Appendix C

Environmental Scan Report

Fairview

CORRIDOR PLANNING STUDY

March 2015

Fairview

CORRIDOR PLANNING STUDY

Environmental Scan Report

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Abbreviations and Acronyms

ACS	American Community Survey
BG	Block Group
BOR	Bureau of Reclamation
CAPS	Crucial Areas Planning System
CEIC	Census and Economic Information Center
CFR	Code of Federal Regulations
CRABS	Cultural Resource Annotated Bibliography System
CRIS	Cultural Resource Information Systems
CT	Census Tract
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resources and Conservation
DOC	Montana Department of Commerce
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FPPA	Farmland Protection Policy Act
FWP	Montana Department of Fish, Wildlife, and Parks
LUST	Leaking Underground Storage Tank
LWCFA	Land and Water Conservation Fund Act
MBMG	Montana Bureau of Mines and Geology
MBTA	Migratory Bird Treaty Act
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MNHP	Montana Natural Heritage Program
MSATs	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NDDH	North Dakota Department of Health
NDGF	North Dakota Game and Fish
NDHUB	North Dakota GIS HUB Data Portal
NDSWC	North Dakota State Water Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System
NWI	National Wetlands Inventory
PM	Particulate Matter
RP	Reference Post
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Office
SOC	Species of Concern
SPC	Species of Conservation
T&E	Threatened and Endangered
USACE	United States Army Corps of Engineers
USC	United States Code
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank

1.0 Introduction

The primary objective of this environmental scan report is to provide a planning-level overview of physical, biological, social, and cultural resources and determine potential constraints and opportunities within the Fairview corridor study area. This scan is not a detailed environmental investigation.

If improvement options are forwarded from this study, an analysis for compliance with the National and Montana Environmental Policy Acts (NEPA and MEPA) and other applicable Montana and North Dakota environmental regulations will be completed as part of the Montana Department of Transportation (MDT) and the North Dakota Department of Transportation (NDDOT) project development process. Information provided in this report may be forwarded into the NEPA and/or MEPA process for future improvement options forwarded within Montana and North Dakota, at that time.

1.1 Study Area

Unlike most MDT corridor studies, this study crosses state boundaries. The Fairview corridor study area encompasses approximately 4,800 acres in northeastern Montana and northwestern North Dakota in Richland County, Montana, and McKenzie County, North Dakota. The southern boundary of the study area is located just south of Country Road (CR) 133 in Montana and 29th Street NW in North Dakota. The northern boundary is located north of 32nd Street NW in North Dakota. The study area eastern boundary follows a dirt road just west of Reference Post (RP) 1.0 on North Dakota Highway 200 (ND 200). The western boundary extends north and south from RP 68 on Montana Highway 201 (MT 201). The study area location is illustrated in Exhibit 1, and a topographic map of the study area is provided in Exhibit 2. For ease of reference, all exhibits are included in Attachment 1.

The study area is located within the Yellowstone River Valley. Based on a 2015 field review and aerial photography, land use within the study area primarily includes agricultural lands (cultivated and fallow fields), dispersed residential development, dispersed commercial/industrial development, undeveloped prairie grassland, and the developed town of Fairview. A system of irrigation ditches and canals crisscross the area. The portion of Montana 200 (MT 200) within the study area is classified as a principal arterial – non interstate, connecting the city of Sidney and the town of Fairview to North Dakota, North Dakota Highway 58 (ND 58), and the Bakken oil fields. When MT 200 crosses into North Dakota, and becomes ND 200, the highway classification changes to minor arterial – non interstate.

Information in this report was obtained from publically-available reports, websites, and documentation from both Montana and North Dakota. The level of detail provided for a given resource may vary depending on the data available from each state. In addition, each state has its own environmental policies and regulations, state agencies, and federal offices, which add to the complexity of a multi-state study process. These differences are noted in the following resource sections.

1.2 Goals of the Study

Within the Fairview area, substantial growth has occurred in recent years as a result of the energy boom in the Bakken oil fields. This has led to increased traffic, particularly truck traffic, and congestion. Currently, MT 200 bisects the town of Fairview, which has experienced increased truck traffic moving through the town. Because of this growth, MDT had identified a need for a planning study to investigate potential transportation improvement alternatives within the study area.

The goal of the study is to assess current and projected conditions in the Fairview area and identify options to address identified needs. The study will analyze alternative routes and attempt to minimize the cost of any selected route while considering and avoiding areas of environmental and social concern. Additionally, work products created as part of this study can be utilized in NEPA/MEPA studies undertaken for future projects. Quantm software will be used for corridor alignment scenarios.

2.0 Physical Environment

2.1 Soil Resources and Prime Farmland

Soils information was reviewed to determine the presence of prime and unique farmland in the study area to demonstrate compliance with the Farmland Protection Policy Act (FPPA). The FPPA is intended "to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland."

The term "farmland" refers to prime farmland; some prime if irrigated farmland; unique farmland; and farmland, other than prime or unique farmland, that is of statewide importance. Prime farmland soils are those that have the best combination of physical and chemical characteristics for producing food, feed, and forage; the area must also be available for these uses. Prime farmland can be either non-irrigated or lands that would be considered prime if irrigated. Farmland of statewide importance is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, forage, and oilseed crops.

Soil surveys of the study area are available from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (see Attachment 2). NRCS soil surveys (ND053 and MT083) from both Richland County, Montana, and McKenzie County, North Dakota, indicate the majority of the study area is either farmland of statewide importance or prime farmland if irrigated. Exhibit 3 (in Attachment 1) contains a map and descriptions of the farmland classification types found in the study area. There is a clear distinction in the way each state has classified their soils, with prime farmland if irrigated primarily occurring in Montana and farmland of statewide importance primarily occurring in North Dakota.

Improvement options should consider impacts to farmland and farmland infrastructure, and potential effects if farmland is removed from production. Any forwarded improvement options that require right-of-way within identified farmlands and are supported with federal funds will require a CPA-106 Farmland Conversion Impact Rating Form for Corridor Type Projects completed by MDT or NDDOT and coordinated with NRCS. The NRCS uses information from the impact rating form to keep inventory of prime and important farmlands within each state.

2.2 Geologic Resources

Information on the geology and seismicity in the study area was obtained from published sources, including both Montana and North Dakota geologic maps. Geologic mapping was reviewed for rock types, the presence of unconsolidated material, and fault lines. Seismicity and potential seismic hazards were also reviewed. This geologic information can help determine potential design and construction issues related to roadway improvement options. The following is a brief summary of the geologic and seismic conditions present in the study area.

Exhibit 4 (in Attachment 1) presents the surface geology within the study area. Tertiary Tongue River Member of the Fort Union Formation (Tftr), Quaternary alluvial terrace deposits (Qat), and Quaternary alluvium (Qor) make up a majority of the study area. Yellow, orange, or tan, fine- to medium-grained sandstone with thinner interbeds of siltstone and mudstone (Tftr) primarily make up the steeper slopes in the western portion of the study area, and is typical of the badland topography found in eastern Montana and western North Dakota. Alluvium and other unconsolidated deposits are found primarily below the steeper sandstone slopes within the central and eastern portions of the study area. These deposits include a mixture of gravel, sand, silt, and clay (Qat and Qor), and are associated with the plains and terraces of modern rivers and streams. Pockets of glacial till (Qgt) make up the higher elevations on the western slopes.

Typical surficial soils in the study area are AASHTO Soil Classification A-7-6, A-6, and A-4 (Unified Soil Classification CH, CL, and ML). In general, study area soils are considered to have moderate frost susceptibility which can affect pavement and other foundation engineering design. Moisture-sensitive soil can be expected and may affect future construction activities. Future cut slope and embankment design associated with forwarded improvements will need to incorporate stability, erosion, and settlement evaluation due to the prevalence of fine-grained soil in the study area.

Montana is a seismically-active state; however, most seismic activity is concentrated in the mountainous western third of the state. Eastern Montana and western North Dakota experience less seismic activity, with only one significant earthquake occurring in northeastern Montana in 1909. No faults have been mapped within or near the study area in eastern Montana or western North Dakota. In addition, the study area, along with most of eastern Montana and western North Dakota, is located within a Seismic Hazard Zone that is not prone to liquefaction and intense ground motion (see Attachment 3).

In 2005, MDT completed a statewide study of rockfall hazards and mitigation measures. The Rockfall Hazard Rating System report did not identify any sites within the study area that were identified as potential hazards. A similar hazard study has not been conducted by NDDOT.

2.3 Surface Waters

Topographic maps, aerial photographs, and geographic information system (GIS) data were reviewed for both Richland County, Montana, and McKenzie County, North Dakota, to identify the location of surface water bodies within the study area, including rivers, streams, lakes, and reservoirs. There is very little surface water within the study area. One unnamed stream crosses the northwestern corner of the study area, and some small ephemeral drainages cut through the western sandstone slopes. The Main Canal, which flows south to north through the study area, is a large surface water shown on U.S. Geological Survey (USGS) topographic maps as a stream. However, the Main Canal is a man-made irrigation feature that flows seasonally and is discussed in more detail in Section 2.6. No streams or drainages were identified in the eastern portion of the study area (within North Dakota). Freshwater ponds within the study area include a small man-made pond located in East Fairview (North Dakota) and the Town of Fairview sewer lagoons located on CR 133. Exhibit 5 (in Attachment 1) contains maps depicting surface waters found in the study area.

Improvement options should consider potential impacts to surface waters and the costs that may be associated with permitting and potential mitigation. Coordination with federal, state, and local agencies may be necessary, as work within these surface waters may be regulated by the United States Army Corps of Engineers (USACE), including both the Montana and North Dakota Regulatory Offices; Montana Fish, Wildlife & Parks (FWP); the Montana Department of Environmental Quality (DEQ), and the North Dakota Department of Health (NDDH). In addition, forwarded improvement options may trigger the need to obtain coverage under the Montana Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity, the North Dakota Pollutant Discharge Elimination System General Permit for Storm Water Discharges from Construction Activities, and comply with the requirements outlined in MDT's and NDDOT's Storm Water Management Plans.

Total Maximum Daily Loads

The study area (including North Dakota and Montana) is located within the Lower Yellowstone Watershed (hydrologic unit code (HUC) 10100004). Information on the Yellowstone River and its tributaries within the study area was obtained from the DEQ website and the NDDH website. Section 303 subsection "d" of the Clean Water Act requires the State of Montana and the State of North Dakota to develop a list, subject to United States Environmental Protection Agency (USEPA) approval, of water bodies that do not meet water quality standards. When water quality fails to meet state water quality standards, DEQ and NDDH determine the causes and sources of pollutants and set maximum pollutant levels, called total maximum daily loads (TMDL). Neither the DEQ nor the NDDH, in their Integrated Section 304(b) and Section 303(d) Water Quality Reports, list any waterbodies within the study area as having an impairment. The closest downstream impaired water is the Yellowstone River, which DEQ lists as impaired for stream alteration, chromium, copper, fish-passage barrier, lead, nitrogen, phosphorus, sediment, total dissolved solids, and pH. The NDDH does not list the Yellowstone River as impaired.

Should improvement options be advanced from this study, it will be necessary to consider downstream TMDL standards within the Yellowstone River and potential impacts to water quality within receiving waterbodies in the study area.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act, created by Congress in 1968, provides for the protection of certain rivers, and their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, or cultural resources, or other similar values. Based on a review of the United States National Park Service website, there are no wild or scenic rivers within the study area.

2.4 Wetlands

The USACE defines wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping data is available for this area from the NWI website, the Montana Natural Resource Information System (NRIS), or the North Dakota GIS HUB Data Portal (NDHUB). While some useful information can be ascertained from the NWI maps, these maps are based on the USFWS definition of wetlands, which does not follow the USACE definition that MDT and NDDOT uses in wetland determination and delineation. NWI maps are typically generated based on aerial and satellite imagery, and are not sufficiently accurate or detailed for MDT/NDDOT project wetland determination and/or delineation. NWI mapping is depicted in Exhibit 5 (in Attachment 1).

Photo 1. Ditch paralleling CR 133 with wetland fringe. Photo taken in July 2013 for the Sidney to Fairview project.

No large emergent, shrub-scrub, or forested wetlands were observed during the February 25, 2015, field review; however, dead wetland vegetation, including sedge (*Carex* sp.), horsetail (*Equisetum* sp.), and cattail (*Typha angustifolia*), was observed along the edges of several irrigation ditches/canals within the study area. Based on previous delineations conducted for the MDT Sidney to Fairview project, narrow emergent wetland fringe is common along the banks of irrigation ditches/canals within the study area vicinity and emergent wetland fringe would likely be found to some degree along most irrigation ditches/canals within the study area.

Improvement options should consider potential impacts to wetlands and the costs that may be associated with permitting and potential mitigation. Future wetland delineations would be required if improvement options are forwarded from the study that could potentially impact irrigation ditches where fringe wetland may occur. Future improvements would need to incorporate project design features to avoid and minimize adverse impacts to wetlands to the maximum extent practicable. Work within USACE jurisdictional wetlands would require a Clean Water Act 404 permit. Unavoidable impacts to wetlands must be compensated through mitigation in accordance with USACE regulatory requirements and requirements of Executive Order 11990. However, the 2005 USACE Montana Mitigation Ratio Policy states that relocation of regulated ditches and canals that support wetlands will be considered self-mitigating (compensatory mitigation not required) if the new channel is dimensionally similar in cross-section and profile, and in the same type of substrate. Mitigation would need to be sought early in the planning process, as MDT currently does not have wetland mitigation sites within the Lower Yellowstone Watershed. The locations of NDDOT wetland mitigation banks are not available.

2.5 Groundwater

According to the Montana Bureau of Mines and Geology (MBMG) Groundwater Information Center (GWIC) and the North Dakota State Water Commission (NDSWC), there are 4,467 wells on record in Richland County, Montana, and 1,207 wells on record in McKenzie County, North Dakota. Approximately 164 of these wells are located within or immediately adjacent to the study area, particularly within and surrounding the town of Fairview. As of February 2015, the newest well on record for Richland County was February 20, 2015, and the oldest well on record was from January 1, 1890. The majority of wells within Richland County (approximately 2,671) are at a depth of 0 to 99 feet. The deepest well within the study area (Richland County) is at 1,360 feet. The wells in Richland and McKenzie Counties have widely varying uses, with stock water being the most common, followed by domestic use. Several public water supply and groundwater wells occur within Fairview. Groundwater data, such as well locations and information for Richland County, Montana, and McKenzie County, North Dakota, is presented in Exhibit 6 (in Attachment 1) and Attachment 4.

Impacts to existing wells will need to be considered during future project development of improvement options. While there are fewer groundwater wells to the east and southeast of Fairview, impacting one of these wells may be costly if replacement is required.

2.6 Irrigation

The study area is within the Lower Yellowstone Irrigation District. Irrigation water is supplied to farmers and ranchers in the area through the Lower Yellowstone Project, a system of canals, laterals, ditches, and drains that crisscross portions of eastern Montana and western North Dakota. According to the U.S. Department of Interior Bureau of Reclamation (BOR) 1993 report on the Lower Yellowstone Project, water is diverted from the Yellowstone River by the Yellowstone Diversion Dam, 18 miles below Glendive, Montana. The diverted water flows into the Main Canal, which is a 71.6-mile long canal that flows northeasterly along the western edge of the Yellowstone River Valley to its confluence with the Missouri River. Approximately 225 miles of laterals distribute water to project lands. Seepage is collected and disposed of by 118 miles of irrigation drains. Irrigation waters are distributed primarily through a gravity flow system. The Lower Yellowstone Project provides irrigation water to approximately 52,133 acres of land lying along the west bank of the Yellowstone River.

Within the study area, the Main Canal flows south to north along the western edge of the Yellowstone River Valley and the town of Fairview. Six lateral ditches flow west to east though the study area, providing diverted irrigation water to farmland in the area. A number of farm turnouts divert water from the laterals to individual farms via a smaller ditch network that provides water for flood irrigation or use of large pivots. Two irrigation drains cross through the eastern portion of the study area collecting irrigation waste water and seepage, which is discharged back into the Yellowstone River. Irrigation facilities within the study area are presented in Exhibit 7 (in Attachment 1). The Main Canal, the six lateral ditches, and the two irrigation drains all discharge water back into either the Missouri or Yellowstone Rivers. Irrigation ditches/canals with return flow to a water of the United States are considered jurisdictional by the USACE.

Photo 2. Main Canal at CR 134. Photo taken in February 2015.

Irrigation facilities are likely to be impacted by improvement options forwarded from the study, given the extent of irrigation infrastructure within the study area. Impacts to irrigation facilities should be avoided to the greatest extent practicable, particularly where large pivots are located as these are costly to mitigate. Any future modifications to existing irrigation canals, ditches, or drains would be redesigned and constructed in consultation with the irrigation district, BOR, and owners to minimize impacts to agricultural operations. In addition, work within these irrigation ditches/canals may be regulated by the USACE Montana and North Dakota Regulatory Offices, the DEQ, and the NDDH.

2.7 Floodplains and Floodways

Executive Order (EO) 11988, Floodplain Management, requires federal agencies to avoid to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities" for the following actions:

- acquiring, managing, and disposing of federal lands and facilities;
- providing federally-undertaken, financed, or assisted construction and improvements; and
- conducting federal activities and programs affecting land use, including but not limited to, water and related land resources planning, regulation, and licensing activities.

In addition, Federal-aid Policy Guide, 23 CFR 650, Bridges, Structures, and Hydraulics, provides “policies and procedures for the location and hydraulic design of highway encroachments on flood plains, including direct Federal highway projects administered by the [Federal Highway Administration (FHWA)].” This regulation calls for the assessment of federally-funded highway projects in terms of impacts on flood risk, where such projects must avoid hazardous or incompatible use and development of floodplains, avoid longitudinal or substantial floodplain encroachment, minimize negative impacts on base flood elevations, restore and preserve natural and beneficial floodplain values, and be consistent with Federal Emergency Management Agency (FEMA), state, and local government standards for the administration of the National Flood Insurance Program.

FEMA-issued flood insurance rate maps (FIRM) for Richland County, Montana, and preliminary flood hazard data maps for McKenzie County, North Dakota, indicate that three floodplain zones exist within the study area (see Exhibit 8 in Attachment 1):

<u>Zone A</u>: Special Flood Hazard Area (SFHA) - 100-Year Flood, No Base Flood Elevations Determined;

<u>Zone D</u>: Flood Hazards Undetermined, but possible; and

<u>Zone X</u>: Areas Outside the 500-Year Flood.

Flood Zone A designated within Richland County, Montana, stops at the North Dakota border. A FIRM map does not currently exist for this portion of McKenzie County, North

Dakota. Preliminary flood hazard data indicates “no special flood hazard areas;” however, this delineated Flood Zone A could extend into North Dakota.

Improvement options crossing the delineated flood hazard area would result in the placement of fill within the regulatory floodplain. Impacts to floodplains would need to be identified and evaluated, and coordination with Richland County, Montana, and McKenzie County, North Dakota, would be required to obtain necessary floodplain permits for project construction. Coordination with both counties would likely be required for improvement options with undetermined flood hazard areas, or areas outside of the 500-year flood; however, floodplain permits would not be anticipated.

2.8 Air Quality

The USEPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants, including carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide, and lead. The USEPA designates communities that do not meet NAAQS as “non-attainment areas.” States are required to develop a plan to control source emissions and ensure future attainment of NAAQS. A review of the DEQ and NDDH websites indicate that the study area is not located in a non-attainment area for any of the criteria pollutants. Additionally, there are no nearby non-attainment areas. As a result, special design considerations are not anticipated in future project design to accommodate NAAQS non-attainment issues.

Depending on the scope of improvements being considered within the study area, an evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment which are known or suspected to cause cancer or other serious health and environmental effects.

2.9 Hazardous Substances

Reviews of the NRIS database, the MBMG database, the DEQ database, and the National Pipeline Mapping System were conducted to obtain available information on underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, petroleum release fund claims, mining districts, abandoned mine sites, remediation response sites, landfills, National Priority List sites, open cut permits, hazardous waste, oil and gas pipelines, toxic release inventory sites, and oil wells/directionals within Montana. Reviews of the NDDH website and NDHUB were conducted to obtain available data in North Dakota on LUST sites, UST sites, abandoned mine sites, landfills, oil wells/directional, and spill sites due to fracking operations. Currently, there is no mapped data in Montana for reported spills due to fracking.

Based on available information obtained in February 2015, ten active USTs, eight LUSTs, four petroleum release fund claims, eight abandoned or inactive mine sites, four open cut permits, the town of Fairview sewer lagoon, several oil and gas wells and horizontal drilling paths, one gas transmission pipeline, and three reported oil spills were identified within the study area. The following is a brief summary of the primary sites within the study area and potential contamination impacts, which should be avoided if possible.

Underground Storage Tanks

Ten active USTs were identified within the study area. Nine were identified within the Fairview town limits and one was identified in North Dakota on 29th Street NW. These

UST locations are provided on Exhibit 9 in Attachment 1, with the two black stars representing the location of all nine UST sites in Montana. Additional investigation regarding the precise locations of the USTs may be warranted if improvement options are forwarded from this study.

Leaking Underground Storage Tanks and Petroleum Release Fund Claims

Eight LUSTs were identified within the study area, all of which are found in Montana. Five of these LUSTs do not correlate with the Active UST database (see Exhibit 9 in Attachment 1). Table 1 provides a list of the LUSTs identified in the study area. Four of these LUSTs are found at two facilities. Four petroleum release fund claims were also identified at four of the LUSTs.

Improvement options located where LUSTs or contaminated soils are encountered would likely require removal and cleanup in accordance with MDT (107-22) and NDDOT (203-P01) special provisions regarding contaminated soil and applicable federal, state, and local laws and regulations. This cleanup may result in additional project construction time and cost.

Table 1. LUST Incidents within Study Area

Facility ID#	Facility Name	Town	Status	Confirmed Date	Resolved Date
4208227	Loren Young, INC. #2221	Fairview	Active	5/25/1994	NA
4203363	Farmers Union Oil Co Fairview #3606	Fairview	Active	12/3/1998	NA
4203363	Farmers Union Oil Co Fairview #2227	Fairview	Release Resolved	5/19/1994	5/3/1996
4203914	Mini Mart 714 #2262	Fairview	Active	7/18/1994	NA
4204828	Bob's Tire Service #3053	Fairview	Active	11/4/1996	NA
4208642	Shannon Oil #3108	Fairview	Release Resolved	1/12/1997	3/6/1998
4208642	Ferrell Gas Former Shannon Oil #4380	Fairview	Release Resolved	12/1/2004	2/3/2011
4206505	Robert R. Johnson #1899	Fairview	Release Resolved	10/13/1993	12/13/1993

Source: DEQ, 2015.

Abandoned and Inactive Mine Sites

Eight abandoned and inactive mines are located within the study area (see Exhibit 9 in Attachment 1). If improvements are proposed in this area, these sites have the potential to affect project design and construction, and additional investigation may be necessary.

Open Cut Permits

Open cut permits are permits required for open cut mining of bentonite, clay, scoria, soil materials, peat, sand or gravel. Four open cut permits were identified in the northwestern portion of the study area (see Attachment 5). If improvements are proposed in this area, additional coordination may be required.

Oil and Gas

Eighteen oil wells and two injection disposal wells have been documented within the study area. Additionally, several horizontal directionals extend north and south through the study area (see Exhibit 9 in Attachment 1). An underground natural gas transmission pipeline, operated by WBI Energy Transmission, Inc., bisects the southeastern corner of the study area in both Montana and North Dakota (see Attachment 5). North Dakota spill data indicates three spills, one saltwater/brine and two oil spills, within the study area since 2013 (see Attachment 5).

Improvements near oil wells and improvements crossing the underground natural gas transmission pipeline would require additional investigation and coordination with oil and gas representatives. Improvements near known oil and brine spills may require removal and cleanup in accordance with MDT (107-22) and NDDOT (203-P01) special provisions regarding contaminated soil and applicable federal, state, and local laws and regulations. This cleanup may result in additional project construction time and cost.

3.0 Biological Resources

3.1 Vegetation

The study area is within the larger River Breaks ecoregion of the Northwestern Great Plains. The River Breaks ecoregion is composed of very highly dissected terraces and uplands that descend to the Missouri and Yellowstone river systems. This ecoregion is dissected to a greater extent than the surrounding ecoregions by uncultivated areas, wooded draws and a number of ephemeral drainages that occur between rolling hills, all of which provide valuable winter and summer wildlife habitat.

Within the study area itself, Montana and North Dakota land cover maps show the area is dominated by a combination of deciduous-dominated draws and ravines, cultivated crops, Great Plains sand prairie, Great Plains mixed prairie grasslands, and pasture/hay habitat. Other land cover in the study area includes quarries, strip mines and gravel pits; developed open space; high-intensity residential; low-density residential; and commercial/industrial (refer to Exhibit 10 in Attachment 1 and Attachment 6).

A large portion of the study area has been disturbed either by cultivation; road and highway construction; and residential, oil, commercial, and industrial development. Cultivated crop land includes crops such as sugar beets, corn, and alfalfa. Other plant species observed within the study area and vicinity during the February 2015 field visit and during previous field visits conducted in the Sidney/Fairview area (2013) include eastern cottonwood (*Populus deltoides*), Russian olive (*Elaeagnus angustifolia*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), common dandelion (*Taraxacum officinale*), and showy milkweed (*Asclepias speciose*). Various landscape and ornamental plants are found around residences and within the town of Fairview.

Photo 3. Crop land south of CR 133. Photo taken in July 2013 for the Sidney to Fairview project.

Native vegetation, which is primarily located along the western study area limits, and large stands of trees and shrubs should be considered during improvement option identification to minimize removal of native vegetation and mature trees and shrubs. If improvement options are forwarded from the study, practices outlined in MDT standard specifications (including staking construction limits, avoiding damage to vegetation not designated for removal, and replacing damaged or destroyed vegetation) and NDDOT standard specifications (which include designating construction limits and vegetation to be preserved) should be followed to minimize adverse impacts to vegetation.

Noxious Weeds

Noxious weeds can degrade native vegetative communities, damage riparian areas, compete with native plants, create fire hazards, degrade agricultural and recreational lands, and pose threats to the viability of livestock, humans, and wildlife. Areas with a history of disturbance, like highway rights-of-way and fallow fields, are at particular risk of weed encroachment.

The Invaders Database System lists seven weed species considered noxious in Montana and 55 exotic species for Richland County, Montana. North Dakota Department of Agriculture Weed Surveys for McKenzie County list 13 weed species considered noxious in North Dakota, all of which are also exotic species (Attachment 7). From previous vegetation surveys conducted in the Sidney/Fairview area (2013), several noxious weeds have been observed in the area and are listed in Table 2.

Table 2. Noxious Weeds Found within the Study Area Vicinity

Common Name	Scientific Name	Montana Priority[1,2]
Canada thistle	*Cirsium arvense*	2B
Cheatgrass	*Bromus tectorum*	3
Dalmatian toadflax	*Linaria dalmatica*	2B
Field bindweed	*Convolvulus arvensis*	2B
Houndstongue	*Cynoglossum officinale*	2B
Leafy spurge	*Euphorbia esula*	2B
Russian olive	*Elaeagnus angustifolia*	3
Spotted knapweed	*Centaurea stoebe or maculosa*	2B

[1]Priority 2B: Weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containments where less abundant. Priority 3: These plants are not noxious weeds but have the potential to have significant negative impacts.
[2] North Dakota does not designate noxious weed priorities.

If improvements are forwarded from the study, field surveys for noxious weeds should commence prior to any ground disturbance and coordination with the Richland County Weed Control Board and the McKenzie County Weed Control Board should occur. To reduce the spread and establishment of noxious weeds and to re-establish permanent vegetation, disturbed areas should be seeded with desirable native plant species.

3.2 General Wildlife Species

Mammals

A majority of the study area has been heavily disturbed by various agricultural practices and residential development; however, small wooded draws still bisect the western portion of the study area. These small, wooded drainage corridors still possess specimens of the native vegetation that was likely present in this area prior to its conversion to agriculture. These corridors are important wildlife corridors for mammals moving from the upper badlands down to the Yellowstone River valley.

According to Montana Natural Heritage Program (MNHP) Natural Heritage Tracker database, which records and maps documented observations of species in a known location, the study area and vicinity are home to a number of mammal species including, but not limited to, white-tailed deer, mule deer, raccoon, striped skunk, porcupine, bobcat, beaver, muskrat, deer mouse, and northern grasshopper mouse (Attachment 8). North Dakota Game and Fish (NDGF) does not currently have an observation tracker database for wildlife species in North Dakota, but it is assumed that most species listed in the Montana portion of the study area would likely be found in the North Dakota portion of the study area as well.

White-tailed and mule deer are prevalent within the study area and the surrounding vicinity. Both FWP and NDGF include all of the study area and general vicinity as general/secondary range for mule deer. FWP includes the study area as general and winter range for white-tailed deer. The entire study area and surrounding vicinity are also located within the distribution range for pronghorn, with NDGF designating the study area and vicinity as primary pronghorn range, and FWP designating the study area and vicinity as general range. In addition, NDGF also designates the study area and surrounding vicinity as primary range for black-tailed prairie dog (refer to Attachment 9 for FWP and NDGF range distribution maps).

A review of the MDT Maintenance animal incident database between December 21, 2004, and November 15, 2012, indicates that at least five animal carcasses were collected along the existing MT 200 corridor (RP 61.5 to RP 64.1). All five animal carcasses were white-tailed deer. Carcass data may not accurately reflect animal-vehicle conflicts throughout the corridor, and not all carcasses result from vehicle collisions. Additionally, recently-approved legislation has permitted the collection of game animals killed on MT roadsides for personal consumption. These factors may affect collections and incidents reported in the MDT maintenance animal incident database. NDDOT does not currently have a carcass data program.

If improvement options are forwarded from the study, impacts to habitat and other wildlife mitigation strategies should be considered during the project development process. Additional coordination with MDT, FWP and NDGF area wildlife biologists should be undertaken for local expertise in the study area.

Amphibians and Reptiles

According to the MNHP Natural Heritage Tracker database, amphibian species known to occur within the study area and vicinity include, but are not limited to, the northern leopard frog and the plains gartersnake (Attachment 8). No observation data is currently available for North Dakota.

Birds

As noted in previous sections, the conversion of the study area to agricultural, commercial, and residential use has greatly reduced the native vegetation in the area. Nesting habitat for bird species is limited to pockets of native grassland and wooded draws that primarily occur within the western portion of the study area, landscaped trees and shrubs in residential/commercial areas, and the occasional vegetated wind break that surrounds some of the homes in the study area. A grove of cottonwood trees is found at the corner of CR 133 and MT 200.

The MNHP Natural Heritage Tracker database indicates there are more than 61 species of birds documented with the potential to occur and nest in the study area. These species include representative songbirds, birds of prey, waterfowl, owls, and shorebirds (Attachment 8). FWP also maps a portion the study area and vicinity as within the distribution range for sharp-tailed grouse (Attachment 9). No observation data is currently available for North Dakota; however, it is assumed that most species listed in the Montana portion of the study area would likely be found in the North Dakota portion of the study area as well.

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). Under this strict liability law, it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any migratory bird, part, nest, egg or product, manufactured or not. Direct disturbance of a nest occupied with birds or eggs is prohibited under the law. The destruction of unoccupied nests of eagles; colonial nesters such as cormorants, herons, and pelicans; and some ground nesters such as burrowing owls or bank swallows may also be prohibited under the MBTA.

Bald and golden eagles are protected under the MBTA and managed under the Bald and Golden Eagle Protection Act, which prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle or golden eagle, alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." A review of FWP and MNHP data was conducted to determine the presence of nesting bald and golden eagles in the study area and vicinity. According to FWP 2012 data, no bald eagle nests are located within the study area. The closest nest recorded is located over ten miles southeast of Fairview on the Yellowstone River; however, there is potential for bald eagles to forage and travel through the study area. Bald eagle nest data for North Dakota is not available. With regard to golden eagles, the MNHP database does not list the species within the study area or vicinity; however, NDGF includes the study area and surrounding vicinity as primary golden eagle breeding range (Attachment 9).

Any improvements forwarded from this study should consider potential impacts to bird nesting and foraging habitat and the presence of unknown or future bald and golden eagle nests. The disturbance or removal of trees or structures associated with nesting birds may need to be scheduled to take place outside of the typical nesting season of April 15 to August 15.

Fisheries

Surface waters within the study area primarily include seasonal irrigation ditches and canals, small ephemeral drainages, and roadside drainage, which are not considered suitable habitat for aquatic species. The closest water bodies that support fisheries are the Yellowstone River (approximately two miles east of the study area) and the Missouri River (approximately six miles north of the study area). Given that the source of water for the Main Canal is the Yellowstone River, which then outlets at the Missouri River, some fish may be present in the Main Canal despite efforts by the BOR, the Lower Yellowstone Irrigation District, and FWP to prevent fish entrainment. Some individual fish may make their way from the Main Canal down the smaller irrigation ditches during the summer irrigation season. However, general irrigation practices likely affect these small populations to some extent when conveyance is ceased each fall.

Crucial Areas Planning System and Action Plan Focus Areas

The FWP Crucial Areas Planning System (CAPS) is a resource intended to provide non-regulatory information during early planning stages of projects, conservation opportunities, and environmental review. The finest data resolution within CAPS is at the square-mile section scale or water body. Use of these data layers at a more localized scale is not appropriate and may lead to inaccurate interpretations since the classification may or may not apply to the entire square-mile section. The CAPS system was consulted to provide a general overview of the study area. In general, that study area contains Class I, II, III, and IV ranked areas for Terrestrial Conservation Species and contains Class II, III, and IV ranked areas for Terrestrial Species Richness. The study area does not contain any ranked drainages for Aquatic Connectivity or any ranked drainages for Fish Native Species Richness. CAPS results are presented in Attachment 10.

The online CAPS mapping tool provides FWP general recommendations and recommendations specific to transportation projects for both terrestrial and aquatic species and habitat. These recommendations can be applied generically to possible future improvements carried forward from the study.

NDGF does not have a planning system similar to the FWP CAPS resource; however, NDGF developed a North Dakota Wildlife Action Plan in 2005 which promotes a comprehensive approach to habitat and wildlife management to leverage conservation of all species. While the action plan primarily focuses on species of conservation priority, it also includes information on all wildlife species that occur in North Dakota. Action plan focus areas represent unique and rare natural community types or habitats considered of high importance to species identified as conservation priorities. For each focus area, a number of conservation actions are outlined. The study area and vicinity are located within the Missouri Breaks Action Plan Focus Area. Coordination with NDGF would be required for any improvement options carried forward from this study.

3.3 Threatened and Endangered Species

The federal list of threatened and endangered (T&E) species is maintained by the USFWS. Species on this list receive protection under the Endangered Species Act (ESA). An “endangered” species is in danger of extinction throughout all or a significant portion of its range. A “threatened” species is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list. According to the USFWS, 11 threatened, proposed threatened, or candidate species are listed as occurring in Richland County, Montana, and McKenzie County, North Dakota (see Table 3 and Attachment 11).

In addition to the species listed below, Richland County, Montana, and McKenzie County, North Dakota, contain designated critical habitat for the piping plover and are both within the whooping crane migration corridor. McKenzie County, North Dakota, also contains proposed critical habitat for the Dakota skipper, a threatened insect.

Table 3. T&E Species in Richland County, MT & McKenzie County, ND

Species		Status
Bird Species	Greater sage-grouse	Candidate[1]
	Interior least tern	Endangered
	Piping plover	Threatened
	Red knot	Threatened
	Sprague's pipit	Candidate
	Whooping crane	Endangered
Fish Species	Pallid sturgeon	Endangered
Insect Species	Dakota skipper	Threatened
Mammal Species	Black-footed ferret	Endangered
	Gray wolf	Endangered
	Northern long-eared bat	Threatened

Source: USFWS, 2015.

According to the MNHP March 3, 2015, database, no T&E species occurrences have been documented within the study area, and USFWS maps show no critical habitat for T&E species within the study area; however, three T&E species have been documented as occurring outside of the study area in the general vicinity (refer to map in Attachment 13). These species include the Interior least tern, whooping crane, and pallid sturgeon. No observation data is currently available for North Dakota. In addition, the study area is within the far western range of the northern long-eared bat, and some suitable habitat, including abandoned mines and small riparian draws, is found at the western study area limits.

With regard to the greater sage-grouse, no suitable habitat is found within the study area; however, the study area sits along the border of the USFWS Sage-Grouse Great Plains Management Zone. Montana Governor Steve Bullock established, by Executive Order, the Greater Sage-Grouse Habitat Conservation Advisory Council on February 2, 2013. The purpose of the Council was to "to gather information, furnish advice, and provide to the governor recommendations on policies and actions for a state-wide strategy to preclude the need to list the greater sage-grouse under the ESA", by no later than January 31, 2014. The Council was co-chaired by FWP Director, Jeff Hagener, and the Governor's Natural Resources Policy Advisor, Tim Baker. Council members included representatives from agriculture and ranching, conservation and sportsmen, energy,

[1] On September 22, 2015 the U.S. Fish and Wildlife Service determined that the protection for the greater sage grouse under the Endangered Species Act is no longer warranted and is withdrawing the species from the candidate species list. MDT will continue to follow the stipulations for the conservation of the greater sage grouse contained in the State of Montana – Office of the Governor – Executive Order No. 12-2015 "Executive Order Amending and Providing for the implementation of the Montana Sage Grouse Conservation Strategy".

mining and power transmission, tribal government, local government, and the legislature. The council has concluded its work and provided recommendations to the Governor's office in the form of a "Montana Strategy to address threats to the Sage-Grouse in Montana" (Attachment 12).

While T&E species listed for both counties are not likely to occur within the study area, improvements forwarded from the study should consider potential effects to T&E species during the project development process. As federal status of protected species changes over time, reevaluation of the listed status and afforded protection to each species should be completed prior to issuing a determination of effect relative to potential impacts. Surveys of abandoned mines with open shafts and riparian draws should be undertaken to determine the presence of northern long-eared bat, if improvement options along the western study area limits are proposed. In addition, recommendations outlined in Montana's sage-grouse conservation plan should also be taken into consideration during development of improvement options.

3.4 Species of Concern and Species of Conservation

Montana species of concern (SOC) and North Dakota species of conservation (SPC) are native plants or native animals breeding in the state that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution. Designation of a species as a Montana SOC or a North Dakota SPC is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision makers to direct limited resources to priority data collection needs and address conservation needs proactively. In Montana, each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). State ranks may be followed by modifiers, such as B (breeding) or N (non-breeding). In North Dakota, species are categorized into three levels that ranges from Level 1 (greatest need of conservation), Level 2 (in need of conservation, but have had support from other wildlife programs), and Level 3 (in moderate need of conservation, but believed to be on the edge of their range in North Dakota).

A search of the MNHP species of special concern database on March 3, 2015, revealed ten SOC documented within the vicinity of the study area, primarily along the Yellowstone River (Table 4 and Attachment 13). NDGF does not currently have an observation tracker database for SPC in North Dakota; however, several of the SOC documented in Montana are also SPC in North Dakota. According to the MDT area biologist, given the highly disturbed nature of the study area, the distance from the Yellowstone River, and the limited aquatic resources within the area, SOC and SPC listed in Table 4 would likely not be present within the study area due to lack of suitable habitat and human-based activities.

Table 4. Species of Concern and Species of Conservation Documented Within the Study Area Vicinity

Animal Subgroup	Common Name	State Rank	Habitat Description
Birds	Interior least tern	S1B (MT) Level 2 (ND)	Unvegetated shorelines and sandbars
	Whooping crane	S1M (MT) Level 3 (ND)	Wetlands and marshes

Animal Subgroup	Common Name	State Rank	Habitat Description
Fish Fish	Blue sucker	S2,S3 (MT) Level 1 (ND)	Large, swift rivers
	Paddlefish	S2 (MT) Level 2 (ND)	Large, slow rivers or impoundments
	Pallid sturgeon	S1 (MT) Level 2 (ND)	Large, turbid rivers
	Sauger	S2 (MT)	Large, turbid rivers or impoundments
	Sicklefin chub	S1 (MT) Level 1 (ND)	Large, turbid rivers
	Shortnose gar	S1 (MT)	Large, slow rivers
	Sturgeon chub	S2,S3 (MT) Level 1 (ND)	Swift, turbid rivers
Reptiles	Spiny softshell	S3 (MT)	Large rivers and backwaters

Source: MNHP, 2015.

In addition, while the greater sage-grouse is not documented within the study area or study area vicinity, the study area is adjacent to the USFWS Sage-Grouse Great Plains Management Zone.

A thorough field investigation for the presence of SOC and SPC should be conducted if improvement options are forwarded from this study. If present, special conditions to the project design or during construction should be considered to avoid or minimize impacts to these species. Recommendations outlined in Montana's sage-grouse plan should also be taken into consideration during identification of improvement options.

4.0 Social and Cultural Resources

4.1 Population Demographics and Economic Conditions

Demographics

Under NEPA/MEPA and associated implementing regulations, state and federal agencies are required to assess potential social and economic impacts resulting from proposed actions. FHWA guidelines recommend consideration of impacts to neighborhoods and community cohesion, social groups including minority populations, local and/or regional economies, as well as growth and development that may be induced by transportation improvements. Demographic and economic information presented in this section is intended to assist in identifying human populations that may be affected by improvements within the study area.

Title VI of the United States Civil Rights Act of 1964, as amended (USC 2000(d)), ensures that individuals are not excluded from participation in, denied the benefits of, or subjected to discrimination under any program or activity receiving federal financial assistance on the basis of race, color, national origin, age, sex, and disability. Executive Order 12898 directs that federal programs, policies, and activities do not have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

The study area is within Richland County, Montana, and McKenzie County, North Dakota. Data from the 2010 U.S. Census Bureau (USCB) were used to provide information on the presence of protected populations. Data specific to the study area were evaluated to assess the demographic composition at the block group level (Census Track [CT] 701, Block Group [BG] 1 and Census Tract 9625, Block Group 1) and were compared with the percentages of corresponding county and state occurrences. Summary File 1 of the 2010 Census was used to obtain information on the presence of racial and ethnic minorities and the elderly. The 2009-2013 American Community Survey (ACS) was used to obtain information on the presence of persons living below the poverty level. Tables 5 and 6 summarize population and demographic data.

Table 5. Racial and Ethnic Demographics

		CT 701, BG 1	Richland County	Montana	CT 9625, BG 1	McKenzie County	North Dakota
Population	Total Population	1,476	9,746	989,415	1,308	6,360	672,591
Race	% White	95.8	95.0	89.4	95.9	75.3	90.0
	% Black or African American	0.3	0.1	0.4	0.4	0.1	1.2
	% American Indian & Alaska Native	1.7	1.7	6.3	1.5	22.2	5.4
	% Asian	0.0	0.2	0.6	0.2	0.3	1.0
	% Pacific Islander	0.0	<0.1	0.1	0.0	0.0	0.0
	% Other Race	1.0	0.8	0.6	0.8	0.4	0.5
	% Two or More	1.2	2.1	2.5	1.2	1.6	1.8
Ethnicity	% Hispanic or Latino	2.5	3.0	2.9	1.8	2.2	2.0

Source: U.S. Census Bureau, 2010.

Table 6. Age and Poverty Status

	CT 701, BG 1	Richland County	Montana	CT 9625, BG 1	McKenzie County	North Dakota
Total Population	1,476	9,746	989,415	1,308	6,360	672,591
% Ages 60 and Older	22.5	21.0	21.3	22.6	19.5	19.8
Total Population for Whom Poverty is Determined	1,345	10,270	974,000	1,504	7,272	665,576
% Below Poverty Level	22.8	14.2	15.2	6.1	13.8	11.9
Households	618	4,167	409,607	541	2,410	281,192

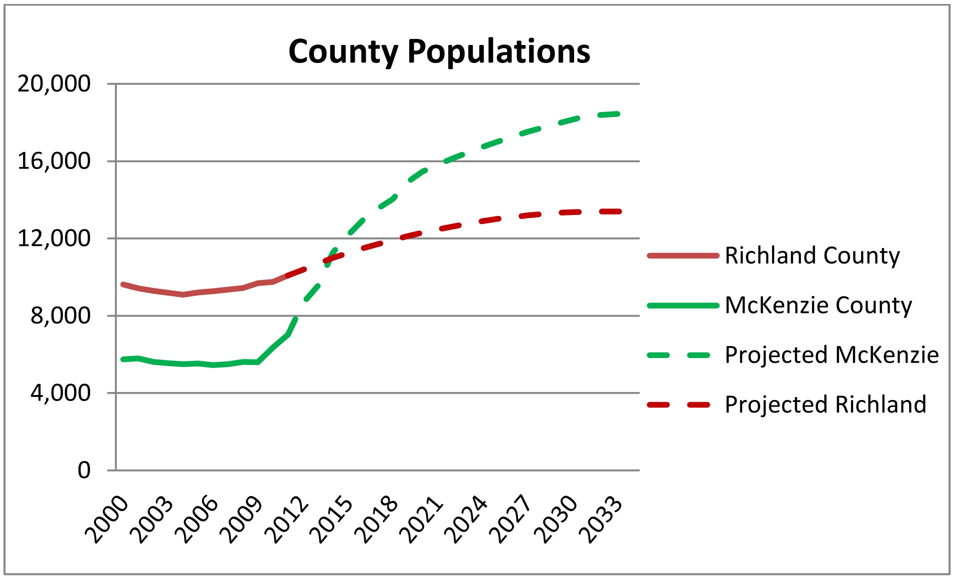
Source: U.S. Census Bureau, 2010 and ACS, 2009-2013.

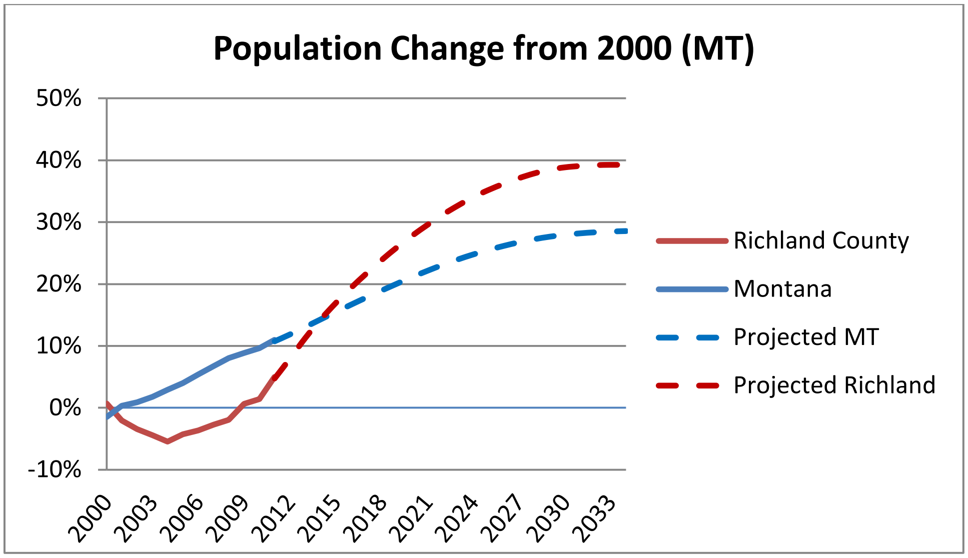
The percentages shown above for the study area BGs are consistent with or below the corresponding percentages for Richland and McKenzie Counties, and for Montana and North Dakota. Both BGs are predominately white, with very small percentages for black or African American, American Indian, and Asian populations. These correspond to the percentages shown for both counties and states, with the exception of American Indians. McKenzie County shows a much higher percentage (22.6%). This is due largely to the Ft. Berthold Indian Reservation, which lies in the eastern portion of the county. BG population percentages of people over the age of 60 and below the poverty line were also similar to percentages for Richland and McKenzie Counties and for Montana and North Dakota. The only percentage that was notably higher than corresponding county and state percentages was the below the poverty level percentage for CT 701, BG 1 (22.8%). However, this variance is not substantial enough to indicate a relative population concentration of residents below the poverty level.

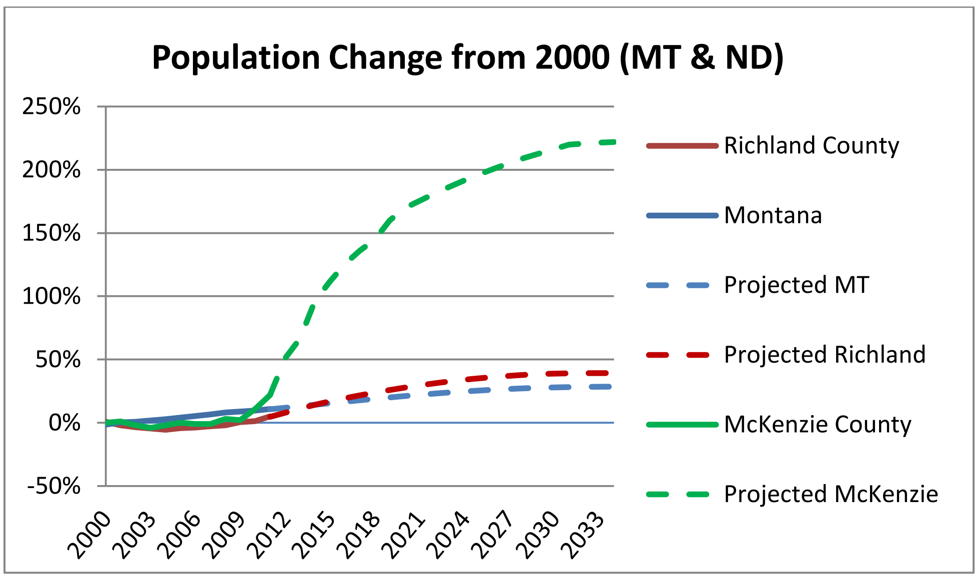
Populations in eastern Montana and western North Dakota, for the most part, have been declining in recent decades, with the exception of communities near significant oil formations. Even many of these communities were struggling with regard to economic and population trends until the last decade. With more recent technological advances in oil extraction (i.e., horizontal hydraulic fracturing, or “fracking”), many communities in eastern Montana and in North Dakota have seen dramatic changes resulting from oil extraction. As the rest of the country has slowly pulled out of recession, areas near the Bakken have seen unprecedented growth. Fairview and the surrounding areas are no exception.

As of February 2015, the populations of both Richland and McKenzie Counties had seen substantial growth since the last census in 2010. The largest city in Richland County is Sidney, with approximately half of the county’s total population. Fairview is substantially smaller, with less than a thousand residents. Fairview’s population has grown approximately 12% since 2010, but other areas near the Bakken have grown at much higher rates. In McKenzie County, Watford City is the largest community, although it does not compose a large segment of the county’s total population. Watford City’s population has nearly doubled since the 2010 census, and is a prime example of the extreme growth associated with the North Dakota Bakken. The graphs below show population growth and projections.

Figure 1. Historic and Forecast Population







Source: MT and Richland County estimates are provided by MT Dept. of Commerce EREMI projections. McKenzie County data is derived from "Williston Basin 2012" Study by North Dakota State University's School of Agribusiness and Applied Economics as well as historical Census estimates.

The population of McKenzie County, North Dakota, has increased by more than 100% since 2000, and is projected to double again by the year 2030. Richland County, Montana, has also seen substantial growth, although of a lesser magnitude. Since 2010, the population of Richland County has grown by more than 15% after numerous years of decline. This growth rate is projected to peak at 40% above the 2000 population in year 2033, as compared to 28% for Montana as whole in 2033.

Housing and Income

As of February 2015, the housing market was unable to keep up with demand as a result of oil workers moving to the Fairview region. Total housing demand (both temporary and permanent) is expected to peak in 2020, according to research by North Dakota State University. The percentage of vacant homes/apartments in Richland County is 9.6%, compared to 15.8% for the rest of Montana. Table 7 summarizes housing and income data in the study area vicinity.

Table 7. Housing and Income Statistics

	Richland County	Montana	McKenzie County	North Dakota
Housing units, 2013	4,961	485,771	3,547	339,313
Homeownership rate, 2008-2012	67.7%	68.5%	69.6%	66.4%
Per capita income, 2008-2012	$30,411	$25,002	$33,574	$28,700
Median household income, 2008-2012	$56,050	$45,456	$61,893	$51,641

Source: American Community Survey 2008-2012 and Census Quick-Facts 2013.

The amount of temporary housing is difficult to determine with census data, which focuses on permanent residents and housing. Median household income in Richland County ($56,050) is 23% higher than the Montana average ($45,456). McKenzie County's median household income ($61,893) is almost 20% higher than North Dakota as a whole.

Economic Conditions

Agriculture has historically been the most predominant industry in both Richland and McKenzie Counties. Energy exploration has boomed at times and busted at others, including an increase in the 1970s and 1980s. More recently, advancements in horizontal hydraulic fracturing technology have resulted in increases in accessible oil reserves in the Bakken region and an oil boom larger than those in the past. This has resulted in an increase in jobs, both directly and indirectly related to oil extraction. Figure 2 shows the industries and their respective employment distribution for Richland County. Table 8 represents industries and employment distribution for McKenzie County.

Figure 2. Richland County Economic Base 2008-2010

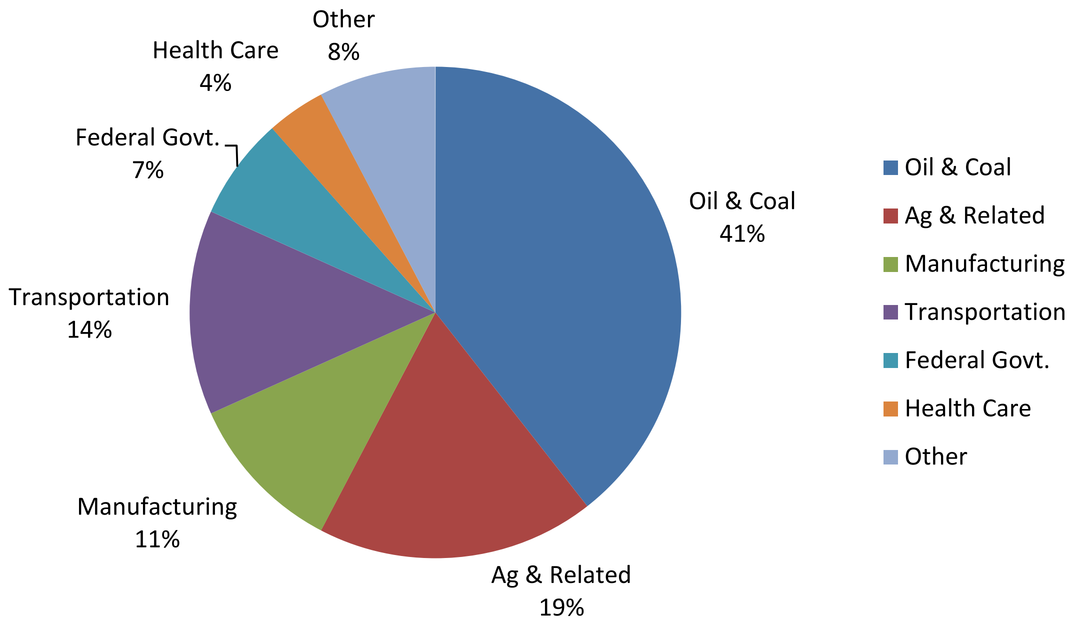


Table 8. McKenzie County Employment by Industry (2009-2013)

Industry	Total Estimate
Agriculture, forestry, fishing, and hunting	866
Construction	266
Manufacturing	127
Wholesale trade	78
Retail trade	305
Transportation and warehousing, and utilities	317
Information	42
Finance and insurance, and real estate and rental and leasing	167
Professional, scientific, and management , and administrative and waste management services	137
Educational Services, health care and social assistance	580
Arts, entertainment, recreation, and accommodation and food services	324
Other services, except public administration	226
Public Administration	233
Civilian employed population (16 years and over)	**3,668**

Source: American Community Survey 2009-2013.

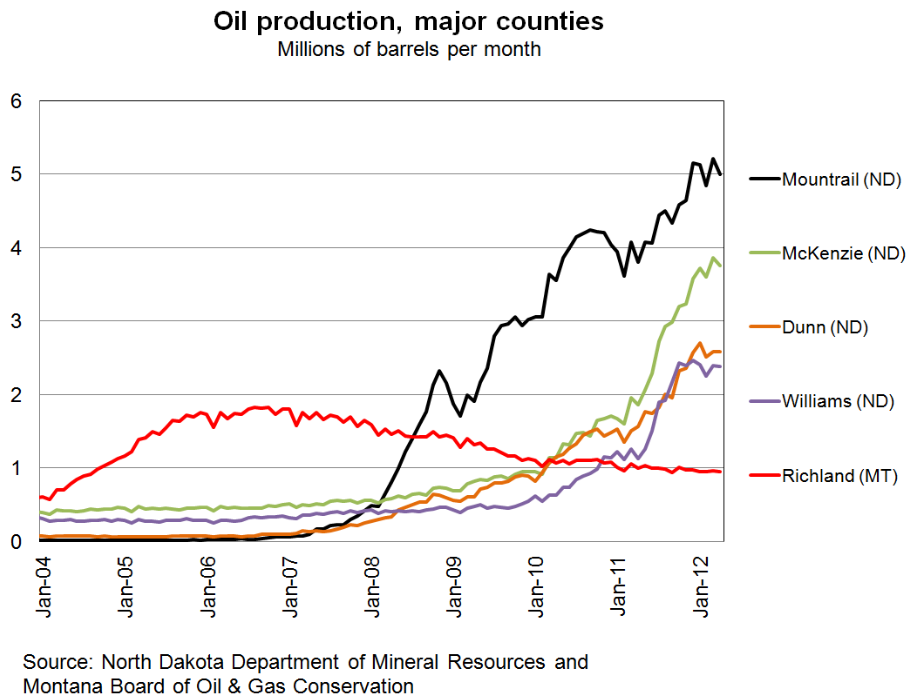
The economic base of a county refers to the industries vital to the county's economy. In Richland County, Montana, this includes oil and coal extraction and agriculture. Coal extraction in Richland County is not located in the immediate Fairview vicinity. The Savage Mine is located approximately twenty miles south of Sidney, and is a substantial producer of lignite coal (about 350,000 tons annually). In terms of oil production, the Elm Coulee oilfield has been a crucial element to the economy since the early 2000s. Elm Coulee is located primarily in Richland County, just southwest of the study area. It extends northwest to southeast through the county. The construction industry is benefitting from mining and oil production as a result of housing and other oil-related infrastructure development. Transportation industries are also benefitting from increased demand for transporting materials such as fracking sand or oil produced from the wells. As with the rest of Montana and the other Great Plains states, farming and ranching have strong roots in the region. The highest grossing agricultural products for Richland County include wheat, alfalfa, sugar beets, and beef cattle.

As of February 2015, both Richland and McKenzie Counties had very low unemployment rates - 2.6% in Richland County and 1.7% in McKenzie County according to the Bureau of Labor Statistics. These are compared to Montana's unemployment rate of 4.6%, North Dakota's unemployment rate of 2.9%, and the United States' rate of 6.2%. Economists argue that a natural unemployment rate of around 4% is to be expected, even in a healthy economy. In terms of unemployment, Richland and McKenzie Counties have been performing exceptionally well.

Oil Development

As of May 2014, according to North Dakota's Department of Mineral Resources, oil production in the North Dakota Bakken has exceeded thirty million barrels per month, equivalent to nearly one million barrels per day. If Montana is included, production is over a million barrels per day. The Minneapolis Federal Reserve reports that 2014 will be a record year for oil production in the Bakken, but oil production growth is beginning to lessen. Oil leasing activity has slowed considerably and the number of active oil rigs has leveled off, although the effects of this may not be seen for a few years. Growth over the past decade has been of great magnitude in most of the region, and housing, population, and other development are still catching up to oil production. Figure 3 shows growth in oil production by county through 2012.

Figure 3. Oil Production, Major Counties



In the early to mid-2000s, Richland County, Montana, and Elm Coulee Oilfield were the highest producers of oil in the region, but production has been declining since 2007 when new fracking technology and vast reserves led to rapid growth in other counties. Currently, McKenzie County is second only to Mountrail in oil production with Richland at substantially lower levels. Williams County, just north of McKenzie County, and home to Williston, falls almost directly between McKenzie and Richland counties in terms of oil production. Williston is widely considered the hub of oil activity in the Bakken and provides the necessary amenities and services, including potential lodging, which many of the smaller towns do not. In Montana, Sidney is largely considered the hub of oil production despite lacking the oil production increases that North Dakota has seen recently. Although oil production may not be as high in the Montana Bakken, many of the impacts are still felt. Many oil-related trucks and workers from North Dakota pass through Fairview and then Sidney in route to Billings or other cities.

4.2 Land Use

Property maps for Richland County, Montana, and McKenzie County, North Dakota, show land within the study area as privately owned or owned by the county or the town of Fairview. No federal- or state-owned lands were identified. Land use within the study area is primarily agriculture, with commercial and residential uses centered within and around the town of Fairview. Several oil pads are located within the study area, including a large storage tank facility northwest of the ND 200 and ND 58 intersection. A railroad spur line and large material loading facility are also located in the study area to the east of Fairview. In addition, the town of Fairview sewer lagoons are located just north of CR 133 at the intersection with CR 356 (refer to Exhibit 9 in Attachment 1).

Photo 4. Oil pad typical in the area. Photo taken in February 2015.

Photo 5. Material loading facility and railroad spur line. Photo taken in February 2015.

A review of existing regional and local planning reports was conducted to determine existing and future planning opportunities within the study area. Planning documents included the McKenzie County, North Dakota, Comprehensive Plan (2013); McKenzie County, North Dakota, Zoning Map (2015); Richland County, Montana, Community Strategic Plan (2010 update); Richland County, Montana, Growth Policy Update (2015); and the Town of Fairview Growth Policy (2015). In general, the North Dakota portion of the study area is zoned residential, agricultural, commercial, and administrative zoning by township. Zoning maps for Richland County, Montana, are not available. The Town of Fairview Growth Policy identifies future land use growth areas for residential, commercial, and industrial use. Most of these growth areas are located beyond the town boundaries, as indicated in the future land use map presented in Attachment 14. Residential growth areas have been identified for infill areas around new and existing developments. Commercial growth areas are identified along major transportation corridors, including arterial and collector streets, as well as state highways. Industrial growth areas are focused away from existing and planned future residential development.

Adjacent land ownership and use, including existing zoning and identified future growth areas, will need to be considered during the study process. This would include evaluating how proposed transportation improvements may affect future town of Fairview growth areas and McKenzie County zoning.

4.3 Recreational Resources

Recreational resource information was gathered during the field review and through review of aerial photographs and city/county resources. Recreational resources within the study area are limited due to extent of privately-owned property and the size of the town of Fairview. There are no state or federal public lands within or immediately surrounding the study area. Identified recreational resources include Sharbano Park (corner of MT 200 and 1st Street), the playground and sports field at the East Fairview Elementary School (301 2nd Street), and the sports fields and track at the Fairview High School (713 S. Western Avenue).

These recreational areas may be protected under Section 4(f) of the U.S. Department of Transportation Act of 1966, which was enacted to protect publically-owned parks, recreation areas, wildlife and waterfowl refuges, and public and private historic sites of local, state, and national significance. Federally-funded transportation projects cannot "use" Section 4(f) properties unless there are no feasible and prudent avoidance alternatives and all possible planning to minimize harm has occurred. "Use" can occur when land is permanently incorporated into a transportation facility or when there is a temporary occupancy of the land that is adverse to a Section 4(f) resource. Constructive "use" can also occur when a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are "substantially impacted."

Depending on the location of future improvements forwarded from this study, coordination with officials having jurisdiction over the park and schools may be required to assess whether these properties should be protected under Section 4(f). Potential effects to any Section 4(f) protected recreational resources would also need to be considered and evaluated in accordance with Section 4(f). Potential Section 4(f) resources are mapped in relation to the study area in Exhibit 11 (found in Attachment 1).

The National Land and Water Conservation Fund Act (LWCFA), or Section 6(f), was enacted to preserve, develop, and assure the quality and quantity of outdoor recreation resources. Section 6(f) protection applies to all projects that impact recreational lands purchased or improved with LWCFA funds. The Secretary of the Interior must approve any conversion of LWCFA property to a use other than public, outdoor recreation. According to FWP LWCFA Sites by County and North Dakota Parks and Recreation LWCFA Projects and Grant Listings, LWCFA grants were used for four projects within the study area. No projects are located in North Dakota. All four projects are found in Montana, within the town of Fairview, at Sharbano Park, and are listed below.

- Fairview pool renovation (Sharbano Park) – approved 10/19/1970 — $1,013.36
- Fairview pool bathhouse (Sharbano Park) – approved 4/7/1976 — $5,051.29
- Fairview play area (Sharbano Park) – approved 3/14/1979 — $976.50
- 1983 statewide community projects that, per Montana State Parks, were all within Sharbano Park –approved 6/30/1983 — $11,150.00

Sharbano Park is identified in Exhibit 11 (found in Attachment 1). Potential impacts to Sharbano Park would need to be considered if improvements are proposed near the park. Additional coordination with FWP would be necessary if improvements are forwarded from this study that could affect the park.

4.4 Cultural Resources

Cultural resources are properties that reflect the heritage of local communities, states, and nations. The National Historic Preservation Act (NHPA) of 1966, as amended, defines historic properties as sites, buildings, structures, districts (including landscapes), and objects included on, or eligible for inclusion on, the National Register of Historic Places (NRHP), as well as artifacts, records, and remains related to such properties.

To be considered eligible for listing on the NRHP, a property must meet at least one of the following criteria:

A: Is associated with events that have made a significant contribution to the broad patterns of our history.

B: Is associated with the lives of persons significant in our past.

C: Embodies the distinctive characteristics of a type, period, or method of construction or that represents the work of a master, or that possess high artistic values, or that represents a significant distinguishable entity whose components may lack individual distinction.

D: Yielded, or may likely yield, information important in prehistory or history (36 CFR Part 60.4).

If MDT and NDDOT projects forwarded from the study are federally funded, MDT and NDDOT would need to consider the potential effects of their undertakings on historic properties as required under Section 106 of the NHPA. Under the Section 106 process, historic and archaeological properties that could be affected by the undertaking are identified, the effects of the project are assessed, and methods to avoid and minimize or mitigate any adverse effects on historic and archaeological properties are determined. In addition to protections granted under the NHPA, properties eligible for inclusion on the NRHP may also be potential Section 4(f) properties and protected under Section 4(f) of the Transportation Act. As noted in the previous section, federally-funded transportation projects cannot "use" Section 4(f) properties unless there are no feasible and prudent avoidance alternatives and all possible planning to minimize harm has occurred.

A file search through the Montana State Historic Preservation Office (SHPO) and coordination with the North Dakota SHPO revealed several properties/sites eligible for listing on the NRHP within the study area limits (Attachment 15). Table 9 lists the site type, approximate location, and NRHP eligibility. Exhibit 11 (found in Attachment 1) provides the location of NRHP-eligible sites in relation to the study area.

Table 9. Recorded Cultural Resource Sites

<table>
<tr><th colspan="2">Site Type</th><th>Site No.</th><th>Township</th><th>Range</th><th>Sections</th><th>NRHP Eligibility</th></tr>
<tr><td rowspan="7">MT SHPO</td><td rowspan="2">Historic irrigation system (Lower Yellowstone Irrigation Project)</td><td rowspan="2">24RL0204</td><td>24N</td><td>60E</td><td>5, 7, 8, 18, and 19</td><td rowspan="2">Eligible</td></tr>
<tr><td>24N</td><td>59E</td><td>36</td></tr>
<tr><td>Historic railroad</td><td>24RL0230</td><td>24N</td><td>60E</td><td>6, 17, 19, and 20</td><td>Eligible</td></tr>
<tr><td>Historic residence</td><td>24RL0376</td><td>24N</td><td>60E</td><td>8</td><td>Eligible</td></tr>
<tr><td>Historic energy development</td><td>24RL0321</td><td>24N</td><td>60E</td><td>17, 19, and 20</td><td>Eligible</td></tr>
<tr><td>Historic homestead/farmstead</td><td>24RL0414</td><td>24N</td><td>60E</td><td>19</td><td>Eligible</td></tr>
<tr><td rowspan="3">ND SHPO</td><td rowspan="2">Historic irrigation system (Lower Yellowstone Irrigation Project)</td><td rowspan="2">32MZ1174</td><td>151N</td><td>104W</td><td>29, 30, 31, and 32</td><td rowspan="2">Eligible</td></tr>
<tr><td>150N</td><td>104W</td><td>5, 6, 7, and 8</td></tr>
<tr><td>Historic railroad</td><td>32MZ1556</td><td>151N</td><td>104W</td><td>30</td><td>Eligible</td></tr>
</table>

Source: Montana and North Dakota SHPOs, 2015.

A majority of the sites listed in Table 9 are ditches and canals constructed as part of the Lower Yellowstone Irrigation Project. Preliminary planning for the Lower Yellowstone

Irrigation Project began in 1903, when a team of BOR engineers came to eastern Montana to assess the suitability of the Yellowstone Valley for irrigation (Kordecki et al., 2000). Their positive findings resulted in authorization of the Lower Yellowstone Irrigation Project on May 10, 1904. The BOR acted as design engineer and contractor for the Lower Yellowstone Irrigation Project. Work began on the project in late summer of 1905. The entire irrigation system became operational for the first time in the spring of 1924 (Kordecki et al., 2000). An additional 39 miles of laterals were also constructed, perhaps in the 1930s. The last notable new construction occurred in 1946, when the intake pumping plant and 4 miles of lateral were constructed. The Lower Yellowstone Irrigation Project currently operates 72 miles of main canal, 225 miles of laterals and 118 miles of open drains (BOR, 1993). The system serves approximately 52,133 acres of irrigable land.

Direct and indirect impacts (such as visual, noise, and access impacts) to eligible or listed properties would need to be considered if improvements options are carried forward. In addition, there are segments of the Lower Yellowstone Irrigation project that have not been surveyed, and there are a number of noted sites within the study area where eligibility has not been determined (refer to Attachment 15). A cultural resource survey for unrecorded historic and archaeological sites within the area of potential effect would need to be completed during the project development process. Known sites with undetermined eligibility and sites identified during future surveys would need to be assessed for listing eligibility on the NRHP. Concurrence from the Montana SHPO or the North Dakota SHPO on the eligibility determinations would need to be requested. Flexibility in design will be important to avoid and/or minimize impacts to any significant sites.

4.5 Noise

Traffic noise would need to be evaluated for future improvements forwarded from this study. Noise analysis is required for all Type I-classified projects. Type I projects involve construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.

Type I projects require a detailed noise analysis, consistent with FHWA requirements and MDT and NDDOT noise policies which include measuring ambient noise levels at selected receivers and modeling design year noise levels using projected traffic volumes. Noise abatement measures would need to be considered if noise levels approach or substantially exceed noise abatement criteria. The noise abatement measures must be considered reasonable and feasible prior to implementation and supported by the affected public.

4.6 Visual Resources

The visual resources of an area include landforms, vegetation, water features, and physical modifications caused by human activities that give the landscape its visual character and aesthetic qualities. Visual resources are typically assessed based on the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distance of seen areas) of a geographically defined view shed.

The study area is characterized as primarily agricultural, with low- and high-density residential areas, commercial and industrial areas, and a transportation network of roadways and railroads. The landscape towards the central and eastern edge of the study area is primarily flat, with agricultural fields and irrigation ditches extending out east, south, and north as far as the eye can see. Distant views of the cottonwoods along the Yellowstone River corridor are visible far to the east. In the center of the study area is the town of Fairview with its residential and commercial development. The western edge of the study area includes sandstone slopes that rise 200 feet from the Yellowstone River valley floor. Oil wells, with their continually moving pump jacks, are scattered throughout the area. While the study area has been highly disturbed through years of agriculture, the rural and scenic landscape remains, offering aesthetically-pleasing views to residents and motorists.

Evaluation of the potential effects on visual resources would need to be conducted if improvement options are forwarded from this study.

5.0 Conclusion

This environmental scan report identifies physical, biological, social, and cultural resources within the study area that may be affected by potential future improvements. Project-level environmental analysis would be required for any improvements forwarded from this study. Information contained in this report may be used to support future NEPA/MEPA environmental documentation.

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Attachment 1
Exhibits

List of Exhibits

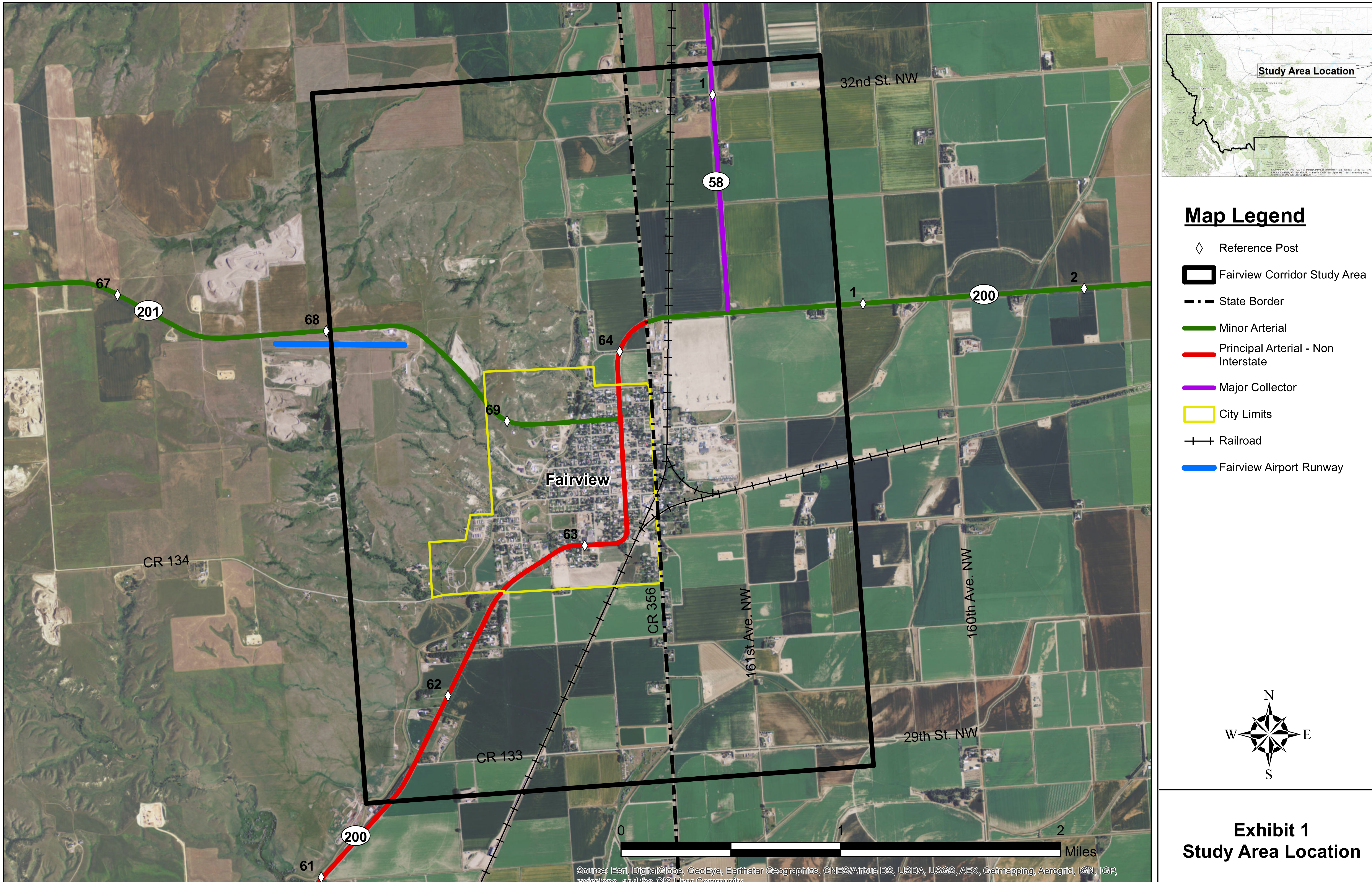
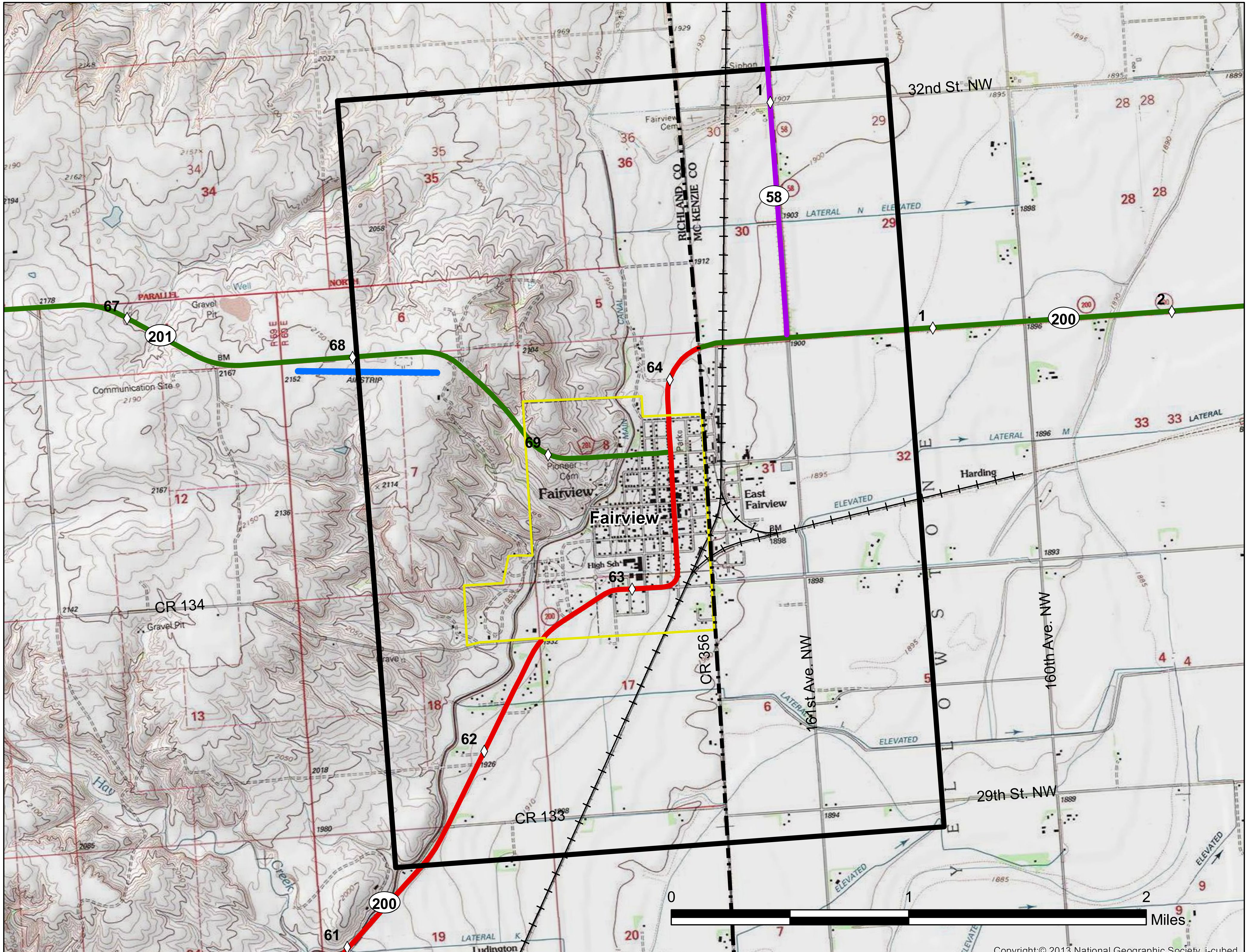
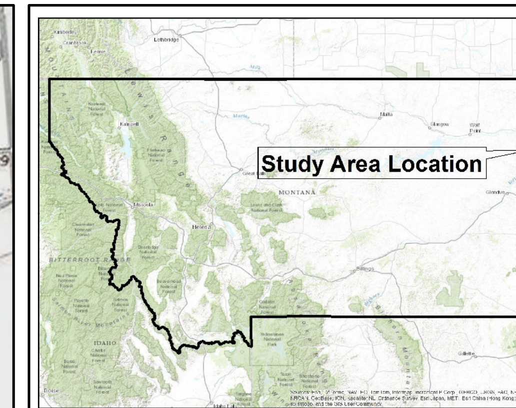


Exhibit 1
Study Area Location





Map Legend

- Reference Post
- Fairview Corridor Study Area
- State Border
- Minor Arterial
- Principal Arterial - Non Interstate
- Major Collector
- City Limits
- Railroad
- Fairview Airport Runway

Exhibit 2
Topographic Map of Study Area

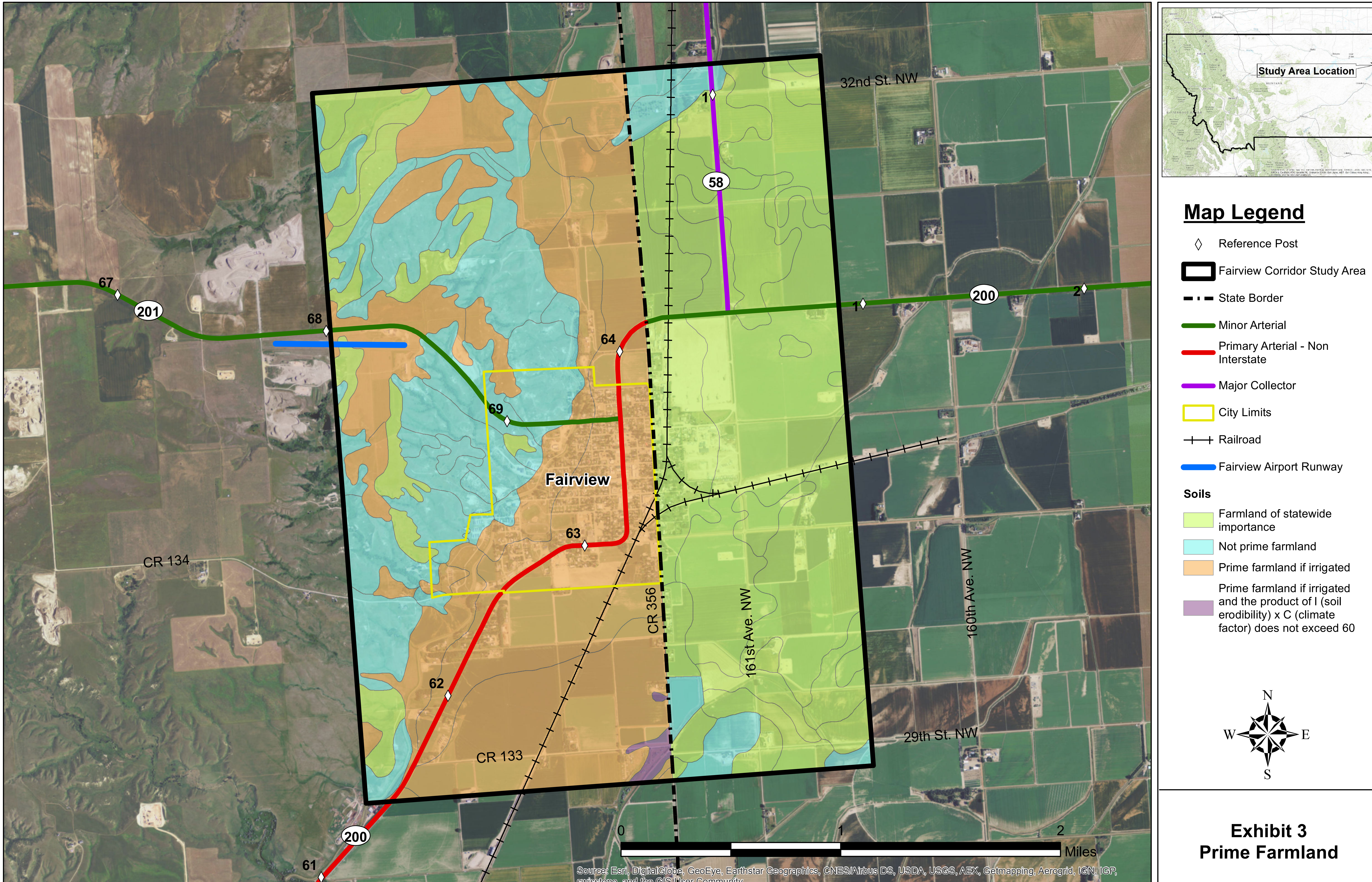
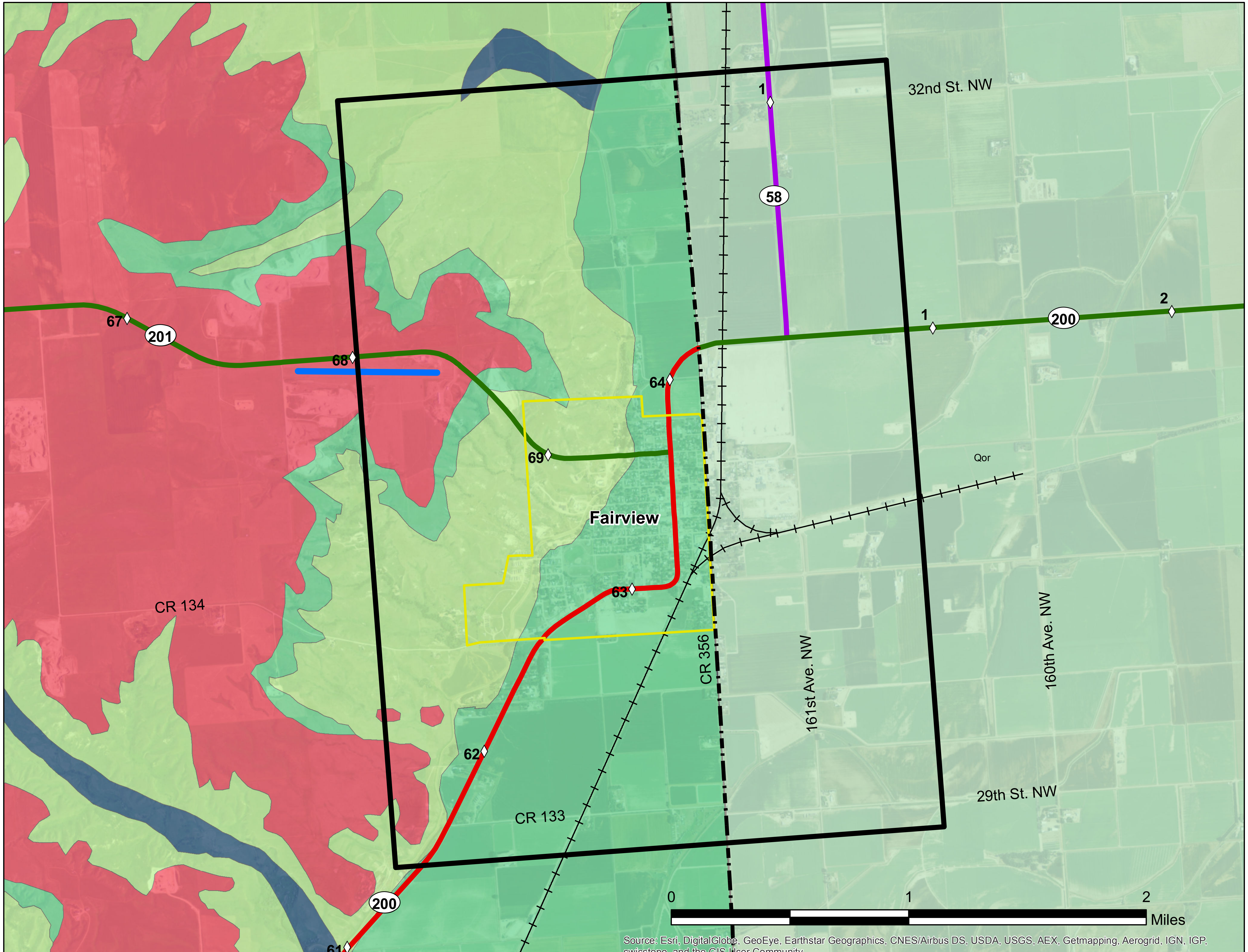


Exhibit 3
Prime Farmland



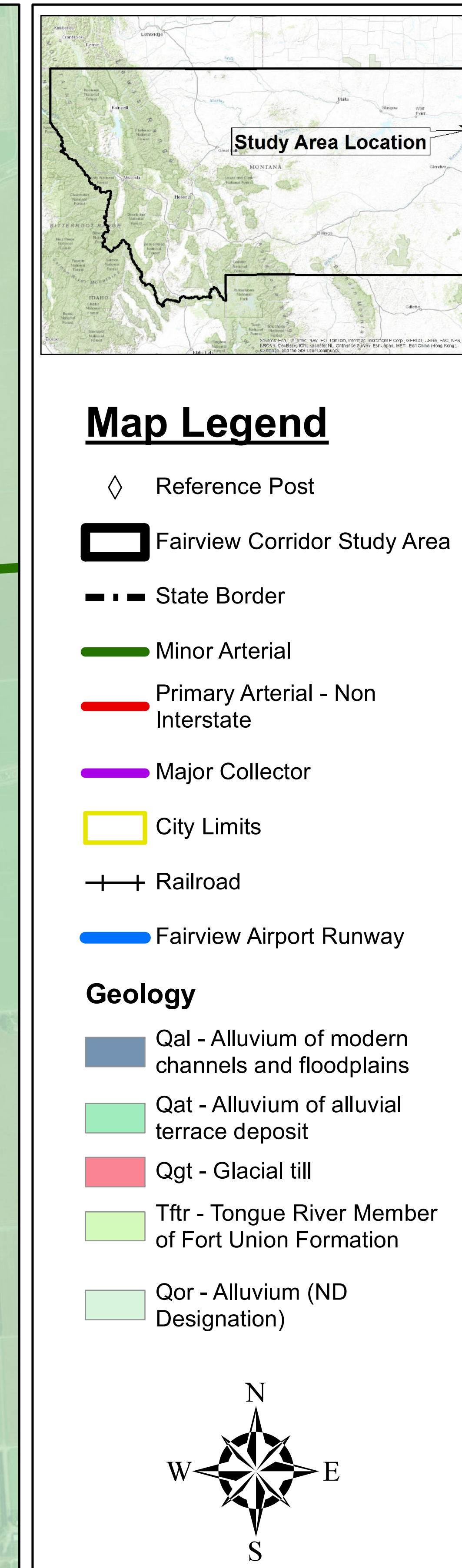
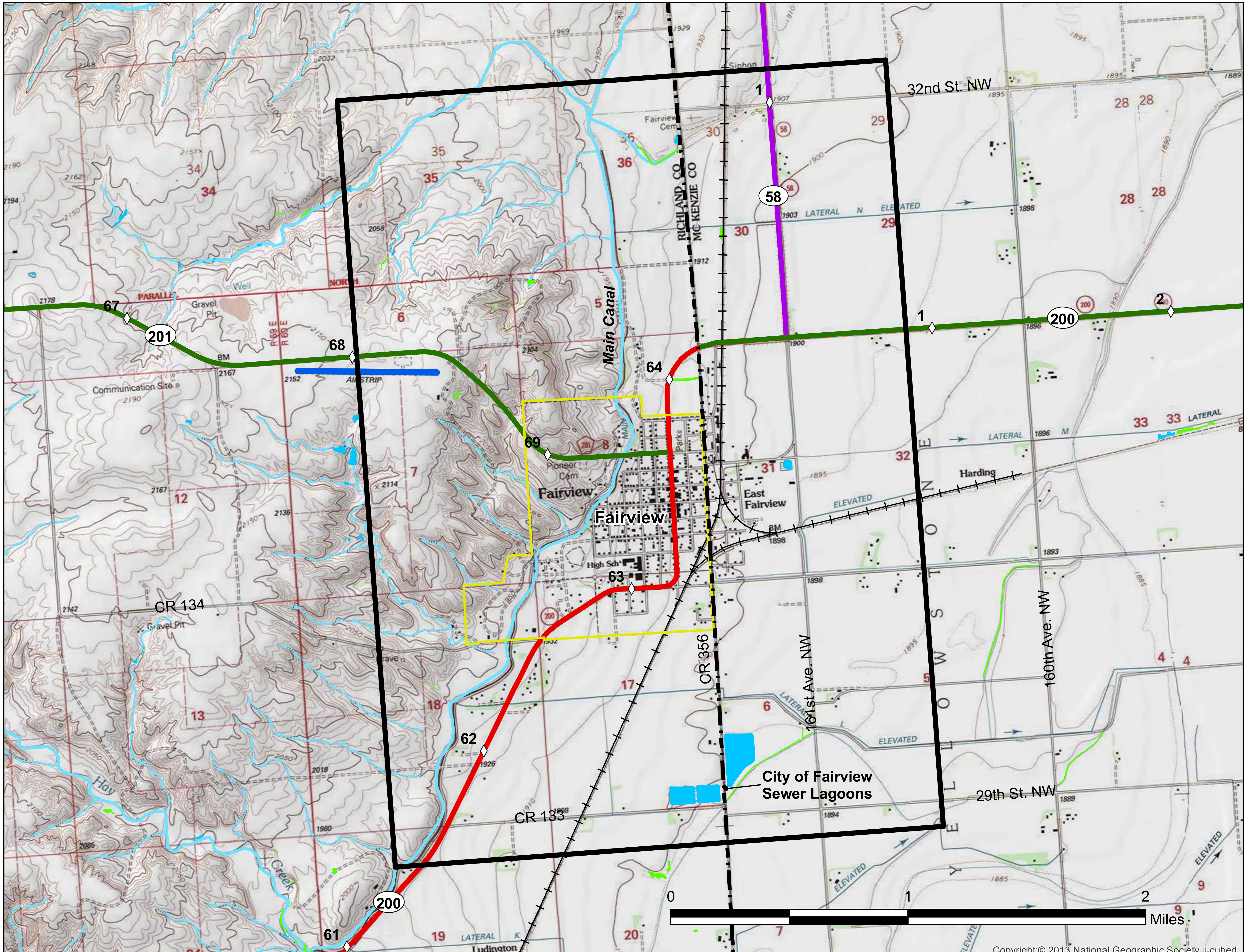


Exhibit 4
Geology



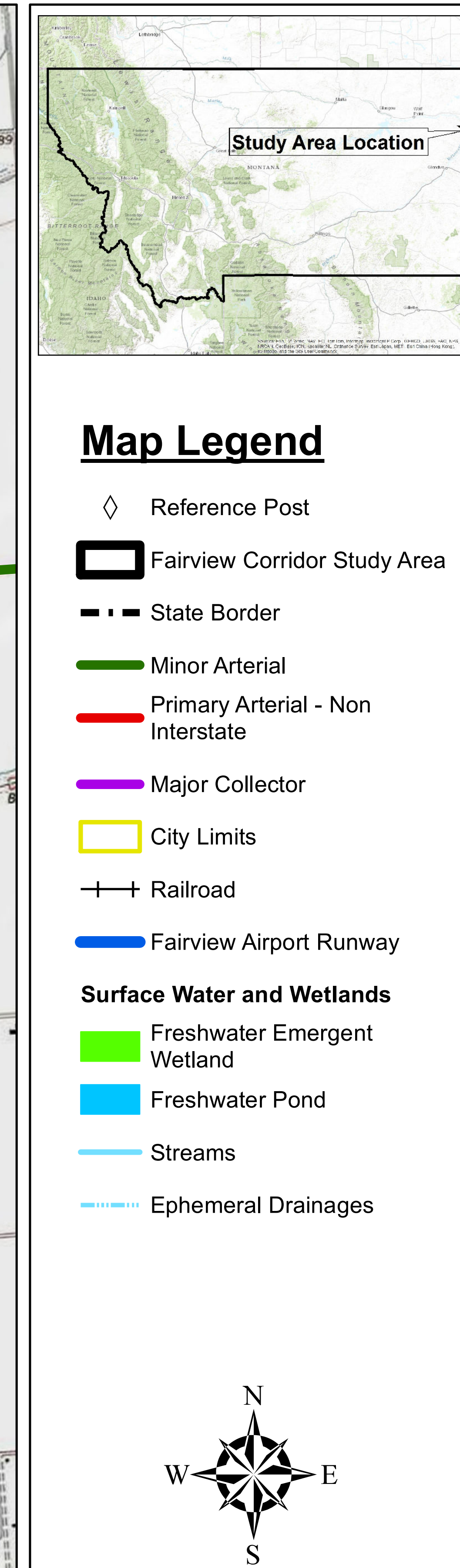


Exhibit 5
Suface Water and Wetlands

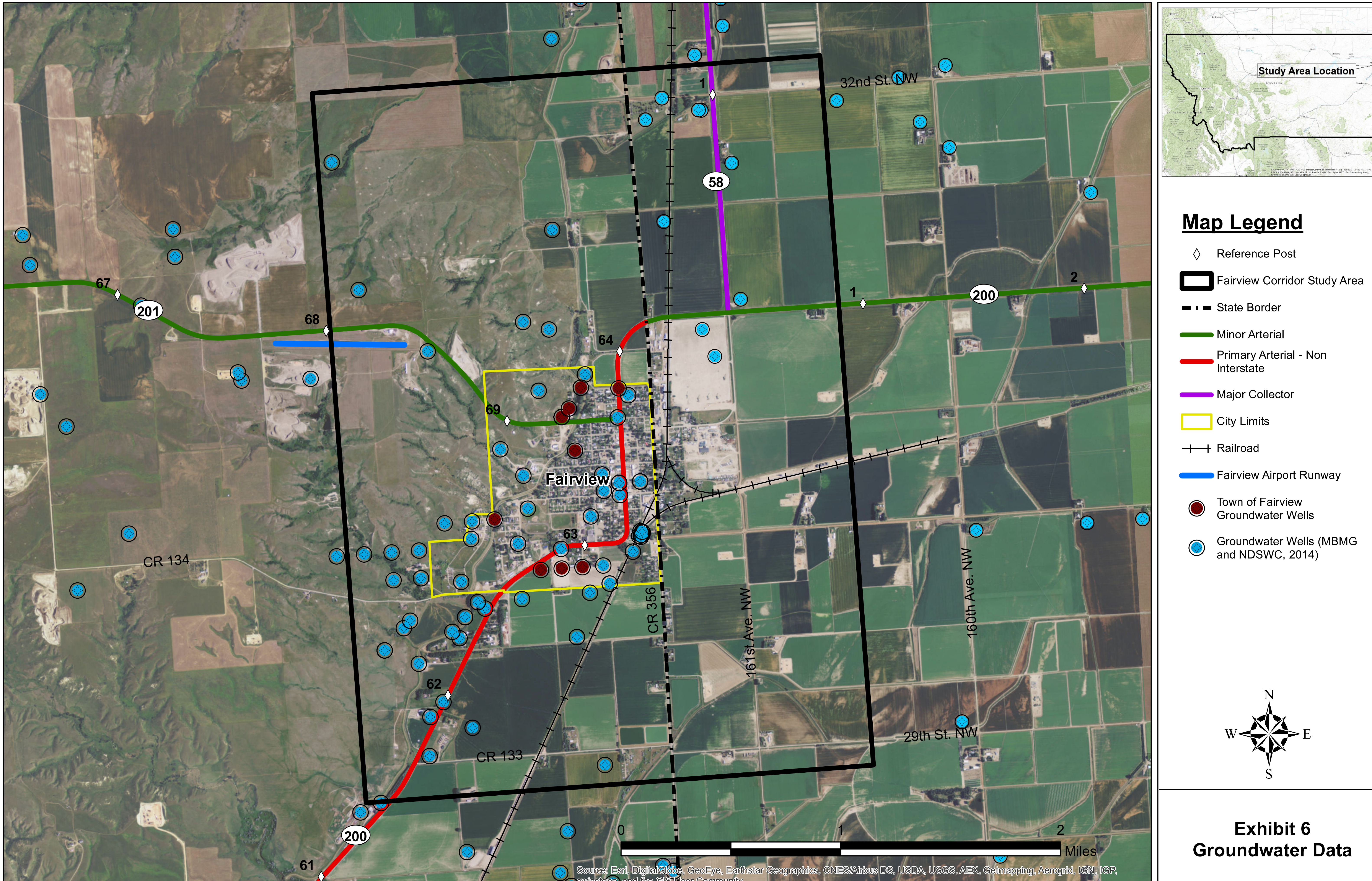


Exhibit 6
Groundwater Data

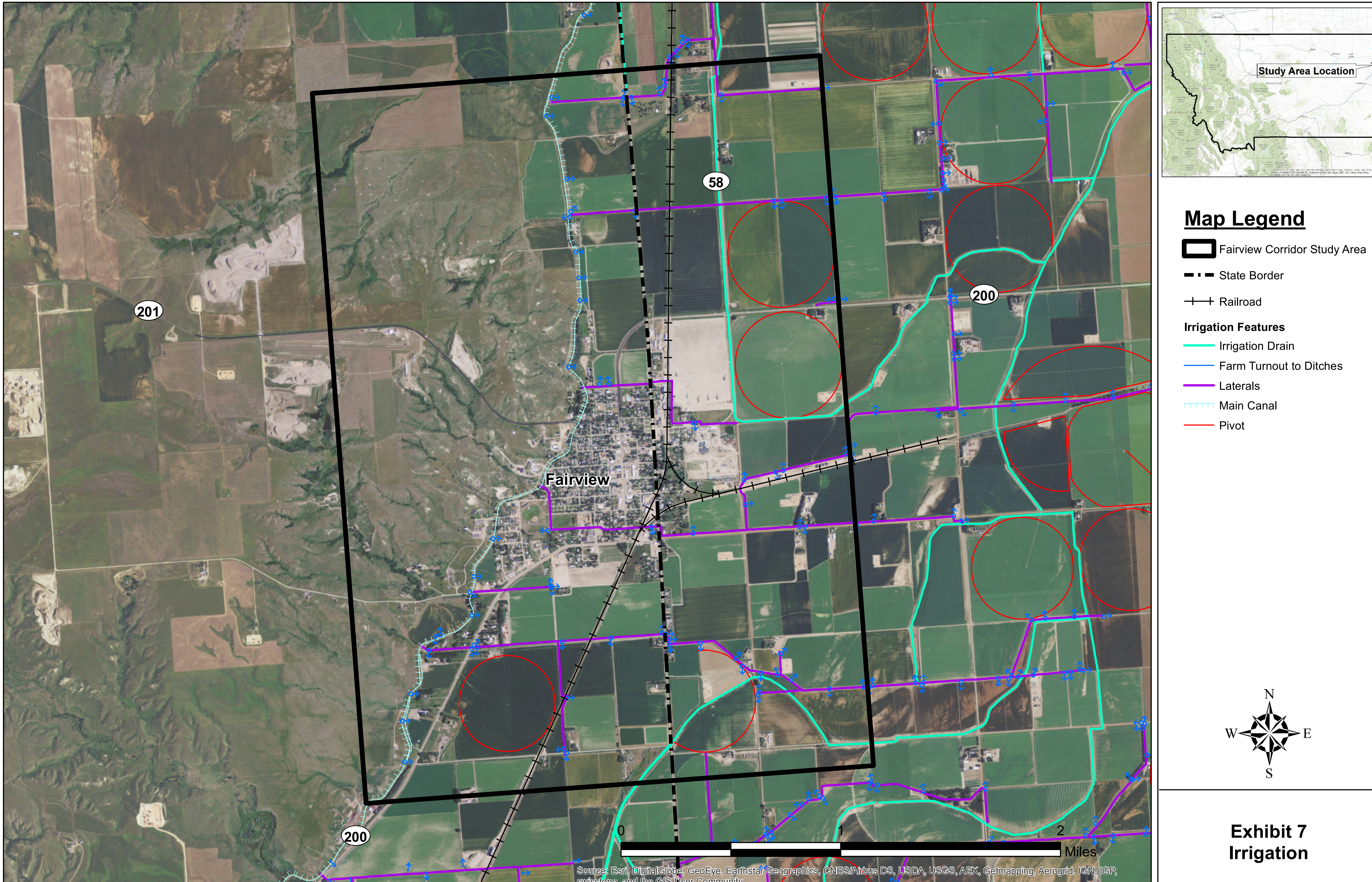


Exhibit 7
Irrigation

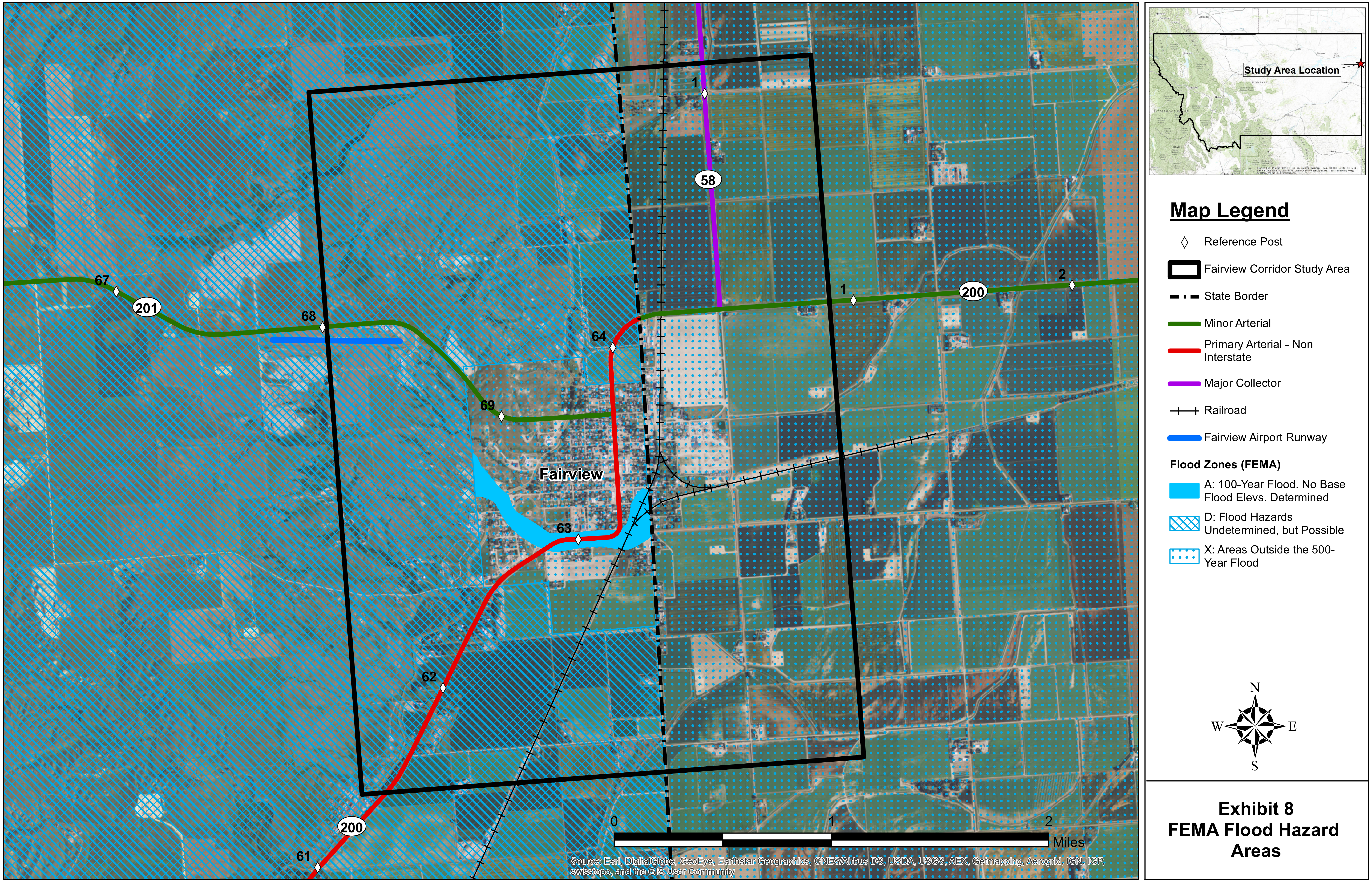


Exhibit 8
FEMA Flood Hazard Areas

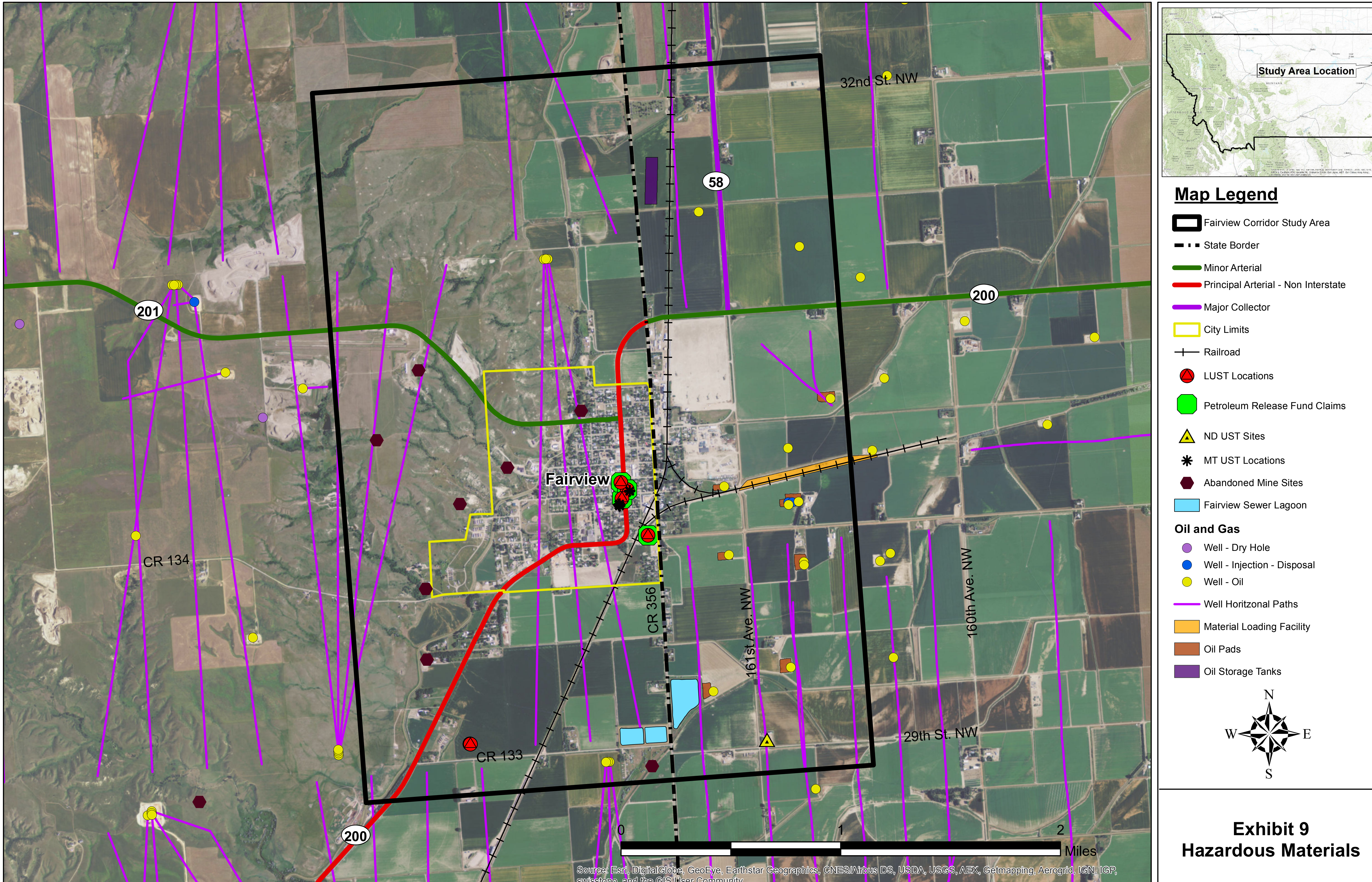


Exhibit 9
Hazardous Materials

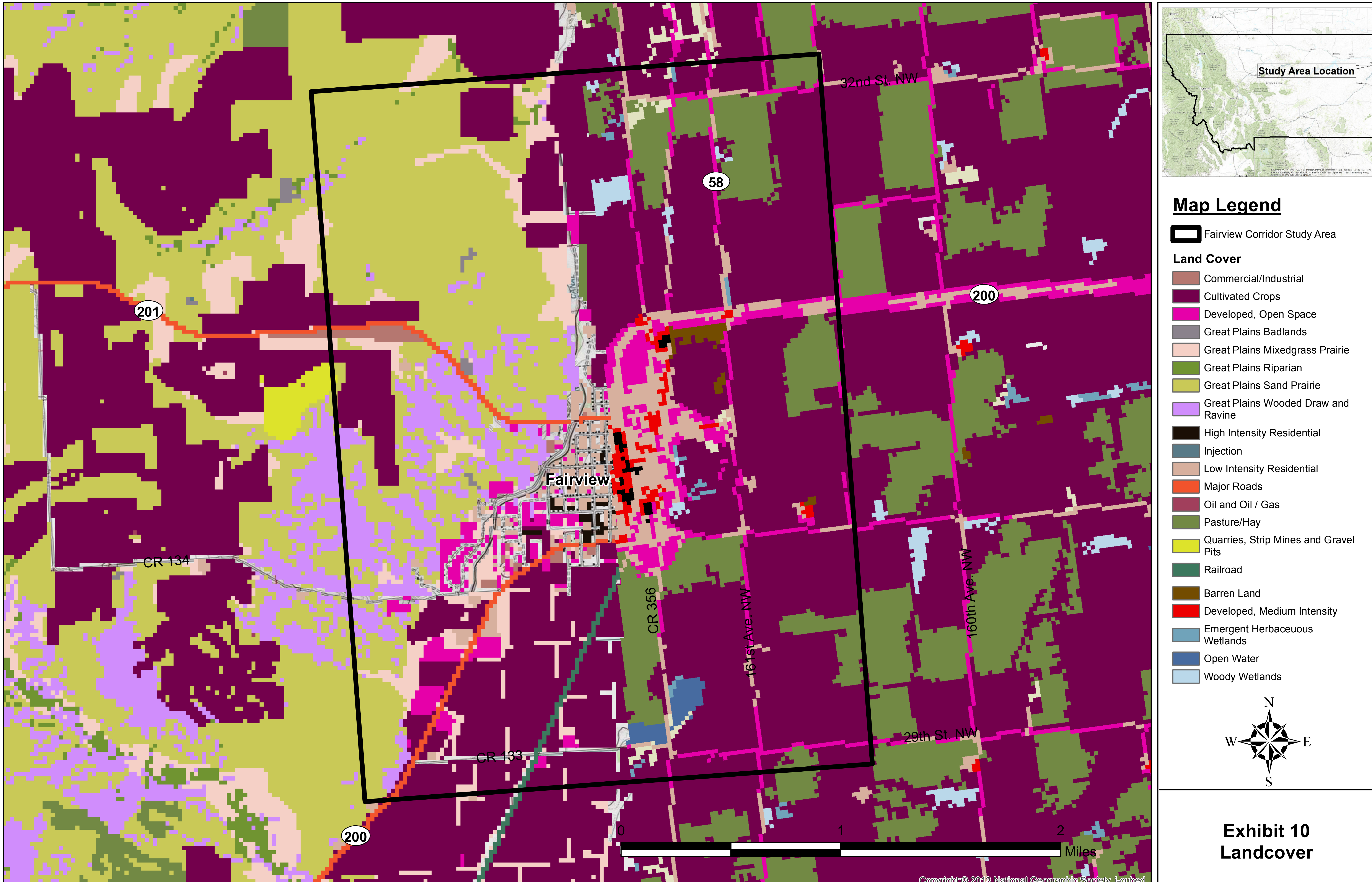


Exhibit 10
Landcover

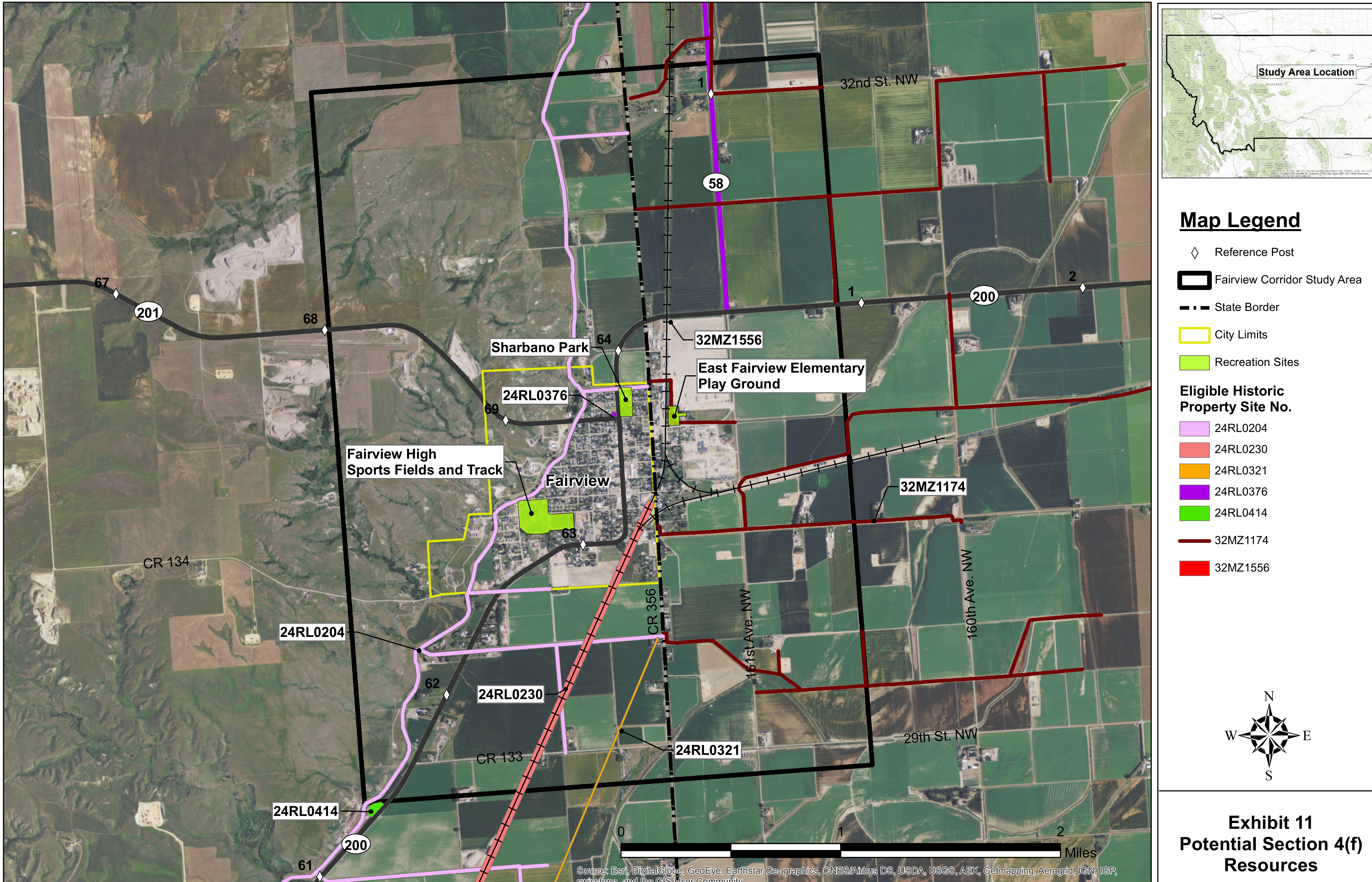


Exhibit 11
Potential Section 4(f) Resources

Attachment 2
Soil Resource Report

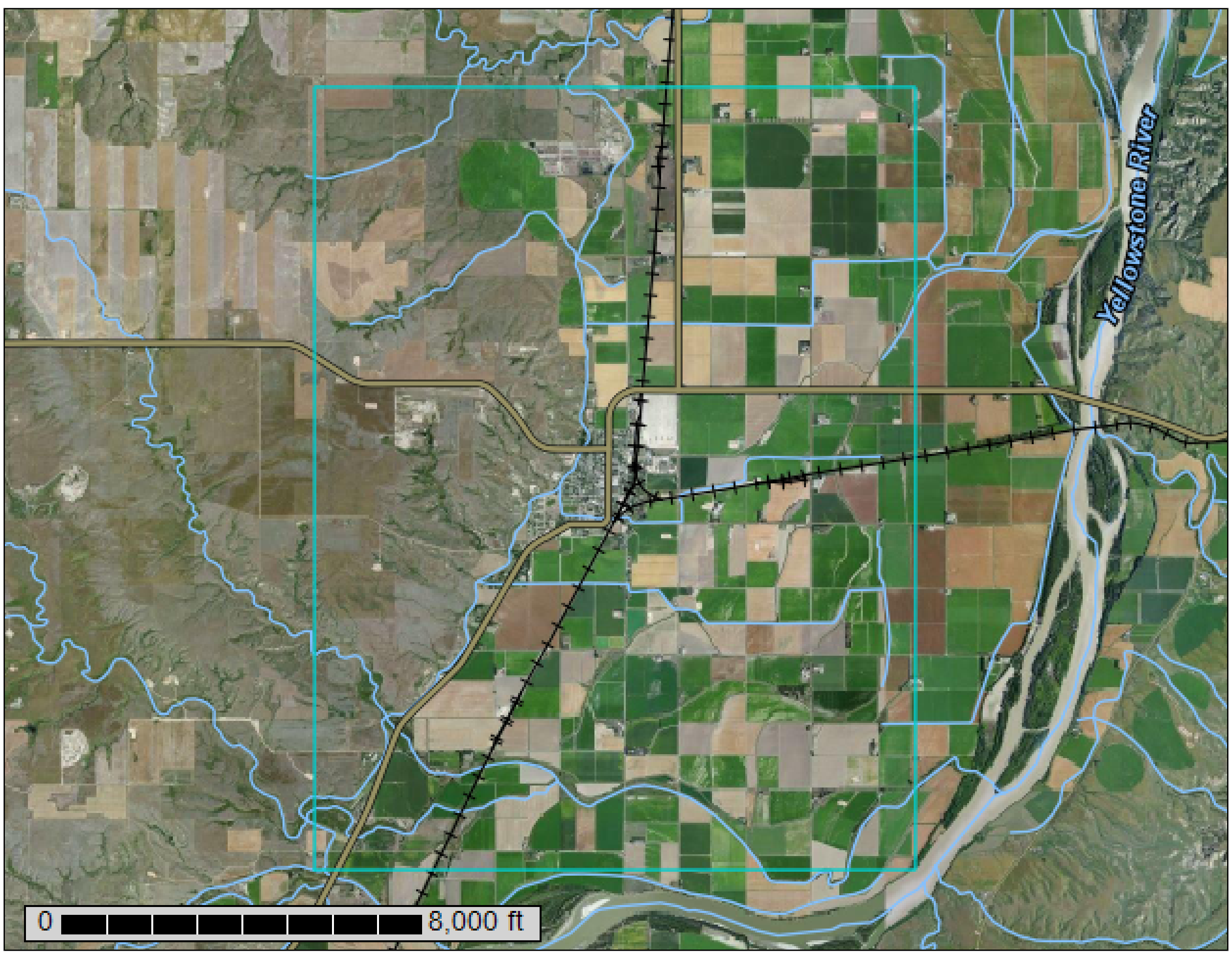
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for McKenzie County, North Dakota, and Richland County, Montana



March 9, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

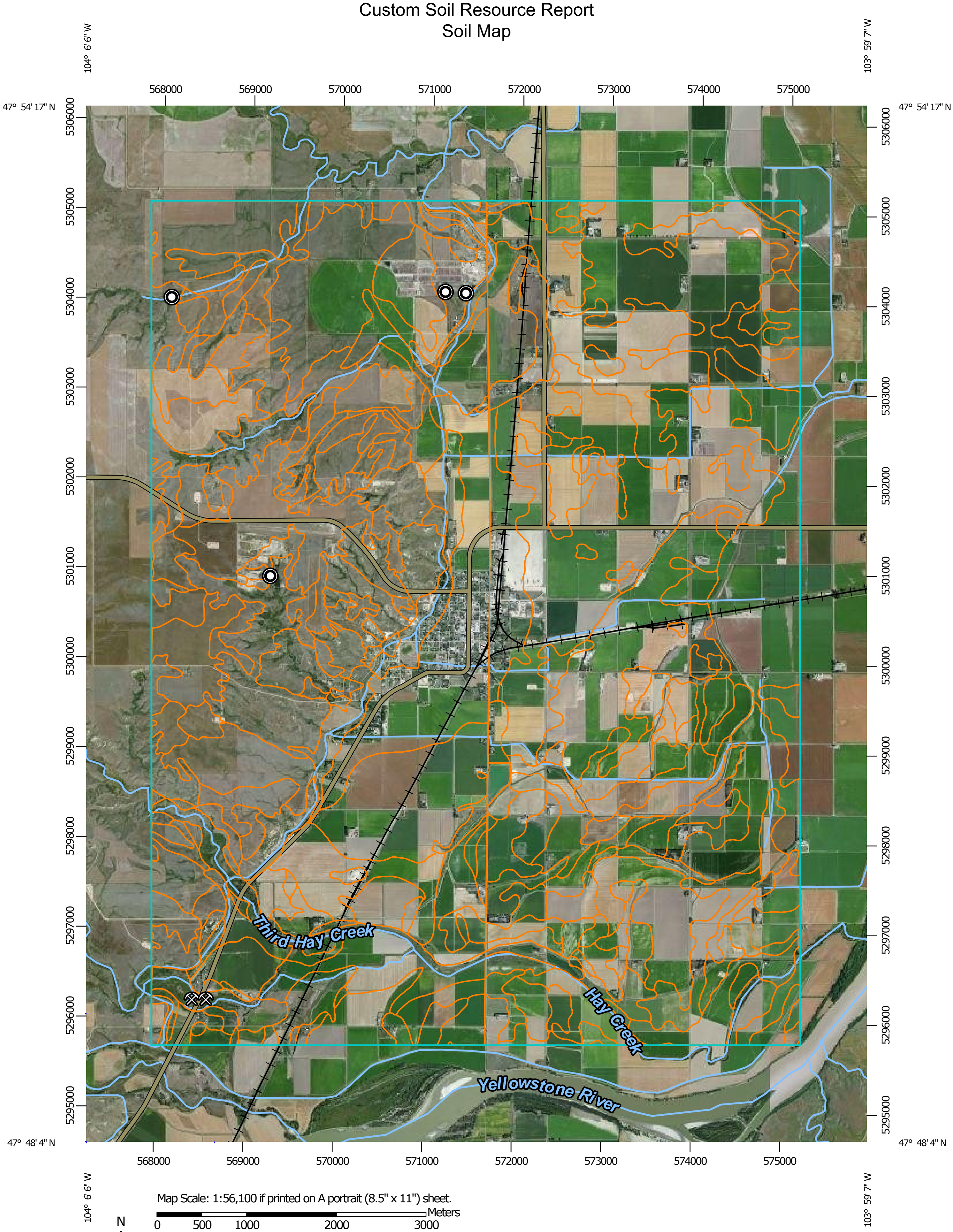
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:56,100 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2500, 5000, 10000, 15000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: McKenzie County, North Dakota
Survey Area Data: Version 17, Sep 19, 2014

Soil Survey Area: Richland County, Montana
Survey Area Data: Version 11, Sep 23, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 28, 2011—Sep 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

McKenzie County, North Dakota (ND053)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
42B	Williams-Zahl loams, 3 to 6 percent slopes	1.1	0.0%
E0835A	Savage-Grail silty clay loams, 0 to 2 percent slopes	32.9	0.2%
E3203C	Cherry silt loam, 6 to 9 percent slopes	9.0	0.1%
E4051A	Trembles fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	201.5	1.2%
E4103A	Lohler silty clay, saline, 0 to 1 percent slopes, occasionally flooded	83.4	0.5%
E4105A	Lohler complex, 0 to 2 percent slopes, occasionally flooded	18.1	0.1%
E4106A	Lohler silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	1,020.0	6.0%
E4121A	Havrelon loam, 0 to 2 percent slopes, occasionally flooded	875.1	5.2%
E4122A	Havrelon loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	1,303.4	7.7%
E4128A	Havrelon silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded	150.9	0.9%
E4132A	Havrelon silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	2,436.9	14.4%
E4134A	Hoffmanville silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	311.7	1.8%
E4153A	Ridgelawn silt loam, 0 to 2 percent slopes, occasionally flooded	259.5	1.5%
E4159A	Scorio silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	1,023.6	6.1%
E4187A	Trembles fine sandy loam, 0 to 2 percent slopes, occasionally flooded	36.6	0.2%
E4202A	Banks fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	37.0	0.2%
E4205B	Banks loamy fine sand, 0 to 6 percent slopes, occasionally flooded	29.2	0.2%

McKenzie County, North Dakota (ND053)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
E4227D	Seroco, hummocky-Banks, occasionally flooded loamy fine sands, 0 to 15 percent slopes	14.6	0.1%
E4541A	Bowdle-Lehr loams, 0 to 2 percent slopes	147.1	0.9%
E4542B	Lehr-Bowdle loams, 2 to 6 percent slopes	96.7	0.6%
E4553A	Tally fine sandy loam, gravelly substratum, 0 to 2 percent slopes	2.3	0.0%
E4561F	Manning-Schaller-Wabek complex, 6 to 35 percent slopes	7.0	0.0%
E4995F	Pits, gravel and sand	19.7	0.1%
E4997	Miscellaneous water	21.8	0.1%
Subtotals for Soil Survey Area		**8,139.1**	**48.2%**
Totals for Area of Interest		**16,897.1**	**100.0%**

Richland County, Montana (MT083)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
201C	Lonna-Cambeth silt loams, 2 to 8 percent slopes	32.8	0.2%
202D	Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes	56.5	0.3%
AdC	Adger silty clay loam, 0 to 8 percent slopes	3.5	0.0%
BkB	Banks loamy fine sand, 0 to 4 percent slopes	298.8	1.8%
BmB	Benz clay loam, 0 to 4 percent slopes	31.6	0.2%
CeA	Cherry silty clay loam, 0 to 2 percent slopes	661.0	3.9%
CeB	Cherry silty clay loam, 2 to 4 percent slopes	213.5	1.3%
DoB	Dooley fine sandy loam, 2 to 6 percent slopes	47.8	0.3%
FaA	Farnuf loam, 0 to 2 percent slopes	513.6	3.0%
HaA	Havrelon silt loam, 0 to 1 percent slopes	359.6	2.1%
Hb	Havrelon silty clay loam	32.4	0.2%
Lc	Lambert-Badland complex	7.6	0.0%
LfF	Lambert-Dimyaw complex, 15 to 65 percent slopes	216.8	1.3%
Lo	Lohler silty clay loam	293.9	1.7%
Rd	Ridgelawn loam	97.2	0.6%

Richland County, Montana (MT083)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SaA	Savage silty clay loam, 0 to 2 percent slopes	559.2	3.3%
ShA	Shambo loam, 0 to 2 percent slopes	120.7	0.7%
ShB	Shambo loam, 2 to 4 percent slopes	202.0	1.2%
TaB	Tally fine sandy loam, 2 to 4 percent slopes	2.4	0.0%
TaC	Tally fine sandy loam, 4 to 12 percent slopes	115.6	0.7%
TeF	Tinsley soils, 15 to 65 percent slopes	48.2	0.3%
Tm	Trembles fine sandy loam	33.9	0.2%
ToB	Turner-Beaverton complex, 0 to 4 percent slopes	99.7	0.6%
Va	Vanda clay	87.8	0.5%
VdB	Vida clay loam, 1 to 4 percent slopes	348.0	2.1%
VdC	Vida clay loam, 4 to 8 percent slopes	1,754.2	10.4%
VhC	Vida-Zahill complex, 4 to 8 percent slopes	67.2	0.4%
VhD	Vida-Zahill complex, 8 to 15 percent slopes	390.7	2.3%
WmB	Williams loam, 0 to 4 percent slopes	787.4	4.7%
ZaF	Zahill loam, 15 to 65 percent slopes	1,074.5	6.4%
ZbF	Zahill-Lambert complex, 15 to 65 percent slopes	199.9	1.2%
Subtotals for Soil Survey Area		**8,758.0**	**51.8%**
Totals for Area of Interest		**16,897.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

McKenzie County, North Dakota

42B—Williams-Zahl loams, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: ct30
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Williams and similar soils: 49 percent
Zahl and similar soils: 27 percent
Minor components: 24 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Williams

Setting

Landform: Rises
Landform position (two-dimensional): Backslope, summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy till

Typical profile

Ap - 0 to 6 inches: loam
Bt1 - 6 to 10 inches: clay loam
Bt2 - 10 to 15 inches: clay loam
Btk - 15 to 24 inches: clay loam
Bk - 24 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 3 to 6 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Loam (G054XY100ND)

Description of Zahl

Setting

Landform: Rises
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy till

Typical profile

Ap - 0 to 5 inches: loam
Bk - 5 to 20 inches: clay loam
C - 20 to 60 inches: clay loam

Properties and qualities

Slope: 3 to 6 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Minor Components

Bowbells

Percent of map unit: 8 percent
Landform: Swales
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: Loamy overflow (R054XY023ND)
Other vegetative classification: Overflow (G054XY500ND)

Max

Percent of map unit: 8 percent
Landform: Rises
Landform position (two-dimensional): Backslope, summit

Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Loam (G054XY100ND)

Dooley

Percent of map unit: 3 percent
Landform: Rises
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Loam (G054XY100ND)

Niobell

Percent of map unit: 2 percent
Landform: Rises
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

Chama

Percent of map unit: 1 percent
Landform: Pediments
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Tonka

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Wet meadow (R054XY037ND)
Other vegetative classification: Wet (G054XY900ND)

Amor

Percent of map unit: 1 percent
Landform: Pediments
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

E0835A—Savage-Grail silty clay loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1vzs8
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Savage and similar soils: 62 percent
Grail and similar soils: 18 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Savage

Setting

Landform: Alluvial flats
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 7 inches: silty clay loam
Bt - 7 to 25 inches: silty clay
Bk - 25 to 51 inches: silty clay loam
C - 51 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2c
Hydrologic Soil Group: C

Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

Description of Grail

Setting

Landform: Swales
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Clayey alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 5 inches: silty clay loam
A - 5 to 10 inches: silty clay loam
Bt - 10 to 24 inches: silty clay
Bk - 24 to 52 inches: silty clay loam
C - 52 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2c
Hydrologic Soil Group: C
Ecological site: Loamy overflow (R054XY023ND)
Other vegetative classification: Overflow (G054XY500ND)

Minor Components

Belfield

Percent of map unit: 8 percent
Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

Farland

Percent of map unit: 5 percent
Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)

Other vegetative classification: Loam (G054XY100ND)

Regent

Percent of map unit: 3 percent
Landform: Pediments
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

Daglum

Percent of map unit: 2 percent
Landform: Alluvial flats
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: Claypan (R054XY021ND)
Other vegetative classification: Claypan (G054XY800ND)

Lawther

Percent of map unit: 2 percent
Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

E3203C—Cherry silt loam, 6 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1vzvk
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cherry and similar soils: 73 percent
Minor components: 27 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cherry

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-silty alluvium

Typical profile

A - 0 to 3 inches: silt loam
Bw - 3 to 33 inches: silty clay loam
C - 33 to 60 inches: silty clay loam

Properties and qualities

Slope: 6 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 8.0 mmhos/cm)
Available water storage in profile: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Minor Components

Maschetah

Percent of map unit: 12 percent
Landform: Ridges
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Lambert, occasionally flooded

Percent of map unit: 5 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Shambo

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Loam (G054XY100ND)

Cherry

Percent of map unit: 3 percent
Landform: Alluvial fans

Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

Daglum

Percent of map unit: 2 percent
Landform: Alluvial fans
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: Claypan (R054XY021ND)
Other vegetative classification: Claypan (G054XY800ND)

Chama

Percent of map unit: 2 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Thin loamy (R054XY038ND)
Other vegetative classification: Limy Upland (G054XY400ND)

E4051A—Trembles fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d1wq
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Trembles, occasionally flooded, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trembles, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: fine sandy loam
C - 9 to 59 inches: fine sandy loam
2C - 59 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Minor Components

Havrelon, occasionally flooded

Percent of map unit: 14 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Trembles, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Overflow (G054XY500ND)

Ridgelawn, occasionally flooded

Percent of map unit: 3 percent
Landform: Flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Banks, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

E4103A—Lohler silty clay, saline, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d1tg
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Lohler, saline, occasionally flooded, and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lohler, Saline, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

Ap - 0 to 8 inches: silty clay
C - 8 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to moderately saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: Saline lowland (R054XY024ND)

Other vegetative classification: Saline (G054XY895ND)

Minor Components

Lohler, slightly saline, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

Lohler, strongly saline, occasionally flooded

Percent of map unit: 4 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

E4105A—Lohler complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: cdqf
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lohler, occasionally flooded, and similar soils: 48 percent
Minor components: 52 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lohler, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

Ap - 0 to 8 inches: silty clay
C - 8 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Minor Components

Lohler, occasionally flooded

Percent of map unit: 36 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Havrelon, occasionally flooded

Percent of map unit: 9 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Lallie, occasionally flooded

Percent of map unit: 4 percent
Landform: Oxbows on flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Wet meadow (R054XY037ND)
Other vegetative classification: Wet (G054XY900ND)

Ridgelawn, occasionally flooded

Percent of map unit: 3 percent
Landform: Flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

E4106A—Lohler silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d33f
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lohler, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lohler, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

A - 0 to 8 inches: silty clay
C - 8 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Minor Components

Lallie, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains, oxbows on flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Wet meadow (R054XY037ND)
Other vegetative classification: Wet (G054XY900ND)

Havrelon, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

E4121A—Havrelon loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 1vzvv
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Havrelon, occasionally flooded, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon, Occasionally Flooded

Setting

Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: loam
C1 - 9 to 59 inches: loam
C2 - 59 to 80 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 6.0 mmhos/cm)
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Minor Components

Trembles, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Fluvaquents, channeled, frequently flooded

Percent of map unit: 5 percent
Landform: Channels on flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Non-site (R054XY999ND)
Other vegetative classification: Not suited (G054XY000ND)

Lallie, occasionally flooded

Percent of map unit: 3 percent
Landform: Oxbows on flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Wet meadow (R054XY037ND)
Other vegetative classification: Wet (G054XY900ND)

Ridgelawn, occasionally flooded

Percent of map unit: 2 percent
Landform: Flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

E4122A—Havrelon loam, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 1sdwr
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Havrelon, occasionally flooded, and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: loam
C1 - 9 to 59 inches: loam
C2 - 59 to 80 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 6.0 mmhos/cm)
Available water storage in profile: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Minor Components

Havrelon, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Trembles, occasionally flooded

Percent of map unit: 4 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Lallie, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains, oxbows on flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Wet meadow (R054XY037ND)
Other vegetative classification: Wet (G054XY900ND)

Lohler, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

E4128A—Havrelon silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 1vzvy
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Havrelon, saline, occasionally flooded, and similar soils: 60 percent
Minor components: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon, Saline, Occasionally Flooded

Setting

Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: silty clay loam
C1 - 9 to 59 inches: loam
C2 - 59 to 80 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Slightly saline to moderately saline (5.0 to 16.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

Minor Components

Trembles, strongly saline, occasionally flooded

Percent of map unit: 14 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Not suited (G054XY000ND)

Scorio, saline,occasionally flooded

Percent of map unit: 12 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

Havrelon, strongly saline, occasionally flooded

Percent of map unit: 7 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Not suited (G054XY000ND)

Trembles, saline, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

Lohler, saline, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

E4132A—Havrelon silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: cdtw
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Havrelon, occasionally flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: silty clay
C1 - 9 to 59 inches: loam
C2 - 59 to 80 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 6.0 mmhos/cm)
Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Minor Components

Lohler, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Havrelon, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

E4134A—Hoffmanville silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d33g
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hoffmanville, occasionally flooded, and similar soils: 75 percent

Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoffmanville, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium over sandy and gravelly alluvium

Typical profile

Ap - 0 to 8 inches: silty clay
C1 - 8 to 26 inches: silty clay
2C2 - 26 to 50 inches: loamy fine sand
3C3 - 50 to 61 inches: silty clay loam
4C4 - 61 to 80 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

Minor Components

Lohler, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Scorio, occasionally flooded

Percent of map unit: 8 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Overflow (G054XY500ND)

Ridgelawn, occasionally flooded

Percent of map unit: 5 percent
Landform: Flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Banks, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

E4153A—Ridgelawn silt loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d33d
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ridgelawn, occasionally flooded, and similar soils: 60 percent
Minor components: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgelawn, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy alluvium over sandy and gravelly alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
C - 9 to 29 inches: silt loam
2C - 29 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Minor Components

Banks, occasionally flooded
Percent of map unit: 12 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Trembles, occasionally flooded
Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Havrelon, occasionally flooded
Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Lohler, occasionally flooded
Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Hoffmanville, occasionally flooded
Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Clayey Subsoil (G054XY210ND)

E4159A—Scorio silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: d33h
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Scorio, occasionally flooded, and similar soils: 76 percent
Minor components: 24 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scorio, Occasionally Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium over loamy alluvium

Typical profile

Ap - 0 to 8 inches: silty clay
C1 - 8 to 32 inches: silty clay
2C2 - 32 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C

Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Overflow (G054XY500ND)

Minor Components

Scorio, occasionally flooded
Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Overflow (G054XY500ND)

Lohler, occasionally flooded
Percent of map unit: 6 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (R054XY020ND)
Other vegetative classification: Overflow (G054XY500ND)

Scorio, saline, occasionally flooded
Percent of map unit: 5 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline lowland (R054XY024ND)
Other vegetative classification: Saline (G054XY895ND)

Havrelon, occasionally flooded
Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

E4187A—Trembles fine sandy loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 1vzw5
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Trembles, occasionally flooded, and similar soils: 78 percent
Minor components: 22 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trembles, Occasionally Flooded

Setting

Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 9 inches: fine sandy loam
C - 9 to 59 inches: fine sandy loam
2C - 59 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Minor Components

Havrelon, occasionally flooded

Percent of map unit: 12 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Fluvaquents, channeled, frequently flooded

Percent of map unit: 5 percent
Landform: Channels on flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Non-site (R054XY999ND)
Other vegetative classification: Not suited (G054XY000ND)

Korchea, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

Banks, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

E4202A—Banks fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2r4f1
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Minor Components

Banks, occasionally flooded

Percent of map unit: 65 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Banks, occasionally flooded

Percent of map unit: 12 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Banks, occasionally flooded

Percent of map unit: 10 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Trembles, occasionally flooded

Percent of map unit: 8 percent

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Ridgelawn, occasionally flooded

Percent of map unit: 5 percent
Landform: Flats on flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

E4205B—Banks loamy fine sand, 0 to 6 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: cdq9
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Banks, occasionally flooded, and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Banks, Occasionally Flooded

Setting

Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand
C1 - 6 to 15 inches: fine sandy loam
C2 - 15 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Minor Components

Banks, occasionally flooded

Percent of map unit: 12 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Banks, occasionally flooded

Percent of map unit: 7 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Fluvaquents, channeled, frequently flooded

Percent of map unit: 5 percent
Landform: Channels on flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Non-site (R054XY999ND)
Other vegetative classification: Not suited (G054XY000ND)

Trembles, occasionally flooded

Percent of map unit: 4 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Havrelon, occasionally flooded

Percent of map unit: 2 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy terrace (R054XY041ND)
Other vegetative classification: Loam (G054XY100ND)

E4227D—Seroco, hummocky-Banks, occasionally flooded loamy fine sands, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2qz8b
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Seroco, hummocky, and similar soils: 80 percent
Banks, occasionally flooded, and similar soils: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Seroco, Hummocky

Setting

Landform: Dunes, knobs, ridges
Landform position (two-dimensional): Summit, shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy alluvium derived from sedimentary rock and/or eolian sands

Typical profile

A - 0 to 3 inches: loamy fine sand
C - 3 to 60 inches: fine sand

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Thin sands (R054XY034ND)
Other vegetative classification: Not suited (G054XY000ND)

Description of Banks, Occasionally Flooded

Setting

Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

Ap - 0 to 6 inches: loamy fine sand
C1 - 6 to 15 inches: fine sandy loam
C2 - 15 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Sand (G054XY300ND)

Minor Components

Trembles, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy terrace (R054XY042ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

E4541A—Bowdle-Lehr loams, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2qkxl
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches

Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Bowdle and similar soils: 42 percent
Lehr and similar soils: 40 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bowdle

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 8 inches: loam
Bw1 - 8 to 16 inches: loam
Bw2 - 16 to 22 inches: loam
Bk - 22 to 25 inches: gravelly loam
2C1 - 25 to 30 inches: very gravelly loamy sand
2C2 - 30 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Description of Lehr

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy alluvium

Typical profile

Ap - 0 to 6 inches: loam

Bw - 6 to 11 inches: loam
Bk1 - 11 to 15 inches: loam
2Bk2 - 15 to 22 inches: gravelly loamy coarse sand
2C - 22 to 60 inches: very gravelly coarse sand

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: Shallow gravel (R054XY029ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Minor Components

Wabek
Percent of map unit: 8 percent
Landform: Rises on terraces
Landform position (two-dimensional): Shoulder, summit
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Very shallow (R054XY035ND)
Other vegetative classification: Not suited (G054XY000ND)

Stady
Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Falkirk
Percent of map unit: 3 percent
Landform: Rises
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Loam (G054XY100ND)

Arnegard
Percent of map unit: 2 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Loam (G054XY100ND)

E4542B—Lehr-Bowdle loams, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qkxm
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Lehr and similar soils: 58 percent
Bowdle and similar soils: 30 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lehr

Setting

Landform: Terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-loamy alluvium

Typical profile

Ap - 0 to 6 inches: loam
Bw - 6 to 11 inches: loam
Bk1 - 11 to 15 inches: loam
2Bk2 - 15 to 22 inches: gravelly loamy coarse sand
2C - 22 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: A
Ecological site: Shallow gravel (R054XY029ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Description of Bowdle

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 8 inches: loam
Bw1 - 8 to 16 inches: loam
Bw2 - 16 to 22 inches: loam
Bk - 22 to 25 inches: gravelly loam
2C1 - 25 to 30 inches: very gravelly loamy sand
2C2 - 30 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Minor Components

Wabek

Percent of map unit: 5 percent
Landform: Rises on terraces
Landform position (two-dimensional): Shoulder, summit
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Very shallow (R054XY035ND)
Other vegetative classification: Not suited (G054XY000ND)

Stady

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Appam

Percent of map unit: 2 percent
Landform: Glacial drainage channels
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Arnegard

Percent of map unit: 2 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy overflow (R054XY023ND)
Other vegetative classification: Loam (G054XY100ND)

E4553A—Tally fine sandy loam, gravelly substratum, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2qz97
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tally, gravelly substratum, and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tally, Gravelly Substratum

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: fine sandy loam
Bw - 6 to 32 inches: fine sandy loam
Bk - 32 to 42 inches: fine sandy loam
2BCk - 42 to 48 inches: gravelly sandy loam
2C - 48 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Minor Components

Manning

Percent of map unit: 10 percent
Landform: Stream terraces on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Parshall, gravelly substratum

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Loam (G054XY100ND)

Lihen

Percent of map unit: 3 percent
Landform: Alluvial flats
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Sands (R054XY025ND)
Other vegetative classification: Sand (G054XY300ND)

Stady

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Lehr

Percent of map unit: 2 percent
Landform: Terraces

Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Shallow loamy (R054XY030ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Vebar

Percent of map unit: 2 percent
Landform: Pediments
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

E4561F—Manning-Schaller-Wabek complex, 6 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2r4ff
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Manning and similar soils: 30 percent
Schaller and similar soils: 25 percent
Wabek and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manning

Setting

Landform: Escarpments on stream terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Bw - 5 to 18 inches: fine sandy loam
Bk - 18 to 25 inches: fine sandy loam
2C - 25 to 60 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Description of Schaller

Setting

Landform: Escarpments on stream terraces
Landform position (two-dimensional): Shoulder, summit
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Sandy alluvium derived from sedimentary rock

Typical profile

A - 0 to 9 inches: sandy loam
Bk - 9 to 15 inches: fine sandy loam
C - 15 to 60 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 6 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sands (R054XY025ND)
Other vegetative classification: Not suited (G054XY000ND)

Description of Wabek

Setting

Landform: Escarpments on terraces
Landform position (two-dimensional): Shoulder, summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium

Typical profile

A - 0 to 5 inches: loam
Bk - 5 to 10 inches: gravelly coarse sandy loam
C - 10 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 9 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Very shallow (R054XY035ND)
Other vegetative classification: Not suited (G054XY000ND)

Minor Components

Stady

Percent of map unit: 11 percent
Landform: Escarpments on stream terraces
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy (R054XY031ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Tally, gravelly substratum

Percent of map unit: 6 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (R054XY026ND)
Other vegetative classification: Droughty Loam (G054XY120ND)

Lehr

Percent of map unit: 5 percent
Landform: Escarpments on terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Shallow gravel (R054XY029ND)
Other vegetative classification: Very Droughty Loam (G054XY130ND)

Cabba

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder

Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Shallow loamy (R054XY030ND)
Other vegetative classification: Not suited (G054XY000ND)

E4995F—Pits, gravel and sand

Map Unit Setting

National map unit symbol: 1w03j
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits, gravel and sand: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Gravel And Sand

Setting

Landform: Stream terraces
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Alluvium

Typical profile

C1 - 0 to 6 inches: extremely gravelly sand
C2 - 6 to 60 inches: extremely gravelly sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Ecological site: Non-site (R054XY999ND)
Other vegetative classification: Not suited (G054XY000ND)

E4997—Miscellaneous water

Map Unit Setting

National map unit symbol: 1w03k
Elevation: 1,650 to 3,600 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Water, sewage lagoon: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water, Sewage Lagoon

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Ecological site: Non-site (R054XY999ND)
Other vegetative classification: Not suited (G054XY000ND)

Richland County, Montana

201C—Lonna-Cambeth silt loams, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2td94
Elevation: 1,930 to 3,460 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 41 to 45 degrees F
Frost-free period: 100 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Lonna and similar soils: 50 percent
Cambeth and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lonna

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, side slope, interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: silt loam
Bw - 5 to 10 inches: silt loam
Bk - 10 to 30 inches: silt loam
BC - 30 to 60 inches: silt loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to slightly saline (1.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Description of Cambeth

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from calcareous siltstone

Typical profile

A - 0 to 3 inches: silt loam
Bw - 3 to 11 inches: silt loam
Bk - 11 to 35 inches: silt loam
Cr - 35 to 60 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (1.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Cabbart

Percent of map unit: 4 percent
Landform: Low hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (sw) rru 58a-e 10-14" p.z. (R058AE019MT)

Alona

Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-saline (sis) rru 58a-e 10-14" p.z. (R058AE193MT)

Kobase

Percent of map unit: 3 percent
Landform: Stream terraces

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Sixbeacon

Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to gravel (swgr) rru 58a-e 10-14" p.z. (R058AE191MT)

Rock outcrop

Percent of map unit: 2 percent

202D—Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes

Map Unit Setting

National map unit symbol: 2tvls
Elevation: 1,890 to 3,460 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 100 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Lonna and similar soils: 40 percent
Cambeth and similar soils: 30 percent
Cabbart and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lonna

Setting

Landform: Low hills, alluvial fans
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

A - 0 to 3 inches: silt loam
Bw - 3 to 11 inches: silt loam
Bk - 11 to 36 inches: silt loam
BC - 36 to 60 inches: silt loam

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 26 percent
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Description of Cambeth

Setting

Landform: Low hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty residuum weathered from sandstone and siltstone

Typical profile

A - 0 to 3 inches: silt loam
Bw - 3 to 11 inches: silt loam
Bk - 11 to 35 inches: silt loam
Cr - 35 to 60 inches: bedrock

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (1.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Description of Cabbart

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, nose slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and siltstone

Typical profile

A - 0 to 3 inches: silt loam
Bk - 3 to 12 inches: loam
BC - 12 to 15 inches: loam
Cr - 15 to 60 inches: bedrock

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow (sw) rru 58a-e 10-14" p.z. (R058AE019MT)

Minor Components

Busby

Percent of map unit: 5 percent
Landform: Low hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Kobase

Percent of map unit: 4 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 60b-e 10-14" p.z. (R060BE566MT)

Yawdim

Percent of map unit: 3 percent

Landform: Low hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Shallow clay (swc) rru 58a-e 10-14" p.z. (R058AE199MT)

Tricart

Percent of map unit: 2 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Gravel (gr) rru 58a-e 10-14" p.z. (R058AE016MT)

Rock outcrop

Percent of map unit: 1 percent

AdC—Adger silty clay loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: clbd
Elevation: 2,000 to 4,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Adger and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Adger

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

A - 0 to 4 inches: silty clay loam
Bt - 4 to 15 inches: silty clay
Bk - 15 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to moderately saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Dense clay (dc) rru 58a-e 10-14" p.z. (R058AE014MT)

Minor Components

Williams

Percent of map unit: 4 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Zahill

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Vida

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

BkB—Banks loamy fine sand, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: clbg
Elevation: 1,600 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Banks and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Banks

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 8 inches: loamy fine sand
C - 8 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sands (sa) 10-14" p.z. (R053AE076MT)

Minor Components

Areas of riverwash

Percent of map unit: 4 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Havrelon

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Overflow (ov) rru 58a-e 10-14" p.z. (R058AE007MT)

Trembles

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

BmB—Benz clay loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: clbh
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Benz and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Benz

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 8 inches: clay loam
C - 8 to 60 inches: stratified clay loam to sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to moderately saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: Saline upland (su) rru 58a-e 10-14" p.z. (R058AE011MT)

Minor Components

Trembles

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Havrelon

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Vanda

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Dense clay (dc) rru 58a-e 10-14" p.z. (R058AE014MT)

CeA—Cherry silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: clbl
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Cherry and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cherry

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 11 inches: silty clay loam
Bw - 11 to 21 inches: silty clay loam
Bk - 21 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Havrelon

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Savage

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Lohler

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Marias

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

CeB—Cherry silty clay loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: clbm
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Cherry and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cherry

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 11 inches: silty clay loam
Bw - 11 to 21 inches: silty clay loam
Bk - 21 to 60 inches: silty clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Savage

Percent of map unit: 4 percent

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Marias
Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Shambo
Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

DoB—Dooley fine sandy loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: clbs
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Dooley and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dooley

Setting
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile
Ap - 0 to 6 inches: fine sandy loam
Bt - 6 to 15 inches: sandy clay loam
BC - 15 to 27 inches: sandy loam
2C - 27 to 60 inches: clay loam

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Minor Components

Tally
Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Williams
Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Zahill
Percent of map unit: 2 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Vida
Percent of map unit: 2 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

FaA—Farnuf loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: clbt
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches

Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Farnuf and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Farnuf

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 10 inches: loam
Bt - 10 to 15 inches: clay loam
Bk - 15 to 25 inches: clay loam
BC - 25 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (2.0 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Savage

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Turner

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Shambo

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

HaA—Havrelon silt loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: clbw
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Havrelon and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 8 inches: silt loam
C - 8 to 60 inches: stratified very fine sandy loam to loam to silty clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Cherry

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Lohler

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Trembles

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Hb—Havrelon silty clay loam

Map Unit Setting

National map unit symbol: clby
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Havrelon and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Havrelon

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 8 inches: silty clay loam
C - 8 to 60 inches: stratified very fine sandy loam to loam to silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Cherry

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Lohler

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Trembles

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Lc—Lambert-Badland complex

Map Unit Setting

National map unit symbol: clc3
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Lambert and similar soils: 50 percent

Badland: 40 percent
Blanchard and similar soils: 3 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lambert

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: silt loam
C - 4 to 18 inches: silt loam
Cr - 18 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Silty-steep (sistp) rru 58a-e 10-14" p.z. (R058AE004MT)

Description of Blanchard

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loamy fine sand
C - 6 to 60 inches: loamy fine sand

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Minor Components

Dast

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Zahill

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Tinsley

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Gravel (gr) 10-14" p.z. (R053AE621MT)

Ringling

Percent of map unit: 1 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Very shallow (vsw) rru 58a-e 10-14" p.z. (R058AE017MT)

LfF—Lambert-Dimyaw complex, 15 to 65 percent slopes

Map Unit Setting

National map unit symbol: clc5
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Lambert and similar soils: 55 percent
Dimyaw and similar soils: 35 percent

Blanchard and similar soils: 3 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lambert

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 3 inches: silt loam
C - 3 to 18 inches: silt loam
Cr - 18 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Silty-steep (sistp) rru 58a-e 10-14" p.z. (R058AE004MT)

Description of Dimyaw

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: silty clay loam
C - 4 to 60 inches: silty clay loam

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Clayey-steep (cystp) rru 58a-e 10-14" p.z. (R058AE005MT)

Description of Blanchard

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loamy fine sand
C - 6 to 60 inches: loamy fine sand

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Minor Components

Dast

Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Ringling

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Very shallow (vsw) rru 58a-e 10-14" p.z. (R058AE017MT)

Zahill

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Lo—Lohler silty clay loam

Map Unit Setting

National map unit symbol: clc8
Elevation: 1,900 to 6,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Lohler and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lohler

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

A - 0 to 8 inches: silty clay loam
C - 8 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Minor Components

Havrelon
Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Marias
Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Ridgelawn
Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Hoffmanville
Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Trembles
Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Cherry
Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Rd—Ridgelawn loam

Map Unit Setting
National map unit symbol: clcd
Elevation: 1,900 to 6,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ridgelawn and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgelawn

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 7 inches: loam
C1 - 7 to 24 inches: loam
2C2 - 24 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Havrelon

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Hoffmanville

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Lohler

Percent of map unit: 2 percent

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Trembles

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

SaA—Savage silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: clcg
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Savage and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Savage

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

A - 0 to 11 inches: silty clay loam
Bt - 11 to 19 inches: silty clay
Bk - 19 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 3.0 mmhos/cm)

Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Minor Components

Farnuf

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Cherry

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Marias

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Turner

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

ShA—Shambo loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: clcj
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Shambo and similar soils: 90 percent
Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shambo

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loam
Bw - 6 to 31 inches: loam
Bk - 31 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Cherry

Percent of map unit: 4 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Turner

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Farnuf

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

ShB—Shambo loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: clck
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Shambo and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Shambo

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loam
Bw - 6 to 31 inches: loam
Bk - 31 to 60 inches: loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Minor Components

Farnuf

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Cherry

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Turner

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Lambert

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

TaB—Tally fine sandy loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: clct
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tally and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tally

Setting

Landform: Alluvial fans
Down-slope shape: Linear

Across-slope shape: Linear

Typical profile

A - 0 to 7 inches: fine sandy loam
Bw - 7 to 16 inches: fine sandy loam
Bk - 16 to 60 inches: fine sandy loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Minor Components

Lihen

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Turner

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Dast

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Shambo

Percent of map unit: 1 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

TaC—Tally fine sandy loam, 4 to 12 percent slopes

Map Unit Setting

National map unit symbol: clcv
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tally and similar soils: 85 percent
Blanchard and similar soils: 3 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tally

Setting

Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 7 inches: fine sandy loam
Bw - 7 to 16 inches: fine sandy loam
Bk - 16 to 60 inches: fine sandy loam

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Description of Blanchard

Setting

Landform: Hills

Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 6 inches: loamy fine sand
C - 6 to 60 inches: loamy fine sand

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Minor Components

Lihen

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Dast

Percent of map unit: 5 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) rru 58a-e 10-14" p.z. (R058AE003MT)

Shambo

Percent of map unit: 2 percent
Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

TeF—Tinsley soils, 15 to 65 percent slopes

Map Unit Setting

National map unit symbol: clcw
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Tinsley and similar soils: 45 percent
Tinsley and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tinsley

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 3 inches: gravelly sandy loam
C - 3 to 60 inches: very gravelly sand

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Gravel (gr) 10-14" p.z. (R053AE621MT)

Description of Tinsley

Setting

Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 3 inches: gravelly loamy sand
C - 3 to 60 inches: very gravelly sand

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Gravel (gr) 10-14" p.z. (R053AE621MT)

Minor Components

Beaverton

Percent of map unit: 3 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to gravel (swgr) rru 58a-e 10-14" p.z. (R058AE191MT)

Lambert

Percent of map unit: 2 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Lihen

Percent of map unit: 2 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sands (sa) rru 58a-e 10-14" p.z. (R058AE018MT)

Farnuf

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Zahill

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Turner

Percent of map unit: 1 percent
Landform: Paleoterraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Tm—Trembles fine sandy loam

Map Unit Setting

National map unit symbol: clcx
Elevation: 1,600 to 6,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Trembles and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trembles

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 7 inches: fine sandy loam

C1 - 7 to 30 inches: stratified fine sandy loam to loam
C2 - 30 to 60 inches: stratified fine sandy loam to loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Minor Components

Hoffmanville

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Ridgelawn

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Banks

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sands (sa) 10-14" p.z. (R053AE076MT)

Lohler

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) 10-14" p.z. (R053AE061MT)

Cherry

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Havrelon

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

ToB—Turner-Beaverton complex, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: clcy
Elevation: 1,900 to 5,000 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Turner and similar soils: 55 percent
Beaverton and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Turner

Setting

Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 11 inches: clay loam
Bt - 11 to 26 inches: clay loam
2C - 26 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Description of Beaverton

Setting

Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Gravelly alluvium

Typical profile

Ap - 0 to 8 inches: loam
Bt - 8 to 10 inches: clay loam
Bk - 10 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Shallow to gravel (swgr) rru 58a-e 10-14" p.z. (R058AE191MT)

Minor Components

Farnuf

Percent of map unit: 4 percent
Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Shambo

Percent of map unit: 3 percent
Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Savage

Percent of map unit: 3 percent
Landform: Paleoterraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Va—Vanda clay

Map Unit Setting

National map unit symbol: clcz
Elevation: 1,900 to 4,500 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 105 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Vanda and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vanda

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

Ap - 0 to 8 inches: clay
Byz - 8 to 60 inches: clay

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Slightly saline to moderately saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Dense clay (dc) rru 58a-e 10-14" p.z. (R058AE014MT)

Minor Components

Marias

Percent of map unit: 4 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (cy) rru 58a-e 10-14" p.z. (R058AE002MT)

Cherry

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Lohler

Percent of map unit: 3 percent
Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Dense clay (dc) 10-14" p.z. (R053AE073MT)

VdB—Vida clay loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: cld0
Elevation: 1,600 to 4,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Vida and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vida

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 9 inches: clay loam
Bk - 9 to 60 inches: clay loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Bowbells

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Williams

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Zahill

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Dooley

Percent of map unit: 1 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

VdC—Vida clay loam, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: cld1
Elevation: 1,600 to 4,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Vida and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vida

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 9 inches: clay loam
Bk - 9 to 60 inches: clay loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Williams

Percent of map unit: 5 percent

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Zahill

Percent of map unit: 5 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Bowbells

Percent of map unit: 4 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Dooley

Percent of map unit: 1 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

VhC—Vida-Zahill complex, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: cld2
Elevation: 1,600 to 3,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Vida and similar soils: 50 percent
Zahill and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vida

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 6 inches: clay loam

Bt - 6 to 9 inches: clay loam
Bk - 9 to 60 inches: clay loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Description of Zahill

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: loam
Bk - 4 to 16 inches: clay loam
Cy - 16 to 60 inches: clay loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Williams

Percent of map unit: 10 percent

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Bowbells

Percent of map unit: 5 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

VhD—Vida-Zahill complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: cld3
Elevation: 1,600 to 3,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Vida and similar soils: 50 percent
Zahill and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vida

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 6 inches: clay loam
Bt - 6 to 9 inches: clay loam
Bk - 9 to 60 inches: clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Description of Zahill

Setting
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile
A - 0 to 4 inches: loam
Bk - 4 to 16 inches: clay loam
Cy - 16 to 60 inches: clay loam

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Williams
Percent of map unit: 6 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Bowbells
Percent of map unit: 4 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

WmB—Williams loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: cld5
Elevation: 1,600 to 4,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Williams and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Williams

Setting

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Ap - 0 to 7 inches: loam
Bt - 7 to 21 inches: clay loam
Bk - 21 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Minor Components

Vida

Percent of map unit: 4 percent

Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Bowbells

Percent of map unit: 3 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Dooley

Percent of map unit: 2 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy (sy) 10-14" p.z. (R053AE062MT)

Zahill

Percent of map unit: 1 percent
Landform: Ground moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

ZaF—Zahill loam, 15 to 65 percent slopes

Map Unit Setting

National map unit symbol: cld6
Elevation: 1,800 to 4,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Zahill and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zahill

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: loam
Bk - 4 to 16 inches: clay loam

Cy - 16 to 60 inches: clay loam

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Minor Components

Vida

Percent of map unit: 8 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Williams

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Lambert

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

ZbF—Zahill-Lambert complex, 15 to 65 percent slopes

Map Unit Setting

National map unit symbol: cld7
Elevation: 1,800 to 5,000 feet
Mean annual precipitation: 13 to 15 inches

Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Not prime farmland

Map Unit Composition

Zahill and similar soils: 45 percent
Lambert and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zahill

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: loam
Bk - 4 to 16 inches: clay loam
Cy - 16 to 60 inches: clay loam

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Description of Lambert

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 3 inches: silt loam
C - 3 to 18 inches: silt loam
Cr - 18 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 65 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Silty-steep (sistp) 10-14" p.z. (R053AE064MT)

Minor Components

Vida
Percent of map unit: 10 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Williams
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) 10-14" p.z. (R053AE060MT)

Shambo
Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (si) rru 58a-e 10-14" p.z. (R058AE001MT)

Tinsley
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Gravel (gr) 10-14" p.z. (R053AE621MT)

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Prime and other Important Farmlands

This table lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Report—Prime and other Important Farmlands

Prime and other Important Farmlands–McKenzie County, North Dakota		
Map Symbol	**Map Unit Name**	**Farmland Classification**
42B	Williams-Zahl loams, 3 to 6 percent slopes	Not prime farmland
E0835A	Savage-Grail silty clay loams, 0 to 2 percent slopes	Farmland of statewide importance
E3203C	Cherry silt loam, 6 to 9 percent slopes	Farmland of statewide importance
E4051A	Trembles fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4103A	Lohler silty clay, saline, 0 to 1 percent slopes, occasionally flooded	Not prime farmland
E4105A	Lohler complex, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4106A	Lohler silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4121A	Havrelon loam, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4122A	Havrelon loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4128A	Havrelon silty clay loam, saline, 0 to 1 percent slopes, occasionally flooded	Not prime farmland
E4132A	Havrelon silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4134A	Hoffmanville silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4153A	Ridgelawn silt loam, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4159A	Scorio silty clay, slightly wet, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4187A	Trembles fine sandy loam, 0 to 2 percent slopes, occasionally flooded	Farmland of statewide importance
E4202A	Banks fine sandy loam, slightly wet, 0 to 2 percent slopes, occasionally flooded	Not prime farmland
E4205B	Banks loamy fine sand, 0 to 6 percent slopes, occasionally flooded	Not prime farmland
E4227D	Seroco, hummocky-Banks, occasionally flooded loamy fine sands, 0 to 15 percent slopes	Not prime farmland
E4541A	Bowdle-Lehr loams, 0 to 2 percent slopes	Not prime farmland
E4542B	Lehr-Bowdle loams, 2 to 6 percent slopes	Not prime farmland
E4553A	Tally fine sandy loam, gravelly substratum, 0 to 2 percent slopes	Farmland of statewide importance
E4561F	Manning-Schaller-Wabek complex, 6 to 35 percent slopes	Not prime farmland
E4995F	Pits, gravel and sand	Not prime farmland
E4997	Miscellaneous water	Not prime farmland

Prime and other Important Farmlands–Richland County, Montana		
Map Symbol	**Map Unit Name**	**Farmland Classification**
201C	Lonna-Cambeth silt loams, 2 to 8 percent slopes	Not prime farmland
202D	Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes	Not prime farmland
AdC	Adger silty clay loam, 0 to 8 percent slopes	Not prime farmland
BkB	Banks loamy fine sand, 0 to 4 percent slopes	Not prime farmland
BmB	Benz clay loam, 0 to 4 percent slopes	Not prime farmland
CeA	Cherry silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated

Prime and other Important Farmlands–Richland County, Montana		
Map Symbol	**Map Unit Name**	**Farmland Classification**
CeB	Cherry silty clay loam, 2 to 4 percent slopes	Prime farmland if irrigated
DoB	Dooley fine sandy loam, 2 to 6 percent slopes	Farmland of statewide importance
FaA	Farnuf loam, 0 to 2 percent slopes	Prime farmland if irrigated
HaA	Havrelon silt loam, 0 to 1 percent slopes	Prime farmland if irrigated
Hb	Havrelon silty clay loam	Prime farmland if irrigated
Lc	Lambert-Badland complex	Not prime farmland
LfF	Lambert-Dimyaw complex, 15 to 65 percent slopes	Not prime farmland
Lo	Lohler silty clay loam	Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Rd	Ridgelawn loam	Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
SaA	Savage silty clay loam, 0 to 2 percent slopes	Prime farmland if irrigated
ShA	Shambo loam, 0 to 2 percent slopes	Prime farmland if irrigated
ShB	Shambo loam, 2 to 4 percent slopes	Prime farmland if irrigated
TaB	Tally fine sandy loam, 2 to 4 percent slopes	Farmland of statewide importance
TaC	Tally fine sandy loam, 4 to 12 percent slopes	Farmland of statewide importance
TeF	Tinsley soils, 15 to 65 percent slopes	Not prime farmland
Tm	Trembles fine sandy loam	Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
ToB	Turner-Beaverton complex, 0 to 4 percent slopes	Not prime farmland
Va	Vanda clay	Not prime farmland
VdB	Vida clay loam, 1 to 4 percent slopes	Prime farmland if irrigated
VdC	Vida clay loam, 4 to 8 percent slopes	Farmland of statewide importance
VhC	Vida-Zahill complex, 4 to 8 percent slopes	Not prime farmland
VhD	Vida-Zahill complex, 8 to 15 percent slopes	Not prime farmland
WmB	Williams loam, 0 to 4 percent slopes	Prime farmland if irrigated
ZaF	Zahill loam, 15 to 65 percent slopes	Not prime farmland
ZbF	Zahill-Lambert complex, 15 to 65 percent slopes	Not prime farmland

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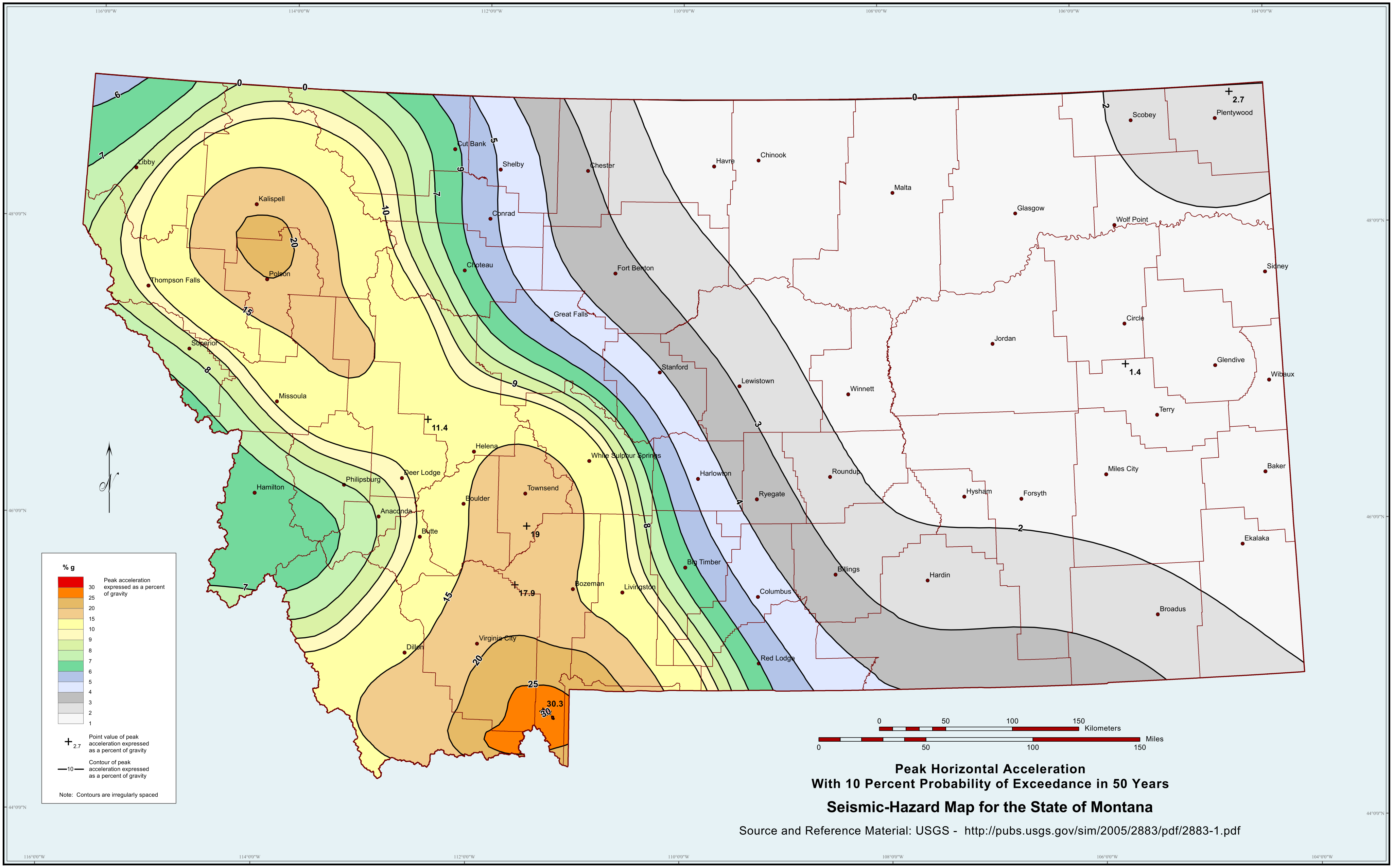
Attachment 3
Seismicity Map


Peak Horizontal Acceleration
With 10 Percent Probability of Exceedance in 50 Years
Seismic-Hazard Map for the State of Montana
Source and Reference Material: USGS - http://pubs.usgs.gov/sim/2005/2883/pdf/2883-1.pdf
% g
Peak acceleration expressed as a percent of gravity
30
25
20
15
10
9
8
7
6
5
4
3
2
1
Point value of peak acceleration expressed as a percent of gravity
Contour of peak acceleration expressed as a percent of gravity
Note: Contours are irregularly spaced
Kilometers
0
50
100
150
Miles
0
50
100
150
Libby
Kalispell
Polson
Thompson Falls
Superior
Missoula
Hamilton
Philipsburg
Anaconda
Deer Lodge
Butte
Dillon
Helena
Boulder
Townsend
Virginia City
Bozeman
Livingston
White Sulphur Springs
Cut Bank
Shelby
Conrad
Choteau
Great Falls
Chester
Fort Benton
Stanford
Lewistown
Harlowton
Big Timber
Columbus
Red Lodge
Ryegate
Billings
Roundup
Havre
Chinook
Malta
Winnett
Glasgow
Jordan
Hysham
Forsyth
Hardin
Scobey
Plentywood
Wolf Point
Sidney
Circle
Glendive
Wibaux
Terry
Miles City
Baker
Ekalaka
Broadus
11.4
19
17.9
30.3
2.7
1.4

Attachment 4
Groundwater Data

Ground Water Information Center
Montana Bureau of Mines and Geology
Montana Tech of The University of Montana
1300 West Park Street - Natural Resources Building Room 329
Butte Montana 59701-8997
Ph: (406) 496-4336 Fx: (406) 496-4343

Overview of RICHLAND county

At-A-Glance

Number of wells in County	4467
Deepest well on record (feet)	1945
Shallowest well on record (feet)	1
Most recent well on record	2/20/2015
Oldest well on record	1/1/1890
Number of water quality samples	361
Number of measured water levels	629157
Statewide Monitoring Network wells	8

Other Reports

Use By Year View this report to see the number of wells and their reported water uses by year.

Histograms for RICHLAND county

Wells by Year

The table below shows the breakdown of wells reportedly drilled in the county during the last 20 years. Click the "show all" link to display all data available.

2015	1
2014	85
2013	117
2012	143
2011	85
2010	66
2009	58
2008	79
2007	90
2006	55
2005	50
2004	47
2003	54
2002	43
2001	59
2000	61
1999	49
1998	48
1997	33
1996	46

Show all years

Wells by Depth

The table below shows the number of wells that fall between the depth ranges in the left hand column. All depths are listed in feet below ground surface.

0 - 99	2671
100 - 199	950
200 - 299	398
300 - 399	170
400 - 499	73
500 - 599	26
600 - 699	14
700 - 799	8
800 - 899	20
900 - 999	4
> 1000	133

Reported Water Use

The table below shows the number of each type of water use that has been reported for wells in this county.

UNKNOWN	128
INJECTION	7
INDUSTRIAL	72
OTHER	31
PUBLIC WATER SUPPLY	98
TEST WELL	134
UNUSED	193
FIRE PROTECTION	1
MONITORING	299
COMMERCIAL	47
IRRIGATION	120
RESEARCH	24
GEOTECH	71
STOCKWATER	2403
DOMESTIC	1874
* Total	5502

* Number may differ from county total since one well may have several reported **water uses**.

Geologic Source

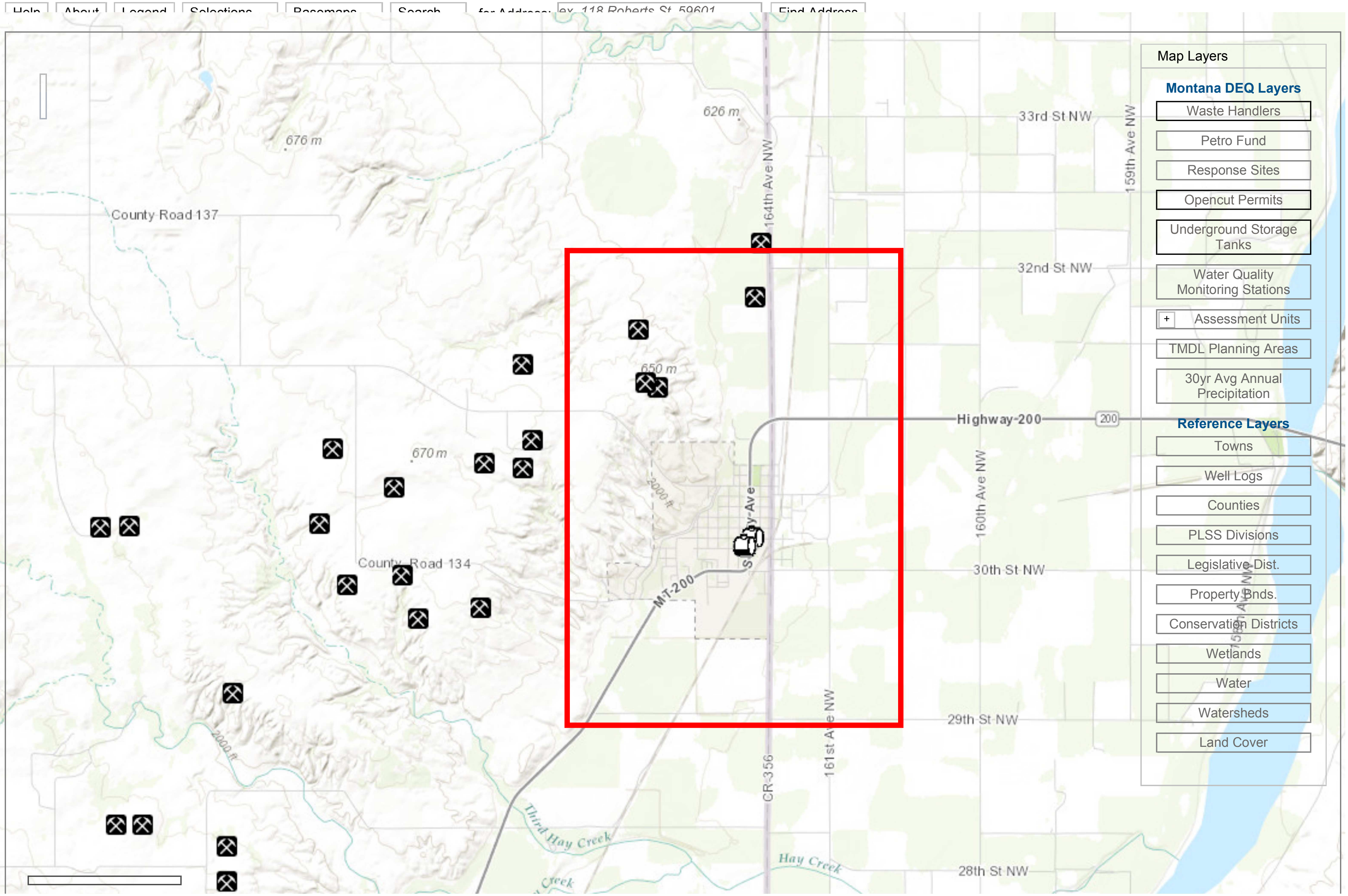
The table below shows the breakdown of geologic sources for wells in this county. Note that not all wells in a county necessarily have had the geologic source code assigned.

TONGUE RIVER MEMBER (OF FT UNION FM.) (125TGRV)	1253
FORT UNION FORMATION (125FRUN)	429
ALLUVIUM (QUATERNARY) (110ALVM)	410
TERRACE DEPOSITS (PLEISTOCENE) (112TRRC)	173
ALLUVIUM (HOLOCENE) (111ALVM)	85
FOX HILLS-HELL CREEK AQUIFER (211FHHC)	77
SAND AND GRAVEL (QUATERNARY) (110SNGR)	45
FOX HILLS FORMATION OR SANDSTONE (211FXHL)	40
COLGATE SANDSTONE MEMBER (OF FOX HILLS FM.) (211COGT)	36
TERRACE DEPOSITS (QUATERNARY) (110TRRC)	30
HELL CREEK FORMATION (211HLCK)	28
ALLUVIUM (PLEISTOCENE) (112ALVM)	27
TULLOCK MEMBER (OF FT UNION FM.) (125TLCK)	25
GLACIAL OUTWASH (PLEISTOCENE) (112OTSH)	24
GLACIAL DRIFT (112DRFT)	12
SAND AND GRAVEL (PLEISTOCENE) (112SNGR)	11
GLACIAL TILL (112TILL)	4
SAND AND GRAVEL (HOLOCENE) (111SNGR)	4
MADISON GROUP OR LIMESTONE (330MDSN)	3
CENOZOIC UNDIFFERENTIATED (100UDFD)	3
COLLUVIUM (QUATERNARY) (110CLVM)	1
TERRACE DEPOSITS (HOLOCENE) (111TRRC)	1
LEBO SHALE MEMBER (OF FT UNION FM.) (125LEBO)	1

Attachment 5
Hazardous Materials

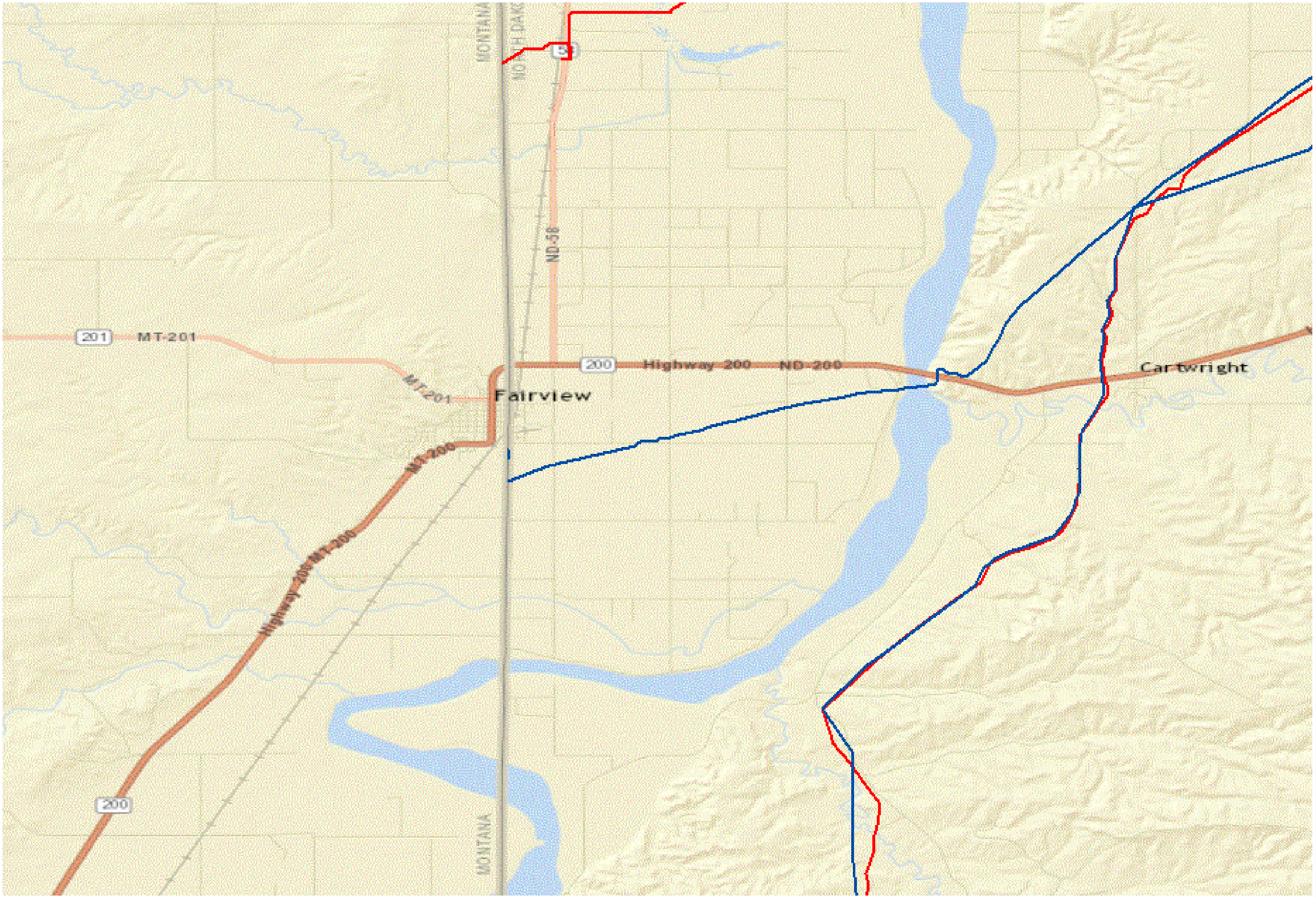
DEQ Mapping DEQ's Data

Help | About | Legend | Selections | Basemaps | Search | for Address: ex. 118 Roberts St. 59601 | Find Address



Pipeline and Hazardous Materials Safety Administration

NATIONAL PIPELINE MAPPING SYSTEM



Legend

- Gas Transmission Pipelines
- Hazardous Liquid Pipelines

0 0.8 Miles

Pipelines depicted on this map represent gas transmission and hazardous liquid lines only. Gas gathering and gas distribution systems are not represented.

This map should never be used as a substitute for contacting a one-call center prior to excavation activities. Please call 811 before any digging occurs.

Questions regarding this map or its contents can be directed to npms-nr@mbakercorp.com.

Projection: Geographic

Datum: NAD83

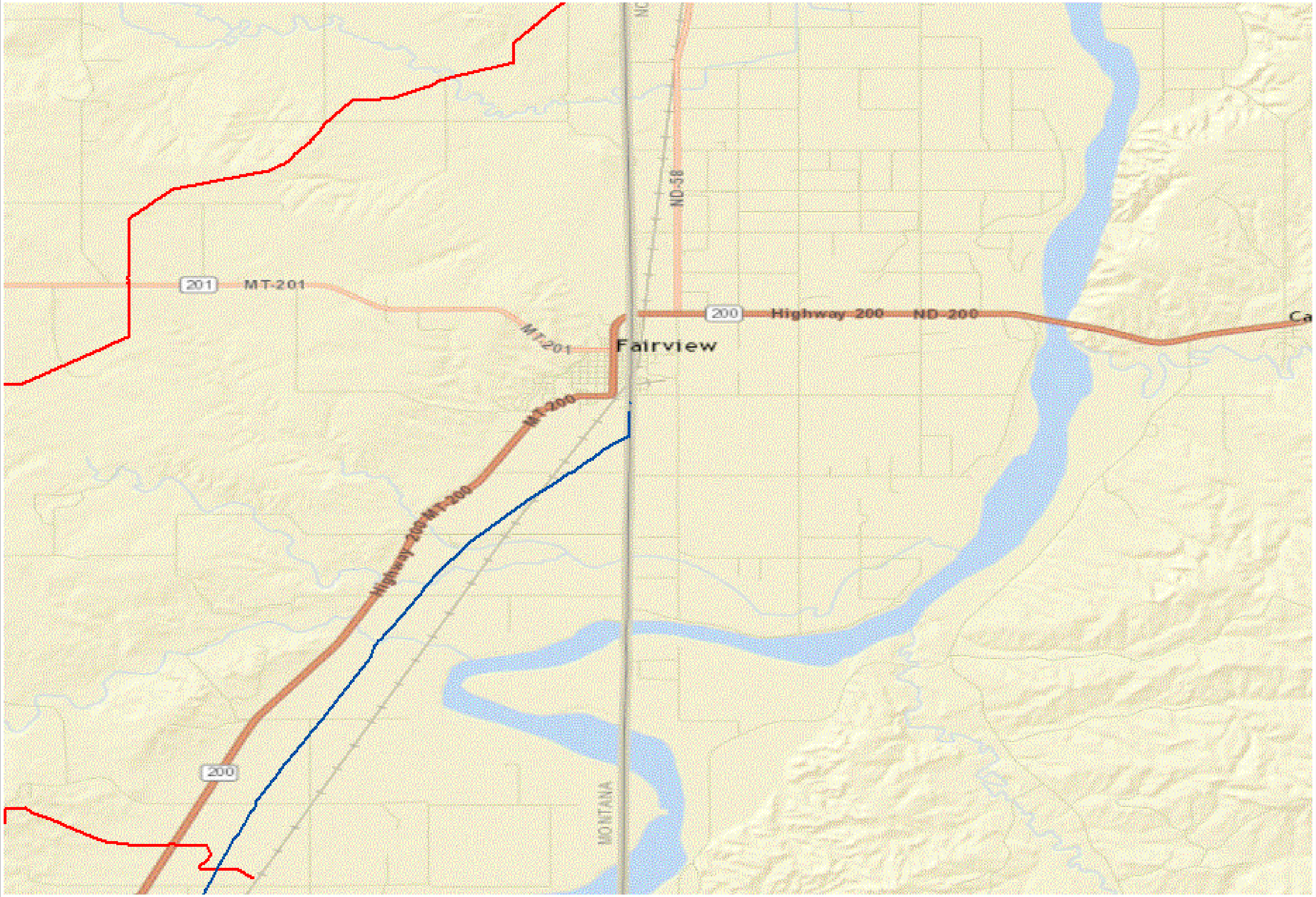
Map produced by the NPMS Public Viewer at www.npms.phmsa.dot.gov

Date Printed: Apr 29, 2015

811 Know what's below. Call before you dig.

Pipeline and Hazardous Materials Safety Administration

NATIONAL PIPELINE MAPPING SYSTEM



Legend

Gas Transmission Pipelines

Hazardous Liquid Pipelines

0 0.7 Miles

Pipelines depicted on this map represent gas transmission and hazardous liquid lines only. Gas gathering and gas distribution systems are not represented.

This map should never be used as a substitute for contacting a one-call center prior to excavation activities. Please call 811 before any digging occurs.

Questions regarding this map or its contents can be directed to npms-nr@mbakercorp.com.

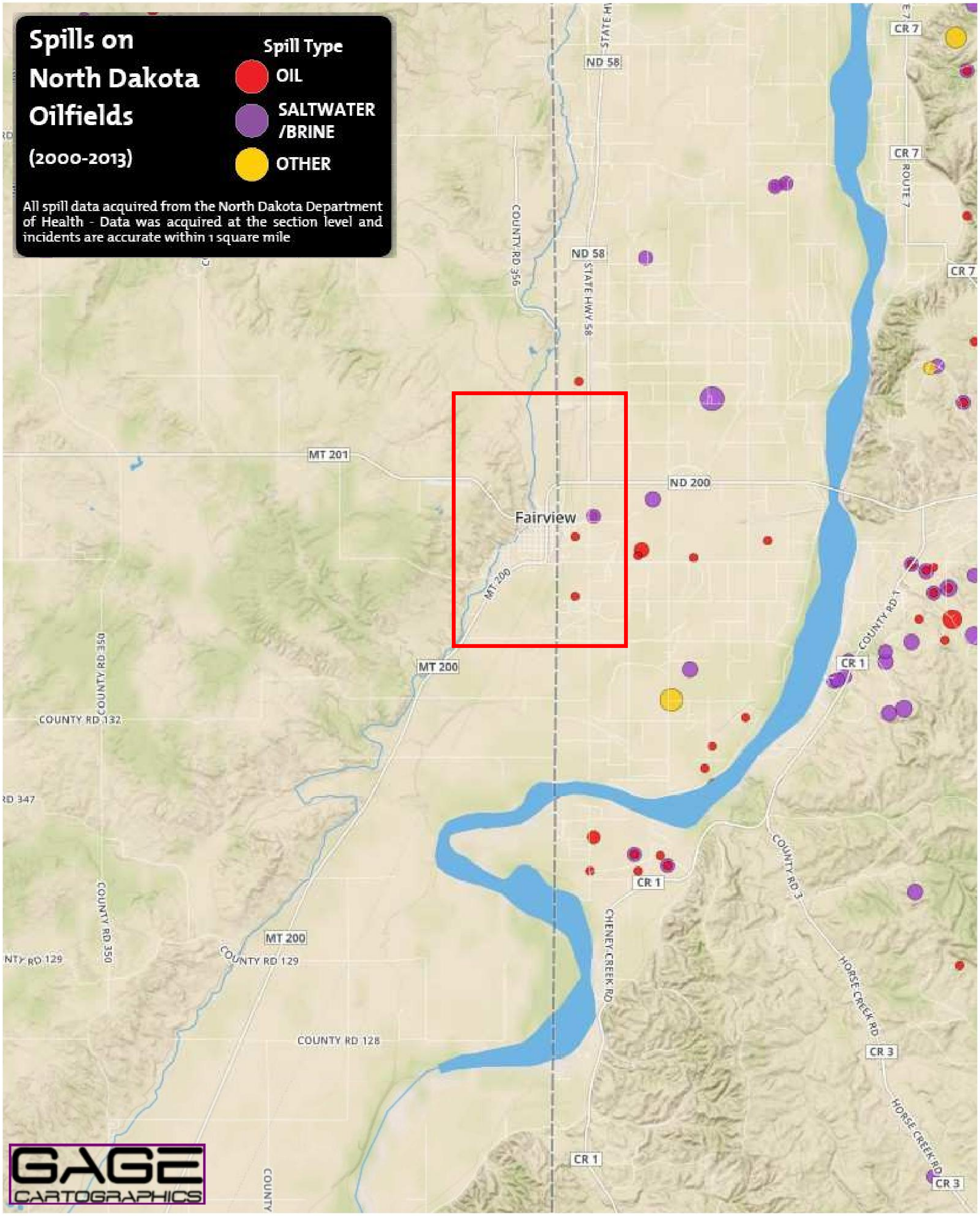
Projection: Geographic

Datum: NAD83

Map produced by the NPMS Public Viewer at www.npms.phmsa.dot.gov

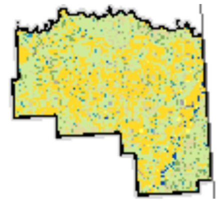
Date Printed: Apr 29, 2015

811 Know what's below. Call before you dig.


Spills on North Dakota Oilfields
(2000-2013)
Spill Type
OIL
SALTWATER /BRINE
OTHER
All spill data acquired from the North Dakota Department of Health - Data was acquired at the section level and incidents are accurate within 1 square mile
Fairview
ND 58
STATE HWY 58
ND 200
MT 201
MT 200
COUNTY RD 356
COUNTY RD 350
COUNTY RD 132
COUNTY RD 129
COUNTY RD 128
CR 1
CR 3
CR 7
ROUTE 7
COUNTY RD 1
COUNTY RD 3
CHENEY CREEK RD
HORSE CREEK RD
GAGE CARTOGRAPHICS

Attachment 6
Landcover Report

MONTANA Natural Heritage Program
A program of the Montana State Library's
Natural Resource Information System
operated by the University of Montana.

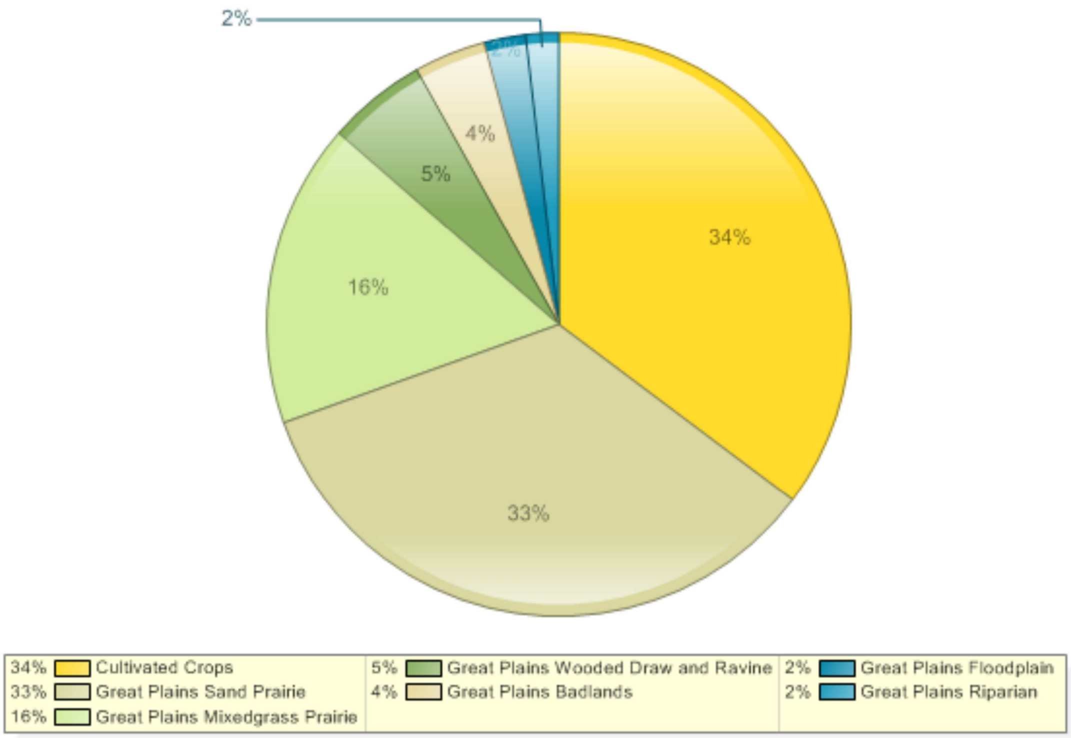


Montana Ecological Systems - Landcover Report

Report generated 3/11/2015 7:36:21 PM

Richland County

1,345,233 Acres (1.43% of Montana)



Primary Composition of Landcover

34% (*457,102 Acres*)

Human Land Use
Agriculture

Cultivated Crops

These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.

33% (*444,982 Acres*)

Grassland Systems
Lowland/Prairie Grassland

Great Plains Sand Prairie

The sand prairies constitute a very unique system within the western Great Plains. The unifying and controlling feature for this system is that coarse-textured soils predominate and the dominant grasses are well-adapted to this condition. In the northwestern portion of the system's range, stand size corresponds to the area of exposed caprock sandstone, and small patches predominate, but larger patches are found embedded in the encompassing Great Plains Mixed Grass Prairie, and usually occupy higher positions in local landscapes where former caprock formations have eroded into more subdued and planar topography. In most of eastern Montana, substrates supporting this system have weathered in place from sandstone caprock. Soils can be relatively thin or deep due to varying amounts of downslope movement of weathered sands. Needle and thread (*Hesperostipa comata*) is the dominant grass species. Other frequent species include little bluestem (*Schizachyrium scoparium*), often occurring with threadleaf sedge (*Carex filifolia*) and dominating both sandy sites and actively eroding sites. Prairie sandreed (*Calamovilfa longifolia*), sand bluestem (*Andropogon hallii*) and big bluestem (*Andropogon gerardii*) are sporadically distributed and found generally on the coarsest-textured sands. Other graminoids include bluebunch wheatgrass (*Pseudoroegneria spicata*), sun sedge (*Carex inops ssp. heliophila*), and purple threeawn (*Aristida purpurea*). Characteristic forbs differ by occurrence, but species of scurf pea (*Psoralidium* species) and Indian breadroot (*Pediomelum*) species are common. Communities of silver sage (*Artemisia cana* ssp. *cana*) or skunkbush sumac (*Rhus trilobata*) can occur within this system. Wind erosion, fire and grazing constitute the other major dynamic processes that can influence this system.

16% (*218,638 Acres*)

Grassland Systems
Lowland/Prairie Grassland

Great Plains Mixedgrass Prairie

The system covers much of the eastern two-thirds of Montana, occurring continuously for hundreds of square kilometers, interrupted only by wetland/riparian areas or sand prairies. Soils are primarily fine and medium-textured. The growing season averages 115 days, ranging from 100 days on the Canadian border to 130 days on the Wyoming border. Climate is typical of mid-continental regions with long severe winters and hot summers. Grasses typically comprise the greatest canopy cover, and western wheatgrass (*Pascopyrum smithii*) is usually dominant. Other species include thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle and thread (*Hesperostipa comata*). Near the Canadian border in north-central Montana, this system grades into rough fescue (*Festuca campestris)* and Idaho fescue (*Festuca idahoensis*) grasslands. Remnants of shortbristle needle and thread *(Hesperostipa curtiseta)* dominated vegetation are found in northernmost Montana and North Dakota, and are associated with productive sites, now mostly converted to farmland. Forb diversity is typically high. In areas of southeastern and central Montana where sagebrush steppe borders the mixed grass prairie, common plant associations include Wyoming big sagebrush-western wheatgrass (*Artemisia tridentata* ssp. *wyomingensis*/ *Pascopyrum smithii*). Fire and grazing are the primary drivers of this system. Drought can also impact it, in general favoring the shortgrass component at the expense of the mid-height grasses. With intensive grazing, cool season exotics such as Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and Japanese brome (*Bromus japonicus*) increase in dominance; both of these rhizomatous species have been shown to markedly decrease species diversity. Previously cultivated acres that have been re-vegetated with non-native plants have been transformed into associations such as Kentucky bluegrass (*Poa pratensis*)/western wheatgrass *(Pascopyrum smithii)* or into pure crested wheatgrass (*Agropyron cristatum)* stands.

5% (*71,172 Acres*)

Forest and Woodland Systems
Deciduous dominated forest and woodland

Great Plains Wooded Draw and Ravine

This system is typically associated with highly intermittent or ephemeral streams. It may occur on steep northern slopes or within canyon bottoms where soil moisture and topography produce higher moisture levels than are common throughout most of the area. In some areas of the western Great Plains, in higher elevation draws and ravines, Rocky Mountain juniper (*Juniperus scopulorum)* can dominate the canopy. Aspen (*Populus tremuloides*), paper birch (*Betula papyrifera*), or boxelder maple (*Acer negundo*) are commonly present in portions of the northwestern Great Plains. In central and eastern Montana, green ash (*Fraxinus pennsylvanicus*) or chokecherry (*Prunus virginiana*) are the usual dominants. Douglas hawthorne (*Crataegus douglasii*) is occasionally seen as a dominant in south-central Montana, especially around the Pryor Mountains. This system is found in ravines formed by ephemeral and intermittent streams, and on toeslopes and north-facing backslopes. Generally, these systems are less than 50 meters (165 feet) wide, although the linear extent may be considerable. Soils are usually deep and loamy. Flooding is very short in duration when it occurs, as water is rapidly channeled downslope.

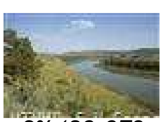
4% (51,551 Acres)

Sparse and Barren Systems

Bluff, Badland and Dune

Great Plains Badlands

The Western Great Plains Badlands ecological system occurs within the mixed grass and sand prairie regions of eastern and southeastern Montana, where the land lies well above or below its local base level, shaped by the carving action of streams, erosion, and erosible parent material. It is easily recognized by its rugged, eroded, and often colorful land formations, and the relative absence of vegetative cover. In those areas with vegetation, species can include scattered individuals of many dryland shrubs or herbaceous taxa, including curlycup gumweed (*Grindelia squarrosa*), threadleaf snakeweed (*Gutierrezia sarothrae*) (especially with overuse and grazing), greasewood (*Sarcobatus vermiculatus*), Gardner's saltbush (*Atriplex gardneri*), buckwheat (*Eriogonum* species), plains muhly (*Muhlenbergia cuspidata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and Hooker's sandwort (*Arenaria hookeri*). Patches of sagebrush (*Artemisia* spp.) can also occur. Climate is typical of mid continental regions with long severe winters and warm summers. Precipitation ranges from 7 to 14 inches per year, with two-thirds of the precipitation falling during the summer, and a third falling in the spring. The sedimentary parent material of exposed rocks and the resultant eroded clay soils are derived from Cretaceous sea beds and are often fossil-rich. Dominant soil types are in the order Entisols. These mineral soils are found primarily on uplands, slopes, and creek bottoms and are easily erodible. The growing season is short, averaging 115 days, with a range from 100 days on the Canadian border to 130 days on the Wyoming border. Land use is limited, except for off-highway vehicle recreation and incidental grazing.



2% (29,873 Acres)

Wetland and Riparian Systems

Floodplain and Riparian

Great Plains Floodplain

This system occurs along the Missouri and Yellowstone Rivers and their larger tributaries, including parts of the Little Missouri, Clark's Fork Yellowstone, Powder, Tongue, Bighorn, Milk, and Musselshell rivers. These are the big perennial rivers of the region, with hydrologic dynamics largely driven by snowmelt and rainfall originating in their headwater watersheds, rather than local precipitation events. In the absence of disturbance, periodic flooding of fluvial and alluvial soils and channel migration will create depressions and backwaters that support a mosaic of wetland and riparian vegetation, whose composition and structure is sustained, altered and redistributed by hydrology. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats, linked by underlying soils and flooding regimes. In the western part of the system's range in Montana, the overstory dominant species is black cottonwood (*Populus balsamifera ssp. trichocarpa*) with narrowleaf cottonwood *(Populus angustifolia)* and eastern cottonwood (*Populus deltoides)* occurring as co-dominants in the riparian/floodplain interface near the mountains. Further east, narrowleaf cottonwood and Plains cottonwood become dominant. In relatively undisturbed stands, willow (*Salix* species), redosier dogwood (*Cornus sericea*) and common chokecherry (*Prunus virginiana*) form a thick, multi-layered shrub understory, with a mixture of cool and warm season graminoid species below.

In Montana, many occurrences are now degraded to the point where the cottonwood overstory is the only remaining natural component. The hydrology of these floodplain systems has been affected by dams, highways, railroads and agricultural ditches, and as a result, they have lost their characteristic wetland /riparian mosaic structure. This has resulted in a highly altered community consisting of relict cottonwood stands with little regeneration. The understory vegetation is dominated by non-native pasture grasses, legumes and other introduced forbs, or by the disclimax western snowberry (*Symphoricarpos occidentalis*) and rose (*Rosa* species) shrub community.

2% (*23,727 Acres*)

Wetland and Riparian Systems

Floodplain and Riparian

Great Plains Riparian

This system is associated with perennial to intermittent or ephemeral streams throughout the northwestern Great Plains. In Montana, it occurs along smaller tributaries of the Yellowstone anc Missouri rivers, as well as tributaries to the large floodplain rivers that feed them (e.g. the Milk, Marias, Musselshell, Powder, Clark's Fork Yellowstone, Tongue, etc). In areas adjacent to the mountain ranges of central and southeastern Montana, and near the Rocky Mountain Front, it grades into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland systems. This system is found on alluvial soils in highly variable landscape settings, from confined, deep cut ravines to wide, braided streambeds. Channel migration occurs in less-confined areas, but within a more narrow range than would occur in broad, alluvial floodplains. Typically, the rivers are wadeable by mid-summer.

The primary inputs of water to these systems include groundwater discharge, overland flow, and subsurface interflow from the adjacent upland. Flooding is the key ecosystem process, creating suitable sites for seed dispersal and seedling establishment, and controlling vegetation succession. Communities within this system range from riparian forests and shrublands to tallgrass wet meadows and gravel/sand flats. Dominant species are similar to those found in the Great Plains Floodplain System. In the western part of the system's range in Montana, the dominant overstory species is black cottonwood (*Populus balsamifera ssp. trichocarpa*) with narrowleaf cottonwood *(Populus angustifolia)* and Plains cottonwood (*Populus deltoides)* occurring as co-dominants in the riparian/floodplain interface near the mountains. Further east, narrowleaf cottonwood and Plains cottonwood become dominant. In wetter systems, the understory is typically willow (*Salix spp.*) and redosier dogwood (*Cornus stolonifera*) with graminoids such as western wheatgrass (*Pascopyrum smithii*) and forbs like American licorice (*Glycyrrhiza lepidota*). In areas where the channel is incised, the understory may be dominated by big sagebrush (*Artemisia tridentata*) or silver sagebrush (*Artemisia cana*). Like floodplain systems, riparian systems are often subjected to overgrazing and/or agriculture and can be heavily degraded, with salt cedar (*Tamarix ramosissima*) and Russian olive (*Eleagnus angustifolia*) replacing native woody vegetation and regrowth. Groundwater depletion and lack of fire have resulted in additional species changes.

Additional Limited Landcover

Citation for this report:
Montana Ecological Systems - Landcover Report
Richland County
Natural Heritage Map Viewer. Montana Natural Heritage Program.
Retrieved on March 11, 2015, from http://mtnhp.org/mapviewer/LandcoverReport.aspx?x=1007586.7267081087&y=414647.3920991821&v=0

Attachment 7

Noxious Weeds

The University of Montana–Missoula

Invaders Database System

Friday, March 06, 2015

Home | Log In | Sign Up | Site Map

Query By Area

5 Northwestern States:
- Query by Name
- Query From List
- Query by Area
- Query From Map
- Links Database

Other Services:
- INVADERS Data Entry
- Weed Alert Service
- State/Provincial Noxious Weed Lists
- Biocontrol Service
- Blackfoot Weed Management
- ID/MT Risk Assessment
- Verification System

About INVADERS:
- Statistics
- INVADERS Citation
- Purpose
- Goals
- Potential users
- Applications
- Publications
- Demonstration projects
- Comments

You queried the area of Richland County in Montana from 1875 to 2015 for Noxious Species.

Results of Query

There are 14 species for this query.

Exotic
12

Database queried on: March 6, 2015 Database last updated on: July 27, 2014

Genus	Species	Common Name	Noxious In	Exotic
Gypsophila	paniculata	baby's breath	WA	×
Solanum	rostratum	buffalobur	ID,OR,WA	
Cirsium	arvense	Canada thistle	ID,MT,OR,WA,WY	×
Linaria	dalmatica	dalmatian toadflax	ID,MT,OR,WA,WY	×
Polygonum	sachalinense	giant knotweed	OR,WA	×
Cardaria	draba	hoary cress	ID,MT,OR,WA,WY	×
Kochia	scoparia	kochia	OR,WA	×
Euphorbia	esula	leafy spurge	ID,MT,OR,WA,WY	×
Sonchus	arvensis	perennial sowthistle	ID,WA,WY	×
Phalaris	arundinacea	reed canarygrass	WA	×
Centaurea	repens	Russian knapweed	ID,MT,OR,WA,WY	×
Centaurea	maculosa	spotted knapweed	ID,MT,OR,WA,WY	×
Tamarix	spp.	Tamarix complex (combined)	MT,OR,WA,WA,WY	×
Mirabilis	nyctaginea	wild four o'clock	WA	

The University of Montana–Missoula

Invaders Database System

Friday, March 06, 2015

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- Query by Area
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Other Services:
- INVADERS Data Entry
- Weed Alert Service
- State/Provincial Noxious Weed Lists
- Biocontrol Service
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- ID/MT Risk Assessment
- Verification System

About INVADERS:
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- Applications
- Publications
- Demonstration projects
- Comments

Query By Area

You queried the area of Richland County in Montana from 1875 to 2015 for Exotic Species.

Results of Query

There are 55 species for this query.

Noxious
12

Database queried on: March 6, 2015 Database last updated on: July 27, 2014

Genus	Species	Common Name	Noxious In
Medicago	sativa	alfalfa	
Gypsophila	paniculata	baby's breath	WA
Solanum	dulcamara	bittersweet nightshade	
Polygonum	convolvulus	black bindweed	
Solanum	nigrum	black nightshade	
Setaria	verticillata	bristly foxtail	
Ranunculus	testiculatus	bur buttercup	
Poa	compressa	Canada bluegrass	
Cirsium	arvense	Canada thistle	ID,MT,OR,WA,WY
Asperugo	procumbens	catchweed	
Lepidium	perfoliatum	clasping pepperweed	
Campanula	glomerata	clustered bellflower	
Chenopodium	album	common lambsquarters	
Vaccaria	pyramidata	cowcockle	
Campanula	rapunculoides	creeping bellflower	
Rumex	crispus	curly dock	
Euphorbia	cyparissias	cypress spurge	
Linaria	dalmatica	dalmatian toadflax	ID,MT,OR,WA,WY
Alyssum	desertorum	dwarf alyssum	

Rhamnus	cathartica	European buckthorn	
Lappula	echinata	European sticktight	
Thlaspi	arvense	field pennycress	
Descurainia	sophia	flixweed	
Poa	palustris	fowl bluegrass	
Senecio	mikanioides	German ivy	
Polygonum	sachalinense	giant knotweed	OR,WA
Setaria	viridis	green foxtail	
Cardaria	draba	hoary cress	ID,MT,OR,WA,WY
Poa	pratensis	Kentucky bluegrass	
Kochia	scoparia	kochia	OR,WA
Echinochloa	crusgalli	large barnyard grass	
Euphorbia	esula	leafy spurge	ID,MT,OR,WA,WY
Prunus	tomentosa	nanking cherry	
Chenopodium	glaucum	oakleaf goosefoot	
Sonchus	arvensis	perennial sowthistle	ID,WA,WY
Matricaria	matricarioides	pineapple weed	
Lactuca	serriola	prickly lettuce	
Polygonum	aviculare	prostrate knotweed	
Phalaris	arundinacea	reed canarygrass	WA
Centaurea	repens	Russian knapweed	ID,MT,OR,WA,WY
Elaeagnus	angustifolia	Russian olive	
Salsola	iberica	Russian thistle	
Carthamus	tinctorius	safflower	
Capsella	bursa-pastoris	shepherd's purse	
Camelina	microcarpa	smallseed false flax	
Silene	csereii	smooth catchfly	
Centaurea	maculosa	spotted knapweed	ID,MT,OR,WA,WY
Eragrostis	cilianensis	stinkgrass	
Sisymbrium	altissimum	tall tumblemustard	
Tamarix	spp.	Tamarix complex (combined)	MT,OR,WA,WA,WY
Lycopersicon	lycopersicum	tomato	
Hibiscus	trionum	venice mallow	
Tragopogon	dubius	western salsify	
Brassica	kaber	wild mustard	
Avena	fatua	wild oat	

2014 McKenzie County Annual Weed Board Report

6. County/City Listed Noxious Weeds & Acreages

	McKenzie	Totals Averages
Annual sowthistle Acreage		
Annual sowthistle Lo		
Annual sowthistle Mod		
Annual sowthistle Hvy		
Annual sowthistle Total (Herbicide)		
Annual sowthistle Total (Mechanical)		
Annual sowthistle Total (Bio)		
Babysbreath Acreage	4	4 4.00
Babysbreath Lo	2	2 2.00
Babysbreath Mod	2	2 2.00
Babysbreath Hvy	0	
Babysbreath Total (Herbicide)	4	4 4.00
Babysbreath Total (Mechanical)	0	
Babysbreath Total (Bio)	0	
Black henbane Acreage	1.5	2 1.50
Black henbane Lo	1	1 1.00
Black henbane Mod	0.5	
Black henbane Hvy	0	
Black henbane Total (Herbicide)	1.5	2 1.50
Black henbane Total (Mechanical)	0	
Black henbane Total (Bio)	0	
Common burdock Acreage	8.75	9 8.75
Common burdock Lo	2.75	3 2.75
Common burdock Mod	2	2 2.00
Common burdock Hvy	4	4 4.00
Common burdock Total (Herbicide)	8.75	9 8.75
Common burdock Total (Mechanical)	0	
Common burdock Total (Bio)	0	
Common milkweed Acreage		
Common milkweed Lo		
Common milkweed Mod		
Common milkweed Hvy		
Common milkweed Total (Herbicide)		
Common milkweed Total (Mechanical)		
Common milkweed Total (Bio)		
Common tansy Acreage		
Common tansy Lo		
Common tansy Mod		
Common tansy Hvy		
Common tansy Total (Herbicide)		
Common tansy Total (Mechanical)		

Common tansy Total (Bio)		
Downy brome Acreage		
Downy brome Lo		
Downy brome Mod		
Downy brome Hvy		
Downy brome Total (Herbicide)		
Downy brome Total (Mechanical)		
Downy brome Total (Bio)		
False chamomile Acreage		
False chamomile Lo		
False chamomile Mod		
False chamomile Hvy		
False chamomile Total (Herbicide)		
False chamomile Total (Mechanical)		
False chamomile Total (Bio)		
Hoary cress Acreage		
Hoary cress Lo		
Hoary cress Mod		
Hoary cress Hvy		
Hoary cress Total (Herbicide)		
Hoary cress Total (Mechanical)		
Hoary cress Total (Bio)		
Houndstongue Acreage	11	11 11.00
Houndstongue Lo	8	8 8.00
Houndstongue Mod	3	3 3.00
Houndstongue Hvy	0	
Houndstongue Total (Herbicide)	11	11 11.00
Houndstongue Total (Mechanical)	0	
Houndstongue Total (Bio)	0	
Kochia Acreage		
Kochia Lo		
Kochia Mod		
Kochia Hvy		
Kochia Total (Herbicide)		
Kochia Total (Mechanical)		
Kochia Total (Bio)		
Orange hawkweed Acreage		
Orange hawkweed Lo		
Orange hawkweed Mod		
Orange hawkweed Hvy		
Orange hawkweed Total (Herbicide)		
Orange hawkweed Total (Mechanical)		
Orange hawkweed Total (Bio)		
Perennial sowthistle Acreage		

Perennial sowthistle Lo		
Perennial sowthistle Mod		
Perennial sowthistle Hvy		
Perennial sowthistle Total (Herbicide)		
Perennial sowthistle Total (Mechanical)		
Perennial sowthistle Total (Bio)		
Scotch thistle Acreage		
Scotch thistle Lo		
Scotch thistle Mod		
Scotch thistle Hvy		
Scotch thistle Total (Herbicide)		
Scotch thistle Total (Mechanical)		
Scotch thistle Total (Bio)		
Yellow toadflax Acreage	1	1 1.00
Yellow toadflax Lo	1	1 1.00
Yellow toadflax Mod	0	
Yellow toadflax Hvy	0	
Yellow toadflax Total (Herbicide)	1	1 1.00
Yellow toadflax Total (Mechanical)	0	
Yellow toadflax Total (Bio)	0	

7. Houndstongue Acreages

	McKenzie	Totals Averages
Houndstongue Acreage	11	11 11.00
Houndstongue Lo	8	8 8.00
Houndstongue Mod	3	3 3.00
Houndstongue Hvy	0	
Houndstongue Total (Herbicide)	11	11 11.00
Houndstongue Total (Mechanical)	0	
Houndstongue Total (Bio)	0	

NORTH DAKOTA DEPARTMENT OF AGRICULTURE
2014 NOXIOUS WEED LIST SURVEY - REPORTED ACRES

County/City Weed Board Data NOXIOUS WEED ACREAGE RANKING	**Absinth Wormwood** *Artemisia absinthium* **3**		**Canada thistle** *Cirsium arvense* **1**		**Dalmatian toadflax** *Linaria genistifolia* **10**		**Diffuse Knapweed** *Centaurea diffusa* **7**		**Leafy Spurge** *Euphorbia esula* **2**		**Musk Thistle** *Carduus nutans* **7**		**Purple Loosestrife** *Lythrum salicaria* **10**		**Russian Knapweed** *Centaurea repens* **9**		**Saltcedar** *Tamarix ramosissima* **5**		**Spotted Knapweed** *Centaurea maculosa* **4**		**Yellow Toadflax** *Linaria vulgaris* **9**		
	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public	Private	Tota Acre
McKenzie	8	4	46	132			2		26	12	2				1		3		2	7	1		246
Grand Totals	**8**	**4**	**46**	**132**			**2**		**26**	**12**	**2**				**1**		**3**		**2**	**7**	**1**		**246**

CITY DATA INCLUDED WITHIN RESPECTIVE COUNTY DATA

County/City Weed Board Data NOXIOUS WEED ACREAGE RANKING	**Absinth Wormwood** *Artemisia absinthium* **3**											**Canada thistle** *Cirsium arvense* **1**													
	Public					Private						Public					Private						Pul		
	Low	Mod	Hi	Total	TIA	Low	Mod	Hi	Total	TIA	Total TIA	Low	Mod	Hi	Total	TIA	Low	Mod	Hi	Total	TIA	Total TIA	Low	Mod	H

McKenzie	2	2	5	8	8	1	2	1	4	4	12	7	6	59	72	46	15	27	90	132	132	178			
Grand Totals	**2**	**2**	**5**	**8**	**8**	**1**	**2**	**1**	**4**	**4**	**12**	**7**	**6**	**59**	**72**	**46**	**15**	**27**	**90**	**132**	**132**	**178**			

CITY DATA INCLUDED WITHIN RESPECTIVE COUNTY DATA

Attachment 8

MNHP General Wildlife Species within Study Area

General Species Observations in Fairview Corridor Study Area and Vicinity

Species Group	Common Name	Scientific Name	Global Rank	State Rank	Obs Date Start	Obs Date End
Mammals	Bobcat	Lynx rufus	G5	S5	12/1/2004	2/15/2005
Mammals	Deer Mouse	Peromyscus maniculatus	G5	S5	9/14/1967	9/14/1967
Mammals	House Mouse	Mus musculus	G5	SNA	9/14/1967	9/14/1967
Mammals	Northern Grasshopper Mouse	Onychomys leucogaster	G5	S4	9/28/1887	9/28/1887
Mammals	Olive-backed Pocket Mouse	Perognathus fasciatus	G5	S4	9/29/1887	10/6/1887
Mammals	Porcupine	Erethizon dorsatum	G5	S4	10/6/1887	10/6/1887
Mammals	Striped Skunk	Mephitis mephitis	G5	S5	6/26/2012	6/26/2012
Mammals	White-tailed Deer	Odocoileus virginianus	G5	S5	1/1/1887	12/31/1887
Birds	American Crow	Corvus brachyrhynchos	G5	S5B	7/10/1997	7/10/1997
Birds	American Redstart	Setophaga ruticilla	G5	S5B	6/18/2005	6/18/2005
Birds	American Robin	Turdus migratorius	G5	S5B	7/10/1997	7/10/1997
Birds	American White Pelican	Pelecanus erythrorhynchos	G4	S3B	6/18/2005	6/18/2005
Birds	Baird's Sandpiper	Calidris bairdii	G5	SNA	8/19/2007	8/19/2007
Birds	Baird's Sparrow	Ammodramus bairdii	G4	S3B	6/8/2012	6/8/2012
Birds	Barn Swallow	Hirundo rustica	G5	S5B	8/19/2007	8/19/2007
Birds	Black-headed Grosbeak	Pheucticus melanocephalus	G5	S5B	6/4/1997	6/4/1997
Birds	Blue Jay	Cyanocitta cristata	G5	S5	6/4/1997	6/4/1997
Birds	Bobolink	Dolichonyx oryzivorus	G5	S3B	6/8/2012	6/8/2012
Birds	Brewer's Blackbird	Euphagus cyanocephalus	G5	S5B	6/8/2011	6/8/2011
Birds	Brown Thrasher	Toxostoma rufum	G5	S5B	7/14/2012	7/14/2012
Birds	Brown-headed Cowbird	Molothrus ater	G5	S5B	6/8/2012	6/8/2012
Birds	Canada Goose	Branta canadensis	G5	S5B	6/4/1997	6/4/1997
Birds	Chestnut-collared Longspur	Calcarius ornatus	G5	S2B	6/8/2012	6/8/2012
Birds	Clay-colored Sparrow	Spizella pallida	G5	S4B	6/8/2012	6/8/2012
Birds	Common Yellowthroat	Geothlypis trichas	G5	S5B	6/26/1997	6/26/1997
Birds	Downy Woodpecker	Picoides pubescens	G5	S5	7/10/1997	7/10/1997
Birds	Eastern Kingbird	Tyrannus tyrannus	G5	S5B	6/8/2012	6/8/2012
Birds	Eastern Screech-Owl	Megascops asio	G5	S3S4	7/4/2012	7/4/2012
Birds	Eurasian Collared-Dove	Streptopelia decaocto	G5	SNA	7/14/2012	7/14/2012
Birds	Field Sparrow	Spizella pusilla	G5	S4B	6/8/2011	6/8/2011
Birds	Grasshopper Sparrow	Ammodramus savannarum	G5	S4B	6/8/2012	6/8/2012

General Species Observations in Fairview Corridor Study Area and Vicinity

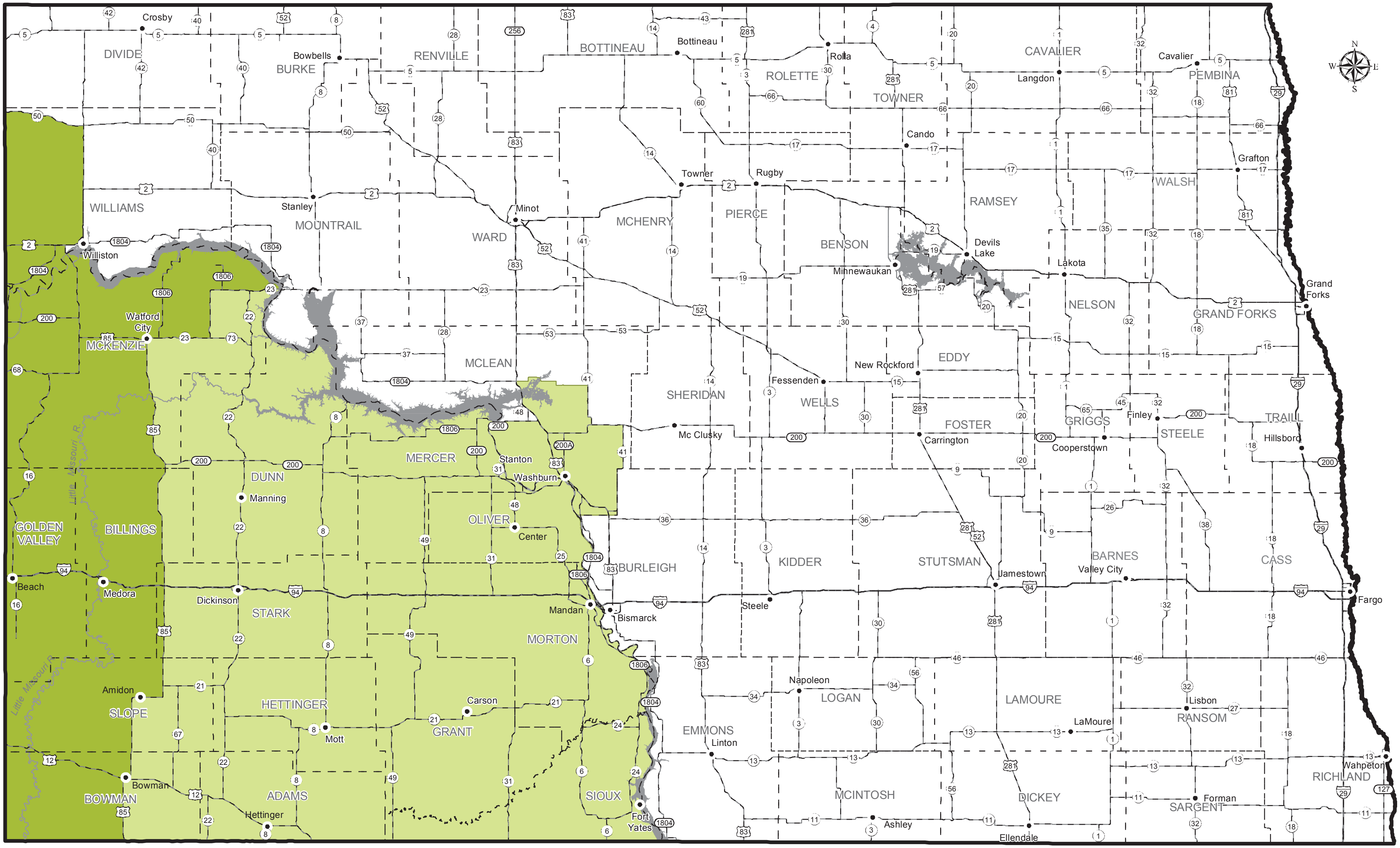
Birds	Gray Catbird	Dumetella carolinensis	G5	S5B	7/14/2012	7/14/2012	
Birds	Great Horned Owl	Bubo virginianus	G5	S5	6/23/2002	6/23/2002	
Birds	Hairy Woodpecker	Picoides villosus	G5	S5	6/12/1997	6/12/1997	
Birds	Horned Lark	Eremophila alpestris	G5	S5	6/8/2012	6/8/2012	
Birds	House Wren	Troglodytes aedon	G5	S5B	6/8/2011	6/8/2011	
Birds	Killdeer	Charadrius vociferus	G5	S5B	6/8/2012	6/8/2012	
Birds	Lark Bunting	Calamospiza melanocorys	G5	S4B	6/8/2012	6/8/2012	
Birds	Lark Sparrow	Chondestes grammacus	G5	S5B	7/10/1997	7/10/1997	
Birds	Lazuli Bunting	Passerina amoena	G5	S4B	6/18/2005	6/18/2005	
Birds	Least Flycatcher	Empidonax minimus	G5	S5B	7/10/1997	7/10/1997	
Birds	Long-billed Dowitcher	Limnodromus scolopaceus	G5	SNA	8/19/2007	8/19/2007	
Birds	Mallard	Anas platyrhynchos	G5	S5	8/19/2007	8/19/2007	
Birds	Marbled Godwit	Limosa fedoa	G5	S4B	6/8/2012	6/8/2012	
Birds	Mountain Bluebird	Sialia currucoides	G5	S5B	6/8/2011	6/8/2011	
Birds	Mourning Dove	Zenaida macroura	G5	S5B	6/8/2012	6/8/2012	
Birds	Northern Flicker	Colaptes auratus	G5	S5	7/14/2012	7/14/2012	
Birds	Northern Harrier	Circus cyaneus	G5	S4B	6/8/2012	6/8/2012	
Birds	Ovenbird	Seiurus aurocapilla	G5	S4B	6/18/2005	6/18/2005	
Birds	Red-eyed Vireo	Vireo olivaceus	G5	S4B	6/18/2005	6/18/2005	
Birds	Red-winged Blackbird	Agelaius phoeniceus	G5	S5B	6/8/2012	6/8/2012	
Birds	Ring-necked Pheasant	Phasianus colchicus	G5	SNA	6/8/2012	6/8/2012	
Birds	Savannah Sparrow	Passerculus sandwichensis	G5	S5B	7/14/2012	7/14/2012	
Birds	Sedge Wren	Cistothorus platensis	G5	S3B	7/15/1843	7/21/1843	
Birds	Semipalmated Sandpiper	Calidris pusilla	G5	SNA	8/19/2007	8/19/2007	
Birds	Song Sparrow	Melospiza melodia	G5	S5B	7/10/1997	7/10/1997	
Birds	Spotted Towhee	Pipilo maculatus	G5	S5B	6/8/2011	6/8/2011	
Birds	Sprague's Pipit	Anthus spragueii	G4	S3B	6/8/2011	6/8/2011	
Birds	Swainson's Thrush	Catharus ustulatus	G5	S5B	6/4/1997	6/4/1997	
Birds	Tree Swallow	Tachycineta bicolor	G5	S5B	6/4/1997	6/4/1997	
Birds	Turkey Vulture	Cathartes aura	G5	S4B	6/18/2005	6/18/2005	
Birds	Upland Sandpiper	Bartramia longicauda	G5	S4B	6/8/2011	6/8/2011	
Birds	Vesper Sparrow	Pooecetes gramineus	G5	S5B	6/8/2012	6/8/2012	

General Species Observations in Fairview Corridor Study Area and Vicinity

Birds	Warbling Vireo	Vireo gilvus	G5	S5B	7/10/1997	7/10/1997	
Birds	Western Kingbird	Tyrannus verticalis	G5	S5B	6/8/2012	6/8/2012	
Birds	Western Meadowlark	Sturnella neglecta	G5	S5B	6/8/2012	6/8/2012	
Birds	Wood Duck	Aix sponsa	G5	S5B	7/14/2012	7/14/2012	
Birds	Yellow Warbler	Setophaga petechia	G5	S5B	6/8/2011	6/8/2011	
Birds	Yellow-breasted Chat	Icteria virens	G5	S5B	6/18/2005	6/18/2005	
Reptiles	Plains Gartersnake	Thamnophis radix	G5	S4	7/20/1969	7/20/1969	
Amphibians	Northern Leopard Frog	Lithobates pipiens	G5	S1,S4	1/1/1853	12/31/1872	
Invertebrates	A Sand-dwelling Mayfly	Analetris eximia	G3	S3	4/25/2002	4/25/2002	
Invertebrates	A Sand-dwelling Mayfly	Homoeoneuria alleni	G4	S2	4/25/2002	4/25/2002	
Invertebrates	A Sand-dwelling Mayfly	Lachlania saskatchewanensis	G4	S1	4/22/2002	4/22/2002	
Invertebrates	Fatmucket	Lampsilis siliquoidea	G5	S5	8/7/2002	8/7/2002	

Attachment 9
Species Range Maps

North Dakota Game & Fish Department
Pronghorn Range

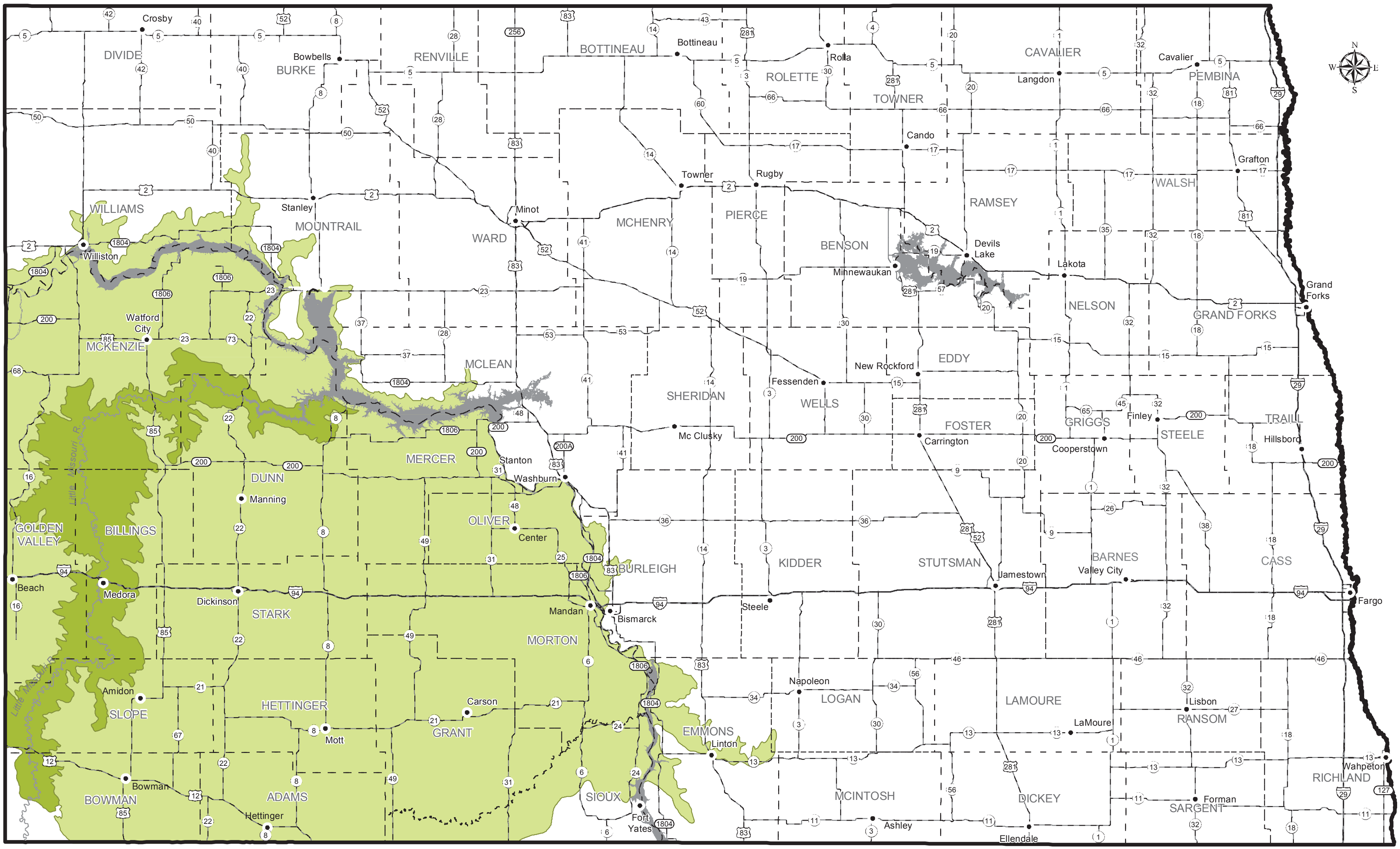


Primary Pronghorn Range

Secondary Pronghorn Range

North Dakota Game & Fish Department 2013

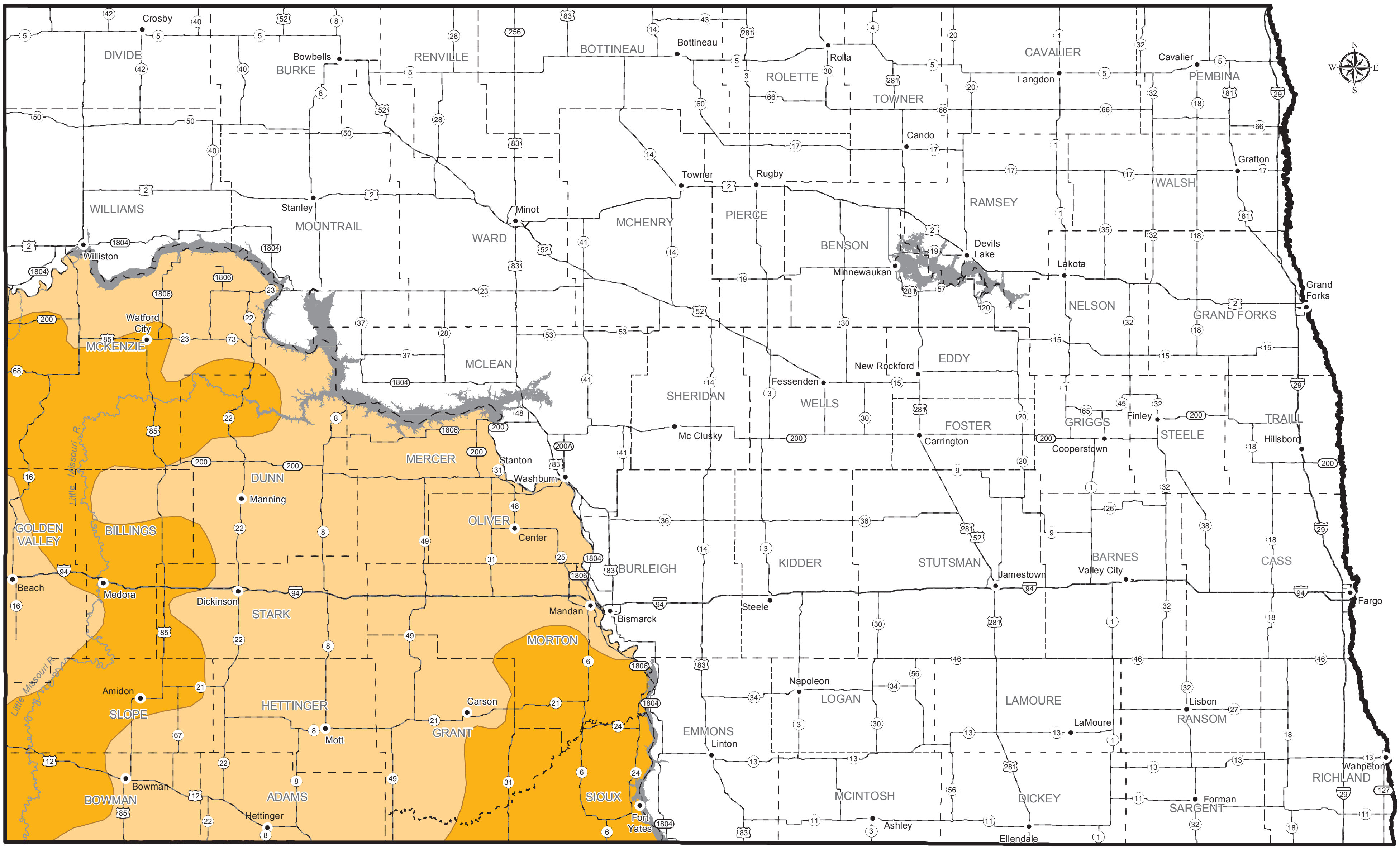
North Dakota Game & Fish Department
Mule Deer Range



Primary Mule Deer Range

Secondary Mule Deer Range

North Dakota Game & Fish Department
Black-tailed Prairie Dog Range

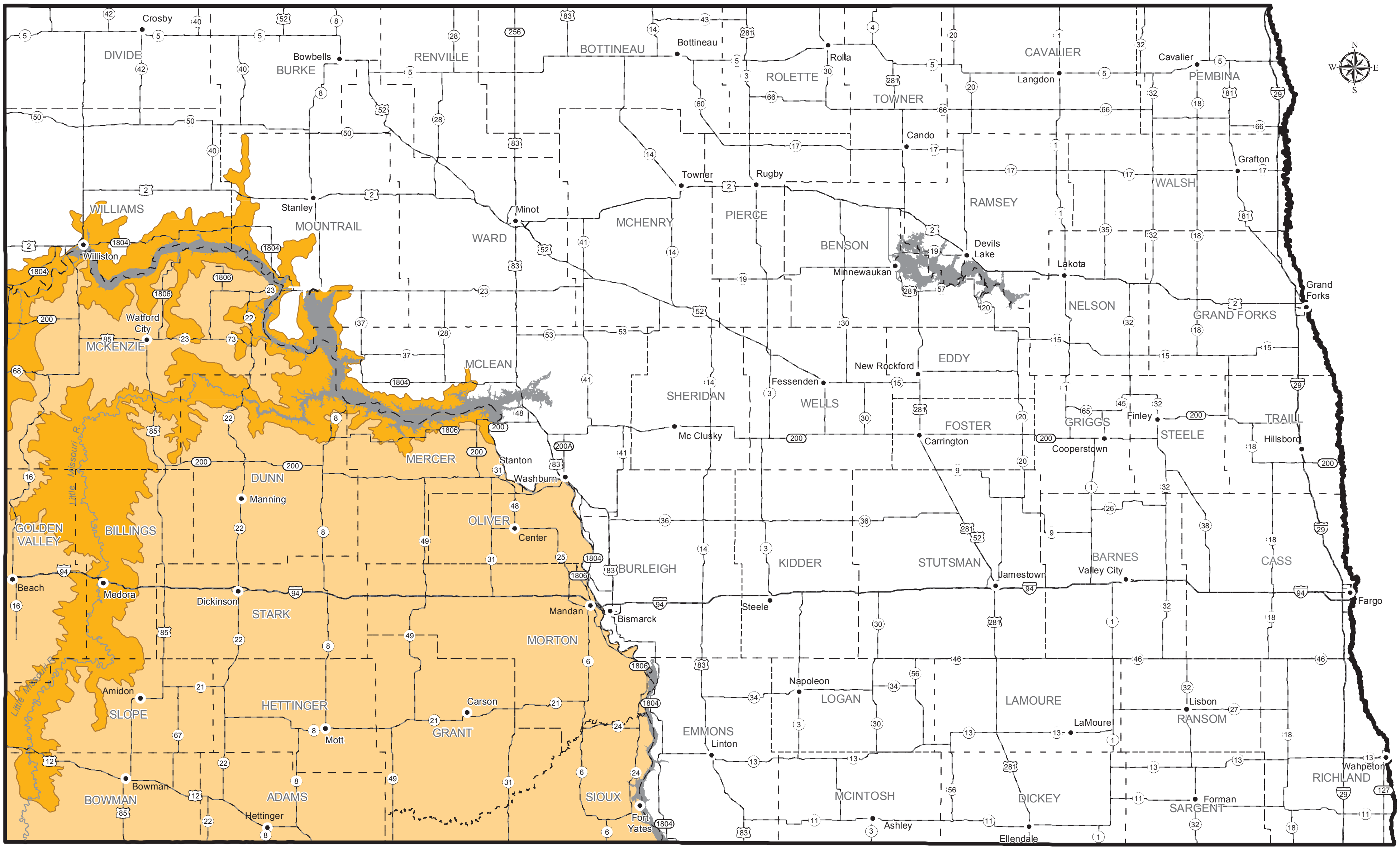


Primary Range

Secondary Range

North Dakota Game & Fish Department 2013

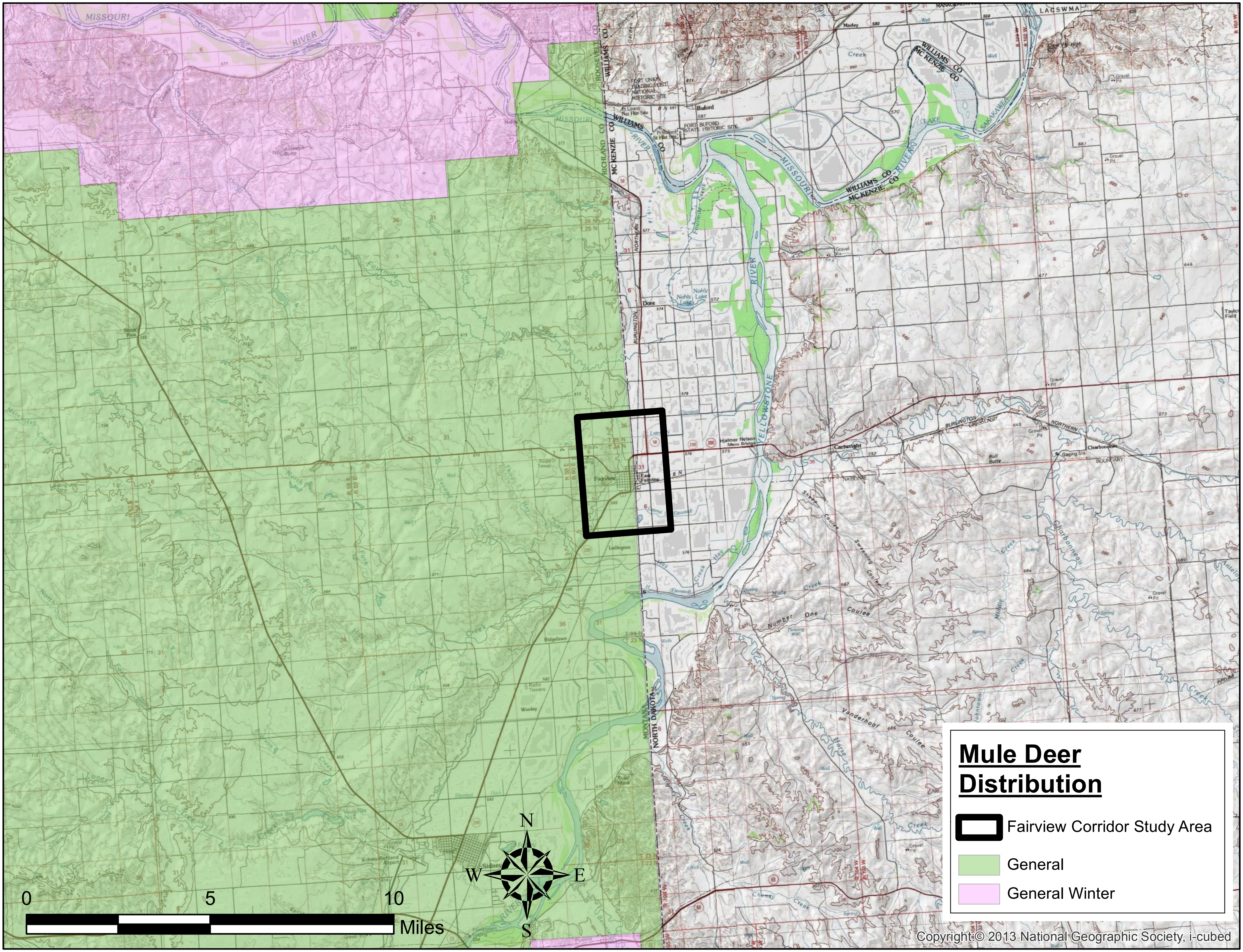
North Dakota Game & Fish Department
Golden Eagle Breeding Range

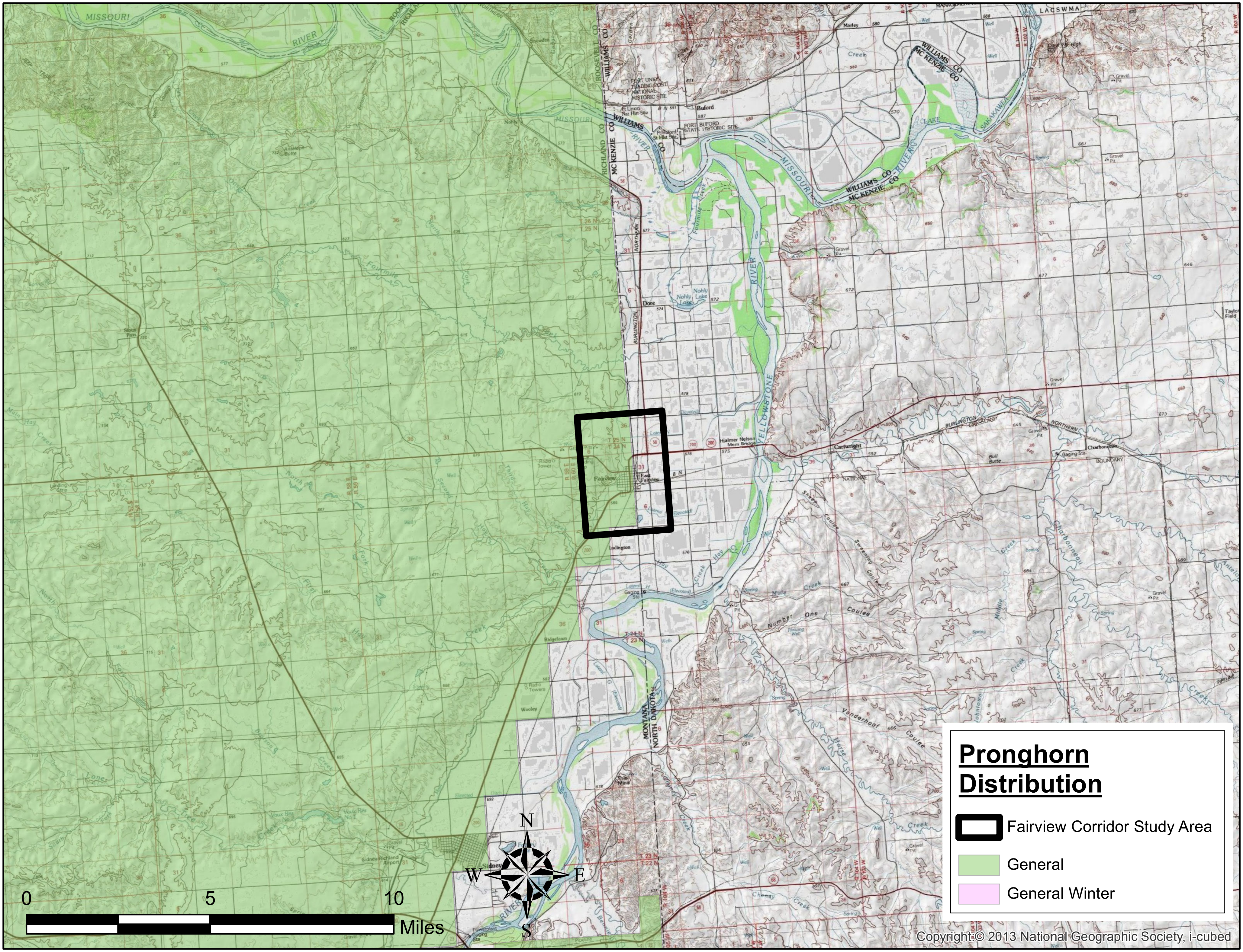


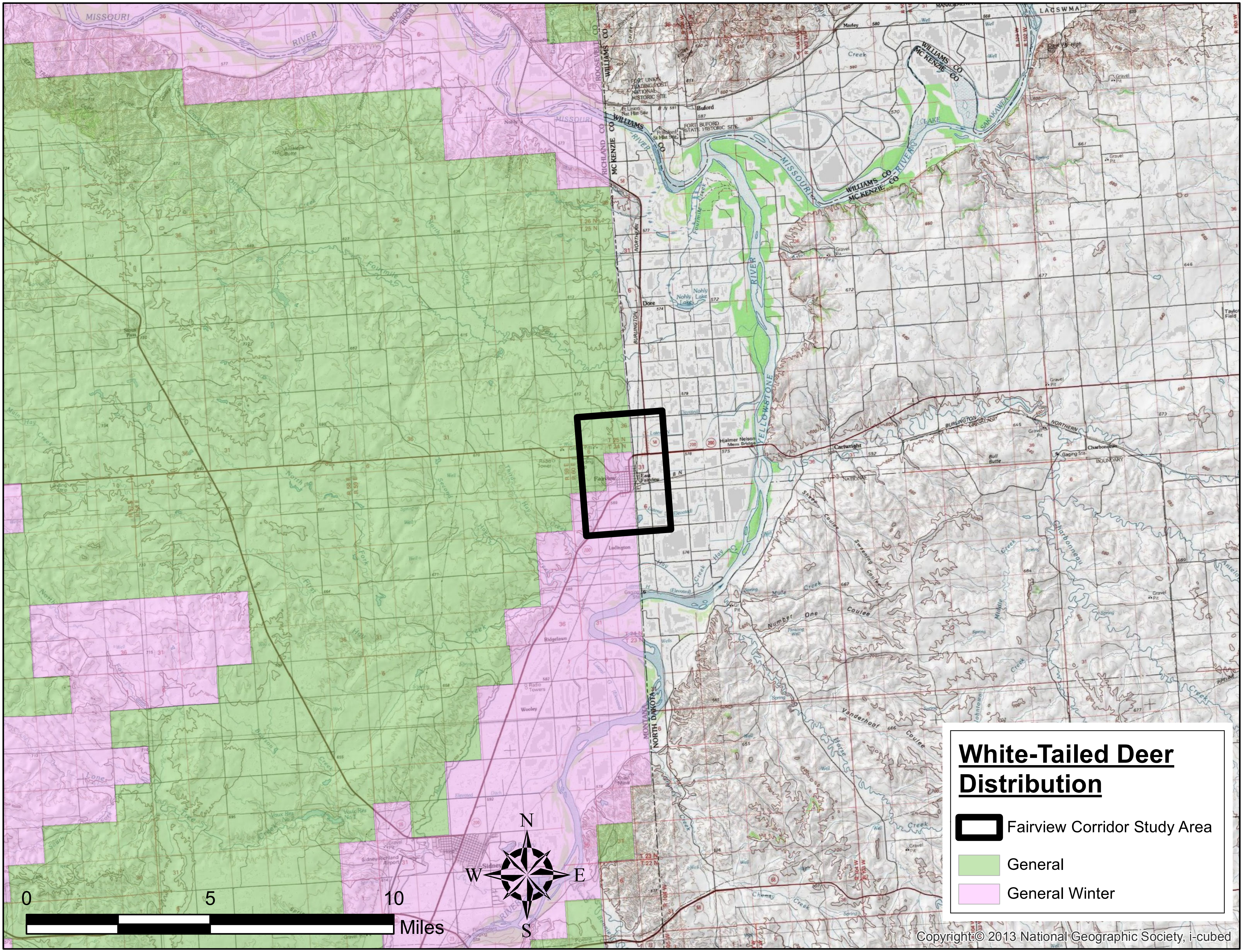
Primary Breeding Range

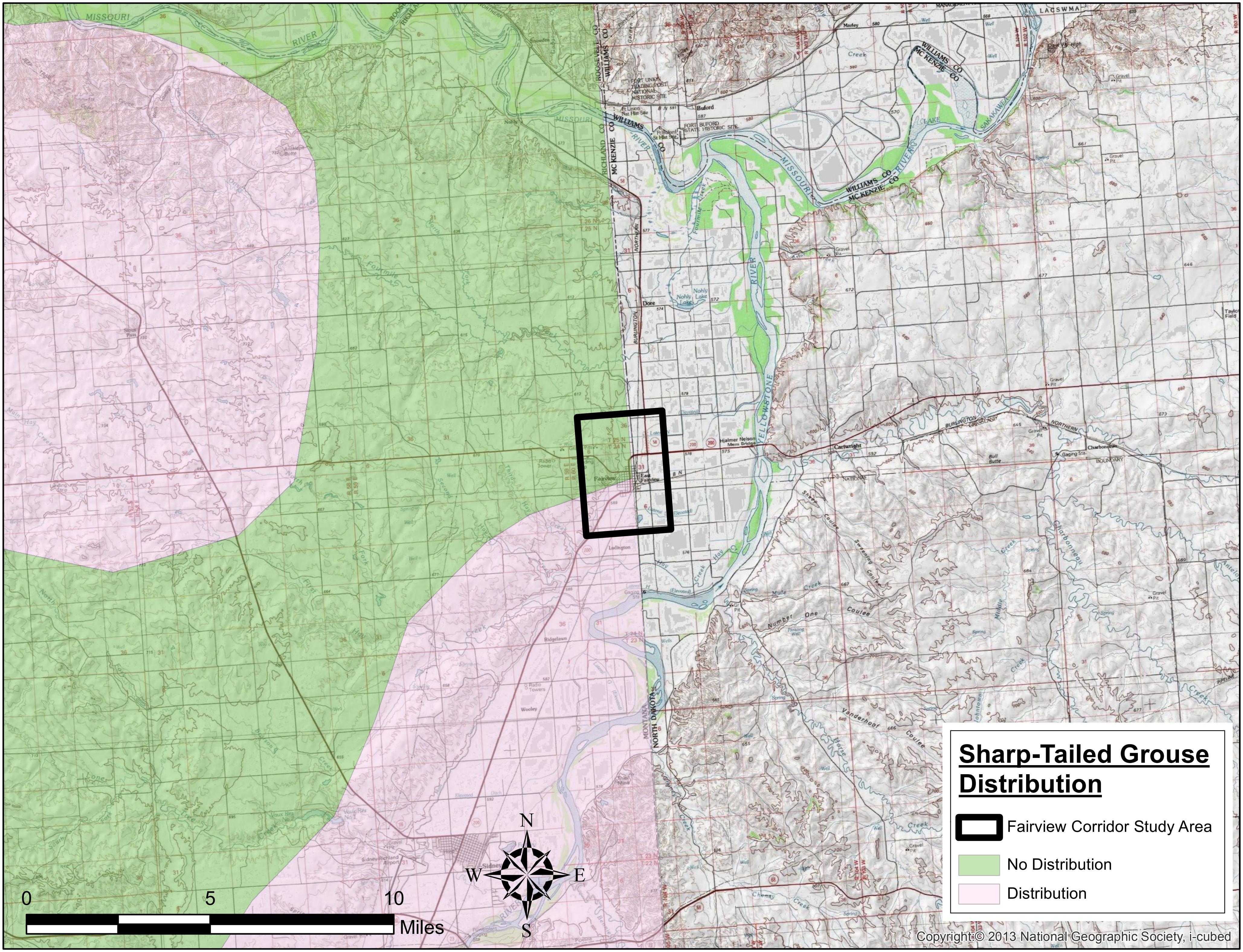
Secondary Breeding Range

North Dakota Game & Fish Department 2013


Mule Deer Distribution
Fairview Corridor Study Area
General
General Winter
0
5
10
Miles
N
S
E
W
Copyright:© 2013 National Geographic Society, i-cubed


Pronghorn Distribution
Fairview Corridor Study Area
General
General Winter
0
5
10
Miles
N
S
E
W
Copyright© 2013 National Geographic Society, i-cubed


White-Tailed Deer Distribution
Fairview Corridor Study Area
General
General Winter
0
5
10
Miles
N
S
E
W
Copyright:© 2013 National Geographic Society, i-cubed


Sharp-Tailed Grouse Distribution
Fairview Corridor Study Area
No Distribution
Distribution
0
5
10
Miles
N
S
E
W
Copyright © 2013 National Geographic Society, i-cubed

Attachment 10

Crucial Area Planning System Data

The following data is provided through use of the Montana Department of Fish, Wildlife and Parks Crucial Areas Planning System (CAPS) program for the Fairview Corridor study area.

Terrestrial

The study area contains Class I, II, III, and IV ranked areas for Terrestrial Conservation Species. Terrestrial Conservation Species depicts the cumulative expected occurrence of 85 of Montana's vertebrate species of concern. For more detailed information see: (http://fwpiis.mt.gov/content/getitem.aspx?id=41536)

The study area contains Class II, III, and IV ranked areas for Terrestrial Species Richness. Terrestrial species richness depicts all native land-based species in Montana, including amphibians, reptiles, birds, and mammals. Species included are found year round or breed in the state. For more detailed information see: (http://fwpiis.mt.gov/content/getitem.aspx?id=41535)

The study area contains Class III and IV ranked areas for Terrestrial Species Game Quality. Terrestrial game quality depicts areas considered valuable to 12 native game species and their specific habitat requirements. For more detailed information see:
(http://fwpiis.mt.gov/content/getitem.aspx?id=41531)

Aquatic

The study area does not contain any ranked drainages for Aquatic Connectivity. Aquatic Connectivity depicts important stream corridors for fish species that require connected habitats to complete all or a portion of their life history. For more detailed information see: (http://fwpiis.mt.gov/content/getitem.aspx?id=41523)

The study area does not contain any ranked drainages for Fish Native Species Richness. Fish native species richness depicts native biodiversity using counts of native fish species present in water bodies and streams. For more detailed information see:
(http://fwpiis.mt.gov/content/getitem.aspx?id=42834)

The study area does not contain any ranked drainages for Fish Species of Concern. Aquatic species of concern highlights areas with rare, declining or federally-listed threatened or endangered fish species present as recognized by the joint Montana Fish, Wildlife & Parks and Montana Natural Heritage Program (MTNHP) Species of Concern (SOC) Report. Species were ranked by their Endangered Species Act (ESA) status or SOC status. This layer only includes 23 fish species, not aquatic invertebrates or plants. For more detailed information see: (http://fwpiis.mt.gov/content/getitem.aspx?id=41486)

The study area does not contain any ranked drainages for Game Fish Quality. Game fish quality depicts the relative quality of 46 cold and warm water game fish populations available to anglers in Montana. For more detailed information see: (http://fwpiis.mt.gov/content/getitem.aspx?id=41529)

The study area does not contain any ranked drainages for Game Fish Life History. Game fish life history depicts habitats that support at least one of 43 recognized game fish species during life history stages (spawning areas, rearing areas, and thermal refuge). For more detailed information see:
(http://fwpiis.mt.gov/content/getitem.aspx?id=41530)

The following is a summary of example General Recommendations and Recommendations Specific to Transportation Projects for both terrestrial and aquatic species and habitat provided by MFWP through the CAPS program. If improvement options are forwarded from this study, these recommendations should be evaluated for potential applicability.

Terrestrial

- Avoid or minimize the loss of winter range.
- Focus wildlife impact mitigation efforts on maintaining landscape permeability, the ability for species to move freely across the landscape.
- Conduct pre-construction and post-construction monitoring to evaluate effectiveness of impact mitigation efforts, and apply adaptive management techniques to increase effectiveness over time.
- Minimize development footprint by limiting the total area dedicated to houses, roads, and other infrastructure.
- Provide open space for animal movement, including travel between winter and summer ranges.
- A combination of methods may be necessary to provide safe and efficient wildlife passage (e.g., crossings, fences, escape ramps).
- Roadside gates: Locate gates on both sides of a highway where known migration routes occur. Leave gates open during the winter months to facilitate movements of ungulates across the highway and to minimize trapping animals between fences and next to the highway.
- Locate new roads and existing road realignments outside of important wildlife habitat.
- Wildlife Crossing Structures over or under highways. Identify the wildlife species the structure is intended to serve. Locate structure near animals' natural travel routes. One crossing may not suffice for the full suite of species moving across a large landscape. Keep in mind that the largest crossing structures are suitable for the greatest diversity of wildlife. Design structures as flat and straight as the terrain permits, so that animals can see through the structure to suitable habitat on the other side. The land adjacent to the right-of-way at a crossing location should ideally be owned and managed in a manner that is compatible with wildlife activity.
- Roadside fencing: Build fence either to hold livestock in or keep livestock out, while allowing for as much free movement by wildlife as possible, as well as easy passage for recreationists at stream crossings. Attempt to balance the needs of wildlife with the landowner's liability (81-4-101, Montana Code Annotated defines legal fences).
- Raptors: Time road construction projects to avoid spring nesting periods.
- Songbirds (Passerines): Time road construction projects to avoid spring nesting periods.

Aquatic

- Maintain or restore natural vegetative buffer from water bodies, and provide an additional building setback. Tailor to type of waterbody. For example. Rivers: 250' buffer + 50' setback = 300' total (from ordinary high-water mark); Other Perennial Streams: 150' buffer + 50' setback = 200' total (from ordinary high-water mark); Other Water Bodies, including wetlands: 100' buffer + 30' setback = 130' total (from the defined boundary of a wetland or the high-water mark of intermittent streams, lakes, ponds, and reservoirs).
- Limit the number of stream crossings.
- Locate crossings in stable reaches of streams; position them perpendicular to the direction of stream flow.

- Bridge construction: Design bridge to maintain a constant grade, avoid large drops above or below the structure, accommodate both juvenile and adult fish, maintain water depth similar to the natural stream, minimize turbulence and flow contraction, and allow upstream fish passage. Bridge should be wide enough to exceed the 100-year floodplain and allow flood flows to spread onto the floodplain. Allow for some dry ground or an artificial ledge beneath the bridge on one or both sides, to accommodate both aquatic and terrestrial wildlife passage.
- Culverts: Maintain or improve stream grade to accommodate fish movement. Consider various culvert types to accommodate passage for the weakest fish in the assemblage. Keep culvert length to the minimum needed to ensure side slope stability. Ideally, inspect culverts annually following spring runoff.

Attachment 11

USFWS T&E Species List by County

U.S. Fish and Wildlife Service

Trust Resources List

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

North Dakota Ecological Services Field Office
3425 MIRIAM AVENUE
BISMARCK, ND 58501
(701) 250-4481
http://www.fws.gov/northdakotafieldoffice/endspecies/endangered_species.htm

Project Name:

Fairview Corridor Planning Study

Project Counties:

McKenzie, ND

Project Type:

Transportation

Endangered Species Act Species List (USFWS Endangered Species Program).

There are a total of **10** threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Birds	Status		Has Critical Habitat	Contact

Trust Resources List

Least tern (*Sterna antillarum*) Population: interior pop.	Endangered	species info		North Dakota Ecological Services Field Office
Piping Plover (*Charadrius melodus*) Population: except Great Lakes watershed	Threatened	species info	Final designated critical habitat Final designated critical habitat	North Dakota Ecological Services Field Office
Red Knot (*Calidris canutus rufa*) Population:	Threatened	species info		North Dakota Ecological Services Field Office
Sprague's Pipit (*Anthus spragueii*) Population:	Candidate	species info		North Dakota Ecological Services Field Office
Whooping crane (*Grus americana*) Population: except where EXPN	Endangered	species info	Final designated critical habitat	North Dakota Ecological Services Field Office
Fishes				
Pallid sturgeon (*Scaphirhynchus albus*) Population: Entire	Endangered	species info		North Dakota Ecological Services Field Office
Insects				
Dakota Skipper (*Hesperia dacotae*)	Threatened	species info	Proposed critical habitat	North Dakota Ecological Services Field Office
Mammals				

Black-Footed ferret (*Mustela nigripes*) Population: U.S.A. (specific portions of AZ, CO, MT, SD, UT, and WY)	Experimental Population, Non-Essential	species info		North Dakota Ecological Services Field Office
Gray wolf (*Canis lupus*) Population: U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, KS, KY, LA, MA, MD, ME, MO, MS, NC, NE, NH, NJ, NV, NY, OK, PA, RI, SC, TN, TX, VA, VT and WV; and portions of AZ, IA, IN, IL, ND, NM, OH, OR, SD, UT, and WA. Mexico.	Endangered	species info		North Dakota Ecological Services Field Office
northern long-eared Bat (*Myotis septentrionalis*) Population:	Proposed Endangered	species info		North Dakota Ecological Services Field Office

Critical habitats within your project area: (View all critical habitats within your project area on one map)

The following critical habitats lie fully or partially within your project area.

Birds	Critical Habitat Type
Piping Plover (*Charadrius melodus*) Population: Great Lakes watershed	Final designated critical habitat
Insects	
Dakota Skipper (*Hesperia dacotae*)	Proposed critical habitat

FWS National Wildlife Refuges (USFWS National Wildlife Refuges Program).

There are **2** refuges in your refuge list

Crosby Wetland Management District (701) 965-6488 10100 HIGHWAY 42 NW CROSBY, ND58730	refuge profile
Lostwood Wetland Management District (701) 848-2466 8315 HIGHWAY 8 KENMARE, ND58746	refuge profile

Trust Resources List

FWS Migratory Birds (USFWS Migratory Bird Program).

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. For more information regarding these Acts see: http://www.fws.gov/migratorybirds/RegulationsandPolicies.html.

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

For information about Birds of Conservation Concern, go to:
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html.

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tool links in the Bird Conservation Tools section at: http://www.fws.gov/migratorybirds/CCMB2.htm.

For information about conservation measures that help avoid or minimize impacts to birds, please visit:
http://www.fws.gov/migratorybirds/CCMB2.htm.

Migratory birds of concern that may be affected by your project:
There are **22** birds on your Migratory birds of concern list. The underlying data layers used to generate the migratory bird list of concern will continue to be updated regularly as new and better information is obtained. User feedback is one method of identifying any needed improvements. Therefore, users are encouraged to submit comments about any questions regarding species ranges (e.g., a bird on the USFWS BCC list you know does not occur in the specified location appears on the list, or a BCC species that you know does occur there is not appearing on the list). Comments should be sent to the ECOS Help Desk.

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area

Trust Resources List

American bittern (*Botaurus lentiginosus*)	Yes	species info	Breeding
Baird's sparrow (*Ammodramus bairdii*)	Yes	species info	Breeding
Bald eagle (*Haliaeetus leucocephalus*)	Yes	species info	Wintering
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	Yes	species info	Breeding
Brewer's Sparrow (*Spizella breweri*)	Yes	species info	Breeding
Burrowing Owl (*Athene cunicularia*)	Yes	species info	Breeding
Common tern (*Sterna hirundo*)	Yes	species info	Breeding
Dickcissel (*Spiza americana*)	Yes	species info	Breeding
Ferruginous hawk (*Buteo regalis*)	Yes	species info	Breeding
Golden eagle (*Aquila chrysaetos*)	Yes	species info	Year-round, Wintering
Grasshopper Sparrow (*Ammodramus savannarum*)	Yes	species info	Breeding
Greater sage-grouse (*Centrocercus urophasianus*)	Yes	species info	Year-round
Hudsonian Godwit (*Limosa haemastica*)	Yes	species info	Migrating
Loggerhead Shrike (*Lanius ludovicianus*)	Yes	species info	Breeding
Long-Billed curlew (*Numenius americanus*)	Yes	species info	Breeding
Marbled Godwit (*Limosa fedoa*)	Yes	species info	Breeding
Prairie Falcon (*Falco mexicanus*)	Yes	species info	Wintering, Year-round
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	Yes	species info	Breeding
Short-eared Owl (*Asio flammeus*)	Yes	species info	Year-round
Sprague's Pipit (*Anthus spragueii*)	Yes	species info	Breeding

Swainson's hawk (*Buteo swainsoni*)	Yes	species info	Breeding
Upland Sandpiper (*Bartramia longicauda*)	Yes	species info	Breeding

NWI Wetlands (USFWS National Wetlands Inventory).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

Data Limitations, Exclusions and Precautions
The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

The following wetland types intersect your project area in one or more locations:

Wetland Types	NWI Classification Code	Total Acres
Freshwater Emergent Wetland	PEM/ABF	8.7069
Freshwater Emergent Wetland	PEMF	34.364
Freshwater Emergent Wetland	PEMA	267.468
Freshwater Emergent Wetland	PEMC	159.1204
Freshwater Emergent Wetland	PEMB	4.4652
Freshwater Emergent Wetland	PEMAd	86.8064
Freshwater Emergent Wetland	PEMCh	28.9891
Freshwater Emergent Wetland	PEMAh	16.309
Freshwater Emergent Wetland	PEMCd	13.0463
Freshwater Emergent Wetland	PEMCb	0.3072
Freshwater Emergent Wetland	PEMCx	0.6115
Freshwater Emergent Wetland	PEMFh	5.4937
Freshwater Forested/Shrub Wetland	PFOA	10.9298
Freshwater Forested/Shrub Wetland	PSSCb	0.6486
Freshwater Forested/Shrub Wetland	PSSAx	0.1375
Freshwater Forested/Shrub Wetland	PSSA	112.8724
Freshwater Forested/Shrub Wetland	PFOAh	3.681

Trust Resources List

Freshwater Pond	PUBFx	3.6436
Freshwater Pond	PABFh	158.9953
Freshwater Pond	PABGx	1.4268
Freshwater Pond	PUBGx	1.7687
Freshwater Pond	PABKx	6.2409
Freshwater Pond	PABF	11.7687
Freshwater Pond	PABGb	1.8065
Freshwater Pond	PABFx	1.9112
Lake	L2USAh	35.1832
Lake	L1UBHh	277182.7639
Lake	L2USCh	73.4298
Lake	L2ABG	53.7257
Other	PUSA	9.0637
Other	PUSAh	3.773
Other	PUSCx	0.6639
Other	PUSCh	5.6567
Other	PUSKx	0.1532
Other	PUSAx	0.1156
Riverine	R4SBC	3.7009
Riverine	R2UBF	71.2347
Riverine	R2USC	75.6629
Riverine	R2USA	123.7119
Riverine	R4USA	17.0565
Riverine	R4USC	8.685

U.S. Fish and Wildlife Service

Trust Resources List

This resource list is to be used for planning purposes only — it is not an official species list.

Endangered Species Act species list information for your project is available online and listed below for the following FWS Field Offices:

Montana Ecological Services Field Office
585 SHEPARD WAY, SUITE 1
HELENA, MT 59601
(406) 449-5225

Project Name:

Fairview Corridor Planning Study

Project Counties:

Richland, MT

Project Type:

Transportation

Endangered Species Act Species List (USFWS Endangered Species Program).

There are a total of **6** threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fishes may appear on the species list because a project could cause downstream effects on the species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section below for critical habitat that lies within your project area. Please contact the designated FWS office if you have questions.

Species that should be considered in an effects analysis for your project:

Birds	Status		Has Critical Habitat	Contact

Trust Resources List

Greater sage-grouse (*Centrocercus urophasianus*) Population: entire	Candidate	species info		Montana Ecological Services Field Office
Least tern (*Sterna antillarum*) Population: interior pop.	Endangered	species info		Montana Ecological Services Field Office
Piping Plover (*Charadrius melodus*) Population: except Great Lakes watershed	Threatened	species info	Final designated critical habitat Final designated critical habitat	Montana Ecological Services Field Office
Sprague's Pipit (*Anthus spragueii*) Population:	Candidate	species info		Montana Ecological Services Field Office
Whooping crane (*Grus americana*) Population: except where EXPN	Endangered	species info	Final designated critical habitat	Montana Ecological Services Field Office
Fishes				
Pallid sturgeon (*Scaphirhynchus albus*) Population: Entire	Endangered	species info		Montana Ecological Services Field Office

Critical habitats within your project area: (View all critical habitats within your project area on one map)

The following critical habitats lie fully or partially within your project area.

Birds	Critical Habitat Type
Piping Plover (*Charadrius melodus*) Population: Great Lakes watershed	Final designated critical habitat

FWS National Wildlife Refuges (USFWS National Wildlife Refuges Program).

There is **1** refuge in your refuge list

U.S. Fish and Wildlife Service

Trust Resources List

Northeast Montana Wetland Management District (406) 789-2305 C/O MEDICINE LAKE NWR 223 NORTH SHORE ROAD MEDICINE LAKE, MT59247	refuge profile

FWS Migratory Birds (USFWS Migratory Bird Program).

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. For more information regarding these Acts see: http://www.fws.gov/migratorybirds/RegulationsandPolicies.html.

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

For information about Birds of Conservation Concern, go to:
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html.

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tool links in the Bird Conservation Tools section at: http://www.fws.gov/migratorybirds/CCMB2.htm.

For information about conservation measures that help avoid or minimize impacts to birds, please visit:
http://www.fws.gov/migratorybirds/CCMB2.htm.

Migratory birds of concern that may be affected by your project:
There are **25** birds on your Migratory birds of concern list. The underlying data layers used to generate the migratory bird list of concern will continue to be updated regularly as new and better information is obtained. User feedback is one method of identifying any needed improvements. Therefore, users are encouraged to submit comments about any questions regarding species ranges (e.g., a bird on the USFWS BCC list you know

does not occur in the specified location appears on the list, or a BCC species that you know does occur there is not appearing on the list). Comments should be sent to the ECOS Help Desk.

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area
American bittern (*Botaurus lentiginosus*)	Yes	species info	Breeding
Baird's sparrow (*Ammodramus bairdii*)	Yes	species info	Breeding
Bald eagle (*Haliaeetus leucocephalus*)	Yes	species info	Wintering, Year-round
Black tern (*Chlidonias niger*)	Yes	species info	Breeding
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	Yes	species info	Breeding
Brewer's Sparrow (*Spizella breweri*)	Yes	species info	Breeding
Burrowing Owl (*Athene cunicularia*)	Yes	species info	Breeding
Common tern (*Sterna hirundo*)	Yes	species info	Breeding
Dickcissel (*Spiza americana*)	Yes	species info	Breeding
Ferruginous hawk (*Buteo regalis*)	Yes	species info	Breeding
Golden eagle (*Aquila chrysaetos*)	Yes	species info	Year-round
Grasshopper Sparrow (*Ammodramus savannarum*)	Yes	species info	Breeding
Greater sage-grouse (*Centrocercus urophasianus*)	Yes	species info	Year-round
Hudsonian Godwit (*Limosa haemastica*)	Yes	species info	Migrating
Loggerhead Shrike (*Lanius ludovicianus*)	Yes	species info	Breeding
Long-Billed curlew (*Numenius americanus*)	Yes	species info	Breeding
Marbled Godwit (*Limosa fedoa*)	Yes	species info	Breeding

McCown's Longspur (*Calcarius mccownii*)	Yes	species info	Breeding
Prairie Falcon (*Falco mexicanus*)	Yes	species info	Year-round
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	Yes	species info	Breeding
Short-eared Owl (*Asio flammeus*)	Yes	species info	Year-round
Sprague's Pipit (*Anthus spragueii*)	Yes	species info	Breeding
Swainson's hawk (*Buteo swainsoni*)	Yes	species info	Breeding
Upland Sandpiper (*Bartramia longicauda*)	Yes	species info	Breeding
Yellow Rail (*Coturnicops noveboracensis*)	Yes	species info	Breeding

NWI Wetlands (USFWS National Wetlands Inventory).

The U.S. Fish and Wildlife Service is the principal Federal agency that provides information on the extent and status of wetlands in the U.S., via the National Wetlands Inventory Program (NWI). In addition to impacts to wetlands within your immediate project area, wetlands outside of your project area may need to be considered in any evaluation of project impacts, due to the hydrologic nature of wetlands (for example, project activities may affect local hydrology within, and outside of, your immediate project area). It may be helpful to refer to the USFWS National Wetland Inventory website. The designated FWS office can also assist you. Impacts to wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes. Project Proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

Data Limitations, Exclusions and Precautions

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

Trust Resources List

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery and/or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Exclusions - Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Precautions - Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

The following wetland types intersect your project area in one or more locations:

Wetland Types	NWI Classification Code	Total Acres
Freshwater Emergent Wetland	PEM/ABF	0.9629
Freshwater Emergent Wetland	PEMF	27.0722
Freshwater Emergent Wetland	PEMA	1281.06
Freshwater Emergent Wetland	PEMC	257.3795
Freshwater Emergent Wetland	PEMB	0.5784
Freshwater Emergent Wetland	PEM/SSA	37.2017
Freshwater Emergent Wetland	PEMCh	39.0977
Freshwater Emergent Wetland	PEMAh	24.1666
Freshwater Emergent Wetland	PEM/USA	71.4463

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Freshwater Emergent Wetland	PEM/USC	10.2523
Freshwater Emergent Wetland	PEM/ABFh	1.0453
Freshwater Emergent Wetland	PEMFh	7.2811
Freshwater Forested/Shrub Wetland	PFOA	17.9462
Freshwater Forested/Shrub Wetland	PFOC	5.7017
Freshwater Forested/Shrub Wetland	PSSAh	2.0129
Freshwater Forested/Shrub Wetland	PFOCh	1.0786
Freshwater Forested/Shrub Wetland	PFO/SSA	12.43
Freshwater Forested/Shrub Wetland	PSSA	396.192
Freshwater Forested/Shrub Wetland	PSS/EMA	226.5204
Freshwater Forested/Shrub Wetland	PSSC	1.44
Freshwater Forested/Shrub Wetland	PFOAh	1.8148
Freshwater Pond	PUBFx	0.5797
Freshwater Pond	PABFh	338.8888
Freshwater Pond	PUBGx	1.6404
Freshwater Pond	PUBG	2.8959
Freshwater Pond	PABF	17.8307
Freshwater Pond	PABFx	2.071
Other	PUSC	0.0988
Other	PUSA	16.0957
Other	PUSAh	1.9895
Other	PUSCh	17.2182
Riverine	R2USC	652.577
Riverine	R2USA	47.6834
Riverine	R4USF	9.3798
Riverine	R4USC	8.086

Attachment 12

Greater Sage-Grouse Habitat Conservation Strategy

GREATER SAGE-GROUSE HABITAT CONSERVATION STRATEGY

Prepared by
Montana's Greater Sage-grouse Habitat Conservation Advisory Council

January 29, 2014

Contents

I. INTRODUCTION

The Greater Sage-Grouse, a prairie species that depends on sagebrush habitat and open lands, has been the subject of significant discussion, litigation, collaboration and debate in the 11 western states that form its range. Montana has managed and regulated Greater Sage-Grouse (hereafter sage-grouse) for well over a century, but habitat loss and sage-grouse population declines in Montana and throughout the birds' range have prompted federal Endangered Species Act (ESA) petitions and litigation that seek to add the sage-grouse to the Endangered Species List.

These legal and procedural processes continue to move forward, and as they do they threaten Montana's ability to manage sage-grouse. The US Fish and Wildlife Service (Service) is cooperating with states – individually and collectively – on habitat conservation plans in advance of a court-ordered September 2015 decision on a potential ESA listing for this species. If the sage-grouse is added to the ESA List, the Service, a federal agency, would replace existing state authority and assume management responsibility for sage-grouse.

History shows loss of sage-grouse habitat and populations has occurred across all land management types, including federal land managed by the Service, Bureau of Land Management (BLM), and U.S. Forest Service. This plan calls on cooperation from federal, state, tribal, and private landowners and managers to conserve and protect sage-grouse.

In 2005, Montana created its first sage-grouse conservation plan, *Management Plan and Conservation Strategies for Sage-Grouse in Montana*. Since then, this plan has guided sage-grouse management in Montana. However, new research and science, coupled with new or expanded potential threats to sage-grouse habitat and populations, have combined with new court decisions to create a need for Montana to update its state sage-grouse conservation plan, policies and actions.

Early in 2013, following efforts in Wyoming and other states with sage-grouse populations, Montana Governor Steve Bullock issued Executive Order 2-2013 (Appendix A), creating a citizen-based Greater Sage-Grouse Habitat Conservation Advisory Council (Advisory Council). This Advisory Council was directed to "gather information, furnish advice, and provide to the Governor recommendations on policies and actions for a state-wide strategy to preclude the need to list the Greater Sage-Grouse under the ESA." In addition, the 2013 Montana State Legislature overwhelmingly passed HB 580 (Appendix B), legislation that funded the Governor's Advisory Council and supported its purpose to recommend policies and actions for a state wide sage-grouse strategy. Paramount in the Executive Order and the legislation was a directive to the Advisory Council to craft a strategy that will serve to preclude the need to add sage-grouse to the Endangered Species List.

In April 2013, the Governor appointed the 12-member Greater Sage-Grouse Habitat Conservation Advisory Council (Appendix C). Since then the Advisory Council has held nine comprehensive meetings. A full list of Advisory Council meeting agendas, minutes, presentations, documents, and more is available on Montana Fish, Wildlife and Parks (FWP) website at http://fwp.mt.gov/fishAndWildlife/management/sageGrouse/habitatConservation/.

Public Comment

This *Greater Sage-Grouse Habitat Conservation Strategy* forms the basis of recommendations from the Advisory Council to Governor Bullock. The Advisory Council held seven public hearings in Montana in primary sage-grouse areas, and well over 450 people attended the public hearings. During the hearings the draft strategy was outlined by FWP personnel at the start of the hearing, copies of the strategy were available for the public, and the public had the opportunity to ask questions about the draft strategy or offer opinions on the draft strategy. The public hearings were held at the locations below:

CITY	LOCATION	TIME
Dillon	U of M – Western, Lewis & Clark Room, Mathews Hall	November 13 – 6 – 8 pm
Billings	FWP Region 5 Headquarters	November 18 – 6 – 8 pm
Baker	Senior Citizens Center	November 19 – 1 – 3 pm
Miles City	Miles Community College, James P Lucas Bldg, Rm 106	November 19 – 7 – 9 pm
Glasgow	Cottonwood Inn and Suites	November 20 – 6 – 8 pm
Malta	First State Bank	November 21 – 12 – 2 pm
Lewistown	FWP Lewistown Area Office	November 21 – 6 – 8 pm

In addition, the Advisory Council created a 34-day comment period for the public to offer written comments on the draft strategy. The Advisory Council received close to 380 comments during that period. During a December 18, 2013 video conference and during a January 14-15, 2014 meeting, the Advisory Council reviewed public comment and modified and finalized its recommendations to the Governor. Because the Advisory Council serves to advise the Governor, the Governor will accept, modify or reject the Advisory Council's recommendations. After finalizing Montana's sage-grouse strategy and developing an implementation plan, the Governor will submit Montana's sage-grouse conservation strategy to the Service for its review. After reviewing the strategy, it is anticipated that the Service will notify the Governor about the strategy's adequacy.

Throughout the Advisory Council's deliberations, the Service has made it clear that for the Service to consider Montana's *Greater Sage-Grouse Habitat Conservation Strategy* (*Montana Strategy*) as an effective mechanism for sage-grouse conservation in their final listing decision, the strategy must pass two critical tests: (1) the Service must have certainty the *Montana Strategy* will be implemented; and (2) once the *Montana Strategy* is implemented, the Service must have certainty the plan will be effective in protecting sage-grouse habitat and conserving sage-grouse populations. This document and Montana's sage-grouse conservation plan are built upon Montana's need to successfully address this two-part test.

Readers will note that the report is organized into major sections based on the primary threats facing sage-grouse. First, the main threats identified by the Service are addressed. Second, additional threats identified by the Advisory Council, are addressed. Each section contains a series of recommendations to address identified threats.

Readers will also note that this current Advisory Council ends its duties in early 2014. However, this Advisory Council is recommending that the Governor appoint a new citizen and agency-based working group to oversee sage-grouse conservation in Montana, the Montana Sage-Grouse Oversight Team. With significant amounts of emerging research and other information anticipated to be available in the near future, the Advisory Council believes it is essential that the State of Montana retain a sharp focus on the status of sage-grouse habitat, populations, threats and science. Wyoming has found the use of an established sage-grouse working group particularly effective and valuable in addressing ongoing sage-grouse issues. Montana's Advisory Council also believes creation of a new citizen and agency-based working group will be helpful in ensuring this *Greater Sage-Grouse Habitat Conservation Strategy* is successfully and effectively implemented now and into the future.

II. PERFORMANCE STANDARD

As of January 31, 2014, the State of Montana shall adopt a sage-grouse population target based on the number of displaying males. Displaying males are an index to sage-grouse abundance and distribution trends over time. This index to sage-grouse populations will be estimated regularly using a consistent protocol and will serve as a primary metric for quantifying the success or failure of this *Greater Sage-Grouse Habitat Conservation Strategy*. Sage-grouse populations vary naturally over time and across regions, which means numbers of birds counted in a given year or a given area could be higher or lower than average but are still within a sustainable range for the species. Between 2004 and 2013, the average number of displaying males in a given year in Montana ranged from 6.98 – 18.71 males/lek (NOTE: these numbers may change based on an ongoing evaluation of lek monitoring data by FWP). This range shall serve as the baseline for future regular population monitoring and will serve to determine sage-grouse population growth or loss as determined by a statistically-valid analysis over a 10-year period, and will also serve to guide future modifications of the *Montana Strategy* by the Montana Sage-Grouse Oversight Team and other state and federal entities. Deviations from historical or statewide trends in a given region of the state will also be taken into account when evaluating modifications to the *Montana Strategy*.

III. GENERAL PROVISIONS

Governor Bullock's Greater Sage-Grouse Habitat Conservation Advisory Council recommends the following *Montana Strategy* to address threats to the sage-grouse in Montana. The goal of the *Montana Strategy* is to conserve sage-grouse populations and habitats and to preclude the need to list the bird under the Endangered Species Act. To achieve this goal, the following stipulations were developed to conserve sage-grouse populations and habitats while concurrently achieving substantive economic and social growth. Primary threats that led to the Service's warranted but precluded finding in 2010 include fragmentation and alteration of sagebrush systems, and a lack of regulatory mechanisms to conserve sage-grouse habitat. Specific threats identified by the Service include wildfire, non-native plant species, energy development, sagebrush removal, improper grazing, range management structures, pinyon-juniper expansion, agricultural conversion, mining, recreation, ex-urban development, infrastructure, and fences. Predation and hunting were also identified by the Advisory Council as threats to sage-grouse and are included in this strategy. In its final form, the *Montana Strategy* will be presented to Governor Bullock for consideration as the primary regulatory mechanism to conserve sage-grouse and preclude the need for listing the bird as a threatened or endangered species pursuant to the Endangered Species Act of 1973. The following are general overarching provisions intended to convey how this strategy will be implemented and how agencies will work in concert to achieve effective conservation of sage-grouse in Montana:

1. Management by all Montana state agencies should focus on the maintenance and enhancement of sage-grouse habitats, populations and connectivity areas, including inter-state and international Connectivity Areas, identified in Section IV. Core Areas play a critical role and General Habitat plays an important role in sage-grouse conservation. Because regulatory certainty is important, it is important that scientifically defensible, mapped Core Areas be retained unless substantial and compelling information indicates that boundaries may need to be changed.
2. All valid and existing land uses and rights in sage-grouse Core Areas, Connectivity Areas and General Habitat should be recognized and respected. State trust lands have valid and existing rights and responsibilities under the Enabling Act at Statehood, November 8, 1889.
3. A Montana Stewardship and Conservation Fund will be established to create and fund voluntary and incentive-based non-regulatory conservation programs designed to conserve sagebrush habitat and

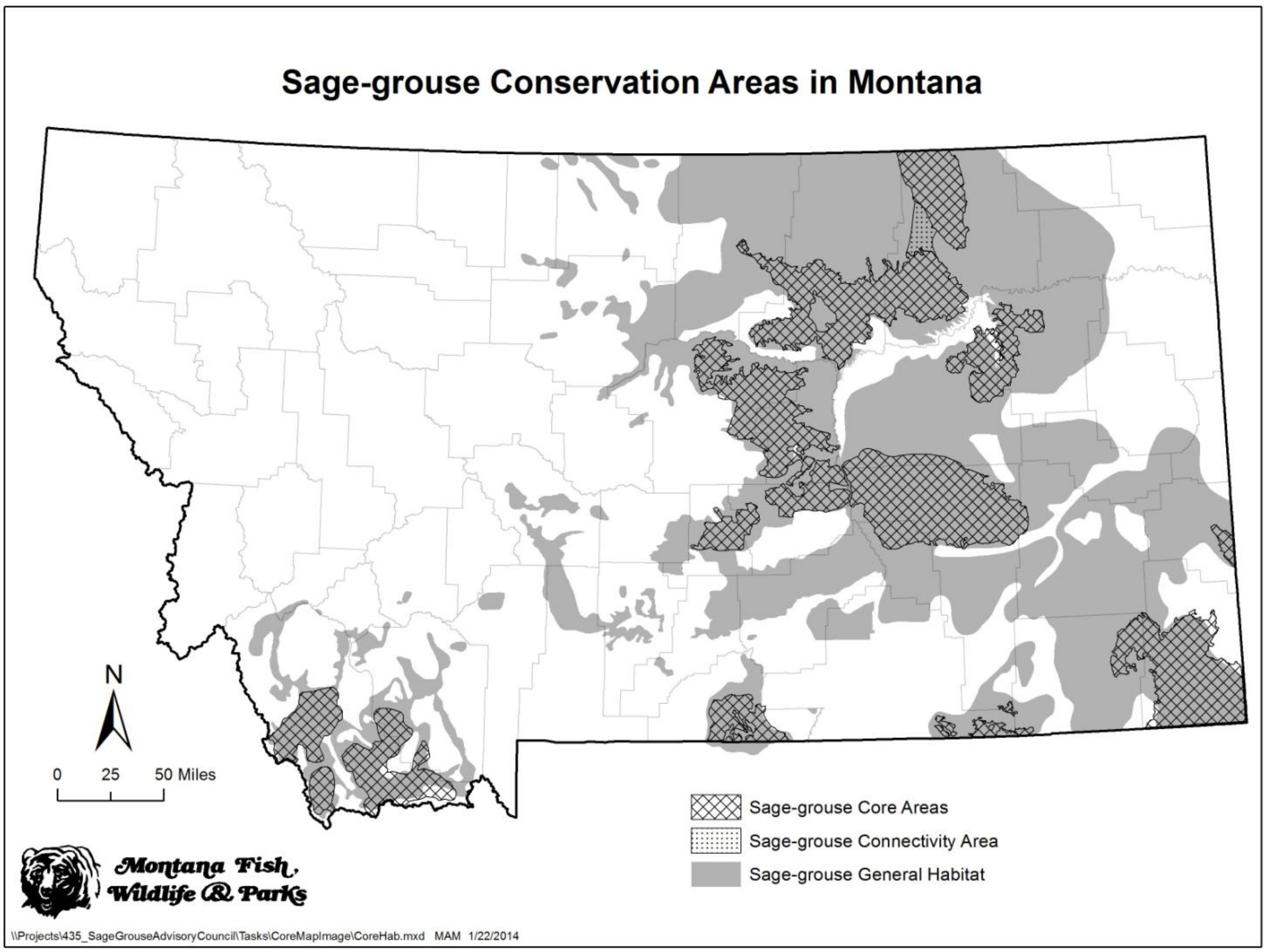
grazing lands within identified sage-grouse Core Areas, Connectivity Areas, and General Habitat areas on private lands (Section V).

4. The Governor shall direct and prioritize an appropriate amount of all state funds available for conservation of habitats for protection, enhancement, and restoration of sage-grouse habitat in Core Areas, Connectivity Areas, and General Habitat.
5. Activities conducted pursuant to a permit or permit application prior to January 31, 2014 will not be managed under the stipulations found in this strategy. Examples of existing activities include oil and gas, mining, agriculture, overhead power lines, processing facilities, housing and other uses that were in place prior to the development of this policy. Provided these activities are within a defined project boundary (such as a recognized state or federal oil and gas unit, drilling and spacing unit, mine plan, subdivision plat, etc.) they should be allowed to continue within the existing boundary, even if the use exceeds recommended stipulations (see Section VI), recognizing that all applicable state and federal actions shall continue. New development associated with existing activities may be subject to these stipulations (Section VI).
6. This strategy in no way adds or expands the review or approval authority of any state agency. Section VIII contains a list of land uses and landowner activities that do not require review for consistency.
7. New development or land uses requiring a permit or other authorizations within sage-grouse Core Areas should be authorized or conducted only when it can be reasonably demonstrated that the activity (factoring in mitigation) will not cause declines in sage-grouse populations. Activities that exceed recommended stipulations may require compensatory mitigation (Section VIII).
8. Development consistent with the stipulations set forth in Section VI shall be deemed sufficient to demonstrate that the activity will not cause declines in sage-grouse populations.
9. Core and Connectivity Areas and General Habitat will receive priority by state agencies for all sage-grouse funding, land management agreements (including Candidate Conservation Agreements and Candidate Conservation Agreements with Assurances), habitat enhancement projects, reclamation efforts, mapping projects, and other associated proactive efforts designed to assure viability of sage-grouse in Montana.
10. Incentives to accelerate or enhance reclamation in habitats in and adjacent to Core and Connectivity Areas and General Habitat should be developed, including but not limited to stipulation waivers, funding for enhanced reclamation, and other strategies. Any incentives developed will result in net benefit to and not cause declines in sage-grouse populations.
11. Immediate suppression of wildfire in Core and Connectivity Areas and General Habitat will be prioritized by all fire-fighting units under the jurisdiction of the state, recognizing that other local, regional, and national suppression priorities may take precedent. Coordination among all fire-fighting units, including federal, state, regional, and local units, is necessary to implement fire prevention, suppression, and rehabilitation management as detailed in Section X. However, public and firefighter safety remains the number one priority for all fire management activities. Reclamation and restoration of sage-grouse habitat burned by wildfire will be a primary mitigation opportunity under this plan.
12. State agencies shall work collaboratively and in cooperation with federal and local governments and private landowners to ensure a uniform and consistent application of this strategy to maintain and enhance sage-grouse habitats and populations.
13. A Montana Sage-grouse Oversight Team (MSGOT) will be established (Section XI). This body will be responsible for providing oversight for the implementation of Montana's *Greater Sage-grouse Habitat Conservation Strategy*.
14. State agencies shall strive to maintain consistency with the items outlined in this strategy, but it should be recognized that adjustments to the stipulations may be necessary based upon local conditions and limitations. Any adjustments to these stipulations must be recommended for approval by the MSGOT

and subsequently approved by the appropriate agency. The goal is to minimize future disturbance by co-locating proposed disturbances within areas already disturbed or naturally unsuitable.

15. The protective stipulations outlined in this Strategy should be reevaluated on a continuous basis and at a minimum annually, as new science, information, and data emerge regarding the habitats and behaviors of sage-grouse.
16. The State of Montana will implement a policy of yearly surveys of sage-grouse and leks statewide using biologists, wardens, and applicable public.
17. The State of Montana shall commit funding for the implementation of this Strategy as described in Section XI). This Strategy supersedes the 2005 *Management Plan and Conservation Strategies for Sage-grouse in Montana – Final*.
18. State agencies shall report to the Office of the Governor, Montana Environmental Quality Council, State Land Board, and Montana Fish and Wildlife Commission detailing their actions to comply with this Strategy.

IV. SAGE-GROUSE CONSERVATION AREAS



Geographic Information System layers of Montana's Greater Sage-Grouse Conservation Areas are available from Montana Fish, Wildlife and Parks upon request.

A. **Core Areas –** areas of highest conservation value for sage-grouse. Core Areas were delineated by Montana Fish, Wildlife and Parks (FWP) in cooperation with federal and non-governmental partners to encompass the areas with the greatest number of displaying males and associated habitat. FWP estimates the Core Areas include approximately 76% of the displaying males in Montana, as of 2013. Male counts at lek sites are assumed to represent the overall sage-grouse population.
B. **General Habitat –** areas that provide habitat for sage-grouse in Montana but are not considered Core Areas.
C. **Connectivity Areas –**areas that provide important linkages among populations of sage-grouse, particularly between Core Areas or priority populations in adjacent states and across international borders. Additional Connectivity Areas may be mapped when more information becomes available.

V. MONTANA STEWARDSHIP AND CONSERVATION FUND

Approximately 64% of sage-grouse habitat in Montana is in private ownership. The ongoing stewardship of private landowners is critical to successful conservation of sage-grouse habitat and providing additional opportunities to support land stewardship is fundamental to this strategy. The Advisory Council recommends the creation of the Montana Stewardship and Conservation Fund (Fund) to provide immediate and ongoing annual funding to:

1) Conserve sage-grouse habitat and populations until sage-grouse populations are stable and the sage-grouse is no longer vulnerable to an Endangered Species Act listing.
2) Create and fund voluntary and incentive-based non-regulatory conservation programs on private land.
3) Conserve key wildlife connectivity areas to help diminish potential future ESA listings of other species.
4) Target appropriate funding to conserve riparian and wetland areas to help diminish potential future ESA listings.
5) Improve habitat health to reduce threat of catastrophic fire, including projects designed to address conifer encroachment and invasive species.
6) Promote and support mitigation and conservation plans and measures. Funds cannot be used directly for compensatory mitigation but can be used to leverage existing compensatory mitigation projects to maximize sage-grouse conservation benefit.

In addition, this Fund would:

1) Be housed in the Montana Department of Natural Resources and Conservation.
2) Be managed by a citizen's board (with legislative representation) that would have authority to award funding through a competitive grant process to entities based on Fund guidelines, legislative intent, rule-making, and other specific provisions.
3) Allow entities such as watershed groups, conservation districts, nonprofit organizations, state agencies, and others to be eligible for grant funding.
4) Be used as a matching source of funds to ensure that Fund dollars are maximized for on-the-ground projects. The Fund could be used as match for mitigation programs, federal programs, private donations, other state programs, and more.
5) Be part of the governor's budget submission in late 2014 with a defined and identified dollar amount contained within the budget. The Advisory Council recommends funding for the *Montana Strategy* in the Governor's budget. To ensure transparency, the Fund would regularly report to the

Legislature, the Governor, the Montana Environmental Quality Council, and the Montana Fish and Wildlife Commission.

VI. STIPULATIONS FOR DEVELOPMENT

The goal of this Strategy is to conserve sage-grouse populations and habitats and to preclude the need to list the bird under the Endangered Species Act. To achieve this goal, the following stipulations were developed to conserve sage-grouse populations and habitats while concurrently achieving substantive economic and social growth. New development projects in sage-grouse Core Areas that require any state or federal permits will be required to follow the permitting process and stipulations outlined below. Development projects in sage-grouse Connectivity Areas and General Habitat may also be required to follow certain stipulations (see below). Activities exempt from these stipulations can be found in Section VIII. The permitting entity (e.g., Bureau of Land Management, Department of Environmental Quality) will have ultimate responsibility for compliance with these stipulations.

a) Core Area Stipulations

i. Core Area – Basic Stipulations

The stipulations in this section apply to all new activities in Core Areas with the exception of exempt activities defined in Section VIII. Additional stipulations that apply to specific industries and activities are described in Section VI.a.ii. Where there is a conflict between the basic and the specific stipulations for any given activity, the more specific will apply.

Sage-grouse Core Areas have been designated as areas of highest conservation priority. These stipulations are designed to maintain existing suitable sage-grouse habitat by regulating activities in Core Areas to ensure the maintenance of sage-grouse abundance and distribution in Montana.

1. **Sequence of Decisions for Surface Disturbance Activities:** State-approved projects that result in more than minimal adverse impacts to sage-grouse and/or their habitat will follow the following sequence of decisions:
    a. **Avoid Impacts**. The best way to protect sage-grouse habitat is to avoid impacts that fragment or otherwise damage or destroy sage-grouse habitat. To accomplish this, project developers should consider alternative locations for their project located outside sage-grouse habitat (i.e., consider locations outside Core Areas, outside suitable habitat, and/or in areas already considered disturbed). To meet this provision, the project developer needs to show authorizing agencies rationale as to why a given proposed surface disturbance in sage-grouse habitat is unavoidable.
    b. **Minimize the Size of the Impact**. If impacts to sagebrush habitat cannot be avoided, they should be minimized by limiting the magnitude of the proposed surface disturbance. Reducing impacts can preserve at least portions of the habitats' important functions, including limiting fragmentation. Impacts can be minimized by reducing the project footprint, constructing fewer structures, clustering features, shifting the development pattern to use topographical screening, timing restrictions, or similar measures. In order to meet this requirement, the project developer should be able to show that the project minimizes the impact to sage-grouse habitat, while continuing to meet the purpose of the development.

   c. **Compensation for Impacts**. If project impacts are unavoidable and Core Area stipulations cannot be met, mitigation measures shall be required, following the Mitigation Framework outlined in Section IX.[1] Mitigation can include enhanced reclamation.

2. **Surface Occupancy Active Leks:** There will be a No Surface Occupancy (NSO) buffer within 1.0 mile of active sage-grouse leks within Core Areas. NSO, as used in these recommendations, means no surface facilities, including roads, shall be placed within the NSO area. Other activities may be authorized with the application of appropriate seasonal stipulations, provided the resources protected by the NSO are not adversely affected. For example, underground utilities may be permissible if installation is completed outside applicable seasonal stipulation periods and significant resource damage does not occur. Similarly, geophysical exploration may be permissible in accordance with seasonal stipulations. See Appendix D for the definition of an active lek.
3. **Surface Disturbance**: Surface disturbance will be limited to an average of 5% of suitable sage-grouse habitat within the Density and Disturbance Calculation Tool (DDCT) examination area (or other suitable term for Montana's density and disturbance analysis process; see Appendix E). The calculation method for this disturbance density will follow Wyoming's DDCT process that is described in Appendix E. The calculation of total percent disturbance will include:
   a. All existing disturbance (anthropogenic);
   b. Authorized but yet to be implemented activities; and
   c. Proposed activities;

   but will not include areas that are naturally unsuitable for sage-grouse (e.g., bodies of water). A definition of unsuitable habitat is provided in Appendix D. Distribution of proposed disturbance may be considered and approved on a case-by-case basis with a goal of consolidating disturbance. Unsuitable and disturbed habitat should be identified in a seasonal and landscape context, on a case-by-case basis, outside the NSO buffer around leks. This will incentivize proponents to locate projects, where technically feasible, in unsuitable and disturbed habitat to avoid creating additional disturbance acres. Acres of development in unsuitable habitat are not considered disturbance acres. The primary focus should be on protection of undisturbed suitable habitats and protection from habitat fragmentation. See Appendix D for a description of suitable habitat and surface disturbance.
4. **Seasonal Use**: As authorized by permitting agency or agencies, activities (production, maintenance, and emergency activity exempted) will typically be prohibited from March 15 – July 15 outside of the NSO perimeter of an active lek in Core Areas where breeding, nesting, and early brood-rearing habitat is present. Allowed maintenance and production activity will not occur between the hours of 4:00 - 8:00 am and 7:00 - 10:00 pm between March 15 – July 15. In areas used as winter concentration areas, exploration and development activity will be prohibited December 1 – March 15. Activities may be allowed during seasonal closure periods as determined on a case-by-case basis. Activities in unsuitable habitat also may be approved year round on a case-by-case basis.
5. **Noise**: New noise levels, at the perimeter of a lek, should not exceed 40 dBA above ambient noise (existing activity included) from 6:00 pm - 8:00 am during the breeding season (March 15 – July 15) with the exception of those sites identified under Special Management Core Areas.[2] Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise. The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.

[1] A Minority Committee Report has been written for the Compensation for Impacts stipulation, see Appendix H.

[2] A Minority Committee Report has been written for the Noise stipulation, see Appendix H.

6. **Vegetation Removal:** Vegetation removal as part of permitted activities will be limited to the minimum disturbance required by the project. All topsoil stripping and vegetation removal in suitable habitat will occur between July 16 – March 14 in areas that are within 4.0 miles of an active lek. Disturbance in unsuitable habitat between March 15 and July 15 may be approved on a case-by-case basis.
7. **Reclamation**: Reclamation should re-establish native grasses, forbs, and shrubs during interim and final reclamation. The goal of reclamation is to achieve cover, species composition, and life form diversity commensurate with the surrounding plant community or desired ecological condition to benefit sage-grouse and replace or enhance sage-grouse habitat to the degree that environmental conditions allow. Seed mixes should include at least two native forbs and two native grasses with at least one native bunchgrass species. Where sagebrush establishment is prescribed, establishment is defined as meeting the standard prescribed in the individual reclamation plan. Landowners should be consulted on the desired plant mix on private lands. The operator is required to control noxious and invasive plant species, especially cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*).
8. **Existing Activities**: Areas already disturbed or approved for development within Core Areas prior to January 31, 2014 are not subject to new sage-grouse stipulations with the exception that existing operations may not initiate activities resulting in new surface occupancy within 1.0 mile of an active sage-grouse lek. Any existing disturbance will be counted toward the calculated disturbance cap for a new proposed activity. The level of disturbance for existing activities may exceed 5%.

ii. Core Area - Specific Stipulations

The stipulations in this section apply to specific activities and/or industries. They should be followed in addition to the basic stipulations described above. Where there is a conflict between the basic and the specific stipulations for any given activity, the more specific will apply.

1. **Transportation***:* Locate main roads used to transport production and/or waste products a minimum of 2.0 miles from the perimeter of active sage-grouse leks. Locate other roads used to provide facility site access and maintenance a minimum of 1.0 mile from the perimeter of active sage-grouse leks. Construct roads to minimum design standards needed for production activities.
2. **Pipelines**: Bury pipelines and restore disturbed area with native plant species that are compatible with the surrounding ecological site conditions. Co-locate pipelines with roads, transmission lines, and other linear features when possible. Compensatory mitigation for temporary loss of habitat will be required by the applicable permitting agency.
3. **Overhead Power lines and Communication Towers**: Locate new overhead power lines and communication towers a minimum of 1.0 mile from the perimeter of active sage-grouse leks. Use topographic screening and bury lower voltage transmission lines where economically feasible. Follow the Service's Best Management Practices for tall structures when erecting new communication towers. Burying of local distribution lines should be encouraged where economically feasible. Co-locate all new power lines with roads, existing power lines, or other linear features, when possible. Burying existing overhead lines that have been identified as contributing to a decline in sage-grouse populations will be considered as a mitigation option. Anti-collision measures should be installed within 1.0 mile of the perimeter of known sage-grouse concentration areas such as leks, winter ranges, etc. where icing conditions are unlikely to occur. Raptor-proofing poles is encouraged when proven effective. Industry and their suppliers are encouraged to continue efforts to develop effective perch preventers. If effective perch preventers are identified, they should be installed within 1.0 mile of known concentration areas such as leks, winter ranges, etc. Electric utilities, including electric cooperatives, are working with the Avian Power Line Interaction Committee (APLIC), which includes

federal agencies (including the Service and BLM), and state wildlife agencies (including FWP) to develop a set of Best Management Practices (BMPs) to guide construction, operation, and maintenance activities in sage-grouse habitats. This document will not be completed until after the Advisory Council submits their recommendations to the Governor. Until the BMP document is reviewed and approved by the Service, BLM, and other appropriate state and federal agencies, it will be referenced as "Best Management Practices for Electric Utilities in Sage-Grouse Habitat**".** It will be added to the Montana *Greater Sage-grouse Habitat Conservation Strategy* when the BMP document is finalized.

4. **Oil and Gas Development**: Well pad densities are not to exceed an average of one pad per square mile (640 acres) within the DDCT examination area (or other suitable term for Montana's density and disturbance analysis process; see Appendix E). As an example, the number of well pads within a 2.0 mile radius of the perimeter of an active sage-grouse lek should not exceed 11, distributed preferably in a clumped pattern in one general direction from the lek.
5. **Coal Mining**: Conservation measures will be developed for and imposed on coal mining operations on a case-by-case basis via the terms and conditions included in permits issued by the Montana Department of Environmental Quality (MDEQ) under the authority of the Montana Strip and Underground Mine Reclamation Act (MSUMRA), and in compliance with the federal Surface Mining Control and Reclamation Act (SMCRA). The Administrative Rule components of the MSUMRA can be accessed at http://www.deq.mt.gov/wqinfo/Laws/StripMiningReclamatio.mcpx. The associated coal permitting rules and standard of the Montana Department of Environmental Quality can be accessed at http://.deq.mt.gov/CoalUranium/Coalpermitting.mcpx. Links to SMCRA and the enabling components of the Code of the Federal Regulations can be found at http://www.osmre.gov/lrg.shtm.

    a. Coal mining will first try to avoid operating in sage-grouse habitat.
    b. To avoid potentially significant impacts to sage-grouse, coal companies will delineate the area that will be disturbed. They will report baseline vegetation surveys of the permit area, four season sage-grouse baseline surveys of the permit area and periphery, along with population density and habitat delineations. They will show pre-mine land use conditions, capacity, productivity, and history (per ARM 17.24.304). The sage-grouse plan (per ARM 17.24.312) will include:
        i. An operations plan (per ARM 17.24.308) that includes a plan to prevent the establishment of, or to effect the control of, noxious weeds (including cheatgrass and Japanese brome) in the proposed permit/amendment area.
        ii. A sage-grouse plan (per ARM 17.24.312) will include:
            1. A plan to minimize disturbances and impacts on sage-grouse and related environmental values during mining and reclamation;
            2. Details on how enhancement of sage-grouse values will be achieved;
            3. Descriptions of sage-grouse enhancement features to be established; and
            4. Statements of impact control measures, management techniques, and annual monitoring methods to protect or enhance sage-grouse or habitats identified through the consultation process as important and/or high value.
        iii. A reclamation plan to reclaim mined area back to suitable habitat (per ARM 17.24.313) will include:

            1. The proposed post-mining land use;
            2. A timetable for each reclamation step;
            3. A map of the proposed post-mining topography;

4. Demonstration that the post-mining topography can be achieved;
5. Details on reestablishment of hydrologic balance;
6. Details on topsoil salvage, protection, and replacement methods;
7. A narrative on the details of the revegetation methods to be applied;
8. Details on the reclaimed vegetation monitoring to be conducted; and
9. Mine and reclamation plan reviews by the Service relative to threatened, endangered, and candidate species through Section 7 consultation processes.

iv. The establishment of vegetation to protect sage-grouse (per ARM 17.24.711) will require that:

1. Vegetation must be reestablished on the disturbed areas and it must be diverse, effective, and permanent;
2. Vegetation cover must be comprised of native species or approved alternatives and be compatible with post-mine land uses;
3. Reclamation vegetation must be equivalent in cover to natural vegetation and be capable of self-regeneration and plant succession;
4. There is compliance with noxious weed restrictions; and
5. For sage-grouse habitat, shrubs must be established to achieve cover and stocking rates as approved by MDEQ after consultation and approval by FWP.

v. Shrub species (per ARM 17.24.717) must be adapted to local conditions and meet the post-mining land use.

vi. Monitoring (per ARM 17.24.723) requirements include:

1. Periodic vegetation, soils, and wildlife monitoring with coverage and frequency as approved by MDEQ; and
2. Submittal of detailed monitoring reports to MDEQ.

If monitoring data indicates corrective measures are needed, then adaptive management practices need to be applied.

The requirements for monitoring shall terminate at the same time that the MDEQ has determined that phase III reclamation, as defined in ARM 17.24.1116(6)(c), has been completed

vii. Revegetation success criteria (per ARM 1724.724) requirements include:

1. Determination of success will be via comparison to un-mined reference areas or through approved technical standards.

viii. Vegetation measurement (per ARM 17.24.726) requirements include:

1. Use of MDEQ-approved methods;
2. Demonstration of equivalent production, cover, and density per MDEQ-approved standards;
3. Minimum shrub density standards; and

4. Demonstration of compliance with noxious weed restrictions.

6. **Bentonite, Scoria, Peat, and Sand and Gravel Mining[3]**: Conservation measures will be developed for and imposed on opencut mining operations on a case-by-case basis via the terms and conditions included in permits issued by the Montana DEQ under the authority of the Montana Opencut Mining Act (83-4-401, Montana Code Annotated (MCA)), which can be accessed at http://deq.mt.gov/opencut/forms/2013-Title82Chapter4Part4.pdf .

    a. Opencut mining operations will first try to avoid operating in sage-grouse habitat.
    b. To avoid potentially significant impacts to sage-grouse, opencut mining companies will delineate the area that will be disturbed. They will report baseline vegetation surveys of the permit area, four season sage-grouse baseline surveys of the permit area and periphery, along with population density and habitat delineations (Per ARM 17.24.222). They will show pre-mine land use conditions, capacity, productivity, and history (per ARM 17.24.217). The sage-grouse plan will include:
        i. An operations plan (per ARM 17.24.218 and 219) that includes a plan to prevent the establishment of, or to effect the control of, noxious weeds (including cheatgrass and Japanese brome) in the proposed permit/amendment area.
        ii. A sage-grouse plan (per ARM 17.24.219) will include:

            1. A plan to minimize disturbances and impacts on sage-grouse and related environmental values during mining and reclamation;
            2. Details on how enhancement of sage-grouse values will be achieved;
            3. Descriptions of sage-grouse enhancement features that will be established; and
            4. Statements of impact control measures, management techniques, and annual monitoring methods to protect or enhance sage-grouse or habitats identified through the consultation process as important and/or high value

        iii. A reclamation plan (per ARM 17.24.219) to reclaim mined area back to suitable habitat will include:

            1. The proposed post-mining land use;
            2. Timetable for each reclamation step;
            3. A map of the proposed post-mining topography;
            4. Demonstration that the post-mining topography can be achieved;
            5. Details on reestablishment of hydrologic balance;
            6. Details on topsoil salvage, protection, and replacement methods;
            7. A narrative on the details of the revegetation methods to be applied;
            8. Details on the reclaimed vegetation monitoring to be conducted; and
            9. Mine and reclamation plan reviews by the Service relative to threatened, endangered, and candidate species through Section 7 consultation processes.

        iv. The establishment of vegetation to protect sage-grouse (per ARM 17.24.219) will require that:

[3] A Minority Committee Report has been written for the Bentonite, Scoria, Peat, and Sand and Gravel Mining stipulation, see Appendix H.

1. Vegetation must be reestablished on the disturbed areas and it must be diverse, effective and permanent;
2. Vegetation cover must be comprised of native species or approved alternatives and be compatible with post-mine land uses;
3. Reclamation vegetation to be equivalent in cover to natural vegetation and be capable of self-regeneration and plant succession;
4. There is compliance with noxious weed restrictions; and
5. For sage-grouse habitat, shrubs must be established to achieve cover and stocking rates as approved by MDEQ after consultation and approval by FWP.

v. Shrub species (per ARM 17.24.219) must be adapted to local conditions and meet the post-mining land use.

vi. Monitoring (per ARM 17.24.219) requirements include:

1. Periodic vegetation, soils, and wildlife monitoring with coverage and frequency as approved by MDEQ; and
2. Submittal of detailed monitoring reports to MDEQ

If monitoring data indicates corrective measures are needed, then adaptive management practices need to be applied.

The requirements for monitoring shall terminate upon bond release (per ARM 17.24.203)

vii. Revegetation success criteria (per ARM 1724.219) requirements will include:

1. Success to be determined via comparison to un-mined reference areas or through approved technical standards.

viii. Vegetation measurements (per ARM17.24.219) requirements include:

1. Use of MDEQ-approved methods;
2. Demonstration of equivalent production, cover, and density per MDEQ-approved standards;
3. Minimum shrub density standards; and
4. Demonstration of compliance with noxious weed restrictions.

7. **Other Mining**:

a. For development drilling or ore body delineation drilling on tight centers (approximately 50’ x 50’), the disturbance area will be delineated by the external limits of the development area. Assuming a more widely-spaced disturbance pattern, the actual footprint will be considered the disturbance area.
b. Sage-grouse monitoring results will be reported in the mine permit annual report. This document will be given to FWP and the regulating body. Pre-disturbance surveys will be conducted as required by the appropriate regulatory agency.
c. The number of active mining development areas (e.g., operating equipment and significant human activity) is not to exceed an average of one project per square mile (640 acres).

d. Surface disturbance and surface occupancy stipulations will be waived within the Core Area when implementing underground mining practices that are necessary to protect the health, welfare, and safety of miners, mine employees, contractors, and the general public. The mining practices include but are not limited to bore holes or shafts necessary to: 1) provide adequate oxygen to an underground mine; 2) supply inert gases or other substances to prevent, treat, or suppress combustion or mine fires; 3) inject mine roof stabilizing substances; and 4) remove methane from mining areas. Any surface disturbance or surface occupancy necessary to access the sites to implement these mining practices will also be exempt from any stipulation.
e. Mining permits will include requirements for mitigation that enhances or promotes genetic diversity, critical habitat, connectivity, and population viability.

8. **Wind Energy**: Wind energy development will be excluded from sage-grouse Core Areas. This provision will be reevaluated on a continuous basis as new science, information, and data emerges.
9. **Sagebrush Treatments**: Sagebrush eradication and treatment programs aimed at reducing or eliminating sagebrush will be prohibited on state and discouraged on private lands unless those treatments are approved by MSGOT and can be satisfactorily shown to result in no loss of habitat or be beneficial to sage-grouse habitat. Sagebrush treatments are considered disturbance and will contribute to the 5% disturbance factor. Sagebrush treatments that have been approved by MSGOT will not contribute to the 5% disturbance factor. Sagebrush canopy cover should be maintained at present levels. Treatments to enhance sagebrush-grassland will be evaluated based upon the existing habitat quality and the functional level post-treatment. Restored sagebrush grassland habitats that provide effective cover and food for sage-grouse should be recognized as part of the habitat base; this provision serves as an incentive for restoring and protecting converted habitats. For government agencies managing sagebrush in Core Areas, there should be a “no net conifer expansion” policy adopted, with criteria for approve waivers. This policy can be enacted through management plans and their implementation; stipulations in permits, leases, and licenses; and similar mechanisms. Conifer removal in sage-grouse Core Areas should be done manually, unless other methods can be shown to remove conifers without significantly impacting sagebrush. Where conifer encroachment is an issue near leks, land managers should ensure that all conifers are removed within at least 0.6 miles (1,000 meters) of leks.
10. **Conversion to Cropland Agriculture**: The Advisory Council recommends that the Montana Board of Land Commissioners enact a prohibition of conversion of native range to cropland on state land in Core Areas, with criteria for approved waivers. If enacted, prohibition details and criteria for approved waivers will be incorporated in to the *Montana Strategy* as an Addendum. The Advisory Council also requests that federal agencies prohibit the conversion of native range to cropland on lands that they control surface rights. State and federal agencies are also encouraged to work cooperatively with Tribal governments to adopt policies that prevent conversion of sage-grouse habitat to agricultural cropland.
11. **Range Management**: Rangelands on state lands will be managed in accordance with the recommendations in Section X.a, whenever possible, taking into consideration the existing management practices of the lessee on surrounding non-state lands. State agencies are encouraged to collaborate with federal agencies and private landowners to craft grazing management plans that adhere to the concepts included in this document.
12. **Wildfire and Prescribed Fire**: Immediate suppression of wildfire in Core Areas will be prioritized by all fire-fighting units under the jurisdiction of the state. Prescribed burns will be prohibited in sagebrush habitat in Core Areas unless those prescribed burns are approved by MSGOT and can be satisfactorily shown to result in no loss of habitat or be beneficial to sage-grouse habitat. Although lands burned by

wildfire are excluded from the disturbance cap, these lands require a management plan resulting in a trend to reestablish functional sage-grouse habitat as soon as possible. Burnouts, backfires, and all other public safety measures are appropriate for fighting wildfires.

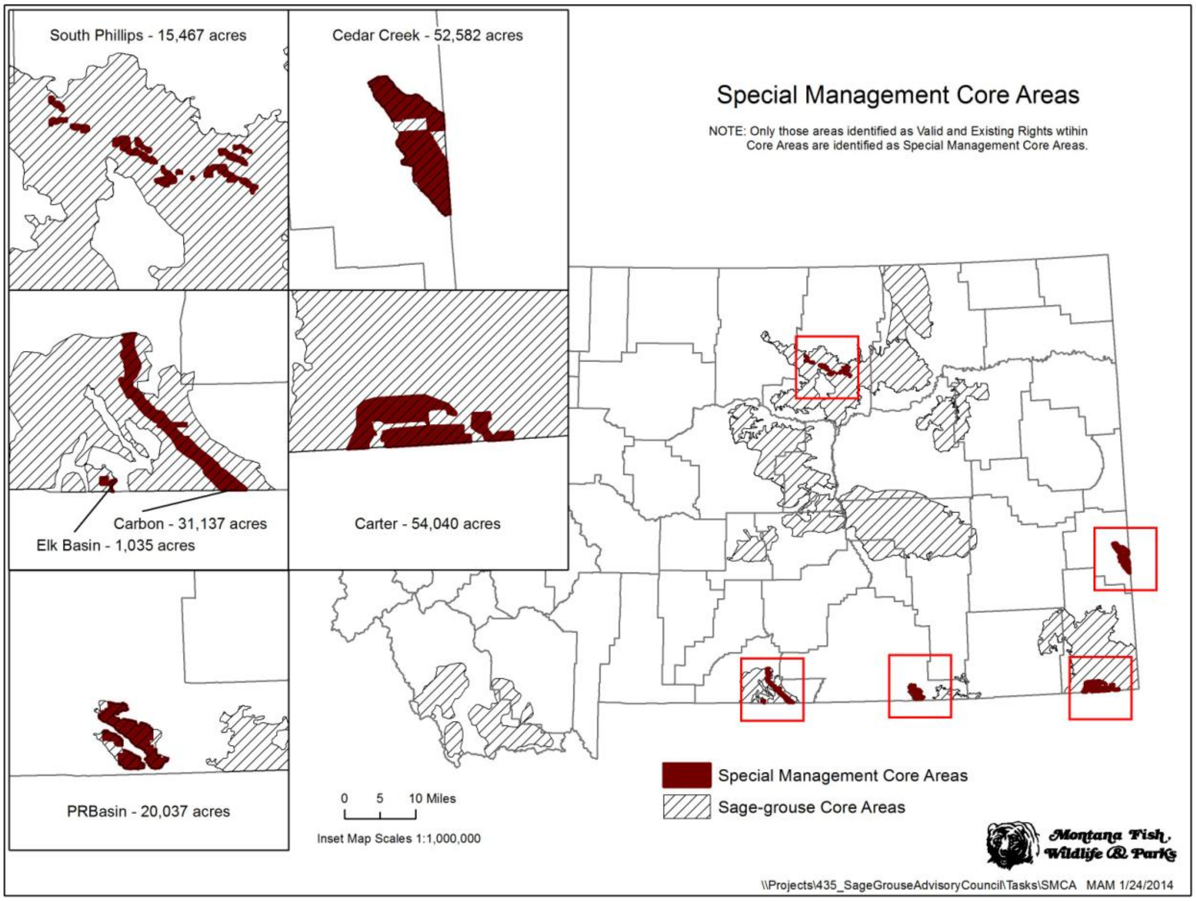
13. **Monitoring/Adaptive Response**: For all activities allowed in Core Areas, sage-grouse monitoring will be conducted to evaluate the response of active leks within 4.0 miles of the project footprint to permitted activity, excluding underground utilities such as pipelines and buried utility lines. Monitoring plans submitted by project proponents will be coordinated and modified by the permitting agency with input from FWP. Monitoring will include the evaluation of affected leks and at least three reference leks (one control area) located a minimum of more than 4 miles from the disturbance. If declines in affected leks (using a three-year running average during any five-year period relative to trends on reference leks) are determined to be caused by the project, the operator will propose adaptive management responses to increase the number of sage-grouse. If the operator cannot demonstrate a restoration of sage-grouse numbers to baseline levels (established by pre-disturbance surveys, reference surveys, and taking into account regional and statewide trends) within three years, operations will cease until such numbers are achieved. However, in the interim, the operator, permitting agency, FWP, and the MSGOT will create additional adaptive management efforts to restore sage-grouse population numbers and baseline numbers, as well as restore project operations. Natural occurrences and their effects on sage-grouse and sagebrush habitat will be considered in all cases.
14. **Exceptions**: Any exceptions to these stipulations will be considered on a case-by-case basis and must show that the exceptions are not expected to cause declines in sage-grouse populations. Operations necessary to provide essential services like delivery of electricity will be excluded from requirements to cease activity if it is shown to have caused a decline in sage-grouse after three years. Any departures from these stipulations must be recommended for approval by MSGOT and subsequently approved by the appropriate agency.

b) Special Management Core Areas

Special Management Core Areas (SMCA) are defined as a subset of Core Areas in which special consideration has been given to valid existing rights and the fact that it is recognized that existing and planned development in these areas cannot be implemented within the constraints outlined in this document. SMCAs are as follows:

Location	Resource[4]	Acres
Cedar Creek Anticline	Oil and gas, wind	62,857
Carter County	Bentonite	54,039
Powder River Basin	Coal	20,653
Carbon County	Bentonite	31,110
Elk Basin	Oil and gas	1,035
South Phillips County	Bentonite	15,466

[4] Documentation of valid existing rights for these SMCAs will be provided to the Governor's office.



Each developer (those with the valid, existing rights) in a SMCA shall develop a conservation plan in cooperation with FWP. All applicable Core Area stipulations will apply to the SMCA until the conservation plan has been recommended for approval by MSGOT and subsequently approved by the appropriate agency. The conservation plan will follow the mitigation framework outlined in Section IX that will include a noise abatement stipulation, and will also include a strategy for restoration/reclamation within the Core Area, which results in a long-term reduction in surface disturbance. In addition, conservation plans must have a monitoring component using peer-reviewed scientific methods that is designed to monitor sage-grouse populations, the impact of development, and restoration efforts on sage-grouse populations, and provide feedback if adjustments are needed in the conservation plan to reduce impacts on sage-grouse populations. The mitigation plan will also include plans for off-set mitigation. The conservation goal of these areas is to maintain and restore seasonal sage-grouse habitats that support viable sage-grouse populations. As industrial activities subside, these populations are expected to expand into vacant functional habitats.

1. Petitions may be submitted to MSGOT to create a new SMCA. The petition shall contain a geographic description of the area proposed to be created and a detailed description of the number and location of the sage-grouse lek(s) within the area. The petition must also contain an evaluation of how the creation of the proposed SMCA would impact the Core Area function relative to the sage-grouse. The petition must also contain an explanation of the rationale for the creation of the SMCA. In evaluating whether to recommend approval of the creation of the new SMCA, the MSGOT shall consider how the creation of a SMCA will impact the habitat and population of sage-grouse both within the Core Area and on a statewide basis. The petition must include a proposal for off-set mitigation.
2. Petitions may be made to MSGOT for additional SMCA designation, but in no case will SMCA total acreage encapsulate more than 3% of the state's sage-grouse Core Areas. In addition, the Advisory

Council recommends that the MSGOT develop a population threshold that cannot be exceeded within SMCAs (i.e., the population of sage-grouse impacted by all SMCAs may not exceed a specific population, measured by the number and size of leks impacted or a similar population metric).

3. The MSGOT must develop a process where designated SMCAs can be reclassified as Core Areas. This process should be based on metrics measuring the quantity and quality of sage-grouse habitat restored and/or reclaimed, as well as the documented use of that habitat by sage-grouse.

c) General Habitat Stipulations

General sage-grouse habitats are areas that provide sage-grouse nesting, brood-rearing and wintering habitat but are not identified as Core Areas. General Habitat was mapped by FWP biologists using lek locations, telemetry, and other available data. The health of General Habitat areas is a critical element in the effort to maintain the abundance and distribution of sage-grouse in Montana. Development scenarios in General Habitat are more flexible than in Core Areas, but should still be designed and managed to maintain populations, habitats, and essential migration routes. The goal in General Habitat is to maintain habitat conditions by implementing appropriate management practices that minimize sagebrush loss and disturbance. Applicable standard and sage-grouse management practices should be applied to development within both Core Areas and General Habitat to achieve the goals of this conservation strategy (Section X). In all General Habitat areas, the following stipulations apply:

1. **Sequence of Decisions for Surface Disturbance Activities:** State-approved projects that result in more than minimal adverse impacts to sage-grouse and/or their habitat will follow the following sequence of decisions:
    a. **Avoid Impacts**. The best way to protect sage-grouse habitat is to avoid impacts that fragment or otherwise damage or destroy sage-grouse habitat. To accomplish this, project developers should consider alternative locations for their project located outside sage-grouse habitat (i.e., consider locations outside General Habitat, outside suitable habitat, and/or in areas already considered disturbed). To meet this provision, the project developer needs to show authorizing agencies rationale as to why a given proposed surface disturbance in sage-grouse habitat is unavoidable.
    b. **Minimize the Size of the Impact**. If impacts to sagebrush habitat cannot be avoided, they should be minimized by limiting the magnitude of the proposed surface disturbance. Reducing impacts can preserve at least portions of the habitats' important functions, including limiting fragmentation. Impacts can be minimized by reducing the project footprint, constructing fewer structures, clustering features, shifting the development pattern to use topographical screening, timing restrictions, or similar measures. In order to meet this requirement, the project developer should be able to show that the project minimizes the impact to sage-grouse habitat, while continuing to meet the purpose of the development.
    c. **Compensation for Impacts**. If project impacts are unavoidable and General Habitat stipulations cannot be met, mitigation measures may be required, following the Mitigation Framework outlined in Section IX.[5]
2. **Surface Occupancy**: Within 0.25 miles of the perimeter of an active sage-grouse lek there will be no surface occupancy (NSO).[6]

[5] A Minority Committee Report has been written for the Compensation for Impacts stipulation, see Appendix H.

[6] A Minority Committee Report has been written for the No Surface Occupancy stipulation for General Habitat, see Appendix H.

3. **Surface Disturbance**: There are no specific surface disturbance limits in General Habitat. However, standard management practices will be required to minimize surface disturbance, such as co-locating new and existing structures. Structures and associated infrastructure will be removed and areas reclaimed to the standards found in item #16 (below) when a project is completed.
4. **Seasonal Use**: As authorized by the permitting agency or agencies, activities (production and maintenance activity exempted) will be prohibited from March 15 – July 15 within 2.0 miles of an active lek where breeding, nesting, and early brood-rearing habitat is present. Allowed maintenance and production activity will not occur between the hours of 4:00 - 8:00 am and 7:00 - 10:00 pm between March 15 – July 15. In areas used as winter concentration areas, exploration and development activity will be prohibited December 1 – March 15. Activities may be allowed during seasonal closure periods as determined on a case-by-case basis. This stipulation may be modified or waived for areas of unsuitable habitat. Any deviations from this stipulation for unsuitable habitat will be determined by the applicable permitting agency in coordination with FWP and the MSGOT.
5. **Noise**: New noise levels, at the perimeter of a lek, should not exceed 40 dBA above ambient noise (existing activity included) from 6:00 pm to 8:00 am during the breeding season (March 15 – July 15). [7] Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise. The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.
6. **Pipelines**: Bury pipelines and restore disturbed area with native plant species that are compatible with the surrounding ecological site conditions. Co-locate pipelines with roads, transmission lines, and other linear features when possible.
7. **Overhead Power Lines and Communication Towers**: New overhead power lines and communication towers will be located outside sage-grouse habitat whenever possible. Where avoidance of General Habitat is not possible, develop a route or siting location – with agencies, utilities, and landowners cooperating – that uses topography, vegetative cover, site distance, etc. to effectively protect identified sage-grouse habitat in a cost efficient manner. If siting of overhead power lines is required within 2 miles of important breeding, brood-rearing, and winter habitat, follow the most current version of the Avian Power Line Interaction Committee guidelines to minimize collision potential and raptor perch sites or bury a portion of the line. Site new lines in existing corridors wherever practicable. The pending "Best Management Practices for Electric Utilities in Sage-Grouse Habitat**"** will be added to this Strategy when it is finalized (see Section VI.a.ii.3).
8. **Oil and Gas, Mining**: Encourage development in incremental stages to stagger disturbance and design schedules that include long-term strategies to localize disturbance and recovery within established zones over a staggered time frame. Use off-set mitigation as described in Section IX. Remove facilities and infrastructure and reclaim to the standards found in item #16 (below) when use is completed, including for exploration activities.
9. **Coal Mining**: Conservation measures will be developed for and imposed on coal mining operations on a case-by-case basis via the terms and conditions included in permits issued by MDEQ under the authority of the Montana Strip and Underground Mine Reclamation Act (MSUMRA) and in compliance with the federal Surface Mining Control and Reclamation Act (SMCRA). The Administrative Rule components of the MSUMRA can be accessed at http://www.deq.mt.gov/wqinfo/Laws/StripMiningReclamatio.mcpx. The associated coal permitting rules and standard of the Montana Department of Environmental Quality can be accessed at http://.deq.mt.gov/CoalUranium/Coalpermitting.mcpx. Links to SMCRA and the enabling components of the Code of the Federal Regulations can be found at http://www.osmre.gov/lrg.shtm.

[7] A Minority Committee Report has been written for the Noise stipulation, see Appendix H.

a. Coal mining will first try to avoid operating in sage-grouse habitat.
b. To avoid potentially significant impacts to sage-grouse, coal companies will delineate the area that will be disturbed. They will report baseline vegetation surveys of the permit area, four season sage-grouse baseline surveys of the permit area and periphery along with population density and habitat delineations. They will show pre-mine land use conditions, capacity, productivity, and history (per ARM 17.24.304). The sage-grouse plan (per ARM 17.24.312) will include:
    i. An operations plan (per ARM 17.24.308) that includes a plan to prevent the establishment of, or to effect the control of, noxious weeds (including cheatgrass and Japanese brome) in the proposed permit/amendment area.
    ii. A sage-grouse plan (per ARM 17.24.312) will include:
        1. A plan to minimize disturbances and impacts on sage-grouse and related environmental values during mining and reclamation;
        2. Details on how enhancement of sage-grouse values will be achieved;
        3. Descriptions of sage-grouse enhancement features to be established; and
        4. Statements of impact control measures, management techniques and annual monitoring methods to protect or enhance sage-grouse or habitats identified through the consultation process as important and/or high value.
    iii. A reclamation plan to reclaim mined area back to suitable habitat including (per ARM 17.24.313) will include:

        1. The proposed post-mining land use;
        2. A timetable for each reclamation step;
        3. A map of the proposed post-mining topography;
        4. Demonstration that the post-mining topography can be achieved;
        5. Details on reestablishment of hydrologic balance;
        6. Details on topsoil salvage, protection and replacement methods;
        7. A narrative on the details of the revegetation methods to be applied;
        8. Details on the reclaimed vegetation monitoring to be conducted; and
        9. Mine and reclamation plan reviews by the Service relative to threatened, endangered, and candidate species through Section 7 consultation processes.

    iv. The establishment of vegetation to protect sage-grouse (per 17.24.711) will require that:

        1. Vegetation must be reestablished on the disturbed areas and it must be diverse, effective and permanent;
        2. Vegetation cover must be comprised of native species or approved alternatives and be compatible with post-mine land uses;
        3. Reclamation vegetation must be equivalent in cover to natural vegetation and be capable of self-regeneration and plant succession;
        4. There is compliance with noxious weed restrictions; and
        5. For sage-grouse habitat, shrubs must be established to achieve cover and stocking rates as approved by MDEQ after consultation and approval by MFWP.

    v. Shrub species (per ARM 17.24.717) must be adapted to local conditions and meet the post-mining land use.

vi. Monitoring (per ARM17.24.723) requirements include:

1. Periodic vegetation, soils, and wildlife monitoring with coverage and frequency as approved by MDEQ; and
2. Submittal of detailed monitoring reports to MDEQ.

If monitoring data indicates corrective measures are needed, then adaptive management practices needs to be applied.

The requirements for monitoring shall terminate at the same time that the MDEQ has determined that phase III reclamation, as defined in ARM 17.24.1116(6)(c), has been completed.

vii. Revegetation success criteria (per ARM1724.724) requirements include:

1. Determination of success will be via comparison to un-mined reference areas or through approved technical standards

viii. Vegetation measurements (per ARM17.24.726) requirements include:
1. Use of MDEQ-approved methods;
2. Demonstration of equivalent production, cover and density per MDEQ-approved standards;
3. Minimum shrub density standards; and
4. Demonstration of compliance with noxious weed restrictions.

9. **Bentonite, Scoria, Peat, and Sand and Gravel Mining**[8]: Conservation measures will be developed for and imposed on opencut mining operations on a case-by-case basis via the terms and conditions included in permits issued by MDEQ under the authority of the Montana Opencut Mining Act (83-4-401, MCA) which can be accessed at http://deq.mt.gov/opencut/forms/2013-Title82Chapter4Part4.pdf .

a. Opencut mining operations will first try to avoid operating in sage-grouse habitat.
b. To avoid potentially significant impacts to sage-grouse, opencut mining companies will delineate what area will be disturbed. They will report baseline vegetation surveys of the permit area, four season sage-grouse baseline surveys of the permit area and periphery along with population density and habitat delineations (Per ARM 17.24.222). They will show pre-mine land use conditions, capacity, productivity, and history (per ARM 17.24.217). The sage-grouse plan will include:
i. An operations plan (per ARM 17.24.218 and 219) that includes a plan to prevent the establishment of, or to effect the control of, noxious weeds (including cheatgrass and Japanese brome) in the proposed permit/amendment area.
ii. A sage-grouse plan (per ARM 17.24.219) will include:

1. A plan to minimize disturbances and impacts on sage-grouse and related environmental values during mining and reclamation;

[8] A Minority Committee Report has been written for the Bentonite, Scoria, Peat, and Sand and Gravel Mining stipulation, see Appendix H.

2. Details on how enhancement of sage-grouse values will be achieved;
3. Descriptions of sage-grouse enhancement features to be established; and
4. Statements of impact control measures, management techniques and annual monitoring methods to protect or enhance sage-grouse or habitats identified through the consultation process as important and/or high value.

iii. A reclamation plan (per 17.24.219) to reclaim mined area back to suitable habitat will include:

1. The proposed post-mining land use;
2. A timetable for each reclamation step;
3. A map of the proposed post-mining topography;
4. Demonstration that the post-mining topography can be achieved;
5. Details on reestablishment of hydrologic balance;
6. Details on topsoil salvage, protection, and replacement methods;
7. A narrative on the details of the revegetation methods to be applied;
8. Details on the reclaimed vegetation monitoring to be conducted; and
9. Mine and reclamation plan reviews by the Service relative to threatened, endangered, and candidate species through Section 7 consultation processes.

iv. The establishment of vegetation to protect sage-grouse (per 17.24.219) will require that:

1. Vegetation must be reestablished on the disturbed areas and it must be diverse, effective and permanent;
2. Vegetation cover must be comprised of native species or approved alternatives and be compatible with post-mine land uses;
3. Reclamation vegetation must be equivalent in cover to natural vegetation and be capable of self-regeneration and plant succession;
4. There is compliance with noxious weed restrictions; and
5. For sage-grouse habitat, shrubs must be established to achieve cover and stocking rates as approved by MDEQ after consultation and approval by FWP.

v. Shrub species (per ARM 17.24.219) must be adapted to local conditions and meet the post-mining land use.

vi. Monitoring (per ARM17.24.219) requirements include:

1. Periodic vegetation, soils and wildlife monitoring with coverage and frequency as approved by MDEQ; and
2. Submittal of detailed monitoring reports to MDEQ.

If monitoring data indicates corrective measures are needed, then adaptive management practices needs to be applied.

These requirements for monitoring shall terminate upon bond release (per ARM 17.24.203).

vii. Revegetation success criteria (per ARM1724.219) requirements include:

    1. Determination of success will be via comparison to un-mined reference areas or through approved technical standards

viii. Vegetation measurements (per ARM17.24.219) requirements include:

    1. Use of MDEQ-approved methods;
    2. Demonstration of equivalent production, cover and density per MDEQ-approved standards;
    3. Minimum shrub density standards; and
    4. Demonstration of compliance with noxious weed restrictions.

10. **Other Mining**:
    a. For development drilling or ore body delineation drilling on tight centers, (approximately 50' x 50') the disturbance area will be delineated by the external limits of the development area. Assuming a more widely-spaced disturbance pattern, the actual footprint will be considered the disturbance areas.
    b. Sage-grouse monitoring results will be reported in the mine permit annual report. This document will be given to FWP and the regulating body. Pre-disturbance surveys will be conducted as required by the appropriate regulatory agency.
    c. The number of active mining development areas (e.g., operating equipment and significant human activity) is not to exceed an average of one project per square mile (640 acres).
    d. Surface disturbance and surface occupancy stipulations will be waived within the Core Area when implementing underground mining practices that are necessary to protect the health, welfare, and safety of miners, mine employees, contractors and the general public. The mining practices include but are not limited to bore holes or shafts necessary to: 1) provide adequate oxygen to an underground mine; 2) supply inert gases or other substances to prevent, treat, or suppress combustion or mine fires; 3) inject mine roof stabilizing substances; and 4) remove methane from mining areas. Any surface disturbance or surface occupancy necessary to access the sites to implement these mining practices will also be exempt from any stipulation.
    e. Mining permits will include requirements for mitigation that enhances or promotes genetic diversity, critical habitat, connectivity, and population viability.
11. **Wind Energy**: New wind energy facilities are not recommended within 4.0 miles of the perimeter of active sage-grouse leks. Work cooperatively with agencies, utilities, and landowners to use topography, vegetative cover, site distance, etc. to effectively protect identified sage-grouse habitat. Wind energy projects in sage-grouse habitat will adhere to the *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines*.
12. **Vegetation Removal**: Vegetation removal as part of permitted activities will be limited to the minimum disturbance required by the project.
13. **Sagebrush Treatments**: Sagebrush eradication and treatment programs aimed at reducing or eliminating sagebrush will be prohibited on state lands, and discouraged on private lands unless those treatments are approved by MSGOT and can be satisfactorily shown to result in no loss of habitat or be beneficial to sage-grouse habitat. The MSGOT should develop specification as to how case-by-case exceptions will be determined, including how a risk assessment will be conducted. The Advisory Council also requests federal agencies prohibit sagebrush eradication and treatment programs aimed at reducing or eliminating sagebrush on lands that they control surface rights. Sagebrush canopy cover should be maintained at optimum levels, as described above. Treatments to enhance sagebrush-grassland will be evaluated based upon the existing habitat quality and the functional level post-

treatment. Restored sagebrush grassland habitats that provide effective cover and food for sage-grouse should be recognized as part of the habitat base; this provision serves as an incentive for restoring and protecting converted habitats.

For government agencies managing sagebrush in General Habitat where conifer encroachment is an issue near leks, land managers should ensure that encroaching conifers are removed within at least 0.6 miles (1,000 meters) of leks. Conifer removal in sage-grouse General Habitat should be done manually, unless other methods can be shown to remove conifers without significantly impacting sagebrush.

14. **Conversion to Agricultural Cropland**: The sage-grouse Advisory Council recommends that the Montana Board of Land Commissioners enact a prohibition of conversion of suitable sage-grouse native range to cropland on state lands, while providing for approved waivers. The State will develop criteria describing when it is appropriate to break unsuitable sage-grouse native range in General Habitat. The Advisory Council also requests that federal agencies prohibit the conversion of native range to cropland on land where they hold surface rights. State and federal agencies are encouraged to work cooperatively with Tribal governments to adopt policies that prevent conversion of sage-grouse habitat to agricultural cropland.
15. **Range Management**: Rangelands on state lands will be managed in accordance with the recommendations in Section X.a, whenever possible, taking into consideration the existing management practices of the lessee on surrounding non-state lands. State agencies are encouraged to collaborate with federal agencies and private landowners to craft grazing management plans that adhere to the concepts included in this document.
16. **Reclamation**: Reclamation should re-establish native grasses, forbs, and shrubs during interim and final reclamation. The goal of reclamation is to achieve cover, species composition, and life form diversity commensurate with the surrounding plant community or desired ecological condition to benefit sage-grouse and replace or enhance sage-grouse habitat to the degree that environmental conditions allow. Seed mixes should include at least two native forbs and two native grasses with at least one native bunchgrass species. Where sagebrush establishment is prescribed, establishment is defined as meeting the standard prescribed in the individual reclamation plan. Landowners should be consulted on the desired plant mix on private lands. The operator is required to control noxious and invasive plant species, including cheatgrass (*Bromus tectorum*) and Japanese brome (*Bromus japonicus*).
17. **Wildfire and Prescribed Burns**: Immediate suppression of wildfire in General Habitat will be prioritized by all fire-fighting units under the jurisdiction of the state. Federal agencies are also strongly encouraged to comply. Prescribed burns should be prohibited in General Habitat unless those prescribed burns are approved by MSGOT and can be satisfactorily shown to result in no loss of habitat or be beneficial to sage-grouse habitat. Burnouts, backfires, and all other public safety measures are appropriate for fighting wildfires.

d) Connectivity Area Stipulations

Connectivity habitat includes those areas that provide important linkages among populations of sage-grouse, particularly between Core Areas or priority populations in adjacent states and across international borders. Within the context of this report, only one sage-grouse connectivity area has been scientifically identified and mapped (see Sage-grouse Conservation Areas map, Section IV). This Montana-Saskatchewan Connectivity Area represents the largest known Greater Sage-Grouse annual migration and is an historic pathway for this important international population of sage-grouse, as well as an important link between two critical sage-grouse Core Areas.

Research continues, based on genetics work, to help better define the composition of priority Connectivity Areas. Connectivity Areas will be identified and additional stipulations may be established by the MSGOT when more informed science becomes available. A public review process on proposed stipulations for Connectivity Areas is required before the stipulations can be adopted by the State. The goal of conserving Connectivity Areas is to maintain those areas that are critical for facilitating movement and genetic exchange among individuals and populations.

Stipulations within this section of the *Montana Strategy* for the Montana-Saskatchewan Connectivity Area, as indicated on the Conservation Area map (Section IV), shall be identical to Core Area stipulations contained within this document. The connectivity stipulations within this strategy apply only to the Montana-Saskatchewan Connectivity Area and future stipulations for additional Connectivity Areas will be determined on a case-by-case basis by MSGOT with technical assistance from FWP.

VII. PERMITTING PROCESS

During the application process to any state agency, project proponents (proponents) must provide a thorough description of their project as it relates to sage-grouse (details such as draft project area, habitat maps, and any other information will help to expedite the project). FWP has a role of consultation, recommendation, and facilitation.

Maximum Density and Surface Disturbance Process: All activities will be evaluated within the context of maximum allowable density (e.g., location and number of well pads) and surface disturbance (disturbance percentages). The maximum density and surface disturbance allowed (see Section VI.A – VI.C) will be analyzed via a standardized mapping tool process conducted by the land management agency on federal land and the project proponent on non-federal (private, state) land. The MSGOT will oversee the implementation of a standardized density and disturbance analysis that follows Wyoming's Density and Disturbance Calculation Tool (DDCT; Appendix E).

Process Deviation: Master development plans proposing alternatives to the Core Area, Connectivity Area, and General Habitat stipulations and corresponding plans for offset mitigation should be evaluated by the MSGOT and approving agency on a case-by-case basis. Development that is not covered by these stipulations may be considered depending on site-specific circumstances. Any proposals for deviations from these stipulations or undefined activities must reasonably demonstrate that the proposed activities will not cause declines in sage-grouse populations in Core Areas.

Exempt Activities: A list of land uses and landowner activities that do not require state agency review or federal oversight is provided in Section VIII.

VIII. EXEMPT ACTIVITIES

The following existing land uses and landowner activities are exempt from compliance with this strategy:

A. Existing animal husbandry practices (including branding, docking, herding, trailing, etc.).
B. Existing farming practices (excluding conversion of sagebrush/grassland to cropland agriculture).

C. Existing grazing operations that meet rangeland health standards or utilize recognized rangeland management practices (for example, allotment management plans, Natural Resource and Conservation Service (NRCS) grazing plans, prescribed grazing plans, etc.).
D. Construction of agricultural reservoirs and **aquatic** habitat improvements less than 10 surface acres and drilling of agriculture and residential water wells (including installation of tanks, water windmills, and solar water pumps) more than 1.0 mile from the perimeter of a lek in Core and Connectivity Areas and more than 0.25 miles from a lek in General Habitat. Within 1.0 mile of a lek in Core and Connectivity Areas and within 0.25 miles of a lek in General Habitat, no review is required if construction does not occur March 15 – July 15 and construction does not occur on the lek. All water tanks shall have bird escape ramps.
E. Agricultural and residential electrical distribution lines more than 1.0 mile from leks in Core and Connectivity Areas and 0.25 miles from leks in General Habitat. Within 1.0 mile of a lek in Core and Connectivity Areas and within 0.25 miles of a lek in General Habitat, no review is required if construction does not occur between March 15 – July 15 and construction does not occur on the lek. Raptor perching deterrents shall be installed on all poles within 1.0 or 0.25 miles, respectively, from leks, if they are proven to be effective according to Avian Power Line Interaction Committee guidance. Other management practices, such as vegetation screening and anti-collision measures, should be applied to the extent possible. Routine maintenance of existing power lines conducted between July 16 – March 14 is also an exempt activity.
F. Pole fences. Wire fences if fitted with visibility markers where high potential for sage-grouse collisions has been documented.
G. Irrigation (excluding the conversion of sagebrush/grassland to new irrigated lands). Tribal lands under existing and future state water compacts.
H. Spring development if the spring is protected with fencing and enough water remains at the site to provide mesic (wet) vegetation.
I. Herbicide and pesticide use except for in the control of sagebrush and associated native forbs. Grasshopper/Mormon cricket control following Reduced Agent-Area Treatments (RAATS) protocol.
J. Existing county road maintenance.
K. Production and maintenance activities associated with existing oil, gas, communication towers, and power line facilities in compliance with approved authorizations.
L. Cultural resource pedestrian surveys.
M. Emergency response.

IX. MITIGATION FRAMEWORK

In Core Areas and General Habitat, the Service's hierarchy shall be adopted as the mitigation framework for implementation of this strategy. In General Habitat, reclamation and off-set mitigation (steps 3 and 4 below) will only be required under specified circumstances. The MSGOT or designated working group will define a mitigation strategy for adoption under this strategy and will reference the forthcoming Service's Compensatory Mitigation Guidance, BLM Mitigation Guidance, and other viable approaches, such as Oregon's Mitigation Framework, the Lesser Prairie Chicken Business Plan, or Habitat Exchanges (see Appendix D). Elements of the framework will include (in order):

1. **Avoid**: Avoid new disturbance to habitat (e.g., exclude wind development from Core Areas).
2. **Minimize**: If avoidance is not possible, minimize the extent of the disturbance to reduce or eliminate negative impacts to sage-grouse and their habitat (e.g., surface disturbance limits, timing stipulations, lek buffers, etc.).
3. **Reclamation**: Reclaim, restore and enhance habitat that is disturbed (e.g., reclamation after mining activities or pipeline construction). Typically, on-site reclamation is implemented by the entity responsible for the impact.
4. **Off-set mitigation**: When temporary or permanent impacts will occur, protect, restore, and enhance important sage-grouse habitat within a defined service area. Off-set mitigation can be used to reduce the existing human footprint that will allow for additional development activities in the future, especially in those areas already heavily impacted by development. Mitigation ratios will be developed by the MSGOT; those ratios will differ depending on the nature and location of a disturbance. A variety of tools may be used for off-set mitigation such as conservation banks, habitat exchanges, and approved conservation plans. Mitigation will occur prior to the impacts that are being mitigated. The standards that successful mitigation must meet (functionality demonstrated by sage-grouse use) will be defined by the MSGOT. Off-set mitigation would be implemented within a service area and prioritized as:
    a. Within impacted Core Area;
    b. Within Core Areas predicted to be at high risk of conversion from grazing to farming or non-native grasses or forbs;
    c. Within Connectivity Areas; then
    d. Within Core Areas or General Habitat adjacent to Core Areas with good restoration potential.

X. MANAGEMENT RECOMMENDATIONS (non-development activities)

The following recommendations outline voluntary management practices designed on private lands and regulatory practices on state lands to maintain or enhance sage-grouse populations and habitats for non-development activities. Some of these practices may be required as part of a conservation plan and/or serve as mitigation tools. Whenever possible, adherence to these recommendations is encouraged.

The Advisory Council encourages the Governor to direct the Montana Department of Natural Resources and Conservation to develop additional lease evaluation criteria to be used for school trust grazing lands in Core Areas and the Montana-Saskatchewan Connectivity Area. The criteria should establish rangeland characteristics that should be considered and evaluated, with a goal of ensuring responsible grazing management practices that are consistent with maintaining and improving habitat for sage-grouse, while still providing for working rangelands.

a) Range Management

Livestock grazing is the most widespread type of land use across the sagebrush biome. Although improper livestock management, as determined by local ecological conditions, may have negative impacts on sage-grouse seasonal habitats, proper livestock management is a critical tool for providing and maintaining high quality sage-grouse habitat. Range management structures and fences necessary for proper grazing management can also be placed or designed to be neutral or beneficial to sage-grouse. The following recommendations are intended to support grazing management as a tool for providing quality sage-grouse habitat.

a. Grazing management: The State of Montana will collaborate with relevant federal agencies on appropriate site-based action to achieve sage-grouse conservation objectives outlined herein.
    i. On private lands, landowners in sage-grouse Core, General and Connectivity Areas are encouraged to adopt the Sage-Grouse Initiative grazing practices and range management recommendations, including:
        1. Rotating livestock to different pastures, while resting others to establish a diversity of habitat types.
        2. Changing seasons of use within pastures to ensure all plants have the ability to reproduce.
        3. Leaving residual cover (grass from the past season) to increase hiding and nesting cover for sage-grouse.
        4. Managing the frequency and intensity of grazing to sustain native grasses, wildflowers, and shrubs.
        5. Managing livestock access to water to ensure healthy livestock and healthy watersheds.
    ii. The State of Montana will collaborate with appropriate federal agencies in defining a framework for evaluating situations to determine if a causal relationship exists between improper grazing (by wildlife or livestock) and Greater Sage-Grouse conservation objectives where conservation objectives are not being achieved on federal land.
    iii. On state lands, the Advisory Council recommends that DNRC work cooperatively with lessees to maintain healthy sagebrush shrub, native grass, and forb communities on state grazing lands in Core and Connectivity Areas. For leases that fail to meet DNRC standards, staff should consider corrective alternatives such as: development and implementation of grazing or weed management plans; adjustment or rotating season of use; requiring annual reporting of livestock numbers and period of use; or shorter lease terms. Follow-up monitoring should be conducted as determined necessary and as workloads allow. If a lessee fails to implement or follow required corrective actions, lease non-renewal or cancellation should be considered.
    iv. Given limited agency resources, priority should be given to Core Areas and then sage-grouse habitats adjacent to Core Areas.
b. Range structures:
    i. Range management structures should be designed and placed to be neutral or beneficial to sage-grouse.
    ii. Structures that are currently contributing to negative impacts to either sage-grouse or their habitats should be removed or modified to remove the threat.
c. Fences:
    i. Mark fences that are in high risk areas for collision with permanent flagging or other suitable device to reduce sage-grouse collisions.
    ii. Identify and remove unnecessary fences.
    iii. Placement of new fences and livestock management facilities (including corrals, loading facilities, water tanks, and windmills) should consider their impact on sage-grouse and, to the extent practicable, be placed at least 0.6 miles from active leks.

b) Wildfire Response

Wildfire temporarily or permanently eradicates sagebrush habitat. Fire, both lightning-caused and human-caused, is a primary risk to sage-grouse, not only by deteriorating and often eliminating habitat, but also by increasing future fire frequencies through the promotion of fire-prone vegetation, especially invasive grasses. The replacement of native perennial bunchgrass communities by invasive annuals is a primary contributing factor to increasing fire frequencies in the sagebrush ecosystem. The following recommendations are designed to reduce the potential for fire in sagebrush systems, suppress fires that do ignite, and (re)establish sagebrush and native species in areas that do burn. State agencies should be directed to adopt these recommendations to the maximum extent possible:

a. Prevention (Pre-fire):
    i. Broaden DNRC, Volunteer Fire Departments, and all fire-fighting unit awareness by providing maps of sage-grouse habitat and copies of the *Montana Strategy*.
    ii. Place sage-grouse habitat maps in every county fire-fighting office.
    iii. Prioritize eradication of cheatgrass and Japanese brome and/or address management practices, acquire funding for appropriate herbicide treatments, and explore biological controls.
    iv. Examine feasibility of establishing fire breaks outside Core Areas if possible.
    v. During high-risk fire seasons, reduce risk of human caused fires as authorized in 7-33-2212 MCA, 77-1-804 MCA and other applicable statutes.
b. Suppression (Fire):
    i. Prioritize initial attack with the goal of immediate suppression in Core Areas, and secondarily in Connectivity Areas and General Habitat, including use of fire retardants and other appropriate tools.
        1. Improve coordination between state agencies (e.g., DNRC) and Montana Association of Counties on all fire suppression activities.
        2. Request federal partners mirror the initial attack program of DNRC.
    ii. Prioritize outreach from DNRC to private operators regarding initial attack in sagebrush areas.
    iii. Review liability of Good Samaritan role of private operators/private landowners.
    iv. Carefully consider the use of backfires within Core and Connectivity Areas and General Habitat to minimize the potential for escape and further damage to sage-grouse and sagebrush habitats (tactical decision).
    v. Identify and establish defensible fire lines in areas where: (i) effectiveness is high, (ii) fire risk is likely, and (iii) negative impacts from these efforts (e.g., fragmentation) are minimized. Avoid use of any vegetative stripping in healthy, unfragmented habitats, unless fire conditions and local ecological conditions so warrant.
c. Rehabilitation (Post-fire):

    i. The State of Montana will request cooperation and collaboration from federal agencies on rehabilitation projects after wildfire.
    ii. Use available tools to prevent (re)establishment of cheatgrass and Japanese brome, as necessary.
    iii. Ensure most successful restoration strategies are being implemented that (re)establish native sage-grouse habitat; develop handbook of methods for most appropriate restoration strategies.
    iv. Identify funding options for restoration implementation.
    v. Use locally available seeds where it is most likely to be effective and in areas of high need.
    vi. Prioritize Core Areas over sagebrush areas outside of Core Areas for restoration efforts.

vii. Verify that all seeding in Core Areas is certified by an independent contractor as weed-free and free of cheatgrass and Japanese brome.
viii. Establish a seed bank managed by state, if viability of seeds can be maintained; evaluate use of local seed sources (i.e., seed orchards).
ix. Ensure post-fire monitoring for successful reestablishment of sagebrush communities.

c) Invasive Plant Species

Exotic annual grasses and other invasive plants alter habitat suitability for sage-grouse by reducing or eliminating native forbs and grasses essential for food and cover. Non-native annual grasses also facilitate an increase in mean fire frequency. The following management recommendations are designed to control the spread of invasive species and reduce or eliminate established non-natives to provide better quality habitat for sage-grouse. State agencies should be directed to adopt these recommendations to the maximum extent possible.

a. Retain all remaining large intact sagebrush patches, particularly at low elevations.
b. Reduce or eliminate disturbances that promote the spread of invasive plant species, such as reducing fires to a "normal range" of fire activity for the local ecosystem, employing grazing management that maintains the perennial native grass and shrub community appropriate to the local site, reducing impacts from any source that allows for the invasion by these species into undisturbed sagebrush habitats, and precluding the use of treatments intended to remove sagebrush.
c. Restore altered ecosystems by reducing non-native invasive plants to levels that do not put the area at risk of conversion if a catastrophic event were to occur.
d. Recommend to Montana Department of Agriculture that Japanese brome (*Bromus japonicus*) be listed as a regulated species (priority #3) in Montana.
e. Prioritize eradication of cheatgrass and Japanese brome and/or address management practices, acquire funding for Plateau treatments, and explore biological controls.

d) Predators

The Advisory Council believes predators can be a threat to sage-grouse conservation. Although predation is one of five specific ESA listing criteria, the Service did not identify predation as a significant threat to sage-grouse populations in their 2010 decision to list the species as warranted for protection under the Endangered Species Act, but precluded by higher priorities. Predators are part of the ecosystem and they have always preyed upon sage-grouse. Habitat fragmentation, infrastructure, weather, urban development, and improper grazing can increase predation pressure on sage-grouse. The Advisory Council believes anthropogenic actions have, in places, altered the historic predator-prey relationship with sage-grouse and that this alteration is at least partially responsible for diminishment of some local sage-grouse populations. The Advisory Council also believes good quality and quantity of habitat reduces predation pressure and that quality habitat is essential for sage-grouse population stability. While predator control may not be a long-term solution to a general range-wide decline in populations of sage-grouse, it can be an effective tool to gain increased survival of specific populations. Predator management can provide important and beneficial short-term relief to localized decreases in sage-grouse populations. While federal laws, such as the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act, restrict options for managing avian predators, the Advisory Council recommends predator control be managed cooperatively by Animal and Plant Health Inspection Service (U.S. Department of Agriculture) Wildlife Service, FWP, and the Service.

Actions the Advisory Council believes should be taken within this strategy include:

a. Eliminate or minimize external food sources for ravens and small mammals, particularly dumps, landfills, waste transfer facilities, and road kill.
b. Remove abandoned farmhouses, barns, building debris piles, and other structures that harbor mammalian predators.
c. Provide adequate buffers (4.0 miles from leks) between placement of new tall structures and nesting and brood-rearing habitat to minimize influence of predators. Bury power lines, when feasible.
d. Remove abandoned tall structures, such as fence posts, power line poles, and cell towers that can serve as perching structures for aerial predators.
e. Apply habitat management practices (e.g., grazing management and vegetation treatments) that improve sage-grouse nesting habitat thus decreasing the effectiveness of predators.
f. Develop strategies for specific, selective, and if needed, assertive short-term predator control based on biological assessments appropriate to local conditions, especially in instances where a sage-grouse population has declined from exotic conditions, such as West Nile Virus.
g. Request the State use localized predator control when permanent anthropogenic features are documented to contribute to unnatural numbers of predators that are reducing local sage-grouse populations, and where the impacts from these permanent features will not be eliminated or minimized enough to stabilize the local sage-grouse population.
h. Research and monitor the effects of predator control to determine causal connections with Greater Sage-Grouse survival; modify control strategies accordingly.
i. When research on sage-grouse population dynamics confirms that a local sage-grouse population is declining and predators may be a cause for the decline, undertake a public-private cooperative research project, under the direction of FWP and MSGOT. This research project should measure the level of predation and its impact on local sage-grouse population stability and include a public outreach/involvement component to landowners, hunters, bird recreationists, local government, and other interested parties. The research should examine sage-grouse population dynamics, anthropogenic changes, conifer encroachment and predator populations and impacts, and determine if creation of and implementation of a predator plan would assist in long-term stability of specific and localized sage-grouse populations.
j. Encourage local government to help with small mammal predator control during sage-grouse breeding, nesting, and brood-rearing season.

e) Disease (West Nile virus)

West Nile virus was a new source of mortality for sage-grouse, particularly in low and mid-elevation populations, from 2003 – 2007. Elimination of anthropogenic-created habitat for the mosquito vectors of West Nile virus is an important conservation measure for sage-grouse.

a. Construct ponds to reduce prevalence of mosquitoes that transmit West Nile virus per BLM guidance (Appendix F).
b. Manage ponds to reduce prevalence of mosquitoes that transmit West Nile virus.
c. Other management actions to reduce prevalence of mosquitoes that transmit West Nile virus include erection of bat houses, and managing containers, wood piles, and tire storage facilities that harbor breeding or overwintering mosquitoes and/or larvae.

d. If there is a West Nile virus outbreak that significantly reduces sage-grouse populations, the MSGOT should look at a local site-specific strategy for enhancing the sage-grouse population.

f) Hunting

Hunting sage-grouse in Montana is a regulated activity that involves scientific population monitoring and the ability to adjust seasons as appropriate, including season dates, season length, bag limit, and area restrictions.

a. Hunting will continue to be managed by FWP through the Montana Fish and Wildlife Commission.
b. A framework of hunting bag limits and area closures was originally outlined in the *Management Plan and Conservation Strategies for the Greater Sage-Grouse in Montana – Final.* FWP will continue to annually monitor sage-grouse population fluctuations and work with the Commission to adopt appropriate hunting season regulations.
c. FWP will re-evaluate and further adapt this season-setting approach including re-examining closure (and opening) criteria, hunting districts, season length, and season dates. Establishment of hunting districts/zones will be considered during the annual season setting process.

XI. IMPLEMENTATION

a) **Authority of Executive Order**: It is the Advisory Council's recommendation that the Governor of the State of Montana issue an Executive Order that requires full compliance with this strategy by all state agencies. This includes actions conducted by the Montana Department of Environmental Quality, Montana Department of Transportation, Department of Natural Resource and Conservation and associated governing boards, Montana Fish, Wildlife and Parks, and other state agencies. The Advisory Council's goal is this strategy can be coordinated with federal land managers.
b) **Existing Regulatory Mechanisms**: The stipulations in this strategy apply to all activities within sage-grouse habitat that require a state permit or lease. Permits affected might include, but are not limited to, those issued under the Major Facilities Siting Act, Board of Oil and Gas Conservation, Water Quality Discharge Permits, and State Trust Land leases. All new development projects in Core Areas will be required to work through the standardized disturbance analysis process that will be developed by the MSGOT.
c) **Non-regulated activities**: State agencies shall adhere to the stipulations and management recommendations outlined in this strategy when providing consultation, technical, financial, or other assistance for non-regulated activities (e.g., livestock grazing, wind development).
d) **Montana Sage-grouse Oversight Team (MSGOT):** A Montana Sage-grouse Oversight Team (MSGOT) shall be appointed by Governor Bullock within 60 days of issuance of an Executive Order. The MSGOT will be responsible for providing oversight for the implementation of the *Montana Strategy*. MSGOT duties will include, but are not limited to, developing the surface disturbance analysis process and overseeing its implementation, identifying additional connectivity areas based on emerging science, approving deviations from this strategy, addressing policy questions that arise from implementation, identifying adequate mitigation strategies, and integrating new science and other information into the strategy. MSGOT shall consist, at a minimum, of executive level representatives from state and federal agencies, tribes, conservation groups, and local government; and from the oil and gas, coal mining, mining (non-coal), electrical distribution and transmission, and agriculture industries. The Advisory Council recommends that the MSGOT meet at least on a quarterly basis. The MSGOT shall provide all

permit-related recommendations to agencies and issue all permit-related decisions within 120 days of receiving completed applications.

e) Compliance Monitoring and Reporting: State agencies issuing permits or leases shall be responsible for ensuring compliance with the stipulations in this strategy. The MSGOT will establish a compliance monitoring framework to track projects. This framework will allow for annual reporting to the Service and will correspond with their forthcoming conservation metrics database.

f) **Staffing Required for Implementation:** The State of Montana shall commit to providing funding to support at least 6 new Full-Time Equivalent (FTE) positions as outlined below. These positions will be located in a state agency or academic institution, to be determined. The State of Montana shall also commit to fund travel and other related expenses incurred by representatives to the MSGOT.

   i) Mapping application development – 0.5 FTE (new, temporary).
   ii) Database development and analysis tool; database administration – 2 FTE (new, permanent).
   iii) Disturbance calculation and compliance; project review – 2.5 FTE (new, permanent). Capacity needs may vary depending on the number and complexity of projects proposed.
   iv) MSGOT and Policy Review; supervision of project reviews – 1 FTE (new, permanent) to serve as MSCOT coordinator.
   v) Compliance Monitoring and Reporting – fulfilled by MSGOT coordinator.

g) **Population Monitoring and Additional Science Needs:** The Council recognizes that the MSGOT may identify additional monitoring and research projects necessary for the conservation of sage-grouse and ongoing implementation of this strategy. Staff and funding required for newly identified needs will likely exceed existing staff capacity and will require additional funding support from the State of Montana. This support will be in addition to the 6 FTE request in Section XI.f.

APPENDIX A: Governor Bullock's Executive Order 2-2013

STATE OF MONTANA
OFFICE OF THE GOVERNOR
EXECUTIVE ORDER No. 2-2013

Establishing a Greater Sage-grouse Habitat Conservation Advisory Council

WHEREAS, the Greater Sage-grouse (*Centrocercus urophasianus*) is an iconic species that inhabits much of the sagebrush-grassland habitats in Montana;

WHEREAS, the State of Montana currently enjoys viable and widespread populations of the species, the second largest abundance of Greater Sage-grouse among western states;

WHEREAS, the United States Fish and Wildlife Service (USFWS) has determined that the Greater Sage-grouse species is warranted for listing as a threatened or endangered species under the Endangered Species Act (ESA), but is precluded by other higher priority species;

WHEREAS, the United States District Court for the District of Idaho ruled on February 2, 2012 that the USFWS must re-evaluate the status of the Greater Sage-grouse by September 30, 2015;

WHEREAS, the United States Secretary of the Interior has invited Montana and other western states impacted by the potential listing of the Greater Sage-grouse to develop state-specific regulatory mechanisms to conserve the species and preclude the need to list under the ESA;

WHEREAS, the development of a state-specific strategy in Montana will be critical in demonstrating to the USFWS that the species does not warrant federal protection under the ESA;

WHEREAS, the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) are currently implementing national Instruction Memoranda to guide interim management of public lands and to develop Greater Sage-grouse conservation measures for incorporation into the agencies' respective land use plans;

WHEREAS, the development of a state-specific strategy will enable the BLM and USFS to incorporate relevant elements from the strategy into their land use plans and environmental analyses;

WHEREAS, approximately half of Greater Sage-grouse habitat in Montana involves private property, and maintaining the species will require effective conservation strategies across property ownerships;

WHEREAS, the State of Montana has management authority over Greater Sage-grouse populations in Montana;

WHEREAS, the State of Montana in collaboration with stakeholders developed and adopted a state Greater Sage-grouse plan in 2004, pertaining to sage-grouse population responses to large-scale changes in habitat;

WHEREAS, the State of Montana has identified and will update, as appropriate, Greater Sage-grouse Core Areas, which include priority habitats for conservation;

WHEREAS, it is in the interest of this State to bring stakeholders and experts together to recommend a course of action that will provide for conservation measures sufficient to preclude the need to list the Greater Sage-grouse;

WHEREAS, the listing of the Greater Sage-grouse could have a significant adverse effect on the economy of the State of Montana; and

WHEREAS, it is appropriate and beneficial to establish the Governor's Greater Sage-grouse Habitat Conservation Advisory Council ("Council").

PURPOSE

1. The purpose of the Council is to gather information, furnish advice, and provide to the Governor recommendations on policies and actions for a state-wide strategy to preclude the need to list the Greater Sage-grouse under the ESA, by no later than January 31, 2014.

DUTIES

2. In preparing its recommendations, the Council shall review the 2004 Montana Sage-grouse Conservation Plan, BLM Interim Memorandum Guidance, National Technical Team Report, relevant scientific information, and other existing strategies and information.
3. The recommendations of the Council must be based on the following objectives and/or criteria:
    a. Conserve the species and its habitat based on the most current scientific information, with input from a variety of stakeholders, and maintaining public trust management of Greater Sage-grouse and predictable and multiple uses of private, state, and public lands;
    b. Tailor the management recommendations to the importance of the habitat, considering the interests of the State;
    c. Address the following primary threats to the species as identified by the USFWS:
        i. Habitat fragmentation caused by energy development and mineral extraction;
        ii. Conversion of habitat for agriculture and urbanization; and
        iii. Lack of effective regulatory mechanisms to conserve Greater Sage-grouse habitats.

d. Address the secondary threats to the species as identified by the USFWS, as appropriate:

   i. Disease/West Nile virus;
   ii. Management issues related to livestock grazing;
   iii. Collisions with fences and power lines;
   iv. Prescribed fire and range treatments; and
   iv. Conifer expansion.

e. Identify opportunities for pro-active Greater Sage-grouse habitat conservation projects;

f. Recognize, encourage, and incentivize land use practices that are actively maintaining or improving Greater Sage-grouse habitat as evidenced by improvements in habitat quality and quantity, and monitoring which indicates stable/increasing populations of the species; and

g. Identify a long-term adaptive management structure that engages landowners and local working groups, and ensures the effective implementation of these recommendations.

4. The duties of the Council are solely advisory.

5. The Council will provide its recommendations to the Governor no later than January 31, 2014.

<u>COMPOSITION AND ORGANIZATION</u>

6. The Council members shall be appointed by and serve at the pleasure of the Governor until January 31, 2014.

7. The Council shall be comprised of 8-12 members, representing the various geographic areas, non-governmental organizations, and industries of the State within the range of the species.

8. The Office of the Governor will assist in staffing this Council. My office may rely on the services of other Governors or any member of my Cabinet in staffing this Committee.

9. The Council members shall be appointed from the following categories:

   a. Agriculture and Ranching;
   b. Conservation and Sportsmen;
   c. Energy, Mining, and Power Transmission;
   d. Tribal;
   e. Local Government; and

f. Legislature.

10. The Council may establish procedural bylaws to aid it in the performance of its duties.

11. The Council may establish subcommittees comprised of members of the Committee to aid it in the performance of its duties.

12. The Council is attached to the Department of Fish, Wildlife and Parks for administrative purposes. The Director of the Montana Department of Fish, Wildlife and Parks shall retain an independent contractor to provide assistance to the Council.

13. Local Greater Sage-grouse working groups are encouraged to continue in their efforts to conserve the sage-grouse in the State of Montana and are advised to participate in the development of the recommendations here ordered.

OTHER

14. The Council may request consultation, information, and technical expertise from Directors or their designees of state agencies, including but not limited to, the members of the Montana Legislature, the Montana Department of Fish, Wildlife, and Parks, the Montana Department of Natural Resources and Conservation, the Montana Department of Agriculture, the Montana Department of Environmental Quality, and the Montana Board of Oil and Gas, regarding: the biological needs of the species; activities on state, federal and private lands potentially impacted by the status of the species; and, requirements of the ESA and other relevant statutory requirements.

15. The Council may request comments, information, and technical expertise from such other sources as it deems necessary, including the university system, federal agencies, and members of the public including members of existing local sage-grouse working groups.

COMPENSATION

16. Council members eligible for compensation under section 2-15-122(5) MCA, shall be compensated in an amount to be determined by the Director of the Department of Fish, Wildlife and Parks, not to exceed $50 for each day in which the member is actually and necessarily engaged in the performance of Council duties. All Council members shall be reimbursed for travel expenses pursuant to section 2-15-122(5), MCA.

DURATION

17. The Council shall cease to exist on January 31, 2014.

NOW, THEREFORE, I, STEVE BULLOCK, Governor of the State of Montana, by the authority vested in me by under the laws and Constitution of the State of Montana, do hereby establish the Governor's Greater Sage-grouse Habitat Conservation Advisory Council.

This Order is effective immediately.

Given under my hand and the Great Seal of the State of Montana, this 20th day of February, 2013.

STEVE BULLOCK, Governor

ATTESTED:

LINDA McCULLOCH, Secretary of State

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APPENDIX B: House Bill 580

AN ACT PROVIDING AN APPROPRIATION FOR THE GREATER SAGE-GROUSE HABITAT CONSERVATION ADVISORY COUNCIL ESTABLISHED BY THE GOVERNOR; AND PROVIDING AN IMMEDIATE EFFECTIVE DATE.

WHEREAS, the greater sage-grouse (Centrocercus urophasianus) is an iconic species that inhabits much of the sagebrush-grassland habitats in Montana; and

WHEREAS, the State of Montana currently enjoys viable and widespread populations of the species, the second largest abundance of greater sage-grouse among western states; and

WHEREAS, the United States Fish and Wildlife Service (USFWS) has determined that the greater sage-grouse species is warranted for listing as a threatened or endangered species under the Endangered Species Act (ESA) but is precluded by other higher priority species; and

WHEREAS, the United States District Court for the District of Idaho ruled on February 2, 2012, that the USFWS must reevaluate the status of the greater sage-grouse by September 30, 2015; and

WHEREAS, the United States Secretary of the Interior has invited Montana and other western states impacted by the potential listing of the greater sage-grouse to develop state-specific regulatory mechanisms to conserve the species and preclude the need to list it under the ESA; and

WHEREAS, the development of a state-specific strategy in Montana will be critical in demonstrating to the USFWS that the species does not warrant federal protection under the ESA; and

WHEREAS, the United States Bureau of Land Management (BLM) and the United States Forest Service (USFS) are currently implementing national instruction memoranda to guide interim management of public lands and to develop greater sage-grouse conservation measures for incorporation into the agencies' respective land use plans; and

WHEREAS, the development of a state-specific strategy will enable the BLM and USFS to incorporate relevant elements from the strategy into their land use plans and environmental analyses; and

WHEREAS, approximately half of greater sage-grouse habitat in Montana involves private property, and maintaining the species will require effective conservation strategies across property ownerships; and

WHEREAS, the State of Montana has management authority over greater sage-grouse populations in Montana; and

WHEREAS, the State of Montana in collaboration with stakeholders developed and adopted a state greater sage-grouse plan in 2004, pertaining to sage-grouse population responses to large scale changes in habitat; and

WHEREAS, the State of Montana has identified and will update, as appropriate, greater sage-grouse core areas, which include priority habitats for conservation; and

WHEREAS, it is in the interest of this state to bring stakeholders and experts together to recommend a course of action that will provide for conservation measures sufficient to preclude the need to list the greater sage-grouse; and

WHEREAS, the listing of the greater sage-grouse could have a significant adverse effect on the economy of the state of Montana; and

WHEREAS, it is appropriate and beneficial to fund the Greater Sage-Grouse Habitat Conservation Advisory Council established by Governor Steve Bullock in Executive Order No. 2-2013.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MONTANA:

Section 1. Appropriation. (1) There is appropriated a total of $75,000 from the state special revenue fund oil and gas ERA account to the governor's office for the bienniums beginning July 1, 2011, and July 1, 2013, for the purpose of funding the greater sage-grouse habitat conservation advisory council established by the governor in Executive Order No. 2-2013.

(2) The legislature recommends that the greater sage-grouse habitat conservation advisory council develop its proposed recommendations on policies and actions for a statewide strategy to preclude the need to list the greater sage-grouse under the Endangered Species Act of 1973 by October 31, 2013, so that the public may review and comment on the proposed recommendations and the council may make any necessary changes prior to the recommendations being delivered to the governor by the established deadline of January 31, 2014.

Section 2. Effective date. [This act] is effective on passage and approval.

\- END -

APPENDIX C: Sage-grouse Habitat Advisory Council representatives

Name	Street/PO Box	City	Zip	Email
Mr. Paul Callahan	3015 Martinwood	Missoula	59802	pcallahan@swca.com
Rep. Pat Connell	567 Tiffany Lane	Hamilton	59840	connell4HD87@yahoo.com
Ms. Janet Ellis	703 Breckenridge St	Helena	59601	jellis@mtaudubon.org
Mr. Gary Forrester	2527 Gardiner	Billings	59101	Gary.forrester@mduresources.com
Mr. Jay Gore	127 Crestview	Missoula	59803	tealdux@hotmail.com
Sen. Brad Hamlett	PO Box 49	Cascade	59421	senatorhamlett@gmail.com
Mr. Robert Lee	P O Box 1123	Forsyth	59327	rlee@rosebudcountymt.com
Mr. Glenn Marx	P O Box 892	Helena	59624	montanamalt@q.com
Rep. Bill McChesney	316 Missouri Ave	Miles City	59301	macwilly66@hotmail.com
Curtis Monteau, Jr.	5627 Lower Box Elder Rd	Box Elder	59521	curtismonteau@yahoo.com
Rep. Ray Shaw	251 Bivens Creek Road	Sheridan	59749	shaw@3rivers.net
Mr. Carl Wambolt	3300 Graf #86	Bozeman	59715	cwambolt@montana.edu

APPENDIX D: Definitions

Suitable Habitat – is within the mapped occupied range of sage-grouse, and:

1) Generally has 5% or greater canopy cover of sagebrush, where “sagebrush” includes all species and sub-species of the genus *Artemisia*. This excludes mat-forming sub-shrub species such as *A. frigida* (fringed sagewort) and *A. pedatifida* (birdfoot sage). Sagebrush canopy cover may be less than 5% when complimented by other shrubs suitable for sage-grouse cover requirements; OR
2) Is moist meadow containing forbs suitable for brood-rearing within 300 yards of suitable sagebrush cover (as defined above). Introduced species such as alfalfa may be very important on these sites where native forbs are not available.

Vegetation monitoring to determine habitat suitability will follow the Habitat Assessment Framework, available at
http://www.blm.gov/pgdata/etc/medialib/blm/wo/Communications_Directorate/public_affairs/sage-grouse_planning/documents.Par.23916.File.dat/SG_HABITATASESSMENT0000669.pdf

Unsuitable Habitat – is land within the historic range of sage-grouse that did not, does not, nor will not provide sage-grouse habitat due to natural ecological conditions such as badlands or canyons.

Surface Disturbance – includes any conversion of formerly suitable habitat to grasslands, croplands, mining, well pads, roads, or other physical disturbance that renders the habitat unusable for sage-grouse.

Lek Status -

- Active - Data supports existence of lek. Supporting data defined as 1 year with 2 or more males lekking on site followed by evidence of lekking within 10 years of that observation.
- Inactive - A confirmed active lek with no evidence of lekking for the last 10 years. Requires a minimum of 3 survey years with no evidence of lekking during a 10 year period.
- Extirpated - Habitat changes have caused birds to permanently abandon a lek as determined by the biologists monitoring the lek.
- Unconfirmed - Possible lek. Sage-grouse activity documented. Data insufficient to classify as active status.

Valid Existing Right(s) – legal “rights” or interest that are associated with land or mineral estate and that cannot be divested from the estate until that interest expires, is relinquished, or acquired.

Habitat Exchange - an efficient, effective approach to wildlife conservation in America, developed in partnership by private landowners, industry, environmental groups, academics and government. In a Habitat Exchange, landowners and industry are given financial incentives to conserve wildlife habitat. Landowners benefit by earning revenue from credit sales and developers benefit by meeting conservation objectives or regulatory requirements with less red tape.

APPENDIX E: Wyoming's Density and Disturbance Calculation Tool Process

The Montana Sage-grouse Oversight Team will oversee the implementation of a standardized disturbance analysis in Montana that follows Wyoming's Density and Disturbance Calculation Tool (described below).

All activities will be evaluated within the context of maximum allowable disturbance (disturbance percentages, location and number of disturbances) of suitable sage-grouse habitat within the area affected by the project. The maximum disturbance allowed will be analyzed via a Density/Disturbance Calculation Tool (DDCT) process conducted by the Federal Land Management Agency on federal Land and the project proponent on non-federal (private, state) land. Unsuitable habitat occurring within the project area will not be included in the disturbance cap calculations.

1. Density/Disturbance Calculation Tool (DDCT): Determine all occupied leks within a core population area that may be affected by the project by placing a 4 mile boundary around the project boundary (as defined by the proposed area of disturbance related to the project). All occupied leks located within the 4 mile boundary and within a core population area will be considered affected by the project.

   A four-mile boundary will then he placed around the perimeter of each affected lek. The core population area within the boundary of affected leks and the 4 mile boundary around the project boundary creates the DDC'I' for each individual project. Disturbance will be analyzed for the DDCT as a whole and for each individual affected lek within the DDCT. Any portion of the DDCT occurring outside of Core Area will be removed from the analysis.

   If there are no affected leks within the 4 mile boundary around the project boundary, the DDCT area will be that portion of the 4 mile project boundary within the core population area.

2. Disturbance analysis: Total disturbance acres within the DDCT will he determined through an evaluation of:
   i. Existing disturbance (sage-grouse habitat that is disturbed due to existing anthropogenic activity and wildfire).
   ii. Approved permits (that have approval for on the ground activity) not yet implemented.

3. Habitat Assessment:
   a. A habitat assessment is not needed for the initial DDCT area provided that the entire DDCT area is considered suitable.
   b. A habitat assessment should be conducted when the initial DDCT indicates proposed project will cause density/disturbance thresholds to be exceeded, to see whether siting opportunities exist within unsuitable or disturbed areas that would reduce density/disturbance effects.
   c. When a habitat assessment is conducted it should create a baseline survey identifying:
      i. Suitable and unsuitable habitat within the DDCT area
      ii. Disturbed habitat within the DDCT area
      iii. Sage-grouse use of suitable habitat (seasonal, densities, etc.)
      iv. Priority restoration areas (which could reduce the 5% cap)
         A. Areas where plug and abandon activities will eliminate disturbance
         B. Areas where old reclamation has not produced suitable habitat
      v. Areas of invasive species
      vi. Other assurances in place (CCAA, easements, habitat, contracts, etc.)

4. Determination of existing and allowable suitable habitat disturbance: Acres of disturbance within suitable habitat divided by the total suitable habitat within the DDCT area times 100 equals the percent of disturbed suitable habitat within the DDCT area. Subtracting the percentage of existing disturbed suitable habitat from 5% equals new allowable suitable habitat disturbance until plant regeneration or reclamation reduces acres of disturbed habitat within the DDCT area.

APPENDIX F: BLM guidance for pond construction

The following guidance is copied from A Report on National Sage-grouse Conservation Measures, Appendix C: BMPs for how to make a pond that won't produce mosquitoes that transmit West Nile virus (from Doherty (2007)). The entire report is available at http://sagemap.wr.usgs.gov/docs/rs/GrSG%20Tech%20Team%20Report.pdf.

The following are seven distinct site modifications that if adhered to, would minimize exploitation of Coal Bed Natural Gas ponds by *Culex tarsalis*:

1. Increase the size of ponds to accommodate a greater volume of water than is discharged. This will result in un-vegetated and muddy shorelines that breeding *Cx. tarsalis* avoid (De Szalay and Resh 2000). This modification may reduce *Cx. tarsalis* habitat but could create larval habitat for *Culicoides sonorensis*, a vector of blue tongue disease, and should be used sparingly (Schmidtmann et al. 2000). Steep shorelines should be used in combination with this technique whenever possible (Knight et al. 2003).
2. Build steep shorelines to reduce shallow water (>60 cm) and aquatic vegetation around the perimeter of impoundments (Knight et al. 2003). Construction of steep shorelines also will create more permanent ponds that are a deterrent to colonizing mosquito species like *Cx. tarsalis* which prefer newly flooded sites with high primary productivity (Knight et al. 2003).
3. Maintain the water level below that of rooted vegetation for a muddy shoreline that is unfavorable habitat for mosquito larvae. Rooted vegetation includes both aquatic and upland vegetative types. Avoid flooding terrestrial vegetation in flat terrain or low lying areas. Aquatic habitats with a vegetated inflow and outflow separated by open water produce 5-10 fold fewer Culex mosquitoes than completely vegetated wetlands (Walton and Workman 1998). Wetlands with open water also had significantly fewer stage III and IV instars which may be attributed to increased predator abundances in open water habitats (Walton and Workman 1998).
4. Construct dams or impoundments that restrict down slope seepage or overflow by digging ponds in flat areas rather than damming natural draws for effluent water storage, or lining constructed ponds in areas where seepage is anticipated (Knight et al. 2003).
5. Line the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water, thus precluding shallow surface inflow and accumulation of sediment that promotes aquatic vegetation.
6. Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation.
7. Fence pond site to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.

Literature Cited:

De Szalay, F.A. and V.H. Resh. 2000. Factors influencing macroinvertebrate colonization of seasonal wetlands: responses to emergent plant cover. Freshwater Biology. 45: 295-308.

Doherty, M.K. 2007. Mosquito populations in the Powder River Basin, Wyoming: a comparison of natural, agricultural and effluent coal bed natural gas aquatic habitats. M.S. Thesis. Montana State University, Bozeman, U.S.A.

Knight, R.L., W.E. Walton, G.F. Meara, W.K. Riesen and R. Wass. 2003. Strategies for effective mosquito control in constructed treatment wetlands. Ecological Engineering. 21: 211-232.

Schmidtmann, E.T., R.J. Bobian, R.P. Beldin. 2000. Soil chemistries define aquatic habitats with immature populations of the *Culicoides variipennis* complex (Diptera: *Ceratopogonidae*). Journal of Medical Entomology. 37: 38-64.

Walton, W.E., and P.D. Workman. 1998. Effect of marsh design on the abundance of mosquitoes in experimental constructed wetlands in Southern California. Journal of the American mosquito control Association 14:95-107.

APPENDIX G: Summary of Relevant Science Considered by Council

The following summary briefly details the published literature that was presented to and considered by the Sage-grouse Advisory Council during the crafting of this Strategy. It is not an exhaustive list of sage-grouse related research. Specific presentations and handouts provided to Council throughout the process are available for download at http://fwp.mt.gov/fishAndWildlife/management/sageGrouse/habitatConservation/

Sage-grouse General Ecology and Habitat Use

Connelly et al. 2011 – sage-grouse population characteristics, range-wide summary

- General dependence on big and silver sagebrush species; can use other shrub species at times but they are not critical for sage-grouse persistence
- Three seasonal habitats – breeding, summer, winter
- Male displaying grounds (leks) are usually traditional locations but temporary satellite leks can form in years of relatively high abundance
- Average nest distance from lek is 3.2 – 5 km (2 – 3.1 miles)
- Nestlings fed primarily invertebrates; juveniles change to eating forbs in late summer; sagebrush dominates diet in winter
- Highest mortality for juveniles is probably hatching to brood break up
- Adult survival tends to be relatively high over winter
- Some populations migratory (move >10 km [6.2 miles] among 2 or more seasons); other populations non-migratory
- Birds disperse ~4 – 5.5 miles from place of hatch to place of breeding
- Large, interconnected expanses of sagebrush are required by sage-grouse;
- Range-wide habitat loss and degradation is threatening populations

Taylor et al. 2012 – vital rates of sage-grouse

- Three rates were important for population growth, in order: female survival, chick survival and nest success.

Sika 2006 – central Montana

- 97% of nests were within 3 miles of an active lek

Holloran and Anderson 2005, Holloran 2005 - western WY:

- Sage-grouse nest locations are spatially related to lek locations and a 5 km (3.1 mi.) buffer included 64% of known nests. Moynahan's (2004) work in north central MT supports this finding.
- The substantial number of females nesting > 5 km (3.1 mi.) from a lek could be important for population viability.
- Observed lek to nest distances was not related to lek size.
- Successful nests were generally located further from leks than destroyed nests.
- Nests located $\leq$ 1 km (0.6 mi.) from another known nest tended to have lower success probabilities.

Tack 2009 – northern Valley County and southern Saskatchewan

- Average distance from lek of capture to nest site was 5.3 km (3.3. mi.). Seventy-five and 95% of nests were within 6.8 and 12.3 km (4.3 and 7.7 mi.) of lek of capture, respectively.
- All radio-collared individuals moved >20km in consecutive years to winter habitat

Smith 2013 – long-distance migration in sage-grouse

- Sage-grouse moved as far as 240-km (149 mi.) from breeding habitat in north-central Montana/southern Saskatchewan to winter habitat north of the Missouri River.
- Grouse migrated through gently rolling sagebrush flats (<5% slope), using native sagebrush rangeland in proportion to its availability, and avoiding cropland and badlands where food was scarce.

Montana Sage Grouse Working Group 2005 – state management plan

- Sage-grouse populations demonstrate annual and cyclic fluctuations
- Montana populations appear to cycle over approximately a 10-year period under existing habitat conditions and the current combination of weather and predators.

Table 1. Range-wide and Montana-specific vital rates for sage-grouse compiled by Fish, Wildlife and Parks.

Vital Rate	**Range-wide rates**[1]	**Montana rates**	**Years of MT study**	**Location**	**Reference**
Nest success	15 – 86%	64%	1969 - 1972	Petroleum Co.	Wallestad and Pyrah 1974
		28 - 43%	2004 - 2005	Musselshell and Golden Valley Co.	Sika 2006
		35 – 61%	2001 - 2003	S. Phillips Co.	Moynahan et al. 2007
		53 – 61%	2007 - 2008	Milk River Basin	Tack 2009
		59%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data[2]
Chick survival	12 – 50%	33 – 38%	2007 - 2008	Milk River Basin	Tack 2009
		12%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data[2]
Hen survival	37 – 78%	25 – 96%[3]	2001 – 2003	S. Phillips Co, Montana	Moynahan et al. 2006
		94% (nesting season) 84 – 93% (late summer)	2004 - 2005	Musselshell and Golden Valley Co.	Sika 2006
		55 – 91% (spring/summer) 84 – 92% (over winter)	2007 - 2008	Milk River Basin	Tack 2009
		59%	2011 - 2012	Musselshell and Golden Valley Co.	Berkeley, unpubl. data

[1]Range-wide stimates from Connelly et al. 2011.
[2] Spring and early summer weather during 2011 and 2012 were subject to historic extremes of high precipitation in 2011 and severe drought in 2012, which likely affected nest and chick survival rates.
[3]25% annual survival in 2003 was attributed to a WNv outbreak and severe winter conditions; annual survival in 2001-2002 averaged 96%.

Coates et al. 2013 – Seasonal Space Use, Bi-state population (California & Nevada border)

- 5% of sage-grouse seasonal use area encompassed within a 0.25 mile buffer around leks
- 28% of sage-grouse seasonal use area encompassed within a 0.60 mile buffer around leks
- 90% of sage-grouse seasonal use area encompassed within a 3 mile buffer around leks
- Buffers up to 7.5 km (4.7 miles) around leks will encompass most seasonal space use; managers should consider buffers between 5.0 and 7.5 km (3.1 – 4.7 miles)

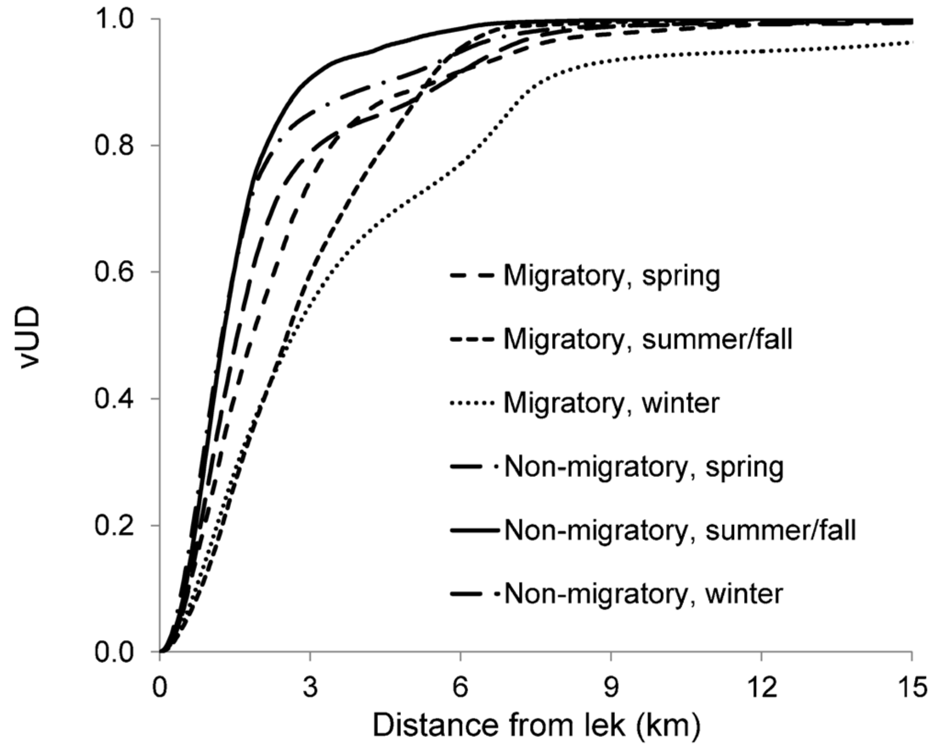

Figure 1. Response curves of volume of utilization distribution (vUD) for sage-grouse grouped by migratory status and season as a function of distance to leks. We collected these data in the Bi-State Distinct Population Segment in Mono County, California, during 2002–2009. *Copied directly from Coates et al. (2013).*

FWP note: This graphical representation from the Coates et al. research shows the percentage of estimated animal use area (vUD) encompassed by increasing distances from the lek. The vUD can be loosely interpreted as the total area used by sage-grouse in this population. The authors report that at 0.25, 0.60, and 3 mile distances from the lek, approximately 5%, 28%, and 90%, of the total area used by sage-grouse was encompassed, respectively. The graph suggests that at 1 mile (1.6 km) from the lek, approximately 50-60% of the total area used by sage-grouse was encompassed.

Summary: On a range wide scale, occurrence of sage-grouse is largely defined by sagebrush distribution. Sage-grouse require a landscape that meets different habitat requirements for breeding, brood-rearing, and winter seasons. A 5 mile buffer around active leks will typically capture most seasonal habitat with the exception of winter habitat for migratory populations. The three vital rates that tend to drive sage-grouse population dynamics are nest success, chick survival, and hen survival. In Montana, these vital rates appear to be within range-wide estimates suggesting Montana populations are relatively secure overall (Table 1). Recent declines in male lek attendance documented by Fish, Wildlife and Parks are likely representative of natural fluctuations that are influenced, in part, by weather.

Importance of Sagebrush Habitats to Sage-grouse

Johnson et al. 2011 - evaluation of anthropogenic and landscape feature influence on lek trends

- Lek trends increased modestly but steadily with the cover of all sagebrush at both 5-km and 18-km radius around leks.

Wisdom et al. 2011 – factors associated with sage-grouse extirpations

- Compared historical locations in occupied (n=239) vs extirpated (n=136) range for sage-grouse

- Historical locations in occupied range contained almost twice as much area in sagebrush as those in extirpated range (46% vs. 24% area).
- Mean patch size of sagebrush was >9 times larger, and mean core area >11 times larger, in occupied versus extirpated range. Sagebrush patches also were substantially closer to one another in occupied range.

Knick et al. 2013 – ecological similarities in sage-grouse lek characteristics
- Lek locations had approximately twice the average large-scale sagebrush cover for the study area and three times that of historic locations. 79% of area within 5km of lek was in sagebrush cover at active leks, 28% at historic but no longer occupied leks, and 35% for the study area.
- Active leks were surrounded by >40% landscape cover of sagebrush on average.

Martin 1970. Sagebrush control related to habitat and sage grouse occurrence.
- Only 4% of 415 sage grouse observations were made on sprayed strips. Sprayed strips were ~9x the area of unsprayed habitat.
- Study area in southwest Montana

Wallestad and Pyrah. 1974. Movement and nesting of sage grouse hens in central Montana
- Radio-collared 31 sage-grouse hens and located 22 nests in central Montana.
- All nests occurred in sagebrush stands with a canopy coverage that exceeded 15% and sagebrush formed the nesting cover over all of the 41 nests located.
- Successful nests had significantly greater sagebrush cover within 24 inches of nest, within a 100 ft^2 plot around nest and were located in stands of sagebrush with a higher average canopy coverage than those of unsuccessful nests.
- Wintering and nesting areas are dominated by dense stands of sagebrush and should be considered together as a wintering-nesting complex. No sagebrush control should be considered on these wintering–nesting complexes.

Baker et al. 1976. Conservation Committee report on effects of alteration of sagebrush communities on the associated avifauna.
- "…control of sagebrush in large blocks (larger than 16 ha) appears to be detrimental [to sage-grouse]."

Braun et al. 1977. Guidelines for maintenance of sage grouse habitats.
- "[Patterson] affirmed that sage grouse have not adjusted, and doubtlessly will not adjust their life processes to fit a pattern of land use that eliminates or seriously disturbs large tracts of the sagebrush-grassland types on any of their seasonal ranges."
- The authors summarized research documenting the dependence of sage-grouse on sagebrush ecosystems.
- Recommended control of vegetation be avoided on all lands within a 3km radius of occupied leks and any areas known to have supported important wintering concentrations of sage grouse within the past 10 years.

Wambolt and Sherwood. 1999. Sagebrush response to ungulate browsing in Yellowstone.
- "Ultimately, many organisms are sacrificed with the loss of quality big sagebrush habitat."

Wambolt et al. 2001. Recovery of sagebrush after burning, south-western Montana
- Big sagebrush canopy cover, density and production of winter forage were significantly greater in unburned than burned portions of a paired comparison.
- Total perennial grass cover did not differ between burned and unburned areas.
- "Managers considering prescribed burning of big sagebrush communities should be aware that herbaceous plant responses may be minimal while shrub values will likely be lost for many years."

Sowell et al. 2011. Northern, central and southern Montana and northern Wyoming

- There was little association (1% of the variation) between herbaceous vegetation cover and Wyoming big sagebrush cover
- "Removing Wyoming big sagebrush cover to increase herbaceous vegetation for any purpose, including enhancing sage-grouse brood survival, does not appear to be biologically sound."

Summary: Sage-grouse are dependent on large, intact landscapes of good quality sagebrush habitat. Removal or degradation of sagebrush is clearly detrimental to sage-grouse lek persistence and trends, nesting success, and over-winter survival.

Impacts of cropland agriculture on sage-grouse populations

Swenson et al. 1987. Decrease of sage grouse *Centrocercus urophasianus* after ploughing of sagebrush steppe.

- Number of males on leks declined by 73% in Shields River Valley (Park Co.) between 1973 and 1984. 16% of the winter habitat area was plowed by 1984. No similar trend in nearby area where plowing did not occur.
- With 84% of total area in sagebrush steppe, the population index for sage grouse declined from 241 to 65 males on leks. This equated to halving the population every seven years.
- Sagebrush loss was on a relatively small area but a relatively large portion of winter habitat (30%).

Tack 2009. Sage-grouse and the human footprint

- Large leks are 4.5 times less likely to occur than small leks when agricultural tillage fragments 21% of land within 1.0km of breeding sites.

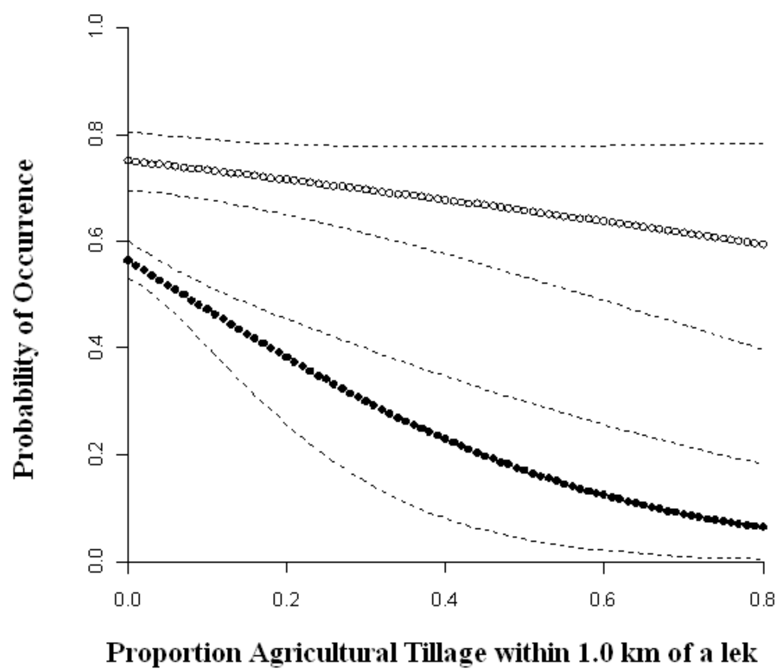

Figure 2. Probability of active lek occurrence of leks with < 25 males (open circles), and leks >25 males (closed circles) and agricultural tillage within 1.0km of a lek, values predicted for leks in big sagebrush habitat. *Copied from Tack 2009*

Knick et al. 2011. Ecological influence and pathways of land use in sagebrush.

- Agriculture, mostly mapped croplands, currently covers >230,000 km^2 (11%) of sage-grouse habitat.
- In the Great Plains (MZI), agriculture covers 18.7% and area influenced by agriculture ranges from 68.1 to 90.7% of the landscape.

Knick et al. 2013. – ecological similarities in sage-grouse lek characteristics

- <2% of leks were in areas surrounded by >25% agriculture within a 5-km radius
- 93% of leks were in areas surrounded by <10% agriculture within a 5-km radius.

Copeland et al. 2013. Measuring the effectiveness of the WY strategy

- "Targeted easements [$250 mil] averted an additional 9-11% of expected declines compared to that of the core area policy alone." In Wyoming.
- "…random placement of easements within core areas has much lower potential for benefiting sage-grouse populations."

Summary: Conversion of native range to cropland effectively removes sage-grouse habitat from the landscape. Even relatively low levels of tillage, 21-25% of the landscape, can lead to lek abandonment, especially by larger leks.

Predators and Sage-grouse

Howe et al. 2014. Nesting habitat selection by common ravens in sagebrush habitats

- "ravens were most likely to nest near edges of adjoining big sagebrush (*Artemisia tridentata*) and land cover types that were associated with direct human disturbance or fire."
- Odds of raven nesting declined by 31% for every 1km (0.6 mi) increase in distance away from a transmission line.
- For every 100-m increase in distance from the edge of big sagebrush habitat with another cover type, the odds of a raven nest decreased by 20%
- "An increase in the amount of edge by 1 km [0.6 mi] within an area of 102.1 ha [252 ac] across the study area increased the odds of nesting by 49%"

Hagen 2011 – range-wide summary

- Sage-grouse are adapted to predation and in <u>unaltered systems</u> will persist indefinitely with predation pressure
- Predators in <u>altered systems</u> can lead to decreased annual recruitment of sage-grouse
- Predators of sage-grouse tend to be generalists that take prey opportunistically
- Common predators are coyote, red fox, American Badger, bobcat, golden eagles and other raptors. Common ravens and black-billed magpies will depredate nests.
- Anthropogenic, landscape level changes have increased abundance of some predators, notably red fox and common raven, within the sage-grouse range
- Predator control programs can have localized, short-term effects, but the sustainability of predator control as a long-term management tool has not been demonstrated.

Taylor et al. 2012 – sage-grouse vital rates

- The influence of predation on sage-grouse population dynamics typically only becomes problematic when vital rates, especially nest, chick and hen survival, are consistently reduced below naturally-occurring levels. (See Table 1 for FWP's compilation of sage-grouse vital rates range-wide and in Montana).
- Recommend increasing survival and nest success rates by restoring large, intact sagebrush-steppe landscapes, reducing human-caused mortality, and eliminating anthropogenic habitat features that subsidize predators.

Baxter et al. 2007 – Strawberry Valley, Utah

- Low sage-grouse survival was attributed to unusually high density of red fox that were attracted to the area by anthropogenic activity
- Adult survival appeared to increase with fox removal; however, demographic rates were concomitantly increasing across the region during the study period, limiting inference on the success of the fox removal program.

Holloran 2005 – western Wyoming

- Increased nest predation rates were attributed to high corvid abundance; corvid abundance was influenced by anthropogenic structures associated with natural gas development

Bui 2009, Bui et al. 2010 – ravens in western Wyoming

- Ravens used road networks, fences, power lines, and other infrastructure associated with development.
- Found a negative association between raven presence and sage-grouse nest and brood fate.
- Predation was attributed primarily to territorial pairs, not groups of juveniles, sub-adults, or non-breeding birds.

Coates 2007 – nest predation in northeastern Nevada

- Raven removal resulted in short-term reductions in raven populations; however, other individuals re-populated the vacated habitat within a year
- Badger predation may have compensated somewhat for decreases in raven populations

Slater 2003 – coyote control in southwestern Wyoming

- Coyote control had no effect on nest success or chick survival

Mezquida et al. 2006 – implications of coyote control

- Removal of coyotes can lead to a release of otherwise suppressed medium-sized predators, such as red fox, which tend to be more effective predators of sage-grouse nests and individuals

Summary: Populations of some predators have increased, in large part because of anthropogenic subsidies. The ability of sage-grouse to withstand increased predation pressure is enhanced in unaltered landscapes, especially those that have been managed to provide good quality habitat for sage-grouse. Reported vital rates for sage-grouse in Montana are within range-wide estimates, suggesting Montana's populations overall are not experiencing excessive predation. However, predators could be suppressing sage-grouse populations in localized areas. Reducing the human footprint and associated anthropogenic subsidies that support predator populations, such as landfills, tall structures, abandoned buildings and other infrastructure, and road net works can help control predator populations (Leu and Hanser 2011). Predator control through lethal means is difficult to sustain, e.g., ravens re-populate vacated territories quickly after removal, and can have unintended consequences, e.g., coyote control can release numbers of medium-sized predators. Predator control options need to be evaluated on a case-by-case basis and at a local, not statewide, scale.

Sage-Grouse Breeding Activities Related to Development

Holloran 2005 – western WY radio-marking study.

- Male lek attendance declined as distance from leks to drilling rigs, producing wells and haul roads decreased and as densities of those infrastructure facilities increased. Effects were detectable out to various distances (3.0 – 6.2 km; 1.9-3.9 mi.) depending on the disturbance variable. These observations were similar to that reported for sage-grouse associated with energy development in Alberta (Aldridge and Brigham 2003) and Colorado (Remington and Braun 1991).
- Well densities exceeding 1 producing well every 283 ha (1 well/699 acres) appeared to negatively influence male lek attendance.
- Main haul roads within 3 km (1.9 mi.) of leks negatively influenced male lek attendance largely through increased traffic volume. Investigators reported a prominent drop in lek attendance when daily traffic exceeded 50 axles per day.
- Male attendance decreased with traffic volume of < 12 vehicles per day and leks became inactive when volume exceeded 75 vehicles per day.
- To maintain continued nesting for future sage-grouse generations the author recommended, at a minimum, all potential nesting habitat within 5km (3.1 miles) of an active lek be protected from development.

Walker et al. 2007a - northeast WY and southeast MT radio-marking study.

- From 2001-2005, the number of males counted on leks in coal bed natural gas (CBNG) fields declined more quickly than counts on leks outside of CBNG fields.
- By 2005, active leks within CBNG had 46% fewer males than leks outside of CBNG fields. Leks with energy development within 6.2 km experienced decreased male attendance.
- Of those leks considered active in 1997, only 38% remained active within CBNG fields by 2004-2005, compared to 84% of leks outside CBNG fields.
- CBNG development as distant as 6.4 km from a lek had a detectable impact on lek persistence.
- From 2000-2005, leks in CBNG fields had 11-55% fewer males per active lek than leks outside CBNG development. All known remaining leks with ≥25 males occurred outside CBNG fields in 2005.
- Findings showed that CBNG development is having negative effects on lek persistence over and above other habitat effects including power lines, preexisting roads, West Nile Virus mortality, or tillage agriculture, even after controlling for availability of sagebrush habitat.
- Research findings show a lag effect, with leks predicted to disappear, on average, within 4 years of CBNG development.
- Leks typically remained active when well spacing was ≥ 500 acres (1.3 wells per section), whereas leks typically were lost when spacing exceeded 4.2 wells per section.

Tack 2009 – lek analysis within eastern Montana, southwest North Dakota, northwest South Dakota, southwest Saskatchewan, and southeast Alberta.

- Showed steep decline in probability of occurrence of larger leks (> 25 males) associated with oil or gas development, even at levels of less than 1 well/640 acres within a 12.3 km (7.8 mile) radius of leks.
- Showed probability of occurrence of leks with >25 males dropped off as density of roads within 3.2 km of a lek increased.

Doherty et al. 2010 – Wyoming statewide lek survival and male attendance retrospective analysis relative to oil and gas development.

- Developed research-based matrix revealing how increases in well density within 3.2 km (2 mi) of a lek affects lek attendance and lek survival.
- The authors did not detect any impacts to male counts or lek survival with well densities of up to 1 well/640 acres.
- For Management Zone I, Well densities spanning 1.03-3.1 wells/640 acres experienced an 11.5% decline in the number of active leks and a 31.4% decline in number of males on remaining leks.
- For Management Zone II, well densities spanning 1.03-3.1 wells/640 acres experienced a 12.1% decline in the number of active leks and a 55.5% decline in number of males on remaining leks.

Harju et al. 2010 – Seven study areas in different parts of Wyoming involving a retrospective lek attendance and oil and gas development analysis.

- Leks with at least one well within a 0.4 km (0.25-mile) radius had 35-91% fewer attending males compared to leks that lacked any wells within that radius.
- In two of five project areas, negative effects of well surface occupancy was detectable out to 4.8 km (3 miles), which was the largest buffer tested.
- Analysis showed a general trend of declining male numbers with an increase in well pad densities.
- Negative impacts on male counts were first detectable at well pad densities as low as 2/640 acres on one project area, 1 /640 acres on one project area, and 0 to 1 well pad/640 acres on two project areas.
- Well pad densities of 4 /640 acres experienced male attendance that was 13-74% lower than leks that lacked well pads within 8.5. km. For those areas with a well pad density of 8/640 acres, male attendance at leks was 74-79% lower than leks that lacked well pads within 8.5 km (5.3 mi.).
- A time lag effect between the time of development and when it was detectable via male counts on leks ranged from 2-10 years.

Holloran et al. 2010 – Southwest Wyoming, investigated behavior of yearling male and female sage-grouse associated with natural gas development.

- Found leks that recruited more than the expected number of males were 2.1-2.9 times further from drilling rigs, producing wells, and main haul roads compared with leks that recruited fewer males than expected.
- Radiomarked males were 4.6 times more likely to establish on leks outside of developed areas.
- Treatment yearling males (with natal brooding areas—a radius of 1.65 km of nest site of origin—that had greater than 1 producing well pad or greater than 1 km of main haul road) were 50% less likely to establish a breeding territory compared to control yearling males.
- Annual survival of treatment yearling males associated with development areas (54%) was significantly lower than survival of yearling males that were reared outside of development (100%). In similar fashion, annual survival of treatment yearling females associated with development areas (69.4%) was significantly lower than survival of yearling females that were reared outside of development (100%).
- Concluded that yearling dispersal distances suggest the need to "manage landscapes where sagebrush-dominated regions within those landscapes remain undeveloped for sage-grouse."

Johnson et al 2011 – range-wide analysis of leks associated with a variety of anthropogenic features.

- Measured lek trends at 3 scales and found that trends of leks within 5 km (3.1 mi.) of a producing oil or natural gas well were depressed. Trends were also lower on leks with more than 10 producing wells within 5 km (3.1 mi) or more than 160 wells within 18 km (11.2 mi.) of the lek.
- Found that a density of more than one producing well/6.4 km^2 (1 well/2.5mi^2) within 18 km (11.2 mi) of leks negatively influences lek count trends.
- Declines in lek trends occurred across a Management Zones if the median human footprint score >3 regardless of the activities that contributed to the score.
- Found length of pipeline within 5-km of lek negatively influences lek count trends
- Effect of power lines on lek trends not detected

Knick et al. 2013 – minimum requirements for distribution of greater sage-grouse leks

- Found that sagebrush land cover within 5 km of the lek averaged 79% at currently occupied leks, 28% at historic but no longer occupied leks, and 35% throughout study area
- Found <2% of the leks were in areas surrounded by >25% agriculture within a 5-km radius, and 93% by <10% agriculture.
- 99% of active leks were in landscapes with <3% developed; all lands surround leks were <14% developed.
- 93% of active leks fell below 0.01 km/km^2 densities of interstate highways
- Highest habitat suitability had pipeline densities <0.01 km/km^2 and power line densities <0.06 km/km^2
- Leks were absent from areas where power lines densities exceeded 0.20km/km^2, pipeline densities exceeded 0.47 km/km^2 or communication towers exceeded 0.08 km/km^2.

Copeland et al. 2013 – measuring efficacy of sage-grouse conservation in Wyoming

- Predict WY's core area strategy plus $250 mil in targeted conservation easements reduces sage-grouse population declines from 14-29% (no conservation measures) to 9-15% (with conservation measures). This cuts anticipated losses by roughly 1/2 statewide and nearly 2/3 within sage-grouse core breeding areas.

LeBeau 2012 – wind energy in Wyoming

- Nest and brood survival negatively affected within 3 miles of wind turbines
- No effect of wind energy on female survival
- Sage-grouse selected brood habitat closer to wind facilities

Hagen et al. 2011 – lesser prairie chickens, southwestern Kansas

- Avoided power lines up to 0.45 miles
- Documented prairie chicken collisions with power lines

Ellis 1985

- Power lines influenced increased predation and sage-grouse dispersal to 0.75 miles

Summary: Impacts of anthropogenic activities on sage-grouse can vary depending on activity and local habitat conditions but cumulative impacts of multiple activities can have significant, negative impacts on sage-grouse populations. Oil and gas well densities commonly permitted in Montana and Wyoming can severely impact sage-grouse breeding populations (Naugle et al. 2011). A number of studies involving both radio-equipped birds and regional and range-wide lek analyses report declining trends of male counts where leks are associated with oil and gas developments. These associations varied by density and nearness of lek. Densities as low as 1 well/6.4 km^2 (1 well/2.5 $mi.^2$) showed negative impacts on male counts. Four studies reported declines in lek male counts associated with oil and gas development that were detectable at development distances of more than 6 km (3.8 mi.) from the lek. As development densities increase and encroach closer to leks, the impact in population trends is more severe. Drilling rigs, haul roads, and producing wells were all found to have impacts on male attendance and lek persistence. Lag times between onset of development and population response averaged 4 years but extended out to 10 years. This lag time is explained in large part by annually returning adult males (as long as they survive) but yearling males associated with gas development experienced lower survival and moved to leks outside of development areas to establish a breeding territory. Yearling females raised in the vicinity of producing wells or main haul roads also showed significantly lower survival, directly affecting annual population recruitment and trends. Current well pad placement restrictions that allow development as close as 0.4 km (0.25 mi.) of a lek are wholly inadequate for effectively conserving sage-grouse. Landscape scale set asides or incremental development that leaves large habitat expanses undeveloped may be most appropriate for assuring long term sage-grouse viability.

Sage-Grouse Nesting and Brood Rearing

Holloran and Anderson 2005, Holloran 2005 - western WY:

- Sage-grouse nest locations are spatially related to lek locations and a 5 km (3.1 mi.) buffer included 64% of known nests. Moynahan’s (2004) work in north central MT supports this finding.
- The substantial number of females nesting > 5 km (3.1 mi.) from a lek could be important for population viability.
- Observed lek to nest distances was not related to lek size.
- Successful nests were generally located further from leks than destroyed nests.
- Nests located $\leq$ 1 km (0.6 mi.) from another known nest tended to have lower success probabilities.
- Nesting females strongly avoided areas with high well densities but adult females can exhibit strong nest site fidelity. Mean annual survival rates for females suggest that 5 to 9 years may be required to realize ultimate nesting population response to development activities.
- Nest and brood survival probabilities were found to be higher within developed areas but those benefits were overridden by lower hen survival rates within developed areas.
- Sage-grouse population decline in developed areas were best explained when comparing nest success and hen survival pre and post-development, which revealed lower nest survival and lower annual survival of female sage-grouse post-development.

Lyon and Anderson 2003 – western WY

- Female sage-grouse disturbed by natural gas development during the breeding season had lower nest initiation rates.

Schroeder and Robb 2003 – north central WA

- Nest distribution patterns may change as a result of habitat alteration and fragmentation and the 5 km (3.1 mi.) buffer should be considered relevant only for contiguous sagebrush habitats.

Aldridge and Boyce 2007 - southeast AB

- Sage-grouse chick survival decreased as well densities increased within 1 km (0.6 mi.) of brooding locations. These brood-rearing areas acted as habitat sinks where recruitment was poor.
- Low nest success (39%) and low brood survival (12%) characterized sage-grouse vital rates in habitat fragmented by energy development in southern Alberta.

Tack 2009 – northern Valley County and southern Saskatchewan

- Average distance from lek of capture to nest site was 5.3 km. Seventy-five and 95% of nests were within 6.8 and 12.3 km (4.3 and 7.7 mi.) of lek of capture, respectively.

Holloran et al. 2010 – Southwest Wyoming, investigated behavior of yearling male and female sage-grouse associated with natural gas development.

- Yearling females avoided nesting within 950m (0.6 mi.) of infrastructure, regardless of whether they were reared in the vicinity of development or not.

Summary: Female sage-grouse are spatially grouped around a lek or lek complex during the nesting season. Females tend to move away from leks in selecting nest locations and to an extent, those movements appear to improve their rates of nest success. However, females in developed habitat moved twice as far as females in undisturbed habitat and exhibited lower rates of nest initiation. Females also select nest locations that segregate their nests from those of adjacent hens and the probability of successfully hatching those nests increases when that distance is $\geq$1 km. When females have suitable and contiguous nesting habitat to select from, slightly over 60% of nests occur within 5 km (3.1 mi.) of the lek. This strategy of mutual avoidance reduces nest densities and therefore reduces probability of detection by nest predators. However, land use practices that fragment sagebrush habitat and reduce the amount of suitable nesting cover may lead to increased densities of nesting birds and lower rates of nest success. Even if 5 km (3.1 mi.) buffers are employed around existing leks, increased development and production activity in the zone beyond that buffer will impact the remaining 40% of nesting hens and potentially compromise the success of those birds nesting within that 5 km buffer based on the density dependent factors noted above. Population declines associated with development are attributable to lower hen survival. Seasonal surface use restrictions within 2 miles (3.2 km) of an active lek during the breeding and nesting period (1 March – 15 June) are inadequate to maintain sage-grouse populations within developed habitat.

Sage-Grouse Winter Habitat Use

Doherty et al. 2008 – Powder River Basin (PRB) in Montana and Wyoming

- Researchers established a predictive winter habitat use model based on key habitat features that was strongly correlated with observed sage-grouse locations ($R^2 = 0.984$).
- Sage-grouse select for large intact and relatively flat expanses of sagebrush as winter habitat and avoid more rugged terrain and conifer habitat. Given that severe winter conditions (deep snow, low temperatures) could force birds into more rugged terrain, topographic variables should be considered in regions outside the PRB.
- After controlling for vegetation and topography, the addition of a variable quantifying the extent of energy development showed that sage-grouse avoid energy development in otherwise suitable habitat. Probabilities of use decrease by ≈30% at a 32 ha well spacing (80 acre spacing). Sage-grouse were 1.3 times more likely to use winter habitat if CBNG development were not present.
- The model classified only 13% of study area as high quality winter habitat (D.E. Naugle, University of Montana, unpublished data).
- Authors concluded that breeding season timing restrictions and quarter mile no surface development around leks are insufficient for preventing infrastructure and ongoing human activity associated with producing wells from displacing sage-grouse in winter.

Tack 2009 – northern Valley County and southern Saskatchewan

- All radio-collared individuals moved >20km in consecutive years to winter habitat

Smith 2013 – long-distance migration in sage-grouse

- Sage-grouse moved 240-km from breeding habitat in north-central Montana/southern Saskatchewan to winter habitat north of the Missouri River.
- Grouse migrated through gently rolling sagebrush flats (<5% slope), using native sagebrush rangeland in proportion to its availability, and avoiding cropland and badlands where food was scarce.

Summary: Sage-grouse use connected patches of relatively flat sagebrush for migration and winter habitat. Sage-grouse are sensitive to energy development associated with winter habitat. Recent advances in modeling efficiencies provide a tool to assess important winter habitat and the spatial relationship between known leks and potential winter habitat. Sage-grouse in this region can be nonmigratory when suitable seasonal habitats occur in reasonable juxtaposition while other population segments do migrate to more distant winter habitat. In some cases, these dissimilar distribution patterns may involve birds using the same lek complex or a shared winter range. Winter habitat should be conserved at an appropriate scale and with some knowledge of sage-grouse distribution patterns. Seasonal restrictions will not be effective at mitigating infrastructure development if the level of development is moderate to intense and overlays important winter habitat.

West Nile Virus

Zou et al. 2006; Walker et al. 2007b; Walker and Naugle 2011; Doherty 2007

- West Nile Virus (WNV) was documented as an important new source of mortality in lower and mid elevation populations across the range of sage-grouse from 2003-2007, affecting all sex and age classes.
- Local and regional population declines have been attributed to WNV outbreaks.
- Research shows that CBNG ponds pose a threat to sage-grouse because they provide habitat for mosquitoes that spread WNV. Larval *Cx. Tarsalis,* the species of mosquito that spreads the disease, were produced at similar rates in CBNG and natural sites, whereas CBNG ponds produced *Cx. tarsalis* over a longer time period compared to both agricultural and natural sites.
- CBNG ponds resulted in a 75% increase in potential breeding habitat for *Cx. Tarsalis*.

Summary: West Nile Virus should be considered endemic across the northern Great Plains portion of the range of greater sage-grouse. The presence of this disease has added another stressor to sage-grouse population dynamics. The prevalence of the disease and associated level of mortality in sage-grouse appears to vary considerably from year to year based on environmental conditions. However, CBNG ponds do provide a much more consistent set of conditions favorable to the spread of WNV even in years of low natural precipitation. Conservation actions need to consider the relationship between CBNG and WNV and attempt to mitigate those conditions favorable to WNV.

SYNTHESIS

- Recent research using different techniques across many representative parts of the eastern range of sage-grouse has reached similar conclusions about the sensitivity of sage-grouse to anthropogenic disturbances, including conversion to cropland agriculture and oil and gas development. Sage-grouse avoid energy development during both breeding and wintering seasons and do so at scales that render current protective stipulations (e.g., 0.25 mile no surface occupancy buffers) ineffective. A new conservation strategy will be necessary to balance effective sage-grouse conservation with anthropogenic stressors.
- A conservation strategy that focuses on maintaining and enhancing existing sagebrush habitat and minimizing new disturbance will likely be the most effective for sage-grouse.
- A common theme among recent research is the level of impact to sage-grouse relative to placement of developments, density of developments, extent of developments, and level of activity associated with developments.
- Research on wind energy is currently inconclusive. The recent development of wind energy in sage-grouse habitats and lag effect of possible population responses may mask longer term population impacts (Knick et al 2011).

However, human activity, roads, traffic, power lines, visual obstruction, noises, and other factors may result in responses by sage-grouse similar to that found with oil and gas developments.

- Effective sage-grouse habitat conservation must be implemented in a landscape context (Doherty et al. 2011).
- Naugle et al. (2011) characterized different approaches for achieving conservation and energy development based on biological and energy values. Those areas of high biological value but low energy value should be immediately conserved. Those areas of high biological value and high energy value will need to reform policies to reduce threats. And, those areas of lower biological value but high energy potential can emphasize development as the higher priority over conservation.
- Significant fragmentation of habitat and associated loss of populations within the Powder River Basin and other areas in Management Zones 1 and 2, could have status implications to the species within the Great Plains portion of the species' range.
- Implementation of Wyoming's Core Area policy and targeted conservation easements are predicted to reduce sage-grouse population losses but are not expected not to stop population declines completely (Copeland et al. 2013).

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APPENDIX H: Minority Committee Reports

Minority Committee Report for
MITIGATION STANDARD
Greater Sage-Grouse Habitat Conservation Strategy

This Minority Committee Report on the Mitigation Standards found in the *Montana Greater Sage-Grouse Habitat Conservation Strategy* (*Montana Strategy*) was written because the final standard adopted was adopted "on the fly," and it may have unintended consequences for sage-grouse conservation.

As background, on December 18, 2013, the Council established a subcommittee to address how disturbances to sage-grouse habitat should be handled in terms of avoidance, minimization, and mitigation issues. The subcommittee was asked to review related public comments on the Draft *Montana Strategy*, including extensive comments by the U.S. Fish and Wildlife Service (Service), and make recommendations to the Governor's Greater Sage-Grouse Habitat Advisory Council (Council) on how these provisions should be modified. This subcommittee presented its recommendations to the Council on January 14, 2014, one of the last days the Council met. In discussions regarding the subcommittee recommendations, the Council revised the mitigation provisions. After further review of this section, it appears that the Council may have weakened the mitigation provisions, perhaps unintentionally.

A recommended change to the Mitigation Standard, with justification, is provided below.

APPROVED LANGUAGE. The Council included the following recommendation for mitigation in the *Montana Strategy*:

General Provisions, Page 9, Item 7:
New development or land uses requiring a permit or other authorizations within sage-grouse Core Areas should be authorized or conducted only when it can be reasonably demonstrated that the activity (factoring in mitigation) will not cause declines in Greater Sage-Grouse populations. Activities that exceed recommended stipulations may require compensatory mitigation (Section VIII).

Core Areas, Page 15, Item 1.c.:
Compensation for Impacts. If project impacts are unavoidable and core area stipulations cannot be met, mitigation measures shall be required, following the Mitigation Framework outlined in Section IX. Mitigation can include enhanced reclamation.

General Habitat, Page 33, Item 1.c.:
Compensation for Impacts. If project impacts are unavoidable and general stipulations cannot be met, mitigation measures may be required, following the Mitigation Framework outlined in Section IX.

RECOMMENDED CHANGE. A minority of the Council recommends the following changes to the *Montana Strategy*'s mitigation standard:

General Provisions, Page 9, Item 7:
New development or land uses requiring a permit or other authorizations within sage-grouse Core Areas should be authorized or conducted only when it can be reasonably demonstrated that the activity (factoring in mitigation) will not cause declines in Greater Sage-Grouse populations. Activities in Core Areas that ~~exceed~~ do not meet recommended stipulations ~~may~~ shall require compensatory mitigation (Section VIII).

Core Areas, Page 15, Item 1.c.:
Compensation for Impacts. If project impacts are unavoidable and core area stipulations cannot be met, mitigation measures shall be required, following the Mitigation Framework outlined in Section IX. In addition, if project impacts are unavoidable, their size has been minimized, Core Area stipulations have been followed, and

project impacts remain after reclamation, mitigation shall also be required following the Mitigation Framework outlined in Section IX. ~~Mitigation can include enhanced reclamation.~~

General Habitat, Page 33, Item 1.c.:
Compensation for Impacts. If project impacts are unavoidable and general stipulations cannot be met, mitigation measures may be required, following the Mitigation Framework outlined in Section IX. In addition, if project impacts are unavoidable and their size has been minimized, mitigation may also be required following the Mitigation Framework outlined in Section IX.

RATIONALE FOR RECOMMENDED CHANGE:

1. Based on comments on the Draft *Montana Strategy*, it was made clear that the Service wanted to see changes to the mitigation standard. They also specifically recommended that mitigation be required after avoidance, minimization, and reclamation. The Minority Committee's recommended change to the mitigation standard specifically addresses these issues. The Service made their request in December 9, 2013 comments on the Draft *Montana Strategy*:

Page 3: "The Strategy provides a mitigation section, but currently does not provide clear direction as to when compensatory mitigation for proposed surface disturbance activities would be required. We recommend that compensatory mitigation be required for all such projects that would result in direct, indirect, temporary, and permanent impacts to GSG [Greater Sage-Grouse] that would remain following application of avoidance, minimization, and reclamation / rectification such that neutral or positive GSG population trends and habitats would be maintained; particularly in core areas." (Service 2013b, page 3)

Page C4: "19). VI. Stipulations for Development, a) Core Area Stipulations, ii. Core Area – Specific Stipulations, p. 15: We recommend that the following overall concepts should apply to subsections 1-7:
1) Clear statement / enactment of an "avoidance first" approach to proposed surface disturbance activities to GSG habitat in core areas. The COT Report [Service 2013a] conservation objective for infrastructure, a widespread threat to most Montana GSG populations, is to avoid development of infrastructure within PACS (core areas). We recommend that such an "avoidance first" approach be enacted, and rationale be required by authorizing agencies as to why a given proposed surface disturbance to GSG habitat in core habitat is unavoidable. Clear, mandatory direction to adhere to (and document adherence to) the mitigation sequence in Section IX (avoid, minimize, reclaim, offset) should be provided.

2) Clear direction as to when compensatory mitigation for proposed surface disturbance activities would be required. We recommend that compensatory mitigation be required for all such projects that would result in direct, indirect, temporary, and permanent impacts to GSG that would remain following application of avoidance, minimization, and reclamation / rectification such that neutral or positive GSG population trends and habitats would be maintained. In the absence of a project-level effects analysis, approved projects that do not comply with Strategy stipulations should be subject to compensatory mitigation. We generally recommend mitigation implementation in advance of impacts; advance (functionality demonstrated by GSG use) compensatory mitigation to offset any approved proposed disturbance to suitable habitat in core areas that would exceed the 5% disturbance threshold should be required in all cases. All proposed compensatory mitigation should be subject to MSGOT review. Please also see Comments 55 and 56 regarding mitigation." (Service 2013b, page C4)

2. The Service specifically recommended no mitigation requirement when Core Area/ general habitat stipulations were not being met; instead, the Service recommended that permits should be denied when stipulations are not met. Subsequently, changes made on January 14, 2014 to the *Montana Strategy* appear to run contrary to the Service recommendation. Because the Council did not specifically discuss this issue while they were making conceptual amendments to the document on January 14, this result may have been done unintentionally. That said, the intentions of the Service were clear in their letter on the Draft *Montana Strategy*:

The Service commented about the stipulation found in Item #7, page 8 of the Draft *Montana Strategy* that stated, "*Activities that exceed recommended stipulations may require compensatory mitigation.*" The Service wrote about this stipulation: "This implies that proposed activities are not necessarily required to comply with the stipulations, and in that case compensatory mitigation only "may" be required. The Strategy should clearly convey that activities proposing to exceed the stipulations should, in the normal course of business, first be modified such that they meet the stipulations, or disallowed. Compensatory mitigation should be required for impacts remaining following application of avoidance, minimization, and rectification/reclamation measures. For projects that may be allowed to exceed stipulations on a case-by-case, site-specific basis, compensatory mitigation commensurate with the impacts should be required and subject to review by the MSGOT." (Service 2013b, page C2)

3. If mitigation is only required when Core Area/ general habitat stipulations are not met, then project sponsors may be able to develop mitigation projects that allow them to build whatever they want, wherever they want to build it, even in critical sage-grouse habitat. The stipulations found in the *Montana Strategy* were designed to minimize habitat fragmentation. If these stipulations can be avoided, as the current mitigation standard suggests, sage-grouse habitat is more likely to become fragmented. Once lost, sage-grouse habitat is difficult—if not impossible—to recover: The following studies and professional opinions support this statement:

- "…Braun (1998) reported recovery of populations in Montana, Wyoming, and Colorado may occur after initial development and subsequent reclamation of mine sites, ***although populations do not recover to pre-development sizes*** [emphasis added]. Additionally, population re-establishment may take as long as 30 years (Braun, 1998)." (Manier et al. 2013)

- "Sage-grouse populations can be significantly reduced, and in some cases locally extirpated, by non-renewable energy development activities, even when mitigative measures are implemented (Walker et al. 2007)." (Service 2013a)

- "Success is not guaranteed when conducting Greater Sage-Grouse habitat restoration projects in semiarid environments. The only guarantee is that annual weather conditions can vary widely and these often dictate success of restoration projects" (Pyke 2011, p. 544).

- "Grasses and forbs may respond within 1 to 3 years if soils and seed sources permit recovery or restoration, but return to a shrub-dominated community often requires > 20–30 years, and landscape restoration may require centuries or longer (Hemstrom et al. 2002). Even longer periods may be required for sage-grouse to use recovered or restored landscapes." (Knick et al. 2011, p. 251)

- "Due to the long period of time (years to decades) required to restore sagebrush habitat upon which sage-grouse depend and because of the uncertainty involved in the successful in-kind mitigation for any loss of sage-grouse habitat within Core Areas, both in quantity and quality, sage-grouse habitat within Core Areas with few exceptions will be considered irreplaceable (per ODFW Mitigation Policy." (Oregon Department of Fish and Wildlife 2012)

4. Sage-grouse exhibit high site fidelity, using the same leks and general breeding areas year-after-year. Colonization rates of new areas, even if suitable habitat exists, are relatively low. Therefore, it is more important to conserve existing sage-grouse habitat than to attempt to replace losses elsewhere through off-set mitigation. A strategy that allowed for off-site mitigation without first maximizing conservation on-site would not conserve sage-grouse populations adequately. The following studies and professional opinions support this statement:
"Sage-grouse exhibit strong site fidelity (loyalty to a particular area) to seasonal habitats (i.e., breeding, nesting, brood rearing, and wintering areas) (Connelly et al. 2004; Connelly et al. 2011a). Adult sage-grouse rarely switch from these habitats once they have been selected, limiting their ability to respond to changes in their local environments (Schroeder et al. 1999)." (Service 2013a)

- "Importantly, sage-grouse have demonstrated strong site fidelity suggesting resistance of individuals to adjust to changing habitat conditions (Berry and Eng, 1985; Fischer and others, 1993; Schroeder and Robb, 2003; Holloran and Anderson, 2005; Moynahan and others, 2007; Baxter and others, 2008; Doherty and others, 2010a; Holloran and others, 2010)." (Manier et al. 2013)

- "High site fidelity but low survival of adult sage-grouse combined with lek avoidance by yearlings [11] resulted in a time-lag of 3–4 years between the onset of energy development and lek loss [30]. The time-lag observed by Holloran [30] in conventional gas fields in southwest Wyoming matched that for leks that became inactive 3–4 years following coal-bed natural gas development in northeast Wyoming [19]." (Doherty et al. 2010)

- "Maintaining a local population of birds may increase the chance for a successful restoration because strong site fidelity hinders re-colonization from more distant sites and past precedence shows that translocations, while problematic, are more apt to succeed in areas with resident populations (Reese and Connelly 1997, Baxter et al. 2008)." (Taylor et al. 2012)

5. And finally, because the Montana Strategy has a 5% cap on anthropogenic disturbances within Core Areas, development projects should utilize the tools of avoidance, minimization, restoration, and mitigation to keep disturbances below this threshold. If this process is successfully done, economic development projects and sage-grouse conservation should be able to co-exist for the long-term.

MINORITY REPORT SUBMITTED BY:
Janet Ellis, Jay Gore, and Carl Wambolt

DATE: 1-24-2014

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Minority Committee Report for
NOISE STANDARD
Greater Sage-Grouse Habitat Conservation Strategy

This Minority Committee Report on the Noise Standard found in the *Montana Greater Sage-Grouse Habitat Conservation Strategy* (*Montana Strategy*) for Core Areas and General Habitat was written because the final standard adopted is not science-based.

As background, between August 2013 and January 14, 2014, the noise standard found in the Draft *Montana Strategy* was similar to that found in other states (10 decibels above ambient noise), including Wyoming (State of Wyoming 2012). However, after learning that Wyoming is currently re-examining its noise standard because they have had problems implementing their current standard, and in response to some public comment, a majority of the Governor's Greater Sage-Grouse Habitat Council (Council) voted on January 15, 2014 to change the Montana standard to one that is not based in science—and is likely detrimental to this species. Because the objective of the *Montana Strategy* is to show the U.S. Fish & Wildlife Service (Service) that Montana has a science-based plan that will lead to sage-grouse conservation, several committee members believe that it is important for the Governor to change this standard.

A recommended change to the Noise Standard, with justification, is provided below.

APPROVED LANGUAGE. The Council included the following recommendation for managing noise in the *Montana Strategy*:

Core Area Basic Stipulations, Page 16, Item 5:
Noise: New noise levels, at the perimeter of a lek, should not exceed 40 dBA above ambient noise (existing activity included) from 6:00 pm to 8:00 am during the breeding season (March 15 – July 15) with the exception of those sites identified under Special Management Core Areas. Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise. The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.

General Habitat Stipulations, Page 34, Item 5:
Noise: New noise levels, at the perimeter of a lek, should not exceed 40 dBA above ambient noise (existing activity included) from 6:00 pm to 8:00 am during the breeding season (March 15 – July 15). Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise. The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.

RECOMMENDED CHANGE. A minority of the Council recommends the following changes to the *Montana Strategy*'s noise standard, which has a basis in science:

Core Area Basic Stipulations, Page 16, Item 5:
Noise: New noise levels, at the perimeter of a lek, should not exceed 40 dBA ~~above ambient noise~~ (existing activity included) from 6:00 pm to 8:00 am during the breeding season (March 15 – July 15) with the exception of those sites identified under Special Management Core Areas. ~~Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise.~~ The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.

General Habitat Stipulations, Page 34, Item 5:
Noise: New noise levels, at the perimeter of a lek, should not exceed 40 dBA ~~above ambient noise~~ (existing activity included) from 6:00 pm to 8:00 am during the breeding season (March 15 – July 15). ~~Ambient noise levels should be determined by measurements taken at the perimeter of a lek at sunrise.~~ The MSGOT should follow Wyoming's review and litigation discussion of this stipulation and amend the strategy accordingly.

RATIONALE FOR RECOMMENDED CHANGE:

1. It is recommended that the reference to ambient noise be removed. This portion of the standard is difficult and expensive to measure. It also appears to be problematic for agencies trying to base their management on this measurement. The following professional opinions support these statements:

- "In addition, collecting measurements of ambient noise levels in quiet areas is extremely challenging and requires expensive, specialized equipment; this makes the requirement to collect ambient values at each lek difficult to implement. Unfortunately, non-ideal weather (especially wind, even at low levels) and almost all errors by the person deploying the noise meter (e.g. poor placement of the meter for long-term deployment, rustling from clothing, crunching leaves underfoot and even breathing close to the meter when handheld) will inflate ambient measures." (Patricelli et al. 2012)

- '…[W]e suggest that it is not feasible or practical to establish baseline noise levels by having agency personnel or consultants with little specialized training measure ambient at each lek prior to development." (Patricelli et al. 2012)

2. The noise standard currently found in the *Montana Strategy* is 60 (+) decibels (dBA). This number is estimated based on ambient noise levels predicted to be approximately 20 - 22 dBA in rural sagebrush habitats, and the *Montana Strategy's* recommendation of "40 dBA above ambient noise" (40 dBA + 20 dBA for ambient noise = 60 (+) dBA). This standard is not scientifically defensible. The following studies and professional opinions support these statements:

- "Based on our review of reports and empirical measurements collected in Wyoming, we estimate that true ambient values pre-development in nights and calm morning in sagebrush habitat are closer to 20-22 dBA…" (Patricelli et al, 2012)

- "Indeed, results from our experiments indicate that <u>49 dBA is too loud to avoid significant impacts on sage-grouse</u> [*emphasis added*]. Our noise-playback leks (described above, Blickley et al. 2012) experienced levels that were in compliance these recommendations, i.e. less than 49 dBA across most of the lek area, except the area within ~20 meters of the speakers. Yet we found large declines in attendance, increases in stress levels and altered display behaviors across the lek (Blickley et al. in review, in prep)." (Patricelli et al, 2012)

- "Male attendance at leks would be expected to be reduced when subjected to the current standard noise limitation of 50 decibels at the lek site. Despite the protective measures used to prevent impacts from projects in sage-grouse habitat, there would be no restrictions on the total amount of habitat that could be disturbed and declines in abundance and lek losses would be expected." (BLM 2013)

- Even the State of Montana's 2005 *Management Plan and Conservation Strategies for Sage Grouse in Montana* recommended not exceeding 49 dBA:
  "Noise can disrupt breeding rituals and cause abandonment of leks.
  1) Restrict noise levels from production facilities to 49 decibels (10 dba above background noise at the lek)[1]
  2) Restrict use of heavy equipment that exceeds 49 decibels[1] within 2 miles of a lek from 4 a.m.-8 a.m. and 7 p.m. - 10 p.m. during March 1-June 15…" (Montana Sage Grouse Working Group 2005)

  [1]When the 2005 Montana Plan was written, ambient noise levels were estimated to be 39 dBA; studies done recently show that ambient noise in rural sagebrush habitat is 20 – 22 dBA.

2. Although the science is changing, 40 decibel (dBA) can be defended by at least some scientific studies. The following studies and professional opinions support these statements:

- "However, there is recent science that demonstrates the effects of noise on sage-grouse breeding behavior (Crompton and Dean 2005, Holloran 2005, Blickley and Patricelli *in press*). In brief, sound levels >40 decibels (dbA) reduced breeding activity and increased stress levels (as measured by hormone levels) in sage-grouse (Blickley and Patricelli in press)." (Oregon Department of Fish and Wildlife 2012)

4. It is important to change this standard and make it science-based because it has been well established that Greater Sage-Grouse are negatively impacted by noise, avoiding areas where anthropogenic noise from roads, oil and gas development and infrastructure, compressor stations, and more, exist on the landscape. Noise, therefore, is considered a type of habitat fragmentation for these birds. The following studies and professional opinions support these statements:

- "Functional habitat loss also contributes to habitat fragmentation, as greater sage-grouse avoid areas due to human activities, including noise, even though sagebrush remains intact (Blickley et al. 2012)." (Service 2013)

- "…[C]hanges in the number of males occupying leks situated downwind of drilling rigs were more negative than those witnessed on leks upwind of drilling rigs, supporting evidence that increased noise intensity negatively influences male lek attendance (Holloran, 2005)." (Manier et al. 2013)

- "Noise can disrupt breeding rituals and cause abandonment of leks." (Montana Sage Grouse Working Group 2005)

- "Our results suggest that males and possibly females avoid leks exposed to anthropogenic noise." (Blickley et al. 2012a)

- "Taken together, results from Blickley et al. [43] and this study suggest that noise alone can cause greater sage-grouse to avoid otherwise suitable habitat and increase the stress responses of birds that remain in noisy areas. Thus, noise mitigation may be a fruitful conservation measure for this species of concern." (Blickley et al. 2012b)

MINORITY REPORT SUBMITTED BY:
Janet Ellis, Jay Gore, and Carl Wambolt

DATE: 1-24-2014

REFERENCES:

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Patricelli, G., J. Blickley, and S. Hooper. 2012. The impacts of noise on greater sage-grouse: a discussion of current stipulations in Wyoming with suggestions for further research and interim stipulations. Prepared for: The Bureau of Land Management, Lander Field Office and Wyoming State Office, Cheyenne and Wyoming Game and Fish Department.

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Minority Committee Report for
BENTONITE, PEAT, SOCRIA, AND SAND & GRAVEL STANDARD
Greater Sage-Grouse Habitat Conservation Strategy

This Minority Committee Report on the Bentonite, Peat, Scoria, and Sand & Gravel Standard found in the *Montana Greater Sage-Grouse Habitat Conservation Strategy* (*Montana Strategy*) was written because the Governor's Greater Sage-Grouse Habitat Advisory Council (Council) adopted this 2-1/2 page standard—all new material that the Council had not reviewed—late on its last meeting day. This new standard was developed and promoted by industry, with no ability for Council members to ask questions of regulators to confirm statements being made. The specifics of the standard may add conservation protection to sage-grouse habitat—or it may just solidify "business as usual," with no new requirements being placed on these industries. Because of the last minute and expedited way this standard was adopted, the Council members writing this Minority Committee Report were not able to ascertain the ramifications of the standard. Therefore, we decided to write this Minority Committee Report to the Governor, essentially "flagging" this item for increased scrutiny.

As background, on December 18, 2013, the Council established a coal subcommittee to review coal-related public comments on the Draft *Montana Strategy* and make recommendations to the Council on how these standards could be improved. This subcommittee worked hard with industry representatives and agency personnel to determine what provisions of state and federal law relating to coal should be added to the *Montana Strategy*. After a thorough review of the coal standards within the *Montana Strategy*, including a presentation by the Montana Department of Environmental Quality overseeing this program, the Council adopted the new coal standards found in the plan. Then, on the last day of our Council's meetings, late in the afternoon, the Council received a new proposal from the bentonite industry, which also applied to peat, scoria, and sand & gravel mining. This proposal closely paralleled the coal provisions already adopted, applying similar standards to these other mining sectors.

APPROVED LANGUAGE: The Bentonite, Scoria, Peat, Sand and Gravel Mining standards can be found in the *Montana Strategy* in the following locations:

- For Core Areas: pages 23 – 26, Item 6
- For General Habitat: pages 38 – 42, Item 10

RATIONALE FOR ADDITIONAL SCRUTINY OF THIS STANDARD:

Although the Council was assured that the regulatory framework that applies to the coal industry was nearly identical to the regulatory framework for the bentonite, peat, scoria, and sand & gravel industries, there were no agency personnel available to confirm this statement. In addition, one fundamental difference exists between the regulatory framework for coal and the framework for these other mining industries: coal has a significant federal law, the Surface Mining Control and Reclamation Act (SMCRA), that sets minimum standards that the state's Montana Strip and Underground Mine Reclamation Act (MSUMRA) cannot go below. There is no federal minimum standard set for bentonite, peat, scoria, and sand & gravel. Therefore, there is less assurance that strong standards that are in rule and statute today will be there long-term.

Although the Montana Strategy's stipulations for bentonite, peat, scoria, and sand & gravel might be acceptable, we have no way to confirm that. Therefore, we wanted to request that the Governor's office review this new section and make sure that it adequately protects sage-grouse.

This request is not made lightly. At least for the bentonite and sand & gravel sectors, agencies are aware of their potential impacts to sage-grouse:

> "Other forms of mining (for example, bentonite, gravel, potash, and trona) can also influence sage-grouse habitats. The magnitude of the impacts of mining activities on sage-grouse and sagebrush habitats is largely unknown (Braun, 1998), but mining of various Federal mineral resources (locatable and saleable) currently affects approximately 3.6 percent of potential sage-grouse habitat directly (across all MZs [Management Zones]) with indirect effects potentially affecting large portions (5–32 percent) of some MZs (table 17A). In addition, existing leases for

development of non-energy, leasable minerals represent a relatively small threat (spatially) but may ultimately be developed to their full, spatial extent based on existing agreements (table 17B).

Development of surface mines and associated infrastructure (such as, roads and power lines), noise, and human activity may negatively impact sage-grouse numbers in the short term (Braun, 1998), and a variety of mineral claims could result in industrial activities that would disrupt the habitat and life-cycle of sage-grouse (fig. 24). The number of displaying sage-grouse on 2 leks within 2 km (1.25 mi) of active mines in northern Colorado declined by approximately 94 percent during a 5-year period following an increase in mining activity (Remington and Braun, 1991). However, Braun (1998) reported recovery of populations in Montana, Wyoming, and Colorado may occur after initial development and subsequent reclamation of mine sites, ***although populations do not recover to pre-development sizes*** [emphasis added]. Additionally, population re-establishment may take as long as 30 years (Braun, 1998)." (Manier et al. 2013)

MINORITY REPORT SUBMITTED BY:
Janet Ellis, Jay Gore and Carl Wambolt

DATE: 1-24-2014

REFERENCE:

Manier, D.J., Wood, D.J.A., Bowen, Z.H., Donovan, R.M., Holloran, M.J., Juliusson, L.M., Mayne, K.S., Oyler- McCance, S.J., Quamen, F.R., Saher, D.J., and Titolo, A.J., 2013, Summary of science, activities, programs, and policies that influence the rangewide conservation of Greater Sage-Grouse (*Centrocercus urophasianus*): U.S. Geological Survey Open-File Report 2013–1098, 170 pp., http://pubs.usgs.gov/of/2013/1098/.

Minority Committee Report for
NO SURFACE OCCUPANCY STANDARD IN GENERAL HABITAT
Greater Sage-Grouse Habitat Conservation Strategy

This Minority Committee Report on the general habitat No Surface Occupancy (NSO) standard found in the *Montana Greater Sage-Grouse Habitat Conservation Strategy* (*Montana Strategy*) was written because the final standard adopted is not science-based.

As background, the U.S. Fish & Wildlife Service (Service) first pointed out the inadequacies of the general habitat NSO standard in informal comments submitted to the Governor's Greater Sage-Grouse Habitat Advisory Council (Council) on September 24, 2013. Previous to that, Montana Fish, Wildlife & Parks (FWP) had given the Council a handout summarizing the scientific literature behind various standards, including the NSO, dated July 29, 2013; that handout specifically concluded that, "development[s] as close as 0.4 km (0.25 mi.) of a lek are wholly inadequate for effectively conserving sage-grouse" (FWP 2013). Despite this information, the Council voted to retain the 0.25-mile standard at its January 15, 2014 meeting.

It is particularly important to change the general habitat NSO standard found in the Draft *Montana Strategy* because of the differences between the sage-grouse strategies in Montana and Wyoming. The 0.25-mile standard is nearly identical to that found in Wyoming (State of Wyoming 2012). However, Wyoming has the ability to deliver more conservation protections to sage-grouse from its Core Area stipulations (relying less on general habitat) for the reasons described below. In contrast, the *Montana Strategy* must depend more significantly on general habitat for conservation of sage-grouse populations.

Because the objective of the *Montana Strategy* is to show the U.S. Fish & Wildlife Service (SERVICE) that Montana has a science-based plan that will lead to sage-grouse conservation, several committee members believe that it is important for the Governor to change this standard.

A recommended change to the general habitat NSO Standard, with justification, is provided below.

APPROVED LANGUAGE. The Council included the following recommendation for managing NSO in the *Montana Strategy*:

General Habitat Stipulations, Page 32, Item 2:
Surface Occupancy: Within 0.25 miles of the perimeter of an active sage-grouse lek there will be no surface occupancy (NSO).

RECOMMENDED CHANGE. A minority of the Council recommends the following changes to the *Montana Strategy*'s NSO standard, which has a basis in science:

General Habitat Stipulations, Page 32, Item 2:
Surface Occupancy: Within ~~0.25~~ 1.0 miles of the perimeter of an active sage-grouse lek there will be no surface occupancy (NSO).

RATIONALE FOR RECOMMENDED CHANGE:

1. The general habitat No Surface Occupancy (NSO) standard for Greater Sage-Grouse (GSG) leks currently found in the *Montana Strategy* is 0.25 miles. This standard is not scientifically defensible. The following studies and professional opinions support these statements:

- "Current well pad placement restrictions that allow development as close as 0.4 km (0.25 mi.) of a lek are wholly inadequate for effectively conserving sage-grouse. (FWP 2013)

- "In the context of this [Montana] Strategy, the proposed 0.25-mile NSO from active GSG leks in general habitat is inadequate to achieve GSG lek protection. This measure was decreased from the originally proposed 0.6 mile NSO in the pre-draft Strategy. Studies demonstrating the inadequacy of this measure include Holloran (2005), who found that development stipulations including a 0.25-mile NSO were inadequate to maintain GSG breeding populations in natural gas fields. Walker et al. (2007) found that lease stipulations that prohibit development within 0.4 km (0.25 mi) of GSG leks on federal lands were inadequate to ensure lek persistence and may result in impacts to breeding populations over larger areas. Harju et al. (2010) found that leks with ≥1 oil or gas well within a 0.4-km (0.25-mile) radius encircling the lek had 35–91% fewer attending males than leks with no well within this radius." (SERVICE 2013b, page C10)

- "Government imposed stipulations often restricted surface occupancy within 0.4 km (0.25 mi) of a lek during the time most studies were conducted, and leks that had ≥1 pad within this radius had 35 to 92 percent fewer attending males than did leks with zero wells within this distance (Harju and others, 2010; Naugle and others, 2011)." (Manier et al. 2013)

- "Surface occupancy of oil or gas wells adjacent to leks was negatively associated with male lek attendance in 5 of 7 study areas. For example, leks that had ≥1 oil or gas well within a 0.4-km (0.25-mile) radius encircling the lek had 35–91% fewer attending males than leks with no well within this radius." (Harju et al. 2010)

2. Although the science indicates a 4.0-mile NSO would have little to no impact on sage-grouse, an NSO of 1.0 mile for general habitat can be defended by at least some research. The following studies and professional opinions support this statement:

- "As we conveyed in our September 24, 2013 informal written comments, numerous recent studies (please again refer to the July 29, 2013 technical literature summary handout provided to the Council by FWP) document a large percent of nesting, as well as adverse effects of development, out to approximately 4 miles from leks. We recommend that the general habitat NSO be increased from 0.25 mile to the extent possible to minimize potential impacts to nesting habitat and breeding activities in general habitat and add conservation benefit to the Strategy. We recommend that the general habitat NSO match the core habitat NSO of 1 mile, but at a minimum extend to 0.6 mile in order to have any discernible effect. The increased NSO should apply consistently throughout the plan where referenced." (SERVICE 2013b, page C10)

- "…Coates et al. [2013] research shows the percentage of estimated animal use area (vUD) encompassed by increasing distances from the lek. The vUD can be loosely interpreted as the total area used by sage-grouse in this population. The authors report that at 0.25, 0.60, and 3 mile distances from lek, approximately 5%, 28%, and 90%, of the total area used by sage-grouse is encompassed, respectively. The graph suggests that at 1 mile from the lek, approximately 50-60% of the total area used by sage-grouse is encompassed." (MFWP 2014)

3. It is important to change this standard and make it science-based because it has been well established that sage-grouse are significantly impacted by disturbances. The following professional opinion supports this statement:

- "The loss and fragmentation of sagebrush habitats is a primary cause of the decline of sage-grouse populations (Patterson 1952; Connelly and Braun 1997; Braun 1998; Johnson and Braun 1999; Connelly et al. 2000; Miller and Eddleman 2000; Schroeder and Baydack 2001; Johnsgard 2002; Aldridge and Brigham 2003; Beck et al. 2003; Pedersen et al. 2003; Connelly et al. 2004; Schroeder et al. 2004; Leu and Hanser 2011; 75 FR 13910). Habitat fragmentation, largely a result of human activities, can result in reductions in lek persistence, lek attendance, population recruitment, yearling and adult annual survival, female nest site selection, nest initiation, and complete loss of leks and winter habitat (Holloran 2005; Aldridge and Boyce 2007; Walker et al. 2007; Doherty et al. 2008). Functional habitat loss also contributes to habitat fragmentation, as greater sage-grouse avoid areas due to human activities, including noise, even though sagebrush remains intact (Blickley et al. 2012)." (SERVICE 2013a)

4. This standard should be changed because in Montana general habitat plays a larger role in sage-grouse conservation than in Wyoming because of the proportion of sage-grouse population occurring in Core Areas. The following information in support of this statement was obtained from presentations given to the Governor's Greater Sage-Grouse Habitat Advisory Council:

- In Montana, Core Areas only contain approximately 76% of the state's sage-grouse population; while Core Areas in Wyoming protect 84% of the sage-grouse population. Because Core Area stipulations are much more protective of sage-grouse than general habitat stipulations, Wyoming protects a higher percentage of its sage-grouse population through Core Area stipulations than Montana.

- In Montana, approximately 9.6 million acres are designated as Cores Areas and 24 million acres are designated as general habitat (34 million acres total). in Wyoming, about 15 million acres are designated as Core Areas, with 28 million acres designated as general habitat (43 million acres total). Again, because Core Area stipulations are much more protective of sage-grouse than general habitat stipulations, Wyoming protects significantly more sage-grouse habitat with Core Area stipulations than Montana.

- In Montana, public lands (state and federal) make up approximately 29% of the Core Areas and private lands make up 64% of the Core Areas. In Wyoming, this scenario is almost reversed: public ownership makes up about 61% of Core Areas, and private land is about 37% of Core Areas. It is more effective for government agencies to protect sage-grouse on public land, than on private land, because of the limited regulations that can be applied to private land. Consequently, because of land ownership patterns, Wyoming is able to ensure that more sage-grouse habitat is protected than Montana.

- The *Montana Strategy* allows up to 3% of Core Areas to become Special Management Core Areas (SMCA) (about 290,000 acres total). These SMCAs are areas identified within Core Areas where stipulations can be relaxed in the short-term, economic development opportunities can be realized in the near-term, and conservation benefits will hopefully be realized in the long-term. In Wyoming, there is no ability to designate SMCAs. Because SMCAs can be designated in Montana, and these areas may or may not produce long-term conservation benefits to sage-grouse, the *Montana Strategy* has set up a state-specific stipulation that may be a barrier in achieving sage-grouse conservation goals. In addition to delivering long-term rather than short-term conservation, concerns have been raised about Montana's SMCAs causing significant fragmentation of large sagebrush landscapes (see SERVICE 2013b, page C9).

- Given the above-outlined factors, the conservation measures in Core Areas in Montana need to be bolstered by more substantial conservation stipulations in general habitat in order for Montana to potentially reach the overall protections in the current Wyoming strategy. A 1.0-mile NSO in general habitat would qualify as a substantial conservation stipulation for sage-grouse. This statement is backed up by the following comment from the SERVICE on the *Montana Strategy*:

  "We [the SERVICE] agree that the health of general habitat areas is a critical element in the effort to maintain the abundance and distribution of GSG in Montana. Again, discussion on Page 2 of our comment letter provides support for the currently larger proposed NSOs in core habitat and highlights the importance of and requirement for general habitat protection, including NSOs, in the Montana Strategy." (SERVICE 2013b, page C10)

5. And finally, it makes sense to change the general habitat NSO stipulation to a standard that is supported by scientific studies, because it is a stand-alone stipulation: unlike Core Area stipulations, there are no associated density standards or disturbance caps that accompany the general habitat NSO. Therefore, it is important that the general habitat NSO provides defensible conservation protection to sage-grouse as a stand-along stipulation.

MINORITY REPORT SUBMITTED BY:
Janet Ellis, Jay Gore and Carl Wambolt

DATE: 1-24-2014

REFERENCES:

Coates, P.S., M.L. Casazza, E.J. Blomberg, S.C Gardner, S.P. Espinosa, J.L. Yee, L. Wiechman, and B.J.Halstead. 2013. Evaluating greater sage-grouse seasonal space use relative to leks: Implications for surface use designations in sagebrush ecosystems. Journal of Wildlife Management, 77 (8): 1598-1609.

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Manier, D.J., Wood, D.J.A., Bowen, Z.H., Donovan, R.M., Holloran, M.J., Juliusson, L.M., Mayne, K.S., Oyler- McCance, S.J., Quamen, F.R., Saher, D.J., and Titolo, A.J., 2013, Summary of science, activities, programs, and policies that influence the rangewide conservation of Greater Sage-Grouse (*Centrocercus urophasianus*): U.S. Geological Survey Open-File Report 2013–1098, 170 pp., http://pubs.usgs.gov/of/2013/1098/.

FWP. 2013. FWP “Straw Dog” Rationale – DRAFT. Technical scientific literature summary provided to the Governor’s Greater Sage-Grouse Habitat Advisory Committee on July 29, 2013, 8 pp.

FWP. 2014. What is the scientific information pertaining to development around Sage-Grouse Leks? Summary memo provided to the Governor’s Greater Sage-Grouse Habitat Advisory Committee on January 13, 2014, 5 pp.

State of Wyoming. 2011. State of Wyoming Executive Order 2011-5 (Replaces 2010-4): GREATER SAGE-GROUSE CORE AREA PROTECTION. June 2, 2011. 18 pp.

U.S. Fish & Wildlife Service. 2013a. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, CO. February 2013. 115 pp.

U.S. Fish & Wildlife Service. 2013b. Montana Draft Greater Sage-Grouse Habitat Conservation Strategy Comments. Letter to Montana Fish, Wildlife & Parks Director Jeff Hagener, December 9, 2013. 27 pp.

Attachment 13
MNHP Sensitive Species

Species of Concern Data Report

Visit http://mtnhp.org for additional information.

Report Date:
Tuesday, March 3, 2015

Grus americana

View Species in MT Field Guide

Common Name: Whooping Crane

General Habitat: Wetlands

Description: Birds

Mapping Delineation:

Boundary representing the U.S. Fish and Wildlife Service's 95% confidence interval for all migratory observations in Montana.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S1M
Global: G1

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service: LE
U.S. Forest Service: ENDANGERED
U.S. Bureau of Land Management: SPECIAL STATUS

Species Occurrences

Species Occurence Map Label: 10020256

First Observation Date:	10/04/1958	**SO Number:**	1
Last Observation Date:	04/28/2008	**Acreage:**	1,866,376

Sternula antillarum

View Species in MT Field Guide

Common Name: Least Tern

General Habitat: Large prairie rivers

Description: Birds

Mapping Delineation:

Stream reaches with confirmed breeding based on the presence of a nest, chicks, or territorial adults during the breeding season or where breeding effort is believed to occur due to confirmed effort in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats in the maintenance of natural flood plain dynamics which the species depends on, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S1B
Global: G4

FWP CFWCS Tier: 1

MT PIF Code: 1

Federal Agency Status:

U.S. Fish & Wildlife Service: LE
U.S. Forest Service: ENDANGERED
U.S. Bureau of Land Management: SPECIAL STATUS

Species Occurrences

Species Occurence Map Label: 10026346

First Observation Date:	06/29/1988	**SO Number:**	
Last Observation Date:	07/31/2013	**Acreage:**	39,191

MONTANA Natural Heritage Program
Natural Resource Information System
Montana State Library
PO Box 201800
Helena, MT 59620-1800
(406)444-3009 mtnhp@mt.gov

Species of Concern Data Report

Visit http://mtnhp.org for additional information.

Report Date:
Tuesday, March 3, 2015

Scaphirhynchus albus

View Species in MT Field Guide

Common Name: Pallid Sturgeon
General Habitat: Large prairie rivers
Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S1
Global: G2

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service: LE
U.S. Forest Service: ENDANGERED
U.S. Bureau of Land Management: SPECIAL STATUS

Species Occurrences

Species Occurence Map Label: 10096719

First Observation Date:
Last Observation Date:
SO Number:
Acreage: 42,047

Polyodon spathula

View Species in MT Field Guide

Common Name: Paddlefish
General Habitat: Large prairie rivers
Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S2
Global: G4

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

Species Occurrences

Species Occurence Map Label: 10096724

First Observation Date:
Last Observation Date:
SO Number:
Acreage: 43,374

Lepisosteus platostomus

View Species in MT Field Guide

Common Name: Shortnose Gar

General Habitat: Large prairie rivers

Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S1
Global: G5

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management:

Species Occurrences

Species Occurence Map Label: 10096730

First Observation Date:
Last Observation Date:

SO Number:
Acreage: 11,343

Macrhybopsis gelida

View Species in MT Field Guide

Common Name: Sturgeon Chub

General Habitat: Large prairie rivers

Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S2S3
Global: G3

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

Species Occurrences

Species Occurence Map Label: 10102059

First Observation Date:
Last Observation Date:

SO Number:
Acreage: 44,580

MONTANA Natural Heritage Program
Natural Resource Information System
Montana State Library
PO Box 201800
Helena, MT 59620-1800
(406)444-3009 mtnhp@mt.gov

Species of Concern Data Report

Visit http://mtnhp.org for additional information.

Report Date:
Tuesday, March 3, 2015

Macrhybopsis meeki

View Species in MT Field Guide

Common Name: Sicklefin Chub
General Habitat: Large prairie rivers
Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S1
Global: G3

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management:

Species Occurrences

Species Occurence Map Label: 10102073

First Observation Date:
Last Observation Date:
SO Number:
Acreage: 33,126

Cycleptus elongatus

View Species in MT Field Guide

Common Name: Blue Sucker
General Habitat: Large prairie rivers
Description: Fish

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S2S3
Global: G3G4

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

Species Occurrences

Species Occurence Map Label: 10102109

First Observation Date:
Last Observation Date:
SO Number:
Acreage: 54,923

Sander canadensis

View Species in MT Field Guide

Common Name: Sauger

General Habitat: Large prairie rivers

Description: Fish

Mapping Delineation:

Stream reaches and standing water bodies where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters, standing water bodies greater than 1 acre are buffered 50 meters, and standing water bodies less than 1 acre are buffered 30 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S2
Global: G5

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

Species Occurrences

Species Occurence Map Label: 10102209

First Observation Date:
Last Observation Date:

SO Number:
Acreage: 55,237

Apalone spinifera

View Species in MT Field Guide

Common Name: Spiny Softshell

General Habitat: Prairie rivers and larger streams

Description: Reptiles

Mapping Delineation:

Stream reaches where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards.

Species Status

Click Status for Explanations

Natural Heritage Ranks:

State: S3
Global: G5

FWP CFWCS Tier: 1

MT PIF Code:

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

Species Occurrences

Species Occurence Map Label: 10033202

First Observation Date: 07/29/1806
Last Observation Date: 07/17/2013

SO Number:
Acreage: 72,008

Montana Species of Concern
Fairview Corridor Study

SPECIES OCCURRENCE: A polygon feature representing only what is known from direct observation with a defined level of certainty regarding the spatial location of the feature.

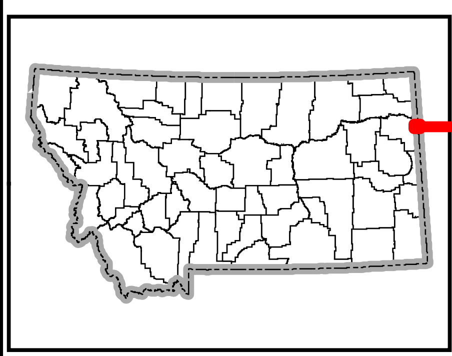
- Lichens
- Bryophytes
- Vascular Plants
- Invertebrates
- Amphibians
- Fish
- Reptiles
- Birds
- Mammals

Sites

- Sites

Wetland Types

- Lake
- River
- Freshwater Pond
- Freshwater Emergent Wetland
- Freshwater Scrub-Shrub Wetland
- Freshwater Forested Wetland
- Riparian Emergent
- Riparian Scrub-Shrub
- Riparian Forested

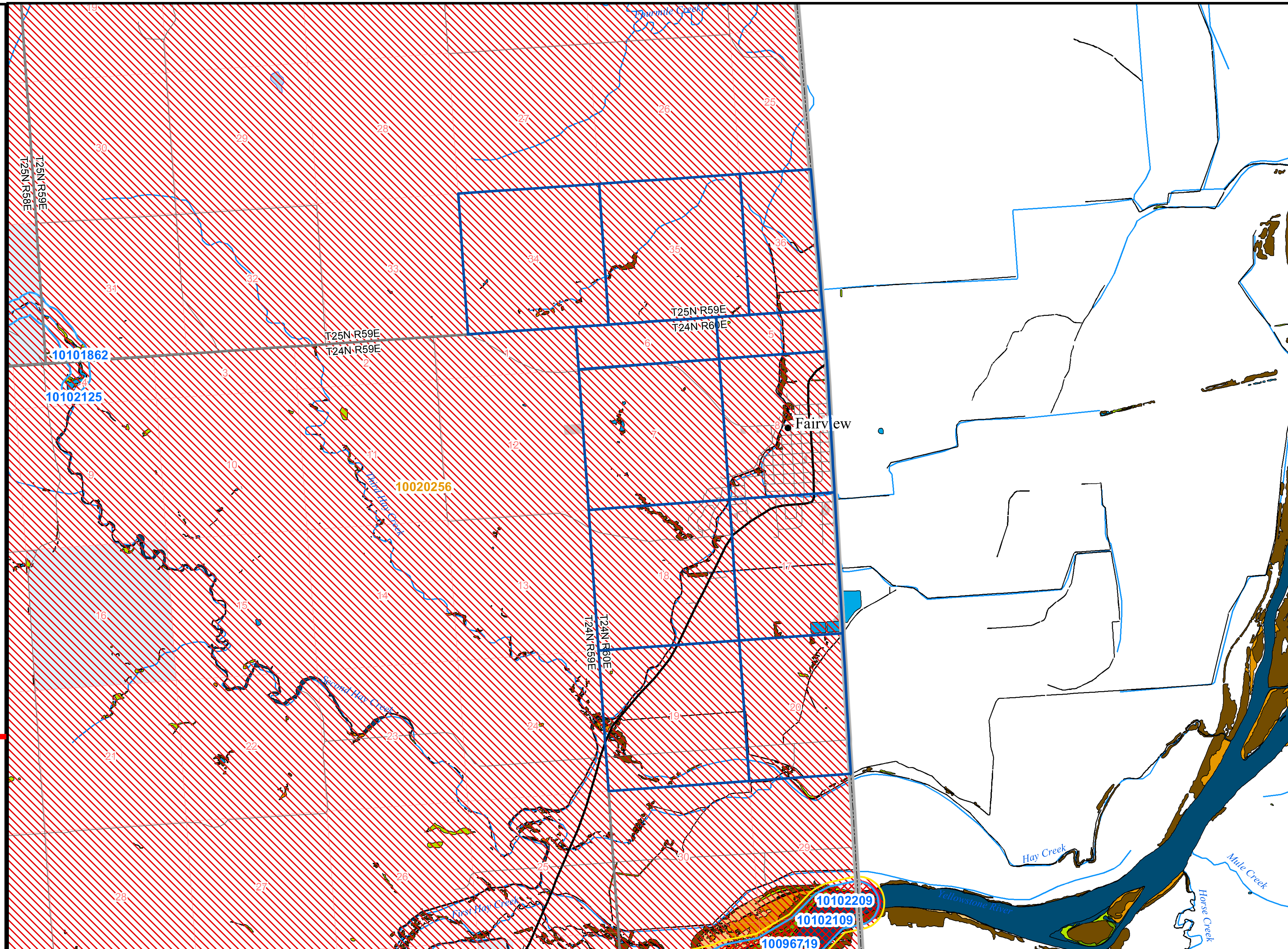


Not all legend items may occur on the map.

Features shown on this map do not imply public access to any lands.

Land ownership information shown on this map is not suitable for legal purposes.

Montana Natural Heritage Program



0 0.5 1 2 3 4 Miles

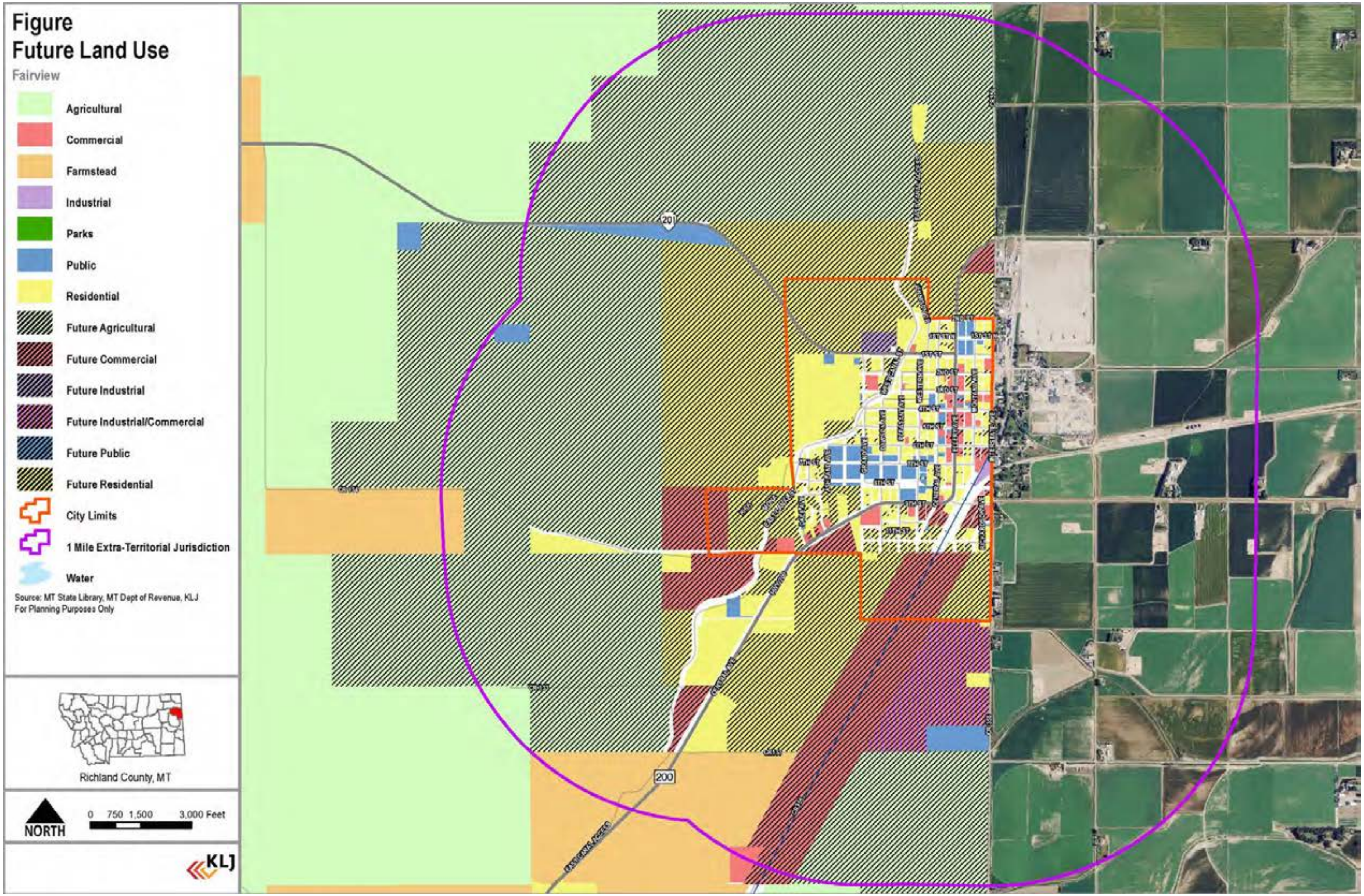
Natural Resource Information System, Montana State Library
1515 East Sixth Ave., Helena, MT 59620-1800

406 444-5354 http://mtnhp.org mtnhp@mt.gov

Map Document: K:\REQUESTS\Requests\15\MDT\15mdt0010\15mdt0010.mxd (3/3/2015)

Attachment 14
Fairview Growth Policy Future Land Use Map

Figure 8 - Fairview Future Land Use



Attachment 15
State Historic Preservation Data

Site #	Twp	Rng	Sec	Qs	Site Type1	Site Type 2	Time Period	Owner	NR Status
24RL0204	24 N	60E	5	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0186	24 N	60E	5		Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	Ineligible
24RL0230	24 N	60E	6	SE	Historic Railroad	Null	Historic More Than One Decade	Private	CD
24RL0204	24 N	60E	7	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0147	24 N	60E	7	SE	Historic Mining	Historic Coal Mine	1910-1919	State Owned	undetermined
24RL0204	24 N	60E	8	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0376	24 N	60E	8	NE	Historic Residence	Null	1910-1919	Private	CD
24RL0146	24 N	60E	8	NW	Historic Mining	Historic Coal Mine	1910-1919	State Owned	Unresolved
24RL0270	24 N	60E	8	NW	Historic Building Foundation	Null	Historic Period	Combination	Ineligible
24RL0114	24 N	60E	8	NW	Historic Vehicular/Foot Bridge	Null	1930-1939	No Data	undetermined
24RL0184	24 N	60E	8	SW	Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	Ineligible
24RL0185	24 N	60E	8	SW	Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	Ineligible
24RL0321	24 N	60E	17	Comb	Historic Energy Development	Null	1920-1930	Combination	CD
24RL0230	24 N	60E	17	comb	Historic Railroad	Null	Historic More Than One Decade	Private	CD
24RL0204	24 N	60E	18	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0183	24 N	60E	18	Comb	Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	DOE
24RL0435	24 N	60E	18	NE	Historic Residence	Null	1950-1959	Private	Ineligible
24RL0454	24 N	60E	18	NE	Historic Residence	Historic Outbuildings	Historic More Than One Decade	Private	Ineligible
24RL0459	24 N	60E	18	NE	Historic Residence	Historic Outbuildings	Historic More Than One Decade	Private	Ineligible
24RL0417	24 N	60E	18	NE	Historic Residence	Null	Historic More Than One Decade	Private	Ineligible
24RL0416	24 N	60E	18	NE	Historic Residence	Null	1960-1969	Private	Ineligible
24RL0412	24 N	60E	18	SE	Historic Residence	Historic Outbuildings	1960-1969	Private	Ineligible
24RL0413	24 N	60E	18	SE	Historic Outbuildings	Null	Historic Period	Private	Ineligible
24RL0460	24 N	60E	18	comb	Historic Agriculture	Historic Outbuildings	Historic More Than One Decade	Private	Ineligible
24RL0321	24 N	60E	19	Comb	Historic Energy Development	Null	1920-1930	Combination	CD
24RL0204	24 N	60E	19	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0182	24 N	60E	19	NW	Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	CD
24RL0468	24 N	60E	19	NW	Historic Vehicular/Foot Bridge	Null	1900-1909	BOR	CD
24RL0415	24 N	60E	19	NW	Historic Residence	Null	1920-1930	Private	Ineligible
24RL0414	24 N	60E	19	NW	Historic Homestead/Farmstead	Null	Historic More Than One Decade	Private	CD
24RL0230	24 N	60E	19	comb	Historic Railroad	Null	Historic More Than One Decade	Private	CD
24RL0321	24 N	60E	20	Comb	Historic Energy Development	Null	1920-1930	Combination	CD
24RL0230	24 N	60E	20	NW	Historic Railroad	Null	Historic More Than One Decade	Private	CD
24RL0204	25 N	59E	36	Comb	Historic Irrigation System	Historic Reclamation	1900-1909	BOR	CD
24RL0187	25 N	59E	36	NW	Historic Vehicular/Foot Bridge	Null	1900-1909	MDOT Other	undetermined

Township: 24 N Range: 60E Section: 5

VINSON EDRIE L.

4 / /1988 *LOWER YELLOWSTONE PROJECT MAIN CANAL BRIDGE U.S. RECLAMATION SERVICE 1907-1908*

CRABS Document Number: RL 4 30084 Agency Document Number:

Township: 24 N Range: 60E Section: 5

BRUMLEY JOHN H.

9 / /2000 *A CULTURAL INVENTORY OF 14 BRIDGE PROJECTS AREAS WITHIN RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 23550 Agency Document Number: BOR : LY-00-114

Township: 24 N Range: 60E Section: 5

KORDECKI CYNTHIA, ET AL.

4 / /2001 *LOWER YELLOWSTONE IRRIGATION PROJECT, 1996 AND 1997 CULTURAL RESOURCES INVENTORY, DAWSON AND RICHLAND COUNTIES, MONTANA AND MCKENZIE COUNTY IN NORTH DAKOTA*

CRABS Document Number: ZZ 6 23753 Agency Document Number: MTAOLYOO-089

Township: 24 N Range: 60E Section: 7

WOOD GARVEY C.

10 /29/1985 *HILDE CONSTRUCTION/JOHNSON DEVELOPMENT CO. GRAVEL PIT*

CRABS Document Number: RL 4 8935 Agency Document Number:

Township: 24 N Range: 60E Section: 7

ANDERSON PAUL, ET AL.

10 / /1986 *CULTURAL RESOURCE INVENTORY AND ASSESSMENT OF SELECTED ABANDONED COAL MINE SITES THROUGHOUT MONTANA AND SELECTED HARDROCK SITES IN BUTTE*

CRABS Document Number: ZZ 2 10784 Agency Document Number:

Township: 24 N Range: 60E Section: 7

KLINNER DUANE G.

9 /2 /1996 *SURVEYS OF TWO BORROW AREAS AND ONE FILL AREA NEAR FAIRVIEW, MONTANA FOR THE YELLOSTONE RIVER BRIDGE PROJECT*

CRABS Document Number: RL 4 18305 Agency Document Number: BRS-SS-200(002)003

Township: 24 N Range: 60E Section: 8

ANDERSON PAUL, ET AL.

10 / /1986 *CULTURAL RESOURCE INVENTORY AND ASSESSMENT OF SELECTED ABANDONED COAL MINE SITES THROUGHOUT MONTANA AND SELECTED HARDROCK SITES IN BUTTE*

CRABS Document Number: ZZ 2 10784 Agency Document Number:

Township: 24 N Range: 60E Section: 8

BRUMLEY JOHN H.

9 / /2000 *A CULTURAL INVENTORY OF 14 BRIDGE PROJECTS AREAS WITHIN RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 23550 Agency Document Number: BOR : LY-00-114

Township:24 N Range:60E Section:8

KORDECKI CYNTHIA, ET AL.

4 / /2001 *LOWER YELLOWSTONE IRRIGATION PROJECT, 1996 AND 1997 CULTURAL RESOURCES INVENTORY, DAWSON AND RICHLAND COUNTIES, MONTANA AND MCKENZIE COUNTY IN NORTH DAKOTA*

CRABS Document Number: ZZ 6 23753 Agency Document Number: MTAOLYOO-089

Township:24 N Range:60E Section:8

KORDECKI CYNTHIA

3 / /1999 *FAIRVIEW LATERAL M SEGMENT CULTURAL RESOURCES INVENTORY, LOWER YELLOWSTONE IRRIGATION PROJECT, RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 21985 Agency Document Number:

Township:24 N Range:60E Section:8

AXLINE JON

1 / /2012 *FAIRVIEW INTERSECTION IMPROVEMENTS*

CRABS Document Number: RL 4 33321 Agency Document Number: SFCP 20-2(26)63

Township:24 N Range:60E Section:8

VINSON EDRIE L.

4 / /1988 *LOWER YELLOWSTONE PROJECT MAIN CANAL BRIDGE U.S. RECLAMATION SERVICE 1907-1908*

CRABS Document Number: RL 4 30084 Agency Document Number:

Township:24 N Range:60E Section:8

BRUMLEY JOHN H.

10 /1 /1995 *A CULTURAL RESOURCE INVENTORY OF PROPOSED IMPROVEMENTS TO THE FAIRVIEW WATER SYSTEM*

CRABS Document Number: RL 6 17420 Agency Document Number:

Township:24 N Range:60E Section:8

BRUMLEY JOHN H.

9 / /2000 *A CULTURAL INVENTORY OF 14 BRIDGE PROJECTS AREAS WITHIN RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 23550 Agency Document Number: BOR : LY-00-114

Township:24 N Range:60E Section:17

SCHAEFER JERRY M.

7 /1 /1993 *IDA DANIELSON LAND LEVELING AND REMOVAL OF LATERAL*

CRABS Document Number: RL 6 15874 Agency Document Number:

Township:24 N Range:60E Section:17

KORDECKI CYNTHIA

3 / /1999 *FAIRVIEW LATERAL M SEGMENT CULTURAL RESOURCES INVENTORY, LOWER YELLOWSTONE IRRIGATION PROJECT, RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 21985 Agency Document Number:

Township:24 N Range:60E Section:17

KORDECKI CYNTHIA, ET AL.

4 / /2001 ***LOWER YELLOWSTONE IRRIGATION PROJECT, 1996 AND 1997 CULTURAL RESOURCES INVENTORY, DAWSON AND RICHLAND COUNTIES, MONTANA AND MCKENZIE COUNTY IN NORTH DAKOTA***

CRABS Document Number: ZZ 6 23753 Agency Document Number: MTAOLYOO-089

Township:24 N Range:60E Section:17

KUEHN DAVID D.

11 /19/1984 ***AN INTENSIVE CULTURAL RESOURCES INVENTORY OF THE FAIRVIEW EPA SEWAGE TREATMENT SITE***

CRABS Document Number: RL 6 8950 Agency Document Number:

Township:24 N Range:60E Section:17

SMITH CHARLINE G.

7 /29/1980 ***HIGHWAY CONSTRUCTION PROJECT F20-2(2)52 SIDNEY-FAIRVIEW***

CRABS Document Number: RL 4 8924 Agency Document Number: F20-2(2)52

Township:24 N Range:60E Section:18

SMITH CHARLINE G.

7 /29/1980 ***HIGHWAY CONSTRUCTION PROJECT F20-2(2)52 SIDNEY-FAIRVIEW***

CRABS Document Number: RL 4 8924 Agency Document Number: F20-2(2)52

Township:24 N Range:60E Section:18

KORDECKI CYNTHIA, ET AL.

4 / /2001 ***LOWER YELLOWSTONE IRRIGATION PROJECT, 1996 AND 1997 CULTURAL RESOURCES INVENTORY, DAWSON AND RICHLAND COUNTIES, MONTANA AND MCKENZIE COUNTY IN NORTH DAKOTA***

CRABS Document Number: ZZ 6 23753 Agency Document Number: MTAOLYOO-089

Township:24 N Range:60E Section:18

BRUMLEY JOHN H.

9 / /2000 ***A CULTURAL INVENTORY OF 14 BRIDGE PROJECTS AREAS WITHIN RICHLAND COUNTY, MONTANA***

CRABS Document Number: RL 6 23550 Agency Document Number: BOR : LY-00-114

Township:24 N Range:60E Section:18

ANDERSON PAUL, ET AL.

10 / /1986 ***CULTURAL RESOURCE INVENTORY AND ASSESSMENT OF SELECTED ABANDONED COAL MINE SITES THROUGHOUT MONTANA AND SELECTED HARDROCK SITES IN BUTTE***

CRABS Document Number: ZZ 2 10784 Agency Document Number:

Township:24 N Range:60E Section:18

WAGERS SCOTT J. ET AL.

11 / /2013 ***SIDNEY TO FAIRVIEW: A CLASS III CULTURAL RESOURCE INVENTORY ALONG STATE HIGHWAY 200 BETWEEN SIDNEY AND FAIRVIEW, RICHLAND COUNTY, MONTANA***

CRABS Document Number: RL 4 36685 Agency Document Number: STPP 20-2(29)53, UPN 7950000

Township: 24 N Range: 60E Section: 18

NOISAT BRAD

6/25/2012 *CLASS III CUTURAL RESOURCE INVENTORY: VZW MT4 FAIRVIEW COMMUNICATIONS SITE, RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 33836 Agency Document Number: 10012-01204.00

Township: 24 N Range: 60E Section: 18

VINSON EDRIE L.

4/ /1988 *LOWER YELLOWSTONE PROJECT MAIN CANAL BRIDGE U.S. RECLAMATION SERVICE 1907-1908*

CRABS Document Number: RL 4 30084 Agency Document Number:

Township: 24 N Range: 60E Section: 18

COUTANT BRAD A.

8/ /1991 *FIFTEEN ASSORTED STRUCTURES ON THE LOWER YELLOWSTONE IRRIGATION DISTRICT, RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 6 13050 Agency Document Number: MTPO LY-90-40

Township: 24 N Range: 60E Section: 19

WAGERS SCOTT J. ET AL.

11/ /2013 *SIDNEY TO FAIRVIEW: A CLASS III CULTURAL RESOURCE INVENTORY ALONG STATE HIGHWAY 200 BETWEEN SIDNEY AND FAIRVIEW, RICHLAND COUNTY, MONTANA*

CRABS Document Number: RL 4 36685 Agency Document Number: STPP 20-2(29)53, UPN 7950000

Township: 24 N Range: 60E Section: 19

KORDECKI CYNTHIA, ET AL.

4/ /2001 *LOWER YELLOWSTONE IRRIGATION PROJECT, 1996 AND 1997 CULTURAL RESOURCES INVENTORY, DAWSON AND RICHLAND COUNTIES, MONTANA AND MCKENZIE COUNTY IN NORTH DAKOTA*

CRABS Document Number: ZZ 6 23753 Agency Document Number: MTAOLYOO-089

Township: 24 N Range: 60E Section: 19

VINSON EDRIE L.

4/ /1988 *LOWER YELLOWSTONE PROJECT MAIN CANAL BRIDGE U.S. RECLAMATION SERVICE 1907-1908*

CRABS Document Number: RL 4 30084 Agency Document Number:

Township: 24 N Range: 60E Section: 19

WOOD GARVEY C.

10/29/1985 *HILDE CONSTRUCTION - BORROW SOURCE PIT (PIT 136-5)*

CRABS Document Number: RL 4 8933 Agency Document Number:

Township: 24 N Range: 60E Section: 19

SMITH CHARLINE G.

7/29/1980 *HIGHWAY CONSTRUCTION PROJECT F20-2(2)52 SIDNEY-FAIRVIEW*

CRABS Document Number: RL 4 8924 Agency Document Number: F20-2(2)52

Township:24 N Range:60E Section:20

GOODYEAR MARK G.

3 / /2014 ***MILLER 21-20-1H, 2H, & 3H WELL PAD AND ACCESS ROAD: A CLASS III INTENSIVE CULTURAL RESOURCE INVENTORY IN RICHLAND COUNTY, MONTANA.***

CRABS Document Number: RL 2 37045 Agency Document Number: M10311-MT-020-14-56

Township:25 N Range:59E Section:36

BRUMLEY JOHN H.

9 / /2000 ***A CULTURAL INVENTORY OF 14 BRIDGE PROJECTS AREAS WITHIN RICHLAND COUNTY, MONTANA***

CRABS Document Number: RL 6 23550 Agency Document Number: BOR : LY-00-114