
# FINAL MEMORANDUM I-1-C
# NORTHWESTERN PLAINS
# RAPID ECOREGIONAL ASSESSMENT

Prepared for:

Department of Interior
Bureau of Land Management
Rapid Ecological Assessments

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| | |
|---|---|
| AMT | Assessment Management Team |
| BLM | Bureau of Land Management |
| BRFA | Big River Fish Assemblage |
| BTPD | Black-Tailed Prairie Dog |
| CA | change agent |
| CAPS | Crucial Areas Planning System |
| CBM | coalbed methane |
| CE | conservation element |
| CRP | Conservation Reserve Program |
| ESA | Endangered Species Act |
| FPC | Fish Passage Center |
| GAP | Gap Analysis Program |
| GIS | geographic information system |
| HUC | Hydrologic Unit Code |
| km | kilometer |
| $km^2$ | square kilometers |
| LCC | Landscape Conservation Cooperatives |
| LCCS | Land Cover Classification System |
| $mi^2$ | square miles |
| MQ | management question |
| NVCS | National Vegetation Classification System |
| OHV | off-highway vehicle |
| PFA | Prairie Fish Assemblage |
| PNV | potential natural vegetation |
| REA | Rapid Ecoregional Assessment |
| SAIC | Science Applications International Corporation |
| SGCN | Species of Greatest Conservation Need |
| SOW | Statement of Work |
| SWAP | state wildlife action plan |
| TNC | The Nature Conservancy |
| WUI | Wildland Urban Interface |

**Assessment Management Team (AMT):** The AMT consists of Bureau of Land Management (BLM) Branch Managers for renewable resources, and other natural resource scientists from all the BLM states involved.

**Change Agent (CA):** An environmental phenomenon or human activity that can alter/influence the future status of resource condition. Some change agents (e.g., roads) are the result of direct human actions or influence. Others (e.g., climate change, wildland fire, invasive species) may involve natural phenomena or be partially or indirectly related to human activities.

**Coarse Filter:** A focus of ecoregional analysis that is based upon conserving resource elements that occur at coarse scales, such as ecosystems, rather than upon finer scale elements, such as specific species. The concept behind a coarse filter approach is that preserving coarse-scale conservation elements will preserve elements occurring at finer spatial scales

**Conservation Element (CE):** A renewable resource object of high conservation interest often called a conservation target by others made up of core (those that are used as surrogates to measure ecological integrity) and desired (those outside of core indicators that are also of interest in the region). For purposes of this Statement of Work (SOW), CEs will likely be types or categories of areas and/or resources including ecological communities or larger ecological assemblages.

**Ecological System:** Ecological Systems are defined as "groups of plant community types that tend to co-occur within landscapes with similar ecological processes, substrates and/or environmental gradients" (Comer et al. 2003). The ecological system concept emphasizes existing dominant vegetation types, but also incorporates physical components such as landform position, substrates, hydrology, and climate (Lowry et al. 2005).

**Ecological Integrity:** The ability of an ecological system to support and maintain a community of organisms that have the species composition, diversity, and functional organization comparable to those of natural habitats within the ecoregion.

**Fine Filter:** A focus of ecoregional analyses that is based upon conserving resource elements that occur at fine scale, such as specific species. A fine-filter approach is often used in conjunction with a coarse-filter approach (i.e., a coarse filter/fine-filter framework) because coarse filters do not always capture some concerns, such as when a threatened and endangered species is a conservation element.

**Hazard:** Any real or potential condition that can cause injury or damage to life, property or other value that is assigned by people for a particular event.

**Rapid Ecoregional Assessment (REA):** REAs look across an ecoregion to more fully understand ecological conditions and trends; natural and human influences; and opportunities for resource conservation, restoration, and development. They seek to identify important resource values and patterns of environmental change that may not be evident when managing smaller, local land areas. REAs describe and map areas of high ecological value. REAs then gauge the potential of these values to be affected by environmental change agents. REAs are called "rapid" assessments because they synthesize existing information, rather than conduct research or collect new data, and are generally completed within 18 months.

**Risk:** The chance (probability) of an event starting (i.e. wildfire, bark beetle infestation, landslide, etc) as determined by the presence and activity of causative agents.

**Regionally Significant:** A native plant, wildlife, or fish resource or community that has a range of distribution and affects management concerns across two or more BLM field office boundaries and is more than locally important. Being more than locally important could include having qualities that give the resource special worth, meaning, or value.

## EXECUTIVE SUMMARY

This final memorandum documents the work completed under Task 1 of Phase I of the Rapid Ecoregional Assessment (REA) for the Northwestern Plains ecoregion. This final memorandum builds on the draft that was submitted prior to Assessment Management Team (AMT) workshop 1 in Billings, Montana, and includes feedback, comments, and recommendations received during and after the workshop. Through the REA process, the Bureau of Land Management (BLM) is taking a proactive landscape-scale approach to the evaluation of natural resources that cross traditional administrative boundaries and transcend ownership. The Northwestern Plains ecoregion is a large diverse area that includes two different Commission for Environmental Cooperation Level III ecoregions. This assessment will identify areas of high ecological value and assess the current condition and potential risk to areas across the ecoregion. The ultimate goal of this assessment is to produce documents, maps, and other materials that will provide BLM land managers with tools and information that will inform decisions for carrying out the BLM's mission "to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations."

The Science Applications International Corporation (SAIC) Team met with the AMT on November 8-10, 2010, at AMT workshop 1 to discuss the draft memorandum. Feedback, comments, and recommendations received at this workshop were used to modify the draft memorandum for completion of this final memorandum.

We anticipate this REA process to be a cooperative effort between the AMT and the SAIC Team. This memorandum is the first step to the cooperative effort that will be carried through both phases of the process.

During this first phase, the SAIC Team used the management questions (MQs) contained in the statement of work (SOW) as a basis to develop the initial list of MQs. The draft memorandum contained a list of 100 MQs (Appendix 1). These questions were consolidated and aggregated under the various MQs contained in the SOW. The aggregated table of MQs is in Appendix 1. The revised list of MQs is contained in Section 3 (page 8, Table 3-1). The list of MQs may further be revised during the data identification tasks dependent on the availability and quality of data.

The identification of conservation elements (CEs) and change agents (CAs) representative of this ecoregion started with an evaluation of the CEs and CAs identified in the SOW. For CEs, we propose using the coarse-filter/fine-filter approach. This approach started with an evaluation of habitats across the ecoregion. We used the Northwest and North Central Gap Analysis Programs (GAP) to identify major ecological systems that would provide habitat for species-specific CEs. Section 4 describes the process used for the identification of CEs in this ecoregion. The coarse filters are located on page 22, Table 4-3. The fine filters are located on page 24, Table 4-4.

For faunal CEs, the identification process started with the development of a database that included species listed in the BLM SOW; species contained in the state wildlife action plans (SWAPs); species that are listed as federally endangered, threatened, or candidate by the U.S. Fish and Wildlife Service; and species listed as G1-G3 by NatureServe and the BLM sensitive species lists for Wyoming, Montana, Nebraska, North Dakota, and South Dakota. This database was useful to screen faunal species and identify those that could serve as potential CEs. The draft memorandum included a

candidate list of 36 species-specific CEs. During AMT workshop 1, various criteria were used to reduce the candidate list to the 10 species/assemblages described in Section 4.2.2.

Development of the CAs started with the evaluation of those proposed by the BLM in the SOW and included a thorough evaluation of ecoregion-specific literature that has identified threats to the resources in this ecoregion. Five major categories of CAs include fire; development; invasive species; insect/diseases; and climate change. Within each of these categories are subcategories that further specify the threat of the CA to resources within the ecoregion. CAs can be found on Table 5-1 on page 25.

Once the MQs were developed and the CAs and CEs were selected, the SAIC Team initiated development of ecoregion-specific conceptual models. This process started with the development of a graphical diagram that identified the processes, habitats, CEs, and CAs within the ecoregion. This diagram is included in Section 2. The conceptual model for this ecoregion is presented in Section 6.

# 1.0 INTRODUCTION

The Bureau of Land Management (BLM) is currently evaluating a wide variety of environmental challenges to western ecosystems. These challenges transcend land ownership and administrative jurisdictions and necessitate a landscape-scale approach to evaluation of these ecosystems. Rapid Ecoregional Assessments (REAs) are the BLM's first step toward a broader initiative to systematically develop and incorporate landscape-scale information into the evaluation and eventual management of public land resources.

REAs look across an ecoregion to more fully understand ecological conditions and trends; natural and human influences; and opportunities for resource conservation, restoration, and development. They seek to identify important resource values and patterns of environmental change that may not be evident when managing smaller, local land areas. REAs describe and map areas of high ecological value. REAs then gauge the potential of these values to be affected by environmental change agents. REAs are called "rapid" assessments because they synthesize existing information, rather than conduct research or collect new data, and are generally completed within 18 months.

REAs are organized into various phases with specific tasks in each phase (Table 1-1). Phase I is the pre-assessment and includes four tasks. Phase II is the assessment and includes three tasks. Phase I includes finalization of the management questions (MQs) that the REA will attempt to answer. MQs identify (implicitly or explicitly) information needed to formulate management responses to regional or landscape-scale resource management issues or concerns. Conservation elements (CEs) and change agents (CAs) specific to the Northwestern Plains ecoregion will also be identified. A CA is an environmental phenomenon or human activity that can influence the future progression and condition of CEs. Phase I also includes the development of conceptual models, the identification of datasets to be used, and data gaps, and culminates in a work plan that will provide a roadmap for the completion of Phase II. Phase II includes analysis of the data relative to the identified CEs and CAs, documentation of the results, and culminates in the REA document, which will guide BLM and other land managers in developing and prioritizing planning and management strategies.

**Table 1-1. REA Phases and Tasks**

| Phase | Task # | Product |
|---|---|---|
| I. Pre-assessment | 1 | Refine management questions |
| | 2 | Identify and recommend datasets for analysis |
| | 3 | Identify and recommend analytical models and tools |
| | 4 | Prepare REA work plan |
| II. Assessment | 1 | Synthesize datasets |
| | 2 | Conduct analyses and generate findings |
| | 3 | Prepare REA report, maps, and supporting documents |

Management Questions

The BLM specifically designed the REA approach to start with MQs. These questions identify current or anticipated problems or issues concerning resource management.

MQs need to provide clear direction concerning the information needed to answer the question, and without this direction an REA can become merely an expensive data collection effort (Johnson et. al. 1999). The BLM Assessment Management Team (AMT) for this ecoregion developed 52 initial questions or applications of questions that were used as a basis in developing the list of questions in this memorandum.

Conservation Elements and Change Agents

Although the MQs are key drivers of this REA, the REA could not be completed without the identification of CEs and CAs. In order to be able to answer the most important MQ, which is "What do we have?," the CEs must be identified early in the process. In addition to the CEs, in order to answer another important MQ, which is "What is happening to what we have?," the CAs must also be identified early in the process. Identification of the CEs and CAs in each ecoregion also assists with the development of conceptual models for the ecoregion.

Conceptual Model

The conceptual model developed for this ecoregion will be used to provide a science-based context regarding how the CEs will be affected by the CAs identified for the Northwestern Plains. The ecoregion model will be used as a guide for the development of specific CE models that will depict particular CE status relative to CAs.

Memorandum

This memorandum documents the activities completed under Task 1 of Phase I. The objectives of this task were to identify the boundaries of the Northwestern Plains ecoregion, refine and finalize the MQs, identify the CEs and CAs, develop the ecoregion-specific conceptual model, and complete this memorandum as an initial basis for the REA work plan that will be completed under Task 4 of this phase.

# 2.0 REA STUDY AREA AND LANDSCAPE REPORTING UNITS

## 2.1 STUDY AREA

The assessment area of the Northwestern Plains ecoregion (Figure 2-1), as defined by BLM, includes the area within the boundaries of the Northwestern Glaciated Plains (9.3.1) and the Northwestern Great Plains (9.3.3) Level 3 Ecoregions (Commission for Environmental Cooperation 2006) plus a buffer area. The buffer area surrounding the Northwestern Plains ecoregion includes the ecoregion boundary and all the 5$^{th}$ level hydrologic units that intersect the two ecoregions. The purpose of the buffer is to help ensure seamless boundaries between mapped layers generated for REAs in neighboring regions and to avoid problems associated with "edge effects" during geographic information system (GIS) analyses. The extent of the assessment area, including the buffer area for this REA, is 236,249 square miles (mi$^2$) (611,885 square kilometers [km$^2$]).

The Northwestern Plains ecoregion is located primarily in Montana, Wyoming, North Dakota, and South Dakota, with small extensions into Nebraska, and includes parts of 13 different BLM field office administrative areas. A substantial amount of conservation evaluation and assessment work has been completed throughout this ecoregion. This work includes documents such as "*Oceans of Grass,*" completed in 2004 by the Northern Plains Conservation Network (Forrest 2004), and "*Ecoregional Planning in the Northern Great Plains Steppe,*" completed in 1999 by The Nature Conservancy (TNC) (TNC 2000). Although the boundaries of these evaluations encompassed larger land areas, including areas in Canada, a large portion of the assessment area included for this REA was evaluated in these two documents.

Much of this ecoregion receives less than 16 inches of precipitation a year. Variable precipitation combined with prolonged drought and periodic wildfire has created an environment where native prairie species have adapted, but also prevents major forest establishment, with the exception of moister upland areas. This ecoregion is dominated by mixed-grass prairie. Woodlands throughout this ecoregion consist mainly of ponderosa pine, substantial amounts of Rocky Mountain juniper, and in Montana in particular, limber pine; however, riparian forests and hardwood-dominated draws are also located throughout. Extensive areas of shrub-steppe occur throughout Wyoming and areas of Montana, and substantial wetlands are located throughout the northern and eastern portions of this ecoregion study area (the Northwestern Glaciated Plains, which corresponds to the western portion of the Prairie Pothole Region in the United States). The Missouri River and associated tributaries, coupled with the prairie pothole wetlands, comprise the dominant aquatic features throughout this portion of the ecoregion. Many bird and mammal species breed only on the Western Great Plains. As much of this area has been converted to agriculture, the remaining intact grasslands provide specific habitat for Great Plains endemics (Samson and Knopf 1996). The region supports extensive livestock grazing and dryland farming and has high value for recreation and public enjoyment. The Northwestern Plains and bordering mountains form the primary watershed for the upper Missouri River. The region also contains major reserves of oil, gas, and coal, as well as areas of high potential for wind and geothermal energy development. Figure 2-2 represents various habitats, processes, CEs, and CAs in the Northwestern Plains ecoregion.

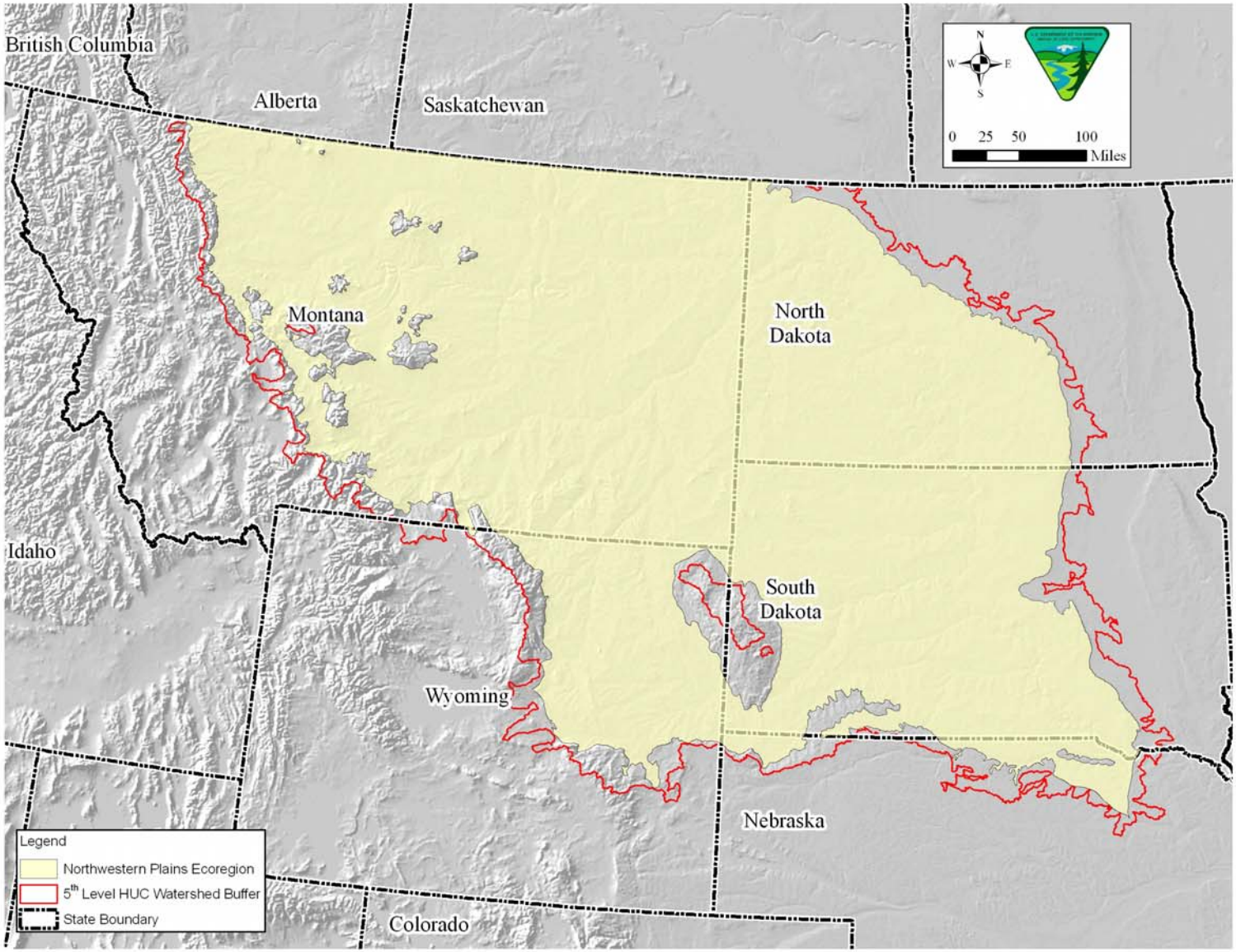


**Figure 2-1. Extent of the Northwestern Plains Ecoregion.**

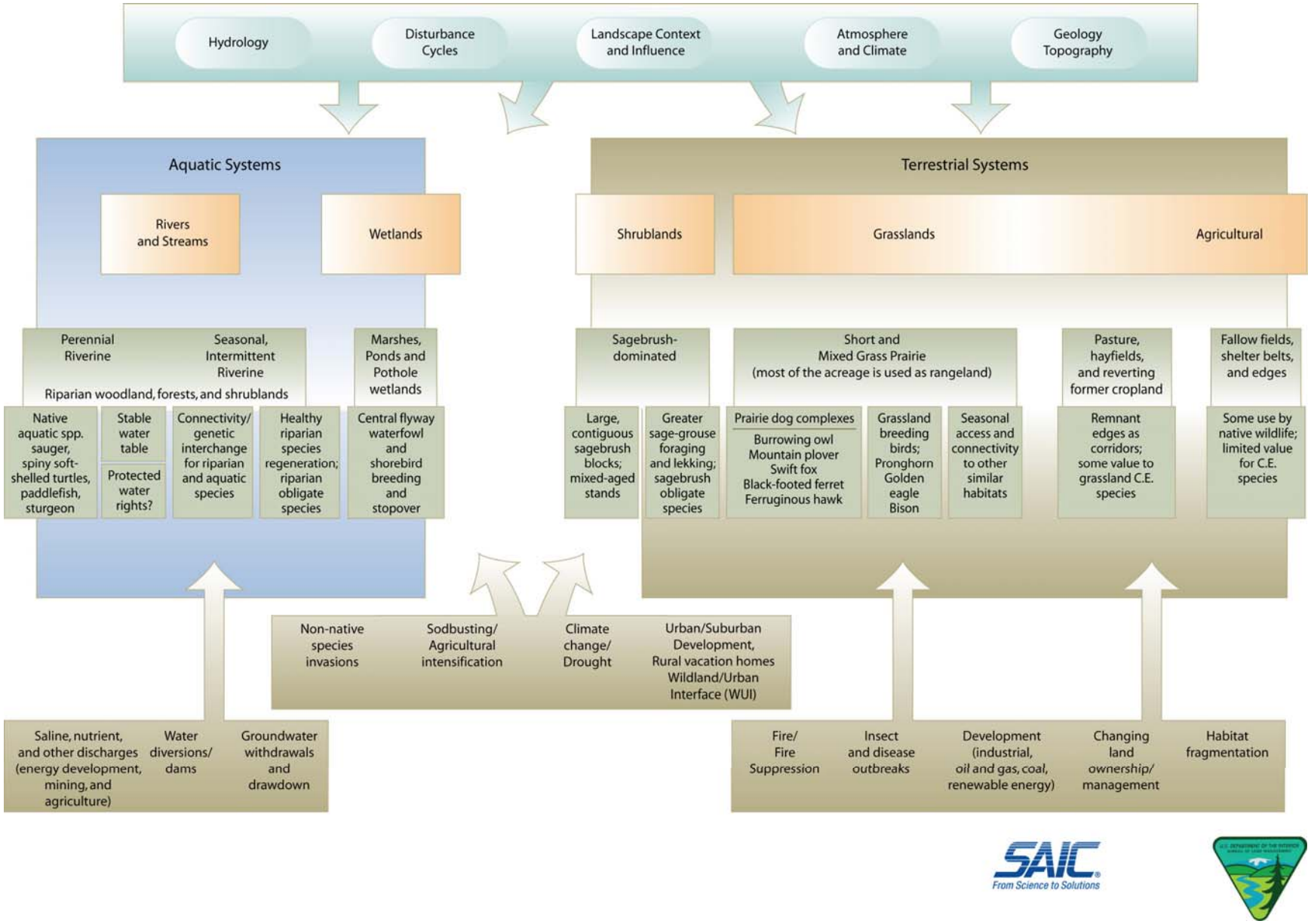


**Figure 2-2. Examples of Habitats, Processes, Conservation Elements, and Change Agents in the Northwestern Plains Ecoregion**

## 2.2 LANDSCAPE REPORTING UNITS

Throughout this REA process, a wide variety of data will be collected and evaluated, much of which will vary in scale and in the region covered. Uniform landscape reporting units will provide common assessment reporting throughout the process. Landscape reporting units are predefined areas that are specific enough to provide useful information about species and communities but general enough to provide appropriate context and avoid mapping at an inappropriately small scale. Although collected datasets will be maintained at their native resolution, the primary landscape unit for this REA will be at least the 6$^{th}$ level hydrological unit of the National Watershed Boundary Dataset (USGS 2009), with ecological integrity assessed at the 5$^{th}$ level unit. Thirty meter pixel raster data will be utilized in the geospatial analysis and modeling in support of answering the MQs. For raster data, 30 meter pixel resolution refers to the resolution of the raster data derived from satellite imagery. In addition to the landscape reporting units listed above, the downscaled regional climate model data that will be provided by BLM will be at the 15 kilometer (km) resolution level.

# 3.0 MANAGEMENT QUESTIONS

## 3.1 INTRODUCTION

REAs are driven by MQs and conclude with determining how completely the questions were answered by the analysis. MQs need to provide clear direction concerning the information necessary to answer the question; without this direction an REA can become merely an expensive data collection effort (Johnson et. al. 1999). In their simplest form, MQs should address landscape scale issues, resource values, (species, populations, communities or ecological values), and CAs or phenomena that influence or affect the resource values.

## 3.2 MANAGEMENT QUESTION SCREENING CRITERIA

The AMT for this ecoregion included 52 different MQs or applications of MQs grouped into nine categories in the statement of work (SOW). Because a diversity of interests are involved in every ecoregion, the BLM recommended that MQ screening criteria be developed to ensure that the MQs are not only focused, but can be answered by the analysis completed as part of this project. The six criteria are listed below:

1. Is the MQ clear, focused, and relevant to the ecoregion?
2. Can the MQ be answered if data are available?
3. Does the MQ address regional scale issues?
4. Does the MQ help to answer the following: What do we have? What is its condition? and What is happening or likely to happen to what we have?
5. Do the conceptual models respond to the MQs?
6. Is the MQ amenable to geospatial analysis? (This would apply to all questions except the overarching general questions at the top of the list).

## 3.3 MANAGEMENT QUESTIONS

The Science Applications International Corporation (SAIC) Team presented the screened list of 100 MQs to the AMT in the draft memorandum. Although the SAIC Team used the initial BLM MQ list as a basis, it was determined that many of the 100 were redundant, or otherwise did not meet the criteria listed above. Based on discussions that occurred at the workshop, it was determined that the MQs included in the SOW should be used as the main overarching MQs for this final memorandum. Also included in the SOW under each of the main overarching MQs was a list of MQ applications, which are more appropriately called geospatial exercises that help answer the overarching main MQ. The MQ list contained in the draft memorandum was consolidated relative to the screening criteria listed above and the AMT input received at the workshop. Many of the original 100 MQs contained in the draft memorandum should have been labeled as MQ applications and were accordingly aggregated under the main overarching MQs contained in the SOW. The aggregated list of MQs and MQ applications is presented in Table 3-1. The MQ list contained in Appendix 1 is cross-referenced to criteria that excluded or combined the question. If the MQ was retained, the table in Appendix 1 shows where the MQ has been included in Table 3-1.

## Table 3-1. Management Questions

| Terrestrial Biotic Resources | | |
|---|---|---|
| **SOW Management Question** | **Revised Management Question** | **Comment/Note(s)** |
| ***1.*** *What is the terrestrial ecological integrity (i.e. high, medium, low) for regionally significant features, functions, and services across the ecoregional landscape?* | *Where are the important regionally significant terrestrial features, functions, and services across the ecoregional landscape?* | Ecological Integrity was changed to regional significance. (see definition below) |
| **Example of Application of this Management Question** | | |
| a) What is the current location/distribution of sites that have the greatest species richness? | | |
| b) What are the regionally significant vegetation types? How are they distributed over the landscape (extent/pattern) Where is the potential for corridor connectors and where are areas of potential restoration? | | |
| c) Where will current regionally significant vegetation types be at greatest risk from CAs? | | |
| d) What soils are present and what is their current condition? | | |
| e) Which CAs are likely to affect soil fertility and erodibility? | | |
| f) Where are areas of high soil erodibility due to wind or water erosion if existing vegetation cover is removed? | | |

## Table 3-1. Management Questions (cont'd)

| Aquatic/Riparian Biotic Resources | | |
|---|---|---|
| **SOW Management Question** | **Revised Management Question** | **Comment/Note(s)** |
| ***2.*** *What is the aquatic ecological integrity (i.e. high, medium, low) for regionally significant features, functions, and services across 5th level Hydrologic Unit Code (HUC) (or 6th) watersheds?* | *Where are the important regionally significant aquatic/riparian biotic features, functions, and services across the ecoregional landscape?* | Ecological Integrity was changed to regional significance. (see definition below) |
| **Example applications of this management question** | | |
| a) Where are the current locations of regionally significant aquatic/riparian habitats, including rivers, streams, lakes, ponds, wetlands, springs, and reservoirs? | | |
| b) Where are current riparian or aquatic areas currently at risk of fragmentation impoundment, diversion, and lowered water tables due to development, mineral extraction, and agricultural and residential development? | | |
| c) What is the current flow regime (hydrograph) of regionally significant stream or river habitats or duration and extent of surface water in CE pond and lake habitats? | | |
| d) What is the condition of aquatic systems as defined by the Fish Passage Center (FPC)? | | |
| e) How have dominant species changed over time? | | |
| f) Where are exotic species an existing and potential problem? | | |
| g) Where are degraded aquatic systems (water quality), and what are the sources of the degradation (saline discharges, petrochemical discharges, leaching of toxic mineral salts, eutrophication due to concentrated nutrient runoff, other)? | | |
| h) Where will regionally significant aquatic habitats potentially be affected by CAs (duration, magnitude, and temperature of flow; duration and extent of surface water presence, if applicable)? | | |
| i) Where will regionally significant aquatic habitats potentially experience the greatest effects of climate change (duration and magnitude of flow, duration and extent of surface water presence, if applicable)? | | |
| j) Where are the most species losses likely to occur due to temperature increases or water reductions? | | |
| k) What/where is the potential for future change in dominant species composition of regionally significant aquatic habitats? | | |
| l) What areas have potential for regionally significant aquatic habitat restoration (based on available geospatial data)? | | |
| m) Where are areas of watershed habitat connectivity? | | |
| n) Where are aquatic habitat strongholds for sensitive species that are intact and provide the best opportunity for protection, restoration, and enhancement? | | |
| o) Where are sensitive aquatic species at risk from stream connectivity or risk from interbreeding with closely related non-native or exotic species? | | |

## Table 3-1. Management Questions (cont'd)

| Landscape Species/Species Richness | | |
|---|---|---|
| **SOW Management Question** | **Revised Management Question** | **Comment/Note(s)** |
| ***3.*** *Where are the key habitat types (seasonal, refuges, corridors/connectivity, migration routes, concentrations of regionally significant species, etc.) for landscape species, keystone species, regionally significant species, and regionally significant suites of species?* | | No change |
| **Example applications of this management question:** | | |
| a) Where are areas that have potential for restoring regionally significant species habitat or habitat connectivity for regionally significant species, currently and in the future? | | |
| b) Where are the key habitat types (season refuges, corridors/connectivity, migration routes, concentrations of regionally significant species)? | | |
| c) Where are current regionally significant landscape/keystone species and their habitats, including seasonal habitat and movement corridors, at greatest risk from CAs including climate change (connectivity, small population size)? | | |
| d) Where are the crucial winter and/or parturition areas for big game species at risk from long-term habitat conversion or fragmentation? | | |
| e) Which species groups should be used as surrogates? | | |
| f) Where are the regionally significant keystone species complexes at risk from disturbance or development? | | |
| **Change Agents** | | |
| **Wildland Fire** | | |
| **SOW Management Question** | **Revised Management Question** | **Comment/Note(s)** |
| ***4.*** *Where will regionally significant values identified above be at risk from altered wildland fire regimes (frequency, severity, and seasonality change from historic to present to future)?* | *Where could core regionally significant values be negatively and positively affected from altered wildland fire regimes (frequency, severity, and seasonality change from historic to present to future)?* | Changed to address Core CEs identified in memo by the AMT. |
| **Example applications of this management question:** | | |
| a) Where are areas that have been historically changed by fire suppression? | | |
| b) Where are current areas with high fire frequency such that they burn on a regular basis? | | |
| c) Where are Wildland Urban Interface (WUI) areas that have high potential for frequent fire? | | |
| d) Where will regionally significant values be at risk from altered fire regimes? | | |
| e) Where are areas with potential to show future increases or decreases in wildfire frequency or intensity? | | |
| f) Where do these areas intersect with human development, high conservation, and restoration potential? | | |
| g) Where are watersheds with high erosion potential vulnerable to high severity fire? | | |

## Table 3-1. Management Questions (cont'd)

| Change Agents | | |
|---|---|---|
| **Invasive or Undesired Non-native Species, Insect and Disease** | | |
| **SOW Management Question** | **SOW Management Question** | **SOW Management Question** |
| ***5.*** *Where will regionally significant values be affected through changes in the spatial distribution and abundance of invasive and (undesired) non-native species?* | *Where will regionally significant values be affected through changes in the spatial distribution and abundance of insects/disease and invasive and (undesired) non-native species?* | *Where will regionally significant values be affected through changes in the spatial distribution and abundance of invasive and (undesired) non-native species?* |
| **Example applications of this management question:** | | |
| a) What habitats have been or have the potential to be most severely affected by exotic invasions and where are they? | | |
| b) What areas have the greatest occurrence of invasive species (high, moderate, low effect)? | | |
| c) Where are areas with invasive species that have restoration potential to reverse the infestation (high, moderate, low)? | | |
| d) Which exotics have potential for control and which do not? | | |
| e) Where are areas of potential future introduction and encroachment from invasive species currently known from the region? | | |
| f) Which areas are experiencing the most rapid spread of invasives (may not be supported by existing data) and why? | | |
| g) How might other CAs influence the introduction or spread of non-native species? | | |
| h) Which insects and diseases might pose a significant future problem? | | |
| i) Where will state and federal high-valued resource areas be affected through changes in intensity and range of insects and disease? | | |
| j) What has the change been in frequency and severity of outbreaks (in the last 50 years), and where have they occurred? | | |
| k) How and where are frequency and severity of outbreaks expected to change in response to climate change and to other CAs such as change in fire frequency and intensity? | | |
| l) Where are the major tree stands that have been substantially impacted by insects? | | |
| m) Based on climate change models, what areas could be susceptible to insect infestation or disease in the future? | | |
| n) Where are the forests that have been substantially impacted by disease? | | |
| o) Where are the stands of major tree species that have not been impacted by the insects or disease? | | |

## Table 3-1. Management Questions (cont'd)

| Change Agents | | |
|---|---|---|
| **Urban, Agricultural, Industrial, and Water Development** | | |
| **Management Question** | **Management Question** | **Management Question** |
| ***6.*** *Where will regionally significant values be affected through development?* | *Where will regionally significant values be affected through development?* | *Where will regionally significant values be affected through development?* |
| **Example applications of this management question:** | | |
| a) Where are areas of existing, planned, and potential future development, including roads (based on existing WUI literature including Theobald and others)? | | |
| b) Where will the WUI increase as a result of urban/suburban/exurban and second vacation home development relative to state and federal areas of high conservation and restoration potential? | | |
| c) Which regionally significant values are threatened by sod-busting, energy development, gravel mining, fragmentation, loss of connectivity, and other development pressures? | | |
| d) Where are areas of existing, planned, and future renewable and non-renewable energy development (based on existing geospatial data bases), including locations of existing leases, relative to areas of high conservation and restoration potential? | | |
| e) Where are existing, planned, and potential corridors, including roads, transmission lines, and pipelines, and how do they relate geographically to state and federal high value areas? | | |
| f) Where are likely sources and sinks of discharge from such developments that may diminish quality of receiving waters and habitats (e.g., saline discharges)? | | |
| g) Location of methane extraction ponds located that could serve as breeding sites for mosquitoes carrying west Nile virus and threaten Sage Grouse? | | |
| h) Where are aquifers and their recharge basins? What is the current and projected land use in these areas? | | |
| i) Where are areas in which groundwater extraction has the potential to change surface flow? | | |
| j) Where are areas with high densities of surface water impoundment? | | |
| k) Where do surface water diversions or ground water withdrawals have the potential to create discontinuity between spawning and other habitats (i.e., by creating seasonally dry or impassible stream reaches)? | | |
| l) Where are opportunities to restore continuity in habitats? | | |
| m) Where are existing, planned, and potential areas for development or expansion of recreation areas (e.g., off-highway vehicle [OHV] and snowmobile routes, ski areas, reservoirs) in proximity to areas of high conservation and restoration potential? | | |
| n) Where are existing, planned, and potential visitor serving facilities (food, lodging, etc.) and corridors including roads and utilities, and how do they relate geographically to high conservation value areas? | | |
| o) Where are specially designated areas of high ecological value (designated by various agencies or in other work)? What levels of resource management and protection from future development exist in these areas? | | |
| p) On public lands, where are high conservation value resource areas vulnerable to unauthorized use? | | |

## Table 3-1. Management Questions (cont'd)

| Climate Change | | |
|---|---|---|
| **SOW Management Question** | **Revised Management Question** | **Comment/Note(s)** |
| ***7.*** *Where are climatic zones located today, and what are the potential realistic scenarios for climate (precipitation, temperature, evapotranspiration, storm intensity, flood frequency, etc.) and the impacts to regionally significant ecological values?* | *Where will regionally significant values be affected by climate change?* | Changed per request in comments. |
| **Example applications of this management question:** | | |
| a) Where are climatic zones located today, and what are the potential realistic scenarios for climate (precipitation, temperature, evapotranspiration, storm intensity, flood frequency, etc.) and the impacts to regionally significant ecological values? | | |
| b) Where are species habitats most vulnerable to climate change? | | |
| c) Where are areas of state and federal high conservation value and restoration potential most vulnerable to climate change? | | |
| d) Where are watersheds with the greatest potential for alterations in thermal regime and hydrologic regime? What will these changes be? | | |
| e) Where are surface water and groundwater availability likely to change? | | |
| f) What are predicted changes in the distribution of vegetation types given climate change (including changes to extramural climate)? | | |
| g) Where are regionally significant species' habitats most vulnerable to changing climatic conditions? | | |
| h) What and where are the vegetation types and seral stages that are carbon sinks and carbon sources? What actions in those vegetation types alter the sink/source balance? | | |
| i) Where are the highly vulnerable stands of major tree species susceptible to impacts from climate change over the next 50 years, and what is the potential for decreased carbon sequestration on public lands? | | |
| j) Where are potential carbon sequestration areas? | | |

Regionally Significant – See definition in the List of Acronyms, Abbreviations, and Definitions section.

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# 4.0 CONSERVATION ELEMENT SELECTION

## 4.1 INTRODUCTION

The Northwestern Plains REA is intended to characterize the current status (baseline conditions) and forecast the future condition of ecological resources in this ecoregion. Conducting the REA requires specific resource values at a regional scale throughout the ecoregion to be identified. These will be referred to as CEs and will be the objects of assessment for current condition and future status and trends. As stated in the REA SOW, "Conservation elements are the "what" that are to be conserved and/or restored." The SOW further defines classes of CEs as species, ecosystems and landscapes, and scenery/special values recognized as warranting conservation/protection.

Identification of the CEs included consideration of the following Core Ecological Values identified by BLM and discussed with the AMT. These Core Ecological Values include:

(1) Native fish, wildlife, or plants of regional conservation concern (e.g., populations, species, or communities identified in state wildlife action plans; species listed under the Endangered Species Act (ESA); species and communities identified through other agency/nongovernmental organization assessments; etc.).

(2) Regionally-important, terrestrial ecological features, functions, and services (e.g., large areas of native vegetation providing important cover, fiber, and forage; habitat strongholds and corridors; upland areas important for water quality or water supply; areas capable of significant carbon sequestration; etc.).

(3) Regionally-important, aquatic ecological features, functions, and services (e.g., habitat strongholds and corridors; wetland, riparian, and other aquatic areas important for water quality, water supply, stream bank stability, flood control, and similar purposes).

In this section, we propose a limited suite of CEs that will be used to represent the entirety of renewable resources and values within the ecoregion. Through the REA analyses of the condition of these CEs within the Northwestern Plains ecoregion in Phase II of the project, we will ultimately evaluate ecological integrity across the ecoregion.

Our approach to selecting CEs is based on identifying an effective set of ecosystems, species assemblages, and individual species that will adequately represent the ecoregion's resources and be suitable gauges of the effects of CA impacts. The selected CEs must assist us in clearly articulating our understanding of the roles of key ecological drivers of the region's natural systems. Information in existing databases on selected CEs must be adequate to permit us to characterize the current condition of these resources. For example, thousands of species are present in the region, but for most of them, existing documentation would not permit us to account for important aspects of their geographic range, life histories, and responses to CAs. The CEs must also be useful in depicting the effects of CAs on these resources (i.e., it must be possible to clearly state what the potential change in status of these resources would be in terms of trends, magnitude, or scope of change, and likelihood of change over the required time horizons).

To ensure that our suite of core CEs adequately represents the ecoregion's resources of conservation concern, we will use the "coarse-filter/fine-filter" approach recommended in the SOW. This approach focuses on ecosystem representation, complemented by a limited subset of focal species assemblages and individual species. The objective of this dual approach is to include the ecosystems and ecological functions (coarse filter) that are required for biotic integrity, while also providing for biodiversity and species of concern (fine filter).

## 4.2 CONSERVATION ELEMENTS

### 4.2.1 Coarse-Filter Ecological Systems

#### *4.2.1.1 Introduction*

Coarse filter CEs will include all of the major ecosystem types that occur within the assessment area, and should represent all of the predominant natural ecosystem functions and services in the ecoregion. The desired outcome of coarse-filter selection is to provide coverage for the vast majority of species that occur in the ecoregion. For this analysis, we used the Northwest and North Central Gap Analysis Program (GAP) and North Central GAP Program definitions of vegetation types in the Northwestern Plains ecoregion, because this classification approach provides several levels of detail that can be used to characterize and map vegetation cover (USGS 2010). The Northwestern Plains ecoregion included a mosaic of GAP data sources, including two of the National GAP landcover regions, the Northwest and North Central. The source data for the Northwest region was the Northwest ReGAP dataset that improved upon the original Northwest GAP analysis.

The Level 1 (Land Cover) Classification is the most generalized level of vegetation type aggregation in the database. It is useful for displaying broad categories of vegetation structure such as forest land, grassland, shrubland, etc. (Figure 4-1). GAP Level 3 (Ecological Systems[1]) subdivides Level 1 categories into the major ecosystems and broad categories of human land use and disturbance in the region. This classification system will provide the necessary detail to characterize habitat occupancy for the landscape-species CEs that will be used as fine filters in this REA. A complete listing of Level 3 ecological systems that occur in the Northwestern Plains ecoregion including the HUC Level 5 buffers organized by Level I ecosystems is presented in Appendix 2.

Although the GAP data will serve as the primary source for vegetation data, it is recognized that the GAP data may not be completely accurate for various ecological systems. For example, it is widely known that the GAP system does not provide accurate classifications for xeric uplands. In addition, GAP does not provide a classification for whitebark or limber pine. These inaccuracies will be addressed through all phases of the REA.

[1] Ecological Systems – See definition in the List of Acronyms, Abbreviations, and Definitions section.

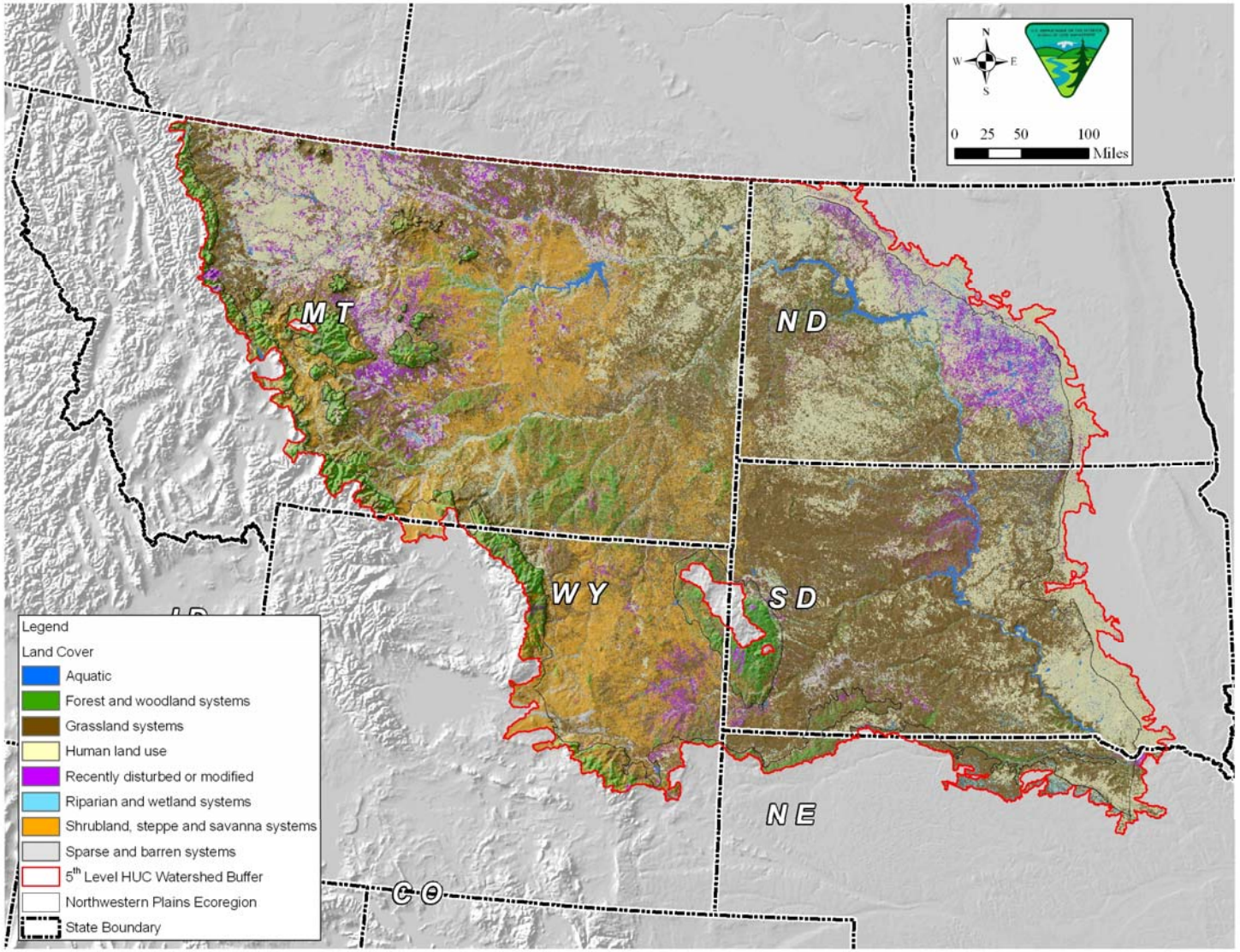


**Figure 4-1. Major Land Cover Types (GAP Level I) of the Northwestern Plains Ecoregion**

#### *4.2.1.2 Selection Approach*

Starting with a listing of the GAP Level 3 ecological systems (N = 107), we recommend not including Level 1 human land use systems and areas for which there are no GAP data as coarse-filter CEs. Collectively, these systems, along with the "no data" category account for approximately 32.8 percent of the ecoregion (Table 4-1). Conditions in these areas consist of human-created land cover, such as developed areas and cropland. Cropland and other disturbed areas provide habitat value for some species of conservation concern (e.g., pronghorn). It should be noted that geospatial data for disturbed systems would nonetheless be utilized in the REA, in particular with regard to the role those systems play relative to CAs such as urbanization and agricultural conversion. Thus, the data for all mapped ecological systems and cover types in the ecoregion will be retained and available for use in the event that it is required by conceptual models for fine-filter CEs.

**Table 4-1. Human Land Use GAP Level 3 and Other Land Cover Types Not Included as Coarse Filters for the Northwestern Plains Ecoregion**

| Human Land Use | Percent of Ecoregion |
|---|---|
| Developed, High Intensity | 0.01 |
| Developed, Medium Intensity | 0.07 |
| Developed, Low Intensity | 0.24 |
| Developed, Open Space | 1.39 |
| Quarries, Mines, Gravel Pits, and Oil Wells | 0.07 |
| Pasture/Hay | 3.44 |
| Cultivated Cropland | 18.13 |
| No Data | 9.43 |
| **TOTAL** | **32.78** |

Although it is important to identify human land use systems (Table 4-1), the BLM has no influence over these areas, and thus they will not be carried forward as CEs; however, they can be important indicators in measuring habitat quality. Recently disturbed systems (Table 4-2), such as burned or logged systems, will be retained with their respective pre-disturbance ecological systems. Relatively minor amounts of these cover types classified as recently disturbed are present in the Northwestern Plains ecoregion. Discussion at the AMT workshop identified the temporary nature or reversibility of some of these conditions (e.g., recently burned or harvested) and the fact that these areas may provide habitat value for CE species now or in the foreseeable future. Therefore, these categories will be available for analysis but will not be evaluated at coarse-filter CEs. Placement of these disturbed systems is described below.

**Table 4-2. Disturbed GAP Level 3 Systems and Other Land Cover Types that Were Aggregated with Natural Ecological Systems and Included in the Coarse Filters for the Northwestern Plains Ecoregion**

| Recently Disturbed | |
|---|---|
| **System** | **Percent of Ecoregion** |
| Ruderal Wetland and Forest | 0.00 |
| Introduced Upland Vegetation - Shrub | 0.01 |
| Recently Burned Grassland | 0.01 |
| Harvested Forest - Grass/Forb Regeneration | 0.01 |
| Harvested Forest - Northwestern Conifer Regeneration | 0.01 |
| Introduced Riparian and Wetland Vegetation | 0.03 |
| Harvested Forest-Shrub Regeneration | 0.04 |
| Disturbed, Non-Specific | 0.07 |
| Recently Burned Forest | 0.08 |
| Introduced Upland Vegetation - Annual Grassland | 0.40 |
| Recently Burned Shrubland | 1.16 |
| Introduced Upland Vegetation - Perennial Grassland and Forbland | 2.28 |
| **TOTAL** | **4.09** |

It is important to note that at abrupt elevation gradients where prairies adjoin mountains, both at the western margin of the Northwestern Plains ecoregion and in the mountain ranges that form “ecological islands” in the western part of the Northwestern Plains, there are significant differences in the Level 3 ecological systems within the ecoregion boundaries depending on whether the HUC10 watershed buffer is included or not. This is because the watersheds within the buffer extend into the mountains toward the headwaters, causing some montane and subalpine ecosystems to be included within the buffered ecoregion boundaries. Although important ecotonal areas occur between the prairie and montane systems, these are represented in Level 3 ecosystems that occur within the Northwestern Plains outside of the buffers, as well as extending into the buffers and beyond. Examples are Northwestern Great Plains-Black Hills Ponderosa Pine Woodland and Savanna, Rocky Mountain Foothill Limber Pine-Juniper Woodland, and Northern Rocky Mountain Foothill Conifer Wooded Steppe. These are included in the Evergreen Forest and Woodland category and retained in the coarse-filter analysis for the Northwestern Plains ecoregion.

Higher montane and subalpine systems included in the buffers are not necessarily representative of major systems within the Northwestern Plains ecoregion but are extensively represented in the adjacent Middle Rockies ecoregion. In particular, for example, these systems include Rocky Mountain Lodgepole Pine Forest, Rocky Mountain Subalpine Dry Mesic Spruce-fir, and Middle Rocky Mountain Montane Douglas-fir. The location of these montane and subalpine systems, predominantly in the buffer zone of this ecoregion, are shown in Figure 4-2. These have not been carried forward in the coarse-filter analysis for Northwestern Plains. Additional montane Level 3

ecological systems whose occurrence in the Northwestern Plains ecoregion GIS analysis (Appendix 2) is exclusively or nearly exclusively within the buffer. The aerial extent of these systems within the ecoregion, including buffer, is very small and therefore not representative of the ecoregion and has also not been carried forward as coarse-filter CEs in the analysis for Northwestern Plains. These systems are listed in footnotes of the Table 3-1 in Appendix 3.

All other natural ecological systems will be retained as coarse filters with the exception of human land uses and no data categories (Table 4-1). The GAP Level 3 systems were aggregated into higher-level classifications that were cross-referenced (crosswalked) to the National Vegetation Classification System (NVCS) (Appendix 3). ReGAP mapping units (Level 3 ecological systems) have recently been crosswalked by BLM staff to the Idaho Land Cover Classification System (LCCS) (Foster 2010, personal communication) at the division level, which has been crosswalked to a comparable category in the NVCS. Appendix 3 contains a listing of Level 3 ecosystems organized by Division, Formation, and Class in an adaptation of the BLM Idaho (LCCS).

The Idaho LCCS includes 14 natural vegetation divisions, 3 sparse vegetation/barren area divisions, 2 agricultural divisions, 2 urban and other developed land divisions, and 1 open water division. The Idaho LCCS natural vegetation divisions include GAP Level 3 recently disturbed systems (Table 4-2), such as harvested or burned systems, which have not been converted to human land uses. For example, Harvested Forest-Northwestern Conifer Regeneration and Recently Burned Forest are grouped with the Evergreen Woodland division, and Recently Burned Grassland is grouped with the Perennial Grassland division (see Appendix 3).

Most of the GAP Level 3 systems that occur in the Northwestern Plains ecoregion (listed in Appendix 2) are included in the Idaho LCCS divisions, effectively linking the GAP Level 3 systems to NVCS. Additional NVCS crosswalk efforts in other states, such as the Montana Crucial Areas Planning System (CAPS) (Vance 2010, personal communication, Comer et al. 2003) and professional judgment, were used to associate remaining Level 3 systems to Idaho LCCS divisions (Appendix 3).

The aggregation and crosswalk process allows evaluation of a reduced number of coarse-filter CEs, for example, at the division level, while retaining the capability to evaluate nested geospatial data on every Level 3 mapping unit within or across divisions. Table 4-3 lists the 10 division-level coarse filters that we propose to carry forward to the next phase of the REA.

It is important to note that all of the Level 3 system data are retained through the aggregation to division process, and we have the ability to re-aggregate any number of Level 3 systems as needed for the REA analysis.

The selected suite of ecological systems encompasses the habitat requirements of most characteristic native species, ecological functions, and services in the region. Careful selection of fine-filter species as CEs will ensure that resources of particular interest to the AMT and local agency managers are included in the REA.

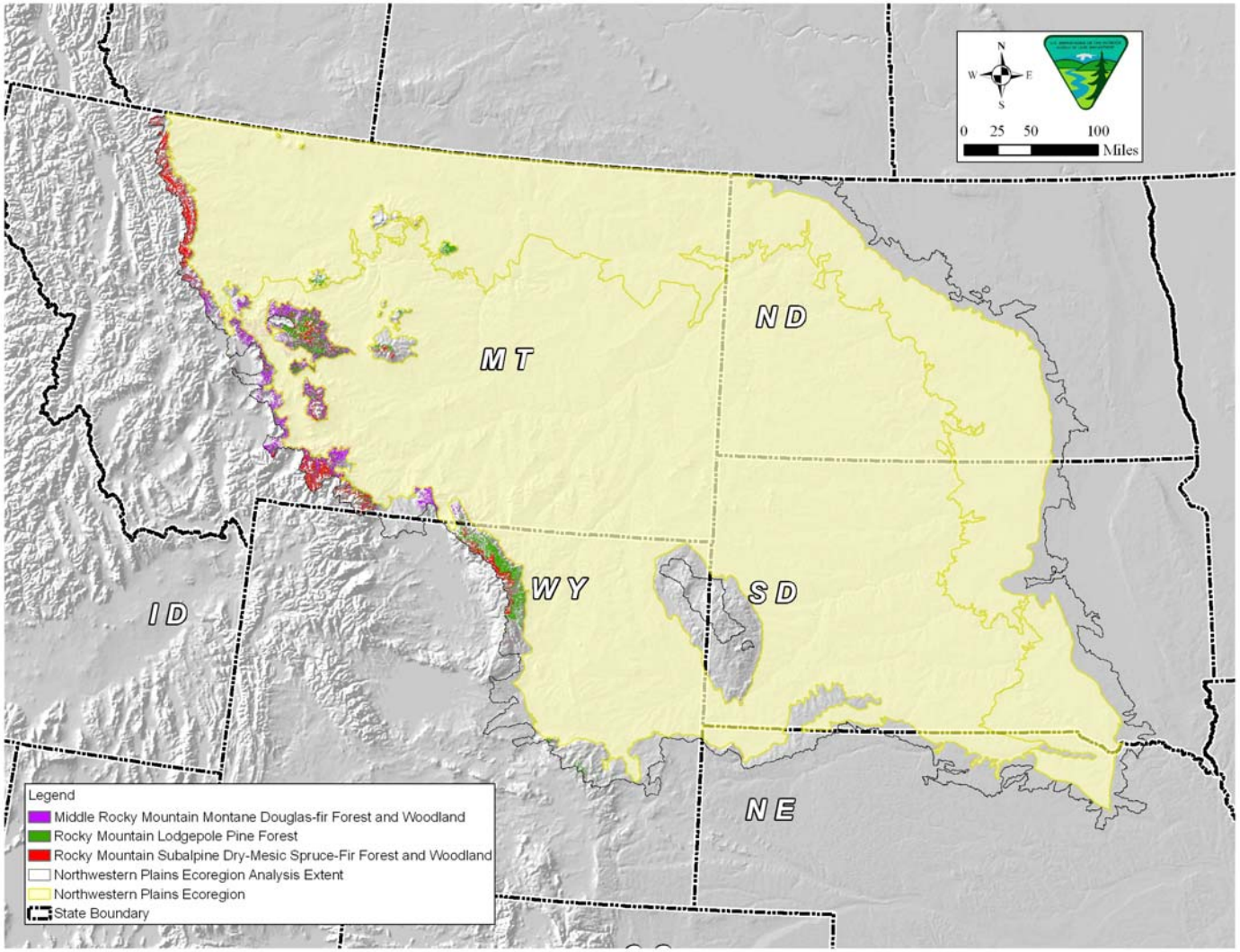


**Figure 4-2. Ecological Systems Proposed to be Excluded from the Northwestern Plains Ecoregion**

**Table 4-3. Proposed Ecological Systems (Coarse Filters) for the Northwestern Plains Ecoregion**

| Division Name (Idaho LCCS Crosswalk with ReGAP) | Percent of Ecoregion* | SOW Regionally Significant Vegetation Types |
|---|---|---|
| ***Terrestrial Systems*** | ***59.3*** | *Regionally Significant Terrestrial Communities, Functions, and Services* |
| Deciduous Forest and Woodland[1] | 0.4 | Mixed Deciduous Woodlands |
| Evergreen Forest and Woodland | 4.4 | Mixed Conifer Woodlands (Ponderosa, Lodgepole, Douglas Fir, Juniper)<br>Pine Woodlands (5-Needle Pines) |
| Mesic Shrubland (Deciduous and Evergreen)[3] | 0.6 | Mixed Shrub/Grass Associations* |
| Perennial Grassland | 35.5 | Prairie Grassland associations* |
| Semi-Desert Shrubland and Grassland | 16.3 | Sagebrush-Grassland Complexes* |
| Sparse Vegetation and Natural Barren Areas | 2.1 | Badlands/Breaks |
| ***Aquatic/Riparian/Floodplain and Wetland Systems*** | ***5.4*** | *Regionally Significant Aquatic/Riparian Features, Functions, Services.* |
| Deciduous Forest and Woodland[2] | 3.1 | Riparian Communities (evaluate at the division/subdivision/system level as appropriate): Deciduous Woodlands, Riparian Shrublands |
| Mesic Shrubland[4] | 0.3 | |
| Emergent Wetland | 0.5 | Prairie Potholes, Herbaceous Wetlands,<br>wetlands/springs/spring-brooks |
| Open Water (Fresh) | 1.5 | Regionally significant watercourses/reservoirs |
| Total Terrestrial and Aquatic Systems) | 64.7 | |

Notes:
[1] Includes upland deciduous systems
[2] Includes floodplain and riparian systems, including wooded draws and ravines
[3] Includes upland mesic shrublands
[4] Includes floodplain mesic shrublands (greasewood flats)
*Should be considered at the ecological system level where appropriate (per SOW)

Ecological models for these coarse-filter elements (or combinations of Level 3 ecosystems subsumed within these division level categories, as needed) will form a major focus for this REA. The list includes nine terrestrial and aquatic categories that encompass approximately 65 percent of the ecoregion area.

Appendix 3 presents a complete list of all Level 3 ecological systems in the Northwestern Plains ecoregion and the divisions within which they are nested.

### 4.2.2 Landscape-Species Conservation Elements

#### *4.2.2.1 Introduction*

Landscape species-specific CEs are fine-filter elements in this REA. The fine filter focuses on species and species assemblages that include rare species and landscape/keystone species. Species assemblages are groups of species whose

habitats and distribution are sufficiently similar that they may be treated as a single unit of analysis. Landscape species are defined by their use of large, ecologically diverse areas and their impacts on the structure and function of natural ecosystems (Sanderson et al. 2002). Keystone species play a lead role in their ecosystems, helping to determine the types and numbers of various other species that co-occur in the system. Selecting these species involves considering whether they have habitat requirements that are adequately represented by the coarse-filter elements, or whether they are likely to be overlooked in the assessment, for example, because of distinctive habitat requirements or particular vulnerability to certain CAs. For example, species that are strongly associated with a major coarse-filter ecological system may be adequately represented by assessment of the ecological system. Other species, however, should be addressed as individual elements, because they have habitat requirements that are different from other species of concern or range over wide areas. This category would include landscape species.

#### *4.2.2.2 Selection Approach*

Our goal in the selection process was to produce an initial list of 25-35 candidate species for consideration as fine-filter CEs. This list was presented for AMT review with the ultimate goal of focusing on 7 to 12 species to be carried through the REA process as core CEs. To build the initial list, we started with the list of species identified in the SOW, recognizing that the AMT and agency partners had given considerable thought to the species-specific CEs in this ecoregion. This initial list was supplemented with some landscape species that have been identified in the literature and species that are representative of habitat that may be inadequately represented by the coarse-filter ecological system data in Table 4-3.

A comprehensive review of federal, state, and agency lists of species of conservation concern were also conducted as part of the initial selection process. For ease of review this information was compiled into a database. Due to size limitations, the database was not included as an appendix. However, representative screenshots are included in Appendix 4. The database includes species from the following sources:

1. All species listed as federally endangered, threatened or candidate status.
2. G1-G3 ranked species.
3. Species listed by applicable state wildlife action plans (SWAPs) with habitat in this ecoregion.
4. BLM Special Status species.

Any species that was included in three or more SWAPs and appeared to be of landscape scale was automatically included in the initial candidate list of CEs.

#### *4.2.2.3 Final Landscape-Species Conservation Element Selections*

At AMT workshop 1, the AMT recommended that the selection criteria for landscape species CEs be modified to reduce the number of candidate species and species assemblages. The primary criterion for selecting CE species is that they should be **regionally significant.** Being regionally significant includes species for which management by one BLM field offices may affect management concerns of other BLM field offices (i.e., these species have trans-boundary management issues). CE species are not necessarily surrogates for other species of concern; they should be of concern

themselves. The following criteria reflect workshop guidance and were used to **reduce** the list of candidate fine-filter CEs (from Appendix 5):

- Strong association with one or more coarse-filter CEs (such as a specific GAP Level 3 ecological system)
- Association with a keystone or umbrella species identified as a CE (examples include species typically associated with black-tailed prairie dog (BTPD) colonies)
- Association with a species group or assemblage being carried forward as a CE (e.g., prairie water fish species, grassland breeding bird species, forest carnivores, big river fish species)
- Lack of consensus among the AMT to carry the species forward as a fine-filter CE. Discussion points for not carrying a species forward included:
  - insufficient ecological knowledge or lack of data
  - not of regional significance or strong agency concern throughout the ecoregion

These criteria were used to reduce the candidate list of fine-filter CEs. If any of the candidate fine-filter CEs met any of the criteria listed above, the candidate CE was either combined with an assemblage or not carried forward as a core CE. The rationale for each of the candidate CEs is contained in the table in Appendix 4. Table 4-4 lists the core CEs that will be evaluated in this REA.

**Table 4-4. Fine-Filter Core Conservation Elements for the Northwestern Plains**

| Conservation Element | Rationale |
|---|---|
| Grassland Bird Assemblage | Regional Significance |
| Sage Grouse | Landscape Species of Regional Significance |
| Pronghorn | Landscape Species of Regional Significance |
| BTPD and Associates | Umbrella or Keystone Species |
| Big River Fish Assemblage | Species Assemblage |
| Prairie Fish Assemblage | Species Assemblage |
| Mule Deer | Landscape Species of Regional Significance |
| Wetland/Riparian Areas | Key Habitat Types that May Be Incompletely Represented in GAP Coarse-Filter Data |
| Avian Connectivity (Raptor/bat, Passerine, Waterfowl) | Derived CE Dependent on State Modeling Analyses |
| Sharptail Grouse | Landscape Species of Regional Significance |

# 5.0 CHANGE AGENTS

## 5.1 INTRODUCTION

Successful completion of this REA will in part be based on a sound understanding of the landscape scale CAs and their potential impact on ecological values throughout this ecoregion. CAs are natural or anthropogenic disturbances that influence the current and future status of CEs. The initial CAs for this ecoregion were outlined by the AMT in the scope of work. The REA process focuses on regionally significant CAs that operate and impact on large scales, not on a site-by-site basis. SAIC included these CAs and consulted sources such as state wildlife action plans and regional experts to develop the CAs described below (Table 5-1).

**Table 5-1. Change Agents Selected for the Northwestern Plains**

| Change Agents | Status |
|---|---|
| **Fire** | Accepted |
| **Development** | Accepted |
| Urban and Exurban | Accepted |
| Agricultural | Accepted |
| Hydrological | Accepted |
| **Invasive Species** | Accepted |
| Terrestrial | Accepted |
| Aquatic | Accepted |
| **Climate Change** | Accepted |
| **Insect Outbreaks, and Diseases** | Accepted |

Historically, a variety of localized CAs in the Northwestern Plains ecoregion included natural fire cycles, drought, water impoundment, prairie dogs, beaver activity, mining, timber harvest, and grazing and other agricultural uses. More recently, the suppression of fire, urban development, and other encroachment on natural areas, non-native species invasions, and the changes in climate patterns have played larger roles (i.e. landscape scale).

## 5.2 CHANGE AGENT CATEGORIES

For the purposes of this analysis, CAs were divided into five categories:

- Fire;
- Development;
- Invasive species;
- Insect outbreaks, and diseases; and
- Climate Change.

Several of these categories were subsequently divided into subcategories as shown below. As the SAIC Team refines the data evaluation, CAs important to the ecoregion will be addressed in more detailed analysis and conceptual models. For example, specific invasive species will be selected that impact the CEs selected for this REA.

### 5.2.1 Fire

Fire can be a beneficial CA for some elements and detrimental to others. Changes in frequency, severity, and seasonality from historic to present to future (with climate change) can all affect biota. Areas with the greatest present and potential departure from historical fire regimes will be important to identify throughout this ecoregion. Certain sagebrush communities, such as Wyoming big sagebrush, have poor adaptations to recover from high frequency fire, whereas most grassland and prairie communities are maintained or improved by periodic fire. In addition, connectivity with aquatic features will also be evaluated. In many areas of the Northwestern Plains ecoregion, fire frequency has declined due to fire suppression and road networks acting as firebreaks.

### 5.2.2 Development

Urban and Exurban

Urban and Exurban includes several types of development, including recreation and energy development and mining. Because of the potential for habitat fragmentation, particular attention will be focused on exurban developments, such as resource extraction (mining, coal, oil, and gas) and related processing; generation, including wind; and transmission facilities proposed or projected under reasonably foreseeable development scenarios for areas of intact habitat that are isolated from existing urban and industrial infrastructure. Saline waters, which may accompany oil, gas, and coalbed methane (CBM) processing, are also an ecosystem stressor if not properly discharged. Particular attention is required for these developments due to the potential for landscape-scale indirect impacts, such as pipeline/road corridors for invasive species and human intervention, ignition sources for fire, groundwater extraction, erosion potential, dust generation, and indirect impacts on wildlife species, including effects on wildlife movement corridors.

Agricultural

The Northwestern Plains is North America's largest grassland ecoregion and still contains large unplowed areas of grasslands. Tillage of previously untilled land for agricultural crops remains a threat to remaining native grasslands for complex reasons relating to various government programs and incentives, including crop subsidies and the Conservation Reserve Program (CRP), as well as present and future demand for biofuels.

Hydrological – (dams, diversions, water table drawdown, industrial uses/saline discharges)

Surface water impoundments and diversions affect the timing and amounts of downstream flows, reducing connectivity and gene flow by affecting passage and survival of fish and aquatic vertebrates and curtailing flood events necessary to regenerate cottonwood and willow riparian communities. In addition to physical habitat disturbance, groundwater extraction has the potential to impact groundwater tables and, in some cases, surface waters such as seeps, springs, or live stream segments. Lowering groundwater tables can affect sensitive aquatic invertebrate and vertebrate species, as well as plant species and habitats dependent on surface water or elevated

groundwater tables (e.g., most riparian and wetland species). Effects on these habitats can lead to soil destabilization and erosion and to loss of habitat values for wildlife.

### 5.2.3 Invasive Species

Terrestrial Invasive Species – Expansion of invasive species is associated with human activity, development of roads, and other disturbances in native habitat. Several species such as leafy spurge and knapweed have the potential to cause serious ecological effects in terrestrial habitats. In addition, woody, invasive, non-native species such as Russian-olive and tamarisk have spread through riparian areas and continue to threaten areas throughout this ecoregion. Other terrestrial invasive species identified from the BLM scope of work include European starling, cheatgrass, Japanese brome, medusa head, and possibly star thistle.

Invasive species with the potential to harm aquatic resources include New Zealand mudsnails, tamerisk, Russian olive, whirling disease, didymo, quagga/zebra mussels, Eurasian water milfoil, Asian clam, and chytid fungus.

### 5.2.4 Insect Outbreaks and Diseases

Diseases such as sylvatic plague, canine distemper, chronic wasting disease, and West Nile virus have had or have the potential to exert severe effects on populations of species such as prairie dogs, black-footed ferrets, swift fox, elk, and a wide variety of birds, especially corvids but including Greater Sage-Grouse. Exotic pests such as emerald ash borer and various exotic diseases have the potential to establish and spread through the ecoregion causing severe ecological damage to deciduous woodland and forest trees. White Pine Blister rust is a destructive disease of the five-needle pines, including the whitebark pine and limber pine. A key issue is to conceptually model the relationships between climate change and the spread of invasive species, outbreaks of native and non-native insect pests and diseases, and susceptibility of host plant and animal populations.

### 5.2.5 Climate Change

Global climate change has the potential to directly and indirectly affect organisms and communities by changing the locations where species and communities can exist. Climate change may include changes in precipitation amounts, distribution, and seasonality; frequency and duration of drought episodes; and temperature regimes. Climate change is also likely to affect species and communities by affecting the frequency and distribution of fire and threats from invasive species, disease, and insect irruptions. Although there is a view that climate change toward warmer-drier conditions, for example, would cause communities to move northward (or, in some localized instances, to higher elevations), species are likely to respond individually as they have in past geologic epochs. Additionally, human-caused barriers to movement (such as large-scale agricultural/CRP conversion or urban development) may affect the ability for species or communities to move in response to changing conditions or become genetically isolated. Additionally, potential climate change effects on carbon sequestration and water supply or quality will also be considered.

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# 6.0 BASIC ECOREGION CONCEPTUAL MODEL

## 6.1 INTRODUCTION

As part of this initial task, a base conceptual model for the Northwestern Plains ecoregion has been developed. This conceptual model will be used to provide a science-based context that illustrates how CEs are affected by CAs. This model will be used to guide the development of specific conceptual models developed in Task 3 of Phase I. This conceptual model developed in this task is simple and general due to the diversity of systems that occur throughout this ecoregion.

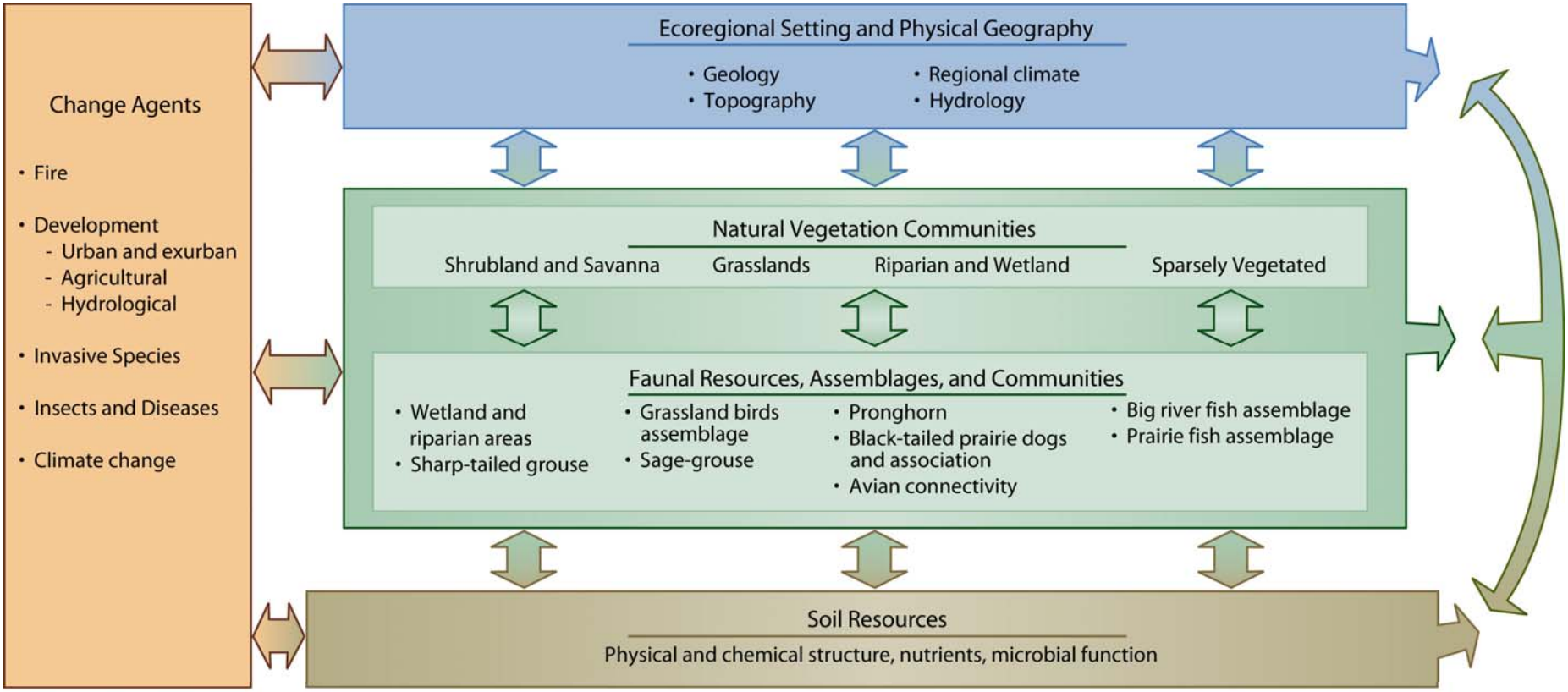
## 6.2 DESCRIPTION OF THE BASIC ECOREGION CONCEPTUAL MODEL FOR THE NORTHWESTERN PLAINS

In this conceptual model for the Northwestern Plains ecoregion, the ecoregional setting and physical geography box at the top of the model includes natural features that form the basis for the setting of this ecoregion (Figure 6-1). These include geology, topography, regional climate, and hydrology. Listed below the setting and geography box are the natural vegetation community types that dominate this specific ecoregion and provide the habitat that is necessary for the sustainment of faunal resources. The natural vegetation box contains the Level 1 GAP classifications for the natural vegetation systems in this ecoregion. Below the natural vegetation system are the faunal and wildlife community resources that were determined to be carried forward as CEs. The bottom box represents soil resources upon which the ecoregional resources described above are based and sustained. The CAs are listed in the left-hand box to depict their relationship/effect on all of the resources of the ecoregion.

This model depicts relationships among functional components of the system (e.g. vegetation resources, wildlife), and the major environmental influences, such as climate and development cycles, that control them.

The specific effects of the CAs are not depicted in this model but could include those resulting from chemical or physical changes including drought, salination, and changes in fire and hydrologic regimes including timing of snowmelt, nutrient and pollutant deposition, and erosion. Biological effects of the CAs could include botanical and migration phenology alterations resulting from climate change, invasive species, diseases, and insect infestations. Human-influenced CAs can also alter landscape extent and pattern, resulting in increased flooding, habitat conversion through agricultural practices, and fragmentation due to development.

Some natural processes that are also CAs, such as historic fire regimes, have been modified or exacerbated by human activities, (i.e. fire ignition, fire suppression, weed spread, and creation of features that act as firebreaks). Other CAs are wholly associated with human influence on the landscape, for example, pollutants, surface water diversion, groundwater extraction, industrial/energy development, and urbanization. Finally, CAs interact with one another to further influence CEs. For example, climate change has an influence on insect outbreaks and frequency of fire. The primary CAs listed are depicted as affecting all of the resources within the ecosystem.




Adapted from: Rocky Mountain Network Vital Signs Monitoring Plan 2007

**Figure 6-1. Conceptual Model for the Northwestern Plains Ecoregion**

The conceptual model shown in Figure 6-1 is intended to be descriptive of landscape scale functions while remaining simple and generic. In Task 3, more detailed models will be developed for the analysis of specific CEs relative to CAs. This ecoregional conceptual model does not include uncertainty or indicate spatial scale, relative magnitude or intensity of effects, or the time-frame of processes. Again, the detailed analytical models developed in Task 3 will provide the indices or categorization needed to complete the REA.

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# 7.0 SUMMARY

This memorandum documents the work completed under Task 1 of Phase I. The development of this memorandum was an iterative process that began with development of the MQs and identification of the initial lists of CEs and CAs, all of which served as a basis for the development of the ecoregion diagram and the conceptual model.

This memorandum describes the geographic and ecological setting of the Northwestern Plains ecoregion, identifies a buffer around the ecoregion boundary defined by the 5$^{th}$ level watersheds, and describes the reporting units for the REA. We developed a comprehensive set of MQs, using those initially provided by BLM, and screened them through various criteria to identify a subset that could be answered through the geospatial analysis and meet the goals of the REA.

We proposed candidate lists of coarse- and fine-filter resources for consideration as CEs that were discussed with the AMT at the first workshop. These resources included ecosystems, dominant plant species in the principal ecosystems of the region, landscape-level species taken from the BLM SOW, ESA listings, and SWAP species rankings. Species richness information for this ecoregion is currently under development by NatureServe and will be incorporated into the analysis when available.

After direction from the AMT to aggregate the Level 3 systems to the NVCS, we propose to carry forward 10 division Level coarse-filter elements. Ecological models for these coarse-filter elements (or combinations of Level 3 ecosystems subsumed within these division-level categories, as needed) will form a major focus for this REA. We also reduced the number of the fine-filter CEs by focusing on species of **regional significance.**

We also discussed CAs in broad categories including fire, invasive or non-native species, climate change, and development, and considered the stressor processes that they impose on ecoregion resources. Development is discussed in terms of sub-categories including urban, exurban, and rural (industrial) development, agricultural development, surface water diversion, and groundwater extraction. We discussed interactions of these CAs, for example, effects of climate change on wildfire frequency, severity, and seasonality, and the effects of climate change on disease and insect irruptions.

The conceptual model in this final memorandum illustrates events or processes that impact ecosystem attributes, focusing on the major forces of change with large-scale influence, and include CAs that are influenced by both natural and human forces.

Through the development of this memorandum, the SAIC Team has identified various intricacies associated with the Northwestern Plains. For example, the occurrence of subalpine and montane systems as a result of the buffer analysis highlights the dynamics and the spatial extent of this ecoregion.

The number and variety of MQs included in this document also indicate that the REA process for this ecoregion will be comprehensive and broad in scope. It will be imperative that the SAIC Team and the AMT maintain focus on landscape scale applications that are relevant to resources across the ecoregion. Because a wide variety of local, state, and federal agencies, stakeholders, and nongovernmental organizations

have substantial interests in the resources of this ecoregion, a clear landscape-scale vision must be maintained throughout the process.

Various sensitive resources and issues that are of significant importance to certain localized areas of the ecoregion or to agencies or interest groups have the potential to distract the analysis and change the outputs throughout the process. In order to maintain this landscape-scale vision, it will be further imperative to initiate and develop strong and trusting relationships with groups, such as the Landscape Conservation Cooperatives (LCCs) and others, so that wise use of resources can be maintained and agencies are clearly aligned along a similar path to landscape conservation.

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# APPENDIX 1
# BLM MANAGEMENT QUESTIONS

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At AMT workshop 1, the SAIC Team and the AMT evaluated the MQs to determine if data would be readily available to address each MQ. In addition, discussion resulted in reduction of the MQ list to remove redundant MQs and combine others where applicable. The table contained in this appendix displays the crosswalk, as well as whether the MQ was carried forward to the final memorandum or, if removed, the reason why.

Status of MQ:

1. MQ carried forward to final memorandum
    a. MQ carried forward but made subset or combined with other MQ
2. Determined insufficient data exists to completely answer MQ
3. Redundant with other MQ
4. Directed by AMT to remove MQ

## Appendix 1. Management Questions

| General Landscape Questions | | Status | Current MQs Number |
|---|---|---|---|
| | ~~1. Where are current intact regionally significant landscapes?~~ | 2 | |
| | ~~2. What is required to maintain long-term (20-50 year) productivity of the ecosystems being evaluated?~~ | 2 | |
| | ~~3. What is required to maintain current biodiversity in the ecoregion?~~ | 2 | |
| | ~~4. What management actions will restore and maintain ecosystem resilience (i.e. the capacity of a system to absorb disturbance and still retain its basic function and structure).~~ | 2,4 | |
| | ~~5. What is the acceptable range of future conditions and what is the historic range of conditions?~~ | 2 | |
| | ~~6. What is required to maintain CEs over time?~~ | 2 | |
| **Landscape Species/Species Richness** | | **Status** | **Current MQs Number** |
| CE Species (Fish, Wildlife, and Plants) | 7. What is the terrestrial ecological integrity (high, medium, low) for regionally significant features, functions, and services across the landscape? | 1a | 1 |
| | 8. Where are current CE landscape/keystone species and their habitats, including seasonal habitat and movement corridors, at greatest risk from CAs including climate change (connectivity, small population size)? | 1a | 3c |
| | ~~9. Where are areas of high species richness for surrogate groups of species?~~ | 3 | |
| | ~~10. What is the current location/distribution of G1-G3 & BLM special status species?~~ | 3 | |
| | 11. What areas have potential for restoring CE species habitat or habitat connectivity for CE species, currently and in the future? | 1a | 3a |
| | 12. Where are the key habitat types (season refuges, corridors/connectivity, migration routes, concentrations of regionally significant species)? | 1 | 3d |
| | 13. Where are the crucial winter and or parturition areas for big game species at risk from long-term habitat conversion or fragmentation? | 1 | 3e |
| | 14. Where are the regionally significant keystone species complexes such as BTPDs at risk from disturbance or development? | 1 | |
| **Terrestrial Resource Values** | | **Status** | **Current MQs Number** |
| Sites of High Biodiversity (Both Terrestrial and Aquatic) | 15. What is the current location/distribution of sites that have the greatest species richness? | 1 | 1a |
| | 16. Which species groups should be used as surrogates? | 1 | 1b |
| | ~~17. Which high biodiversity sites will potentially be affected by CAs and where are they?~~ | 2 | |

## Appendix 1. Management Questions (cont'd)

| Terrestrial Resource Values (cont'd) | | Status | Current MQs Number |
|---|---|---|---|
| Vegetation Types | 18. What are the CE vegetation types? How are they distributed over the landscape (extent/pattern) and how have they changed over time? | 1a | 1c |
| | 19. Where will current CE vegetation types be at greatest risk from CAs? | 1 | 1d |
| | ~~20. What CE vegetation types are currently at risk due to; development, hydrologic alterations, overgrazing and fragmentation (connectivity, size, etc.)?~~ | 2 | |
| | 21. What CE vegetation types are suitable for potential corridor connectors? | 1a | 1c |
| | ~~22. Where will there be changes in CE vegetation types?~~ | 2 | |
| | ~~23. What areas have potential for CE vegetation type restoration (based on existing available data)?~~ | 3 | |
| Specially Designated Areas (Both Terrestrial and Aquatic) | 24. Where are specially designated areas of high ecological value (designated by various agencies or in other work)? | 1 | 1e |
| | 25. What levels of resource management and protection from future development exist in these areas, and where are adjacent areas with potential for restoring connectivity? | 1 | 1e |
| Soils | 26. What soils are present and what is their current condition? | 1 | 1f |
| | 27. Which CAs are likely to affect soil fertility and erodibility? | 1 | 1g |
| | 28. Where are areas of high soil erodibility due to wind or water erosion if existing vegetation cover is removed? | 1 | 1h |
| | ~~29. What/where is the potential for future change in soil conditions due to CAs?~~ | 2 | |
| **Aquatic Resource Values** | | **Status** | **Current MQs Number** |
| | 30. What is the aquatic ecological integrity (i.e. high, medium, low) for regionally significant features, functions, and services across the Hydrologic Unit Code (HUC) watersheds? | 1 | 2 |
| | 31. Where are the current locations of CE aquatic/riparian habitats, including rivers, streams, lakes, ponds, wetlands, springs and reservoirs? | 1 | 2a |
| | 32. Where are current riparian or aquatic areas currently at risk of fragmentation impoundment, diversion and lowered water tables due to development, mineral extraction, and agricultural and residential development? | 1 | 2b |
| | 33. What is the current flow regime (hydrograph) of CE stream or river habitats or duration and extent of surface water in CE pond and lake habitats? | 1 | 2c |
| | 34. What is the condition of aquatic systems as defined by the Fish Passage Center (FPC)? | 1 | 2d |
| | 35. How have dominant species changed over time? | 1 | 2e |

## Appendix 1. Management Questions (cont'd)

| Aquatic Resource Values (cont'd) | | Status | Current MQs Number |
|---|---|---|---|
| | 36. Where are exotic species an existing and potential problem? | 1 | 2f |
| | 37. Where are degraded aquatic systems (water quality) and what are the sources of the degradation (saline discharges, petrochemical discharges, leaching of toxic mineral salts, eutrophication due to concentrated nutrient runoff, other)? | 1 | 2g |
| | 38. Where will CE aquatic habitats potentially be affected by CAs (duration, magnitude and temperature of flow; duration and extent of surface water presence, if applicable)? | 1 | 2h |
| | 39. Where will CE aquatic habitats potentially experience the greatest effects of climate change (duration and magnitude of flow, duration and extent of precipitation and surface water presence, if applicable)? | 1 | 2i |
| | 40. Where are the most species losses likely to occur due to temperature increases or water reductions? | 1 | 2j |
| | 41. What/where is the potential for future change in dominant species composition of CE aquatic habitats? | 1 | 2k |
| | 42. What areas have potential for CE aquatic habitat restoration (based on available geospatial data)? | 1 | 2l |
| | 43. Where are areas of watershed habitat connectivity? | 1 | 2m |
| | 44. Where are aquatic habitat strongholds for sensitive species that are intact and provide the best opportunity for protection, restoration and enhancement? | 1 | 2n |
| | ~~45. Where are the fisheries and associated aquatic macroinvertibrate food sources of regional concern?~~ | 2 | |
| | 46. Where are sensitive aquatic species at risk from stream connectivity or risk from interbreeding with closely related non-native or exotic species? | 1 | 2o |
| **Change Agents** | | **Status** | **Current MQs Number** |
| Fire | 47. Where are areas that have moved outside their presettlement range of variation from fire regimes? | 1 | 4a |
| | ~~48. Where are areas of sagebrush/forest ecotone?~~ | 4 | |
| | 49. Where are current areas with high fire frequency such that they burn on a regular basis? | 1 | 4b |
| | 50. Where are Wildland-Urban Interface (WUI) areas that have high potential for frequent fire? | 1 | 4c |
| | 51. Where will CEs be at risk from altered fire regimes? | 1 | 4d |
| | 52. Where are areas with potential to show future increases or decreases in wildfire frequency or intensity? | 1 | 4e |
| | 53. Where do these areas intersect with human development, high conservation and restoration potential? | 1 | 4f |
| | 54. Where are old growth forest areas that might be vulnerable to stand-replacing fires due to fire suppression? | 1 | 4g |
| | 55. Where are watersheds with high erosion potential vulnerable to high severity fire? | 1 | 4h |

## Appendix 1. Management Questions (cont'd)

| Change Agents (cont'd) | | Status | Current MQs Number |
|---|---|---|---|
| Invasive Species, Insect Outbreaks, and Diseases | ~~56. What portions of the landscapes have the most potential for the restoration of native species?~~ | 3 | |
| | 57. What habitats have been or have the potential to be most severely affected by exotic invasions and where are they? | 1 | 5a |
| | 58. What areas have the greatest occurrence of invasive species (high, moderate, low effect)? | 1 | 5b |
| | 59. Where are areas with invasive species that have restoration potential to reverse the infestation (high, moderate, low)? | 1 | 5c |
| | 60. Which exotics have potential for control and which do not? | 1 | 5d |
| | 61. Where are areas of potential future introduction and encroachment from invasive species currently known from the region? | 1 | 5e |
| | 62. Which areas are experiencing the most rapid spread of invasives (may not be supported by an existing database) and why? | 1 | 5f |
| | 63. How might other CAs influence the introduction or spread of non-native species? | 1 | 5g |
| | 64. Which insects and diseases might pose a significant future problem? | 1 | 5h |
| | 65. Where will state and federal high valued resource areas be affected through changes in intensity and range of insects and disease? | 1 | 5i |
| | 66. What has the change been in frequency and severity of outbreaks (in the last 50 years) and where have they occurred? | 1 | 5j |
| | 67. How and where are frequency and severity of outbreaks expected to change in response to climate change and to other CAs such as change in fire frequency and intensity? | 1 | 5k |
| | 68. Where are the major tree stands that have been substantially impacted by insects? | 1 | 5l |
| | 69. Based on climate change models what areas could be susceptible to insect infestation or disease in the future? | 1 | 5m |
| | 70. Where are the forests that have been substantially impacted by disease? | 1 | 5n |
| | 71. Where are the stands of major tree species that have not been impacted by the insects or disease? | 1 | 5o |
| Development – Urban and Exurban | 72. Where are areas of existing, planned, and potential future development, including roads (based on existing WUI literature including Theeobald and others)? | 1 | 6a |
| | 73. Where will the WUI increase as a result of urban/suburban/exurban and second/ vacation home development relative to state and federal areas of high conservation and restoration potential? | 1 | 6b |
| | 74. Which core CEs are threatened by sod-busting, energy development, gravel mining, fragmentation, loss of connectivity, and other development pressures? | 1 | 6c |

## Appendix 1. Management Questions (cont'd)

| Change Agents (cont'd) | | Status | Current MQs Number |
|---|---|---|---|
| Development – Urban and Exurban Energy Development/ Mining | 75. Where are areas of existing, planned, and future renewable and non-renewable energy development (based on existing geospatial data bases), including locations of existing leases, relative to areas of high conservation and restoration potential? | 1 | 6d |
| | 76. Where are existing, planned, and potential corridors including roads, transmission lines, and pipelines and how do they relate geographically to state and federal high value conservation areas? | 1 | 6e |
| | 77. Where are likely sources and sinks of discharge from such developments that may diminish quality of receiving waters and habitats (e.g., saline discharges)? | 1 | 6f |
| | 78. Where are methane extraction ponds located that could serve as breeding sites for mosquitoes that could carry West Nile Virus and threaten Greater Sage-Grouse? | 1 | 6g |
| Development – Hydrological (Dams, Diversions Water Table Drawdown, Industrial Uses/Saline Discharges) | 79. Where are aquifers and their recharge basins? What is the current and projected land use in these areas? | 1 | 6h |
| | 80. Where are areas in which groundwater extraction has the potential to change surface flow? | 1 | 6i |
| | 81. Where are areas with high densities of surface water impoundment? | 1 | 6j |
| | 82. Where do surface water diversions or ground water withdrawals have the potential to create discontinuity between spawning and other habitats (i.e., by creating seasonally dry or impassible stream reaches)? | 1 | 6k |
| | ~~83. Where are opportunities to restore continuity in habitats?~~ | 3 | |
| Development – Urban and Exurban Recreation | 84. Where are existing, planned, and potential areas for development or expansion of recreation areas (e.g., off-highway vehicle [OHV] and snowmobile routes, ski areas, reservoirs) in proximity to areas of high conservation and restoration potential? | 1 | 6l |
| | 85. Where are existing, planned, and potential visitor serving facilities (food, lodging, etc) and corridors including roads, utilities and how do they relate geographically to high conservation value areas? | 1 | 6m |
| | 86. On public lands, where are high conservation value resource areas vulnerable to unauthorized use? | 1 | 6n |
| Climate Change | 87. Which habitats and species are most likely to be negatively impacted by climate change? | 1a | 7b |
| | 88. Where are areas of state and federal high conservation value and restoration potential most vulnerable to a changing climate? | 1 | 7c |
| | 89. Where are watersheds with the greatest potential for alterations in thermal regime and hydrologic regime? What will these changes be? | 1 | 7d |
| | 90. Where are surface water and groundwater availability likely to change? | 1 | 7e |
| | ~~91. How is the timing of streamflow likely to change?~~ | 2 | |

## Appendix 1. Management Questions (cont'd)

| Change Agents (cont'd) | | Status | Current MQs Number |
|---|---|---|---|
| Climate Change (cont'd) | 92. What are predicted changes in the distribution of vegetation types given climate change (including changes to extramural climate)? | 1 | 7f |
| | 93. Where are CE species' habitats most vulnerable to changing climatic conditions? | 1 | 7g |
| | ~~94. Where are areas projected to lose dominant native plant species and what species are projected to replace them?~~ | 2 | |
| | 95. What and where are the vegetation types and seral stages that are carbon sinks and carbon sources? What actions in those vegetation types alter the sink/source balance? | 1 | 7h |
| | 96. Where are potential carbon sequestration areas? | 1 | 7j |
| Development – Agricultural | ~~97. Where are historical and existing agriculture and the potential for future land conversion to agriculture (CRP and other conversions through tillage)?~~ | 3 | |
| | ~~98. What is the water availability considering the existing development rights (ongoing and potential)?~~ | 3 | |
| | ~~99. What areas are not impacted by grazing?~~ | 3,4 | |

Status of MQ:
1. MQ carried forward to final memorandum
   a. MQ carried forward but made subset or combined with other MQ
2. Determined insufficient data exists to completely answer MQ
3. Redundant with other MQ
4. Directed by AMT to remove MQ

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**APPENDIX 2**
**NORTHWESTERN PLAINS LEVEL 3 ECOLOGICAL SYSTEMS**

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## Coarse-Filter Ecological System Conservation Elements for the Northwestern Plains Ecoregion (*Note: Ecoregion Inclusions are Included*)

| **Shrubland and Savanna Systems (13.61%)** | |
|---|---|
| **Percent of Ecoregion** | **Ecological System** |
| 0.00 | Inter-Mountain Basins Mixed Salt Desert Scrub |
| 0.00 | North-Central Interior Oak Savanna |
| 0.01 | Rocky Mountain Lower Montane-Foothill Shrubland |
| 0.02 | Rocky Mountain Alpine Dwarf-Shrubland |
| 0.02 | Western Great Plains Sandhill Steppe |
| 0.03 | Inter-Mountain Basins Big Sagebrush Shrubland |
| 0.04 | Wyoming Basins Dwarf Sagebrush Shrubland and Steppe |
| 0.06 | Northern Rocky Mountain Subalpine Deciduous Shrubland |
| 0.09 | Northern Rocky Mountain Montane-Foothill Deciduous Shrubland |
| 0.23 | Inter-Mountain Basins Mat Saltbush Shrubland |
| 0.4 | Northern Rocky Mountain Foothill Conifer Wooded Steppe |
| 0.54 | Northwestern Great Plains Shrubland |
| 0.77 | Inter-Mountain Basins Montane Sagebrush Steppe |
| 11.4 | Inter-Mountain Basins Big Sagebrush Steppe |
| **Grasslands (35.88%)** | |
| **Percent of Ecoregion** | **Ecological System** |
| 0.00 | North-Central Interior Sand and Gravel Tallgrass Prairie |
| 0.01 | Northern Tallgrass Prairie |
| 0.03 | Rocky Mountain Alpine Fell-Field |
| 0.03 | Central Tallgrass Prairie |
| 0.04 | Southern Rocky Mountain Montane-Subalpine Grassland |
| 0.05 | Central Mixedgrass Prairie |
| 0.08 | Rocky Mountain Dry Tundra |
| 0.09 | Northern Rocky Mountain Subalpine-Upper Montane Grassland |
| 0.19 | Rocky Mountain Subalpine-Montane Mesic Meadow |
| 0.22 | Western Great Plains Tallgrass Prairie |
| 0.59 | Western Great Plains Shortgrass Prairie |
| 1.47 | Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland |
| 4.03 | Western Great Plains Sand Prairie |
| 29.05 | Northwestern Great Plains Mixedgrass Prairie |

## Coarse-Filter Ecological System Conservation Elements for the Northwestern Plains Ecoregion (*Note: Ecoregion Inclusions are Included*) (cont'd)

| Riparian and Wetland Classes (3.71%) | |
|---|---|
| **Percent of Ecoregion** | **Ecological System** |
| 0.00 | Northern Rocky Mountain Conifer Swamp |
| 0.00 | Columbia Plateau Vernal Pool |
| 0.00 | Northern Rocky Mountain Wooded Vernal Pool |
| 0.00 | Inter-Mountain Basins Alkaline Closed Depression |
| 0.00 | Western Great Plains Floodplain |
| 0.00 | Rocky Mountain Subalpine-Montane Riparian Woodland |
| 0.00 | Eastern Great Plains Floodplain Systems |
| 0.01 | Rocky Mountain Subalpine-Montane Fen |
| 0.01 | Rocky Mountain Alpine-Montane Wet Meadow |
| 0.01 | Rocky Mountain Subalpine-Montane Riparian Shrubland |
| 0.03 | North American Arid West Emergent Marsh |
| 0.04 | Western Great Plains Open Freshwater Depression Wetland |
| 0.05 | Great Plains Prairie Pothole |
| 0.06 | Western Great Plains Closed Depression Wetland |
| 0.10 | Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland |
| 0.11 | Western Great Plains Riparian Woodland and Shrubland |
| 0.13 | Western Great Plains Saline Depression Wetland |
| 0.14 | Rocky Mountain Lower Montane Riparian Woodland and Shrubland |
| 0.16 | Northwestern Great Plains Floodplain |
| 0.19 | Eastern Great Plains Wet Meadow, Prairie, and Marsh |
| 0.33 | Inter-Mountain Basins Greasewood Flat |
| 0.48 | Western Great Plains Depressional Wetland Systems |
| 0.63 | Western Great Plains Floodplain Systems |
| 1.22 | Northwestern Great Plains Riparian |

## Coarse-Filter Ecological System Conservation Elements for the Northwestern Plains Ecoregion (*Note: Ecoregion Inclusions are Included*) (cont'd)

| **Human Land Use (23.34%)** | |
|---|---|
| **Percent of Ecoregion** | **Ecological System** |
| 0.01 | Developed, High Intensity |
| 0.07 | Developed, Medium Intensity |
| 0.07 | Quarries, Mines, Gravel Pits and Oil Wells |
| 0.24 | Developed, Low Intensity |
| 1.39 | Developed, Open Space |
| 3.44 | Pasture/Hay |
| 18.13 | Cultivated Cropland |
| **Recently Disturbed or Modified (4.09%)** | |
| **Percent of Ecoregion** | **Ecological System** |
| 0.00 | Ruderal Wetland and Forest |
| 0.01 | Harvested Forest - Grass/Forb Regeneration |
| 0.01 | Harvested Forest - Northwestern Conifer Regeneration |
| 0.01 | Recently Burned Grassland |
| 0.01 | Introduced Upland Vegetation - Shrub |
| 0.03 | Introduced Riparian and Wetland Vegetation |
| 0.04 | Harvested Forest-Shrub Regeneration |
| 0.07 | Disturbed, Non-Specific |
| 0.08 | Recently Burned Forest |
| 0.40 | Introduced Upland Vegetation - Annual Grassland |
| 1.16 | Recently Burned Shrubland |
| 2.28 | Introduced Upland Vegetation - Perennial Grassland and Forbland |
| **No Data (9.43%)** | |
| **Percent of Ecoregion** | **Ecological System** |
| 9.43 | No Data |

## Coarse-Filter Ecological System Conservation Elements for the Northwestern Plains Ecoregion (*Note: Ecoregion Inclusions are Included*) (cont'd)

| **Sparsely Vegetated/Barren Classes (2.15%)** | |
|---|---|
| **Percent of Ecoregion** | **Ecological System** |
| 0.00 | Rocky Mountain Cliff, Canyon and Massive Bedrock |
| 0.00 | Inter-Mountain Basins Shale Badland |
| 0.00 | Inter-Mountain Basins Shale Badland |
| 0.01 | Western Great Plains Badland |
| 0.01 | North American Alpine Ice Field |
| 0.02 | Rocky Mountain Cliff, Canyon and Massive Bedrock |
| 0.05 | Rocky Mountain Alpine Bedrock and Scree |
| 0.07 | Western Great Plains Badland |
| 0.11 | Southwestern Great Plains Canyon |
| 1.88 | Southwestern Great Plains Canyon |
| **Open Water (1.53%)** | |
| **Percent of Ecoregion** | **Ecological System** |
| 1.53 | Open Water |

Classes adapted from:
U.S. Geological Survey, National Biological Information Infrastructure, Gap Analysis Program (GAP). February 2010. National Land Cover, Version 1, Available http://www.gap.uidaho.edu/landcoverviewer.html (Accessed: October 2010).

# APPENDIX 3

# NATIONAL VEGETATION CLASSIFICATION SYSTEM CROSSWALK WITH GAP VEGETATION SYSTEMS

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| Appendix Table 3-1. Idaho Land Cover Classification System Cross-walk with Northwestern Plains Level 3 Ecosystems | | | | |
|---|---|---|---|---|
| **Information:** Where the Northwest ReGap mapping unit (ecological system) included more than one formation (Forest, Woodland, Mesic Shrubland, etc.) we assigned it to the structurally taller or denser formation. For example, forested ecological systems that include "forest and woodland" descriptors (e.g. Rocky Mountain Aspen Forest and Woodland) were assigned to the appropriate forest division (e.g. Deciduous Forest) rather than woodland division for mapping. Where an ecological system had "woodland and savanna" or "woodland and parkland" in its title it was assigned to the woodland division rather than a grassland division for mapping. In addition, some ecological systems listed here are not listed on the NatureServe website as being in Idaho. These are identified with an * after the ecological system name and are likely mis-classified if mapped in Idaho. | | | | |
| **Class** | **Formation** | **Division** | **Northwestern Plains Level 3 Ecosystems** | **Total % of Area** |
| 1. Forest and Woodland | Forest | Deciduous Forest | Rocky Mountain Aspen Forest and Woodland | 0.15 |
| | Woodland | Deciduous Woodland | Western Great Plains Wooded Draw and Ravine | 0.75 |
| | | | Western Great Plains Dry Bur Oak Forest and Woodland | 0.26 |
| | | | Western Great Plains Floodplain Systems [1] | 0.80 |
| | | | Northwestern Great Plains Floodplain | 0.16 |
| | | | Eastern Great Plains Floodplain Systems | 0.00 |
| | | | Western Great Plains Floodplain | 0.00 |
| | | | Northwestern Great Plains Riparian [2] | 1.57 |
| | | | Rocky Mountain Lower Montane Riparian Woodland and Shrubland | 0.14 |
| | | | Western Great Plains Riparian Woodland and Shrubland | 0.11 |
| | | | Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland | 0.10 |
| | | | Other Deciduous Woodland [3] | 0.03 |
| | | | Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland | 0.03 |
| | | | Eastern Great Plains Tallgrass Aspen Parkland | 0.00 |
| | | | Northwestern Great Plains Aspen Forest and Parkland | 0.00 |
| | | Evergreen Woodland | Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna [4] | 3.72 |
| | | | Northern Rocky Mountain Ponderosa Pine Woodland and Savanna | 0.14 |
| | | | Southern Rocky Mountain Ponderosa Pine Woodland | 0.02 |
| | | | Northern Rocky Mountain Foothill Conifer Wooded Steppe | 0.40 |
| | | | Rocky Mountain Foothill Limber Pine - Juniper Woodland | 0.19 |
| | | | Recently Burned Forest | 0.08 |
| | | | Harvested Forest - Northwestern Conifer Regeneration | 0.01 |
| | | | Harvested Forest - Grass/Forb Regeneration | 0.01 |

| Appendix Table 3-1. Idaho Land Cover Classification System Cross-walk with Northwestern Plains Level 3 Ecosystems (cont'd) | | | | |
|---|---|---|---|---|
| **Class** | **Formation** | **Division** | **Northwestern Plains Level 3 Ecosystems** | **Total % of Area** |
| 2. Mesic Shrubland and Grassland | Mesic Shrubland (Deciduous and Evergreen) | | Northwestern Great Plains Shrubland [5] | 0.56 |
| | | | Western Great Plains Sandhill Steppe | 0.02 |
| | | | Inter-Mountain Basins Greasewood Flat | 0.33 |
| | | | Harvested Forest-Shrub Regeneration | 0.04 |
| | Mesic Grassland | Perennial Grassland | Northwestern Great Plains Mixedgrass Prairie [6] | 29.10 |
| | | | Central Mixedgrass Prairie | 0.05 |
| | | | Western Great Plains Sand Prairie | 4.03 |
| | | | Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland | 1.47 |
| | | | Western Great Plains Shortgrass Prairie | 0.59 |
| | | | Western Great Plains Tallgrass Prairie [7] | 0.27 |
| | | | Central Tallgrass Prairie | 0.03 |
| | | | Northern Tallgrass Prairie | 0.01 |
| | | | North-Central Interior Sand and Gravel Tallgrass Prairie | 0.00 |
| | | | Recently Burned Grassland | 0.01 |
| | | Emergent Wetland | Western Great Plains Depressional Wetland Systems [8] | 0.27 |
| | | | Western Great Plains Saline Depression Wetland | 0.13 |
| | | | Western Great Plains Closed Depression Wetland | 0.06 |
| | | | Great Plains Prairie Pothole | 0.05 |
| | | | Western Great Plains Open Freshwater Depression Wetland | 0.04 |
| | | | Columbia Plateau Vernal Pool | 0.00 |
| | | | Inter-Mountain Basins Alkaline Closed Depression | 0.00 |
| | | | Eastern Great Plains Wet Meadow, Prairie, and Marsh [9] | 0.23 |
| | | | North American Arid West Emergent Marsh | 0.03 |
| 3. Semi-Desert Shrubland and Grassland | Semi-Desert Shrubland | Deciduous Shrubland | Inter-Mountain Basins Mat Saltbush Shrubland [10] | 0.23 |
| | | | Inter-Mountain Basins Mixed Salt Desert Scrub | 0.00 |
| | | Evergreen Shrubland | Inter-Mountain Basins Big Sagebrush Steppe [11] | 11.46 |
| | | | Wyoming Basins Dwarf Sagebrush Shrubland and Steppe | 0.04 |
| | | | Inter-Mountain Basins Big Sagebrush Shrubland | 0.03 |
| | | | Recently Burned Shrubland | 1.16 |
| | | | Inter-Mountain Basins Montane Sagebrush Steppe | 0.77 |
| | Semi-Desert Grassland | Perennial Grassland | Introduced Upland Vegetation - Perennial Grassland and Forbland | 2.28 |
| | | | CRP | |
| | | Annual Grassland | Introduced Upland Vegetation - Annual Grassland | 0.40 |
| 4. Sparse Vegetation and Natural Barren Areas | | Unconsolidated Materials | Western Great Plains Badland [12] | 1.98 |
| | | | Southwestern Great Plains Canyon | 0.05 |
| | | | Inter-Mountain Basins Shale Badland | 0.02 |
| | | | Rocky Mountain Cliff, Canyon and Massive Bedrock | 0.01 |
| | | | Western Great Plains Cliff and Outcrop | 0.01 |
| | | | Inter-Mountain Basins Cliff and Canyon | 0.00 |
| | | | Inter-Mountain Basins Active and Stabilized Dune | 0.11 |

| Appendix Table 3-1. Idaho Land Cover Classification System Cross-walk with Northwestern Plains Level 3 Ecosystems (cont'd) | | | | |
|---|---|---|---|---|
| **Class** | **Formation** | **Division** | **Northwestern Plains Level 3 Ecosystems** | **Total % of Area** |
| 5. Agriculture | | Crops | Cultivated Cropland | 18.13 |
| | | Pasture, Hayland, Etc. | Recently Disturbed | 4.09 |
| | | | Pasture/Hay | 3.44 |
| | | | Introduced Riparian and Wetland Vegetation | 0.03 |
| | | | Introduced Upland Vegetation - Shrub | 0.01 |
| | | | Ruderal Wetland and Forest | 0.00 |
| | | | Rural Upland - Old Field | N/A |
| 6. Urban and Other Developed Lands | Urban/Industrial/Excavation Areas | Urban | Developed, Open Space | 1.39 |
| | | | Developed, Low Intensity | 0.24 |
| | | | Developed, Medium Intensity | 0.07 |
| | | | Developed, High Intensity | 0.01 |
| | | Industrial, Excavation and Other Areas | Quarries, Mines and Gravel Pits | 0.07 |
| | | | Non-Specific Disturbed | 0.07 |
| | Transportation, Communication and Energy Linear Features | Roads | | N/A |
| | | Railroads | | N/A |
| | | Communication/Energy Lines and Pipelines | | N/A |
| 7. Open Water | | | Open Water | 1.53 |
| 8. No Data | | | No Data | 9.43 |

Notes:
N/A = information is not available from GAP

Level 3 ecosystems indented and displayed with colored letters have been included in the preceding Level 3 ecosystem, because of ecological similarity, as annotated below in the notes section. The percentages have been included in the total for the preceding ecosystem.

Level 3 ecosystems highlighted in blue are combined into the Deciduous Forest and Woodland and Mesic Shrubland Coarse Filters under Aquatic/Riparian/Floodplain and Wetland Systems in Table 4-3; those highlighted in blue are combined under the respective categories under Terrestrial Systems in Table 4-3.

1. Western Great Plains Floodplain Systems, also includes: Northwestern Great Plains Floodplain, Eastern Great Plains Floodplain Systems, and Western Great Plains Floodplain
2. Northwestern Great Plains Riparian, also includes: Rocky Mountain Lower Montane Riparian Woodland and Shrubland, Western Great Plains Riparian Woodland and Shrubland, and Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland.
3. Other Deciduous Woodland includes: Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland, Eastern Great Plains Tallgrass Aspen Parkland, and Northwestern Great Plains Aspen Forest and Parkland
4. Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna, also includes: Northern Rocky Mountain Ponderosa Pine Woodland and Savanna and Southern Rocky Mountain Ponderosa Pine Woodland
5. Northwestern Great Plains Shrubland, also includes: Western Great Plains Sandhill Steppe
6. Northwestern Great Plains Mixedgrass Prairie, also includes: Central Mixedgrass Prairie
7. Western Great Plains Tallgrass Prairie, also includes: Central Tallgrass Prairie, Northern Tallgrass Prairie, and North-Central Interior Sand and Gravel Tallgrass Prairie
8. Western Great Plains Depressional Wetland Systems, also includes: Western Great Plains Saline Depression Wetland, Western Great Plains Closed Depression Wetland, Great Plains Prairie Pothole, Western Great Plains Open Freshwater Depression Wetland, and Columbia Plateau Vernal Pool
9. Eastern Great Plains Wet Meadow, Prairie, and Marsh, also includes: North American Arid West Emergent Marsh
10. Inter-Mountain Basins Mat Saltbush Shrubland, also includes: Inter-Mountain Basins Mixed Salt Desert Scrub
11. Inter-Mountain Basins Big Sagebrush Steppe, also includes: Wyoming Basins Dwarf Sagebrush Shrubland and Steppe and Inter-Mountain Basins Big Sagebrush Shrubland
12. Western Great Plains Badland, also includes: Southwestern Great Plains Canyon, Inter-Mountain Basins Shale Badland, Rocky Mountain Cliff, Canyon and Massive Bedrock, Western Great Plains Cliff and Outcrop, and Inter-Mountain Basins Cliff and Canyon

**Appendix Table 3-2. Level 3 Ecological Systems Omitted from the NWP Coarse-filter Analysis**

| Level 3 Ecological System | Percentage of Ecoregion Area Including Buffer |
|---|---|
| Rocky Mountain Lodgepole Pine Forest | 0.56 |
| Middle Rocky Mountain Montane Douglas-Fir Forest and Woodland | 0.56 |
| Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland | 0.41 |
| Rocky Mountain Poor-Site Lodgepole Pine Forest | 0.02 |
| Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland | 0.03 |
| **Total:** | 1.58 |

*Note:*
These Montane and Subalpine Systems were omitted due to their occurrence being wholly or largely within the HUC-10 buffer with adjoining areas of the Middle Rockies ecoregion and were identified as montane and subalpine ecosystems not representative of the Northwestern Plains ecoregion.

## APPENDIX 4

## SPECIES-SPECIFIC CONSERVATION ELEMENT DATABASE (SCREEN SHOT)

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| Sci_Name | Com_Name | Status | ESA | State | Natureserve | MT-SWAI | WY-SGCN | SD-SGCN | SD-Statu | SD-Rankin | ND-SoCP | ND-SoCP | BLM-SOW | BLM-MT, ND, SD | BLM-WY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Abronia ammophila | Tweedy's Sand-verbena | G1 | | WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Acalypta cooleyi | Cooley's Tingid | G2 | | OR, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Accipiter gentiles | Northern goshawk | | | SD, WY | ☐ | | ☑ | ☑ | | S3B,S2N | ☐ | | ☐ | ☑ | ☑ |
| Accipiter sp. | goshawk | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Achnatherum contractum | Contracted Ricegrass | G3G4 | | CO, MT, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Acipenser fulvescens | Lake Sturgeon | G3G4 | | AL (extirpated), AR, GA, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Acipenser transmontanus | White sturgeon | | LE | ID, MT | ☐ | Tier I | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Acris crepitans | Northern Cricket Frog | | | SD | ☐ | | ☐ | ☑ | | S1 | ☐ | | ☐ | ☐ | ☐ |
| Adelolecia pilati | | G2G4 | | MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Adrityla cucullata | A Millipede | G1G3 | | MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Aechmophorus clarkii | Clark's Grebe | | | ID, WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Aechmophorus occidentalis | Western Grebe | | | ID, WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Aegolius funereus | Boreal Owl | | | ID, WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Agapetus montanus | An Agapetus Caddisfly | G3 | | ID, MT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Agastache cusickii | Cusick's Giant-hyssop | G3G4 | | ID, MT, NV, OR | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☑ | ☐ |
| Ageratina occidentalis = Eupat | Western boneset | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☑ | ☐ |
| Agrestia hispida | A Lichen | G3 | | ID, MT, OR, UT, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Agrostis rossiae | Ross' Bentgrass | G1 | | WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Alasmidonta marginata | elktoe | | | SD | ☐ | | ☐ | ☑ | | S1 | ☐ | | ☐ | ☐ | ☐ |
| Alces alces | Moose | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Aletes humilis | Larimer Aletes | G2G3 | | CO, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Allium acuminatum | Tapertip onion | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☑ | ☐ |
| Allium columbianum | Columbia Onion | G3 | | ID, MT, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Allomyia bifosa | A Caddisfly | G3G4 | | MT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Allomyia chama | A Caddisfly | G2G4 | | WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Allomyia hector | A Caddisfly | G1G2 | | MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Allomyia picoides | A Caddisfly | G1G3 | | AK, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Alloperla pilosa | Hairy Sallfly | G3 | | CO, NM, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Amblema plicata | Threeridge | | | ND | ☐ | | ☐ | ☐ | | | ☑ | Level II | ☐ | ☐ | ☐ |
| Amblycheila cylindriformis | Great Plains tiger beetle | | | SD | ☐ | | ☐ | ☑ | | S1 | ☐ | | ☐ | ☐ | ☐ |
| Ambystoma tigrinum | Tiger Salamander | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameiurus melas | Black Bullhead | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameiurus natalis | Yellow Bullhead | | | ND | ☐ | | ☐ | ☐ | | | ☑ | Level III | ☐ | ☐ | ☐ |
| Ameletus bellulus | A Mayfly | G3 | | CA, MT, OR, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameletus majusculus | A Mayfly | G3G4 | | CA, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameletus pritchardi | A Mayfly | G3G4 | | CA, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameletus shepherdi | A Mayfly | G3G4 | | CA, MT, OR | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ameletus vernalis | A Mayfly | G3G4 | | CA, MT, OR, WA, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Ammodramus bairdii | Baird's sparrow | | | ND, SD, WY | ☐ | | ☐ | ☑ | | S2B,SZN | ☑ | Level I | ☐ | ☑ | ☑ |
| Ammodramus leconteii | LeConte's sparrow | | | ND, SD | ☐ | | ☐ | ☑ | | S1S2B,SZ | ☑ | Level II | ☐ | ☑ | ☐ |
| Ammodramus nelsoni | Nelson's sharp-tailed sparro | | | MT, ND | ☐ | Tier I | ☐ | ☐ | | | ☑ | Level I | ☐ | ☑ | ☐ |
| Ammodramus savannarum | Grasshopper Sparrow | | | ID, ND, WY | ☐ | | ☑ | ☐ | | | ☑ | Level I | ☐ | ☐ | ☐ |
| Amnicola limosus | Mud Amnicola | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Amphispiza belli | Sage sparrow | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☑ | ☑ |
| Anagapetus hoodi | A Caddisfly | G3G4 | | OR, WA, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Analetris eximia | A Mayfly | G3 | | MT, SD, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Anas acuta | Northern Pintail | | | ID, ND, WY | ☐ | | ☑ | ☐ | | | ☑ | Level II | ☐ | ☐ | ☐ |
| Anepeorus rusticus | A Mayfly | G2 | | MT, UT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |

| Sci_Name | Com_Name | Status | ESA | State | Natureserve | MT-SWAI | WY-SGCN | SD-SGCN | SD-Statu | SD-Rankin | ND-SoCP | ND-SoCP | BLM-SOW | BLM-MT, ND, SD | BLM-WY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Catalpa bignonioides | Southern Catalpa | G3G4 | | AL, AR, AZ, CA, CT, DC, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catapyrenium compactum | | G3G4 | | CO, NM, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catapyrenium plumbeum | | G3 | | CO, MT, NM, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catinella gelida | Frigid Ambersnail | G1 | | IA, IL, IN, KY (extirpated | ☑ | | ☐ | ☑ | | S1 | ☐ | | ☐ | ☐ | ☐ |
| Catinella rehderi | Chrome Ambersnail | G3Q | | CA, ID, MT, WA, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catinella stretchiana | Sierra Ambersnail | G3 | | CA, SD, UT, WY | ☑ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catinella wandae | Slope Ambersnail | G2 | | AR, IA, KS, OK, WY | ☑ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catocala nuptialis | Married Underwing | G3G4 | | AR, IA, IL, KS, KY, MN, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catocala whitneyi | Whitney's Underwing | G3G4 | | AR, IA, IL, KS, KY, MN, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Catoptrophorus semipalmatus | Willet | | | ND, SD | ☐ | | ☐ | ☑ | | S5 | ☑ | Level I | ☐ | ☐ | ☐ |
| Catostomus catostomus | Longnose sucker | | | SD | ☐ | | ☐ | ☑ | ST | S1 | ☐ | | ☐ | ☐ | ☐ |
| Catostomus discobolus | Bluehead Sucker | | | ID, WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☑ |
| Catostomus latipinnis | Flannelmouth Sucker | G3G4 | | AZ, CA, CO, NM, NN, NV | ☑ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☑ |
| Catostomus platyrhynchus | Mountain sucker | | | SD, WY | ☐ | | ☑ | ☑ | | S3 | ☐ | | ☐ | ☐ | ☐ |
| Caudatella edmundsi | A Mayfly | G3G4 | | CA, ID, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Caudatella jacobi | A Mayfly | G3G4 | | AK, CA, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Caurinella idahoensis | A Mayfly | G3 | | ID, MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Centrocercus urophasianus | Greater-sage grouse | | | ID, MT, ND, SD, WY | ☐ | Tier I | ☑ | ☑ | | S2 | ☑ | Level II | ☑ | ☑ | ☑ |
| Ceraclea copha | A Caddisfly | G3G4 | | CO, ID, MT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cercobrachys fox | A Mayfly | G3G4 | | IA, IN, ND, NE, SD, WI | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cervus canadensis | Elk | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Chaenactis leucopsis | Alpine Pincushion | G3G4Q | | CO, ID, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Chaenotheca subroscida | | G3G4 | | MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Chaetodipus hispidus | Hispid Pocket Mouse | | | ND, WY | ☐ | | ☑ | ☐ | | | ☑ | Level III | ☐ | ☐ | ☐ |
| Charadrius melodus | Piping Plover | G3 | LE, LT | AL, AR, CO, CT, DE, FL, | ☑ | Tier I | ☐ | ☑ | ST | S2B,SZN | ☑ | Level II | ☐ | ☐ | ☐ |
| Charadrius montanus | Mountain Plover | G3 | PT | AZ, CA, CO, KS, MT, ND, | ☑ | Tier I | ☑ | ☐ | | | ☐ | | ☐ | ☑ | ☐ |
| Charina bottae | Rubber Boa | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Chelydra serpentina | snapping turtle | | | MT, ND | ☐ | Tier I | ☐ | ☐ | | | ☑ | Level II | ☐ | ☑ | ☐ |
| Chenopodium subglabrum | Smooth Goosefoot | G3G4 | | CO, KS, MI, MT, ND, NE, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Chlidonias niger | Black tern | | | ID, MT, ND, SD, WY | ☐ | Tier I | ☑ | ☑ | | S3B,SZN | ☑ | Level I | ☐ | ☑ | ☐ |
| Chrysemys picta bellii | Western Painted Turtle | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cicindela lepida | Ghost Tiger Beetle | G3G4 | | AL, AR, AZ, CO, CT, DE, I | ☑ | | ☐ | ☑ | | S1 | ☐ | | ☐ | ☐ | ☐ |
| Cicindela patruela | Northern Barrens Tiger Bee | G3 | | CT, DC, DE, GA, IN, KY, | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cinclus mexicanus | American dipper | | | SD | ☐ | | ☐ | ☑ | ST | S2 | ☐ | | ☐ | ☐ | ☐ |
| Cinygma dimicki | A Mayfly | G3 | | CA, ID, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cinygmula gartrelli | A Mayfly | G2G3 | | CA, MT, OR, UT, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cinygmula kootenai | A Mayfly | G1G3 | | UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Circus cyaneus | Northern Harrier | | | ND | ☐ | | ☐ | ☐ | | | ☑ | Level II | ☐ | ☐ | ☐ |
| Cirsium aridum | Cedar Rim Thistle | G2Q | | WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☑ |
| Cirsium barnebyi | Barneby's Thistle | G3G4 | | CO, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cirsium longistylum | Long-styled Thistle | G3 | | MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cirsium ownbeyi | Ownbey's Thistle | G3 | | CO, UT, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☑ |
| Cistothorus plantensis | Sedge wren | | | MT, ND | ☐ | Tier I | ☐ | ☐ | | | ☑ | Level II | ☐ | ☑ | ☐ |
| Cladonia imbricarica | | G2G3 | | ID, SD, WA, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cladonia luteoalba | | G2 | | ID, MT | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cladonia verruculosa | | G3 | | CA, ID, MT, OR, WA | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |
| Cleome lutea | yellow bee plant | | | | ☐ | | ☐ | ☐ | | | ☐ | | ☐ | ☑ | ☐ |
| Cleome multicaulis | Many-stemmed Spider-flo | G2G3 | | AZ, CO, NM, TX, WY | ☑ | | ☐ | ☐ | | | ☐ | | ☐ | ☐ | ☑ |
| Cnemidophorus sexlineatus vir | Prairie Racerunner | | | WY | ☐ | | ☑ | ☐ | | | ☐ | | ☐ | ☐ | ☐ |

# APPENDIX 5

# RATIONALE FOR SELECTION OF FINE-FILTER CONSERVATION ELEMENTS FOR THE NORTHWESTERN PLAINS ECOREGION

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## Appendix 5. Proposed Fine-Filter Conservation Elements for the Northwestern Plains Ecoregion

| Species Common Name or Species Assemblage | Species Scientific Name(s) | Rationale for Proposing the Species or Assemblage | AMT Decision[1] |
|---|---|---|---|
| ***Grassland Bird Assemblage*** | | | |
| Lark Bunting | *Calamospiza melanocorys* | ND, SD, WY SWAP, SD-Species of Greatest Conservation Need (SGCN), WY-SGCN, ND SoCOP | Carried forward as CE |
| Chestnut-Collared Longspur | *Calcarius ornatus* | SD-SGCN, WY-SGCN, ND, SD, WY SWAP, ND SoCOP, BLM special status species | Carried forward as CE |
| Sprague's Pipit | *Anthus spragueii* | ND, SD SWAP, SD-SGCN, ND SoCOP, BLM special status species | Carried forward as CE |
| Indicator of ecological integrity. This group has experienced rapid declines since the 1960s. They are threatened by climate change in their breeding ranges and, in some instances, in their winter ranges as well. Habitat fragmentation affects many of the species and some (e.g., sharp-tailed grouse and lesser and greater prairie-chickens) do not breed near tall structures such as oil rigs, wind turbines, or power lines or in proximity to improved roads. Many of the species do not tolerate invasion of woody species (e.g., chestnut-collared longspur) or planting of shelterbelts (partially because of the cover they offer to avian and mammalian predators of ground nesting species). Example species include those listed above and northern harrier, grasshopper sparrow, dickcissel, bobolink, western meadowlark, Baird's sparrow, Leconte's sparrow, Sprague's pipit, piping plover, mountain plover, ferruginous hawk, least tern, upland sandpiper, chestnut-collared longspur, bobolink, prairie-chicken, sharp-tailed grouse. | | | |
| ***Other Species*** | | | |
| Greater Sage-Grouse | *Centrocercus urophasianus* | MT SWAP, WY SGCM, ID SGCN, ID S2, BLM special status species, ESA candidate list in 2010 | Carried forward as CE |
| BTPD | *Cynomys ludovicianus* | Keystone species and indicator of shortgrass prairie ecological integrity. Through its extensive burrowing and herbivory, this colonial species creates favorable conditions for the existence of many other species and is an important prey species for the endangered black-footed ferret and the declining ferruginous hawk and swift fox. MT-SWAP Tier I; WY-SGCN; ND-SoCP Level I; BLM-SOW; BLM-MT, ND, SD | Carried forward as CE |
| Swift Fox | *Vulpes velox* | G3; MT, ND, SD, WY; WY-SGCN; SD-SGCN; SD-ST; SD-S1; ND-SoCP Level II; BLM-MT, ND, SD; BLM-WY | Combined with BTPD |
| Burrowing Owl | *Athene cunicularia* | ND, SD, WY; WY-SGCN; SD-SGCN; SD- S3S4B, SZN; ND-SoCP Level II; BLM-MT, ND, SD, BLM-WY | Combined with BTPD |
| Black-Footed Ferret | *Mustela nigripes* | G1; LE, XN; MT, ND, SD, WY; MT-SWAP Tier I; WY-SGCN; SD-SGCN; SD-SE; SD-S1; ND-SoCP Level I | Combined with BTPD |
| Black-Backed Woodpecker | *Picoides arcticus* | Lack of consensus by AMT to carry forward | Not carried forward as Core CE |
| Ferruginous Hawk | *Buteo regalis* | ID, ND, SD, WY; WY-SGCN; SD-SGCN; SD-S4B, SZN; ND-SoCP Level I; BLM-SOW; BLM-MT, ND, SD, WY | Combined with BTPD |

## Appendix 5. Proposed Fine-Filter Conservation Elements for the Northwestern Plains Ecoregion (cont'd)

| Species Common Name or Species Assemblage | Species Scientific Name(s) | Rationale for Proposing the Species or Assemblage | AMT Decision[1] |
|---|---|---|---|
| ***Other Species (cont'd)*** | | | |
| Mountain Plover | *Charadrius montanus* | Proposed as a threatened species under Federal ESA June 29, 2010. G3; ESA-PT; MT, ND, SD, WY; MT-SWAP Tier I; WY-SGCN; BLM-MT, ND, SD | Combined with BTPD |
| Piping Plover | *Charadrius melodus* | Lack of AMT consensus by AMT to carry forward | Not carried forward as core CE |
| Plains Sharp-Tailed Grouse | *Tympanuchus phasianellus jamesi* | CE. MT, ND, WY; MT-SWAP-Tier I; WY-SGCN; ND-SoCP Level II; BLM-SOW; BLM-WY | Carried forward as CE |
| Black Tern | *Chlidonias nige* | WY–SWAP Tier II, SGCN; MT-SWAP Tier I; SD-SGCN, S3B, SZN; ND-SoCP Level I; BLM-MT, ND, SD- Lack of consensus to carry forward—some association with pothole wetlands/riparian areas | Not carried forward as Core CE |
| American White Pelican | *Pelecanus erythrorhynchos* | WY-SGCN; SD-SGCN, S3B, SZN; ND-SoCP Level I | Associated with BRFA |
| Trumpeter Swan | *Cygnus buccinator* | Lack of consensus by AMT to carry forward | Not carried forward as core CE |
| Peregrine Falcon | *Falco peregrinus* | WY-SGCN; ID-SGCN, S2B; ND-SoCP Level III; BLM-MT, ND, SD, WY | Combined with Avian Connectivity |
| Bald Eagle | *Haliaeetus leucocephalus* | ID, MT, WY. MT SWAP Tier I, WY-SGCN, Tier I, ID-SGCN, S3B, S4N; BLM-SOW, MT, SD | Combined with Avian Connectivity and BRFA |
| American Bison | *Bison bison bison* | Lack of consensus by AMT to carry forward | Not carried forward as core CE |
| Green Ash | *Fraxinus pennsylvanica* | Lack of consensus by AMT to carry forward | Not carried forward as core CE |
| Golden Eagle | *Aquila chrysaetos* | ND; ND-SoCP Level II; BLM-SOW; BLM-MT, ND, SD | Combined with Avian Connectivity and BRFA |
| Townsend's Big-eared Bat | *Corynorhinus townsendii* | MT-SWAP Tier 1, WY SGCN, SD SGCN, BLM-MT, ND, SD, WY | Combined with Avian Connectivity |

## Appendix 5. Proposed Fine-Filter Conservation Elements for the Northwestern Plains Ecoregion (cont'd)

| Species Common Name or Species Assemblage | Species Scientific Name(s) | Rationale for Proposing the Species or Assemblage | AMT Decision[1] |
|---|---|---|---|
| ***Big Game Species*** | | | |
| Mule Deer | *Odocoileus hemionus* | BLM SOW | Carried forward as CE - winter range and parturition areas |
| Pronghorn | Antilocapra *americana* | BLM SOW | Carried forward as CE – migration corridors |
| Big game species, in addition to their economic and recreational value, primarily make up the secondary production trophic level in the ecoregion, consuming the available vegetation in a variety of habitats (sagebrush, grasslands, shrublands, and wetlands). They are the prey species for the predators of several systems as well as for scavengers (turkey vulture, coyote, occasionally black bear). A limiting factor may be availability of winter and severe winter range, access to which has potential to be affected by climate change and energy development. | | | |
| ***Fish (Big River Fish Assemblage [BRFA])*** | | | |
| Pallid Sturgeon | *Scaphirhynchus albus* | WY–SWAP Tier I, SGCN; SD-SGCN, ST, S2; ND-SoCP Level I; BLM-MT, ND, SD | Carried forward as CE as part of the BRFA |
| Sturgeon Chub | *Macrhybopsis gelida* | WY–SWAP Tier I, SGCN; SD-SGCN, ST, S2; ND-SoCP Level I; BLM-MT, ND, SD | Carried forward as CE as part of the BRFA |
| Paddlefish | *Polyodon spathula* | MT–SWAP Tier I; SD-SGCN, S4; ND-SoCP Level II; BLM ND, SD, MT | Carried forward as CE as part of the BRFA |
| Sauger | *Sander canadensis* | MT, WY, MT-SWAP Tier I; BLM SOW | Carried forward as CE as part of the BRFA |
| Soft-Shelled Turtles<br><br>Smooth Softshell<br>Spiny Softshell | *Apalone mutica*<br>*Apalone spinifera* | ND, SD; SD-SGCN; SD-S2; ND-SoCP Level 3; BLM SOW<br>MT, WY; MT-SWAP Tier 1; WY-SGCN; SD-S2; BLM SOW; BLM MT, ND, SD | Carried forward as CE as part of the BRFA |

## Appendix 5. Proposed Fine-Filter Conservation Elements for the Northwestern Plains Ecoregion (cont'd)

| Species Common Name or Species Assemblage | Species Scientific Name(s) | Rationale for Proposing the Species or Assemblage | AMT Decision[1] |
|---|---|---|---|
| ***Fish (Prairie Fish Assemblage [PFA]) (cont'd)*** | | | |
| Pearl Dace | *Margariscus margarita* | ND Level I, SD–S2, MT-Tier I, WY-SGCN | Carried forward as part of the PFA Assemblage |
| Northern Redbelly X Finescale Dace | *Phoxinus eos* X *Phoxinus neogaeus* | WY–SWAP Tier II, SGCN; SD-SGCN, ST, SE; ND-SoCP Level II and III; BLM-MT, ND, SD | Carried forward as part of the PFA Assemblage |
| ***Communities*** | | | |
| Badlands/Breaks | River breaks and badlands (e.g., Upper Missouri River Break, MT; Bobcat draw, WY) are an example of a coarse-filter element that may not be adequately represented in the coarse-filter ecological system data in Appendix 2. These can be scenic areas with their juxtaposition of barren rock outcrops, trees, and prairie and provide habitat for a wide variety of species not otherwise able to persist in grassland ecosystems. Grazing management is under development to restore woody shrub species such as red-osier dogwood, chokecherry, serviceberry, currant, and gooseberry - all of which are highly important as food sources for mammals and birds. The Missouri Breaks provide home to at least 60 mammal species and hundreds of bird species. | | Captured in coarse-filter CE (Natural Barren Areas) |
| Prairie Pothole Wetlands | Wetlands in the formerly glaciated terrain in the northern and eastern part of the ecoregion are essential for waterfowl and shorebird breeding and migratory stopovers along the North American Central Flyway. These wetlands form part of a system of international importance but comprise such a small percentage of the ecoregion area, that they would be underrepresented in the Coarse Sieve analysis described above. | | Carried forward (Wetland/Riparian Areas) |

## Appendix 5. Proposed Fine-Filter Conservation Elements for the Northwestern Plains Ecoregion (cont'd)

| Species Common Name or Species Assemblage | Species Scientific Name(s) | Rationale for Proposing the Species or Assemblage | AMT Decision[1] |
|---|---|---|---|
| ***Other Species (cont'd)*** | | | |
| Long-Billed Curlew | *Numenius americanus* | ID, MT, SD, WY. MT-SWAP Tier I; WY-SGCN; SD-SGCN, S3B, SZN; ID-SGCN, S2B; BLM-MT,SD,WY<br>Uncommon shorebird during breeding season in this area, nesting in dry grasslands. These birds forage individually and fly/roost in loose flocks. Threats include habitat loss/degradation/alteration, changes to historical disturbance regimes, nest site disturbance by early season grazing, mowing, pesticide use, and other human activities. | Lack of consensus to carry forward as CE and associated with potholes and wetlands |
| Black Tern | *Chlidonias niger* | ID, MT, SD, WY. WY–SWAP Tier II, SGCN; MT-SWAP Tier I; WY-SGCN; SD-SGCN, S3B, SZN; ID-SGCN, S1B; BLM-MT,SD<br>Uncommon and local, this tern nests on marshy ponds and roosts with other terns on sandbars. Threats include habitat loss/degradation by conversion/drainage of wetlands, changes to historical disturbance regimes, vulnerability to weather conditions that destroy nests through wind, waves, or changing water levels; other water level manipulations that flood nests or make them vulnerable to predation; and pesticides/herbicides. | Lack of consensus to carry forward as CE |
| Townsend's Big Eared Bat | *Corynorhinus townsendii* | ID, MT, SD, WY. MT-SWAP Tier I; WY-SGCN; SD-SGCN, S2S3; BLM-MT, ND, SD, WY<br>Inhabits a variety of grasslands, shrubland, and forests using rock shelters, caves, and/or abandoned mines for roosts. Habitat loss/degradation occurs when caves and mines are closed or if roost sites and hibernacula are disturbed or vandalized. | Lack of consensus to carry forward as CE |

[1] Selection Criteria Used to Drop Species from Consideration as CEs:

- Strong association with one or more coarse-filter conservation elements (such as a specific GAP Level 3 ecological system).
- Association with a keystone or umbrella species identified as a CE
- Association with a species group or assemblage being carried forward as a CE
- Lack of consensus among the AMT to carry the species forward as a fine-filter CE, including a) insufficient ecological knowledge or lack of data, and b) not of regional conservation significance or strong agency concern throughout the ecoregion.

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