CHAPTER 6 CONSERVATION ACTIONS

The goal of the coarse filter strategy is to provide the framework to evaluate appropriate objectives for conserving ecosystem diversity. However, the amount of native ecosystem diversity maintained on the landscape that is sufficient to meet these objectives still remains a question. The SDWAP does not attempt to return South Dakota to an "historical" condition. The plan focuses on providing sufficient amounts of functionally similar ecosystems represented across all ecoregions in order for native species to continue to persist in South Dakota. The term used to describe this is "representation". Under an historical range of variability-based approach, this identifies an estimate of the threshold level to "represent" each ecological community occurring under natural disturbance regimes. This threshold level identifies a minimum estimated amount of all native ecosystems needed to maintain biological diversity and ecosystem integrity within an acceptable level of risk. Scientific analysis can define and quantify the degree of risk associated with various levels of ecosystem representation so that appropriate policies and plans can be developed. However, it is important to understand that society will ultimately determine the acceptable level of risk. Thus, a scientific approach identifies probabilities for conserving biological diversity and ecosystem integrity given a proposed level of ecosystem representation, but society ultimately determines what is adequate.

Quantifying risk has many complexities that must be factored into its determination. The first and primary complexity is the recognition that our understanding of many ecological relationships still remains relatively poor and therefore problematic. These uncertainties require that the question of adequacy, or "how much is enough", revolves around a discussion of the acceptable level of risk to ecosystem diversity and species persistence. Science based approaches strive to gather knowledge that reduces these uncertainties. Although the true answer will never be completely known, a science-based approach can place probabilities of risk on possible outcomes of different alternatives. Identifying the levels of risk associated with the selected level of representation is beyond the scope of this document but is included as a future action item to conserve biological diversity.

Habitat loss has been reported to be the leading threat to biological diversity at the species level (Barbault and Sastrapradia 1995, Temple 1986). As discussed previously, habitat loss and its effects on biological diversity result from the actual loss of habitat, alteration of disturbance processes that reduce the habitat quality of an ecosystem for a particular species, reduction in the size and connectivity of the remaining habitat patches for the occurrence of species, and shifting populations from being a single population within the landscape to being a metapopulation (i.e. consisting of many independent populations that only interact with occasional dispersal of individuals).

Each of these four areas of concern relative to habitat loss can influence the question of adequacy or "how much is enough". The first two areas of concern, direct and indirect reduction in habitat, are both causes of habitat loss, although the indirect losses are more subtle, and not as readily identified. Obviously, as available habitat declines within a landscape, the ability of the landscape to support a certain population size of a species declines as well. The species-area relationship addresses the fact

that each species requires a certain amount of habitat in one block or within a home range-sized area if the habitat is to be usable by the species. This is a question of whether the available habitat in a landscape is either of a sufficient quality or patch size, or whether it occurs in a close enough aggregate to support an individual or pair of the species. Obviously, the more habitat that is lost due to direct or indirect causes, the higher the likelihood that the remaining habitat will not occur in sufficient size to sustain the species.

The final concern addresses the distribution or arrangement of habitat within a landscape. When a landscape contains adequate habitat for a species, the species is distributed throughout the landscape and individuals interact in a relatively continuous and contiguous manner. If sufficient high quality habitat remains, and the species can move among areas of habitat, the landscape supports one population of the species, and the probability of persistence is fairly high. As available habitat is lost, through either natural or human-caused factors, fewer areas are available to support the species, and/or movement among areas of high quality habitat becomes more difficult. Habitat loss can lead to similar isolated patches in landscapes that previously supported relatively continuous distributions of a species. Species occurrences and distributions can be influenced by the number, size, and arrangement of habitat patches remaining within the landscape. In addition, the condition of the intervening areas that must be crossed by the species if it is to disperse to the remaining habitat patches will also play a major role in the status of the species within a landscape. It is desirable in landscape planning to provide suitable habitat and movement capabilities for species to minimize isolating conditions. If the occurrence of an isolated population is produced by alteration of the landscape, then the management of the resulting population becomes more complex.

Thus, the determination of representation from a species viability perspective is a complicated question. Because of this complexity, fine-filter, or species-based approaches to conservation of biological diversity have major shortcomings. The quantity of information needed to address the viability question of any single species is considerable. If the needs of all species were to be contemplated, the resulting information and analysis needs become staggering. In addition, meeting the needs of each species on landscapes altered significantly from historical conditions may result in conflicting plans for species that were once common under historical conditions and species that are common today due to these changes.

Maintaining or restoring an appropriate level of ecosystem diversity throughout South Dakota is an important first step toward addressing the habitat needs and future persistence of all South Dakota's species. It is important to note that although additional factors such as direct mortality, effects of pollutants, and competition from exotics will also need to be considered in conservation strategies of specific species, the question of habitat primarily involves the question of amounts, sizes, distributions, and quality of ecosystems. As such, the question of representation from a habitat standpoint also requires thorough evaluation of location, juxtaposition, and size of ecosystems selected for representation. In addition, considerable emphasis should be placed on ensuring the quality of a native ecosystem, either through maintenance or restoration actions, where feasible. Thus, the approach of

providing ecosystem representation combined with consideration for species habitat needs will ultimately influence the adequacy of a coarse filter for ecosystem representation.

6.1 Representation Goals

For the SDWAP, a goal for representation will be identified as maintaining more than or restoring at least 10% of the primary historical ecosystems for each ecological site type within each of South Dakota's ecoregions (MLRAs). Table 6-1 presents the number of acres representing this 10% goal for terrestrial systems, and Table 6-2 represents the 10% goal for riparian and wetland systems. Although 10% is not necessarily a recommended level of representation, it has often been used as a conservation goal under various national and international programs. Empirical studies of ecosystem loss and resulting effects on species viability reveal that at very high levels of native ecosystem loss (>95%), loss of species is likely. A level of 10 -12% representation is consistent with several recommendations (IUCN 1980, Brundtland 1987, Virkkala and Toivonen 1999) but with the exception of one these sources (Virkkala and Toivonen 1999), these recommendations lacked a strong empirical basis. The initial goal of 10% representation will require on-going evaluation and monitoring to determine its effectiveness in conserving South Dakota's biological diversity. The monitoring strategy that will be utilized to determine effectiveness is discussed more fully in a later section. In addition, although this Plan makes recommendations on conservation goals in each ecoregion, information on existing amounts of historical ecosystems is not currently available in all ecoregions or for each ecosystem type. Obtaining better knowledge of historical conditions and estimates of historical ecosystem amounts will also be a primary conservation action identified in this Plan. As better information is obtained and developed on historical conditions and their amounts as well as the status of existing conditions, conservation goals and their prioritization will need to be revised and updated to reflect this improved knowledge. Achieving native ecosystem representation goals in South Dakota will face challenges as most lands are in private ownership. To reach the goals identified, restoration objectives must be implemented on lands of willing landowners, using innovative incentive-based programs and practices to address the restoration need while respecting and addressing the needs of the landowner (Haufler and Kernohan 2009). Opportunities for restoration on public lands should also be evaluated and coordinated between the appropriate land management agencies.

The potential native ecosystem disturbance states that can be maintained or restored on each ecological site have been described for this effort, where available. The disturbance state with the least representation on the landscape today when compared with the amounts likely to have occurred historically should be targeted for restoration. For most of South Dakota, with the exception of prairie dog colonies (disturbance states G and H), the historical grass-shrub disturbance state that is likely to be the least represented on the landscape today were conditions produced under frequent fire regimes and light grazing or Disturbance state A as previously described and presented in Figure 3-16. This is particularly true for the more productive grass-shrub ecological sites, as a higher percentage of these sites have been converted to other uses. Restoration of prairie dog colonies will not be addressed through the representation goals of the SDWAP but rather by the goals identified in the South Dakota Black-tailed Prairie Dog Conservation and Management Plan (Cooper and Gabriel 2005).

Further, it cannot be overemphasized that representation is only achieved if an ecosystem is functionally similar to the native species composition, structure, and disturbance processes targeted for an ecological site. Considerable emphasis and effort must be placed on ensuring native ecosystem conditions are maintained, restored, or adjusted where necessary, to achieve the goals of the coarse filter approach.

Table 6-1. Proposed representation goals (i.e. 10% of historical native ecosystem diversity) to meet coarse filter and biodiversity objectives on each terrestrial ecological site, by Major Land Resource Area in South Dakota. High restoration priority should be given to those sites highlighted by reddish shade, where direct native ecosystem loss is >= 60%; moderate priority to those sites highlighted by yellow where native ecosystem loss is >= 30% and <60%; and low priority to those sites highlighted by green where native ecosystem loss is <30%.

ECOLOGICAL SITES	53B	53C	54	55B	55C	56	58D	60A	61	62	63A	63B	64	65	66	102A	102B	102C	TOTAL
Grassland/Shrub	242,146	215,082	574,137	168,968	547,378	1,364	103,118	393,959	32,547	11,404	578,355	201,392	251,620	26,301	147,020	328,270	102,330	63,495	3,988,886
LOAMY	186,804	139,112	155,588	99,686	426,781	469	9,659	73,166	10,691	2,874	41,461	24,436	103,380	136	27,530	247,964	89,201	50,942	1,689,880
CLAYEY	26,737	38,243	69,110	37,277	35,307	483	1,172	103,873	2,174	167	250,854	84,173	22,646		8,496	24,165	120	1,885	706,882
SHALLOW CLAY			8,654		628		315	49,767	636		161,737	49,377	11,740		999				283,853
SANDY	4,074	126	85,867	5,536	17,583	222	31,926	6,898	206		2,512	3,997	20,409	1,192	66,622	6,617	340	1,613	255,740
THIN UPLAND	3,276	25,247	20,091	2,903	36,920	54	972	26,879	6,801	430	45,407	19,566	6,852		3,099	26,796	10,281	7,800	243,374
THIN CLAYPAN	1,113	1,952	116,064	7,721	2,055		16,981	25,695	36		16,762	3,524	6,954	103	567				199,527
CLAYPAN	3,420	6,452	26,180	12,011	20,490		18,696	2,518			4,072	3,955	8,924	46	3,098	56			109,918
DENSE CLAY		356						42,315			40,311	6,058	4,817						93,857
SANDS	1,997		5,486	2,277	161	9	8,952	7,922	132		1,842	1,099	7,561	23,320	26,376	209		843	88,186
SHALLOW LOAMY			45,656	140			10,538	11,802	11,254	281			160						79,831
SHALLOW								958		4,702	4,114	1,845	54,858	60	996				67,533
SHALLOW TO GRAVEL	8,566	1,907		1,215	6,588	127					544	1,290	194		2,777	19,375	2,109	365	45,057
SHALLOW SANDY			33,317				2,544	246											36,107
VERY SHALLOW	5,369	1,687	3,294	75	865		548	3,487	617	102	8,739	1,945	2,577		45	3,088	279	47	32,764
SHALLOW DENSE CLAY								30,851											30,851
SHALLOW LIMY												23	548	90	6,340				7,001
SANDY CLAYPAN	790		4,830	127			815	30											6,592
SALINE UPLAND								3,803											3,803
SHALLOW POROUS CLAY								3,487											3,487
MOUNTAIN PRAIRIE										2,146									2,146
CHOPPY SANDS												104		1,354	75				1,533
HIGH COUNTRY LOAMY										702									702
POROUS CLAY								262											262
Forested			226				2,499	2,166	18,032	121,947									144,870
DRY WARM SLOPES								291	9,028	41,276									50,595
ROCKY SIDESLOPES										28,286									28,286
SHALLOW RIDGE								215	5,921	13,464									19,600
MOIST WARM SLOPES										18,550									18,550
COOL SLOPES			79				1,201	59	277	16,592									18,208
STONY HILLS			147				1,298	15	1,240	3,114									5,814
SAVANNAH								1,465	80	665									2,210
SILTY FOOTSLOPES								121	1,486										1,607
Total	242,146	215,082	574,363	168,968	547,378	1,364	105,617	396,125	50,579	133,351	578,355	201,392	251,620	26,301	147,020	328,270	102,330	63,495	4,133,756

Table 6-2. Proposed representation goals (i.e. 10% of historical native ecosystem diversity) to meet coarse filter and biodiversity objectives on each riparian and wetland ecological site, by Major Land Resource Area in South Dakota. High restoration priority should be given to those sites highlighted by reddish shade, where direct native ecosystem loss is >= 60%; moderate priority to those sites highlighted by yellow where native ecosystem loss is >= 30% and <60%; and low priority to those sites highlighted by green where native ecosystem loss is <30%.

Ecological Site	53B	53C	54	55B	55C	56	58D	60A	61	62	63A	63B	64	65	66	102A	102B	102C	TOTAL
DEPRESSION	**35075**	**28887**	**4297**	**13388**	**87766**	**261**	**789**	**2729**	**105**	**50**	**7872**	**2451**	**2288**	**510**	**2498**	**34911**	**9768**	**517**	**234162**
EPHEMERAL	828	2234	509	243	2660		178	164	24	13	633		848	12	287	945	785	180	10543
TEMPORARY	4254	2699	518	4370	20031	55	187	223	11	9	522	166	193	52	445	5435	3016	187	42373
SEASONAL	16655	7267	1754	4300	26860	53	191	926	25	7	2635	909	996	86	936	9775	2977	71	76423
SEMI-PERMANENT	11264	9109	1375	3798	33362	133	124	688	36	15	2702	897	118	262	623	17797	2798	42	85143
PERMANENT	2025	7547	141	667	4536		109	728	9	2	1380	475	133	82	207	921	188	27	19177
INTERMITTENT	49	31		10	317	20				4		4		16		38	4	10	503
LACUSTRINE	**2493**	**1251**	**1442**	**943**	**4444**	**52**	**117**	**1563**	**12**	**201**	**32303**	**12972**	**475**	**372**	**698**	**18705**	**1496**	**152**	**79691**
EPHEMERAL					2							2							4
TEMPORARY				1			3	7											11
SEASONAL			51		4		9	24			14								102
SEMI-PERMANENT	96	428	45	19	293		4	29				4	2	45	4	34	25		1028
PERMANENT	2397	823	1346	923	4145	52	101	1503	12	201	32289	12966	473	327	694	18671	1471	152	78546
RIVERINE	**14862**	**12868**	**34073**	**36664**	**54869**	**1868**	**5596**	**40173**	**3542**	**5401**	**27968**	**14257**	**29078**	**2625**	**8804**	**71279**	**28133**	**32655**	**424715**
INTERMITTENT	13942	11605	18163	30452	48268	1868	1693	21381	2830	5357	21980	9331	19815	1856	5789	65651	19712	12512	312205
PERMANENT	920	1263	15910	6212	6601		3903	18792	712	44	5988	4926	9263	769	3015	5628	8421	20143	112510
Total	**52430**	**43006**	**39812**	**50995**	**147079**	**2181**	**6502**	**44465**	**3659**	**5652**	**68143**	**29680**	**31841**	**3507**	**12000**	**124895**	**39397**	**33324**	**738568**

Restoration conditions have not been identified for forested systems for this version of the SDWAP; however some information on historical forest structures has been developed by others and may be applicable for this purpose. Where available, riparian and wetland restoration conditions will also represent conditions produced by more frequent fire regimes and lighter grazing.

A combination of practices may need to be identified for each selected area and should be designed to produce the desired species composition, structure, and processes for an ecological site. As an example, for grass-shrub ecosystems these practices may include prescribed burning, control of introduced weeds, interseeding with desired native species appropriate for each ecological site, planting to establish appropriate native plant communities on any croplands to be restored, and prescribed grazing implemented through long-term grazing plans to produce and maintain the desired conditions. Each site should be individually evaluated to determine the combination of practices that is most likely to produce the desired conditions.

Treatments developed for a particular site should be based on consideration of the underlying ecological site and the current condition on the site. For many areas, incorporating prescribed burning will be an important practice. Where feasible, the prescribed burning should be planned to simulate historical fire patterns for the ecological site. Introduced species will likely never be totally eliminated from restoration sites, but they should be suppressed to the extent that is practical and feasible. Suppression of introduced species may be achieved through herbicide application, prescribed burning, prescribed grazing, interseeding or planting of desired native species, or a combination of these treatments. No single prescription is envisioned as a universal solution, as the combination of site differences, current conditions, weather patterns, landscape influences, and other factors mean that treatment selection must be flexible yet site specific and responses will undoubtedly be variable.

6.2 Web-Tool for Sharing Information on Species of Greatest Conservation Need

Appendix M illustrates a species web tool developed during the Plan revision. SDGFP intends to build on this tool with Plan information on each SGCN (distribution map, description, key habitats, conservation challenges and opportunities, relevant SWG projects), but supplemented with a link to the ecosite web tool. Additional species, such as game or other high-visibility species will be added, making this platform a dynamic information source for the public and for SDGFP's conservation partners.

6.3 Conservation Opportunity Areas - Overview

Conservation opportunity areas (COAs) were not proposed in the 2006 South Dakota Wildlife Action Plan, but SDGFP committed to completing this process during the Plan revision. The goal of this process was to use relevant variables to map areas in South Dakota where increased emphasis on habitat conservation, protection, or management will benefit rare species and remaining intact native habitats.

Identified areas may include lands owned or managed by federal, state, tribal, or private entities and areas that may already be managed to maximize species and habitat diversity. The COA maps are not intended to display a land acquisition blueprint, but are an attempt to identify areas that would help fulfill the specific objectives for terrestrial and aquatic systems in South Dakota, as described in this Plan.

The U.S. Geological Survey (2006) described key steps in strategic habitat conservation in the following adaptive management loop: biological planning, conservation design, conservation delivery, and monitoring and research. This approach's guiding principles emphasize that habitat conservation is a means of conserving populations and ecological functions, population objectives must be defined, biological planning should use the best available information, management activities must be defensible and well documented, strategies should be implemented in an adaptive management scenario, and partnerships are critical to success.

Advantages of COA delineation include the ability to address shortage of resources in a geographically large area and lack of specific biological information on species occurrences and habitat conditions and distribution. COAs allow conservation partners and public or private conservation programs and resources to be most effective in directing limited resources in the context of a shared set of priorities. As an example, various funding initiatives promoted by the NRCS could target specific COAs that are consistent with the particular initiative being promoted, whether it has a species or habitat focus. The selected COAs are simply a representation of some areas in South Dakota that could be considered as priorities for future conservation initiatives, protection, or enhancement.

Separate terrestrial and aquatic COAs were identified during this Plan revision. Each approach used the best available information to draft COA boundaries. Each of these processes is considered a first step to address the need to strategically identify areas within South Dakota that merit attention by agencies, tribes, NGOS, and landowners because they offer high quality habitats or provide important habitat for rare animal species.

Why Aquatic and Terrestrial COAs Were Developed Separately

Several challenges caused terrestrial and aquatic resources to be considered separately during the COA development process. In this Plan, MLRAs define terrestrial ecosystems. Watersheds and drainages define interacting freshwater systems and act as the primary evolutionary constraint to freshwater biodiversity. Therefore, defining ecosystems for freshwater biodiversity requires the integration of both ecoregion and drainage boundaries. This difference resulted in the use of different geographical frameworks in our selection process of COAs for terrestrial and aquatic systems.

6.4 Terrestrial Conservation Opportunity Areas

The goal of the terrestrial COA exercise was to attempt to provide for the 10% representation goals for each ecological site type within each MLRA (Figure 3-3; Table 3-2). Figure 6-1 depicts South Dakota's MLRA boundaries, with major cities and counties illustrated to aid in orientation. This description pertains to the process and resulting draft map and associated information for an initial arrangement of terrestrial COAs for South Dakota.

Preparation and coordination:

A variety of examples from other states were reviewed for applicability to South Dakota. SDGFP's GIS staff located available data sources that could assist in the COA analysis. Other land and resource agencies and tribes were contacted to seek their input on this process, to potentially help SDGFP benefit from lessons learned during other landscape planning efforts. A specific internal staff meeting with SDGFP land management and habitat staff was held to gather their input on COA identification.

Two specific contacts were made with land and resource management agencies and Native American tribes related to the identification of terrestrial COAs. A November 30, 2012 memo requested listings and descriptions of relevant conservation initiatives that should be considered during Plan preparation, with the expectation that this listing might be a data source for identifying COAs. The Science Team and internal SDGFP staff compiled a list of current conservation initiatives (Appendix P). However, the scope of these initiatives was typically too large or too small to assist in COA identification.

A March 6, 2013 memo outlined a previous draft approach to defining terrestrial conservation opportunity areas and requested COAs for inclusion in the Plan. Input was received from representatives of the U.S. Forest Service's Forest and Grassland Research Laboratory, the National Park Service's Missouri National Recreational River, the U.S. Fish and Wildlife Service's Habitat and Population Evaluation Team, and the U.S. Forest Service's Nebraska National Forest. All comments were considered during the terrestrial COA identification process.

The U.S. Fish and Wildlife Service's Habitat and Population Evaluation Team (HAPET) in Bismarck, North Dakota, provided certain components of the grassland and wetland easement layer to SDGFP for specific, agreed-upon purposes. This information allowed verification that the draft terrestrial COA map would reflect federal easement priorities for protection of these habitat types. The easement data were not used as a primary data source.

SDGFP GIS staff assembled the data sources listed in Table 6-3 and used the following process for terrestrial COA identification:

Data sources and manipulation:

1. A grid of 1-mile radius hexagons was created to cover South Dakota.
2. Ecosite data were provided by EMRI.
3. Land protection data, including ownership or permanent easement status, were collected from state and federal agencies and non-government organizations (Table 6-4).
4. Public lands and conservation easements were combined as the Protected Land variable and overlaid with the hexagon grid. Percent area of protected land was calculated for each hexagon (Figure 6-2).
5. Large Intact Blocks were taken from a WGA exercise to determine large areas of South Dakota that were relatively intact and had low levels of human impacts (Sasmal et al. 2014; Figure 6-3). Additional information on the WGA effort is available at: http://www.westgovchat.org/. A component of Figure 6-3 was the National Land Cover Dataset for 2006 (Figure 6-4). The most

recent depiction of land cover use is from 2011. Additional information on the National Land Cover Dataset is available at: (http://www.mrlc.gov/nlcd2011.php)

6. a. Species data points were collected from a variety of sources (Table 6-3) to create the Species Richness variable (Figure 6-5);
   b. NatureServe Explorer (http://www.natureserve.org/) provided separation distance values for suitable habitat for all species used in the species richness analysis (Appendix Q);
   c. Buffers were created for each species using the separation distance values; and
   d. Buffers were then overlaid with the hexagon layer to determine the number of species found within each hexagon.

COA Selection – COAs were selected using the following tiered criteria:

1. Round 1: Any hexagon with greater than or equal to 50% public land and/or conservation easements, a large intact block category of 1, a species richness total greater than or equal to 100, or a 1-mile buffer (riparian area) around South Dakota's major rivers (Bad, Belle Fourche, Big Sioux, Cheyenne, Grand, James, Little White, Missouri, Moreau, Vermillion, White).
2. Round 2: Any hexagon with greater than or equal to 25% public land and/or conservation easements or a species richness value greater than or equal to 50.
3. Round 3: Any hexagon with a large intact block category of 2.

The result of this process is illustrated in Figure 6-6 and numerically represented in Appendix R. This first attempt to identify terrestrial COAs used a data-based approach to accommodate the 10% representation goals identified earlier in this Plan. Representation goal of 10% was met for all ecological site types within each MLRA using the process described above. Figure 6-6 does not depict the current situation, but rather shows areas that may need more attention to management or protection to meet the terrestrial COA goal of providing for 10% representation for all ecological site types within each MLRA. The utility of terrestrial COAs will depend on future involvement of land and resource managers, landowners, and others to identify specific areas that are matched to local land management, participation in specific conservation initiatives or government programs, and wildlife conservation needs (e.g. Appendix S).

Future needs related to proposed COA delineation:

1. The approach should be proofed for whether unique habitats, such as caves and mines that provide bat habitat and colonial waterbird colonies, will be accommodated.
2. An additional refinement to this attempt is consideration of habitat size needed to accommodate SGCN, particularly for species such as prairie grouse and sage-grouse that require large intact blocks of grassland or grass-shrub habitats.
3. Improved information on habitat connectivity needs should be incorporated into future iterations of the COAs.
4. Information on SGCN with limited distributions should be used to proof the COAs to assure that the needs of these species are accommodated.

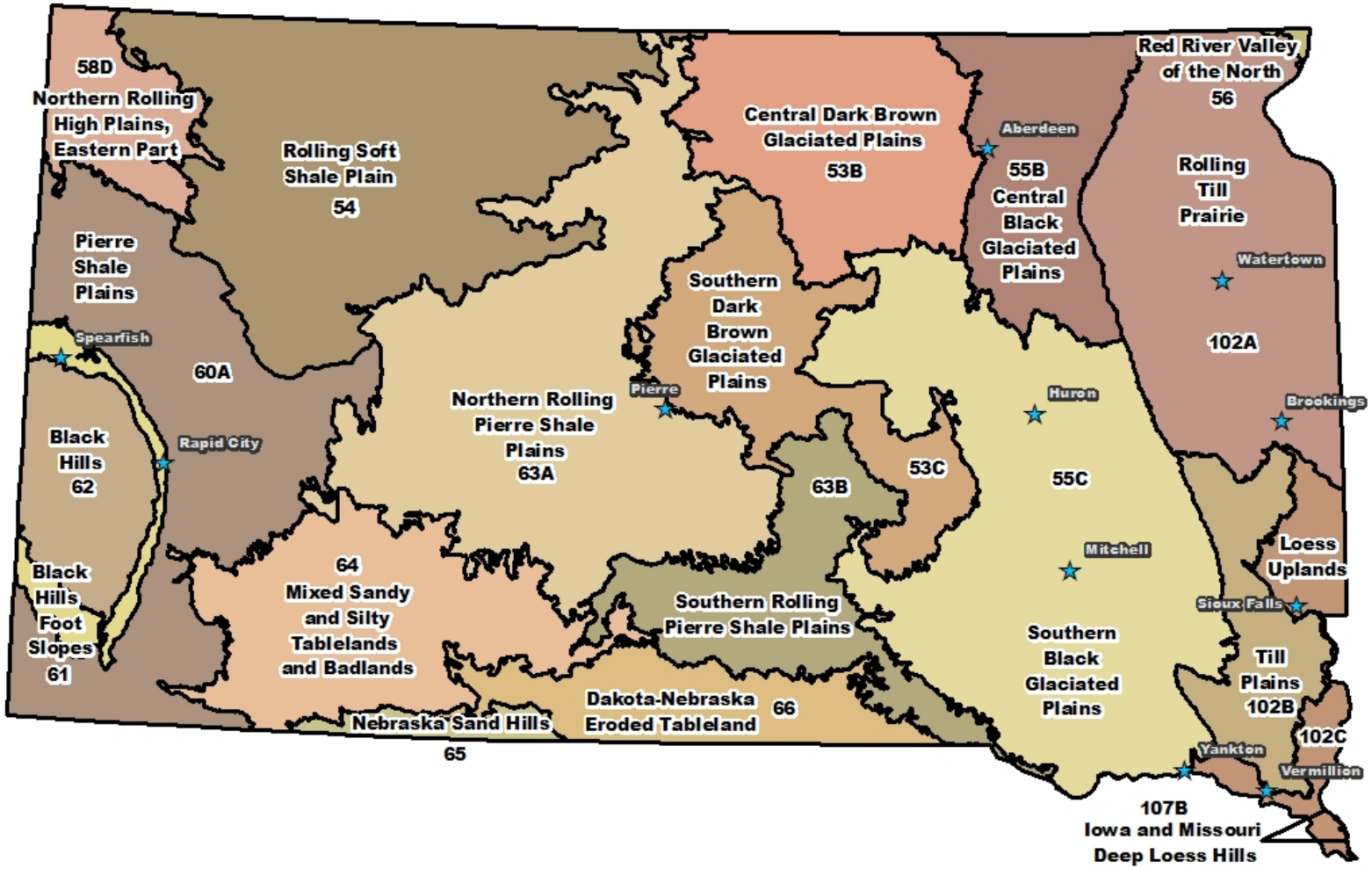

Figure 6-1. Map of Major land resource areas in South Dakota (USDA NRCS 2006).

Table 6-3. Plant and animal species data sources used in terrestrial conservation opportunity area identification.

Data	Data Provider
prairie grouse and sage-grouse lek data and other surveys	SDGFP, USFS and SDSU
data collected from a variety of State Wildlife Grant-funded projects	see Appendix F for list of State Wildlife Grant projects
golden eagle nest data from northwestern South Dakota	SDGFP
bald eagle nest data	SDGFP, USFWS and other cooperators
South Dakota Natural Heritage Database	SDGFP and NatureServe
colonial waterbird survey data	SDGFP and RMBO
river otter collection and observation data	SDGFP and cooperators
South Dakota breeding bird atlas data from first and second atlas	SDGFP, RMBO, SDOU, and cooperators
ruffed grouse occupied sites	SDGFP and USFS
various burrowing owl surveys	agencies, SDOU and cooperators
greater sage-grouse breeding and wintering data	SDGFP and USFS
butterfly collection data	Gary Marrone (SD lepidopterist) database and cooperators
black-footed ferret data	various entities involved in black-footed ferret reintroduction and prairie dog mapping; known ferret reintroduction sites were overlaid with prairie dog towns active in 2008 with 0.75 km buffer
Fort Pierre National Grassland winter raptor survey data	SDGFP and USFS

Table 6-3 (continued). Plant and animal species data sources used in terrestrial conservation opportunity area identification.

grouse survey data and research data	SDGFP
mammal trapping data	SDGFP
Fort Pierre National Grassland aerial mule deer surveys	SDGFP and USFS
aerial mule deer surveys from Meade and Pennington counties	SDGFP
active prairie dog colonies from 2008 that were greater than 10 acres	SDGFP
turkey flock counts	SDGFP

Table 6-4. Protected lands data sources for terrestrial conservation opportunity area identification.

Public Land Layers	Permanent Conservation Easements
national forest (USFS)	grassland and wetland easements (USFWS and Ducks Unlimited)
national grassland (USFS)	wetland, grassland, and emergency flood easements (NRCS)
wilderness areas (USFS)	South Dakota Parks and Wildlife Foundation easements
Bureau of Land Management	Northern Prairies Land Trust
U.S. Army Corps of Engineers	TNC easements
National Park Service	
national wildlife refuges (USFWS)	
waterfowl production areas (USFWS)	
game production areas (SDGFP)	
state park and recreation areas (SDGFP)	
SD Office of School and Public Lands	
TNC properties	

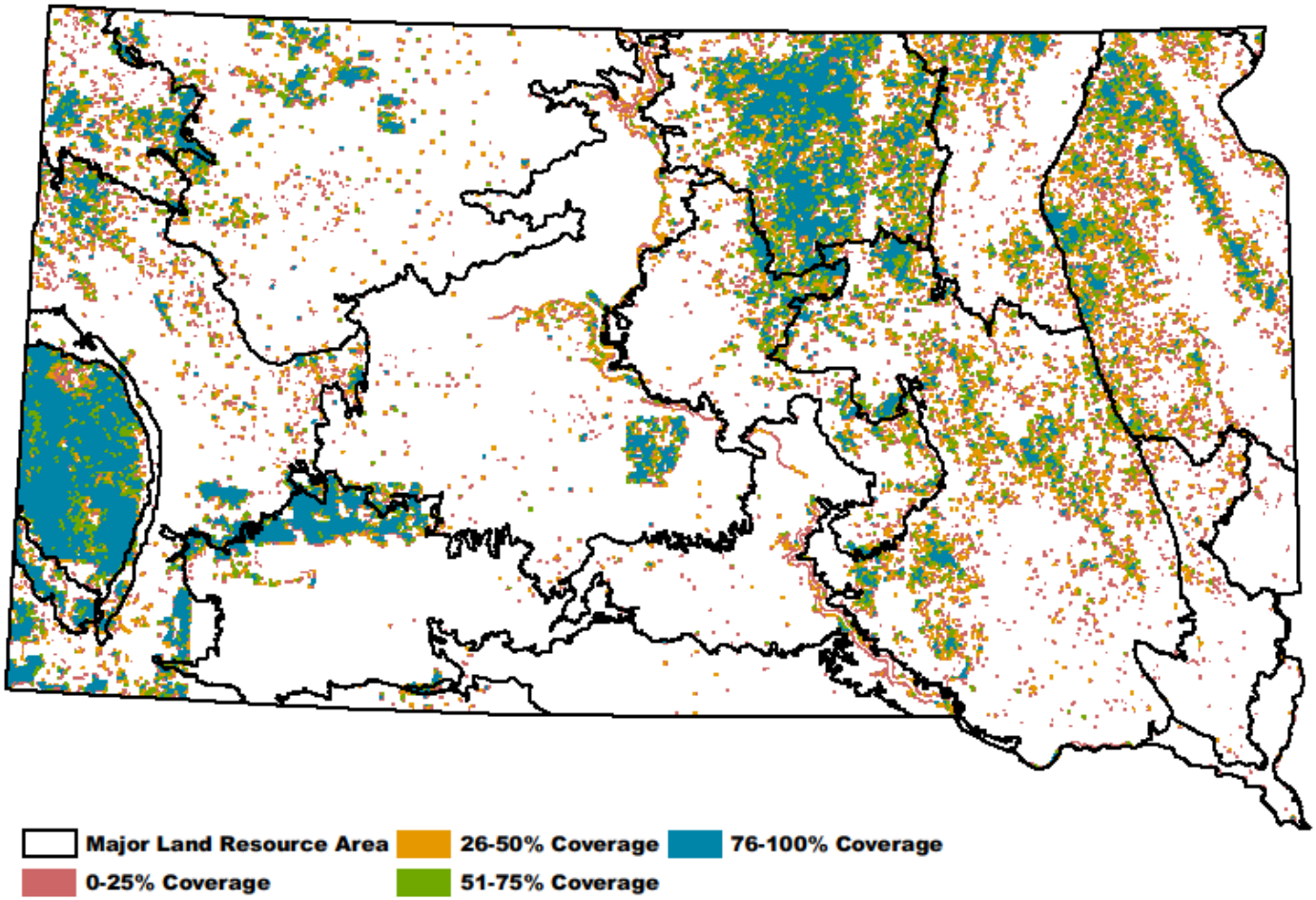

Figure 6-2. Map of percentage of public lands and conservation easements within 1-mile hexagon boundaries.

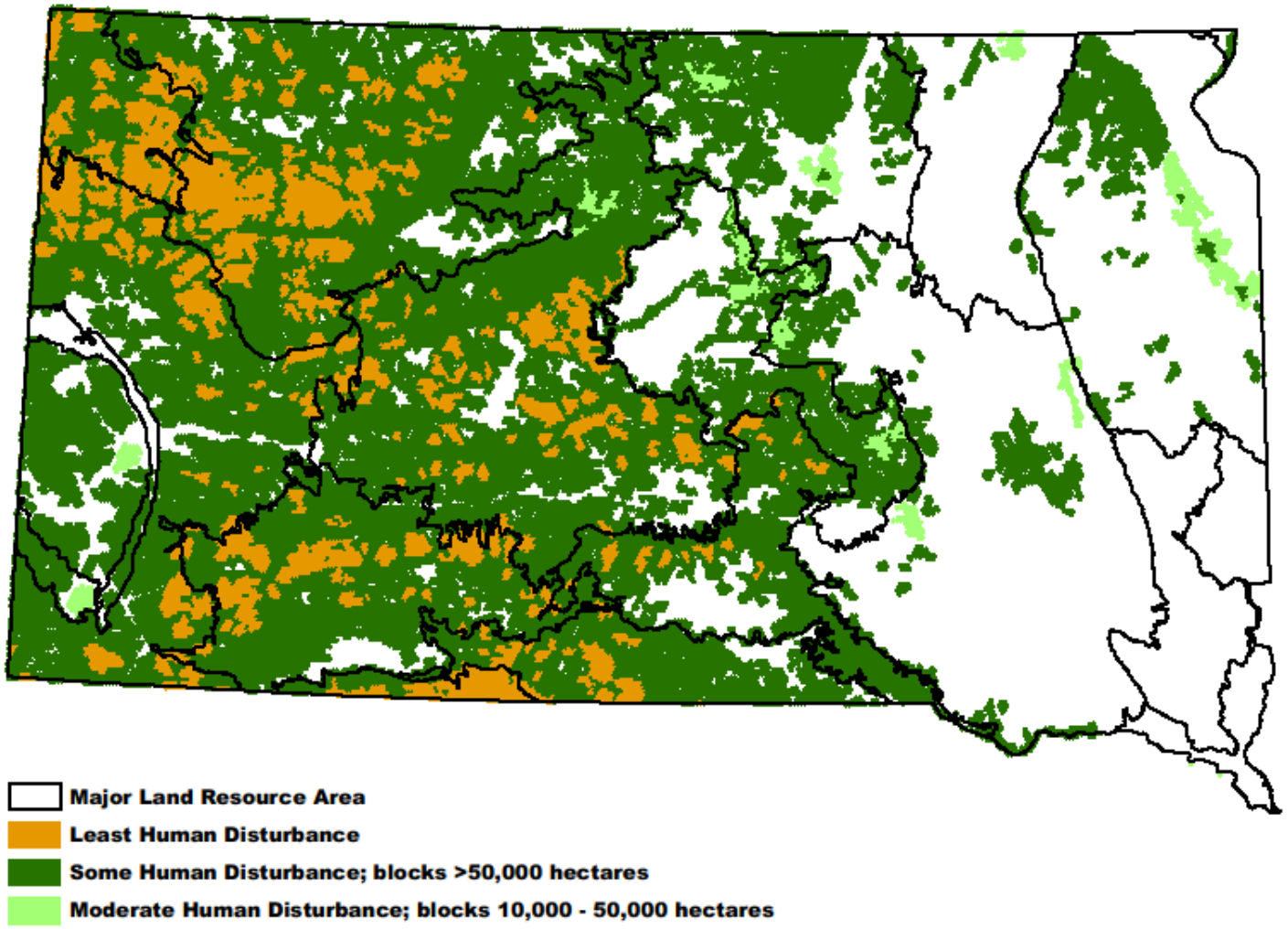

Figure 6-3. Map of large (>1,000 hectares) habitat blocks with limited amounts of human disturbance.

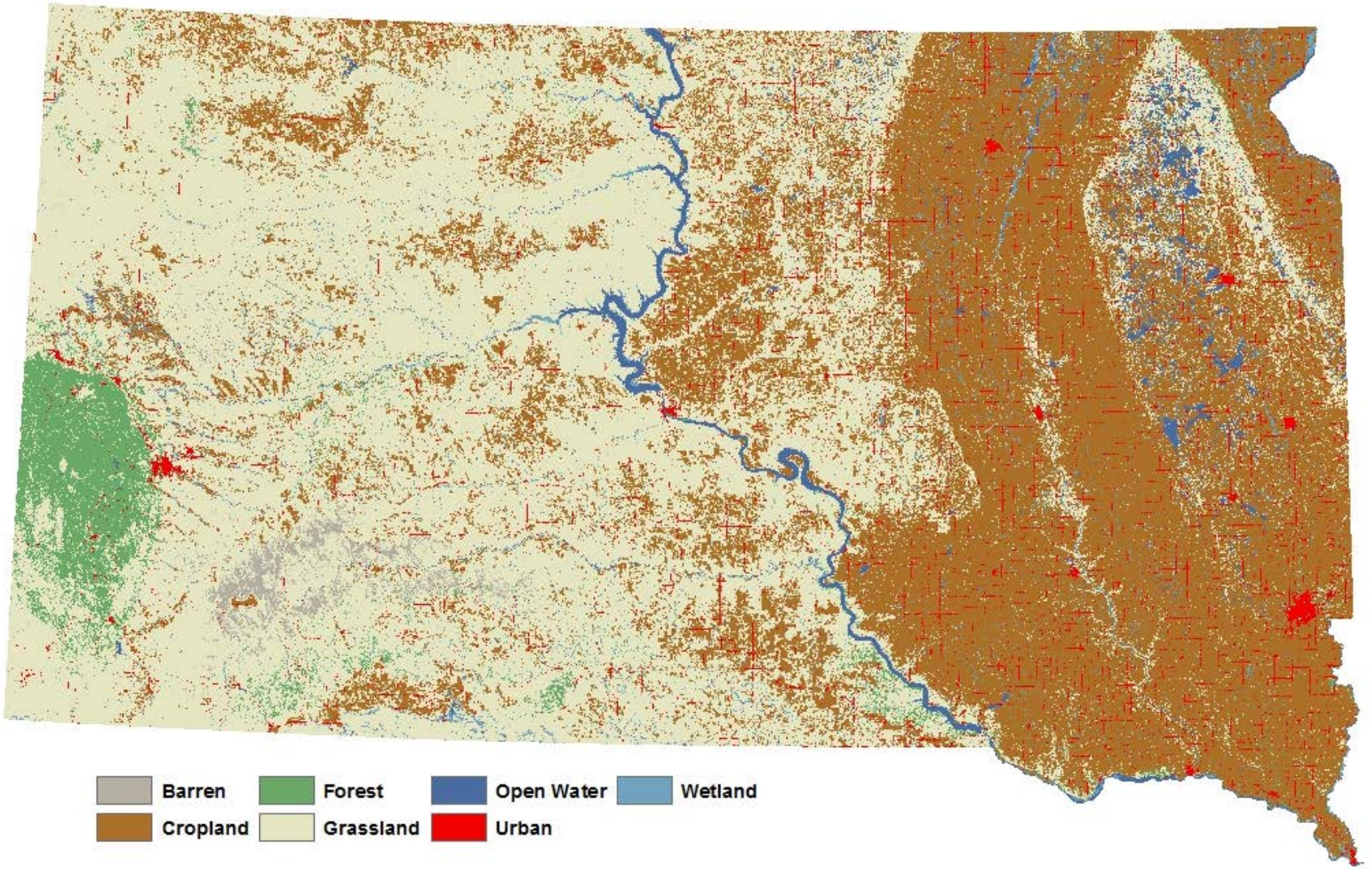

Figure 6-4. Simplified version of National Land Cover Dataset for 2006.

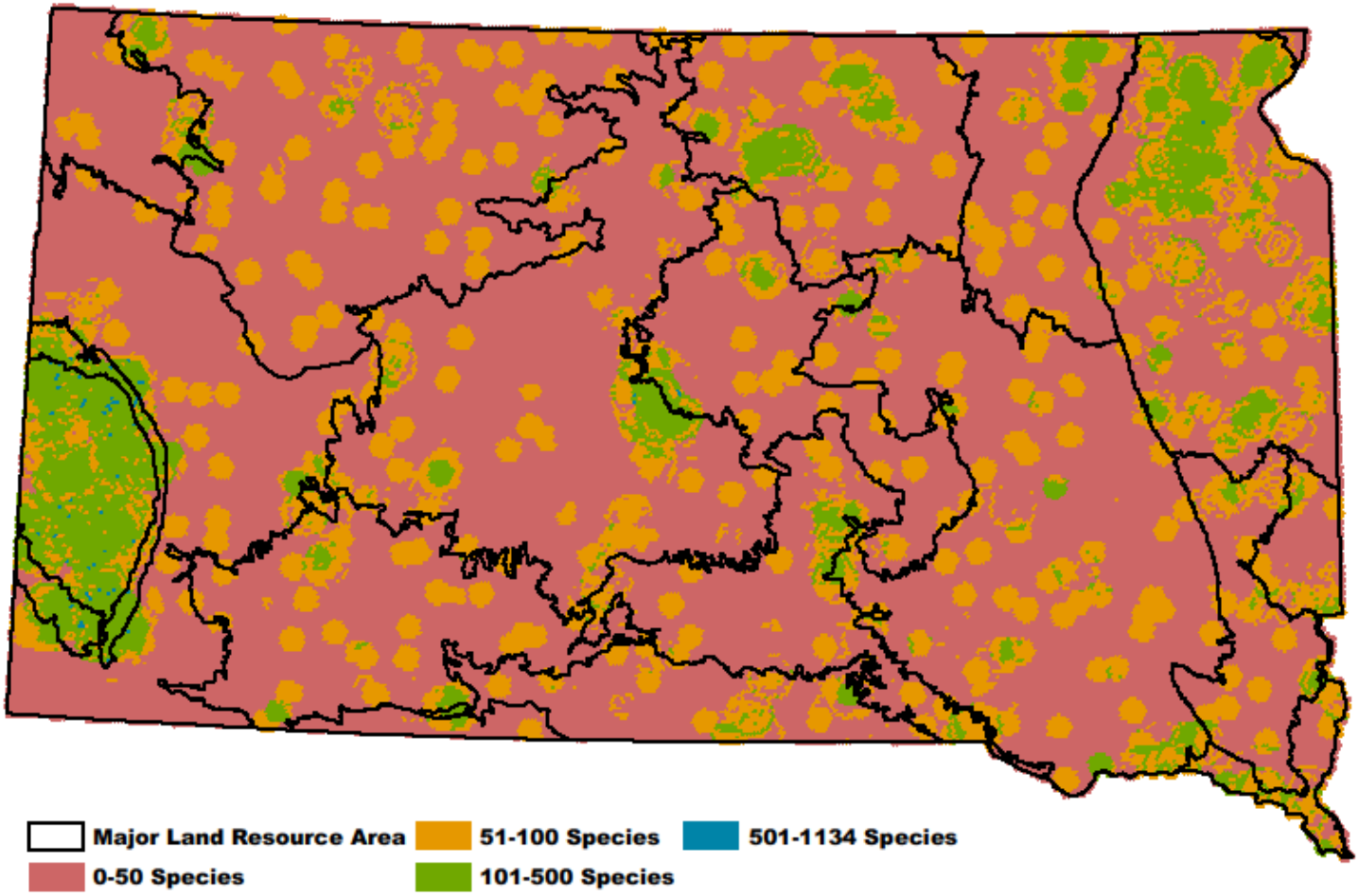

Figure 6-5. Map of terrestrial species richness.

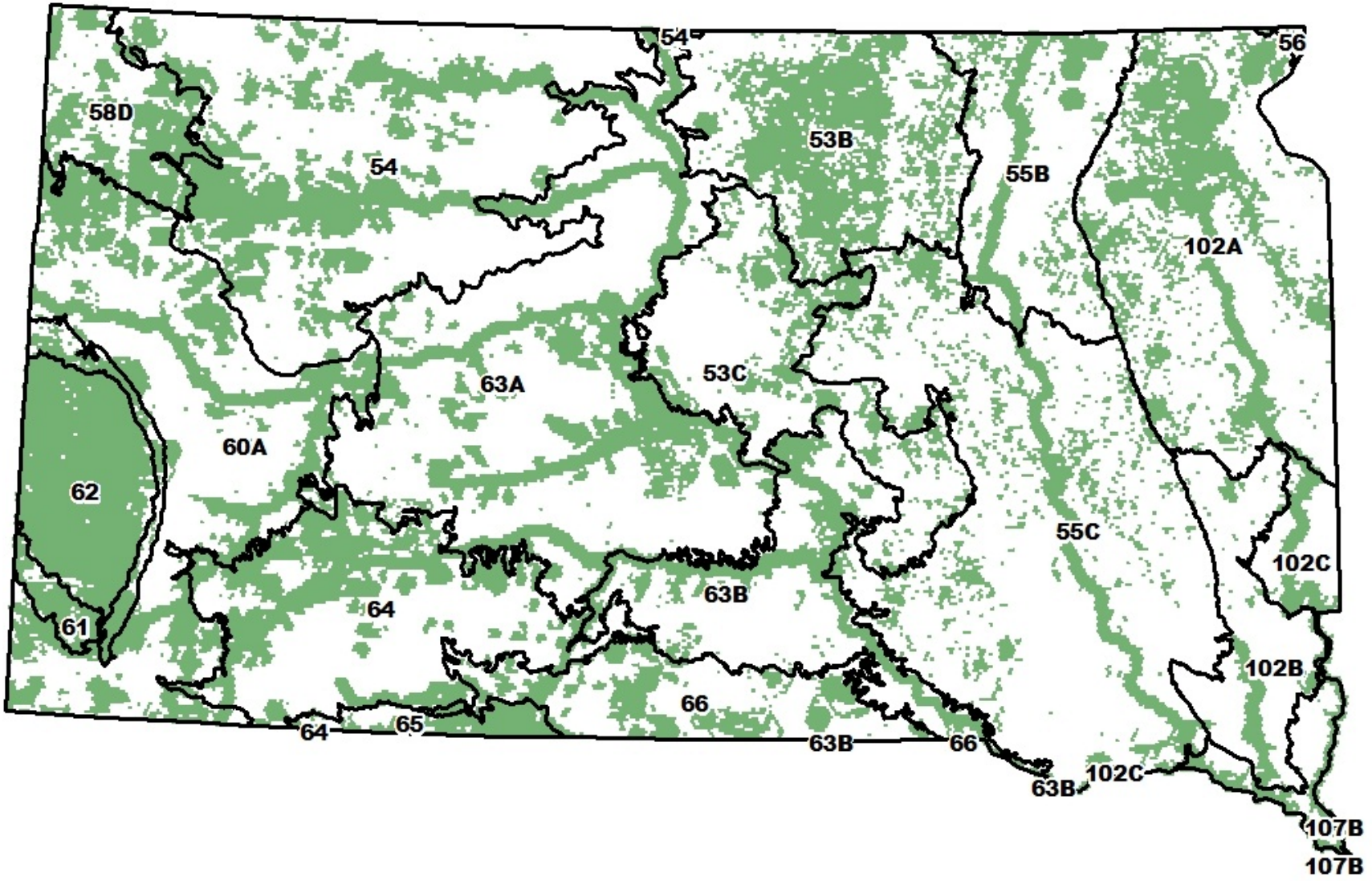

Figure 6-6. Map of terrestrial conservation opportunity areas.

6.5 Aquatic Conservation Opportunity Areas

To address the conservation needs of the aquatic biodiversity of South Dakota and their associated habitats, we produced a framework for focusing conservation efforts on key landscapes called Conservation Opportunity Areas (COAs). These priority areas represent the full extent of distinct aquatic habitats across the state and provide a way to direct and maximize limited resources to areas where SGCN will benefit.

The Missouri River Gap Analysis Program (MOGAP) aquatic riverine classification hierarchy was adopted as the geographic framework for developing COAs. From this classification system, Aquatic Ecological System (AES)-Types were selected as the abiotic conservation targets in the selection process for identifying COAs. To fully address the biotic targets, aquatic SGCN were used as the primary focus within the COA selection process.

Conservation Strategy

Combinations of factors were used to develop a conservation strategy. This strategy was used to identify and map a statewide map of COAs that collectively represent all of the distinct riverine ecosystems within South Dakota and the full array of SGCN distributions.

Basic Elements of the Conservation Strategy:

- Develop separate COAs for each Ecological Drainage Unit (EDU);
- Identify at least one COA for each AES-Type within each EDU;
- When an EDU was composed of a single AES-Type, identify one COA for individual AESs representing separate stream classes (i.e. upper, middle, lower):
    - Upper: includes headwater, creek and small river stream classes.
    - Middle: includes headwater, creek, and medium or large river stream classes.
    - Lower: includes headwater, creek, and great river stream classes.

Through this conservation strategy we provided an ecosystem approach to biological conservation and represented a wide spectrum of the diversity of macrohabitats across South Dakota. This strategy was developed to represent multiple populations for SGCN to select a wide range of COAs for protecting these species throughout South Dakota. We then established quantitative and qualitative assessment criteria for selecting COAs at the AES level.

Assessment Criteria

AES level COA selection criteria were selected on a hierarchical system (listed in order of importance):

- Highest confirmed/probable species richness for SGCN (Section 4.4 Aquatic SGCN);
- Lowest Human Stressor Index (HSI) value (Section 5.4 Aquatic Systems: HSI);

- Highest percentage of public ownership (Section 4.5 Ownership/Stewardship)

When necessary, additional aquatic COAs were selected to capture underrepresented SGCN with limited ranges (contained only within one or two individual AESs across the entire state). In that way all aquatic SGCN were represented by at least one COA.

Each selected COA was named to generally correspond with the name of the largest tributary stream contained within the boundary of the selected AES.

It is important to note, that in some instances, selected COAs did not contain current records for any aquatic SGCN. However, these COAs were selected to fulfill our conservation strategy and followed the latter portion of the assessment criteria. SGCN may be present within these selected COAs, but presence has not been confirmed due to gaps in monitoring efforts.

Walking through the Aquatic Conservation Strategy and Assessment Process

The Cheyenne EDU served as the pilot area for the statewide COA selection process and tested the conservation strategy and assessment process (Figure 6-7).

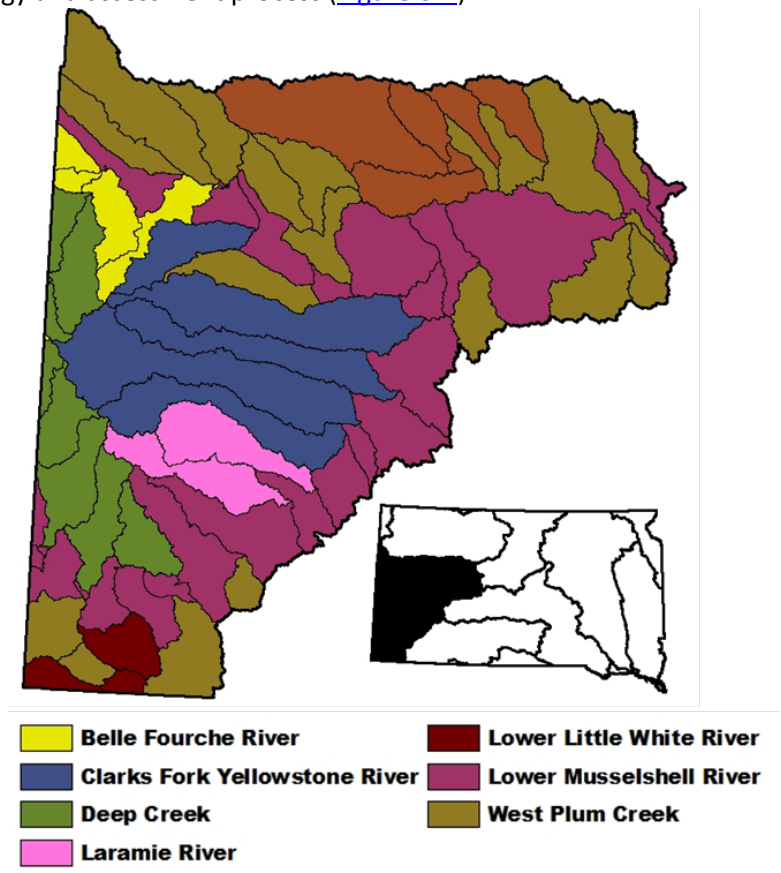

Figure 6-7. Map showing the Cheyenne Ecological Drainage Unit that was selected to meet all elements of the basic conservation strategy developed for the aquatic conservation opportunity area selection process in South Dakota. The figure also shows the seven associated aquatic ecological system-types found within the Cheyenne Ecological Drainage Unit.

The Cheyenne EDU contains seven separate AES-types: the Belle Fourche River, Clarks Fork Yellowstone River, Deep Creek, Laramie River, Lower Little White River, Lower Musselshell River, and West Plum Creek. At least one COA was identified for each AES-type within the Cheyenne EDU based on the assessment criteria.

The assessment criteria were used on all seven redundant AES-Types (i.e. Belle Fourche River, Clarks Fork Yellowstone River, Deep Creek, Laramie River, Lower Little White River, Lower Musselshell River, and West Plum Creek) to select individual AESs that warranted conservation (COAs). The Clarks Fork Yellowstone River AES-Type was further examined (Figure 6-8). COAs were selected based on the following hierarchical criteria in order of importance: highest species richness (confirmed and probable species occurrences) for SGCN, lowest human stressor index (HSI) value, and highest percentage of public ownership (Figure 6-8).

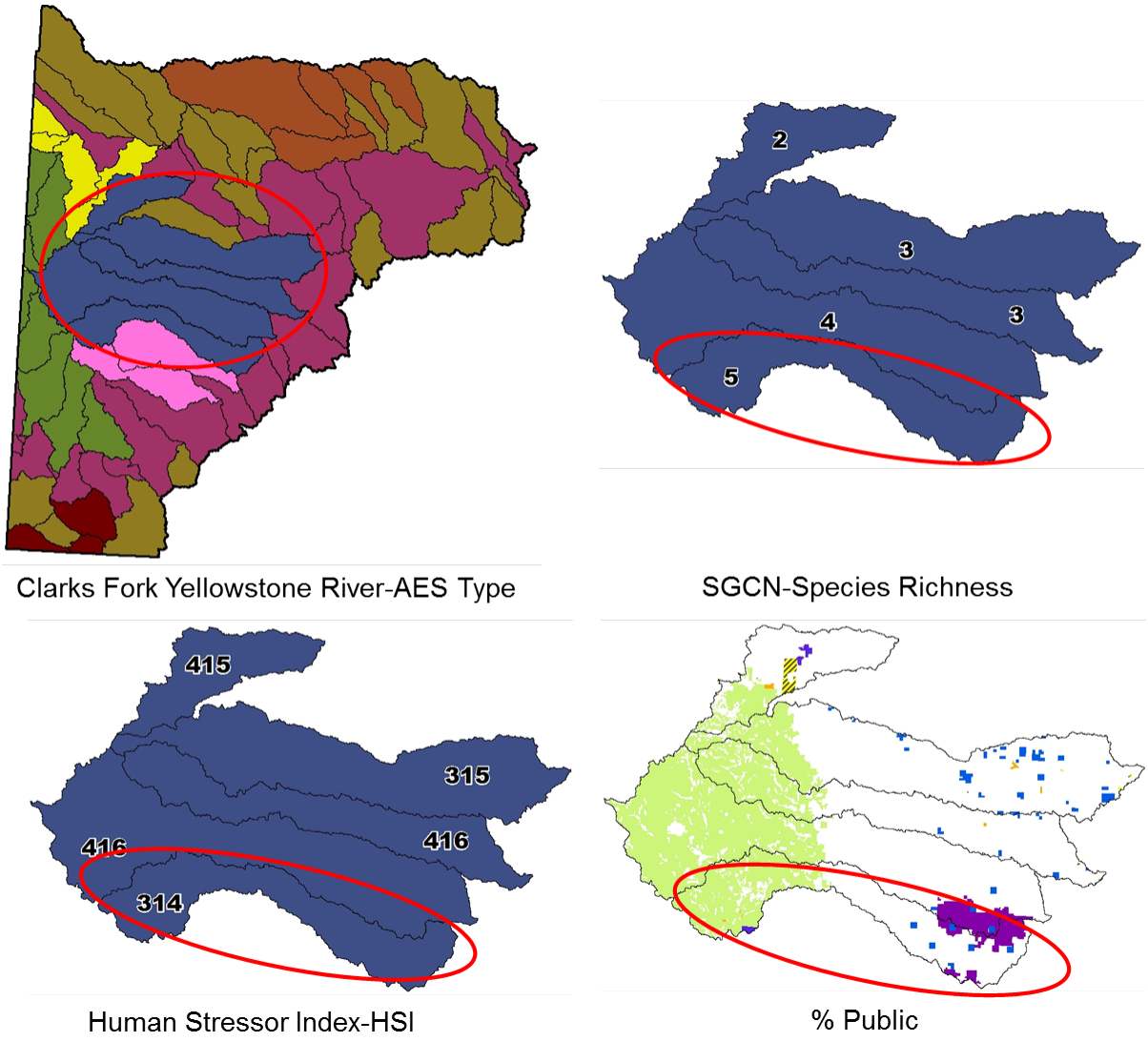

Figure 6-8. Map breaking down the assessment criteria for the Clarks Fork Yellowstone River aquatic ecological system-Type, within the Cheyenne Ecological Drainage Unit. Conservation Opportunity Areas were selected by a hierarchy system based on the highest species richness, lowest Human Stressor Index value, and highest percentage of public ownership.

Following the conservation strategy and assessment process for the Clarks Fork Yellowstone River AES-Type, two COAs were identified; one was selected based on limited species ranges (Figure 6-9). These two areas represent the broad diversity of watershed and stream types that occur throughout the Cheyenne EDU. The single AES that warranted conservation based on the assessment criteria is Newton Fork COA and is approximately 245,500 acres in size. This COA was selected based on a species richness of 5 and an HSI value of 314. More than half (52.5%) of this AES is privately owned with only a small percentage in public ownership. This is a common trend throughout South Dakota and particularly in the eastern portion of the state where public ownership is limited. One additional AES was selected within the Clarks Fork Yellowstone River AES-Type due to underrepresented SGCN presence with a limited

range. This COA (Rapid Creek) was the only AES within the entire state that contain confirmed records for Elktoe mussels.

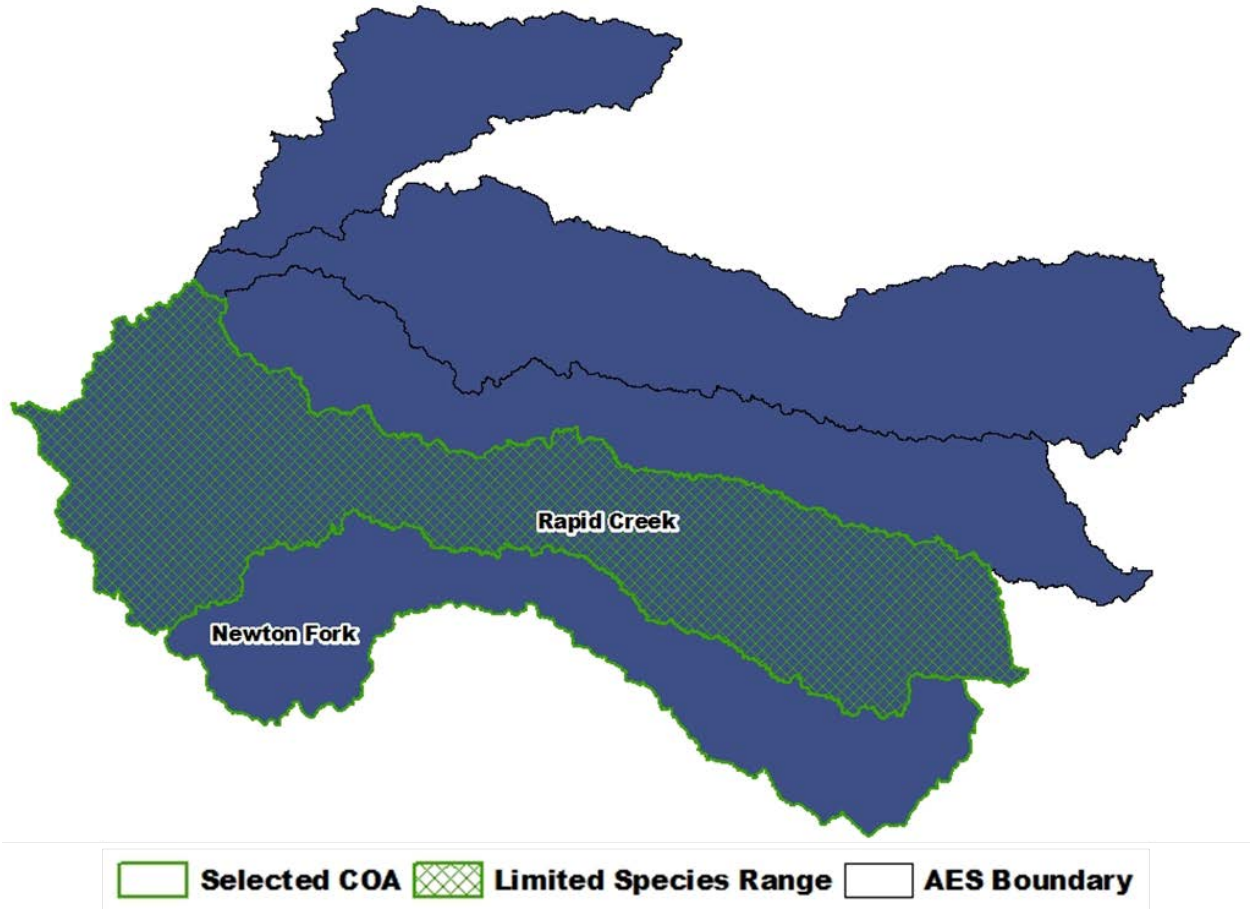

Figure 6-9. Map of two conservation opportunity areas within Clarks Fork Yellowstone River Aquatic Ecological System-Type, Cheyenne Ecological Drainage Unit that were selected to meet all elements of the conservation strategy and assessment process in South Dakota.

The James EDU was the only EDU within South Dakota that was composed of a single AES-Type (Figure 6-10).

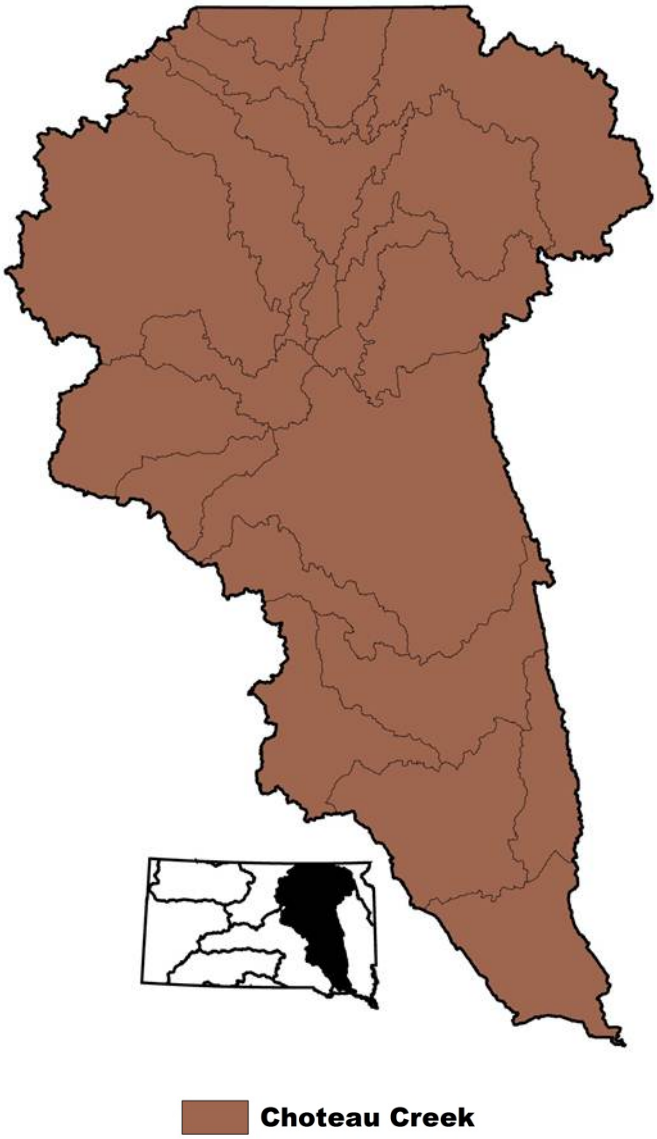

Figure 6-10. Map showing the James Ecological Drainage Unit (EDU), the only EDU in South Dakota which contains a single Aquatic Ecological System (AES)-Type (Choteau Creek AES-Type).

In the case of an EDU containing only a single AES-Type, the conservation strategy identified COAs for separate stream classes at the individual AES level. Stream classes were divided into three categories:

- Upper: includes headwater, creek and small river stream classes.
- Middle: includes headwater, creek, and medium or large river stream classes.
- Lower: includes headwater, creek, and great river stream classes.

The James EDU was broken into two different stream classification categories (Upper and Middle) following the conservation strategy (Figure 6-11). Based on this, at a minimum the James EDU would select two separate COAs, one from each stream classification. COAs were then selected following the assessment criteria. When necessary, additional COAs were selected to capture underrepresented SGCN with limited ranges (contained within one or two individual AESs across the entire state).

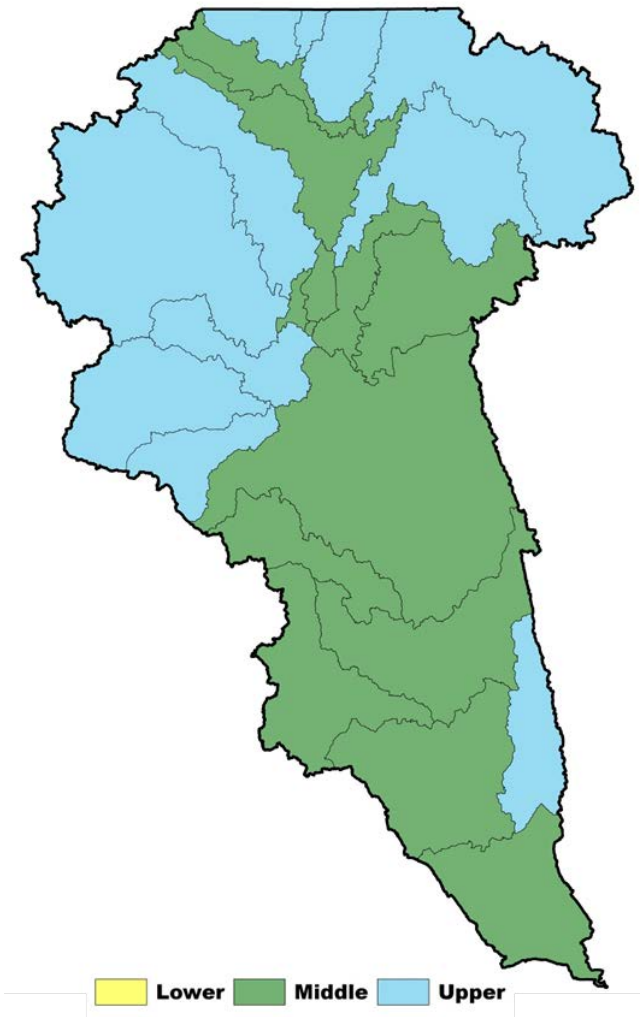

Figure 6-11. Map showing the James Ecological Drainage Unit broken down by stream classification type: lower, middle, upper.

Discussion

Conservation opportunity areas (COAs) have been identified and named for the largest tributary stream for all 12 EDUs in South Dakota (Appendix T, COA description). Statewide, 49 COAs were identified through the conservation strategy and assessment process (Figure 6-12). Figure 6-12 does not depict the current situation, but rather shows priority areas to better maximize limited resources, while representing the full extent of distinct aquatic ecosystems and habitats across South Dakota. These COAs represent the broad diversity of stream ecosystems and riverine assemblages within South Dakota and cover a relatively small percentage of the landscape. Specifically, the COAs encompass approximately 3.1% of the total stream miles in the state. In terms of land area, the COAs cover 14.9 million acres, or approximately 30% of the entire state. All 36 aquatic SGCN are contained and represented by at least one COA within the state (Appendix U). To conserve the overall ecological integrity of South Dakota, efforts cannot be limited to the land area and streams contained within the selected COAs. However, the selected methodology provided an efficient and effective strategy for the long-term conservation of relatively high quality examples of the various ecosystem and community types that exist across the state.

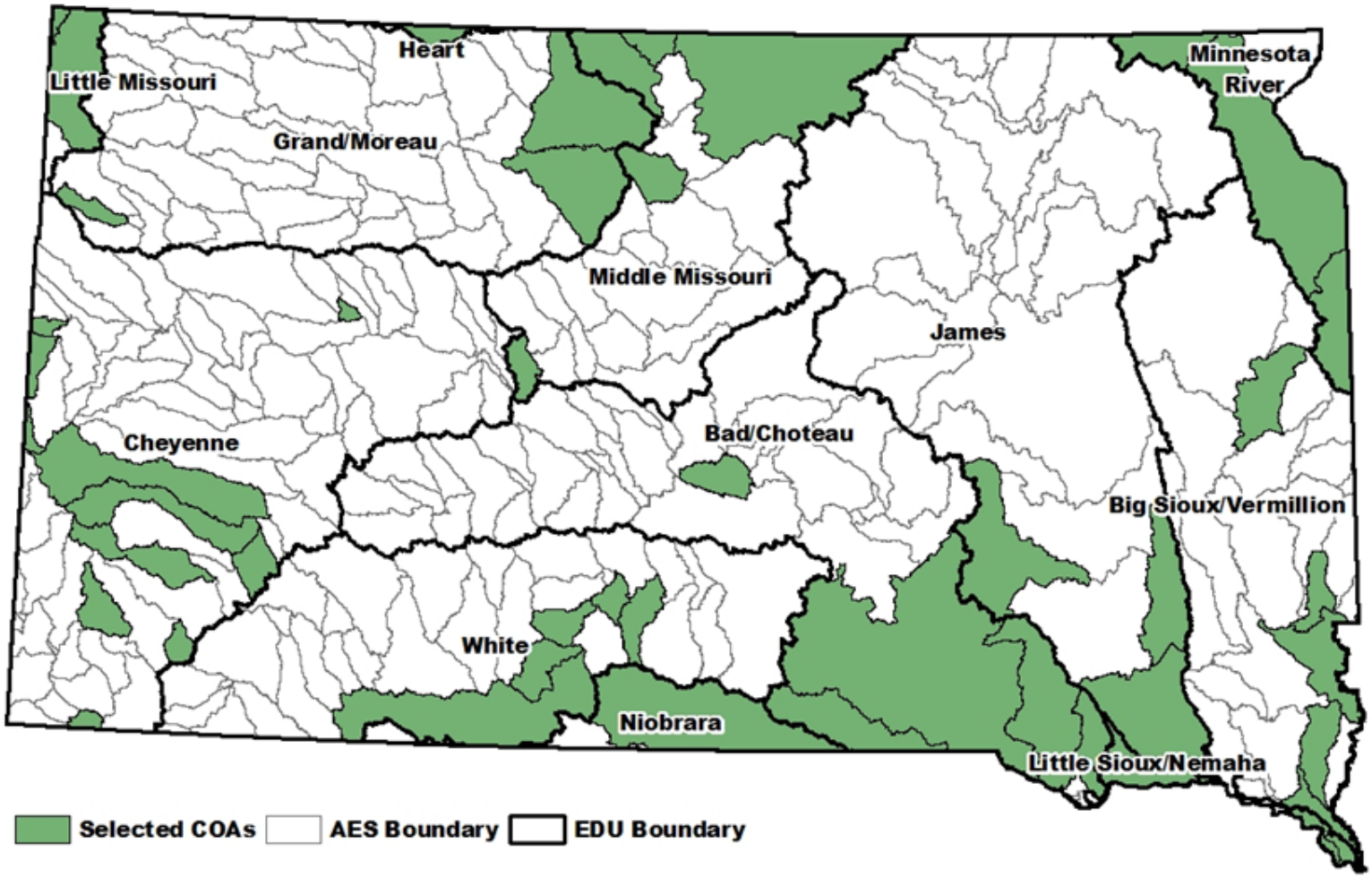

Figure 6-12. Map of 49 aquatic conservation opportunity areas selected to meet all elements of the aquatic conservation strategy and assessment process across South Dakota.

The selected COAs provide the framework to identify areas with the greatest potential to maintain or restore large areas to desired conditions to maintain South Dakota's aquatic biodiversity. In addition to conserving South Dakota's aquatic biodiversity, COAs provide spatial data and other necessary information for natural resource professionals, NGOs, state and federal agencies, and landowners to make informed decisions on the prioritization of research and monitoring needs to fill information gaps and to expand incentive programs in specific areas with the greatest potential to maintain and restore native conditions.

The coarse and fine filter strategies for identifying COAs provide the framework to maintaining and conserving aquatic biodiversity in South Dakota. However, the amount of land required to maintain and restore native ecosystem diversity still remains a large question. This is largely due to our relatively poor understanding of the ecological relationships, habitat requirements, and limiting factors for aquatic SGCN. At a minimum, the strategy used focuses on providing COAs across all unique drainages (i.e., ecological drainage units (EDUs) and aquatic ecological system-types (AES-types)), while representing the full array of aquatic SGCN.

Because more than 80% of the state is in private ownership, conservation of the state's biodiversity depends on support and participation by private landowners. Conservation actions should be evaluated considering costs and benefits for meeting conservation goals, and the partnership and perspective of landowners should be treated as invaluable resources.

Implementation of the conservation actions on a statewide level will help ensure that a significant number of opportunities for conservation of biological diversity in South Dakota are acted upon. The following actions are recommended to help further achieve the goals identified for maintaining and conserving biodiversity.

6.6 Conservation Actions Summary: Terrestrial and Aquatic Systems

Conservation challenges will continue to alter South Dakota's landscapes and ecological processes that sustain ecosystem diversity. Historically, natural disturbances such as drought, flooding events, fire, and natural grazing regimes shaped the patterns of ecosystem diversity on South Dakota's landscape. Today, the suppression of natural disturbances, human-influenced changes to hydrology, the introduction of exotic and invasive species, habitat fragmentation, pollution, and climate change have all directly and indirectly impacted species and degraded the habitats that sustain them. Future actions should promote the maintenance and restoration of natural ecosystems and address species-level challenges that are not accommodated through ecosystem maintenance and related disturbance regimes. The following conservation actions are recommended to help further achieve the representation goals identified for native ecosystem diversity at both the terrestrial and aquatic system levels.

Coordination

1. Develop and expand partnerships with agencies, organizations, and landowner groups to meet the conservation goals for ecosystem diversity identified for each of South Dakota's ecoregions.

2. Identify applicable federal, state, local, and non-governmental programs that can be used to achieve the representation goals identified, and develop coordination among these programs. For example, meet with NRCS to explore these options in existing and future landowner programs.
3. Increase collaboration and communication to share responsibilities, reduce duplication, increase data exchange, and maximize limited resources on conservation priorities. Identify the lead and supportive roles for partners.
4. Continue efforts to identify funding sources to help meet representation goals. State Wildlife Grant funds are a small and unreliable funding source to meet nearly unlimited needs. The Wildlife Action Plan's success will depend on the ability to leverage government dollars and resources with other sources of match.

Management

1. Conduct assessments of existing ecosystem conditions using the coarse filter framework to determine the amount of historical ecosystem conditions present today that can contribute to target goals for ecosystem diversity.
2. Identify site management tools and techniques to maintain or restore desired ecosystem conditions.
3. Apply existing or develop new incentive programs that make it possible for landowners to participate in partnerships to meet conservation goals for ecosystem diversity.
4. Evaluate South Dakota public lands for opportunities to contribute toward ecosystem diversity goals.
5. Identify and map unique natural communities/habitat features that are not addressed through ecosystem diversity objectives that are also important for conservation of biological diversity in South Dakota (e.g., caves, cliffs, etc.).
6. Continue to promote enforcement of road right-of-way mowing restrictions and investigate wildlife value of this habitat type.
7. Continue or expand efforts to control exotic and invasive species across South Dakota.
8. Develop one-stop shopping programs for landowners interested in ecosystem restoration to ensure easy and timely access to funds and professional assistance.
9. Identify locations (example: COAs as described in this Plan) where concerted efforts can be coordinated to produce habitat blocks of sufficient size to address habitat fragmentation concerns.
10. Continue to search for data sources to help identify more discrete COAs in western South Dakota.

11. Identify resources to allow wildlife interests to better compete with agricultural land values to further the goal of ecosystem representation in eastern South Dakota.
12. Address connectivity concerns to allow sufficient movement and genetic exchange to support populations of SGCN.
13. Restoration projects should focus on creating habitat corridors and stream connectivity that connect disjunct habitats.
14. Explore options to develop captive breeding, stocking, and trap and transfer programs for extirpated and declining populations of aquatic SGCN for future reintroductions.

Research

1. Continue to explore data sources for better information on pre-settlement vegetation conditions and the historical range of variability across all South Dakota ecoregions and ecosystem types.
2. Develop a better understanding of the effects of natural disturbance regimes on plant species compositions, structures, and functions of ecosystems.
3. Develop a better understanding of landscape patterns of heterogeneity resulting from natural disturbance regimes.
4. Develop prescribed burning methods and programs that better simulate natural disturbance regimes and their effects on South Dakota's ecosystem diversity.
5. Define ecosystem friendly grazing/haying practices (i.e. reduced stocking rates, rotational grazing, staggered timing of haying, and height of cutting) and develop recommendations for applying this management tool.
6. Define management practices that reduce nutrient, agricultural runoff, and sedimentation to enhance water quality and aquatic ecosystems.
7. Develop and refine landscape models to quantify historical range of variability in South Dakota.
8. Identify the levels of risk associated with selected levels of representation.
9. Develop a better understanding of exotic and invasive plant species distributions and spread relative to priorities for ecosystem diversity.
10. Research and monitor the establishment, spread, control measures and impacts of aquatic invasive species on native ecosystems.

Education

1. Develop educational materials for landowners that describe desired ecosystem conditions, management actions to achieve these conditions, and the potential economic and social benefits of their actions.

2. Develop and use best practices in conservation education to teach about the importance of ecosystem diversity and species conservation. These practices include both active efforts (e.g., school programs, teacher trainings, etc.) and passive efforts (e.g., posters, brochures, signage, etc.). Such programs will be conducted by SDGFP personnel and contractors, in partnership with other individuals, organizations, and agencies.
3. Increase the amount of information available to the public via the South Dakota Wildlife Diversity/Natural Heritage Program website regarding ecosystem diversity.
4. Promote outreach efforts that emphasize exotic and invasive plant prevention/control, prevention of the spread of aquatic invasive species and associated impacts on ecosystem diversity.

In addition to these coarse filter-targeted actions, species-specific conservation actions may be found in SGCN profiles (Appendix C) and Appendices G-K.