats of the Black Hills: A Description of Status and Conservation Needs. SDGFP. Wildlife Division Report 2003-05.

Description: Small bat; may appear the size of a large moth. Gray, yellow and brown tri-colored hairs give it a yellowish to orange overall appearance.

Protection Status:

- Federal proposed as endangered
- State none
- Global Rank G3 (Vulnerable)
- State Rank SNR (State Not Ranked)



Distribution: Current distribution unknown. First documented in 2003 hibernating in the Black Hills, Pennington County (Geluso et al. 2005). Statewide distribution speculated in suitable habitats such as riparian corridors but not documented. Speculation that distribution occurs statewide in suitable habitats such as riparian corridors is supported by acoustic monitoring (Kempema and Tigner 2015).

Key Habitats: Forested or wooded areas, especially along watercourses. Summer maternity roosts in tree foliage or cavities and human-made structures. Hibernates underground in caves, mines, or tunnels. Roosts singly or in small numbers.

Conservation Challenges:

- White-nose Syndrome
- Mortality from wind turbines; Wind energy mortality
- Human disturbance at maternity/nursery roosts and hibernacula
- Broadcast application of pesticides

Conservation Actions:

- Conservation of riparian areas
- Reduce pesticides used to control important prey species
- Mitigate wind farm mortality
- Proper exclusion of unwanted roosts from human-made structures that does not result in bat mortality or human-bat interaction
- Educate how to limit or avoid disturbance at hibernacula and maternity/nursery roosts
- Limit the spread of white-nose syndrome

Current Monitoring Inventory Programs (Appendix E):

- North American Bat Monitoring Program
- Monitoring status and trends of Black Hills bats (SDGFP, BatWorks, Wind Cave National Park)

SWG Accomplishments (Appendix F):

- Bat habitat protection and evaluation: implementing and assessing management techniques (T-15)

- Assessment, monitoring, and protection of bat habitats in western South Dakota (T-37)
- Evaluation of artificial bat roost selection and occupancy in South Dakota (T2-8)
- Preliminary investigations into migratory movements of bats in South Dakota (T-49)
- Continued analysis of migratory bat data from South Dakota (T-64)

Priority Research and Monitoring Needs (Appendix G- K):

- Monitor population status and trends
- Reproduction rate, home range, movement patterns
- Habitat requirements and use during different life stages including breeding and hibernating
- Better understand how wind energy, pesticide use, and white-nose syndrome affects populations

Additional Information: Criterion 3 - limited in ability to recover due to low reproductive rates. Considered Vulnerable by the International Union for Conservation of Nature, a Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative and a Species of Greatest Conservation Need in Nebraska and Minnesota.

Existing Recovery Plans and Conservation Strategies Status Reports:

COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

South Dakota Bat Working Group. 2004. South Dakota bat management plan. Wildlife Division Report 2004-08. 89 pp.

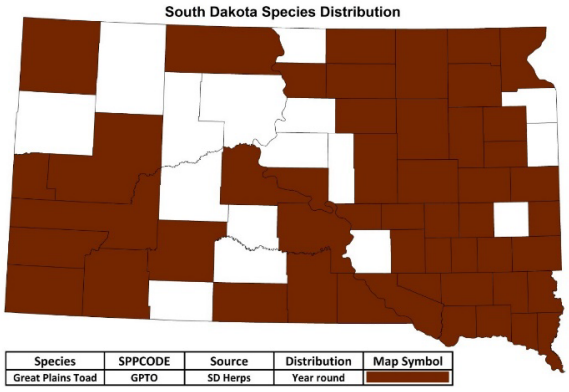
References:

Geluso, K., T. R. Mollhagen, J. M. Tigner, and M. A. Bogan. 2005. Westward expansion of the Eastern pipistrelle (*Pipistrellus subflavus*) in the United States, including new records from New Mexico, South Dakota and Texas. Western North American Naturalist 65:405-409.

Kempema, S. L. F. and J. Tigner. 2018. Initial analysis of migratory bat data from South Dakota. South Dakota Department of Game, Fish and Parks State Wildlife Grant T-64-R-1 Final Report. Pierre, South Dakota. 81 pages.

Description: Large (3–4 inches) toad with large dark green blotches, on the back, outlined in white. They have a white belly typically with a single spot. Males have a dark throat while females have a pale throat. The cranial crests (ridge behind each eye) meet in between the eyes to form a V-shape. Calls are pulsating, metallic trills often lasting 10–50 seconds.

Protection/Population Status:
- Global Rank G5 (secure)
- State Rank S5 (secure)



Distribution: Occurring through the Great Plains from Montana south to Texas and in the desert southwest to California. Potentially, statewide in South Dakota except for high-elevation sites in the Black Hills. Currently, there are state range gaps, particularly in central and northwest South Dakota.

Key Habitats: Typically, underground in burrows within prairies, open grasslands, and agricultural lands. Fishless wetlands for breeding.

Conservation Challenges:
- Understudied species
- Habitat loss, degradation, and fragmentation
- Introduction of fish into formerly fishless areas
- Pesticide use

Conservation Actions:
- Known breeding areas and surrounding prairies/grasslands should be identified and protected particularly from pesticides and fish stocking
- Work with agencies, landowners, and industry to reduce pesticide/herbicide use in habitat and fish stocking.

Research and Monitoring Needs:
- Surveys and monitoring of populations could provide information to better describe population status and current range extent

Additional Information: SD Wildlife Action Plan criterion: 2a. This species has declined throughout its range according to NatureServe. Additionally, it is listed as a SGCN in Minnesota, Wyoming, and Montana. South Dakota is an important portion of their remaining range, particularly due to the potential statewide distribution, which does not occur elsewhere within their range.

Existing Recovery Plans or Status Reports:

Backlund, Doug. 2004. Herpetology surveys for South Dakota Comprehensive Wildlife Conservation Plan. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Davis, Drew R, Christopher E Smith, and Don Becker. 2018. Creating online resources to engage South Dakota citizens in amphibian and reptile identification, distribution, and conservation. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Jessen, Tom. 2005. Herpetological Survey of Eastern South Dakota. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Kerby, Jacob, and Kirsten Wert. 2012. Nocturnal Acoustic Monitoring of Amphibians and Birds on the Niobrara Delta and the 59 Mile Reach of the Missouri River. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Kerby, Jacob, and Spencer Siddons. 2015. Recruitment and training of South Dakotan citizen scientists for FrogWatch USA. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Smith, Brian, and Hugh Quinn. 2012. Threats, management, and suggested harvest and collection policy of herpetofauna of South Dakota. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

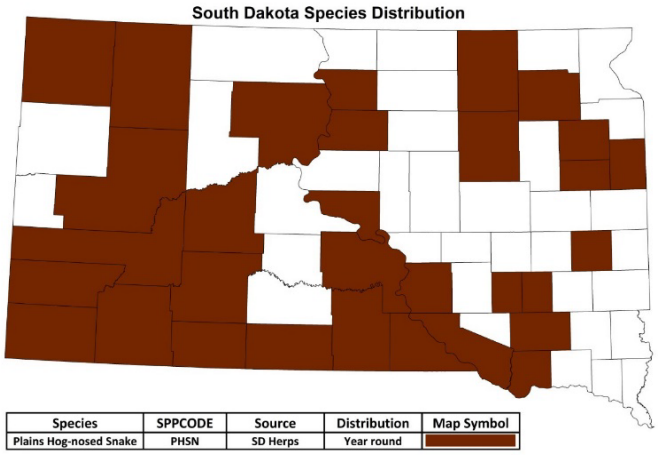
Wilmont, Ron, Mike Baker, Theresa Horton, and Kim Meerdink. 2001. Cricket frog survey – Union County, SD. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Description: Brown or tan with darker blotches on the back and sides with an upturned scale on the nose. The belly and underside of the tail are mostly black, with occasional light patches. It is differentiated from the Eastern Hog-nosed Snake by having black pigment on the underside of its tail (Eastern Hog-nosed Snakes have pigment on the underside of their tail that is lighter than their belly).

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S5 (secure)

Distribution: Occurring throughout the Great Plains from Montana south to Texas, with disjunct populations in South Dakota, Minnesota, Iowa, and Illinois. Found in the western half of South Dakota with disjunct populations in the eastern portion of the state.



Key Habitats: Open, sparsely vegetated habitats on well-drained soils. Dry prairie habitats are preferred, but it may occur near aquatic habitats.

Conservation Challenges:

- Understudied species
- The destruction/disturbance of sand dune habitat by recreationists, commercial and recreational development
- The fragmentation of suitable habitat may hinder interconnectivity of populations
- Pesticide/herbicide ingestion due to primary diet of frogs and toads

Conservation Actions:

- Develop programs and materials to educate the public on appropriate activities near suitable habitat
- Work with agencies and landowners to reduce pesticide and herbicide use near habitat and to maintain open vegetative cover

Research and Monitoring Needs:

- This species would benefit from population surveys and monitoring
- Characterize habitat features of snake hibernacula via GIS modeling and surveying modeled habitat
- Collect genetic data to determine genetic variation among South Dakota populations and compared to populations elsewhere
- Participate in the identification of PARCAs through regional PARC chapters

Additional Information: SD Wildlife Action Plan criterion: 2a. This species is on the MAFWA regional SGCN list due to regional declines. It is currently listed as a SGCN in North Dakota, Wyoming, and Minnesota and Endangered in Iowa. While there are gaps in their distribution within South Dakota, the state remains an important portion of their remaining range.

Existing Recovery Plans or Status Reports:

Backlund, Doug. 2004. Herpetology surveys for South Dakota Comprehensive Wildlife Conservation Plan. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

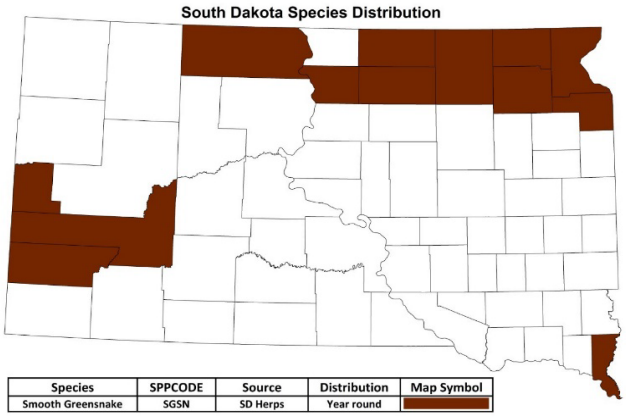
Davis, Drew R, Christopher E Smith, and Don Becker. 2018. Creating online resources to engage South Dakota citizens in amphibian and reptile identification, distribution, and conservation. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Jessen, Tom. 2005. Herpetological Survey of Eastern South Dakota. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Smith, Brian, and Hugh Quinn. 2012. Threats, management, and suggested harvest and collection policy of herpetofauna of South Dakota. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Description: Bright green, occasionally olive-green, snake with pale yellow or white belly that ranges from 12-20 inches in length.

Protection/Population Status:
- Global Rank G5 (secure)
- State Rank S3 (vulnerable)



Distribution: Occurs from Maine south to Virginia and west to Montana with isolated populations in Texas. Increasingly disjunct populations in the western portion of its range, including South Dakota, North Dakota, Iowa, Minnesota, Nebraska, Missouri, and Kansas. In South Dakota, it occurs in northeastern and southeastern South Dakota and in the Black Hills.

Key Habitats: Prefers open grassy areas. However, uses a wide variety of habitats including, grasslands, meadows, woodlands, and urban areas.

Conservation Challenges:
- Understudied species
- Destruction of habitat and hibernacula
- Road mortality, primarily in the Black Hills
- Pesticide exposure due to their insectivorous diet

Conservation Actions:
- Known hibernacula should be protected and monitored
- A collection/bag limit would help protect this species
- Work with agencies, landowners, and industry to reduce pesticide/herbicide use in habitat

Research and Monitoring Needs:
- Surveys and monitoring of populations could provide information to better describe population status and range extent
- Characterize habitat features of snake hibernacula via GIS modeling and surveying modeled habitat
- Participate in the identification of PARCAs through regional PARC chapters

Additional Information: SD Wildlife Action Plan criterion: 3. This species is listed as a SGCN in North Dakota, Wyoming, Montana, Nebraska, Iowa, and Kansas. Additionally, the MAFWA listed it as a regional SGCN. The populations in the Black Hills and northeastern South Dakota were found to be genetically distinct (Smith et al. 2007).

Existing Recovery Plans or Status Reports:

Backlund, Doug. 2004. Herpetology surveys for South Dakota Comprehensive Wildlife Conservation Plan. Final report, South Dakota Department of Game, Fish and Parks Wildlife Division.

Davis, Drew R, Christopher E Smith, and Don Becker. 2018. Creating online resources to engage South Dakota citizens in amphibian and reptile identification, distribution, and conservation. Final report, South Dakota Department of Game, Fish and Parks Wildlife Division.

Massie, Jodi L, Brian Smith, and Hugh Quinn. 2013. Black Hills Redbelly Snake (*Storeria occipitomaculata pahasapae*) and Smooth Greensnake (*Opheodrys vernalis*) activity along roadways near presumed hibernacula. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

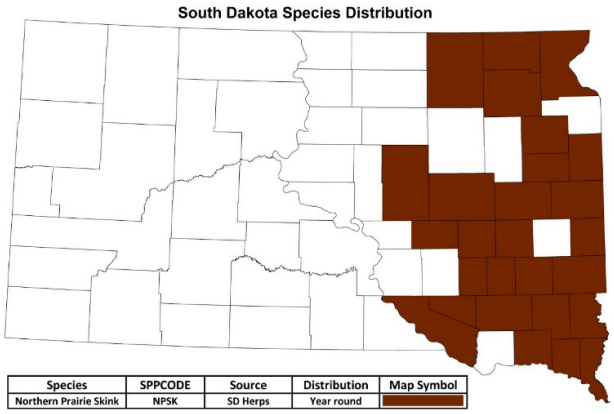
Smith, Brian, and Hugh Quinn. 2012. Threats, management, and suggested harvest and collection policy for. Final report, South Dakota Department of Game, Fish and Parks Wildlife Division.

Smith, Brian, Cynthia Anderson, Shane Sarver, and Laurelin R Cottingham. 2007. Genetic variation in the Smooth Green Snake, *Opheodrys vernalis*, in South Dakota. Final report, Final Report Submitted to the South Dakota Department of Game, Fish, and Parks Wildlife Division.

Description: Medium-sized (4–8 inches) tan lizard with two large dorsolateral black stripes. These black stripes differentiate it from the Many-lined Skink, where these black stripes are absent. During mating season, the males have reddish-orange coloration on their chin and mouth.

Protection/Population Status:

- Global Rank G5T5 (species and subspecies secure)
- State Rank S5 (secure)



Distribution: Regionally endemic species occurring in North Dakota, South Dakota, Nebraska, Minnesota, Iowa, Wisconsin, Missouri, and Kansas. Found in eastern South Dakota.

Key Habitats: Open grasslands, historically tallgrass prairie, with sandy and loose soil to accommodate digging behavior

Conservation Challenges:

- Understudied species
- Fragile sand habitat is at risk of destruction and/or degradation. The fragmentation of suitable habitat could hinder the genetic flow of populations.

Conservation Actions:

- Monitor and inventory current populations
- Prevent overgrowth by shrubs and trees to maintain openness in sand habitats
- Restrict off-road vehicle use on suitable habitat

Research and Monitoring Needs:

- Surveys and monitoring of populations in eastern South Dakota could provide information to better describe population status and range extent

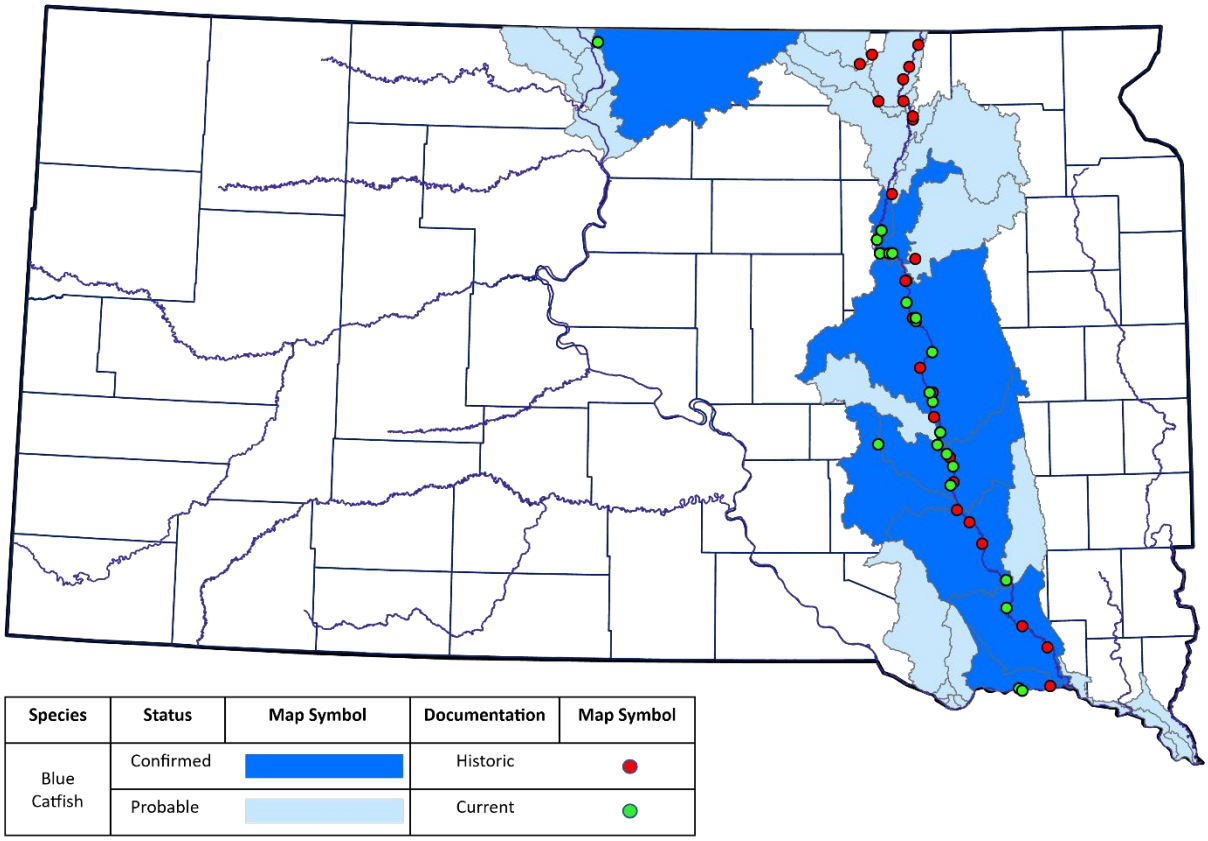
Additional Information: SD Wildlife Action Plan criterion 3. This regionally endemic species is a SGCN in North Dakota and Iowa. Additionally, it is on the MAFWA regional species watchlist. Due to the limited dispersal of an individual, <100m, populations in South Dakota could experience issues with gene flow due to fragmentation of suitable habitat.

Existing Recovery Plans or Status Reports:

Backlund, Doug. 2004. Herpetology surveys for South Dakota Comprehensive Wildlife Conservation Plan. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.

Davis, Drew R, Christopher E Smith, and Don Becker. 2018. Creating online resources to engage South Dakota citizens in amphibian and reptile identification, distribution, and

conservation. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.
Fogel, Dan. 2003. Herp. surveys of several state areas in southeast SD with an emphasis on the lined snake. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.
Jessen, Tom. 2005. Herpetological Survey of Eastern South Dakota. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.
Smith, Brian, and Hugh Quinn. 2012. Threats, management, and suggested harvest and collection policy for. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.



Species	Status	Map Symbol	Documentation	Map Symbol
Blue Catfish	Confirmed		Historic	
	Probable		Current	

Description:

- Deep, robust body with a broad, wedge-shaped head.
- Blueish-silver color, with two sets of chin barbels, and a spine present on the dorsal fin and on each pectoral fin.
- Distal edge of anal fin is straight and tapers towards a deeply forked caudal fin.
- SIMILAR SPECIES: Channel Catfish

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S5 (Secure)

Distribution:

- Eastern SD-James River and the lower Missouri River
- SD is within the northern edge of the range for this species

Key Habitat:

- Prefers large, rivers with deep, swift channels or flowing pools.
- Also inhabit the open waters of large reservoirs, and their tailwaters.

Conservation Challenges:

- Modified flood regime
    - Major hydrologic alterations
    - Permitted discharges
- Ecosystem/habitat conversion or loss
- Ecosystem alteration/habitat degradation
    - Impoundments
    - Dams
    - Water diversion

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)
- Lake and rivers fisheries surveys (SDGFP)
- Lower Missouri River fish surveys (SDGFP, US Army Corps of Engineers, USFWS)

Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

Additional Information:

- Iowa list Blue Catfish as a SGCN.
- SDGFP staff have documented declines, historically Blue Catfish thrived in the southern half of the Missouri River in South Dakota.

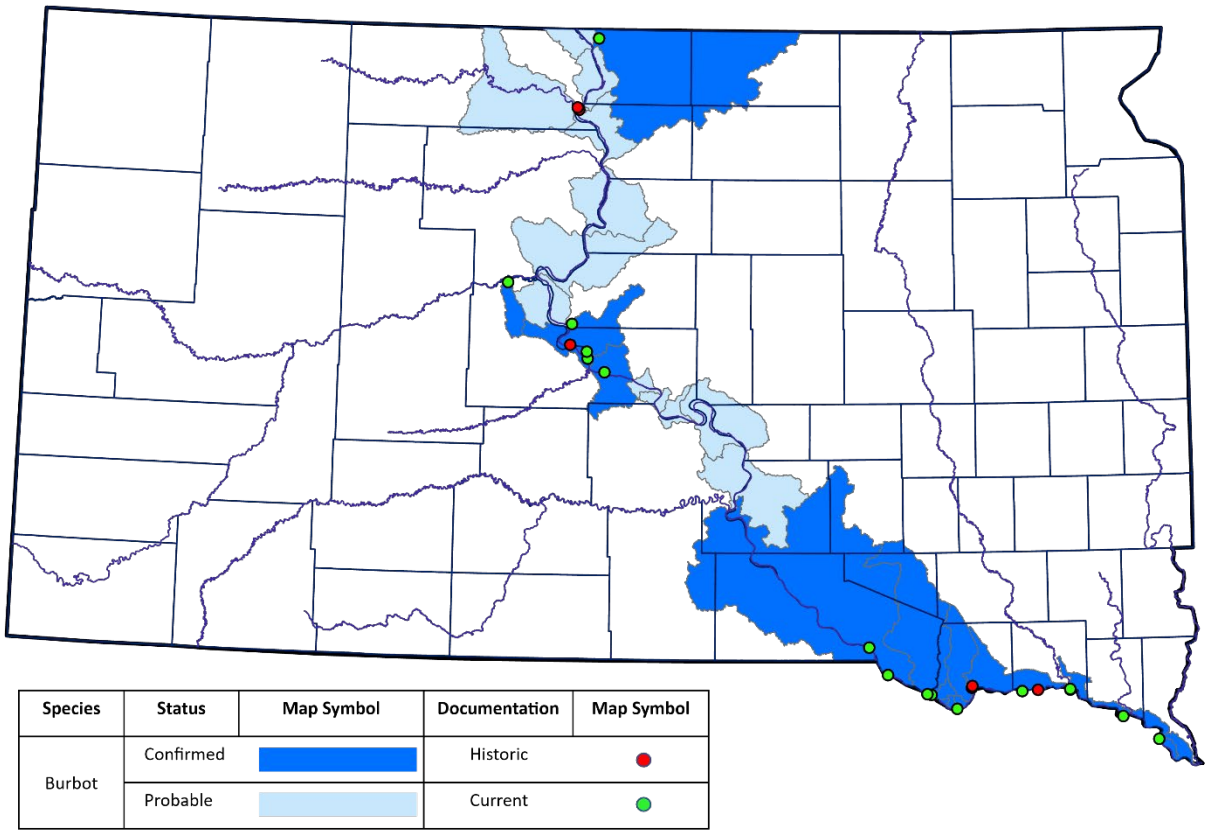
Bailey, R. M. and M. O. Allum. 1962. Fishes of South Dakota. Misc. Publ., Mus. Of Zoology, Univ. of Michigan, No. 119. 131 pp.

Haslouer, S.G., M.E. Eberle, D.R. Edds, K.B. Gido, C.S. Mammoliti, J.R. Triplett, J.T. Collins, D.A. Distler, D.G. Huggins, W.J. Stark. 2005. Current status of native fish species in Kansas. Transactions of the Kansas Academy of Science 108: 32-46.

Hesse, L.W., G.E. Mestl, J.W. Robinson. 1993. Status of selected fishes in the Missouri River in Nebraska with recommendations for their recovery. Nebraska Game and Parks Commission, Staff Research Publications. 22.

Hoagstrom, C.W., C. Hayer, J.G. Kral, S.S. Wall, and C.R. Berry Jr. 2006. Rare and declining fishes of South Dakota: A river drainage scale perspective. Proceedings of the South Dakota Academy of Science 85:171-211.

Glodek, G. S. (1980). *Ictalurus furcatus* (LeSueur) blue catfish. Page 439 in D. S. Lee, et al. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History, Raleigh.
Graham, K. 1999. A review of the biology and management of Blue Catfish. American Fisheries Society Symposium 24:37-49.



Species	Status	Map Symbol	Documentation	Map Symbol
Burbot	Confirmed		Historic	
	Probable		Current	

Description:

- Elongated, eel-like body, brown in color and may be mottled.
- Single chin barbel.
- Two-part, soft dorsal fin, with the first being short and the second being much longer.
- Anal fin long.
- SIMILAR SPECIES: American Eel

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S5 (Secure)

Distribution:

- Central SD-Missouri River basin
- SD is on the southern edge of the range for this species

Key Habitat:

- Prefers cold, deep lakes, reservoirs, and large rivers.
- Often hide within dark crevices under boulders or any other available cover.

Conservation Challenges:

- Modified flood regimes
- Ecosystem/habitat conversion or loss
- Ecosystem alteration/habitat degradation
  - Impoundments
  - Channelization
  - Dredging
- Pollution/pesticides/herbicides

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)

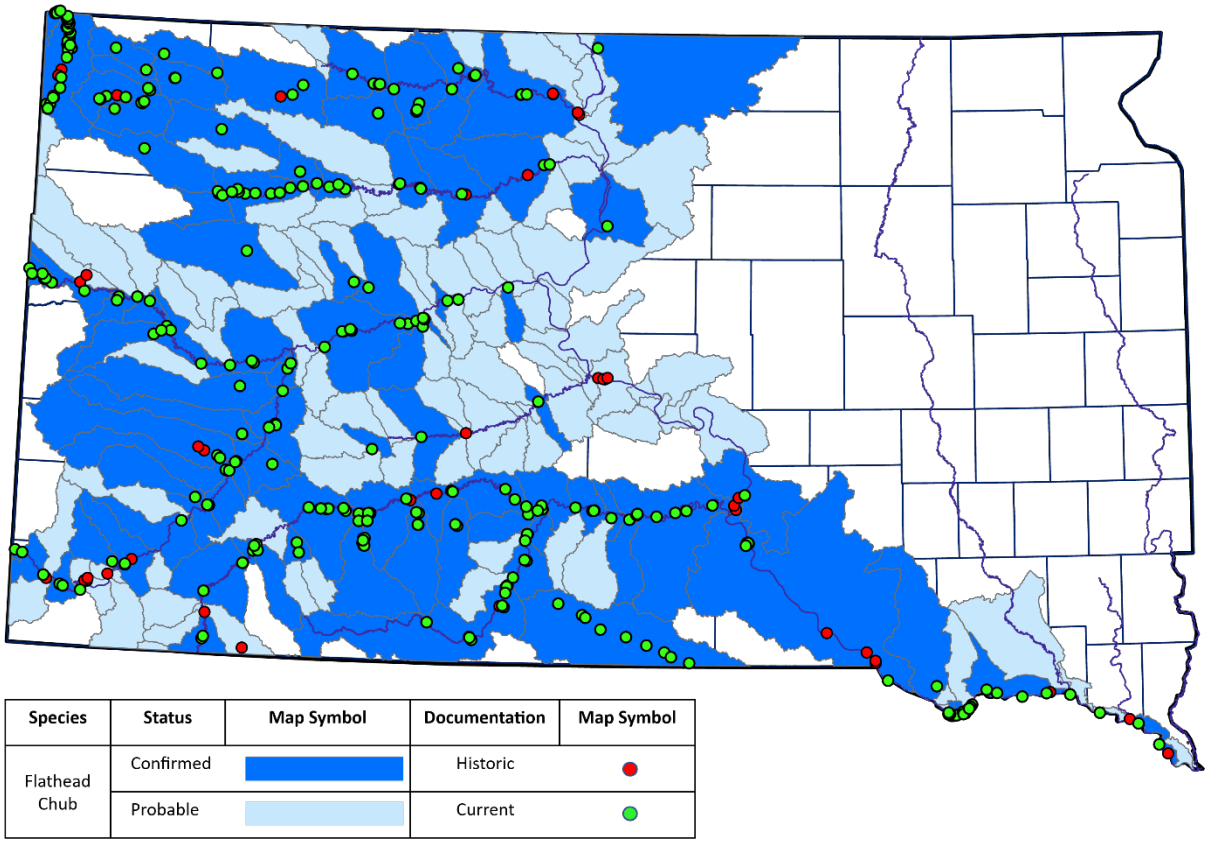
Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Develop standardized protocols for monitoring all life history stages among all habitats
- Evaluate the role of sediment transport & discharge on the creation & maintenance of habitats for all life stages
- Identify critical habitats & limiting factors
- Research seasonal movements
- Climate vulnerability assessment

Additional Information:

- Currently there is no specific monitoring of Burbot in South Dakota.
- Information from the Missouri River and its reservoirs comes from incidental capture during standard surveys.
- More information is needed to assess its status.
- Iowa, Nebraska, North Dakota, Wyoming all list Burbot as a SGCN.

Lewandoski, S. A. 2015. Exploitation of burbot *Lota lota* in the Wind River Drainage, Wyoming. Master's Thesis. Department of Fish and Wildlife Management, Montana State University. Bozeman, Montana.



Species	Status	Map Symbol	Documentation	Map Symbol
Flathead Chub	Confirmed		Historic	
	Probable		Current	

Description:

- A broad, flattened, “wedge-shaped” head with a pointed snout, small eyes, and a mouth barbel at the corners of the mouth.
- Long, pointed, sickle-shaped pectoral fins.
- SIMILAR SPECIES: Plains Minnow, Western Silvery Minnow, Silver Chub, Sicklefin Chub and Sturgeon Chub

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S5 (Secure)

Distribution:

- Western SD-Missouri River and western tributary basins
- SD is on within the center of the range for this species

Key Habitat:

- Prefers large, turbid rivers.
- Prefer moderate to strong currents over sand or silt substrates.

- Also observed in channel border waters that are shallow and with lower water velocities.

Conservation Challenges:

- Exotic/introduced species impacts
- Modified flood regime
    - Major hydrologic alterations
    - Permitted discharges
- Ecosystem/habitat conversion or loss
    - Fragmentation of habitat
- Ecosystem alteration/habitat degradation
    - Impoundments
    - Dams
    - Channelization
    - Water diversion
- Pollution/pesticides/herbicides
- Grazing/Agricultural practices

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)
- Lake and rivers fisheries surveys (SDGFP)
- Lower Missouri River fish surveys (SDGFP, US Army Corps of Engineers, USFWS)

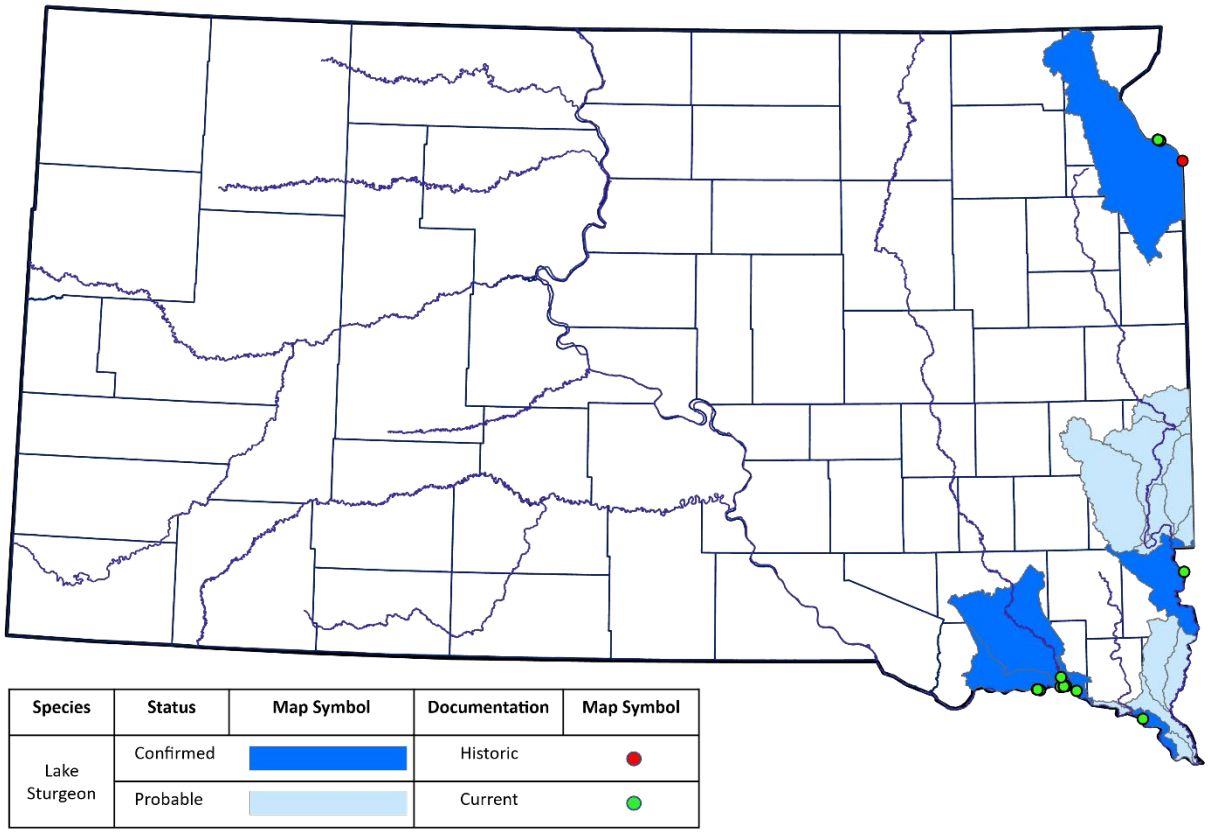
Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

Additional Information:

- Flathead Chub are listed by Midwest Landscape Initiative (MLI) as a Midwest Regional Species of Greatest Conservation Need (RSGCN).
- Minnesota, Iowa, North Dakota, Nebraska, and Wyoming list Flathead Chub as a SGCN.
- The status of Flathead Chub is unknown in SD. Surrounding states have documented declines. In South Dakota, Flathead Chub are a legal bait fish. More information is needed.

Bailey, R. M. and M. O. Allum. 1962. Fishes of South Dakota. Misc. Publ., Mus. Of Zoology, Univ. of Michigan, No. 119. 131 pp.
Fisher, S.J., D.W. Willis, M.M. Olson, and S.C. Krentz. 2002. Flathead Chubs, *Platygobio gracilis*, in the Upper Missouri River: The biology of a species at risk in an endangered habitat. The Canadian Field Naturalist 116: 26-41.
Jones, S.J. 2018. Western prairie stream fisheries: an assessment of past and present fish assemblage structure, biotic homogenization, and population dynamics in western South Dakota streams. Unpublished M.S. Thesis, South Dakota State University, Brookings, South Dakota.
Personal communication with Mark Pegg, University of Nebraska-Lincoln, Lincoln, Nebraska, November 1, 2022.
Steffensen, K.D., D.A. Schumann, S. Stukel. 2014. The status of fishes in the Missouri River, Nebraska: Shoal Chub, Sturgeon Chub, Sicklefin Chub, Silver Chub, Flathead Chub, Plains Minnow, Western Silvery Minnow, and Brassy Minnow. Transactions of the Nebraska Academy of Sciences and affiliated Societies: Winter 12-31.
Walters, D.M., T.E. Zuellig, H.J. Crockett, J.F. Bruce, P.M. Lukacs, and R.M. Fitzpatrick. 2013. Barriers impede upstream spawning migration of flathead chub. Transactions of the American Fisheries Society 143(1) 17-25.



Species	Status	Map Symbol	Documentation	Map Symbol
Lake Sturgeon	Confirmed		Historic	
	Probable		Current	

Description:

- Large, flat bodied fish, wider towards the bottom, with dark olive or gray body.
- Flat, shovel-shaped snout with short, rounded edge.
- Five prominent rows of large bony scutes on top & sides but lacking on belly.
- Bases of barbels without fringe, aligned in a single, straight row.
- A small opening, the spiracle, is present between the eye and the upper corner of the gill cover.
- SIMILAR SPECIES: Pallid Sturgeon and Shovelnose Sturgeon

Protection Status:

- Federal: Candidate
- State: None
- Global rank: G3 (Vulnerable)
- State rank: S2 (Imperiled)

Distribution:

- Eastern SD-Lower Missouri River, free flowing stretches of the Big Sioux River, and Big Stone Lake (Minnesota River drainage) and its tributaries
- SD is on the western edge of the range for this species

Key Habitat:

- Inhabit large rivers and lakes with sand, gravel, or mud substrate.

Conservation Challenges:

- Modified flood regime
- Ecosystem/habitat conversion or loss
    - Fragmentation of habitat
- Ecosystem alteration/habitat degradation
    - Impoundments
    - Dams
    - Channelization
    - Dredging
    - Water diversion
- Pollution/pesticides/herbicides
    - Concentrated Animal Feeding Operations (CAFOS)
    - Agricultural runoff
    - Permitted discharges

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)
- Lake and rivers fisheries surveys (SDGFP)
- Lake Sturgeon stocking/reintroduction program (collaborative effort with Minnesota DNR, SDGFP, and Genoa National Fish Hatchery, Wisconsin).

Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats (spawning habitats) and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

Additional Information:

- Lake Sturgeon are listed by Midwest Landscape Initiative (MLI) as a Midwest Regional Species of Greatest Conservation Need (RSGCN).
- Minnesota, Iowa, and Nebraska list Lake Sturgeon as a SGCN.
- Status of lower Missouri River is unknown and anecdotal at best, Big Stone Lake population was extirpated in 1942 with habitat improvements and reintroduction began in 2014. These efforts are ongoing.

Drauch, A.M., and O.E. Rhodes Jr. 2007. Genetic evaluation of the lake sturgeon reintroduction program in the Mississippi and Missouri rivers. North American Journal of Fisheries Management 27:434-442.

Hayes, D.B. and D.C. Caroffino. 2012. Michigan's Lake Sturgeon Rehabilitation Strategy. Michigan Department of Natural Resources. Fisheries Special Report 62, Lansing, Michigan.

Jensen, M. 2007. Little Minnesota River Watershed/Big Stone Lake Restoration/Continuation Project. Section 319 Nonpoint Source Pollution Control Program, Watershed Project Final Report, Roberts County Conservation District, South Dakota.

Minnesota Department of Natural Resources (MNDNR). 2013. Proposal for reintroduction of lake sturgeon *Acipenser fulvescens* into Big Stone Lake. MNDNR Section of Fisheries, Ortonville, Minnesota.

Schram, S.T., J. Lindgren, and L.M. Evrard. 1999. Reintroduction of lake sturgeon in the St. Louis River, Western Lake Superior. North American Journal of Fisheries Management 19:815-823.

Sevareid, E. 1968. Canoeing with the Cree. Minnesota Historical Society, Reprint Edition, St. Paul, MN.

Stewig, J.D. 2005. A population assessment of lake sturgeon in Lake of the Woods and the Rainy River, 2004. Completion Report, MNDNR, F-29-R(P)-24, Job #706, St. Paul, MN.

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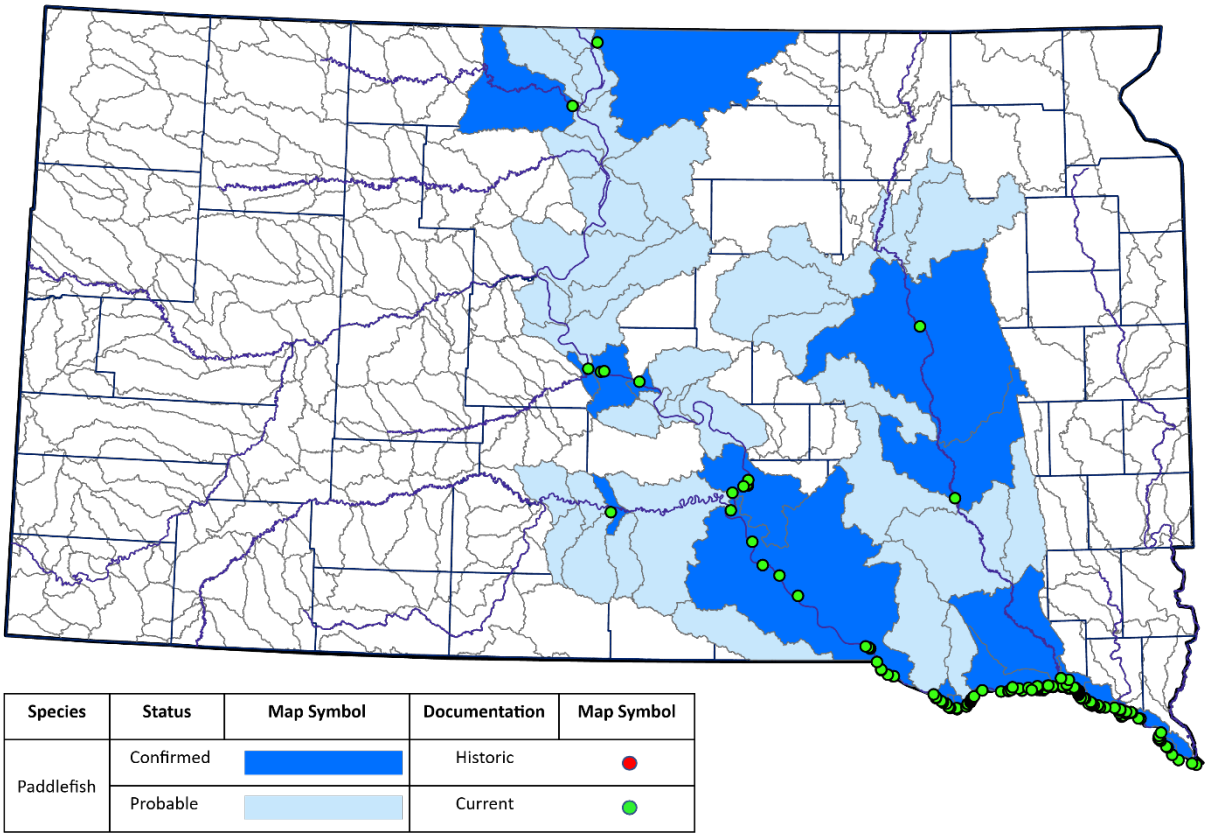

Species	Status	Map Symbol	Documentation	Map Symbol
Paddlefish	Confirmed		Historic	
	Probable		Current	

Description:

- Large, blueish-gray, often mottled, scaleless body, with strongly-forked, heterocercal tail.
- Long, paddle-shaped snout; approximately one-third of adult body length; covered with small sensory pores.
- SIMILAR SPECIES: None

Protection Status:

- Federal: None
- State: None
- Global rank: G4 (Apparently Secure)
- State rank: S4 (Apparently Secure)

Distribution:

- Central SD-Missouri River and James River basins
- SD is on the western edge of the range for this species

Key Habitat:

- Prefers medium to large rivers, reservoirs in open waters near side channels and areas below structures, sandbars, bays, or eddies.
- Present in impounded and free-flowing reaches of the Missouri River.

- Prefers depths greater than five feet.
- Spawn in fast shallow water over gravel bars.

Conservation Challenges:

- Modified flood regime
    - Major hydrologic alterations
    - Permitted discharges
- Ecosystem/habitat conversion or loss
    - Fragmentation of habitat
- Ecosystem alteration/habitat degradation
- Impoundments
    - Dams
    - Channelization
    - Dredging
    - Water diversion
- Pollution/pesticides/herbicides
    - Concentrated Animal Feeding Operations (CAFOs)
    - Agricultural runoff
- Overharvest

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)
- Lake and rivers fisheries surveys (SDGFP)
- Lower Missouri River fish surveys (SDGFP, US Army Corps of Engineers, USFWS)

Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

Additional Information:

- Minnesota, Iowa, North Dakota, Nebraska, and Montana list Paddlefish as a SGCN.
- SDGFP staff have documented declines, historically Paddlefish thrived in the Missouri River, however the impoundment of the Missouri River led to significant declines with several large river species including Paddlefish.

Bailey, R. M. and M. O. Allum. 1962. Fishes of South Dakota. Misc. Publ., Mus. of Zoology, Univ. of Michigan, No. 119. 131 pp.
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Southall, P. D., and W. A. Hubert. 1984. Habitat use by paddlefish in the upper Mississippi River. Transactions of the American Fisheries Society 113:125-131.
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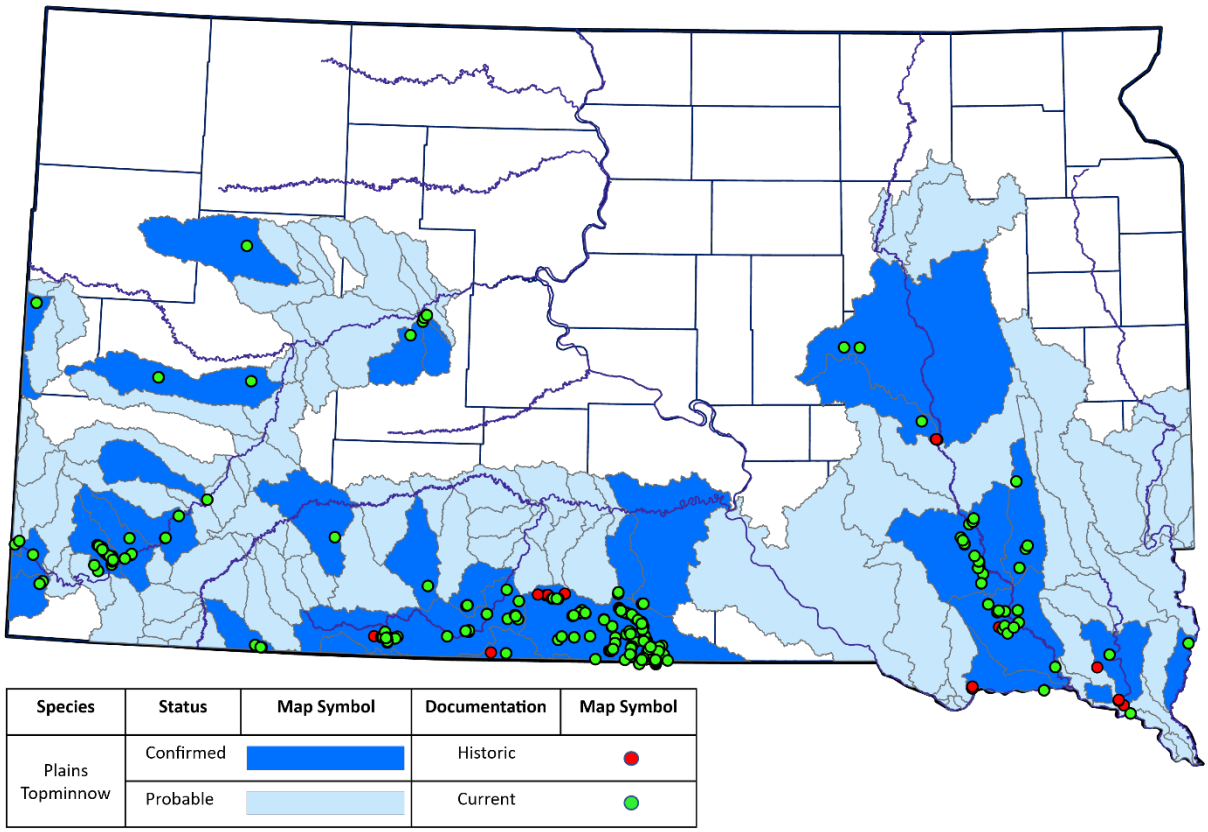
Stancill, W., G. R. Jordan, and C. P. Paukert. 2002. Seasonal migration patterns and site fidelity of adult paddlefish in Lake Francis Case, Missouri River. North American Journal of Fisheries Management 22:815-824.
Wilkinson, T. 1997. Plight of the paddlefish. Wildlife Conservation, March/April, pp. 52-55.



Species	Status	Map Symbol	Documentation	Map Symbol
Plains Topminnow	Confirmed		Historic	
	Probable		Current	

Description:

- Small, stout bodied minnow.
- Dark olive colored body with a prominent gold dorsal stripe anterior of dorsal fin.
- Broad and flattened head with a superior mouth.
- Dorsal and anal fins situated posteriorly and almost parallel to one another.
- Rounded caudal fin.
- SIMILAR SPECIES: Central Mudminnow

Protection Status:

- Federal: None
- State: None
- Global rank: G4 (Apparently Secure)
- State rank: S4 (Apparently Secure)

Distribution:

- Southern SD- tributaries to the James and Vermillion Rivers, Sandhills region, and tributaries to the Cheyenne and White River basins
- SD is on the northern edge of the range for this species

Key Habitat:

- Small, clear streams with groundwater input.

- Backwater areas, pools & dugouts with sand, silt, or mud substrate, and dense submerged and overhanging aquatic vegetation.

Conservation Challenges:

- Exotic/introduced species impacts
- Ecosystem/habitat conversion or loss
    - Urban development
    - Road stream crossings
    - Fragmentation of habitat
- Ecosystem alteration/habitat degradation
    - Impoundments
    - Dams
    - Channelization
    - Water diversion
- Pollution/pesticides/herbicides
- Grazing/Agricultural practices

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Lake and rivers fisheries surveys (SDGFP)
- Topeka Shiner monitoring (SDGFP)

Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

Additional Information:

- Plains Topminnow are listed by Midwest Landscape Initiative (MLI) as a Midwest Regional Species of Greatest Conservation Need (RSGCN).
- Minnesota, Iowa, Nebraska, and Wyoming list Plains Topminnow as a SGCN.
- The status of Plains Topminnow is unknown in SD. Surrounding states have documented declines. More information is needed.

Bailey, R. M. and M. O. Allum. 1962. Fishes of South Dakota. Misc. Publ., Mus. Of Zoology, Univ. of Michigan, No. 119. 131 pp.

Felts. E. 2013. Ecology of glacial relict fishes in South Dakota's Sandhills. M.S. Thesis. South Dakota State University, Brookings, SD. 85 pp.
Felts, Eli A., and Katie N. Bertrand. 2014. Conservation status of five headwater stream specialists in southwestern South Dakota. American Midland Naturalist 172(1): 131-159.
Krause, J.R. 2013. Biotic Integrity and Northern Pike Ecology in Eastern South Dakota. SDSU Master's Thesis. Brookings, SD. Pgs. 83. (2013).
Schumann, D. A. 2017. Measuring aquatic organism responses to grassland restoration: Does the Field of Dreams really exist? PhD Dissertation, South Dakota State University, Brookings.
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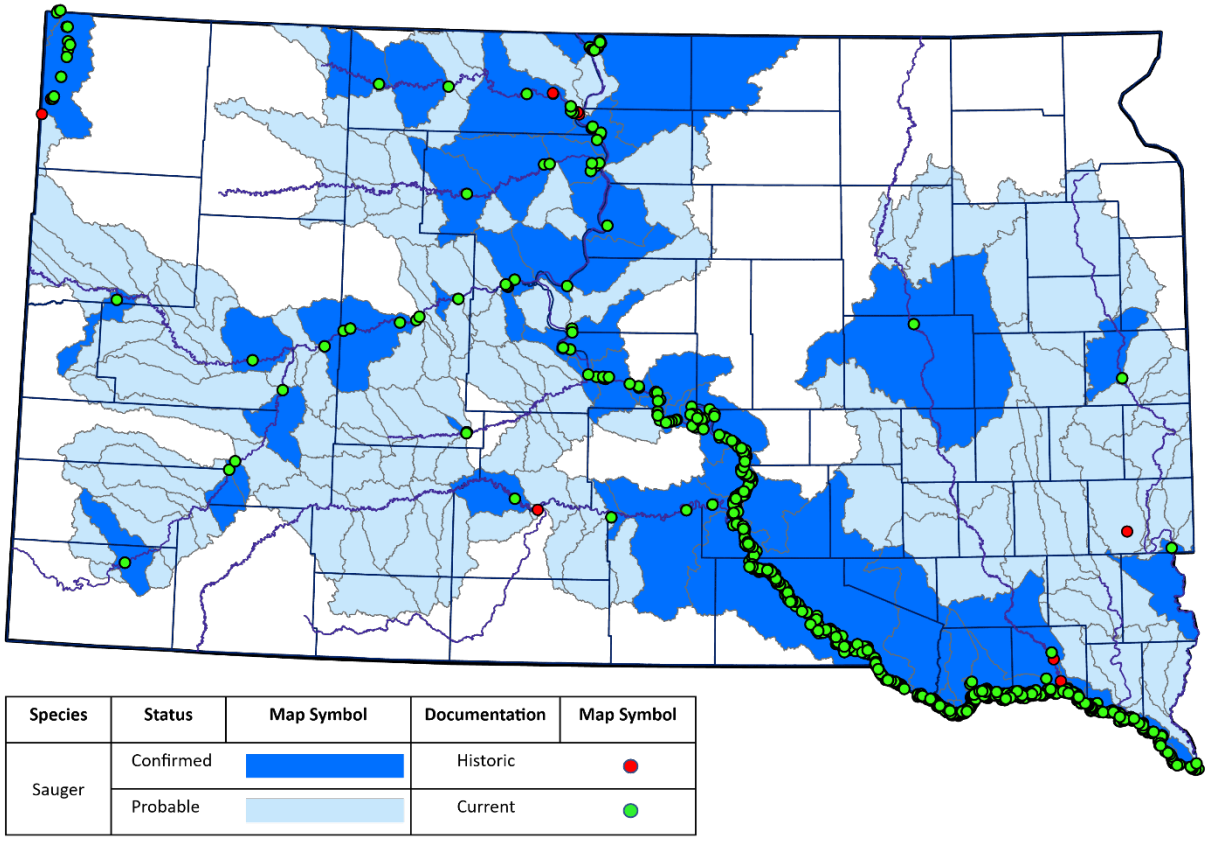
Schumann, D.A., K.N.B. Graeb, J. Pfrimmer, J.D. Stafford, S.R. Chipps. 2021. The local responses of aquatic ecosystems to adjacent grassland conservation: Can streams of dreams exist in a degraded riverscape? Aquatic Conservation: Marine and Freshwater Ecosystems 2021: 1-15.



Species	Status	Map Symbol	Documentation	Map Symbol
Sauger	Confirmed		Historic	
	Probable		Current	

Description:

- Fusiform, slender body, dark gray to brown, with saddles extending down lateral sides.
- Two-part dorsal fin, front with sharp spines and dark spots, second with soft rays
- SIMILAR SPECIES: Walleye

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S5 (Secure)

Distribution:

- Central SD-Missouri River and its tributaries
- SD is within the center of the range for this species

Key Habitat:

- Prefers deep, highly turbid, main channels of large rivers with sand and silt substrates.
- Also inhabit large, shallow lakes.

Conservation Challenges:

- Modified flood regime
  - Major hydrologic alterations
  - Permitted discharges
- Exotic/introduced species impacts
- Ecosystem/habitat conversion or loss
  - Shoreline development
- Ecosystem alteration/habitat degradation
  - Impoundments
  - Dams
  - Water diversion
- Pollution/pesticides/herbicides
  - Agricultural runoff
  - Permitted discharges
- Hybridization with Walleye

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

Current Monitoring & Inventory Programs (Appendix E):

- Missouri River reservoir fisheries surveys (SDGFP)
- Lake and rivers fisheries surveys (SDGFP)
- Lower Missouri River fish surveys (SDGFP, US Army Corps of Engineers, USFWS)

Priority Research & Monitoring Needs (Appendices G-K):

- Develop baseline data & status through monitoring efforts
- Identify critical habitats and limiting factors.
- Determine population dynamics
- Research life history characteristics and feeding habitats.
- Research seasonal movements.
- Research genetic variation.
- Climate vulnerability assessment

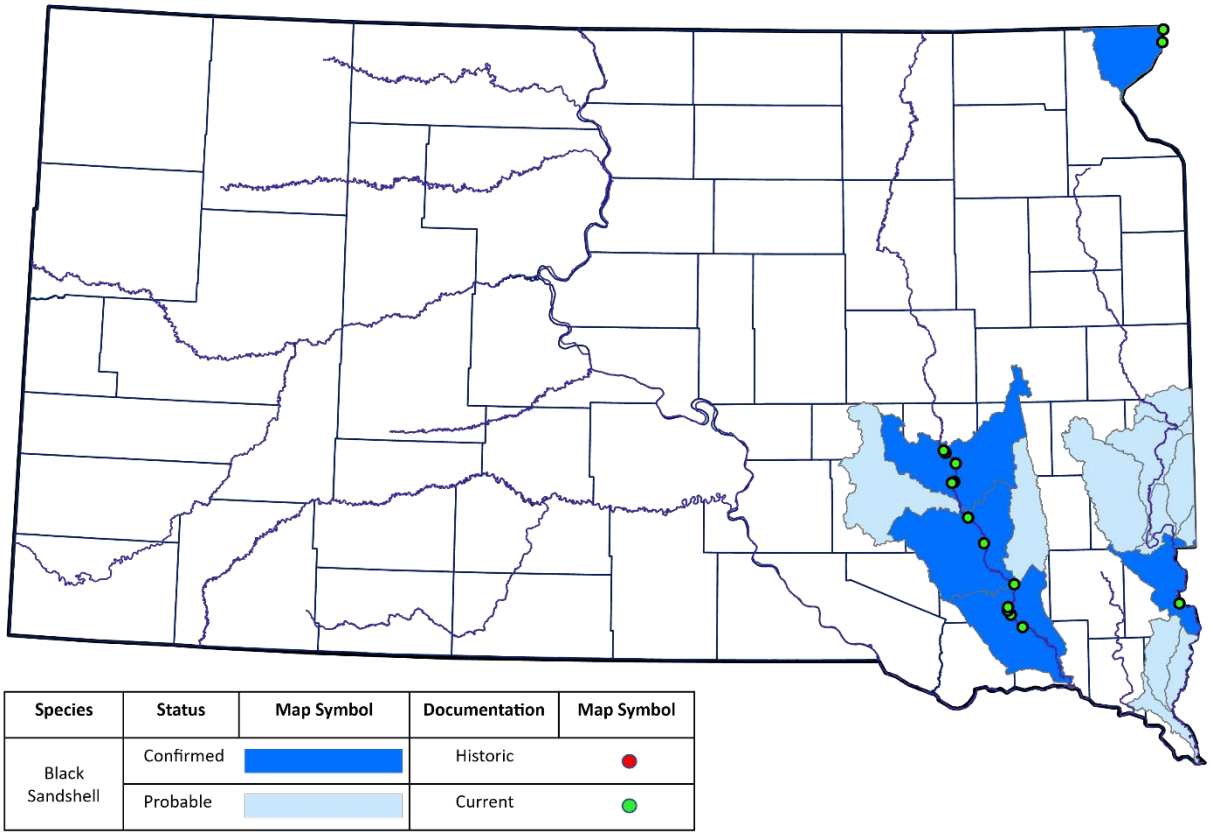
Additional Information:

- Montana and Wyoming list Sauger as a SGCN.
- Anecdotal declines have been documented by SDGFP staff.

Baxter, R.M. and P. Glaude. 1980. Environmental effects of dams and impoundments in Canada: experience and prospects. Canadian Bulletin of Fisheries Aquatic Science 205.

Fincel, M.J., N.B. Kludt, H.A. Meyer, M. Weber, C.M. Longhenry. 2019. Long-term data suggest potential interactions of introduced Walleye and Smallmouth Bass on native Sauger in four Missouri River impoundments. Journal of Fish and Wildlife Management 10(2):xx-xx; e1944-687X. https://doi.org/10.3996/122018-JFWM-115

Graeb, B.D., D.W. Willis, and B.D. Spindler. 2009. Shifts in sauger spawning locations after 40 years of reservoir ageing: influence of a novel delta ecosystem in the Missouri River, USA. River Research and Applications 25:153–159.
Haxton, T.J. and C.S. Findlay. 2009. Variation in large-bodied fish-community structure and abundance in relation to water-management regime in a large, regulated river. Journal of Fish Biology 74:2216–2238.
Humphries P. and P.S. Lake. 2000. Fish larvae and the management of regulated rivers. Regulated Rivers: Research and Management 16:421–432.
Jaeger, M.E., A.V. Zale, T.E. McMahon, and B.J. Schmitz. 2005. Seasonal movements, habitat use, aggregation, exploitation, and entrainment of saugers in the lower Yellowstone River: an empirical assessment of factors affecting population recovery. North American Journal of Fisheries Management 25:1550–1568.
Nelson, W.R. 1968. Reproduction and early life history of sauger (*Stizostedion canadense*) in Lewis and Clark Lake. Transactions of the American Fisheries Society 97:159–166.
Pegg, M.A., P.W. Bettoli, and J.B. Layzer. 1997. Movement of saugers in the lower Tennessee River determined by radio telemetry, and implications for management. North American Journal of Fisheries Management 17:763–768.
Seibert, K.L., G.W. Whitledge, N.P. Rude, D. C. Oliver, A. Loubere, and J.R. Seibert. 2018. Population demographics of Sauger and simulated effects of minimum length limits in the Kaskaskia and Ohio Rivers. Journal of Fish and Wildlife Management 9 (2): 431-445.



Species	Status	Map Symbol	Documentation	Map Symbol
Black Sandshell	Confirmed		Historic	
	Probable		Current	

Description:

- Elongate, valves moderately thick
- Periostracum smooth and shiny, greenish or black, often rayed
- Sexually dimorphic, females with more truncate posterior, males pointed posteriorly
- Beak sculpture: a few double-looped lines, usually obscure
- Pseudocardinal and lateral teeth well developed, nacre white, purple, or a combination of both.
- Length: up to 8 inches
- SIMILAR SPECIES: Pondmussel, Spike, and Yellow Sandshell

Protection Status:

- Federal: None
- State: None
- Global rank: G4 (Apparently Secure)
- State rank: S2 (Imperiled)

Distribution:

- Eastern SD- James and Big Sioux River
- SD is on the western edge of the range for this species

Key Habitat:

- Prefers medium or large rivers in soft or coarse substrate and flowing water.

Conservation Challenges:

- Modified flood regime
  - Major hydrologic alterations
  - Permitted discharges
- Ecosystem/habitat conversion or loss
- Exotic/introduced species impacts
- Ecosystem alteration/habitat degradation
  - Impoundments
  - Dams
  - Water diversion
  - Impervious surfaces
- Pollution/pesticides/herbicides
  - Concentrated Animal Feeding Operations (CAFOs)
  - Agricultural runoff

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- Develop programs to reduce/eliminate the threat of non-native species competing with native mussels
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

SWG Accomplishments (Appendix F):

- An aquatic invasive species risk assessment for South Dakota –T-36
- A population survey of mussels in South Dakota rivers –T-61
- Design and assessment of dreissenid veliger filtration system for field use –T-74

Priority Research & Monitoring Needs (Appendices G-K):

- Facilitate a state-wide comprehensive survey and long-term monitoring program for mussels
- Conduct research on life history, reproductive behaviors & potential
- Identify suitable and critical habitats
- Identify limiting factors
- Climate vulnerability assessment

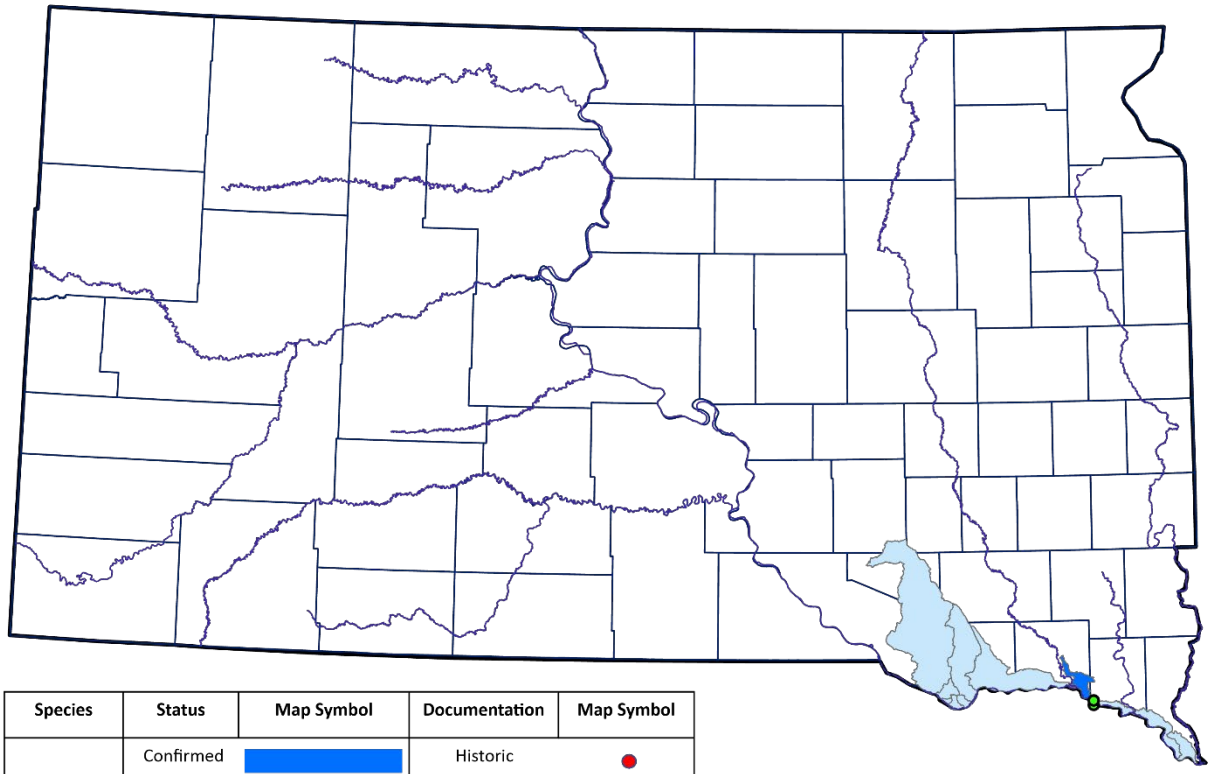
Additional Information:

- Black Sandshell are listed by Midwest Landscape Initiative (MLI) as a Midwest Regional Species of Greatest Conservation Need (RSGCN).
- Minnesota and North Dakota list Black Sandshell as a SGCN.

Faltys, K.L. 2016. Assessing freshwater mussels (*Bivalvia: Unionidae*) in South Dakota and identifying drivers of assemblage variation. M.S. Thesis, South Dakota State University, Brookings. w*ith corrections*

Troelstrup, N.H. Jr., K. Beebout, K. Faltys, K. Wollman. 2019. A statewide survey of freshwater mussels (*Unionidae*) in wadeable streams and eastern South Dakota lake basins. A final completion report submitted to South Dakota Game, Fish and Parks. 112 pp.

Wollman, K.M. 2019. Assessing freshwater mussel (*Bivalvia Unionidae*) assemblages and effects of eutrophication on *Pyganodon grandis* in lakes of eastern South Dakota.



Species	Status	Map Symbol	Documentation	Map Symbol
Flat Floater	Confirmed		Historic	
	Probable		Current	

Description:

- Rounded, valves thin, compressed
- Umbo not raised above hinge line; periostracum smooth and glossy
- Yellowish, golden, or brown, light green rays sometimes present
- Beak sculpture: two rows of irregular or broken ridges resembling double loops
- Teeth absent, nacre silvery, salmon, or orangish
- Length: up to 7 inches
- SIMILAR SPECIES: Giant Floater and Pink Papershell

Protection Status:

- Federal: None
- State: None
- Global rank: G5 (Secure)
- State rank: S1 (Critically Imperiled)

Distribution:

- Eastern SD - lower Missouri River
- SD is within the northern edge of the range for this species

Key Habitat:

- Prefers large rivers, backwaters, or sloughs with soft substrate.

Conservation Challenges:

- Modified flood regime
    - Major hydrologic alterations
    - Permitted discharges
- Ecosystem/habitat conversion or loss
- Exotic/introduced species impacts
- Ecosystem alteration/habitat degradation
    - Impoundments
    - Dams
    - Water diversion
    - Impervious surfaces
- Pollution/pesticides/herbicides
    - Concentrated Animal Feeding Operations (CAFOs)
    - Agricultural runoff

Conservation Actions:

- Increase partnerships & cooperative arrangements
- Increase educational efforts
- Promote management practices that reduce/limit soil erosion & nutrient/pesticide runoff
- Maintain/restore natural hydrology & stream connectivity when possible
- Develop programs to reduce/eliminate the threat of non-native species competing with native mussels
- River corridor habitat protection through conservation programs/incentives or purchase
- Explore captive breeding and stocking programs

SWG Accomplishments (Appendix F):

- An aquatic invasive species risk assessment for South Dakota –T-36
- A population survey of mussels in South Dakota rivers –T-61
- Design and assessment of dreissenid veliger filtration system for field use –T-74

Priority Research & Monitoring Needs (Appendices G-K):

- Facilitate a state-wide comprehensive survey and long-term monitoring program for mussels
- Conduct research on life history, reproductive behaviors & potential
- Identify suitable and critical habitats
- Identify limiting factors
- Climate vulnerability assessment

Additional Information:

- Flat Floater are listed by Midwest Landscape Initiative (MLI) on the watchlist as a Midwest Regional Species of Greatest Conservation Need (RSGCN).
- Minnesota and Nebraska list Flat Floater as a SGCN.
- Surveys specific to freshwater mussels have been limited, however, Flat Floater have not been sampled during the recent comprehensive statewide survey and were not sampled by Perkins 2007. Last occurrences were live mussels but extremely limited from the late 90s (Perkins 2000).

Faltys, K.L. 2016. Assessing freshwater mussels (*Bivalvia: Unionidae*) in South Dakota and identifying drivers of assemblage variation. M.S. Thesis, South Dakota State University, Brookings. w*ith corrections*

Perkins, K. I. 2007. Final report: Unionid mussels- species distribution and response to changes in discharge along the fifty nine mile reach of the Missouri National Recreational River from Gavin's Point Dam to Ponca, NE. Final report submitted to the National Park Service. Yankton, SD. 85 p.

Perkins, K. III., and D.C. Backlund. 2000. Freshwater mussels of the Missouri National Recreational River below Gavins Point Dam, South Dakota and Nebraska. South Dakota Game, Fish and Parks Report 2000-1.

Troelstrup, N.H. Jr., K. Beebout, K. Faltys, K. Wollman. 2019. A statewide survey of freshwater mussels (*Unionidae*) in wadeable streams and eastern South Dakota lake basins. A final completion report submitted to South Dakota Game, Fish and Parks. 112 pp.

Wollman, K.M. 2019. Assessing freshwater mussel (*Bivalvia Unionidae*) assemblages and effects of eutrophication on *Pyganodon grandis* in lakes of eastern South Dakota.

Description: A deciduous shrub that can reach 10 feet (3 m) in height. Bark on younger branches is lighter colored than the gray color of older bark. Buds and leaves are alternately arranged on the stems. Distinguishing features include glands at petiole summits, glandular teeth on leaves, and late flowing and fruiting periods. Flowers in June; fruiting from July to September. Catkins emerge after leaves. Can be confused with extremely rare species in the Black Hills, shining willow (*S. luci*da), which has not been documented recently.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S1 (critically imperiled)

Distribution: Ranges throughout Canada and some northern and northeastern states. South Dakota's Black Hills host one of three disjunct populations, with others found in southeastern Wyoming and northcentral Colorado. South Dakota has four occurrences in the central Black Hills of small to medium-sized populations. These sites have elevated water tables, fen habitat, and saturated organic substrates (Hornbeck et al. 2003).

Key Habitats: A wetland-obligate shrub that occurs in swamps, fens, and boggy meadows and riparian systems in valleys and foothills.

Conservation Challenges:

- Invasive plant species
- Impacts of various pests, such as leaf galls, willow borer, and a rust (*Melampsora ribesii-purpureae*), all documented in South Dakota plants of this species

Conservation Actions:

- Provide habitat for pollinators and protect these areas against indiscriminate spraying and pesticide drift
- Protect hydrology of areas that support this species

Research and Monitoring Needs:

- Regularly survey known sites to assess population health and potential threats

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique habitat type in South Dakota. This species occurs in several unique wetland types within the Black Hills. This is a disjunct population, which can have important genetic value.

Wildlife and Native American Associations: Pollinated by a variety of bumble bees (*Bombus* spp.)

Existing Recovery Plans or Status Reports:

Hornbeck, J. H., C. Hull Sieg, and D. J. Reyher. 2003. Conservation assessment for the autumn willow in Black Hills National Forest, South Dakota and Wyoming. U.S.D.A., Forest Service, Rocky Mountain Region, Black Hills National Forest, Custer, SD. Available: https://www.fs.usda.gov/rm/pubs_other/rmrs_2003_hornbeck_j001.pdf [Accessed 10 Jan 2023].

Description: A distinguishing feature of this and seven closely related species of *Astragalus* is their palmately trifoliate leaves. This low-growing perennial becomes elevated above the soil's surface in eroding habitats. Mats of the typical cushion-like growth form may reach nearly 18 inches (46 cm) across, but plants are rarely greater than 4 inches (10.2 cm) high. First collected in South Dakota in 1932; named for Claude Barr, a botanist and horticulturist from Smithwick, South Dakota.

Protection/Population Status:

- Global Rank G3 (vulnerable)
- State Rank S3 (vulnerable)

Distribution: Regional endemic in southwestern South Dakota, northeastern Wyoming, southwestern Montana, and northwestern Nebraska. Many of state's occurrences found in Badlands National Park and Buffalo Gap National Grassland. Much of the land where this species occurs is managed for multiple uses.

Key Habitat: Badlands. Barren outcrops on buttes, hills and ridges with fine parent materials, which may be derived from shale, sandstones, limestone, or silts. May occur with sparse shrub cover provided by *Artemisia tridentata* (big sagebrush) and a variety of other plant species (Ladyman 2006).

Conservation Challenges:

- Off-road vehicle use
- Energy development; potential impact of coalbed methane development
- Invasive noxious weeds

Conservation Actions:

- Monitor known populations, particularly in areas subject to recreational ORV use
- Consider land exchanges to consolidate known and potential habitat
- Educate public and recreationists about vulnerability of populations to ORV impacts

Research and Monitoring Needs:

- Continued surveys to assess population trends
- Assess impacts of energy development

Additional Information: SD Wildlife Action Plan criterion: 2a. This is a rare regional endemic species that occurs in a limited portion of southwestern South Dakota.

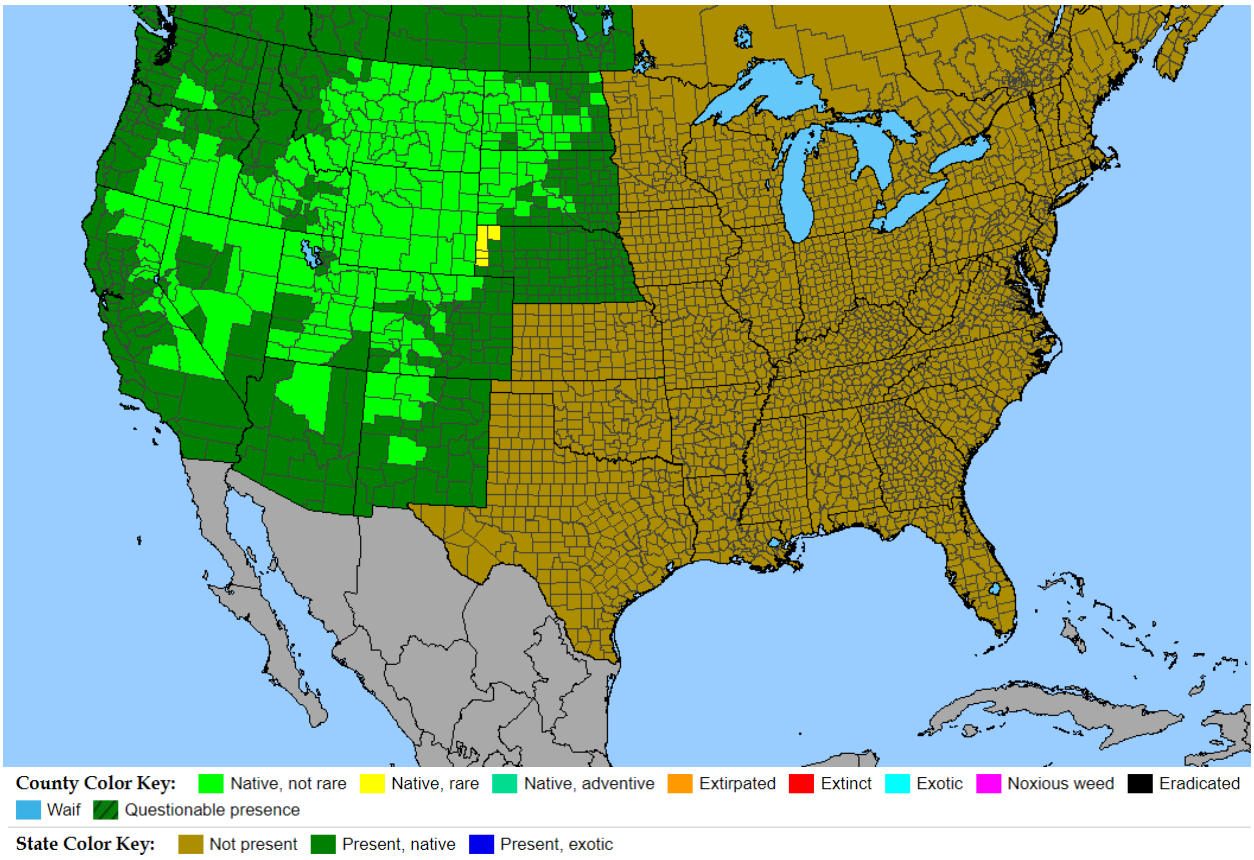
Existing Recovery Plans or Status Reports:

Ladyman, J.R. 2006. *Astragalus barrii* Barneby (Barr's milkvetch): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. 80 pp. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206823.pdf; [Accessed 5 Jan 2023]

Description: Stout branching shrub with a wide range of maximum heights, depending on the variety. Many small yellowish flowers on panicles above the foliage during late summer. Short leaves are three-lobed at tips and wedge-shaped at the base. Reproduces by seed.

Protection/Population Status:

- Global Rank G5T5 (secure species and subspecies; *A. t. wyomingensis*)
- State Rank SNR; not monitored by South Dakota Natural Heritage Program; no state rank assigned



Distribution: Widely ranging in western Canada and within the Great Basin in the U.S.; occurs in all 17 western states, with South Dakota as one of the states on the eastern periphery of the species' range.

Key Habitat: Rocky or fine soils in valleys and open grasslands. Found mainly on valley floors and upland plains of far western portion of the state. Speculation that subspecies found in South Dakota (*A. t. wyomingensis*) may be better able to cope with prolonged droughts and grazing disturbance than the subspecies associated with the Great Basin. Often associated with various bunchgrasses.

Conservation Challenges:

- Intolerant of fire
- Cheatgrass invasion

Conservation Actions:

- Opportunities to benefit from much recent study and implementation of sagebrush restoration techniques in association with conservation of various sage-grouse species

Research and Monitoring Needs:

- Explore opportunities to partner with other entities interested in the sage-steppe system in identifying research and monitoring needs

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique and declining habitat in South Dakota, sage-steppe habitats.

Wildlife and Native American Associations: Critically important to **Greater Sage-Grouse, a state animal species of greatest conservation need**. Used for food and cover, especially during late fall, winter, and early spring and as nesting protective cover. Also, important habitat for pronghorn and other native ungulates.

This plant has been used by Native Americans as medicine, a source of yellow dye, and fuel.

Existing Recovery Plans or Status Reports:

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Available: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1079&context=govdocs [Accessed 12 Jan 2023].

Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: A perennial herb that can reach 1-4 feet (0.3–1.2 m) tall. Flowers are yellowish green, with 5 or more found in loose clusters at the top of the stem. Flowers are ½ inch (1.3 cm) across with six petal-like sepals and six yellow stamens surrounding a green center. Leaves are 2- or 3-lobed. Stems are erect, hairless, and typically light green. The fruit is a green, berry-like seed that is deep blue when ripe. Fruit is poisonous.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S3 (vulnerable)

Distribution: Eastern North America; western periphery of range extends from North Dakota to Oklahoma. Found in rich forests of eastern South Dakota.

Key Habitats: Damp deciduous forests, shaded or partly shaded sites.

Conservation Challenges:

- Herb with medicinal value; collection pressure
- Lack of significant cultivation sources
- Habitat conversion, fragmentation, and displacement by exotic species

Conservation Actions:

- Support development of propagation techniques to help protect wild populations
- Determine sustainable levels of collection

Research and Monitoring Needs:

- Monitor populations to assess status and potential impacts of collection

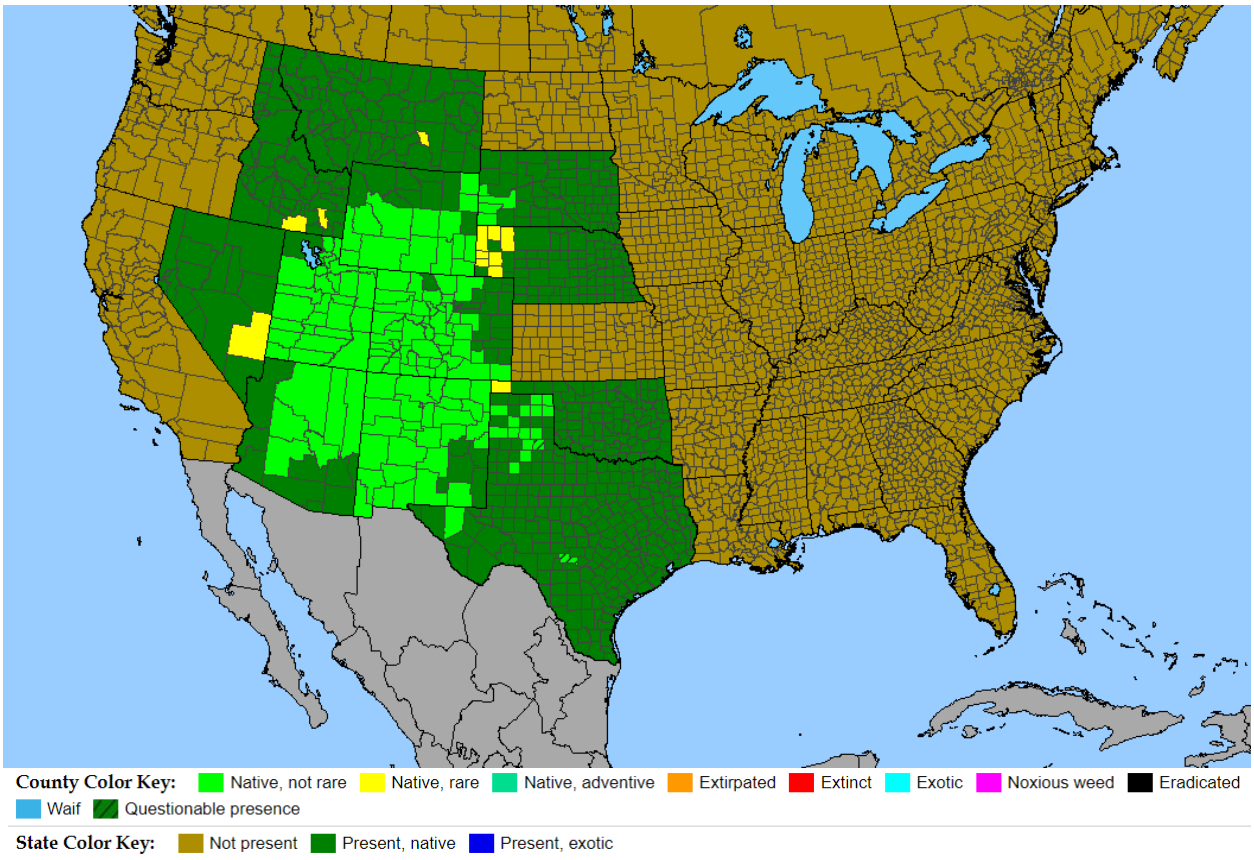
Additional Information: SD Wildlife Action Plan criterion: 3 – species that is indicative of a unique habitat in South Dakota, deciduous forests.

Wildlife and Native American Associations: Used as a tea or decoction by Native American women to aid childbirth and regulate menstruation. Additional modern uses include addressing constipation, seizures, sort throat, and hiccups, although the traditional medical community has shared concerns about the safety of this supplement.

Description: This shrub or small tree can reach 1 foot (3 m) tall. Young twigs are pale green. By the second year, twigs are dark red, and bark is waxy gray. Alternate leaves are simple and about 1 inch (2-3 cm) long. Inconspicuous greenish flowers have an elongated floral tube for fruit development. Flowering occurs from June to early July, with fruiting from July to August. Fruit has a plumelike style, facilitating long, wind-borne movements. Also called alderleaf mountain mahogany.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S3 (vulnerable); this rank applies to the Alderleaf Mountain-mahogany/ Sideoats Grama Shrubland plant community



Distribution: A species of the Southwest and northern Mexico, barely extending into the southern end of the Black Hills.

Key Habitat: Sunny sites; well drained sandy to clay loams. Within South Dakota, it occurs in chaparral habitats on limestone or limestone-derived soils.

Conservation Challenges:
*
Conservation Actions:
*
Research and Monitoring Needs:
*
Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique habitat in South Dakota, mountain mahogany shrubland.

*N/A; this species is added as a plant species of greatest conservation need because it represents a particular habitat type, rather than because it is considered rare within the state and in need of specific monitoring or conservation actions.

Wildlife and Native American Associations: Favored forage for cattle and domestic sheep. Also eaten by mule deer and porcupines, with deer and elk eating twigs during the winter.

Strong durable wood makes it useful for campfires. Used by Native Americans for bows and spearheads. Bark and roots produce reddish dye.

Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: This perennial species reaches 3-10 feet (1-3 m) in height. Single or clustered yellow flowers at the tops of the stems are 2½-4 inches (6.3-10 cm) across. Bracts and flower stalks are thickly covered in long, white hairs. Alternate leaves are deeply divided and covered in short hairs. Upper stem produces resin when plant is blooming. Named for the tendency of basal leaves to orient in a north-south direction to avoid full impact of the sun.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S3 (vulnerable)

Distribution: Ranges through much of the Midwest, northeastern states, and Ontario. Occurs in remnant prairies in southeastern South Dakota.

Key Habitats: Tallgrass prairie, sand prairie, savannas, and glades.

Conservation Challenges:

- Depends on prairie habitats that are in continued decline and degradation
- Young plants palatable to livestock; will decrease and disappear if heavily grazed

Conservation Actions:

- Propagation methods include seed processing and use of bareroot plant.

Research and Monitoring Needs:

- Approximately a dozen relatively recent occurrences known in South Dakota; resurvey known areas to assess continued viability and extent

Additional Information: SD Wildlife Action Plan criterion: 3 – species dependent on a declining habitat in South Dakota, tallgrass prairie.

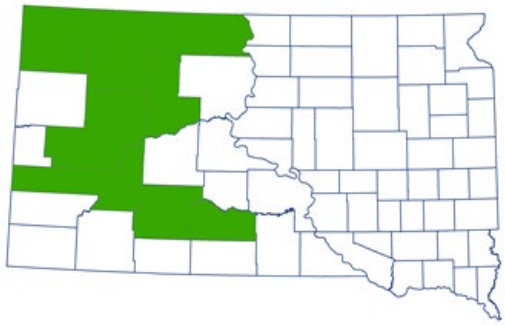
Wildlife and Native American Associations: Nectar may attract swallowtails, monarchs, and sulphurs. Mainly pollinated by long-tongued bees, such as bumble bees and miner bees. Finches eat remaining seed in the fall. Tall sturdy plant that provides perching sites for songbirds.

Native children used the stem resin as chewing gum. Pounded root was used to make a medicinal tea.

Description: This annual herb reaches 4-14 inches (10-35 cm) tall. An erect widely branching form gives the plant a skeletal appearance. Leaves on the lower portion of the stem are smaller and more oblong than basal leaves. Plants flower from late June to July with very small, pale-yellow flowers.

Protection/Population Status:

- Global Rank G3 (vulnerable)
- State Rank S3 (vulnerable)



Distribution: Great Plains regional endemic species occurring in North Dakota, South Dakota, and Montana. Occurs within unglaciated Missouri Plateau of the Great Plains physiographic province. Found in South Dakota on Grand River National Grassland in the northcentral part of the state and on Badlands National Park and Buffalo Gap National Grassland in southwestern South Dakota.

Key Habitats: Barren shale and clay outcrops within badlands habitat. Sparsely vegetated grasslands.

Conservation Challenges:

- Livestock grazing and trampling; indirect threat that causes soil disturbance, allowing opportunities for invasive plant species
- Invasive plant species, particularly *Kochia scoparia* and *Salsola iberica* (prickly Russian thistle)
- Climate change
- Genetic limitations of a regionally endemic species

Conservation Actions:

- Practice modest cattle stocking rates and rotations
- Invasive exotic weed species control

Research and Monitoring Needs:

- Establish permanent monitoring plots in a variety of habitats

Additional Information: SD Wildlife Action Plan criterion: 2a. This Great Plains regional endemic species is considered by NatureServe to be globally vulnerable. Within its known distribution, South Dakota's populations on two national grasslands and a national park represent an important portion of the species' range.

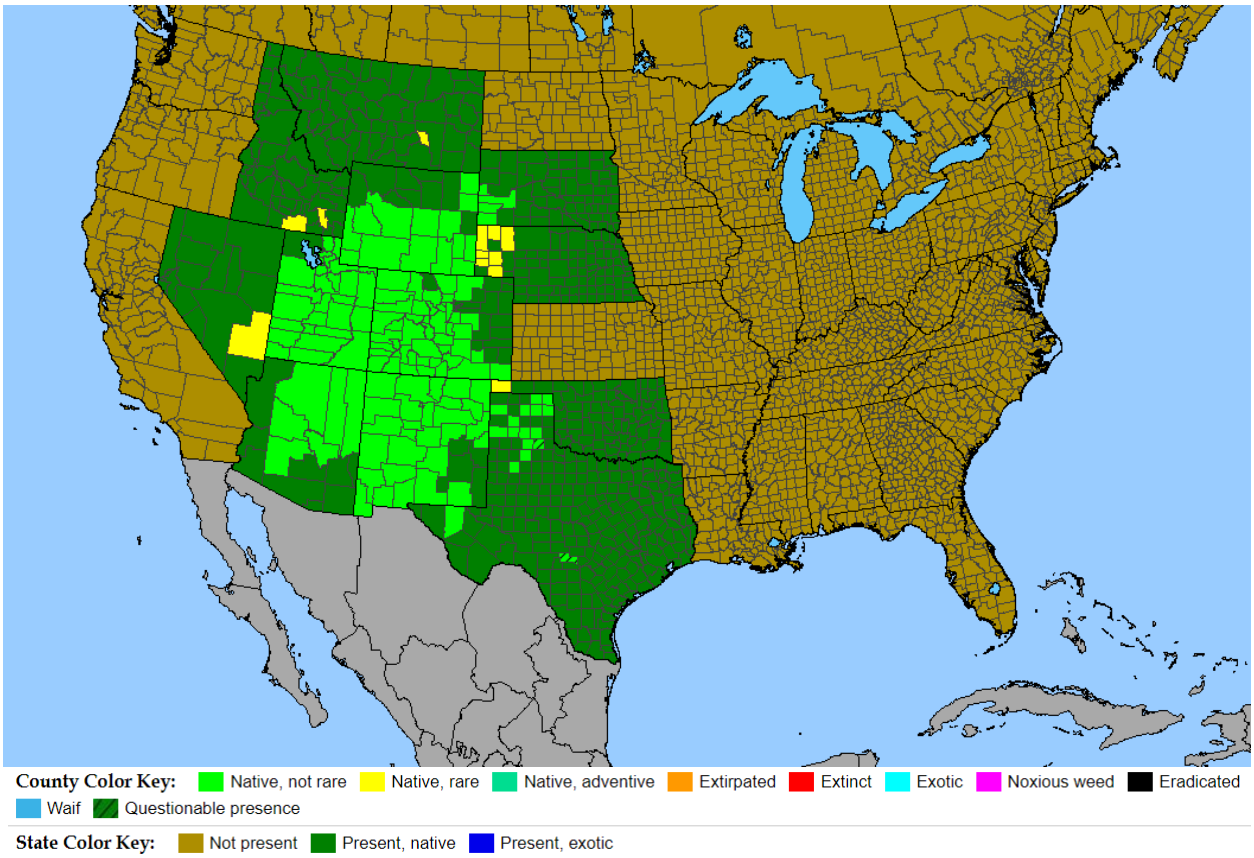
Existing Recovery Plans or Status Reports:

Ladyman, J.A.R. 2006. *Eriogonum visheri* A. Nelson (Visher's buckwheat): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/ projects/scp/assessments/eriogonumvisheri.pdf [Accessed 5 Jan 2023].

Description: Softly hairy perennial plant that can reach 6-10 inches (15-25 cm) in height. Flowers are pale yellow to greenish in a dense, leafy spike along upper half of stem. Hairy leafy bracts are shorter than flower and may be yellow or pinkish. Yellow-green leaves lack leaf stalks and are 1-3 inches (2.5-7.6 cm) long and lobed in 3 parts. Hairy stems are unbranched, but plant usually has multiple stems. Semiparasitic - it contains some chlorophyll and is capable of photosynthesis, but it may take some nutrition from other plants, in this case, from plant roots. Also called downy painted-cup.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank SNR; not monitored by South Dakota Natural Heritage Program; no assigned state rank



Distribution: Central Canada south through Great Plains states as far south as Texas and west to Arizona. Also extends into Mexico. Widely distributed in South Dakota.

Key Habitat: Sunny areas of dry upland prairies, often on rocky hillsides. Less common in sandy soils. Plant height and spread improve with better soil and moisture.

Conservation Challenges:
*
Conservation Actions:
*
Research and Monitoring Needs:
*
Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a declining habitat in the state – upland prairie.

*N/A; this species is added as a plant species of greatest conservation need because it represents a particular habitat type, rather than because it is considered rare within the state and in need of specific monitoring or conservation actions.

Wildlife and Native American Associations: Considered poor forage, but may provide feed for domestic sheep, deer, and elk.

Map Source:
Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: This perennial plant reaches 2 feet (0.6 m) tall. Blooms during late spring with inconspicuous green flowers. Fruiting/seed production lasts from spring to summer.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S1 (imperiled)

Distribution: This Southwestern species reaches its northeastern limit in South Dakota, where it is restricted to the area around Harney Peak in the Black Hills, within Black Hills National Forest.

Key Habitats: Moist subalpine meadows at elevations of approximately 9,200 - 13,000 feet (2800 – 3900 m). May occur along streams in moist woods and wet meadows in lower alpine region of spruce-fir communities.

Conservation Challenges:

- Modifications to hydrology
- Overgrazing
- May be impacted by hiking trails

Conservation Actions:

- Periodically conduct threats assessment

Research and Monitoring Needs:

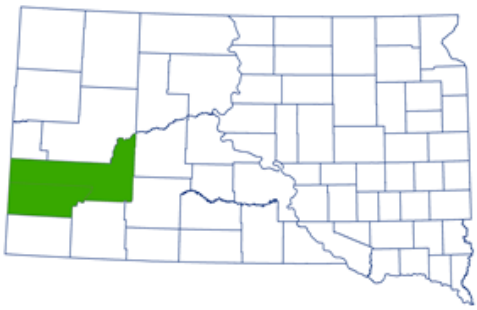
- Revisit known sites periodically
- Determine if South Dakota's population is disjunct from the remainder of the species' range

Additional Information: SD Wildlife Action Plan criterion: 3. This species relies on a specific habitat type within the Black Hills, moist subalpine meadows. Its continued existence may indicate the sustainability of that habitat type.

Description: Also called Fendler's buckbrush, this low, thorny shrub may reach 3 feet (0.9 m) tall but will not be as tall when growing at higher altitudes. Plant has low stems with a spreading growth form, smooth bark, and thorns up to 2 inches (5 cm) long. Flowers are white to light green in clusters at the ends of stems or branches.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)



Distribution: This flowering shrub ranges from Arizona to Texas and north, with South Dakota at the northeastern periphery of the range. Within South Dakota, common west of Boles Canyon in the southwestern Black Hills in both South Dakota and Wyoming. Two historical and one relatively recent occurrence (Pennington County).

Key Habitats: Conifer forests and mixed woodlands, chaparral, and other open habitats, typically with rocky soils.

Conservation Challenges:

- In some parts of range, may be prone to overgrazing by large ungulates during forest restoration treatments

Conservation Actions:

- Coordinate with U.S. Forest Service to plan management activities that avoid destroying habitat supporting this species

Research and Monitoring Needs:

- Periodically resurvey known site in the Black Hills. Previous survey indicated healthy plants but no fruits
- Monitor for signs of overgrazing by native ungulates

Additional Information: SD Wildlife Action Plan criterion: 3: has a highly localized or restricted distribution. Within South Dakota, this species is known from only one area in the Black Hills, which represents the northeastern periphery of the species' range.

Wildlife and Native American Associations: Provides browse for deer and livestock. Eaten by porcupines and rabbits. Bees and moths visit the flowers.

Native Americans used this species for a variety of purposes, including brewing a tea from the dried leaves, using leaves and stems for medicinal purposes, and eating the sweetened berries.

Description: A perennial herb with tall slender stems that may reach 4-24 inches (10-60 cm) in height. Groups of small, saucer-shaped flowers mature upwards along the stem. Leaves are mainly basal and suborbicular (nearly circular) with rounded teeth.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S1 (critically imperiled)

Distribution: Ranges through western Canada and Alaska and western and northwestern states. South Dakota is on the eastern periphery of the species' range. Two known occurrences in the state, in Lawrence County in the Black Hills.

Key Habitats: Typically found in moist, shady sites in meadows, woods, and mountain forest habitats. South Dakota occurrences are in white spruce and paper birch/hazelnut communities along streams, primarily in moist to saturated low areas. Some known sites are associated with seeps.

Conservation Challenges:

- Potential impacts from domestic livestock grazing

Conservation Actions:

- Coordinate with U.S. Forest Service regarding whether there are additional sites that host this species in the Black Hills

Research and Monitoring Needs:

- Known occurrences in states last observed in 1993 and 2014; resurvey sites to gain updated information on viability and coverage

Additional Information: SD Wildlife Action Plan criterion: 3: indicative of a unique habitat in South Dakota. Ponderosa pine forests of the Black Hills provide important economic and recreational values, but other habitats within those forests need to be recognized for wildlife and ecological contributions. This species is included for its representation of moist woodland sites within white spruce and paper birch/hazelnut plant communities.

Existing Recovery Plans or Status Reports:

U.S.D.A. U.S. Forest Service. 2022. Black Hills National Forest - Draft Forest Assessment: At Risk Species Status. Rocky Mountain Region/Black Hills National Forest. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd1035057.pdf [Accessed 10 Jan 2023].

Description: This perennial plant reaches 4-16 inches (10-41 cm) in height. Small irregular blue to purple flowers on slender stalks may bloom from July to September. Narrow basal leaves are up to an inch (2.5 cm) long, with teeth along the edges. Leaves and stems are mostly hairless.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)

Distribution: Widely distributed through most of Canada and northern, upper Midwestern, and northeastern states. Within South Dakota, only 8 recent known occurrences, in northeastern portion of the state.

Key Habitats: A wetland-obligate of the Great Plains, this species inhabits springs, fens, and wet meadows. May occur in neutral or calcareous sites.

Conservation Challenges:

- Invasive plant species
- Wetland drainage or alteration

Conservation Actions:

- Protect hydrology responsible for calcareous fen habitats

Research and Monitoring Needs:

- Periodic monitoring of sites to assess sustainability and potential threats

Additional Information: SD Wildlife Action Plan criterion: 3: indicative of calcareous fens, a unique and potentially declining habitat in South Dakota.

Wildlife and Native American Associations: Attracts hummingbirds.

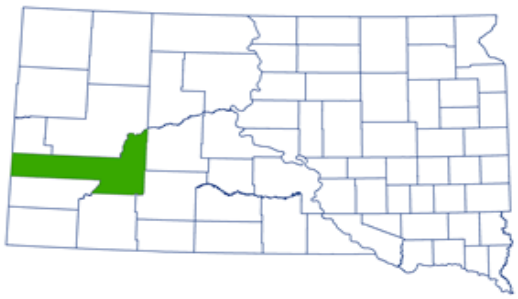
Used by some Native Americans tribes internally to induce vomiting or topically for treating abscesses and earaches.

Description: Single or multiple stems from the base. These perennial plants are 6-18 inches (15-46 cm) high. Spreading rhizomes allow production of small colonies. Flowers are ¼-inch (0.6 cm) across with 4-5 red, oblong petals and shorter sepals. Flowers arranged in flat cluster up to 2 inches (5 cm) across at stem tip. Separate male and female flowers on separate plants. Alternate leaves are fleshy, succulent, and waxy coated.

Protection/Population Status:

- Federal Threatened (listed in 1992)
- Global Rank G5T1 (secure species; critically imperiled subspecies)
- State Rank S1

Distribution: This subspecies is limited to western New York, southeastern Minnesota, and the Black Hills of South Dakota. Single occurrence in the central Black Hills. Considered a glacial relict species.



Key Habitats: South Dakota's single location is a mostly barren area of northerly-facing granite rock walls. This area is within the Black Elk Wilderness Area, managed by the U.S. Forest Service.

Conservation Challenges:

- Narrow habitat requirements characterized by areas where ground water and cool air can seep through rocky substrate
- Small populations disjunct from each other

Conservation Actions:

- Do not publicize the exact location of this population

Research and Monitoring Needs:

- Monitor the known population in state, including evaluation of direct threats of collection and trampling by recreationists
- Coordinate with U.S. Fish and Wildlife Service and U.S. Forest Service to identify research, monitoring or recovery strategies

Additional Information: SD Wildlife Action Plan criterion: 1 (state or federal listed)

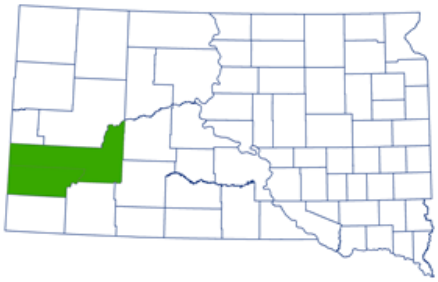
Existing Recovery Plans or Status Reports:

U.S. Fish and Wildlife Service. 1998. *Sedum integrifolium* ssp. *leedyi* (Leedy's roseroot) Recovery Plan. Ft. Snelling, Minnesota. vi + 31 pp. Available: https://meridian.allenpress.com/jfwm/article-supplement/432994/pdf/10_3996022018-jfwm-010_s15 [Accessed 18 Jan 2023].

Description: A long-lived, slow-growing evergreen tree that can reach heights of 26 feet (8 m). Growth form typically pyramidal. Smooth bark is silvery gray to black in older trees. Needles in groups of 5. Wingless seeds. Named for the flexible branches, an advantage when growing at high elevation sites exposed to strong winds.

Protection/Population Status:

- Global Rank G4 (apparently secure)
- State Rank S1 (critically imperiled)



Distribution: A tree species of western and northwestern North America, with South Dakota as one of the states forming the eastern periphery of the species' range. Only two known occurrences in the Black Hills; one within the Cathedral Spires area and a smaller colony on the northerly slopes of Harney Peak.

Key Habitats: Found on dry, rocky sites at various elevations. Considered a habitat generalist with an ability to tolerate a wide variety of conditions and exist across a broad array of latitudes and elevations.

Conservation Challenges:

- Impacts of mountain pine beetles, drought, and non-native pathogens, such as white pine blister rust
- Subject to damage by porcupines

Conservation Actions:

- Continue coordination with U.S. Forest Service to monitor and protect known sites in Black Hills National Forest

Research and Monitoring Needs:

- Seed has previously been collected by U.S. Forest Service and provided to Bessey Tree Nursery, Nebraska National Forest, NE. Follow up to assess whether seeding or planting at additional sites is warranted
- Dates for most recent surveys of two known sites in the state are 2009 and 2011. Surveys needed to reassess status and potential threats

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique habitat in South Dakota.

Wildlife and Indigenous Associations: Seeds eaten by chipmunks, squirrels, pinyon jays, grouse, and magpies. Porcupines eat bark. Mule deer and elk eat needles. Depends on corvids, such as Clark's nutcracker, for dispersal, a relationship that benefits both members.

Description: Evergreen tree that can reach 80 feet or more (25 m) tall. Orange-brown or gray bark has shallow fissures. Paired needles are 2-3 inches (3-7 cm) long and sharply pointed. Female cones may remain closed for several years. Winged seeds.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)

Distribution: A species of northwestern North America, with South Dakota almost at the most southeastern periphery of the species' range. Considered locally common in South Dakota, with occurrences ranging from isolated tress to one sizeable stand (approximately 150 acres; 61 ha) in the northern Black Hills.

Key Habitats: Species found on well-drained soils, dry sandy sites, and peat bogs. Populations can be rejuvenated by forest fires.

Conservation Challenges:

- Limited distribution within South Dakota
- Subject to lodgepole pine beetle (*Dendroctonus murrayanae*), which can cause mortality but not considered an aggressive species

Conservation Actions:

- Provide Black Hills National Forest with results of any new survey efforts (See Research and Monitoring Needs)

Research and Monitoring Needs:

- Most recent record in South Dakota Natural Heritage Database is from 2004. Need renewed survey effort to update knowledge of known stands and locate new stands
- Species considered to be highly resistant to climatic factors and extreme events, which may have future research implications

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique habitat in South Dakota.

Wildlife and Indigenous Associations: Seeds eaten by grouse, chickadees, squirrels, and chipmunks. Porcupines eat bark of small branches. Deer and elk eat needles.

Named for the straight trunk, which is suitable for tipi lodge poles. Inner bark was scraped and eaten by indigenous people.

Description: An inconspicuous perennial orchid that reaches 3-10 inches (7.6-25.4 cm) in height. Greenish yellow flowers are less than ½ inch (1.3 cm) long and bloom from June to July. Two basal leaves are up to 1½ inches (3.8 cm) wide and sheathe the lower stem. Hairless leaves and stem. Sometimes called fen orchid.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S1 (critically imperiled)

Distribution: Widespread throughout much of Canada and eastern and midwestern states, but rare along southern/southeastern periphery of species' range. Few known occurrences in South Dakota; all restricted to fens in the northeastern portion of the state.

Key Habitats: A wetland-obligate in the Great Plains, this species occurs mainly in fens and bogs in shady or sunny sites.

Conservation Challenges:

- Invasive plant species
- May be overbrowsed by native ungulates

Conservation Actions:

- Protection of hydrology that sustains fen habitats

Research and Monitoring Needs:

- Periodic monitoring of known sites to assess viability and potential threats

Additional Information: SD Wildlife Action Plan criterion: 3: indicative of fens, a unique and potentially declining habitat in South Dakota.

Description: A large, tall perennial herb with a clumped growth form and long, fernlike basal leaves. The reproductive spike is several feet long, with hundreds of large pink flowers on a single, thick stalk. Sometimes called giant lousewort.

Protection/Population Status:

- Global Rank G4 (apparently secure)
- State Rank S2 (imperiled)

Distribution: Limited in distribution to six western states, with South Dakota on the northeastern periphery of the species' range. Mainly occurs in the Deerfield area of the Black Hills within the state.

Key Habitats: Shaded mountain slopes, meadow edges, and valleys within aspen and spruce-fir plant communities. Within South Dakota, may be found in open forests and clearings above 6,000 feet (1,830 m).

Conservation Challenges:

- Unknown aside from rarity within the state and occurrences within a relatively small area

Conservation Actions:

- Following visits to the known occurrences (see Research and Monitoring Needs section), provide updated information to the U.S. Forest Service to incorporate into their planning and land management needs

Research and Monitoring Needs:

- Aside from one record from 2001, the last observed dates for many of South Dakota's records are from the mid- to late 1990s. All sites should be visited to assess status of known sites

Additional Information: SD Wildlife Action Plan criterion: 3 - has a highly localized distribution within the state.

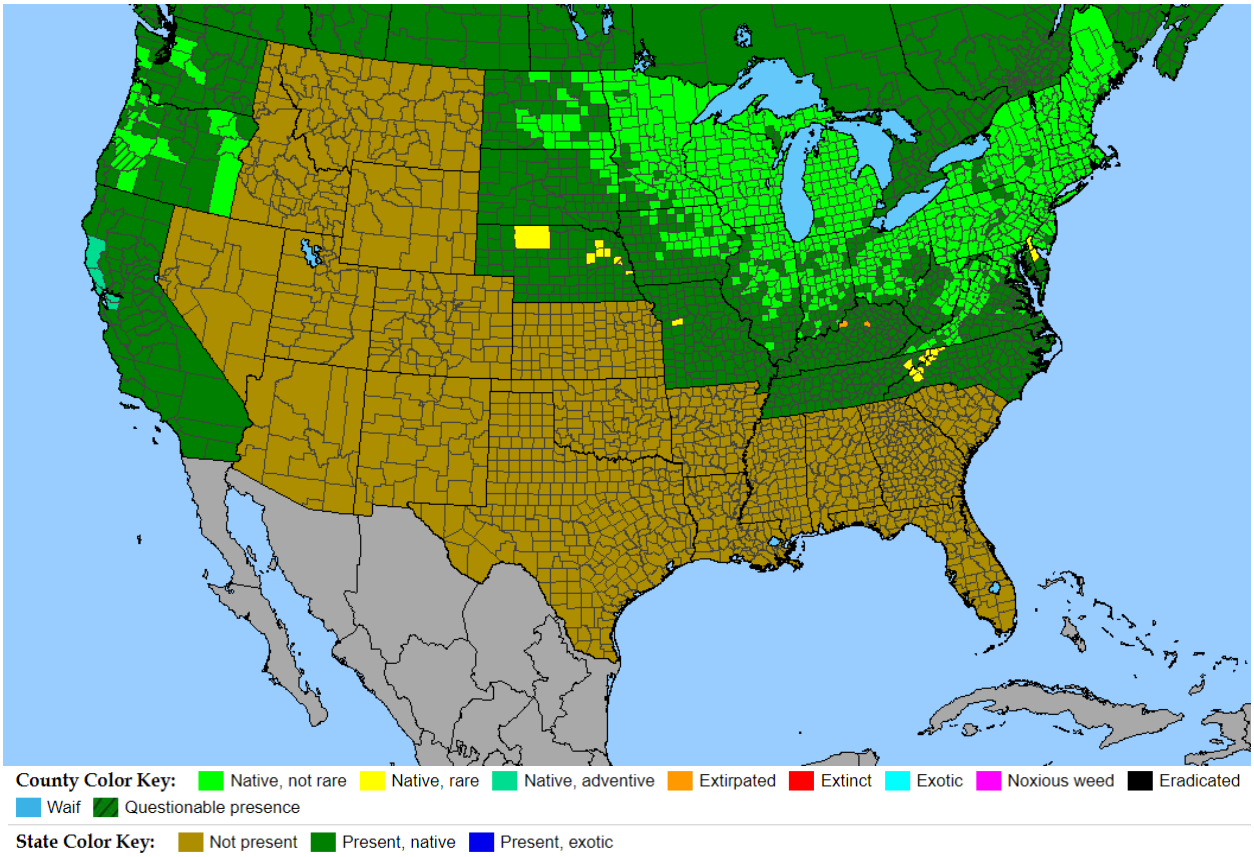
Wildlife and Native American Associations: Deer and elk eat the flowers.

Used for ceremonial purpose by some tribes. This and other species in the genus are modern-day medicinal herbs used for a variety of conditions and ailments.

Description: Bright yellow flowers grow in groups of 2-5 at the ends of branching stems. Flower has 5-9 petal-like sepals with veins radiating from the base. Many yellow stamens found in flower's center. Mostly basal leaves that are round or kidney-shaped; heart-shaped at the base. Leaf edges often scalloped. Hairless, branching stems. Plant often grows in clumps.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank SNR; not monitored by South Dakota Natural Heritage Program; no state rank assigned



Distribution: Circumpolar distribution. Throughout Canada and Alaska, northern Great Plains and upper Midwestern states, Great Lakes states, and northeastern states. Disjunct population in southern British Columbia, Washington, and Oregon. Found in several counties in northeastern and eastcentral South Dakota.

Key Habitats: A wetland-obligate in the Great Plains. Wet meadows and seasonal streams.

Conservation Challenges:

- Hydrological alterations, shoreline development, wetland drainage
- Climate variations to temperature and precipitation patterns

- Unlimited livestock access to streams

Conservation Actions:
- Protect intact wetland systems from drainage and diversion

Research and Monitoring Needs:
- Surveys needed to better understand distribution and abundance in areas at edges of distribution, such as South Dakota
- May be suitable species to study climate change impacts

Additional Information: SD Wildlife Action Plan criterion: 3 – species indicative of a unique or declining habitat type in South Dakota, wet meadows.

Wildlife and Native American Associations: This early blooming plant provides nectar and pollen for bees and flies. Mature seeds are eaten by birds and rodents.

Medicinal uses by Native Americans included treatment of skin inflammation, gastrointestinal problems, and general aches and pains. Some Native cultures believe the species to have magical effect on internal bleeding. The root was used as a blue dye. Handling the plant can cause irritation to the skin, and uncooked parts can be toxic to humans, cattle, and horses.

Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: This frost-tolerant shrub has stems ranging from 1-4 feet (0.3-1.2 m) high. Small, alternate leaves are 1-3 inches (2-7 cm) long. Reproduces by seed or from adventitious buds on rhizomes and root crown. Each stem can produce one berry. Roots can penetrate as deeply as 40 inches (100 cm).

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)

Distribution: Occurs in western Canada and western U.S. Within South Dakota, found in the Lead-Deadwood area of the northern Black Hills above 5,000-foot (1,524 m) elevation. Although known from more than two dozen sites in the state, 90% of them are clustered in a township-sized area of private land.

Key Habitats: Understory species of coniferous woods, talus slopes, and subalpine fir forests. Can survive low severity fires.

Conservation Challenges:

- Observations of South Dakota populations indicate plants do not fruit in dry years, indicating a potential susceptibility to climate change impacts
- Majority of state populations found within an area of private land that could be subject to mining

Conservation Actions:

- Unknown

Research and Monitoring Needs:

- A potential species for monitoring impacts of climate change in the northern Black Hills

Additional Information: SD Wildlife Action Plan criterion: 3 – species with characteristics that make them vulnerable; in this case, potential susceptibility to climate change, especially prolonged drought.

Wildlife and Native American Associations: Grizzly and black bears eat berries, leaves, stems, and roots. Ungulates browse this shrub. Berries eaten by **ruffed grouse (an animal species of greatest conservation need**) and various songbirds. Dense thickets provide cover for small birds and mammals.

In some parts of its range, Native Americans burned patches during the fall after harvesting berries, to reduce shrub and tree invasion. An important food for Native Americans in the Pacific Northwest.

Existing Recovery Plans or Status Reports:

Simonin, K.A. 2000. *Vaccinium membranaceum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.usda.gov/database/feis/plants/shrub/vacmem/all.html [Accessed 11 Jan 2023].

Description: A perennial herbaceous plant that reaches 6-24 inches (15-60 cm) tall. A single terminal flower has three white to cream-colored, strongly recurved petals and three sepals nearly as long as the petals. A whorl of three leaves tops the main stem. Named because flowers hang downwards, sometimes resulting in their concealment by the leaves.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)

Distribution: Ranges from central and eastern Canada and northcentral and northeastern states south to the Great Lakes and mid-Atlantic states. Rarer along its southern periphery. Occurs in northeastern South Dakota, which is the southwestern periphery of the species' range.

Key Habitats: Forested wetlands. Within South Dakota, habitats include forested coulees in maple-basswood forests.

Conservation Challenges:

- Invasive plant species
- Overbrowsing by native ungulates, such as white-tailed deer
- Loss and fragmentation of habitat from urban development and agriculture

Conservation Actions:

- Unknown

Research and Monitoring Needs:

- Periodically revisit known sites to assess status and potential threats

Additional Information: SD Wildlife Action Plan criterion: 3 – species depends on a unique habitat in South Dakota, maple-basswood forest.

Wildlife and Native American Associations: Favored browse by white-tailed deer.

As a group, trilliums have a variety of medicinal uses by both traditional and modern users. Native Americans used a trillium root tea for childbirth and menstrual issues. Secondary metabolites have been identified in this group with potential medicinal values.

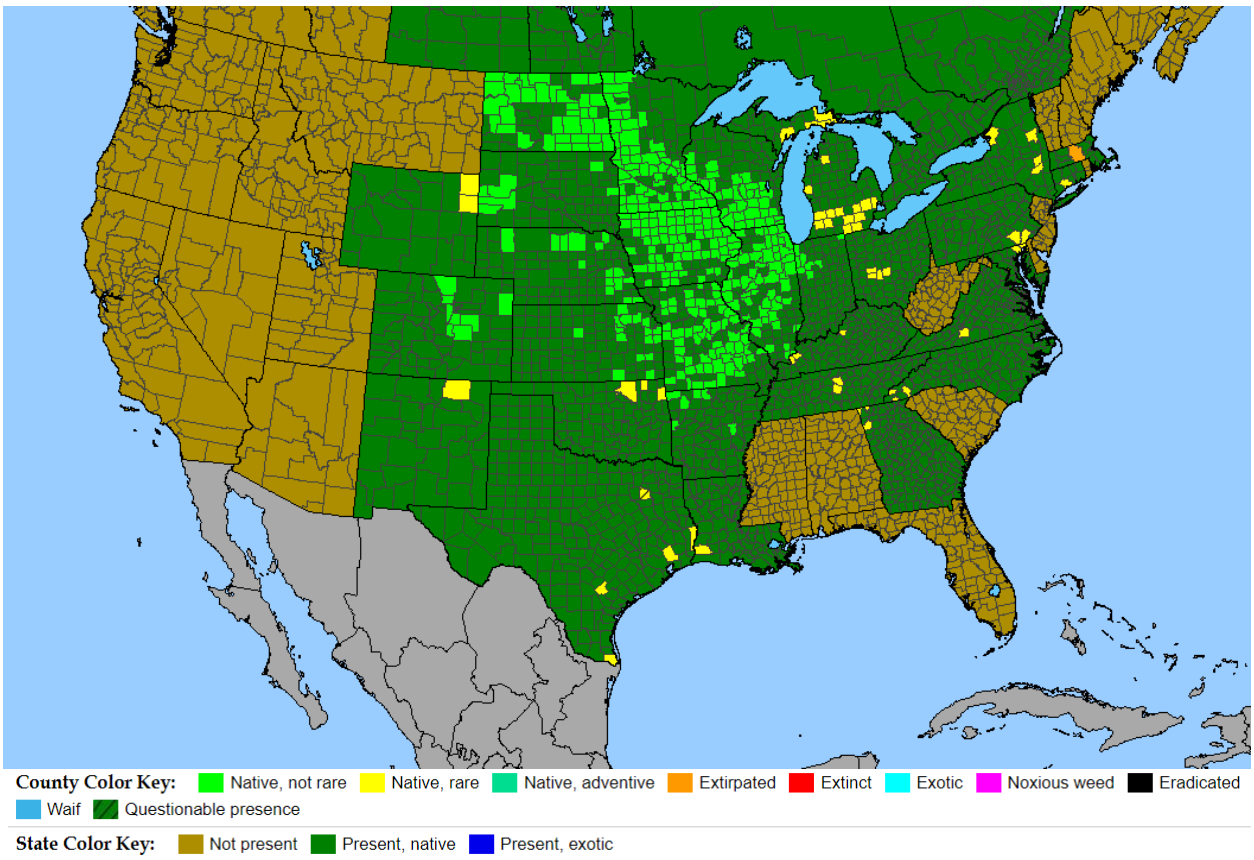
Existing Recovery Plans or Status Reports:

Meredith, C., A. Frances, A. Highland, L. Oliver, A. Floden, L.L. Gaddy, W. Knapp, D. Leaman, S. Leopold, T. Littlefield, R. Raguso, E.E. Schilling, A. Schotz, A. Walker, and K. Wayman. 2022. The Conservation Status of Trillium in North America. Mt. Cuba Center, and New Mexico BioPark Society. Hockessin, DE and Albuquerque, NM. Available: https://issuu.com/mtcuba/docs/the_conservation_status_of_trillium_in_north_ameri?e=43224013/92008195 [Accessed 11 Jan 2023].

Description: A warm-season perennial grass that grows in circular tufts 4-10 inches (10-25 cm) across. Open panicles reach 1-3½ feet (0.3-1 m) tall. Mostly basal leaves. Foliage turns golden color in fall. Flowers emit a vanilla-like aroma.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank SNR; not monitored by South Dakota Natural Heritage Program; no state rank assigned



Distribution: Widespread distribution across eastern ¾ of the U.S. and from Alberta to Quebec in Canada. Rarer in the eastern portion of its range.

Key Habitats: Prairies. In South Dakota. May occur in tallgrass prairie and wetter mixed-grass prairie, including sites in the foothills of the Black Hills. Can be associated with Indiangrass and big bluestem. A component of an imperiled ecosystem, the Northern Tallgrass Prairie.

Conservation Challenges:

- Plant community succession, habitat conversion and fragmentation, and certain forest management practices
- Woody encroachment from fire suppression

- Hydrological alterations
- May decrease with grazing pressure

Conservation Actions:
- Continue efforts to identify and conserve remaining tracts of tallgrass prairie
- Continue efforts to partner with landowners and land managers to maintain integrity of mixed-grass prairie

Research and Monitoring Needs:
- Ecosystem monitoring, particularly of Northern Tallgrass Prairie

Additional Information: SD Wildlife Action Plan criterion: 3 – species that is indicative of declining habitats in the state, tallgrass and mixed-grass prairies.

Wildlife and Native American Associations: A larval host plant for Dakota Skipper, a federal threatened species and Poweshiek skipperling, a federal endangered species. Provides habitat for other prairie butterflies, such as Ottoe skipper. **These three species are state animal species of greatest conservation need.**

Provides cover for small wild animals. Songbirds and rodents eat seeds. Wildlife may graze young plants.

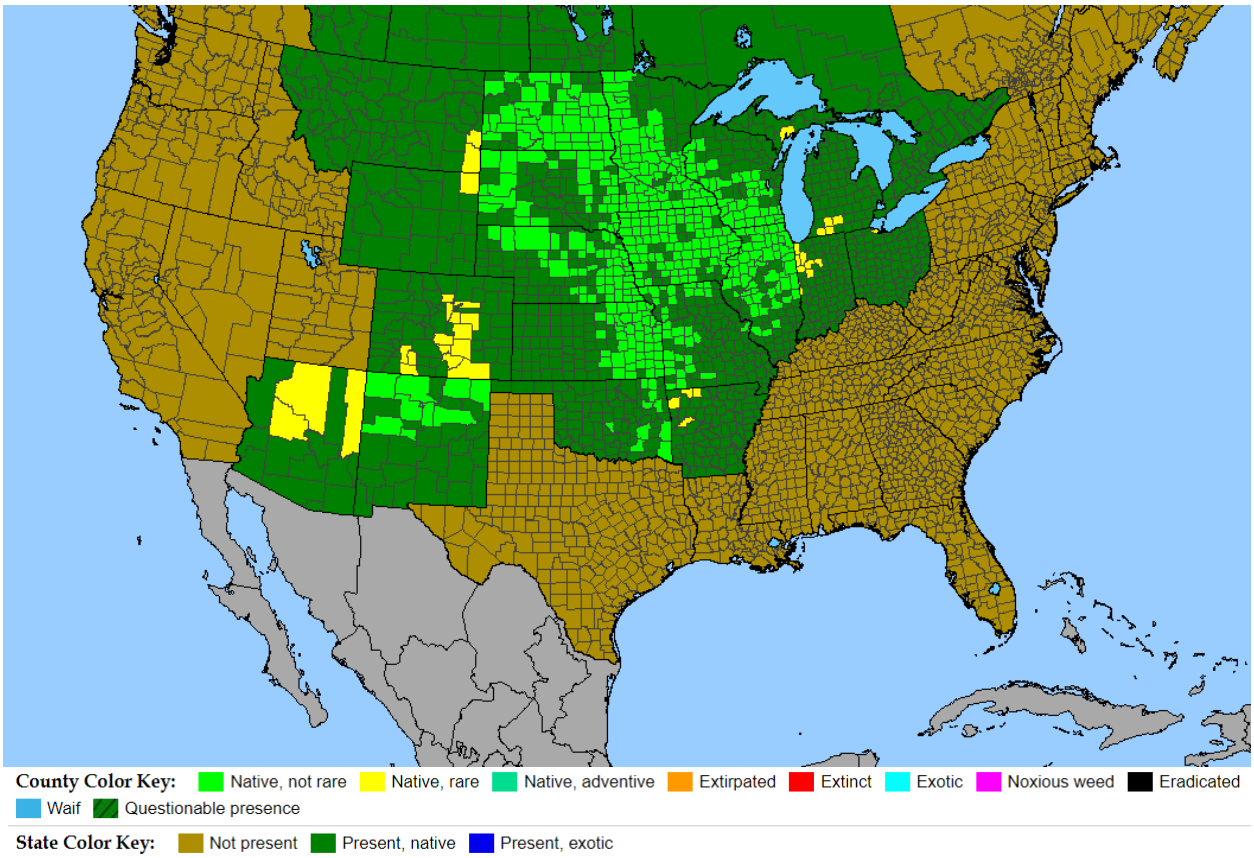
Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: A perennial herbaceous plant that reaches about 12 inches (30 cm) tall. Five-petaled blue-violet flowers face outward and hang from leafless stalks. Green leaves are all basal and deeply palmately lobed.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank SNR; not monitored in South Dakota Natural Heritage Program; no state rank assigned



Distribution: Ranges from Ontario and Alberta south through majority of central states.

Key Habitats: Dry prairie; open woods. Sunny sites with mesic to dry soils. Considered an indicator of high-quality prairie remnant habitats.

Conservation Challenges:
*

Conservation Actions:
*

Research and Monitoring Needs:
*

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of declining habitats in the state – tallgrass and upland prairies.

*N/A; this species is added as a plant species of greatest conservation need because it represents a particular habitat type, rather than because it is considered rare within the state and in need of specific monitoring or conservation actions.

Wildlife and Native American Associations: Violets in general are important larval host plants for a variety of insects, including various types of bees and butterflies. **This species is a larval host plant for the regal fritillary, a state animal species of greatest conservation need** and likely other South Dakota fritillaries, such as variegated, great spangled, Aphrodite, and silver-bordered.

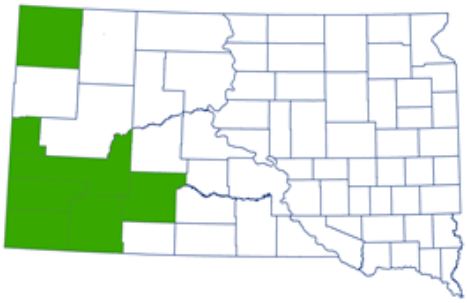
Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: This small, many-stemmed perennial herb reaches 6 inches (15 cm) high. Yellow flowers bloom in May and June. Many basal leaves in a rosettelike pattern. Leaves have silvery appearance with short, fine hairs. Also called Rydberg's double twinpod and double twinpod.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S3 (vulnerable)



Distribution: A regional endemic of the Northern Great Plains. Within the state, documented mainly in northwestern and southwestern South Dakota.

Key Habitats: Clay soils, dry gravel sites, and barren rock outcrops in badlands, barren habitats, and bare hillsides.

Conservation Challenges:

- Regional endemic of the Northern Great Plains. Not considered secure in its status in any of the 6 states within its range.

Conservation Actions:

- Unknown

Research and Monitoring Needs:

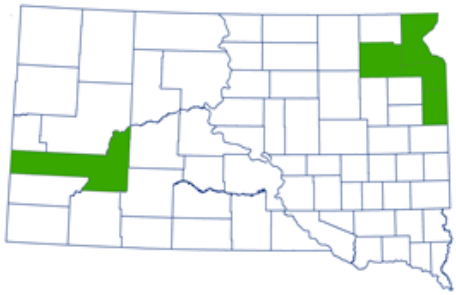
- Investigate whether all occurrences are this species or could be *P. didymocarpa*, which South Dakota plants were previously considered to be

Additional Information: SD Wildlife Action Plan criterion: 2a – a species that is regionally or globally imperiled and for which South Dakota represents an important portion of their remaining range. Although NatureServe has assigned a global rank of G5, this rank has not been reviewed since 1986. Of the six states within this species' range, four have assigned state ranks of S3 (vulnerable) and two states have assigned ranks of S1 (critically imperiled).

Description: A low-growing, deciduous, perennial shrub that can reach 5 feet (1.5 m) tall. Narrow leaves are densely white-woolly on the undersides. Woolly hairs on branches and leaves give the plant an overall appearance of a sage color. Catkins emerge with the leaves. Also called hoary willow.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S1 (critically imperiled)



Distribution: Broadly distributed across Canada, Alaska, and northern states from west to east coast. Within South Dakota, the most prominent site is McIntosh Fen in the Black Hills, which is adjacent to Castle Creek upstream from Deerfield. Additional smaller populations occur in northeastern South Dakota.

Key Habitats: Wetland obligate of the Great Plains. Calcareous seeps, bogs, and swamps. In South Dakota, all known occurrences are in small fens.

Conservation Challenges:

- Alteration of hydrology; wetland drainage or diversion
- Reduction in beaver populations and fire suppression
- Willow species in general can be harmed by effects of browsing by cattle and native ungulates and related trampling of seedlings

Conservation Actions:

- Protect integrity of McIntosh Fen, a Forest Service Botanical Area, including continued protection from off-road vehicles and livestock use and continued use and assessment of prescribed burns. The isolated nature of this population may represent a source of genetic diversity for the species.

Research and Monitoring Needs:

- Most of the 8 known occurrences were last visited and assessed in the mid-1980s. Revisit to update information on status and potential threats
- Investigate use of this species by insect pollinators
- Survey other areas, particularly on private lands, to locate additional populations

Additional Information: SD Wildlife Action Plan criterion: 3 – species that represent a unique habitat in South Dakota, fen habitats.

Existing Recovery Plans or Status Reports:

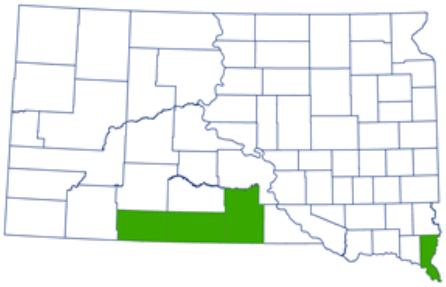
Decker, K. 2006. *Salix candida* Flueggé ex Wild. (sageleaf willow): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/ projects/scp/assessments/salixcandida.pdf [Accessed 12 Jan 2023].

Glisson, B.T. 2003. Conservation Assessment of Hoary Willow in the Black Hills National Forest, South Dakota and Wyoming. U.S.D.A., Forest Service, Rocky Mountain Region, Black Hills National Forest, Custer, South Dakota. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5226892.pdf [Accessed 12 Jan 2023].

Description: A warm-season, clump-forming perennial grass that reaches 15-60 inches (38-150 cm) tall. Straight branches divide many times from the central stalk. The tip of each branchlet has a finely textured spikelet or flower cluster, usually purplish and slightly flattened. Mostly basal leaves that are hairless except for a few long hairs on lower ¼ of the upper surface.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S4 (apparently secure)



Distribution: Southern South Dakota to Texas; Midwestern and Great Lakes states; and a few northeastern and western states. Within the state, occurs in the Sandhills of southcentral South Dakota (and adjoining Nebraska) and in Missouri River-adjacent sand dunes in extreme southeastern portion of state. Likely undercollected in the state.

Key Habitats: Open sandy woods, sandy range sites, roadsides, sandy prairies, and rocky slopes.

Conservation Challenges:
*

Conservation Actions:
*

Research and Monitoring Needs:
*

Additional Information: SD Wildlife Action Plan criterion: 3 –indicative of a unique or declining habitat in the state – sandhill prairies and Missouri River sand dunes.

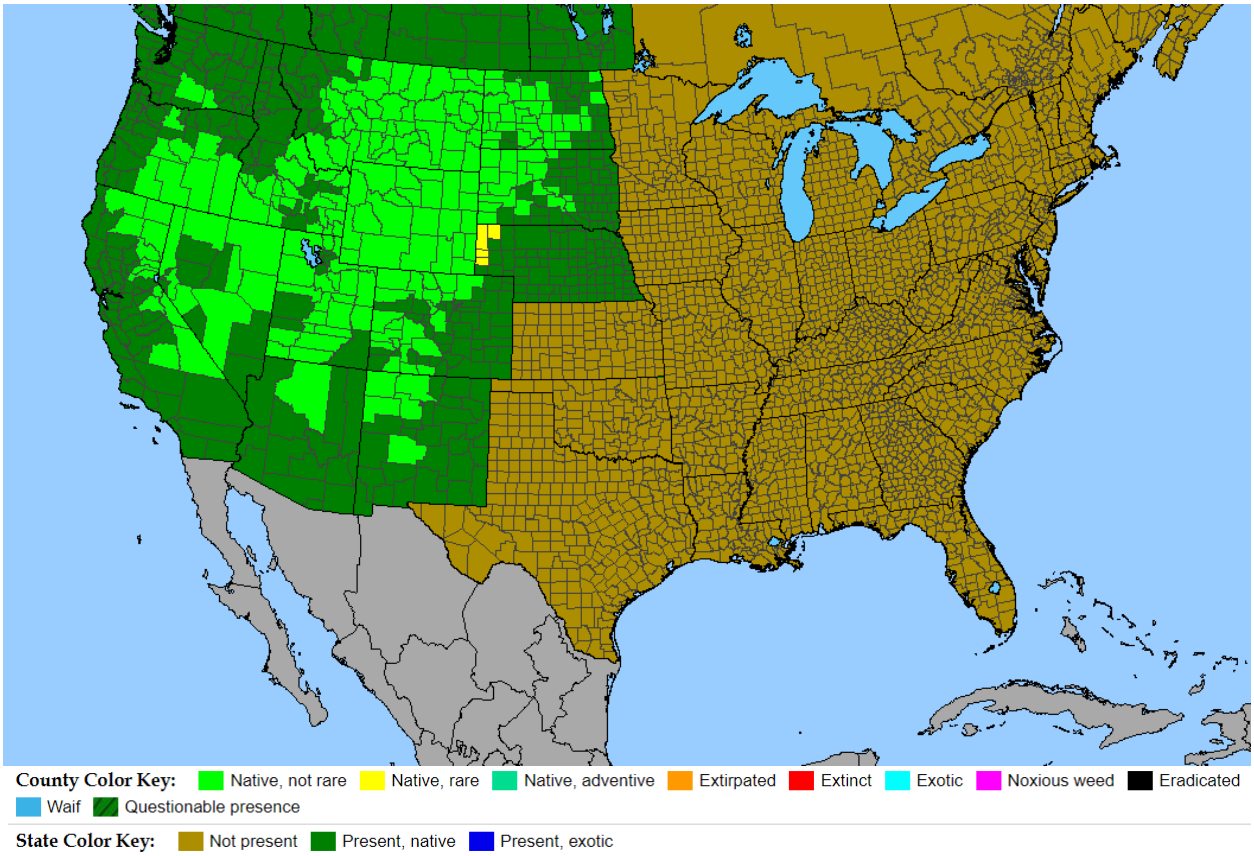
*N/A; this species is added as a plant species of greatest conservation need because it represents a particular habitat type, rather than because it is considered rare within the state and in need of specific monitoring or conservation actions.

Wildlife and Native American Associations: Useful forage for wildlife and domestic livestock, particularly during the summer.

Description: Erect to spreading woody shrub that reaches 3 feet (1 m) tall. Silvery appearance with narrow leaves. Branching stems have shredding bark and many small, yellowish flower in clusters within panicles. Spreads from rhizomes and root sprouting, especially following fire or mowing. Also called threadleaf sagebrush.

Protection/Population Status:

- Global Rank G5
- State Rank SNR; not monitored by South Dakota Natural Heritage Program; no state rank assigned



Distribution: Central Canada; within U.S., ranges from Minnesota westward and southward through majority of western and southwestern states. Scattered in central and western South Dakota.

Key Habitats: Dry prairies, alluvial flats, valley bottoms, and drainages. Often associated with other sagebrushes and a variety of grasses. Component of silver sagebrush/western wheatgrass shrubland plant community.

Conservation Challenges:

- Can decline with heavy grazing pressure
- Intolerant of fire
- Cheatgrass invasion

Conservation Actions:

- Opportunities to benefit from much recent study and implementation of sagebrush restoration techniques in association with conservation of various sage-grouse species

Research and Monitoring Needs:

- Explore opportunities to partner with other entities interested in the sage-steppe system in identifying research and monitoring needs

Additional Information: SD Wildlife Action Plan criterion: 3 – indicative of a unique and declining habitat in South Dakota, sage-steppe habitats.

Wildlife and Native American Associations: Fall and winter browse for pronghorn, particularly during deep snow conditions. Sage grouse eat the foliage, nest under this shrub, and use this species during the winter; G**reater Sage-Grouse is a state animal species of greatest conservation need**. Also grazed by domestic livestock.

Used in various ways by Lakota people: burning to protect against evil; as a tea; and for bracelets worn during the sun dance.

Existing Recovery Plans or Status Reports:

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming. Available: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1079&context=govdocs [Accessed 12 Jan 2023].

Map Source:

Kartesz, J.T., The Biota of North America Program (BONAP). 2023. Taxonomic Data Center. (http://www.bonap.net/tdc). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2023. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]

Description: This perennial plant has a clumped or tufted growth form (cespitose) and can reach 6 inches (15 cm) high. Stems are erect, with mostly basal leaves. White flowers occur on the upper half of the stem with inconspicuous bracts below. Usually, single nutlets.

Protection/Population Status:

- Global Rank G5 (secure)
- State Rank S2 (imperiled)

Distribution: A regional endemic limited to portions of Montana, Wyoming, Colorado, Nebraska, and South Dakota. Occurs in southwestern South Dakota in Custer and Fall River counties. Also ranked S2 in Colorado; S3 in Wyoming; and S4 in Montana.

Key Habitats: Sandy, calcareous soils of slopes and rangelands, juniper woodlands, and sagebrush steppe.

Conservation Challenges:

- Unknown

Conservation Actions:

- See Research and Monitoring Needs section

Research and Monitoring Needs:

- Eight known occurrences in the state; none are current
- Former GFP botanist commented that he expected this species to be more common on Buffalo Gap National Grassland than has been documented. Additional surveys needed to better understand state distribution

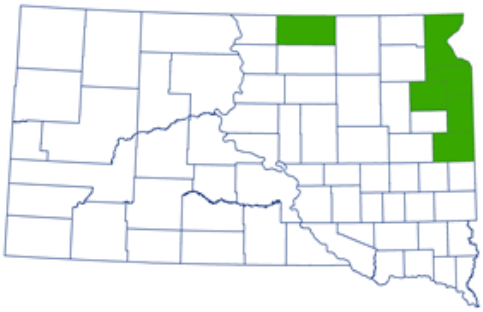
Additional Information: SD Wildlife Action Plan criterion: 2a - species that are regionally or globally imperiled and for which South Dakota represents an important portion of their remaining range. NatureServe's rank of G5 has not been reviewed since 1991. This species is considered vulnerable or imperiled by Natural Heritage Programs in 3 of the 5 states where it occurs. Additional survey work may indicate the species is more common than previously thought.

Description: Small annual plant with single blue to blue-violet blooms at the end of the main stem. Trumpet-shaped flowers are 1-2 inches (2.5-5 cm) long. Edges of the four rounded flower lobes have short fringe or fine serrations. A plant may have 1-6 flowers, with only one blooming at a time, from August to September. The narrow leaves are up to 1½ inches (3.8 cm) long, opposite, and hairless. Slender, erect stems are unbranched or with a few branches. The fruit capsule contains many seeds. Also called lesser fringed gentian.

Protection/Population Status:

- Global Rank G5 (secure); global rank last reviewed in 1985
- State Rank S2 (imperiled)

Distribution: From the St. Lawrence Seaway in New York west to Ontario and Manitoba, upper Midwestern and Great Lakes states, and extreme northeastern states. Found in northeastern and northcentral South Dakota.



Key Habitats: Wetland obligate of the Great Plains. Inhabits moist soil sites of wet meadows, stream banks, thickets, and calcareous fens and springs. May be found in sunny or partially shaded sites.

Conservation Challenges:

- Activities that alter hydrology or threaten or destroy wetlands that support this species

Conservation Actions:

- Unknown

Research and Monitoring Needs:

- Periodically revisit known sites to assess status

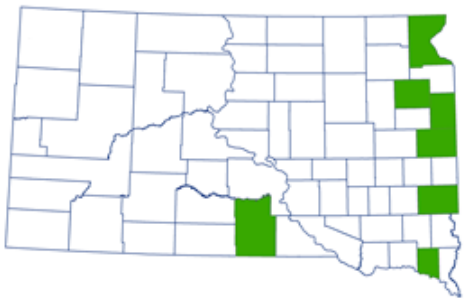
Additional Information: SD Wildlife Action Plan criterion: 3 – species that is indicative of unique or declining habitats in South Dakota, wet meadows and calcareous fens and springs.

Description: This perennial species may occur in clumps of dozens of stems emerging from a single root. One or rarely two flowers are present on a slender stem. The lower petal, or slipper, is up to 1 inch (2.5 cm) long and glossy white. Upper part of stem has 2-4 leaves that are 2-6 inches (5-15 cm) long and covered with short hairs.

Protection/Population Status:

- Global Rank G4 (apparently secure); global rank last reviewed in 1990
- State Rank S1 (critically imperiled)

Distribution: Manitoba and Ontario southward and southeastward through much of the Midwest and upper eastern states. Rare along periphery of its range, including in South Dakota, Nebraska, and Missouri. Occurs primarily in eastcentral South Dakota.



Key Habitats: Tallgrass and mixed-grass prairies; roadside ditches. Also in sedge meadows and calcareous fens. Pollinated by a variety of small andrenid and halictine bees. Its decline mirrors the loss of tallgrass prairie habitat.

Conservation Challenges:

- Habitat degradation, including impacts of invasive plant species
- Alteration of hydrology
- Woody plant encroachment
- Illegal collecting
- Herbicide application
- Loss of pollinators

Conservation Actions:

- Prescribed burning
- Maintain adequate groundwater
- Encourage pollinator habitat throughout the range of the species

Research and Monitoring Needs:

- Evaluate effectiveness of early spring burns for habitat maintenance

Additional Information: SD Wildlife Action Plan criterion: 3. This species depends on tallgrass prairie, a declining habitat in South Dakota and one that **supports the Dakota Skipper, a federal threatened species and state species of greatest conservation need.** This plant relies on pollination by certain bee species. Pollinators in general are suffering dramatic declines.

Description: A small, early blooming perennial that reaches a height of 3-6 inches (8-15 cm). A single, three-petaled, white terminal flower. Three green sepals are shorter than the petals. Just below the flower is a single whorl of three leaflike bracts, approximately 2 inches (5 cm) long, with prominent parallel veins. Leaves and stem are hairless.

Protection/Population Status:

- Global Rank G4 (apparently secure)
- State Rank S2 (imperiled)

Distribution: Widespread across northeastern states and westward as far as South Dakota and Nebraska. Within South Dakota, occurs in southeastern portion of the state, including Newton Hills State Park and some surrounding areas and along bluffs of the Big Sioux River, with an historical record in Deuel County.

Key Habitats: Calcareous wooded habitats. Thrives in areas with little leaf litter and little competition with other herbaceous plants (Meredith et al. 2022).

Conservation Challenges:

- Impacted by invasive plant species
- Depending on location, may be threatened by grazing, quarrying, logging, hydrological alterations, erosion from recreational land use, and habitat loss to development
- Some analyses have found this species to have low levels of genetic variation.

Conservation Actions:

- Appears to have been successfully introduced to another site (Union County State Park). These results suggest this may be a potential conservation action in other areas with appropriate habitat.

Research and Monitoring Needs:

- Of nine occurrences in South Dakota Natural Heritage Database, the 3 most recently surveyed were last observed in 2010 (2) and 2016. Revisit known sites to assess status.

Additional Information: SD Wildlife Action Plan criterion: SD Wildlife Action Plan criterion: 3 – species depends on a unique habitat, wetland forests of southeastern South Dakota.

Existing Recovery Plans or Status Reports:

Meredith, C., A. Frances, A. Highland, L. Oliver, A. Floden, L.L. Gaddy, W. Knapp, D. Leaman, S. Leopold, T. Littlefield, R. Raguso, E.E. Schilling, A. Schotz, A. Walker, and K. Wayman. 2022. The Conservation Status of Trillium in North America. Mt. Cuba Center, and New Mexico BioPark Society. Hockessin, DE and Albuquerque, NM. Available: https://issuu.com/mtcuba/docs/the_conservation_status_of_trillium_in_north_ameri?e=43224013/92008195 [Accessed 11 Jan 2023].

Description: Single stemmed perennial that stands up to 33 inches (85 cm) tall. Has a showy open raceme of up to 24 white to creamy white flowers, each with a long nectar spur. The lip, or lower petal of each flower, is deeply three-lobed and fringed. Flowering plants have three or more smooth, elongate leaves.

Protection/Population Status:

- Federal Threatened (listed 1989)
- Global Rank G3 (vulnerable)
- State Rank SH (historical)

Distribution: Only known locations of this species in South Dakota are from Brookings and Minnehaha counties in eastern South Dakota. Last known state record is from 1916.

Key Habitats: Historically, this species was only found in the Big Sioux River watershed on the Prairie Coteau. Outside of South Dakota, this species prefers quality tallgrass prairie, especially wetter sites that drain well.

Conservation Challenges:

- Not been detected in the state since 1916. However, due to the proximity of known populations of this species in Minnesota and North Dakota, and the fact that it is a federally threatened species, this plant remains a conservation priority if it is detected again within the state.

Conservation Actions:

- Continue Cooperative Agreement with U.S. Fish and Wildlife Service to assist with federal endangered species recovery in state
- Monitor to detect occurrence of species in state
- Educate public and partners to increase likelihood of detection

Research and Monitoring Needs:

- Continue to interact with adjacent states regarding status of species
- Habitat suitability modeling within South Dakota and across the region

Additional Information: SD Wildlife Action Plan criterion: 1 - federal or state listed species

Existing Recovery Plans or Status Reports:

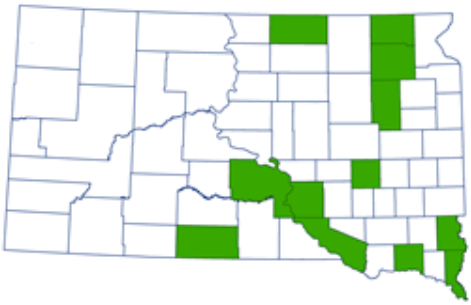
MN Dept. of Natural Resource. no date. Western prairie fringed orchid – a threatened midwestern prairie plant. Adapted from Sather, N. 1991. “Western prairie fringed orchid: a threatened midwestern prairie plant.” Minnesota Department of Natural Resources, St. Paul. 14 pages. Available: https://files.dnr.state.mn.us/natural_resources/ets/fringed_orchid.pdf

U.S. Fish and Wildlife Service. 1996. *Platanthera praeclara* (western prairie fringed orchid) recovery plan. U.S. Fish and Wildlife Service, Ft. Snelling, Minnesota. vi = 101 pp. Available: https://puc.sd.gov/commission/dockets/HydrocarbonPipeline/2014/HP14-002/rstexhibit/24.pdf

Description: A small, low-growing perennial species that may reach 10-12 inches (25-30 cm) in height. Blooms from late May through late June. One terminal convex or flat-topped flower head of small, pale, 5-petaled flowers. Seed pods have many fluffy seeds. Variable leaf shape, with fine woolly hairs on upper and lower surfaces. Two to three weakly erect stems covered with hairs.

Protection/Population Status:

- Global Rank G4 (apparently secure)
- State Rank S2 (imperiled)



Distribution: Manitoba and upper Midwest as far west as Montana and Wyoming and as far east as Wisconsin and Illinois. Locally rare within its eastern South Dakota distribution. The type specimen was collected in South Dakota by naturalist Thomas Nuttall in 1811 in the Missouri River breaks below the confluence with the White River. Relatively few historical collection sites in South Dakota have been relocated.

Key Habitats: Prairies, dry upland woods, or gravelly hillside prairies; sandy or rocky soils.

Conservation Challenges:

- Impacts of indiscriminate broadcast spraying
- Destruction of prairie habitats
- Compared to other milkweeds, produces relatively few seeds per stem

Conservation Actions:

- Habitat maintenance or restoration through selective clearing and prescribed burns

Research and Monitoring Needs:

- Continue surveying known sites and manage as needed
- Determine which invertebrate species are associated with this milkweed species

Additional Information: SD Wildlife Action Plan criterion: 3 - species depends on native prairie in eastern South Dakota, a habitat type much reduced from historical times.

Appendix D. Species codes used in Wildlife Action Plan. New species and codes are highlighted.

Common Name	Scientific Name	Species Code
BIRDS		
American Dipper	*Cinclus mexicanus*	AMDI
American Three-toed Woodpecker	*Picoides dorsalis*	ATTW
American White Pelican	*Pelecanus erythrorhynchos*	AWPE
Baird's Sparrow	*Ammodramus bairdii*	BAIS
Bald Eagle	*Haliaeetus leucocephalus*	BAEA
Black Tern	*Chlidonias niger*	BLTE
Black-billed Cuckoo	*Coccyzus erythrophthalmus*	BBCU
Black-billed Magpie	*Pica hudsonia*	BBMA
Black-backed Woodpecker	*Picoides arcticus*	BBWO
Bobolink	*Dolichonyx oryzivorus*	BOBO
Burrowing Owl	*Athene cunicularia*	BUOW
Chestnut-collared Longspur	*Calcarius ornatus*	CCLO
Chimney Swift	*Chaetura pelagica*	CHSW
Clark’s Grebe	*Aechmophorus clarkii*	CLGR
Ferruginous Hawk	*Buteo regalis*	FEHA
Grasshopper Sparrow	*Ammodramus savannarum*	GRSP
Golden Eagle	*Aquila chrysaetos*	GOEA
Greater Prairie-Chicken	*Tympanuchus cupido*	GRPC
Greater Sage-Grouse	*Centrocercus urophasianus*	SAGR
Least Tern	*Sternula antillarum*	LETE
Lark Bunting	*Calamospiza melanocorys*	LARB
Le Conte's Sparrow	*Ammodramus leconteii*	LCSP
Lewis's Woodpecker	*Melanerpes lewis*	LEWO
Loggerhead Shrike	*Lanius ludovicianus*	LOSH
Long-billed Curlew	*Numenius americanus*	LBCU
Marbled Godwit	*Limosa fedoa*	MAGO
Merlin	*Falco columbarius*	MERL
Northern Goshawk	*Accipiter gentilis*	NOGO
Osprey	*Pandion haliaetus*	OSPR
Peregrine Falcon	*Falco peregrinus*	PEFA
Pinyon Jay	*Gymnorhinus cyanocephalus*	PIJA
Piping Plover	*Charadrius melodus*	PIPL
Red-headed Woodpecker	*Melanerpes erythrocephalus*	RHWO
Ruffed Grouse	*Bonasa umbellus*	RUGR

Short-eared Owl	*Asio flammeus*	SEOW
Sprague's Pipit	*Anthus spragueii*	SPPI
Trumpeter Swan	*Cygnus buccinator*	TRUS
White-winged Junco	*Junco hyemalis aikeni*	WWJU
Whooping Crane	*Grus americana*	WHCR
Willet	*Tringa semipalmata*	WILL
Wilson's Phalarope	*Phalaropus tricolor*	WIPH
GASTROPODS		
Cooper's rocky mountainsnail	*Oreohelix strigosa cooperi*	CRMO
Callused (Dakota) vertigo	*Vertigo arthuri*	DAVE
Frigid ambersnail	*Catinella gelida*	FRAM
Mystery vertigo	*Vertigo paradoxa*	MYVE
AMPHIBIANS AND REPTILES		
Black Hills Redbelly Snake	*Storeria occipitomaculata pahasapae*	BHRS
Great Plains Toad	*Anaxyrus cognatus*	GPTO
Blanchard's Cricket Frog	*Acris blanchardi*	BCFR
Cope's Gray Treefrog	*Hyla chrysoscelis*	CGTR
Eastern Hognose Snake	*Heterodon platirhinos*	EHSN
Northern False Map Turtle	*Graptemys pseudogeographica*	FMTU
Plains Hog-nosed Snake	*Heterodon nasicus*	PHSN
Great Plains Earless Lizard	*Holbrookia maculata*	LELI
Smooth Greensnake	*Opheodrys vernalis*	SGSN
Lined Snake	*Tropidoclonion lineatum*	LISN
Many-lined Skink	*Plestiodon multivirgatus*	MLSK
Northern Prairie Skink	*Plestiodon septentrionalis septentrionalis*	NPSK
Northern Sagebrush Lizard	*Sceloporus graciosus*	SALI
Greater Short-horned Lizard	*Phrynosoma hernandesi*	SHLI
Midland Smooth Softshell	*Apalone mutica*	SMSO
Western (Ornate) Box Turtle	*Terrapene ornata*	WBTU
MAMMALS		
Black Hills red squirrel	*Tamiasciurus hudsonicus dakotensis*	BHSQ
Black-footed ferret	*Mustela nigripes*	BFFE
Eastern Red Bat	*Lasiurus borealis*	ERBA
Franklin's ground squirrel	*Poliocitellus franklinii*	FGSQ
Fringe-tailed myotis	*Myotis thysanodes pahasapensis*	FTMY
Little Brown Myotis	*Myotis lucifugus*	LBMY
Northern flying squirrel	*Glaucomys sabrinus*	NFSQ

Northern Hoary Bat	*Lasiurus cinereus*	NHBA
Northern myotis	*Myotis septentrionalis*	NOMY
Northern river otter	*Lontra canadensis*	NROT
Plains (eastern) Spotted skunk	*Spilogale putorius interrupta*	PSSK
Richardson's ground squirrel	*Urocitellus richardsonii*	RGSQ
Silver-haired bat	*Lasionycteris noctivagans*	SHBA
Swift Fox	*Vulpes velox*	SWFO
Tricolored Bat	*Perimyotis subflavus*	TCBA
Townsend's big-eared bat	*Corynorhinus townsendii*	TBBA
TERRESTRIAL INSECTS		
American burying beetle	*Nicrophorus americanus*	AMBE
Dakota skipper	*Hesperia dacotae*	DASK
Great Plains tiger beetle	*Amblycheila cylindriformis*	GPTB
Indian Creek tiger beetle	*Cicindela nevadica makosika*	ICTB
Iowa skipper	*Atrytone arogos iowa*	IOSK
Little White tiger beetle	*Cicindela lepida*	LWTB
Monarch	*Danaus plexippus*	MONA
Northern Sandy tiger beetle	*Cicindela limbata nympha*	NSTB
Ottoe skipper	*Hesperia ottoe*	OTSK
Pahasapa fritillary	*Speyeria atlantis pahasapa*	PAFR
Poweshiek skipperling	*Oarisma poweshiek*	POSK
Regal fritillary	*Speyeria idalia*	REFR
AQUATIC INSECTS		
A Mayfly	*Analetris eximia*	ANEX
Dakota Stonefly	*Perlesta dakota*	PEDA
Dot-winged Baskettail	*Epitheca petechialis*	EPPE
Elusive Clubtail	*Stylurus notatus*	STNO
FRESHWATER MUSSELS		
Black Sandshell	*Ligumia recta*	BLSA
Creek Heelsplitter	*Lasmigona compressa*	CRHE
Elktoe	*Alasmidonta marginata*	ELKT
Flat Floater	*Utterbackiana suborbiculata*	FLFL
Hickorynut	*Obovaria olivaria*	HICK
Higgins Eye	*Lampsilis higginsii*	HIEY
Mapleleaf	*Quadrula quadrula*	MAPL
Pimpleback	*Quadrula pustulosa*	PIMP
Rock Pocketbook	*Arcidens confragosus*	ROPO
Scaleshell	*Leptodea leptodon*	SCAL
Yellow Sandshell	*Lampsilis teres*	YESA

FISHES		
Banded Killifish	*Fundulus diaphanus*	BAKI
Blacknose Shiner	*Notropis heterolepis*	BLSH
Blackside Darter	*Percina maculata*	BLDA
Blue Catfish	*Ictalurus furcatus*	BLCA
Blue Sucker	*Cycleptus elongus*	BLSU
Burbot	*Lota lota*	BURB
Carmine Shiner	*Notropis percobromus*	CASH
Central Mudminnow	*Umbra limi*	CEMU
Finescale Dace	*Chrosomus neogaeus*	FIDA
Flathead Chub	*Platygobio gracilis*	FLCH
Hornyhead Chub	*Nocomis biguttatus*	HOCH
Lake Chub	*Couesius plumbeus*	LACH
Lake Sturgeon	*Acipenser fulvescens*	LAST
Logperch	*Percina caprodes*	LOGP
Longnose Sucker	*Catostomus catostomus*	LOSU
Mountain Sucker	*Catostomus platyrhynchus*	MOSU
Northern Pearl Dace	*Margariscus nachtriebi*	NPDA
Northern Redbelly Dace	*Chrosomus eos*	NRDA
Paddlefish	*Polyodon spathula*	PADD
Pallid Sturgeon	*Scaphirhynchus albus*	PAST
Plains Topminnow	*Fundulus sciadicus*	PLTO
Sauger	*Sander canadensis*	SAUG
Shovelnose Sturgeon	*Scaphirhynchus platorynchus*	SHST
Sicklefin Chub	*Macrhybopsis meeki*	SICH
Southern Redbelly Dace	*Chrosomus erythrogaster*	SRDA
Sturgeon Chub	*Macrhybopsis gelida*	STCH
Topeka Shiner	*Notropis topeka*	TOSH
Trout-perch	*Percopsis omiscomaycus*	TRPE
PLANTS		
Autumn Willow	*Salix serissima*	AUWI
Barr's Milkvetch	*Astragalus barrii*	BAMI
Big Sagebrush	*Artemisia tridentata*	BISA
Blue Cohosh	*Caulophyllum thalictroides*	BLCO
CO Birchleaf Mtn-mahogany	*Cercocarpus montanus*	CBMM
Compass Plant	*Silphium laciniatum*	COPL
Dakota Buckwheat	*Eriogonum visheri*	DABU
Downy Paintbrush	*Castilleja sessiliflora*	DOPA
Elegant Sedge	*Carex bella*	ELSE
Fendler's Whitethorn	*Ceanothus fendleri*	FEWH

Five-point Bishop's Cap	*Mitella pentandra*	FPBC
Kalm's Lobelia	*Lobelia kalmii*	KALO
Leedy's Roseroot	*Rhodiola integrifolia* ssp. *leedyi*	LERO
Limber Pine	*Pinus flexilis*	LIPI
Lodgepole Pine	*Pinus contorta*	LOPI
Loesel's Twayblade	*Liparis loeselii*	LOTW
Long-leaved Lousewort	*Pedicularis procera*	LLLO
Marsh Marigold	*Caltha palustris*	MAMA
Mountain Huckleberry	*Vaccinium membranaceum*	MOHU
Nodding Trillium	*Trillium cernuum*	NOTR
Prairie Dropseed	*Sporobolus heterolepis*	PRDR
Prairie Violet	*Viola pedatifida*	PRVI
Rydberg's Twinpod	*Physaria brassicoides*	RYTW
Sage Willow	*Salix candida*	SAWI
Sand Lovegrass	*Eragrostis trichodes*	SALO
Silver Sagebrush	*Artemisia cana*	SISA
Silver-mounded Candleflower	*Cryptantha cana*	SMCA
Small Fringed Gentian	*Gentianopsis procera*	SFGE
Small White Lady's-slipper	*Cypripedium candidum*	SWLS
Snow Trillium	*Trillium nivale*	SNTR
Western Prairie Fringed Orchid	*Platanthera praeclara*	WPFO
Woolly Milkweed	*Asclepias lanuginosa*	WOMI

Appendix G. Species-level research and survey needs identified during South Dakota Wildlife Action Plan revision to address conservation challenges. Amended during 2022 Minor Revision to add species where appropriate, highlighted in table.

Conservation challenge	**Future or ongoing survey needs Future research needs**	**Relevant SGCN**	**Related completed or ongoing projects**
Diseases	**Survey**: • Establish monitoring program to detect new occurrences of ranavirus by geographic area or watershed • Monitor West Nile virus incidence and mortality (ND) • Monitor white pelicans and associated colonial waterbirds for disease outbreaks (ND) • Monitor impacts of white-nose syndrome on bat populations	• Cope's Gray treefrog • Blanchard's Cricket frog • Greater Sage-Grouse • American White pelican • All SGCN terrestrial populations • Golden Eagle • Black-billed Magpie • All bat SGCN	
	Research: • Investigate prevalence of ranavirus in South Dakota amphibian species		• Kerby, Jacob and Danielle Gavin. 2022. Surveillance of Ranavirus and the Novel Amphibian Pathogen Bsal Across South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Kerby, Jacob and Drew Davis. 2016. Status of Salamander Species in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Kerby, Jacob. 2011. Prevalence of an emerging disease in South Dakota amphibian populations. Report to South Dakota Game, Fish

			and Parks Department, Pierre, South Dakota. • Brown, Jennifer. 2012. Impacts of Chytrid fungus and contaminants on amphibians of the Missouri River. MSc thesis submitted to the South Dakota Department of Game, Fish and Parks.
	• Investigate prevalence of West Nile virus and its effects on terrestrial populations, particularly birds (AK)		• USGS research
	• Examine bacterial and viral species present in American pelican feces, determining strains of microorganisms that may be detrimental to populations (AK)		• Sovada, M. A., P. J. Pietz , R. O. Woodward, A. J. Bartos, D. A. Buhl and M. J. Assenmacher. 2013. American white pelicans breeding in the northern plains – Productivity, behavior, movements, and migration: U.S. Geological Survey Scientific Investigations Report 2013-5105, 177 p., http://pubs.usgs.gov/sir/2013/5105/.
Exotic or introduced species impacts	**Survey**: • Determine whether SDGFP AIS efforts should be expanded to additional areas with high levels of SGCN occurrence. • Evaluate the relative impact of invasive species on plant SGCNs	• all aquatic and multiple terrestrial SGCN • Autumn Willow • Barr's Milkvetch • Big Sagebrush • Dakota Buckwheat • Kalm's Lobelia	• SDGFP AIS work

		• Limber Pine • Lodgepole Pine • Loesel's Twayblade • Nodding Trillium • Silver Sagebrush • Snow Trillium	
Pollution/pesticides	**Survey**: • Establish monitoring program for large white pelican colonies in South Dakota, in association with fish contaminant monitoring in areas near the largest colonies. • Monitor water quality at Clark's Grebe nesting colonies • Monitor pesticide and lead levels in raptors • Monitor pesticide levels in insectivorous birds and bats • Investigate impact of roundup-ready crops to milkweeds • Monitor impact of herbicide drift	• American White pelican • Clark's Grebe • Merlin • Short-eared Owl • Black-billed Magpie • Black-billed Cuckoo • Golden Eagle • Ferruginous Hawk • Monarch • All bat SGCN • Small White Lady's-slipper • Woolly Milkweed	• USGS research study on large white pelican colonies in the Northern Great Plains
	Research: • Secure and analyze white pelican chick mortalities for analysis of contaminant loads.	• American White pelican	
	Research: • Analyze contaminant loads in Eastern Hog-nosed snakes, Lined snakes, and Greater Short-horned lizards.	• Eastern hog-nosed snake • Lined snake • Greater Short-horned lizard	
	Research	• All bat SGCN	

	• Understand influence of pesticides on bat populations and other insectivorous species	• Chimney Swift	
Wetland quality (includes riparian strips)	**Research**: • Analyze contaminant levels in wetlands; assess damage to these areas (particularly grazing) (BS)	• all amphibians • Midland Smooth Softshell turtle • Blanchard's Cricket Frog • Red-bellied snakes • Five-point Bishop's Cap	• Campbell, Kaitlyn and Jake Kerby. 2019. Presence of selenium in South Dakota tile wetland species. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Kerby, Jacob and Jeff Wesner. 2017. Examining the impacts of agricultural tile drainage on wetland fauna in eastern South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Wert, Kirsten. 2012. An examination of the effects of anthropogenic habitat modification and contaminants on Missouri River Valley Fauna. MSc thesis submitted to the South Dakota Department of Game, Fish and Parks.
Damage to Black Hills meadows	**Research**: • Study effects of grazing on mesic meadows at higher elevations in the Black Hills (>4000 ft.) (BS) **Survey:**	• Black Hills Red-bellied snake • Autumn Willow • Long-leaved Lousewort	

	• Monitor quality and plant composition of Black Hills meadow habitats	• Elegant Sedge • Five-point Bishop's Cap	
Protection of habitats used by sagebrush lizards and greater short-horned lizards	**Research**: • Characterization of these habitat types via niche modeling (BS)	• Northern Sagebrush lizard • Greater Short-horned lizard • associated species using this habitat type • Big Sagebrush • Silver Sagebrush • Silver-mounded Candleflower	• Quinn, Hugh, Brian Smith, Holly Quinn and Gwen H. Writer. Short-horned lizard survey (*Phrynosoma hernandesi*) survey in South Dakota 2008 – 2009. 2009. Final Report Submitted to the South Dakota Department of Game, Fish and Parks. • Brian E. Smith, Jodi L. Massie, and Ben G. Blake. Distribution of the sagebrush lizards, *Sceloporus graciosus*, in the Black Hills of South Dakota. 2006. Unpublished report submitted to the South Dakota Department of Game, Fish and Parks.
Protection of snake hibernacula	**Research**: • Characterization of habitat features required for snake hibernacula via GIS modeling; surveys of such habitat (BS)	• all snakes	• Smith, Brian E., and Hugh Quinn. 2012. Threats, management and suggested harvest and collection policy for herpetofauna of South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Massie, J.L., B.E. Smith, and H. Quinn. 2013. Redbelly snake (*Storeria occipitomaculata*) and smooth greensnake (*Opheodrys vernalis*) activity along roadways near a presumed hibernaculum. Report to South Dakota Department of Game, Fish and Parks, Pierre, South Dakota.

			• Smith, Brian E. and Jodi L. Massie. 2022. Surveys of the Black Hills redbelly snake, *Storeria occipitomaculata pahasapae*, in the Northern Black Hills of South Dakota, 2021 and 2022. Report to South Dakota Department of Game, Fish and Parks, Pierre, South Dakota.
Over-collection of reptiles and amphibians	**Policy:** • Enact bag limits for the collection of all amphibians and reptile species in South Dakota (HQ).	• all amphibians and reptiles	• Smith, Brian E. and Hugh Quinn. 2012. Threats, management and suggested harvest and collection policy for herpetofauna of South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.
Genetic Structure Data	**Research**: • Inbreeding rates and nesting success of American white pelicans, determining factors that may contribute to poor survival (AK) • Examine subspecies determinations for herpetofauna. Will help understand and protect habitat for these species (AK). • Participate in genetics analyses of two spotted skunk species • Examine genetic diversity of rare regionally endemic plant species	• American white pelican • All herpetofauna • Plains (Eastern) spotted skunk • Dakota Buckwheat • Leedy's Roseroot	• USGS research studies • 2021. Clark, J. L. and Brian E. Smith. Conservation Genetics and Management of the Black Hills Redbelly Snake, *Storeria occipitomaculata pahasapae*. MSc thesis. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Kiesow, Alyssa M and Drew R. Davis. 2020. Field Guide to the Amphibians and Reptiles of South Dakota. Second edition. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota. • Smith, Brian E., Cynthia Anderson, Shane Sarver, and Laurelin R. Cottingham. 2007. Genetic variation in the Smooth Green Snake,

			Opheodrys vernalis, in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.
Riparian area habitat degradation and loss	**Survey**: • Establish a monitoring program for mussels and other aquatic biodiversity in South Dakota, in association with housing development along riparian areas. (KPaquatics).	• All mussels • All aquatic SGCN • Autumn Willow	•
	Research: • Study effects of housing developments along riparian areas on mussels and other aquatic biodiversity. (KPaquatics).		•
Hydrological changes and non-riparian habitat degradation and loss	**Survey:** • Evaluate relative impacts of this threat to plant SGCNs	• Autumn Willow • Elegant Sedge • Kalm's Lobelia • Loesel's Twayblade • Marsh Marigold • Prairie Dropseed • Sage Willow • Small Fringed Gentian	•
Understudied species	**Research** • Collect information on distribution, survival, reproduction, habitat requirements, and movement patterns at different life stages • Population monitoring	• All bat SGCN • All herp SGCN • Pinyon Jay • Chimney Swift	•

	Survey: • Collect updated information on undersurveyed plant SGCNs	• All plant SGCNs	
Susceptibility to overgrazing by domestic livestock and/or native ungulates	**Survey:** • Incorporate this potential threat into surveys to determine extent of impact to plant SGCNs	• Nearly all plant SGCNs	
Impacts of ORV use and other recreation	**Survey:** • Evaluate timing and severity of this threat to plant SGCNs	• Barr's Milkvetch • Elegant Sedge • Sage Willow	
Overcollection of plant SGCNs and/or lack of knowledge of sustainable collection levels	**Research:** • Investigate this topic based on experiences of other states or land management entities	• Blue Cohosh • Small White Lady's-slipper	
Habitat management practices to enhance plant SGCNs	**Research:** • Investigate effectiveness of early spring burns for habitat maintenance	• Small White Lady's-slipper	
Determine animal species associated with plant SGCNs	**Research:** • Investigate which invertebrate species are associated with selected plant SGCNs	• Woolly Milkweed	

Appendix H. Species-level research and survey needs identified during the South Dakota Wildlife Action Plan revision by habitat types or geographical areas. Amended during 2022 Minor Revision to add species where appropriate, highlighted in table.

Habitat or area	Future research needs future or ongoing survey needs	Relevant SGCN	Related completed or ongoing projects or reviewer comments
Sagebrush	**Survey:** • Map sagebrush habitat on private lands • Map sagebrush habitat in Fall River County (ND) • Complete faunal survey of sagebrush habitat (ND) • Determine quality of sagebrush (ND) • Monitor sagebrush habitats (MH)	• Greater Sage-Grouse • Northern Sagebrush lizard • Big Sagebrush • Silver Sagebrush	• Mergen Daryl E. and Corely, Carin J. .2013. Past and Current Vegetation Conditions of Core Sagebrush Habitat and Leks of the Greater Sage Grouse (*Centrocercus urophasianus*) at the eastern most extent of its range in Western South Dakota. (Butte, Harding and Fall River Counties, SD). Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Wright, P. and D. Wegner. 2007. Mapping sagebrush for sage grouse habitat in Butte and Harding Counties, South Dakota. Bureau of Reclamation Technical Service Center Remote Sensing and GIS Group Technical Memorandum No. 86-68260-08-01. 35 pages. This mapping needs to be extended to the private lands. It may require updated photographs, but a good start would be to extend the current classification (MR).
	Research: • Effects of livestock grazing on sagebrush obligates (ND)	• Greater Sage-Grouse • Northern Sagebrush lizard	

Wetlands	**Survey**: • Update National Wetlands Inventory maps; put priority on wetlands east of the James River **Research**: • How are wetland migrants distributed among natural and man-made wetlands? (Source: SD All Bird Conservation Plan) • Analyze hydrological conditions and threats at sites supporting wetland-obligate plant SGCNs	• Blanchard's cricket frog • Willet • Wilson's Phalarope • Black Tern • aquatic insects • Whooping Crane • Piping Plover • Clark's Grebe • Small Fringed Gentian • Loesel's Twayblade • Kalm's Lobelia • Sage Willow • Marsh Marigold	• Stewart, James and Dixon Mark. 2016. Mapping potential sites of calcareous fens in eastern South Dakota using ecological niche modeling. Report to South Dakota Game, Fish and Parks Department. • Cahlander-Mooers, Alex., Volke, Malia., Dixon, Mark., and Johnson W. Carter. 2014. Classification and mapping of riparian forest along the White River in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Bakker, K.K. 2005. South Dakota All Bird Conservation Plan. South Dakota Department of Game, Fish and Parks, Wildlife Division Report 2005-09.
	Survey: • Tile drainage locations (agreement with the importance of this factor – CD)	• Whooping Crane • Willet • Long-billed Curlew • Marbled Godwit • Wilson's Phalarope • Black Tern • Clark's Grebe • LeConte's Sparrow • All Aquatic SGCN	
	Research • Impact of narrowleaf cattail and hybrid spp. on wetland birds	• Black Tern • Trumpeter Swan • Clark's Grebe	

	Research: • ID quality stopover habitat for wetland birds	• Piping Plover • Willet • Marbled Godwit • Wilson's Phalarope	
Grassland	**Survey**: • Map remaining native prairie on a recurring basis • Overlap lost grassland habitat with the habitat needs of monitored species (CD) • Assess grassland habitats throughout state during migration and in breeding season (MH)	• Baird's Sparrow • Swift Fox • Western Box Turtle • Great Plains Toad • Northern Prairie Skink • Smooth Greensnake • Plains Hog-nosed Snake • Dakota Skipper • Sprague's Pipit • Lark Bunting • Baird's Sparrow • Le Conte's Sparrow • Chestnut-collared Longspur • Golden Eagle • Monarch • Short-eared Owl • Bobolink • Dakota Buckwheat • Grasshopper Sparrow • Woolly Milkweed	• Narem, Diane M. 2015. Classifying and mapping native grasslands of South Dakota's Northern Prairie Coteau and characterizing habitat for Dakota Skipper conservation. MSc thesis submitted to the South Dakota Department of Game, Fish and Parks. • Higgins, K.F., V. J. Smith, J.A. Jenks, J. J. Higgins, and G. A. Wolbrink. 2000. A provisional inventory of relict tallgrass prairie tracts remaining in Eastern South Dakota. SD Agricultural Experiment Station Extension Circular EC912. South Dakota State University, Brookings

		• Small White Lady's-slipper • Sand Lovegrass • Western Prairie Fringed Orchid • Compass Plant • Downy Paintbrush • Prairie Violet • Prairie Dropseed • Silver Sagebrush	
	Survey: • Map Grassland Bird Conservation Areas, West River (as done for East River by Bismarck HAPET office/Prairie Pothole Joint Venture (ND)	• Baird's Sparrow • Swift Fox • Chestnut-collared Longspur • Greater Prairie-Chicken • Ferruginous Hawk • Lark Bunting • Short-eared Owl • Bobolink • Grasshopper Sparrow	
	Survey: • Map untilled prairie on a recurring basis	• Baird's Sparrow • Swift Fox • Western Box Turtle • Great Plains Toad • Northern Prairie Skink • Smooth Greensnake	

		• Plains Hog-nosed Snake • Dakota Skipper • Bobolink • Grasshopper Sparrow	
	Survey: • Determine quality of untilled prairie	• Baird's Sparrow • Swift Fox • Western Box Turtle • Great Plains Toad • Northern Prairie Skink • Smooth Greensnake • Plains Hog-nosed Snake • Dakota Skipper • Bobolink • Grasshopper Sparrow	
	Research: • Habitat requirements for non-passerine grassland birds	• Burrowing Owl • Marbled Godwit • Long-billed Curlew • Greater Prairie Chicken • Ferruginous Hawk • Golden Eagle • Short-eared Owl • Bobolink	Relevant species conservation plans (ND) • http://www.whsrn.org/sites/default/files/file/Marbled_Godwit_Conservation_Plan_10_02-28_v1.2.pdf • http://www.whsrn.org/sites/default/files/file/Marbled_Godwit_Conservation_Plan_10_02-28_v1.2.pdf • http://www.whsrn.org/sites/default/files/file/Long-billed_Curlew_Plan_-_USFWS_rev_2009_Sept.pdf

		• Grasshopper Sparrow	
	Research: • Evaluate impacts of CRP loss on wildlife (ND)	• Ferruginous Hawk • Marbled Godwit • Long-billed Curlew • Greater Prairie-Chicken • Willet • Baird's Sparrow • Lark Bunting • Chestnut-collared Longspur • Sprague's Pipit • Dakota skipper • Monarch • Great Plains Toad • Northern Prairie Skink • Smooth Greensnake • Plains Hog-nosed Snake • Short-eared Owl • Bobolink • Grasshopper Sparrow	• SD State Wildlife Grant project T-59-R-1 (Evaluation of the James River Conservation Reserve Enhancement Program in South Dakota); duration 1 January 2013 – 31 December 2016 • Schumann, D. A. 2017. Measuring aquatic organism responses to grassland restoration: Does the Field of Dreams really exist? PhD Dissertation, South Dakota State University, Brookings. • Pfrimmer, J. D. 2017. An integrated evaluation of the Conservation Reserve Enhancement Program in South Dakota. PhD Dissertation, South Dakota State University, Brookings.
	Research: • Nest success between native and "tame" grasslands (ND	• Marbled Godwit • Long-billed Curlew • Greater Prairie-Chicken	

		• Willet • Baird's Sparrow • Lark Bunting • Chestnut-collared Longspur • Sprague's Pipit • Short-eared Owl • Bobolink • Grasshopper Sparrow	
	Research • Life cycle demographic information	• Bobolink • Grasshopper Sparrow	
	Research • Migration behavior	• Bobolink	
Aquatic	**Survey**: • Description of aquatic habitats (e.g., Substrate, flow, conductivity, temperature, dissolved oxygen, pH, and channel width)	• All Aquatic SGCN	
	Survey: • Location of springs	• river otter • Fish SGCN	
	Survey: • Map lakes and streams	• American White Pelican • Blanchard's Cricket Frog • Northern False Map Turtle	• Burdick, S.L. and D.L. Swanson. 2010. Status, distribution and microhabitats of Blanchard's cricket frog *Acris blanchardi* in South Dakota. Herpetological Conservation and Biology 5:9-16. (DS) • Swanson, D.L. and S.L. Burdick. 2010. Overwintering physiology and hibernacula

		• Midland Smooth Softshell • Fish SGCN	microclimates of Blanchard's cricket frogs at their northwestern range boundary. Copeia 2010:248-254. (DS)
	Survey: • Aquatic vegetation layer (produces invertebrates as a food source)	• Fish SGCN • Mussel SGCN • Wilson's Phalarope	
	Research: • Bioassessment toolkit	• Fish SGCN • Aquatic Insects	• Krause, J.R., K.N. Bertrand, A.Kafle, and N.H. Troelstrup, Jr. In press. A fish index of biotic integrity for South Dakota's Northern Glaciated Plains Ecoregion. Ecological Indicators.
Multiple	**Research**: • What is a large intact habitat block for wildlife species in South Dakota? • Conduct an assessment of grassland and wetland loss in correlation to wetland, wildlife, and overall ecosystem health (including effects that will be detrimental to humans, potentially including water clarity, invertebrate species composition and quantity, vegetation structure, percent full and average depth for existing wetlands) (MH)	• Long-billed curlew • swift fox • Greater Short-horned lizard • Great Plains Toad • Northern Prairie Skink • Smooth Greensnake • Plains Hog-nosed Snake • Greater Prairie-chicken • Willet • Sprague's Pipit (ND) • Bobolink	

		• Grasshopper Sparrow • All SGCN • Silver-mounded Candleflower	
Riparian	**Survey**: • Map riparian corridor habitats • Monitor riparian hardwood habitat (Source: SD Private Lands Habitat & Access Programs Plan)	• Bald Eagle • Silver-haired Myotis • Northern River Otter • Northern Myotis • Fringe-tailed Myotis • All Aquatic SGCN • All bat SGCN • Eastern Hog-nosed Snake • Autumn Willow • Marsh Marigold	• Ley, Matt J. 2012. Riparian forest vegetation patterns and historic channel dynamics of the Big Sioux River, South Dakota. MSc thesis submitted to the South Dakota Department of Game, Fish and Parks. • South Dakota Department of Game, Fish and Parks. 2008. Private Lands Habitat & Access Programs Strategic Plan. South Dakota Department of Game, Fish and Parks; Wildlife Division – Habitat Section.
Woodlands	**Survey**: • Woody habitat layer including tree type or tree group; density, average tree height	• Silver-haired bat (MR) • All bat SGCN • Smooth Greensnake • Blue Cohosh • Fendler's Whitethorn • Long-leaved Lousewort • Nodding Trillium • Snow Trillium	

		• Mountain Huckleberry • Mountain Mahogany • Five-point Bishop's Cap	
	Research: • Nest success between natural and man-made woodlands • Monitor nesting success and factors effecting nest success of woodland birds using relevant current protocols (DS)		• I made a meager attempt to evaluate cowbird parasitism in green ash woodlands along the Missouri river. It was not very successful. The study was vastly underfunded. (MR) • Gentry, D.J., D.L. Swanson, and J.D. Carlisle. 2006. Species richness and nesting success of migrant forest birds in natural river corridors and anthropogenic woodlands in southeastern South Dakota. Condor 108:140-153. (DS)
	Research: • Establish standard methods to evaluate woodland habitat quality and compare natural and planted woodlands		• Uresk has already completed woodland classifications for cottonwood, green ash, oak, and box elder woodland types (MR). • Liu, M. and D.L. Swanson. 2014. Physiological evidence that anthropogenic woodlots can substitute for native riparian woodlands as stopover habitat for migrant birds. Physiological and Biochemical Zoology 87: *In press* (DS) • Thomas, N.E. and D.L. Swanson. 2013. Plasma metabolites and creatine kinase levels of shorebirds during fall migration

			in the Prairie Pothole Region. Auk 130:*In press*. http://www.jstor.org.stable/10.1525/auk.2013.12169 (DS)
Pine-juniper-mahogany habitat, southern Black Hills	**Survey**: • Outline and survey extent of this habitat type, especially related to distribution of unique species (ex: Virginia's warbler) (DS)	• Pinyon Jay	
Black Hills	**Survey/research**: (MR) • Black Hills meadows, aspen, conifers	• Northern Goshawk • Ruffed Grouse • Black Hills Red squirrel • Northern flying squirrel • Smooth Greensnake • Black-backed Woodpecker (MR) • American Three-toed Woodpecker (MR) (DS) • Red-headed Woodpecker • Elegant Sedge • Fendler's Whitethorn • Long-leaved Lousewort	• There is need for monitoring population estimate protocol for BBWO populations, and further research to tease out relations with mountain pine beetle infestations such as spatial configuration of home ranges, characteristics of trees selected for foraging, cause specific mortality. There also is need for research on summer prescribed fire and timing of wildfires as it relates to BBWO habitat (MR). • There is also likely a need for genetics research on NTWO. There are a lot fewer of these than BBWOs and I suspect it would be likely there is genetic isolation here as well (MR). • Ervin. A.E. 2011. Habitat selection, nesting success and genetic structure of the American Three-toed Woodpecker in the Black Hills of South Dakota. Ph.D.

		• Lodgepole Pine • Limber Pine • Leedy's Roseroot • Autumn Willow • Mountain Huckleberry • Mountain Mahogany • Five-point Bishop's Cap	dissertation, University of South Dakota, Vermillion. 156 pp. (DS)
	Research: • Effects of development on Black Hills wildlife	• American Dipper • Northern Goshawk • Black-backed, American Three-toed, and Lewis's woodpeckers • Black Hills Red squirrel • Northern flying squirrel • Mountain Sucker • Townsend's Big-eared bat • All bat SGCN • Smooth Greensnake	• I don't see development being an issue on these woodpeckers. BBWO, NTWO, and Lewis' are all uncommon disturbance dependent (at some scale), and housing is not likely a problem. We have actually searched and found nests of BBWOs behind developments in the Deerfield area (MR).
Black Hills	**Research**: • Wildlife response to mountain pine bark beetle epidemic (ND)	• Northern Goshawk • Ruffed Grouse • Black-backed, American Three-	

		toed and Lewis's woodpeckers • Black Hills red squirrel • Northern flying squirrel • Townsend's big-eared bat • All bat SGCN	
Badlands	**Survey:** • Gather updated survey information on Badlands habitat dependent plant SGCNs (not limited to immediate vicinity of Badlands National Park)	• Barr's Milkvetch • Dakota Buckwheat • Rydberg's Twinpod	

Appendix I. Species-level research and survey needs identified during South Dakota Wildlife Action Plan revision for terrestrial animal species groups. Amended during 2022Minor Revision to add species where appropriate, highlighted in table.

Species or species group	Future or ongoing survey needs Future research needs Educational needs	Relevant SGCN	Related completed or ongoing projects
BIRDS			
Raptors	**Survey:** • Continue to monitor nest site selection, nesting phenology, nest success, and population trends of all raptor species. • Survey small mammal populations in key habitats to assess changes in prey base. • Collate data on human-caused mortality (direct hunting, power lines, wind turbines, etc.) (ND)	• Bald Eagle • Osprey • Burrowing Owl • Ferruginous Hawk • Northern Goshawk • Peregrine Falcon • Golden Eagle • Merlin • Short-eared Owl	• South Dakota Breeding Bird Atlas 1 and 2 • Bald Eagle Midwinter Survey • Bald Eagle Nest Surveys • Osprey nest surveys in the Black Hills • Ft. Pierre National Grasslands winter raptor surveys • Raptor Management Surveys • A raptor survey of the Grand River National Grassland, Perkins County, SD • Aerial survey of Northwestern South Dakota for nesting golden eagles
	Research:		• Burrowing owl distribution and nest site selection in western South Dakota

	• Identify critical habitats and prey preferences. • Research the effects of lead and other contaminants in the ecosystem to raptor populations. • Evaluate the potential effects of oil and gas development in northwest South Dakota to raptor nest success. • Assess the impact of wind energy facilities to resident and migratory raptors. • Evaluate the effects of habitat loss due to land conversion and fragmentation to raptor ecology		• Breeding ecology of ferruginous hawks and golden eagles in north central and western South Dakota • Nesting ecology of the northern goshawk in the Black Hills of South Dakota
	Survey: • Continue to solicit sightings of color-banded birds to	• Osprey • Peregrine Falcon	

	evaluate success of reintroduction efforts		
	Survey: • Continue periodic monitoring of Black Hills population, including evaluation of nests that may pose risks to powerlines or other structures	• Osprey	• Yearly Osprey nest surveys in the Black Hills
	Survey: • Investigate reports of nesting pairs or color-banded birds	• Peregrine Falcon	• Dowd Stukel, E. 2013. Peregrine falcon (*Falco peregrinus*) reintroduction in South Dakota. Final Report by SDGFP, Project T-10-R-1, Amendment #5.
	Species Reintroduction: • Continue the reintroduction of selected species into suitable sites across South Dakota	• Osprey	• Dowd Stukel, Eileen. 2011. Reintroduction of osprey into suitable sites along the Missouri River in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Dowd Stukel, E. 2013. Peregrine falcon (*Falco peregrinus*) reintroduction in South Dakota. Final Report by SDGFP, Project T-10-R-1, Amendment #5.
Colonial Waterbirds	**Survey:** • Continue statewide long-term monitoring of populations, identification of key	• American White Pelican • Black Tern • Least Tern	• South Dakota statewide colonial and semi-colonial Waterbird inventory with a plan for long-term monitoring, 2007 • South Dakota 2012 colonial waterbird survey • South Dakota Breeding Bird Atlas 1 and 2 • Colonial waterbird volunteer counts, 2009 and 2010

	colonies, and searches for new colony locations. • Determine what and how management actions may positively or negatively impact breeding waterbirds. • Track size and locations of colonies to aid management of waterbird-fisheries conflicts. • Monitor colonies with double-crested cormorants to evaluate how they impact other species in the colonies (CD) • Document all bird species using Bitter Lake complex (CD)	• Piping Plover • Clark's Grebe	• Drilling, N. E. 2007. South Dakota statewide colonial and semi-colonial waterbird inventory with a plan for long-term monitoring: Final Report. SDGFP Wildlife Division Report 2008-01. Tech. Rep. M-ColonySD-04. Rocky Mountain Bird Observatory, Brighton, CO. 80 pp. • Drilling, N.E. 2013. South Dakota 2012 Colonial waterbird survey. Tech. Rpt. SCColony-SD-05. Rocky Mountain Bird Observatory, Brighton, CO, USA.
	Research:		• Nesting success of tree-nesting waterbirds in colonies on selected wetlands in northeast South Dakota

	• Evaluate breeding habitat requirements and the effects of surrounding land use, changes in water levels, and human disturbances. • Identify causes of colony turnover. • Evaluate potential effects of commercial and non-commercial bait collection to food source availability. • Research factors that contribute to and the effects of interspecific competition at colonies.		• Drilling, N. E. 2007. South Dakota statewide colonial and semi-colonial waterbird inventory with a plan for long-term monitoring: Final Report. SDGFP Wildlife Division Report 2008-01. Tech. Rep. M-ColonySD-04. Rocky Mountain Bird Observatory, Brighton, CO. 80 pp. • Drilling, N.E. 2013. South Dakota 2012 Colonial waterbird survey. Tech. Rpt. SCColony-SD-05. Rocky Mountain Bird Observatory, Brighton, CO, USA. • Exploration of factors that influence productivity of American white pelicans at Bitter Lake in northeastern South Dakota: Sovada, M. A., P. J. Pietz , R. O. Woodward, A. J. Bartos, D. A. Buhl and M. J. Assenmacher. 2013. American white pelicans breeding in the northern plains – Productivity, behavior, movements, and migration: U.S. Geological Survey Scientific Investigations Report 2013-5105, 177 p., http://pubs.usgs.gov/sir/2013/5105/.
American dipper	**Survey:** • Continue monitoring nest site occupancy in Black Hills (KeB)	• American Dipper	• Forest Service also interested in monitoring. Possible sharing of personnel, etc. • Drilling, Nancy. 2019. Identification and monitoring of American Dipper populations and inhabited areas in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.

	• Identify critical wintering areas (ND) • Continue to document sightings of color-marked birds **Research:** • Factors limiting population size, distribution (ND) • Winter ecology (ND) • Monitor breeding population/success (ND)		
Ruffed grouse	**Survey** • Monitor long-term population trends. Possible cost share with FS (KeB) **Research:** • Refine monitoring protocol to be more cost effective (KeB) • Reasons for dramatic decrease in distribution (ND)	• Ruffed Grouse	• Hansen, Christopher P.; Rumble, Mark A.; Millspaugh, Joshua J. 2010. Monitoring ruffed grouse in the Black Hills: Protocol and user's manual for the occupancy spreadsheet program. Gen. Tech. Rep. RMRS-GTR-246WWW. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 36 p. • Integrated Monitoring in Bird Conservation Regions (IMBCR). • Hansen, C.P., J.J. Millspaugh, M.A. Rumble. 2011. Occupancy modeling of ruffed grouse in the Black Hills National Forest. J. Wildl. Manage. 75(1): 71-77. • Hansen, C.P., M.A. Rumble, J.J. Millspaugh. Ruffed grouse selection of drumming sites in the Black Hills National Forest. Am. Midl. Nat. 165:400-411.

Greater Prairie-Chicken	**Research:** (Source: SD Prairie Grouse Management Plan) • Relate weather variables to grouse production on Ft. Pierre National Grasslands	• Greater Prairie-Chicken	• Prairie Grouse Management Plan for South Dakota 2017–2021. 2017. South Dakota Department of Game, Fish and Parks, Wildlife Division Report 2017-03. Pierre, SD.
Woodpeckers	**Survey:** • Monitor long-term population trends. Possible cost share with FS. (KeB) • Develop appropriate survey and monitoring techniques (ND) • Conduct baseline survey to determine distribution, estimate population sizes (ND) • Develop plan for long-term monitoring (ND) **Research:** • Evaluate effectiveness of	• Black-backed Woodpecker • Lewis's Woodpecker • American Three-toed Woodpecker • Red-headed Woodpecker	• Integrated Monitoring in Bird Conservation Regions (IMBCR) • Alternate protocol may be needed for low density birds with irregular distribution such as black-backed woodpecker • Matseur, Elizabeth. 2017. Abundance of black-backed woodpeckers and other birds in relation to disturbance and forest structure in the Black Hills and Bear Lodge Mountains of South Dakota and Wyoming. M.S. Thesis, University of Missouri, Columbia, Columbia, Missouri. • Matseur, E. A., F. R. Thompson, B. E. Dickerson, M. S. Rumble, and J.J. Millspaugh. 2018. Black-backed Woodpecker Abundance in the Black Hills. Journal of Wildlife Management; DOI: 10.1002/jwmg.21450.

	IMBCR for monitoring trends (KeB) • Evaluate woodpecker responses to tree mortality caused by mountain pine bark beetles and fire (ND) • Identify limiting factors to population growth (ND) • Elucidate wood-boring insect prey population cycles in burns (ND)		
Piping Plover and Least Tern	**Research** • Assess health of sandbar habitats with observed success of piping plover and least terns to determine successful habitat characteristics (MH) • Continue evaluation of nesting	• Piping Plover • Least Tern	• Variety of habitat evaluations conducted by U.S. Army Corps of Engineers, U.S.G.S. and additional research entities

	requirements and responses to annual available habitat		
Piping Plover	**Survey:** • Participate in International Piping Plover Census	• Piping Plover	•
Trumpeter Swan	**Survey**: • Winter distribution and limits to that distribution (ND) **Research**: • Investigate why breeding population is not spreading (ND)	• Trumpeter Swan	•
Northern Goshawk	**Research**: • Telemetry study – where do pairs go when lose nest tree/stand/ nest- and territory site fidelity (ND) • Prey preferences; prey responses to habitat change and NOGO responses to prey base changes (ND)	• Northern Goshawk	• Bruggeman, J.E. and P.L. Kennedy. 2021b. Evaluation of Northern Goshawk nest-site data and population status in the Black Hills National Forest of South Dakota and Wyoming: Changes in nest-site habitat suitability and related forest attributes. Final Report Prepared for South Dakota Department of Game, Fish & Parks, Pierre, SD. 184 pp. September 17, 2021. • Related documents available at Wildlife Action Plan Explorer website: https://apps.sd.gov/gf43wap/?_ga=2.190492585.340984290.1674491365-884690202.1667484065

Ferruginous Hawk	**Research**: • Effects of prairie dog shooting, poisoning (ND)	• Ferruginous Hawk	•
Whooping Crane	**Survey:** • Continue monitoring movements and associated habitat use of migrating whooping cranes. **Research**: • Habitat requirements at stopover sites (ND)	• Whooping Crane	•
Long-billed Curlew	**Survey**: • Breeding distribution in SD (ND) • Location of core areas for conservation efforts (ND)	• Long-billed Curlew	• Clarke, J. N. 2006. Reproductive ecology of long-billed curlews breeding in grazed landscapes of western South Dakota. M.S. Thesis, South Dakota State University, Brookings, SD. 94 pp.
Sprague's Pipit	**Research**: • Reproductive success in native versus nonnative grasslands (ND • Habitat requirements	• Sprague's Pipit	•

	during migration (ND)		
Chestnut-collared Longspur	**Research**: • Identify core areas with highest population densities (ND) • Long-term monitoring of all grassland bird species (ND)	• Chestnut-collared Longspur	•
White-winged Junco	**Survey:** • Monitor general status through existing methods, such as SDBBA2, North American Breeding Bird Survey and SDOU reporting	• White-winged Junco	•
Black-billed Cuckoo	**Survey:** • Develop and implement suitable monitoring protocol to obtain more information on breeding, distribution, and population status and trends.	• Black-billed Cuckoo	

Black-billed Magpie	**Survey:** • Monitor general status through existing methods, such as SDBBA2, North American Breeding Bird Survey and SDOU reporting **Research** • Identify causes of population decline	• Black-billed Magpie	
MAMMALS			
Bats	**Survey:** • Monitor progression of WNS (KeB) • Monitor important hibernacula sites for evidence of WNS (outside cave entrances for excessive winter/spring bat mortality) (KeB) • Evaluate cave conditions to determine if conditions are conducive to WNS (KeB)	• Northern myotis • Townsend's big-eared bat • Silver-haired bat • Red bat • All bat SGCN	• Nationwide monitoring of WNS (USFWS) • Forest Service effort to monitor bats, hibernacula and WNS as funding and time permits. • Forest Service temperature/humidity data loggers in several caves in Black Hills. • South Dakota Bat Working Group. 2004. South Dakota Bat Management Plan. Wildlife Division Report 2004-08. 89 pp. • Bales, B.T. 2007. Regional distribution and monitoring of bats, especially species of conservation concern, along the lower Missouri River in South Dakota. M.S. Thesis, South Dakota State University, Brookings. • Swier, V.J. 2003. Distribution, roost site selection and food habits of bats in eastern South Dakota. M.S. Thesis, South Dakota State University, Brookings. • Tigner, J. and E.D. Stukel. 2003. Bats of the Black Hills – A description of status and conservation needs. South Dakota Department of Game, Fish and Parks. Wildlife Division Report 2003-05. • Tigner (BatWorks) contract work for SDGFP, USFWS and BLM.

	• Riparian area surveys, intensive monitoring programs along riparian areas in eastern SD (e.g., lakes and wetlands) and western SD (e.g., rivers) (AK) **Survey**: • See SD Bat Management Plan for list • Identify and protect important maternity roosts, nursery roosts, and hibernacula. (JT) **Research**: • See SD Bat management Plan for list • Role of abandoned mines in supporting bat populations. (JT) • Conduct future research under framework similar to *Guidelines for the Protection of Bat*		

	Roosts, American Society of Mammalogists, 1992. (JT) **Education**: • See SD Bat management Plan for list **Agency Coordination**: • Agencies involved with public land and wildlife management should develop formal relationships to maintain monitoring and continue habitat research. (JT) • Continue requiring compliance with South Dakota bat collection and sampling protocol for scientific collector's permit holders. (JT) • Protect specific locational information on		

	significant roosting locations to prevent unnecessary disturbance. (JT)		
Ground Squirrels	**Survey**: • Monitor distribution and abundance to evaluate effects of native grassland alteration. **Research**: • Assess habitat use and requirements • Research factors influencing distributional changes in South Dakota	• Franklin's Ground Squirrel • Richardson's Ground Squirrel	• Status and distribution of Franklin's and Richardson's ground squirrels in eastern South Dakota-T-53-R-1: Ronningen, T. 2015. Status and distribution of Franklin's and Richardson's ground squirrels in eastern South Dakota. M. S. Thesis, South Dakota State University, Brookings.
Jackrabbits	**Research**: • Needs study to identify limited factors. (CD)		• Schaible, D. J. 2007. Status, distribution, and density of white-tailed jackrabbits and black-tailed jackrabbits in South Dakota. M.S. Thesis, South Dakota State University, Brookings.
Black-footed ferret	• Determine the influence of predators and prey on black-footed ferret populations • Evaluate and improve reintroduction	• Black-footed ferret	• Research needs identified by the Conservation Subcommittee of the National Black-footed Ferret Recovery Implementation Team, letter to the Executive Committee, 20 February 2013.

	methods including captive rearing, captive animal release and translocation of wild animals • Further understand the ecology of sylvatic plague • Evaluate and improve current sylvatic plague mitigation methods including vaccination and insecticide application • Evaluate efficacy of sylvatic plague vaccine as a disease management tool and its effect on black-tailed prairie dog ecosystems		
Arboreal squirrels	**Survey:** • Monitor long-term population trends. (KeB) • Conduct surveys and monitor	• Northern flying squirrel • Red squirrel	• Kiesow, A.M. 2008. Genetic structure of Northern flying squirrel (*Glaucomys sabrinus*) and red squirrel (*Tamiasciurus hudsonicus*) populations in the Black Hills. PhD Dissertation, University of South Dakota, Vermillion. • Hough, M.J. 2008. Research techniques, habitat use, and ecology of northern flying squirrels, and research techniques and distribution of red

	population trends and dynamics (e.g., reproductive success). Do so in intervals (e.g., every other year) rather than annually to gather long-term data (AK) **Research:** • Evaluate effects of timber harvest and mountain pine beetle to population dynamics and movements • Habitat relationships, habitat use, desired habitat characteristics (KeB)		squirrels in the Black Hills National Forest and northeastern South Dakota. M.S. Thesis, South Dakota State University, Brookings.
River otter	**Survey:** (source: SD River Otter Management Plan) • Update knowledge of river otter distribution in South Dakota	• river otter	• South Dakota Department of Game, Fish and Parks. 2012. South Dakota River Otter Management Plan. South Dakota Department of Game, Fish and Parks Wildlife Division Report Number 2012-07, Pierre, South Dakota, USA. • Melquist, W. E. 2015. Determination of river otter (Lontra canadensis) distribution and evaluation of potential sites for population expansion in South Dakota. Report for Grant Number T-55-R-1, Study No. 2465.

	Research (source: SD River Otter Management Plan) • Determise life history characteristics of river otters in South Dakota • Determine cause of mortality and reproductive status of river otters in South Dakota • Determine reproductive status of river otters in South Dakota **Education** (source: SD River Otter Management Plan) • Provide information to the public about river otter population and legal status		
River otter	• Conduct river otter reintroduction to speed up recovery (CD)	• river otter	

Plains (Eastern) spotted skunk	**Survey:** • Develop survey or sampling methodology to update knowledge of state distribution and population status (CH and EDS) • Share updated information with U.S. Fish and Wildlife Service to inform listing decision (CH and EDS) **Research:** • Collect DNA samples opportunistically for genetics analysis and pesticide accumulation testing; (CH and EDS) • Investigate distribution connectivity within occupied range (CH and EDS)	• Plains (Eastern) spotted skunk	• Distribution, habitat selection and survival of plains spotted skunks in South Dakota, USA. State Wildlife Grant study in progress; cooperators South Dakota State University and Oklahoma State University.

	• Use survey and associated habitat data to predict occupancy potential (CH and EDS)		
REPTILES AND AMPHIBIANS			
Amphibians and reptiles	**Education:** • Conduct state wildlife law and species identification training regarding amphibians and reptiles to wildlife law enforcement and other GF&P Department personnel (HQ).	• All amphibians and reptiles	
	Research: • Characterization (i.e., niche modeling) of foraging habitat used during active season to predict locations of more populations of these species in South Dakota (BS)	• Northern Sagebrush lizard • Smooth Greensnake • Great Plains Toad • Northern Prairie Skink • Plains Hog-nosed Snake	• Massie, J.L., B.E. Smith, and H. Quinn. 2013. Redbelly snake (*Storeria occipitomaculata*) and smooth greensnake (*Opheodrys vernalis*) activity along roadways near a presumed hibernaculum. Report to South Dakota Department of Game, Fish, and Parks, Pierre, South Dakota. • Short-horned lizard (*Phrynosoma hernandesi*) survey in South Dakota 2008 – 2009. Final Report Submitted to the South Dakota Department of Game, Fish and Parks 31 December 2009. Hugh Quinn, Brian Smith, Holly Quinn and Gwen H. Writer. • Brian E. Smith, Jodi L. Massie, and Ben G. Blake. Distribution of the Sagebrush Lizard, *Sceloporus graciosus*, in the Black Hills of South Dakota. 2006. Unpublished report submitted to the South Dakota Department of Game, Fish, and Parks.

		• Greater short-horned lizard • Black Hills redbelly snake	
	Survey: • Establish statewide effort, e.g., FrogWatch, to monitor amphibian populations. Organize and advertise citizen science program throughout the state, working with universities, Dept. of Education, etc. (AK)	• all amphibian species	• Kerby, Jacob, and Spencer Siddons. 2015. Recruitment and training of South Dakotan citizen scientists for FrogWatch USA. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.
	Survey: • Establish statewide effort, e.g., FrogWatch, to monitor reptile populations. Organize and advertise citizen science program throughout the state, working with	• all reptile species	

	universities, Dept. of Education, etc. (AK)		
	Survey: • Digitize herp. book via marking it an "app" for download. Educational product available to all. Will assist with statewide monitoring efforts (AK).	• all herpetofauna	• Davis, Drew R, Christopher E Smith, and Don Becker. 2018. Creating online resources to engage South Dakota citizens in amphibian and reptile identification, distribution, and conservation. Final report, South Dakota Department of Game, Fish, and Parks Wildlife Division.
	Survey: • Surveys of habitats in foraging habitat characterization (BS).	• Northern Sagebrush lizard	• Brian E. Smith, Jodi L. Massie, and Ben G. Blake. Distribution of the Sagebrush Lizard, *Sceloporus graciosus*, in the Black Hills of South Dakota. 2006. Unpublished report submitted to the South Dakota Department of Game, Fish, and Parks.
Turtles	**Survey:** • Survey Missouri River False Map turtle populations north of Pierre to the North Dakota border (HQ).	• Northern False Map turtle	• Kerby, J., D. Davis, and A. Kase. 2019. Surveys for false map turtles and identification of key nesting sites in the upper Missouri River of South Dakota. Final Report, Grant Number T-77-R-1, Study Number 2488, to South Dakota Department of Game, Fish and Parks, Pierre, SD, USA.

	• Survey rivers in the northern and western portions of the state for smooth softshell populations (HQ).	• Midland Smooth softshell	
	• Survey potential ornate box turtle sites identified via. GIS technology by Higa et al. 2012 (HQ).	• Ornate box turtle	• Higa, Alessandra, Hugh Quinn, and Daniel W. Uresk. 2012. Distribution, abundance, and seasonal habitat use patterns in ornate box turtles (*Terrapene ornata*) in South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.
	Research: • Examine the scope of aquatic turtle mortality as bycatch in fish traps (HQ).	• Northern False map turtle • Midland Smooth softshell	
	• Identify areas where large concentrations of smooth softshells overwinter and produce plans to manage those areas (HQ).	• Midland Smooth softshell	
Turtles	**Policy/Enforcement**: • Identify key false map turtle and smooth softshell	• Northern False map turtle	• Kerby, Jacob. Drew Davis, and Anna Kase. 2019. Surveys for false map turtles and identification of key nesting sites in the upper Missouri River of

	nesting beaches along the Missouri River, and 1) prevent nest disturbances by recreationalists, 2) establish predator (of turtle nests) control programs at the beaches, and 3) post boat speed limits near the beaches (to prevent propeller injuries to females as they congregate to lay eggs) (HQ).	• Midland Smooth softshell	South Dakota. Report to South Dakota Game, Fish and Parks Department. • Dieter, Charles D., Dixon, Laura A., Ronningen, Samantha L., and Ronningen, Tait. 2014. Surveys of turtles nesting on the Missouri River on South Dakota-Nebraska border. Great Plains Research 24:111–118.
	• Encourage enactment of tribal law to provide protection of ornate box turtles on Pine Ridge and Rosebud Reservations (HQ).	• Ornate box turtle	
	Survey: • Continue surveys of greater short-horned lizards to better understand	• Greater short-horned lizard	• Quinn, Hugh, Brian Smith, and Gwen H. Writer. 2009. Short-horned lizard (*Phrynosoma hernandesi*) in South Dakota 1008 – 2009. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.

	their distribution in the state. Use of predictive ecological niche modeling should further help define appropriate areas to search (HQ).		
	• Conduct pitfall trap as well as visual surveys for many-lined skinks and common earless lizards in areas of sandy soils in Fall River, Shannon, Custer, Pennington, Jackson, Bennett, Mellette, Todd, Tripp and potentially Gregory Counties (HQ).	• Many-lined skink • Great Plains earless lizard	
Lizards	**Research**: • Collect and analyze molecular genetic population data of greater short-horned lizards and sagebrush lizards	• Greater short-horned lizard • Northern Sagebrush lizard	• Quinn, Hugh, Brian Smith, and Gwen H. Writer. 2009. Short-horned lizard (*Phrynosoma hernandesi*) in South Dakota 2008 – 2009. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota. • Smith, Brian E., and Hugh Quinn. 2012. Threats, management and suggested harvest and collection policy for herpetofauna of South Dakota. Report to South Dakota Game, Fish and Parks Department, Pierre, South Dakota.

	to examine population differentiation, gene flow, and populations potential at risk due to low genetic variation (HQ & BS).		• Brian E. Smith, Jodi L. Massie, and Ben G. Blake. Distribution of the Sagebrush Lizard, *Sceloporus graciosus*, in the Black Hills of South Dakota. 2006. Unpublished report submitted to the South Dakota Department of Game, Fish, and Parks. • Massie, J.L., B.E. Smith, and H. Quinn. 2013. Redbelly snake (*Storeria occipitomaculata*) and smooth greensnake (*Opheodrys vernalis*) activity along roadways near a presumed hibernaculum. Report to South Dakota Department of Game, Fish, and Parks, Pierre, South Dakota. • Smith, Brian, Cynthia Anderson, Shane Sarver, and Laurelin R Cottingham. 2007. Genetic variation in the Smooth Green Snake, *Opheodrys vernalis*, in South Dakota. Final report, Final Report Submitted to the South Dakota Department of Game, Fish, and Parks Wildlife Division.
	• Examine micro- and macro-habitat use of greater short-horned lizards and sagebrush lizards to better understand the requirements of this species in South Dakota (HQ & BS).	• Greater short-horned lizard • Northern Sagebrush lizard	
	• Conduct genetic analyses of many-lined skink and Great Plains earless lizard	• Many-lined skink • Great Plains Earless Lizard	

	populations to determine the distinctiveness of South Dakota populations from those in other parts of their ranges (HQ).		
Snakes	**Research:** • Define patterns of genetic variation and differentiation among South Dakota eastern hog-nosed snake populations, and compare these to populations outside the state (HQ).	• Eastern hognose snake	
	• Identify specific areas of high lined snake road mortality, and design methods to ameliorate such losses (HQ).	• Lined snake	
	• Conduct genetic analyses to determine the distinctiveness of	• Lined snake	• Davis, Drew R. 2022. Characterizing the genetic makeup of lined snakes (*Tropidoclonion lineatum*) in South Dakota. Interim Report to South Dakota Department of Game, Fish and Parks.

	South Dakota lined snake populations from those in other parts of their range (HQ).		
	• Long-term mark-recapture studies to track population densities through time (BS)	• snake species	•
Amphibians and reptiles	**Policy**: • Participate in identification of Priority Amphibian and Reptile Conservation Areas (PARCAs) through regional Partners in Amphibian and Reptile Conservation (PARC) chapters	• all species	http://www.parcplace.org/publications/parcas-priority-amphibian-and-reptile-conservation-areas.html
TERRESTRIAL INSECTS			
Little white tiger beetle	**Survey**: • Survey dunes in the Hecla area to see if this is still present. Identify threats (intensive	• Little white tiger beetle	

	grazing). Spomer's recent habitat evaluation indicated some areas that were heavily grazes and dunes trampled. Continued presence at this site may depend on remaining undisturbed or lightly disturbed dunes (SS). • Clean (undisturbed) blowouts need to be identified inland or on shores of lakes or river. Blacklighting or using Mercury Vapor can provide good results. (SS)		
Northern sandy tiger beetle	**Survey**: • More surveys needed (SS)	• Northern sandy tiger beetle	•

Indian Creek tiger beetle	• Continual monitoring of these species. Due to continued loss of prairie habitats in NE SD it is important to locate larval and adult populations of insects dependent on prairie habitats (AK).	• Indian Creek tiger beetle	• Dennis Skadsen
Dakota skipper and other prairie butterflies	**Survey:** • Continued monitoring of these species	• Dakota skippers, other prairie butterflies	• Annual surveys by Dennis Skadsen
	Research: • Continued participation in captive propagation and reintroduction efforts		• Dennis Skadsen contract work in association with Minnesota Zoo
Monarch	**Survey:** • Determine and implement assessment of milkweed extent, particularly in eastern South	• Monarch	• Mid-American Monarch Conservation Strategy development (http://www.mafwa.org/?page_id=2347) • South Dakota Department of Game, Fish and Parks. 2018. South Dakota Monarch Conservation and Management Strategic Plan. SD Game, Fish and Parks, Pierre.

	Dakota (CH and EDS) • Participate opportunistically in regional and national conservation planning efforts, such as the Mid-America Monarch Conservation Strategy, led by the Midwest Association of Fish and Wildlife Agencies, and related coordinated insect and habitat surveys (CH and EDS) **Research:** • Determine relationship between monarch populations and habitat patch size and juxtaposition within areas that do not provide habitat for larvae		

	or adults (CH and EDS) • Regional land management strategies that enhance pollinator habitat in a sustained and implementable way (CH and EDS)		
American burying beetle	**Research:** • Continued participation in captive propagation and reintroduction efforts	• American burying beetle	• Hoback, W.W., D. G. Snethen, and M. Reed. 2021. South Dakota occurrence and population assessment of American burying beetle (*Nicrophorus americanus*). Final Report to South Dakota Game, Fish and Parks.

Appendix J. Species-level research and survey needs identified during South Dakota Wildlife Action Plan revision for aquatic animal species groups. Amended during 2022 Minor Revision to add species where appropriate, highlighted in table.

Species or species group	**Future or ongoing survey needs** **Future research needs** **Educational or coordination needs** **(Initials indicate respondents [a])**	**Relevant SGCN**	**Related completed or ongoing projects**
All SGCN			
Educational or coordination: • Improve and increase collaboration and communication • Promote and improve conservation programs and incentives • Increase environmental efforts about the ecological, economic, and social values of aquatic SGCN • Establish standardized surveys and status assessments for native species, especially SGCN • Continue to build voucher, reference collections for all aquatic biodiversity • Follow up on recommendations from completed research projects • Focus conservation on the best opportunities • Promote management that focuses on conserving aquatic biodiversity			
FRESHWATER MUSSELS			
all mussels	**Survey:** • Establish baseline status & distribution information. • Facilitate a state-wide comprehensive survey, (particularly east river KPaquatic). • Facilitate a long-term monitoring program.	• Black Sandshell • Elktoe • Flat Floater • Rock Pocketbook • Higgins Eye • Yellow Sandshell • Creek Heelsplitter • Scaleshell • Hickorynut • Pimpleback • Mapleleaf	**Survey:** • Backlund, D. 1996. Freshwater Mussel Survey of the Medicine Knoll Creek Area, Hughes County, South Dakota. Unpublished Report, South Dakota Game, Fish and Parks. • Ecological Specialists, Inc. 1998. Final Report: Unionid Survey in Lake Sharpe, South Dakota and Possible Effects of Drawdown. Prepared for U.S. Army Corps of Engineers Omaha District, Omaha, NE.

all mussels (continued)			**Survey:** • Ecological Specialists, Inc. 2005. Characterization of Unionid Communities at three sites in the Missouri River at river miles 810.0, 769.8, and 761.5. Prepared for U.S. Army Corps of Engineers Omaha District, Omaha, NE. • Hoke, E. 1983. Unionid Mollusks of the Missouri River on the Nebraska Border. American Malacological Bulletin 1:71-74. • Hoke, E. 2003. Investigations on the distributions of freshwater mussels in the Missouri River reservoirs of South Dakota. Final Report to South Dakota Game, Fish and Parks, Pierre, South Dakota. Perkins, K. III. 1975. Distribution and Relative Abundance of the Unionid Mussels in the Vermillion River, S.D. MS Thesis, University of South Dakota, Vermillion. • Perkins, K. III., D. Skadsen, and D.C. Backlund. 1995. A survey for unionid mussels in Day, Deuel, Grant, and Roberts Counties, South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota. • Perkins, K. III., and D.C. Backlund. 2000. Freshwater mussels of the Missouri National Recreational River below Gavin's Point Dam, South Dakota and Nebraska. South Dakota Game, Fish and Parks Report 2000-1. • Perkins, K. III., and D.C. Backlund. 2003. A survey for winged mapleleaf (*Quadrula fragosa*) and scaleshell (*Leptodea leptodon*) in the James River, South Dakota. South Dakota Game, Fish and Parks Report 2003-17. • Skadsen, D. 1998. A report on the results of a survey for Unionid mussels on the Upper and Middle Big Sioux River and tributaries: Grant, Codington, Hamlin, Brookings, and Moody Counties, South Dakota. South Dakota Game, Fish and Parks Report 1998-02. • Shearer, J., D. Backlund, and S.K. Wilson. 2005. Freshwater mussel survey of the 39-mile district-Missouri National Recreational River, South Dakota and Nebraska. South Dakota Game, Fish and Parks Report 2005-08.

all mussels (continued)	**Research:** • Identify suitable & critical habitats. • Conduct research on life history requirements. • Examine reproductive behaviors: identify hosts, seasonal timing, & environmental variables. • Identify if & where recruitment is occurring. • Research genetic variation. • Identify limiting factors in current populations, such as host fish presence & distributions, & critical densities to maintain recruitment.		
	Education: • Increase awareness of mussels & their link to healthy ecosystems thru education & outreach. • Develop a Field Guide to the Freshwater Mussels of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065

GASTROPODS			
Gastropods	**Survey**: • Periodic surveys to monitor population status and trends	• Dakota Vertigo • Mystery Vertigo • Frigid Ambersnail • Cooper's Rocky Mountainsnail	• Anderson, T., R. Guralnick, and K. Weaver. 2006. Endemism and population relationships of the Black Hills Oreohelix snails – Final Report. • Anderson, T. K., K. F. Weaver, and R. P. Guralnick. 2007. Variation in adult shell morphology and life-history traits in the land snail *Oreohelix cooperi* in relation to biotic and abiotic factors. Journal of Molluscan Studies 73: 129-137. • Weaver, K., T. K. Anderson, and R. P. Guralnick. 2006. Combining phylogenetic and ecological niche modeling approaches to determine distribution and historical biogeography of the Black Hills Mountain Snails (Oreohelicidae). Diversity and Distributions 12:756-766. • Anderson, T. K and C. Schmidt. 2007. Population dynamics of a land snail species of conservation concern in the Black Hills. Intermountain Journal of Sciences 13:13-31. • Anderson, T. K. 2004. Field Guide to Black Hills Land Snails. Natural History Inventory Publication No. 22. University of Colorado Museum. • Anderson, T. K. 2004. A Review of the U.S. distribution of *Melanoides tuberculatus* (Muller, 1774), an exotic freshwater snail. Ellipsar 6(2): 15-18.

FISHES			
Statewide Cyprinidae (Minnows)	**Survey:** • Determine baseline surveys and status assessments (completed for Topeka Shiner). • Facilitate a management plan (completed for Topeka Shiner). • Develop & implement a monitoring program to evaluate management goals and provide baseline data in 11 watersheds (33 sites) once every three years (Ongoing for Topeka Shiner). • Implement Topeka Shiner monitoring at a minimum of 3 sites per watershed (88 sites) for the remaining watersheds not included within the ongoing monitoring program (10 streams in the James, 5 streams in the Vermillion, and 14 streams in the Big Sioux River basins.	• Blacknose Shiner • Carmine Shiner • Finescale Dace • Flathead Chub • Hornyhead Chub • Lake Chub • Northern Pearl Dace • Northern Redbelly Dace • Sicklefin Chub • Southern Redbelly Dace • Sturgeon Chub • Topeka Shiner	**Survey:** • Glacial relict fishes in spring-fed headwater streams of South Dakota's Sandhills region (T2-8-R-1). (Completion Date: December 2013). • Keya Paha Watershed Project with Nebraska (U-4-HM-1). (Completion Date: September 2016). • Topeka shiner (*Notropis topeka*) monitoring in eastern South Dakota streams (T-12-R). Completed 2007. • Topeka shiner (*Notropis topeka*) monitoring in eastern South Dakota streams (Round Two) (T2-9-R-1). Completed 2012. • Bailey, R.M., and Allum, M.O. 1962. Fishes of South Dakota (No. 119). Ann Arbor: Museum of Zoology, University of Michigan. • Bertrand, K. 2010. South Dakota Scientific Collector's Permit. South Dakota Game, Fish, and Parks. • Bertrand, K. 2011. South Dakota Scientific Collector's Permit. South Dakota Game, Fish, and Parks. • Blausey, C.M. 2001. The status and distribution of the Topeka shiner *Notropis topeka* in eastern South Dakota. MS. Thesis. South Dakota State University, Brookings. • Cunningham, G.R. and R.D. Olson. 1994. Fish species collected in streams in West River South Dakota-1994. • Cunningham, G.R., R.D. Olson, and S.M. Hickey. 1995. Fish surveys of the streams and rivers of south central South Dakota west of the Missouri River. Proceedings of the South Dakota Academy of Sciences 74:55-64. • Cunningham, G.R., and S.M. Hickey. 1997. Topeka shiner (*Notropis topeka*) survey at selected sites within the James and Big Sioux river drainages in South Dakota. Eco-Centrics, Omaha, NE. 39 pp. • Cunningham, G.R. 1999. A survey for the Topeka shiner (*Notropis topeka*) within the Big Sioux, Vermillion, and James river basins in South Dakota. Eco-Centrics, Omaha, NE. 73 pp. • Cunningham, G.R. 1999. Rare fish surveys in selected streams of eastern South Dakota. 1999 Survey. Wildlife Diversity Small Grant Report. • Cunningham, G.R. 2002. Topeka shiner surveys and population estimates in eastern South Dakota survey year 1999. Eco-Centrics, Omaha, NE.

Statewide Cyprinidae (Minnows)	**Survey:** (continued)	•	• Cunningham, G.R. 2006. Pearl dace (*Margariscus margarita*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Dieterman, D.J. and C.R. Berry, Jr. 1994. Fishes in seven streams of the Minnesota River drainage in north eastern South Dakota. Proceedings of the South Dakota Academy of Sciences 73:23-30. • Heakin, A., N. Morey, and C. Berry, Jr. 2003.Environmental monitoring and assessment program activities in South Dakota. Annual progress report. South Dakota Game, Fish, and Parks by U.S. Geological Survey. • Isaak, D.J., W.A. Hubert, and C.R. Berry, Jr. 2002. Conservation assessment for lake chub, mountain sucker, and finescale dace in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region. • McCoy, R.W. and D.C. Hales. 1974. A survey of eight streams in eastern South Dakota: Physical and chemical characteristics, vascular plants, insects and fishes. Proceedings of the South Dakota Academy of Sciences 53:202-219. • Morey, N.M. and C.R. Berry, Jr. 2004. New distributional records of the northern redbelly dace in the northern Great Plains. The Prairie Naturalist 36(4):257-260. • Morey, N. 2005. A survey of fishes from Snake Creek in the upper James River watershed. South Dakota Department of Transportation. • Moyle, J.B. and W.D. Clothier. 1959. Effects of management and winter oxygen levels on the fish populations of a prairie lake. Transactions of the American Fisheries Society 88:178-185. • Pasbrig, C.A. and D.O. Lucchesi. 2012. Topeka shiner (*Notropis topeka*) monitoring in eastern South Dakota streams (2010-2012. Unpublished report #T2-9-R-1. South Dakota Game, Fish and Parks. • Schultz, L. D., S. J. Lewis, and K. N. Bertrand. 2012. Fish assemblage structure in Black Hills, South Dakota streams. Prairie Naturalist 44:98-104.

Statewide Cyprinidae (Minnows)	**Survey:** (continued)		• Shearer, J.S. 2003. Topeka shiner (*Notropis topeka*) management plan for the state of South Dakota. Wildlife Division Report 2003-10. South Dakota Game, Fish, and Parks. • Shuman, D. A. and R. A. Klumb. 2012. 2011 annual report. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segments 5 and 6. U.S. Fish and Wildlife Service, Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota. Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program. April 2012. (SSaquatic) • Shuman, D. A. and R. A. Klumb. 2012. 2011 annual report. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segments 5 and 6. U.S. Fish and Wildlife Service, Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota. Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program. April 2012. • Stasiak, R. 2006. Lake Chub (*Couesius plumbeus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Stasiak, R. 2006. Northern redbelly dace (*Chrosomus eos*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Stasiak, R. and G.R. Cunningham. 2006. Finescale dace (*Chrosomus neogaeus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Stukel, S., J. Kral, and N. Loecher. 2011. Pallid Sturgeon population assessment and associated fish community monitoring for the Missouri River: Segment 7. Prepared for the U.S Army Corps of Engineers-Missouri River Recovery Program. South Dakota Game, Fish and Parks. (SSaquatic) • Wall, S.S., C.M. Blausey, J.A. Jenks, and C.R. Berry, Jr. 2001. Topeka shiner (*Notropis topeka*) population status and habitat conditions in South Dakota. South Dakota Cooperative Fish and Wildlife Research Unit, Completion Report, Research Work Order 73, Brookings. • Wall, S.S. 2002. Dawson Creek Survey (2002). Unpublished report. South Dakota Game, Fish, and Parks. • Wall, S.S. 2005. Topeka Shiner (*Notropis topeka*) Monitoring in Eastern South Dakota Streams. Unpublished report. South Dakota Game, Fish, and Parks.

Statewide Cyprinidae (Minnows)	**Survey:** (continued)		• Wall, S.S. 2006. Topeka Shiner (*Notropis topeka*) Monitoring in Eastern South Dakota Streams. Unpublished report. South Dakota Game, Fish, and Parks. • Wall, S.S. and S.K. Thomson. 2007. Topeka shiner (*Notropis topeka*) monitoring in eastern South Dakota streams (2004-2006). Unpublished report. South Dakota Game, Fish and Parks. • Wall, S.S. and S.K. Thomson. 2009. Population estimate of Topeka shiners within a watershed in eastern South Dakota. Unpublished report. South Dakota, Game, Fish, and Parks. • Wall, S.S. and S.K. Wall. 2010. Variations and trends in population estimates of Topeka shiners in eastern South Dakota. Unpublished report. South Dakota Game, Fish, and Parks.
Statewide Cyprinidae (Minnows) (continued)	**Research:** • Identify critical habitats. • Assess population dynamics. • Research life history characteristics and feeding habitats in South Dakota. • Research genetic variation. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment.		**Research:** • Anderson, C.M. and S.K. Sarver. 2008. Development of polymorphic microsatellite loci for the endangered Topeka shiner, *Notropis topeka*. Molecular Ecology Resources 8:311-313. • Blank, M., R. Bramblett, J. Cahoon, T. McMahon, O. Stein, S. Kalinowski. 2006. Impacts of Barriers on Topeka shiner populations SD2006-07. Western Transportation Institute. South Dakota Department of Transportation. • Cunningham, G.R. 2002. Road and bridge construction best management practices for stream sites inhabited by *Notropis topeka* (Topeka shiner). Report to the South Dakota Department of Transportation, Pierre. • Cunningham, G.R. 2006. Pearl dace (*Margariscus margarita*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Isaak, D.J., W.A. Hubert, and C.R. Berry, Jr. 2002. Conservation assessment for lake chub, mountain sucker, and finescale dace in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region. • Sarver, S.K. 2001. Development of DNA fingerprinting markers in Topeka shiner. Final Report to South Dakota Game, Fish & Parks, Pierre, South Dakota. • Stasiak, R.H. 1978. Reproduction, Age, and Growth of the Finescale Dace, Chrosomus neogaeus, in Minnesota. Transactions of the American Fisheries Society 107(5):720-723. • Stasiak, R. 2006. Northern redbelly dace (*Chrosomus eos*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region.

Statewide Cyprinidae (Minnows)	**Research:** (continued)		• Stasiak, R. and G.R. Cunningham. 2006. Finescale dace (*Chrosomus neogaeus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Thompson, S.K. 2008. The influence of livestock watering ponds (dugouts) on native stream fishes, especially the endangered Topeka shiner (*Notropis topeka*). Master's thesis. South Dakota State University. Brookings, SD. • Toline, C.A. and A.J. Baker. 1995. Mitochondrial DNA variation and population genetic structure of the northern redbelly dace (*Phoxinus eos*). Molecular ecology, 4(6):745-754. • Wall, S.S. and C.R. Berry, Jr. 2002. Inventory and mitigation of culverts crossing streams inhabited by Topeka shiners (*Notropis topeka*) in South Dakota – Draft. South Dakota Department of Transportation, Pierre, South Dakota. • Wall, S.S. and C.R. Berry, Jr. 2004. Road culverts across streams with the endangered topeka shiner, *Notropis topeka*, in the James, Vermillion, and Big Sioux River basins. Proceedings of the South Dakota Academy of Science 83: 125-135. • Wall, S.S. and C.R. Berry, Jr. 2006. The importance of multiscale habitat relations and biotic associations to the conservation of an endangered fish species, the Topeka shiner. American Fisheries Society Symposium 48: 305-322.
	Education: • Increase awareness of Cyprinids & their link to healthy ecosystems through education & outreach. • Create a Field Guide to the nongame fishes of South Dakota.		**Education:** • Ashton, D.E. and E.M. Dowd. 2006. Fragile Legacy: Rare Animals of South Dakota. South Dakota Game, Fish, and Parks. 2nd Edition. Report No. 91-04. • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Pallid Sturgeon	**Survey:** • Facilitate a management plan (completed). • Develop & implement a monitoring program to evaluate management goals and provide baseline data (Ongoing).	• False Map Turtle • Pallid Sturgeon • Shovelnose Sturgeon • Lake Sturgeon • Sicklefin Chub	**Survey:** • Klumb, R. A., D. A. Shuman, D. A. James, and K. L. Grohs. 2012. Movement Patterns of Age-1 and Age-7 Pallid Sturgeon Within the Missouri River During Record 2011 Discharges Downstream of Fort Randall Dam. Progress Report Prepared for WAPA, Billings, Montana and the Upper Basin Pallid Sturgeon Workgroup USFWS,

	• Develop standardized protocols for monitoring all life history stages.	• Flathead Chub • Smooth Softshell Turtle • Sturgeon Chub	Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota. • Missouri River Recovery Program. Pallid Sturgeon and Associated Fish Community Population Assessment website: http://moriverrecovery.usace.army.mil/mrrp/f?p=136:155:12288912760890::NO::PIS_ID:44. • Shuman, D. A. and R. A. Klumb. 2012. 2011 annual report. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segments 5 and 6. U.S. Fish and Wildlife Service, Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota. Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program. April 2012. • Stukel, S., J. Kral, and N. Loecher. 2011. Pallid Sturgeon population assessment and associated fish community monitoring for the Missouri River: Segment 7. Prepared for the U.S. Army Corps of Engineers-Missouri River Recovery Program. South Dakota Game, Fish, and Parks. • U.S. Fish and Wildlife Service. 1993. Pallid Sturgeon Recovery Plan. USFWS, Bismarck, North Dakota. 55 pp.
Pallid Sturgeon (continued)	**Research:** • Evaluate the role of sediment transport & discharge on the creation & maintenance of habitats for all life stages. • Identify limiting factors associated with natural recruitment including environmental factors, microhabitat features, predation, and pollution. • Research spawning & potential natural recruitment below Gavins Point Dam. What are the factors influencing egg and age-0 juvenile survival? • Investigate seasonal movements, use, and potential spawning on the James River for all life stages.		**Research**: • Development and application of a habitat assessment tool for juvenile Pallid Sturgeon in the upper Missouri River (T-24-R). Completed 2008. • Chipps, S.R., R.A. Klumb and E.B. Wright. 2008. Development and Application of Juvenile Pallid Sturgeon Bioenergetics Model. Final Report, State Wildlife Grant Program, Study T-24-R Study No. 2424. Submitted to South Dakota Department of Game, Fish and Parks, Pierre, SD. • French, W.E., B.D.S. Graeb, S.R. Chipps, K.N. Bertrand, and R.A. Klumb. In Press. Size-Dependent trophic patterns of Pallid Sturgeon and Shovelnose Sturgeon in a large river system. Journal of Fish and Wildlife Management. • French, W. E., B. D. S. Graeb, S. R. Chipps, K. N. Bertrand, T. M. Selch and R. A. Klumb. 2010. Vulnerability of age-0 pallid sturgeon Scaphirhynchus albus to fish predation, J. Appl. Ichthyol. 26: 6-10. • Grohs, K.L. 2008. Macroinvertebrate composition and patterns of prey use by juvenile pallid sturgeon (Scaphirhynchus albus) in the Missouri River, South Dakota and Nebraska. M.S. Thesis, South Dakota State University, Brookings.

Pallid Sturgeon (continued)			• Grohs, K. L., R. A. Klumb, S. R. Chipps and G. A. Wanner. 2009. Ontogenetic patterns in prey use by pallid sturgeon in the Missouri River, South Dakota and Nebraska. J. Appl. Ichthyol. 25: 48-53. • Missouri River Recovery Program. Pallid Sturgeon and Associated Fish Community Population Assessment website: http://moriverrecovery.usace.army.mil/mrrp/f?p=136:155:12288912760890::NO::PIS_ID:44. • Shuman, D. A., D. W. Willis, and S. C. Krentz. 2006. Application of a length-categorization system for pallid sturgeon (Scaphirhynchus albus). Journal of Freshwater Ecology 21:71-78. • Shuman, D. A., R. A. Klumb, R. Wilson, M. Jaeger, T. Haddix, B. Gardner, W. Doyle, P. Horner, M. Ruggles, K. Steffensen, S. Stukel, and G. A. Wanner. 2011. Pallid sturgeon growth, condition, and size structure within the Missouri River basin. Journal of Applied Ichthyology 27:269-281. • Sloss, B. L., R. A. Klumb, and E. J. Heist. 2009. Genetic conservation and paddlefish propagation. American Fisheries Society Symposium 66:307-327. Spindler, B.D. 2008. Modeling spatial distribution and habitat associations for juvenile pallid sturgeon (Scaphirhynchus albus) in the Missouri River. M.S Thesis, South Dakota State University, Brookings. • Spindler, B.D. 2008. Modeling spatial distribution and habitat associations for juvenile pallid sturgeon (Scaphirhynchus albus) in the Missouri River. M.S Thesis, South Dakota State University, Brookings. • Spindler, B. D., S. R. Chipps, R. A. Klumb and M. C. Wimberly. 2009. Spatial analysis of pallid sturgeon Scaphirhynchus albus distribution in the Missouri River, South Dakota. J. Appl. Ichthyol. 25: 8-13. • Spindler, B.D., S.R. Chipps, R.A. Klumb, B.D.S. Graeb, and M.C. Wimberly. 2012. Habitat and prey availability attributes associated with juvenile and early adult pallid sturgeon occurrence in the Missouri River, USA. Endangered Species Research Vol. 16: 225-234. • Wanner, G. A., R. A. Klumb, G. R. Jordan, and W. J. Stancill. 2007. Habitat use and movements of adult pallid sturgeon in the Missouri River downstream of Fort Randall Dam, South Dakota and Nebraska. Proceedings of the South Dakota Academy of Science 86:21-33.

			• Wanner, G. A., D. A. Shuman, M. L. Brown, and D. W. Willis. 2007. An initial assessment of sampling procedures for juvenile pallid sturgeon in the Missouri River downstream of Fort Randall Dam, South Dakota and Nebraska. Journal of Applied Ichthyology 23:529-538. • Wanner, G. A., D. A. Shuman, and D. W. Willis. 2006. Food habits of juvenile pallid sturgeon and adult shovelnose sturgeon in the Missouri River below Fort Randall Dam, South Dakota. Journal of Freshwater Ecology 22:81-92. • Wanner, G. A. 2006. Evaluation of a gastric lavage method on juvenile pallid sturgeon. North American Journal of Fisheries Management 26:587-591.
	Education: • Increase awareness of Pallid Sturgeon monitoring and recovery efforts thru education & outreach.		• Ashton, D.E. and E.M. Dowd. 2006. Fragile Legacy: Rare Animals of South Dakota. South Dakota Game, Fish, and Parks. 2nd Edition. Report No. 91-04. • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Statewide Catostomidae (Suckers)	**Survey:** • Conduct baseline surveys and status assessments.	• Longnose Sucker • Mountain Sucker • Blue Sucker	**Survey:** • Conservation status of the mountain sucker (*Catostomus platyrhynchus*) in South Dakota (T2-2-R-1). Completed 2011. • Schultz, L. D. and K. N. Bertrand. 2012. Long term trends and outlook for mountain sucker in the Black Hills of South Dakota. Am. Midl. Nat. 167:96-110. • Schultz, L. D., S. J. Lewis, and K. N. Bertrand. 2012. Fish assemblage structure in Black Hills, South Dakota streams. Prairie Naturalist 44:98-104. • Shuman, D. A. and R. A. Klumb. 2012. 2011 annual report. Pallid sturgeon population assessment and associated fish community monitoring for the Missouri River: Segments 5 and 6. U.S. Fish and Wildlife Service, Great Plains Fish and Wildlife Conservation Office, Pierre, South Dakota.

			Prepared for the U.S. Army Corps of Engineers – Missouri River Recovery Program. April 2012. • Stukel, S., J. Kral, and N. Loecher. 2011. Pallid Sturgeon population assessment and associated fish community monitoring for the Missouri River: Segment 7. Prepared for the U.S. Army Corps of Engineers-Missouri River Recovery Program. South Dakota Game, Fish, and Parks.
Statewide Catostomidae (Suckers) (continued) Statewide Catostomidae (Suckers) (continued)	**Research:** • Identify critical habitats. • Assess population dynamics. • Research life history characteristics and feeding habitats in South Dakota. • Research genetic variation. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment. **Research:** (continued)	• Longnose Sucker • Mountain Sucker • Blue Sucker	**Research:** • Belica, L.T. and N.P. Nibbelink. 2006. Mountain Sucker (*Catostomus platyrhynchus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. • Dauwalter, D.C., F.J. Rahel, S.R. Hirtzel, K.G. Gerow, and G.D. Hayward. 2008. MIS Monitoring Protocol for Mountain Sucker. Black Hills National Forest, USDA Forest Service, Region 2. • Isaak, D.J., W.A. Hubert, and C.R. Berry, Jr. 2002. Conservation assessment for lake chub, mountain sucker, and finescale dace in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region. • Morey, N.M. and C.R. Berry Jr. 2003. Biological characteristics of Blue Sucker in the James River and Big Sioux River, South Dakota. Journal of Freshwater Ecology 18(1): 33-41. • Schultz, L. D. 2011. Environmental factors associated with long-term trends of mountain sucker populations in the Black Hills, and an assessment of their thermal tolerance. M.S. Thesis, South Dakota State University, Brookings. 102 pp. • Schultz, L. D. and K. N. Bertrand. 2011. An assessment of the lethal thermal maxima for mountain sucker. Western North American Naturalist 71(3):404-411.
Statewide Catostomidae (Suckers) (continued)	**Education:** • Increase awareness of Catostomids & their link to healthy ecosystems through education & outreach. • Create a Field Guide to the nongame fishes of South Dakota.	• Longnose Sucker • Mountain Sucker • Blue Sucker	**Education:** • Ashton, D.E. and E.M. Dowd. 2006. Fragile Legacy: Rare Animals of South Dakota. South Dakota Game, Fish, and Parks. 2nd Edition. Report No. 91-04. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065

Statewide Fundulidae (Killifishes & Topminnows)	**Survey:** • Determine baseline surveys and status assessments.	• Banded Killifish • Plains Topminnow	**Survey:** • Glacial relict fishes in spring-fed headwater streams of South Dakota's Sandhills region (T2-8-R-1). (Completion Date: December 2013). • Keya Paha Watershed Project with Nebraska (U-4-HM-1). (Completion Date: September 2016). • Pasbrig, C.A., K.D. Koupal, S. Schainost, and W.W. Hoback. 2012. Changes in range-wide distribution of plains topminnow, *Fundulus sciadicus*. Endangered Species Research 16: 235-247.
Statewide Fundulidae (Killifishes & Topminnows)	**Research:** • Identify critical habitats. • Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment.	• Banded Killifish • Plains Topminnow	**Research:** • Schumann, D.A., C.A. Pasbrig, K.D. Koupal, and W.W. Hoback. 2012. Culture of Plains Topminnow in a pond constructed for species conservation. North American Journal of Aquaculture 74(3): 360-364.
Statewide Fundulidae (Killifishes & Topminnows)	**Education:** • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Statewide Percidae (Darters & Logperch)	**Survey:** • Determine baseline surveys and status assessments.	• Blackside Darter • Logperch • Sauger	**Survey:**
	Research: • Identify critical habitats.		**Research:**

	• Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment.		
	Education: • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Statewide Umbridae (Mudminnows)	**Survey:** • Determine baseline surveys and status assessments.	• Central Mudminnow	**Survey:**
	Research: • Identify critical habitats. • Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment.		**Research:**
	Education:		**Education:**

	• Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		
Statewide Percopsidae (Trout-Perch)	**Survey:** • Determine baseline surveys and status assessments.	• Trout-Perch	**Survey:**
Statewide Percopsidae (Trout-Perch) (continued)	**Research:** • Identify critical habitats. • Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment.	• Trout-Perch	**Research:**
Statewide Percopsidae (Trout-Perch) (continued)	**Education:** • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:**
Statewide Ictaluridae (catfishes)	**Survey:** • Determine baseline surveys and status assessments.	• Blue Catfish	**Survey:** • Hoagstrom, C.W., C. Hayer, J.G. Kral, S.S. Wall, C.R. Berry. 2006. Rare and declining fishes of South Dakota: A river drainage scale perspective. Proceedings of the South Dakota Academy of Science 85:171-211.
	Research: • Identify critical habitats. • Determine population dynamics.		**Research:**

	• Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment. • Climate change vulnerability assessment.		
	Education: • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Statewide Gadidae (Cod fishes)	**Survey:** • Determine baseline surveys and status assessments.	• Burbot	**Survey:**
	Research: • Identify critical habitats. • Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment. • Climate change vulnerability assessment.		**Research:**

	Education: • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
Paddlefish	**Survey:** • Determine baseline surveys and status assessments.	• Paddlefish	**Survey:** • Carlson, D.M., M.K. Kettler, S.E. Fisher, and G.S. Whitt. 1982. Low genetic variability in paddlefish populations. Copeia 1982:721-725.
	Research: • Identify critical habitats. • Determine population dynamics. • Research life history characteristics and feeding habitats. • Research seasonal movements & re-colonization capabilities after periods of intermittency. • Research genetic variation. • Develop captive breeding and stocking programs. • Identify limiting factors in current populations, such as presence of AIS or game fish species, land-use practices, & critical densities to maintain recruitment. • Climate change vulnerability assessment.		**Research:** • Dillard, J.G., L.K. Graham, and T.R. Russell, editors. 1986. The paddlefish: status, management, and propagation. American Fisheries Society, North central Division, Bethesda, Maryland. Special Publication 7. • Pitman, V.M. and J.O. Parks. 1994. Habitat use and movement of young paddlefish (Polyodon spathula). Journal of Freshwater Ecology 9:181-190. • Rosen, R.A., D.C. Hales, and D.G. Unkenholz. 1982. Biology and exploitation of paddlefish in the Missouri River below Gavins Point Dam. Transactions of the American Fisheries Society 111:216-222. • Southall, P.D., and W. A. Hubert. 1984. Habitat use by paddlefish in the upper Mississippi River. Transactions of the American Fisheries Society 113:125-131. • Sparrowe, R.D. 1986. Threats to paddlefish habitat. Pages 36-45 in J.G. Dillard, L.K. Graham, and T.R. Russell, editors. The Paddlefish: Status, Management and Propagation, North Central Division, American Fisheries Society, Special Publication Number 7. • Stancill, W., G.R. Jordan, and C.P. Paukert. 2002. Seasonal migration patterns and site fidelity of adult paddlefish in

Paddlefish (continued)			Lake Francis Case, Missouri River. North American Journal of Fisheries Management 22:815-824.
	Education: • Increase awareness & interest of nongame fishes & their link to healthy ecosystems thru education & outreach. • Create a Field Guide of the nongame fishes of South Dakota.		**Education:** • South Dakota Game, Fish, and Parks. (In preparation). Rare species field guide. CyberTracker. South Dakota Game, Fish, and Parks. • South Dakota Game, Fish, and Parks. Wildlife Action Plan Interactive website. South Dakota Game, Fish, and Parks. https://apps.sd.gov/gf43wap/?_ga=2.111971526.312951468.1675807972-884690202.1667484065
AQUATIC INSECTS			
all aquatic insects	**Survey:** • Establish baseline status & distribution information.	• *Analetris eximia*-A Mayfly • *Epitheca petechialis*-Dot-winged Baskettail • *Stylurus notatus*-Elusive Clubtail • *Perlesta dakota*-A Stonefly • *Libellula saturate*-Flame Skimmer** • *Brechmorhoga mendax*- Pale-faced Clubskimmer** • *Argia lugens*-Sooty Dancer**	**Survey:** • Huntsman, B. O., Baumann, R. W., & Kondratieff, B. C. (2001). The stoneflies (Plecoptera) of South Dakota. Entomological News, 112(2), 104-111.

		• *Erpetogomphus designates*- Eastern Ringtail (SHaquatic)**	
	Research: • Identify suitable & critical habitats. • Conduct research on life history requirements. • Determine limiting factors.		
	Education: • Increase awareness & interest of aquatic invertebrates & their link to healthy ecosystems thru education & outreach.		

**Topic is of research and/or monitoring importance, but species is not listed as a species of greatest conservation need

[a] Respondents to South Dakota Wildlife Action Plan research and survey needs assessment request.

Respondent	Code	Affiliation	Topics
Katie Bertrand	(KBaquatic)	South Dakota State University	fish
Kerry Burns	(KeB)	Black Hills National Forest	birds and bats, Black Hills
Charles Dieter	(CD)	South Dakota State University	birds, mammals
Nancy Drilling	(ND)	Rocky Mountain Bird Observatory	birds, habitats
Randy Griebel	(RG)	Nebraska National Forest	black-footed ferrets and related issues
Mick Hanan	(MH)	US Fish and Wildlife Service, Lake Andes NWR	birds, habitats
Steve Hummel	(SHaquatic)	Odonata Central	aquatic insects-Odonata
Alyssa Kiesow	(AK)	Northern State University	herptiles, mammals
Dave Lucchesi	(DLaquatic)	SDGFP	fish
Keith Perkins	(KPaquatic)	University of Sioux Falls	mussels
Hugh Quinn	(HQ)	Oglala Lakota College/Black Hills State University	reptiles, amphibians
Mark Rumble	(MR)	USFS, Rocky Mountain Forest and Range Experiment Station	birds, habitats
Will Sayler	(WSaquatic)	SDGFP	fish
Brian Smith	(BS)	Black Hills State University	reptiles, amphibians
Steve Spomer	(SS)	University of Nebraska-Lincoln	terrestrial insects
Sam Stukel	(SSaquatic)	SDGFP	fish (i.e. Pallid Sturgeon, Blue Sucker, Sturgeon Chub, Sicklefin Chub)
David Swanson	(DS)	University of South Dakota	birds, amphibians
Joel Tigner	(JT)	BatWorks Consulting	bats

Appendix J2. Species-level research and survey needs identified during 2022 Minor Revision for plant species of greatest conservation need. (**This is a new table.** The full table is highlighted to be consistent with other portions of this minor revision.)

Plant SGCN	Research	Survey
Autumn Willow	• Evaluate impacts of various pests, such as leaf galls, willow borer, and a rust (*Melampsora ribesii-purpureae*)	• Regularly survey known sites to assess population health and potential threats
Barr's Milkvetch		• Monitor known populations, particularly in areas subject to recreational ORV use • Continued surveys to assess population trends • Assess impacts of energy development
Big Sagebrush		• Explore opportunities to partner with other entities interested in the sage-steppe system in identifying research and monitoring needs
Blue Cohosh	• Determine sustainable levels of collection	• Monitor populations to assess status and potential impacts of collection
Compass Plant		• Approximately a dozen relatively recent occurrences known in South Dakota; resurvey known areas to assess continued viability and extent
Dakota Buckwheat		• Establish permanent monitoring plots in a variety of habitats
Elegant Sedge	• Determine if South Dakota's population is disjunct from the remainder of the species' range	• Periodically conduct threats assessment • Revisit known sites periodically
Fendler's Whitethorn		• Periodically resurvey known site in the Black Hills. Previous survey indicated healthy plants but no fruits • Monitor for signs of overgrazing by native ungulates

Five-point Bishop's Cap		• Known occurrences in states last observed in 1993 and 2014; resurvey sites to gain updated information on viability and coverage
Kalm's Lobelia		• Periodic monitoring of sites to assess sustainability and potential threats
Leedy's Roseroot	• Coordinate with U.S. Fish and Wildlife Service and U.S. Forest Service to identify research, monitoring or recovery strategies	• Monitor the known population in state, including evaluation of direct threats of collection and trampling by recreationists
Limber Pine	• Seed has previously been collected by U.S. Forest Service and provided to Bessey Tree Nursery, Nebraska National Forest, NE. Follow up to assess whether seeding or planting at additional sites is warranted	• Dates for most recent surveys of two known sites in the state are 2009 and 2011. Surveys needed to reassess status and potential threats
Lodgepole Pine	• Species considered to be highly resistant to climatic factors and extreme events, which may have future research implications	• Most recent record in South Dakota Natural Heritage Database is from 2004. Need renewed survey effort to update knowledge of known stands and locate new stands
Loesel's Twayblade		• Periodic monitoring of known sites to assess viability and potential threats
Long-leaved Lousewort		• Aside from one record from 2001, the last observed dates for many of South Dakota's records are from the mid- to late 1990s. All sites should be visited to assess status of known sites
Marsh Marigold	• May be suitable species to study climate change impacts	• Surveys needed to better understand distribution and abundance in areas at edges of distribution, such as South Dakota

Mountain Huckleberry	• A potential species for monitoring impacts of climate change in the northern Black Hills	• Majority of state's population occurs on private land; establish relationship with landowner to facilitate surveys
Nodding Trillium		• Periodically revisit known sites to assess status and potential threats
Prairie Dropseed		• Ecosystem monitoring, particularly of Northern Tallgrass Prairie
Rydberg's Twinpod	• Investigate whether all occurrences are this species or could be *P. didymocarpa*, which South Dakota plants were previously considered to be	
Sage Willow	• Investigate use of this species by insect pollinators	• Most of the 8 known occurrences were last visited and assessed in the mid-1980s. Revisit to update information on status and potential threats • Survey other areas, particularly on private lands, to locate additional populations
Silver Sagebrush		• Explore opportunities to partner with other entities interested in the sage-steppe system in identifying research and monitoring needs
Silver-mounded Candleflower		• Species may be more common on Buffalo Gap National Grassland than has been documented. Additional surveys needed to better understand state distribution
Small Fringed Gentian		• Periodically revisit known sites to assess status
Small White Lady's-slipper	• Evaluate effectiveness of early spring burns for habitat maintenance	

Snow Trillium		• Of nine occurrences in South Dakota Natural Heritage Database, the 3 most recently surveyed were last observed in 2010 (2) and 2016. Revisit known sites to assess status
Western Prairie Fringed Orchid	• Habitat suitability modeling within South Dakota and across the region	• Monitor to detect occurrence of species in state
Woolly Milkweed	• Determine which invertebrate species are associated with this milkweed species	• Continue surveying known sites and manage as needed

Appendix K. Species-level species- or habitat-specific restoration needs. Amended during 2022 Minor Revision to add species where appropriate, highlighted in table.

Species, species group or habitat	**Restoration needs (Initials indicate respondents[a])**	**Relevant SGCN**	**Related completed or ongoing projects**
reptiles, birds	• Restore (either artificially or through natural flooding) open beaches below dams along the Missouri river (HQ).	• For needed nesting habitat: False Map Turtle, Smooth Softshell, Least Tern, Piping Plover • For needed required habitat for all life stages: Eastern Hog-nosed Snake	
migratory birds	• Characterization and protection of migration and wintering habitats in Central and South America	• American White Pelican • Osprey • Ferruginous Hawk • Peregrine Falcon • Willet • Long-billed Curlew • Marbled Godwit • Wilson's Phalarope • Black Tern • Burrowing Owl • Sprague's Pipit	• Southern Wings Program is an international effort to link bird needs across breeding, migration and wintering habitats. SDGFP has contributed to a project in the Saltillo Grasslands in Mexico to help protect important wintering habitat for Ferruginous Hawk, Western Meadowlark, Chestnut-collared Longspur, and Grasshopper Sparrow.

		• Lark Bunting • Baird's Sparrow • Le Conte's Sparrow • Chestnut-collared Longspur • Black-billed Cuckoo • Short-eared Owl • Merlin	
lizards	• Create areas of open sand (discouraging stabilization of sand dune habitats) in areas of Lacreek National Wildlife Refuge where common earless lizards are known to occur (HQ).	• Great Plains Earless Lizard	
Greater Sage-Grouse	• Identify sites in Fall River County with suitable lek, nesting, brood-rearing, and winter habitat (ND) • Reintroduce disease-free birds into Fall River County (ND)	• Greater Sage-Grouse	
sagebrush	• Investigate best propagation and planting methods for big sagebrush (ND) • Identify sites for big sagebrush restoration (ND)	• Greater Sage-Grouse • Northern Sagebrush Lizard	
mussel SGCN	• Identify high priority sites & landowners for potential conservation & recovery (Locate within COAs). • Controlled propagation of mussels to discover methods &	• Black Sandshell • Elktoe • Flat Floater • Rock Pocketbook	

	techniques best suited to recover declined &/or extirpated populations.	• Higgins Eye • Yellow Sandshell • Creek Heelsplitter • Scaleshell • Hickorynut • Pimpleback • Mapleleaf	
Topeka Shiner	• Identify high priority sites & landowners for potential conservation & recovery (Locate within COAs).	• Topeka Shiner	
Pallid Sturgeon	• Continued supplemental stockings needed (Ongoing). • River corridor habitat protection through easements or purchase. (SSaquatic)	• Pallid Sturgeon	• Jordan, G. R., R. A. Klumb, G. A. Wanner, and W. J. Stancill. 2006. Post-stocking movements of hatchery- reared juvenile pallid sturgeon in the Missouri River below Fort Randall Dam, South Dakota and Nebraska. Transactions of the American Fisheries Society 135:1499-1511.
Plant Species	• Seed has previously been collected by U.S. Forest Service and provided to Bessey Tree Nursery, Nebraska National Forest, NE. Follow up to assess whether seeding or planting at additional sites is warranted • Investigate use of known propagation methods • Investigate options for translocation to other areas with appropriate habitat. • Investigate opportunities to benefit from much recent study and implementation of sagebrush	• Limber Pine • Compass Plant • Snow Trillium • Big Sagebrush • Silver Sagebrush	

	restoration techniques in association with conservation of various sage-grouse species		

[a] Respondents to South Dakota Wildlife Action Plan research and survey needs assessment request.

Respondent	Code	Affiliation	Topics
Katie Bertrand	(KBaquatic)	South Dakota State University	fish
Kerry Burns	(KeB)	Black Hills National Forest	birds and bats, Black Hills
Charles Dieter	(CD)	South Dakota State University	birds, mammals
Nancy Drilling	(ND)	Rocky Mountain Bird Observatory	birds, habitats
Randy Griebel	(RG)	Nebraska National Forest	black-footed ferrets and related issues
Mick Hanan	(MH)	US Fish and Wildlife Service, Lake Andes NWR	birds, habitats
Steve Hummel	(SHaquatic)	Odonata Central	aquatic insects-Odonata
Alyssa Kiesow	(AK)	Northern State University	herptiles, mammals
Dave Lucchesi	(DLaquatic)	SDGFP	fish
Keith Perkins	(KPaquatic)	University of Sioux Falls	mussels
Hugh Quinn	(HQ)	Oglala Lakota College/Black Hills State University	reptiles, amphibians
Mark Rumble	(MR)	USFS, Rocky Mountain Forest and Range Experiment Station	birds, habitats
Will Sayler	(WSaquatic)	SDGFP	fish
Brian Smith	(BS)	Black Hills State University	reptiles, amphibians
Steve Spomer	(SS)	University of Nebraska-Lincoln	terrestrial insects
Sam Stukel	(SSaquatic)	SDGFP	fish (i.e., Pallid Sturgeon, Blue Sucker, Sturgeon Chub, Sicklefin Chub)
David Swanson	(DS)	University of South Dakota	birds, amphibians
Joel Tigner	(JT)	BatWorks Consulting	bats