

BRIDGER CANYON
Corridor Planning Study



APPENDIX C
Environmental Scan Report

September 2014

Prepared for:



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Abbreviations and Acronyms

ACS	American Community Survey
APE	Area of Potential Effect
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
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resources and Conservation
DOC	Montana Department of Commerce
DOLI	Montana Department of Labor and Industry
EO	Executive Order
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
HUC	Hydrologic Unit Code
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
MFISH	Montana Fisheries Information System
MNHP	Montana Natural Heritage Program
MSATs	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy 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
T&E	Threatened and Endangered
TMDL	Total Maximum Daily Load
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
USFS	United States Forest Service
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 resources and determine potential constraints and opportunities for the Bridger Canyon Corridor Planning Study. Information in this report was obtained from publically-available reports, websites, and documentation. This scan is not a detailed environmental investigation.

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

1.1 Study Area

The Bridger Canyon corridor is located in south-central Montana in Gallatin and Park Counties. Land use within the corridor varies considerably, and includes dispersed residential development, undeveloped forest, recreational areas, and grass rangeland. The portion of MT 86 within the study area is classified as a rural minor arterial – non interstate, connecting Bozeman and the Gallatin Valley to the Bridger Bowl ski area, the Gallatin National Forest, and US 89 in the Shields River valley. A portion of this roadway is within the Gallatin National Forest and provides entrance to multiple United States Forest Service (USFS) access points throughout the corridor.

The study area for this environmental scan report includes the MT 86 corridor and a 300-foot buffer on both sides of the roadway (for a total buffer width of 600 feet) throughout the majority of the corridor. A buffer width ranging up to approximately 1,700 feet is included from approximate RP 4.0 to RP 5.0 to include a landslide and historic quarry at approximate RP 4.4. The study area begins at the MT 86 intersection with Story Mill Road at Reference Post (RP) 1.95 just east of Bozeman, MT, and ends at the intersection with US 89 at RP 37.5 near Wilsall, MT. Multiple maps have been prepared to illustrate resources present in the study area. Due to the length of the corridor, most exhibits are multiple pages in length. As a result, and for ease of reference, all exhibits are included in Attachment 1. The corridor location is illustrated in Exhibit 1, and a topographic map of the corridor is provided in Exhibit 2.

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 matter 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 indicate the majority of the corridor is either prime farmland, farmland of state or local importance, or prime farmland if irrigated. Specifically, areas classified as prime farmland, prime farmland if irrigated, and farmland of state or local importance are located between RP 1 to RP 15 and RP 22.5 to RP 31 (refer to Exhibit 3).

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 Linear Projects completed by MDT and coordinated with NRCS. The NRCS uses information from the impact rating form to keep inventory of the prime and important farmlands within the state.

Exhibit 3 (in Attachment 1) contains maps and descriptions of the farmland classification types found in the study area.

2.2 Geologic Resources

Information on the geology and seismicity in the area of the corridor study was obtained from several published sources. Geologic mapping was reviewed for rock types, the presence of unconsolidated material, and fault lines. The seismicity and potential seismic hazards were also reviewed. This geologic information can help determine potential design and construction issues related to embankments and road design. The following is a brief summary of the geologic and seismic conditions present in the corridor study area. Exhibit 4 (in Attachment 1) presents the geologic formations and structures within the study area.

Montana is a seismically-active state. The Intermountain Seismic Belt is a regional zone of seismicity that extends through western Montana from the northwest corner (Flathead Lake region) to Yellowstone National Park (see Attachment 3). The Intermountain Seismic Belt roughly corresponds to the eastern margin of the Basin and Range Province (Smith and Sbar, 1974). The study area is located along the eastern edge of the Intermountain Seismic Belt. The most significant seismic events to occur near Bozeman were the 1925 Clarkston Valley earthquake (magnitude 6.75) and Hebgen Lake earthquake in 1959 (magnitude 7.5 and the largest earthquake to have occurred in Montana).

Numerous faults have been mapped within the study corridor. Most of these are old, inactive thrust faults. There are four main Quaternary (younger) faults surrounding the Bozeman area: the Central Park, Bridger, Gallatin Range, and the Elk Creek faults all with offset during the last 1.6 million years (Stickney and others, 2000). The Bridger fault is the only fault located within the study area, and although concealed by surficial deposits, it most likely crosses the study corridor between RP 2.5 and 3.0. The northern portion of the Emigrant fault is located to the east of the study area near Livingston and has had offset during the last 130,000 years (Stickney and others, 2000). No faults have been identified near or within the study area that have had offset in the past 15,000 years.

Seismic design of highway infrastructure is conducted in accordance with American Association of State Highway and Transportation Officials guidelines. Earthquakes can induce rock fall, slope movement (landslides), and liquefaction. When soils liquefy, they lose strength and temporarily behave like liquids. Seismically-induced liquefaction typically occurs in loose, saturated, sandy material commonly associated unconsolidated deposits or fill. The seismically-induced loss of strength can result in failure of the ground surface, most typically expressed as lateral spreads, surface cracks, settlement, or sand boils. Structures, including roadways, can sustain substantial damage during a large seismic event if they are supported in or on a soil susceptible to liquefaction.

Quaternary alluvium (Qal) is present along much of the corridor (Exhibit 4 in Attachment 1). Alluvium and other unconsolidated deposits in this area are typically described as a mixture of gravel, sand, silt, and clay. The presence of alluvium consisting predominantly of sand and potentially susceptible to liquefaction is possible, although unlikely. Bedrock along the study corridor consists of Cambrian- to Cretaceous-aged sedimentary rocks from RP 5 to RP 6. The bedrock along the remainder of the study corridor consists of Cretaceous-aged sedimentary rocks. Landslide deposits (Qls) are present in the area along the valley sides.

A slide area near RP 4.4 has been the subject of investigation by Montana State University geologists and state highway personnel since the late 1950s. The rock face south of the original MT 86 alignment was undermined at its base due to the roadway cut slope and quarry operations, which removed material used for construction of the interstate highway and other roadways in the area. According to a 1967 State Highway Commission memorandum (Attachment 4), a landslide developed in the upper reaches of the quarry shortly after completion of quarrying as a result of blasting and removal of material. At that time, the toe of the slide was several feet above the ditchline of the roadway. A January 1976 Department of Highways memorandum (Attachment 4) notes that “during the spring of 1975, heavy precipitation and surface run-off re-activated the subject slide resulting in the movement of a considerable quantity of rock on to the highway.” In 1975, MT 86 traffic was redirected to the north via a detour route which is still in use today. Past studies have warned that the slide area is unstable and susceptible to continuous sloughing, and that an earthquake or heavy precipitation event could activate another slide event. A minor slide has also been reported on the north side of MT 86 east of the major slide at RP 4.4, although no documentation was identified for the minor slide. Additional slope stability evaluation may need to be conducted on slopes immediately adjacent to MT 86 for any improvements forwarded from this study.

MDT maintains the Montana Rockfall Hazard Rating System to better manage rock slope assets along Montana highways. A 2003-2005 MDT research program evaluated rockfall history and behavior throughout the state. “A”-rated sites indicate a high potential for rockfall hazard. Detailed ratings were completed at approximately 850 “A”-rated sites. The top 100 “A”-rated sites were further evaluated, and conceptual designs and construction cost-to-cure estimates were prepared. The Rockfall Hazard Classification and Mitigation System report (MDT, 2005) lists nine sites within the Bridger Canyon corridor, located from approximate RP 4.4 to 19.1. “A” ratings were assigned to two of the nine sites, one of which (located at approximate RP 4.4) was ranked 36 out of the top 100 sites. The other site is located at approximately RP 15.9-16.0. The estimated cost to cure this site in 2005 dollars was approximately \$364,000 (see Attachment 5). Improvements adjacent to the nine sites may require an engineering analysis to determine if rockfall hazard mitigation is practicable.

Improvements forwarded from the study may require evaluations of soil and rock formations at the location work is anticipated to take place to ensure soil suitability.

2.3 Surface Waters

Topographic maps and geographic information system data were reviewed to identify the location of surface water bodies within the study area, including rivers, streams, lakes, and reservoirs. Named streams within the study area are listed below.

Brackett Creek	Fairy Creek	Olson Creek
Bridger Creek	Flathead Creek	North Fork Brackett Creek
Cache Creek	Lyman Creek	Place Creek
Carrol Creek	Maynard Creek	South Fork Brackett Creek
Dry Creek	Middle Fork Brackett Creek	Stone Creek
East Gallatin River	Muddy Creek	White Creek

A variety of additional surface waters, including unnamed streams, natural drainages, wetlands, and ponds are also present in the study area. Impacts to these surface waters may occur from improvements such as culverts under the roadway, placement of fill, or rip rap armoring of banks. Coordination with federal, state, and local agencies would be necessary to determine appropriate permits if improvement options are forwarded from this study, as any work within these waters may be regulated by the United States Army Corps of Engineers (USACE), the Montana Department of Fish, Wildlife and Parks (FWP), Montana Department of Natural Resources and Conservation (DNRC), and the Montana Department of Environmental Quality (DEQ). Impacts should be avoided and minimized to the maximum extent practicable. Stream and wetland impacts may trigger compensatory mitigation requirements of the USACE. 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 and comply with the requirements outlined in MDT's Storm Water Management Plan. Exhibit 5 (in Attachment 1) contains maps depicting surface waters found in the study area.

Total Maximum Daily Loads

The study area traverses the Gallatin River Watershed (hydrologic unit code (HUC) 10020008) and the Shields River Watershed (HUC 10070003). Information on the Gallatin and Shields Rivers and their tributaries within the study area was obtained from the DEQ website. Section 303 subsection "d" of the Clean Water Act requires the state of Montana 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 determines the causes and sources of pollutants in a sub-basin assessment and sets maximum pollutant levels, called total maximum daily loads (TMDL).

TMDLs set by DEQ become the basis for implementation plans to restore water quality to a level that supports state designated beneficial water uses. The implementation plans identify and describe pollutant controls and management measures to be undertaken (such as best management practices), the mechanisms by which the selected measures would be put into action, and the individuals and entities responsible for implementation projects.

DEQ lists Bridger Creek, East Gallatin River, and Stone Creek as having an impairment in the Draft 2014 Integrated 303(d)/305(b) Water Quality Report for Montana (see Table 1). These three water bodies are listed as Category 4A, defined as waters where all TMDLs required to rectify all identified threats or impairments have been completed and approved. Should improvement options be advanced, it will be necessary to consider DEQ TMDL standards and potential impacts to water quality within receiving streams and watersheds in the study area.

Table 1 303(d) Listed Streams in Study Area

Named Stream	RP*	Category	Possible Impairment	Beneficial Uses
Brackett Creek	18.8		Not Listed in DEQ's Water Quality Database	
Bridger Creek	3.2	4A	Chlorophyll-a, Nitrate/Nitrite	Primary Contact Recreation, Primary Contact Recreation, Aquatic Life
Cache Creek	24.3		Not Listed in DEQ's Water Quality Database	
Carroll Creek	27.0		Not Listed in DEQ's Water Quality Database	
Dry Creek	32.5		Not Listed in DEQ's Water Quality Database	
East Gallatin River	0.8	4A	Nitrogen (Total), Phosphorus (Total)	Aquatic Life, Primary Contact Recreation
Fairy Creek	25.2		Not Listed in DEQ's Water Quality Database	
Flathead Creek	31.0		Not Listed in DEQ's Water Quality Database	
Lyman Creek	3.1		Not Listed in DEQ's Water Quality Database	
Maynard Creek	16.0		Not Listed in DEQ's Water Quality Database	
Middle Fork Brackett Creek	18.8		Not Listed in DEQ's Water Quality Database	
Muddy Creek	37.2		Not Listed in DEQ's Water Quality Database	
North Fork Brackett Creek	19.0		Not Listed in DEQ's Water Quality Database	
Olson Creek	14.1		Not Listed in DEQ's Water Quality Database	
Place Creek	5.9		Not Listed in DEQ's Water Quality Database	
South Fork Brackett Creek	18.8		Not Listed in DEQ's Water Quality Database	
South Fork Dry Creek	32.0		Not Listed in DEQ's Water Quality Database	
Stone Creek	11.4	4A	Alteration in stream-side or littoral vegetative covers, Physical substrate habitat alterations	Beneficial Use
White Creek	20.0		Not Listed in DEQ's Water Quality Database	

Source: DEQ, 2014. *RP locations approximated.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act, created by Congress in 1968, provided 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, none of the waterways within the study area carry the wild and scenic designation.

2.4 Groundwater

According to the Montana Bureau of Mines and Geology (MBMG) Groundwater Information Center (GWIC), there are 16,506 wells on record in Gallatin County, and 5,545 wells on record in Park County. Some of these wells are located within the study area. The newest well on record

is from June 23, 2014, and the oldest well on record is from January 1860. The majority of wells within Gallatin County (approximately 10,075) are at a depth of 0 to 99 feet. In Park County, approximately half of the wells (2770) are at a depth of 0 to 99 feet. There are 76 statewide monitoring network wells in Gallatin County, and 19 in Park County. The wells in Gallatin and Park Counties have widely varying uses, with domestic wells being the most common. Groundwater data, such as well and geologic source information for Gallatin County and Park County, is presented in Exhibit 6 (in Attachment 1) and Attachment 6.

Impacts to existing wells will need to be considered if improvement options are forwarded from the study.

2.5 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 or the Montana Natural Resource Information System (NRIS) (see Exhibit 5 in Attachment 1). 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 uses in wetland determination and delineation. NWI maps are typically generated based on aerial and satellite imagery, and are not accurate enough or detailed enough for MDT project wetland determination and/or delineation.

During the June 25, 2014, field review, wetlands were observed throughout the study area. Wetlands typically border streams that traverse or parallel the MT 86 corridor. Several large emergent and scrub/shrub wetland complexes border the riparian areas of Bridger Creek (RP 5.7 to RP 6.7), Carrol Creek (RP 26.8 to 27.4), South Fork Dry Creek (RP 29.2 to RP 29.7), Flathead Creek (RP 30.0 to RP 30.3), and Dry Creek (RP 32.6). Some of these wetland systems were well developed and provide ample wetland functions and values.

Generally, large emergent and scrub/shrub wetland systems border streams in the Flathead Creek drainage from RP 23 to RP 37.5 and forested, scrub/shrub wetlands border stream systems in the mountainous areas through Bridger Canyon along Bridger Creek and Brackett Creek. Additionally, emergent wetlands were observed in agricultural areas (RP 5 to RP 10) along Bridger Creek adjacent to irrigated hay fields.

Future wetland delineations would be required if improvement options are forwarded from the study that could potentially impact wetlands. Future projects in the corridor would need to incorporate project design features to avoid and minimize adverse impacts to wetlands to the maximum extent practicable. Unavoidable impacts to wetlands must be compensated through mitigation in accordance with the USACE regulatory requirements and requirements of Executive Order 11990. Work within jurisdictional wetlands would require a Clean Water Act 404 permit from the USACE.

2.6 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.

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 document defines "base flood" as the "flood or tide having a 1-percent chance of being exceeded in any given year" and "base flood plain" as the "area subject to flooding by the base flood."

Federal Emergency Management Agency-issued flood maps for Gallatin and Park Counties indicate that five floodplain zones exist within the study area at the following locations (see Exhibit 7 in Attachment 1):

- Zone A: Special Flood Hazard Area (SFHA) - 100-Year Flood, No Base Flood Elevations Determined (RP 4.2 – RP 7.4 and RP-31.0 to 37.2);
- Zone AE: SFHA - 100-Year Flood, Base Flood Elevations Determined (RP 3.2);
- Zone AE: SFHA – 100-Year Flood, Stream Channel Plus Adjacent Floodplains (RP 3.2, RP 4.3);
- Zone D: Flood Hazards Undetermined, but possible (RP 8.9 – RP 31.0), and;
- Zone X: Areas Outside the 500-Year Flood (RP 1.95 – RP 7.9 and RP 31.0 to 37.5).

If improvement options are forwarded from this study that result in the placement of fill within the regulatory floodplain, impacts to floodplains would need to be identified and evaluated. Project development could require coordination with Gallatin and Park Counties to minimize floodplain impacts and obtain necessary floodplain permits for project construction.

2.7 Irrigation

Irrigated grazing land exists in Gallatin and Park Counties adjacent to the study area. Depending on the improvement option(s) proposed during the corridor study, there is potential to impact irrigation facilities. Impacts to irrigation facilities should be avoided to the greatest extent practicable. Any future modifications to existing irrigation canals, ditches, or pressurized systems would be redesigned and constructed in consultation with the owners to minimize impacts to agricultural operations. Historic irrigation maps of Gallatin and Park Counties are provided in Attachment 7.

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 (PM₁₀ 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. 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 will not be required in future project design to accommodate NAAQS non-attainment issues.

Depending on the scope of improvements being considered along this corridor, 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

The NRIS database provides information on underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, abandoned mine sites, remediation response sites, landfills, National Priority List sites, hazardous waste, crude oil pipelines, and toxic release inventory sites. Four LUSTs, one abandoned mine (quarry) site, and one hazardous waste handler were identified within the study area (see Exhibit 8 in Attachment 1). 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

Four USTs were identified within the corridor, all of which are classified as LUSTs and further discussed in the LUST section below. Additional investigation regarding the precise locations of the USTs may be warranted if improvement options are forwarded from this study (see Exhibit 8 in Attachment 1).

Leaking Underground Storage Tanks

Four LUSTs were identified within the study area (see Table 2). If LUSTs or contaminated soils are encountered, removal and cleanup will likely be required.

Table 2 LUST Sites within Study Area

Facility ID#	Facility Name	Address	Town	Status	Confirmed Date	Resolved Date
1604908	USFWS Fish Technology Center #889	4050 Bridger Canyon Road	Bozeman	Release Resolved	9/9/1981	7/8/1992
1611161	Jesse Lair #2674	7300 Bridger Canyon Road	Bozeman	Release Resolved	8/25/1995	7/31/1996
1601758	Paul Visscher #430	7850 Bridger Canyon Road	Bozeman	Release Resolved	1/20/1989	5/2/1989
1611170	Silver Forest Inn #378	15325 Bridger Canyon Road	Bozeman	Release Resolved	8/4/1999	11/15/1999

Source: NRIS, 2014.

Abandoned and Inactive Mine Sites

A single abandoned and inactive quarry site is located at approximate RP 4.4 (see Exhibit 8 in Attachment 1). A landslide associated with this quarry has covered approximately half of the former MT 86 alignment, which is currently bordered with concrete barriers. If improvements are proposed in this area, the site has the potential to affect project design and construction, and additional investigation may be necessary.

Hazardous Waste Handler

One hazardous waste handler was identified within the study area. According to the location indicated in the NRIS database, the site is likely the USFWS Bozeman Fish Technology Center at RP 4.0 (see Exhibit 8 in Attachment 1). If improvements to MT 86 are proposed in this area, additional coordination may be required.

3.0 Biological Resources

3.1 Vegetation

A combination of conifer-dominated forests, cultivated crops, sagebrush steppe, and Rocky Mountain grasslands habitat dominate the land cover in the vicinity of the study area (see in Exhibit 9 in Attachment 1 and Attachment 8). Riparian woodland and shrub-dominated rangeland line the riparian corridors of the numerous creeks and drainages that transect the study area. North and east of RP 23, the study area is buffered by rangeland, grassland, and riparian wetlands bordering the low-gradient streams in the area. Table 3 and Table 4 present land cover within Gallatin and Park Counties.

Table 3 Gallatin County Land Cover

% of Cover	Land Cover Type
13%	Rocky Mountain Montane Douglas-fir Forest and Woodland
11%	Cultivated Crops
11%	Montane Sagebrush Steppe
10%	Rocky Mountain Lower Montane, Foothill, and Valley Grassland
9%	Rocky Mountain Lodgepole Pine Forest
9%	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
6%	Rocky Mountain Subalpine-Montane Mesic Meadow
3%	Aspen Forest and Woodland
3%	Big Sagebrush Steppe
3%	Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland
2%	Alpine-Montane Wet Meadow
2%	Other Roads

Source: MNHP, 2014.

Table 4 Park County Land Cover

% of Cover	Land Cover Type
15%	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and woodland
11%	Montane Sagebrush Steppe
10%	Rocky Mountain Lower Montane, Foothill, and Valley Grassland
10%	Rocky Mountain Montane Douglas-fir Forest and Woodland
8%	Big Sagebrush Steppe
7%	Rocky Mountain Lodgepole Pine Forest
4%	Alpine Turf
4%	Cultivated Crops
4%	Recently Burned Forest
4%	Rocky Mountain Subalpine-Montane Mesic Meadow
3%	Aspen Forest and Woodland
3%	Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland
2%	Alpine Bedrock and Scree
2%	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
2%	Rocky Mountain Subalpine Woodland and Parkland

Source: MNHP, 2014.

If improvement options are forwarded from the study, practices outlined in MDT's standard specifications should be followed to minimize adverse impacts to vegetation. Removal of mature trees and shrubs should be limited to the extent practicable.

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, are at particular risk of weed encroachment. The Invaders Database System lists 262 exotic plant species and 49 noxious weed species in Gallatin County, and 144 exotic plant species and 32 noxious weed species in Park County, some of which may be present in the study area (Attachment 9).

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

3.2 General Wildlife Species

Mammals

The study area is home to a variety of mammal species including white-tail deer, mule deer, elk, moose, black bear, mountain lion, gray wolf, and coyote. Other common mammals potentially occurring in the study area include porcupine, raccoon, striped skunk, badger, bobcat, red fox, beaver, muskrat, Richardson's ground squirrel, deer mouse, vole species, and a variety of bat species. Elk, mule and white-tail deer, moose, and antelope distributions are depicted in Exhibits 10, 11, 12, and 13 (in Attachment 1), respectively.

According to electronic mail communications between FWP and MDT, elk are plentiful in the southern portion of the study area, and local citizens have expressed concern about elk on the highway, especially in the winter months. Specifically, from RP 6 to RP 10 in the Kelly Canyon area, as well as near the intersection with Bridger Canyon Spur Road (RP 8.3) and Jackson Creek Road (RP 9.5), elk are frequently observed crossing the road in the winter months. The design and scoping of any future projects in this location should consider occupied habitat adjacent to and the movement of the elk herd across the highway during winter months relative to recreational traffic accessing the Bridger Bowl ski area.

Whitetail and mule deer are prevalent within the study area and the surrounding vicinity. In the morning hours (7 am to 9 am), numerous deer were observed crossing MT 86 during the June 25, 2014, field review. The majority of the deer were observed in the southern portion of the study area, from approximately RP 5 to RP 22.

Moose and black bear also inhabit the study area, with both species’ habitat predominantly found from RP 5 to RP 22. Based on FWP input, moose are relatively abundant in the area, particularly in the areas of Kelly Canyon, Drinking Horse Reservoir, and Green Mountain. One moose was observed during the field review at approximate RP 28. FWP also reported several mountain lion harvested within a mile of MT 86.

A review of the MDT Maintenance animal carcass database between January 1, 2004, and December 31, 2013, indicates that at least 92 animal carcasses were collected throughout the length of the MT 86 corridor (RP 1.95 to RP 37.5). Carcass locations are illustrated in Exhibit 14 (in Attachment 1). Carcass collections are concentrated between RP 1.75 and RP 12, which may be attributed to higher traffic volumes and faster speed limits in this portion of the corridor. Carcass data may not accurately reflect animal-vehicle conflicts throughout the corridor, and not all carcasses result from vehicle collisions. Animal carcasses in areas along the corridor with steeper topography or denser roadside vegetation may have evaded collection by maintenance personnel due to a lack of visibility. Additionally, recently-approved legislation has permitted the collection of game animals killed on roadsides for personal consumption. These factors may affect collections and incidents reported in the MDT maintenance animal carcass database.

Table 5 summarizes the large mammal carcass collections during the ten-year period

Table 5 Large Mammal Carcasses (2004 – 2013)

Animal	Carcasses Collected	% by Species
Black bear	1	1.09
Elk	6	6.52
Mule Deer	26	28.26
Other (Wild)	3	3.26
Whitetail Deer	54	58.70
Unknown	2	2.17
Total	92	100.00

Source: MDT, 2013.

Whitetail deer (58.7%) accounted for the majority of the carcasses collected along this portion of MT 86, followed by mule deer (28.26%). The majority of the carcasses were collected between RP 1.95 and RP 11.5 (see Exhibit 14 in Attachment 1).

If improvement options are forwarded from the study, wildlife crossing structures and other wildlife mitigation strategies should be explored during the project development process. Additional coordination with the FWP area wildlife biologist should be undertaken for local expertise on the wintering elk herd in the study area.

Amphibians and Reptiles

According to the Montana Natural Heritage Program (MNHP) Natural Heritage Tracker database, which records and maps documented observations of species in a known location, amphibian species known to occur within the study area include, but are not limited to, the boreal chorus frog, American bullfrog, northern leopard frog, Columbia spotted frog, snapping turtle, painted turtle, rubber boa, gophersnake, and common gartersnake.

Birds

The MNHP Natural Heritage Tracker database indicates there are more than two hundred 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.

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/cavity nesters such as burrowing owls or bank or cliff swallows may also be prohibited under the MBTA.

According to FWP, there are multiple bald eagle nests located in the general vicinity; however, none are located within the study area or within approximately five miles of the study area (see Exhibit 15 in Attachment 1). While bald eagle nests are not found within the study area, information from the Montana Field Guide states, "numerous eagles have been observed migrating over Rogers Pass and the Bridger Mountains" (Hawk Watch International 2003). 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."

Information forwarded from MDT indicates that multiple nesting raptors have been observed in the northern portion of the corridor, specifically from RP 25 to RP 38. Any improvements forwarded from this study should consider potential constraints that may result from nesting/breeding periods of migratory birds and presence of bald and golden eagles nests.

Fisheries

Many perennial, intermittent, and ephemeral streams intersect the study area (see Exhibit 5 in Attachment 1). Table 6 depicts fisheries information for named streams within the study area (see Attachment 10).

Table 6 Fisheries Data

Named Stream within Study Area	RP*	RM**	Fish Species Present
Brackett Creek	18.8	19.68	Brook Trout, Brown Trout, Longnose Sucker, Mottled Sculpin, Mountain Whitefish, Rainbow Trout, White Sucker, Yellowstone Cutthroat Trout
Bridger Creek	3.15	2.19	Brook Trout, Brown Trout, Longnose Dace, Mottled Sculpin, Mountain Whitefish, Rainbow Trout
Cache Creek	24.3	4.3	Brook Trout, Brown Trout, Mottled Sculpin, Yellowstone Cutthroat Trout
Carrol Creek	27.0	1.45	Brook Trout, Mottled Sculpin, Yellowstone Cutthroat Trout
Dry Creek	32.5	0.63	Brook Trout, Mottled Sculpin
East Gallatin River	2.7	43.42	Brook Trout, Brown Trout, Longnose Dace, Longnose Sucker, Mottled Sculpin, Mountain Sucker, Mountain Whitefish, Rainbow Trout, White Sucker, Yellowstone Cutthroat Trout
Fairy Creek	25.15	0.86	Brook Trout, Brown Trout, Mottled Sculpin, Yellowstone Cutthroat Trout
Flathead Creek	31.0	1.24	Brook Trout, Brown Trout, Lake Chub, Longnose Dace, Longnose Sucker, Mottled Sculpin, Mountain Sucker, Mountain Whitefish, White Sucker, Yellowstone Cutthroat Trout
Lyman Creek	3.1	0.05	No data available
Maynard Creek	16.0	2.91	Surveyed; no fish captured
Middle Fork Brackett Creek	18.8	0.13	Brook Trout, Mottled Sculpin, Westslope Cutthroat Trout, Yellowstone Cutthroat Trout
Muddy Creek	37.2	0.01	Brook Trout, Brown Trout, Longnose Sucker, Mottled Sculpin, Mountain Sucker, Mountain Whitefish, White Sucker
North Fork Brackett Creek	19.0	0.13	Brook Trout, Brown Trout, Mottled Sculpin, Mountain Whitefish, Yellowstone Cutthroat Trout
Olson Creek	14.1	0.25	Surveyed; no fish captured
Place Creek	5.9	0.14	No data available
South Fork Brackett Creek	18.8	0.07	Yellowstone Cutthroat Trout
South Fork Dry Creek	32.05	0.27	No data available
Stone Creek	11.35	0.19	Brook Trout
White Creek	19.95	0.33	Brook Trout, Rainbow Trout

Source: FWP Montana Fisheries Information System (MFISH), 2014.

*RP: Approximate reference post where MT 86 crosses the stream, or where the stream enters the study area, if not actually crossed.

** RM: Approximate river mile of MT 86 crossing, or closest point to MT 86, if not actually crossed.

According to MNHP, the Brackett Creek and Flathead Creek drainages contain populations of genetically-pure Yellowstone cutthroat trout. Other unnamed stream crossings exist that could also support fish species within the study area. Fish passage and/or barrier opportunities should be considered in cooperation with resource agencies at affected drainages if improvements are forwarded from this study. Permitting from regulatory agencies for any future corridor improvements may also require incorporation of design measures to facilitate aquatic species passage.

Crucial Areas Planning System

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. CAPS results are presented in Attachment 11.

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.

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. 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, six threatened, proposed threatened, or candidate species are listed as occurring in Gallatin and Park Counties (see Table 7 and Attachment 12).

Table 7 Threatened and Endangered Species in Gallatin and Park Counties

Species		Status
Wildlife Species	Greater sage-grouse	Candidate
	Sprague’s pipit	Candidate
	Grizzly bear	Threatened
	Canada lynx	Threatened
Plant Species	Whitebark pine	Candidate
	Ute ladies’-tresses	Threatened

Source: USFWS, 2014.

According to the USFWS database, all of the federally-listed species potentially occurring in Gallatin and Park Counties have occurrence buffers overlapping the study area (see Exhibit 15 in Attachment 1). If improvements are forwarded from the study, an evaluation of potential effects to T&E species will need to be completed 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.

3.4 Species of Concern

Montana species of concern (SOC) 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 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. 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).

A search of the MNHP species of special concern database on June 27, 2014, revealed 21 SOC in Gallatin and Park Counties with potential to occur in the study area based on presence of suitable habitat (Table 8 and Attachment 13).

Table 8 Species of Concern Overlapping the Study Area

Animal Subgroup	Common Name	State Rank	Habitat Description
Amphibians	Western toad	S2	Wetlands, floodplain pools
Birds	Great blue heron	S3	Riparian forest
	Northern goshawk	S3	Mixed conifer forests
	Ferruginous hawk	S3B	Sagebrush grassland
	Great gray owl	S3	Conifer forest near open meadows
	Clark’s nutcracker	S3	Conifer forest
	Brown creeper	S3	Moist conifer forests
	Veery	S3B	Riparian forest
	Sage thrasher	S3B	Sagebrush
	Brewer’s sparrow	S3B	Sagebrush
	Sagebrush sparrow	S3B	Sagebrush
	Bobolink	S3B	Moist grasslands
	Cassin’s finch	S3B	Drier conifer forest
Fish	Yellowstone cutthroat trout	S2	Mountain streams, rivers, lakes
	Westslope cutthroat trout	S2	Mountain streams, rivers, lakes
Mammals	Wolverine	S3	Boreal forest and alpine habitats
Invertebrates	Warm Spring Zaitzevian riffle beetle	S1	Springs
	Brown’s microcyloopus riffle beetle	S1	Springs
Plants	Rocky Mountain twinpod	S3	Gravelly slopes/talus
	Small yellow lady’s-slipper	S3S4	Fens and moist forest-meadows
	Slender wedgrass	S3S4	Wet sites (low-elevation)

Source: MNHP, 2014.

Of particular note, the only known global population of the Warm Spring Zaitzevian riffle beetle occurs within the project area in spring and seepage habitat (total area = 35 square meters) in and along Bridger Creek where it flows through the USFWS-owned Bozeman Fish Technology Center (Montana Field Guide, 2014). Because this is the only globally-known location of this species, every effort should be made to avoid disturbance to this beetle and its habitat. Any potential disturbance to the beetle or its habitat should be coordinated with Montana FWP and the USFWS.

Other sensitive species, including bald eagles, are not listed in Table 8, but have the potential to occur within the study area. A thorough field investigation for the presence and extent of these species 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.

4.0 Social and Cultural Resources

4.1 Population Demographics and Economic Conditions

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, and 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 might be affected by improvements within the study area.

Title VI of the United States Civil Rights Act of 1964, as amended (USC 2000(d)) and EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, require that no minority, or, by extension, low-income person shall be disproportionately adversely impacted by any project receiving federal funds. For transportation projects, this means that no particular minority or low-income person may be disproportionately isolated, displaced, or otherwise subjected to adverse effects. If a project is forwarded from the improvement option(s), environmental justice will need to be further evaluated during the project development process.

Table 9 summarizes population and demographic data for Gallatin and Park Counties based on 2010 Census data and includes Montana for comparison.

Table 9 2010 Census Data for Gallatin and Park Counties

Element		Gallatin	Park	Montana
Population	County	89,513	15,636	989,415
	Bozeman City	37,280		
	Belgrade City	7,389		
	Three Forks City	1,869		
	Livingston City		7,044	
	Clyde Park Town		288	
Race	White	97%	98%	89.4%
	Black or African American	0.3%	0.1%	0.4%
	American Indian & Alaska Native	2%	1%	6.3%
	Asian	1%	0.3%	0.6%
Ethnicity	Hispanic or Latino	2%	1%	2.9%

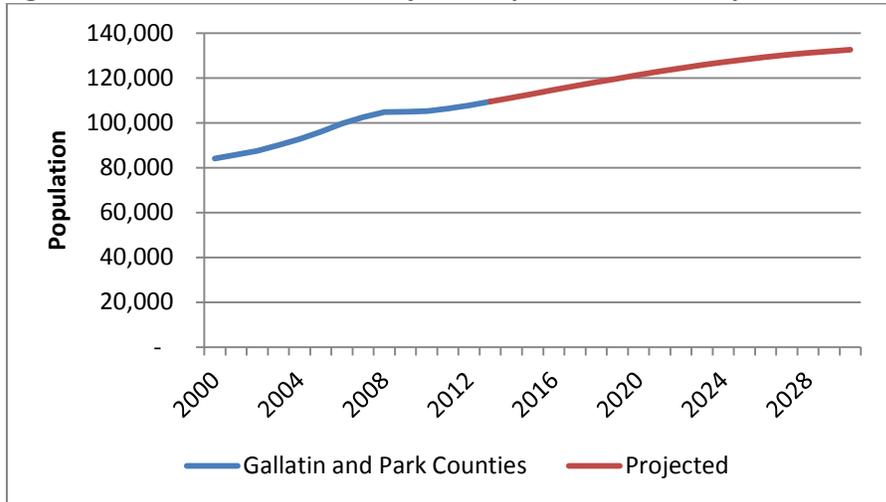
Source: U.S. Census Bureau, 2010.

As of the 2010 Census, Gallatin and Park County were ranked as being the 4th and 12th most populous counties in Montana. A large share of the population in Gallatin County (52 percent) resides within the cities of Bozeman, Belgrade, and Three Forks. Livingston and Clyde Park make up 47 percent of Park County’s population.

According to the 2000 United States Census Bureau (USCB), the population of Gallatin County was 68,375 and the population of Park County was 15,710. By the 2010 Census, the population of Gallatin and Park County was 89,513 and 15,636, respectively. This indicates that Gallatin County’s population has increased by approximately 31 percent over the last decade, while the

population of Park County has remained relatively constant over a 10-year period. However, regionally, the combined population from both counties shows an increase by a mean of 2 percent each year from 2000 to 2013. From 2012 to 2030, the region’s population is projected to increase by approximately 25,000 people. This is an increase of approximately 158 percent of the region’s 2000 population. This increase follows an upward trend of population growth typical throughout western Montana. Figure 1 shows the combined populations of both counties from 2000 to 2013 (in blue) and the projections to year 2030 (in red) based on data services through the Montana Department of Commerce.

Figure 1 Total Observed and Projected Population in the Study Counties

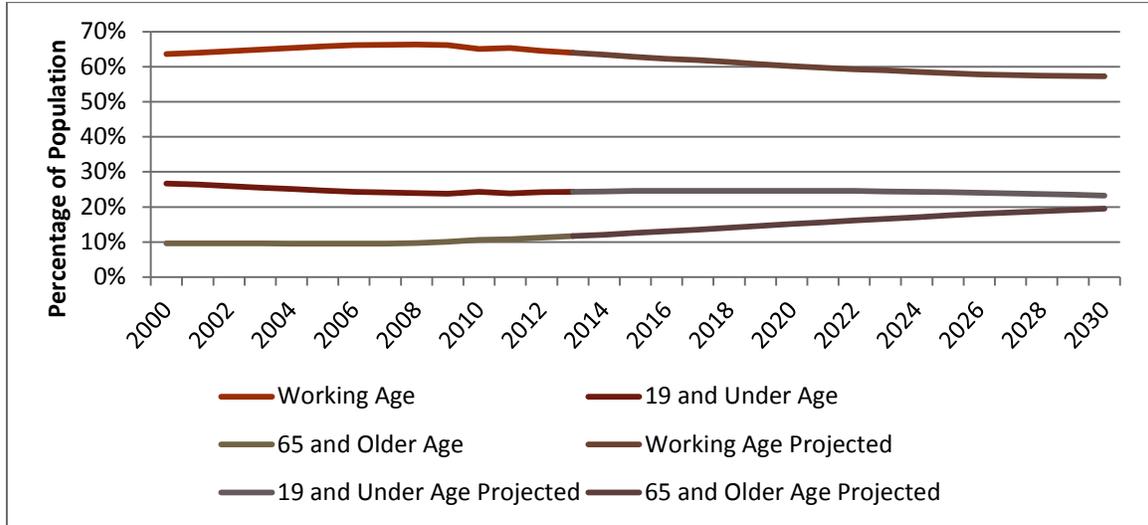


Source: US Census Bureau, 2010.

Gallatin and Park Counties’ population ethnicity in 2010 is primarily white/Caucasian (97 percent and 98 percent, respectively), with American Indian and Alaska Native individuals comprising 1 to 2 percent of the population. A number of races make up the remainder of the population.

The population in the Gallatin County and Park County region is aging, with age distribution projections showing population category 65 and over expected to double by 2030. A decline in the percentage of the working aged population of the two counties (ages 20 to 64) from a peak of approximately 65 percent in the last decade to just over half by 2030 is also expected. The projected age distribution is illustrated in Figure 2.

Figure 2 Age Distribution of the Study Counties (Projected after 2013)



Source: US Census Bureau, 2010.

From 2006 to 2010, the USCB, by means of the American Community Survey (ACS), produced the 5-year estimate for employment by industry for Gallatin and Park Counties. The study indicated that Gallatin County has approximately 42,467 employed individuals in the labor force, while Park County consisted of 5,172 employed individuals. For Gallatin County, the top fields of employment are public administration, followed by the arts, entertainment, recreation, and foods industry. For Park County the top fields of employment are the arts, entertainment, recreation, and foods industry, followed by public administration. Table 10 displays employment within Gallatin County and Park County by industry, according to the ACS.

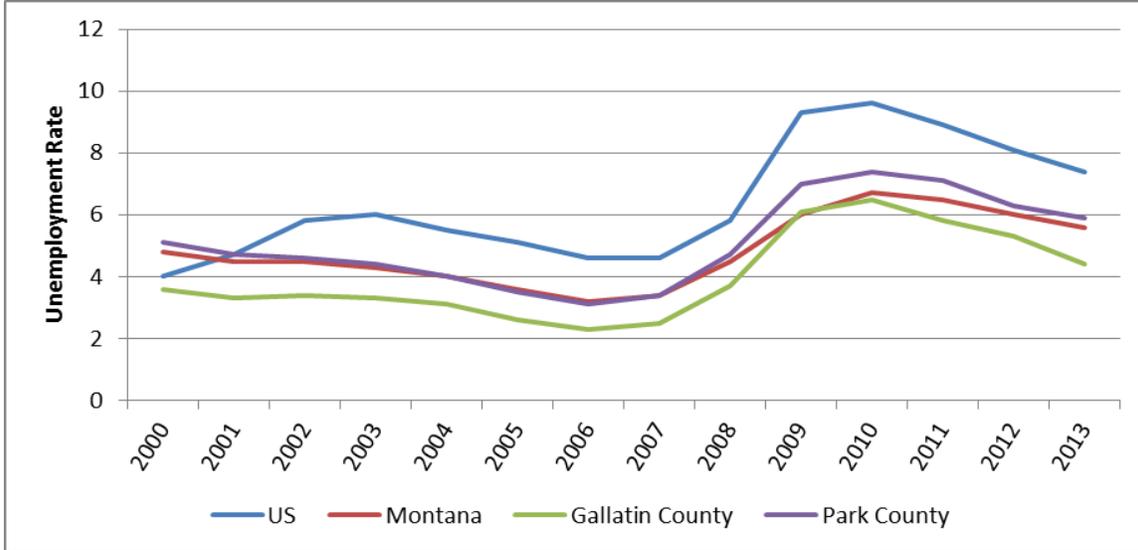
Table 10 County Employment by Industry (2006-2010)

Industry	Total Estimate	
	Gallatin	Park
Agriculture, forestry, fishing, and hunting	483 (1.1%)	154 (3.0%)
Construction	3,285 (7.8%)	296 (5.8%)
Manufacturing	2,244 (5.3%)	248 (4.9%)
Wholesale trade	1,348 (3.2%)	33 (0.7%)
Retail trade	6,548 (15.5%)	646 (12.7%)
Transportation and warehousing, and utilities	921 (2.2%)	39 (0.8%)
Information	559 (1.3%)	81 (1.6%)
Finance and insurance, and real estate and rental and leasing	2,140 (5.1%)	207 (4.1%)
Professional, scientific, and management , and administrative and waste management services	4,444 (10.5%)	228 (4.5%)
Educational Services, health care and social assistance	4,553 (10.8%)	733 (14.5%)
Arts, entertainment, recreation, and accommodation and food services	6,566 (15.6%)	1,314 (25.9%)
Other services, except public administration	1,468 (3.5%)	354 (7.0%)
Public Administration	7,608 (18.0%)	739 (14.6%)
Civilian employed population (16 years and over)	42,167	5,072

Source: US Census Bureau, ACS Survey, 2006-2010.

Figure 3 illustrates the unemployment rate comparison from 2000 to 2013. Unemployment in the Gallatin and Park County region has been similar to the statewide unemployment rate for the last decade. As the recession began in 2007 and unemployment increased, Montana, Gallatin County, and Park County all did relatively well in comparison to the nation as a whole with an unemployment rate below the national average. However, after 2007 Park County has continuously had a higher unemployment rate than the state average. Gallatin County has stayed below both the national and state average over time. The most recent unemployment figures from the state and federal labor departments suggest favorable current employment conditions in the study area. In 2013, the average unemployment rate for Gallatin County and Park County was 4.4 and 5.8 percent, respectively. Although Park County has a slightly higher rate than the Montana rate, both counties fall short of the national unemployment rate of 7.4 percent.

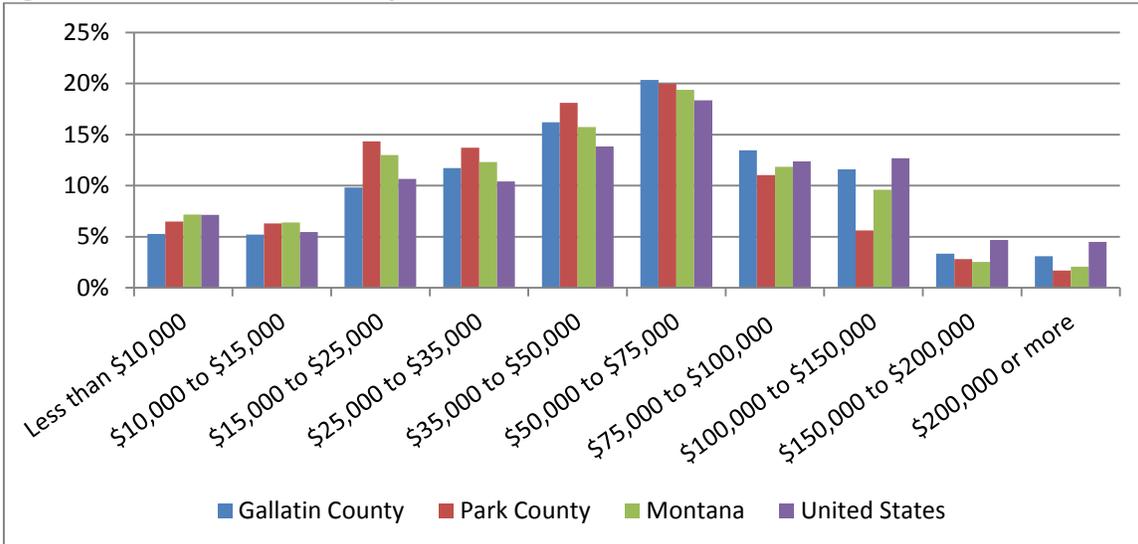
Figure 3 Unemployment Rate Comparison



Source: US Census Bureau, ACS Survey, 2000-2013.

Figure 4 shows the percentage of the population in Gallatin County, Park County, Montana, and the United States in 10 income categories from the 2010 Census. Park County generally has a smaller percentage of the population in the top four income categories compared to the state of Montana or the United States. Gallatin County commonly has a higher percentage than Montana in the majority of income categories. Park County has a higher percentage of household income in the \$15,000 to \$50,000. However, Gallatin County and Park County are relatively close in comparison to the United States and the State of Montana in all income categories above \$15,000.

Figure 4 Income Distribution by Household 2010



Source: U.S. Census Bureau, 2010.

4.2 Land Ownership and Land Use

Ownership of land in the study area is predominantly private, with some interspersed state and federal owners. Specifically, the USFWS owns a parcel of land associated with the Bozeman Fish

Technology Center from approximately RP 4.1 to RP 4.6, and, as part of the Gallatin National Forest, the USFS owns from approximate RP 18.4 to RP 19.5 and from RP 19.7 to RP 20.9. Additionally, state-owned land is located within the northern portion of the study area from RP 34.0 to RP 34.4. Much of the private land adjacent to MT 86 includes low- to moderate-intensity development. Land ownership maps for the study area are provided in Exhibit 16 (in Attachment 1).

Mixed land use arises from the varied land ownership throughout the study area. These land uses include commercial, industrial, crop/pasture, mine/quarry, mixed urban, and recreational (see Exhibit 9 in Attachment 1). If improvements are forwarded from this study, land use adjacent to possible projects will need to be considered during design.

4.3 Recreational Resources

Bridger Canyon provides access to the Bridger Mountains and the Gallatin National Forest, and offers a variety of recreational opportunities, including hiking, downhill skiing at the Bridger Bowl ski area, cross-county skiing at Bohart Ranch, birding and wildlife viewing, cycling, snowshoeing, fishing, hunting, hiking, and camping.

Recreational resource information was gathered during the field review and through review of USFS and FWP resource lists for Gallatin and Park Counties. Table 11 lists publically-owned recreational resources identified in the study area. 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 impact these properties unless there are no feasible and prudent avoidance alternatives and all possible planning to minimize harm has occurred. Prior to approving a project that “uses” a Section 4(f) resource, FHWA must find that there is no prudent or feasible alternative that completely avoids the 4(f) resource. “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.” Potential effects on recreational use would need to be considered in accordance with Section 4(f) if improvements are forwarded from this study. Potential Section 4(f) resources are mapped in relation to the study area in Exhibit 17 (in Attachment 1).

Table 11 Potential Section 4(f) Recreational Resources

Resource	Approximate RP
Story Mill Spur Trail	1.95
Bozeman Fish Technology Center Trails (including College “M” Trailhead and Trail System)	4.2
Stone Creek USFS Access	11.7
Olson Creek USFS Access	14.3
USFS Battle Ridge Campground, Picnic Area, and USFS 500 Trailhead	20.5
Fairy Lake USFS Trailhead	21.6

Source: USFS, 2014.

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, no Section 6(f) resources were identified in the study area. To confirm the accuracy/completeness of the literature, additional coordination with FWP will be necessary if improvements are forwarded from this study.

4.4 Cultural Resources

If MDT projects forwarded from the study are federally funded, MDT would need to conduct a cultural resource survey of the area of potential effect (APE) for this project as specified in Section 106 of the National Historic Preservation Act (36 CFR 800). Section 106 requires federal agencies to “take into account the effects of their undertakings on historic properties.” The purpose of the Section 106 process is to identify historic and archaeological properties that could be affected by the undertaking, assess the effects of the project and investigate methods to avoid, and minimize or mitigate any adverse effects on historic properties. These properties are also afforded protection under Section 4(f) of the Transportation Act.

A file search through the Montana State Historic Preservation Office revealed two historic properties located within 0.15 miles of the existing alignment (24GA1394 and 24GA0802). Table 12 lists the properties, their approximate locations, and National Register of Historic Places (NRHP) eligibility. All of the sites have been previously recorded and their NRHP status established. There are also two NRHP historic and archaeological properties (24GA1075 and 24GA0461) located within one mile of the existing MT 86 alignment but outside the survey area for this corridor study. An examination of the Montana Cadastral Survey information for the designated corridor indicates that at least 76 historic-age properties are located within 0.15 mile of the existing MT 86 alignment.

Table 12 Recorded Cultural Resource Sites

Site Name	Site No.	RP	Township	Range	Section	NRHP Eligibility
Flaming Arrow Ranch House & Office	24GA1394	15.3±	1N	7E	29	Listed
Sedan School	24GA0802	22.6±	2N	7E	3	Listed
Flaming Arrow Lodge	24GA1075	15.5±	1N	7E	29	Listed
Battle Ridge Station	24GA0461	N/A	2N	7E	32	Eligible

Source: Montana SHPO, 2014.

The rural nature of the landscape and size of the current road suggest that there are likely unrecorded archaeological sites within the project corridor. Based on an MDT field review on May 12, 2014, the east end of the project corridor has a higher likelihood of archaeological sites than the west end.

Alluvial terraces adjacent to perennial streams are particularly prone to harboring buried pre-contact campsites. There is a high likelihood of encountering buried archaeological sites near the following stream crossings: Dry Creek, Carrol Creek, Fairy Creek, and Cache Creek. Brackett Creek, and Bridger Creek and its various tributaries, all have the potential to harbor buried archaeological deposits at MT 86 crossings. Buried archaeological sites are often costly to test and excavate. Tipi ring sites may be located where MT 86 approaches the valley wall of Flathead Creek. These sites may be located at or near the ground surface, which generally makes them

less costly to test and/or excavate than more deeply buried sites. Tribal consultation will be necessary for the Battle Ridge Pass area.

Most sites in the study corridor will not be identified until MDT conducts an intensive pedestrian cultural resource inventory of this route. Cultural resource professionals will need to physically walk several 30-meter transects on either side of the proposed route to look for artifacts, particularly high-probability landforms. Some alluvial or colluvial landforms may require backhoe testing to determine the presence or absence of deeply-buried archaeological deposits. A detailed inventory of cultural resources cannot be determined within the corridor without substantial fieldwork, time, and expense.

If a project is forwarded from the corridor study, a cultural resource survey for unrecorded historic and archaeological properties within the APE will need to be completed during the project development process. Flexibility in design will be important to avoid and/or minimize impacts to significant sites in the study corridor.

4.5 Noise

Traffic noise may need to be evaluated for any future improvements to the Bridger Canyon corridor. Noise analysis is necessary for “Type I”-classified projects. If future roadway improvements are limited (e.g., the horizontal and vertical alignments are not changed and the highway remains a two-lane facility), then the project would not be considered a Type I project. If forwarded improvements include a substantial shift in the horizontal or vertical alignments, increasing the number of through lanes, providing passing lanes, or increasing traffic speed and volume, then the project would be considered a Type I project.

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

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 landscape throughout the study area contains an array of biological, topographic, historic, ecological, and cultural resources in a relatively remote location. MT 86 serves as the access point to the Bridger Bowl ski area from Bozeman and the greater Gallatin valley. MT 86 also provides access to the Gallatin National Forest, with numerous trailheads, access points, and a campground accessed via the highway. While the area surrounding the corridor has been slightly developed, the rural and scenic landscape remains, offering aesthetically-pleasing views to residents and motorists.

A rock formation, known as “Maiden Rock,” is located near RP 4.4 on the north side of MT 86. Some accounts indicate the named formation is a stone spire or pinnacle at the entrance to the canyon (see upper right). A Museum of the Rockies archival photograph circa 1900 shows a formation that appears to resemble a maiden’s head (see lower right). Although the spire still remains, much of the larger formation was damaged or removed during blasting by road crews in the 1970s.



Source: Museum of the Rockies Photo Archive Online, accessed August 2014. *Title:* Pinnacle at entrance to Bridger Canyon *Date:* ca 1890s *Photographer:* Charles D. Loughrey



Source: Museum of the Rockies Photo Archive Online, accessed August 2014. *Title:* Maiden Rock, Bridger Canyon near Bozeman, Montana *Date:* ca 1900 *Photographer:* Maurice Lamme

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 to MT 86.

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.

6.0 References

- Berg, R.B., Lopez, D.A., and Lonn, J.D. (2000). Geologic Map of the Livingston 30'x60' Quadrangle South-Central Montana. Montana Bureau of Mines and Geology, Open File Report MBMG 406. Retrieved July 2014 from:
http://www.mbmgt.mtech.edu/mbmgcat/public/ListCitation.asp?selectby=series&series_type=MBMG&series_number=648&series_sub=&
- DEQ. (n.d.). Clean Water Act Information Center. Retrieved July 2014 from:
<http://deq.mt.gov/wqinfo/CWAIC/default.mcp>
- DEQ. (2014). Hazardous Waste Handlers. Retrieved July 2014 from:
<http://deq.mt.gov/HazWaste/default.mcp>
- DEQ. (2014). DEQ Remediation Division - Hazardous Waste Site Cleanup Bureau, Petroleum Release Section, UST-Access Database. Retrieved June 2014 from:
<http://deq.mt.gov/LUST/LUSTSites.mcp>
- DEQ. (2014). DEQ Remediation Division - Hazardous Waste Site Cleanup Bureau, Petroleum Release Section, UST-Access Database. Retrieved June 2014 from:
<http://deq.mt.gov/UST/default.mcp>
- DEQ. (n.d.) DEQ Solid Waste Management Program Archives. Retrieved July 2014 from:
<http://nris.mt.gov/gis/>
- DNRC. (1951). Water Resources Survey - Park County, Montana. Retrieved July 2014 from
http://dnrc.mt.gov/wrd/water_rts/survey_books/default.asp
- DNRC. (1953). Water Resources Survey - Gallatin County, Montana. Retrieved July 2014 from
http://dnrc.mt.gov/wrd/water_rts/survey_books/default.asp
- DOC CEIC. (2013). Montana County Population Projections. Retrieved May 2014 from:
http://ceic.mt.gov/Documents/PopulationProjections/EMRI/StateTotals/eREMI_MT_CountyComparisons_TotalPopulation_April2013.pdf
- DOLI. (2012). Local Area Profiles, Labor Market Information. Retrieved May 2014 from:
<http://www.ourfactsyourfuture.org/cgi/databrowsing/?PAGEID=4&SUBID=273>
- FEMA. (n.d.). FEMA Digital FIRM (DFIRM) for Park County and Unincorporated areas (ID 36067). Retrieved July 2014.
- FEMA. (n.d.). FEMA Digital FIRM (DFIRM) for Gallatin County and Unincorporated areas (ID 30031C). Retrieved July 2014.
- FWP. (2008). Elk Distribution Data. Retrieved July 2014 from:
<http://fwp.mt.gov/gisData/metadata/distributionElk.htm>

- FWP. (n.d.). MFISH Data. Retrieved July 2014 from:
<http://fwp.mt.gov/fishing/mFish/default.html>
- FWP. (n.d.). Recreation Data. Retrieved July 2014 from:
<http://fwp.mt.gov/recreation/visitFwpSite.html>
- MBMG. (n.d.). GWIC Online Overview of Gallatin County. Retrieved July 2014 from:
<http://mbmggwic.mtech.edu/sqlserver/v11/reports/CountyStatistics.asp?MTCountry=GALLATIN>
- MBMG. (n.d.). GWIC Online Overview of Park County. Retrieved July 2014 from:
<http://mbmggwic.mtech.edu/sqlserver/v11/reports/CountyStatistics.asp?MTCountry=PA RK>
- MDT. (1998-2009). MDT Safety Management Animal Carcass Database. Retrieved June 2014.
- MDT. (1962-1991). Geotechnical file for Bridger Canyon slide at RP 4.4. Retrieved July 2014.
- MNHP. (n.d.). Elemental Occurrences Database. Retrieved July 2014 from:
<http://mtnhp.org/Tracker/NHTMap.aspx>
- MNHP. (n.d.). Montana Ecological Systems - Landcover Report - Gallatin County. Retrieved July 2014 from: <http://mtnhp.org/mapviewer/>
- MNHP. (n.d.). Montana Ecological Systems - Landcover Report - Park County. Retrieved July 2014 from: <http://mtnhp.org/mapviewer/>
- MNHP. (n.d.). Montana Field Guide Database. Retrieved July 2014 from:
<http://fieldguide.mt.gov/>
- MNHP. (n.d.). Montana Natural Heritage Program Web Service – Nonvascular Plants, Vascular Plants, Fish, Mammals, Reptiles, Invertebrates, Amphibians, Birds. Retrieved July 2014 from: <http://mtnhp.org/default.asp>
- MNHP. (n.d.). Montana Public Lands and Private Conservation Lands. Retrieved June 2014 from:
http://nris.mt.gov/nsdi/nris/stew_owners.xml
- Museum of the Rockies Photo Archive Online. ca 1890s. Photograph of Pinnacle at entrance to Bridger Canyon. Charles D. Loughrey. Retrieved August 2014 from:
http://www.morphotoarchive.org/location_jpeg_rec.php?objno=x83.13.1931
- Museum of the Rockies Photo Archive Online. ca 1900. Photograph of Maiden Rock, Bridger Canyon near Bozeman, Montana. Maurice Lamme. Retrieved August 2014 from:
http://morphotoarchive.org/location_jpeg_rec.php?objno=x81.25.20
- NRHP. (n.d.). Historic Sites in Gallatin County. Retrieved July 2014 from:
<http://www.nationalregisterofhistoricplaces.com/mt/Gallatin/state.html>

- NRHP. (n.d.). Historic Sites in Park County. Retrieved July 2014 from:
<http://www.nationalregisterofhistoricplaces.com/mt/Park/state.html>
- NRIS. (2005). Abandoned Mines DEQ Mine Waste Cleanup Bureau, Abandoned Mines Section Database. Retrieved June 2014 from:
http://nris.mt.gov/nsdi/nris/deq_abandoned_mines.xml
- SHPO. (n.d.). Site Reports. Retrieved July 2014.
- Smith, R.B, and Sbar, M.L. (1974). Contemporary tectonics and seismicity of the western United States with emphasis on the Intermountain Seismic Belt. Geological Society of America Bulletin, v. 85, no. 2, p. 1205-1218.
- Stickney, M.C., Haller, K.M., and Nachette, M.N. (2000). Quaternary Faults and Seismicity in Western Montana. Montana Bureau of Mines and Geology, Special Publication No. 114.
- USCB. (2010). American Fact Finder. Retrieved May 2014 from:
<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>
- USDA. (n.d.). Natural Resource Inventory System SSURGO Soil Mapping Units. Retrieved July 2014 from:
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_053627
- USDA. (n.d.). Web Soil Survey. Retrieved July 2014 from:
<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>
- USFWS. (n.d.). National Wetlands Inventory. Retrieved July 2014 from:
<http://www.fws.gov/wetlands/>
- USFWS. (n.d.). Threatened and Endangered Species by Montana County. Retrieved July 2014 from:
http://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/countylist.pdf
- USGS. (n.d.). Geographic Information Retrieval and Analysis System Files. Retrieved July 2014 from: <http://nris.mt.gov/nsdi/nris/LU25.html>
- Vuke, S.M., Lonn, J.D., Berg, R.B., and Schmidt, C.J. (2014). Geologic Map of the Bozeman 30'x60' Quadrangle Southwestern Montana, Montana Bureau of Mines and Geology, Open File Report MBMG 648. Retrieved July 2014 from:
http://www.mbmgs.mtech.edu/mbmgcat/public/ListCitation.asp?selectby=series&series_type=MBMG&series_number=406&series_sub=&

Attachment 1

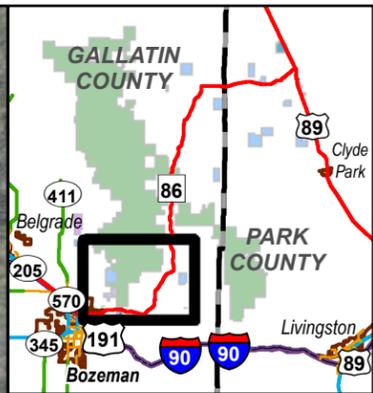
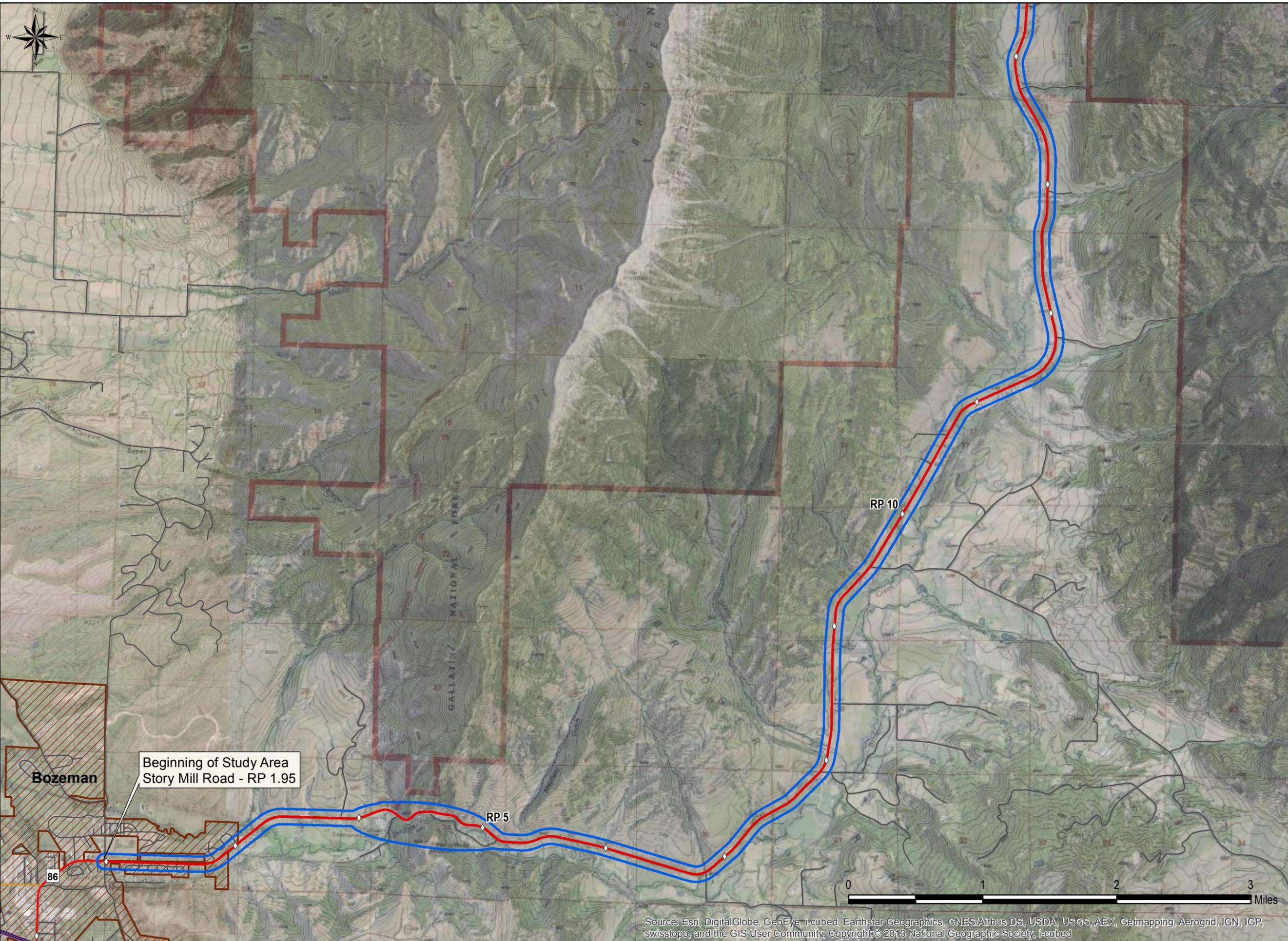
Exhibits



List of Exhibits

Exhibit 1	Corridor Planning Study Area
Exhibit 2	Topographic Map of Study Area
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Exhibit 16	Land Ownership
Exhibit 17	Potential Section 4(f) Resources





Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary

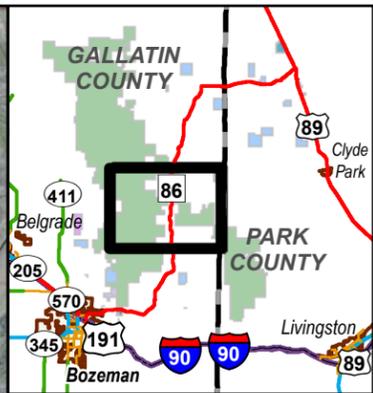
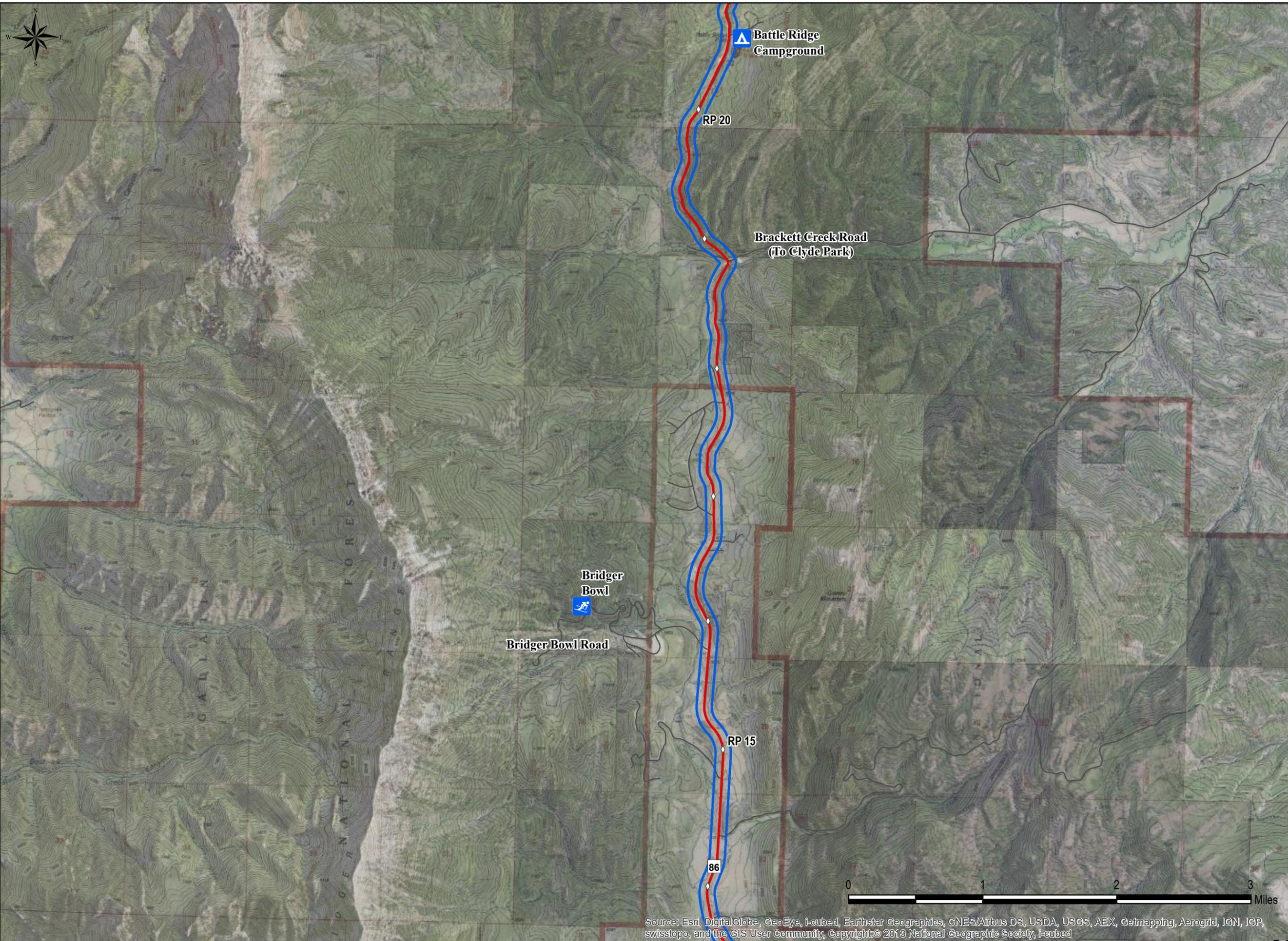
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RP 5

RP 10

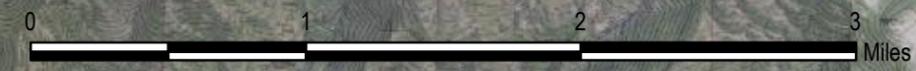


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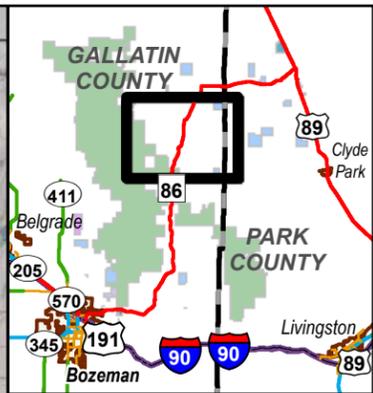
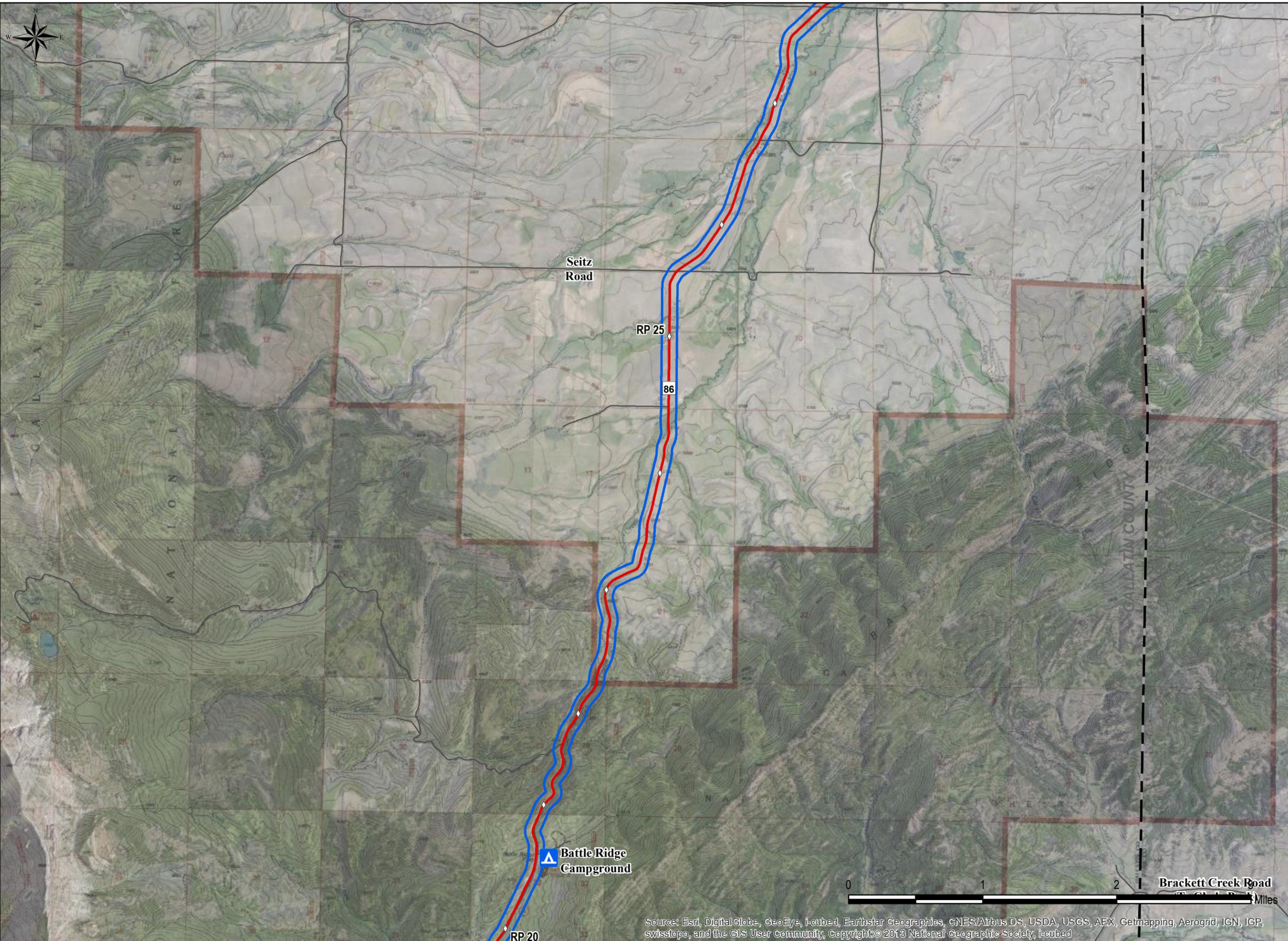


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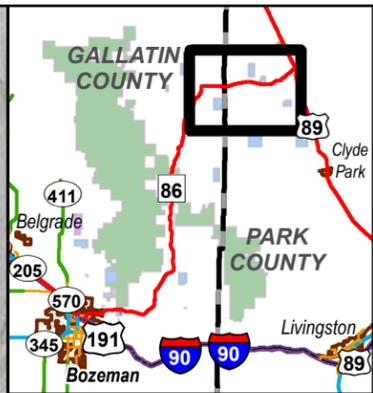
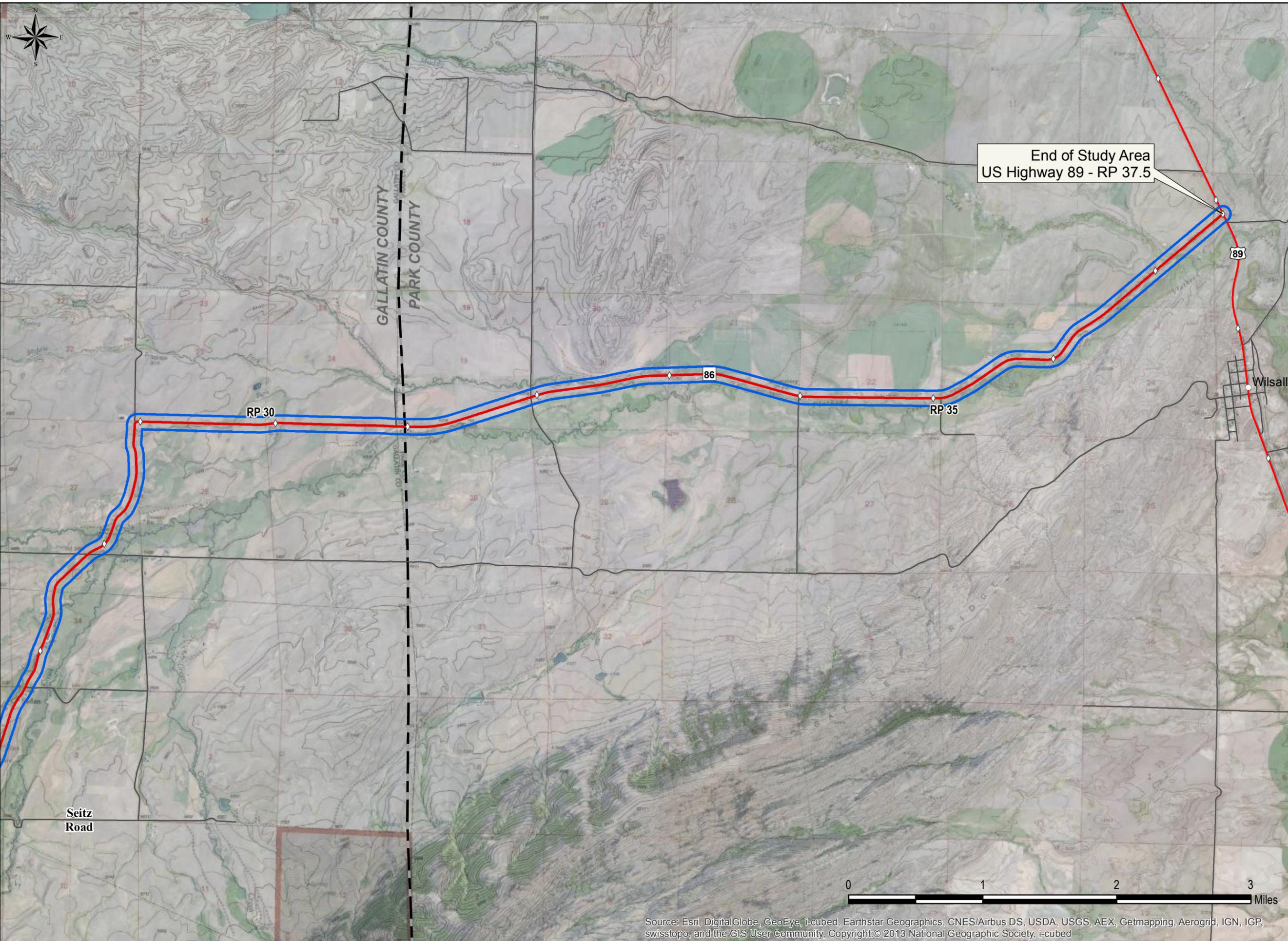


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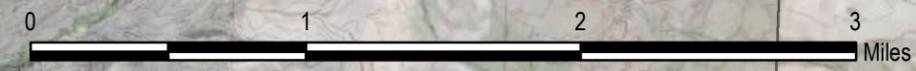


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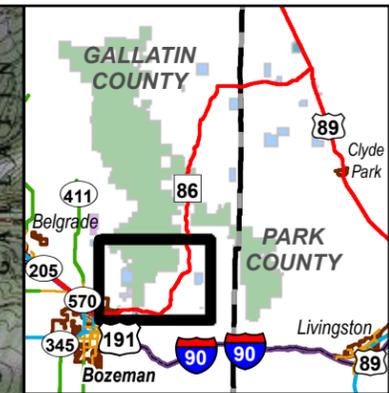
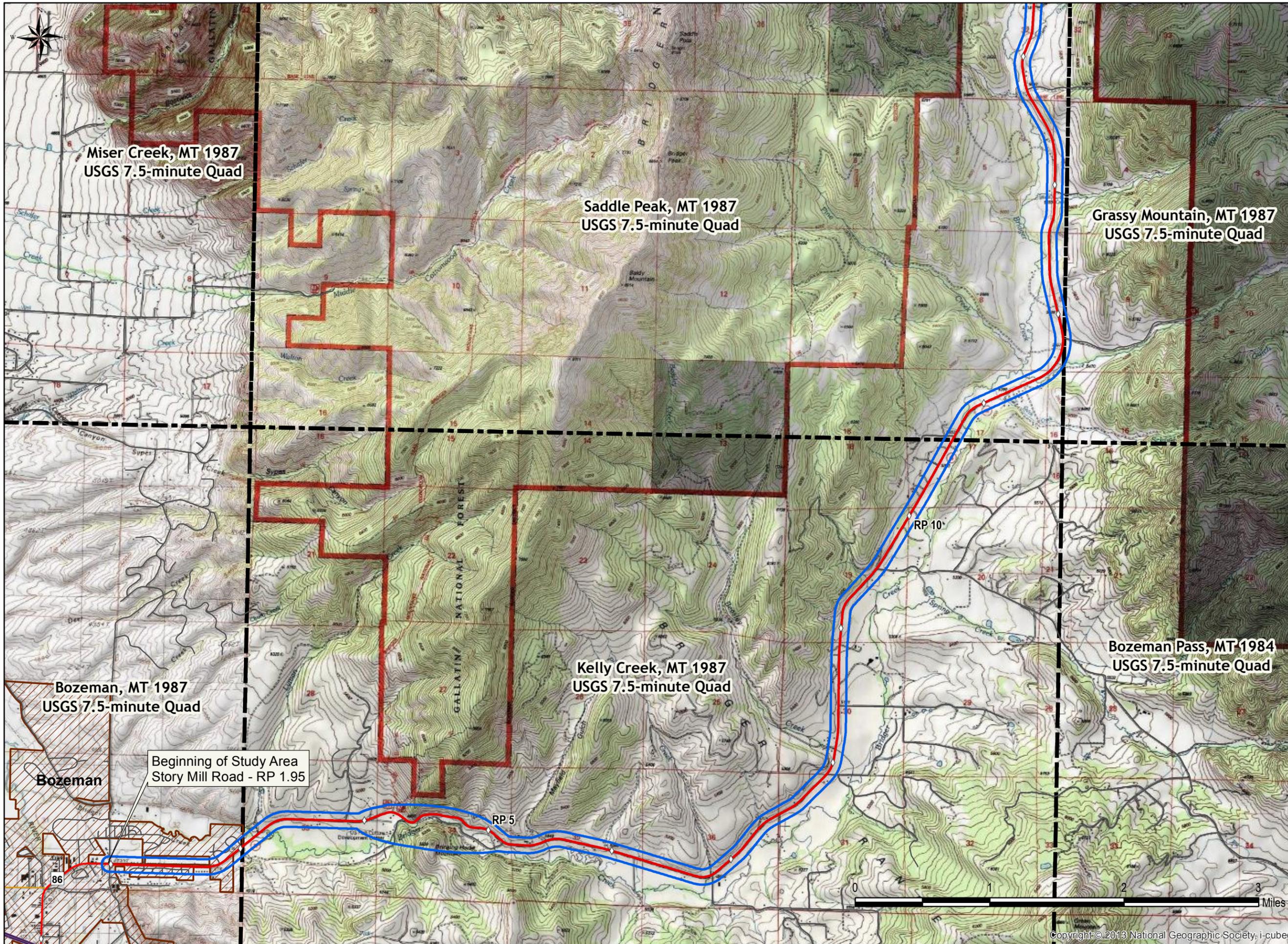


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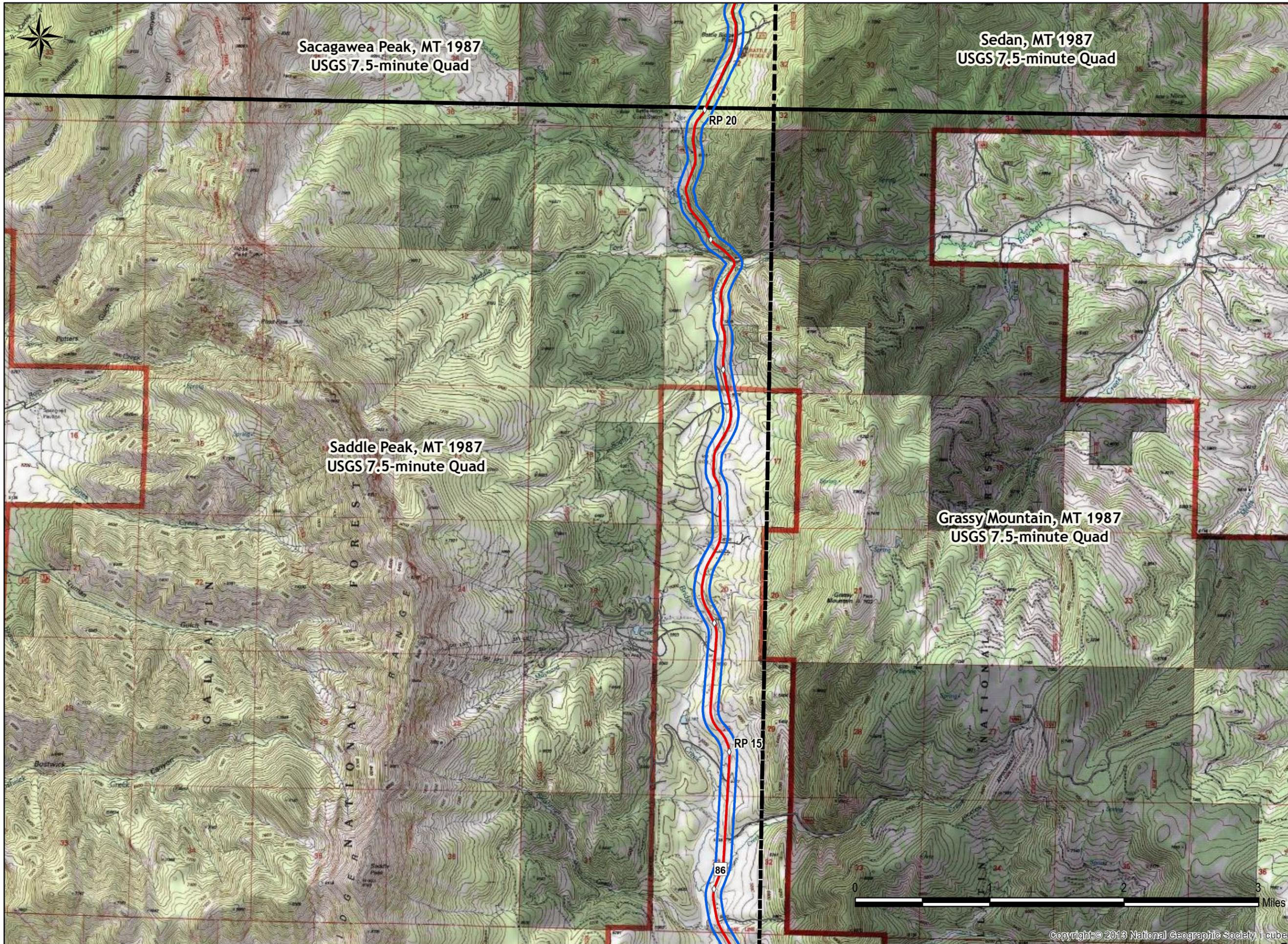
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 - ▭ County Boundary
 - ▭ 7.5 minute U.S. Geologic Survey Quadrangles

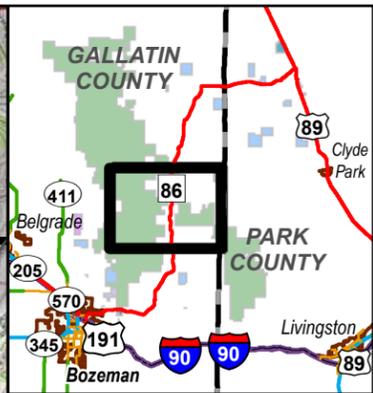


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USGS 7.5-minute Quad

Sedan, MT 1987
USGS 7.5-minute Quad

Saddle Peak, MT 1987
USGS 7.5-minute Quad

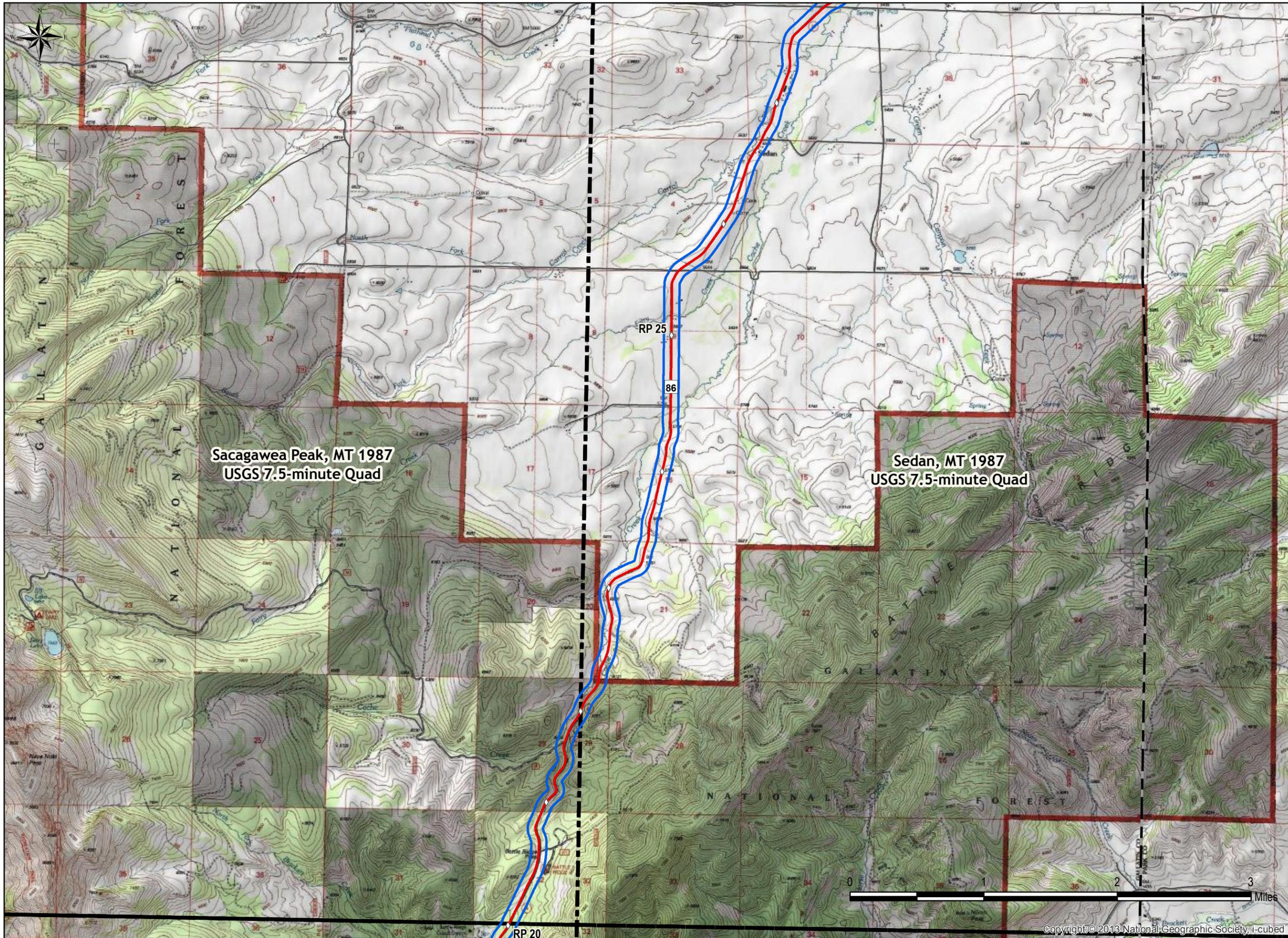
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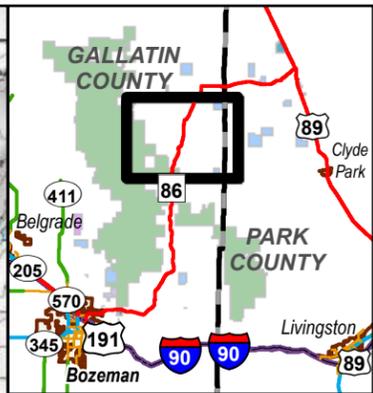
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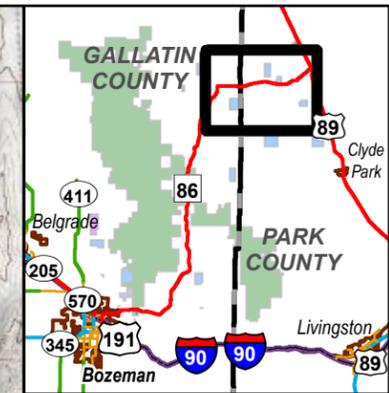
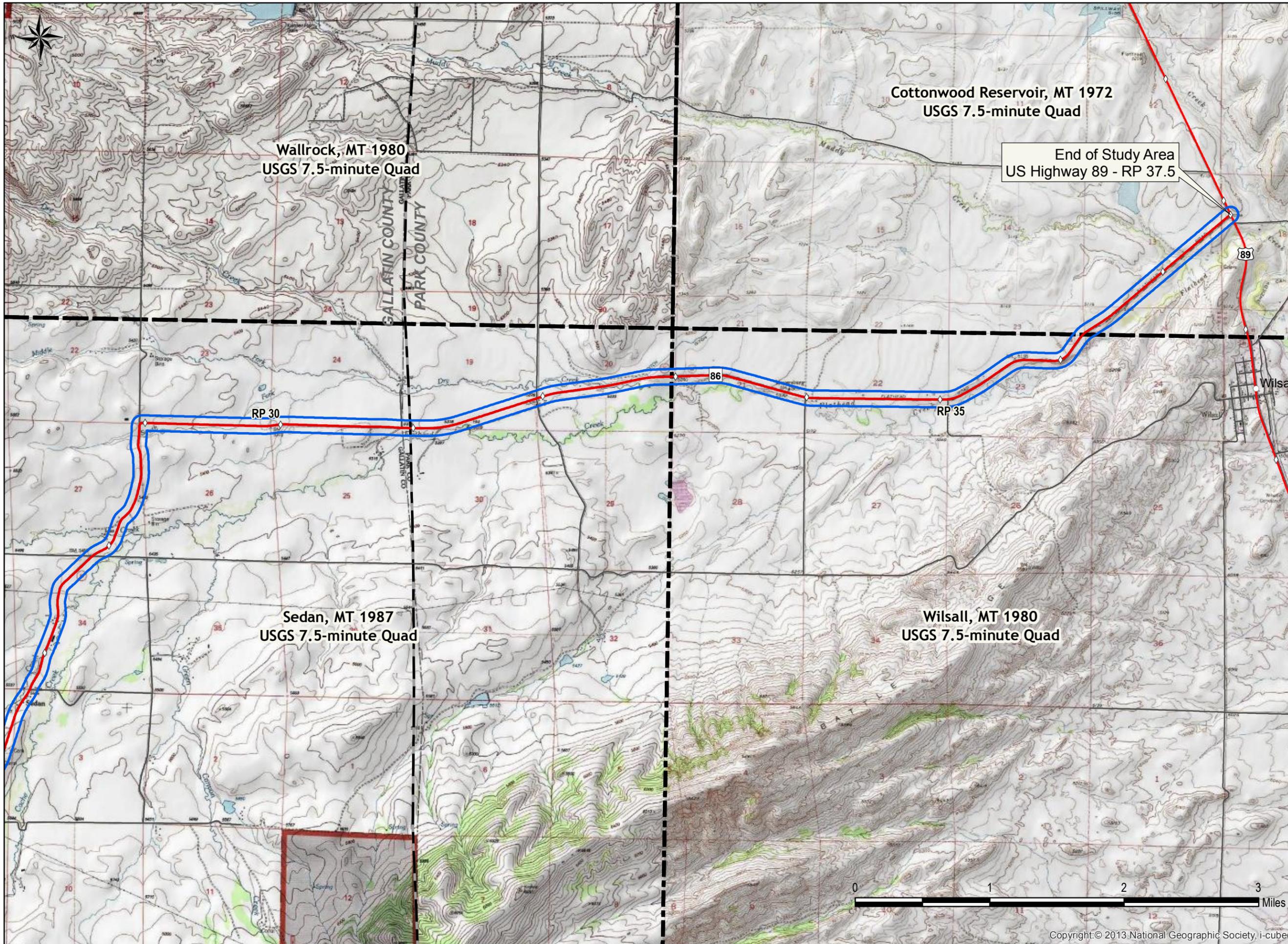
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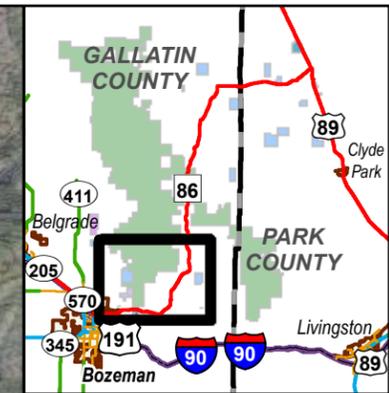
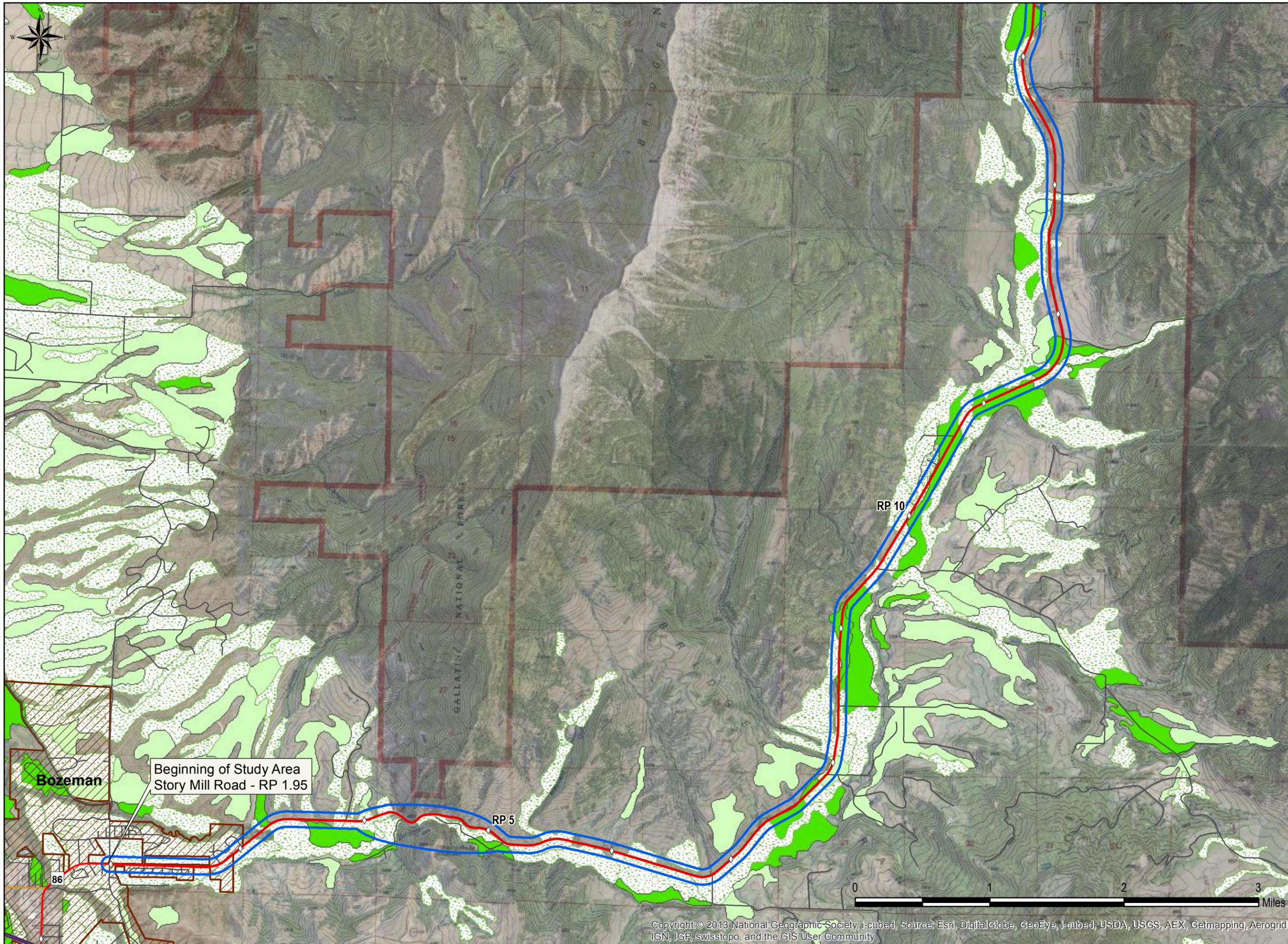
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- Prime Farmland (NRCS, 2013)
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- Farmland of Statewide Importance
- Farmland of Local Importance
- Prime Farmland if Irrigated

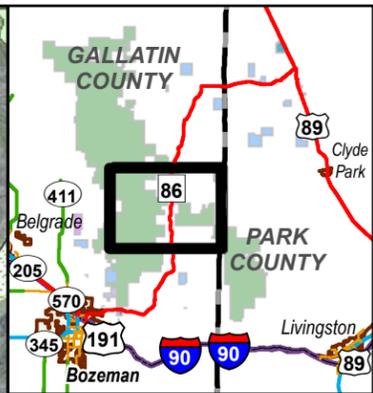
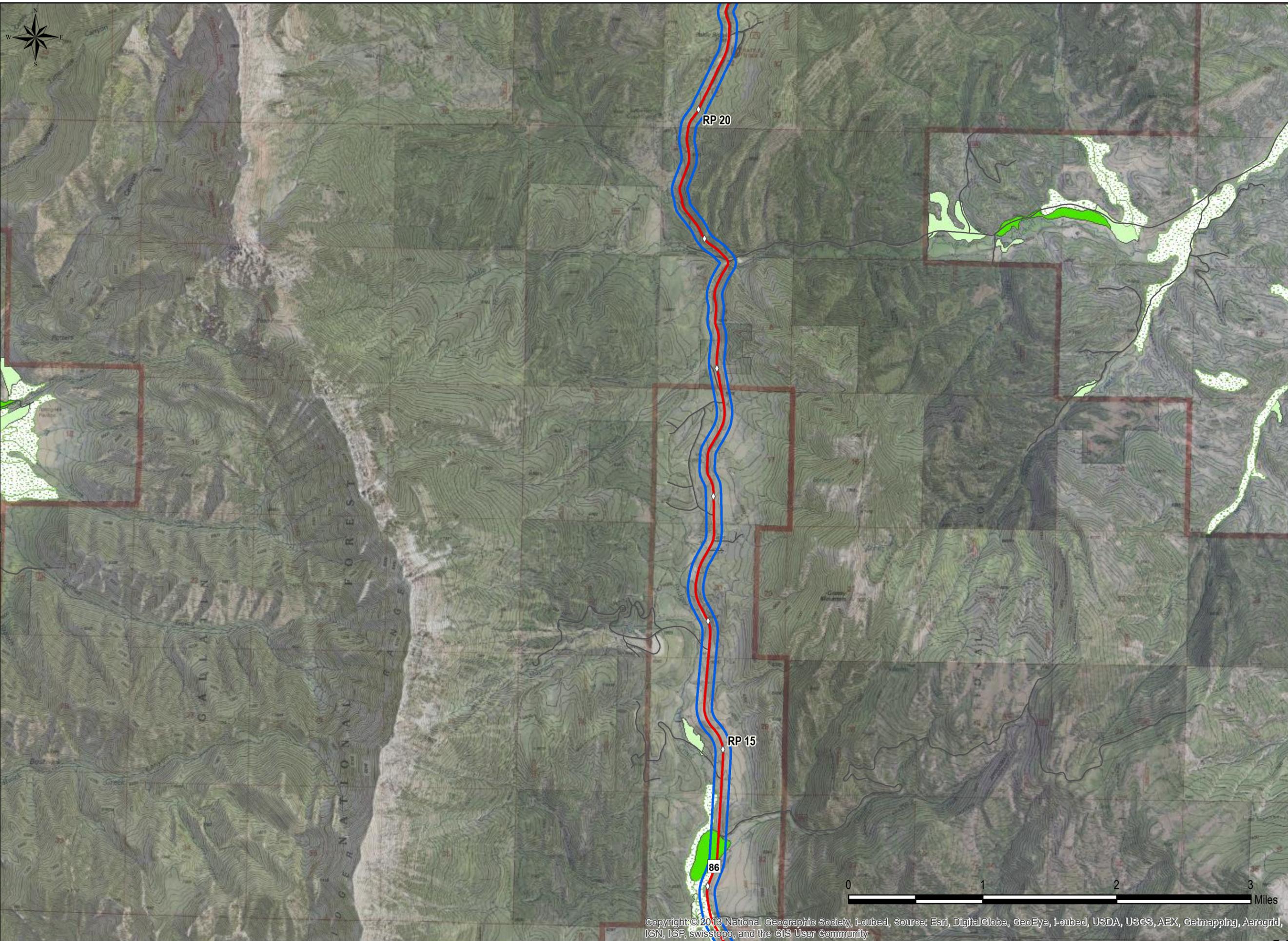
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Story Mill Road - RP 1.95

Bozeman

RP 10

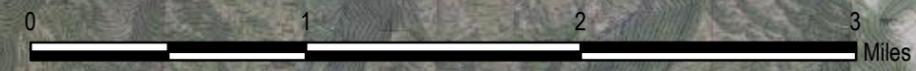
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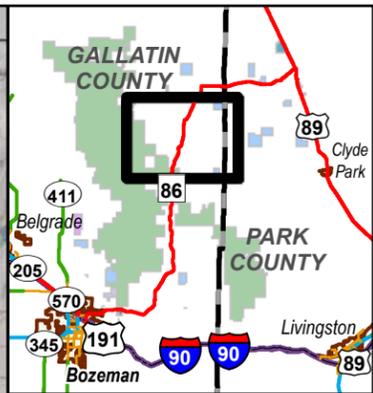
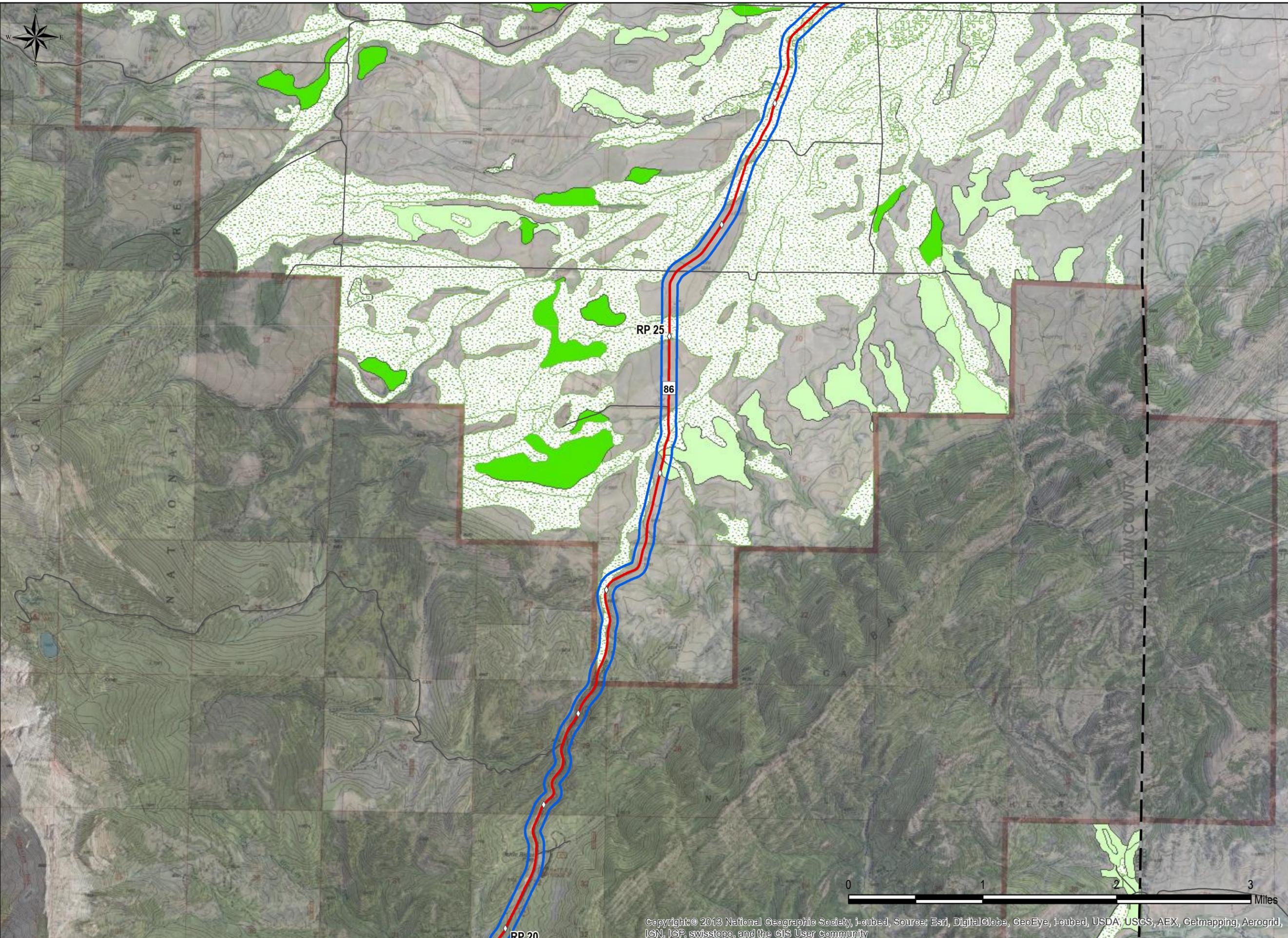


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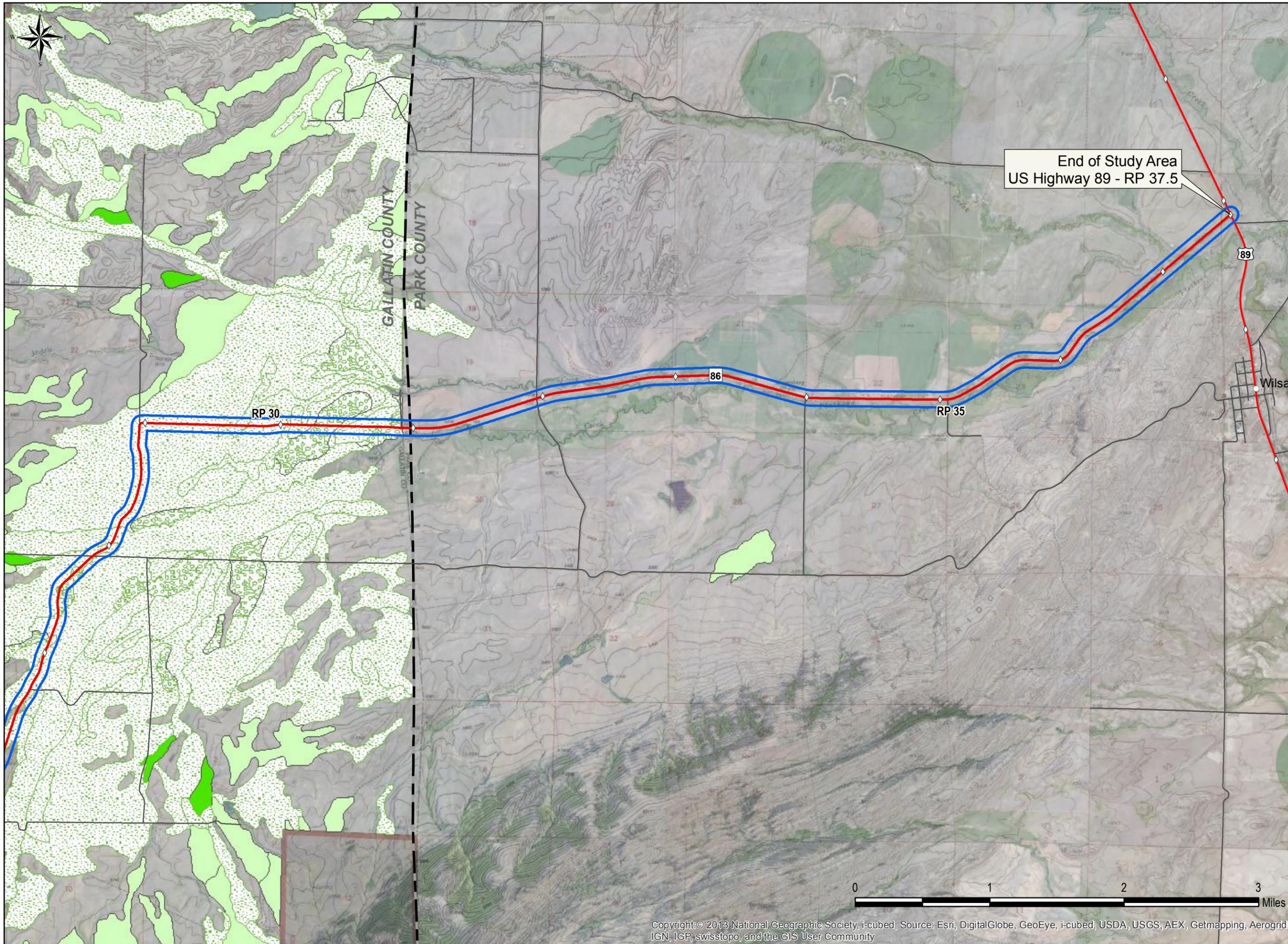


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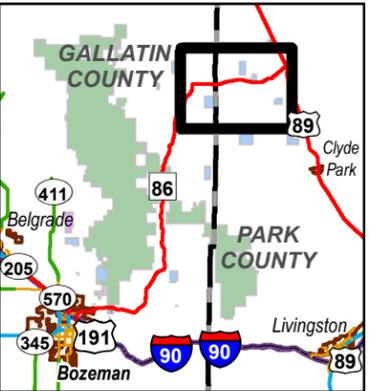


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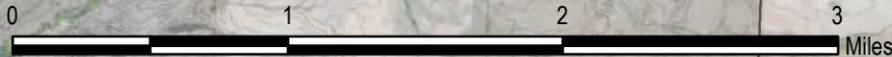


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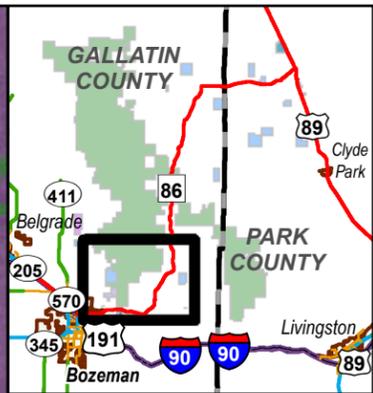
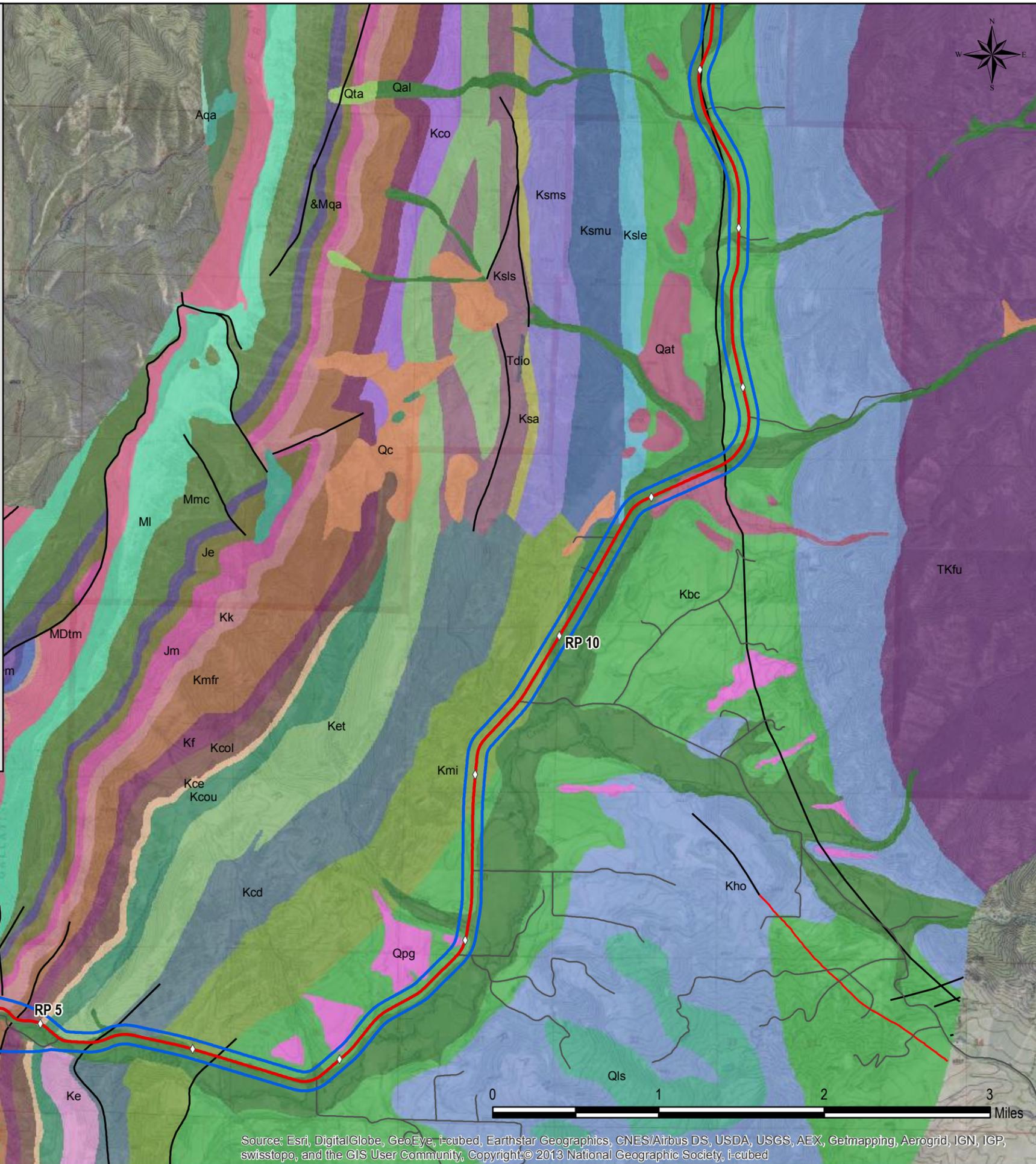
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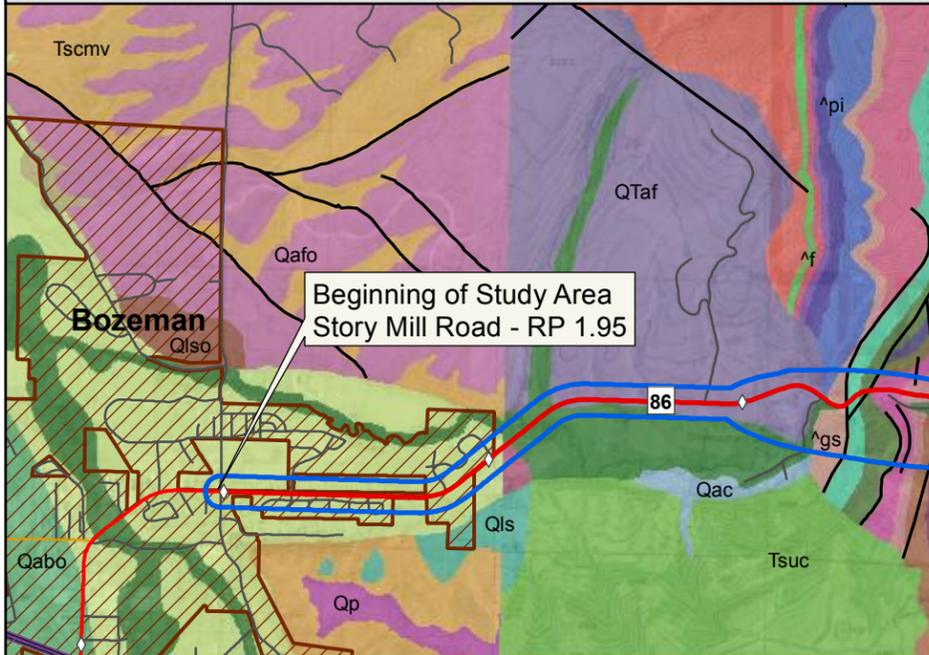
Geology Legend

Geology (MBMG, 2000, 2005)		
&Mqa - Quadrant and Amsden Formations, Undivided	Kmi - Miner Creek Formation of Livingston Group	Qc - Colluvium
Aqa - Quartzite and Amphibolite	Ksa - Ash-Flow Tuff Member, Informal	Qls - Landslide Deposit
Aqfg - Quartzofeldspathic Gneiss	Ksle - Lenape Sandstone Member	Qlso - Landslide Deposit, Older than Qls
Je - Ellis Group, Undivided	Ksls - Lower Sandstone Member, Informal	Qp - Pediment Deposit
Jm - Morrison Formation	Ksms - Middle Sandstone Member, Informal	Qpg - Pediment Gravel Deposit
Kbc - Billman Creek Formation of Livingston Group	Ksmu - Mudstone Member, Informal	Qta - Rock Talus Deposit
Kcd - Cokedale Formation of Livingston Group	MDtm - Three Forks Formation, Jefferson Dolomite, and Maywood Formation, Undivided	TKfu - Fort Union Formation, Undivided
Kce - Eldridge Creek Member of Cody Shale	MI - Lodgepole Limestone of the Madison Group	Tdio - Diorite Dike and Sill
Kco - Cody Shale	Mmc - Mission Canyon Limestone of the Madison Group	Tscmv - Madison Valley Member
Kcol - Lower Shale Member, Informal, of Cody Shale	O ^{asp} - Snowy Range and Pilgrim Limestone, Undivided	Tsuc - Sediment and Sedimentary Rock, Undivided, Dominantly Coarse-Grained
Kcou - Upper Shale Member, Informal, of Cody Shale	Q ^{af} - Alluvial Fan Deposit	XAqfg - Quartzofeldspathic Gneiss
Ke - Eagle Formation	Qab - Alluvium of Braid Plain	^f - Flathead Quartzite
Ket - Eagle Sandstone and Telegraph Creek Formations, Undivided	Qabo - Braid Plain Alluvium, Older than Qab	^gs - Grove Creek and Snowy Range Formations, Undivided
Kf - Frontier Formation	Qac - Alluvium and Colluvium	^m - Meagher Limestone
Kho - Hoppers Formation of Livingston Group	Qaf - Alluvial Fan Deposit	^p - Park Shale
Kk - Kootenai Formation	Qafo - Alluvial-Fan Deposit, Older than Qaf	^pf - Park Shale, Meagher Limestone, Wolsey Shale, and Flathead Quartzite, Undivided
Kmfr - Mowry Shale through Fall River Sandstone, Undivided	Qal - Alluvium	^pi - Pilgrim Limestone
	Qat - Alluvial Terrace Gravel, Undivided	^w - Wolsey Shale
		— Faults
		— Folds



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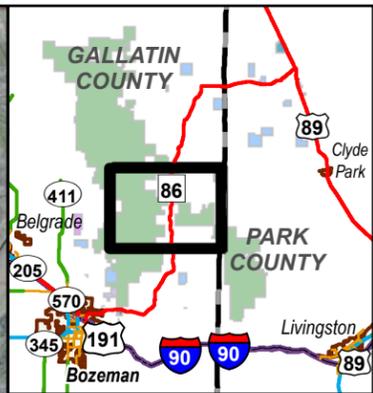
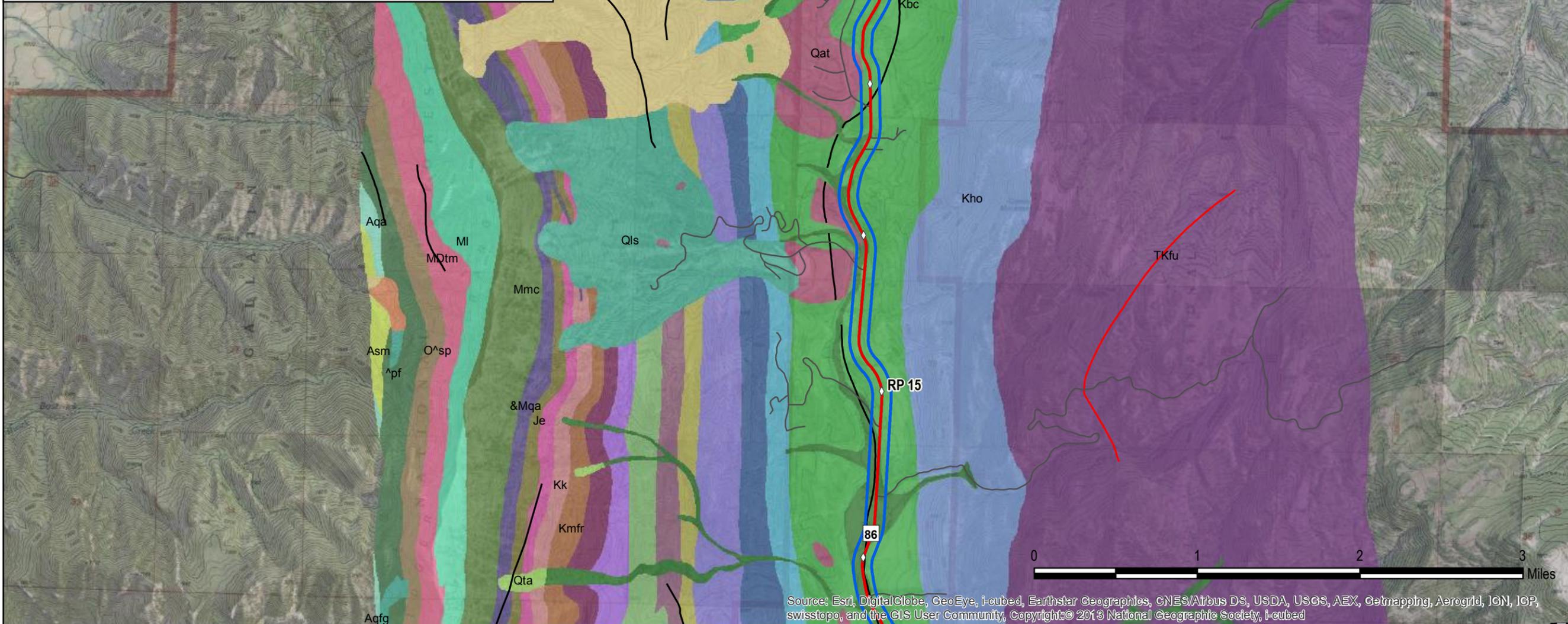


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&Mqa - Quadrant and Amsden Formations, Undivided	Kk - Kootenai Formation	O ^{sp} - Snowy Range and Pilgrim Limestone, Undivided
Aqa - Quartzite and Amphibolite	Kmfr - Mowry Shale through Fall River Sandstone, Undivided	PMpa - Phosphoria through Amsden Formations, Undivided
Aqfg - Quartzofeldspathic Gneiss	Ksa - Ash-Flow Tuff Member, Informal	Qal - Alluvium
Asm - Sillimanite-Garnet-Biotite Gneiss and Marble	Ksle - Lennep Sandstone Member	Qat - Alluvial Terrace Gravel, Undivided
Je - Ellis Group, Undivided	Ksls - Lower Sandstone Member, Informal	Qc - Colluvium
Jm - Morrison Formation	Ksms - Middle Sandstone Member, Informal	Qg - Glacial Deposit, Undivided
Kbc - Billman Creek Formation of Livingston Group	Ksmu - Mudstone Member, Informal	Qls - Landslide Deposit
Kco - Cody Shale	MDtm - Three Forks Formation, Jefferson Dolomite, and Maywood Formation, Undivided	Qta - Rock Talus Deposit
Ket - Eagle Sandstone and Telegraph Creek Formations, Undivided	MI - Lodgepole Limestone of the Madison Group	TKfu - Fort Union Formation, Undivided
Kf - Frontier Formation	Mmc - Mission Canyon Limestone of the Madison Group	Tdio - Diorite Dike and Sill
Kho - Hoppers Formation of Livingston Group	Msr - Snowcrest Range Group	^pf - Park Shale, Meagher Limestone, Wolsey Shale, and Flathead Quartzite, Undivided
	Faults	
	Folds	



Map Legend

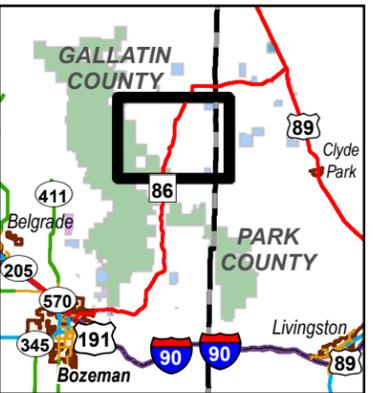
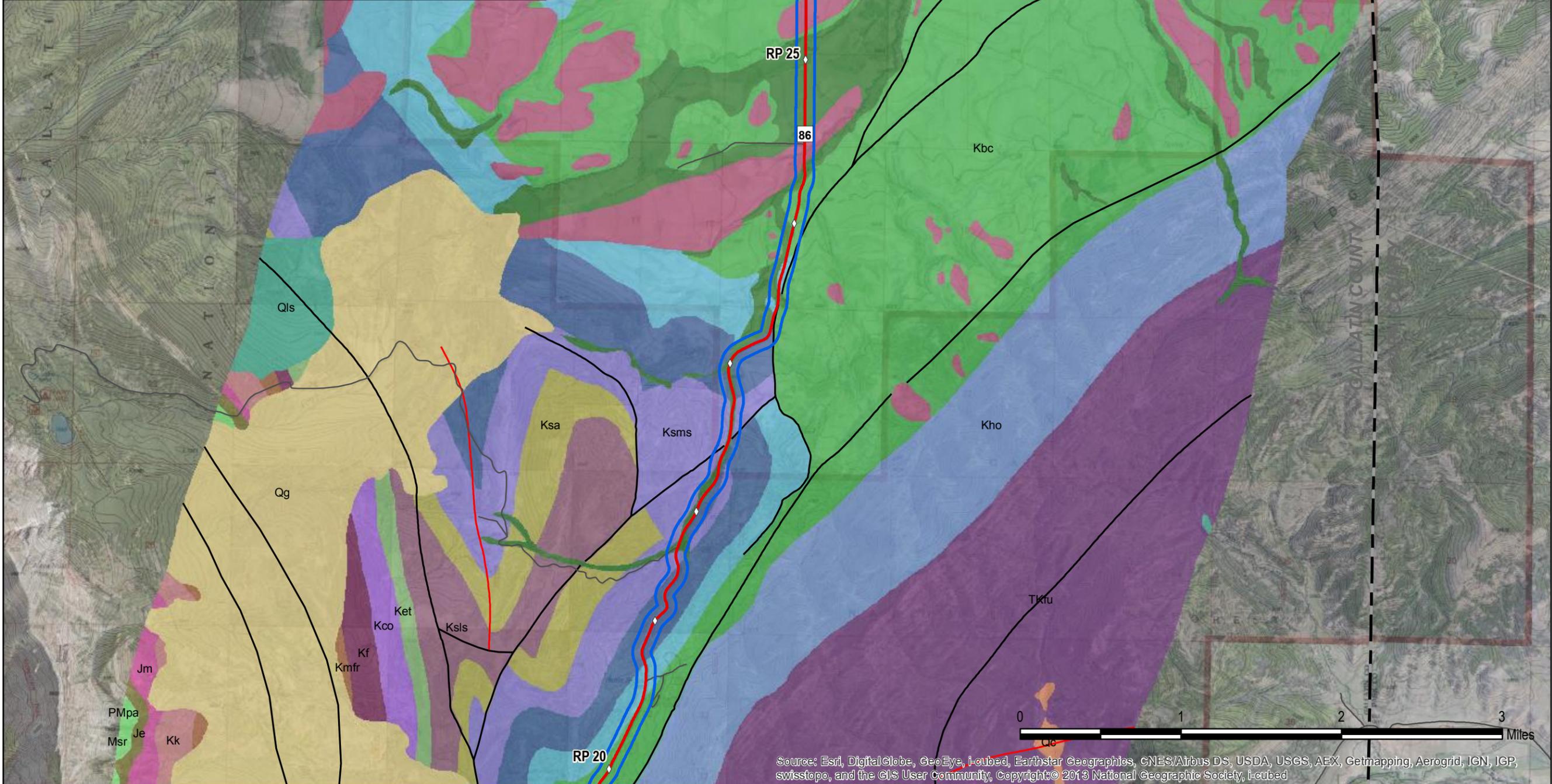
- Reference Post
- MT 86
- Study Area
- On System Routes
- System
- Primary
- Off System Routes
- County Boundary

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Geology Legend

Geology (MBMG, 2000, 2005)

Je - Ellis Group, Undivided	Kk - Kootenai Formation	PMpa - Phosphoria through Amsden Formations, Undivided
Jm - Morrison Formation	Kmfr - Mowry Shale through Fall River Sandstone, Undivided	Qal - Alluvium
Kbc - Billman Creek Formation of Livingston Group	Ksa - Ash-Flow Tuff Member, Informal	Qat - Alluvial Terrace Gravel, Undivided
Kco - Cody Shale	Ksle - Lennep Sandstone Member	Qc - Colluvium
Ket - Eagle Sandstone and Telegraph Creek Formations, Undivided	Ksls - Lower Sandstone Member, Informal	Qg - Glacial Deposit, Undivided
Kf - Frontier Formation	Ksms - Middle Sandstone Member, Informal	Qls - Landslide Deposit
Kho - Hoppers Formation of Livingston Group	Ksmu - Mudstone Member, Informal	TKfu - Fort Union Formation, Undivided
Msr - Snowcrest Range Group	Faults	Folds



Map Legend

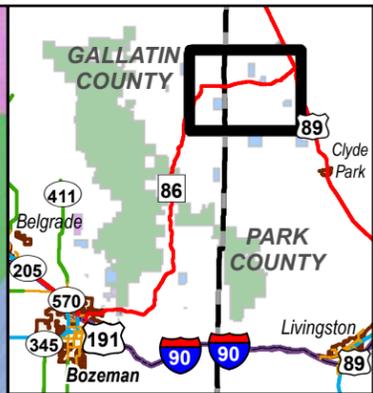
- Reference Post
- MT 86
- Study Area
- On System Routes
- System
- Primary
- Off System Routes
- County Boundary

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, i-cubed

Geology Legend

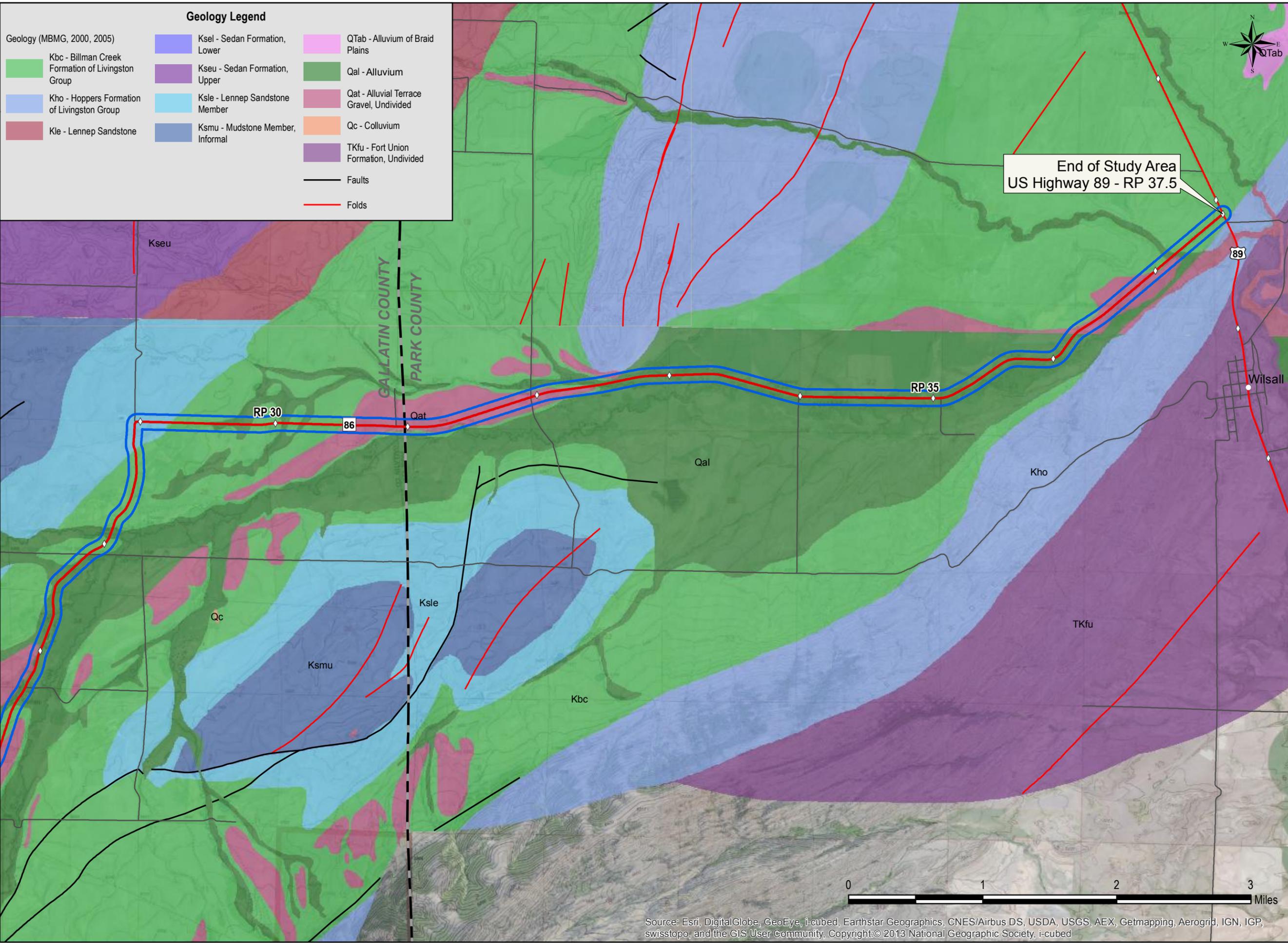
Geology (MBMG, 2000, 2005)

 Kbc - Billman Creek Formation of Livingston Group	 Ksel - Sedan Formation, Lower	 QTab - Alluvium of Braid Plains
 Kho - Hoppers Formation of Livingston Group	 Kseu - Sedan Formation, Upper	 Qal - Alluvium
 Kle - Llenep Sandstone	 Ksle - Llenep Sandstone Member	 Qat - Alluvial Terrace Gravel, Undivided
	 Ksmu - Mudstone Member, Informal	 Qc - Colluvium
	 TKfu - Fort Union Formation, Undivided	
	 Faults	
	 Folds	

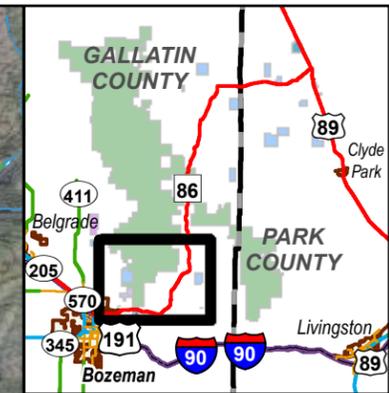
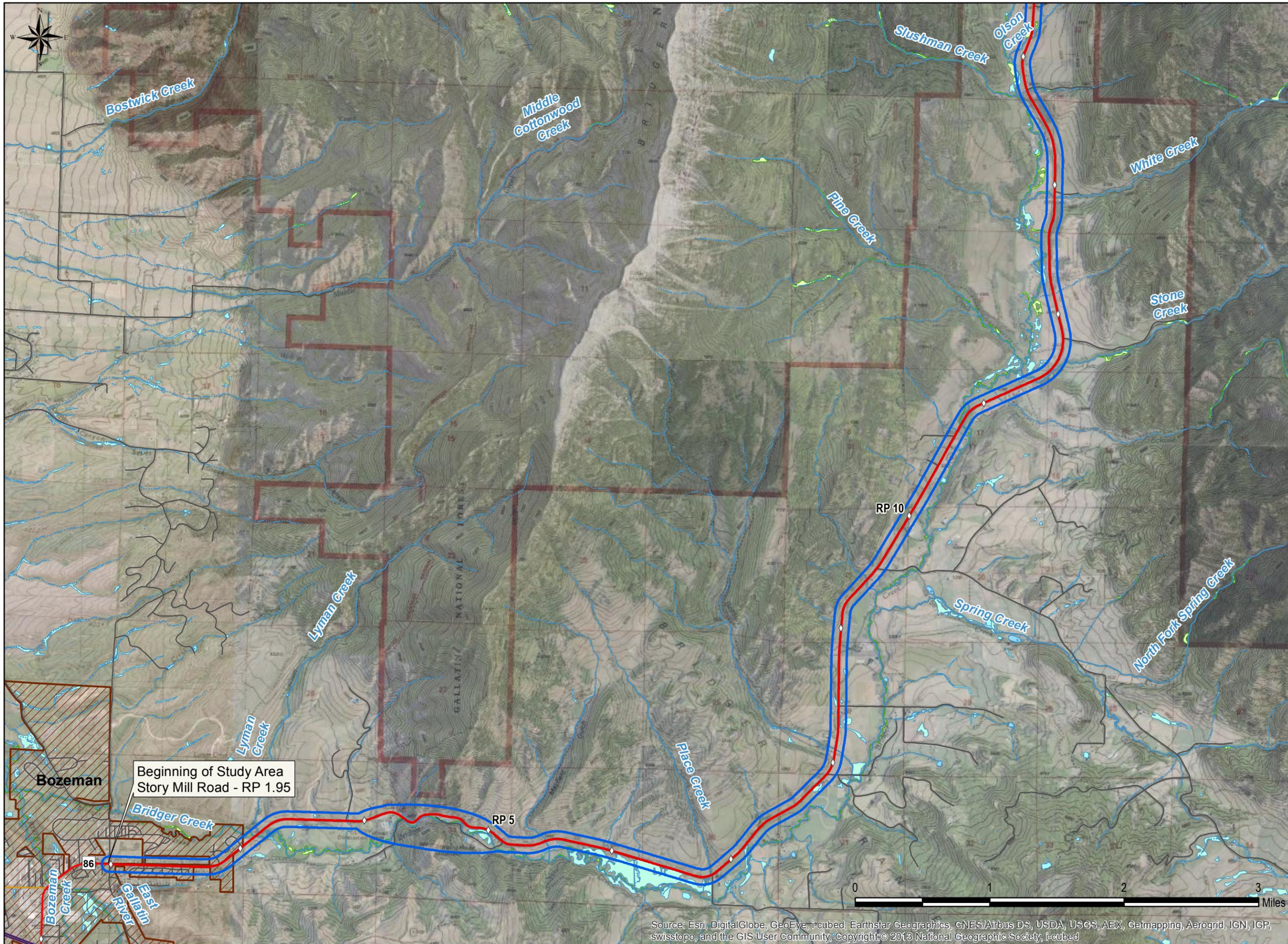


Map Legend

-  Reference Post
-  MT 86
-  Study Area
- On System Routes
- System
-  Primary
-  Off System Routes
-  County Boundary



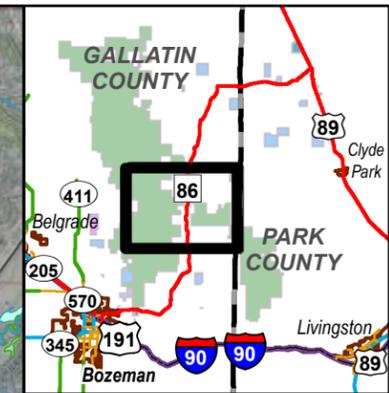
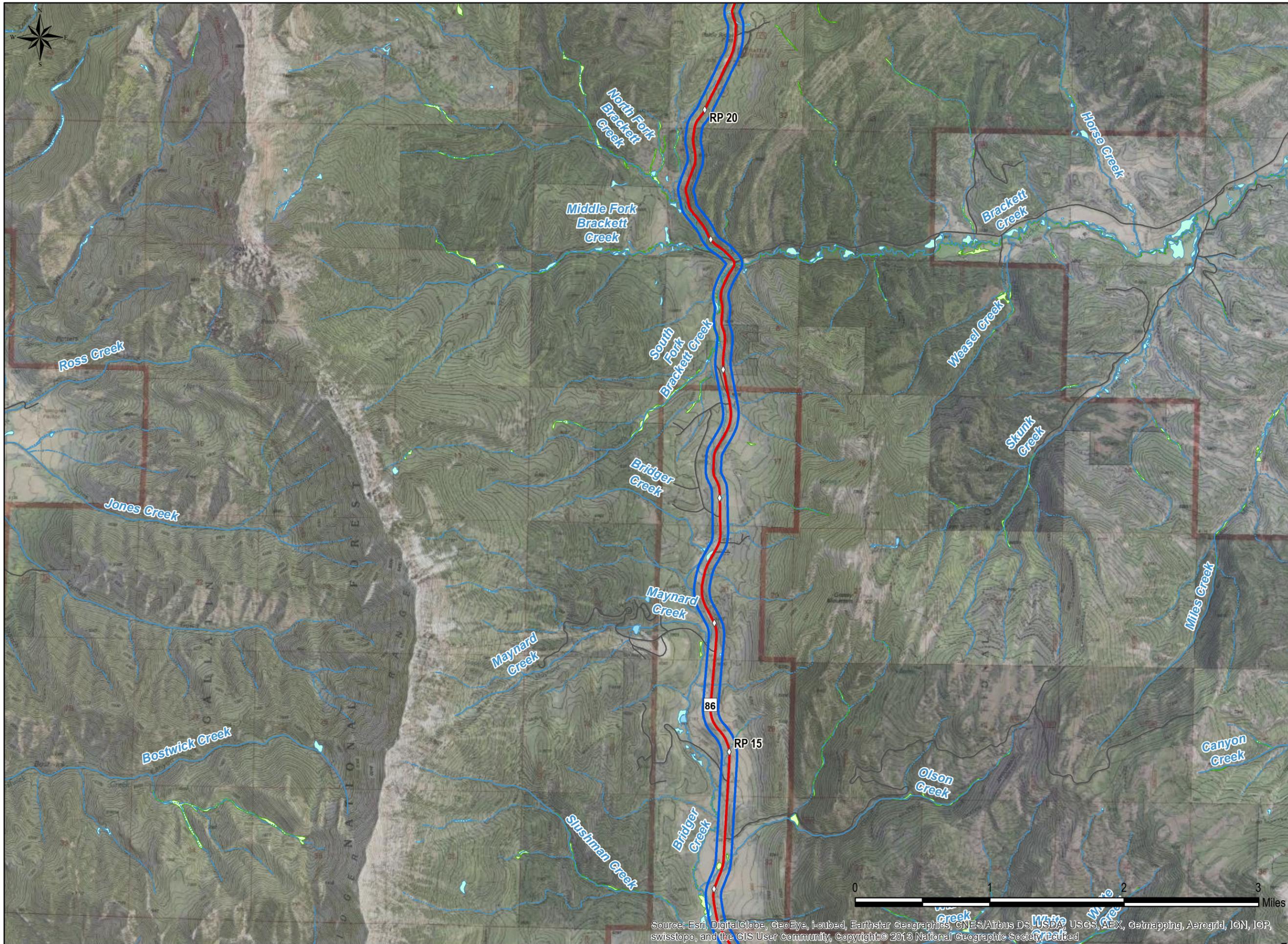
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Surface Water (USGS, 2013)
- ▭ Lakes
- ▭ Major Rivers
- Intermittent Stream/River
- Perennial Stream/River
- Wetland Type (USFWS, 2005)
- ▭ Freshwater Emergent Wetland
- ▭ Freshwater Pond
- ▭ Riparian Emergent
- ▭ Riverine

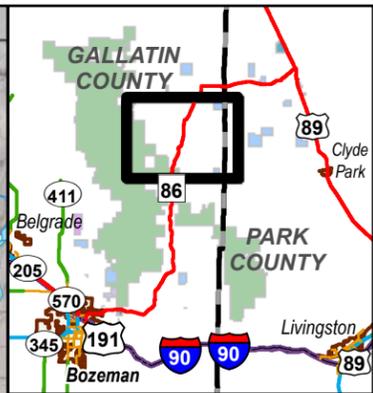
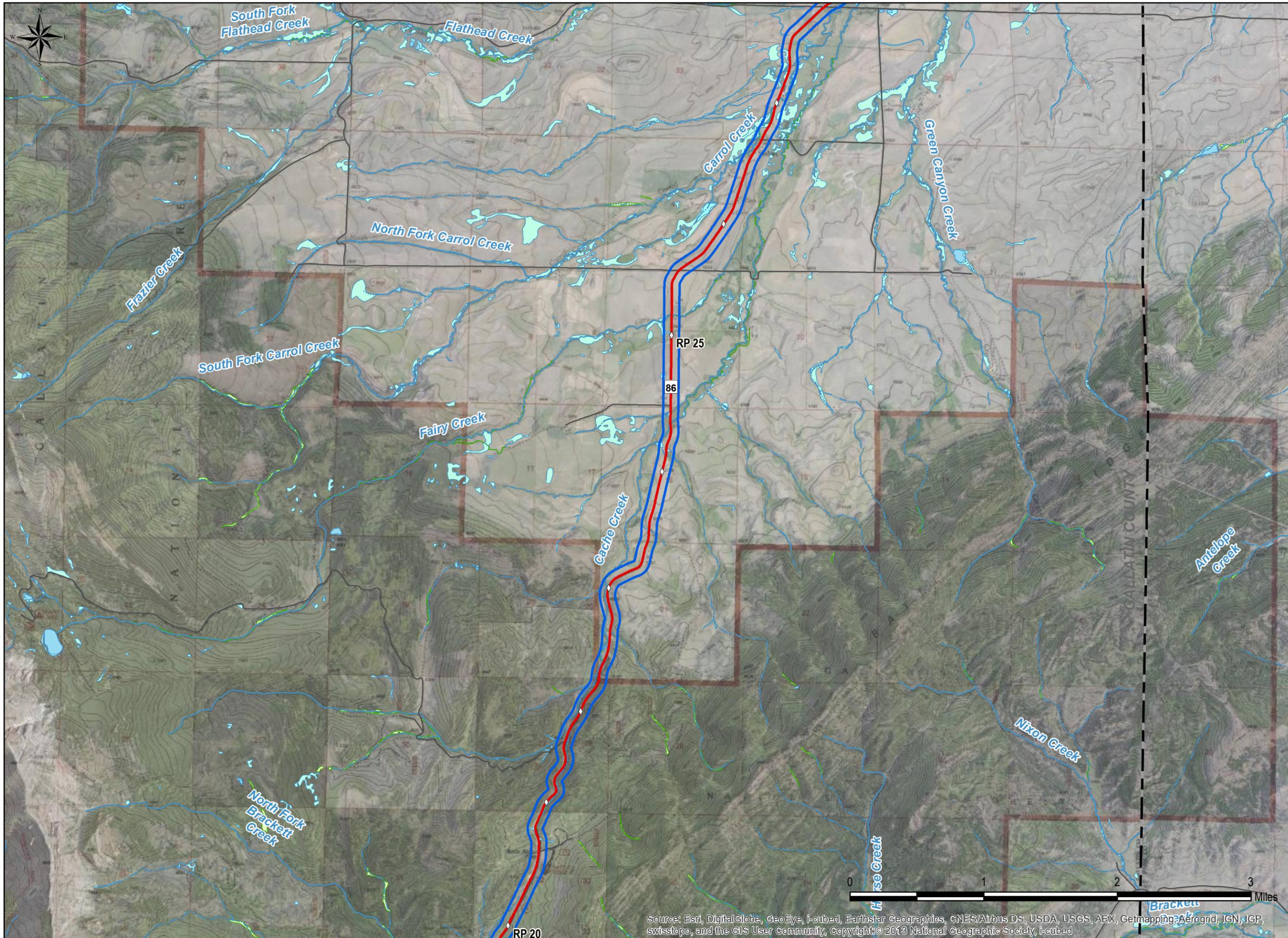
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
 - Primary
 - Off System Routes
- ▭ County Boundary
- Surface Water (USGS, 2013)
 - ▭ Lakes
 - Intermittent Stream/River
 - Perennial Stream/River
- Wetland Type (USFWS, 2005)
 - ▭ Freshwater Emergent Wetland
 - ▭ Freshwater Pond
 - ▭ Riparian Emergent
 - ▭ Riverine

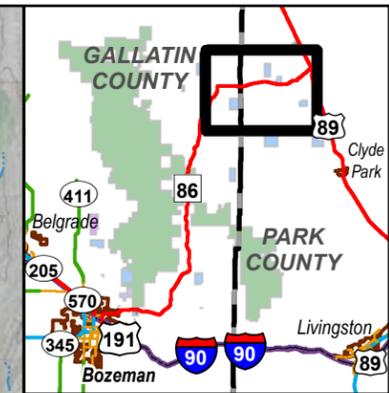
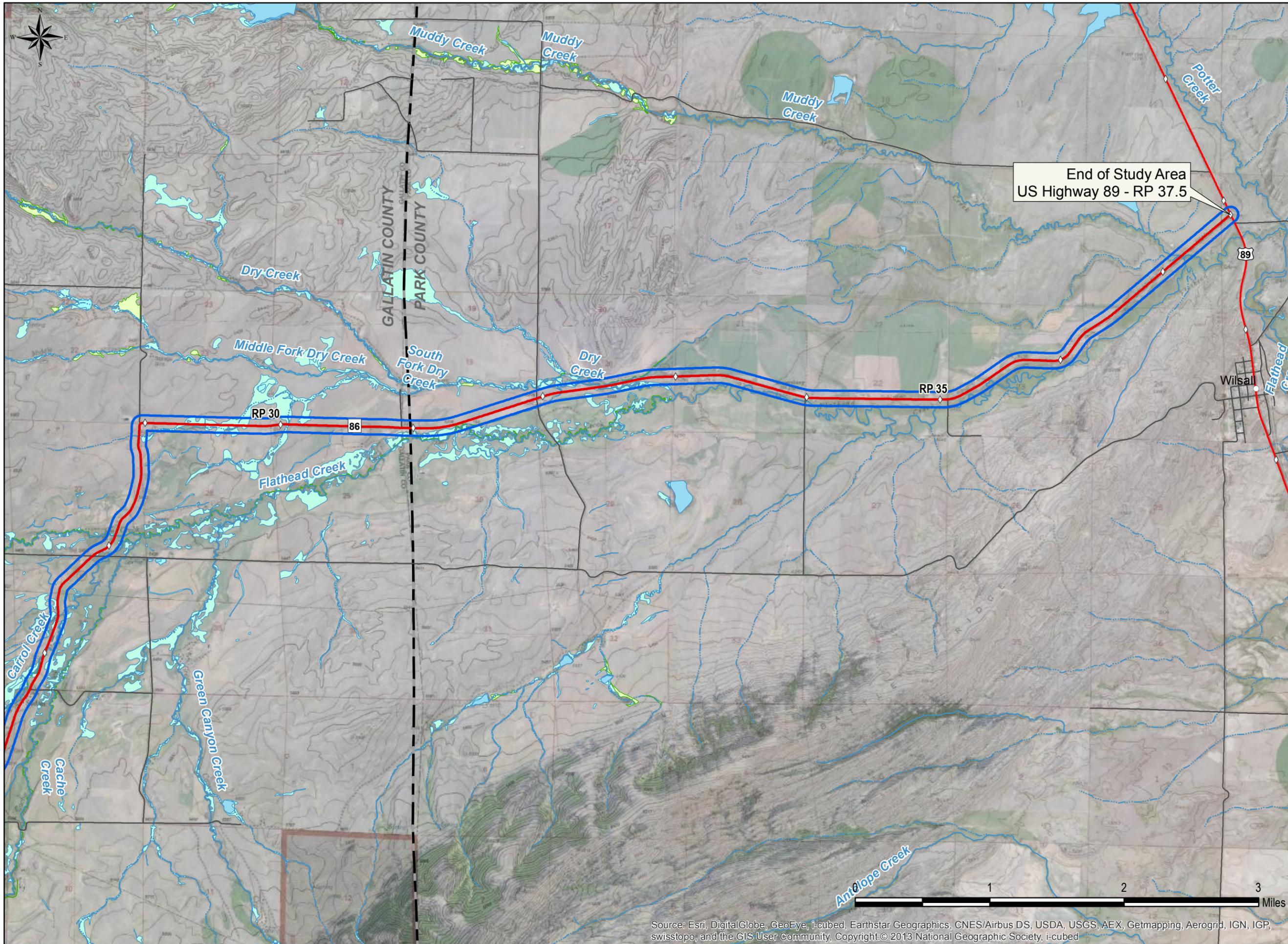
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
 - Primary
 - Off System Routes
- ▭ County Boundary
- Surface Water (USGS, 2013)
 - ▭ Lakes
 - Canal/Ditch
 - Intermittent Stream/River
 - Perennial Stream/River
- Wetland Type (USFWS, 2005)
 - ▭ Freshwater Emergent Wetland
 - ▭ Freshwater Pond
 - ▭ Riparian Emergent
 - ▭ Riverine

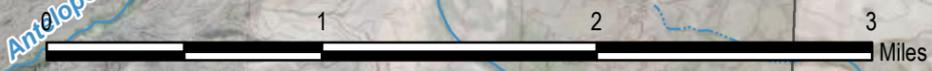
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
 - Primary
 - Off System Routes
- ▭ County Boundary
- Surface Water (USGS, 2013)
 - ▭ Lakes
 - Canal/Ditch
 - Connector
 - Intermittent Stream/River
 - Perennial Stream/River
- Wetland Type (USFWS, 2005)
 - ▭ Freshwater Emergent Wetland
 - ▭ Freshwater Pond
 - ▭ Lake
 - ▭ Riparian Emergent
 - ▭ Riverine

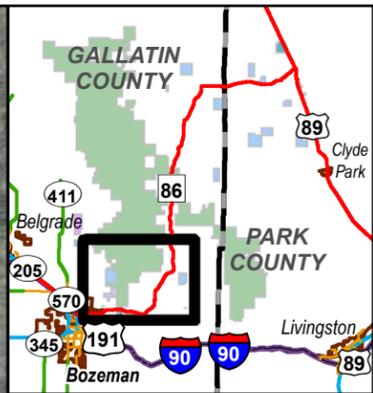
End of Study Area
US Highway 89 - RP 37.5



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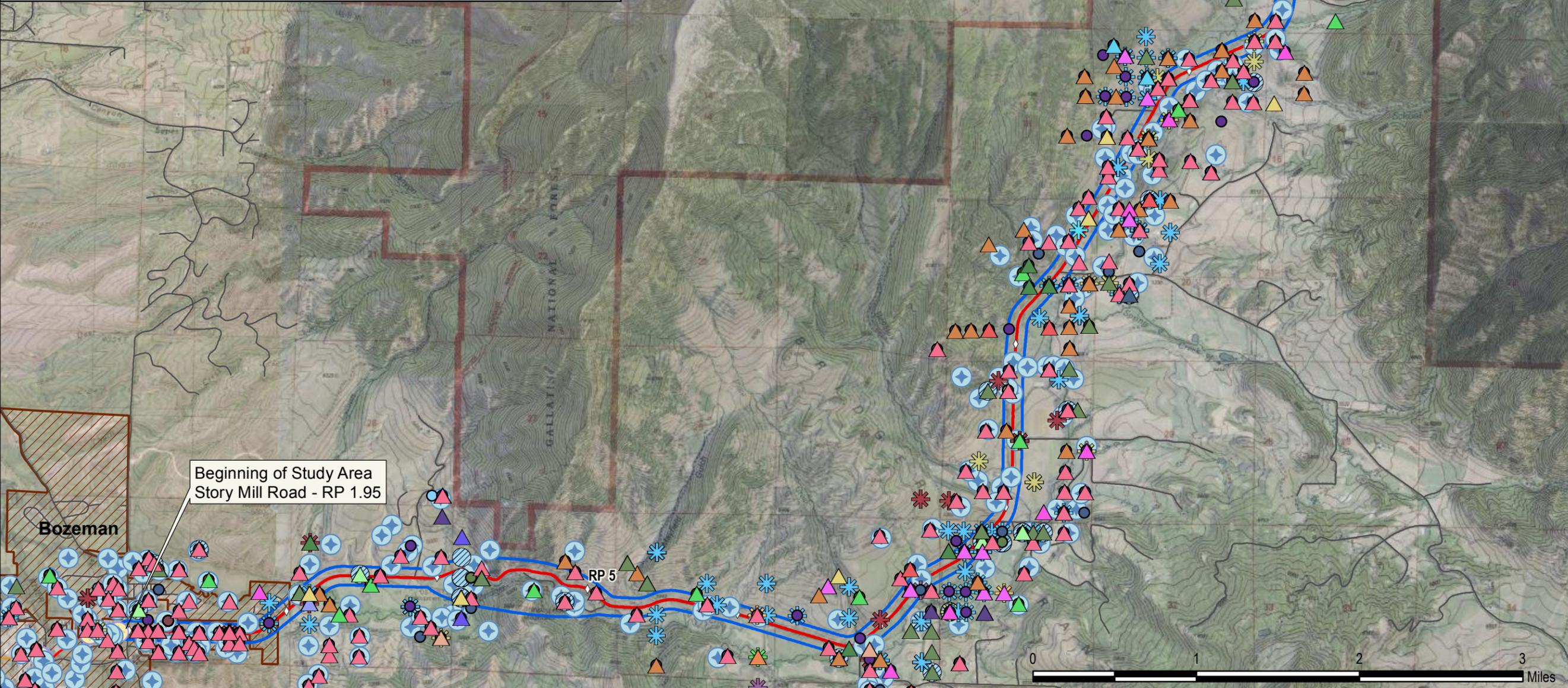
Water Rights Legend (DNRC, 2013)

Active Water Rights - Points of Diversion	▲ Livestock direct from source	Active Water Rights - Points of Use	Active Water Rights - Irrigation Points of Use
Means of Diversion	▲ Multiple	Purpose	Irrigation Type
▲ Dam	▲ Other Diversion	● Commercial	▲ Flood
▲ Dam/Pit	▲ Pipeline	● Domestic	▲ Furrow
▲ Developed Spring	▲ Pit	● Fishery	▲ Multiple Methods
▲ Dike	▲ Pump	● Industrial	▲ Natural Subirrigation
▲ Ditch	▲ Pump/Flood and Dike	● Institutional	▲ Other
▲ Drain Ditch	▲ Pump/Gravity Flow	● Irrigation	▲ Sprinkler
▲ Flowing	▲ Pump/Headgate w/Ditch or Pipeline	● Lawn and Garden	▲ Sprinkler/Flood
▲ Headgate	▲ Spring Box	● Multiple Domestic	▲ Sprinkler/Flood/Furr...
▲ Headgate w/Ditch or Pipeline/Flood and Dike	▲ Subirrigation	● Municipal	▲ Sprinkler/Furrow
▲ Infiltration Gallery	▲ Undeveloped Spring	● Stock	▲ Active Water Rights - Points of Reservoirs
▲ Instream	▲ Unknown		
	▲ Well		



Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- ▲ Water Wells (MBMG, 2014)
- Public Water System Sources (MTDEQ, 2013)



Beginning of Study Area
Story Mill Road - RP 1.95

Bozeman

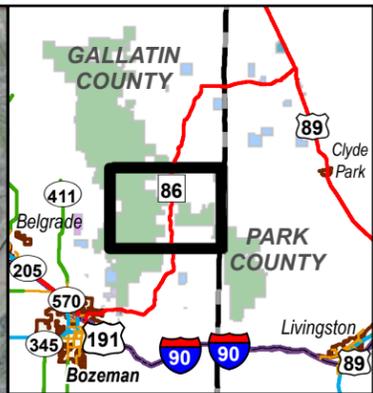
RP 5



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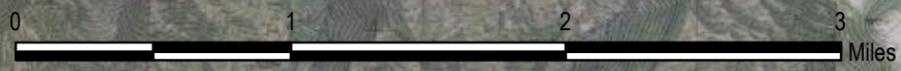
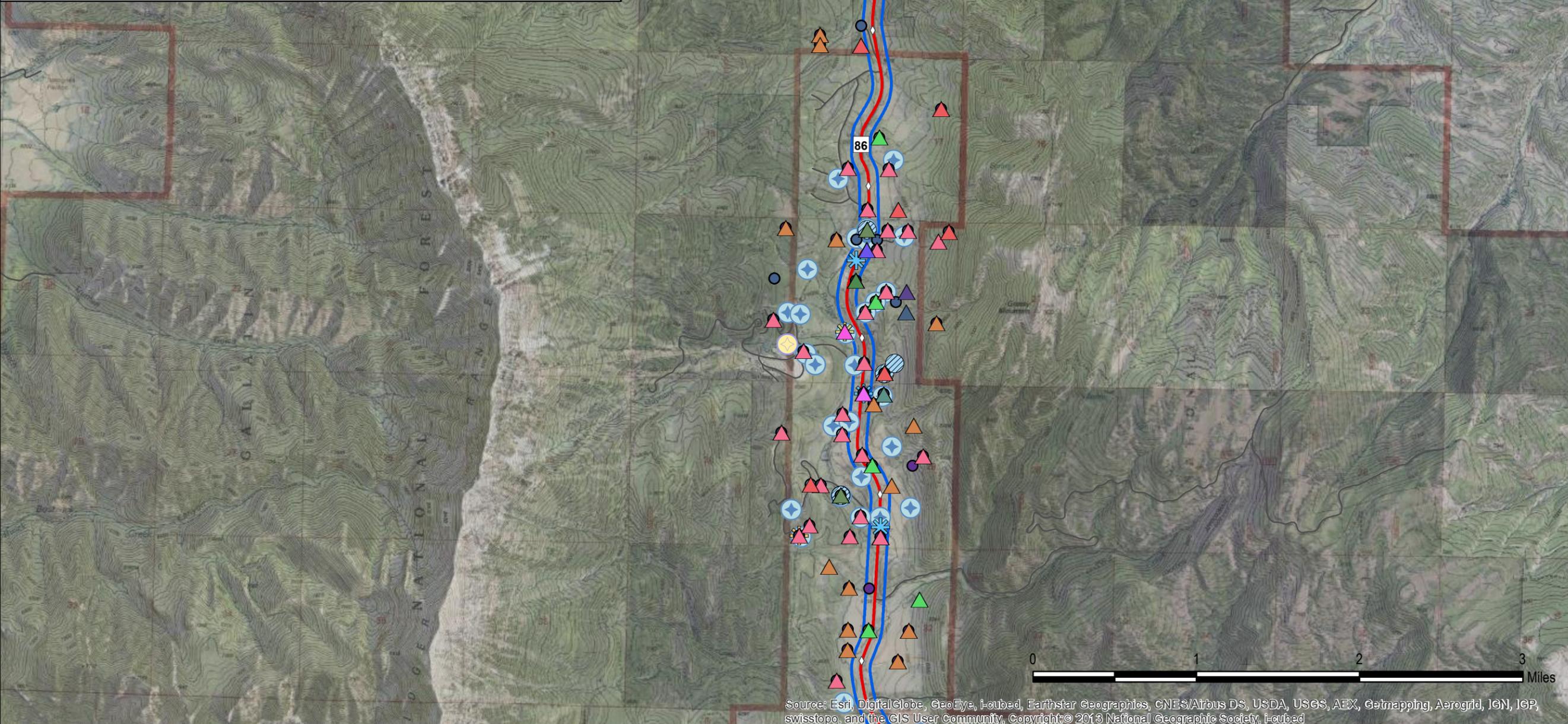
Water Rights Legend (DNRC, 2013)

Active Water Rights - Points of Diversion	Livestock direct from source	Active Water Rights - Points of Use	Active Water Rights - Irrigation Points of Use
Means of Diversion	Multiple	Purpose	Irrigation Type
Dam	Other Diversion	Commercial	Flood
Dam/Pit	Pipeline	Domestic	Furrow
Developed Spring	Pit	Fishery	Multiple Methods
Dike	Pump	Industrial	Natural Subirrigation
Ditch	Pump/Flood and Dike	Irrigation	Other
Drain Ditch	Pump/Gravity Flow	Lawn and Garden	Sprinkler
Flowing	Pump/Headgate w/Ditch or Pipeline	Multiple Domestic	Sprinkler/Flood
Headgate	Spring Box	Municipal	Sprinkler/Flood/Furr...
Headgate w/Ditch or Pipeline/Flood and Dike	Subirrigation	Stock	Sprinkler/Furrow
Infiltration Gallery	Undeveloped Spring		Active Water Rights - Points of Reservoirs
Instream	Unknown		
	Well		



Map Legend

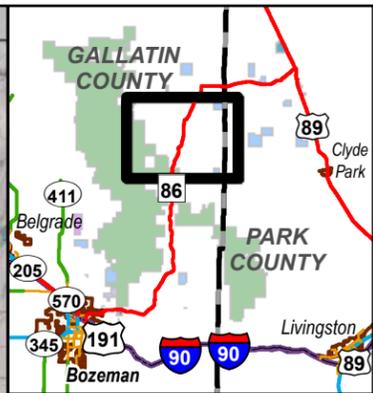
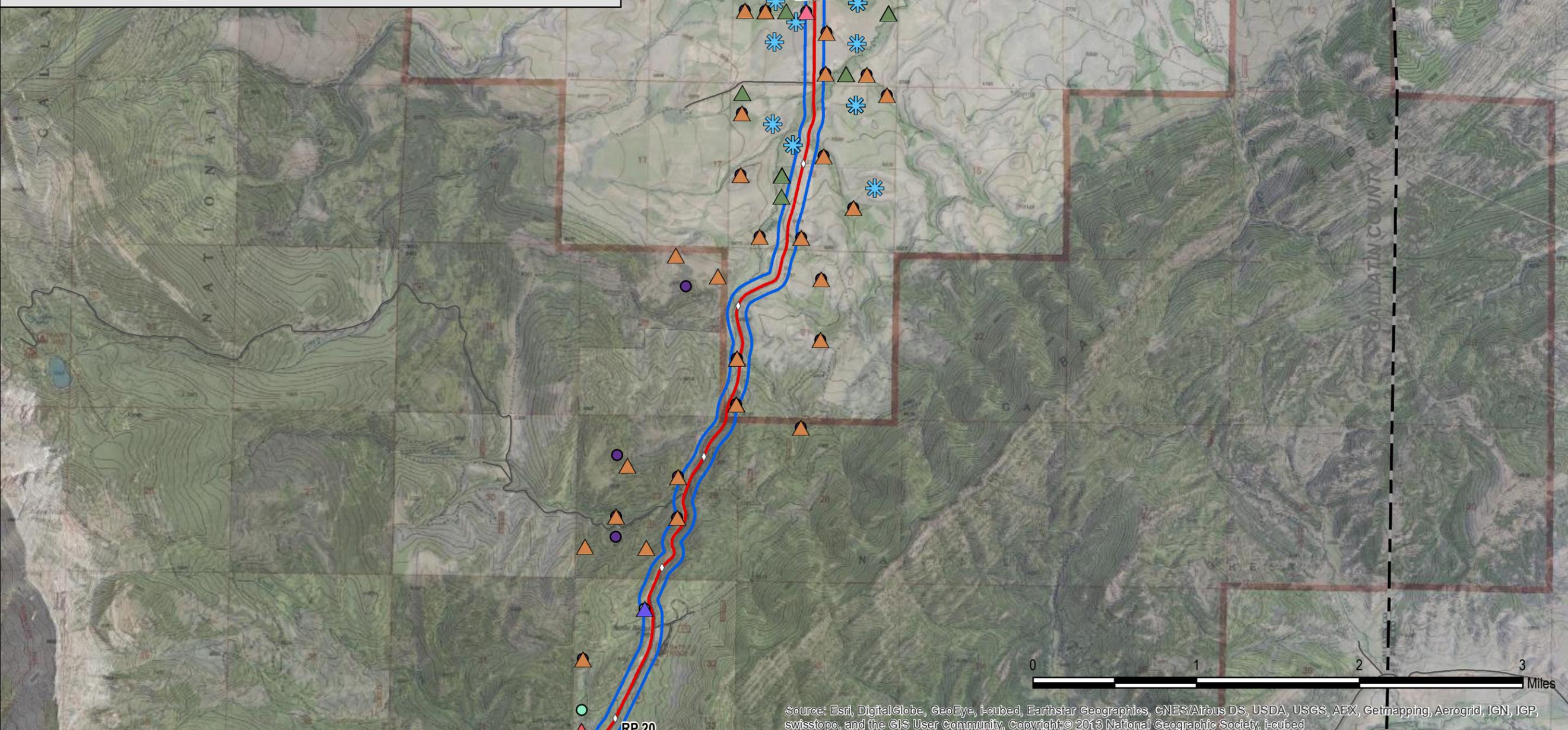
- Reference Post
- MT 86
- Study Area
- On System Routes
- System
- Primary
- Off System Routes
- County Boundary
- Water Wells (MBMG, 2014)
- Public Water System Sources (MTDEQ, 2013)



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Water Rights Legend (DNRC, 2013)

Active Water Rights - Points of Diversion	▲ Livestock direct from source	Active Water Rights - Points of Use	Active Water Rights - Irrigation Points of Use
Means of Diversion	▲ Multiple	Purpose	Irrigation Type
▲ Dam	▲ Other Diversion	● Commercial	▲ Flood
▲ Dam/Pit	▲ Pipeline	● Domestic	▲ Furrow
▲ Developed Spring	▲ Pit	● Fishery	▲ Multiple Methods
▲ Dike	▲ Pump	● Industrial	▲ Natural Subirrigation
▲ Ditch	▲ Pump/Flood and Dike	● Institutional	▲ Other
▲ Drain Ditch	▲ Pump/Gravity Flow	● Irrigation	▲ Sprinkler
▲ Flowing	▲ Pump/Headgate w/Ditch or Pipeline	● Lawn and Garden	▲ Sprinkler/Flood
▲ Headgate	▲ Spring Box	● Multiple Domestic	▲ Sprinkler/Flood/Furr...
▲ Headgate w/Ditch or Pipeline/Flood and Dike	▲ Subirrigation	● Municipal	▲ Sprinkler/Furrow
▲ Infiltration Gallery	▲ Undeveloped SPring	● Stock	▲ Active Water Rights - Points of Reservoirs
▲ Instream	▲ Unknown		
	▲ Well		



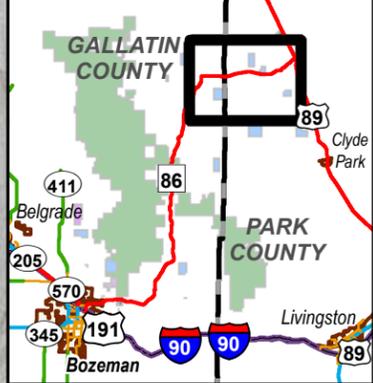
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- ⊕ Water Wells (MBMG, 2014)

Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, I-cubed

**Water Rights Legend
(DNRC, 2013)**

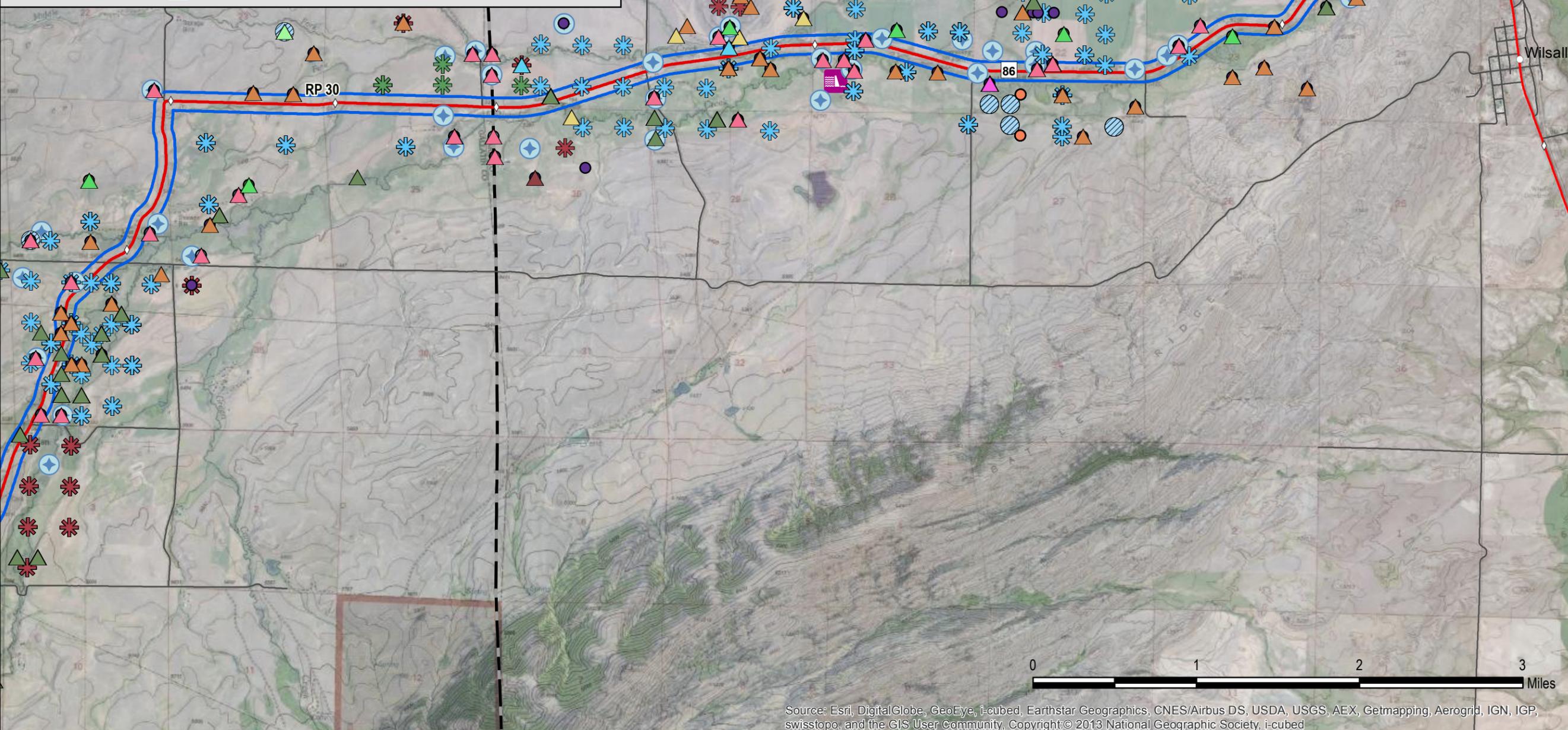
Active Water Rights - Points of Diversion	▲ Livestock direct from source	Active Water Rights - Points of Use	Active Water Rights - Irrigation Points of Use
Means of Diversion	▲ Multiple	Purpose	Irrigation Type
▲ Dam	▲ Other Diversion	● Commercial	★ Flood
▲ Dam/Pit	▲ Pipeline	● Domestic	★ Furrow
▲ Developed Spring	▲ Pit	● Fishery	★ Multiple Methods
▲ Dike	▲ Pump	● Industrial	★ Natural Subirrigation
▲ Ditch	▲ Pump/Flood and Dike	● Institutional	★ Other
▲ Drain Ditch	▲ Pump/Gravity Flow	● Irrigation	★ Sprinkler
▲ Flowing	▲ Pump/Headgate w/Ditch or Pipeline	● Lawn and Garden	★ Sprinkler/Flood
▲ Headgate	▲ Spring Box	● Multiple Domestic	★ Sprinkler/Flood/Furr...
▲ Headgate w/Ditch or Pipeline/Flood and Dike	▲ Subirrigation	● Municipal	★ Sprinkler/Furrow
▲ Infiltration Gallery	▲ Undeveloped Spring	● Stock	○ Active Water Rights - Points of Reservoirs
▲ Instream	▲ Unknown		
	▲ Well		



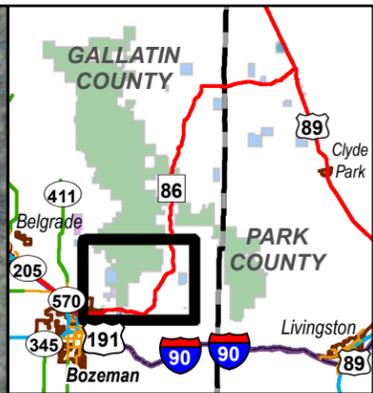
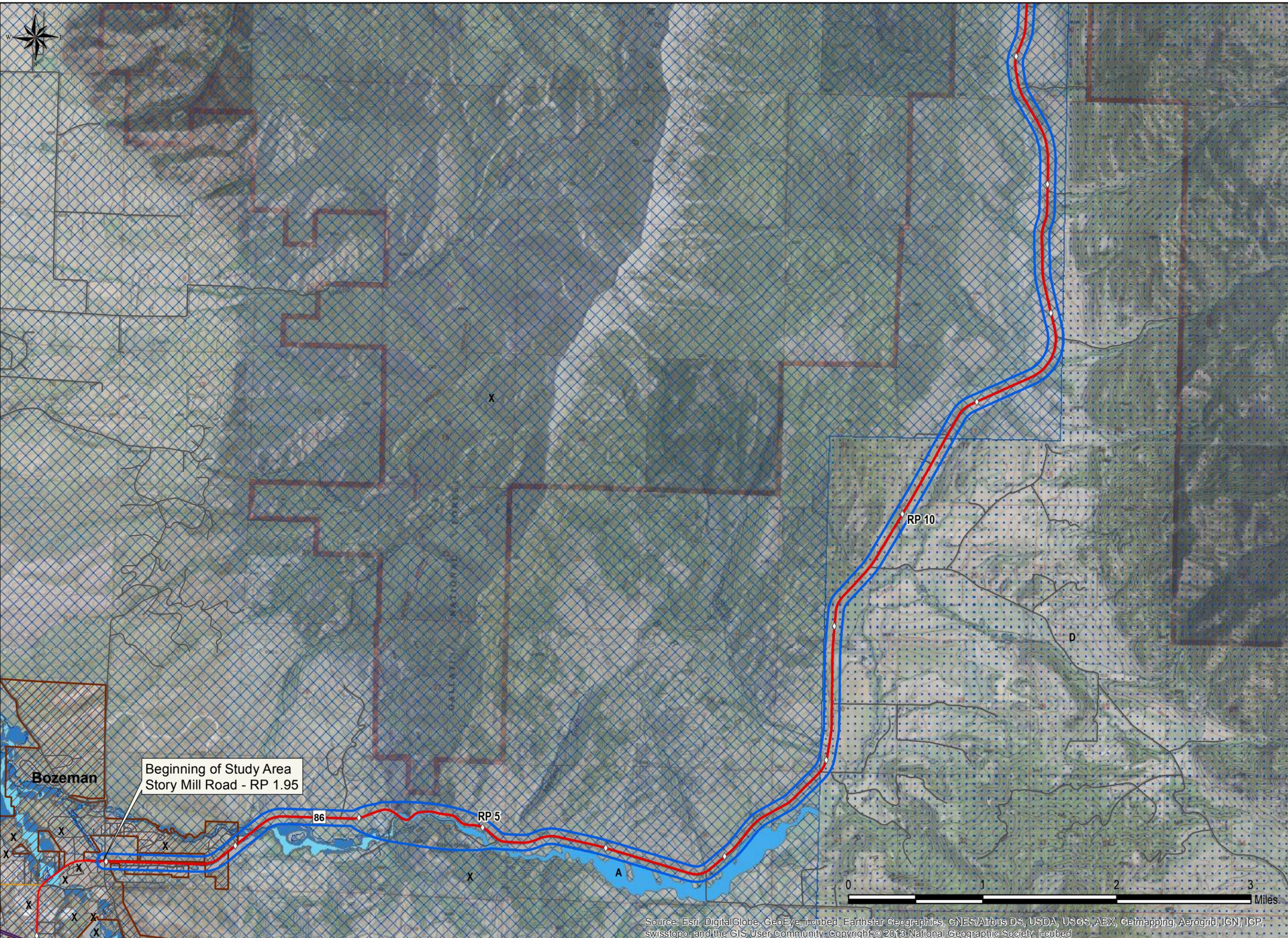
End of Study Area
US Highway 89 - RP 37.5

Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- ⊕ Water Wells (MBMG, 2014)
- Dams (MFWP, 2003)



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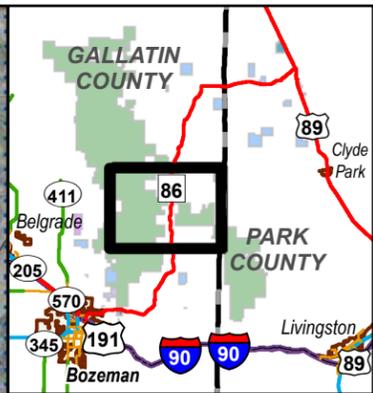
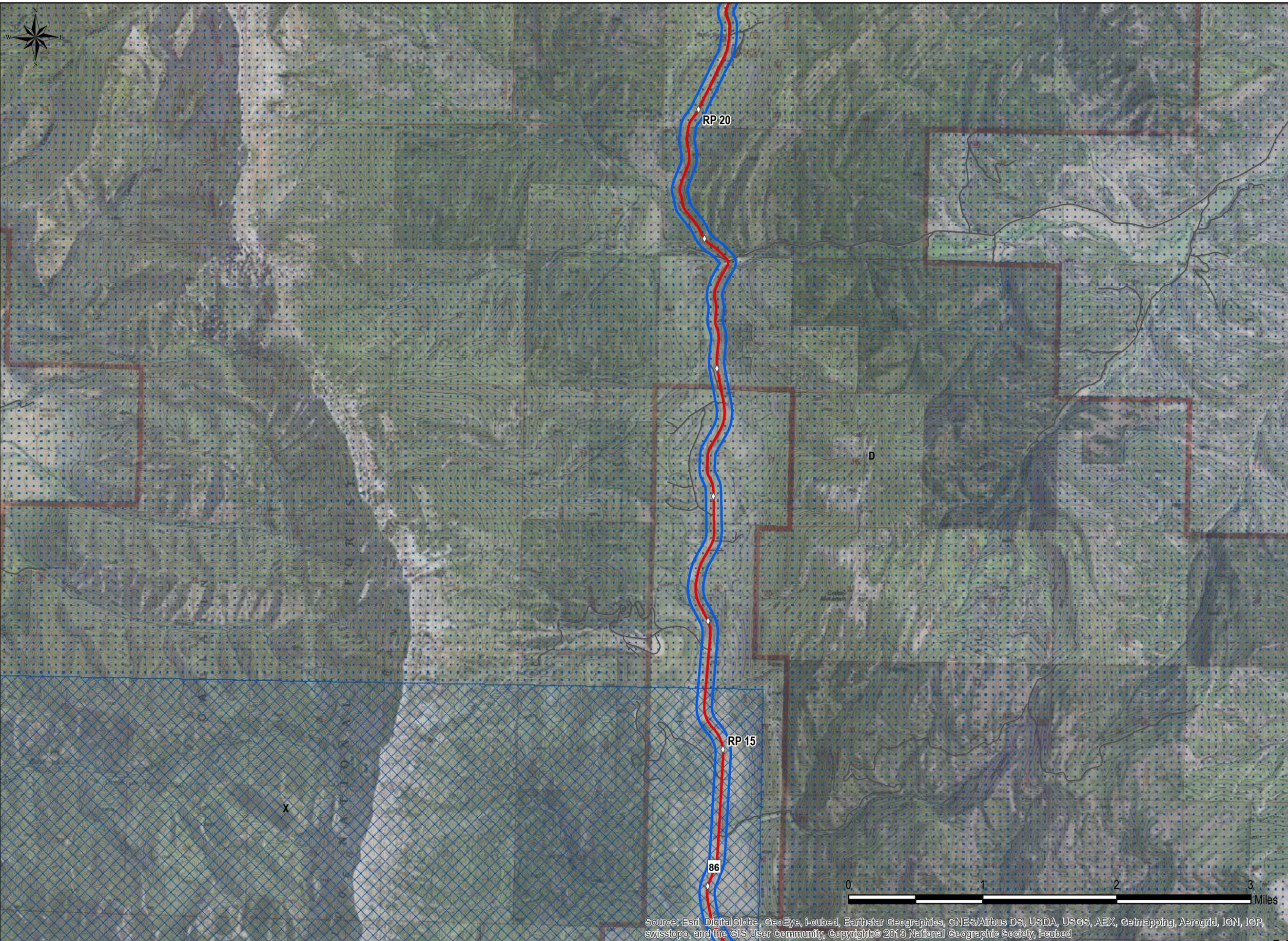


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Flood Zones (FEMA, 2011, 2013)
- A: 100-Year Flood, No Base Flood Elev. Determined
- AE: 100-Year Flood, Base Flood Elev. Determined
- AE: 100-Year Flood, Stream Channel plus Adj. Floodplains
- X: 500-Year Flood
- D: Flood Hazards Undetermined, but Possible
- X: Areas Outside the 500-Year Flood



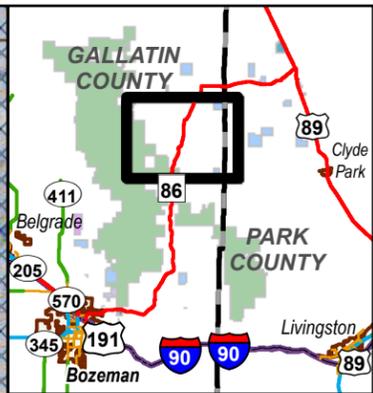
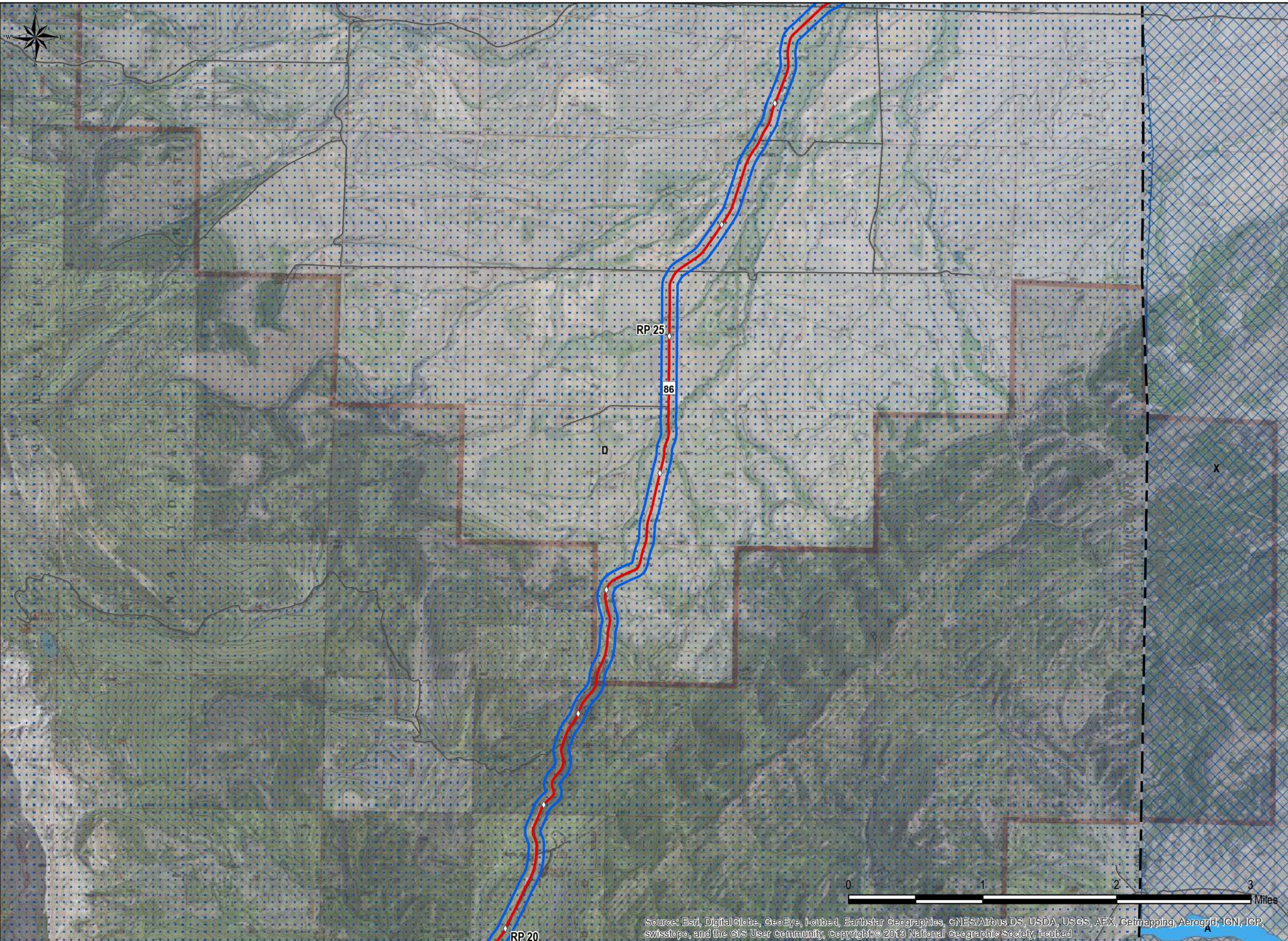
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Flood Zones (FEMA, 2011, 2013)
- D: Flood Hazards Undetermined, but Possible
- X: Areas Outside the 500-Year Flood

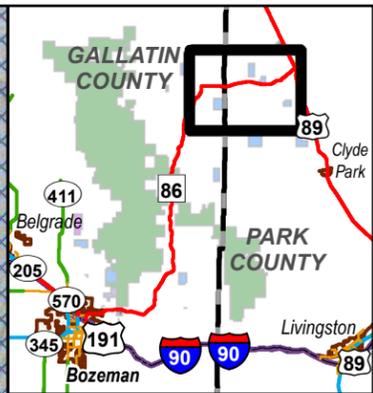
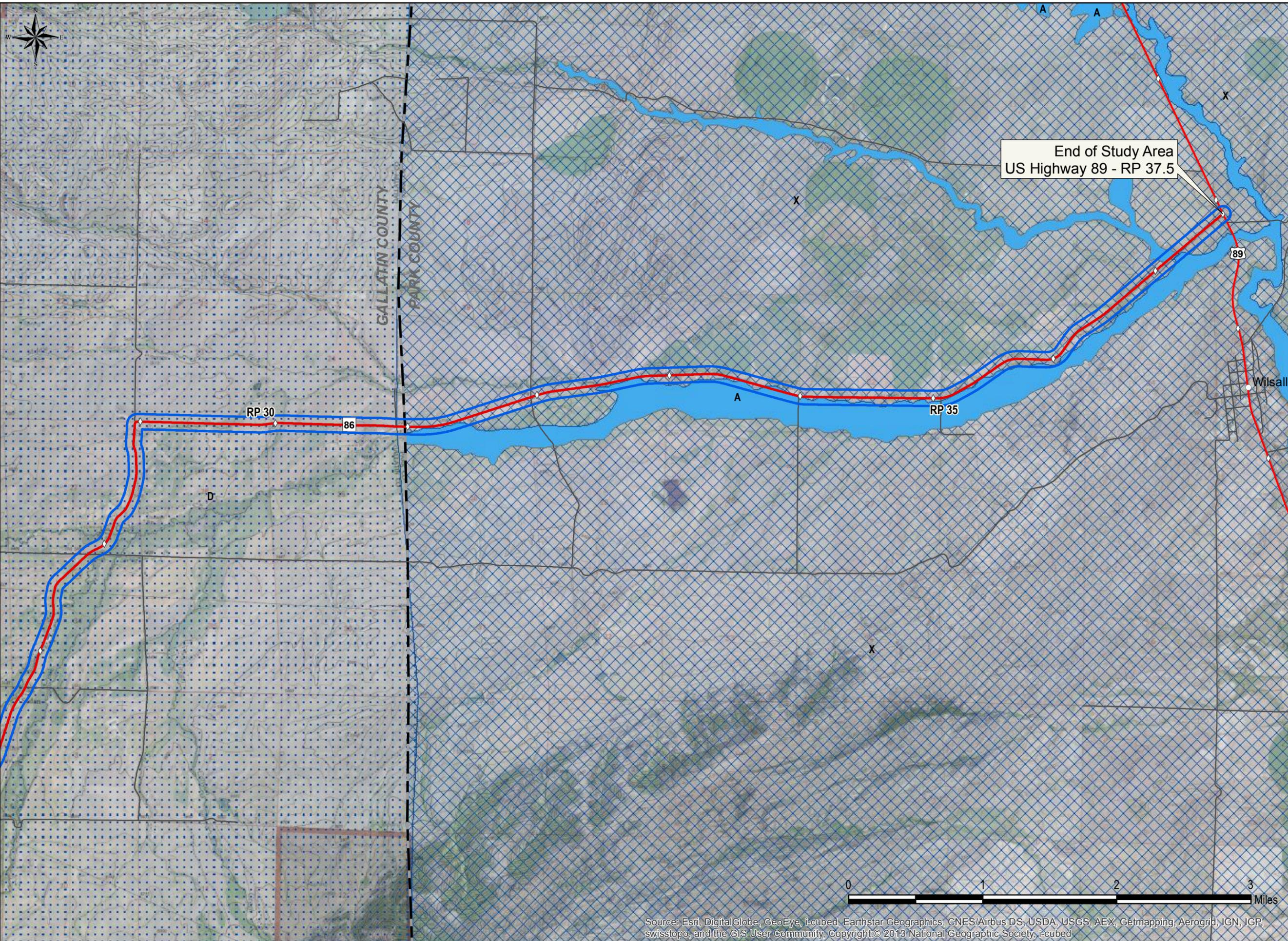
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Flood Zones (FEMA, 2011, 2013)
- A: 100-Year Flood, No Base Flood Elev. Determined
- D: Flood Hazards Undetermined, but Possible
- X: Areas Outside the 500-Year Flood

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, i-cubed

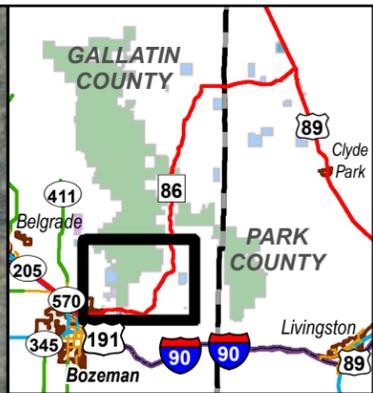
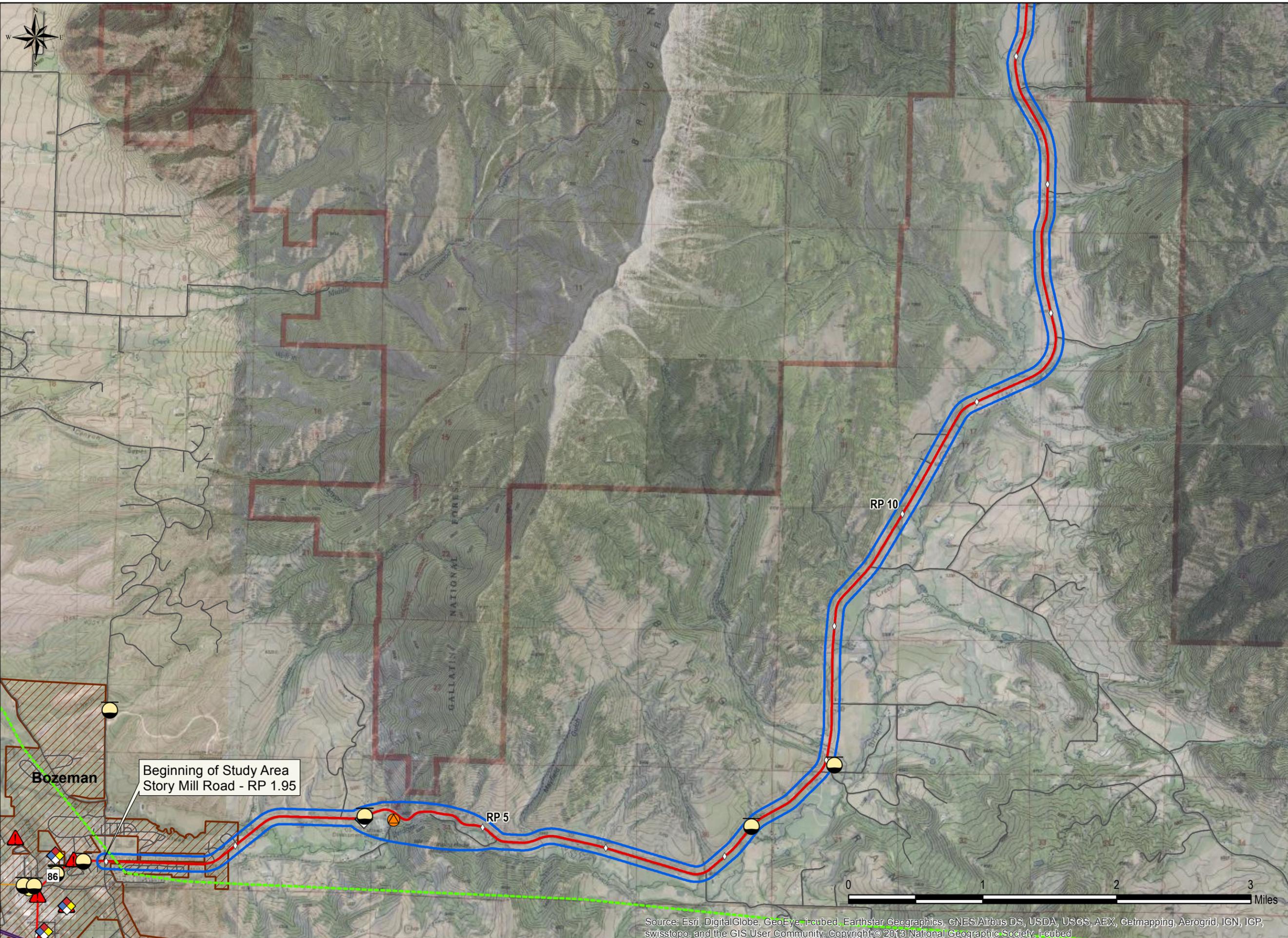


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Flood Zones (FEMA, 2011, 2013)
- A: 100-Year Flood, No Base Flood Elev. Determined
- D: Flood Hazards Undetermined, but Possible
- X: Areas Outside the 500-Year Flood



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGR, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, i-cubed



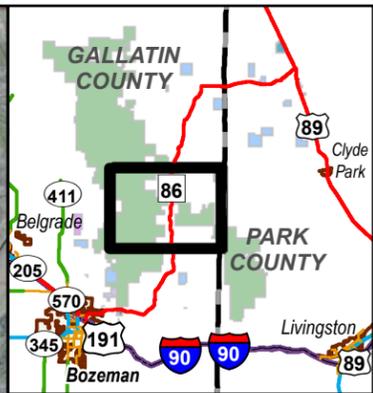
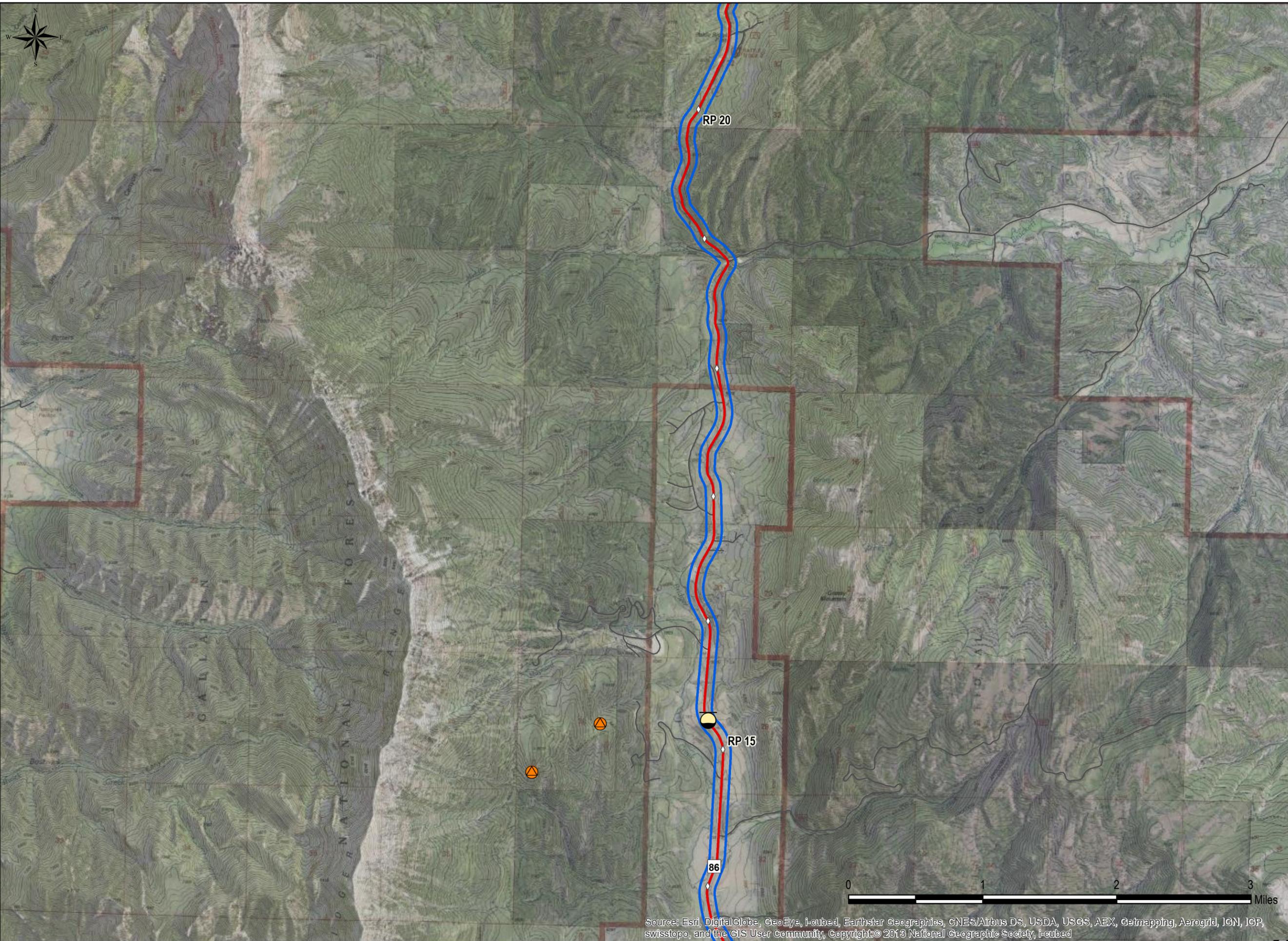
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Abandoned and Inactive Mines (MDEQ, 2005)
- LUST Facilities (MDEQ, 2014)
- DST Hazardous Waste Handlers (MDEQ, 2014)
- DST Underground Storage Tanks (MDEQ, 2014)
- DST Response Sites (MDEQ, 2014)
- Crude Oil Pipeline (MT State Library)

Beginning of Study Area
Story Mill Road - RP 1.95

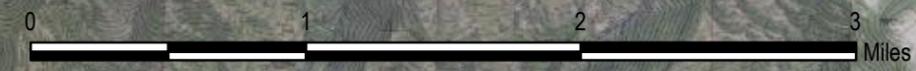


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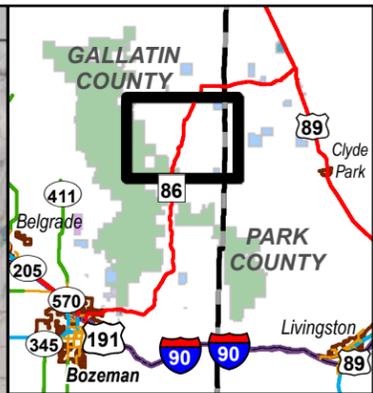
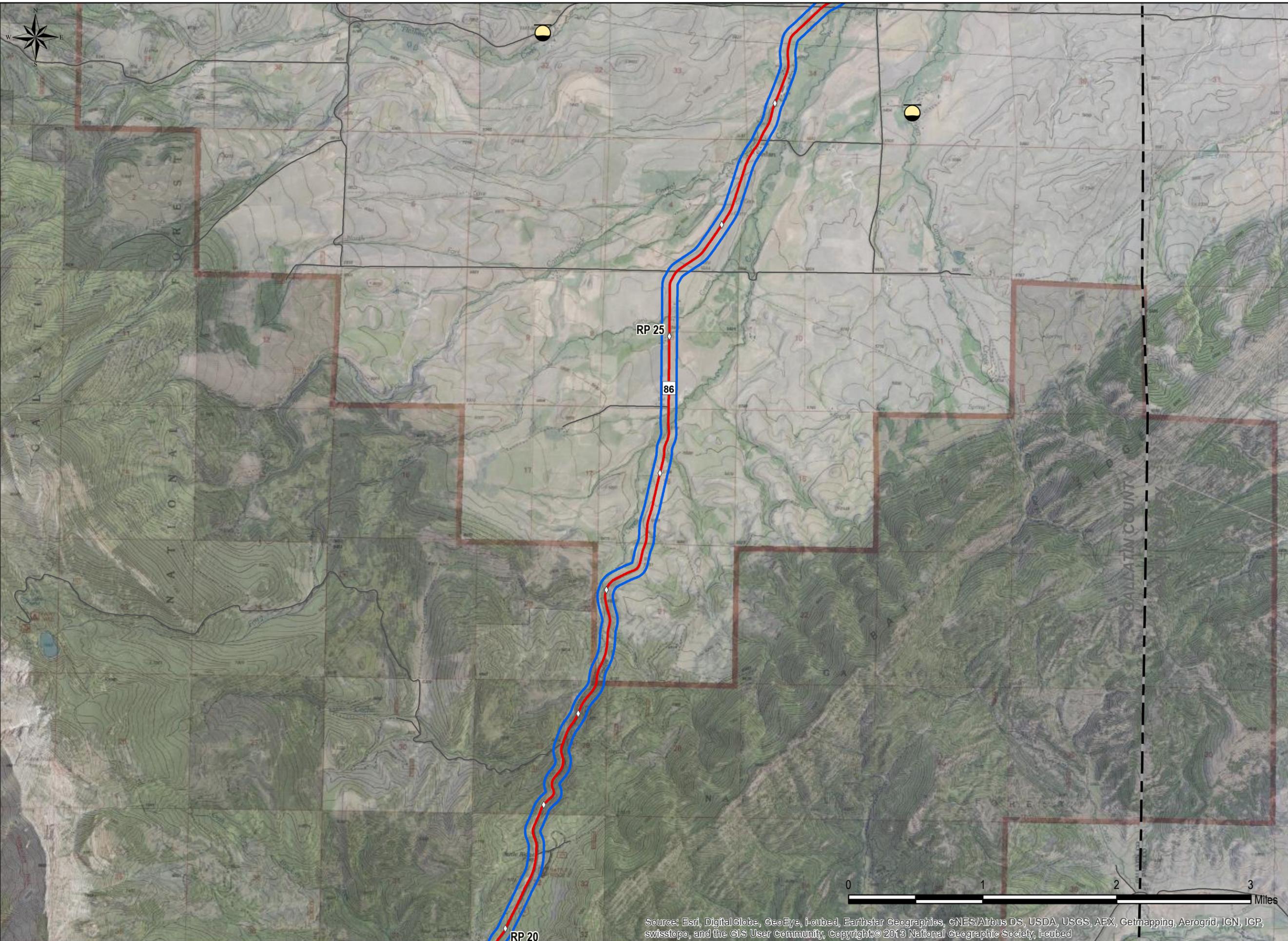


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- ▲ Abandoned and Inactive Mines (MDEQ, 2005)
- LUST Facilities (MDEQ, 2014)



Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, I-cubed

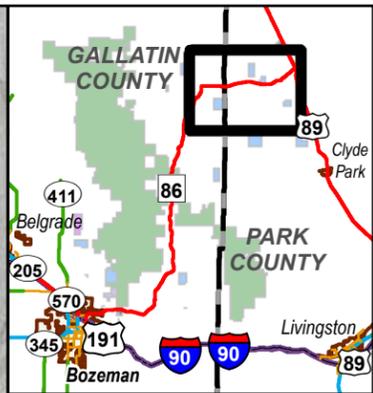
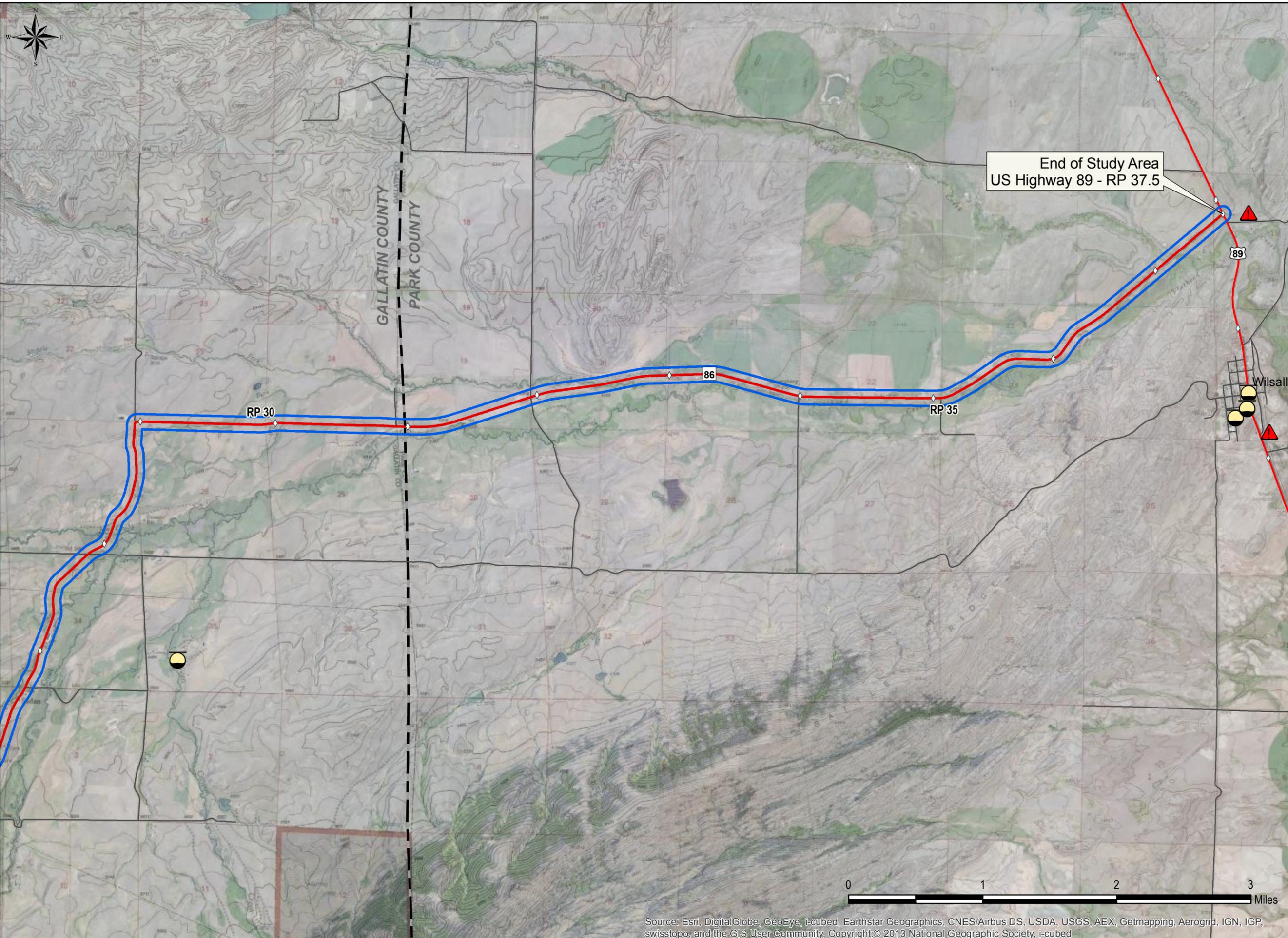


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Abandoned and Inactive Mines (MDEQ, 2005)
- LUST Facilities (MDEQ, 2014)



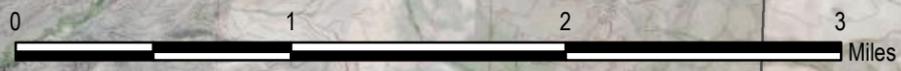
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End of Study Area
US Highway 89 - RP 37.5

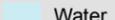
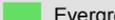
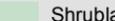
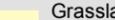
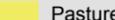
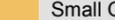
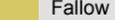
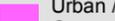
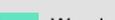
Map Legend

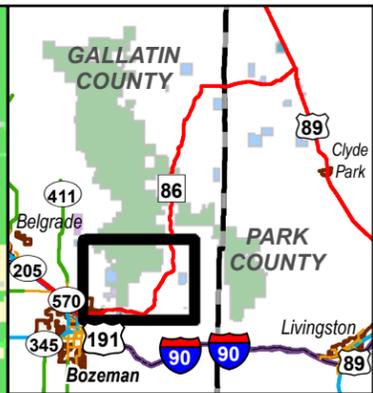
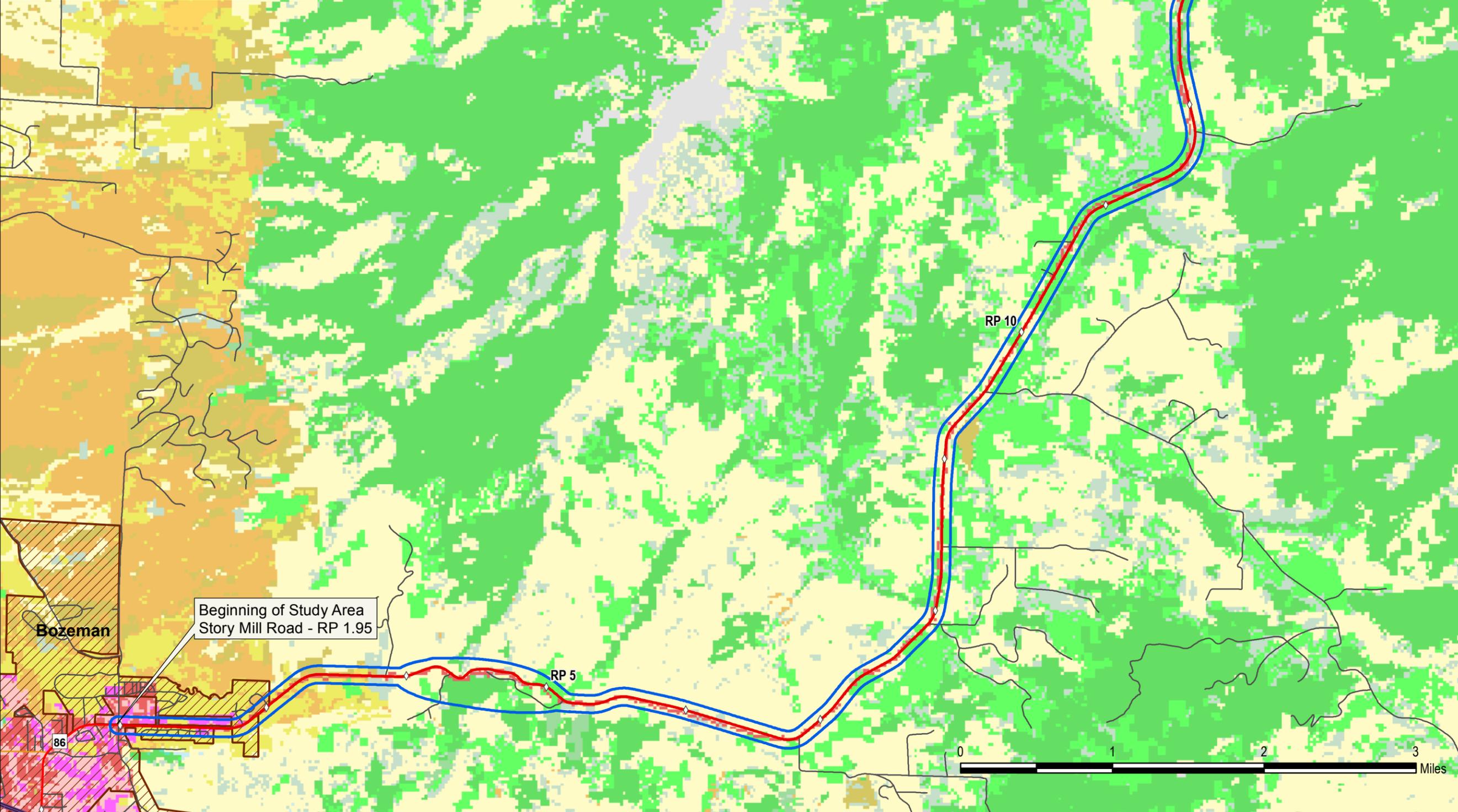
- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- LUST Facilities (MDEQ, 2014)
- DST
- Underground Storage Tanks (MDEQ, 2014)
- ▲ DST Response Sites (MDEQ, 2014)



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Land Cover Legend

Land Cover (USGS, 2000)	
	Water
	Low Intensity Residential
	Commercial / Industrial / Transportation
	Bare Rock
	Deciduous Forest
	Evergreen Forest
	Mixed Forest
	Shrubland
	Grassland / Herbaceous
	Pasture / Hay
	Row Crops
	Small Grains
	Fallow
	Urban / Recreational Grass
	Woody Wetlands



Map Legend

-  Reference Post
-  MT 86
-  Study Area
- On System Routes
- System
-  NHS Interstate
-  Primary
-  Urban
- Off System Routes
-  City Boundary
-  County Boundary

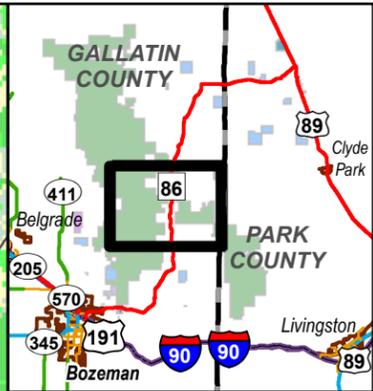
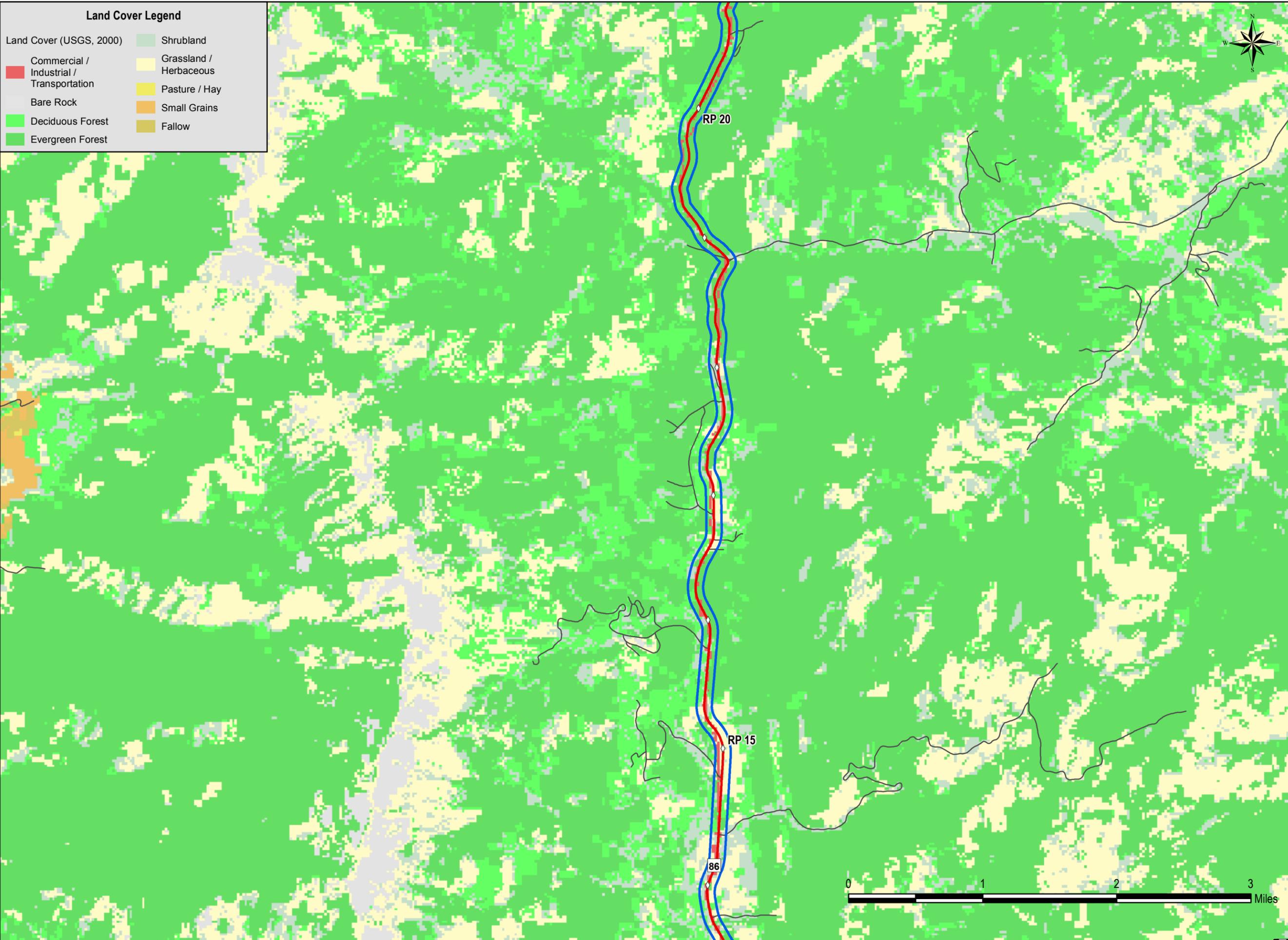
Beginning of Study Area
Story Mill Road - RP 1.95



Land Cover Legend

Land Cover (USGS, 2000)

 Shrubland	 Grassland / Herbaceous
 Commercial / Industrial / Transportation	 Pasture / Hay
 Bare Rock	 Small Grains
 Deciduous Forest	 Fallow
 Evergreen Forest	



Map Legend

-  Reference Post
-  MT 86
-  Study Area

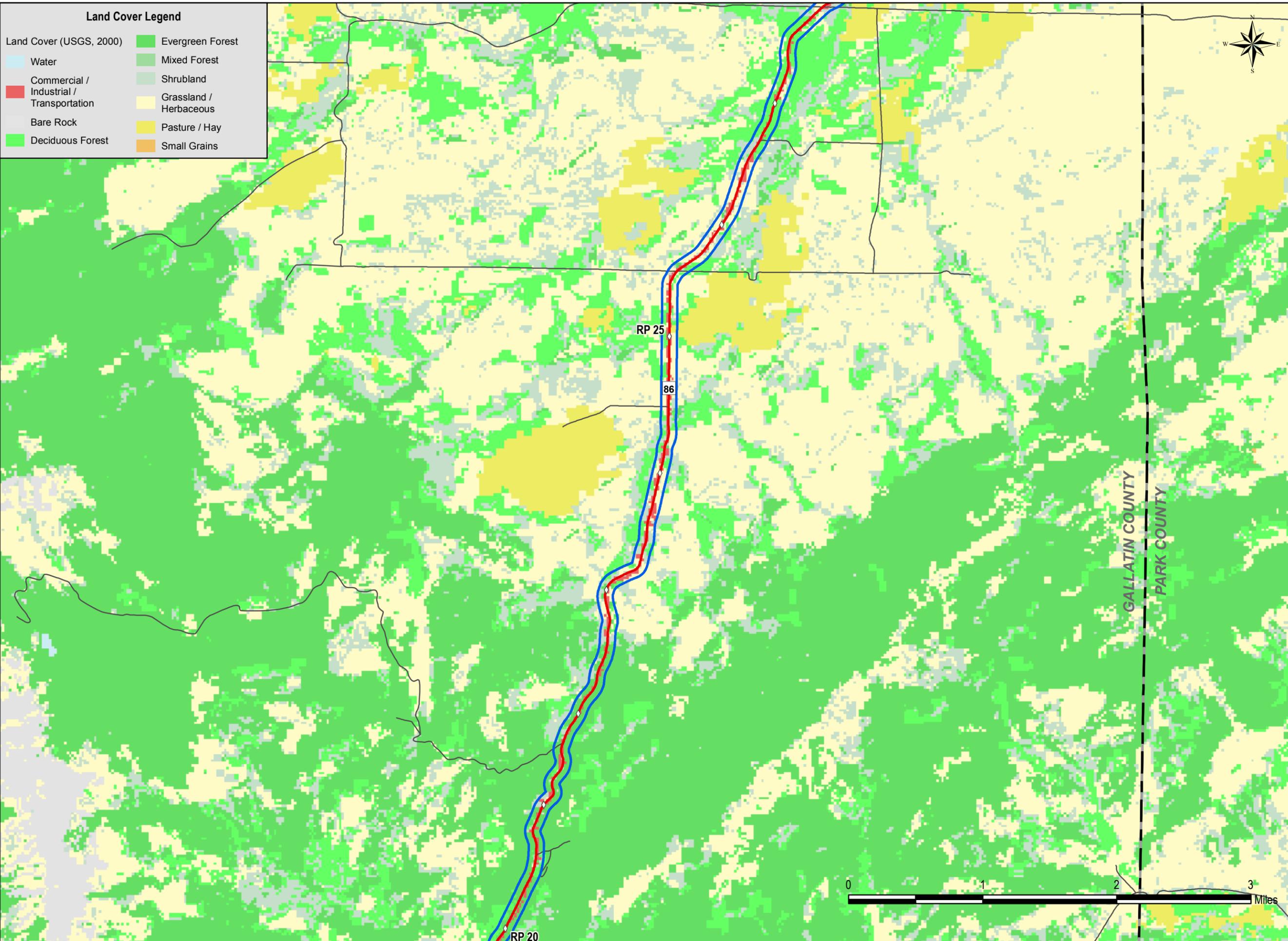
On System Routes

System

-  Primary
-  Off System Routes

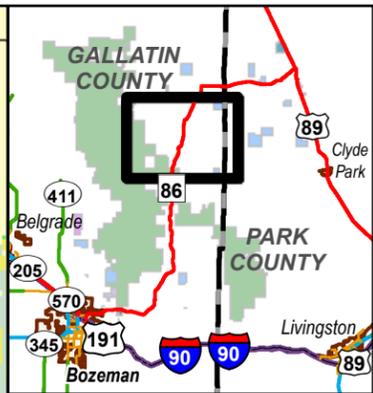
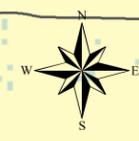
 County Boundary





Land Cover Legend

Land Cover (USGS, 2000)	
■	Evergreen Forest
■	Mixed Forest
■	Grassland / Herbaceous
■	Pasture / Hay
■	Small Grains
■	Water
■	Commercial / Industrial / Transportation
■	Bare Rock
■	Shrubland
■	Deciduous Forest



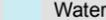
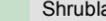
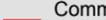
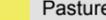
Map Legend

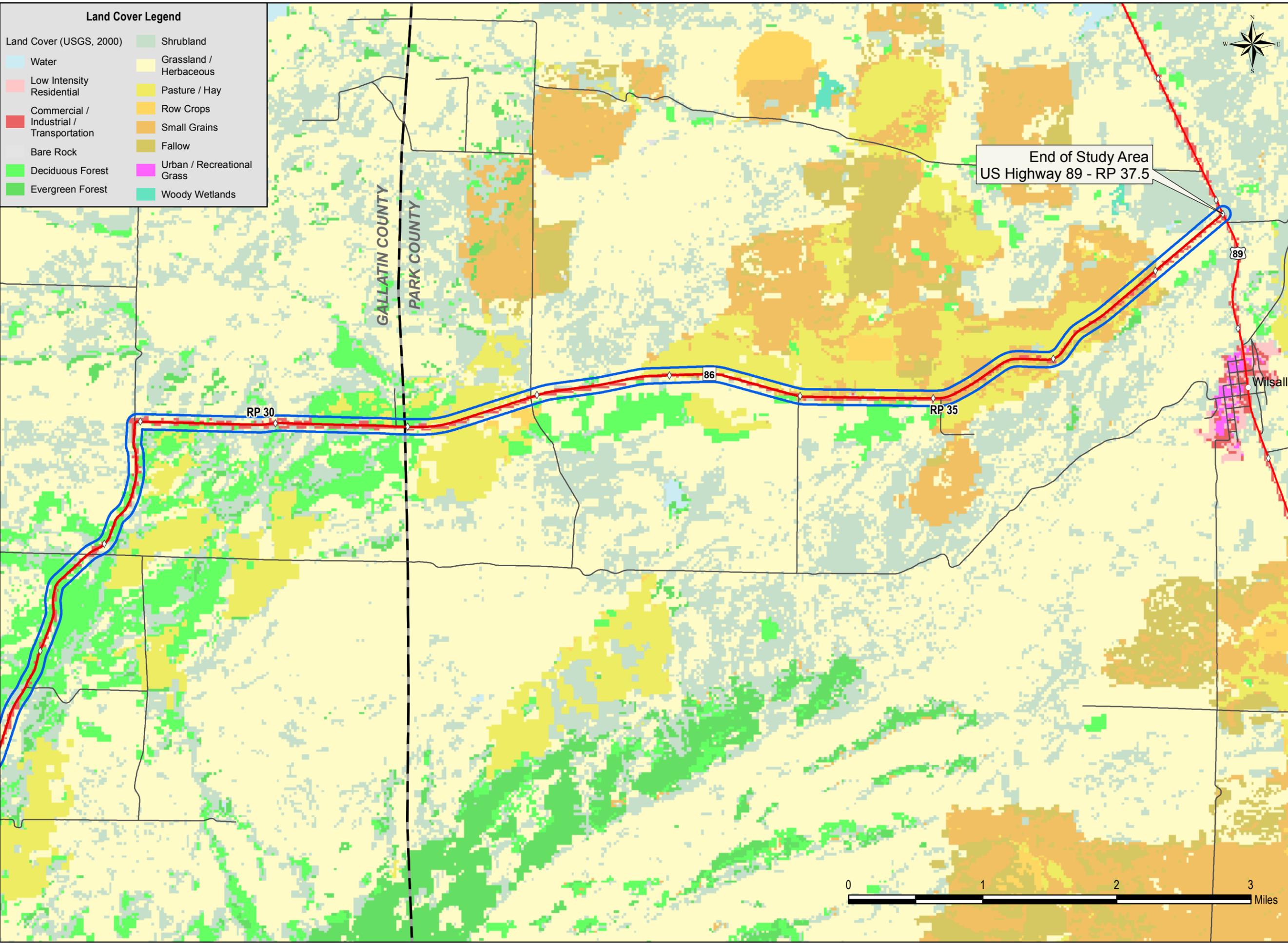
- ◇ Reference Post
- MT 86
- Study Area
- On System Routes
- System
- Primary
- Off System Routes
- County Boundary



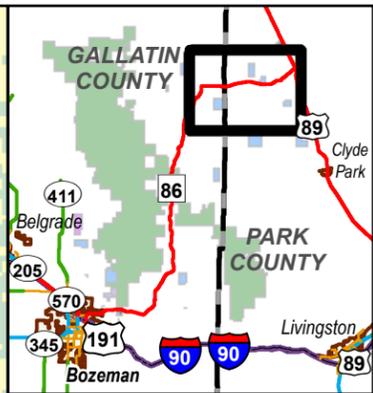
Land Cover Legend

Land Cover (USGS, 2000)

 Water	 Shrubland
 Low Intensity Residential	 Grassland / Herbaceous
 Commercial / Industrial / Transportation	 Pasture / Hay
 Bare Rock	 Row Crops
 Deciduous Forest	 Small Grains
 Evergreen Forest	 Fallow
	 Urban / Recreational Grass
	 Woody Wetlands



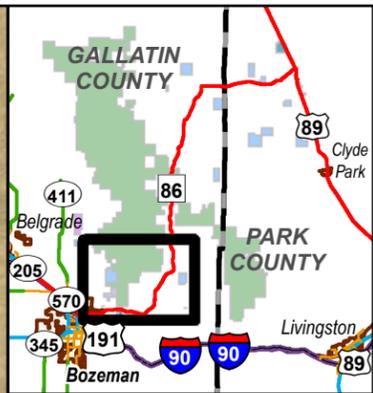
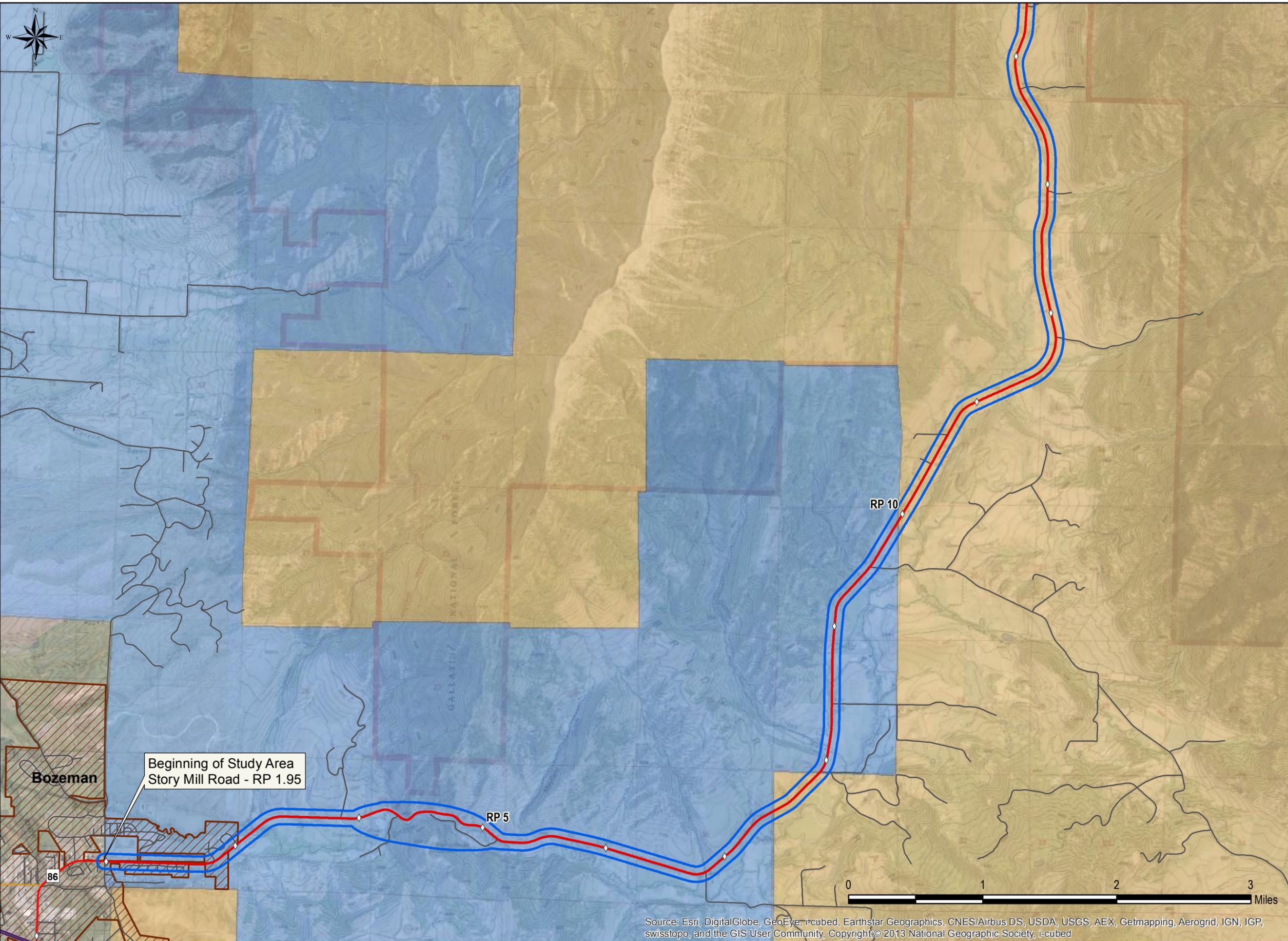
End of Study Area
US Highway 89 - RP 37.5



Map Legend

-  Reference Post
-  MT 86
-  Study Area
- On System Routes
- System
-  Primary
-  Off System Routes
-  County Boundary





Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Elk Distribution (MTFWP, 2008)
- Use Type
- ▭ General
- ▭ Winter

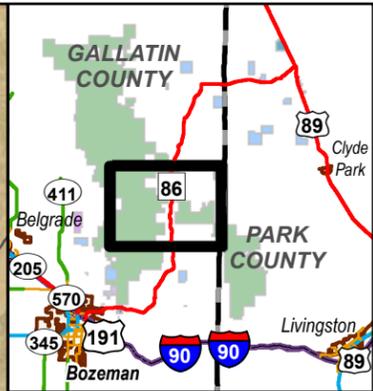
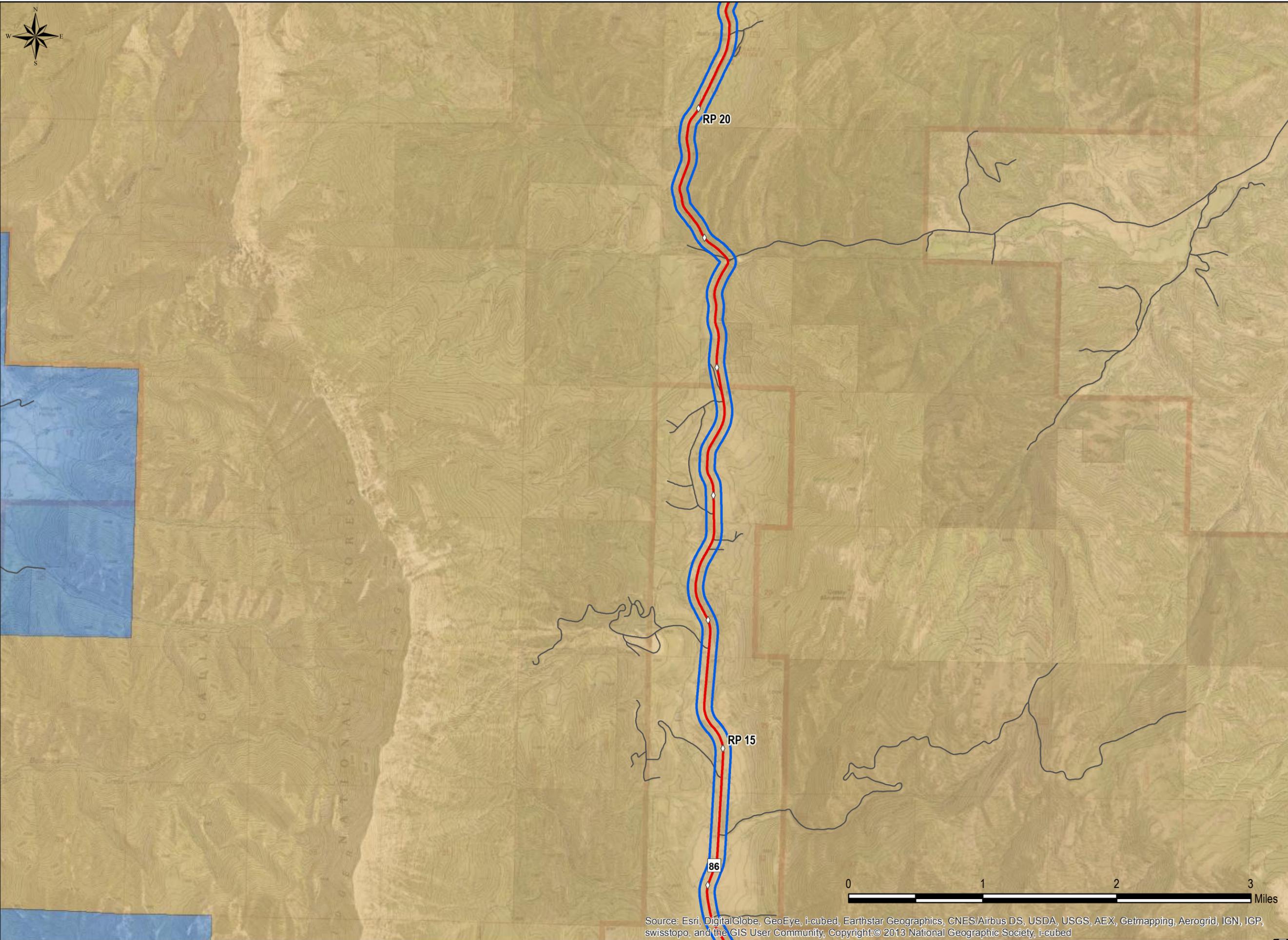
Beginning of Study Area
Story Mill Road - RP 1.95

RP 5

RP 10



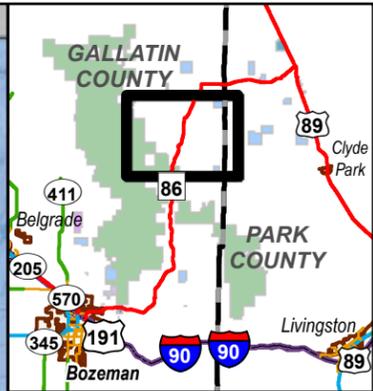
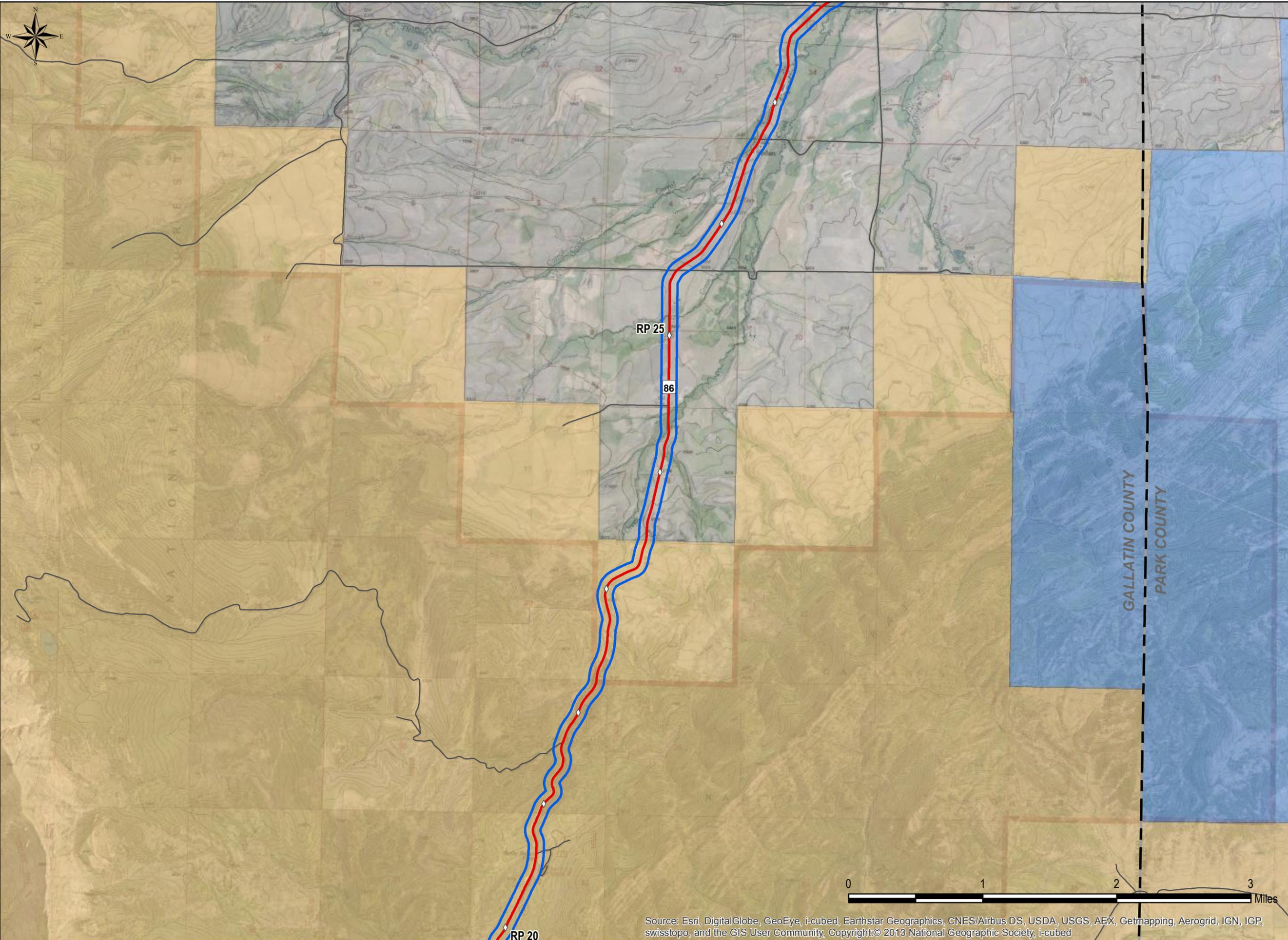
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Elk Distribution (MTFWP, 2008)
- Use Type
- ▭ General
- ▭ Winter

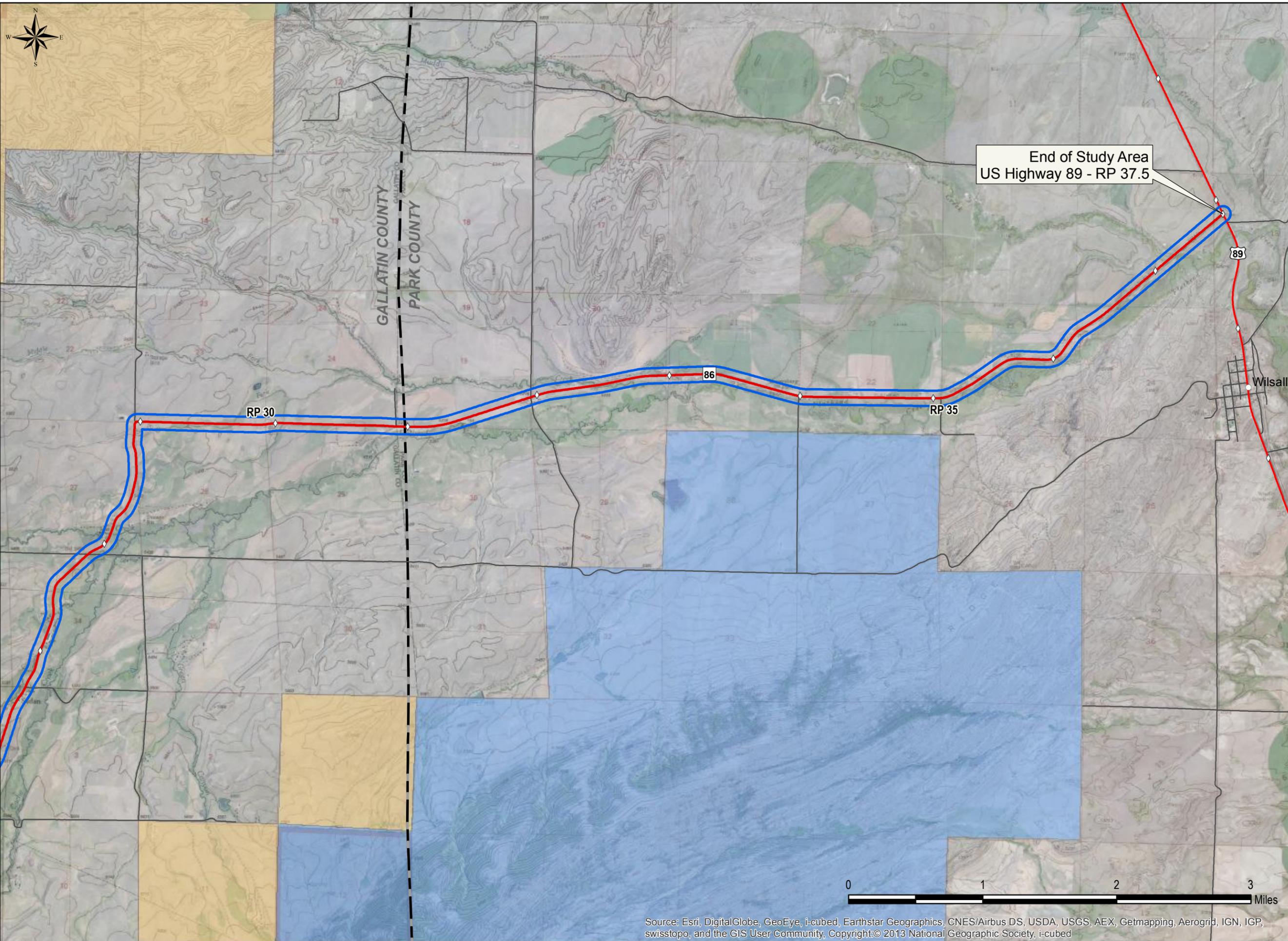
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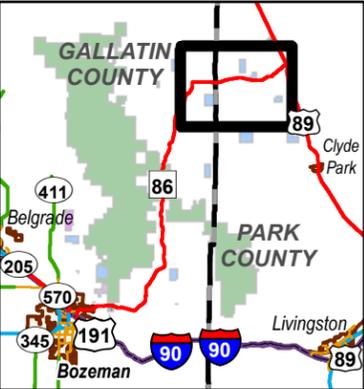
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Elk Distribution (MTFWP, 2008)
- Use Type
- ▭ General
- ▭ Winter

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright:© 2013 National Geographic Society, i-cubed



End of Study Area
US Highway 89 - RP 37.5

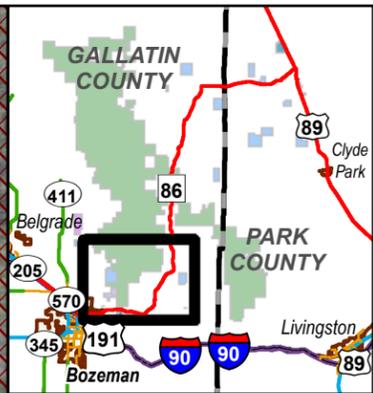
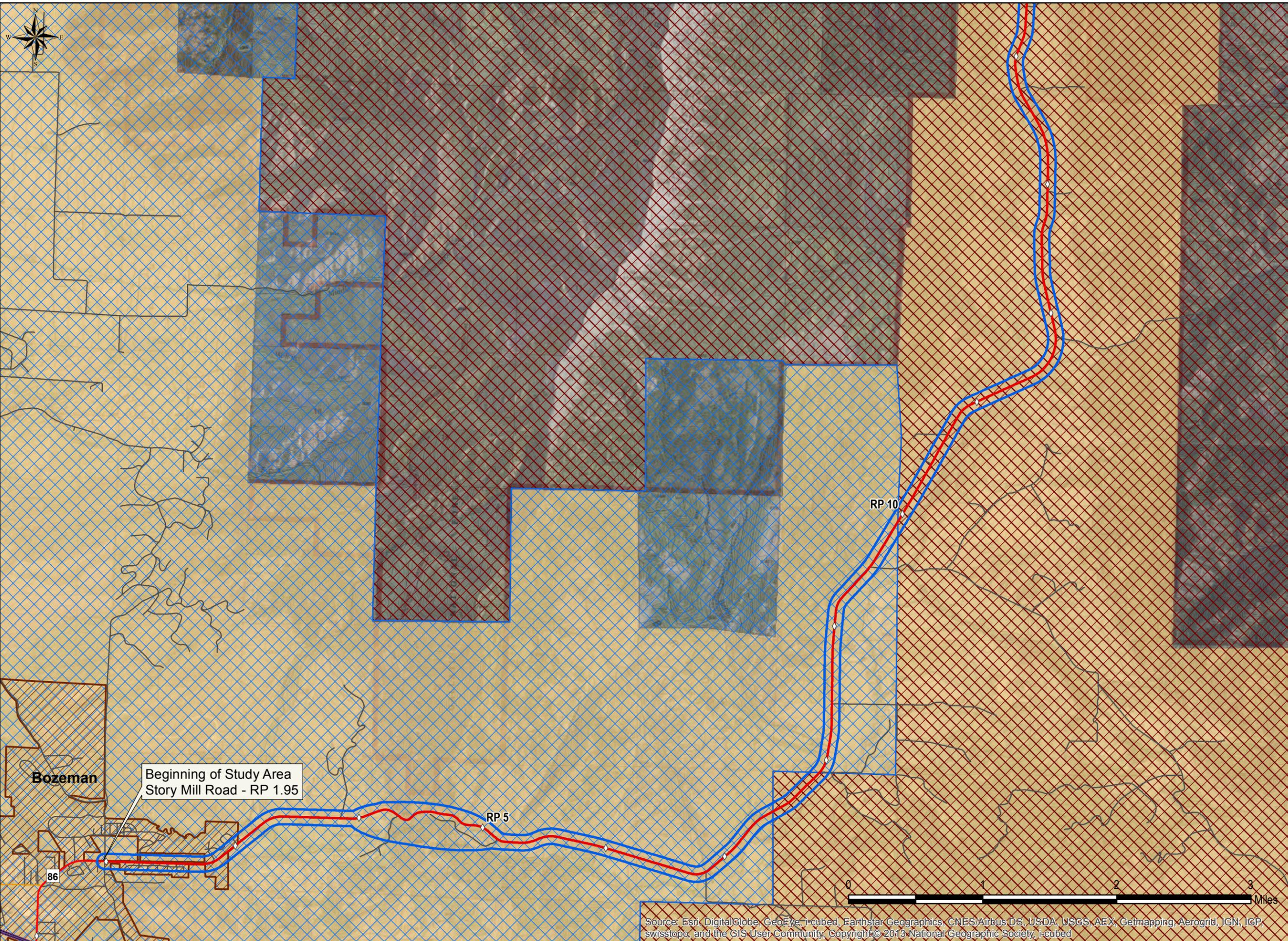


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Elk Distribution (MTFWP, 2008)
- Use Type
- ▭ General
- ▭ Winter



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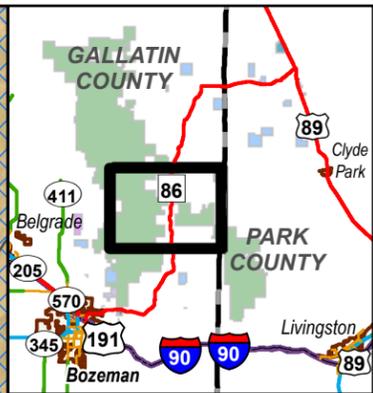
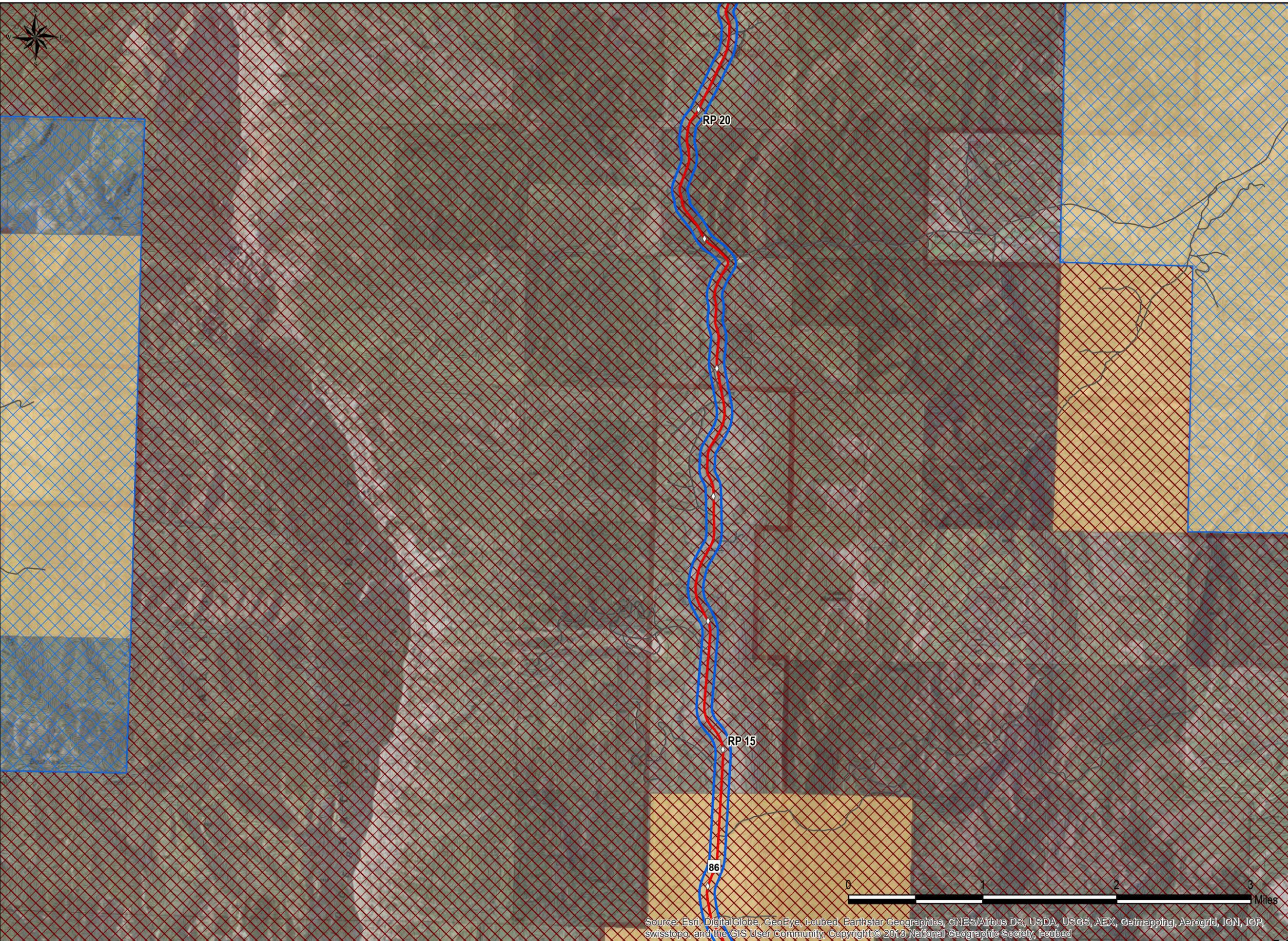
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Mule Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter
- Whitetail Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General

Beginning of Study Area
Story Mill Road - RP 1.95



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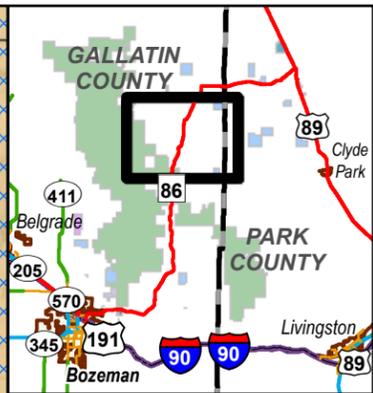
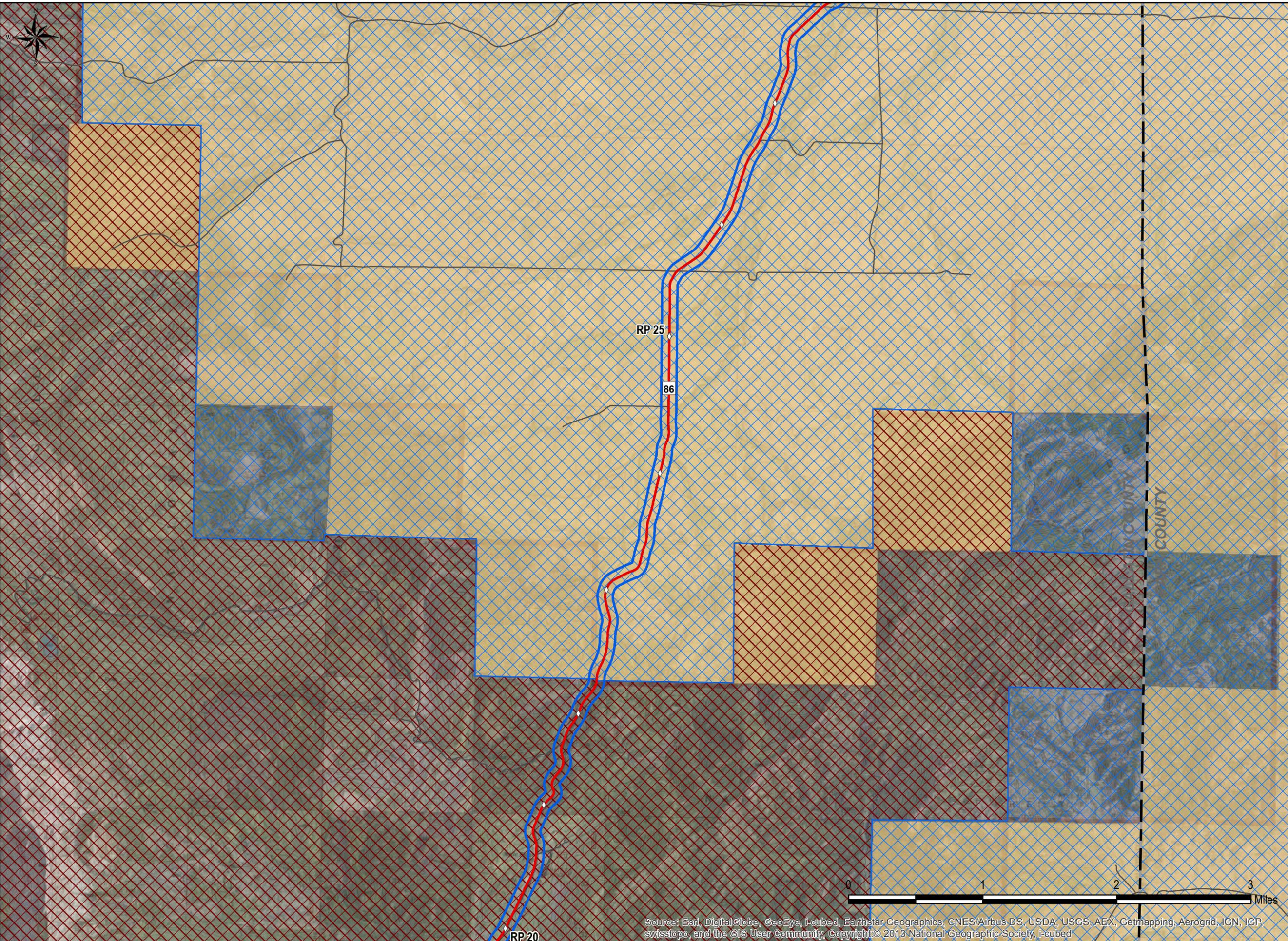


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Mule Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter
- Whitetail Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General



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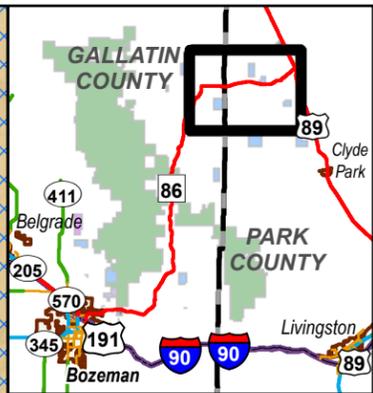
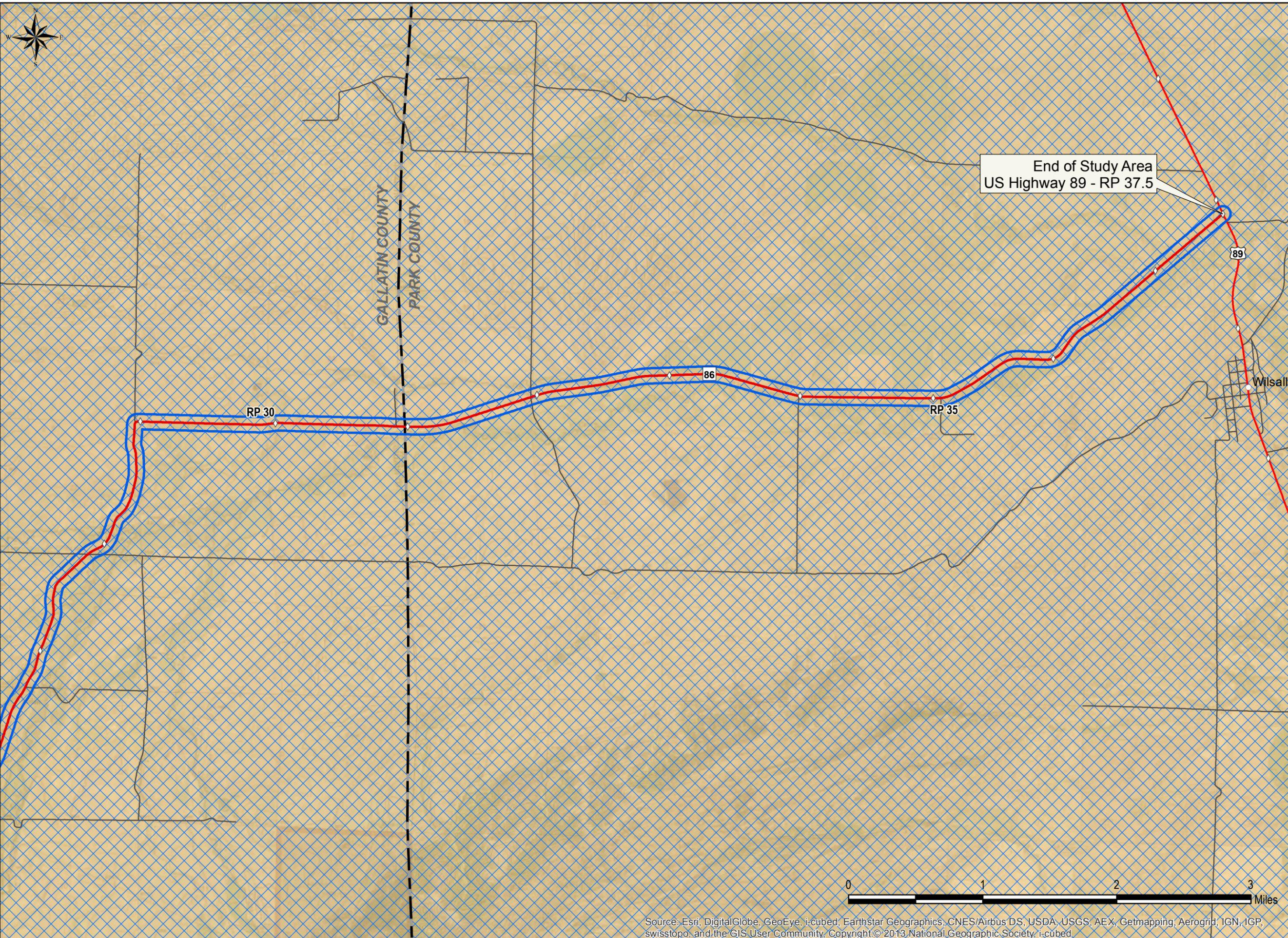


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Mule Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter
- Whitetail Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General



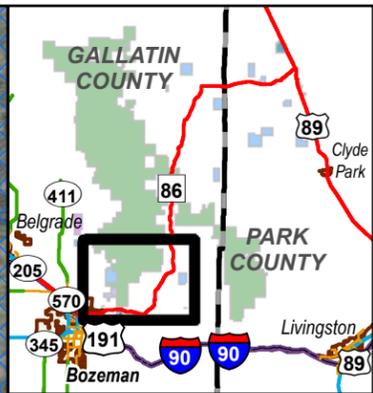
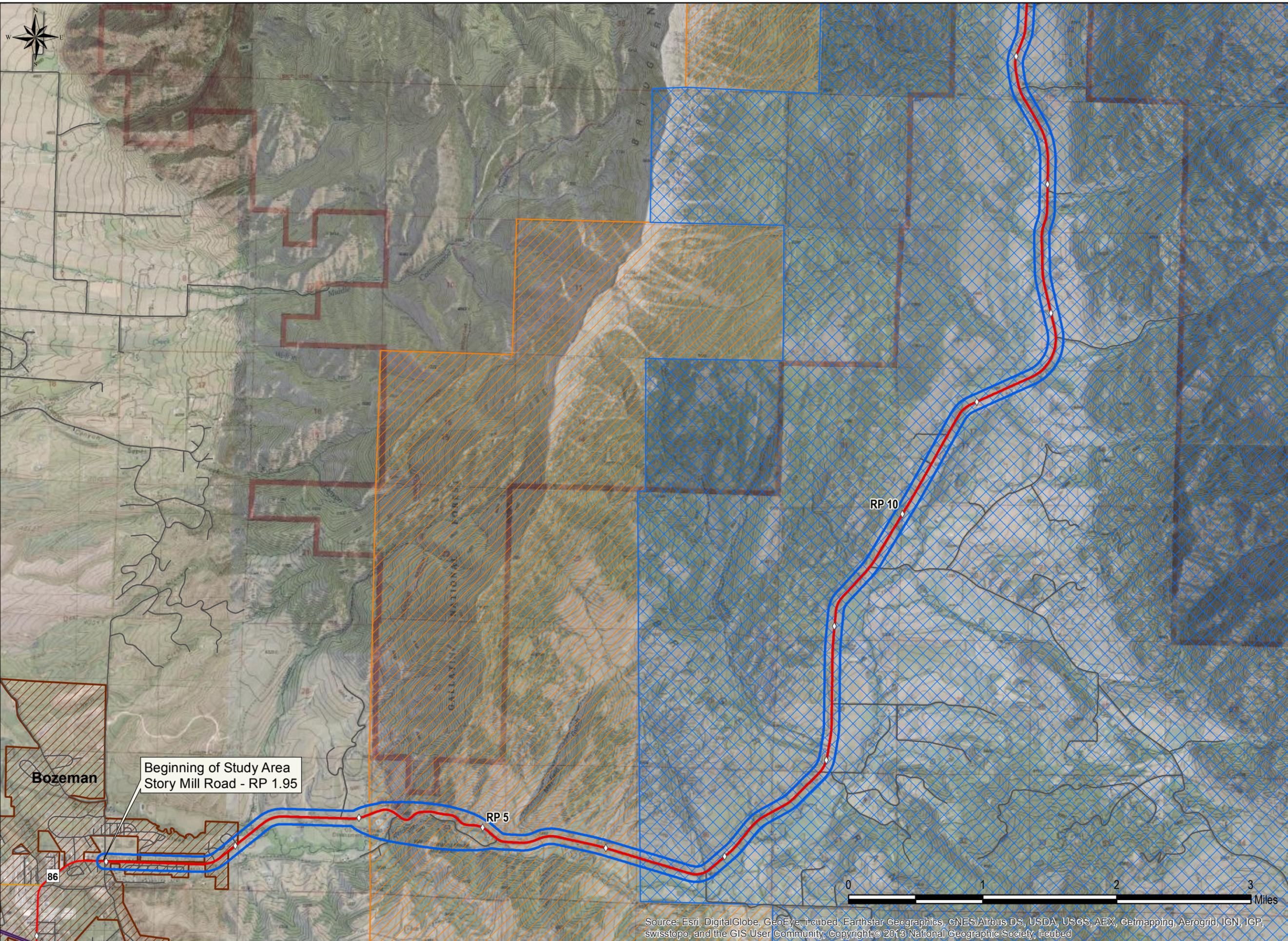
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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Mule Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ Winter
- Whitetail Deer Distribution (MTFWP, 2008)
- Use Type
- ▨ General

Source: Esri, DigitalGlobe, GeoEye, i-cubed, EarthStar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright:© 2013 National Geographic Society, i-cubed



Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Moose Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter

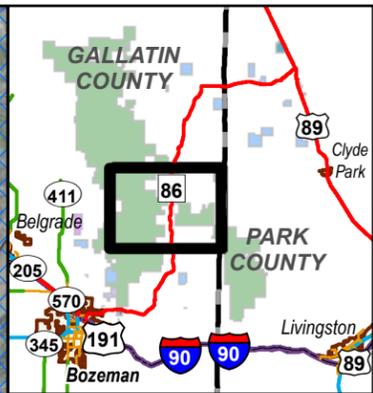
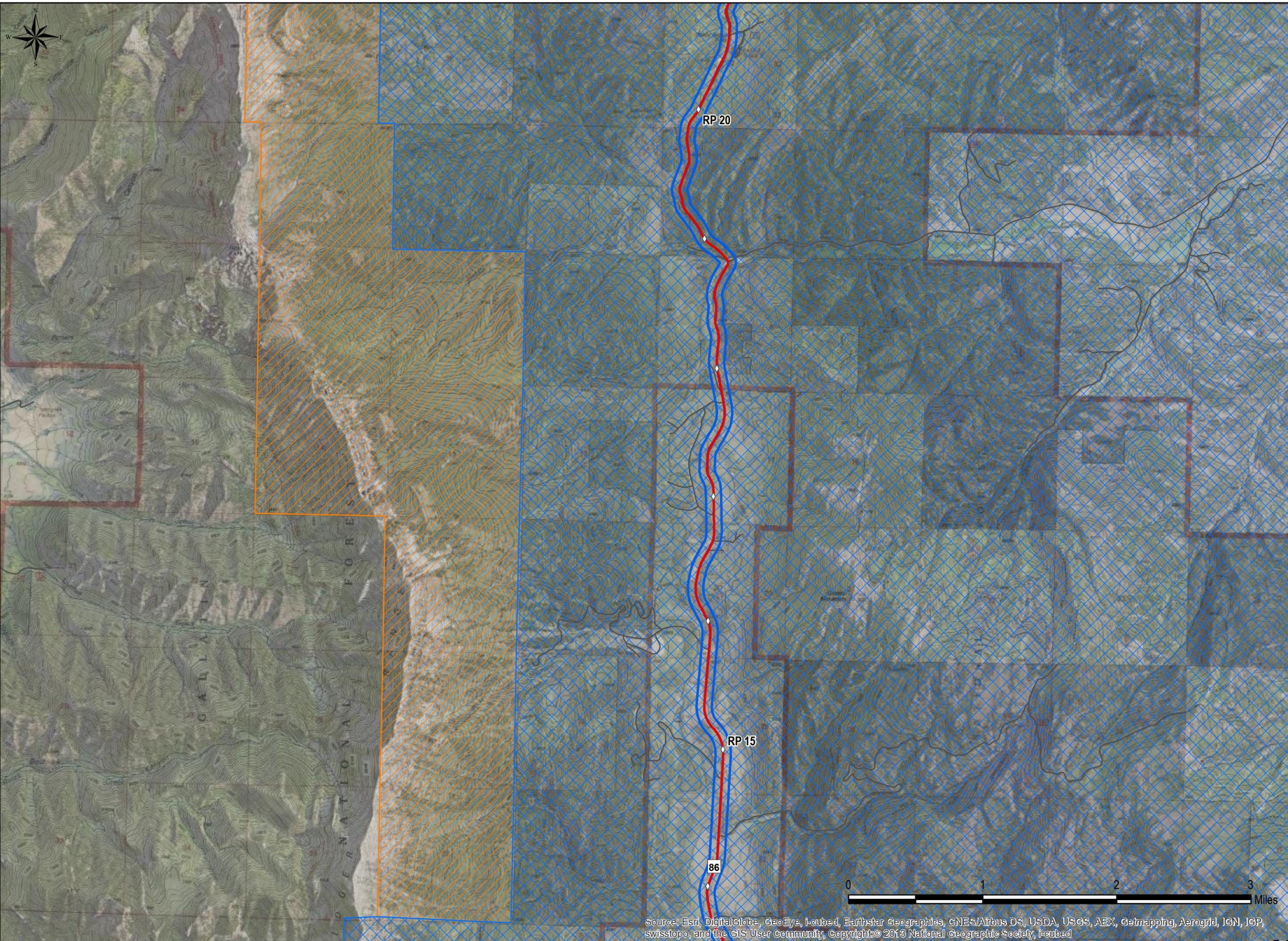
Beginning of Study Area
Story Mill Road - RP 1.95

RP 5

RP 10



Source: Esri, DigitalGlobe, GeoEye, I-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, I-cubed

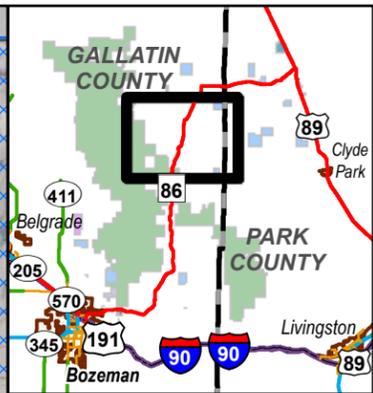
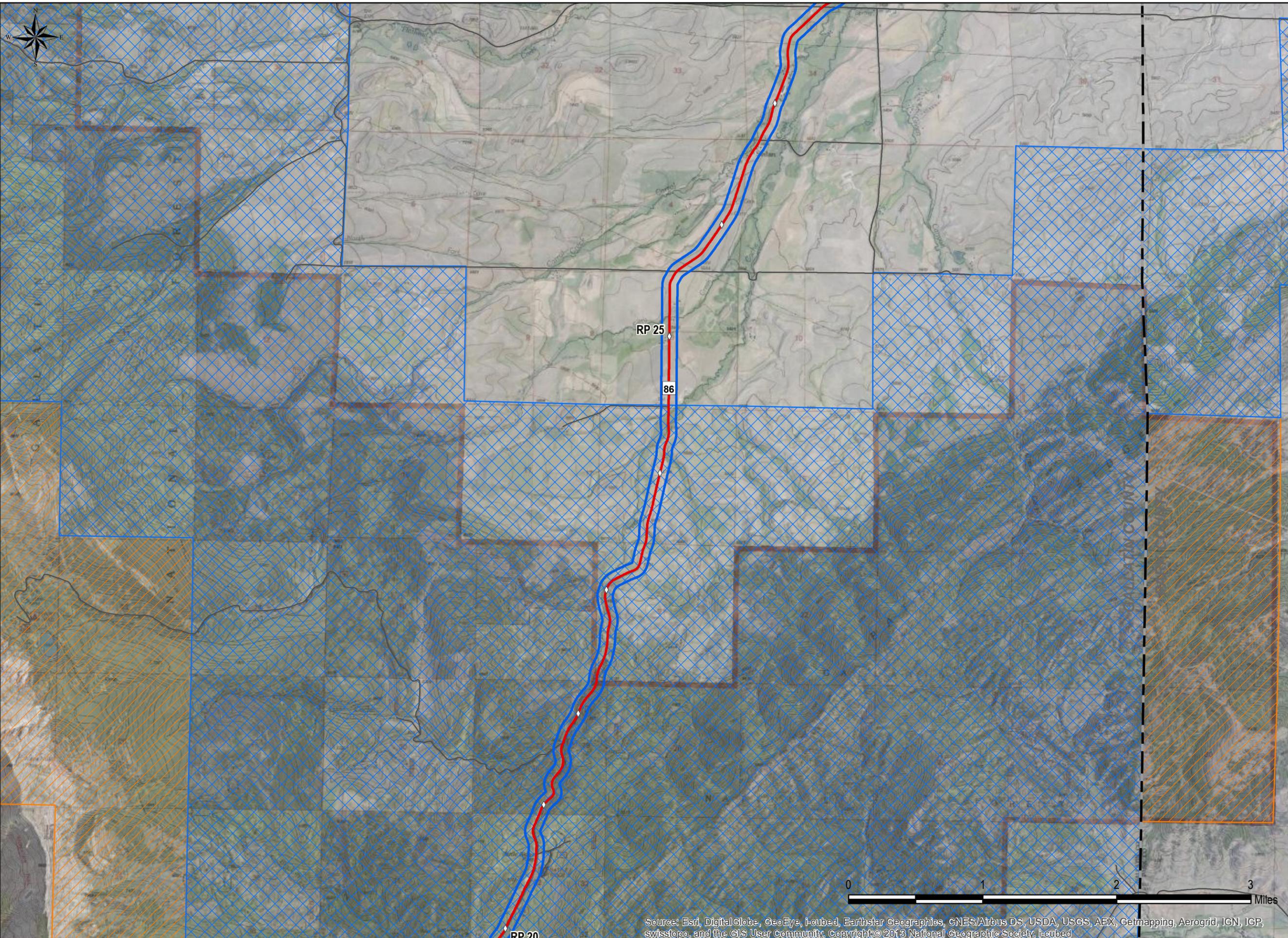


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Moose Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter



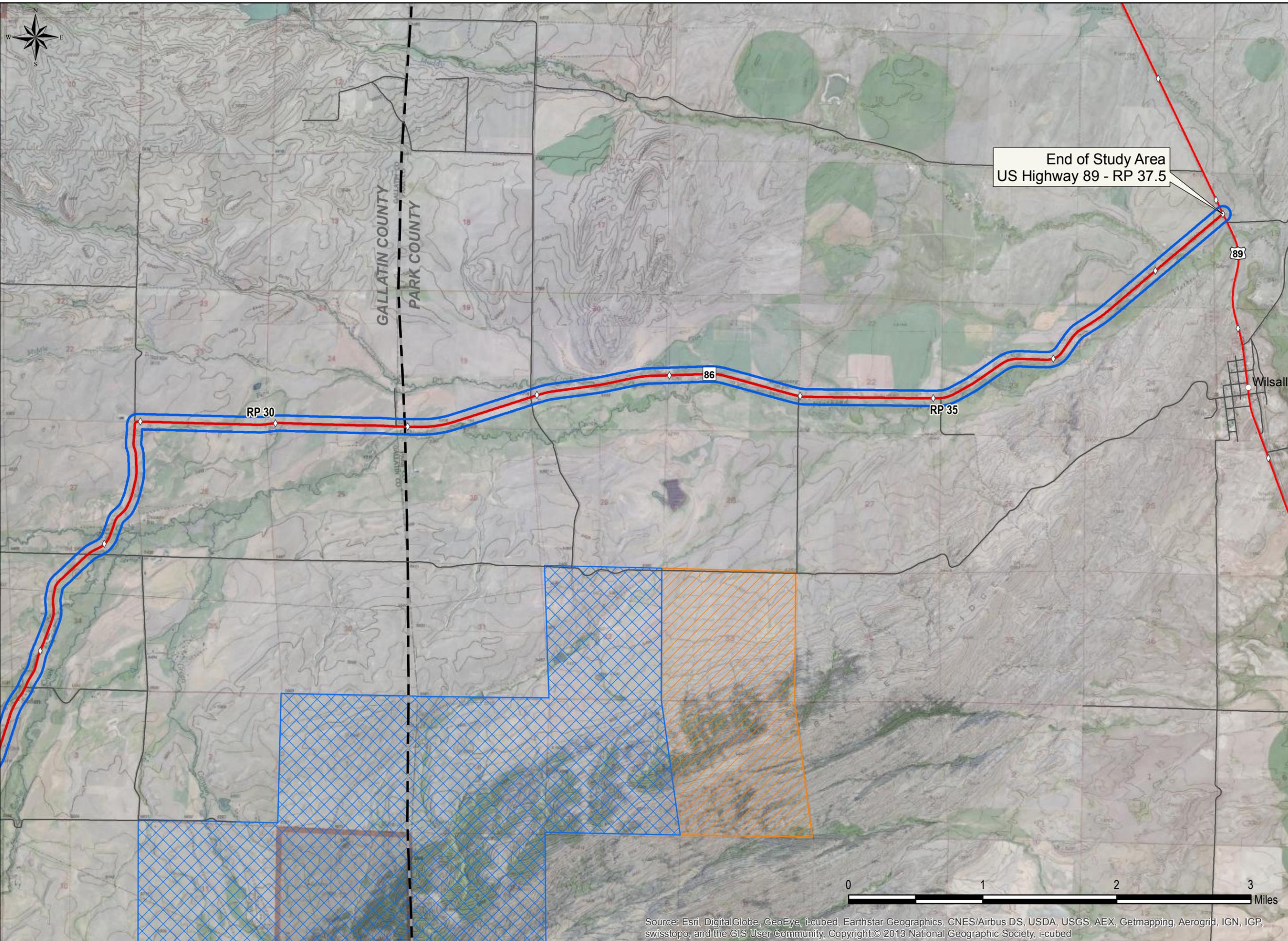
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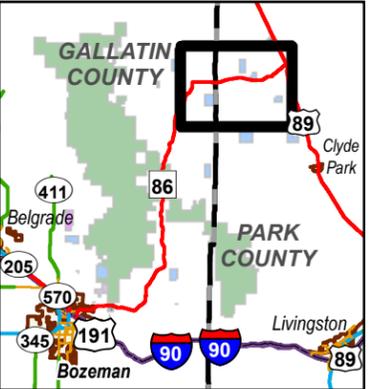
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Moose Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▨ Winter

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Copyright © 2013 National Geographic Society, i-cubed

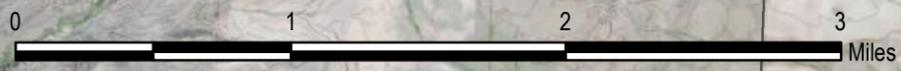


End of Study Area
US Highway 89 - RP 37.5

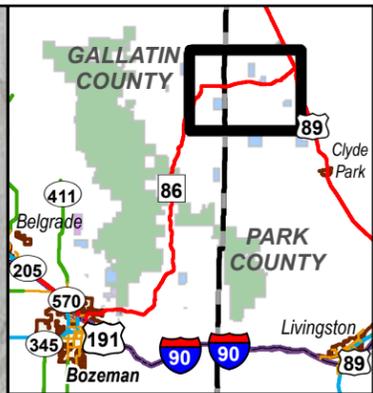
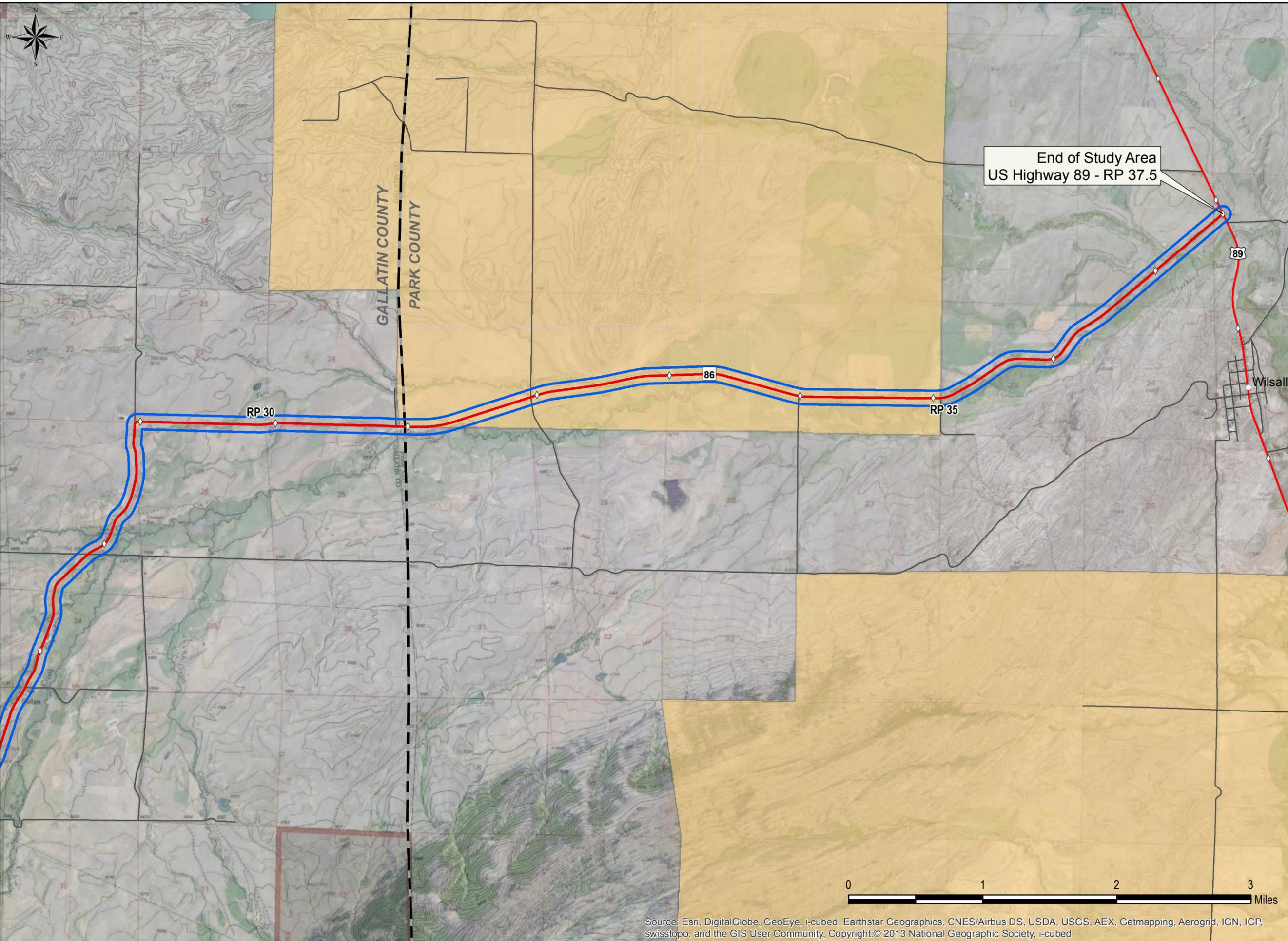


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Moose Distribution (MTFWP, 2008)
- Use Type
- ▨ General
- ▩ Winter

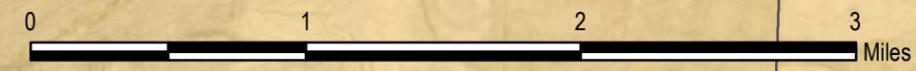


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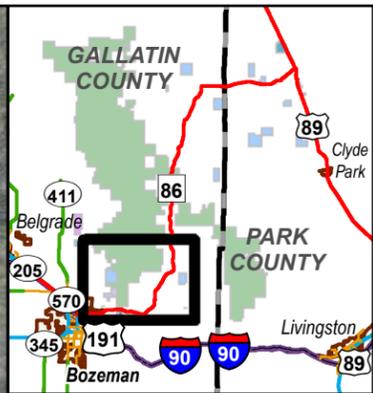
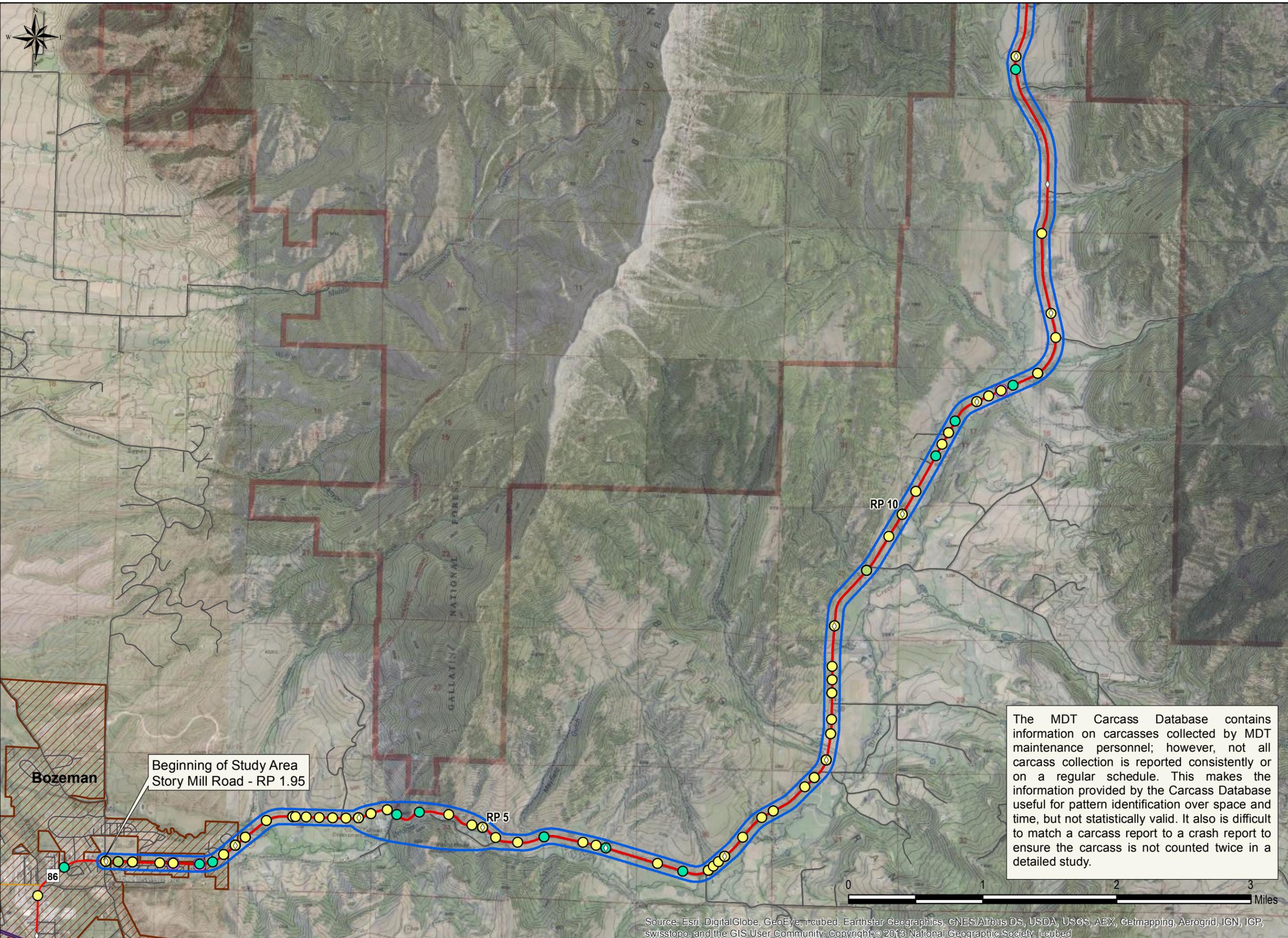


Map Legend

- ◇ Reference Post
- MT 86
- On System Routes
- System
- Primary
- Off System Routes
- Study Area
- County Boundary
- Antelope Distribution (MTFWP, 2008)
- Use Type
- General



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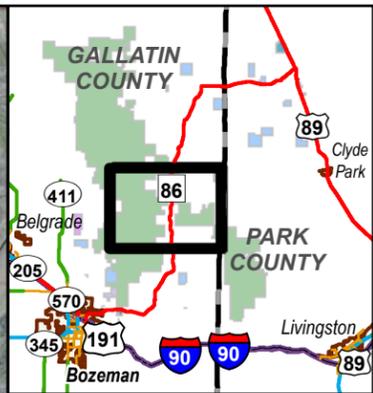
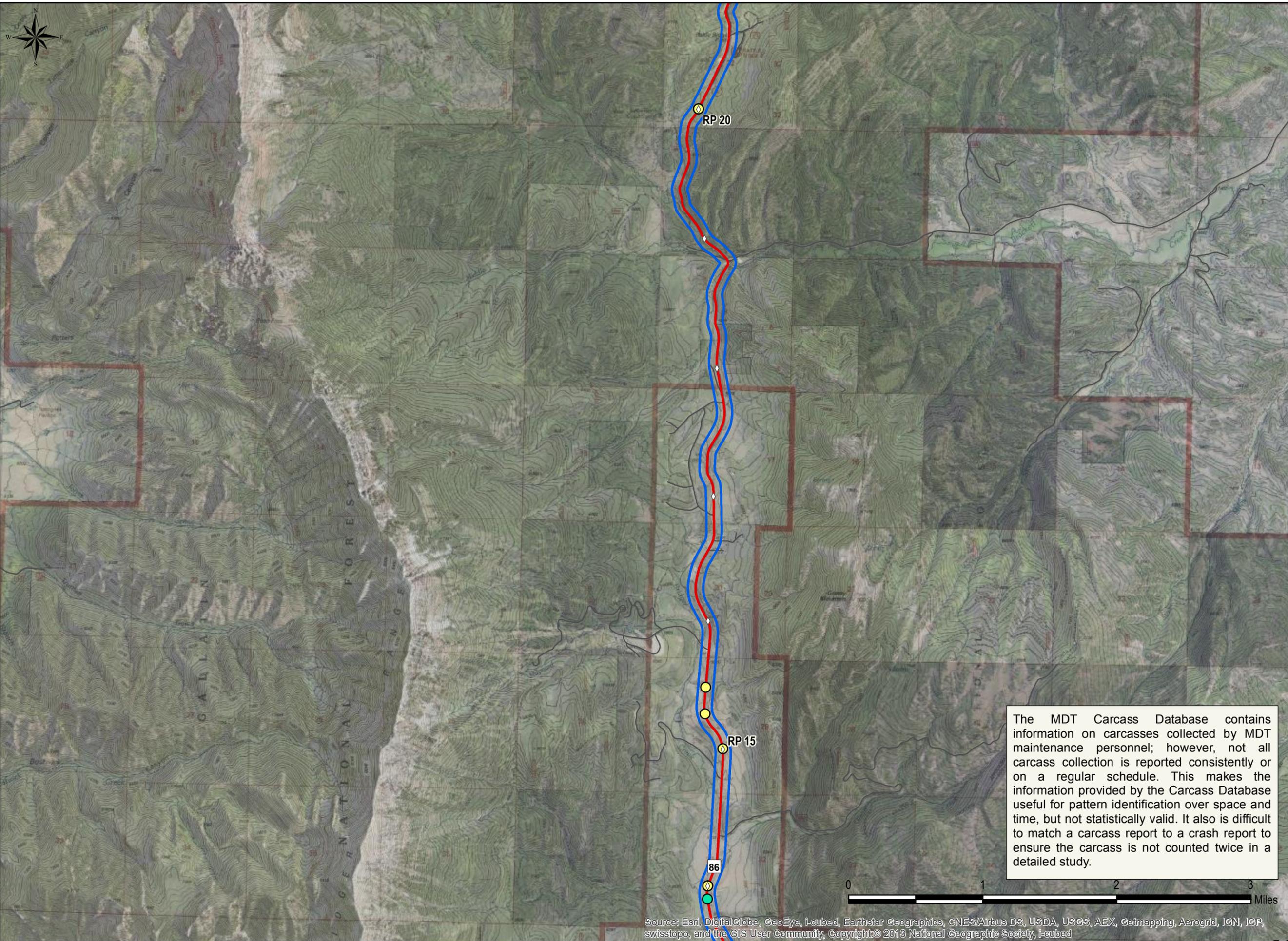


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Animal Carcass (MDT)
- Species
- <Null>
- Mule Deer
- Whitetail Deer
- Black Bear
- Elk

The MDT Carcass Database contains information on carcasses collected by MDT maintenance personnel; however, not all carcass collection is reported consistently or on a regular schedule. This makes the information provided by the Carcass Database useful for pattern identification over space and time, but not statistically valid. It also is difficult to match a carcass report to a crash report to ensure the carcass is not counted twice in a detailed study.

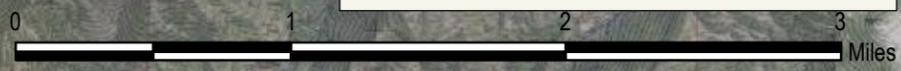
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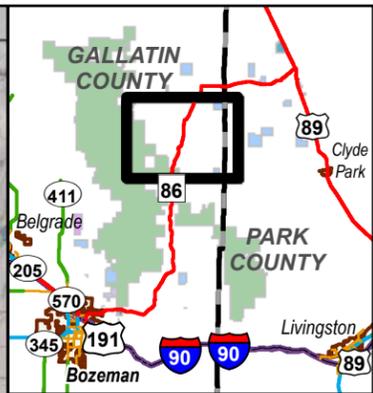
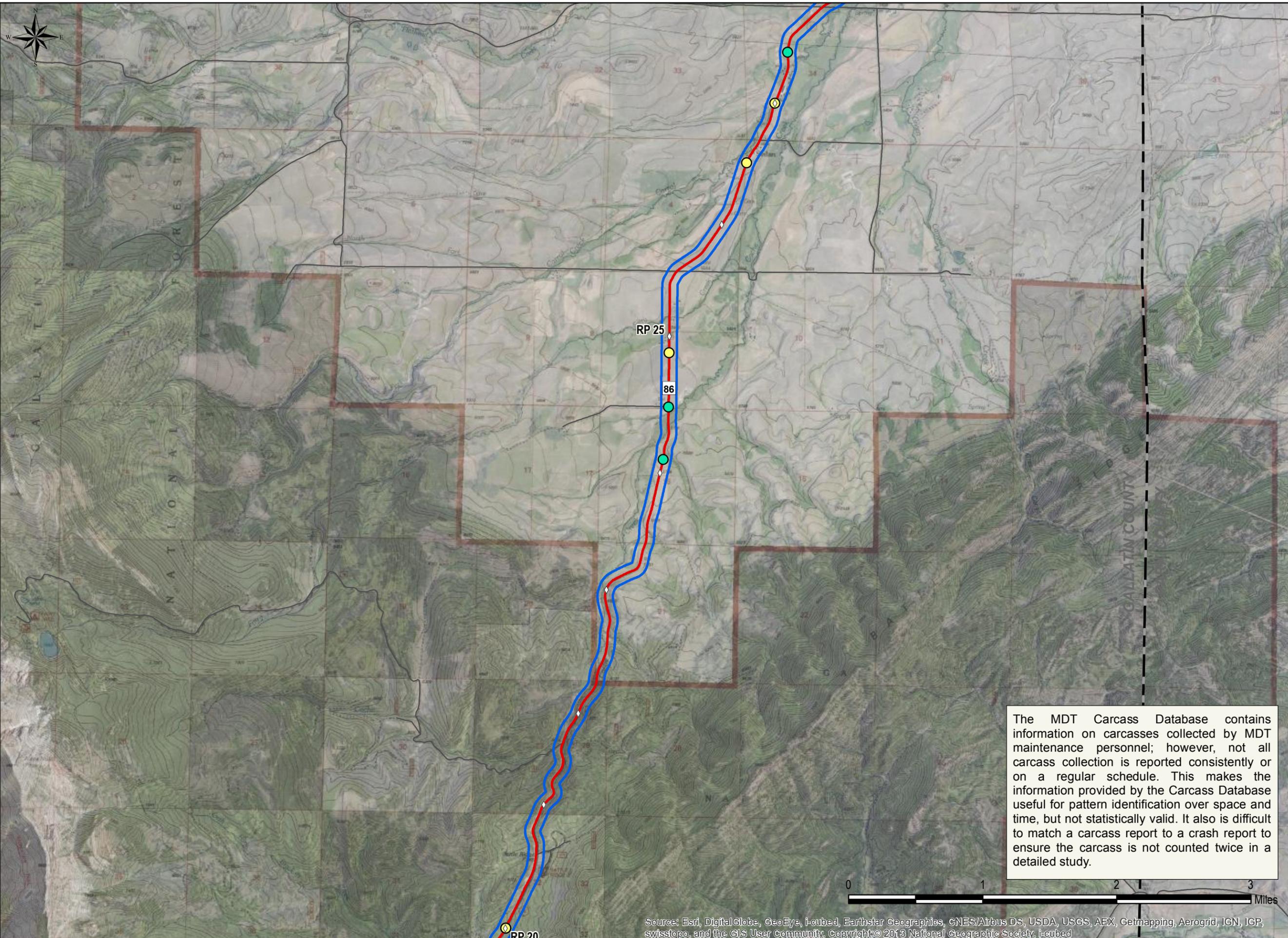
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Animal Carcass (MDT)
- Species
- Mule Deer
- Whitetail Deer

The MDT Carcass Database contains information on carcasses collected by MDT maintenance personnel; however, not all carcass collection is reported consistently or on a regular schedule. This makes the information provided by the Carcass Database useful for pattern identification over space and time, but not statistically valid. It also is difficult to match a carcass report to a crash report to ensure the carcass is not counted twice in a detailed study.



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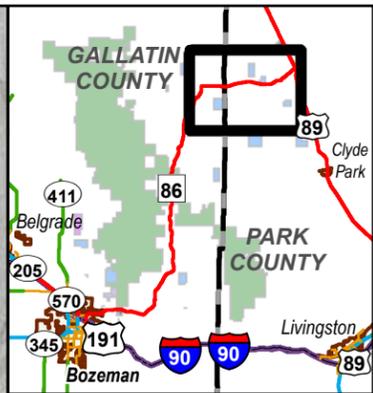
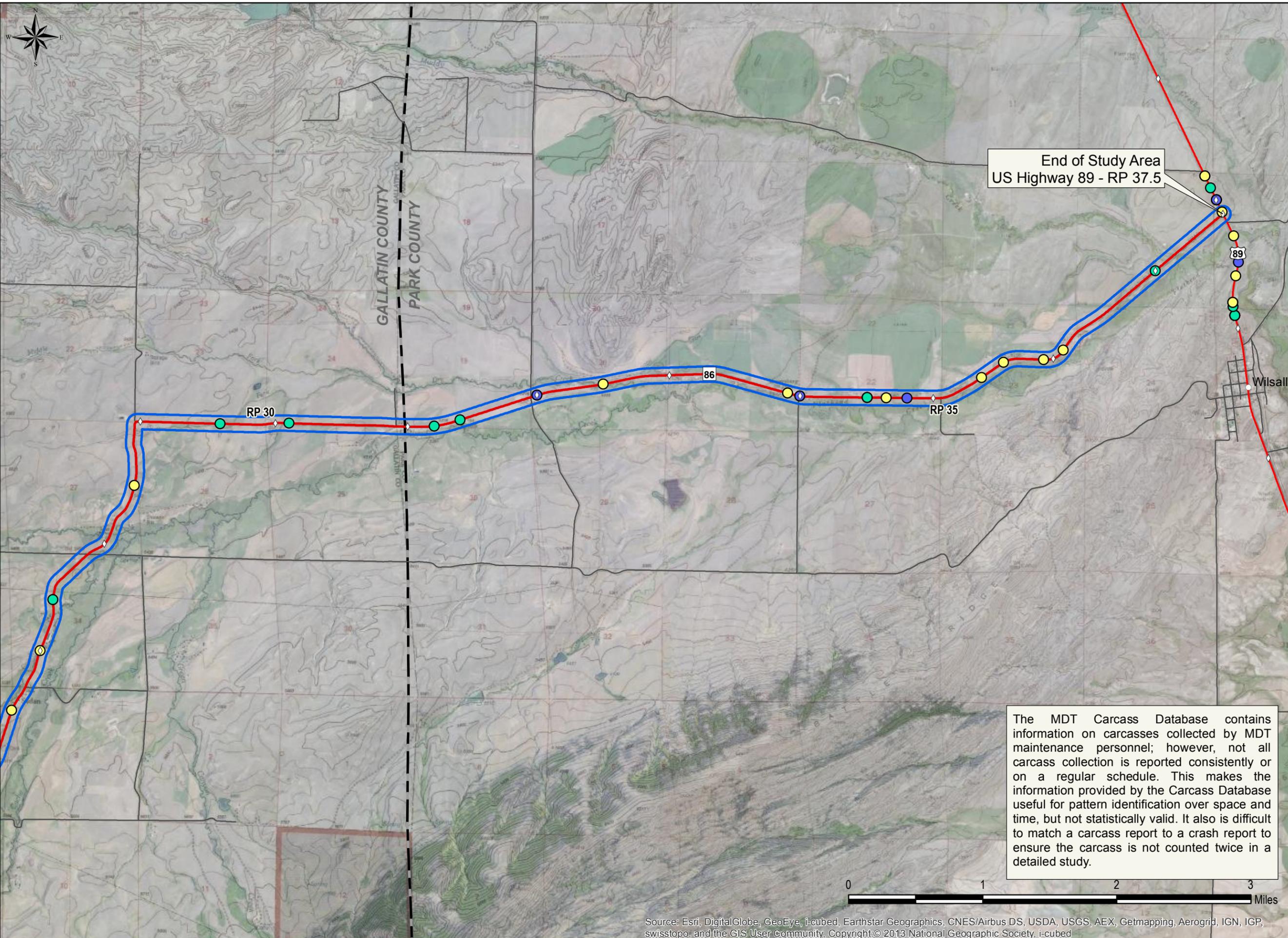
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Animal Carcass (MDT)
- Species
- Mule Deer
- Whitetail Deer

The MDT Carcass Database contains information on carcasses collected by MDT maintenance personnel; however, not all carcass collection is reported consistently or on a regular schedule. This makes the information provided by the Carcass Database useful for pattern identification over space and time, but not statistically valid. It also is difficult to match a carcass report to a crash report to ensure the carcass is not counted twice in a detailed study.



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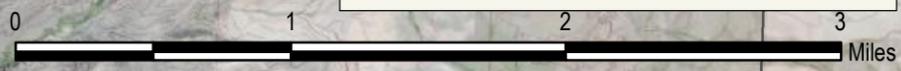


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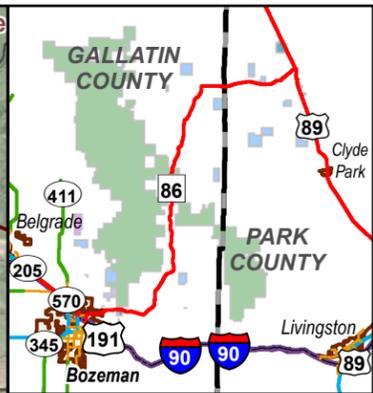
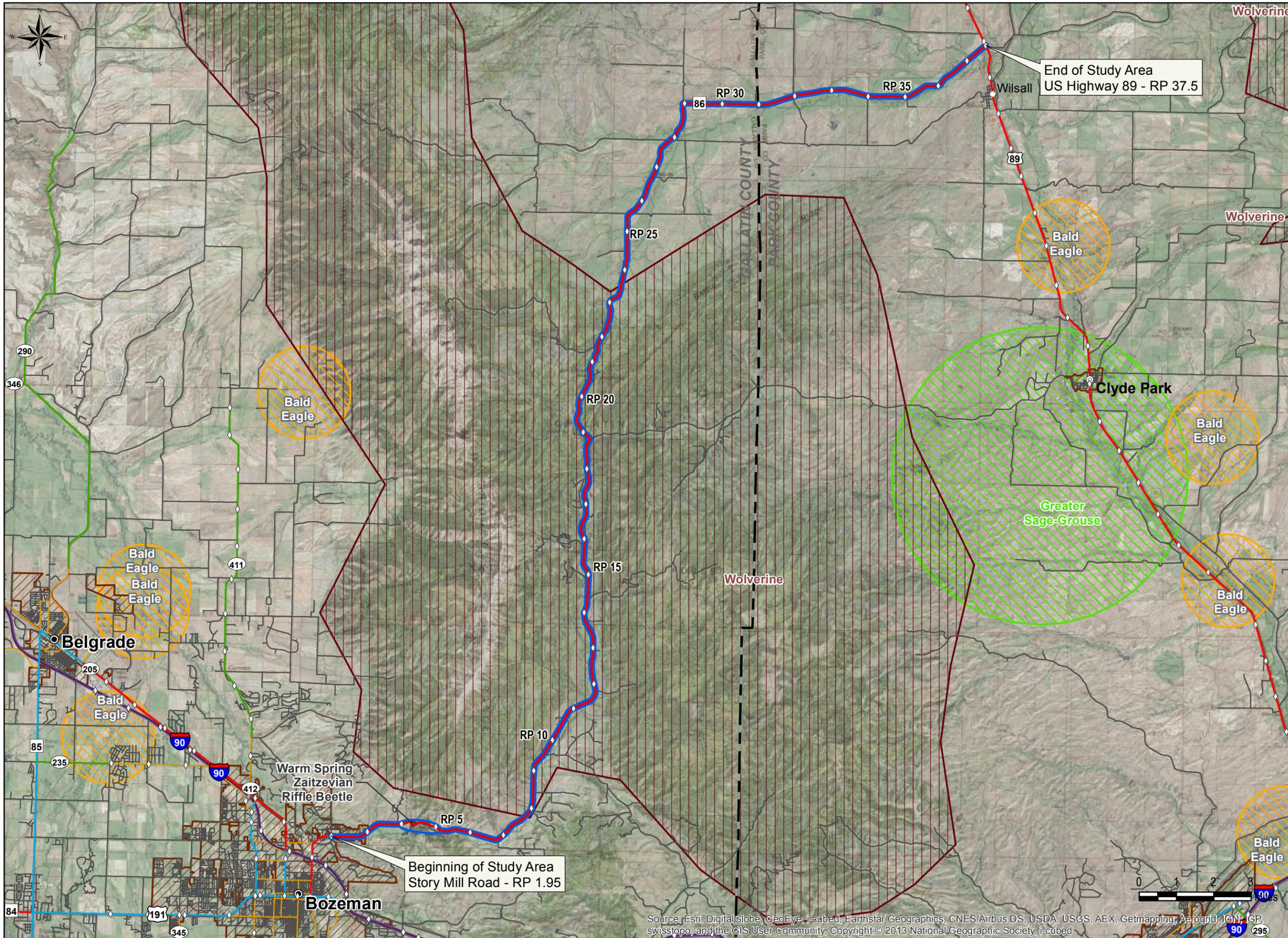
- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Animal Carcass (MDT)
- Species
- Mule Deer
- Whitetail Deer
- Elk
- Other(wild)

End of Study Area
US Highway 89 - RP 37.5

The MDT Carcass Database contains information on carcasses collected by MDT maintenance personnel; however, not all carcass collection is reported consistently or on a regular schedule. This makes the information provided by the Carcass Database useful for pattern identification over space and time, but not statistically valid. It also is difficult to match a carcass report to a crash report to ensure the carcass is not counted twice in a detailed study.



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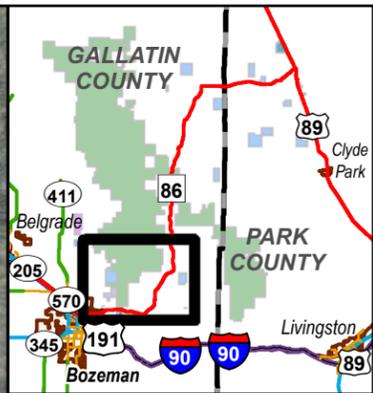
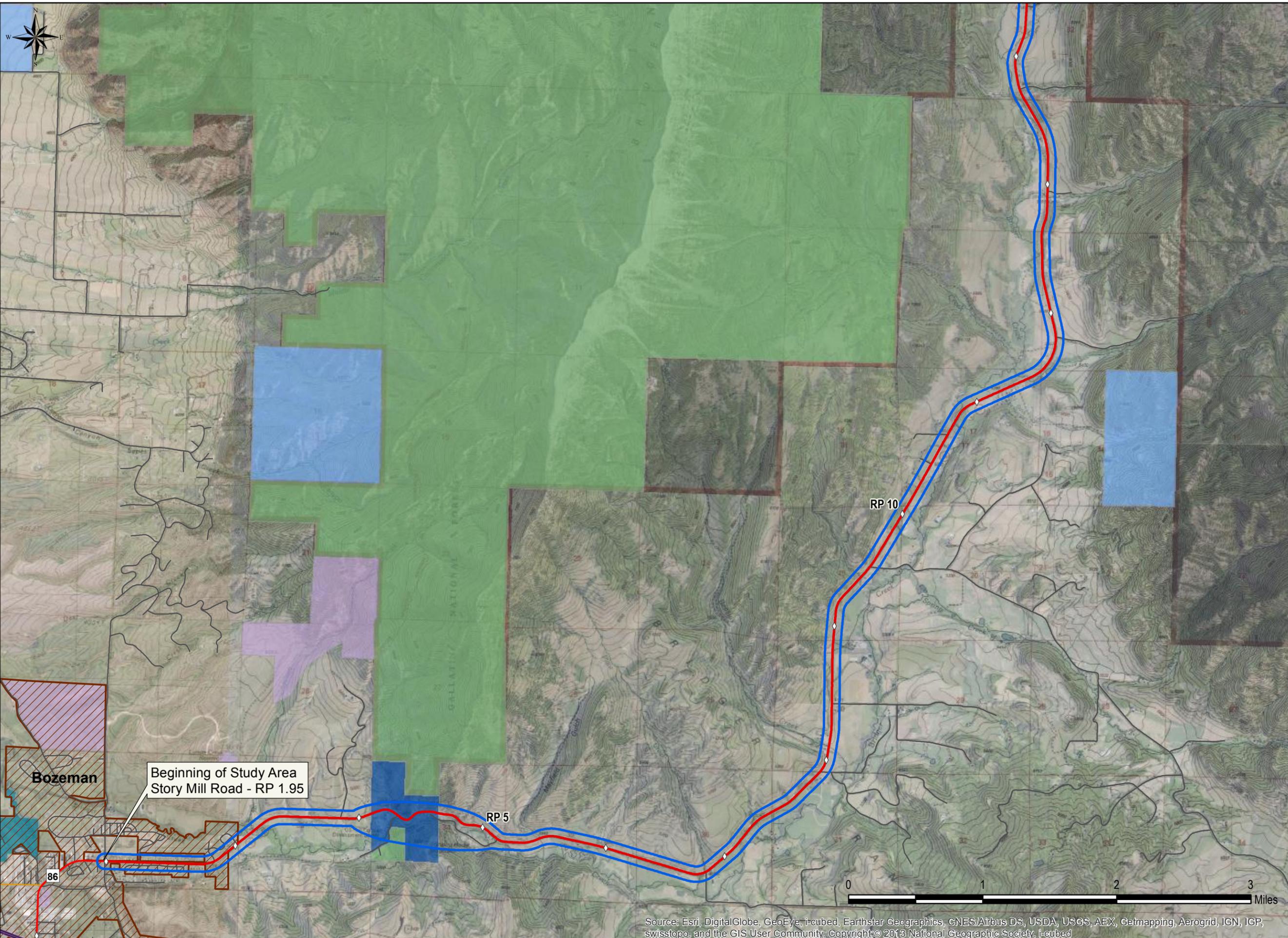
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- NHS Non-Interstate
- Primary
- Secondary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Sensitive Species (MT Natural Heritage Program, 2014)
- ▨ Wolverine
- ▨ Warm Spring Zaitzevian Riffle Beetle
- ▨ Bald Eagle
- ▨ Greater Sage-Grouse

End of Study Area
US Highway 89 - RP 37.5

Beginning of Study Area
Story Mill Road - RP 1.95

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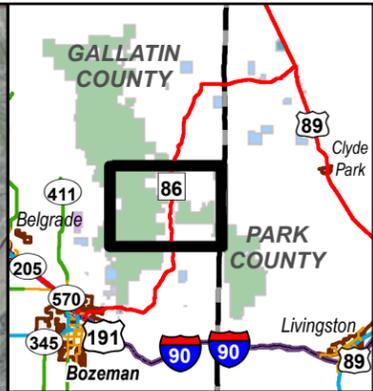
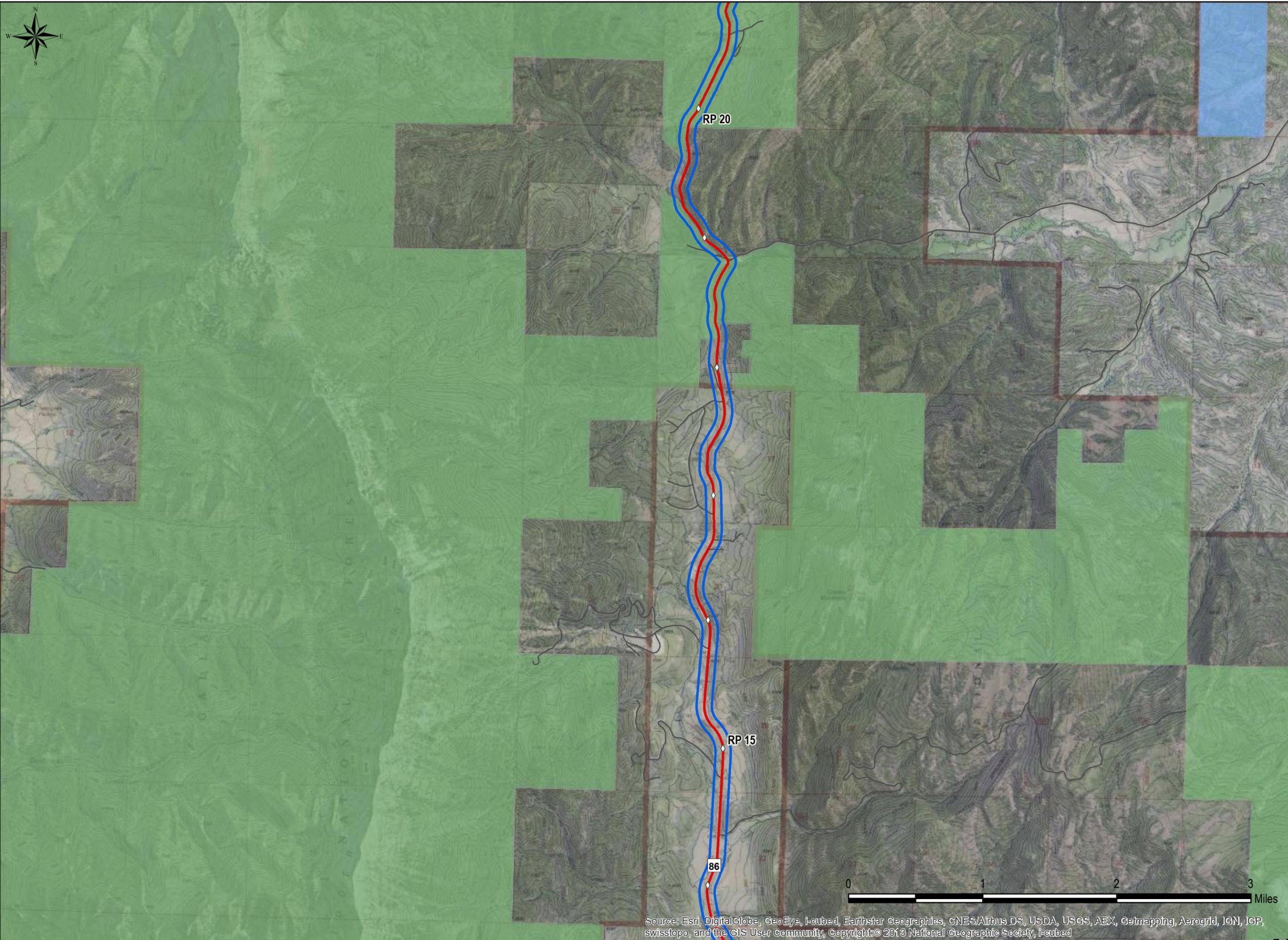
Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Public Land Ownership (MT State Library, 2013)
- Owner
- ▭ City Government
- ▭ County Government
- ▭ Montana State Trust Lands
- ▭ State of Montana
- ▭ US Fish and Wildlife Service
- ▭ US Forest Service

Beginning of Study Area
Story Mill Road - RP 1.95

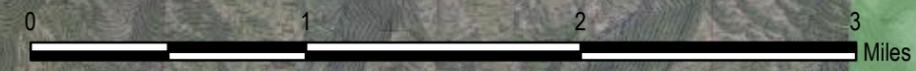


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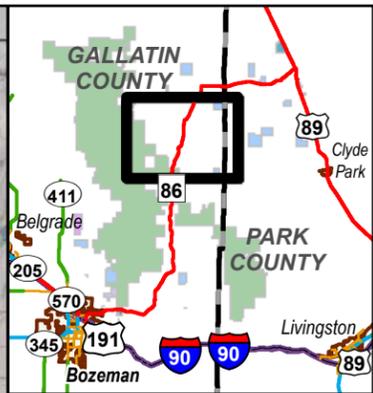
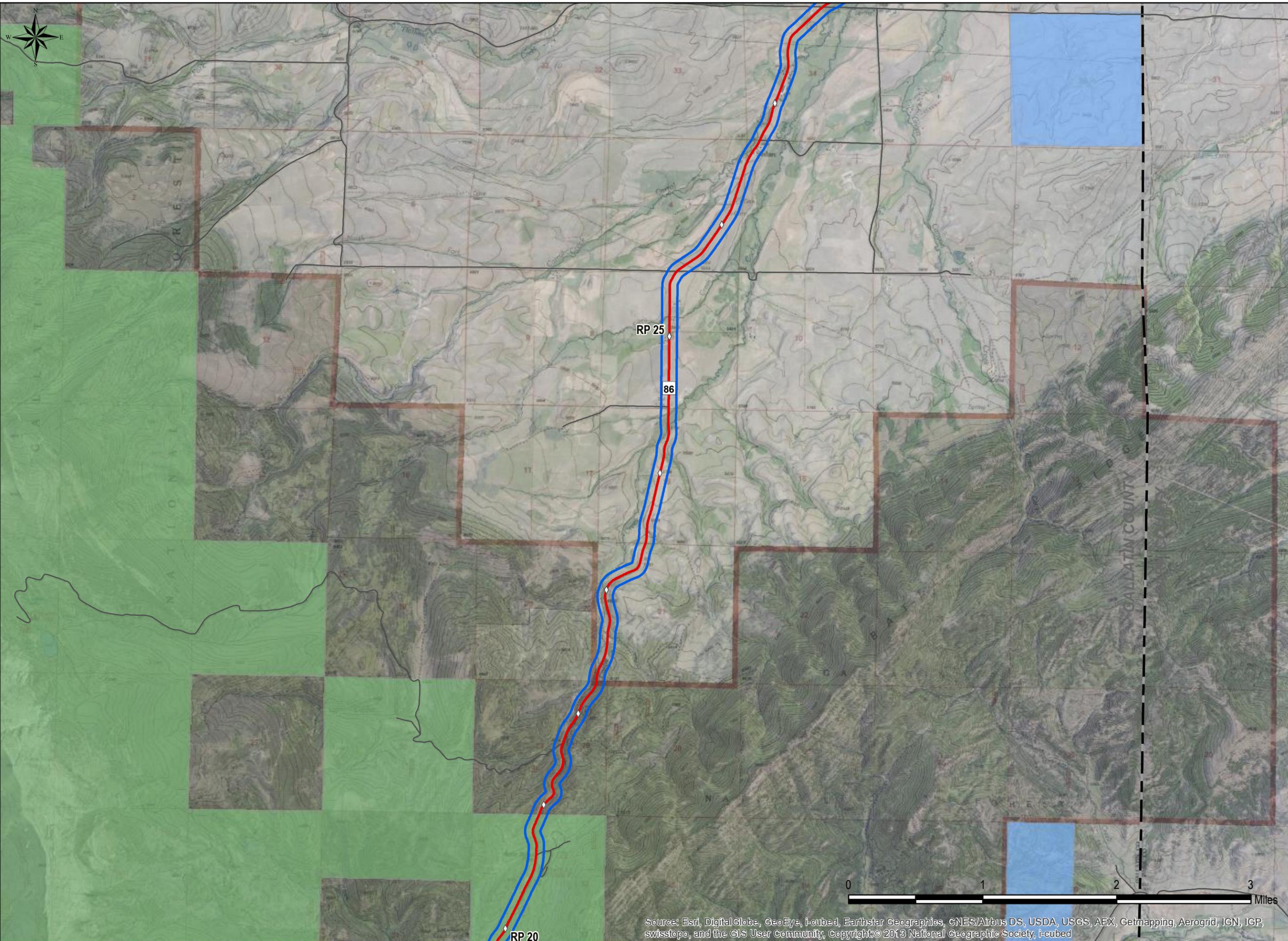


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Public Land Ownership (MT State Library, 2013)
- Owner
- ▭ Montana State Trust Lands
- ▭ US Forest Service



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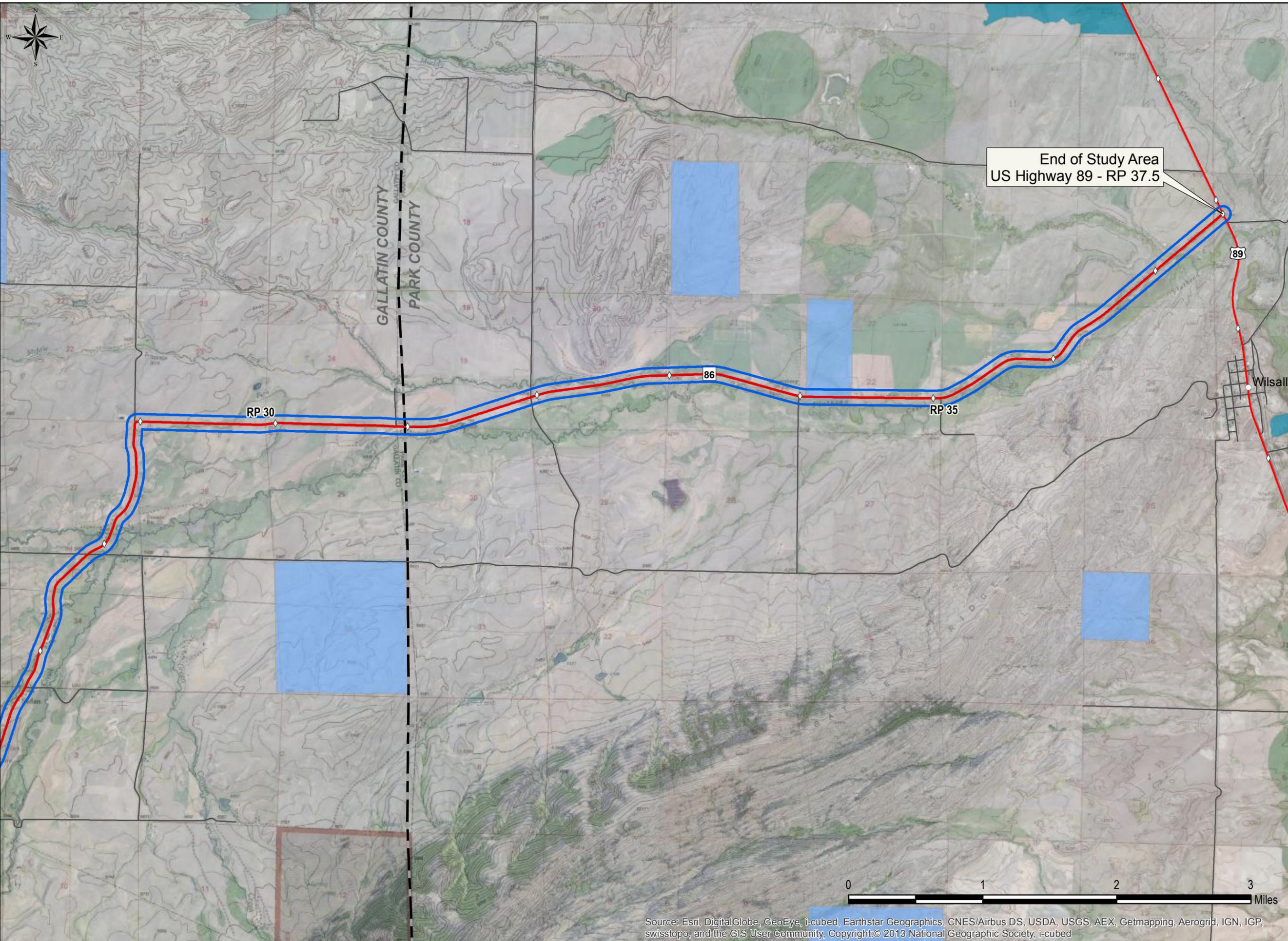


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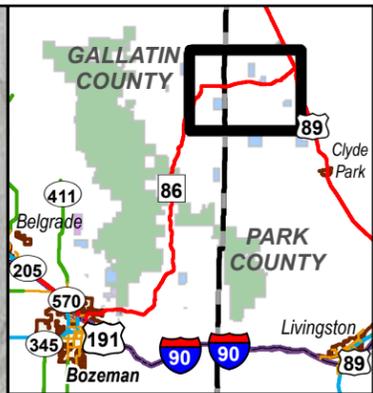
- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
 - Primary
 - Off System Routes
- ▭ County Boundary
- Public Land Ownership (MT State Library, 2013)
- Owner
 - ▭ Montana State Trust Lands
 - ▭ US Forest Service



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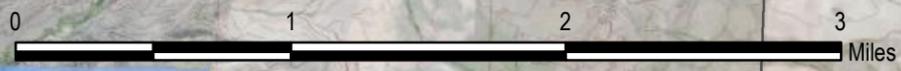


End of Study Area
US Highway 89 - RP 37.5

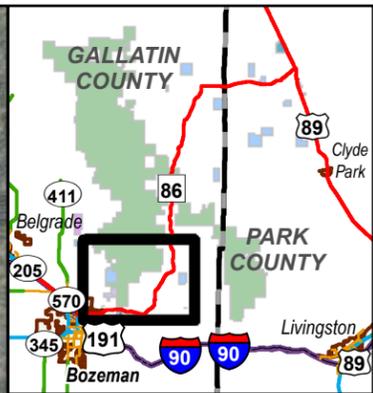
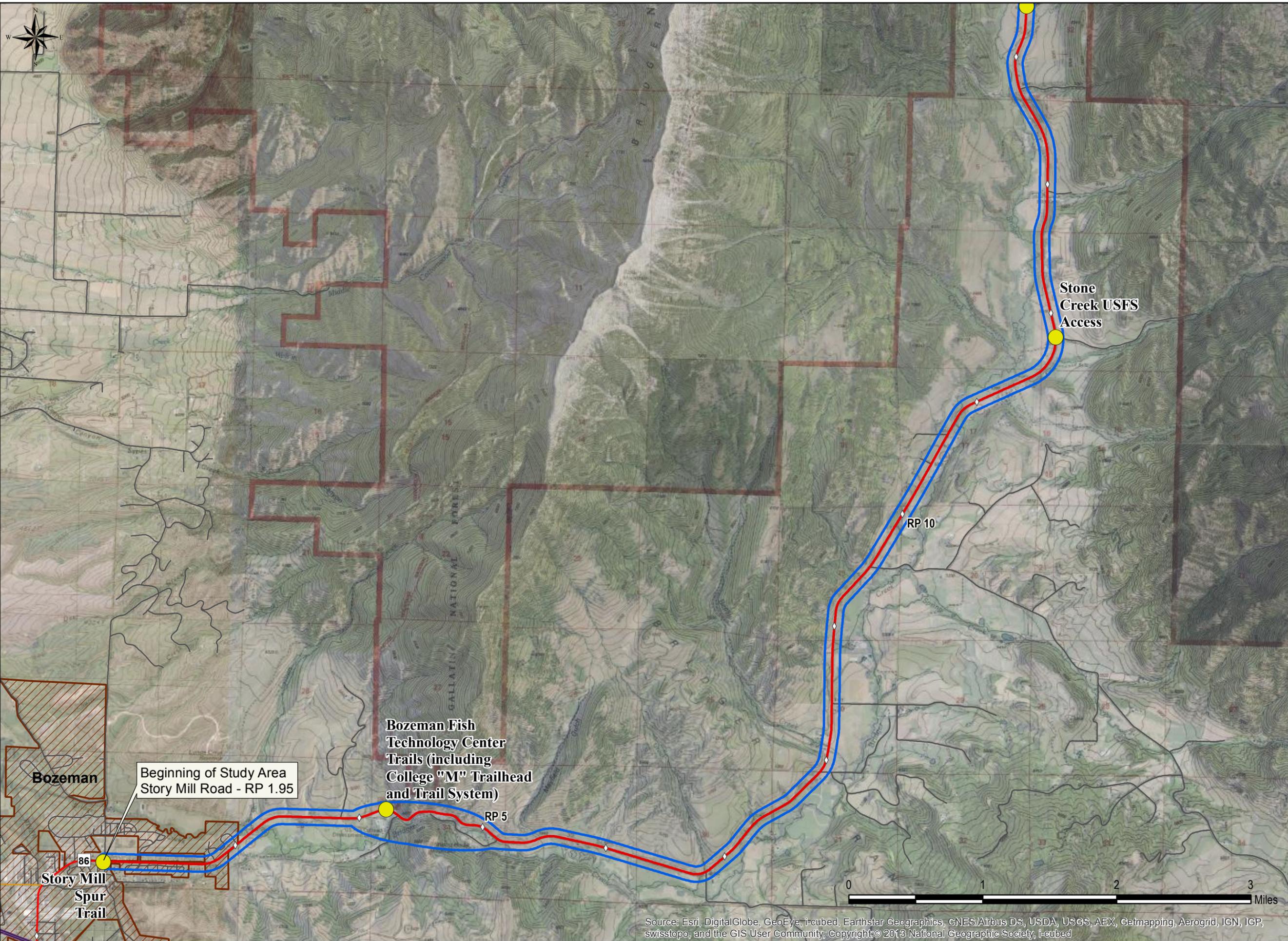


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Public Land Ownership (MT State Library, 2013)
- Owner
- ▭ County Government
- ▭ Montana State Trust Lands
- ▭ State of Montana



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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- NHS Interstate
- Primary
- Urban
- Off System Routes
- ▨ City Boundary
- ▭ County Boundary
- Potential Section 4(f) Recreational Resources (USFS, 2014)

Beginning of Study Area
Story Mill Road - RP 1.95

Bozeman Fish
Technology Center
Trails (including
College "M" Trailhead
and Trail System)

Stone
Creek USFS
Access

RP 10

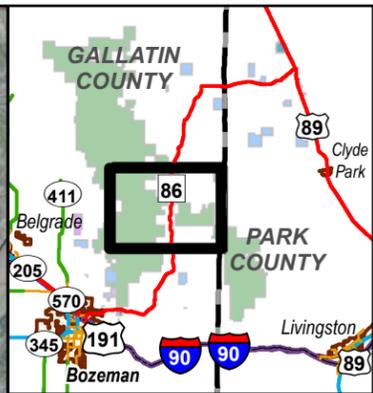
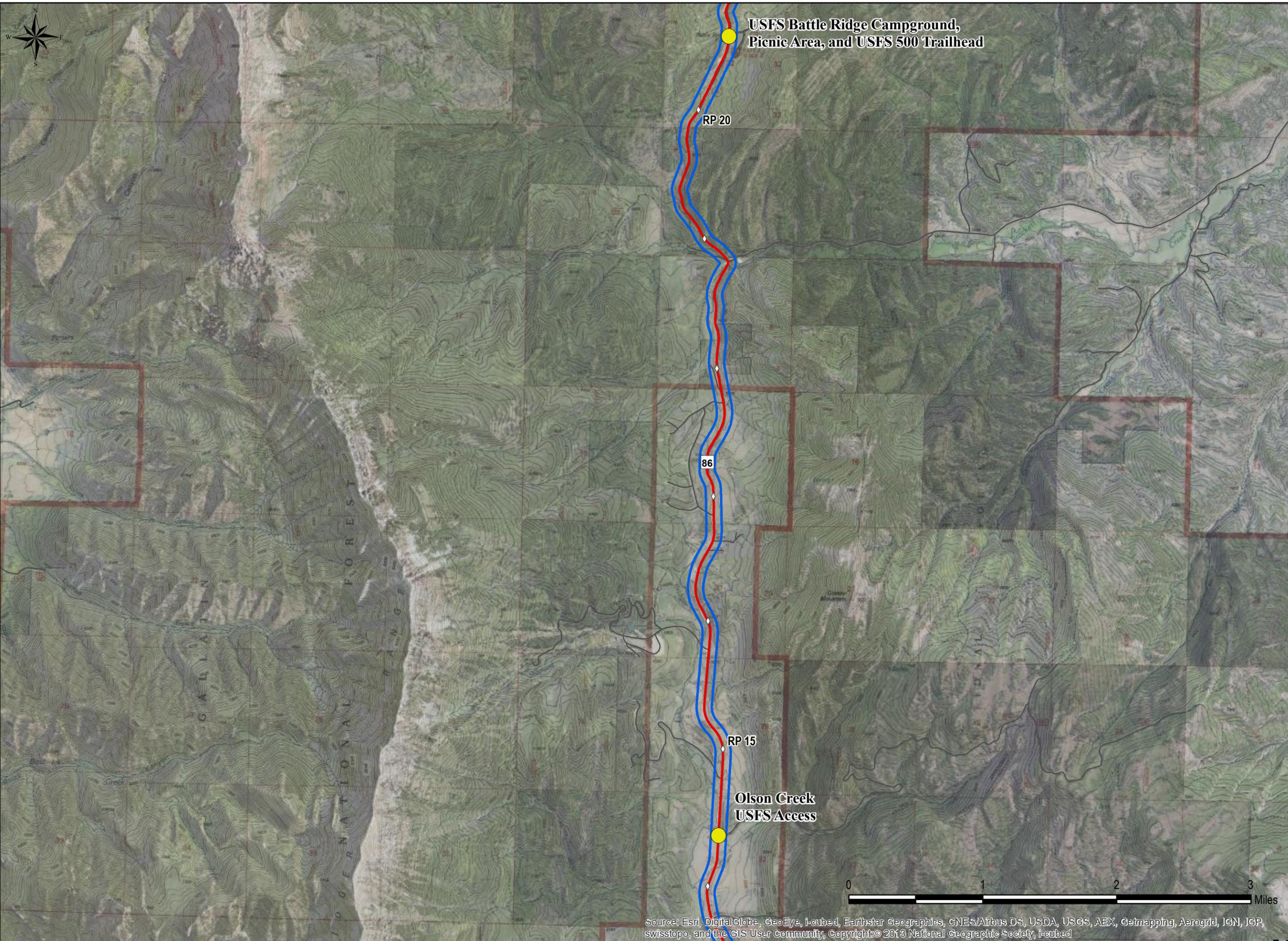
RP 5

Bozeman

86
Story Mill
Spur
Trail

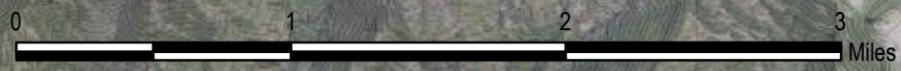


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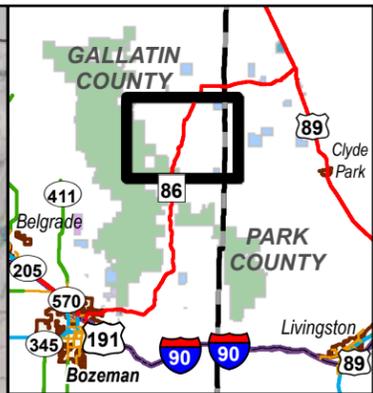
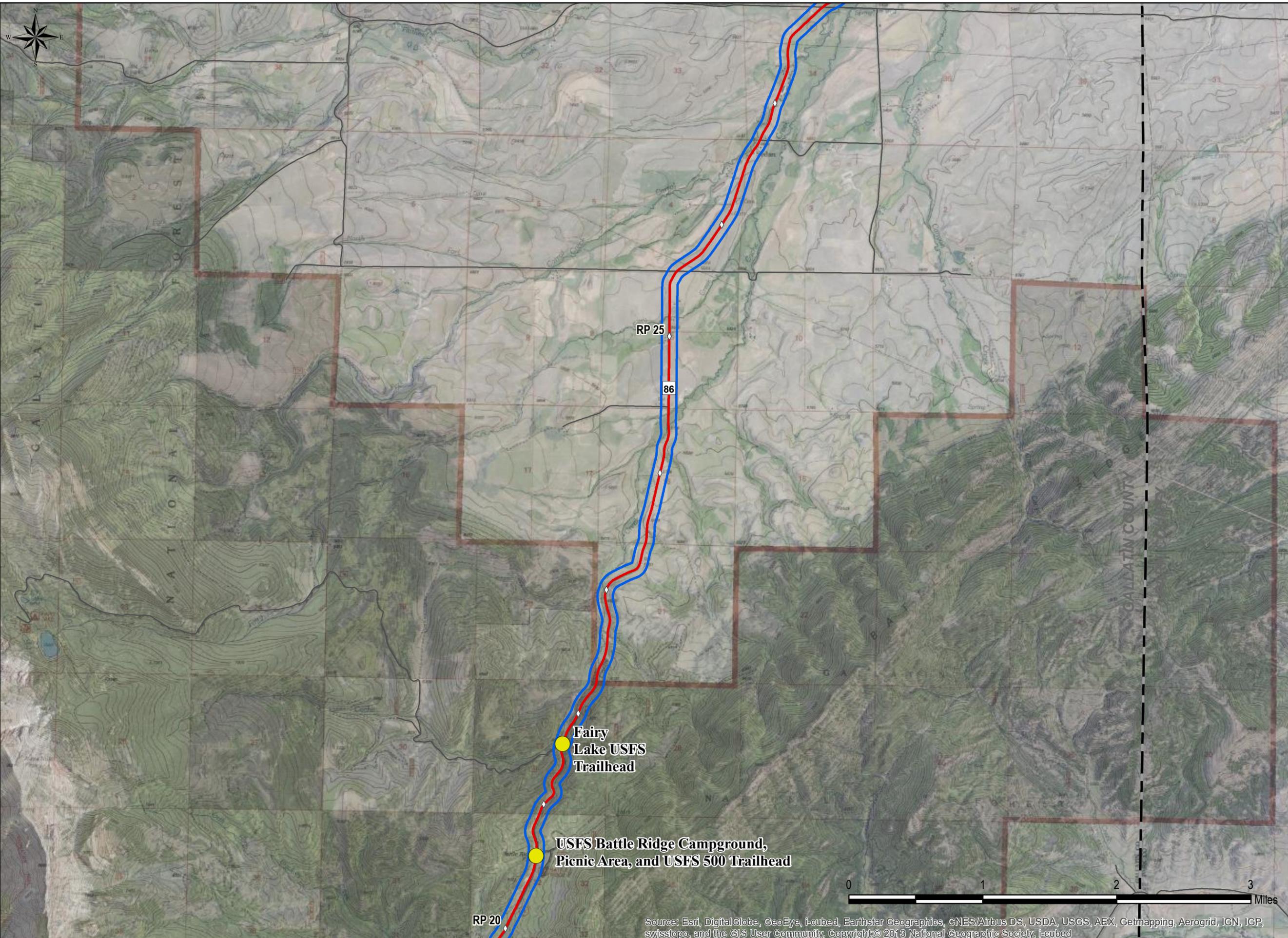


Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Potential Section 4(f) Recreational Resources (USFS, 2014)



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Map Legend

- ◇ Reference Post
- MT 86
- ▭ Study Area
- On System Routes
- System
- Primary
- Off System Routes
- ▭ County Boundary
- Potential Section 4(f) Recreational Resources (USFS, 2014)



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Attachment 2

Soil Resource Report





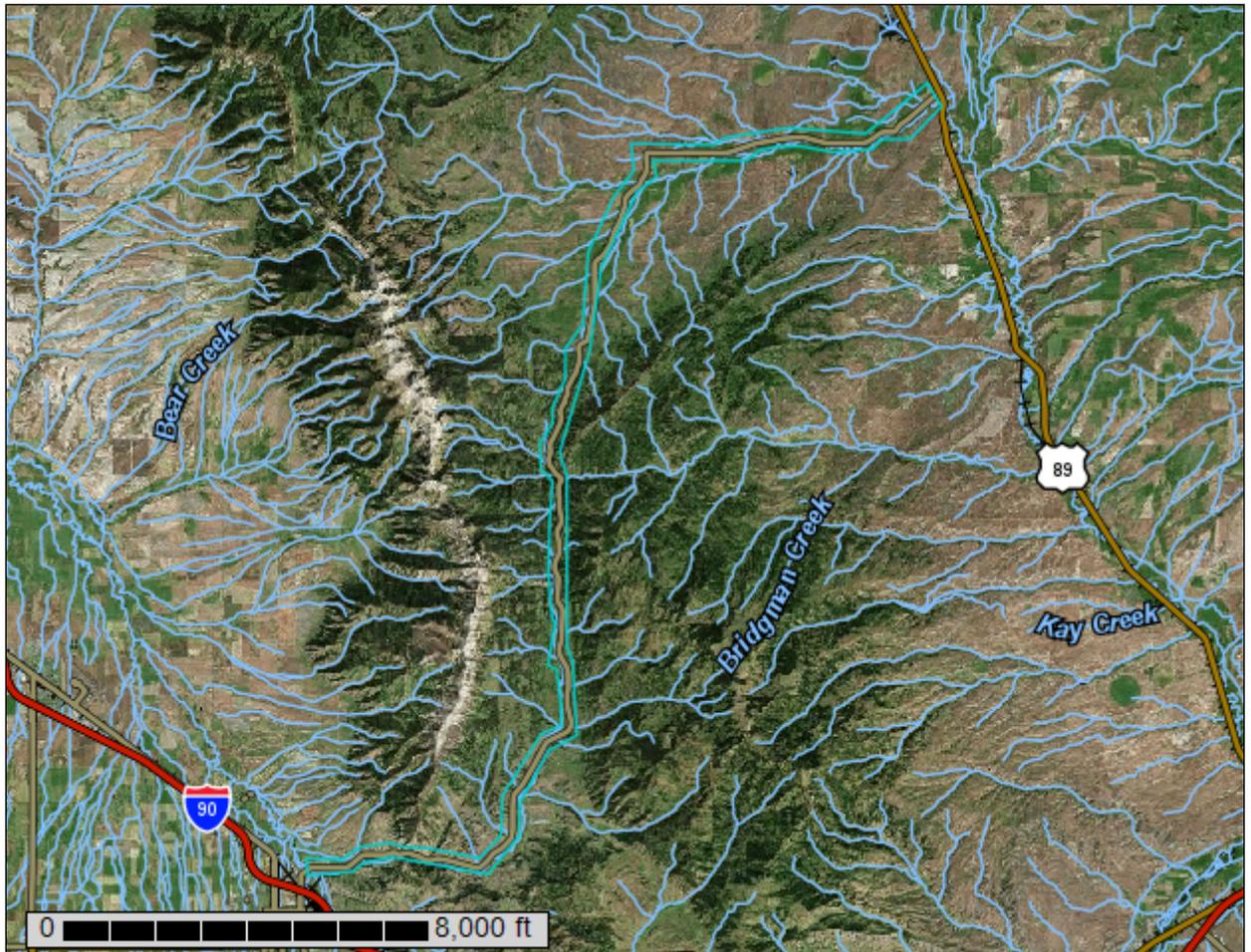
United States
Department of
Agriculture

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 Gallatin County Area, Montana, Gallatin National Forest Area, Montana, and Park County Area, Montana Bridger Canyon Corridor



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.

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Custom Soil Resource Report

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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

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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.

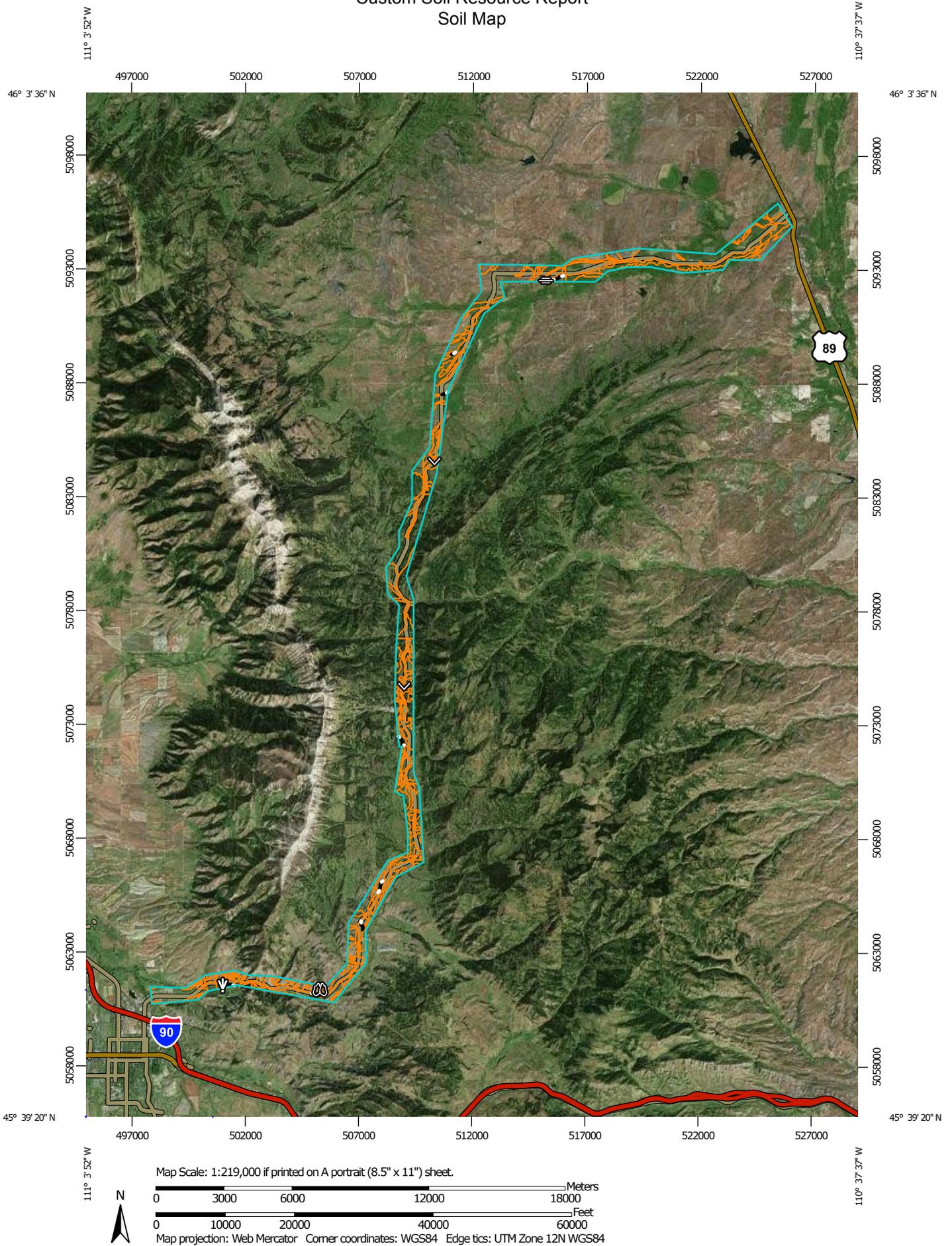
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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.

Custom Soil Resource Report Soil Map



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: Gallatin County Area, Montana
 Survey Area Data: Version 17, Dec 10, 2013

Soil Survey Area: Gallatin National Forest Area, Montana
 Survey Area Data: Version 5, Dec 16, 2013

Soil Survey Area: Park County Area, Montana
 Survey Area Data: Version 7, Dec 10, 2013

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: Apr 20, 2010—Aug 19, 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

Gallatin County Area, Montana (MT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12C	Burnel silty clay loam, 2 to 8 percent slopes	62.1	0.6%
46C	Work clay loam, 4 to 8 percent slopes	14.2	0.1%
58B	Danvers silty clay loam, 0 to 4 percent slopes	1.7	0.0%
64B	Straw loam, 0 to 4 percent slopes	103.6	1.0%
65B	Bigbear loam, 0 to 4 percent slopes	38.9	0.4%
65C	Bigbear loam, 4 to 8 percent slopes	98.7	0.9%
65D	Bigbear loam, 8 to 15 percent slopes	253.9	2.4%
65E	Bigbear clay loam, 15 to 35 percent slopes	14.6	0.1%
72D	Doughty loam, 8 to 15 percent slopes	12.1	0.1%
79C	Bridger loam, 2 to 8 percent slopes	19.1	0.2%
149B	Beaverton cobbly loam, 0 to 4 percent slopes	40.7	0.4%
155F	Anceney cobbly loam, 15 to 60 percent slopes	11.5	0.1%
158B	Tamaneen clay loam, 0 to 4 percent slopes	140.0	1.3%
166C	Windham gravelly loam, 4 to 8 percent slopes	19.4	0.2%
166D	Windham gravelly loam, 8 to 15 percent slopes	19.9	0.2%
179E	Bridger loam, cool, 4 to 25 percent slopes	41.1	0.4%
212C	Burnel-Nythar complex, 2 to 8 percent slopes	24.4	0.2%
249A	Beaverton cobbly clay loam, 0 to 2 percent slopes	4.2	0.0%
252D	Martinsdale cobbly loam, 8 to 15 percent slopes	16.9	0.2%
257B	Meagher cobbly loam, 0 to 4 percent slopes	142.8	1.3%
257C	Meagher cobbly loam, 4 to 8 percent slopes	208.8	1.9%
266B	Windham cobbly loam, 0 to 4 percent slopes	49.3	0.5%

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Gallatin County Area, Montana (MT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
294D	Yellowmule-Lonniebee, stony-Redlodge complex, 4 to 15 percent slopes	134.4	1.2%
294E	Yellowmule-Lonniebee, stony complex, 15 to 45 percent slopes	208.7	1.9%
294F	Yellowmule-Lonniebee complex, 35 to 60 percent slopes, stony	21.6	0.2%
315F	Cabba-Bacbuster complex, 15 to 60 percent slopes	21.9	0.2%
350C	Blackmore silt loam, 4 to 8 percent slopes	6.4	0.1%
354B	Farside loam, 2 to 6 percent slopes	31.3	0.3%
354D	Farside loam, 8 to 15 percent slopes	48.4	0.4%
358B	Tamaneen cobbly clay loam, 0 to 4 percent slopes	44.5	0.4%
366E	Windham cobbly loam, 15 to 35 percent slopes, stony	83.5	0.8%
379D	Bridger cobbly loam, 8 to 15 percent slopes, stony	24.4	0.2%
379E	Bridger cobbly loam, 15 to 35 percent slopes, stony	50.2	0.5%
407A	Sudworth-Nesda loams, 0 to 2 percent slopes	318.7	3.0%
466E	Windham cobbly loam, 15 to 45 percent slopes, stony	9.8	0.1%
479E	Bangtail-Bridger complex, 15 to 45 percent slopes	128.7	1.2%
479F	Bangtail clay loam, 35 to 60 percent slopes	11.1	0.1%
490E	Uinta-Paddy complex, 15 to 45 percent slopes	24.4	0.2%
492E	Yellowmule-Ousefal complex, 8 to 25 percent slopes	1.0	0.0%
494E	Bangtail-Timberlin, stony complex, moist 15 to 45 percent slopes	117.2	1.1%
494F	Bangtail-Timberlin complex, moist, 35 to 60 percent slopes, stony	103.4	1.0%
500A	Bobkitty-Bonebasin complex, 0 to 2 percent slopes	23.4	0.2%
507A	Soapcreek-Bonebasin complex, 0 to 2 percent slopes	54.5	0.5%
509B	Enbar loam, 0 to 4 percent slopes	43.3	0.4%

Custom Soil Resource Report

Gallatin County Area, Montana (MT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
510B	Meadowcreek loam, 0 to 4 percent slopes	32.7	0.3%
512B	Enbar-Nythar loams, 0 to 4 percent slopes	298.0	2.8%
512D	Enbar-Bowery-Nythar complex, 4 to 15 percent slopes	29.3	0.3%
513A	Meadowcreek-Bonebasin complex, 0 to 2 percent slopes	98.3	0.9%
514A	Soapcreek silty clay loam, 0 to 2 percent slopes	25.8	0.2%
522A	Enbar clay loam, 0 to 2 percent slopes	197.9	1.8%
523A	Enbar-Nythar loams, cool, 0 to 4 percent slopes	235.6	2.2%
524A	Fairway-Bonebasin complex, 0 to 2 percent slopes	407.2	3.8%
542A	Blossberg loam, 0 to 2 percent slopes	2.9	0.0%
547E	Hoppers-Adel-Tolbert, very stony complex, 15 to 45 percent slopes	1.6	0.0%
550E	Bridger-Redlodge complex, 4 to 25 percent slopes	54.4	0.5%
606A	Bandy-Riverwash-Bonebasin complex, 0 to 2 percent slopes	53.4	0.5%
608B	Beehive-Mooseflat complex, 0 to 4 percent slopes	73.7	0.7%
614D	Adel loam, cool, 4 to 15 percent slopes	14.8	0.1%
614F	Adel loam, 15 to 60 percent slopes	18.3	0.2%
615F	Cabba-Castner complex, 15 to 60 percent slopes	1.5	0.0%
647F	Hoppers, stony-Tolbert, very stony-Timberlin complex, 35 to 60 percent slopes	15.0	0.1%
660F	Billman, stony-Bangtail-Tolbert, stony complex, 25 to 60 percent slopes	234.1	2.2%
665D	Storyhill-Bigbear complex, 4 to 15 percent slopes	17.6	0.2%
665E	Bigbear-Storyhill-Adel complex, 15 to 45 percent slopes	143.8	1.3%
666F	Lap-Windham-Rock outcrop complex, 35 to 60 percent slopes	10.7	0.1%
679D	Bangtail-Adel loams, 4 to 25 percent slopes	36.6	0.3%
679E	Bangtail-Copenhaver complex, 8 to 25 percent slopes	105.5	1.0%

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Gallatin County Area, Montana (MT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
693E	Bangtail-Timberlin, stony complex, 15 to 45 percent slopes	52.5	0.5%
693F	Bangtail-Timberlin complex, 35 to 60 percent slopes, stony	25.3	0.2%
714E	Adel-Uinta loams, 8 to 35 percent slopes	11.6	0.1%
748A	Hyalite-Beaverton complex, 0 to 4 percent slopes	8.5	0.1%
752E	Meagher-Shawmut-Bowery complex, 15 to 45 percent slopes	20.4	0.2%
760C	Billman-Wilsall clay loams, 2 to 8 percent slopes	1.7	0.0%
760E	Billman-Wilsall clay loams, 8 to 25 percent slopes	381.4	3.5%
768C	Farnuf-Absarokee complex, 4 to 8 percent slopes	0.0	0.0%
769D	Absarokee-Work-Tolbert complex, 4 to 15 percent slopes	42.5	0.4%
786F	Whitecow, stony-Lap, very stony-Rock outcrop complex, 35 to 60 percent slopes	37.4	0.3%
792D	Danaher, stony-Loberg, very stony complex, 8 to 15 percent slopes	31.0	0.3%
814D	Adel-Copenhaver complex, 4 to 15 percent slopes	31.9	0.3%
860D	Bacbuster-Wilsall-Castner complex, 4 to 15 percent slopes	865.4	8.0%
860E	Bacbuster-Wilsall-Castner complex, 15 to 45 percent slopes	13.0	0.1%
869D	Absarokee-Tolbert complex, 4 to 15 percent slopes	2.1	0.0%
870E	Tolbert-Absarook-Rock outcrop complex, 15 to 35 percent slopes	6.8	0.1%
879E	Bangtail-Copenhaver-Adel complex, 15 to 35 percent slopes	184.7	1.7%
960E	Billman-Wilsall-Tolbert complex, 8 to 45 percent slopes	148.6	1.4%
991F	Whitore-Rock outcrop complex, 35 to 70 percent slopes	24.7	0.2%
Subtotals for Soil Survey Area		6,846.5	63.6%
Totals for Area of Interest		10,760.7	100.0%

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Gallatin National Forest Area, Montana (MT623)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
64-2A	Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains	240.3	2.2%
66-1A	Cryaquolls and Cryaquents, flood plains	140.2	1.3%
71-1D	Typic Cryoboralfs-Typic Cryochrepts complex, landslides	0.9	0.0%
84-2B	Mollic Cryoboralfs-Argic Cryoborolls association, structurally controlled slopes	670.1	6.2%
85-3A	Mollic Cryoboralfs-Argic Cryoborolls-Rock outcrop complex, structurally controlled slopes, steep	48.4	0.5%
85-3B	Mollic Cryoboralfs-Argic Cryoborolls complex, structurally controlled slopes, steep	178.3	1.7%
86-3B	Typic Cryoboralfs-Mollic Cryoboralfs complex, structurally controlled slopes, warm	108.4	1.0%
86-3C	Argic Cryoborolls-Typic Cryoborolls association, structurally controlled slopes	58.4	0.5%
Subtotals for Soil Survey Area		1,444.9	13.4%
Totals for Area of Interest		10,760.7	100.0%

Park County Area, Montana (MT669)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
48B	Tamaneen clay loam, 0 to 4 percent slopes	1,063.4	9.9%
248B	Tamaneen cobbly clay loam, 0 to 4 percent slopes	70.4	0.7%
500A	Soapcreek, moderately saline-Absay complex, 0 to 2 percent slopes, rarely flooded	38.2	0.4%
501A	Soapcreek-Clunton complex, 0 to 4 percent slopes, occasionally flooded	424.9	3.9%
510A	Bobkitty-Bonebasin complex, 0 to 2 percent slopes	59.2	0.5%
536A	Clunton and Bigsandy loams, 0 to 4 percent slopes, occasionally flooded	359.4	3.3%
546C	Bacbuster-Wilsall complex, 2 to 8 percent slopes	69.0	0.6%
746E	Bacbuster-Vershal complex, 4 to 25 percent slopes	118.1	1.1%

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Park County Area, Montana (MT669)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
946D	Bacbuster-Wilsall-Tolbert complex, 2 to 15 percent slopes	140.0	1.3%
5428E	Work-Castner-Wickes complex, 2 to 15 percent slopes	91.2	0.8%
5543E	Wickes-Shambo-Whitlash complex, 8 to 35 percent slopes	35.4	0.3%
Subtotals for Soil Survey Area		2,469.2	22.9%
Totals for Area of Interest		10,760.7	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

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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.

Gallatin County Area, Montana

12C—Burnel silty clay loam, 2 to 8 percent slopes

Map Unit Setting

Elevation: 4,750 to 6,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Burnel

Setting

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

Typical profile

A - 0 to 6 inches: neutral, silty clay loam
Bt - 6 to 19 inches: neutral, clay
Bk - 19 to 60 inches: moderately alkaline, clay 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: 15 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

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Burnel

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Anceney

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

46C—Work clay loam, 4 to 8 percent slopes

Map Unit Setting

Elevation: 4,500 to 5,900 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Work and similar soils: 85 percent
Minor components: 15 percent

Description of Work

Setting

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

Typical profile

A - 0 to 5 inches: neutral, clay loam
Bt - 5 to 13 inches: neutral, clay
Bk - 13 to 60 inches: moderately alkaline, gravelly 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 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

Custom Soil Resource Report

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Burnel

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Work, gravelly clay loam

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Work, greater slopes

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

58B—Danvers silty clay loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,750 to 5,800 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Danvers and similar soils: 90 percent

Minor components: 10 percent

Description of Danvers

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey alluvium

Typical profile

A - 0 to 4 inches: neutral, silty clay loam

Bt - 4 to 16 inches: slightly alkaline, silty clay loam

Bk - 16 to 42 inches: moderately alkaline, clay loam

2C - 42 to 60 inches: moderately alkaline, gravelly clay loam

Custom Soil Resource Report

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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Danvers

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Tamaneen

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Danvers

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

64B—Straw loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,350 to 6,150 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Straw

Setting

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

Typical profile

A - 0 to 18 inches: neutral, loam
Bk - 18 to 60 inches: slightly alkaline, 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 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: High (about 10.8 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Minor Components

Enbar

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Sudworth

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Straw

Percent of map unit: 2 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear

Custom Soil Resource Report

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

65B—Bigbear loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 5,500 to 6,100 feet

Mean annual precipitation: 18 to 22 inches

Mean annual air temperature: 37 to 41 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Bigbear and similar soils: 90 percent

Minor components: 10 percent

Description of Bigbear

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 9 inches: neutral, loam

Bt - 9 to 35 inches: neutral, cobbly clay

Bk - 35 to 60 inches: moderately alkaline, cobbly sandy 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: 30 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Farmland classification: All areas are prime farmland

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Storyhill

Percent of map unit: 5 percent

Custom Soil Resource Report

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS709MT)

Bigbear

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

65C—Bigbear loam, 4 to 8 percent slopes

Map Unit Setting

Elevation: 4,700 to 6,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

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

Description of Bigbear

Setting

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

Typical profile

A - 0 to 9 inches: neutral, loam
Bt - 9 to 35 inches: neutral, cobbly clay
Bk - 35 to 60 inches: moderately alkaline, cobbly sandy 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 0.57 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 (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Bigbear

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Burnel

Percent of map unit: 3 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Storyhill

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS709MT)

65D—Bigbear loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 4,800 to 6,300 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

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

Description of Bigbear

Setting

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

Custom Soil Resource Report

Typical profile

A - 0 to 9 inches: neutral, loam

Bt - 9 to 35 inches: neutral, cobbly clay

Bk - 35 to 60 inches: moderately alkaline, cobbly sandy 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 0.57 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 (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Bigbear

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Burnel

Percent of map unit: 3 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Storyhill

Percent of map unit: 2 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS709MT)

65E—Bigbear clay loam, 15 to 35 percent slopes

Map Unit Setting

Elevation: 4,800 to 6,150 feet

Mean annual precipitation: 18 to 22 inches

Mean annual air temperature: 37 to 43 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Bigbear and similar soils: 85 percent

Minor components: 15 percent

Description of Bigbear

Setting

Landform: Escarpments

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium colluvium

Typical profile

A - 0 to 6 inches: neutral, clay loam

Bt - 6 to 28 inches: neutral, cobbly clay

Bk - 28 to 60 inches: moderately alkaline, cobbly sandy clay loam

Properties and qualities

Slope: 15 to 35 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: 30 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: Thin Silty (TSi) 20"+ p.z. (R043BS732MT)

Minor Components

Burnel

Percent of map unit: 5 percent

Landform: Drainageways

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Storyhill

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS324MT)

Bigbear

Percent of map unit: 3 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 20"+ p.z. (R043BS732MT)

Bigbear

Percent of map unit: 2 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 20"+ p.z. (R043BS732MT)

72D—Doughty loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 4,850 to 5,300 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

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

Description of Doughty

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 8 inches: neutral, loam
Bt - 8 to 15 inches: neutral, gravelly clay loam
Bk - 15 to 21 inches: moderately alkaline, gravelly loam
2Ck - 21 to 60 inches: moderately alkaline, very gravelly loam

Custom Soil Resource Report

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 high to high
(0.20 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: 40 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Doughty

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Anceney

Percent of map unit: 3 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Doughty

Percent of map unit: 2 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

79C—Bridger loam, 2 to 8 percent slopes

Map Unit Setting

Elevation: 5,450 to 6,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 36 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bridger and similar soils: 85 percent

Minor components: 15 percent

Description of Bridger

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, loam

Bt - 8 to 28 inches: neutral, gravelly clay loam

Bk - 28 to 60 inches: moderately alkaline, cobbly clay 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: 15 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Bridger, clay loam

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Libeg

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bridger, warm

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

149B—Beaverton cobbly loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,400 to 5,850 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Beaverton

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 5 inches: neutral, cobbly loam
Bt - 5 to 21 inches: neutral, very gravelly clay loam
Bk - 21 to 25 inches: moderately alkaline, very cobbly coarse sandy loam
2Bk - 25 to 60 inches: moderately alkaline, extremely cobbly loamy coarse 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

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Minor Components

Beaverton

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Hyalite

Percent of map unit: 3 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Corbly

Percent of map unit: 2 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

155F—Anceney cobbly loam, 15 to 60 percent slopes

Map Unit Setting

Elevation: 4,500 to 5,900 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Anceney

Setting

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

Typical profile

A - 0 to 6 inches: neutral, cobbly loam
AB - 6 to 10 inches: neutral, gravelly loam
Bk - 10 to 60 inches: moderately alkaline, very cobbly loam

Properties and qualities

Slope: 15 to 60 percent
Depth to restrictive feature: More than 80 inches

Custom Soil Resource Report

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: 30 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Minor Components

Meagher

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Bowery

Percent of map unit: 3 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Overflow (Ov) 15-19" p.z. (R044XS351MT)

Cabba

Percent of map unit: 2 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

158B—Tamaneen clay loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 5,300 to 5,550 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Tamaneen

Setting

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

Typical profile

A - 0 to 7 inches: neutral, clay loam
Bt1 - 7 to 13 inches: neutral, clay loam
Bt2 - 13 to 17 inches: moderately alkaline, clay loam
Bk - 17 to 22 inches: moderately alkaline, gravelly clay loam
2Ck - 22 to 66 inches: moderately alkaline, extremely gravelly 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 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: 40 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Shawmut

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Tamaneen

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Work

Percent of map unit: 2 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

166C—Windham gravelly loam, 4 to 8 percent slopes

Map Unit Setting

Elevation: 4,500 to 6,100 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Windham and similar soils: 85 percent

Minor components: 15 percent

Description of Windham

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 6 inches: moderately alkaline, gravelly loam

Bk1 - 6 to 14 inches: moderately alkaline, very gravelly clay loam

Bk2 - 14 to 60 inches: moderately alkaline, very gravelly 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 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: 60 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: B

Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Minor Components

Windham, cobbly loam

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Beanlake

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Limy (Ly) 15-19" p.z. (R044XS357MT)

Windham, greater slopes

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

166D—Windham gravelly loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 4,450 to 5,650 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Windham and similar soils: 85 percent

Minor components: 15 percent

Description of Windham

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 6 inches: moderately alkaline, gravelly loam

Bk1 - 6 to 14 inches: moderately alkaline, very gravelly clay loam

Bk2 - 14 to 60 inches: moderately alkaline, very gravelly 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 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

Custom Soil Resource Report

Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Minor Components

Windham, cobbly loam

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Beanlake

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Limy (Ly) 15-19" p.z. (R044XS357MT)

Windham, greater slopes

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

179E—Bridger loam, cool, 4 to 25 percent slopes

Map Unit Setting

Elevation: 4,900 to 6,850 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

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

Description of Bridger

Setting

Landform: Drainageways
Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, loam
Bt - 8 to 28 inches: neutral, gravelly clay loam
Bk - 28 to 60 inches: moderately alkaline, cobbly clay loam

Properties and qualities

Slope: 4 to 25 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)

Minor Components

Bangtail

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Redlodge

Percent of map unit: 3 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Bridger

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)

212C—Burnel-Nythar complex, 2 to 8 percent slopes

Map Unit Setting

Elevation: 4,900 to 6,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Burnel and similar soils: 75 percent
Nythar and similar soils: 15 percent
Minor components: 10 percent

Description of Burnel

Setting

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

Typical profile

A - 0 to 6 inches: neutral, clay loam
Bt - 6 to 19 inches: neutral, clay
Bk - 19 to 60 inches: moderately alkaline, clay 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: 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

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

Description of Nythar

Setting

Landform: Drainageways

Custom Soil Resource Report

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

Typical profile

A - 0 to 8 inches: neutral, loam
Bg - 8 to 33 inches: neutral, gravelly silt loam
Cg - 33 to 60 inches: neutral, cobbly sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly 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: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Minor Components

Billman

Percent of map unit: 5 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

Enbar

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

249A—Beaverton cobbly clay loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,450 to 5,900 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Beaverton and similar soils: 90 percent

Minor components: 10 percent

Description of Beaverton

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 5 inches: neutral, cobbly loam

Bt - 5 to 21 inches: neutral, very gravelly clay loam

Bk - 21 to 25 inches: moderately alkaline, very cobbly coarse sandy loam

2Bk - 25 to 60 inches: moderately alkaline, extremely cobbly loamy coarse 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: 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

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: B

Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Minor Components

Beaverton

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Turner

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

252D—Martinsdale cobbly loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 4,550 to 5,850 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Martinsdale and similar soils: 85 percent

Minor components: 15 percent

Description of Martinsdale

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 5 inches: neutral, cobbly loam

Bt - 5 to 13 inches: neutral, clay loam

Bk1 - 13 to 26 inches: moderately alkaline, loam

Bk2 - 26 to 60 inches: moderately alkaline, gravelly sandy 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 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

Gypsum, maximum in profile: 1 percent

Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Minor Components

Meagher

Percent of map unit: 5 percent

Custom Soil Resource Report

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Anceney

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Martinsdale

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

257B—Meagher cobbly loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 5,550 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Meagher

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 6 inches: neutral, cobbly loam
Bt - 6 to 19 inches: neutral, clay loam
Bk1 - 19 to 31 inches: moderately alkaline, loam
2Bk2 - 31 to 60 inches: moderately alkaline, very gravelly 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 high to high
(0.57 to 1.98 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Minor Components

Martinsdale

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Anceney

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

257C—Meagher cobbly loam, 4 to 8 percent slopes

Map Unit Setting

Elevation: 5,500 to 5,950 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Meagher

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Custom Soil Resource Report

Typical profile

A - 0 to 6 inches: neutral, cobbly loam
Bt - 6 to 19 inches: neutral, clay loam
Bk1 - 19 to 31 inches: moderately alkaline, loam
2Bk2 - 31 to 60 inches: moderately alkaline, very gravelly 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 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: 40 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Minor Components

Martinsdale

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Anceney

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

266B—Windham cobbly loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,750 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Windham

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: moderately alkaline, cobbly loam
Bk1 - 6 to 12 inches: moderately alkaline, gravelly loam
Bk2 - 12 to 18 inches: moderately alkaline, extremely gravelly loam
Bk3 - 18 to 60 inches: moderately alkaline, extremely gravelly 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 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: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Minor Components

Windham, very cobbly loam

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Beanlake

Percent of map unit: 3 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Limy (Ly) 15-19" p.z. (R044XS357MT)

Windham, greater slopes

Percent of map unit: 2 percent
Landform: Stream terraces, alluvial fans

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

294D—Yellowmule-Lonniebee, stony-Redlodge complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 5,950 to 6,300 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 34 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Yellowmule and similar soils: 65 percent
Lonniebee and similar soils: 20 percent
Minor components: 15 percent

Description of Yellowmule

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material
E - 1 to 11 inches: slightly acid, loam
Bt - 11 to 31 inches: slightly acid, clay loam
Cr - 31 to 41 inches: , unweathered bedrock

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Description of Lonniebee

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 11 inches: slightly acid, flaggy loam

B_t - 11 to 33 inches: slightly acid, very flaggy clay loam

Cr - 33 to 38 inches: , weathered bedrock

R - 38 to 48 inches: , unweathered bedrock

Properties and qualities

Slope: 4 to 15 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): 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

Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Minor Components

Redlodge

Percent of map unit: 5 percent

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Yellowmule, greater slopes

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Cowood

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Custom Soil Resource Report

Other vegetative classification: subalpine fir/grouse whortleberry (PK730), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

294E—Yellowmule-Lonniebee, stony complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 5,200 to 6,950 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 34 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Yellowmule and similar soils: 65 percent
Lonniebee and similar soils: 20 percent
Minor components: 15 percent

Description of Yellowmule

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material
E - 1 to 11 inches: slightly acid, loam
Bt - 11 to 31 inches: slightly acid, clay loam
Cr - 31 to 41 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Description of Lonniebee

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material
E - 1 to 11 inches: slightly acid, flaggy loam
B_t - 11 to 33 inches: slightly acid, very flaggy clay loam
Cr - 33 to 38 inches: , weathered bedrock
R - 38 to 48 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): 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
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Minor Components

Redlodge

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Yellowmule, channery loam

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Cowood

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

Custom Soil Resource Report

Other vegetative classification: subalpine fir/grouse whortleberry (PK730),
subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Rock outcrop

Percent of map unit: 2 percent

294F—Yellowmule-Lonniebee complex, 35 to 60 percent slopes, stony

Map Unit Setting

Elevation: 5,200 to 6,650 feet

Mean annual precipitation: 25 to 30 inches

Mean annual air temperature: 34 to 43 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Yellowmule and similar soils: 50 percent

Lonniebee and similar soils: 35 percent

Minor components: 15 percent

Description of Yellowmule

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 11 inches: slightly acid, channery loam

Bt - 11 to 31 inches: slightly acid, clay loam

Cr - 31 to 41 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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

Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Custom Soil Resource Report

Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Description of Lonniebee

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 11 inches: slightly acid, flaggy loam

B_t - 11 to 33 inches: slightly acid, very flaggy clay loam

Cr - 33 to 38 inches: , weathered bedrock

R - 38 to 48 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): 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

Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Minor Components

Cowood

Percent of map unit: 8 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/grouse whortleberry (PK730), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Yellowmule, greater slopes

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Redlodge

Percent of map unit: 1 percent

Custom Soil Resource Report

Landform: Depressions
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Rock outcrop

Percent of map unit: 1 percent

315F—Cabba-Bacbuster complex, 15 to 60 percent slopes

Map Unit Setting

Elevation: 4,500 to 6,500 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Cabba and similar soils: 50 percent
Bacbuster and similar soils: 40 percent
Minor components: 10 percent

Description of Cabba

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: moderately alkaline, cobbly clay loam
Bk - 8 to 17 inches: moderately alkaline, loam
Cr - 17 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 60 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Bacbuster

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, cobbly clay loam
Bt - 4 to 15 inches: neutral, clay loam
Bk - 15 to 36 inches: moderately alkaline, clay loam
Cr - 36 to 60 inches: , weathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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 6.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Thin Clayey (TCy) 15-19" p.z. (R044XS360MT)

Minor Components

Norbert

Percent of map unit: 4 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow Clay (SwC) 15-19" p.z. (R044XS726MT)

Castner

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

Billman

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Custom Soil Resource Report

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Rock outcrop

Percent of map unit: 1 percent

350C—Blackmore silt loam, 4 to 8 percent slopes

Map Unit Setting

Elevation: 4,750 to 5,600 feet

Mean annual precipitation: 18 to 22 inches

Mean annual air temperature: 37 to 43 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Blackmore and similar soils: 90 percent

Minor components: 10 percent

Description of Blackmore

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Calcareous loess

Typical profile

A - 0 to 10 inches: neutral, silt loam

Bt - 10 to 27 inches: neutral, silty clay loam

Bk1 - 27 to 42 inches: moderately alkaline, silt loam

Bk2 - 42 to 60 inches: moderately alkaline, silt 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 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

Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Bowery

Percent of map unit: 4 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Doughty

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Brodyk

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Limy (Ly) 15-19" p.z. (R044XS357MT)

354B—Farside loam, 2 to 6 percent slopes

Map Unit Setting

Elevation: 5,000 to 5,700 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

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

Description of Farside

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 11 inches: neutral, loam
Bt - 11 to 31 inches: neutral, sandy clay loam
C - 31 to 60 inches: neutral, gravelly coarse sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches

Custom Soil Resource Report

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

Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: All areas are prime farmland

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Sawicki

Percent of map unit: 6 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Breton

Percent of map unit: 4 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Sandy (Sy) 15-19" p.z. (R044XS352MT)

354D—Farside loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 4,900 to 6,150 feet

Mean annual precipitation: 18 to 22 inches

Mean annual air temperature: 37 to 43 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Farside and similar soils: 90 percent

Minor components: 10 percent

Description of Farside

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Custom Soil Resource Report

Typical profile

A - 0 to 11 inches: neutral, loam
Bt - 11 to 31 inches: neutral, sandy clay loam
C - 31 to 60 inches: neutral, gravelly coarse sandy 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Sawicki

Percent of map unit: 4 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

Bowery

Percent of map unit: 3 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Overflow (Ov) 15-19" p.z. (R044XS351MT)

Farside

Percent of map unit: 3 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

358B—Tamaneen cobbly clay loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 5,300 to 5,900 feet
Mean annual precipitation: 15 to 19 inches

Custom Soil Resource Report

Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Tamaneen

Setting

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

Typical profile

A - 0 to 4 inches: neutral, cobbly clay loam
Bt - 4 to 17 inches: neutral, clay loam
Bk - 17 to 22 inches: moderately alkaline, gravelly clay loam
2Ck - 22 to 60 inches: moderately alkaline, extremely cobbly 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 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: 40 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Shawmut

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Tamaneen

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

366E—Windham cobbly loam, 15 to 35 percent slopes, stony

Map Unit Setting

Elevation: 4,600 to 6,400 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

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

Description of Windham

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone

Typical profile

A - 0 to 6 inches: moderately alkaline, cobbly loam
Bk1 - 6 to 12 inches: moderately alkaline, gravelly loam
Bk2 - 12 to 18 inches: moderately alkaline, extremely gravelly loam
Bk3 - 18 to 60 inches: moderately alkaline, extremely gravelly loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 0.1 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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Minor Components

Windham, bouldery

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Windham, greater slopes

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

379D—Bridger cobbly loam, 8 to 15 percent slopes, stony

Map Unit Setting

Elevation: 5,250 to 7,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 36 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bridger, stony, and similar soils: 85 percent

Minor components: 15 percent

Description of Bridger, Stony

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, cobbly loam

Bt - 8 to 28 inches: neutral, gravelly clay loam

Bk - 28 to 60 inches: moderately alkaline, cobbly clay loam

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 0.1 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 (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

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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 7.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Redchief, very stony

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bridger, loam

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bridger, cobbly

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

379E—Bridger cobbly loam, 15 to 35 percent slopes, stony

Map Unit Setting

Elevation: 5,200 to 7,150 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Bridger, stony, and similar soils: 85 percent
Minor components: 15 percent

Description of Bridger, Stony

Setting

Landform: Stream terraces, alluvial fans

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, cobbly loam
Bt - 8 to 28 inches: neutral, gravelly clay loam
Bk - 28 to 60 inches: moderately alkaline, cobbly clay loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 0.1 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 (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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Redchief, very stony

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bridger, cobbly

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bridger, loam

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

407A—Sudworth-Nesda loams, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,300 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Sudworth and similar soils: 60 percent
Nesda and similar soils: 25 percent
Minor components: 15 percent

Description of Sudworth

Setting

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

Typical profile

A - 0 to 24 inches: moderately alkaline, loam
Bk - 24 to 29 inches: moderately alkaline, loam
2C - 29 to 60 inches: moderately alkaline, extremely gravelly 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: About 48 to 96 inches
Frequency of flooding: Rare
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 7.1 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Description of Nesda

Setting

Landform: Flood plains

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Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 11 inches: neutral, loam
2C - 11 to 60 inches: moderately alkaline, 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
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: About 48 to 96 inches
Frequency of flooding: Rare
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: Low (about 3.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Minor Components

Meadowcreek

Percent of map unit: 8 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Enbar

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Bonebasin

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

466E—Windham cobbly loam, 15 to 45 percent slopes, stony

Map Unit Setting

Elevation: 4,550 to 7,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Windham, stony, and similar soils: 85 percent
Minor components: 15 percent

Description of Windham, Stony

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone

Typical profile

A - 0 to 6 inches: moderately alkaline, cobbly loam
Bk1 - 6 to 12 inches: moderately alkaline, gravelly loam
Bk2 - 12 to 18 inches: moderately alkaline, extremely gravelly loam
Bk3 - 18 to 60 inches: moderately alkaline, extremely gravelly loam

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 0.1 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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Minor Components

Lap, stony

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Windham, greater slopes

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Rock outcrop

Percent of map unit: 2 percent

479E—Bangtail-Bridger complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 60 percent

Bridger and similar soils: 30 percent

Minor components: 10 percent

Description of Bangtail

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, clay loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

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

Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Description of Bridger

Setting

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, loam

Bt - 8 to 28 inches: neutral, gravelly clay loam

Bk - 28 to 60 inches: moderately alkaline, cobbly clay loam

Properties and qualities

Slope: 15 to 45 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: 15 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Minor Components

Timberlin, stony

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Bangtail

Percent of map unit: 4 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Redlodge

Percent of map unit: 1 percent

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

479F—Bangtail clay loam, 35 to 60 percent slopes

Map Unit Setting

Elevation: 4,900 to 6,900 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 85 percent

Minor components: 15 percent

Description of Bangtail

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, clay loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , bedrock

Properties and qualities

Slope: 35 to 60 percent

Depth to restrictive feature: 20 to 40 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

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Minor Components

Copenhaver

Percent of map unit: 8 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220), Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Timberlin, stony

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Rock outcrop

Percent of map unit: 2 percent

490E—Uinta-Paddy complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 5,450 to 6,550 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Uinta and similar soils: 50 percent

Paddy and similar soils: 40 percent

Minor components: 10 percent

Description of Uinta

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Custom Soil Resource Report

Parent material: Loamy colluvium derived from argillite

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 6 inches: neutral, loam

Bt - 6 to 60 inches: neutral, clay loam

Properties and qualities

Slope: 15 to 45 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

Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/
snowberry (PK310)

Description of Paddy

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from argillite

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

A - 1 to 4 inches: neutral, clay loam

Bw - 4 to 10 inches: slightly acid, clay loam

R - 10 to 14 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 8 to 20 inches to lithic 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

Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/
snowberry (PK310)

Minor Components

Uinta, stony

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Paddy

Percent of map unit: 4 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Rock outcrop

Percent of map unit: 1 percent

492E—Yellowmule-Ouselfal complex, 8 to 25 percent slopes

Map Unit Setting

Elevation: 6,400 to 7,900 feet

Mean annual precipitation: 25 to 30 inches

Mean annual air temperature: 32 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Yellowmule and similar soils: 50 percent

Ouselfal and similar soils: 35 percent

Minor components: 15 percent

Description of Yellowmule

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 11 inches: slightly acid, loam

Bt - 11 to 31 inches: slightly acid, clay loam

Cr - 31 to 41 inches: , unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent

Custom Soil Resource Report

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: subalpine fir/grouse whortleberry (PK730), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Description of Ouselfal

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 2 inches: strongly acid, slightly decomposed plant material
E1 - 2 to 7 inches: moderately acid, very flaggy sandy loam
E2 - 7 to 19 inches: moderately acid, very channery sandy loam
Bt - 19 to 25 inches: moderately acid, extremely gravelly clay loam
Cr - 25 to 40 inches: , weathered bedrock
R - 40 to 44 inches: , unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
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
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Other vegetative classification: subalpine fir/grouse whortleberry (PK730), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Minor Components

Cowood

Percent of map unit: 8 percent
Landform: Mountains
Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear

Other vegetative classification: subalpine fir/grouse whortleberry (PK730),
subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Yellowmule, very channery loam

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/grouse whortleberry (PK730),
subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Rock outcrop

Percent of map unit: 1 percent

Rubbleland

Percent of map unit: 1 percent

494E—Bangtail-Timberlin, stony complex, moist 15 to 45 percent slopes

Map Unit Setting

Elevation: 5,050 to 7,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 50 percent

Timberlin and similar soils: 40 percent

Minor components: 10 percent

Description of Bangtail

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 20 to 40 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)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Description of Timberlin

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material
A - 1 to 6 inches: neutral, flaggy loam
Bt1 - 6 to 11 inches: neutral, very flaggy clay loam
Bt2 - 11 to 25 inches: neutral, very flaggy clay loam
Cr - 25 to 30 inches: , weathered bedrock
R - 30 to 34 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic 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
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: spruce/ninebark (PK430), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Minor Components

Yellowmule

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/blue huckleberry (PK720)

Custom Soil Resource Report

Cowood

Percent of map unit: 3 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Rock outcrop

Percent of map unit: 2 percent

494F—Bangtail-Timberlin complex, moist, 35 to 60 percent slopes, stony

Map Unit Setting

Elevation: 5,000 to 7,100 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 45 percent

Timberlin and similar soils: 40 percent

Minor components: 15 percent

Description of Bangtail

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, gravelly loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 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

Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Description of Timberlin

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material
A - 1 to 6 inches: neutral, flaggy loam
Bt1 - 6 to 11 inches: neutral, very flaggy clay loam
Bt2 - 11 to 25 inches: neutral, very flaggy clay loam
Cr - 25 to 30 inches: , weathered bedrock
R - 30 to 34 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic 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
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Minor Components

Yellowmule

Percent of map unit: 8 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/blue huckleberry (PK720)

Cowood

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Rock outcrop

Percent of map unit: 2 percent

500A—Bobkitty-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 3,950 to 5,700 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 95 to 120 days

Map Unit Composition

Bobkitty and similar soils: 65 percent

Bonebasin and similar soils: 25 percent

Minor components: 10 percent

Description of Bobkitty

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 5 inches: moderately alkaline, loam

C - 5 to 48 inches: strongly alkaline, stratified sandy loam to silty clay loam

2C - 48 to 60 inches: moderately alkaline, stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 24 to 42 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 30.0

Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Custom Soil Resource Report

Land capability classification (irrigated): 6w

Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: C

Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Description of Bonebasin

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: strongly acid, muck

A - 4 to 15 inches: slightly alkaline, loam

Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam

2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly 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: About 0 to 12 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

Minor Components

Rivra

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow to Gravel (SwGr) 9-14" p.z. (R044XS338MT)

Ryell

Percent of map unit: 3 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 9-14" p.z. (R044XS339MT)

Lamoose

Percent of map unit: 2 percent

Landform: Channels

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

507A—Soapcreek-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 5,300 to 5,900 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Soapcreek and similar soils: 60 percent
Bonebasin and similar soils: 30 percent
Minor components: 10 percent

Description of Soapcreek

Setting

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

Typical profile

A - 0 to 15 inches: moderately alkaline, silty clay
Bk - 15 to 46 inches: moderately alkaline, silty clay loam
Bg - 46 to 60 inches: moderately alkaline, stratified fine sandy loam to silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 42 inches
Frequency of flooding: Rare
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 9.9 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Description of Bonebasin

Setting

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

Typical profile

Oa - 0 to 4 inches: strongly acid, muck
A - 4 to 15 inches: slightly alkaline, loam
Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam
2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly 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: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Meadowcreek

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Reycreek

Percent of map unit: 3 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Blossberg

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

509B—Enbar loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,400 to 6,000 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Enbar and similar soils: 85 percent

Minor components: 15 percent

Description of Enbar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 22 inches: neutral, loam

Cg - 22 to 49 inches: moderately alkaline, sandy loam

2C - 49 to 60 inches: moderately alkaline, very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly 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: About 24 to 42 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 8.8 inches)

Interpretive groups

Farmland classification: All areas are prime farmland

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C

Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Minor Components

Nythar

Percent of map unit: 10 percent

Custom Soil Resource Report

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Straw

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

510B—Meadowcreek loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,200 to 5,950 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Meadowcreek and similar soils: 85 percent
Minor components: 15 percent

Description of Meadowcreek

Setting

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

Typical profile

A - 0 to 11 inches: slightly alkaline, loam
Bg - 11 to 25 inches: neutral, silt loam
2C - 25 to 60 inches: neutral, very gravelly sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated

Custom Soil Resource Report

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Minor Components

Blossberg

Percent of map unit: 10 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Beaverton

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

512B—Enbar-Nythar loams, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,300 to 6,100 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Enbar and similar soils: 60 percent
Nythar and similar soils: 30 percent
Minor components: 10 percent

Description of Enbar

Setting

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

Typical profile

A - 0 to 22 inches: neutral, loam
Cg - 22 to 49 inches: moderately alkaline, sandy loam
2C - 49 to 60 inches: moderately alkaline, very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained

Custom Soil Resource Report

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: About 24 to 42 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 8.8 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C

Description of Nythar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 8 inches: neutral, loam

Bg - 8 to 33 inches: neutral, silt loam

Cg - 33 to 60 inches: neutral, sandy loam

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly 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: About 0 to 12 inches

Frequency of flooding: Rare

Frequency of ponding: None

Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 5w

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Straw

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Blossberg

Percent of map unit: 5 percent

Landform: Flood plains

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

512D—Enbar-Bowery-Nythar complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 4,450 to 6,300 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Enbar and similar soils: 55 percent
Bowery and similar soils: 20 percent
Nythar and similar soils: 15 percent
Minor components: 10 percent

Description of Enbar

Setting

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

Typical profile

A - 0 to 22 inches: neutral, loam
Bw - 22 to 29 inches: moderately alkaline, loam
C - 29 to 50 inches: moderately alkaline, loam
2Cg - 50 to 60 inches: moderately alkaline, very gravelly sandy loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 42 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 8.9 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C

Custom Soil Resource Report

Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)

Description of Bowery

Setting

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 22 inches: neutral, loam

Bw - 22 to 60 inches: neutral, clay loam

Properties and qualities

Slope: 4 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 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

Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Overflow (Ov) 15-19" p.z. (R044XS351MT)

Description of Nythar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 8 inches: neutral, loam

Bg - 8 to 33 inches: neutral, gravelly silt loam

Cg - 33 to 60 inches: neutral, sandy loam

Properties and qualities

Slope: 4 to 6 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly 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: About 0 to 12 inches

Frequency of flooding: Rare

Frequency of ponding: None

Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Custom Soil Resource Report

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Straw

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Blossberg

Percent of map unit: 5 percent
Landform: Draws
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

513A—Meadowcreek-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,000 to 5,250 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Meadowcreek and similar soils: 60 percent
Bonebasin and similar soils: 25 percent
Minor components: 15 percent

Description of Meadowcreek

Setting

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

Typical profile

A - 0 to 11 inches: moderately alkaline, loam
Bg - 11 to 25 inches: moderately alkaline, silt loam
2C - 25 to 60 inches: neutral, very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent

Custom Soil Resource Report

Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 42 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Subirrigated (Sb) 9-14" p.z. (R044XS343MT)

Description of Bonebasin

Setting

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

Typical profile

Oa - 0 to 4 inches: strongly acid, muck
A - 4 to 15 inches: slightly alkaline, loam
Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam
2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly 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: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

Minor Components

Fairway

Percent of map unit: 5 percent
Landform: Flood plains

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Nesda

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Lamoose

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

514A—Soapcreek silty clay loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,200 to 6,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Soapcreek and similar soils: 85 percent
Minor components: 15 percent

Description of Soapcreek

Setting

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

Typical profile

A - 0 to 15 inches: moderately alkaline, silty clay loam
Bk - 15 to 46 inches: moderately alkaline, silty clay loam
Bg - 46 to 60 inches: moderately alkaline, stratified fine sandy loam to silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 42 inches

Custom Soil Resource Report

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 9.9 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated

Land capability classification (irrigated): 4w

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: D

Ecological site: Subirrigated (Sb) 9-14" p.z. (R044XS343MT)

Minor Components

Meadowcreek

Percent of map unit: 10 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Blossberg

Percent of map unit: 5 percent

Landform: Terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

522A—Enbar clay loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,300 to 5,850 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Enbar and similar soils: 85 percent

Minor components: 15 percent

Description of Enbar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 16 inches: neutral, clay loam

Custom Soil Resource Report

Cg - 16 to 53 inches: moderately alkaline, clay loam

2C - 53 to 60 inches: moderately alkaline, very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 24 to 42 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 8.6 inches)

Interpretive groups

Farmland classification: All areas are prime farmland

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C

Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Minor Components

Nythar

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Sudworth

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Straw

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

523A—Enbar-Nythar loams, cool, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,150 to 6,100 feet

Mean annual precipitation: 18 to 22 inches

Custom Soil Resource Report

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Enbar and similar soils: 70 percent

Nythar and similar soils: 20 percent

Minor components: 10 percent

Description of Enbar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 22 inches: neutral, loam

Cg - 22 to 49 inches: moderately alkaline, sandy loam

2C - 49 to 60 inches: moderately alkaline, very gravelly loamy sand

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly 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: About 24 to 42 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 8.8 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 4w

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C

Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Description of Nythar

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium

Typical profile

A - 0 to 8 inches: neutral, loam

Bg - 8 to 33 inches: neutral, gravelly silt loam

Cg - 33 to 60 inches: neutral, cobbly sandy clay loam

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly drained

Custom Soil Resource Report

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: About 0 to 12 inches

Frequency of flooding: Rare

Frequency of ponding: None

Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 5w

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Sudworth

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Straw

Percent of map unit: 3 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Blossberg

Percent of map unit: 2 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

524A—Fairway-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 5,300 to 6,000 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Fairway and similar soils: 70 percent

Bonebasin and similar soils: 20 percent

Minor components: 10 percent

Description of Fairway

Setting

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

Typical profile

A - 0 to 15 inches: moderately alkaline, clay loam
Cg - 15 to 46 inches: moderately alkaline, silt loam
2Cg - 46 to 60 inches: neutral, sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: Rare
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: Moderate (about 8.7 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Description of Bonebasin

Setting

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

Typical profile

Oa - 0 to 4 inches: strongly acid, muck
A - 4 to 15 inches: slightly alkaline, loam
Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam
2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly 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: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent

Custom Soil Resource Report

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Blossberg

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Soapcreek

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 9-14" p.z. (R044XS343MT)

542A—Blossberg loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,200 to 5,550 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Blossberg and similar soils: 85 percent
Minor components: 15 percent

Description of Blossberg

Setting

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

Typical profile

A - 0 to 15 inches: neutral, loam
Bg - 15 to 24 inches: neutral, sandy clay loam
2C - 24 to 60 inches: neutral, extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 12 to 24 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 4.0 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Bonebasin

Percent of map unit: 10 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Meadowcreek

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

547E—Hoppers-Adel-Tolbert, very stony complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 4,950 to 6,000 feet
Mean annual precipitation: 17 to 22 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 65 to 100 days

Map Unit Composition

Hoppers and similar soils: 40 percent
Adel and similar soils: 25 percent
Tolbert and similar soils: 20 percent
Minor components: 15 percent

Description of Hoppers

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: neutral, loam

Bt - 8 to 26 inches: neutral, sandy clay loam

Cr - 26 to 33 inches: , weathered bedrock

R - 33 to 43 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 20 to 40 inches to lithic 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

Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Description of Adel

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A - 0 to 14 inches: neutral, loam

Bw - 14 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 15 to 45 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

Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Custom Soil Resource Report

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Description of Tolbert

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, cobbly loam

Bt - 4 to 16 inches: neutral, very cobbly clay loam

R - 16 to 26 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Blaincreek

Percent of map unit: 10 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Hoppers

Percent of map unit: 3 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Rock outcrop

Percent of map unit: 2 percent

550E—Bridger-Redlodge complex, 4 to 25 percent slopes

Map Unit Setting

Elevation: 5,100 to 6,300 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Bridger and similar soils: 75 percent
Redlodge and similar soils: 15 percent
Minor components: 10 percent

Description of Bridger

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: neutral, loam
Bt - 8 to 28 inches: neutral, gravelly clay loam
Bk - 28 to 60 inches: moderately alkaline, cobbly clay loam

Properties and qualities

Slope: 4 to 25 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C

Description of Redlodge

Setting

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

Typical profile

Oa - 0 to 7 inches: strongly acid, highly decomposed plant material
A - 7 to 22 inches: neutral, silty clay loam
Bg - 22 to 60 inches: neutral, silty clay loam

Properties and qualities

Slope: 4 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly 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: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 12.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Minor Components

Bavdark

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear

Redlodge, dry

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Libeg, stony

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

606A—Bandy-Riverwash-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 4,200 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Bandy and similar soils: 50 percent
Riverwash: 25 percent
Bonebasin and similar soils: 10 percent
Minor components: 15 percent

Description of Bandy

Setting

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

Typical profile

A - 0 to 8 inches: neutral, loam
Bw - 8 to 17 inches: neutral, sandy loam
C - 17 to 60 inches: neutral, very cobbly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly 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: About 12 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 3 percent
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D

Description of Riverwash

Setting

Landform: Flood plains

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Description of Bonebasin

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: strongly acid, muck

A - 4 to 15 inches: slightly alkaline, loam

Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam

2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly 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: About 0 to 12 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Water

Percent of map unit: 5 percent

Blossberg

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Nesda

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

608B—Beehive-Mooseflat complex, 0 to 4 percent slopes

Map Unit Setting

Elevation: 5,300 to 6,650 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Beehive and similar soils: 60 percent
Mooseflat and similar soils: 30 percent
Minor components: 10 percent

Description of Beehive

Setting

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

Typical profile

O_i - 0 to 2 inches: strongly acid, slightly decomposed plant material
A - 2 to 5 inches: neutral, gravelly sandy loam
C₁ - 5 to 28 inches: neutral, extremely gravelly loamy coarse sand
C₂ - 28 to 60 inches: neutral, extremely cobbly loamy coarse sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 5.95 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Other vegetative classification: spruce/common horsetail (PK410)

Description of Mooseflat

Setting

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

Typical profile

Oe - 0 to 2 inches: strongly acid, mucky peat
A - 2 to 12 inches: slightly acid, loam
Bg - 12 to 24 inches: neutral, silty clay loam
2Cg - 24 to 60 inches: neutral, very gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly 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: About 0 to 12 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Low (about 5.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Minor Components

Beehive

Percent of map unit: 8 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: spruce/common horsetail (PK410)

Water

Percent of map unit: 2 percent

614D—Adel loam, cool, 4 to 15 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,550 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 43 degrees F

Custom Soil Resource Report

Frost-free period: 50 to 70 days

Map Unit Composition

Adel and similar soils: 85 percent

Minor components: 15 percent

Description of Adel

Setting

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A - 0 to 14 inches: neutral, loam

Bw - 14 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 4 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 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

Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)

Minor Components

Redlodge

Percent of map unit: 5 percent

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

Libeg

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Adel

Percent of map unit: 5 percent

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)

614F—Adel loam, 15 to 60 percent slopes

Map Unit Setting

Elevation: 4,750 to 6,500 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Adel and similar soils: 85 percent

Minor components: 15 percent

Description of Adel

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A - 0 to 14 inches: neutral, loam

Bw - 14 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 15 to 60 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

Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/
snowberry (PK310)

Minor Components

Rocky, stony

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Custom Soil Resource Report

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Adel

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Zade

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

615F—Cabba-Castner complex, 15 to 60 percent slopes

Map Unit Setting

Elevation: 4,550 to 6,200 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Cabba and similar soils: 50 percent

Castner and similar soils: 35 percent

Minor components: 15 percent

Description of Cabba

Setting

Landform: Escarpments

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: moderately alkaline, loam

Bk - 8 to 17 inches: moderately alkaline, loam

Cr - 17 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 60 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

Custom Soil Resource Report

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: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Castner

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: neutral, very flaggy loam
Bk - 6 to 18 inches: moderately alkaline, very channery sandy loam
R - 18 to 22 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 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: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Reedwest, stony

Percent of map unit: 10 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Rock outcrop

Percent of map unit: 5 percent

647F—Hoppers, stony-Tolbert, very stony-Timberlin complex, 35 to 60 percent slopes

Map Unit Setting

Elevation: 5,200 to 7,000 feet
Mean annual precipitation: 17 to 22 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 65 to 100 days

Map Unit Composition

Hoppers and similar soils: 40 percent
Tolbert and similar soils: 25 percent
Timberlin and similar soils: 25 percent
Minor components: 10 percent

Description of Hoppers

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: neutral, sandy clay loam
Bt - 8 to 26 inches: neutral, sandy clay loam
Cr - 26 to 33 inches: , weathered bedrock
R - 33 to 41 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic 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
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Timberlin

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material

A - 1 to 6 inches: neutral, loam

Bt₁ - 6 to 11 inches: neutral, very flaggy clay loam

Bt₂ - 11 to 25 inches: neutral, very flaggy clay loam

Cr - 25 to 30 inches: , weathered bedrock

R - 30 to 34 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): 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

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Description of Tolbert

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, cobbly loam

Bt - 4 to 16 inches: neutral, very cobbly clay loam

R - 16 to 26 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Blaincreek

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

660F—Billman, stony-Bangtail-Tolbert, stony complex, 25 to 60 percent slopes

Map Unit Setting

Elevation: 4,900 to 6,900 feet

Mean annual precipitation: 17 to 22 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 65 to 100 days

Map Unit Composition

Billman and similar soils: 40 percent

Bangtail and similar soils: 30 percent

Tolbert and similar soils: 15 percent

Minor components: 15 percent

Description of Billman

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, cobbly clay loam

Bt - 7 to 23 inches: neutral, clay

Cr - 23 to 60 inches: , weathered bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 25 to 60 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Bangtail

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam
Bt - 9 to 23 inches: slightly acid, clay loam
C - 23 to 37 inches: neutral, clay loam
Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 40 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
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310), Douglas-fir/ninebark (PK260)

Description of Tolbert

Setting

Landform: Hills
Down-slope shape: Linear

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Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, cobbly loam

Bt - 4 to 16 inches: neutral, very cobbly clay loam

R - 16 to 26 inches: , unweathered bedrock

Properties and qualities

Slope: 25 to 60 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Adel

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Overflow (Ov) 20"+ p.z. NOT KNOWN (R043BS321MT)

Timberlin

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/
ninebark (PK260)

Rock outcrop

Percent of map unit: 2 percent

665D—Storyhill-Bigbear complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 4,750 to 6,000 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 43 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

Storyhill and similar soils: 50 percent
Bigbear and similar soils: 35 percent
Minor components: 15 percent

Description of Storyhill

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 10 inches: neutral, cobbly loam
Bt - 10 to 32 inches: neutral, very cobbly clay
Bk - 32 to 60 inches: moderately alkaline, very cobbly sandy clay loam

Properties and qualities

Slope: 4 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 0.57 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
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS709MT)

Description of Bigbear

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 9 inches: neutral, loam
Bt - 9 to 35 inches: neutral, cobbly clay
Bk - 35 to 60 inches: moderately alkaline, cobbly sandy clay loam

Properties and qualities

Slope: 4 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 0.57 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 (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.0 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Storyhill

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS324MT)

Bowery

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Overflow (Ov) 15-19" p.z. (R044XS351MT)

Bigbear, stony

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

665E—Bigbear-Storyhill-Adel complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 4,750 to 5,950 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 65 to 95 days

Map Unit Composition

Bigbear and similar soils: 40 percent
Storyhill and similar soils: 25 percent
Adel and similar soils: 20 percent
Minor components: 15 percent

Description of Bigbear

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 9 inches: neutral, cobbly loam
Bt - 9 to 35 inches: neutral, cobbly clay
Bk - 35 to 60 inches: moderately alkaline, cobbly sandy clay loam

Properties and qualities

Slope: 15 to 45 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: 30 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

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Thin Silty (TSi) 20"+ p.z. (R043BS732MT)

Description of Storyhill

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 10 inches: neutral, cobbly loam
Bt - 10 to 32 inches: neutral, very cobbly clay
Bk - 32 to 60 inches: moderately alkaline, very cobbly sandy clay loam

Properties and qualities

Slope: 15 to 45 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: 30 percent
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS324MT)

Description of Adel

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium loamy colluvium

Typical profile

A1 - 0 to 14 inches: neutral, loam
A2 - 14 to 22 inches: neutral, loam
Bk - 22 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 15 to 45 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
Available water storage in profile: High (about 9.3 inches)

Custom Soil Resource Report

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Overflow (Ov) 20"+ p.z. NOT KNOWN (R043BS321MT)

Minor Components

Bigbear

Percent of map unit: 10 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Silty (TSi) 20"+ p.z. (R043BS732MT)

Storyhill

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 20"+ p.z. (R043BS324MT)

666F—Lap-Windham-Rock outcrop complex, 35 to 60 percent slopes

Map Unit Setting

Elevation: 4,150 to 6,550 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Lap and similar soils: 50 percent
Windham and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent

Description of Lap

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from limestone

Typical profile

A - 0 to 11 inches: slightly alkaline, very cobbly loam
Bk - 11 to 16 inches: moderately alkaline, extremely gravelly loam

Custom Soil Resource Report

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic 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: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Windham

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone

Typical profile

A - 0 to 6 inches: moderately alkaline, cobbly loam
Bk1 - 6 to 12 inches: moderately alkaline, gravelly loam
Bk2 - 12 to 18 inches: moderately alkaline, extremely gravelly loam
Bk3 - 18 to 60 inches: moderately alkaline, extremely gravelly loam

Properties and qualities

Slope: 35 to 60 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: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Minor Components

Windham, stony

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Windham, moderately deep

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

679D—Bangtail-Adel loams, 4 to 25 percent slopes

Map Unit Setting

Elevation: 5,250 to 6,650 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 45 percent

Adel and similar soils: 40 percent

Minor components: 15 percent

Description of Bangtail

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , bedrock

Properties and qualities

Slope: 4 to 25 percent

Depth to restrictive feature: 20 to 40 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)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Description of Adel

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium loamy colluvium

Typical profile

A1 - 0 to 14 inches: neutral, loam
A2 - 14 to 22 inches: neutral, loam
Bk - 22 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 4 to 25 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
Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Minor Components

Copenhaver

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (Sw) 20"+ p.z. NOT KNOWN (R043BS322MT)

Bangtail, steeper slopes

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Doby

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow Clay (SwC) 20"+ p.z. (R043BS733MT)

679E—Bangtail-Copenhaver complex, 8 to 25 percent slopes

Map Unit Setting

Elevation: 6,100 to 7,800 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 60 percent
Copenhaver and similar soils: 25 percent
Minor components: 15 percent

Description of Bangtail

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam
Bt - 9 to 23 inches: slightly acid, clay loam
C - 23 to 37 inches: neutral, clay loam
Cr - 37 to 60 inches: , bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 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
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Custom Soil Resource Report

Hydrologic Soil Group: C

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Description of Copenhagen

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, flaggy loam

Bt - 7 to 15 inches: neutral, very flaggy sandy clay loam

R - 15 to 19 inches: , bedrock

Properties and qualities

Slope: 8 to 25 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 20"+ p.z. NOT KNOWN (R043BS322MT)

Minor Components

Redchief, stony

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Bangtail, steeper slopes

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Rock outcrop

Percent of map unit: 2 percent

693E—Bangtail-Timberlin, stony complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 5,000 to 7,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 60 percent

Timberlin and similar soils: 30 percent

Minor components: 10 percent

Description of Bangtail

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam

Bt - 9 to 23 inches: slightly acid, clay loam

C - 23 to 37 inches: neutral, clay loam

Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 20 to 40 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

Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Description of Timberlin

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

A - 1 to 6 inches: neutral, flaggy loam

Bt1 - 6 to 11 inches: neutral, very flaggy clay loam

Bt2 - 11 to 25 inches: neutral, very flaggy clay loam

Cr - 25 to 30 inches: , weathered bedrock

R - 30 to 34 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 inches to lithic 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

Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Minor Components

Copenhaver

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220), Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Adel

Percent of map unit: 4 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Overflow (Ov) 20"+ p.z. NOT KNOWN (R043BS321MT)

Rock outcrop

Percent of map unit: 1 percent

693F—Bangtail-Timberlin complex, 35 to 60 percent slopes, stony

Map Unit Setting

Elevation: 4,800 to 7,500 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 60 percent
Timberlin and similar soils: 30 percent
Minor components: 10 percent

Description of Bangtail

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, gravelly loam
Bt - 9 to 23 inches: slightly acid, clay loam
C - 23 to 37 inches: neutral, clay loam
Cr - 37 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: 20 to 40 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
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Description of Timberlin

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material

A - 1 to 6 inches: neutral, flaggy loam

Bt₁ - 6 to 11 inches: neutral, very flaggy clay loam

Bt₂ - 11 to 25 inches: neutral, very flaggy clay loam

Cr - 25 to 30 inches: , weathered bedrock

R - 30 to 34 inches: , unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 0.1 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): 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

Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Minor Components

Copenhaver

Percent of map unit: 8 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220), Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Rock outcrop

Percent of map unit: 2 percent

714E—Adel-Uinta loams, 8 to 35 percent slopes

Map Unit Setting

Elevation: 5,550 to 6,700 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Adel and similar soils: 60 percent

Uinta and similar soils: 25 percent

Minor components: 15 percent

Description of Adel

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A - 0 to 14 inches: neutral, loam

Bw - 14 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 8 to 35 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

Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Description of Uinta

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Custom Soil Resource Report

Typical profile

Oi - 0 to 1 inches: strongly acid, slightly decomposed plant material

E - 1 to 6 inches: neutral, loam

Bt - 6 to 60 inches: neutral, clay loam

Properties and qualities

Slope: 8 to 35 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

Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/
snowberry (PK310), Douglas-fir/ninebark (PK260)

Minor Components

Danaher, stony

Percent of map unit: 10 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/grouse whortleberry (PK730)

Stemple, stony

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/twinflower-pinegrass phase (PK292)

748A—Hyalite-Beaverton complex, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,350 to 6,150 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Hyalite and similar soils: 70 percent
Beaverton and similar soils: 20 percent
Minor components: 10 percent

Description of Hyalite

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 5 inches: neutral, loam
Bt1 - 5 to 9 inches: neutral, clay loam
Bt2 - 9 to 17 inches: neutral, silty clay loam
2Bt3 - 17 to 26 inches: neutral, very cobbly sandy clay loam
3C - 26 to 60 inches: neutral, very cobbly 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 (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: 5 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Description of Beaverton

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 5 inches: neutral, cobbly loam
Bt - 5 to 21 inches: neutral, very gravelly clay loam
Bk - 21 to 25 inches: moderately alkaline, very cobbly coarse sandy loam
2Bk - 25 to 60 inches: moderately alkaline, extremely cobbly loamy coarse sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Custom Soil Resource Report

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

Farmland classification: Farmland of local importance

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: B

Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

Minor Components

Turner

Percent of map unit: 5 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Hyalite

Percent of map unit: 5 percent

Landform: Stream terraces, alluvial fans

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow to Gravel (SwGr) 15-19" p.z. (R044XS354MT)

752E—Meagher-Shawmut-Bowery complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 4,600 to 6,150 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Meagher and similar soils: 45 percent

Shawmut and similar soils: 35 percent

Bowery and similar soils: 10 percent

Minor components: 10 percent

Description of Meagher

Setting

Landform: Escarpments

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium colluvium

Typical profile

A - 0 to 6 inches: neutral, loam
Bt - 6 to 19 inches: neutral, clay loam
Bk1 - 19 to 31 inches: moderately alkaline, loam
2Bk2 - 31 to 60 inches: moderately alkaline, very cobbly sandy clay loam

Properties and qualities

Slope: 15 to 35 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: 40 percent
Gypsum, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Description of Shawmut

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 6 inches: neutral, cobbly loam
Bt - 6 to 14 inches: neutral, very cobbly sandy clay loam
Btk - 14 to 19 inches: moderately alkaline, very gravelly sandy clay loam
Bk - 19 to 60 inches: moderately alkaline, extremely gravelly sandy clay loam

Properties and qualities

Slope: 15 to 45 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 (0.20 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: 30 percent
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Description of Bowery

Setting

Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 22 inches: neutral, loam
Bw - 22 to 60 inches: neutral, clay loam

Properties and qualities

Slope: 15 to 35 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
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Overflow (Ov) 15-19" p.z. (R044XS351MT)

Minor Components

Shawmut

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)

Shawmut, stony

Percent of map unit: 5 percent
Landform: Escarpments
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty-Droughty (SiDr) 15-19" p.z. (R044XS690MT)

760C—Billman-Wilsall clay loams, 2 to 8 percent slopes

Map Unit Setting

Elevation: 5,300 to 6,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

Billman and similar soils: 60 percent
Wilsall and similar soils: 30 percent
Minor components: 10 percent

Description of Billman

Setting

Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, clay loam
Bt - 7 to 23 inches: neutral, clay
Cr - 23 to 60 inches: , weathered bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

Description of Wilsall

Setting

Landform: Plains

Custom Soil Resource Report

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 3 inches: neutral, clay loam
Bt - 3 to 10 inches: neutral, clay loam
Cr - 10 to 23 inches: , unweathered bedrock

Properties and qualities

Slope: 2 to 8 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 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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow Clay (SwC) 20"+ p.z. (R043BS733MT)

Minor Components

Tolbert

Percent of map unit: 5 percent
Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Burnel

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

760E—Billman-Wilsall clay loams, 8 to 25 percent slopes

Map Unit Setting

Elevation: 4,950 to 6,250 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 80 to 95 days

Map Unit Composition

Billman and similar soils: 50 percent

Wilsall and similar soils: 40 percent

Minor components: 10 percent

Description of Billman

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, clay loam

Bt - 7 to 23 inches: neutral, clay

Cr - 23 to 60 inches: , weathered bedrock

Properties and qualities

Slope: 8 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

Description of Wilsall

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 3 inches: neutral, clay loam

Bt - 3 to 10 inches: neutral, clay loam

Cr - 10 to 23 inches: , unweathered bedrock

Properties and qualities

Slope: 8 to 25 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 low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Custom Soil Resource Report

Frequency of ponding: None

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 7e

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow Clay (SwC) 20"+ p.z. (R043BS733MT)

Minor Components

Tolbert

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Burnel

Percent of map unit: 3 percent

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 20"+ p.z. NOT KNOWN (R043BS636MT)

Rock outcrop

Percent of map unit: 2 percent

768C—Farnuf-Absarokee complex, 4 to 8 percent slopes

Map Unit Setting

Elevation: 5,200 to 5,900 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Farnuf and similar soils: 55 percent

Absarokee and similar soils: 30 percent

Minor components: 15 percent

Description of Farnuf

Setting

Landform: Plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium colluvium

Custom Soil Resource Report

Typical profile

A - 0 to 4 inches: neutral, loam

Bt - 4 to 25 inches: neutral, clay loam

Bk - 25 to 60 inches: moderately alkaline, stratified gravelly sandy loam to silty 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 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: 10 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

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Description of Absarokee

Setting

Landform: Plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 5 inches: neutral, clay loam

Bt - 5 to 17 inches: slightly alkaline, clay

Bk - 17 to 25 inches: moderately alkaline, clay loam

R - 25 to 29 inches: , unweathered bedrock

Properties and qualities

Slope: 4 to 8 percent

Depth to restrictive feature: 20 to 40 inches to lithic 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: 15 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Custom Soil Resource Report

Hydrologic Soil Group: C

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Absarokee

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Tolbert

Percent of map unit: 5 percent

Landform: Plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Rock outcrop

Percent of map unit: 2 percent

769D—Absarokee-Work-Tolbert complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 4,950 to 6,100 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Absarokee and similar soils: 45 percent

Work and similar soils: 35 percent

Tolbert and similar soils: 10 percent

Minor components: 10 percent

Description of Absarokee

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 5 inches: neutral, clay loam

Bt - 5 to 17 inches: slightly alkaline, clay

Bk - 17 to 25 inches: moderately alkaline, clay loam

R - 25 to 29 inches: , unweathered bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Work

Setting

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

Typical profile

A - 0 to 5 inches: neutral, clay loam
Bt - 5 to 13 inches: neutral, clay
Bk - 13 to 60 inches: moderately alkaline, gravelly clay loam

Properties and qualities

Slope: 4 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 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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Tolbert

Setting

Landform: Hills

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, channery loam

Bt - 4 to 16 inches: neutral, very channery clay loam

R - 16 to 20 inches: , unweathered bedrock

Properties and qualities

Slope: 4 to 15 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Absarokee

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Thin Clayey (TCy) 15-19" p.z. (R044XS360MT)

Reedpoint

Percent of map unit: 3 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Very Shallow (VSw) RRU 58A-C 11-14" p.z. (R058AC058MT)

Rock outcrop

Percent of map unit: 2 percent

786F—Whitecow, stony-Lap, very stony-Rock outcrop complex, 35 to 60 percent slopes

Map Unit Setting

Elevation: 4,500 to 7,300 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Whitecow, stony, and similar soils: 50 percent
Rock outcrop: 20 percent
Lap, very stony, and similar soils: 20 percent
Minor components: 10 percent

Description of Whitecow, Stony

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone

Typical profile

Oi - 0 to 2 inches: strongly acid, slightly decomposed plant material
A - 2 to 12 inches: moderately alkaline, cobbly loam
Bk - 12 to 60 inches: moderately alkaline, very gravelly loam

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 0.1 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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B

Custom Soil Resource Report

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Description of Lap, Very Stony

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from limestone

Typical profile

A - 0 to 11 inches: slightly alkaline, very cobbly loam

Bk - 11 to 16 inches: moderately alkaline, extremely gravelly loam

R - 16 to 20 inches: , bedrock

Properties and qualities

Slope: 35 to 60 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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: 60 percent

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Very low (about 1.2 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Whitecow, moderately deep

Percent of map unit: 8 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Rubble land

Percent of map unit: 2 percent

792D—Danaher, stony-Loberg, very stony complex, 8 to 15 percent slopes

Map Unit Setting

Elevation: 5,300 to 6,900 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 34 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Danaher and similar soils: 70 percent
Loberg and similar soils: 20 percent
Minor components: 10 percent

Description of Danaher

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey colluvium derived from sandstone and shale

Typical profile

O_i - 0 to 3 inches: strongly acid, slightly decomposed plant material
E - 3 to 8 inches: slightly acid, loam
E/Bt - 8 to 13 inches: slightly acid, clay loam
Bt - 13 to 60 inches: slightly acid, cobbly clay

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): 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
Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Other vegetative classification: subalpine fir/Sitka alder (PK740), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Description of Loberg

Setting

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey colluvium derived from sandstone

Typical profile

O_i - 0 to 2 inches: strongly acid, slightly decomposed plant material

E₁ - 2 to 14 inches: slightly acid, very flaggy loam

E₂ - 14 to 22 inches: slightly acid, very flaggy loam

B_t - 22 to 60 inches: slightly acid, very channery clay loam

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 1.5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (K_{sat}): 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

Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C

Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Minor Components

Stemple, stony

Percent of map unit: 5 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/grouse whortleberry (PK730), subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Loberg

Percent of map unit: 4 percent

Landform: Mountains

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720)

Redlodge

Percent of map unit: 1 percent

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Custom Soil Resource Report

Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

814D—Adel-Copenhaver complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 5,400 to 6,300 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 34 to 45 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Adel and similar soils: 60 percent

Copenhaver and similar soils: 25 percent

Minor components: 15 percent

Description of Adel

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A1 - 0 to 14 inches: neutral, loam

A2 - 14 to 22 inches: neutral, loam

Bk - 22 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 4 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 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

Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Description of Copenhaver

Setting

Landform: Hills

Custom Soil Resource Report

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, channery loam

Bt - 7 to 15 inches: neutral, very flaggy sandy clay loam

R - 15 to 19 inches: , unweathered bedrock

Properties and qualities

Slope: 4 to 15 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 20"+ p.z. NOT KNOWN (R043BS322MT)

Minor Components

Zade

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Adel

Percent of map unit: 5 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Overflow (Ov) 20"+ p.z. NOT KNOWN (R043BS321MT)

Rock outcrop

Percent of map unit: 2 percent

860D—Bacbuster-Wilsall-Castner complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 4,400 to 6,200 feet

Custom Soil Resource Report

Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Bacbuster and similar soils: 60 percent
Castner and similar soils: 15 percent
Wilsall and similar soils: 15 percent
Minor components: 10 percent

Description of Bacbuster

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, clay loam
Bt - 4 to 15 inches: neutral, clay loam
Bk - 15 to 36 inches: moderately alkaline, clay loam
Cr - 36 to 60 inches: , bedrock

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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 6.6 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Wilsall

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 3 inches: neutral, clay loam
Bt - 3 to 10 inches: neutral, clay loam
Cr - 10 to 23 inches: , bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 4 to 15 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 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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow Clay (SwC) 15-19" p.z. (R044XS726MT)

Description of Castner

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: slightly alkaline, very channery loam
Bk - 6 to 18 inches: moderately alkaline, very channery sandy loam
R - 18 to 22 inches: , bedrock

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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: 15 percent
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Farmland of local importance
Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Work

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

Custom Soil Resource Report

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Rock outcrop

Percent of map unit: 2 percent

860E—Bacbuster-Wilsall-Castner complex, 15 to 45 percent slopes

Map Unit Setting

Elevation: 4,500 to 6,800 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Bacbuster and similar soils: 50 percent

Castner and similar soils: 20 percent

Wilsall and similar soils: 20 percent

Minor components: 10 percent

Description of Bacbuster

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, clay loam

Bt - 4 to 15 inches: neutral, clay loam

Bk - 15 to 36 inches: moderately alkaline, clay loam

Cr - 36 to 60 inches: , weathered bedrock

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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 6.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Thin Clayey (TCy) 15-19" p.z. (R044XS360MT)

Description of Wilsall

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 3 inches: neutral, clay loam
Bt - 3 to 10 inches: neutral, clay loam
Cr - 10 to 23 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 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 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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow Clay (SwC) 15-19" p.z. (R044XS726MT)

Description of Castner

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 6 inches: slightly alkaline, very channery loam
Bk - 6 to 18 inches: moderately alkaline, very channery sandy loam
R - 18 to 22 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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: 15 percent

Custom Soil Resource Report

Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Work

Percent of map unit: 8 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Rock outcrop

Percent of map unit: 2 percent

869D—Absarokee-Tolbert complex, 4 to 15 percent slopes

Map Unit Setting

Elevation: 5,200 to 6,100 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 90 to 110 days

Map Unit Composition

Absarokee and similar soils: 60 percent

Tolbert and similar soils: 25 percent

Minor components: 15 percent

Description of Absarokee

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 5 inches: neutral, clay loam

Bt - 5 to 17 inches: slightly alkaline, clay

Bk - 17 to 25 inches: moderately alkaline, clay loam

R - 25 to 60 inches: , bedrock

Custom Soil Resource Report

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
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: 15 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Tolbert

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, channery loam
Bt - 4 to 16 inches: neutral, very channery clay loam
R - 16 to 20 inches: , bedrock

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic 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
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Reedpoint

Percent of map unit: 8 percent
Landform: Hills
Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear
Ecological site: Very Shallow (VSw) RRU 58A-C 11-14" p.z. (R058AC058MT)

Absarokee

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Thin Clayey (TCy) 15-19" p.z. (R044XS360MT)

Rock outcrop

Percent of map unit: 2 percent

870E—Tolbert-Absarook-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

Elevation: 4,400 to 6,450 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 110 days

Map Unit Composition

Tolbert and similar soils: 45 percent
Absarook and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 10 percent

Description of Tolbert

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, channery loam
Bt - 4 to 16 inches: neutral, very channery clay loam
R - 16 to 20 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic 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
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Absarook

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 5 inches: neutral, loam
Bt - 5 to 20 inches: neutral, sandy clay loam
Bk - 20 to 32 inches: moderately alkaline, channery sandy loam
R - 32 to 36 inches: , unweathered bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 40 inches to lithic 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: 40 percent
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Thin Silty (TSi) 15-19" p.z. (R044XS363MT)

Minor Components

Tolbert

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Farnuf

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

879E—Bangtail-Copenhaver-Adel complex, 15 to 35 percent slopes

Map Unit Setting

Elevation: 5,400 to 7,200 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Bangtail and similar soils: 40 percent
Copenhaver and similar soils: 30 percent
Adel and similar soils: 20 percent
Minor components: 10 percent

Description of Bangtail

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: slightly acid, loam
Bt - 9 to 23 inches: slightly acid, clay loam
C - 23 to 37 inches: neutral, clay loam
Cr - 37 to 60 inches: , bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 40 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
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 20"+ p.z. (R043BS323MT)

Description of Copenhaver

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, flaggy loam

Bt - 7 to 15 inches: neutral, very flaggy sandy clay loam

R - 15 to 19 inches: , bedrock

Properties and qualities

Slope: 15 to 35 percent

Depth to restrictive feature: 10 to 20 inches to lithic 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

Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 20"+ p.z. NOT KNOWN (R043BS322MT)

Description of Adel

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loamy alluvium loamy colluvium

Typical profile

A1 - 0 to 14 inches: neutral, loam

A2 - 14 to 22 inches: neutral, loam

Bw - 22 to 60 inches: neutral, gravelly loam

Properties and qualities

Slope: 15 to 35 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

Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Custom Soil Resource Report

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: Overflow (Ov) 20"+ p.z. NOT KNOWN (R043BS321MT)

Minor Components

Doby

Percent of map unit: 6 percent

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow Clay (SwC) 20"+ p.z. (R043BS733MT)

Rock outcrop

Percent of map unit: 2 percent

Redlodge

Percent of map unit: 2 percent

Landform: Depressions

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Wet Meadow (WM) 20"+ p.z. (R043BS327MT)

960E—Billman-Wilsall-Tolbert complex, 8 to 45 percent slopes

Map Unit Setting

Elevation: 4,950 to 6,300 feet

Mean annual precipitation: 18 to 22 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 80 to 95 days

Map Unit Composition

Billman and similar soils: 50 percent

Wilsall and similar soils: 20 percent

Tolbert and similar soils: 20 percent

Minor components: 10 percent

Description of Billman

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, clay loam

Bt - 7 to 23 inches: neutral, clay

Custom Soil Resource Report

Cr - 23 to 60 inches: , weathered bedrock

Properties and qualities

Slope: 8 to 45 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

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

Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Thin Clayey (TCy) 15-19" p.z. (R044XS360MT)

Description of Tolbert

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, very channery loam

Bt - 4 to 16 inches: neutral, very cobbly clay loam

R - 16 to 20 inches: , unweathered bedrock

Properties and qualities

Slope: 8 to 45 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

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

Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Wilsall

Setting

Landform: Hills

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Custom Soil Resource Report

Typical profile

A - 0 to 3 inches: neutral, clay loam
Bt - 3 to 10 inches: neutral, clay loam
Cr - 10 to 23 inches: , unweathered bedrock

Properties and qualities

Slope: 8 to 45 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 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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow Clay (SwC) 15-19" p.z. (R044XS726MT)

Minor Components

Burnel

Percent of map unit: 8 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Rock outcrop

Percent of map unit: 2 percent

991F—Whitore-Rock outcrop complex, 35 to 70 percent slopes

Map Unit Setting

Elevation: 4,700 to 8,600 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Whitore and similar soils: 70 percent
Rock outcrop: 20 percent
Minor components: 10 percent

Description of Whitore

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from limestone

Typical profile

O_i - 0 to 1 inches: strongly acid, slightly decomposed plant material
A - 1 to 3 inches: moderately alkaline, gravelly loam
B_w - 3 to 15 inches: moderately alkaline, very gravelly loam
B_k - 15 to 60 inches: moderately alkaline, very gravelly loam

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (K_{sat}): Moderately high to high (0.20 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: 60 percent
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Accola

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Whitore, moderately deep

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear

Custom Soil Resource Report

Other vegetative classification: Douglas-fir/pinegrass (PK320), Douglas-fir/snowberry (PK310)

Gallatin National Forest Area, Montana

64-2A—Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains

Map Unit Setting

Elevation: 6,500 to 8,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Typic cryoborolls and similar soils: 50 percent
Argic cryoborolls and similar soils: 50 percent

Description of Argic Cryoborolls

Setting

Landform: Terraces, flood plains
Parent material: Loamy outwash

Properties and qualities

Slope: 0 to 10 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

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Typic Cryoborolls

Setting

Landform: Flood plains, terraces
Parent material: Loamy outwash

Properties and qualities

Slope: 0 to 10 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

Interpretive groups

Farmland classification: Not prime farmland

Custom Soil Resource Report

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

66-1A—Cryaquolls and Cryaquents, flood plains

Map Unit Setting

Elevation: 6,600 to 8,600 feet
Mean annual precipitation: 20 to 50 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 30 to 60 days

Map Unit Composition

Cryaquolls and similar soils: 50 percent
Cryaquents and similar soils: 50 percent

Description of Cryaquents

Setting

Landform: Flood plains

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly 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: About 12 to 24 inches
Frequency of flooding: Rare
Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D

Description of Cryaquolls

Setting

Landform: Flood plains

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly 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: About 0 to 30 inches
Frequency of flooding: Frequent

Frequency of ponding: None

71-1D—Typic Cryoboralfs-Typic Cryochrepts complex, landslides

Map Unit Setting

Elevation: 7,000 to 8,000 feet

Mean annual precipitation: 20 to 35 inches

Mean annual air temperature: 36 to 43 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Typic cryoboralfs and similar soils: 40 percent

Typic cryochrepts and similar soils: 35 percent

Description of Typic Cryoboralfs

Setting

Landform: Landslides

Typical profile

E1 - 0 to 7 inches: moderately acid, gravelly loam

Properties and qualities

Slope: 5 to 20 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

Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: subalpine fir/grouse whortleberry (PK730)

Description of Typic Cryochrepts

Setting

Landform: Landslides

Parent material: Loamy mass movement deposits derived from shale and siltstone

Properties and qualities

Slope: 5 to 20 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): Moderately high to high (0.57 to 1.98 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: B

Other vegetative classification: subalpine fir/grouse whortleberry (PK730)

84-2B—Mollic Cryoboralfs-Argic Cryoborolls association, structurally controlled slopes

Map Unit Setting

Elevation: 6,400 to 7,000 feet

Mean annual precipitation: 20 to 35 inches

Mean annual air temperature: 36 to 43 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Mollic cryoboralfs and similar soils: 70 percent

Argic cryoborolls and similar soils: 20 percent

Minor components: 5 percent

Description of Mollic Cryoboralfs

Setting

Landform: Dip slopes, scarp slopes

Typical profile

E1 - 0 to 15 inches: moderately acid, very gravelly loam

Properties and qualities

Slope: 10 to 20 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

Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/pinegrass (PK750)

Description of Argic Cryoborolls

Setting

Landform: Dip slopes, scarp slopes

Parent material: Loamy colluvium derived from sandstone and shale

Properties and qualities

Slope: 10 to 20 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

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/pinegrass (PK750)

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/pinegrass (PK750)

85-3A—Mollic Cryoboralfs-Argic Cryoborolls-Rock outcrop complex, structurally controlled slopes, steep

Map Unit Setting

Elevation: 6,300 to 7,200 feet

Mean annual precipitation: 20 to 35 inches

Mean annual air temperature: 36 to 43 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Argic cryoborolls and similar soils: 35 percent

Mollic cryoboralfs and similar soils: 35 percent

Rock outcrop: 20 percent

Description of Mollic Cryoboralfs

Setting

Landform: Dip slopes, scarp slopes

Custom Soil Resource Report

Typical profile

E1 - 0 to 15 inches: moderately acid, very gravelly loam

Properties and qualities

Slope: 45 to 70 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

Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/snowberry (PK310)

Description of Argic Cryoborolls

Setting

Landform: Scarp slopes, dip slopes

Parent material: Loamy colluvium derived from sandstone and siltstone

Properties and qualities

Slope: 45 to 70 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

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/snowberry (PK310)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Other vegetative classification: Douglas-fir/snowberry (PK310)

85-3B—Mollic Cryoboralfs-Argic Cryoborolls complex, structurally controlled slopes, steep

Map Unit Setting

Elevation: 6,600 to 7,800 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 36 to 43 degrees F
Frost-free period: 50 to 70 days

Map Unit Composition

Mollic cryoboralfs and similar soils: 60 percent
Argic cryoborolls and similar soils: 20 percent
Minor components: 10 percent

Description of Mollic Cryoboralfs

Setting

Landform: Scarp slopes, dip slopes

Typical profile

E1 - 0 to 15 inches: moderately acid, very gravelly loam

Properties and qualities

Slope: 45 to 70 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
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/blue huckleberry (PK720)

Description of Argic Cryoborolls

Setting

Landform: Scarp slopes, dip slopes
Parent material: Loamy colluvium derived from sandstone and siltstone

Properties and qualities

Slope: 45 to 70 percent

Custom Soil Resource Report

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

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/blue huckleberry (PK720)

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/blue huckleberry (PK720)

86-3B—Typic Cryoboralfs-Mollic Cryoboralfs complex, structurally controlled slopes, warm

Map Unit Setting

Elevation: 5,500 to 7,000 feet

Mean annual precipitation: 20 to 35 inches

Mean annual air temperature: 37 to 41 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Typic cryoboralfs and similar soils: 60 percent

Mollic cryoboralfs and similar soils: 25 percent

Minor components: 5 percent

Description of Typic Cryoboralfs

Setting

Landform: Scarp slopes, dip slopes

Properties and qualities

Slope: 10 to 30 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

Custom Soil Resource Report

Frequency of flooding: None

Frequency of ponding: None

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/grouse whortleberry (PK730)

Description of Mollic Cryoboralfs

Setting

Landform: Dip slopes, scarp slopes

Parent material: Loamy colluvium derived from sandstone and shale

Properties and qualities

Slope: 10 to 30 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

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: C

Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/grouse whortleberry (PK730)

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Other vegetative classification: Douglas-fir/snowberry (PK310), subalpine fir/grouse whortleberry (PK730)

86-3C—Argic Cryoborolls-Typic Cryoborolls association, structurally controlled slopes

Map Unit Setting

Elevation: 5,500 to 7,000 feet

Mean annual precipitation: 10 to 20 inches

Mean annual air temperature: 36 to 39 degrees F

Frost-free period: 50 to 70 days

Map Unit Composition

Argic cryoborolls and similar soils: 65 percent
Typic cryoborolls and similar soils: 25 percent
Minor components: 5 percent

Description of Argic Cryoborolls

Setting

Landform: Dip slopes, scarp slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy colluvium derived from sandstone and shale

Typical profile

A - 0 to 10 inches: neutral, silt loam
Bt - 10 to 32 inches: neutral, clay loam
C - 32 to 60 inches: neutral, clay loam

Properties and qualities

Slope: 10 to 45 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
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C

Description of Typic Cryoborolls

Setting

Landform: Scarp slopes, dip slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy colluvium derived from sandstone and shale

Typical profile

A - 0 to 7 inches: slightly acid, sandy loam
Bw - 7 to 22 inches: slightly acid, very gravelly sandy loam
C - 22 to 60 inches: moderately acid, very cobbly loamy sand

Properties and qualities

Slope: 10 to 45 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

Custom Soil Resource Report

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Minor Components

Rock outcrop

Percent of map unit: 5 percent

Park County Area, Montana

48B—Tamaneen clay loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,900 to 5,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Tamaneen and similar soils: 85 percent
Minor components: 15 percent

Description of Tamaneen

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 3 inches: neutral, cobbly clay loam
Bt - 3 to 12 inches: slightly alkaline, clay loam
Btk - 12 to 15 inches: moderately alkaline, clay loam
Bk1 - 15 to 28 inches: strongly alkaline, very gravelly sandy loam
2Bk2 - 28 to 60 inches: moderately alkaline, very cobbly 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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Absarokee

Percent of map unit: 4 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread, riser

Custom Soil Resource Report

Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Shawmut

Percent of map unit: 4 percent
Landform: Stream terraces
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Clunton

Percent of map unit: 4 percent
Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Fairfield, gravelly substratum

Percent of map unit: 3 percent
Landform: Stream terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

248B—Tamaneen cobbly clay loam, 0 to 4 percent slopes

Map Unit Setting

Elevation: 4,300 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Tamaneen, cobbly clay loam, and similar soils: 80 percent
Minor components: 20 percent

Description of Tamaneen, Cobbly Clay Loam

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Clayey alluvium derived from igneous and sedimentary rock

Custom Soil Resource Report

Typical profile

Ap - 0 to 3 inches: neutral, cobbly clay loam
Bt - 3 to 12 inches: slightly alkaline, clay loam
Btk - 12 to 15 inches: moderately alkaline, clay loam
Bk1 - 15 to 28 inches: strongly alkaline, very gravelly sandy loam
2Bk2 - 28 to 60 inches: moderately alkaline, very cobbly 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: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 35 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Minor Components

Shawmut, cobbly clay loam

Percent of map unit: 12 percent
Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Clunton

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Fairfield, very cobbly

Percent of map unit: 2 percent
Landform: Stream terraces
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Work, cobbly clay loam

Percent of map unit: 2 percent
Landform: Stream terraces

Custom Soil Resource Report

Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Absarokee

Percent of map unit: 1 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Silty-Steep (SiStp) 15-19" p.z. (R044XS689MT)

500A—Soapcreek, moderately saline-Absay complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Elevation: 5,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Soapcreek, moderately saline, and similar soils: 60 percent
Absay and similar soils: 30 percent
Minor components: 10 percent

Description of Soapcreek, Moderately Saline

Setting

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

Typical profile

A - 0 to 13 inches: moderately alkaline, silty clay loam
Bk1 - 13 to 20 inches: moderately alkaline, silty clay loam
Bk2 - 20 to 28 inches: moderately alkaline, silty clay
Bg1 - 28 to 42 inches: moderately alkaline, silty clay
Bg2 - 42 to 60 inches: moderately alkaline, fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 39 inches
Frequency of flooding: Rare

Custom Soil Resource Report

Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (4.0 to 10.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 13.0
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)
Other vegetative classification: quaking aspen/redosier dogwood h.t. (HP217)

Description of Absay

Setting

Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

E - 0 to 3 inches: strongly alkaline, silty clay loam
Btnz - 3 to 7 inches: strongly alkaline, silty clay
Btknz - 7 to 15 inches: strongly alkaline, silty clay
Bkz - 15 to 34 inches: strongly alkaline, clay
Bkg1 - 34 to 41 inches: moderately alkaline, clay loam
Bkg2 - 41 to 60 inches: moderately alkaline, clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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: About 24 to 39 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 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 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 7s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Minor Components

Clunton

Percent of map unit: 10 percent
Landform: Drainageways
Down-slope shape: Concave

Custom Soil Resource Report

Across-slope shape: Concave

501A—Soapcreek-Clunton complex, 0 to 4 percent slopes, occasionally flooded

Map Unit Setting

Elevation: 4,900 to 5,600 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 42 degrees F

Frost-free period: 70 to 90 days

Map Unit Composition

Soapcreek and similar soils: 55 percent

Clunton and similar soils: 30 percent

Minor components: 15 percent

Description of Soapcreek

Setting

Landform: Stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 12 inches: slightly alkaline, clay loam

Bk1 - 12 to 20 inches: moderately alkaline, silty clay loam

Bk2 - 20 to 31 inches: moderately alkaline, silty clay

Bg1 - 31 to 44 inches: moderately alkaline, silty clay loam

Bg2 - 44 to 46 inches: moderately alkaline, fine sandy loam

Bg3 - 46 to 60 inches: moderately alkaline, silty clay loam

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly 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: About 24 to 39 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Gypsum, maximum in profile: 5 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Custom Soil Resource Report

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: D

Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Other vegetative classification: quaking aspen/redosier dogwood h.t. (HP217)

Description of Clunton

Setting

Landform: Flood plains

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: strongly acid, muck

Ag - 4 to 18 inches: neutral, loam

Cg1 - 18 to 30 inches: neutral, clay loam

Cg2 - 30 to 36 inches: neutral, silty clay loam

Cg3 - 36 to 42 inches: neutral, sandy loam

2Cg4 - 42 to 50 inches: neutral, gravelly sandy loam

2Cg5 - 50 to 57 inches: neutral, gravelly loamy sand

2Cg6 - 57 to 64 inches: neutral, silt loam

Properties and qualities

Slope: 0 to 4 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: Occasional

Frequency of ponding: None

Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): 5w

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: C/D

Minor Components

Macar

Percent of map unit: 5 percent

Landform: Stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Other vegetative classification: quaking aspen/redosier dogwood h.t. (HP217)

Meadowcreek

Percent of map unit: 5 percent

Landform: Stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear

Custom Soil Resource Report

Other vegetative classification: narrowleaf cottonwood/redosier dogwood c.t.
(HP212)

Bigsandy

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Concave

Across-slope shape: Convex

Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Other vegetative classification: quaking aspen/redosier dogwood h.t. (HP217)

510A—Bobkitty-Bonebasin complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 3,950 to 5,700 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 37 to 45 degrees F

Frost-free period: 95 to 120 days

Map Unit Composition

Bobkitty and similar soils: 65 percent

Bonebasin and similar soils: 25 percent

Minor components: 10 percent

Description of Bobkitty

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 5 inches: moderately alkaline, loam

C - 5 to 48 inches: strongly alkaline, stratified sandy loam to silty clay loam

2C - 48 to 60 inches: moderately alkaline, stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 24 to 42 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent

Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 30.0

Custom Soil Resource Report

Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6w

Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: C

Ecological site: Saline Subirrigated (SSb) 9-14" p.z. (R044XS333MT)

Description of Bonebasin

Setting

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: strongly acid, muck

A - 4 to 15 inches: slightly alkaline, loam

Cg - 15 to 25 inches: slightly alkaline, stratified sandy loam to silty clay loam

2C - 25 to 60 inches: neutral, very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Very poorly 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: About 0 to 12 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: B/D

Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

Minor Components

Rivra

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Shallow to Gravel (SwGr) 9-14" p.z. (R044XS338MT)

Ryell

Percent of map unit: 3 percent

Landform: Stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Silty (Si) 9-14" p.z. (R044XS339MT)

Lamoose

Percent of map unit: 2 percent
Landform: Channels
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Wet Meadow (WM) 9-14" p.z. (R044XS349MT)

536A—Clunton and Bigsandy loams, 0 to 4 percent slopes, occasionally flooded

Map Unit Setting

Elevation: 5,000 to 5,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Clunton and similar soils: 45 percent
Bigsandy and similar soils: 40 percent
Minor components: 15 percent

Description of Clunton

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

A1 - 0 to 5 inches: neutral, loam
A2 - 5 to 12 inches: neutral, clay loam
Bg - 12 to 28 inches: neutral, silty clay loam
Cg1 - 28 to 35 inches: neutral, silty clay loam
2Cg2 - 35 to 60 inches: neutral, stratified sandy clay loam to loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.13 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Description of Bigsandy

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and clayey alluvium

Typical profile

A - 0 to 3 inches: moderately alkaline, loam
C - 3 to 11 inches: strongly alkaline, stratified fine sandy loam to silty clay loam
Cg - 11 to 60 inches: strongly alkaline, stratified silty clay loam to loamy fine sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly 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: About 12 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 3 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (4.0 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

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: D
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

Minor Components

Fairway

Percent of map unit: 10 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Subirrigated (Sb) 15-19" p.z. (R044XS359MT)

Bigsandy, saline phase

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

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Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

546C—Bacbuster-Wilsall complex, 2 to 8 percent slopes

Map Unit Setting

Elevation: 4,900 to 5,500 feet

Mean annual precipitation: 15 to 19 inches

Mean annual air temperature: 39 to 42 degrees F

Frost-free period: 70 to 90 days

Map Unit Composition

Bacbuster and similar soils: 60 percent

Wilsall and similar soils: 25 percent

Minor components: 15 percent

Description of Bacbuster

Setting

Landform: Low hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 4 inches: neutral, clay loam

Bt - 4 to 12 inches: slightly alkaline, clay

Bk - 12 to 28 inches: moderately alkaline, clay loam

Cr - 28 to 60 inches: , bedrock

Properties and qualities

Slope: 2 to 8 percent

Depth to restrictive feature: 16 to 40 inches to paralithic bedrock

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 (0.8 to 1.5 mmhos/cm)

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Wilsall

Setting

Landform: Low hills
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, clay loam
Bt - 4 to 13 inches: neutral, clay
Cr - 13 to 60 inches: , bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 9 to 20 inches to paralithic bedrock
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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow Clay (SwC) 15-19" p.z. (R044XS726MT)

Minor Components

Vershal

Percent of map unit: 10 percent
Landform: Low hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Very Shallow (VSw) 15-19" p.z. (R044XS364MT)

Bigsandy

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear, concave
Across-slope shape: Concave
Ecological site: Wet Meadow (WM) 15-19" p.z. (R044XS365MT)

746E—Bacbuster-Vershal complex, 4 to 25 percent slopes

Map Unit Setting

Elevation: 5,000 to 5,900 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Bacbuster and similar soils: 65 percent
Vershal and similar soils: 20 percent
Minor components: 15 percent

Description of Bacbuster

Setting

Landform: Hillslopes
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, clay loam
Bt - 4 to 13 inches: slightly alkaline, clay
Bk - 13 to 30 inches: moderately alkaline, clay loam
Cr - 30 to 59 inches: , weathered bedrock

Properties and qualities

Slope: 4 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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 (0.8 to 1.5 mmhos/cm)
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Loamy (Lo) LRU 44B-B (R044BB032MT)

Description of Vershal

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Channery residuum weathered from sedimentary rock

Typical profile

A1 - 0 to 4 inches: neutral, very channery loam
A2 - 4 to 8 inches: neutral, extremely channery loam
R - 8 to 60 inches: , bedrock

Properties and qualities

Slope: 4 to 25 percent
Depth to restrictive feature: 5 to 10 inches to lithic bedrock
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
Salinity, maximum in profile: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water storage in profile: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Very Shallow (VSw) LRU 43B-D (R043BD170MT)

Minor Components

Rock outcrop

Percent of map unit: 5 percent

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Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Ecological site: Shallow Droughty (SwDr) LRU 43B-C (R043BC138MT)

Work

Percent of map unit: 5 percent
Landform: Hillslopes, drainageways on hillslopes
Landform position (two-dimensional): Toeslope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Ecological site: Overflow (Ov) LRU 44B-B (R044BB060MT)

946D—Bacbuster-Wilsall-Tolbert complex, 2 to 15 percent slopes

Map Unit Setting

Elevation: 5,100 to 6,100 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Bacbuster and similar soils: 40 percent
Wilsall and similar soils: 30 percent
Tolbert and similar soils: 15 percent
Minor components: 15 percent

Description of Bacbuster

Setting

Landform: Hillslopes
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 6 inches: neutral, clay loam
Bt - 6 to 13 inches: slightly alkaline, clay
Bk - 13 to 28 inches: moderately alkaline, clay loam
Cr - 28 to 59 inches: , weathered bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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 (0.8 to 1.5 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Loamy (Lo) LRU 44B-B (R044BB032MT)

Description of Wilsall

Setting

Landform: Hillslopes

Landform position (two-dimensional): Shoulder, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex, concave

Across-slope shape: Concave, linear

Parent material: Colluvium over residuum weathered from sandstone and shale

Typical profile

A - 0 to 4 inches: neutral, clay loam

Bt - 4 to 13 inches: neutral, clay

Cr - 13 to 60 inches: , bedrock

Properties and qualities

Slope: 2 to 15 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 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

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D

Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Description of Tolbert

Setting

Landform: Knolls on hillslopes

Down-slope shape: Linear, convex

Across-slope shape: Convex

Parent material: Colluvium over residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: neutral, very channery loam

Bt - 7 to 12 inches: neutral, very cobbly clay loam

R - 12 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 2 to 15 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

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

Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Work

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Foothlope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: Clayey (Cy) 15-19" p.z. (R044XS350MT)

Rock outcrop

Percent of map unit: 5 percent

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Percent of map unit: 5 percent
Landform: Drainageways on hillslopes
Down-slope shape: Linear, concave
Across-slope shape: Convex, concave

5428E—Work-Castner-Wickes complex, 2 to 15 percent slopes

Map Unit Setting

Elevation: 5,200 to 5,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Work and similar soils: 55 percent
Wickes, cobbly, and similar soils: 15 percent
Castner and similar soils: 15 percent
Minor components: 15 percent

Description of Work

Setting

Landform: Hillslopes on anticlines
Landform position (two-dimensional): Backslope, foothlope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear

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Typical profile

Ap - 0 to 5 inches: neutral, clay loam
Bt - 5 to 15 inches: slightly alkaline, clay
Bk - 15 to 60 inches: moderately alkaline, silty clay loam

Properties and qualities

Slope: 2 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 1.0 mmhos/cm)
Available water storage in profile: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Description of Castner

Setting

Landform: Hillslopes on anticlines
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 5 inches: slightly alkaline, extremely gravelly fine sandy loam
Bk - 5 to 13 inches: moderately alkaline, extremely gravelly sandy loam
R - 13 to 23 inches: , bedrock

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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: 15 percent
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Description of Wickes, Cobbly

Setting

Landform: Hillslopes on anticlines

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Gravelly slope alluvium derived from sandstone and shale over loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: neutral, very gravelly fine sandy loam

Bt - 8 to 24 inches: neutral, very gravelly clay loam

Bk - 24 to 30 inches: moderately alkaline, extremely cobbly loam

R - 30 to 34 inches: , bedrock

Properties and qualities

Slope: 2 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): 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: 25 percent

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Ecological site: Silty (Si) 15-19" p.z. (R044XS355MT)

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Whitlash

Percent of map unit: 5 percent

Landform: Hillslopes on anticlines

Landform position (two-dimensional): Shoulder, summit, backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

5543E—Wickes-Shambo-Whitlash complex, 8 to 35 percent slopes

Map Unit Setting

Elevation: 5,100 to 5,600 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Map Unit Composition

Wickes and similar soils: 40 percent
Shambo and similar soils: 25 percent
Whitlash, very gravelly, and similar soils: 18 percent
Minor components: 17 percent

Description of Wickes

Setting

Landform: Hillslopes on anticlines
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Gravelly slope alluvium derived from sandstone and shale over loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 8 inches: neutral, very gravelly fine sandy loam
Bt - 8 to 24 inches: neutral, very gravelly clay loam
Bk - 24 to 30 inches: moderately alkaline, extremely cobbly loam
R - 30 to 34 inches: , bedrock

Properties and qualities

Slope: 8 to 35 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: 25 percent
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Ecological site: Silty-Droughty-Steep (SiDrStp) 15-19" p.z. (R044XS356MT)
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Shambo

Setting

Landform: Hillslopes on anticlines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Linear

Typical profile

A - 0 to 5 inches: neutral, fine sandy loam
Bw - 5 to 14 inches: slightly alkaline, clay loam
Bk - 14 to 38 inches: moderately alkaline, clay loam
BC - 38 to 60 inches: moderately alkaline, clay loam

Properties and qualities

Slope: 8 to 35 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
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Ecological site: Silty-Steep (SiStp) 15-19" p.z. (R044XS689MT)
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)

Description of Whitlash, Very Gravelly

Setting

Landform: Hillslopes on anticlines
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Linear, convex
Across-slope shape: Convex

Typical profile

A - 0 to 4 inches: neutral, very channery loam
Bw - 4 to 12 inches: neutral, very channery sandy loam
R - 12 to 22 inches: , bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
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
Available water storage in profile: Very low (about 1.1 inches)

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Interpretive groups

Land capability classification (irrigated): None specified

Ecological site: Shallow (Sw) 15-19" p.z. (R044XS353MT)

Minor Components

Rock outcrop

Percent of map unit: 12 percent

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Percent of map unit: 5 percent

Landform: Hillslopes, stream terraces

Landform position (three-dimensional): Crest, tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Ecological site: Silty-Steep (SiStp) 15-19" p.z. (R044XS689MT)

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

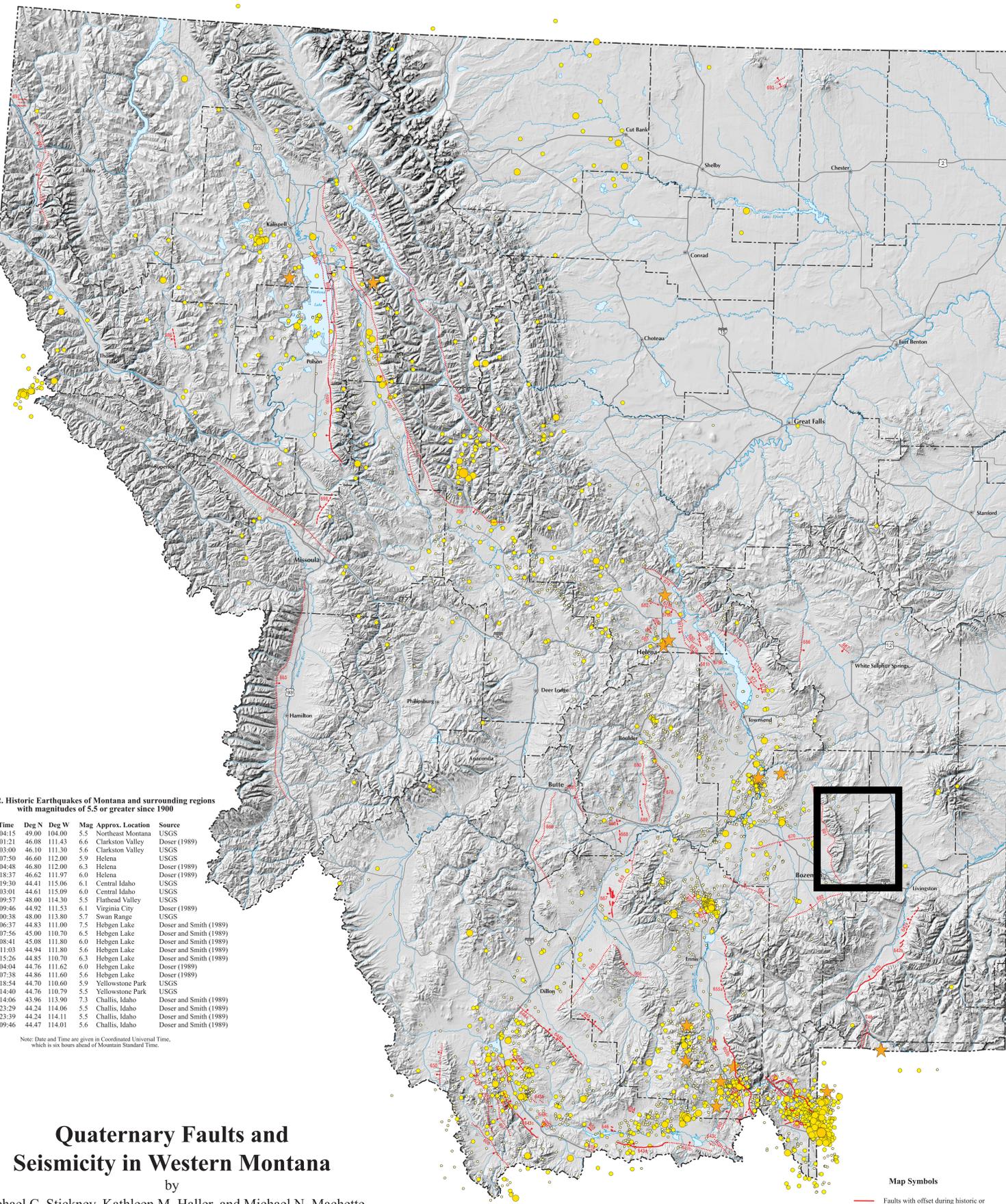
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Attachment 3

Seismicity in Western Montana





Quaternary Faults and Seismicity in Western Montana

by
Michael C. Stickney, Kathleen M. Haller, and Michael N. Machette
2000



Table 1. Names and parameters of Quaternary faults in western Montana.

Fault no.	Fault name	Most recent earthquake	Slip rate (mm/yr)	End-to-end length (km)	Strike (average)	Fault type, down direction
606	Deadman fault*	<1.6 Ma	-0.2 (7)	70.8	360°	Normal, SW
607	Unnamed fault near Mondak*	<1.6 Ma	-0.2 (7)	13.7	302°	Normal, NE
611	Unnamed (north) section	<1.6 Ma	-0.2 (7)	14.4	337°	Normal, NE
612	Red Rock fault	<1.6 Ma	-0.2 (7)	40.7	327°	Normal, NE
614	Unnamed (north) section	<1.6 Ma	-0.2 (7)	14.4	337°	Normal, NE
615	Sheep Creek section	<15 ka	0.2-1.0 (7)	14.8	316°	Normal, NE
616	Emigrant fault	<1.6 Ma	-0.2 (7)	41.0	41°	Normal, NE
617	Unnamed (north) section	<15 ka	0.2-1.0 (7)	12.9	21°	Normal, W
618	Unnamed (south) section	<1.6 Ma	-0.2 (7)	40.0	48°	Normal, NE
619	Centennial fault*	<15 ka	0.2-1.0 (7)	62.5	282°	Normal, N
620	Western Centennial Valley section	<1.6 Ma	-0.2 (7)	23.2	87°	Normal, N
621	Red Rock Lakes section	<1.6 Ma	1.0-5.0	20.0	280°	Normal, N
622	Red Rock Lakes section	<1.6 Ma	-0.2 (7)	3.8	308°	Normal, NE & SW
623	Blackfoot fault	<1.6 Ma	-0.2 (7)	39.7	311°	Normal, NE
624	Unnamed (northwest) section	<1.6 Ma	-0.2 (7)	11.8	310°	Normal, NE
625	Centennial section	<1.6 Ma	-0.2 (7)	31.7	310°	Normal, NE
626	Sweetwater fault	<1.6 Ma	-0.2 (7)	13.2	307°	Normal, NE
627	Luna Reservoir fault	<1.6 Ma	-0.2 (7)	28.9	299°	Normal, N & S
628	Kispiox fault	<1.6 Ma	-0.2 (7)	14.2	337°	Normal, SW
629	Red Rock Hills fault	<1.6 Ma	-0.2 (7)	36.3	314°	Normal, SW
630	Monument Hill section	<1.6 Ma	-0.2 (7)	10.7	324°	Normal, SW
631	Unnamed (central) section	<1.6 Ma	-0.2 (7)	18.2	307°	Normal, SW
632	Unnamed (south) section	<1.6 Ma	-0.2 (7)	5.4	311°	Normal, SW
633	Tobacco Root fault	<1.6 Ma	-0.2 (7)	22.4	209°	Normal, W
634	South Horse Prairie Basin fault*	<1.6 Ma	-0.2 (7)	24.8	2°	Normal, W
635	East Muddy Creek fault	<1.6 Ma	-0.2 (7)	18.2	377°	Normal, SW
636	Unnamed fault near Trail Creek	<1.6 Ma	-0.2 (7)	2.2	308°	Normal, SW
637	Unnamed fault near Middle Creek	<1.6 Ma	-0.2 (7)	2.4	284°	Normal, W
638	Madison fault	<1.6 Ma	-0.2 (7)	98.7	341°	Normal, W
639	Unnamed (north) section	<1.6 Ma	-0.2 (7)	38.8	322°	Normal, W
640	Madison Canyon section*	<1.6 Ma	0.2-1.0	37.9	338°	Normal, W
641	Unnamed (south) section	<1.6 Ma	-0.2 (7)	22.2	327°	Normal, SW
642	Hobgen fault	1959	1.0-5.0	12.9	307°	Normal, SW
643	Red Rock fault	1959	1.0-5.0	30.0	309°	Normal, SW
644	West Fork fault	1959	-0.2 (7)	2.8	64°	Normal, SE
645	Unnamed fault in Hobgen Lake basin	1959	0.2-1.0 (7)	11.5	244°	Normal, NE, SW, & NW
646	Unnamed fault near Mile Creek	<1.6 Ma	-0.2 (7)	5.9	39°	Normal, W
647	Wheat Creek fault	<1.6 Ma	-0.2 (7)	4.0	241°	Normal, W & E
648	Bradley Creek fault	<1.6 Ma	-0.2 (7)	9.6	329°	Normal, NE
649	Bitterroot fault	<1.6 Ma	-0.2 (7)	98.4	304°	Normal, SW
650	Unnamed fault near Cliff Lake	<1.6 Ma	-0.2 (7)	30.4	304°	Normal, SW
651	Ruby Range western border fault	<1.6 Ma	-0.2 (7)	38.0	37°	Normal, NW
652	Ruby Range northern border fault	<1.6 Ma	-0.2 (7)	21.8	387°	Normal, E & W
653	Georgia Gulch fault	<1.6 Ma	-0.2 (7)	14.2	348°	Normal, W
654	Vendone fault	<1.6 Ma	-0.2 (7)	11.4	347°	Normal, E & W
655	Rocker fault	<1.6 Ma	-0.2 (7)	45.4	0°	Normal, W
656	Conrad Park fault	<1.6 Ma	-0.2 (7)	30.3	77°	Normal, S
657	Canyon Ferry fault	<1.6 Ma	-0.2 (7)	35.0	321°	Normal, SW
658	Unnamed (north) section	<1.6 Ma	-0.2 (7)	18.2	308°	Normal, SW
659	Unnamed (south) section	<1.6 Ma	-0.2 (7)	17.8	335°	Normal, SW
660	Lower Snake Creek fault	<1.6 Ma	-0.2 (7)	6.8	317°	Normal, SW
661	Indian Creek fault	<1.6 Ma	-0.2 (7)	3.9	325°	Normal, NE & SW
662	Hilger fault	<1.6 Ma	-0.2 (7)	2.0	299°	Normal, SW
663	Sour Creek fault	<1.6 Ma	-0.2 (7)	12.9	329°	Normal, SW
664	Boulder River valley western border fault	<1.6 Ma	-0.2 (7)	33.5	350°	Normal, E
665	Beaver Creek fault	<1.6 Ma	-0.2 (7)	2.2	340°	Normal, E
666	Helena Valley fault	<1.6 Ma	-0.2 (7)	19.9	294°	Normal, SW
667	Unnamed (main range-bounding) section	<1.6 Ma	-0.2 (7)	19.9	294°	Normal, SW
668	Unnamed (pediment) section	<1.6 Ma	-0.2 (7)	4.7	284°	Normal, S
669	Spokane Hill fault	<1.6 Ma	-0.2 (7)	13.8	321°	Normal, SW
670	Unnamed (range-bounding) section	<1.6 Ma	-0.2 (7)	13.8	321°	Normal, SW
671	Unnamed (pediment) section	<1.6 Ma	-0.2 (7)	13.2	335°	Normal, SW
672	Regulating Reservoir fault	<1.6 Ma	-0.2 (7)	8.2	310°	Normal, SW
673	Regulating Reservoir fault	<1.6 Ma	-0.2 (7)	8.2	310°	Normal, SW
674	Spokane Hill fault	<1.6 Ma	-0.2 (7)	10.2	350°	Normal, SW
675	Unnamed (north) section	<1.6 Ma	-0.2 (7)	10.2	350°	Normal, SW
676	Diamond Springs fault	<1.6 Ma	-0.2 (7)	0.7	6°	Normal, E
677	Iron Gulch fault	<1.6 Ma	-0.2 (7)	3.9	327°	Normal, NE
678	Franklin Mine Road fault	<1.6 Ma	-0.2 (7)	1.9	53°	Normal, SE
679	Fort Harrison fault	<1.6 Ma	-0.2 (7)	1.6	90°	Normal, N
680	Curtis Creek fault	<1.6 Ma	-0.2 (7)	19.2	31°	Normal, SE
681	Smith Valley fault	<1.6 Ma	-0.2 (7)	6.5	307°	Normal, W
682	Unnamed (north) section	<1.6 Ma	-0.2 (7)	7.3	351°	Normal, W
683	Whitehall Creek fault	<1.6 Ma	-0.2 (7)	7.3	351°	Normal, W
684	Ball Mountain western border fault	<1.6 Ma	-0.2 (7)	26.0	61°	Normal, W
685	Bradley fault	<1.6 Ma	-0.2 (7)	48.3	341°	Normal, W
686	Gallatin Range fault	<1.6 Ma	-0.2 (7)	26.7	59°	Normal, NW
687	Unnamed fault near Sweet Grass Hills	<1.6 Ma	-0.2 (7)	26.7	59°	Normal, NW
688	Elk Creek fault	<1.6 Ma	-0.2 (7)	28.1	298°	Normal, NE
689	Carmichael fault	<1.6 Ma	-0.2 (7)	4.9	311°	Normal, W
690	Thompson Valley fault	<1.6 Ma	-0.2 (7)	9.6	348°	Normal, W
691	Pine Creek Valley fault	<1.6 Ma	-0.2 (7)	8.5	213°	Normal, W
692	Jocko fault	<1.6 Ma	-0.2 (7)	15.8	233°	Normal, NW
693	Mission fault	<1.6 Ma	-0.2 (7)	101.9	352°	Normal, W
694	Flathead Lake section	<1.6 Ma	-0.2 (7)	65.4	333°	Normal, W
695	Missoua Valley section	<1.6 Ma	-0.2 (7)	39.0	349°	Normal, W
700	Swan fault	<1.6 Ma	-0.2 (7)	155.9	337°	Normal, SW
701	South Fork Flathead fault	<1.6 Ma	-0.2 (7)	147.7	329°	Normal, SW
702	Bull Lake fault	<1.6 Ma	-0.2 (7)	21.9	356°	Normal, W
703	Savage Lake fault	<1.6 Ma	-0.2 (7)	17.7	19°	Normal, W
704	O'Brien Creek fault	<1.6 Ma	-0.2 (7)	14.9	337°	Normal, SW
705	Nimrod fault	<1.6 Ma	-0.2 (7)	70.1	305°	Normal, SW
706	Unnamed fault near Ovando	<1.6 Ma	-0.2 (7)	28.9	281°	Normal, SW
746	East Gallatin Reservoir Creek fault system*	<1.6 Ma	-0.2 (7)	38.8	5°	Normal, E

*fault extends into Idaho **fault extends into Wyoming

Explanation of Parameters Listed in Table 1

Fault no.—An arbitrary three-digit number used to identify faults. Shorter sections of long faults that may have different earthquake histories from other sections of the fault are denoted with an appended lowercase letter.

Fault name—The name of a fault as used in published references.

Most Recent Earthquake—Time since the most recent surface faulting earthquake in thousands of years (ka) or millions of years (Ma). These times are typically estimated from geomorphic and paleoseismic data. Only the 1959 Hebgen Lake earthquake has caused historic surface rupture in Montana, which is denoted by the year of occurrence.

Slip rate—The slip rate of a fault is determined by measuring the fault offset of a feature (geologic deposit or geomorphic feature) and dividing that offset by the appropriate time interval(s) between surface faulting earthquakes. In most cases, neither value is well constrained, and thus, the slip rates are characterized as nominal ranges.

Length—The horizontal distance along which a fault may be traced or inferred to extend. For those faults composed of multiple sections, the total fault length may not equal the sum of the fault sections because the overall fault length is taken as the straight-line distance between opposing end points and does not account for curvature, overlap, or gaps between sections.

Strike—The average strike direction of a fault or fault section as measured in degrees clockwise from north.

Fault type, down direction—Faults may slip in one of three general ways (Figure 2). A normal fault dips steeply downward into the Earth's crust, and one block moves down (hanging wall) relative to the adjacent block. Normal faulting over extended geologic periods typically results in steep-fronted mountain ranges (uplifted fault blocks) flanking deeply filled alluvial valleys. Most young faults in Montana are normal faults and form in response to extension or stretching of the Earth's crust driven by underlying tectonic forces.

The second fault type, strike slip, results when one side of a steeply dipping fault moves horizontally relative to the other side. Strike-slip faults exhibit either a right-handed or left-handed sense of movement. A fault that offsets a reference marker (a road or fence line for example) to the right when viewed across the fault is known as a right-lateral strike-slip (or dextral) fault. Conversely, a fault which offsets a marker to the left is known as a left-lateral strike-slip (or sinistral) fault. Strike-slip faults form in both extensional and compressional tectonic environments but are most prevalent along transform plate boundaries. The best known example is California's San Andreas fault, a right-lateral strike-slip fault. There is only one recognized young strike-slip fault in Montana (the Pine Creek Valley fault, number 697), located northwest of Libby in extreme northwestern Montana.

The third fault type is reverse or thrust faulting. In reverse faulting, one side of a fault is forced up and over an adjacent block along a steeply dipping fault (45° to 65°). Thrust faults have a similar sense of movement, but the fault planes dip less steeply (<45°). Reverse and thrust faults form in response to horizontal compressive forces. No young thrust or reverse faults are known in Montana; however, many are known from the previous tectonic regime that ended some 50 million years ago.

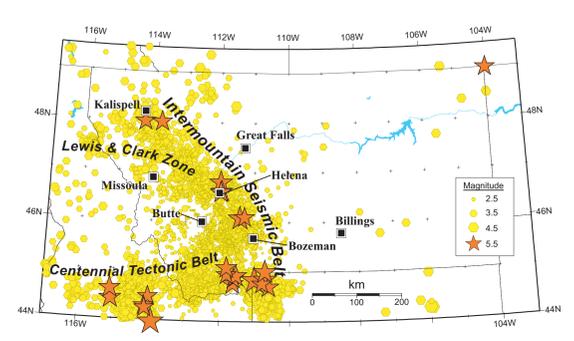


Figure 2. Diagrams illustrating the sense of fault offset along normal, strike slip, thrust, and reverse faults.

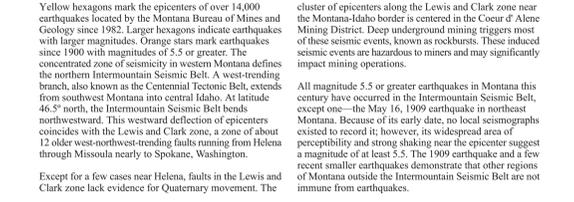


Figure 3. Levels of seismic shaking possible in western Montana.

Introduction
The year 1999 marked the fortieth anniversary of the last destructive Montana earthquake. In contrast, the previous 40 years (1920-1960) saw the occurrence of four major earthquake sequences in Montana. Considering the state's history of damaging earthquakes, it is natural that one may ponder the causes and sources of these earthquakes. In western Montana and throughout the Intermountain West, only the very largest historic earthquakes can be ascribed to specific faults with certainty. This is because western Montana earthquakes typically result from slip (movement) along faults at depths of 2-10 miles (3-15 km) below the ground surface. Only during the largest earthquakes (but generally larger than magnitude 5.5) do faults slip propagating up to and offset the Earth's surface. This offset of the Earth's surface results in a fault scarp. Young fault scarps (those less than 15,000 years old) mark steep mountain ranges (fronts of Madison, Centennial, Absaroka, and Teton ranges for example). These mountain ranges are fault blocks uplifted by repeated earthquakes over millions of years. However, most mountains carved by ice and water into rugged mountains. Sediment eroded from the mountains filled broad valleys overlying the adjacent, downthrown fault blocks (Madison, Centennial, Emigrant, and Red Rock valleys).

The only historic surface-rupturing earthquake in Montana is the 1959 Hebgen Lake earthquake, centered just west of the northwest corner of Yellowstone National Park. The magnitude 7.5 Hebgen Lake earthquake offset the Earth's surface for a distance of 20 miles (32 km) along two principal faults and produced up to 20 feet (6 m) of vertical offset. Earthquakes as large as the 1959 earthquake occur infrequently (perhaps once in a few thousand to tens of thousands of years) in western Montana.

It is these large but infrequent earthquakes that are preserved in the geologic record and modify the landscape, creating fault scarps along which a mountain block is uplifted or a valley floor is lowered. Many other faults have ruptured during the Quaternary (past 1.6 million years) but the age of the last rupture is not well constrained. The long elapsed time since the last major earthquake on these faults may suggest they are no longer active, but their potential to produce an earthquake cannot be completely ignored because many faults in the Intermountain West have very long recurrence times.

Small- and moderate-magnitude earthquakes with magnitudes less than 6.5 generally do not alter the Earth's surface. However, they occur more frequently than surface-rupturing earthquakes and may be powerful enough to cause damage. Thus, much of the seismic hazard facing western Montana comes from smaller but more frequent earthquakes on faults lying hidden beneath the Earth's surface as well as major but infrequent earthquakes along mapped faults.

Topographic data
The topographic representation of western Montana is based on digital elevation models (DEMs) created by the USGS. Western Montana DEMs were obtained from the Montana State Library National Resources Information System (NRIS). A full description of the data is available from the NRIS web site at <http://nr.is.state.mt.us>. The topographic visualization was derived from 30-meter and 3-arc-second DEMs. The 3-arc-second DEMs include some vertical accuracy problems, primarily in the northeast part of the map area. The data from areas with contrasting data quality were smoothed in ARC/INFO GRID using filtering techniques to minimize these artifacts.

The appearance of shaded relief topography was accomplished with the aid of ARC/INFO TIN conversion routines and hill-shading techniques. The visualization of a topographic surface was created by artificially illuminating the DEM with an afternoon sun source (azimuth 315 degrees, altitude 55 degrees, and vertical exaggeration 1.5). The map was created by projecting the illuminated DEM data into a Lambert conformal conic projection using the Montana State Plane Coordinate system with the following parameters: Central Meridian = 109° 57' 18" standard parallel 1° north, 2nd standard parallel 49° 09' 44.25" and false easting 600,000. Data shown on the map such as county boundaries, lakes, rivers, highways, and cities are derived from 1:100,000-scale U.S. Census Bureau Tiger files that also were obtained from NRIS.

Acknowledgments
Funds to produce this map came from the Hazard Grant Mitigation Program administered by the Disaster and Emergency Services Division of the Montana Department of Military Affairs. Larry Akers and Jerry Smithers of DES were helpful in guiding us through the grant application process and program administration—their assistance is gratefully acknowledged. Richard Dart of the USGS supplied the digital fault data in ARC/INFO format. The MBMG Earthquake Studies Office, Confederated Salish and Kootenai Tribes' Safety of Dams Office, and the University of Montana Geology Department provided seismicity data for locating and cataloging western Montana earthquakes. The National Earthquake Hazards Reduction Program has provided two previous grants (awards 1434-94-G-2281 and 1424-95-G-2282) to the Montana State University that expanded seismic monitoring capabilities and re-analysis of previously recorded earthquake data. Finally, thanks to GIS specialists Bill Myers and Paul Thall (MBMG) for GIS production of the map and cartographer Susan Smith (MBMG) for cartographic production.

References
Doser, D.I., 1980. Source parameters of Montana earthquakes (1925-1964) and tectonic deformation in the northern Intermountain Seismic Belt. *Bulletin of the Seismological Society of America*, v. 79, p. 31-50.
Doser, D.I. and Smith, R.B., 1989. An assessment of source parameters of earthquakes in the Cordillera of the Western United States. *Bulletin of the Seismological Society of America*, v. 79, p. 1383-1409.
Stickney, M.C., 1995. Montana seismicity report for 1990: Montana Bureau of Mines and Geology Miscellaneous Contribution 16, 44 p.
Stickney, M.C. and Bartholomew, N.J., 1987. Seismicity and late Quaternary faulting of the northern Basin and Range Province, Montana and Idaho. *Bulletin of the Seismological Society of America*, v. 77, p. 1602-1625.

Wallace, C.A., Lidde, D.J., and Schmidt, R.G., 1990. Faults of the central part of the Lewis and Clark zone and fragmentation of the Late Cretaceous fore-basin in west-central Montana. *Geological Society of America Bulletin*, v. 102, p. 1021-1037.

The number and proximity of seismometers that record an earthquake are the most important factors influencing the accuracy of an epicenter determination. Before 1985, seismograph network stations were generally limited to southwest Montana. Thus, the quality for epicenter locations of pre-1985 earthquakes in northwest Montana is generally lower than for southwest Montana. For the same reason, many northwestern Montana earthquakes went undetected prior to 1995.

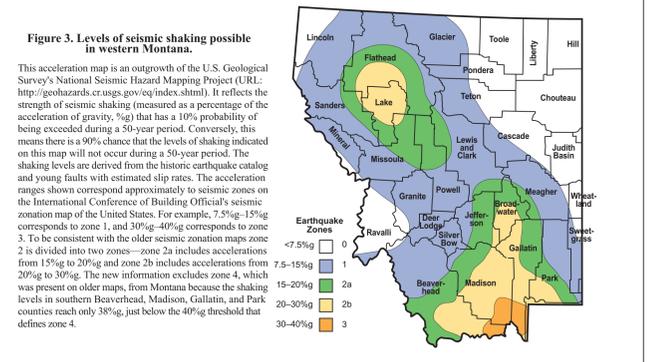


Figure 4. Epicenters of earthquakes from 1982-1999.

cluster of epicenters along the Lewis and Clark zone near the Montana-Idaho border is centered in the Coeur d'Alene Mining District. Deep underground mining triggers most of these seismic events, known as rockbursts. These induced seismic events are hazardous to miners and may significantly impact mining operations.

All magnitude 5.5 or greater earthquakes in Montana this century have occurred in the Intermountain Seismic Belt, except one—the May 16, 1909 earthquake in northeast Montana. Because of its early date, no local seismographs existed to record it; however, its widespread area of perceptibility and strong shaking near the epicenter suggest a magnitude of at least 5.5. The 1909 earthquake and a few recent smaller earthquakes demonstrate that other regions of Montana outside the Intermountain Seismic Belt are not immune from earthquakes.

Attachment 4

Slide

Documentation



INTER-DEPARTMENTAL MEMORANDUM

STATE HIGHWAY COMMISSION OF MONTANA

To Lewis M. Chittim, P.E., Acting State Highway Engineer Date May 9, 1967

From Lehman B. Fox, P.E., Materials Engineer

Subject: S-370 Landslide at the
Mouth of Bridger Canyon

With reference to your letter of April 28, 1967 to Mr. Ralph Armstrong, Gallatin County Commissioner, our Chief Geologist, Dennis A. Williams, P.E., on May 8, 1967 made a preliminary examination of the slide area, and we submit the following information.

The unstable area lies within and above a quarry site which was used to produce crushed surfacing for S-370(12). The project was completed on August 15, 1961. More specifically, the quarry and slide lie on the north face of a steep hill and the material within the quarry is limestone, siltstone, and shales which appear to lie within and between at least two large fault zones striking normal to the valley. The rock is very badly sheared and fractured due to this faulting and subsequent folding.

Because of its fractured nature and the durability of the limestone rock, it is an excellent source for surfacing materials requiring a minimum of blasting for removal.

This same fractured nature renders the material unstable in the steep quarry face, and, as a result of blasting and removal of material, a landslide developed in the upper reaches of the quarry shortly after completion of quarrying. The toe of the slide is only a few feet above ditchline of the roadway, and the slumped blocks which have moved to date appear to have stabilized themselves, resulting in only a small amount of material falling into the ditch and on the roadway.

At the time of this examination, a tension crack is developing about seventy feet above the highest sheer quarry face. This block will no doubt slump in the near future and will probably stabilize itself as has the neighboring block to the east.

There is, however, a good possibility of a major slide occurring, because of the steepness of the hill and the fractured nature of the rock, which would involve a great deal more material than that which is presently involved.

INTER-DEPARTMENTAL MEMORANDUM

DEPARTMENT OF HIGHWAYS

SKK

To S. C. Kologi, P.E., Chief - Preconstruction Bureau

Date January 5, 1976

From Richard E. Wegner, P.E., Chief - Materials BureauSubject HHS - 370 (26)
Bridger Canyon Safety

During the spring of 1975, heavy precipitation and surface run-off re-activated the subject slide resulting in the movement of a considerable quantity of rock on to the highway. Because the area remained (and still is) potentially hazardous, the old detour was re-opened around the slide, and investigation for corrective methods and alignment studies were initiated.

Our department has since been involved in the investigation and corrective design of the project. Three alternate alignments were studied in conjunction with your personnel during this phase of the study. Several meetings have been held including a preliminary P.I.H. on December 2, 1975, with Highway, Fish and Game, Federal Fish Hatchery and the County Commissioners in attendance. Dr. Montagne, Professor of Geology at the Montana State University was also contacted concerning the slide and our corrective design as he has done considerable investigation in the slide area; refer to memorandum dated December 23, 1975.

Our proposed design, presently in the planning stage, would place a 20⁺ foot fill through the middle of the canyon with a sliver cut in the north wall of the canyon. This would improve the horizontal and vertical curvature, provide a rockfall ditch and berm and leave the slide in its present state as further construction near the slide toe could cause a slide of much greater magnitude than exists. We have also considered channeling the creek, the total length of the slide, through a culvert or reinforced box structure to guard against damming of the creek in event of earthquake disaster in the area.

Since our last meeting it has come to our attention that some historical value is associated with the rock face on the north canyon wall which is presently located in our alignment and that some other alignment that will miss this rock face may be necessary.

We are awaiting further information regarding additional alignment studies.

REW/JEA/EWM/lch

cc: H. G. Wheeler
R. C. Holmes/Bozeman Div.
W. Walters/Precon.
G. Anders/Utilities
R. E. Wegner
Geol. File

Richard E. Wegner
Avoid Verbal Instructions

Attachment 5

Rockfall Hazard Data



ROCKFALL HAZARD CLASSIFICATION AND MITIGATION SYSTEM

FHWA/MT-05-011/8174

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

September 2005

prepared by
Lawrence A. Pierson
Darren L. Beckstrand
Brent A. Black

Landslide Technology
Portland, Oregon



RESEARCH PROGRAMS

Table 6-1: Top 100 Sites Ranked by Score

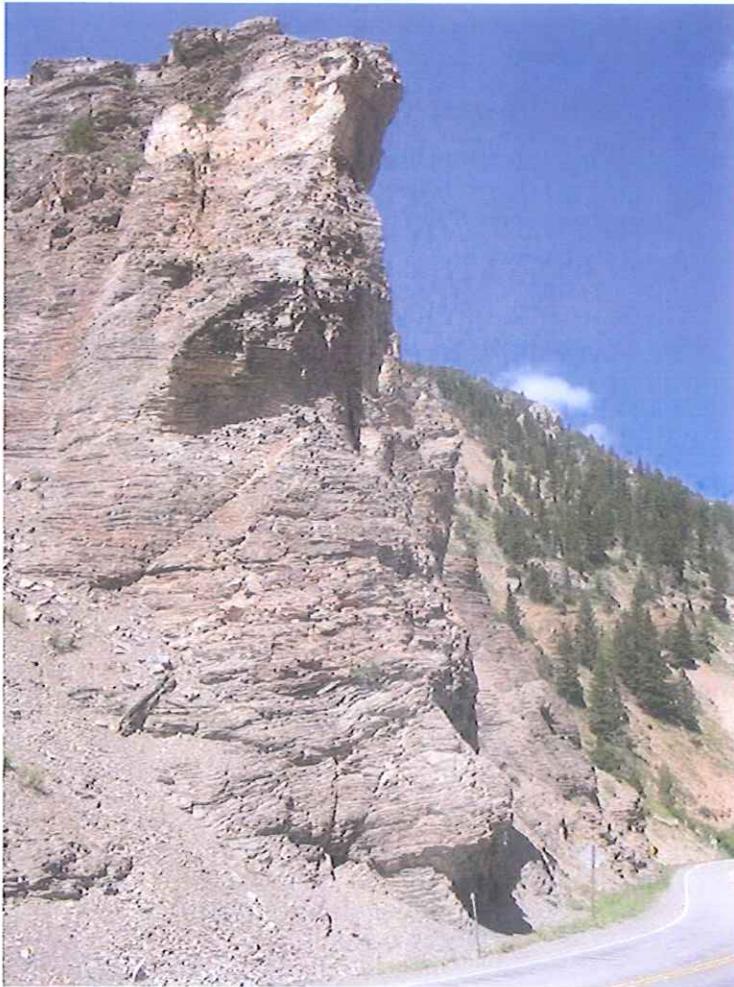
Section						Section					
Rank	Corridor	MP Start	MP End	No.	Score	Rank	Corridor	MP Start	MP End	No.	Score
1	C000028	049+0.720	050+0.370	600	687	51	C000036	010+0.540	010+0.580	852	539
2	C000019	027+0.990	028+0.440	506	684	52	C000567	022+0.840	022+0.940	1587	539
3	C000028	052+0.030	052+0.220	617	668	53	C000015	226+0.980	227+0.230	448	538
4	C000006	064+0.400	064+0.520	189	662	54	C000019	027+0.930	027+0.990	504	527
5	C000087	004+0.020	004+0.750	1132	657	55	C000046	072+0.360	072+0.860	913	524
6	C000011	013+0.320	013+0.660	307	654	56	C000029	068+0.490	068+0.630	675	522
7	C022249	003+0.390	003+0.550	1851	649	57	C000033	017+0.010	017+0.140	734	522
8	C000028	047+0.630	047+0.920	588	647	58	C000015	157+0.770	157+0.930	408	520
9	C000028	050+1.080	050+1.250	605	647	59	C000540	004+0.330	004+0.460	1549	520
10	C000028	050+0.500	050+0.790	602	646	60	C000014	020+0.810	020+0.850	363	510
11	C000001	158+0.470	158+0.640	94	645	61	C018203	008+0.640	008+0.750	1633	509
12	C000015	219+0.540	219+0.820	426	641	62	C048245	001+0.750	001+0.970	1697	509
13	C000090	315+0.260	315+0.500	1261	641	63	C000419	007+0.160	007+0.350	1436	508
14	C022249	003+0.070	003+0.190	1850	636	64	C000014	164+0.210	164+0.390	374	506
15	C000046	068+0.060	068+0.190	904	634	65	C000007	004+0.480	005+0.080	235	504
16	C000015	051+0.780	052+0.320	384	624	66	C000472	021+0.290	021+0.350	1495	502
17	C000006	058+0.150	058+0.210	179	622	67	C000001	026+0.900	027+0.020	35	499
18	C000015	217+0.670	218+0.370	617	617	68	C000015	218+0.450	218+0.530	421	499
19	C000014	165+0.460	165+0.520	375	615	69	C000019	027+0.990	028+0.040	505	499
20	C000028	050+1.940	050+1.960	614	614	70	C031070	000+0.510	000+0.640	1866	499
21	C000006	064+0.520	064+0.630	190	609	71	C000036	010+0.460	010+0.530	851	498
22	C000001	155+0.500	155+0.620	77	602	72	C000083	005+0.540	005+0.690	1076	498
23	C000472	020+0.990	021+0.050	1493	602	73	C081013	001+0.780	001+0.960	1788	498
24	C000001	156+0.600	156+0.730	85	601	74	C022249	003+0.550	003+0.680	1852	497
25	C000028	050+0.390	050+0.500	601	597	75	C081003	001+0.060	001+0.360	1710	496
26	C000029	068+0.490	068+0.610	674	594	76	C000050	052+0.870	052+0.960	937	495
27	C018203	008+0.880	009+0.120	1635	587	77	C000001	020+0.380	020+0.680	26	494
28	C000093	001+0.060	001+0.260	1275	582	78	C000006	064+0.250	064+0.400	54	493
29	C000093	012+0.820	012+0.900	1293	580	79	C081003	000+0.800	000+0.910	1709	493
30	C000029	076+0.070	076+0.140	705	579	80	C000046	072+0.900	073+0.490	914	490
31	C018203	009+0.740	010+0.140	1638	576	81	C000001	155+0.700	155+0.800	79	489
32	C000046	073+0.600	073+0.750	916	571	82	C000090	026+0.240	026+0.430	1177	489
33	C000084	006+0.620	006+0.870	1110	571	83	C015516	002+0.160	002+0.560	1599	489
34	C022249	005+0.080	005+0.240	1855	571	84	C000028	053+0.450	053+0.500	627	487
35	C000011	013+0.840	013+0.960	309	569	85	C000029	076+0.850	077+0.030	711	486
36	C000086	004+0.370	004+0.450	1114	567	86	C000035	015+0.820	016+0.020	825	486
37	C000006	058+0.360	058+0.440	182	565	87	C000050	050+0.680	050+0.800	933	486
38	C000024	003+0.030	003+0.120	532	564	88	C081003	001+0.710	001+0.890	1711	485
39	C000090	024+0.590	024+0.720	1175	564	89	C000508	006+0.620	006+0.920	1518	483
40	C000093	018+0.110	018+0.200	1304	564	90	C000006	058+0.300	058+0.360	181	481
41	C000090	231+0.380	231+0.650	1213	559	91	C022249	005+0.720	005+0.840	1857	480
42	C000050	061+0.180	061+0.260	947	555	92	C000001	157+0.920	158+0.040	90	478
43	C000028	050+1.960	052+0.000	615	551	93	C000093	002+0.860	002+0.900	1277	478
44	C000028	052+0.000	052+0.030	616	551	94	C000330	012+0.850	013+0.150	1399	478
45	C000090	024+0.040	024+0.190	1172	551	95	C000093	015+0.090	015+0.240	1299	477
46	C081001	023+0.480	023+0.690	1871	551	96	C000033	054+0.610	054+0.760	807	476
47	C000050	060+0.730	060+0.960	946	549	97	C000011	013+0.960	014+0.610	310	474
48	C081003	000+0.000	000+0.200	1704	547	98	C000083	009+0.050	009+0.160	1087	474
49	C000013	090+0.770	091+0.070	323	542	99	C000090	231+0.950	232+0.160	1218	473
50	C000033	017+0.610	018+0.010	737	540	100	C000028	047+0.200	047+0.360	585	472

Section Number: 1114

Corridor: C000086N Side: Left

Beginning Mile Point: 004+0.370 Ending Mile Point: 004+0.450

RHRS Score: 567



Conceptual Mitigation Design

This slope is approximately 425 feet long with a maximum height of about 130 feet. The slope is a tall, nearly vertical outcrop above the road. Most block failures appear to be small as material is thinly bedded. Weathered vertical joints pose the threat of larger volume events. There are a number of eroded joints behind these masses. Mitigation would include excavation using controlled blasting to create a larger fallout area in addition to scaling and installing draped mesh.

Mitigation Cost Estimate

Design Element	Quantity / Units	Unit Cost (\$)	Element Cost (\$)
Excavation with Controlled Blasting	10,000 cu. yd.	20	200,000
Scaling	410 hrs.	100	41,000
Draped Mesh	41,000 sq. ft.	3	123,000
Total Cost:			\$364,000
Cost /Score Ratio:			642

Attachment 6

Groundwater Data





Groundwater 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

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Overview of GALLATIN county

BEAVERHEAD

At-A-Glance

Number of wells in County	16506
Deepest well on record (feet)	1490
Shallowest well on record (feet)	1.5
Most recent well on record	6/23/2014
Oldest well on record	1/1/1860
Number of water quality samples	1779
Number of measured water levels	2745186
Statewide Monitoring Network wells	76

Other Reports

[Use By Year](#) View this report to see the number of wells and their reported water uses by year.

Histograms for GALLATIN 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.

2014	83
2013	262
2012	207
2011	147
2010	198
2009	166
2008	325
2007	488
2006	558
2005	585
2004	595
2003	585
2002	560
2001	544
2000	478
1999	538
1998	442
1997	379
1996	406
1995	477

[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	10075
100 - 199	3916
200 - 299	1349
300 - 399	580
400 - 499	283
500 - 599	150
600 - 699	68
700 - 799	27
800 - 899	28
900 - 999	20
> 1000	10

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	274
RECREATION	10
INJECTION	7
INDUSTRIAL	73
OTHER	162
PUBLIC WATER SUPPLY	502
TEST WELL	109
UNUSED	104
WILDLIFE	14
FIRE PROTECTION	98
MEDICAL	2
MONITORING	885
COMMERCIAL	94
IRRIGATION	1636
RESEARCH	12
GEOTHERMAL-EXTRACTION	14
GEOTECH	172
GEOTHERMAL-INJECTION	18
STOCKWATER	1374
DOMESTIC	12719

* Total 18279

* 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.

ALLUVIUM (QUATERNARY) (110ALVM)	223
SEDIMENTS (TERTIARY) (120SDMS)	192
ALLUVIUM (PLEISTOCENE) (112ALVM)	136
SAND AND GRAVEL (HOLOCENE) (111SNGR)	132
SAND AND GRAVEL (TERTIARY) (120SNGR)	110
ALLUVIUM (HOLOCENE) (111ALVM)	96
SAND AND GRAVEL (PLEISTOCENE) (112SNGR)	72
SAND AND GRAVEL (QUATERNARY) (110SNGR)	61
BILLMAN CREEK FORMATION (OF LIVINGSTON GROUP) (211BMCK)	41
GNEISS AND SCHIST (EARLY PROTEROZOIC OR ARCHEAN) (500GNCS)	35
CLIMBING ARROW FORMATION (OF BOZEMAN GROUP) (123CBGA)	28
DUNBAR CREEK FORMATION (OF BOZEMAN GROUP) (123DBCK)	28
HOPPERS FORMATION (OF LIVINGSTON GROUP) (211HPRS)	24
MOWRY SHALE (OF COLORADO GROUP) (217MWRY)	24
MADISON GROUP OR LIMESTONE (330MDSN)	23
GLACIAL TILL (112TILL)	18
FORT UNION FORMATION (125FRUN)	17
SEDAN FORMATION (UPPER CRETACEOUS) (211SDAN)	17
FRONTIER FORMATION (211FRNR)	15

KOOTENAI FORMATION (217KOTN)	14
LAHOOD FORMATION (400LHOD)	13
MUDDY SANDSTONE MEMBER (OF THERMOPOLIS SHALE) (217MDDY)	10
GLACIAL OUTWASH (PLEISTOCENE) (112OTSH)	9
VOLCANICS (PLEISTOCENE) (112VLCC)	8
ALLUVIAL FAN DEPOSITS - PLEISTOCENE (112ALVF)	8
TERTIARY SILT AND CLAY (120SICL)	7
MINER CREEK FORMATION (OF LIVINGSTON GROUP) (211MRCK)	7
THERMOPOLIS SHALE (217TMPL)	7
VOLCANIC ROCKS (PLIOCENE) (121VLCC)	6
COKEDALE FORMATION (OF LIVINGSTON GROUP) (211CKDL)	6
CODY SHALE (211CODY)	6
VOLCANICS (TERTIARY) (120VLCC)	6
MORRISON FORMATION (221MRSN)	5
SEDIMENTS (PALEOZOIC) (300SDMS)	5
CAMBRIAN UNDIFFERENTIATED (370CMBR)	5
MEAGHER LIMESTONE (374MGHR)	5
THREE FORKS SHALE LIMESTONE OR FORMATION (337TRFK)	4
PRE-BELT (500PRBL)	4
SIXMILE CREEK FORMATION (PLIOCENE) (121SXCK)	4
LIVINGSTON FORMATION (EOCENE -CRETACEOUS) (124LVGS)	4
EAGLE SANDSTONE (211EGLE)	3
LENNEP SANDSTONE (OF MONTANA GROUP) (211LNNP)	3
HOLOCENE SILT AND CLAY (111SICL)	2

ALLUVIAL FAN DEPOSITS (HOLOCENE) (111ALVF)	2
JEFFERSON LIMESTONE (341JFRS)	2
PILGRIM LIMESTONE OR DOLOMITE (371PLGM)	2
FLATHEAD QUARTZITE OR SANDSTONE (374FLTD)	2
SHEDHORN SANDSTONE (310SDRN)	2
AMSDEN GROUP (320AMSD)	2
PALEOZOIC UNDIFFERENTIATED (300UDFD)	1
PARK SHALE OR ARGILLITE (374PARK)	1
LODGEPOLE LIMESTONE OR FM. (OF MADISON GP) (337LDGP)	1
MISSION CANYON LIMESTONE (OF MADISON GROUP) (337MSNC)	1
METAMORPHIC ROCKS (400MMPC)	1
CENOZOIC UNDIFFERENTIATED (100UDFD)	1
TERRACE DEPOSITS (QUATERNARY) (110TRRC)	1
COLLUVIUM (HOLOCENE) (111CLVM)	1
PLEISTOCENE SILT AND CLAY (112SICL)	1
UPPER CRETACEOUS LIVINGSTON GROUP (211LVGS)	1
PLUTONIC ROCKS (UPPER CRETACEOUS) (211PLNC)	1
FALL RIVER FORMATION (OF INYAN KARA GROUP) (217FLRV)	1
JUDITH RIVER FORMATION (OF MONTANA GROUP) (211JDRV)	1
TONGUE RIVER MEMBER (OF FT UNION FM.) (125TGRV)	1
CRETACEOUS UNDIFFERENTIATED (210UDFD)	1



Groundwater 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
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Overview of PARK county

BEAVERHEAD

At-A-Glance

Number of wells in County	5545
Deepest well on record (feet)	1607
Shallowest well on record (feet)	5
Most recent well on record	6/9/2014
Oldest well on record	1/1/1880
Number of water quality samples	676
Number of measured water levels	422135
Statewide Monitoring Network wells	19

Other Reports

[Use By Year](#) View this report to see the number of wells and their reported water uses by year.

Histograms for PARK 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.

2014	13
2013	88
2012	78
2011	65
2010	64
2009	94
2008	120
2007	214
2006	223
2005	169
2004	194
2003	166
2002	180
2001	218
2000	137
1999	196
1998	124
1997	132
1996	130
1995	197

[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	2770
100 - 199	1450
200 - 299	797
300 - 399	305
400 - 499	132
500 - 599	45
600 - 699	25
700 - 799	11
800 - 899	7
900 - 999	0
> 1000	3

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	153
RECREATION	1
INJECTION	2
INDUSTRIAL	23
OTHER	55
PUBLIC WATER SUPPLY	145
TEST WELL	70
UNUSED	60
WILDLIFE	1
FIRE PROTECTION	17
MEDICAL	3
MONITORING	401
COMMERCIAL	17
IRRIGATION	356
RESEARCH	1
GEOHERMAL-EXTRACTION	5
GEOTECH	82
GEOHERMAL-INJECTION	5
STOCKWATER	520
DOMESTIC	4367

* Total 6284

* 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.

ALLUVIUM (QUATERNARY) (110ALVM)	322
ALLUVIUM (HOLOCENE) (111ALVM)	296
FORT UNION FORMATION (125FRUN)	293
GLACIAL DRIFT (112DRFT)	281
UPPER CRETACEOUS LIVINGSTON GROUP (211LVGS)	255
VOLCANICS (TERTIARY) (120VLCC)	141
BILLMAN CREEK FORMATION (OF LIVINGSTON GROUP) (211BMCK)	89
ALLUVIUM (PLEISTOCENE) (112ALVM)	74
SEDIMENTS (TERTIARY) (120SDMS)	53
TERRACE DEPOSITS (QUATERNARY) (110TRRC)	43
COLORADO SHALE OR FM. (OF COLORADO GROUP) (211CLRD)	43
MINER CREEK FORMATION (OF LIVINGSTON GROUP) (211MRCK)	30
LIVINGSTON FORMATION (EOCENE -CRETACEOUS) (124LVGS)	29
SAND AND GRAVEL (PLEISTOCENE) (112SNGR)	23
HOPPERS FORMATION (OF LIVINGSTON GROUP) (211HPRS)	22
TERRACE DEPOSITS (PLEISTOCENE) (112TRRC)	19
PLUTONIC ROCKS (TERTIARY - CRETACEOUS) (120PLNC)	15
PRE-BELT (500PRBL)	14
COKEDALE FORMATION (OF LIVINGSTON GROUP) (211CKDL)	14

MADISON GROUP OR LIMESTONE (330MDSN)	12
CODY SHALE (211CODY)	10
MINE DUMPS (111MDMP)	10
ALLUVIAL FAN DEPOSITS (QUATERNARY) (110ALVF)	8
SNOWY RANGE FORMATION (OF GALLATIN GROUP) (371SNRG)	8
SAND AND GRAVEL (QUATERNARY) (110SNGR)	8
GNEISS AND SCHIST (EARLY PROTEROZOIC OR ARCHEAN) (500GNCS)	8
COLLUVIUM (QUATERNARY) (110CLVM)	7
PRECAMBRIAN (EARLY PROTEROZOIC OR ARCHEAN) (500PCMB)	5
SAND AND GRAVEL (HOLOCENE) (111SNGR)	5
KOOTENAI FORMATION (217KOTN)	5
MINE TAILINGS (111MTLG)	4
EAGLE SANDSTONE (211EGLE)	4
FRONTIER FORMATION (211FRNR)	3
LENNEP SANDSTONE (OF MONTANA GROUP) (211LNNP)	3
TERRACE DEPOSITS (HOLOCENE) (111TRRC)	3
COLLUVIUM (HOLOCENE) (111CLVM)	3
SAND AND GRAVEL (TERTIARY) (120SNGR)	3
MEAGHER LIMESTONE (374MGHR)	3
MISSION CANYON LIMESTONE (OF MADISON GROUP) (337MSNC)	3
BIGHORN DOLOMITE (361BGRN)	2
PARK SHALE OR ARGILLITE (374PARK)	2
WOLSEY SHALE OR FORMATION (374WLSY)	2
QUADRANT QUARTZITE (320QDRN)	2
MORRISON FORMATION (221MRSN)	2
SEDAN FORMATION (UPPER CRETACEOUS) (211SDAN)	2

VOLCANICS (PLEISTOCENE) (112VLCC)	2
TELEGRAPH CREEK FORMATION (OF MONTANA GROUP) (211TPCK)	2
MONTANA GROUP (211MNTN)	1
CRETACEOUS UNDIFFERENTIATED (210UDFD)	1
GLACIAL OUTWASH (PLEISTOCENE) (112OTSH)	1
PEDIMENT DEPOSITS (QUATERNARY) (110PDMN)	1
ALLUVIAL FAN DEPOSITS (HOLOCENE) (111ALVF)	1
STILLWATER COMPLEX (ARCHEAN) (500STLR)	1
LANCE-HELL CREEK UNDIFFERENTIATED (211LHUD)	1
AMSDEN GROUP (320AMSD)	1
LAKOTA SANDSTONE (OF INYAN KARA GROUP) (217LKOT)	1
MOWRY SHALE (OF COLORADO GROUP) (217MWRY)	1
ELLIS GROUP (221ELLS)	1
PILGRIM LIMESTONE OR DOLOMITE (371PLGM)	1

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Attachment 7

Historic Irrigation Mapping



WATER RESOURCES SURVEY

GALLATIN COUNTY
MONTANA

Part II

Maps Showing Irrigated Areas

Published by

STATE ENGINEER'S OFFICE

Helena, Montana

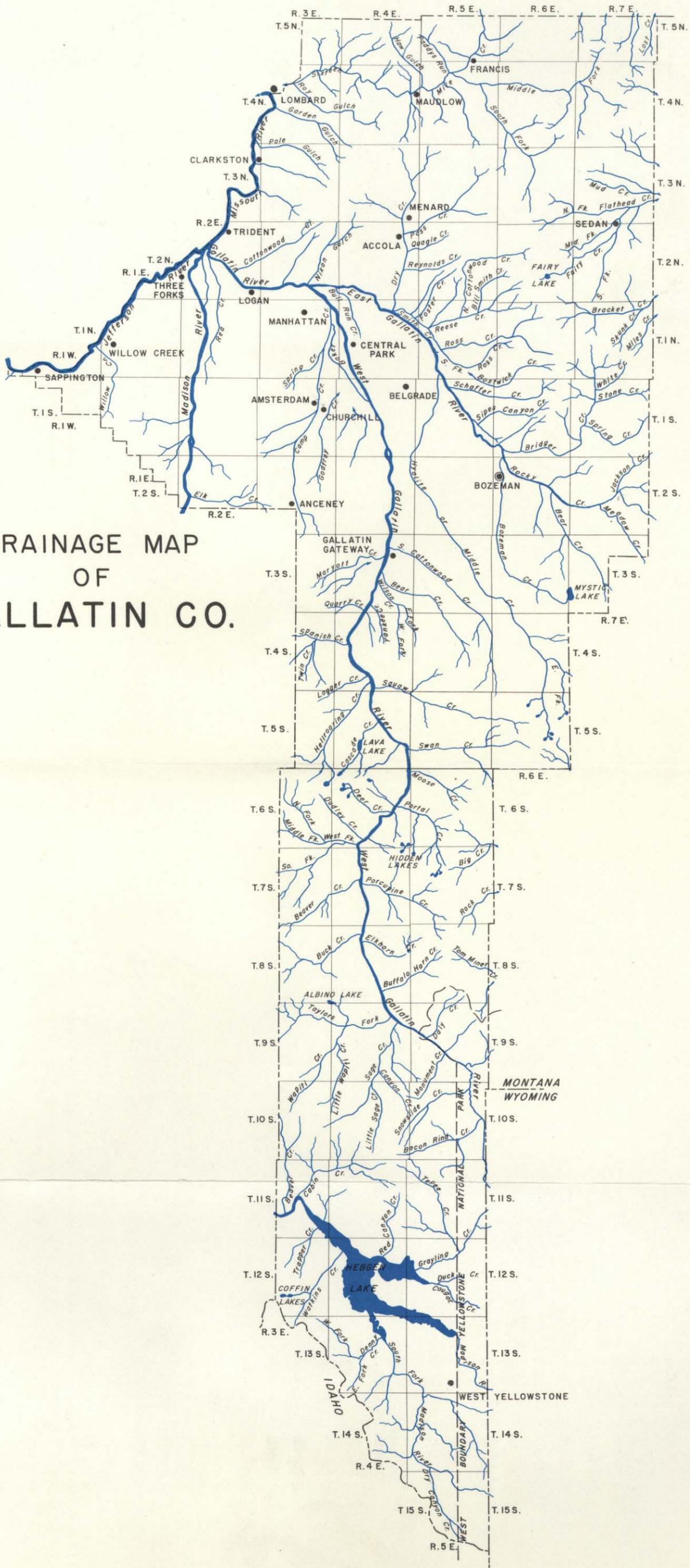
January, 1953

(Reprint as of June, 1961)

MAP INDEX

Township	Range	Page	Township	Range	Page
1 North	1 West	1	1 South	1 East	27
1 North	1 East	2	1 South	2 East	28
1 North	2 East	3	1 South	3 East	29
1 North	3 East	4	1 South	4 East	30
1 North	4 East	5	1 South	5 East	31
1 North	5 East	6	1 South	6 East	32
1 North	6 East	7	1 South	7 East	33
1 North	7 East	8	2 South	2 East	34
2 North	1 East	9	2 South	3 East	35
2 North	2 East	10	2 South	4 East	36
2 North	3 East	11	2 South	5 East	37
2 North	4 East	12	2 South	6 East	38
2 North	5 East	13	2 South	7 East	39
2 North	6 East	14	3 South	4 East	40
2 North	7 East	15	3 South	5 East	41
3 North	2 East	16	3 South	6 East	42
3 North	3 East	16	3 South	7 East	39
3 North	4 East	17	4 South	3 East	43
3 North	5 East	18	4 South	4 East	44
3 North	6 East	19	6 South	3 East	45
3 North	7 East	20	6 South	4 East	46
4 North	3 East	21	7 South	4 East	47
4 North	4 East	22	8 South	4 East	48
4 North	5 East	23	9 South	3 East	49
4 North	6 East	23	9 South	4 East	50
4 North	7 East	24	12 South	4 East	51
5 North	5 East	25	12 South	5 East	52
5 North	7 East	26	13 South	4 East	53

DRAINAGE MAP OF GALLATIN CO.



MAP SYMBOL INDEX

BOUNDARIES

- COUNTY LINE
- NATIONAL FOREST LINE

DITCHES

-  CANALS OR DITCHES
- > DRAIN DITCHES
- > PROPOSED DITCHES

STRUCTURES & UNITS

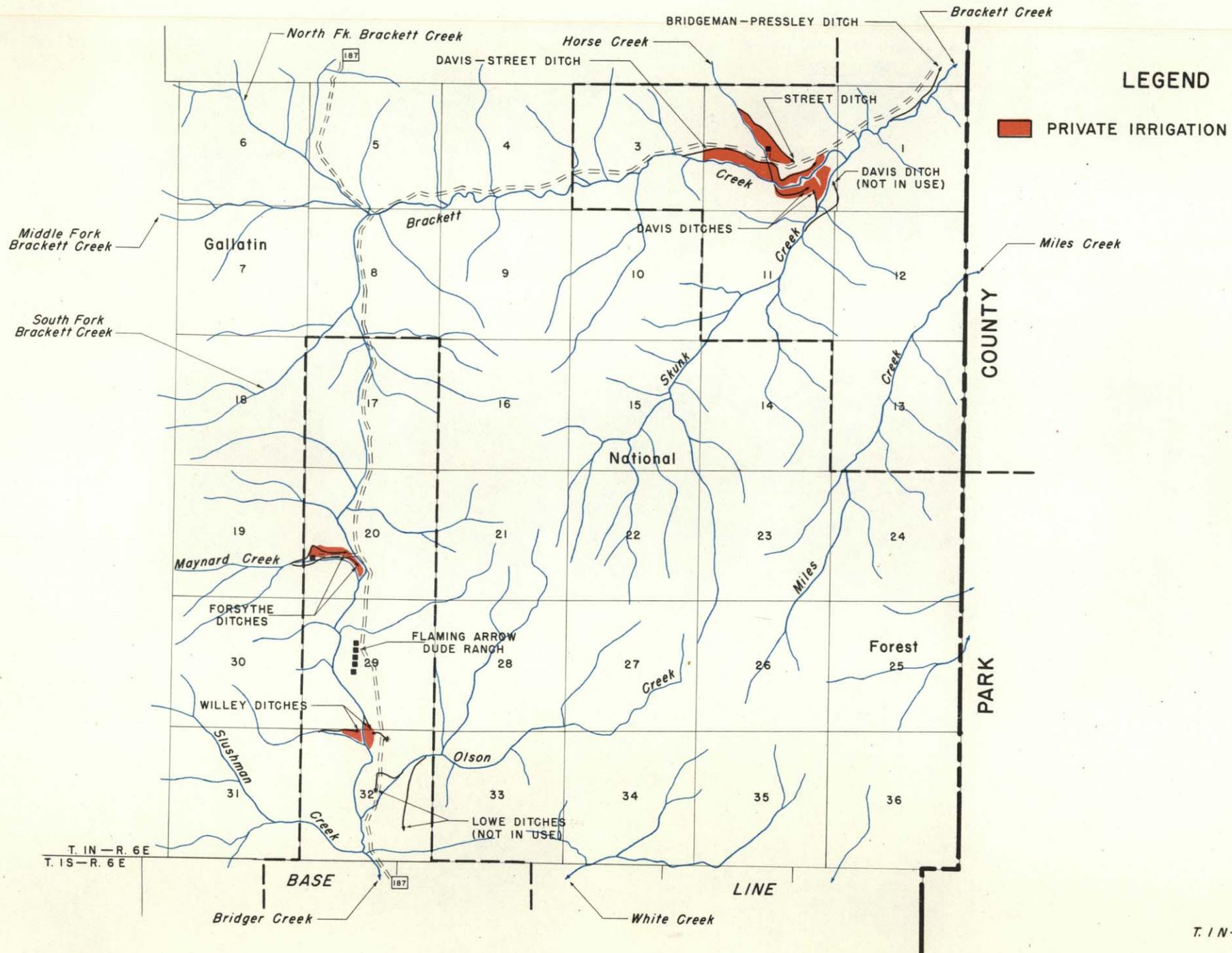
-  DAM
-  DIKE
-  FLUME
-  SIPHON
-  SPILL
-  SPRINKLER SYSTEM
-  WEIR
- ||| PIPE LINE
- PUMP
- PUMP SITE
-  RESERVOIR
- ⊖ WELL

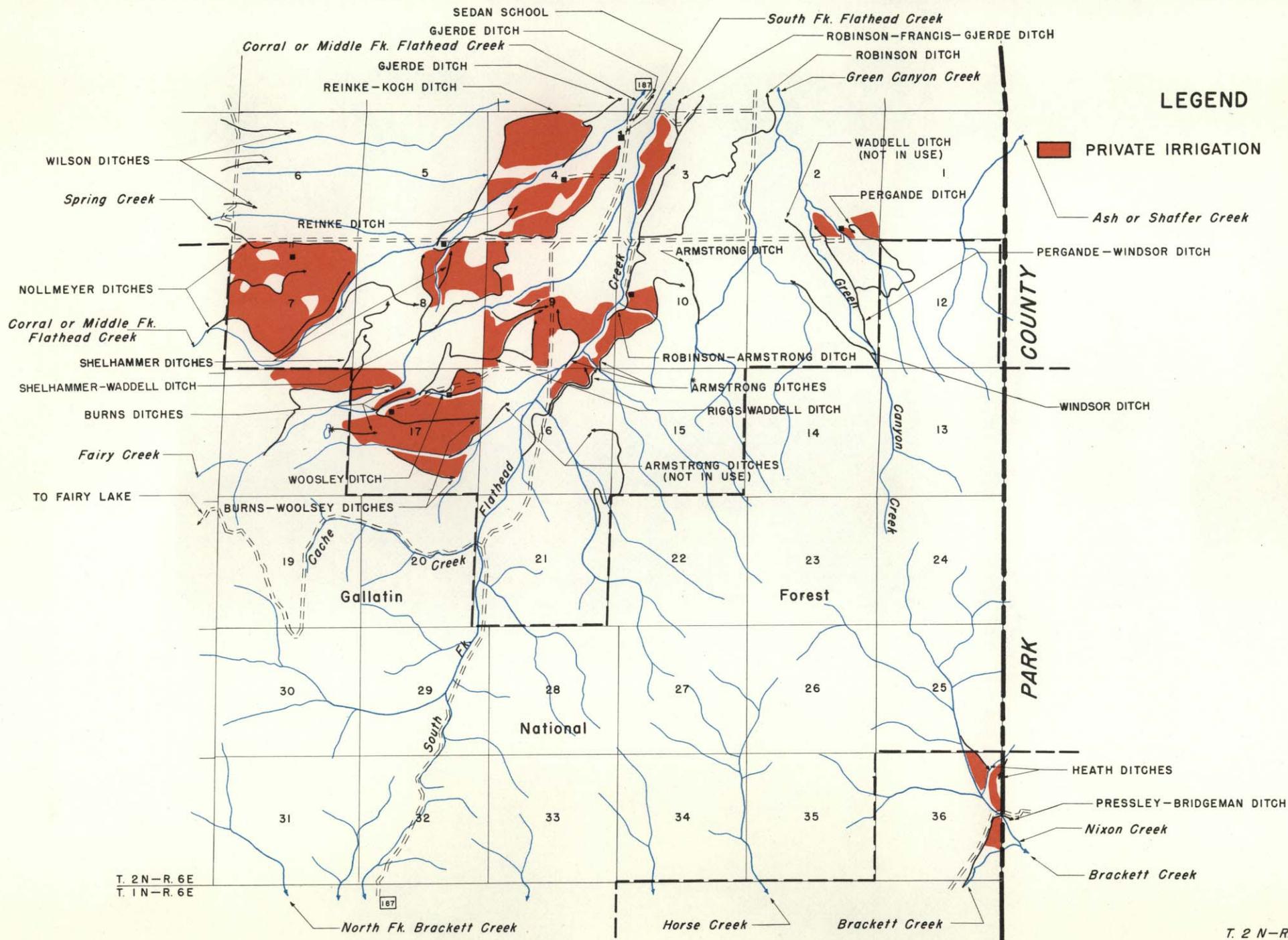
+++ NATURAL CARRIER USED AS DITCH

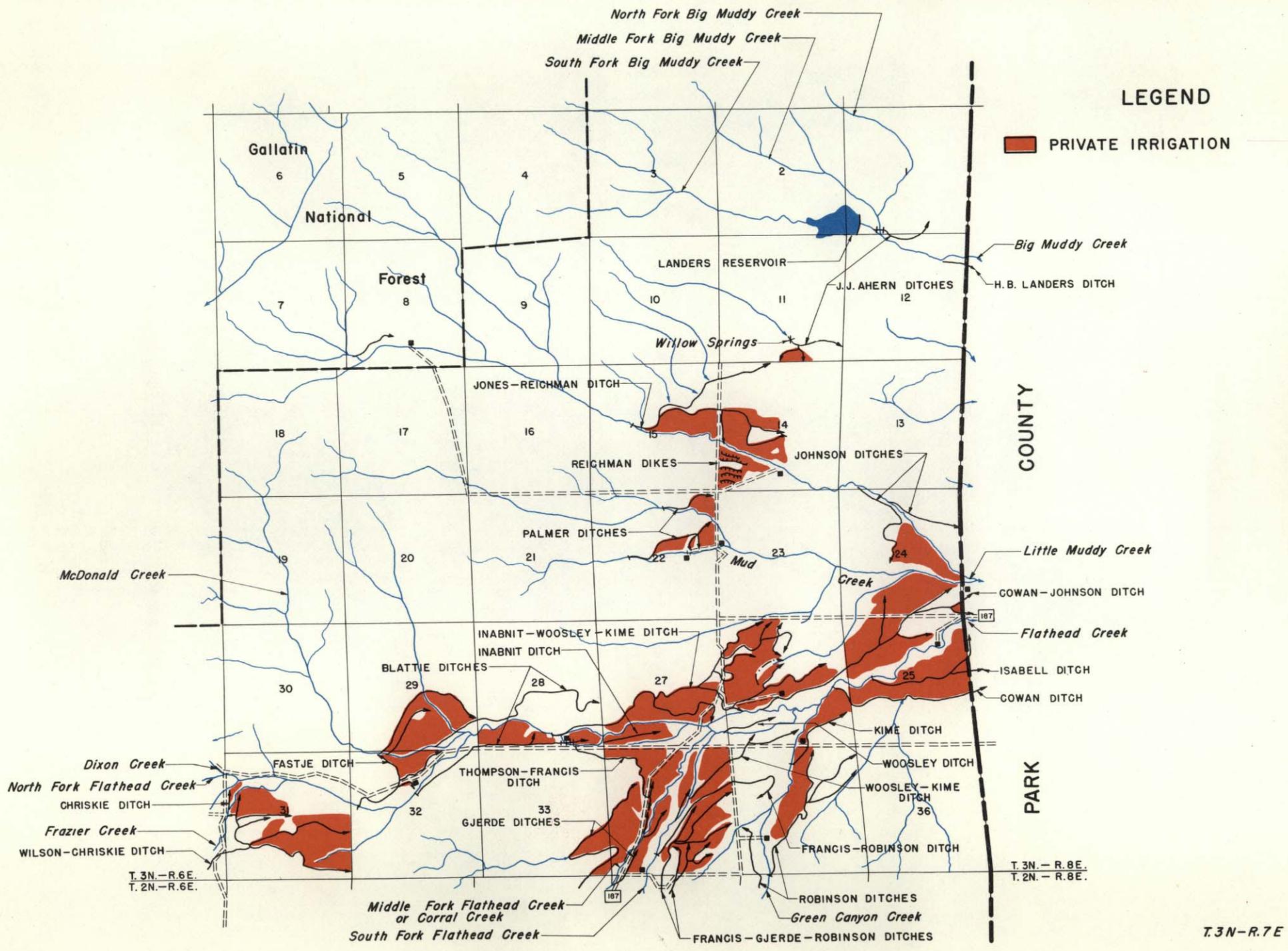
TRANSPORTATION

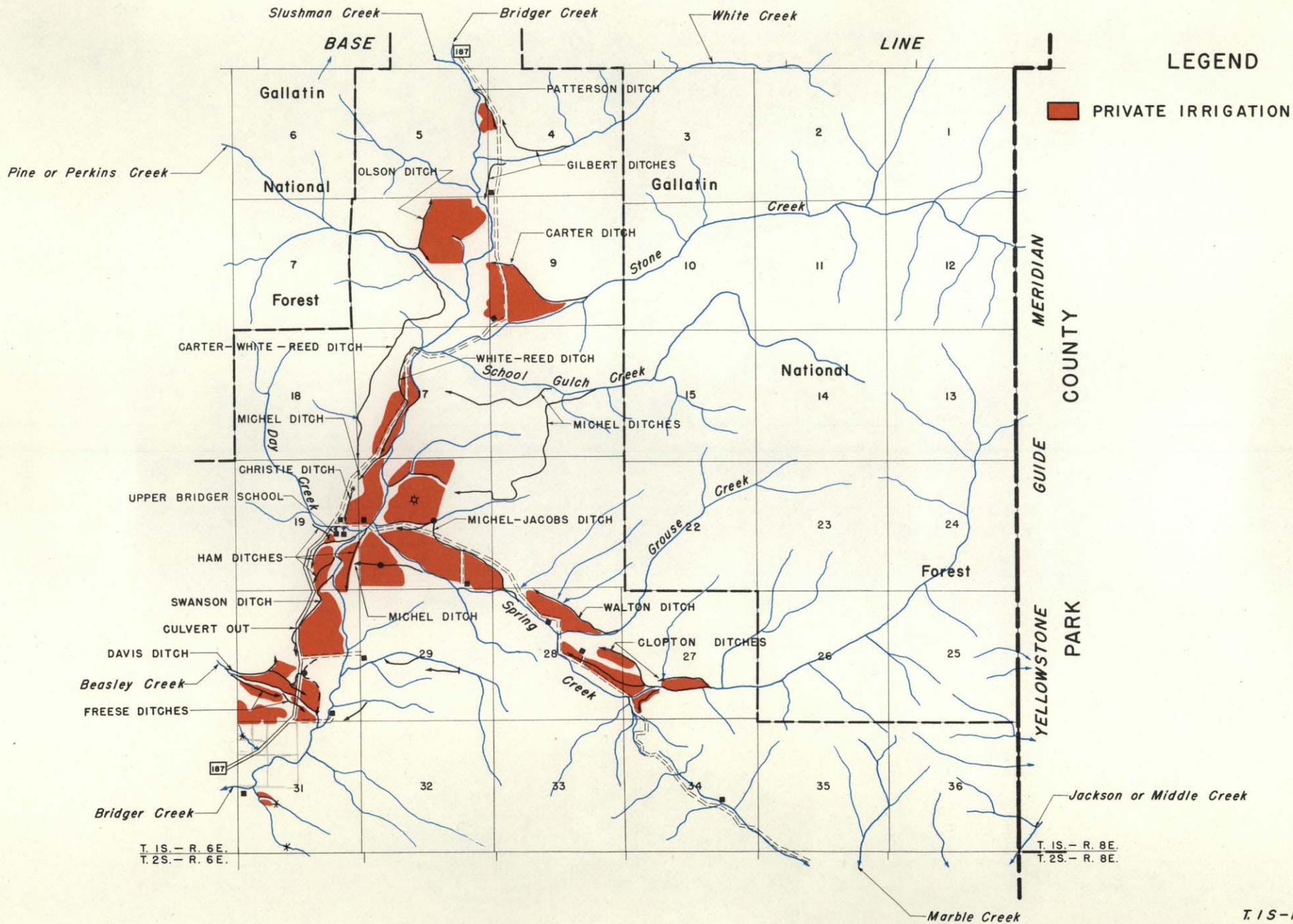
- == PAVED ROADS
- === UNPAVED ROADS
- +++ RAILROADS
-  STATE HIGHWAY
-  U.S. HIGHWAY
- ◇ AIRPORT

- * SPRING
-  SWAMP
-  GAUGING STATION
-  POWER PLANT
-  STORAGE TANK
-  CEMETERY
- ⊙ FAIRGROUND
- FARM OR RANCH UNIT
-  LOOKOUT STATION
-  RANGER STATION
- - - - RAILROAD TUNNEL
- SCHOOL
-  SHAFT, MINE, OR DRIFT









RECORDS
MANAGEMENT
WRS COPY

Water Resources Survey



Part II:

MAPS SHOWING IRRIGATED AREAS IN COLORS
DESIGNATING THE SOURCES OF SUPPLY

Park County, Montana

YELLOWSTONE RIVER
COMPACT COMMISSION
PERMANENT FILE

Published by

STATE ENGINEER'S OFFICE
Helena, Montana, December, 1951



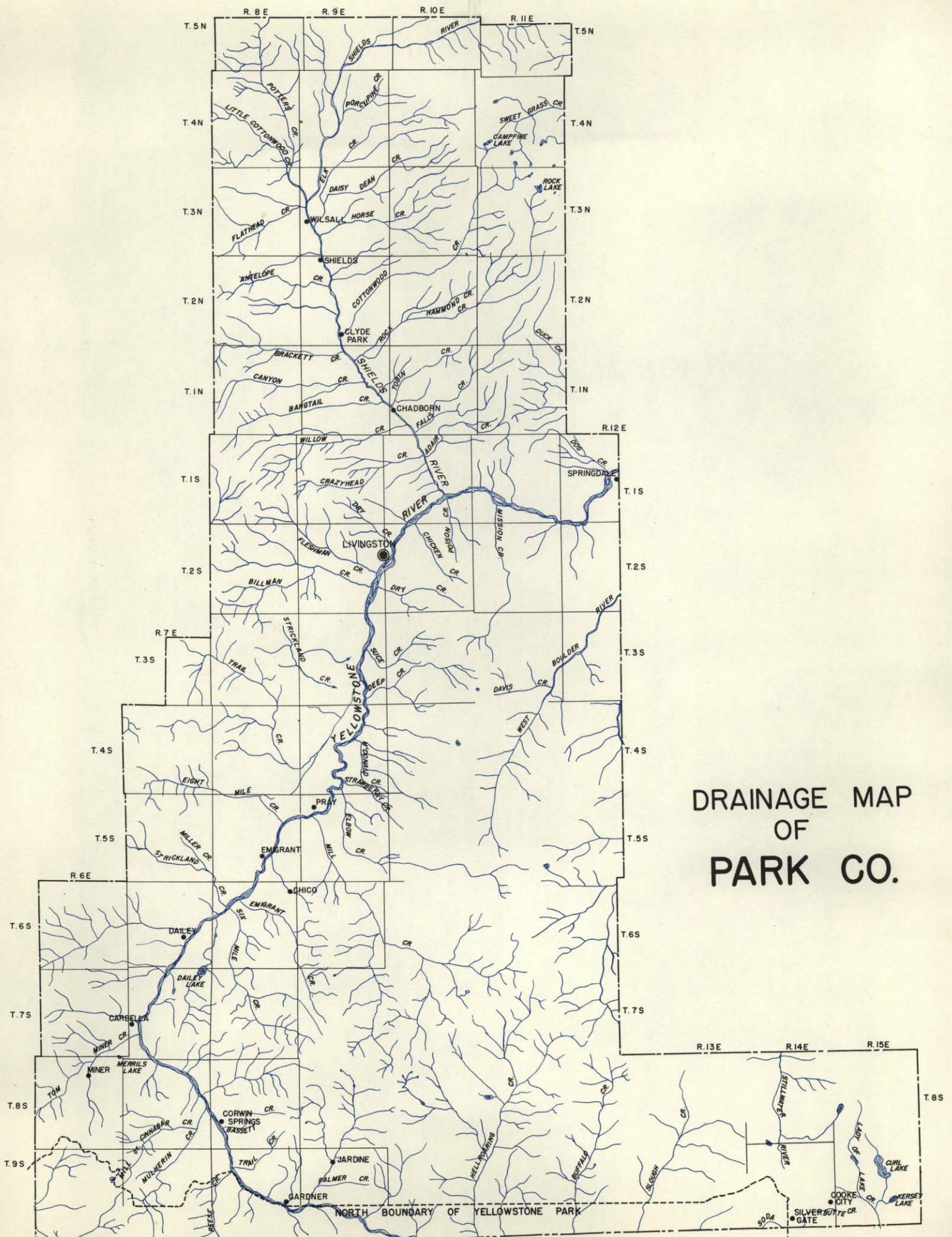
WATER RESOURCES SURVEY

Park County, Montana

Part II

Maps Showing Irrigated Areas

Published by
STATE ENGINEER'S OFFICE
Helena, Montana
December, 1951



DRAINAGE MAP OF PARK CO.

MAP INDEX

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5 North	9 East	2	2 South	10 East	25
5 North	10 East	3	2 South	11 East	26
4 North	8 East	4	2 South	12 East	27
4 North	9 East	5	3 South	8 East	28
4 North	10 East	6	3 South	9 East	29
3 North	8 East	7	3 South	11 East	30
3 North	9 East	8	3 South	12 East	31
3 North	10 East	9	4 South	8 East	32
2 North	8 East	10	4 South	9 East	33
2 North	9 East	11	5 South	7 East	34
2 North	10 East	12	5 South	9 East	35
2 North	11 East	13	6 South	7 East	36
1 North	8 East	14	6 South	8 East	37
1 North	9 East	15	6 South	9 East	38
1 North	10 East	16	7 South	6 East	39
1 North	11 East	17	8 South	6 East	40
1 South	8 East	18	8 South	7 East	41
1 South	9 East	19	8 South	8 East	42
1 South	10 East	20	9 South	7 East	43
1 South	11 East	21	9 South	8 East	44
1 South	12 East	22	9 South	9 East	45
2 South	8 East	23			

MAP SYMBOL INDEX

BOUNDARIES

- COUNTY LINE
- NATIONAL FOREST LINE

DITCHES

-  CANALS OR DITCHES
-  DRAIN DITCHES
-  PROPOSED DITCHES

STRUCTURES

-  DAM
-  DROP
-  FLUME
-  GAUGING STATION
- +++ NATURAL CARRIER USED AS DITCH
- PUMP
- PUMP SITE
-  RESERVOIR
-  SIPHON
- ⊗ STORAGE TANK
-  WEIR
- ⊖ WELL

TRANSPORTATION

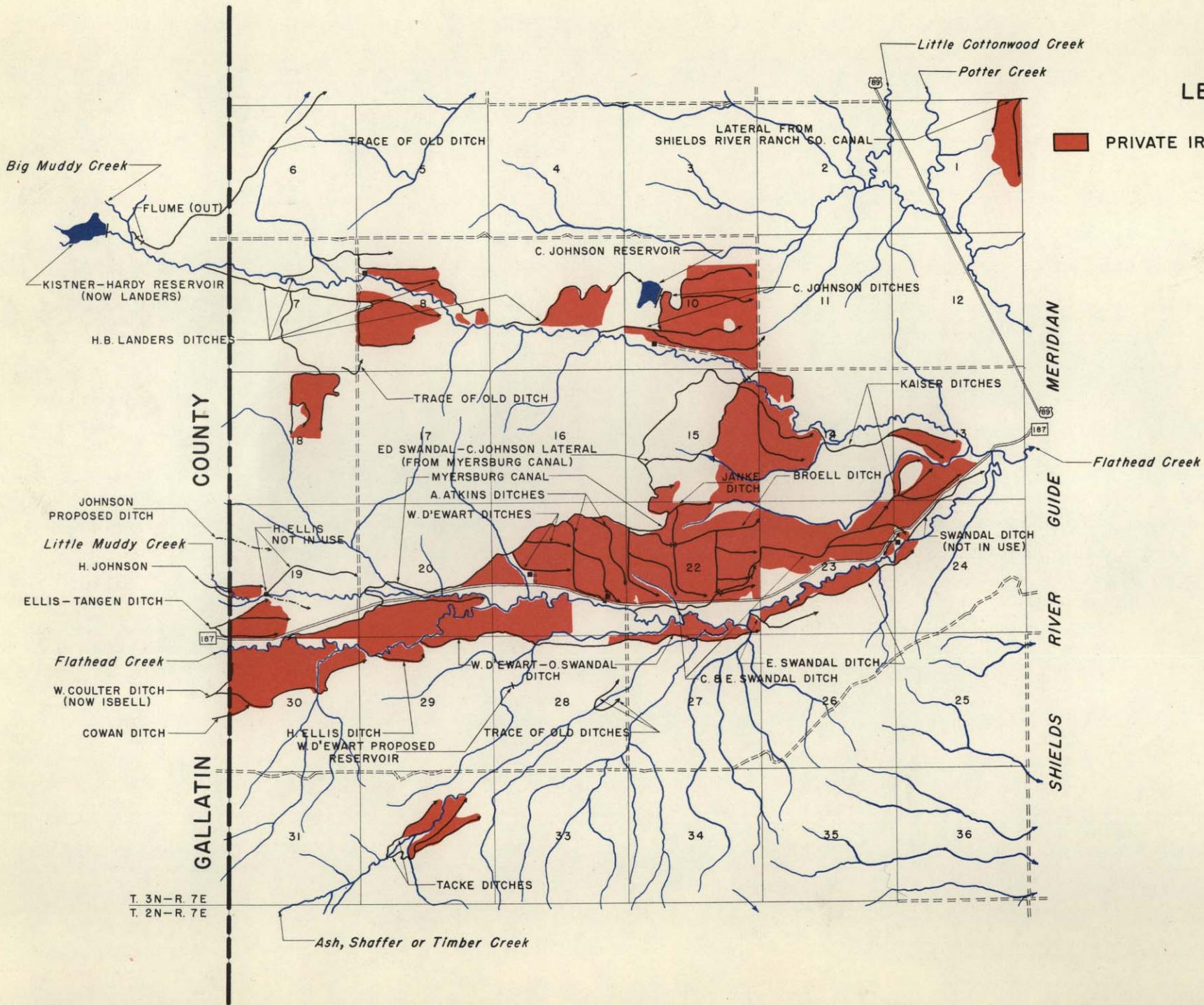
- === COUNTY ROADS
- ==== PAVED HIGHWAY
- +++ RAILROADS
- ⊠ STATE HIGHWAY
- Ⓢ U. S. HIGHWAY

UNITS

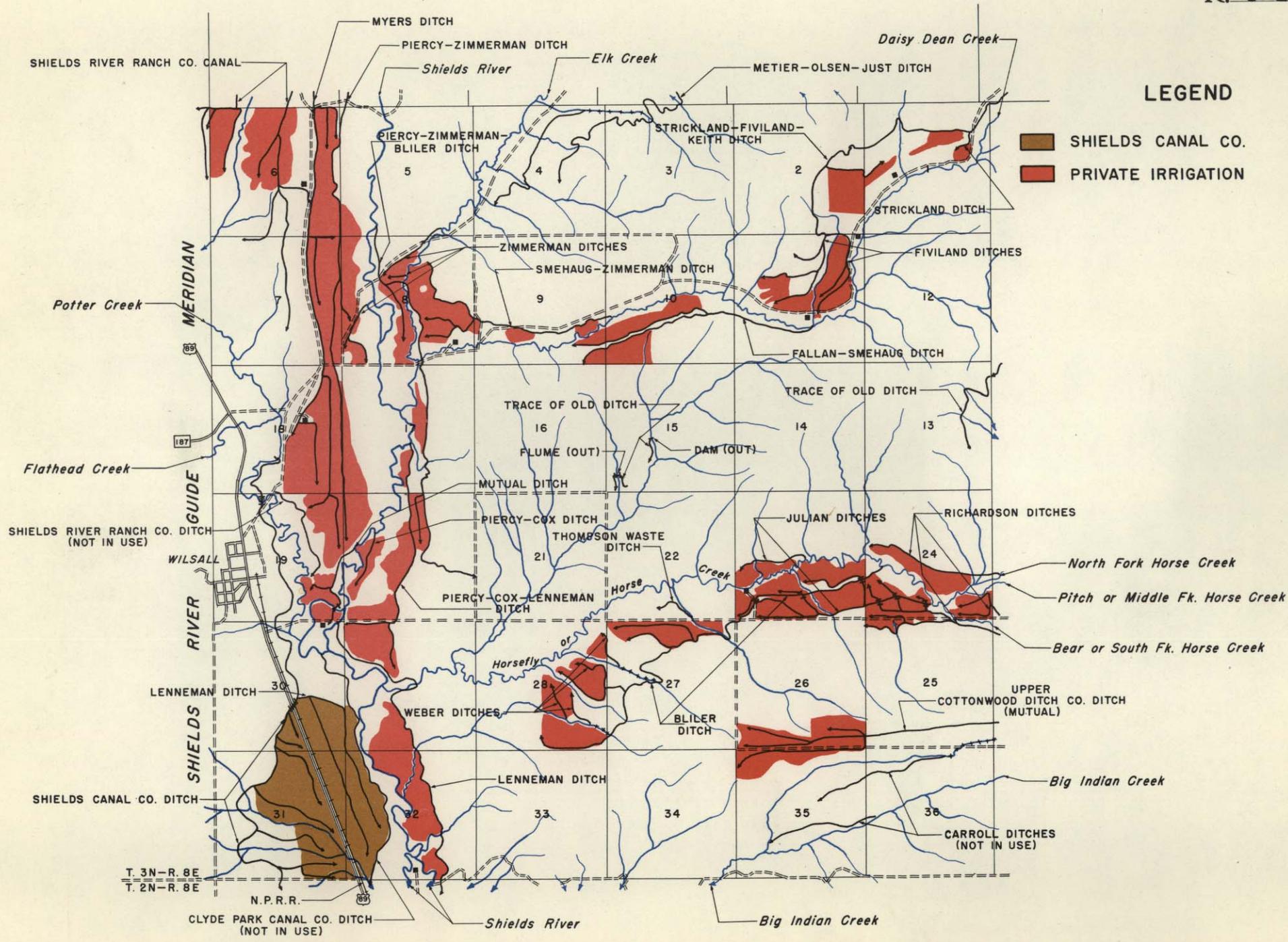
- ⊙ AIRPORT
- ⊠ CEMETARY
- COUNTY SEAT
- ⊙ FAIRGROUND
- FARM OR RANCH UNIT
- ◇ FISH HATCHERY
- Ⓜ LOOKOUT STATION
- Ⓜ POWER PLANT
- Ⓜ RANGER STATION
- Ⓜ SCHOOL HOUSE
- Ⓜ SHAFT, MINE OR DRIFT
- * SPRING
- ⊕ STATE OR NATIONAL MONUMENT

LEGEND

PRIVATE IRRIGATION



T. 3N-R. 7E
T. 2N-R. 7E



LEGEND

- SHIELDS CANAL CO.
- PRIVATE IRRIGATION

T. 3N-R. 8E
T. 2N-R. 8E

N.P.R.R.
CLYDE PARK CANAL CO. DITCH
(NOT IN USE)

Attachment 8

Landcover Report





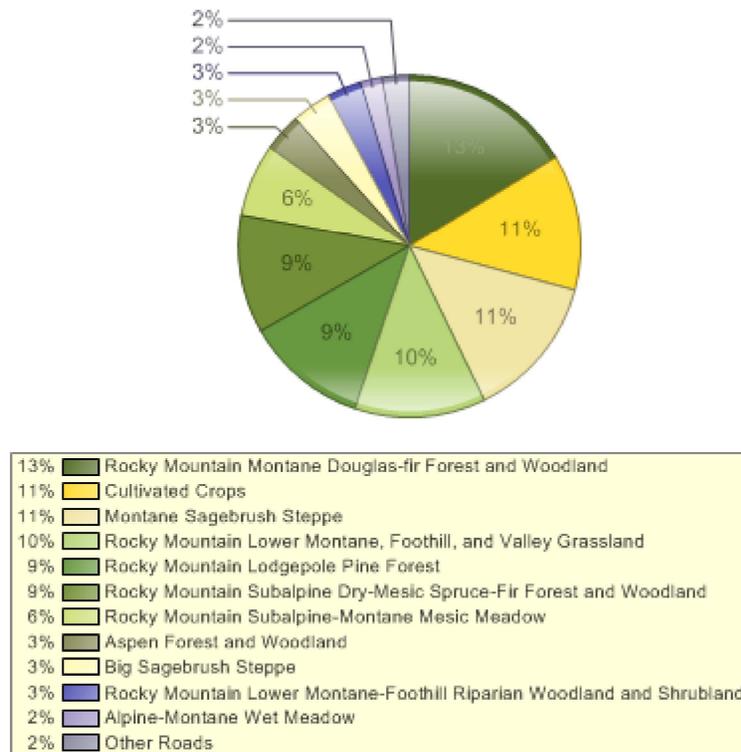
Montana Ecological Systems - Landcover Report

Report generated 7/8/2014 9:49:23 AM

Gallatin County

1,684,760 Acres (1.79% of Montana)

Notes on and Appropriate Uses of Landcover



Primary Composition of Landcover



13%
(224,843
Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Montane Douglas-fir Forest and Woodland

In Montana, this ecological system occurs on the east side of the Continental Divide, north to about the McDonald Pass area, and along the Rocky Mountain Front. This system is associated with a dry to submesic continental climate regime with annual precipitation ranging from 51 to 102 centimeters (20-40 inches), with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,980 meters (6500 feet) in northern Montana and up to 2,286 meters (7500 feet) on warm aspects in southern Montana. It occurs on north-facing aspects in most areas, and south-facing aspects at higher elevations. This is a Douglas-fir (*Pseudotsuga menziesii*) dominated system without any maritime floristic composition. Fire disturbance intervals are as infrequent as 500 years, and as a result, individual trees and forests can attain great age on some

sites (500 to 1,500 years). In Montana, this system occurs from lower montane to lower subalpine environments and is prevalent on calcareous substrates. Common understory shrubs include common ninebark (*Physocarpus malvaceus*), common juniper (*Juniperus communis*), Rocky Mountain juniper (*Juniperus scopulorum*), birch-leaf spiraea (*Spiraea betulifolia*), snowberry (*Symphoricarpos* species), creeping Oregon grape (*Mahonia repens*) and Canadian buffaloberry (*Shepherdia canadensis*). The Douglas-fir/pinegrass (*Calamagrostis rubescens*) type is the most ubiquitous association found within this system in Montana.



11%
(177,338
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.



11%
(188,231
Acres)

Shrubland, Steppe and Savanna Systems Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana* ssp. *viscidula*), subalpine big sagebrush (*Artemisia tridentata* ssp. *spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula* ssp. *arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis*), spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia*). In areas where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



10%
(170,396
Acres)

Grassland Systems Montane Grassland

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below

the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum smithii*) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.



9% (159,552 Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Lodgepole Pine Forest

This forested system is widespread in upper montane to subalpine zones of the Montana Rocky Mountains, and east into island ranges of north-central Montana and the Bighorn and Beartooth ranges of south-central Montana. These are montane to subalpine forests where the dominance of lodgepole pine (*Pinus contorta*) is related to fire history and topoedaphic conditions. In Montana, elevation ranges from 975 to 2,743 meters (3,200-9000 feet). These forests occur on flats to slopes of all degrees and aspect, as well as valley bottoms. Fire is frequent, and stand-replacing fires are common. Following stand-replacing fires, lodgepole pinewill rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests persisting for 50-200 years on warmer, lower elevation forests, and 150-400 years in subalpine forests. They generally occur on dry to intermediate sites with a wide seasonal range of temperatures and long precipitation-free periods in summer. Snowfall is heavy and supplies the major source of soil water used for growth in early summer. Vigorous stands occur where the precipitation exceeds 533 millimeters (21 inches). These lodgepole forests are typically associated with rock types weathering to acidic substrates, such as granite and rhyolite. In west-central Montana ranges such the Big Belts and the Rocky Mountain Front, these forests are found on limestone substrates. These systems are especially well developed on the broad ridges and high valleys near and east of the Continental Divide. Succession proceeds at different rates, moving relatively quickly on low-elevation, mesic sites and particularly slowly in high-elevation forests such as those along the Continental Divide in Montana.



9% (154,502 Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) make up a substantial part of the montane and lower subalpine forests of the Montana Rocky Mountains and mountain island ranges of north-central and west-central Montana. Spruce is usually associated with fir and occurs as either a climax co-dominant or as a persistent, long-lived seral species in most upper elevation firhabitat types. Dry to mesic spruce-dominated forests range from 884-1,585 meters (2,900-5,200 feet) west of the Continental Divide, and 1585-2,073 meters (5,200-6,800 feet) east of the Continental Divide in the northern and central portions of the state. This system can be found at elevations up to 2,896 meters (9,500 feet) in southwestern Montana. Forests are found on gentle to very steep mountain slopes, high-elevation ridge tops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and

inactive stream terraces. Tree canopy characteristics are relatively uniform. In northern Montana, Engelmann spruce hybridizes with its boreal counterpart, white spruce (*Picea glauca*). Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*) (west of the Continental Divide) are seral but often present in these forests. The understory is comprised of a mixture of shrubs, forbs and graminoids tolerant of warmer and drier soil conditions than those found on the more mesic to wet spruce-fir system. The drier occurrences of this system are especially common on steep slopes at upper elevations throughout the eastern Rocky Mountains, whereas the more mesic occurrences form substantial cover west of the Continental Divide in the Flathead, Lolo, Bitterroot and Kootenai river drainages.



6% (95,075 Acres)

Grassland Systems

Montane Grassland

Rocky Mountain Subalpine-Montane Mesic Meadow

This system is restricted to sites from lower montane to subalpine elevations where finely textured soils, snow deposition, or windswept conditions limit tree establishment. Many occurrences are small patches, and are often found in mosaics within woodlands, dense shrublands, or just below alpine communities. Elevations range from 600 to 2,011 meters (2,000-6,600 feet) in the northern Rocky Mountains and up to 2,286- 2,682 meters (7,500-8,800 feet) in the mountains of southwestern Montana. This system occurs on gentle to moderate-gradient slopes and in relatively moist habitats. Soils are typically seasonally moist to saturated in the spring, but dry out later in the growing season. At montane elevations, soils are usually clays or silt loams, and some occurrences may have inclusions of hydric soils in low, depressional areas. At subalpine elevations, soils are derived a variety of parent materials, and are usually rocky or gravelly with good aeration and drainage, but with a well developed organic layer. Some occurrences are more heavily dominated by grasses, while others are more dominated by forbs. Common grasses include tufted hairgrass (*Deschampsia caespitosa*), showy oniongrass (*Melica spectabilis*), mountain brome (*Bromus carinatus*), blue wildrye (*Elymus glaucus*), awned sedge (*Carex atherodes*), and small wing sedge (*Carex microptera*). Forb dominated meadows usually comprise a wide species diversity which differs from montane to subalpine elevations. Shrubs such as shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*) and snowberry (*Symphoricarpos* species) are occasional but not abundant. This system differs from the Rocky Mountain Alpine Montane Wet Meadow system in that its soils dry out by mid-summer.



3% (49,353 Acres)

Forest and Woodland Systems

Deciduous dominated forest and woodland

Aspen Forest and Woodland

This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs in the montane and subalpine zones throughout much of Montana north into Canada. It is similar to the Inter-Mountain Basins Aspen Mixed Conifer Forest-Woodland found in the Big Snowy Mountains, but lacks the conifer component. Distribution of this system is primarily limited by adequate soil moisture required to meet its high evapotranspirative demand, length of growing season, and temperatures. Mean annual precipitation where these systems occur is generally greater than 38 centimeters (15 inches) and typically greater than 51 centimeters (20 inches), except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or areas below large snow drifts. Stands can occur on gentle to moderate slopes, in swales, or on level sites. At lower elevations, occurrences are found on cooler, north aspects and mesic sites. Soils are usually deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. This system describes mesic forests and woodlands dominated by quaking aspen (*Populus tremuloides*) without a significant conifer component (<25% relative tree cover). This aspen system can be stable and long-lived with little encroachment of coniferous species. The understory structure may be complex with multiple shrub and herbaceous

layers, or simple, with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by mesic grasses or forbs. Occurrences of this system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease, windthrow, elk and beaver activity.



Shrubland, Steppe and Savanna Systems

Sagebrush Steppe

3% (51,869 Acres)

Big Sagebrush Steppe

This widespread ecological system occurs throughout much of central Montana, and north and east onto the western fringe of the Great Plains. In central Montana, where this system occurs on both glaciated and non-glaciated landscapes, it differs slightly, with more summer rain than winter precipitation and more precipitation annually. Throughout its distribution, soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs with greater than 25% cover. Overall shrub cover is less than 10 percent. In Montana and Wyoming, stands are more mesic, with more biomass of grass, and have less shrub diversity than stands farther to the west, and 50 to 90% of the occurrences are dominated by Wyoming big sagebrush with western wheatgrass (*Pascopyrum smithii*). Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*) are indicators of disturbance, but cheatgrass is typically not as abundant as in the Intermountain West, possibly due to a colder climate. The natural fire regime of this ecological system maintains a patchy distribution of shrubs, preserving the steppe character. Shrubs may increase following heavy grazing and/or with fire suppression. In central and eastern Montana, complexes of prairie dog towns are common in this ecological system.



3% (44,101 Acres)

Wetland and Riparian Systems

Floodplain and Riparian

Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, it ranges from approximately 945 to 2,042 meters (3,100 to 6,700 feet), characteristically occurring as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and on immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), Plains cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redbud (*Cornus sericea*), hawthorne (*Crataegus spp.*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), Drummond's willow (*Salix drummondiana*), sandbar willow (*Salix exigua*), Pacific willow (*Salix lucida*), rose (*Rosa species*), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos species*). Exotic trees of Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix species*) may invade some stands in southeastern and south-central Montana.



Wetland and Riparian Systems

Wet meadow

Alpine-Montane Wet Meadow

2% (28,349
Acres)

These moderate-to-high-elevation systems are found throughout the Rocky Mountains, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. Occurrences range in elevation from montane to alpine at 1,000 to 3,353 meters (3,280-11,000 feet). This system typically occurs in cold, moist basins, seeps and alluvial terraces of headwater streams or as a narrow strip adjacent to alpine lakes (Hansen et al., 1996). Wet meadows are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10 percent. In alpine regions, sites are typically small depressions located below late-melting snow patches or on snowbeds. The growing season may only last for one to two months. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids such as tufted hairgrass (*Deschampsia caespitosa*), and a diversity of montane or alpine sedges such as small-head sedge (*Carex illota*), small-winged sedge (*Carex microptera*), black alpine sedge (*Carex nigricans*), Holm's Rocky Mountain sedge (*Carex scopulorum*) shortstalk sedge (*Carex podocarpa*) and Payson's sedge (*Carex paysonis*). Drummond's rush (*Juncus drummondii*), Merten's rush (*Juncus mertensianus*), and high elevation bluegrasses (*Poa arctica* and *Poa alpina*) are often present. Forbs such as arrow-leaf groundsel (*Senecio triangularis*), slender-sepal marsh marigold (*Caltha leptosepala*), and spreading globeflower (*Trollius laxus*) often form high cover in higher elevation meadows. Wet meadows are associated with snowmelt and are usually not subjected to high disturbance events such as flooding.

Human Land Use

2% (35,830
Acres)

Developed



Other Roads

County, city and or rural roads generally open to motor vehicles.

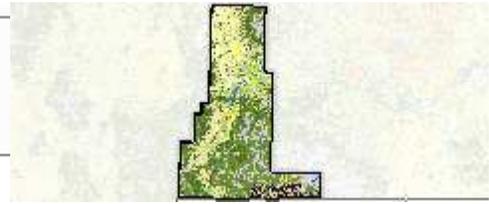
Additional Limited Landcover

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Montana Ecological Systems / Landcover Report
Gallatin County

Natural Heritage Map Viewer. Montana Natural Heritage Program.

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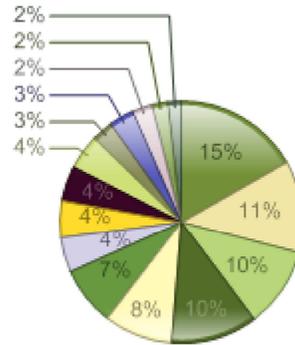
Montana Ecological Systems - Landcover Report

Report generated 7/8/2014 9:54:20 AM

Park County

1,799,580 Acres (1.91% of Montana)

Notes on and Appropriate Uses of Landcover



Primary Composition of Landcover



15%
(269,639
Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) make up a substantial part of the montane and lower subalpine forests of the Montana Rocky Mountains and mountain island ranges of north-central and west-central Montana. Spruce is usually associated with fir and occurs as either a climax co-dominant or as a persistent, long-lived seral species in most upper elevation fir habitat types. Dry to mesic spruce-dominated forests range from 884-1,585 meters (2,900-5,200 feet) west of the Continental Divide, and 1585-2,073 meters (5,200-6,800 feet) east of the Continental Divide in the northern and central portions of the state. This system can be found at elevations up to 2,896 meters (9,500 feet) in southwestern Montana. Forests are found on gentle to very steep mountain slopes, high-elevation ridge tops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and

inactive stream terraces. Tree canopy characteristics are relatively uniform. In northern Montana, Engelmann spruce hybridizes with its boreal counterpart, white spruce (*Picea glauca*). Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*) (west of the Continental Divide) are seral but often present in these forests. The understory is comprised of a mixture of shrubs, forbs and graminoids tolerant of warmer and drier soil conditions than those found on the more mesic to wet spruce-fir system. The drier occurrences of this system are especially common on steep slopes at upper elevations throughout the eastern Rocky Mountains, whereas the more mesic occurrences form substantial cover west of the Continental Divide in the Flathead, Lolo, Bitterroot and Kootenai river drainages.



11%
(198,192
Acres)

Shrubland, Steppe and Savanna Systems Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana* ssp. *viscidula*), subalpine big sagebrush (*Artemisia tridentata* ssp. *spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula* ssp. *arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis*), spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia*). In areas where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



10%
(172,815
Acres)

Grassland Systems Montane Grassland

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum*

smithii) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.



10%
(184,807
Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Montane Douglas-fir Forest and Woodland

In Montana, this ecological system occurs on the east side of the Continental Divide, north to about the McDonald Pass area, and along the Rocky Mountain Front. This system is associated with a dry to submesic continental climate regime with annual precipitation ranging from 51 to 102 centimeters (20-40 inches), with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,980 meters (6500 feet) in northern Montana and up to 2,286 meters (7500 feet) on warm aspects in southern Montana. It occurs on north-facing aspects in most areas, and south-facing aspects at higher elevations. This is a Douglas-fir (*Pseudotsuga menziesii*) dominated system without any maritime floristic composition. Fire disturbance intervals are as infrequent as 500 years, and as a result, individual trees and forests can attain great age on some sites (500 to 1,500 years). In Montana, this system occurs from lower montane to lower subalpine environments and is prevalent on calcareous substrates. Common understory shrubs include common ninebark (*Physocarpus malvaceus*), common juniper (*Juniperus communis*), Rocky Mountain juniper (*Juniperus scopulorum*), birch-leaf spiraea (*Spiraea betulifolia*), snowberry (*Symphoricarpos* species), creeping Oregon grape (*Mahonia repens*) and Canadian buffaloberry (*Shepherdia canadensis*). The Douglas-fir/pinegrass (*Calamagrostis rubescens*) type is the most ubiquitous association found within this system in Montana.



8% (148,107
Acres)

Shrubland, Steppe and Savanna Systems

Sagebrush Steppe

Big Sagebrush Steppe

This widespread ecological system occurs throughout much of central Montana, and north and east onto the western fringe of the Great Plains. In central Montana, where this system occurs on both glaciated and non-glaciated landscapes, it differs slightly, with more summer rain than winter precipitation and more precipitation annually. Throughout its distribution, soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs with greater than 25% cover. Overall shrub cover is less than 10 percent. In Montana and Wyoming, stands are more mesic, with more biomass of grass, and have less shrub diversity than stands farther to the west, and 50 to 90% of the occurrences are dominated by Wyoming big sagebrush with western wheatgrass (*Pascopyrum smithii*). Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*) are indicators of disturbance, but cheatgrass is typically not as abundant as in the Intermountain West, possibly due to a colder climate. The natural fire regime of this ecological system maintains a patchy distribution of shrubs, preserving the steppe character. Shrubs may increase following heavy grazing and/or with fire suppression. In central and eastern Montana, complexes of prairie dog towns are common in this ecological system.



Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Lodgepole Pine Forest

**7% (126,274
Acres)**

This forested system is widespread in upper montane to subalpine zones of the Montana Rocky Mountains, and east into island ranges of north-central Montana and the Bighorn and Beartooth ranges of south-central Montana. These are montane to subalpine forests where the dominance of lodgepole pine (*Pinus contorta*) is related to fire history and topoedaphic conditions. In Montana, elevation ranges from 975 to 2,743 meters (3,200-9000 feet). These forests occur on flats to slopes of all degrees and aspect, as well as valley bottoms. Fire is frequent, and stand-replacing fires are common. Following stand-replacing fires, lodgepole pinewill rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests persisting for 50-200 years on warmer, lower elevation forests, and 150-400 years in subalpine forests. They generally occur on dry to intermediate sites with a wide seasonal range of temperatures and long precipitation-free periods in summer. Snowfall is heavy and supplies the major source of soil water used for growth in early summer. Vigorous stands occur where the precipitation exceeds 533 millimeters (21 inches). These lodgepole forests are typically associated with rock types weathering to acidic substrates, such as granite and rhyolite. In west-central Montana ranges such the Big Belts and the Rocky Mountain Front, these forests are found on limestone substrates. These systems are especially well developed on the broad ridges and high valleys near and east of the Continental Divide. Succession proceeds at different rates, moving relatively quickly on low-elevation, mesic sites and particularly slowly in high-elevation forests such as those along the Continental Divide in Montana.



**4% (75,465
Acres)**

Alpine Systems

Alpine Grassland and Shrubland

Alpine Turf

In Montana, this system occurs above upper treeline throughout the Montana Rocky Mountain ranges, and east into the mountain island ranges. Elevation ranges from as low as 6,600 ft in northwestern to 10,500 feet in southwestern Montana. Turf communities form on gentle to moderate upper slopes, flat ridges, valleys, basins, and gentle summit ridges where soil has become relatively stabilized and the water supply persists until fall. At these elevations, the growing season typically ranges from 60 to 90 days. During the growing season, these areas are subjected to windy conditions and widely variable diurnal temperatures. Freezing temperatures and snow can occur throughout the summer months. Turf communities are composed of a diversity of rhizomatous sedges, rushes, woodrushes, grasses and forbs that form a dense turf that is rarely greater than 12 cm (5 inches) tall. Depending on slope protection, soil development, snow depth, turf communities can range from dry to mesic expressions.



**4% (79,219
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.



**4% (75,384
Acres)**

Recently Disturbed or Modified

Recently burned

Recently burned forest

Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.

Grassland Systems

Montane Grassland



4% (75,172
Acres)

Rocky Mountain Subalpine-Montane Mesic Meadow

This system is restricted to sites from lower montane to subalpine elevations where finely textured soils, snow deposition, or windswept conditions limit tree establishment. Many occurrences are small patches, and are often found in mosaics within woodlands, dense shrublands, or just below alpine communities. Elevations range from 600 to 2,011 meters (2,000-6,600 feet) in the northern Rocky Mountains and up to 2,286- 2,682 meters (7,500-8,800 feet) in the mountains of southwestern Montana. This system occurs on gentle to moderate-gradient slopes and in relatively moist habitats. Soils are typically seasonally moist to saturated in the spring, but dry out later in the growing season. At montane elevations, soils are usually clays or silt loams, and some occurrences may have inclusions of hydric soils in low, depressional areas. At subalpine elevations, soils are derived a variety of parent materials, and are usually rocky or gravelly with good aeration and drainage, but with a well developed organic layer. Some occurrences are more heavily dominated by grasses, while others are more dominated by forbs. Common grasses include tufted hairgrass (*Deschampsia caespitosa*), showy oniongrass (*Melica spectabilis*), mountain brome (*Bromus carinatus*), blue wildrye (*Elymus glaucus*), awned sedge (*Carex atherodes*), and small wing sedge (*Carex microptera*). Forb dominated meadows usually comprise a wide species diversity which differs from montane to subalpine elevations. Shrubs such as shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*) and snowberry (*Symphoricarpos* species) are occasional but not abundant. This system differs from the Rocky Mountain Alpine Montane Wet Meadow system in that it soils dry out by mid-summer.



3% (45,241
Acres)

Forest and Woodland Systems

Deciduous dominated forest and woodland

Aspen Forest and Woodland

This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs in the montane and subalpine zones throughout much of Montana north into Canada. It is similar to the Inter-Mountain Basins Aspen Mixed Conifer Forest-Woodland found in the Big Snowy Mountains, but lacks the conifer component. Distribution of this system is primarily limited by adequate soil moisture required to meet its high evapotranspirative demand, length of growing season, and temperatures. Mean annual precipitation where these systems occur is generally greater than 38 centimeters (15 inches) and typically greater than 51 centimeters (20 inches), except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or areas below large snow drifts. Stands can occur on gentle to moderate slopes, in swales, or on level sites. At lower elevations, occurrences are found on cooler, north aspects and mesic sites. Soils are usually deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. This system describes mesic forests and woodlands dominated by quaking aspen (*Populus tremuloides*) without a significant conifer component (<25% relative tree cover). This aspen system can be stable and long-lived with little encroachment of coniferous species. The understory structure may be complex with multiple shrub and herbaceous layers, or simple, with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by mesic grasses or forbs. Occurrences of this system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease, windthrow, elk and beaver activity.



3% (53,354
Acres)

Wetland and Riparian Systems

Floodplain and Riparian

Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, it ranges from approximately 945 to 2,042 meters (3,100 to 6,700 feet), characteristically occurring as a mosaic of multiple communities that are tree-

dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and on immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), Plains cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redbud (*Cornus sericea*), hawthorne (*Crataegus spp.*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), Drummond's willow (*Salix drummondiana*), sandbar willow (*Salix exigua*), Pacific willow (*Salix lucida*), rose (*Rosa species*), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos species*). Exotic trees of Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix species*) may invade some stands in southeastern and south-central Montana.



**2% (43,335
Acres)**

Alpine Systems

Alpine Sparse and Barren

Alpine Bedrock and Scree

This ecological system is restricted to the highest elevations of the Rocky Mountains, from Alberta and British Columbia south into New Mexico, and west into the highest mountain ranges of the Great Basin. It is composed of barren and sparsely vegetated alpine substrates, typically including both bedrock outcrop and scree slopes, with lichen-dominated communities. In Montana, alpine bedrock and scree are well represented throughout the northern Rocky Mountains and island mountain ranges. Elevations range from as low as 2,285 meters (7,500 feet) in northwestern Montana to 3,500 meters (11,500 feet) in southern Montana. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Typically, there is sparse (less than 10%) cover of forbs, grasses, and low shrubs, with exposed, unstable scree, talus and bedrock constituting the remainder of cover. Diverse crustose and foliose lichen cover is high (often greater than 50%) on exposed talus and bedrock. Soils on these windy, unproductive sites are very poorly developed, often only occurring in fractures of bedrock. This system is characterized by a very cold climate during winter, high winds, high UV radiation and high surface daytime temperatures during summer months on south and west facing aspects, and a very short growing season. Most scree- and bedrock-inhabiting plants are highly adapted to this xeric environment and occur as singular plants among the exposed rocks or in bedrock fractures. These species are typically cushioned, matted or succulent, or grow as flat rosettes, often with thick leaf cuticles or a dense cover of hairs. This system often occurs adjacent to or immediately below North American Alpine Ice Fields and intermingles with Rocky Mountain Alpine Fell Fields.



**2% (33,980
Acres)**

Forest and Woodland Systems

Conifer-dominated forest and woodland (mesic-wet)

Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

These forests are similar to Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (4242), but occur in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They are distinguished by their occurrence on mesic to wet microsites within the matrix of the drier (and warmer) subalpine spruce-fir or lodgepole pine forests. The microsites include north-facing slopes, swales or ravines, toeslopes, cold pockets, and

other locations where available soil moisture is higher or lasts longer into the growing season. This system can extend down in elevation below the subalpine zone in places where cold-air ponding occurs, especially on north and east aspects. Elevations range from 884 to 1,981 meters (2,900-6,500 feet) west of the Continental Divide, and 1,585 to 2,682 meters (5,200-8,800 feet) east of the Continental Divide. Spruce is usually associated with subalpine fir and occurs either as a climax co-dominant or as a persistent, long-lived seral species in most upper elevation subalpine fir stands. Mountain hemlock (*Tsuga mertensiana*) occurs as small patches within the matrix of this mesic spruce-fir system, but only in the most maritime of environments of northwestern Montana, in the coldest and wettest sites. The shrub understory contains many ericaceous species such as rusty leaf menziesia (*Menziesia ferruginea*), dwarf huckleberry (*Vaccinium caespitosum*), mountain huckleberry (*Vaccinium membranaceum*), bilberry (*Vaccinium myrtillus*), grouse whortleberry (*Vaccinium scoparium*), pink mountain heath (*Phyllodoce empetriformis*), black twinberry honeysuckle (*Lonicera involucrata*), gooseberry (*Ribes* species) and thimbleberry (*Rubus parviflorus*). The herbaceous understory contains mesic forbs, graminoids, and ferns and fern allies on the wettest sites. Moss cover is often high. Stand-replacing fires are less common in mesic spruce-fir forests than in dry-mesic forests.



2% (29,767 Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Subalpine Woodland and Parkland

This system includes all subalpine and treeline forest associations of the Montana Rocky Mountains and island ranges. It is characteristically a high-elevation mosaic of stunted tree clumps, open woodlands, and herb- or dwarf-shrub-dominated openings, occurring above closed forest ecosystems and below alpine communities. It includes open areas with stands of whitebark pine (*Pinus albicaulis*) occurring most commonly on south-, east-, and west-facing aspects, or less commonly, alpine larch (*Larix lyallii*) on north-facing aspects and in basins. Subalpine fir (*Abies lasiocarpa*) is the co-dominant in these systems and is often the most prevalent tree species. Engelmann spruce (*Picea engelmannii*) is usually associated with subalpine fir and occurs as either a climax co-dominant or as a persistent, long-lived seral species in most upper elevation subalpine fir habitat types. Elevation range from as low as 1,981 meters (6,500 feet) in northwestern Montana to 2,682 meters (8,800 feet) in southwestern Montana. The climate is typically very cold in winter and dry in summer. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, landslides and rockslides, and cirque headwalls and basins. Snow accumulation is high in basins, but ridgetops have little snow accumulation because of high winds and sublimation. In this harsh, often wind-swept environment, trees are usually stunted and flagged from damage associated with wind, blowing snow and ice crystals, especially at the upper elevations. Fire suppression, disease, insects and climate change are changing the structure, distribution and composition of these systems.

Additional Limited Landcover

Citation for this report:

Montana Ecological Systems / Landcover Report
Park County

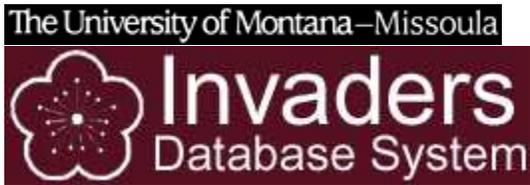
Natural Heritage Map Viewer. Montana Natural Heritage Program.

Retrieved on July 8, 2014, from <http://mtnhp.org/mapviewer/LandcoverReport.aspx?v=0&x=517147.546104869&y=140193.865701587>

Attachment 9

Noxious Weeds





Tuesday, July 08, 2014

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- [State/Provincial Noxious Weed Lists](#)
- [Biocontrol Service](#)
- [Blackfoot Weed Management](#)
- [ID/MT Risk Assessment](#)
- [Verification System](#)

There are 49 species for this query.

Exotic

46

Database queried on: July 8, 2014 Database last updated on: February 10, 2014

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Genus	Species	Common Name	Noxious In	Exotic
Agropyron	repens	quackgrass	OR,WY	×
Arctium	minus	common burdock	WY	×
Artemisia	absinthium	absinth wormwood	WA	×
Bryonia	alba	white bryony	WA	×
Cardaria	draba	hoary cress	ID,MT,OR,WA,WY	×
Carduus	acanthoides	plumeless thistle	OR,WA,WY	×
Carduus	nutans	musk thistle	ID,OR,WA,WY	×
Centaurea	diffusa	diffuse knapweed	ID,MT,OR,WA,WY	×
Centaurea	jacea	brown knapweed	WA	×
Centaurea	maculosa	spotted knapweed	ID,MT,OR,WA,WY	×
Centaurea	repens	Russian knapweed	ID,MT,OR,WA,WY	×
Centaurea	solstitialis	yellow starthistle	ID,MT,OR,WA	×
Chrysanthemum	leucanthemum	oxeye daisy	MT,WA,WY	×
Cirsium	arvense	Canada thistle	ID,MT,OR,WA,WY	×
Cirsium	vulgare	bull thistle	OR,WA	×
Conium	maculatum	poison hemlock	ID,OR,WA	×
Convolvulus	arvensis	field bindweed	ID,MT,OR,WA,WY	×
Cuscuta	approximata	clustered dodder	OR,WA	×

Cynoglossum	officinale	houndstongue	MT,OR,WA,WY	×
Daucus	carota	wild carrot	WA	×
Equisetum	arvense	field horsetail	OR	
Euphorbia	esula	leafy spurge	ID,MT,OR,WA,WY	×
Gypsophila	paniculata	baby's breath	WA	×
Hieracium	aurantiacum	orange hawkweed	ID,MT,OR,WA	×
Hyoscyamus	niger	black henbane	ID,WA	×
Hypericum	perforatum	St. Johnswort	MT,OR,WA,WY	×
Iris	pseudacorus	yellowflag iris	MT,WA	×
Isatis	tinctoria	dyer's woad	ID,MT,OR,WA,WY	×
Kochia	scoparia	kochia	OR,WA	×
Lepidium	latifolium	perennial pepperweed	ID,MT,OR,WA,WY	×
Linaria	dalmatica	dalmatian toadflax	ID,MT,OR,WA,WY	×
Linaria	vulgaris	yellow toadflax	ID,MT,OR,WA,WY	×
Lysimachia	vulgaris	garden loosestrife	WA	×
Matricaria	maritima	scentless chamomile	WA	×
Mirabilis	nyctaginea	wild four o'clock	WA	
Myriophyllum	spicatum	Eurasian watermilfoil	ID,MT,OR,WA	×
Onopordum	acanthium	Scotch thistle	ID,OR,WA,WY	×
Panicum	miliaceum	wild proso millet	OR	×
Phalaris	arundinacea	reed canarygrass	WA	×
Polygonum	bohemica	Bohemian knotweed		×
Polygonum	sachalinense	giant knotweed	OR,WA	×
Potentilla	recta	sulfur cinquefoil	MT,OR,WA	×
Ranunculus	acris	tall buttercup	MT	×
Secale	cereale	cultivated rye	WA	×
Solanum	rostratum	buffalobur	ID,OR,WA	
Sonchus	arvensis	perennial sowthistle	ID,WA,WY	×
Sorghum	halepense	Johnsongrass	ID,OR,WA	×
Tanacetum	vulgare	common tansy	MT,WA,WY	×
Vaccaria	hispanica	cowcockle		×



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There are 32 species for this query.

Exotic

31

Database queried on: July 8, 2014 Database last updated on: February 10, 2014

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Genus	Species	Common Name	Noxious In	Exotic
Agropyron	repens	quackgrass	OR, WY	×
Arctium	minus	common burdock	WY	×
Bryonia	alba	white bryony	WA	×
Cardaria	draba	hoary cress	ID, MT, OR, WA, WY	×
Cardaria	pubescens	hairy whitetop	OR, WA, WY	×
Carduus	nutans	musk thistle	ID, OR, WA, WY	×
Centaurea	maculosa	spotted knapweed	ID, MT, OR, WA, WY	×
Centaurea	repens	Russian knapweed	ID, MT, OR, WA, WY	×
Chrysanthemum	leucanthemum	oxeye daisy	MT, WA, WY	×
Cirsium	arvense	Canada thistle	ID, MT, OR, WA, WY	×
Cirsium	vulgare	bull thistle	OR, WA	×
Conium	maculatum	poison hemlock	ID, OR, WA	×
Convolvulus	arvensis	field bindweed	ID, MT, OR, WA, WY	×
Cynoglossum	officinale	houndstongue	MT, OR, WA, WY	×
Equisetum	arvense	field horsetail	OR	
Euphorbia	esula	leafy spurge	ID, MT, OR, WA, WY	×
Hyoscyamus	niger	black henbane	ID, WA	×
Hypericum	perforatum	St. Johnswort	MT, OR, WA, WY	×

Impatiens	glandulifera	Himalayan balsam	WA	×
Isatis	tinctoria	dyer's woad	ID,MT,OR,WA,WY	×
Kochia	scoparia	kochia	OR,WA	×
Lepidium	latifolium	perennial pepperweed	ID,MT,OR,WA,WY	×
Linaria	dalmatica	dalmatian toadflax	ID,MT,OR,WA,WY	×
Linaria	vulgaris	yellow toadflax	ID,MT,OR,WA,WY	×
Phalaris	arundinacea	reed canarygrass	WA	×
Polygonum	sachalinense	giant knotweed	OR,WA	×
Potentilla	recta	sulfur cinquefoil	MT,OR,WA	×
Rorippa	austriaca	Austrian fieldcress	WA	×
Sonchus	arvensis	perennial sowthistle	ID,WA,WY	×
Tanacetum	vulgare	common tansy	MT,WA,WY	×
Tribulus	terrestris	puncturevine	ID,OR,WA	×
Xanthium	spinosum	spiny cocklebur	OR,WA	×

Attachment 10

MFISH Report



Brackett Creek

River Mile: 0 to 16.8

Miles: 16.8

Total Stream Miles: 16.8

HUC: Shields (10070003)

Tributary To: Shields River

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
13	16.8	Brook Trout	Common	Year-round resident	Resident	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	13.1	Brown Trout	Common	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
13.1	16.8	Brown Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
3.8	4.9	Longnose Sucker	Unknown	Unknown	Unknown	Native	Not Applicable	Extrapolated from a single survey/observation	UN
0	13.1	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
13.1	16.8	Mottled Sculpin	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	16.8	Mountain Whitefish	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	15.7	Rainbow Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	MDEQ
0	7.8	White Sucker	Rare	Unknown	Unknown	Native	Not Applicable	Extrapolated from a single survey/observation	UN
1	3	Yellowstone Cutthroat Trout	Rare	Unknown	Resident	Native	Genetically pure, determined by extrapolation	Extrapolated from multiple surveys/observations	fwp
3	16.8	Yellowstone Cutthroat Trout	Abundant	Unknown	Resident	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Bridger Creek

River Mile: 0 to 18.3

Miles: 18.3

Total Stream Miles: 18.3

HUC: Gallatin (10020008)

Tributary To: East Gallatin River

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	17.2	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP
0	17.2	Brown Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	FWP
0	17.2	Longnose Dace	Rare	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	17.2	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	17.2	Mountain Whitefish	Rare	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	17.2	Rainbow Trout	Abundant	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	FWP

Cache Creek

River Mile: 0 to 9.5

Miles: 9.5

Total Stream Miles: 9.5

HUC: Shields (10070003)

Tributary To: Fairy Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0.1	5.2	Brook Trout	Unknown	Unknown	Unknown	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	UN
0.1	2.4	Brown Trout	Unknown	Unknown	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	UN
0	7.4	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	8.6	Yellowstone Cutthroat Trout	Common	Year-round resident	Resident	Native	90.0%-99.9% pure based on genetic analysis	Extrapolated from multiple surveys/observations	FWP

Carrol Creek

River Mile: 0 to 3.6

Miles: 3.6

Total Stream Miles: 3.6

HUC: Shields (10070003)

Tributary To: Fairy Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	3.6	Brook Trout	Common	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	3.6	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	3.6	Yellowstone Cutthroat Trout	Common	Unknown	Resident	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Dry Creek

River Mile: 0 to 9.1

Miles: 9.1

Total Stream Miles: 9.1

HUC: Shields (10070003)

Tributary To: Flathead Creek

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

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Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	9.1	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP
0	9.1	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP

East Gallatin River

River Mile: 0 to 42.1

Miles: 42.1

Total Stream Miles: 42.1

HUC: Gallatin (10020008)

Tributary To: Gallatin River

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	42.1	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP
0	42.1	Brown Trout	Abundant	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	42.1	Longnose Dace	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	42.1	Longnose Sucker	Abundant	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	42.1	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	36.1	Mountain Sucker	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	42.1	Mountain Whitefish	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	19.2	Rainbow Trout	Common	Year-round resident	Resident	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	fwp
19.2	42.1	Rainbow Trout	Abundant	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	23.9	White Sucker	Abundant	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
23.9	36.1	White Sucker	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
36.1	42.1	White Sucker	Rare	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP

24.3	42.1	Yellowstone Cutthroat Trout	Unknown	Year- round resident	Not applicable	Introduced	Hybridized species based on genetic analysis less than 90%	No Survey, Professional judgment	FWP
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Fairy Creek

River Mile: 0 to 7.9

Miles: 7.9

Total Stream Miles: 7.9

HUC: Shields (10070003)

Tributary To: Cache Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0.8	5.4	Brook Trout	Unknown	Unknown	Unknown	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	UN
0.8	1.9	Brown Trout	Unknown	Unknown	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	UN
0	2.1	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	5.9	Yellowstone Cutthroat Trout	Rare	Year-round resident	Combination	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Flathead Creek

River Mile: 0 to 20.5

Miles: 20.5

Total Stream Miles: 20.5

HUC: Shields (10070003)

Tributary To: Shields River

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	11.6	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	FWP
11.6	17.9	Brook Trout	Common	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	5.9	Brown Trout	Common	Both resident and Fluvial/Adfluvial populations	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
5.9	11.6	Brown Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
11.6	16.2	Brown Trout	Common	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
7.9	9	Lake Chub	Unknown	Unknown	Unknown	Native	Not Applicable	Extrapolated from a single survey/observation	UN
8.8	9.9	Longnose Dace	Not Applicable	Unknown	Unknown	Native	Not Applicable	Extrapolated from a single survey/observation	GS
0	16.2	Longnose Sucker	Abundant	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
9	10	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
0	16.2	Mountain Sucker	Rare	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	16.2	Mountain Whitefish	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	16.2	White Sucker	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	20.5	Yellowstone Cutthroat Trout	Common	Year-round resident	Resident	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Lyman Creek

River Mile: 0 to 3.8

Miles: 3.8

Total Stream Miles: 3.8

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

No Data Found

Maynard Creek

River Mile: 0 to 2

Miles: 2

Total Stream Miles: 2

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	2	Surveyed; no fish captured	Not Applicable	Extrapolated from a single survey/observation	FWP				

Middle Fork Brackett Creek

River Mile: 0 to 3

Miles: 3

Total Stream Miles: 3

HUC: Shields (10070003)

Tributary To: Brackett Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0.6	2.8	Brook Trout	Abundant	Unknown	Unknown	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	fs
0.6	1.6	Mottled Sculpin	Rare	Unknown	Unknown	Native	Not Applicable	Extrapolated from a single survey/observation	fs
0.7	1.7	Westslope Cutthroat Trout	Rare	Unknown	Unknown	Introduced	Potentially unaltered with no record of stocking	Extrapolated from a single survey/observation	fs
0	2.3	Yellowstone Cutthroat Trout	Rare	Both resident and Fluvial/Adfluvial populations	Resident	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Muddy Creek

River Mile: 0 to 8.3

Miles: 8.3

Total Stream Miles: 8.3

HUC: Shields (10070003)

Tributary To: Potter Creek

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	1.1	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP
0	1.1	Brown Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	FWP
0	1.1	Longnose Sucker	Abundant	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
1.1	8.3	Longnose Sucker	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
0	1.1	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	No Survey, Professional judgment	FWP
0	1.1	Mountain Sucker	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
1.1	8.3	Mountain Sucker	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
0	1.1	Mountain Whitefish	Rare	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP
0	1.1	White Sucker	Abundant	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from a single survey/observation	FWP

North Fork Brackett Creek

River Mile: 0 to 4.2

Miles: 4.2

Total Stream Miles: 4.2

HUC: Shields (10070003)

Tributary To: Brackett Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	4.2	Brook Trout	Abundant	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	4.2	Brown Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	Extrapolated from a single survey/observation	FWP
0	4.2	Mottled Sculpin	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	4.2	Mountain Whitefish	Common	Year-round resident	Not applicable	Native	Not Applicable	Extrapolated from multiple surveys/observations	FWP
0	2.8	Yellowstone Cutthroat Trout	Abundant	Year-round resident	Resident	Native	Genetically pure, determined by genetic analysis	Extrapolated from multiple surveys/observations	FWP

Olson Creek

River Mile: 0 to 2.6

Miles: 2.6

Total Stream Miles: 2.6

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	2.6	Surveyed; no fish captured	Not Applicable	No Survey, Professional judgment	FWP				

Place Creek

River Mile: 0 to 2.7

Miles: 2.7

Total Stream Miles: 2.7

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

No Data Found

South Fork Brackett Creek

River Mile: 0 to 3.1

Miles: 3.1

Total Stream Miles: 3.1

HUC: Shields (10070003)

Tributary To: Brackett Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	1	Yellowstone Cutthroat Trout	Rare	Unknown	Resident	Native	Potentially unaltered with no record of stocking	No Survey, Professional judgment	FWP

South Fork Dry Creek

River Mile: 0 to 3.2

Miles: 3.2

Total Stream Miles: 3.2

HUC: Shields (10070003)

Tributary To: Dry Creek

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

No Data Found

Stone Creek

River Mile: 0 to 5.6

Miles: 5.6

Total Stream Miles: 5.6

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin; Park

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	5.6	Brook Trout	Common	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP

White Creek

River Mile: 0 to 3.7

Miles: 3.7

Total Stream Miles: 3.7

HUC: Gallatin (10020008)

Tributary To: Bridger Creek

Regions: Region 3

Counties: Gallatin

Fish Distribution

[Download Data](#)

Begin Mile	End Mile	Species	Abundance	Use Type	Life History	Origin	Genetic Status	Data Rating	Data Source
0	3.7	Brook Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP
0	3.7	Rainbow Trout	Rare	Year-round resident	Not applicable	Introduced	Not Applicable	No Survey, Professional judgment	FWP

Attachment 11

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 Bridger Canyon study area.

Terrestrial

The study area contains Class 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 I, 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 II, 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 contains Class I and III ranked drainages for Aquatic Connectivity. The following streams are categorized as Class I Aquatic Connectivity: the Brackett Creek Drainage system, Cache Creek, Carrol Creek, Fairy Creek, Flathead Creek, and Muddy Creek. 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 contains Class II, III, and IV 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 contains Class III 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 contains Class I, II, III, and IV ranked drainages for Game Fish Quality. The only Class I drainage is the East Gallatin River, on the extreme southwestern extent of the study area. 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 contains Class II 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.

CAPS Program Data (2014)

- 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 12

USFWS Trust Resources List





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:

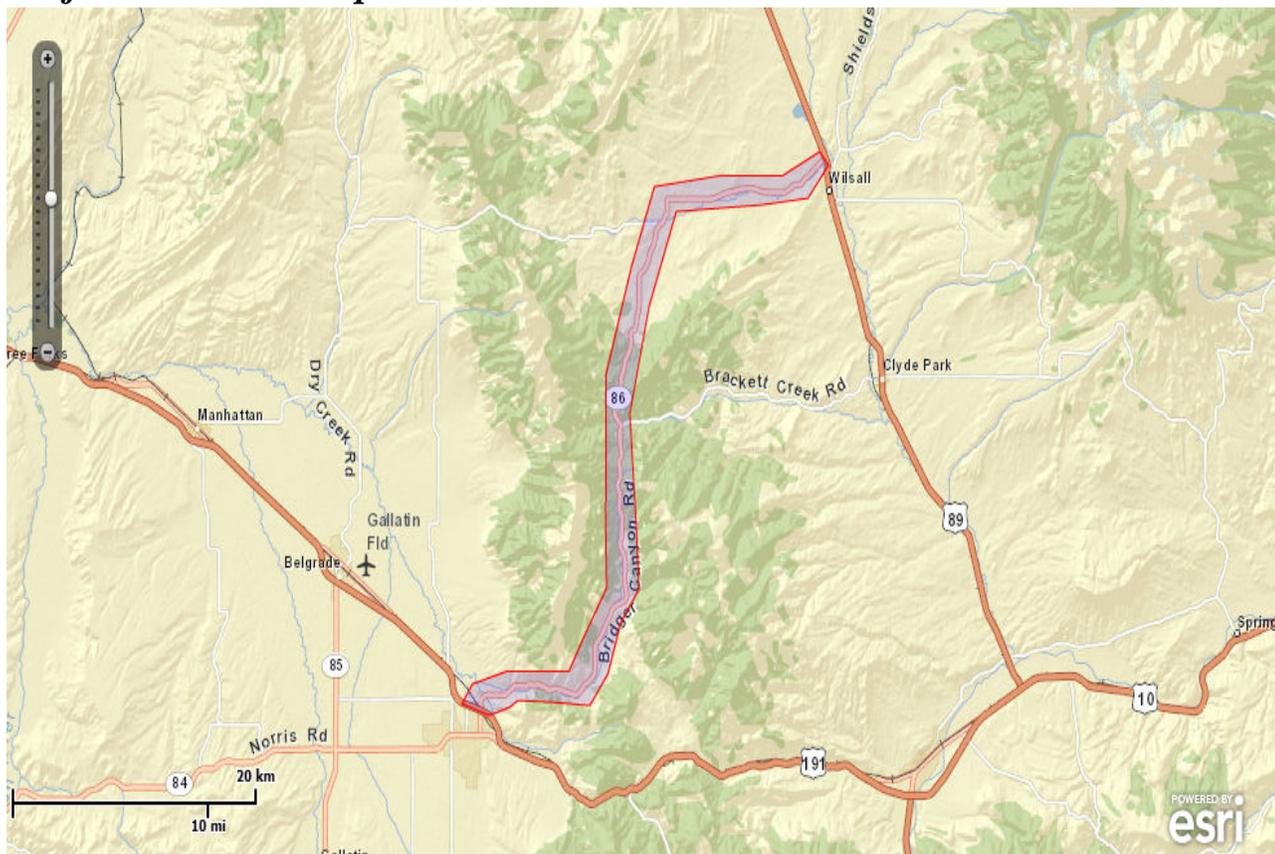
Bridger Canyon



U.S. Fish and Wildlife Service

Trust Resources List

Project Location Map:



Project Counties:

Gallatin, MT | Park, MT



Trust Resources List

Geographic coordinates (Open Geospatial Consortium Well-Known Text, NAD83):

MULTIPOLYGON (((-111.0217363 45.6903899, -111.0505754 45.6971046, -111.0394518 45.7086135, -111.0011369 45.7162848, -110.9365923 45.7162848, -110.9228594 45.7335414, -110.8967668 45.7642066, -110.8981401 45.8140017, -110.8981401 45.8857432, -110.8706743 45.9487992, -110.8459551 45.9955671, -110.7717973 46.002245, -110.708626 46.002245, -110.6701738 46.0155984, -110.6605608 46.0079683, -110.6825334 45.9888407, -110.7319719 45.9850239, -110.8226091 45.9812546, -110.8514482 45.9268332, -110.8720476 45.8646608, -110.8651811 45.7995944, -110.8624345 45.7632007, -110.8816606 45.7440366, -110.8953935 45.7143191, -110.9146196 45.6960494, -110.954445 45.6979678, -110.9915239 45.6989749, -110.9997636 45.6951862, -111.0217363 45.6903899))))))

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
Greater sage-grouse (<i>Centrocercus urophasianus</i>) Population: entire	Candidate	species info		Montana Ecological Services Field Office
Sprague's Pipit (<i>Anthus spragueii</i>)	Candidate	species info		Montana Ecological Services Field Office
Conifers and Cycads				
Whitebark pine (<i>Pinus albicaulis</i>)	Candidate	species info		Montana Ecological Services Field Office
Flowering Plants				



Trust Resources List

Ute ladies'-tresses (<i>Spiranthes diluvialis</i>)	Threatened	species info		Montana Ecological Services Field Office
Mammals				
Canada Lynx (<i>Lynx canadensis</i>) Population: (Contiguous U.S. DPS)	Threatened	species info		Montana Ecological Services Field Office
Grizzly bear (<i>Ursus arctos horribilis</i>) Population: lower 48 States, except where listed as an experimental population or delisted	Threatened	species info		Montana Ecological Services Field Office

Critical habitats within your project area:

There are no critical habitats within your project area.

FWS National Wildlife Refuges ([USFWS National Wildlife Refuges Program](#)).

There are no refuges found within the vicinity of your project.

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.).



Trust Resources List

For information about Birds of Conservation Concern, go to <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html>.

Migratory birds of concern that may be affected by your project:

There are 16 birds on your Migratory birds of concern list. The Division of Migratory Bird Management is in the process of populating migratory bird data with an estimated completion time of Fall 2014; therefore, the list below may not include all the migratory birds of concern in your project area at this time. While this information is being populated, please contact the Field Office for information about migratory birds in your project area.

Species Name	Bird of Conservation Concern (BCC)	Species Profile	Seasonal Occurrence in Project Area
American bittern (<i>Botaurus lentiginosus</i>)	Yes	species info	Breeding
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	species info	Year-round
Brewer's Sparrow (<i>Spizella breweri</i>)	Yes	species info	Breeding
Burrowing Owl (<i>Athene cunicularia</i>)	Yes	species info	Breeding
Calliope Hummingbird (<i>Stellula calliope</i>)	Yes	species info	Breeding
Cassin's Finch (<i>Carpodacus cassinii</i>)	Yes	species info	Breeding
Ferruginous hawk (<i>Buteo regalis</i>)	Yes	species info	Breeding
Golden eagle (<i>Aquila chrysaetos</i>)	Yes	species info	Year-round
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	Yes	species info	Breeding
Greater sage-grouse (<i>Centrocercus urophasianus</i>)	Yes	species info	Year-round
Mountain plover (<i>Charadrius montanus</i>)	Yes	species info	Breeding
Olive-Sided flycatcher (<i>Contopus cooperi</i>)	Yes	species info	Breeding
Pinyon Jay (<i>Gymnorhinus cyanocephalus</i>)	Yes	species info	Year-round



Trust Resources List

Rufous hummingbird (<i>selasphorus rufus</i>)	Yes	species info	Breeding
Sage Thrasher (<i>Oreoscoptes montanus</i>)	Yes	species info	Breeding
Willow Flycatcher (<i>Empidonax traillii</i>)	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.



Trust Resources List

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 tubercid 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	PEMAx	24.6587
Freshwater Emergent Wetland	PEMF	4.6399
Freshwater Emergent Wetland	PEMCx	1.4915
Freshwater Emergent Wetland	PEMA	690.3782
Freshwater Emergent Wetland	PEMC	89.8927
Freshwater Emergent Wetland	PEMB	81.7817
Freshwater Emergent Wetland	PEMAh	2.6518
Freshwater Forested/Shrub Wetland	PSSAx	5.9961
Freshwater Forested/Shrub Wetland	PSSF	0.9376
Freshwater Forested/Shrub Wetland	PSSA	572.3415
Freshwater Forested/Shrub Wetland	PSSC	77.5948
Freshwater Pond	PUBFx	0.0706
Freshwater Pond	PABFh	12.4112
Freshwater Pond	PABF	2.5016
Freshwater Pond	PABFb	4.8525



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Freshwater Pond	PUSA	0.4114
Freshwater Pond	PUSCh	0.8788
Freshwater Pond	PABGx	15.677
Freshwater Pond	PABFx	14.7134
Riverine	R3UBF	3.333
Riverine	R3UBG	85.0045
Riverine	R3UBH	92.2409
Riverine	R4SBC	3.8508
Riverine	R4SBCx	2.6648

Attachment 13

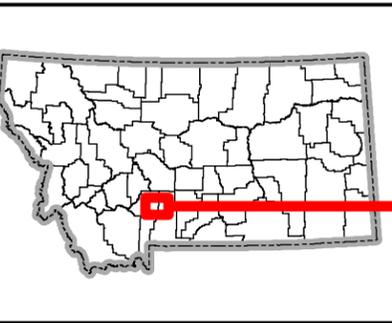
Montana Species of Concern



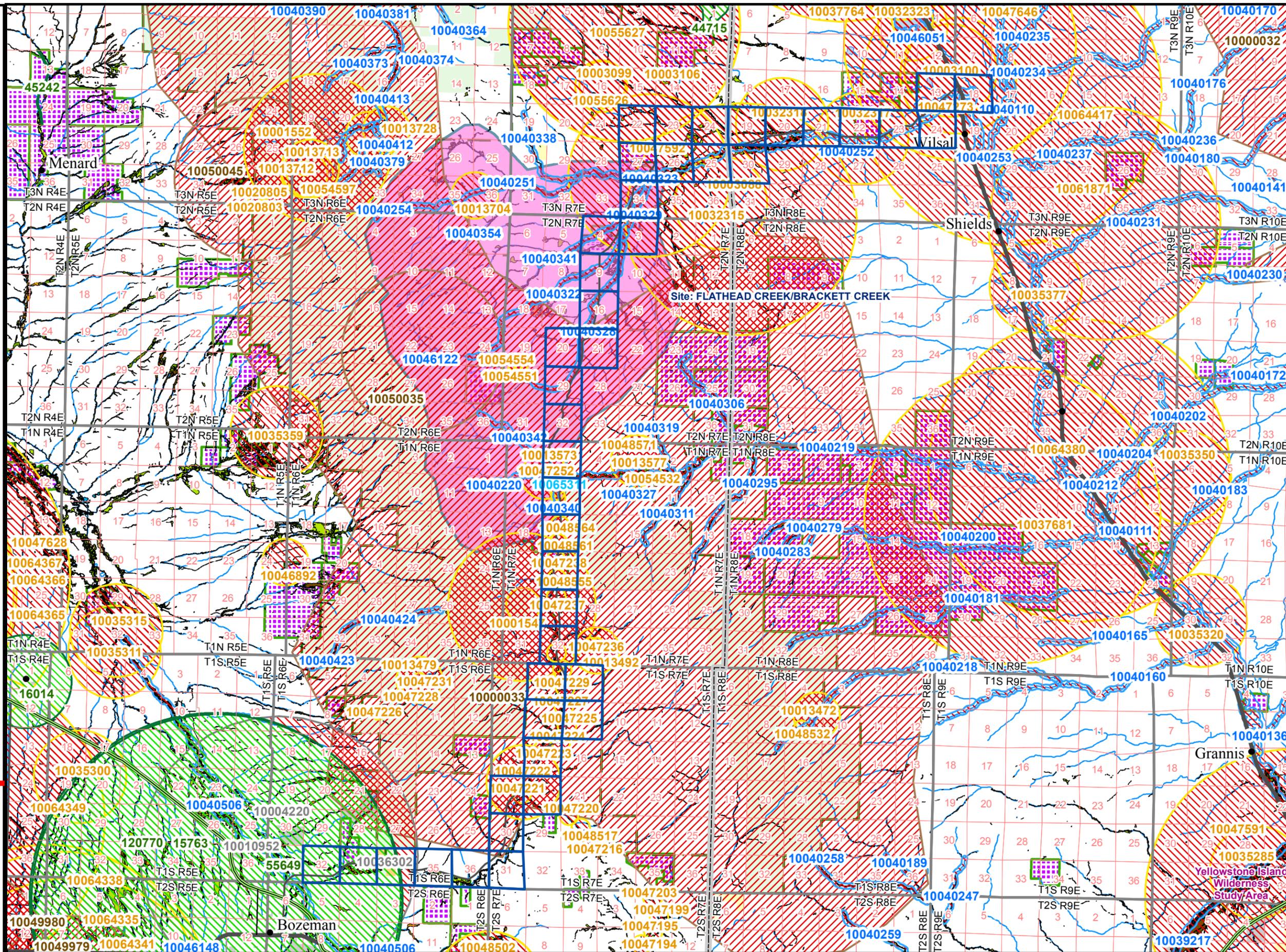
Montana Species of Concern Bridger Canyon Road

SPECIES OF CONCERN: A polygon feature representing only what is known from direct observation with a defined level of certainty regarding the spatial location of the feature.

- NonVascular Plants
- 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

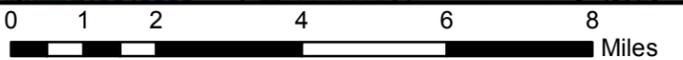


Not all legend items may occur on the map.
Features shown on this map do not imply public access to any lands.
This map displays management status, which may vary from ownership.



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\14\WMDT\14mdt0016\14mdt0016.mxd (6/27/2014)



Ecological Information

FLATHEAD CREEK/BRACKETT CREEK

The geographic scope of your data search intersected an area for which the Natural Heritage Program databases have ecological information. Such information can be useful in assessing biological values and interpreting Species of Concern data. A summary is provided below of conditions at the time of site record creation.

FLATHEAD CREEK/BRACKETT CREEK

General Description

This area is located on the east side of the Bridger Mountains including the watershed from Flathead Pass south to Ross Pass. This area encompasses the upper tributaries of Brackett Creek and Flathead Creek which contain populations of genetically pure Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). For the Brackett Creek drainage, this includes tributaries upstream from Horse Creek (i.e., North, South and Middle Forks of Brackett Creek). Within the Flathead Creek drainage, the tributaries upstream from Green Canyon Creek have been included in this area, including: Cache Creek, Fairy Creek, Corral Creek, and the North, Middle, and South Forks of Flathead Creek. Elevations in this area range from 5412 ft. (1650 m) to 9663 ft. (2946 m).

Biological Significance

Upper reaches and/or tributaries of Flathead and Brackett Creeks contain populations of genetically pure Yellowstone cutthroat trout with moderate to substantial habitat value (as rated by fisheries biologists).

Key Ecological Factors

Exotic Species

Rainbow, brook and brown trout occur within the Flathead Creek and Brackett Creek watersheds. The occurrence and extent of exotic plant infestations is unknown.

Other Values

Management Information

Information Gaps

Information on the presence and distribution of barriers to fish movement would help protect the integrity of populations of pure Yellowstone cutthroat trout. Surveys for animals, plants and communities of special concern have not taken place.



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
Friday, June 27, 2014

Anaxyrus boreas

[View Species in MT Field Guide](#)

Common Name: Western Toad

General Habitat: Wetlands, floodplain pools

Description: Amphibians

Mapping Delineation:

Standing water bodies with confirmed evidence of reproduction (calling adults, eggs, larvae or new metamorphs) buffered by 100 meters in order to reflect importance of adjacent terrestrial habitats to survival of breeding adults and newly metamorphosed juveniles.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S2
Global: G4

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service: SENSITIVE
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 1

MT PIF Code:

Species Occurrences

Species Occurrence Map Label:	10065311		
First Observation Date:	01/01/1974	SO Number:	
Last Observation Date:	12/31/1974	Acreage:	22

Ardea herodias

[View Species in MT Field Guide](#)

Common Name: Great Blue Heron

General Habitat: Riparian forest

Description: Birds

Mapping Delineation:

Confirmed nesting area buffered by a minimum distance of 6,500 meters in order to be conservative about encompassing the areas commonly used for foraging near the breeding colony and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G5

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management:

FWP CFWCS Tier: 3

MT PIF Code:

Species Occurrences

Species Occurrence Map Label:	10064417		
First Observation Date:	02/16/1975	SO Number:	
Last Observation Date:	12/14/1975	Acreage:	32,799



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Accipiter gentilis [View Species in MT Field Guide](#)

Common Name: Northern Goshawk **General Habitat:** Mixed conifer forests

Description: Birds

Mapping Delineation:

Confirmed nesting area buffered by a minimum distance of 750 meters in order to encompass the area around the nest known to be defended by adults and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

[State:](#) S3
[Global:](#) G5

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)
[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#) SENSITIVE

[FWP CFWCS Tier:](#) 2

[MT PIF Code:](#) 2

Species Occurrences

Species Occurrence Map Label:	10000992		
First Observation Date:	06/15/1988	SO Number:	15,271
Last Observation Date:	06/15/1988	Acreage:	417

Buteo regalis [View Species in MT Field Guide](#)

Common Name: Ferruginous Hawk **General Habitat:** Sagebrush grassland

Description: Birds

Mapping Delineation:

Confirmed nesting area buffered by a minimum distance of 2,000 meters in order to encompass the average home range size reported for the species and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

[State:](#) S3B
[Global:](#) G4

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)
[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#) SENSITIVE

[FWP CFWCS Tier:](#) 2

[MT PIF Code:](#) 2

Species Occurrences

Species Occurrence Map Label:	10032318		
First Observation Date:	05/31/1997	SO Number:	501
Last Observation Date:	05/31/1997	Acreage:	3,089



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Species Occurrences

Species Occurrence Map Label:	10032317		
First Observation Date:	05/31/1997	SO Number:	537
Last Observation Date:	05/31/1997	Acreage:	3,089

Species Occurrence Map Label:	10032315		
First Observation Date:	06/12/1998	SO Number:	500
Last Observation Date:	06/12/1998	Acreage:	3,089

Strix nebulosa [View Species in MT Field Guide](#)

Common Name: Great Gray Owl **General Habitat:** Conifer forest near open meadows
Description: Birds
Mapping Delineation:
 Confirmed nesting area buffered by a minimum distance of 3,200 meters in order to encompass the known foraging distance and area likely to be used for reneating and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G5

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 2

MT PIF Code: 3

Species Occurrences

Species Occurrence Map Label:	10001547		
First Observation Date:	06/01/1991	SO Number:	18,602
Last Observation Date:	06/30/1991	Acreage:	7,909

Nucifraga columbiana [View Species in MT Field Guide](#)

Common Name: Clark's Nutcracker **General Habitat:** Conifer forest
Description: Birds
Mapping Delineation:
 Observations with evidence of breeding activity buffered by a minimum distance of 1,000 meters in order to be conservative about encompassing the spring/summer breeding territories of family groups and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G5

FWP CFWCS Tier: 3

MT PIF Code: 3

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

Species Occurrences

Species Occurrence Map Label:	10013577		
First Observation Date:	06/01/1991	SO Number:	30
Last Observation Date:	06/30/1991	Acreage:	945

Species Occurrence Map Label:	10013573		
First Observation Date:	06/15/2001	SO Number:	498
Last Observation Date:	06/15/2001	Acreage:	772

Species Occurrence Map Label:	10013492		
First Observation Date:	07/04/2010	SO Number:	2,748
Last Observation Date:	07/04/2010	Acreage:	772

Certhia americana [View Species in MT Field Guide](#)

Common Name: Brown Creeper **General Habitat:** Moist conifer forests

Description: Birds

Mapping Delineation:

Observations with evidence of breeding activity buffered by a minimum distance of 300 meters in order to be conservative about encompassing home ranges and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G5

FWP CFWCS Tier: 2

MT PIF Code: 1

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

Species Occurrences

Species Occurrence Map Label:	10054532		
First Observation Date:	06/01/1991	SO Number:	
Last Observation Date:	06/30/1991	Acreage:	950



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10054550		
First Observation Date:	07/11/2012	SO Number:	
Last Observation Date:	07/11/2012	Acreage:	70

Species Occurrence Map Label:	10054551		
First Observation Date:	07/11/2012	SO Number:	
Last Observation Date:	07/11/2012	Acreage:	70

Species Occurrence Map Label:	10054553		
First Observation Date:	07/11/2012	SO Number:	
Last Observation Date:	07/11/2012	Acreage:	70

Species Occurrence Map Label:	10054554		
First Observation Date:	07/11/2012	SO Number:	
Last Observation Date:	07/11/2012	Acreage:	70

Catharus fuscescens [View Species in MT Field Guide](#)

Common Name: Veery **General Habitat:** Riparian forest

Description: Birds

Mapping Delineation:

Observations with evidence of breeding activity buffered by a minimum distance of 300 meters in order to be conservative about encompassing home ranges and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3B
Global: G5

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)
[U.S. Forest Service:](#)
[U.S. Bureau of Land Management:](#)

[FWP CFWCS Tier:](#) 2

[MT PIF Code:](#) 2

Species Occurrences

Species Occurrence Map Label:	10047246		
First Observation Date:	06/11/2003	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10047248		
First Observation Date:	06/11/2003	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70

Species Occurrence Map Label:	10047249		
First Observation Date:	06/15/2001	SO Number:	
Last Observation Date:	06/15/2001	Acreage:	70

Species Occurrence Map Label:	10047273		
First Observation Date:	06/17/1993	SO Number:	
Last Observation Date:	06/17/1993	Acreage:	4,852

Species Occurrence Map Label:	10047227		
First Observation Date:	06/20/2007	SO Number:	
Last Observation Date:	06/20/2007	Acreage:	124

Species Occurrence Map Label:	10047224		
First Observation Date:	06/25/1999	SO Number:	
Last Observation Date:	06/25/1999	Acreage:	124

Species Occurrence Map Label:	10047237		
First Observation Date:	06/25/1999	SO Number:	
Last Observation Date:	06/25/1999	Acreage:	124

Species Occurrence Map Label:	10047225		
First Observation Date:	06/25/1999	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	124

Species Occurrence Map Label:	10047216		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	06/20/2007	Acreage:	124



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Species Occurrences

Species Occurrence Map Label:	10047234		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	06/20/2007	Acreage:	124

Species Occurrence Map Label:	10047241		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	06/26/1997	Acreage:	124

Species Occurrence Map Label:	10047220		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	07/02/2001	Acreage:	124

Species Occurrence Map Label:	10047238		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	07/02/2001	Acreage:	124

Species Occurrence Map Label:	10047233		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	07/04/2002	Acreage:	124

Species Occurrence Map Label:	10047223		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	124

Species Occurrence Map Label:	10047239		
First Observation Date:	06/26/1997	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	124

Species Occurrence Map Label:	10047244		
First Observation Date:	06/26/2003	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Species Occurrences

Species Occurrence Map Label:	10047218		
First Observation Date:	06/27/1998	SO Number:	
Last Observation Date:	06/27/1998	Acreage:	124

Species Occurrence Map Label:	10047245		
First Observation Date:	06/30/2001	SO Number:	
Last Observation Date:	06/11/2003	Acreage:	70

Species Occurrence Map Label:	10047251		
First Observation Date:	06/30/2001	SO Number:	
Last Observation Date:	06/11/2003	Acreage:	70

Species Occurrence Map Label:	10047247		
First Observation Date:	06/30/2001	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70

Species Occurrence Map Label:	10047250		
First Observation Date:	06/30/2001	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70

Species Occurrence Map Label:	10047252		
First Observation Date:	06/30/2001	SO Number:	
Last Observation Date:	06/26/2003	Acreage:	70

Species Occurrence Map Label:	10047221		
First Observation Date:	07/02/2001	SO Number:	
Last Observation Date:	07/02/2001	Acreage:	124

Species Occurrence Map Label:	10047235		
First Observation Date:	07/04/2010	SO Number:	
Last Observation Date:	07/04/2010	Acreage:	70



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
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Species Occurrences

Species Occurrence Map Label:	10047236		
First Observation Date:	07/04/2010	SO Number:	
Last Observation Date:	07/04/2010	Acreage:	70

Species Occurrence Map Label:	10047229		
First Observation Date:	07/11/2000	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	124

Species Occurrence Map Label:	10047222		
First Observation Date:	07/11/2000	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	1,987

Oreoscoptes montanus [View Species in MT Field Guide](#)

Common Name: Sage Thrasher **General Habitat:** Sagebrush

Description: Birds

Mapping Delineation:

Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 75 meters in order to encompass the maximum breeding territory size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3B
Global: G5

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 3

MT PIF Code: 3

Species Occurrences

Species Occurrence Map Label:	10055628		
First Observation Date:	06/01/1994	SO Number:	
Last Observation Date:	06/30/1994	Acreage:	601

Species Occurrence Map Label:	10055626		
First Observation Date:	06/01/1998	SO Number:	
Last Observation Date:	06/30/1998	Acreage:	967



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10055627		
First Observation Date:	06/09/1998	SO Number:	
Last Observation Date:	06/09/1998	Acreage:	19,408

Spizella breweri [View Species in MT Field Guide](#)

Common Name: Brewer's Sparrow **General Habitat:** Sagebrush

Description: Birds

Mapping Delineation:

Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 100 meters in order to encompass the maximum territory size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3B
Global: G5

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service:

FWP CFWCS Tier: 2

U.S. Bureau of Land Management: SENSITIVE

MT PIF Code: 2

Species Occurrences

Species Occurrence Map Label:	10003099		
First Observation Date:	06/01/1998	SO Number:	59,968
Last Observation Date:	06/30/1998	Acreage:	772

Species Occurrence Map Label:	10003106		
First Observation Date:	06/09/1998	SO Number:	60,057
Last Observation Date:	06/09/1998	Acreage:	19,309

Species Occurrence Map Label:	10003107		
First Observation Date:	06/14/1992	SO Number:	91,381
Last Observation Date:	08/19/2003	Acreage:	1,738

Species Occurrence Map Label:	10003100		
First Observation Date:	06/17/1993	SO Number:	34,219
Last Observation Date:	06/17/1993	Acreage:	3,089



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10003088		
First Observation Date:	06/29/1998	SO Number:	60,104
Last Observation Date:	06/29/1998	Acreage:	19,309

Artemisiospiza nevadensis [View Species in MT Field Guide](#)

Common Name: Sagebrush Sparrow **General Habitat:** Sagebrush

Description: Birds

Mapping Delineation:

Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 125 meters in order to encompass the majority of breeding territory sizes reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status [Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3B
Global: G5

FWP CFWCS Tier: 3

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 Occurrence Map Label:	10047592		
First Observation Date:	07/01/1908	SO Number:	
Last Observation Date:	08/31/1909	Acreage:	9,510

Dolichonyx oryzivorus [View Species in MT Field Guide](#)

Common Name: Bobolink **General Habitat:** Moist grasslands

Description: Birds

Mapping Delineation:

Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 150 meters in order to conservatively encompass male territory size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status [Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3B
Global: G5

FWP CFWCS Tier: 3

MT PIF Code: 3

Federal Agency Status:

U.S. Fish & Wildlife Service:

U.S. Forest Service:

U.S. Bureau of Land Management: SENSITIVE



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10047646		
First Observation Date:	06/17/1993	SO Number:	
Last Observation Date:	06/17/1993	Acreage:	19,408

Haemorhous cassinii [View Species in MT Field Guide](#)

Common Name: Cassin's Finch **General Habitat:** Drier conifer forest

Description: Birds

Mapping Delineation:

Observations with evidence of breeding activity buffered by a minimum distance of 300 meters in order to be conservative about encompassing the courtship and foraging distance from nesting areas and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G5

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)
[U.S. Forest Service:](#)
[U.S. Bureau of Land Management:](#)

FWP CFWCS Tier: 3

MT PIF Code: 3

Species Occurrences

Species Occurrence Map Label:	10048571		
First Observation Date:	06/01/1991	SO Number:	
Last Observation Date:	06/30/1991	Acreage:	950

Species Occurrence Map Label:	10048517		
First Observation Date:	07/02/2001	SO Number:	
Last Observation Date:	07/02/2001	Acreage:	124

Species Occurrence Map Label:	10048555		
First Observation Date:	07/04/2002	SO Number:	
Last Observation Date:	07/04/2002	Acreage:	124

Species Occurrence Map Label:	10048564		
First Observation Date:	07/04/2002	SO Number:	
Last Observation Date:	07/04/2002	Acreage:	124



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10048582		
First Observation Date:	07/08/2010	SO Number:	
Last Observation Date:	07/08/2010	Acreage:	70

Species Occurrence Map Label:	10048561		
First Observation Date:	07/11/2000	SO Number:	
Last Observation Date:	07/11/2000	Acreage:	124

Species Occurrence Map Label:	10048583		
First Observation Date:	07/11/2012	SO Number:	
Last Observation Date:	07/11/2012	Acreage:	70

Oncorhynchus clarkii bouvieri [View Species in MT Field Guide](#)

Common Name: Yellowstone Cutthroat Trout **General Habitat:** Mountain streams, rivers, lakes

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: G4T2

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service: SENSITIVE
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 1

MT PIF Code:

Species Occurrences

Species Occurrence Map Label:	10040341		
First Observation Date:		SO Number:	
Last Observation Date:		Acreage:	62

Species Occurrence Map Label:	10040340		
First Observation Date:		SO Number:	
Last Observation Date:		Acreage:	96



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10040329	SO Number:	
First Observation Date:		Acreage:	200
Last Observation Date:			
Species Occurrence Map Label:	10040221	SO Number:	
First Observation Date:		Acreage:	210
Last Observation Date:			
Species Occurrence Map Label:	10040342	SO Number:	
First Observation Date:		Acreage:	253
Last Observation Date:			
Species Occurrence Map Label:	10040338	SO Number:	
First Observation Date:		Acreage:	269
Last Observation Date:			
Species Occurrence Map Label:	10040323	SO Number:	
First Observation Date:		Acreage:	318
Last Observation Date:			
Species Occurrence Map Label:	10040235	SO Number:	
First Observation Date:		Acreage:	318
Last Observation Date:			
Species Occurrence Map Label:	10046051	SO Number:	
First Observation Date:		Acreage:	321
Last Observation Date:			
Species Occurrence Map Label:	10040253	SO Number:	
First Observation Date:		Acreage:	337
Last Observation Date:			



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

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Species Occurrences

Species Occurrence Map Label:	10040322	SO Number:	
First Observation Date:		Acreage:	523
Last Observation Date:			
Species Occurrence Map Label:	10040328	SO Number:	
First Observation Date:		Acreage:	583
Last Observation Date:			
Species Occurrence Map Label:	10040234	SO Number:	
First Observation Date:		Acreage:	700
Last Observation Date:			
Species Occurrence Map Label:	10040219	SO Number:	
First Observation Date:		Acreage:	1,461
Last Observation Date:			
Species Occurrence Map Label:	10040252	SO Number:	
First Observation Date:		Acreage:	1,510
Last Observation Date:			
Species Occurrence Map Label:	10040506	SO Number:	
First Observation Date:		Acreage:	1,591
Last Observation Date:			
Species Occurrence Map Label:	10040110	SO Number:	
First Observation Date:		Acreage:	2,622
Last Observation Date:			
Species Occurrence Map Label:	10040111	SO Number:	
First Observation Date:		Acreage:	3,309
Last Observation Date:			



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
Friday, June 27, 2014

Oncorhynchus clarkii lewisi [View Species in MT Field Guide](#)

Common Name: Westslope Cutthroat Trout **General Habitat:** Mountain streams, rivers, lakes

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: G4T3

Federal Agency Status:

U.S. Fish & Wildlife Service:
U.S. Forest Service: SENSITIVE
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 1

MT PIF Code:

Species Occurrences

Species Occurrence Map Label:	10040220
First Observation Date:	SO Number:
Last Observation Date:	Acreage: 96

Gulo gulo [View Species in MT Field Guide](#)

Common Name: Wolverine **General Habitat:** Boreal Forest and Alpine Habitats

Description: Mammals

Mapping Delineation:

Confirmed area of occupancy based on the documented presence of adults or juveniles within tracking regions containing core habitat for the species. Outer boundaries of tracking regions are defined by areas of forest cover on individual mountain ranges or clusters of adjacent mountain ranges with continuous forest cover.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3
Global: G4

Federal Agency Status:

U.S. Fish & Wildlife Service: C
U.S. Forest Service: SENSITIVE
U.S. Bureau of Land Management: SENSITIVE

FWP CFWCS Tier: 2

MT PIF Code:

Species Occurrences

Species Occurrence Map Label:	10000033
First Observation Date:	SO Number: 9
Last Observation Date:	Acreage: 203,366



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
Friday, June 27, 2014

Zaitzevia thermae

[View Species in MT Field Guide](#)

Common Name: Warm Spring Zaitzevian Riffle B **General Habitat:** Springs

Description: Invertebrates

Mapping Delineation:

Confirmed breeding area based on the presence of a resident animal of any age. Point observation location is buffered by a minimum distance of 100 meters in order to encompass the spring system the species is dependent on.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S1
Global: G1

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

[FWP CFWCS Tier:](#)

[MT PIF Code:](#)

Species Occurrences

Species Occurrence Map Label:	10036326		
First Observation Date:	12/06/1936	SO Number:	408,194
Last Observation Date:	05/01/2006	Acreage:	8

Microcyloepus browni

[View Species in MT Field Guide](#)

Common Name: Brown's Microcyloepus Riffle B **General Habitat:** Springs

Description: Invertebrates

Mapping Delineation:

Confirmed breeding area based on the presence of a resident animal of any age. Point observation location is buffered by a minimum distance of 100 meters in order to encompass the spring system the species is dependent on.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S1
Global: G1

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

[FWP CFWCS Tier:](#)

[MT PIF Code:](#)

Species Occurrences

Species Occurrence Map Label:	10036302		
First Observation Date:	12/06/1936	SO Number:	408,195
Last Observation Date:	05/01/2006	Acreage:	8



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(406)444-3009 mtnhp@mt.gov

Species of Concern Data Report

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Report Date:
Friday, June 27, 2014

Isocapnia crinita

[View Species in MT Field Guide](#)

Common Name: Hooked Snowfly

General Habitat: Alpine / Mountain streams

Description: Invertebrates

Mapping Delineation:

Confirmed breeding area based on the presence of a resident animal of any age. Point observation location is buffered by a minimum distance of 100 meters in order to encompass the home range of the individual as well as adjacent habitat likely to support other individuals and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S2
Global: G5

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

[FWP CFWCS Tier:](#)

[MT PIF Code:](#)

Species Occurrences

Species Occurrence Map Label: 10004220

First Observation Date: 01/01/1925

SO Number: 585,264

Last Observation Date: 12/31/1977

Acreage: 27,805



Species of Concern Data Report

Visit <http://mtnhp.org> for additional information.

Report Date:
Friday, June 27, 2014

Physaria saximontana var. dentata

[View Species in MT Field Guide](#)

Common Name: Rocky Mountain Twinpod

General Habitat: Gravelly slopes/talus (Montane/subalpin

Description: Vascular Plants

Mapping Delineation:

Individual occurrences are generally based upon a discretely mapped area provided by an observer and are not separated by any pre-defined distance. Individual clusters of plants mapped at fine spatial scales (separated by less than approximately 25-50 meters) may be grouped together into one occurrence if they are not separated by distinct areas of habitat or terrain features. Point observations are buffered to encompass any locational uncertainty associated with the observation.

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

Federal Agency Status:

State: S3

[U.S. Fish & Wildlife Service:](#)

Global: G3T3

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

Species Occurrences

Species Occurrence Map Label:	120770		
First Observation Date:	06/29/1899	SO Number:	3
Last Observation Date:	06/29/1899	SO Rank:	H
		Acreage:	49,683

Cypripedium parviflorum

[View Species in MT Field Guide](#)

Common Name: Small Yellow Lady's-slipper

General Habitat:

Description: Vascular Plants

Mapping Delineation:

Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

Federal Agency Status:

State: S3S4

[U.S. Fish & Wildlife Service:](#)

Global: G5

[U.S. Forest Service:](#) SENSITIVE

[U.S. Bureau of Land Management:](#)

Species Occurrences

Species Occurrence Map Label:	55649		
First Observation Date:	01/01/2005	SO Number:	86
Last Observation Date:	07/05/2010	SO Rank:	U
		Acreage:	1

Sphenopholis intermedia

[View Species in MT Field Guide](#)

Common Name: Slender Wedgegrass

General Habitat: Mesic sites (low-elevation)

Description: Vascular Plants

Mapping Delineation:

Individual occurrences are generally based upon a discretely mapped area provided by an observer and are not separated by any pre-defined distance. Individual clusters of plants mapped at fine spatial scales (separated by less than approximately 25-50 meters) may be grouped together into one occurrence if they are not separated by distinct areas of habitat or terrain features. Point observations are buffered to encompass any locational uncertainty associated with the observation.



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Species Status

[Click Status for Explanations](#)

Natural Heritage Ranks:

State: S3S4

Global: G5

Federal Agency Status:

[U.S. Fish & Wildlife Service:](#)

[U.S. Forest Service:](#)

[U.S. Bureau of Land Management:](#)

Species Occurrences

Species Occurrence Map Label:	15763		
First Observation Date:	07/25/1898	SO Number:	1
Last Observation Date:	07/26/1905	SO Rank:	H
		Acreage:	49,683