Wyoming State Wildlife Action Plan
Terrestrial Habitat Types and Aquatic Basins

Introduction

Habitat is a general term which means the environment – physical and biological – that provides the necessary food, water, shelter, space and other items in proximity to meet the seasonal and year around needs of a particular organism or group of organisms. Wyoming contains a diversity of both terrestrial and aquatic habitats. Habitats are typically classified by plant and/or animal assemblages, geographic features, ecological attributes, or a combination of these features. While the goal of classification systems is to make each unit distinct for cataloging information, addressing issues and threats, and proposing conservation strategies, there is considerable overlap between units. Some habitat groupings tend to be geographically well-defined while others are widely distributed wherever suitable conditions exist.

Threats and potential conservation actions can vary considerably between habitat types. A habitat classification system with the following attributes was determined to best meet the purposes of Wyoming's State Wildlife Action Plan (SWAP):

1. Identifies habitats with similar flora, fauna, and conservation concerns;
2. Uses a scale consistent with those frequently used in wildlife management;
3. Describes habitats that are easily recognized by the public and policy makers; and
4. Results in a manageable number of habitats for planning purposes.

Features 2 and 3 were considered important for encouraging support for the SWAP and facilitating coordination with existing local, state, and regional wildlife conservation efforts.

Habitat Classification Systems

Terrestrial Habitat Types

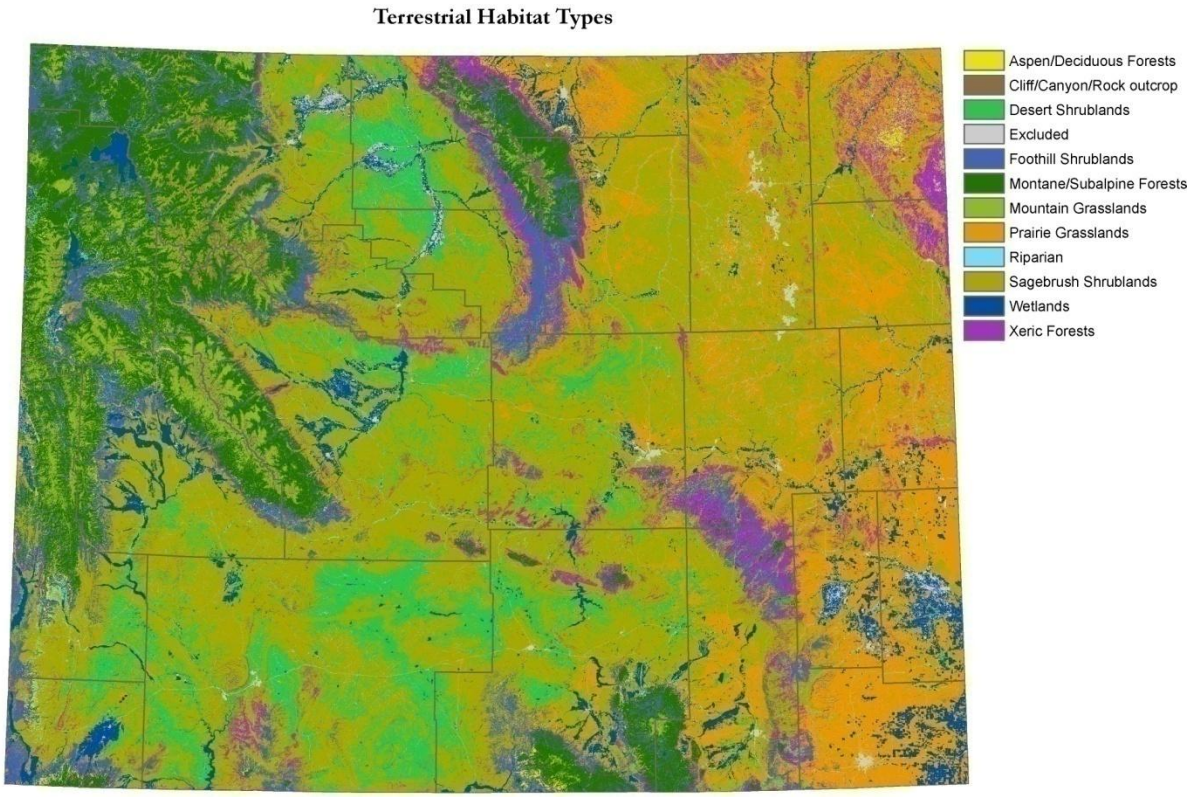
Eleven terrestrial habitat types were included in Wyoming's SWAP based on the attributes described above (Table 1). The habitat types selected closely resemble major types described by Knight (1994) and NatureServe (2010) (http://www.natureserve.org/explorer).

NatureServe Ecological Systems were then assigned to 1 each of the 11 terrestrial habitat types based on shared characteristics by a group of habitat biologists and ecologists from the WGFD and Wyoming Natural Diversity Database (Appendix A). NatureServe Ecological Systems were selected because they provide a classification unit that can be readily mapped and that can be easily identified by natural resource managers in the field (Comer et al. 2003). They are defined by biogeographic region, landscape scale, dominant land cover type, and disturbance regimes. Ecological systems are tied to, but not part of, the U.S. National Vegetation Classification (USNVC) (Federal Geographic Data Committee 2008) and can be cross-walked with other classification systems including the WGFD Wildlife Observation System types. Ninety-six NatureServe Ecological Systems are found in Wyoming and because the systems have been identified for surrounding states, regional and national assessments and analysis can be applied to conserve wildlife. NatureServe Ecological Systems that are composed primarily of developed lands, were exceedingly small, or do not contain any Species of Greatest Conservation Need (SGCN) were excluded. Information about individual ecological systems discussed in the SWAP can be found at: http://www.natureserve.org/explorer.

TABLE 1. Wyoming SWAP Terrestrial Habitat Types

1.	Aspen/Deciduous Forests
2.	Cliff/Canyon/Cave/Rock Outcrops
3.	Desert Shrublands
4.	Foothills Shrublands
5.	Montane/Subalpine Forests
6.	Mountain Grasslands and Alpine Tundra
7.	Prairie Grasslands
8.	Riparian Areas
9.	Sagebrush Shrublands
10.	Wetlands
11.	Xeric and Lower Montane Forests

FIGURE 1. SWAP Terrestrial Habitat Types



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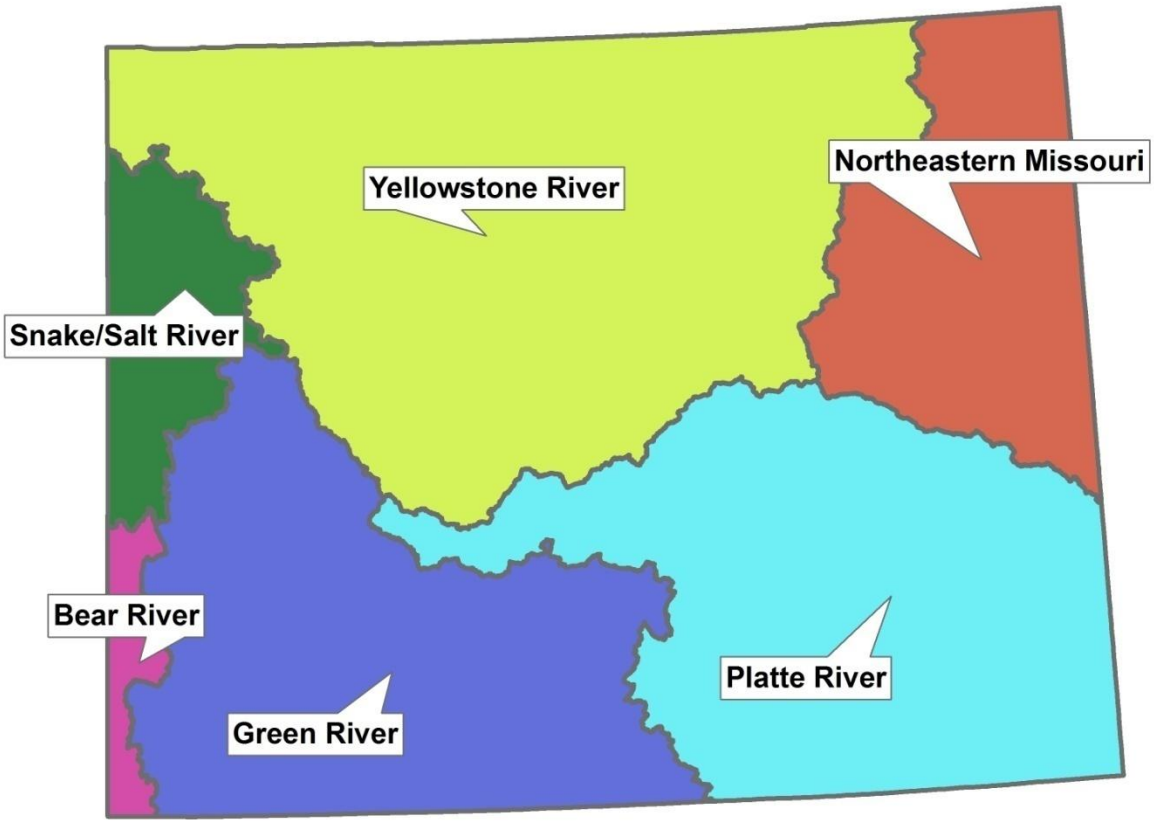
Aquatic Basins

Three of the nation's major river systems have their headwaters in Wyoming: the Missouri, Colorado, and Columbia rivers. Additionally, the Bear River, originating in Wyoming, is major tributary to the inland Great Basin. Based on hydrographic boundaries, fish assemblages, and management considerations, these watersheds provide a natural basis for delineating the six major watersheds used for conservation planning purposes in Wyoming's SWAP (Table 2). The areas are consistent with the aquatic ecosystems identified for freshwater biodiversity conservation worldwide by Abell et al. (2008). The watershed areas are also synonymous with "aquatic zoogeographical units" and "ecological drainage units" identified under The Nature Conservancy's hierarchical classification framework (Higgins et al. 2005). The watersheds each include one to four "sub-regions" (4-digit hydrologic unit code [HUC] watersheds). This approach allows the nesting of multiple spatial and temporal scales for planning and prioritizing conservation actions.

TABLE 2. Wyoming SWAP Aquatic Basins

1. Bear River
2. Green River
3. Northeastern Missouri
4. Platte River
5. Snake/Salt River
6. Yellowstone River

FIGURE 2. SWAP Aquatic Basins



Information Collection

Terrestrial Habitat Types

Information on leading habitat threats, current conservation initiatives, as well as recommended conservation actions and future monitoring was sought for each terrestrial habitat type from habitat experts within the WGFD and also from experts working outside of the WGFD. Individuals were contacted in agencies and organizations that have significant jurisdictional authority, financial resources, and/or technical expertise regarding each habitat type. This approach was considered to be time-efficient for gathering information, as well as encouraging involvement of entities whose participation is important for implementing the SWAP. Collecting information in this way also fulfills Element 7 of federal SWAP guidelines, which requires "Coordination with federal, state, and local agencies and Indian tribes in developing and implementing the wildlife action plan."

The input of several habitat experts was compiled and then further supported by independent research. Existing state wildlife conservation plans used by the WGFD were consulted.[1] Drafts of each terrestrial habitat type were submitted to habitat experts for review and later to the WGFD Assistant Habitat Program Manager and Staff Biologist, Steve Tessman. The reviewed habitat types were electronically posted for review by the WGFD Nongame Section, Habitat Technical Advisory Group, State Wildlife Action Plan Interagency Advisory Team, and representatives from each agency and organization that had contributed information to at least one of the habitat sections. Near the end of each section is a list of individuals who reviewed the document and provided feedback. Before completion, additional edits were incorporated based on feedback from the WGFD Administration, the Wyoming Game and Fish Commission, and the public.

The thoroughness of information and specificity of recommended conservation actions in the sections for each habitat type and aquatic basin vary based upon existing knowledge, the availability of information, and the input provided by section contributors. Individuals providing input were instructed to list only the threats and conservation actions that they believed would have the greatest impact on the habitat type or aquatic basin. As a result, not all issues that may apply to a particular habitat type or aquatic basin are identified, but rather each section provides an overview of the most important issues

Aquatic Basins

Information on watershed characteristics, description of aquatic wildlife, identification of conservation areas, current conservation initiatives, and recommended conservation actions and future monitoring for each aquatic basin were developed originally by four WGFD biologists: the Fish Management Coordinator, Assistant Fish Management Coordinator, Aquatic Habitat Program Manager and the Assistant Aquatic Habitat Program Manager. Information was gathered by consulting department records and sources as well as other pertinent scientific and government agency sources. The WGFD Strategic Habitat Plan was consulted in some cases for development of conservation areas. Drafts of each basin were electronically posted for review by WGFD Fish Division biologists and the public.

Terrestrial Habitat Type and Aquatic Basin Format

Each SWAP habitat type and aquatic basin section is designed to function as a standalone document. This format was adopted because it is anticipated that Wyoming's SWAP will most

[1] Plans included the WGFD's Strategic Habitat Plan (Wyoming Game and Fish Department 2009), Nongame Bird and Mammal Plan (Wyoming Game and Fish Department 1996), A plan for Bird and Mammal Species of Greatest Conservation Need in Eastern Wyoming Grasslands (Wyoming Game and Fish Department 2006), Wyoming Partners In Flight Wyoming Bird Conservation Plan (Nicholoff 2003), Wyoming Wetlands Conservation Strategy (Wyoming Joint Ventures Steering Committee 2010), and A Conservation Plan for Bats in Wyoming (Hester and Grenier 2005).

frequently be accessed through the internet for information on specific subjects, as opposed to being accessed for the document in its entirety. Additionally, it is likely that individual sections of the SWAP will be duplicated and distributed. This approach resulted in some repeated information between habitat sections since many threats, conservation initiatives, conservation actions, and monitoring activities apply to more than one habitat type or aquatic basin. General descriptions of threats, conservation initiatives, and recommendations are provided along with information specific to the habitat type or aquatic basin. Various sections are frequently cross-referenced throughout the SWAP to provide the reader with additional information on a given topic.

The following subject headings are addressed within each terrestrial habitat type and aquatic basin:

Background
This topic heading provides a brief description of the geology, precipitation, vegetation, disturbances, and land uses of each habitat type and aquatic basin.

Maps depicting location and conservation priority areas
The maps identify the location of the habitat type or aquatic basin within Wyoming. Terrestrial maps for the 11 habitat sections were created by displaying the locations of all NatureServe Ecological Systems that comprised a particular habitat type. SWAP Species of Greatest Conservation Need (SGCN) priority areas were superimposed over these habitat maps. Maps depicting the aquatic basins were developed in GIS following Habitat Unit Code boundaries. Separate maps were developed to portray conservation priority areas. **Note the table and figure numbering begins at one (1) in the Introduction, Terrestrial Habitat, and Aquatic Basins sections.*

Associated SGCN
This topic heading lists Wyoming SGCN dependent upon the habitat type or aquatic basin. SGCN may be listed under more than one terrestrial habitat type or aquatic basin. Within the aquatic basin sections, the number of native and introduced aquatic species, number of SGCN, number of extirpated species, and examples of non-SGCN native species are provided. The lists and discussion include fish, aquatic reptiles, mollusks, clams, and gastropods.

Wildlife
This topic heading includes information on: wildlife numbers and species diversity within the habitat or aquatic basin; how the habitat's structure, function, and ecological processes relate to the wildlife it supports; habitat attributes that are critical to supporting associated SGCN; and non-SGCN wildlife species of high social, ecological, or economic value, including keystone species and game species that are associated with the habitat or aquatic basin.

Threats
This topic heading contains primary threats to habitat types or aquatic basins. The threats listed are not intended to be exhaustive, but represent the most significant threats in Wyoming. A description of the general impacts of the threats is provided. Threats were ranked as high, medium, or low in severity based on the input provided by habitat and wildlife experts.

Current conservation initiatives
This topic heading lists local, regional, or national efforts to conserve, manage and/or enhance the habitat type or aquatic basin relevant to Wyoming. Efforts that are listed include those that are particularly large in size and scope, address conservation goals or threats identified within the particular habitat type or aquatic basin or within Wyoming's 2005 Comprehensive Wildlife Conservation Strategy, use specific SWAP-related funds[2], or are established specifically in support of the SWAP.

Recommended conservation actions
This topic heading identifies conservation actions that may have the most significant impact for the longterm conservation of the

[2] State Wildlife Grants, Wyoming Governor's Endangered Species Account, or Wyoming Legislative Sensitive Species Funding.

wildlife value of each specific habitat type or aquatic basin. Conservation actions are listed in general order of priority.

Monitoring activities
This topic heading lists activities that are most achievable and effective in determining the quantity and condition of the habitat type or conditions or species within the aquatic basins, or the success of the recommended conservation actions.

Priority Area Identification

Terrestrial Habitat Types

Areas of the state important for terrestrial SGCN were identified using Marxan, a software tool for systematic conservation planning and reserve selection (Ball et al. 2009, Game and Grantham 2008). The basic steps in using Marxan involve defining planning units, selecting conservation features, setting targets for each feature, and creating a cost layer. The software identifies combinations of planning units that meet defined conservation targets for the lowest cost (Ball and Possingham 2000). The decision to use Marxan for identifying SGCN priority areas was based on the desire for a transparent, objective, and repeatable process that used the best available data on SGCN distributions and habitat condition. The application of Marxan was performed by WGFD geographic information systems (GIS) personnel with assistance from its Nongame Section. Training and consultation on the use of Marxan were received from the Wyoming chapter of the Nature Conservancy.

Planning Units
A statewide grid of 1 mi.^{2} hexagons was created, with each of the 98,435 hexagons considered an individual planning unit. Planning units of this size were considered small enough to take advantage of the higher resolution (30 X 30 meter) datasets for SGCN distribution, habitat location, and habitat condition.

Conservation Features
Conservation features included terrestrial SGCN and the eleven habitat types. The location of SGCN across the state was based on the distribution models developed by WYNDD (Keinath 2010). The location of the eleven habitats was based on the Northwest ReGAP dataset for the state of Wyoming (Gap Analysis Program 2010). The area of each SGCN and habitat type inside of each hexagon planning unit was calculated and used to attribute the planning unit for Marxan analysis.

Conservation Feature Targets
Establishing meaningful and realistic conservation targets is challenging. There is no scientific consensus as to the number or size of populations for individual species that should be conserved to ensure their longterm viability (Groves et al. 2002). For the SWAP, conservation targets were established for all 127 terrestrial SGCN based upon each species' distribution and conservation status. Targets were percentages of each species' modeled Wyoming distribution and ranged from 15% to 50% with a mean of approximately 26%. The selection of this range was based upon recommendation from other conservation planning efforts (Groves and The Nature Conservancy 2003, Neely 2006).

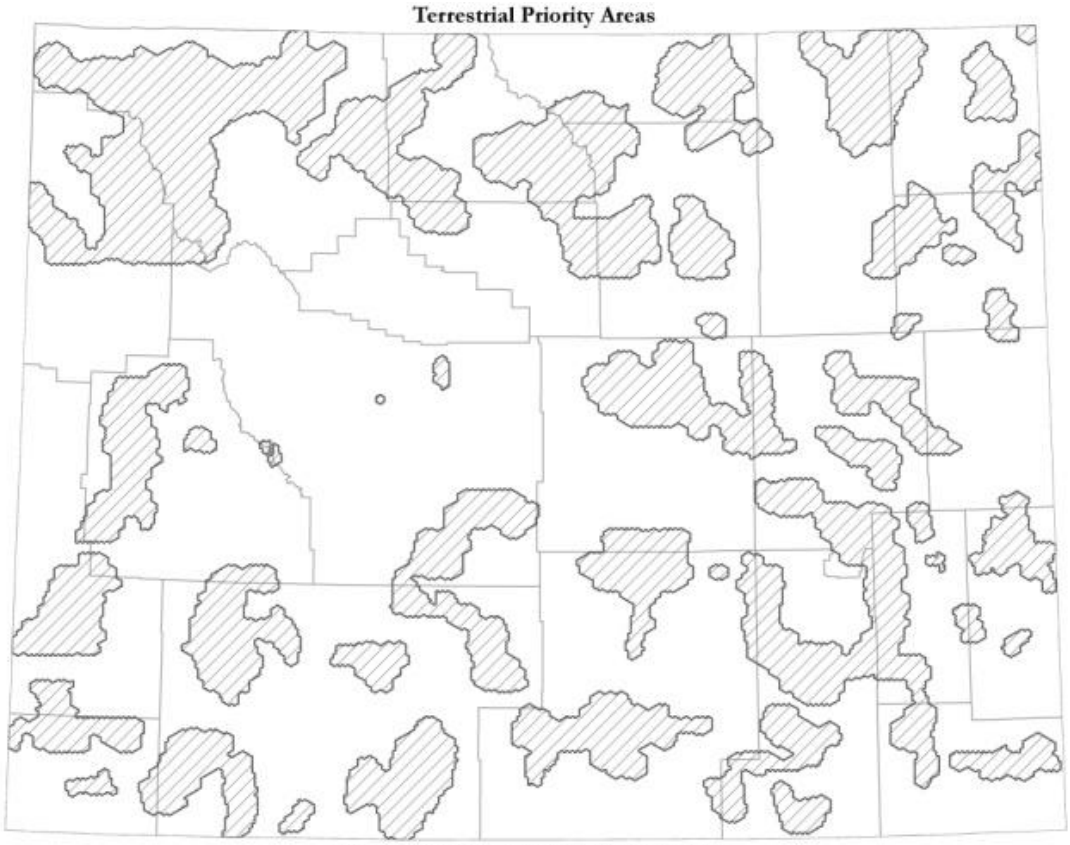
The target for each SGCN was calculated based on its NSS rank (NSS1-NSS4, NSSU) and its range (endemic, limited, disjunct, widespread, or peripheral), with NSS rank contributing up to 35% toward the target and range contributing up to 15%. Most SGCN had targets in the middle of that target range (i.e., 20-30%). Only one species (Wyoming toad) had a target of 50%, and only four species had targets of 15%. All eleven habitat types were given targets of 30%.

Cost Layer
Following the methods outlined in Copeland et al. (2007), the cost layer for Marxan analyses was created to reflect current anthropogenic surface disturbance based on eight criteria: cultivated and haw lands, oil and gas pipelines, oil and gas wells, powerlines, residential

development, roads, surface mines, and wind dataset at a 30-meter resolution and then combined to give a score from zero (low human disturbance) to 100 (high human disturbance). For Marxan analyses, the average disturbance level was calculated for each planning unit and then reclassified to a 4-point scale where 1 indicates low human disturbance and 4 indicates high human disturbance.

Based on the results of Marxan, 44 priority areas were identified (Figure 3). Individual areas range in size from 7 to approximately 4,550 square miles with a mean size of 665 square miles, and cover slightly less than 30% of the state (29,225 square miles). Larger priority areas are comprised of a mix of habitats, and capture the distributions of many terrestrial SGCN. For example, the largest priority area, located in and around Yellowstone National Park, is turbines. Disturbance was calculated for each dominated by Montane/Subalpine Forest, Mountain Grasslands, and Foothill Shrubland habitats, but includes all 11 habitats. It also captures some of the distributions of 81 SGCN, meets the full conservation targets of 11 SGCN, and meets more than half of the conservation targets for 33 SGCN. In contrast, some of the smaller priority areas consist almost entirely of a single habitat type and, in part because of their smaller size, capture the distributions of relatively few SGCN. Priority areas identified with Marxan should be considered as a network that meets conservation targets at the minimum cost, and can not necessarily be interpreted meaningfully as standalone areas. The priority area network has a complementary value that results in the sum exceeding the value of the individual areas (Ball et al. 2009).

Figure 3



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The priority areas developed for SWAP meet or exceed the representation targets for 104 of the 138 conservation features. Of the 34 features represented in the priority areas at less than their target, most were very close to the target. Only two SGCN (least weasel, 89%; yellowpine chipmunk, 93%) and one habitat type (Mountain Grasslands, 94%) are represented at less than 95% of their targets. Some SGCN are markedly overrepresented. For example, more than three times the target distributions of northern myotis, pinyon mouse, fisher, and Hayden's shrew are captured by the priority areas. SGCN which are the most overrepresented tend to be located in only a few of the priority areas.

Three of the habitat types (Mountain Grasslands, Montane Subalpine Forests, Aspen/Deciduous Forests) are found in less than half of the priority areas. The other eight types are found in at least 24 of the 44 areas, often, however, as only minor habitat components. Four of the habitat types (Riparian, Wetlands, Sagebrush Shrublands, Desert Shrublands) are found in more than 40 of the areas. Eight of the priority areas, including the four largest, capture portions of all eleven habitat types. The smallest priority area (7 mi.^{2}) contains only three habitat types. Breakdowns of conservation targets achieved by each SWAP SGCN priority areas are available upon request from the WGFD.

The basic conservation goal addressed by this analysis was to efficiently capture the target distributions of all terrestrial SGCN and habitat types. For conservation planning purposes, SWAP SGCN priority areas maps are best used in conjunction with other maps identifying high value wildlife areas. This can be accomplished through multi-layer GIS analysis. The relative priority of locations based on SWAP goals can be compared with prioritization based on different goals. SGCN priority areas overlap three existing priority area datasets previously developed by Game and Fish: sage-grouse core areas, SHP crucial areas, and key nongame wildlife areas. The largest area of overlap (17,726 sq miles) is with crucial areas developed for the Strategic Habitat Plan. Although SGCN were considered when delineating the SHP crucial areas, other criteria (sage-grouse core areas, WGFD-managed properties, big game ranges, aquatic resources, etc.) were equally important. Area of overlap is smaller between SGCN priority areas and both sage-grouse core areas (8,480 mi.^{2}) and key nongame wildlife areas (5920 mi.^{2}). However these two sets of priority areas cover less of the state than the SHP crucial areas.

SGCN priority areas developed for this report used a measure of existing anthropogenic disturbance as a cost. The effect of this was to steer the selection of planning units, and thus priority areas, away from developed and disturbed areas. Approximately 25,000 square miles (85%) of the priority areas are in cost class 1, with only 135 square miles (< 1%) in cost class 4, the most disturbed class.

SWAP SGCN priority areas will be updated in subsequent revisions of the SWAP as new data becomes available and as threats and SGCN change. Planned analyses include using spatial data on locations where threats, such as energy development, invasive species, climate change, and rural subdivision, are expected to intensify so as to rank priority areas accordingly to their vulnerability. In future Marxan analyses, these threats will be used as a second or alternate cost surfaces. Additionally, identifying and maintaining habitat linkages between SWAP SGCN priority areas, to facilitate wildlife movement, will be an important goal for the 2015 SWAP. Very little wildlife data from the Wind River Indian Reservation was included in the MARXAN analysis which identified SWAP SGCN priority areas. Efforts are planned to increase data sharing with the Wind River Tribes before the 2015 revision. The WGFD will make shape files of SWAP SGCN priority areas available on the Web or through other means.

Aquatic Priority Conservation Areas

Some native fish species have been lost from the major river basins in Wyoming. For

example, shovelnose sturgeon, sauger, goldeye, sturgeon chub, and plains minnow are no longer found in the North Platte River basin due primarily to the construction of large reservoirs and habitat alteration. However, these and the majority of other Wyoming fishes can still be found in some waters in the state. Biologists recognize that they cannot conserve these species in each location they were currently identified in,, so they strive to identify the best places throughout the state so that they can actively work to preserve native fish, amphibians, turtles, and mollusks. These areas are referred to as priority conservation areas. The most valuable areas that remaining for Wyoming's warmwater species are generally found on private ranch lands and lands owned and managed by the Bureau of Land Management. Priority coldwater habitats are generally found on lands owned and managed by the U.S. Forest Service or National Park Service.

In many cases, the priority conservation areas identified in the SWAP had already been identified during the development of the WGFD's Strategic Habitat Plan (SHP). In the SHP, drainages or portions of drainages that needed to be protected or managed in order to maintain Wyoming's aquatic SGCN were called "crucial" aquatic habitat areas. Many of these crucial areas were included as priority conservation areas for aquatic wildlife in the SWAP.

In many Wyoming basins non-traditional funding sources have enabled WGFD biologists to complete extensive surveys of fishes and aquatic habitats in recent years. The department has a wealth of new information in some basins, which aids in the identification of places for conservation of Wyoming's native fishes. For example, the WGFD recently completed an exhaustive survey of fishes throughout the Green River basin, surveying 377 sites in 13 different streams in the basin (Gelwicks et al. 2009). The project enabled the WGFD to accurately assess the populations and distributions of native fishes. Subsequently, this information was used to identify a handful of priority aquatic habitats in the Green River basin for the conservation of SGCN. A second example is the Platte River basin. In the 1990s, a researcher from the University of Wyoming surveyed 68 sites on streams in the North Platte drainage and 8 sites on tributaries to the South Platte River (Patton 1997). The WGFD later conducted extensive surveys throughout these drainages in 2004 and 2005, sampling 54 sites and handling over 30,000 fish (Bear and Barrineau 2007). In 2008 and 2009, another project was conducted that surveyed 37 sites in the North Platte drainage and 7 sites in the South Platte drainage (Moan et al. 2010). The data collected during these projects were then used to identify the most important streams in the Platte River basin for the conservation of native fishes (Patton 2001, Bear 2006). In some cases, crucial areas in the SHP are the same as the priority areas that were identified by these surveys. In other cases, these surveys were not completed in time to be incorporated into the SHP.

The priority conservation areas in the SWAP were identified using the best available fish and habitat survey information. These areas generally represent only a fraction of the streams in each basin, but the management of fishes and habitats in these streams is critical to WGFD efforts to conserve Wyoming's rarest native fishes. Unfortunately, this detailed survey information is still lacking for mollusks, and crustaceans. The list of priority conservation areas will likely be revised as the department gains more information about where these species are found and what habitats they require.

Literature Cited

ABELL R, M. L. THIEME, C. REVENGA, M. BRYER, M. KOTTELAT, N. BOGUTSKAYA, B. COAD, N. MANDRAK, E T A . 2008. Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation. BioScience 58(5):403-414.

BALL, I.R. AND H.P. POSSINGHAM. 2000. Marxan (v1.8.2): Marine Reserve Design Using Spatially Explicit Annealing, A Manual.

BALL, I.R., H.P. POSSINGHAM, AND M. WATTS. 2009. Marxan and relatives: Software for spatial conservation prioritisation. Chapter 14: Pages 185-195 in spatial conservation prioritisation: quantitative methods and computational tools. Eds Moilanen, A., K.A. Wilson, and H.P. Possingham. Oxford University Press, Oxford, UK.

COMER, P., D. FABER-LANGENDOEN, R. EVANS, S. GAWLER, C. JOSSE, G. KITTEL, S. MENARD, M. PYNE, M. REID, K. SCHULZ, K. SNOW, AND J. TEAGUE. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.

HESTER, S.G., AND M. B. GRENIER. 2005. A conservation plan for bats in Wyoming. Wyoming Game and Fish Department, Nongame Program, Lander, WY.

HIGGINS, J.V., M.T. BRYER, M.L. KHOURY, T.W. FITZHUGH. 2005. A freshwater classification approach for biodiversity conservation planning. Conservation Biology 19:432-445.

FEDERAL GEOGRAPHIC DATA COMMITTEE (VEGETATION SUBCOMMITTEE). 2008. National Vegetation classification Standard, Version 2. FGDC-STD-005-2008 (Version 2). available at: http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/

GAME, E.T. AND H.S. GRANTHAM. 2008. Marxan User Manual: For Marxan version 1.8.10. University of Queensland, St. Lucia, Queensland, Australia, and Pacific Marine Analysis and Research Association, Vancouver, British Columbia, Canada.

Groves, C.R. and The Nature Conservancy 2003. Drafting a conservation blueprint: A practitioner's guide to planning for biodiversity. Island Press, Washington D.C.

Groves, C.R. D.B. Jensen, L.L. Valutis, K. H. Redford, M.L. Shaffer, J.M. Scott, J.V. Baumgartner, J.V. Higgins, M.W. Beck, M.G. Anderson. 2002. Planning for Biodiversity Conservation: Putting Conservation Science into Practice BioScience 52(6):499-512.

KNIGHT, D.H. 1994. Mountains and plains: the ecology of Wyoming landscapes. Yale University Press. 338 pp.

NATURESERVE. 2010. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer

Neely, B., S. Kettler, J. Horsman, C. Prague, R. Rondeau, R. Smith, L. Grunau, P. Comer, G. Belew, F. Pusateri, B. Roselund, D. Runner, K sochi, J. Sovell, D Anderson, T. Jackson, and M. Klavetter. 2006. Central shortgrass prairie ecoregional assessment and partnership initiative. The Nature Conservancy of Colorado and the Shortgrass Prairie Partnership.

NICHOLOFF, S. H., COMPILER. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners In Flight. Wyoming Game and Fish Department, Lander, WY.

WYOMING JOINT VENTURES STEERING COMMITTEE. 2010. Wyoming Wetlands Conservation Strategy. Version 1.0. WY Game and Fish Dept., Cheyenne, WY. 109 pp.

WYOMING GAME AND FISH DEPARTMENT. 1996. Nongame Bird and Mammal Plan: a plan for inventories and management of nongame birds and mammals in Wyoming.

_____. 2006. A Plan for Bird and Mammals Species of Greatest Conservation Need in Eastern Wyoming Grasslands. 66pp.

_____. 2009. Strategic Habitat Plan. http://gf.state.wy.us/downloads/pdf/SHP_Jan09.pdf. April 2010. Cheyenne, WY.

Appendix A

Wyoming State Wildlife Action Plan Terrestrial Habitat Type	NatureServe Ecological System
Mountain Grassland	1. Northern Rocky Mountain Subalpine-Upper Montane Grassland 2. Rocky Mountain Alpine Turf 3. Rocky Mountain Alpine Dwarf-Shrubland 4. Rocky Mountain Subalpine-Montane Mesic Meadow 5. Southern Rocky Mountain Montane-Subalpine Grassland 6. Harvested forest-grass regeneration
Prairie Grasslands	1. Inter-Mountain Basins Semi-Desert Grassland 2. Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland 3. Northwestern Great Plains Mixedgrass Prairie 4. Western Great Plains Foothill and Piedmont Grassland 5. Western Great Plains Sand Prairie 6. Western Great Plains Shortgrass Prairie 7. Introduced Upland Vegetation – Forbland 8. Introduced Upland Vegetation - Annual Grassland 9. Introduced Upland Vegetation - Perennial Grassland 10. Recently burned grassland
Sagebrush Shrublands	1. Great Basin Xeric Mixed Sagebrush Shrubland 2. Inter-Mountain Basins Big Sagebrush Shrubland 3. Columbia Plateau Low Sagebrush Steppe 4. Inter-Mountain Basins Big Sagebrush Steppe 5. Inter-Mountain Basins Active and Stabilized Dune 6. Wyoming Basins Dwarf Sagebrush Shrubland and Steppe
Desert Shrublands	1. Western Great Plains Badland 2. Inter-Mountain Basins Shale Badland 3. Northwestern Great Plains Shrubland 4. Inter-Mountain Basins Semi-Desert Shrub-Steppe 5. Introduced Upland Vegetation - Shrub 6. Inter-Mountain Basins Mat Saltbush Shrubland 7. Inter-Mountain Basins Mixed Salt Desert Scrub 8. Inter-Mountain Basins Greasewood Flat

Foothills Shrublands	1. Harvested forest-shrub regeneration 2. Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland 3. Northern Rocky Mountain Montane-Foothill Deciduous Shrubland 4. Northern Rocky Mountain Subalpine Deciduous Shrubland 5. Rocky Mountain Lower Montane-Foothill Shrubland 6. Western Great Plains Wooded Draw and Ravine 7. Inter-Mountain Basins Montane Sagebrush Steppe
Montane/Subalpine Forests	1. Northern Rocky Mountain Subalpine Woodland and Parkland 2. Northern Rocky Mountain Mesic Montane Mixed Conifer Forest 3. Rocky Mountain Lodgepole Pine Forest 4. Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland 5. Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland 6. Middle Rocky Mountain Montane Douglas-fir Forest and Woodland 7. Rocky Mountain Poor-Site Lodgepole Pine Forest 8. Recently burned forest 9. Harvested forest-tree regeneration 10. Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland
Aspen/Deciduous Forests	1. Rocky Mountain Aspen Forest and Woodland 2. Western Great Plains Dry Bur Oak Forest and Woodland 3. Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland 4. Rocky Mountain Bigtooth Maple Ravine Woodland

Xeric Forests	1. Rocky Mountain Foothill Limber Pine-Juniper Woodland 2. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna 3. Southern Rocky Mountain Ponderosa Pine Woodland 4. Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland 5. Inter-Mountain Basins Juniper Savanna 6. Northern Rocky Mountain Foothill Conifer Wooded Steppe 7. Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna 8. Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
Riparian Areas	1. Western Great Plains Floodplain 2. Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland 3. Rocky Mountain Lower Montane Riparian Woodland and Shrubland 4. Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland 5. Rocky Mountain Subalpine-Montane Riparian Woodland 6. Rocky Mountain Subalpine-Montane Riparian Shrubland 7. Northwestern Great Plains Riparian 8. Western Great Plains Riparian Woodland and Shrubland
Wetlands	1. Open Water 2. Pasture/Hay 3. Inter-Mountain Basins Playa 4. Introduced Riparian and Wetland Vegetation 5. Great Plains Prairie Pothole 6. Rocky Mountain Alpine-Montane Wet Meadow 7. Western Great Plains Open Freshwater Depression Wetland 8. North American Arid West Emergent Marsh 9. Columbia Plateau Vernal Pool 10. Rocky Mountain Subalpine-Montane Fen 11. Western Great Plains Closed Depression Wetland 12. Western Great Plains Saline Depression Wetland 13. Inter-Mountain Basins Alkaline Closed Depression 14. Inter-Mountain Basins Interdunal Swale Wetland

Cliff/Canyon/Rock Outcrop	1. Rocky Mountain Cliff, Canyon and Massive Bedrock 2. North American Alpine Ice Field 3. Rocky Mountain Alpine Bedrock and Scree 4. Western Great Plains Cliff and Outcrop 5. Inter-Mountain Basins Cliff and Canyon 6. Rocky Mountain Alpine Fell-Field
Excluded	1. Developed, Open Space 2. Developed, Low Intensity 3. Developed, Medium Intensity 4. Developed, High Intensity 5. Quarries, Mines and Gravel Pits 6. Cultivated Cropland 7. Introduced Upland Vegetation - Treed 8. Geysers and Hot Springs