Integrating climate-informed planning into State Wildlife Action Plans in the North Central United States

Kimberly E. Szcodronski[1]
Indigo T. Bannister[2]
Blake R. Hossack[1]
Alisa A. Wade[2]

[1]U.S. Geological Survey Northern Rocky Mountain Science Center
[2]U.S. Geological Survey North Central Climate Adaptation Science Center

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EXECUTIVE SUMMARY

State fish and wildlife agencies are required to submit a State Wildlife Action Plan (SWAP) every 10 years to be eligible for grants through the State Wildlife Grant Program. With the next round of revisions due in 2025, the U.S. Geological Survey North Central Climate Adaptation Science Center is evaluating how to best support states with further integrating climate-informed planning in their SWAPs. Here, we summarize how states in the North Central region, which includes Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, addressed adaptation planning in their 2015 SWAPs. We review climate adaptation considerations in required SWAP elements one through five, including species, habitats, threats, conservation actions, and conservation monitoring, respectively. We also include a list of potential strategies that the North Central Climate Adaptation Science Center could use to support states in the North Central region with further advancing the integration of climate-informed planning in ongoing and future SWAP revisions. These strategies were primarily identified during meetings in 2021 with six of seven state fish and wildlife agencies in the North Central region where we discussed their priority needs relating to climate-informed planning. Our hope is that these strategies will enhance existing efforts in the region to advance the integration of climate change in conservation planning.

INTRODUCTION

To be eligible for grants through the State Wildlife Grant Program, state fish and wildlife agencies must submit a State Wildlife Action Plan (SWAP) to the U.S. Fish and Wildlife Service. The first round of SWAPs was due in 2005. Given the 10-year revision cycle, states in the North Central region (Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming) are working toward a 2025 SWAP revision. There are eight elements required by Congress for inclusion in SWAPs (Table 1). In the 2005 versions of the plans submitted by states in the North Central region, climate change was either not addressed or minimally addressed. In the 2015 revisions, climate change was addressed more thoroughly under strong recommendation from Congress. In 2009, the U.S. House of Representatives passed climate legislation (H.R. 2454) intended to provide significant new funding for wildlife conservation that was tied to the adoption of state climate adaptation plans, including climate-related elements of SWAPs. Companion legislation never passed the U.S. Senate; however, the bill helped incentivize adaptation planning throughout the country.

The mission of the U.S. Geological Survey's Climate Adaptation Science Center (CASC) network is to provide support to states, tribes, and bureaus that are helping fish, wildlife, water, land, and people adapt to a changing climate. The CASC network is comprised of the National CASC and nine regional CASCs that covers the United States, U.S. Affiliated Pacific Islands, and the U.S. Caribbean. The CASC network has broadly supported adaptation planning in SWAPs. However, the extent to which that support has occurred varies widely among states and regions. The Northeast CASC was closely involved in supporting states in its region for the 2015 revisions by developing a state-of-the-science report for the Northeast and Midwest (Staudinger et al. 2015), participating in regional meetings, and supporting the development of a regional Species of Greatest Conservation Need (SGCN) list. Similarly, the Southeast CASC funded a report titled, "Climate Change and Conservation in the Southeast: A Review of State Wildlife Action Plans" (Lackstrom et al. 2018), that included suggestions to enhance the integration of climate change into conservation planning. The North Central CASC (NC CASC) supported Colorado's climate change vulnerability analysis for high priority wildlife habitats (Decker and Fink 2014) but did not engage with the other states in the region.

Looking to the 2025 SWAP revisions, the CASC network is communicating with states to identify opportunities to collaborate more broadly and to support the inclusion of climate adaptation in SWAPs more cohesively. The NC CASC is evaluating how it can best support the states in the region to achieve this objective. We summarize how the seven states in the North Central region approached climate adaptation planning for the required SWAP elements 1 – 5 and present some potential pathways by which the NC CASC could further support states (informed by relevant literature, the perceived needs of the states, and similar work by our CASC partners). We also summarize priority technical support needs for climate-informed SWAP planning as identified by the North Central states for 2025 SWAP revisions.

Table 1. Eight elements required by Congress for State Wildlife Action Plans.

SWAP Element	Description
1. Species	Information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife.
2. Habitats	Information on the location and relative condition of key habitats and community types essential to the conservation of each state's SGCN.
3. Threats	Descriptions of problems which may adversely affect species identified in element one or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and their habitats.
4. Conservation Actions	Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions.
5. Monitoring	Descriptions of the proposed plans for monitoring species identified in element one and their habitats, for monitoring the effectiveness of the conservation actions proposed in element four, and for adapting these conservation actions to respond appropriately to new information or changing conditions.
6. Review	Each state's provisions to review its strategy at intervals not to exceed ten years.
7. Partner Participation	Each state's provisions for coordination during the development, implementation, review, and revision of its strategy with federal, state, and local agencies and Indian Tribes that manage significant areas of land or water within the state, or administer programs that significantly affect the conservation of species or their habitats.
8. Public Participation	Each state's provisions to provide the necessary public participation in the development, revision, and implementation of its strategy.

CHAPTER 1: REVIEW OF CLIMATE ADAPTATION CONSIDERATIONS IN 2015 SWAPS

Species of Greatest Conservation Need

Under the requirements of the State Wildlife Grant Program, SWAPs must include "information on the distribution and abundance of species of wildlife, including low and declining populations as the state deems appropriate, which are indicative of the diversity and health of the state's wildlife" (required element 1). In practice, this has resulted in the identification of a list of SGCN for each state.

Selection of Species of Greatest Conservation Need

Each state must develop their own criteria for identifying SGCN, which resulted in 22 different criteria across the seven North Central SWAPs (Table 2). The most common criteria were whether the species was listed as endangered, threatened, or a candidate species at the federal or state level. Other common criteria included global rarity, climate change vulnerability, and dependence on rare, vulnerable, or declining habitat. Colorado, Kansas, Montana, Nebraska, North Dakota, and Wyoming further prioritized their SGCN into tiers that reflect the degree of conservation priority.

There were three states that included vulnerability to climate change as a criterion for SGCN selection in their 2015 SWAP revision (Table 2):
1. North Dakota: Climate change was identified as the reason for designating one SGCN, the American Avocet (*Recurvirostra americana*), because of its inclusion in the 2016 Shorebirds of Conservation Concern List (Dyke et al. 2015; U.S. Shorebird Conservation Plan Partnership 2016).
2. South Dakota: Some SGCN were included if projected climatic changes in South Dakota indicated significant future challenges for the species (South Dakota Department of Game, Fish and Parks 2014).
3. Wyoming: SGCN were selected using Wyoming's 2010 SWAP Native Species Status Matrix, which combines population status and limiting factors to determine the rank of the species (Wyoming Game and Fish Department 2017; Chapter IV, Table 1). Limiting factors included habitat, human activity levels, genetics, invasive species, disease, environmental contaminants, and climate change. Wyoming's climate change vulnerability assessment was used to inform the limiting factor of climate change (Wyoming Game and Fish Department 2017).

Table 2. Criteria for identifying and prioritizing Species of Greatest Conservation Need in 2015 SWAP revisions for states in the North Central region.

Criteria	CO	KS	MT	NE	ND	SD	WY
Federally endangered, threatened, or candidate	X	X		X	X	X	X
State endangered, threatened, or candidate	X	X		X	X	X	X
Dependent on rare, vulnerable, or declining habitat			X		X	X	X
Global rarity	X	X		X		X	
Climate Change Vulnerability Index					X	X	X
Endemism		X		X		X	
National rarity	X			X		X	
Population trends or declining population			X	X	X		
Ability to implement conservation actions	X						X
Ecological value of species	X						X
Expert opinion	X				X		
Identified as conservation priority		X			X		
Lack of information	X						X
New or significant threats	X		X				
Population size			X				X
State rarity				X	X		
Range extent or area of occupancy			X				

Number of Species of Greatest Conservation Need

Given the widely differing methodologies for SGCN selection and biophysical diversity of the region, it was unsurprising that the number of SGCN identified also varied widely. Many states did not include insects or plants in their SGCN lists either due to lack of information or lack of jurisdiction over the taxonomic group (Table 3).

Table 3. Number of Species of Greatest Conservation Need for each state in the North Central region.

State	Number of SGCN (excluding insects and plants)	Number of SGCN (including insects and plants)
Colorado	157	348
Kansas	255	285
Montana	128	214
Nebraska	180	766
North Dakota	111	115
South Dakota	84	101
Wyoming	222	222

Shared Species of Greatest Conservation Need

There was a total of 957 SGCN included in SWAPs in the North Central region. Six species were included in all seven North Central states' 2015 SWAP revisions: 1) burrowing owl (*Athene cunicularia*), 2) ferruginous hawk (*Buteo regalis*), 3) chestnut-collared longspur (*Calcarius ornatus*), 4) black tern (*Chlidonias niger*), 5) long-billed curlew (*Numenius americanus*), and 6) swift fox (*Vulpes velox*). Six states included the same 12 SGCN: 1) Baird's sparrow (*Ammodramus bairdii*), 2) golden eagle (*Aquila chrysaetos*), 3) piping plover (*Charadrius melodus*), 4) Townsend's big-eared bat (*Corynorhinus townsendii*), 5) peregrine falcon (*Falco peregrinus*), 6) whooping crane (*Grus americana*), 7) bald eagle (*Haliaeetus leucocephalus*), 8) loggerhead shrike (*Lanius ludovicianus*), 9) sturgeon chub (*Macrhybopsis gelida*), 10) black-footed ferret (*Mustela nigripes*), 11) American white pelican (*Pelecanus erythrorhynchos*), and 12) McCown's longspur (*Rhynchophanes mccownii).* Additionally, there were 20 species listed in five SWAPs, 23 species listed in four SWAPs, 63 species listed in three SWAPs, 152 species listed in two SWAPs, and 681 species were unique to a single SWAP.

For the six states that prioritized SCGN by tiers, there were 343 species identified as a Tier 1 (highest conservation priority) in at least one SWAP. Of these, three species were identified as a Tier 1 species in five different SWAPs including: 1) black-footed ferret (*Mustela nigripes*), 2) sturgeon chub (*Macrhybopsis gelida*), and 3) sicklefin chub (*Macrhybopsis meeki*). No species were identified as Tier 1 across more than five SWAPs.

Habitat Types

Under the requirements of the State Wildlife Grant Program, SWAPs must include a "description of locations and relative conditions of key habitats and community types essential to conservation of species identified in the SWAP" (required element 2). In this section, we review how states in the North Central region classified and mapped major terrestrial and aquatic habitats in their SWAPs.

Selection of habitat types

Many states in the North Central region used the U.S. National Vegetation Classification to identify terrestrial habitats (Table 4), which can be compared across state boundaries and could provide a broader understanding of regional habitat trends (Paskus et al. 2016). Aquatic system classification varied broadly across the North Central region and is thus more challenging to compare. Some states included aquatic systems within their terrestrial datasets while others were solely based on river basins and others used fish ecoregion datasets that had been locally developed (Table 5). The differences in habitat classification systems used is reflected in the diversity of habitats listed within each plan.

Shared habitat types

There were 254 habitat classifications across the seven states in the North Central region. Of these, only five classifications are repeated verbatim across more than one plan, leaving 249 unique entries. However, the majority of states used the U.S. National Vegetation Classification to identify terrestrial habitats, and most unique habitat types could be easily consolidated into major habitat types that all states could use.

Table 4. Classification system of terrestrial habitat types used in State Wildlife Action Plans in the North Central region. "Number" indicates the number of habitat classifications and "Resource" indicates the reference of the classification system.

State	Number	Resource	Details
CO	27	U.S. Geological Service National Gap Analysis Program 2004	Used the U.S. National Vegetation Classification system to identify 57 terrestrial ecological systems, which were then categorized into 20 terrestrial habitat types and 7 other habitat categories (Appendix A, Figure 1A).
KS	18	Kansas Gap Land Cover Map Final Report (Egbert et al. 2001)	Used alliance-level classifications based on the U.S. National Vegetation Classification system, which were then generalized to reflect the habitat types used by managers (Appendix A, Figure 2A).
MT	14	Montana Natural Heritage Program	Based on level two ecological systems with modifications to meet land manager needs including combining similar habitat types and adding several additional land cover types (Appendix A, Figure 3A).
NE	83	Terrestrial ecological systems and natural communities of Nebraska (Rolfsmeier and Steinauer 2010)	Used natural communities' classifications that were developed using the U.S. National Vegetation Classification system.
ND	7	USFWS Land Cover Classification 2002; USGS GAP Land Cover Data Set 2011; National Land Cover Database 2011; NASS Cropland and Cultivated Data Layers 2013	Used a variety of key datasets including land cover data, level IV ecoregions, and other spatial planning tools to identify their landscape components (defined as major habitat types).
SD	34	USDA Natural Resources Conservation Service Soils	Identified potential plant communities that may occur based on different abiotic factors (Appendix A, Figure 4A).
WY	11	U.S. National Vegetation Classification	Excluded classifications that were mostly developed, exceedingly small, or did not contain any SGCN (Appendix A, Figure 5A).

Table 5. Classification system of aquatic habitat types used in State Wildlife Action Plans in the North Central region. "Number" indicates the number of habitat classifications and "Resource" indicates the reference of the classification system.

State	Number	Resource	Details
CO	9	U.S. Geological Service National Gap Analysis Program 2004	Identified nine habitat types based on physiographic regions, managers, and stakeholders needs (Appendix A, Figure 6A).
KS	4	Hawkes et al. 1986	Used Hawkes et al. (1986) and additional input by the staff of the Kansas Department of Wildlife, Parks and Tourism (Appendix A, Figure 7A).
MT	13	Montana's Comprehensive Fish and Wildlife Conservation Strategy 2005	Selected aquatic habitat types from Montana's Comprehensive Fish and Wildlife Conservation Strategy (2005).
NE	7	Nebraska Game and Parks Commission	Used a rough classification system for lakes, rivers, and streams based on temperature and salinity.
ND	2	USFWS Land Cover Classification 2002; USGS GAP Land Cover Data Set 2011; National Land Cover Database 2011; NASS Cropland and Cultivated Data Layers 2013	Identified two major aquatic landscape components (wetlands and lakes; rivers, streams, and riparian).
SD	12	Stewart and Kantrud 1971; Cowardin et al. 1979; Brinson 1993	Classified riparian and wetland systems using hydrogeomorphic classifications and hydrology subclasses from several sources and used USDA Natural Resources Conservation Service's Ecological Site Descriptions and National Wetlands Inventory datasets for mapping purposes (Appendix A, Figure 8A).
WY	6	Abell et al. 2008; The Nature Conservancy's hierarchical classification framework (Higgins et al. 2005)	Identified six major aquatic basins based on hydrographic boundaries, fish assemblages, and management considerations (Appendix A, Figure 9A).

Climate Change Vulnerability Assessments

Under the requirements of the State Wildlife Grant Program, SWAPs must include "descriptions of problems which may adversely affect species identified in element one or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and their habitats" (required element 3). All states in the North Central region addressed climate change as a threat in their SWAPs and included some form of climate change vulnerability analysis.

Climate Change Vulnerability Assessment methodologies

There were several commonalities in how the states conducted Climate Change Vulnerability Assessments (CCVAs; Table 6). All states relied on literature reviews or previous assessments to inform their CCVAs, and most were also informed by expert opinion. All states used NatureServe's Climate Change Vulnerability Index (CCVI) for part of their analysis.

Table 6. Resources or tools used to inform Climate Change Vulnerability Assessments across states in the North Central region. An empty cell indicates the state did not use that resource.

Methods	CO	KS	NE	ND	MT	SD	WY
Literature review or previous assessments	X	X	X	X	X	X	X
Climate Wizard	X			X			X
Climate Change Vulnerability Index	X	X	X	X	X	X	X
Geospatial analysis	X						X
Trait-based analysis						X	
Expert opinion	X	X	X		X		X

Colorado

Colorado included an extensive habitat based CCVA in their SWAP (Colorado Parks and Wildlife 2015). The vulnerability assessment was sourced from a report by Decker and Fink (2014). For the assessment, Decker and Fink (2014) calculated the overall vulnerability ranking for 13 key habitats using methods derived from NatureServe's Habitat Climate Change Vulnerability Assessment (HCCVI; Comer et al. 2012). First, they evaluated exposure and presumed sensitivity to climate change using GIS-based analysis for each habitat and assigned a rank (high, moderate, low) for the combined exposure-sensitivity component. Next, they assigned a rank for the adaptive capacity of the habitat using methods from the Climate Change and Massachusetts Fish and Wildlife Report (Manomet Center for Conservation Sciences and Massachusetts Division of Fisheries and Wildlife 2010). For adaptive capacity, they considered factors that influence how a habitat can respond to changes including bioclimatic envelope, habitat component species' ability to shift their ranges, vulnerability to biological stressors, vulnerability to extreme events, and landscape conditions. Overall vulnerability rank was then calculated from the exposure-sensitivity ranking and the adaptive capacity ranking using a method derived from NatureServe's HCCVI (Comer et al. 2012). Colorado further strengthened their vulnerability assessment by including a detailed literature review for 13 habitat types that

consisted of the climatic drivers for each habitat that were used to inform their decisions during the ranking process. Three of the 13 habitats were found to be highly vulnerable to climate change by mid-century, including foothill and mountain grasslands, shortgrass prairies, and playas.

Colorado also used NatureServe's CCVI to conduct CCVAs for its 117 Plants of Greatest Conservation Need. Given the significant data gaps for plants, many assumptions were made based on field observations, expert judgement, information on related species, and general habitat-level information. Of the 117 plant species assessed, 104 plants scored extremely vulnerable to climate change and 7 plants scored highly vulnerable to climate change.

Kansas

Kansas assessed the vulnerability to climate change for 83 SGCN using NatureServe's CCVI in their SWAP (Rohweder 2015). To make sure that the CCVA covered a representative sample across all species, assessments were completed for at least 30% of species in each group (amphibian, bird, fish, insect, mammal, mollusk, other invertebrates, and reptile) and they chose species to broadly represent differences in geography and habitat. Several sources were used to inform the species' information and range maps including the Catalogue of American Amphibians and Reptiles; Kansas Herpetofaunal Atlas (Taggart 2022); Kansas Mammal Atlas (Schmidt et al. 2021); Kansas Department of Wildlife, Parks and Tourism Stream Survey and Assessment Database; Kansas Fishes (Kansas Fishes Committee 2014); North American Native Fishes Association's North American Native Fishes Association's FishMap.org; NatureServe Explorer; and the U.S. Geological Survey Gap Analysis Project Species Viewer. Most species with a vulnerable CCVI index score (extreme, highly, or moderately vulnerable) were fish, mussels, and invertebrates (Rohweder 2015; Appendix 6, Table 1).

Montana

Montana's SWAP (2015) identified focal areas as Tier I (greatest conservation needs) or Tier II (moderate conservation needs) to direct attention to specific geographic areas considered to be in the greatest need of conservation effort. The technical team ranked 55 terrestrial focal areas and 93 aquatic focal areas in Tier I. They ranked an additional 61 terrestrial focal areas and 164 aquatic focal areas in Tier II. Invited experts and the technical team ranked focal areas based on six primary factors and 10 secondary factors. One of the secondary factors included a CCVA; however, there were no further details on the methods of the vulnerability assessment in the SWAP.

Nebraska

Nebraska assessed the climate change vulnerability of all Tier I species (89 species; defined as globally or nationally at-risk) using NatureServe's CCVI for their SWAP (Schneider et al. 2011). Vulnerability assessments were conducted during workshops with taxon experts and involved a group consensus to evaluate each species' exposure, sensitivity, and adaptive capacity. Nebraska used the vulnerability assessment results to help develop climate adaptation strategies. In addition, they identified a need to assess the climate change vulnerability of a

select number of Tier II species (defined as at-risk within Nebraska while doing well in other parts of their range) and natural community types in the future.

North Dakota

North Dakota's SWAP (Dyke et al. 2015) included CCVAs for their species of conservation priority by using existing scores from NatureServe's CCVI and vulnerability assessment reports from Michigan (Hoving et al. 2013), Illinois (Walk et al. 2011), and the Great Plains (Zack et al. 2010). Two-thirds of North Dakota's species of conservation priority have been previously assessed in other parts of North America based on NatureServe's CCVI. Since North Dakota is expected to experience some of the most extreme warming in the continental United States, they assumed if a species is vulnerable in another region, then it will likely also be vulnerable in North Dakota. The SWAP included a recommendation to assess the vulnerability of their species of conservation priority within the predicted climates for the state by 2017. NatureServe's CCVI scores from other regions indicate that a North Dakota-specific assessment should first focus on insects, fish, and mussels since there is less information regarding these species, and birds and mammals appeared less vulnerable in other regional assessments.

South Dakota

South Dakota's SWAP (South Dakota Department of Game, Fish and Parks 2014) included a CCVA of aquatic SGCN using NatureServe's CCVI. Of the 36 aquatic SGCN, all species were assessed except for four aquatic insect species with insufficient data for ranking. Fourteen out of 20 fish species were found vulnerable to future climate change and of those, eight were highly or extremely vulnerable. Of the nine freshwater mussel species assessed, four were vulnerable to future climate change and of those, two were highly vulnerable.

The SWAP did not include a CCVA of terrestrial SGCN in South Dakota, but it included a summary of projected effects of climate change on terrestrial and riparian-wetland SGCN (South Dakota Department of Game, Fish and Parks 2014; Table 5-5). The projected effects were based on the expected changes of the species' habitat and ecosystem diversity from climate change predictive models, relevant literature, and expert opinion. Each species received a projected effect of "positive", "neutral", or "negative" depending on whether their range "increased, stayed the same, or decreased or shifted" (South Dakota Department of Game, Fish and Parks 2014).

Wyoming

Wyoming's SWAP (Wyoming Game and Fish Department 2017) included a CCVA of terrestrial SGCN, terrestrial habitat types, and terrestrial priority areas. First, they conducted vulnerability assessments for all 131 terrestrial, vertebrate SGCN using NatureServe's CCVI. For these assessments, they evaluated vulnerability to climate change, energy and residential development, and wildlife disease, as well as a cumulative vulnerability to all three threats. Climate vulnerability was calculated as exposure to climate change minus resilience to climate change, which was a combination of sensitivity and adaptive capacity. Exposure was estimated using projected temperature and moisture change for 2050 with climate data from Climate

[Wizard](#). The scores assigned within [NatureServe's CCVI](#) were informed by Wyoming Game and Fish Department staff, reptile and amphibian experts, species accounts from the [American Society of Mammalogists' Mammalian Species Journal](#) and [Cornell Lab of Ornithology's Birds of North America Online](#), and peer reviewed literature and technical assessments.

Second, Wyoming assigned landscape-based vulnerability rankings to each species to further determine priority species. For these assessments, they produced maps that combined landscape-based vulnerability and species-based vulnerability to identify locations with the highest vulnerable habitats and the largest concentrations of sensitive species. This process involved three steps: 1) assignment of species-based vulnerability scores to each raster cell with a medium or high probability of each species' occurrence, 2) calculation of a "cross-species vulnerability index" (Davison et al. 2012) by averaging values in each raster cell across all 131 SGCN and taxonomic groups, and 3) intersection of locations with mean cross-species vulnerability index ≥ 0.30 and locations with high overall landscape vulnerability to determine where habitats may be most vulnerable.

Third, Wyoming assessed the habitat vulnerability of 44 terrestrial priority areas and 11 terrestrial habitat types identified in their SWAP. They created spatial datasets to represent climate change vulnerability, development vulnerability, and combined vulnerability. For climate change vulnerability, they calculated spatially explicit estimates of exposure (temperature change and moisture deficit) and resilience (topographic diversity and water availability, land management status, and landscape integrity) for 30-meter raster cells. The analysis found five of the 11 habitat types were highly vulnerable to climate change including prairie grasslands, sagebrush shrubland, desert shrubland, riparian areas, and wetlands. Eighteen of the 44 priority areas had high climate change vulnerability.

Conservation Actions

Under the requirements of the State Wildlife Grant Program, SWAPs must include "descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions" (required element 4). This section summarizes how each state in the North Central region approached conservation actions in their SWAP, with a specific focus on climate adaptation actions.

Colorado

Conservation actions were identified for each SGCN, habitat, and plant species in Colorado's SWAP (Colorado Parks and Wildlife 2015) using the standard lexicon of threats and actions (Salafsky et al. 2008). A three-tiered priority ranking for actions (low, medium, and high) were assigned and reported, but methodologies of rankings were not provided in the SWAP. For individual wildlife species' conservation actions, climate change was often explicitly addressed as a need for additional information, research, and/or monitoring to understand the current and ongoing impacts. Occasionally, climate change was explicitly addressed in other actions such as managing rangelands as an intact landscape, maintaining patch size and habitat mosaics, limiting water use, and restoring natural fire regimes. Colorado identified six statewide

conservation objectives for Plants of Greatest Conservation Need, four of which mentioned climate change. These objectives were the most forward-looking, addressing issues such as habitat stability and shifts due to climate change, habitat connectivity, and *ex situ* conservation. Habitat conservation actions explicitly referenced climate change as an information gap. Many of the other conservation actions support climate adaptation, although actions do not consider shifts in habitat distributions.

Kansas

Conservation actions were developed for each ecological focus area in Kansas' SWAP (Rohweder 2015) using the standard lexicon of threats and actions (Salafsky et al. 2008). These conservation actions were related to threats that are traditionally considered independent of climate change including habitat loss, invasive species, pollution, and wildlife diseases, and as a result, climate change was not explicitly addressed within the ecological focus areas. Due to uncertainties of climate change, they included seven broad adaptation strategies from the National Fish, Wildlife, and Plants Climate Adaptation Strategy (National Fish, Wildlife and Plants Climate Adaptation Partnership 2012) in their SWAP (Rohweder 2015; Appendix 6) and plan to develop more detailed strategies when species' responses to climate change are better estimated.

Montana

Conservation actions for Community Types of Greatest Conservation Need (Tier I; defined as greatest conservation need), SGCN (S1 and S2 state ranks), and focal areas in Montana's SWAP (2015) were developed by the SWAP's technical team or pulled from Montana's Comprehensive Fish and Wildlife Conservation Strategy (2005). The conservation actions related to the threats of climate change were broadly defined, such as continued evaluation of climate models and recommended actions, continued monitoring to detect change, and collecting baseline data to document range shifts for habitats and species.

Nebraska

Nine statewide conservation actions were identified to overcome barriers and threats for Nebraska's SWAP (Schneider et al. 2011) by conservation practitioners, species experts, and the public. Climate change is addressed through the fourth conservation action, "facilitate species and ecosystem adaptation to climate change," and six specific strategies to achieve this action were identified (Schneider et al. 2011). Strategies included: 1) reduce impacts of non-climate stressors, 2) maintain ecosystem function, 3) protect conservation areas, 4) restore landscape connectivity, 5) increase climate change knowledge, and 6) utilize an adaptive management approach. Nebraska also identified conservation strategies for each biologically unique landscape within the ecoregions and although climate change was not directly addressed at this scale, the strategies support climate adaptation.

North Dakota

Five conservation actions were identified in North Dakota's SWAP (Dyke et al. 2015) using the standard lexicon of threats and actions (Salafsky et al. 2008) that apply to all landscapes in the

state. Although climate change was not addressed within these broad conservation actions, detailed climate-related conservation actions were included for each landscape component (major habitat type) in the SWAP. The actions for each landscape component were developed by the SWAP Summit of April 2014, an internal North Dakota Game and Fish Department working group, and institutional working knowledge. Additionally, a chapter in the SWAP's addendum titled, "Planning for Climate Change in North Dakota" (Dyke et al. 2015), recommends several conservation actions directly related to climate adaptation planning. These recommendations included finishing the CCVAs, creating a list of guiding principles and actions that promote climate change adaptation planning, and identifying actions to address the adaptive capacity of highly vulnerable species.

South Dakota

Statewide conservation actions for terrestrial and aquatic systems were identified within four main themes (coordination, management, research, and education) in South Dakota's SWAP (South Dakota Department of Game, Fish and Parks 2014). Climate change is not directly addressed in these coarse statewide actions; however, there was a strong focus on connectivity and assessing natural landscape regimes. Possible species-specific conservation actions were identified for terrestrial and aquatic SGCN that were predicted to experience negative effects of climate change (South Dakota Department of Game, Fish and Parks 2014; Chapter 5.3, Tables 5-5 and 5-6). Species-specific conservation actions are also included in species profiles for SGCN (Appendix C), and species-level research, survey, and restoration needs were included in Appendices G-K (South Dakota Department of Game, Fish and Parks 2014).

Wyoming

Conservation actions were identified for five statewide threats: 1) rural subdivision and development, 2) energy development, 3) invasive species, 4) climate change, and 5) disruption of historic disturbance regimes in Wyoming's SWAP (Wyoming Game and Fish Department 2017). For the threat of climate change, the SWAP included general conservation actions, species management actions, and habitat management actions. Climate-related actions included developing a structure to coordinate the incorporation of climate change into agency activities, sharing information with the public on the impacts of climate change, assessing the impacts of climate change on disease dynamics, and mapping critical areas of wildlife movement, transition, and refuge. Furthermore, specific conservation actions were identified for each habitat type and occasionally directly addressed climate change (e.g., researching or monitoring the effects of climate change, adaptive management strategies to mitigate the impacts of climate change, and adapting water management techniques to accommodate changes from climate change).

Conservation Monitoring

Under the requirements of the State Wildlife Grant Program, SWAPs must include "proposed plans for monitoring species identified in element one and their habitats, for monitoring the effectiveness of the conservation actions proposed in element four, and for adapting these conservation actions to respond appropriately to new information or changing conditions"

(required element 5). Given the challenge of monitoring, many states took a broad approach to this element. This section includes each states' specific approach to monitoring, with a focus on states who included monitoring related to climate change.

Colorado

The monitoring plan in Colorado's SWAP (Colorado Parks and Wildlife 2015) leveraged existing monitoring efforts and data management tools by the Colorado Natural Heritage Program and Colorado Parks and Wildlife. The monitoring plan included three sections: 1) species monitoring, 2) habitat monitoring, and 3) measuring conservation success. Long-term monitoring efforts are ongoing for many of Colorado's highest priority SGCN, and the state agency has plans to develop monitoring programs for those species that are not currently being monitored. The SWAP acknowledged a lack of statewide habitat monitoring efforts and recommended that new ways to coordinate habitat monitoring should be developed in the future. The SWAP also detailed a biodiversity status analysis (Rondeau et al. 2011) that is used to measure the success of conservation actions for SGCN and key habitats. Specific to climate change, conservation actions were identified to long-term monitor species' populations and distributions in the face of climate change.

Kansas

Kansas' SWAP (Rohweder 2015) outlined a general plan for monitoring based on adaptive management that involved four components: 1) developing plans, 2) implementing those plans, 3) monitoring the effects of management actions, and 4) adjusting future plans. Although monitoring approaches were not detailed, the SWAP stated that existing monitoring efforts are underway by the state wildlife agency and conservation partners, and they outlined their goal to monitor achievements of resource conservation in the future. Monitoring the impacts of climate change was not directly discussed, but the SWAP included a climate change adaptation strategy from the National Fish, Wildlife, and Plants Climate Adaptation Strategy that stated, "support adaptive management in a changing climate through integrated observation and monitoring" (National Fish, Wildlife and Plants Climate Adaptation Partnership 2012).

Montana

Montana's SWAP (2015) focused on two mechanisms to measure the effectiveness of conservation actions including 1) using generic methods from AFWA's "Measuring the Effectiveness of State Wildlife Grants: Final Report" (2011) and 2) using the SGCN list to monitor changes in species' conservation priority (categorized as tiers). If a species moves to a lower tier or off the SGCN list, that is a sign of successful conservation actions and if a species moves to a higher tier, then conservation actions may need to be readjusted. The SWAP also detailed previous and ongoing species and habitat monitoring efforts including the Milk River Initiative, Sage Grouse Initiative Habitat Assessment, the Montana Diversity Monitoring Project, and multi-species bird monitoring. Regarding monitoring efforts directly related to climate change, monitoring was identified as a needed conservation action for species where climate change was identified as a threat.

Nebraska

Nebraska's SWAP (Schneider et al. 2011) described an overall plan for adaptive management and included a framework for species monitoring, habitat monitoring, and implementation monitoring (tracks whether proposed conservation actions were carried out). Adaptive management was called out as a powerful tool for adapting to climate change due to the uncertainty around climate change, the potential rate of change, and pace of knowledge acquisition. The plan identified a need to "develop long-term monitoring systems that are strategically designed to evaluate climate change impacts and species and ecosystem responses" (Schneider et al. 2011). The SWAP stated that future climate change monitoring could be conducted as a stand-alone effort or integrated into existing monitoring efforts.

North Dakota

North Dakota's SWAP (Dyke et al. 2015) described the process of adaptive management and included the objectives of the North Dakota Game and Fish Department's monitoring program. The SWAP provided an overview of existing monitoring efforts for each taxonomic group including birds, reptiles and amphibians, mammals, fish, freshwater mussels, and insects, and included some species-specific survey efforts (Dyke et al. 2015; Appendix A-F). The section also included a list of monitoring efforts occurring within the main habitat types and provided several examples of specific habitat monitoring efforts used to assess changes across the state. The SWAP expressed a need to further develop a statewide monitoring plan by working collaboratively across agencies to coordinate monitoring efforts and share survey information. Climate change was not specifically mentioned in their monitoring efforts.

South Dakota

The purpose of monitoring was clearly stated in South Dakota's SWAP (South Dakota Department of Game, Fish and Parks 2014) as a tool to check on progress toward goals and objectives that were identified in the SWAP. The SWAP identified a need for long-term monitoring that evaluates the responses of species, habitats, and natural communities to the impacts of conservation challenges such as climate change and land-use changes. To address uncertainty, the SWAP emphasized ecosystem-level monitoring should be conducted within an adaptive management framework to continually evaluate conservation actions and adjust as needed. Species-level monitoring was noted as a mechanism to track conservation actions for specific species and was included on each species description page. The SWAP focused on monitoring native ecosystem diversity for terrestrial systems and monitoring conservation opportunity areas for SGCN in aquatic systems. The SWAP also included a list of existing aquatic and terrestrial species-level monitoring programs in South Dakota (South Dakota Department of Game, Fish and Parks 2014; Appendix E).

Wyoming

Monitoring was integrated throughout Wyoming's SWAP (Wyoming Game and Fish Department 2017), with monitoring discussed in the chapters "Leading Wildlife Conversation Challenges", "Habitats", and "SGCN". The chapter on "Leading Wildlife Conservation Challenges" (Wyoming Game and Fish Department 2017) included monitoring strategies to evaluate the success of

conservation actions for each of the five conservation challenges, which included climate change. The SWAP identified the need to modify existing protocols or develop new protocols that improve efforts to monitor climate change impacts on wildlife and ecosystems, with a focus on identifying early warning signs of climate-related stress. Each terrestrial habitat type and aquatic basins included existing monitoring efforts within the "Current Conservation Initiatives" section and recommended monitoring efforts within the "Monitoring Activities" section (Wyoming Game and Fish Department 2017). Current monitoring efforts and identified monitoring needs were included in the individual SGCN's species accounts for mammals, birds, fish, amphibians, reptiles, crustaceans, and mollusks.

CHAPTER 2: STRATEGIES TO FURTHER ADVANCE CLIMATE-INFORMED PLANNING IN THE NORTH CENTRAL REGION

During the summer of 2021, authors Szcodronski, Hossack, and Wade met with SWAP coordinators and management staff of state fish and wildlife agencies in six of the seven states in the North Central region (Kansas was unable to attend). We discussed how the state agencies use their SWAPs, how incorporation of climate information could support future management planning, and identified useful products (i.e., data, tool, analysis, or synthesis) to meet these goals.

State agencies in the North Central region said they use their SWAPs to help prioritize management decisions, including land purchases, allocating project funding, identifying focal areas, habitat restoration, and species monitoring in their nongame programs. States also emphasized that the SWAP is not only an agency plan but is used by a variety of agencies and partners including the U.S. Forest Service, Bureau of Land Management, U.S. Department of Agriculture Natural Resources Conservation Service, and numerous non-governmental organizations (e.g., National Wild Turkey Federation, Pheasants Forever, Ducks Unlimited, Rocky Mountain Elk Foundation, and various land trust groups). Several state agencies are interested in adding climate-related data or information to their upcoming 2025 SWAP revision; however, state agencies said they generally lack time, expertise, and funding and would need help to increase the consideration of climate change in their SWAP.

In this chapter, we include a list of possible strategies to further advance the integration of climate-informed planning in SWAPs that were identified during summer 2021 meetings with SWAP coordinators and other wildlife managers from states in the North Central region. We also include other potential strategies identified during other needs assessment efforts in the North Central region in 2018 and 2019 (Crausbay and Cross 2019; Yocum et al. 2022). When relevant, we include additional information regarding strategies to support climate-informed planning efforts, including 1) regional SWAP reports from the Northeast, Midwest, and Southeast (Staudinger et al. 2015; Lackstrom et al. 2018), 2) previous efforts of the Northeast and Southeast CASCs, and 3) climate change considerations from the Association of Fish and Wildlife Agencies' (AFWA) "Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans and Other Management Plans" (2009)[1].

While these strategies are envisioned for the NC CASC as possible ways to better support state fish and wildlife agencies with climate-informed planning and SWAP revisions, some strategies may be helpful for state agencies or funders. Our hope is that this list of strategies will enhance existing efforts and advance the integration of climate change into wildlife conservation planning in the North Central region, which will help a region-wide mission to support fish and wildlife populations in the face of a changing climate.

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[1] *AFWA's "Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans and Other Management Plans" (2009) is being updated to support 2025 SWAP revisions (completion is expected in 2022).*

Identification and mapping of potential climate change refugia

- Refugia are "areas relatively buffered from contemporary climate change over time" that may provide long-term havens for species despite surrounding shifting climate regimes or stepping-stone habitats that allow species to track optimal climate conditions via range shifts (Morelli et al. 2016; Morelli et al. 2020).
- AFWA's Voluntary Climate Change Guidance (2009) recommended that states evaluate how habitats and communities are likely to change in the future and how these changes will affect the distribution of habitat types.
- During the summer 2021 SWAP meetings, all six participating states expressed an overall interest in forecasting for the future and support in directing conservation and restoration efforts, which could be partially supported by refugia mapping.
  - In a follow-up meeting on refugia mapping in January 2022, state agencies indicated they would use maps of potential climate refugia to evaluate and prioritize conservation, restoration, and focused management action areas.
- There are several ongoing refugia projects in the Northeast, Southwest, and North American Boreal region (Refugia Research Coalition). The NW CASC is currently funding a project to map climate change refugia for wildlife species in Oregon, Washington, and Idaho (NW CASC Climate Refugia and Resilience Atlas).

Menu of climate-informed adaptation actions for wildlife management

- An adaptation "menu" is a list of potential climate-informed conservation actions and strategies that can be used for on-the-ground management actions.
- AFWA's Voluntary Climate Change Guidance (2009) recommended that states: 1) develop conservation actions that address the impacts of climate change on species and habitats over a range of likely future climates; 2) identify which actions will minimize climate change impacts, provide wildlife adaptation or resilience, and support movement to suitable habitats; and 3) link actions to objectives that facilitate monitoring and performance measurement.
- Creating an adaptation menu of climate-informed actions for habitat-focused conservation and restoration efforts was identified as a useful product by five of six states in the North Central region during the summer 2021 SWAP meetings.
- Several climate adaptation menus exist, such as the Northeast CASC Wildlife Adaptation Menu for resource managers in terrestrial ecosystems or the Northern Institute of Applied Climate Science's Adaptation Menus of adaptation actions by topics that can be used in conjunction their Adaptation Workbook. However, additional work to either frame the adaptation menu using the USGS Resist-Accept-Direct Framework to guide management decisions or adaptation actions from these general frameworks to more specific actions or habitats related to the North Central region could be useful (e.g., see Cross et al. 2020).

Climate-informed scenario planning guidance and workshops

- Scenario planning incorporates the uncertainty of the future in the decision-making process by considering several plausible future climates that could occur at a specific place and uses them to help inform adaptation efforts and develop management strategies (Lawrence et al. 2021; Miller et al. 2022).
- AFWA's Voluntary Climate Change Guidance (2009) recommended that states develop conservation actions that address the impacts of climate change on species and habitats over a range of likely future climates.
- During the summer 2021 SWAP meetings, all six participating states expressed an overall interest in forecasting for the future and finding ways to help plan for forthcoming ecosystem changes, which could be largely supported by scenario planning. Participants in Yocum's 2019 interviews with state managers in the North Central region also requested support in developing more scenario-based approaches to adaptation (Yocum et al. 2022).

Climate Change Vulnerability Assessments for Species of Greatest Conservation Need

- Vulnerability is defined as "the propensity or predisposition of species or systems to be adversely affected by climate change and encompasses a variety of elements reflecting risk or susceptibility to harm and capacity to cope or adapt" (IPCC 2014). Vulnerability assessments identify which species are likely to be affected by projected climate change and why the species is likely to be vulnerable (Glick et al. 2011).
- AFWA's Voluntary Climate Change Guidance (2009) recommended using vulnerability assessments to identify and describe the impacts of climate change on species.
- Estimating future climate impacts on species was identified as an interest by three of six North Central states during the summer 2021 SWAP meetings. State agencies use species-specific vulnerability assessments to better prioritize SGCN into priority conservation tiers, which are used to help direct limited time and funding for species.
  - North Central states included species vulnerability assessments for a portion of SGCN in their current SWAPs, except for Wyoming's SWAP (Wyoming Game and Fish Department 2017) that included vulnerability assessments for all their SGCN.
- Participants in Yocum's 2019 interviews with state managers in the North Central region identified a desire to use vulnerability analyses from neighboring states in the North Central region (Yocum et al. 2022). Interviewees in Lackstrom et al. (2018) also noted that "an increase in interstate collaboration and resources to conduct regional-scale assessments would enhance the current, relatively-limited use of impact and vulnerability assessments."
- Potential projects that would provide support for incorporating climate change into identifying SGCN would include updating NatureServe's CCVI, which many states used to guide planning in the 2015 SWAP revisions.

Climate Change Vulnerability Assessments for habitats

- Habitat vulnerability assessments, that can be conducted independently or alongside species assessments, identify how and why terrestrial or aquatic habitats are likely to be affected by future projected climate conditions (Glick et al. 2011). Habitat assessments could help identify areas with greatest need for restoration or intervention versus areas that would most benefit from conservation and protection, such as those identified via refugia mapping.
- AFWA's Voluntary Climate Change Guidance (2009) recommended using vulnerability assessments to identify and describe the impacts of climate change on key habitats.
- Estimating future climate impacts on habitats was identified as an interest by four of six North Central states during the summer 2021 SWAP meetings. Several state agencies said they are focusing their conservation and restoration efforts on habitats or ecosystems to support a wider range of SGCN instead of individual species efforts.
  - Colorado' SWAP (Colorado Parks and Wildlife 2015) assessed 13 habitats, Wyoming's SWAP (Wyoming Game and Fish Department 2017) assessed 11 habitats, and the other states did not include habitat vulnerability assessments.
- The Northeast Fish and Wildlife Habitat Vulnerability Assessment provides a good example of a regional habitat vulnerability assessment.

Regionally coherent list of Species of Greatest Conservation Need

- A regional SGCN list can be used to identify shared species priorities across state boundaries, which state wildlife agencies can leverage to enhance the efficiency and effectiveness of species conservation efforts at a larger, regional scale. Lackstrom et al. (2018) also recommended developing a regional SGCN to promote increased cross-state communication and collaboration.
  - Multi-state efforts could be used to leverage support from larger funding sources by standardizing data collection, discussing best management practices, sharing species information, and coordinating conservation actions.
- AFWA's Voluntary Climate Change Guidance (2009) recommended adjusting existing SGCN list to account for current and future impacts of climate change.
- This has been identified as useful in other regions; for example, there are several regional SGCN lists including the Midwest (Midwest Landscape Initiative Regional SGCN List), Northeast (Staudinger et al. 2015; Appendix 3.1), and Southeast (Southeast Regional SGCN List; Regional SGCN in the Southeastern United States Report).

Provide case studies of climate-informed planning in SWAPs

- During the summer 2021 SWAP meetings, states in the North Central region expressed interest in seeing case studies of various ways nearby states incorporated climate planning in their 2015 SWAPs.
- In response to this request, authors Szcodronski, Hossack, and Wade completed an initial summary of 12 relevant case studies of climate-informed planning in SWAPs from states in the North Central and Northwest regions in February 2022.

Model potential future distributions of species or habitats

- AFWA's Voluntary Climate Change Guidance (2009) recommended that states identify how habitats and communities are likely to change in the future, including potential shifts in the distribution of species and habitat types.
- Producing future species range maps was identified as a useful product to support states with climate-informed planning by half of the state agencies (3/6) during the summer 2021 SWAP meetings. Understanding future distribution was also identified as a data gap during the interviews conducted with state agencies in the North Central region by Crausbay and Cross (2019).
- Modeling future distributions can be a very difficult task and results would need to address sources of uncertainty. However, states are interested in the product and Wyoming's SWAP (Wyoming Game and Fish Department 2017) identified modeling and mapping "future species distribution based on multiple drivers, including climate change" as a long-term goal. Integrating future distributions and climate change refugia may help address some of the uncertainty that is associated with modeling potential future distributions.

Curate and create easily accessible climate change resources and data relevant to wildlife management

- Most state agencies in the North Central region mentioned during the summer 2021 SWAP meetings that they are overwhelmed with the amount of climate change resources that are rapidly being updated and would find it helpful to have one source for recommended region-wide resources and data. Participants in Yocum's 2019 interviews also identified the lack of "shovel-ready" datasets as a hindrance to climate change planning in the 2015 SWAP revisions (Yocum et al. 2022). Most states in the North Central region do not have a climate specialist on staff or the time or funding to gather climate literature and data. There is a particular interest in technical assistance with what climate projections to use for climate modeling (Yocum and Ray 2019).
- Recent addition of Northern Great Plains region-specific information in the U.S. Climate Resilience Toolkit may meet some of these demands, but greater outreach regarding its availability would be useful.
- The Climate Futures Toolbox, recently developed by the North Central CASC, could be useful for some states, although it would require dedicated state staff to be trained on its usage and application as it requires more advanced data analysis skills.
- A potential project related to resources and data is updating The Climate Toolbox datasets, with specific information for the North Central region. Further, the NW CASC compiled climate datasets relevant to that region (A Guidebook to Spatial Datasets for Conservation Planning Under Climate Change in the Pacific Northwest); a similar report could be compiled for the North Central region.

Support cross-state collaboration and coordination

- AFWA's Voluntary Climate Change Guidance (2009) recommended that states coordinate across state boundaries to facilitate management at large ecological scales and engage with diverse partners to share information, expertise, and resources.
- AFWA's "Framework to Enhance Landscape-scale and Cross-boundary Conservation through Coordinated State Wildlife Action Plans" (2021) recommended collaborating across jurisdictions for effective landscape-scale conservation.
- A few states mentioned during the summer 2021 SWAP meetings that they would like to see more collaboration across state boundaries and would support NC CASC efforts to facilitate coordination of SWAP coordinators. Participants in Yocum's 2019 interviews also identified a disconnect between climate scientists and managers as a hindrance to climate adaptation planning in SWAPs (Yocum et al. 2022). Other interviews suggested the usefulness of coordinating with SWAP coordinators from other states to share experiences and gain insights on alternative climate change approaches (Lackstrom et al 2018).
- Several challenges were also noted, including different priorities across states, perceived competition for federal funding, varying timelines, and dissimilar spatial or temporal scales in studies across states (Lackstrom et al. 2018). Further, 2021 interviewees stated that state agencies are overwhelmed with other tasks and time dedicated to collaboration would need to be limited.
- Colorado's CCVA (Decker and Fink 2014) provides a good example of a product from a successful collaboration between wildlife managers and scientists from the Colorado Natural Heritage Program, Colorado Parks and Wildlife, NC CASC, and USGS Fort Collins Science Center.
- Morisette et al. (2017) included collaboration as a case study in an article titled, "Crossing Boundaries in a Collaborative Modeling Workspace."

Training on climate-informed planning for state agency staff

- A few state agencies in the North Central region mentioned during the summer 2021 SWAP meetings that their staff do not have the expertise to conduct climate change analyses. Climate-related training was further identified as a need by the interviews conducted with state agencies in the North Central region by Crausbay & Cross (2019).
- State fish and wildlife agency employees that attended climate trainings in the past found them too detailed and advanced to integrate into management decisions at the state level and would prefer basic, introductory trainings. Interviewees from Lackstrom et al. (2018) noted that limited funding also restricted participation in climate-related trainings, but staff who were able to attend trainings found them useful.
- Trainings specifically designed for wildlife managers have been previously offered by the NC CASC ([NC CASC Climate Solution Days 2022](); [Montana Chapter of The Wildlife Society 2021 Climate Adaptation Training]()).

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APPENDIX A. HABITAT CLASSIFICATION MAPS FOR THE NORTH CENTRAL REGION
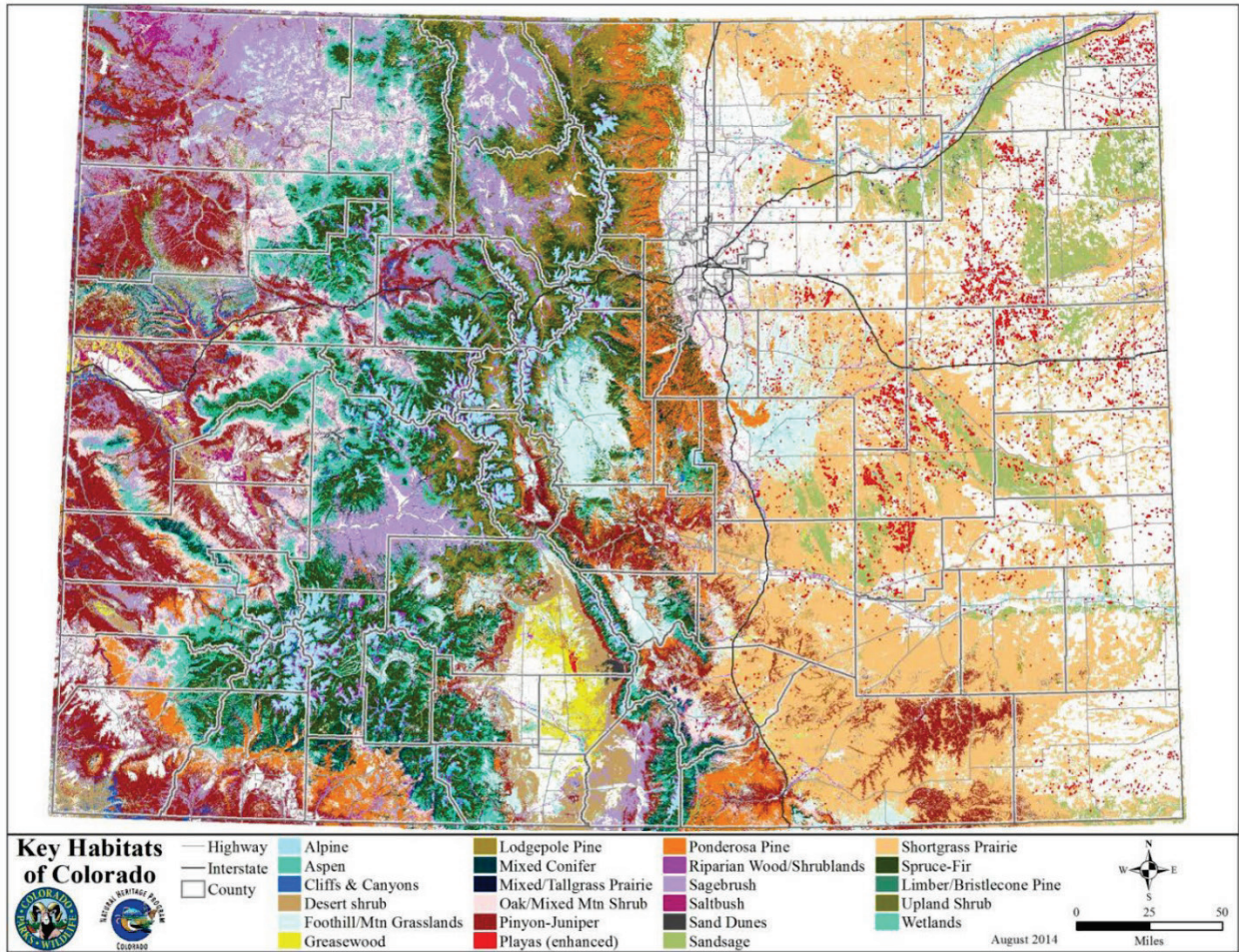
Figure 1A. Key terrestrial habitats in Colorado's 2015 SWAP (Colorado Parks and Wildlife 2015).
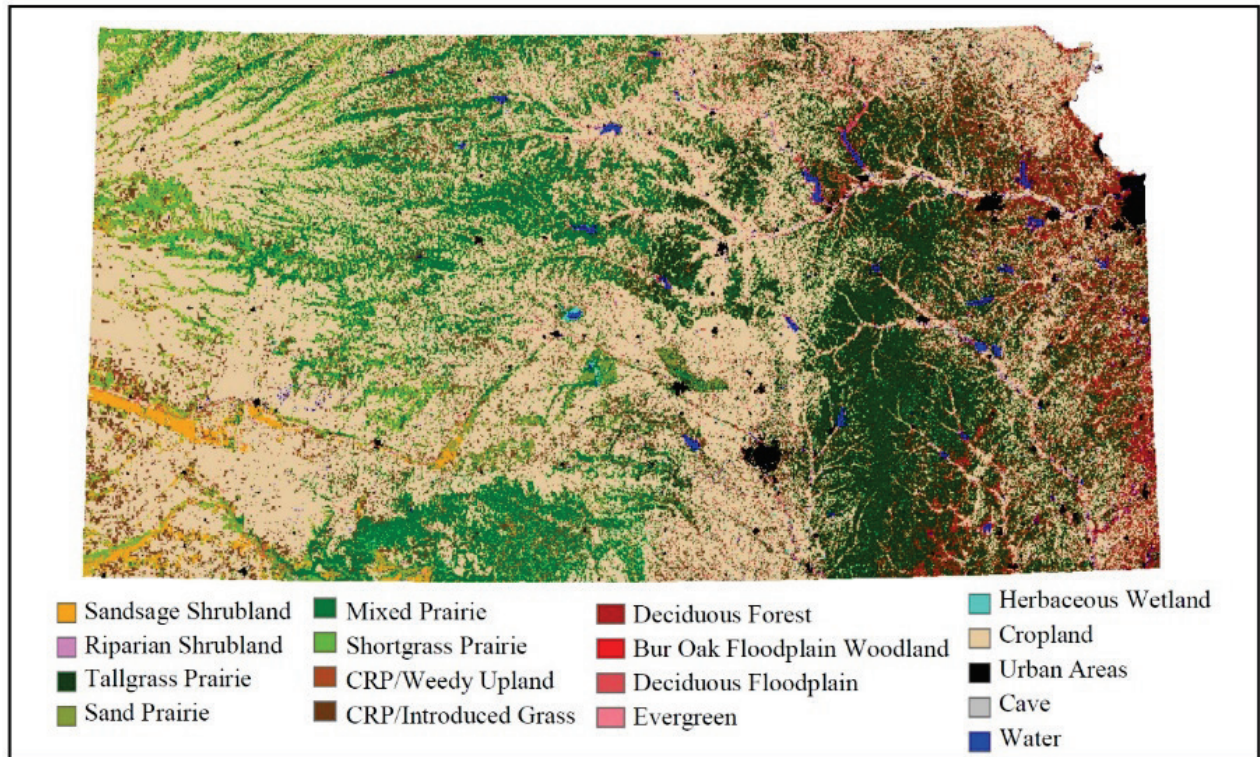
Figure 2A. Key terrestrial habitats in Kansas' 2015 SWAP (Rohweder 2015).
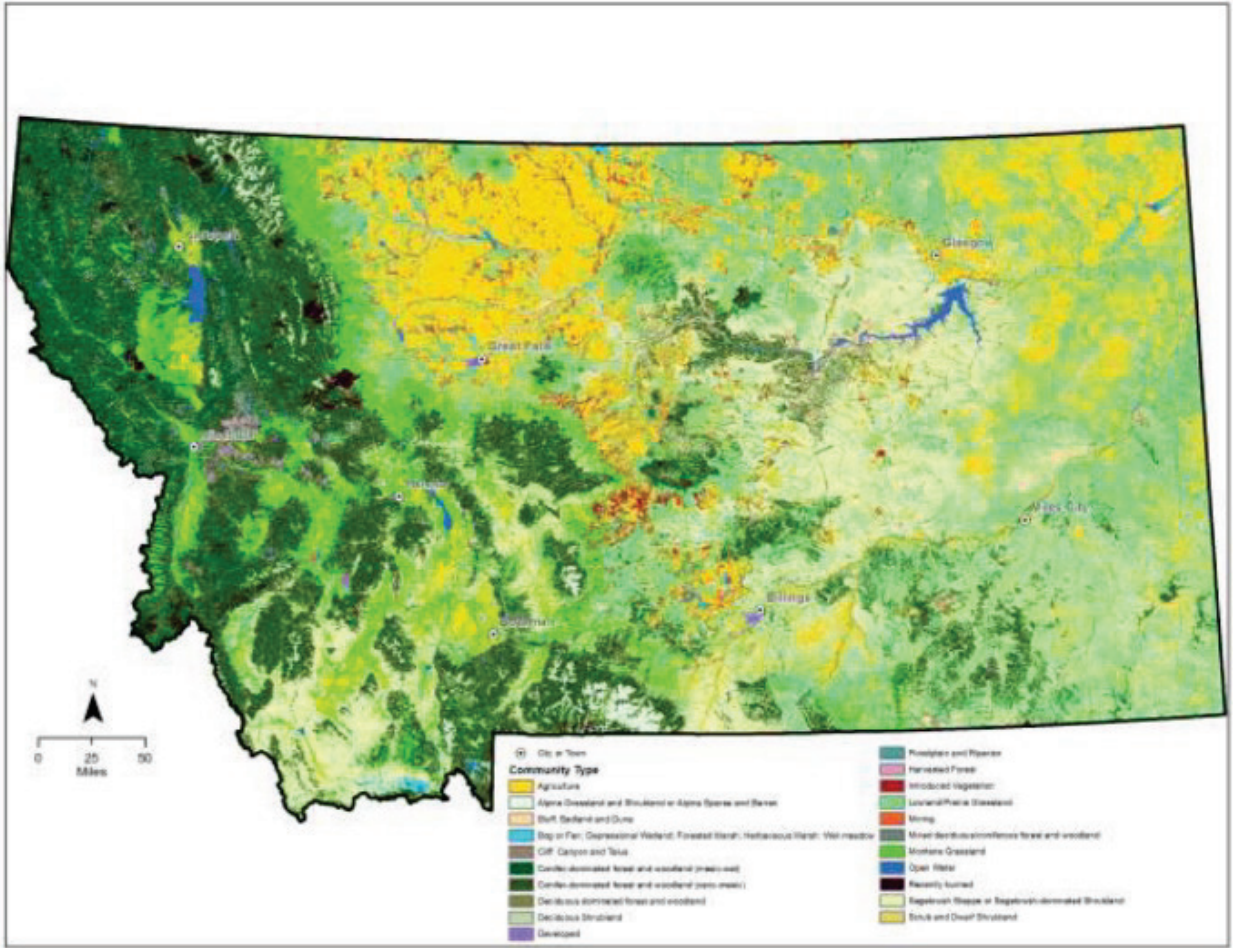
Figure 3A. Key terrestrial habitats in Montana's 2015 SWAP (Montana's State Wildlife Action Plan 2015).
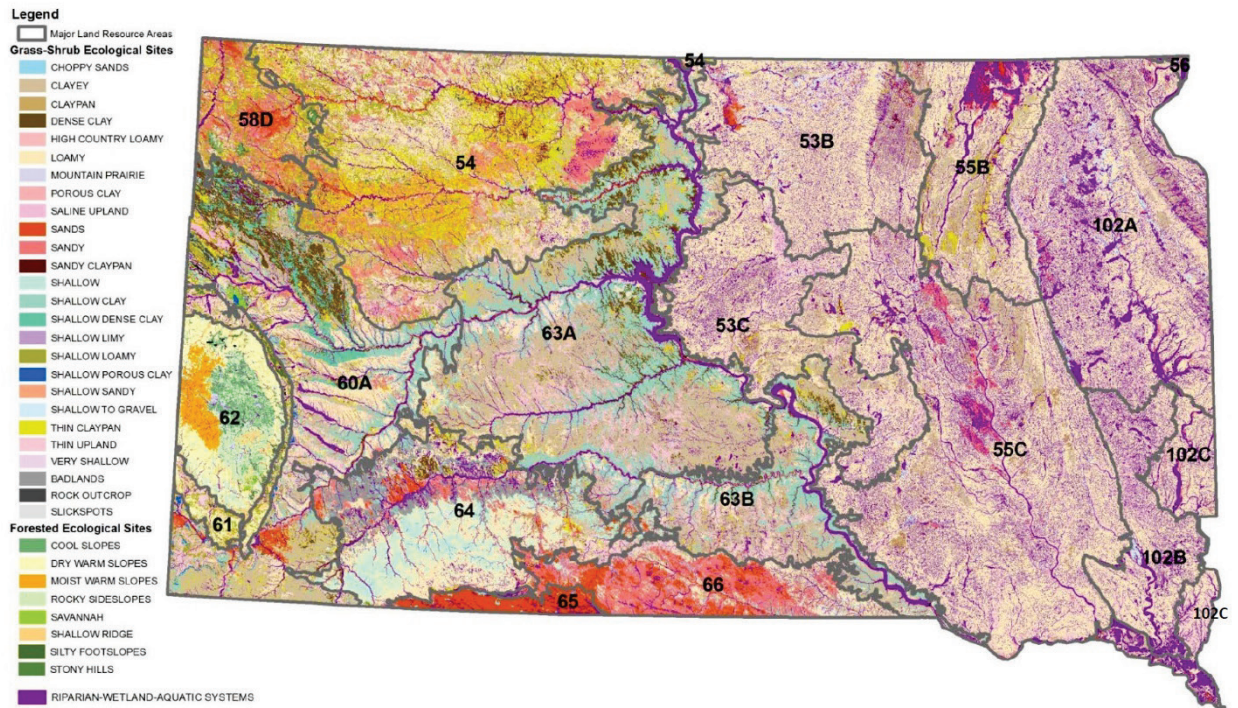
Figure 4A. Key terrestrial habitats in South Dakota's 2014 SWAP (South Dakota Department of Game, Fish and Parks 2014).
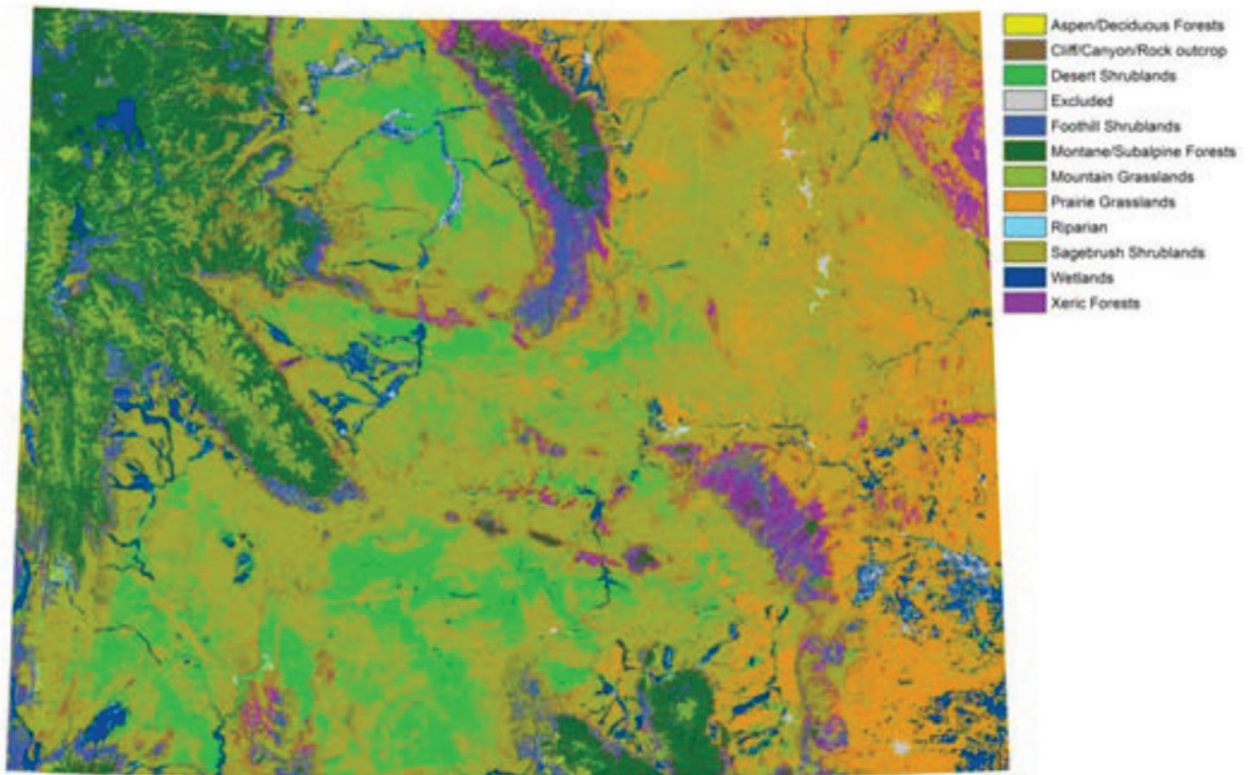
Figure 5A. Key terrestrial habitats in Wyoming's 2017 SWAP (Wyoming Game and Fish Department 2017).
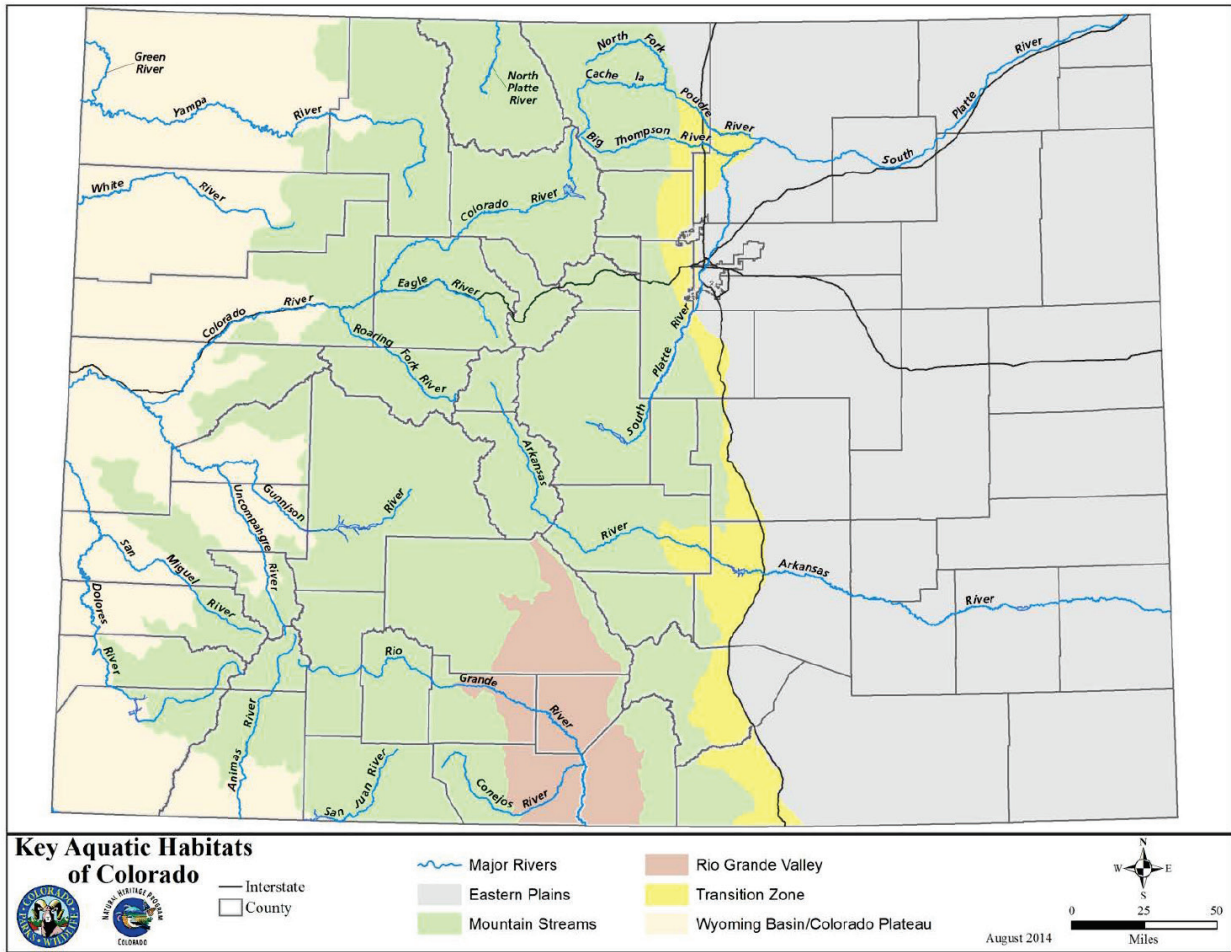
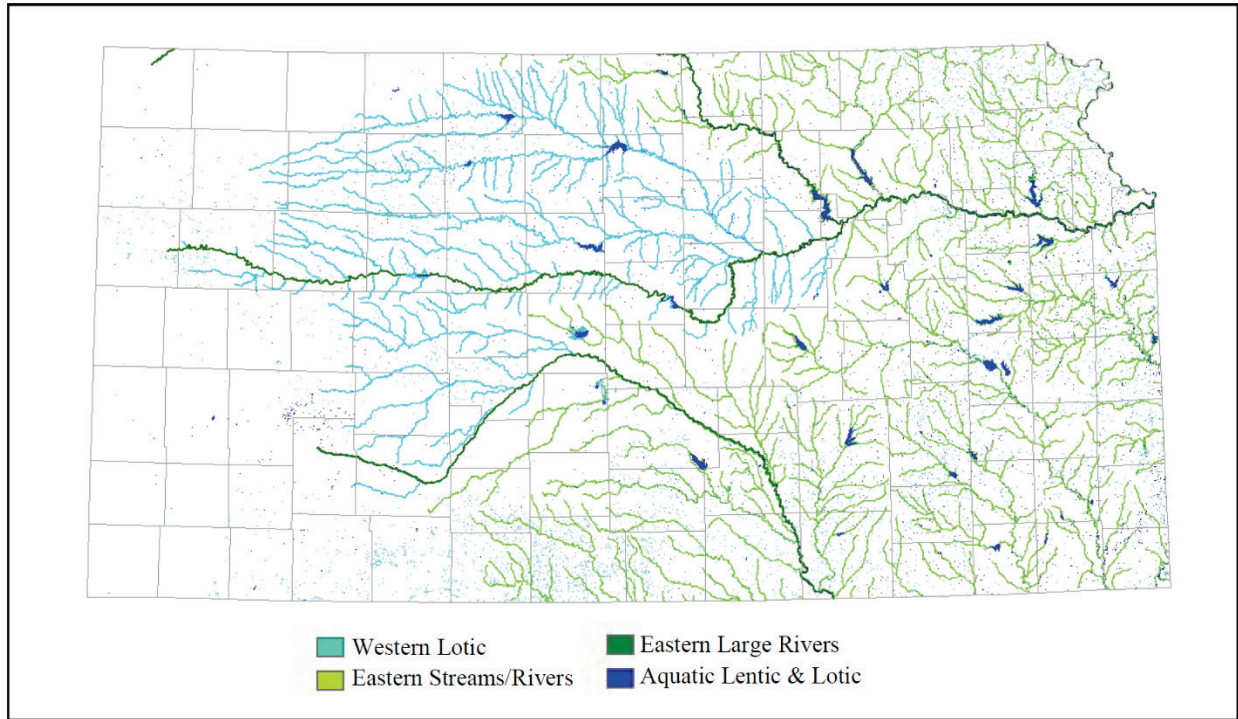Figure 6A. Key aquatic habitats in Colorado's 2015 SWAP (Colorado Parks and Wildlife 2015).

Figure 7A. Key aquatic habitats in Kansas' 2015 SWAP (Rohweder 2015).
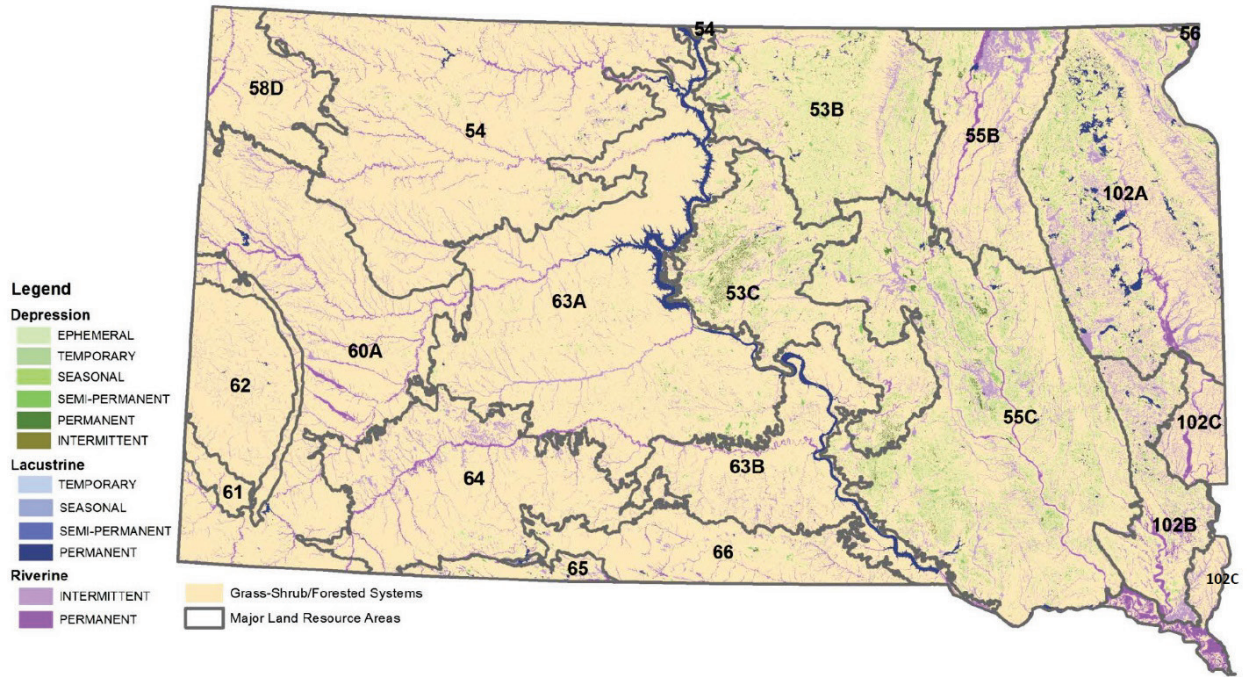
Figure 8A. Key aquatic habitats in South Dakota's 2014 SWAP (South Dakota Department of Game, Fish and Parks 2014).

Figure 9A. Key aquatic habitats in Wyoming's 2017 SWAP (Wyoming Game and Fish Department 2017).