U.S. Department of the Interior
Bureau of Land Management

Environmental Assessment (EA)

American Prairie Reserve Bison Change of Use
DOI-BLM-L010-2018-0007-EA
June 2021

North Central Montana District
Malta Field Office
501 South 2nd St. East
Malta, Montana 59538

TABLE OF CONTENTS

Chapter Page

TABLES

Page

APPENDICES

ACRONYMS AND ABBREVIATIONS

	Full Phrase
APR	American Prairie Reserve
AUM	animal unit month
BLM	United States Department of the Interior, Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOI	United States Department of the Interior
EA	environmental assessment
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act
GIS	Geographic Information Systems
Guidelines	Guidelines for Livestock Grazing Management
MFWP	Montana Department of Fish, Wildlife, and Parks
NEPA	National Environmental Policy Act of 1969
NS	None to Slight (departure from expected Standards of Rangeland Health)
PFC	proper functioning condition
RMP	resource management plan
Standards	Standards of Rangeland Health
TGA	Taylor Grazing Act
US	United States
USFWS	United States Department of the Interior, Fish and Wildlife Service
YNP	Yellowstone National Park

GLOSSARY

Animal unit month (AUM)—the amount of forage required by one animal unit for one month.

Indigenous livestock—animals that are indigenous (native) to an area but are managed as livestock within grazing allotments.

Proper functioning condition (PFC)—a qualitative method for assessing the condition of riparian wetland areas. The term PFC is used to describe both the assessment process and a defined, on-the-ground condition of a riparian-wetland area.

Chapter 1. Purpose of and Need for the Proposed Action

1.1 INTRODUCTION AND BACKGROUND

On September 24, 2019, the American Prairie Reserve (APR) submitted a proposal to the United States (US) Department of the Interior (DOI), Bureau of Land Management (BLM) to modify certain terms and conditions of BLM-administered grazing permits held by the APR. The APR owns private properties, known as "base properties," which gives them grazing preference.[1] The BLM allotments considered in this environmental assessment (EA) are Telegraph Creek (allotment #5654), Flat Creek (allotment #5439), Whiterock Coulee (allotment #5417), East Dry Fork (allotment #5617), French Coulee (allotment #5616), and Garey Coulee (allotment #5447), all in the Malta Field Office in Phillips County, Montana. The Box Elder allotment (#5655) is associated with the grazing proposal because it would be combined with the Telegraph Creek Allotment, deeded land, and State leases to form APR's Sun Prairie Unit (see Chapter 2). It is, therefore, discussed in the assessment, but no change is requested to the permit and no action is needed regarding this allotment.

As described in **Chapter 2**, the APR proposes to manage their base properties and associated allotments in four "units." Together these units comprise 107,850 acres. The project area consists of all four APR units within which the seven BLM grazing allotments occur (see **Appendix A**, Maps). The decision area is limited to the BLM-administered lands within the project area that comprise approximately 69,310 acres of BLM-administered lands and currently provide 7,969 animal unit months (AUMs) of permitted use.

Within the APR unit boundaries, in addition to the 69,310 acres of BLM-administered lands are 32,710 acres of private land deeded to the APR and 5,830 acres of state lands administered by the Montana Department of Natural Resources and Conservation. This document addresses only those public lands

[1] "Grazing preference" or "preference" means a superior or priority position against others for the purpose of receiving a grazing permit or lease. This priority is attached to base property owned or controlled by a permittee or lessee. 43 Code of Federal Regulations (CFR) 4100.0-5.

administered by the BLM. The terms and conditions of the APR's proposal are further described under Alternative B (Applicant Proposed Alternative) in **Chapter 2**, Alternatives.

1.2 Purpose and Need

The purpose of and need for action is to respond to an external proposal submitted to modify terms and conditions on BLM-administered grazing permits held by APR (**Table 1**). The proposal includes changes in class of livestock for Cattle and/or Indigenous animals (bison)[2]; changes to the authorized seasons-of-use, construction, reconstruction, and/or removal of range improvement projects; adjustments to allotments (such as combining pastures); and administrative actions (such as issuing 10-year grazing permits).

The BLM must respond to applications to fully process and renew permits to graze livestock on BLM-administered land under the authority of the Taylor Grazing Act (TGA) and Federal Land Policy and Management Act (FLPMA). Grazing authorizations must also meet the Standards of Rangeland Health (Standards) and conform to the Guidelines for Livestock Grazing Management (Guidelines).

1.3 Conformance with BLM Land Use Plans

The proposed action is in conformance with the HiLine District Resource Management Plan (RMP), approved in September 2015 (BLM 2015a).

- Actions consistent with achieving or maintaining the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Montana, North Dakota, and South Dakota (BLM 1997a) will continue to be incorporated into livestock grazing permits and leases and will apply to all livestock grazing activities (HiLine Approved RMP, page 3-66).
- Adjustments to livestock management practices or livestock numbers including increases or decreases will be made based on results of monitoring studies, rangeland health assessments, allotment evaluations, and through an environmental review process. Where opportunities occur, cooperative efforts to utilize permittee/lessee monitoring and integrated ranch planning will be emphasized (HiLine Approved RMP, page 3-25).
- Adjustments to meet seasonal [Greater] Sage-Grouse habitat requirements could include (HiLine Approved RMP, page 3-26):
  - season or timing of use;

[2] Because of the need to refer to domestic bison from both a biological and rangeland management standpoint throughout this EA, the terms "bison" and "indigenous livestock" are used interchangeably. It should be noted that the proposed action deals only with management of domestic bison, which would be pastured by authorized permittees and does not pertain to wild herds.

  - numbers of livestock (includes temporary non-use or livestock removal);
  - distribution of livestock use;
  - intensity of use; and
  - type of livestock (e.g., cattle, sheep, horses, bison, llamas, alpacas, and goats)

- Potential criteria for prioritizing permit modifications could include whether there has been a request from the permittee to modify the terms and conditions of his/her permit (HiLine Approved RMP, page 3-27).

1.4 Relationship to Statutes, Regulations, Other Plans, or Other National Environmental Policy Act Documents

The proposal is in accordance with the following statutes, regulations, other plans, and other National Environmental Policy Act of 1969 (NEPA) documents:

- Title 43 Code of Federal Regulations (CFR) Part 4100 (Grazing Administration – Exclusive of Alaska). Specifically, 43 CFR 4130.6-4 provides opportunities for the BLM to issue grazing permits or leases for privately owned or controlled indigenous animals at the discretion of the authorized officer. These permits or leases can be issued for a period of up to 10 years. Bison under this proposal are privately owned and are indigenous to the region. Subpart 4130.3-2 states that other terms and conditions of a permit or lease should include the kinds of indigenous animals authorized to graze under specific terms and conditions.
- TGA of June 30, 1934, as amended. Congress passed the TGA in 1934 to regulate livestock grazing on public lands, initiating the federal government's involvement in rangeland management to address uncontrolled grazing and rangeland depletion and deterioration. The TGA authorized the Secretary of the Interior to establish grazing districts and modify the boundaries of grazing districts on lands that are chiefly valuable for grazing and raising forage crops.[1] The proposal to graze domestic indigenous animals is consistent with the authorities in the TGA.
- Carlson-Foley Act of 1968 (Weed Control on Public Lands)

[1] The TGA authorized the Secretary of the Interior "in his discretion, by order to establish grazing districts or additions thereto and/or to modify the boundaries thereof, . . . which in his opinion are chiefly valuable for grazing and raising forage crops . . ." (43 US Code 315).

- NEPA, and updated Council on Environmental Quality (CEQ) guidance[2] regarding NEPA implementation
- Endangered Species Act of 1973 (ESA)
- Federal Noxious Weed Act of 1974, as amended in 1988, 1994
- FLPMA of 1976
- Clean Water Act of 1977
- Public Rangelands Improvement Act of October 25, 1978
- Paleontological Resources Preservation Act of 2009
- Sage-Grouse Habitat Assessment Framework, June 2015
- Record of Decision and Approved HiLine District RMP (BLM 2015a)

1.5 RESOURCE ISSUES IDENTIFIED FOR ANALYSIS

1.5.1 Fish and Wildlife/Special Status Species

- How would the proposed action and alternatives impact fish, wildlife, and special status species?
- How would the proposed action and alternatives impact Greater Sage-Grouse habitat?
- How would the proposed action and alternatives impact big game winter range and migration?

1.5.2 Common Allotment Management

- How would implementation of APR's proposal impact neighboring and in-common BLM grazing permittees?

1.5.3 Public Health and Safety

- How would the presence of bison on BLM-administered lands impact public safety?
- How would the proposed action and alternatives impact safety considerations for access to recreational opportunities, such as hunting?

1.5.4 Rangeland Health

- Under the proposed changes to grazing and range improvement project management, how would Guidelines be conformed to and Rangeland Health Standards be achieved?

[2] References to the CEQ regulations throughout this EA are to the regulations in effect prior to September 14, 2020. The revised CEQ regulations effective September 14, 2020 are not referred to in this EA because the NEPA process associated with the proposed action began prior to this date.

- How does the behavior of bison differ from cattle in terms of forage requirements and patterns of movement? Are the allotments of sufficient size to accommodate bison behavior?
- How would the BLM ensure that the appropriate number of AUMs are permitted for each allotment?

1.5.5 Riparian-Wetland Habitat

- Under the proposed changes to grazing and range improvement project management, how would wetland and riparian ecosystems achieve and maintain properly functioning conditions?

1.5.6 Socioeconomics

- How would the proposed action and alternatives impact the local culture and economy?

1.5.7 Vegetation

- How would the proposed action and alternatives impact upland and sagebrush plant communities with regard to species composition, biodiversity, distribution, succession, and grassland heterogeneity?
- How would the proposed action affect the health, diversity, and reproductive success of woody draw communities?

1.6 Issues/Resource Topics Considered but Eliminated from Further Analysis

1.6.1 Air Quality and Climate Change

Air quality impacts associated with livestock grazing include engine exhaust emissions from vehicles used to access lease areas and particulate emissions associated with land disturbance from grazing animals, range improvements, and increased wind erosion from disturbed areas. Vehicle emissions associated with grazing activity would be low and would have negligible impacts on air quality. Particulate emissions depend on the amount of soil disturbance, soil moisture, vegetative cover, and wind speed. Meeting upland and riparian standards decreases the quantity of particulate emissions by protecting vegetative and soil quality. Air quality impacts are expected to be negligible at current levels of grazing activity.

Climate change was not raised as an issue either internally or externally by the public during the scoping period. Climate change was not considered an issue for the following reasons. Livestock grazing can affect rangeland carbon levels through changes in plant community and changes in ecosystem processes, but the effects have been variable and inconsistent among the ecosystems studied (Derner and Schuman 2007). Some studies have found that improved grazing can result in increased carbon storage, while other studies found little effect (Sanderson et al. 2020). A study found that moderate grazing rates in the northern Great Plains can result in increased carbon storage compared to heavy grazing rates (Liebig et al. 2010). Many changes in rangeland carbon from different grazing practices do not result in substantial changes in total ecosystem carbon, but are redistributions of carbon, such as from above-ground vegetation to root biomass (Derner and Schuman 2007). Overall, changes in rangeland carbon storage from changes in grazing practices are likely to be small and difficult to predict, especially where a rangeland health assessment has determined that rangeland health standards are being met. Therefore, changes in grazing analyzed in this EA would only result in negligible, if any, change in total carbon storage in both the short and long term. Moreover, the proposed action would not result in an increase in AUMs exceeding that which was analyzed in the HiLine Proposed RMP/Final Environmental Impact Statement (BLM 2015b), which accounts for livestock grazing emissions under a range of alternatives.

1.6.2 Cultural Resources, Paleontological Resources, and Native American Concerns

The issuance of a grazing permit and/or a change of the kind of livestock are actions that generally do not involve any direct surface disturbances and, as non-surface-disturbing types of activities, have little or no potential or ability to significantly affect cultural or paleontological properties. Moreover, this project area has not been identified as being significant to any Native American Tribe or group. New fence construction, similar to other common range improvements, may result in temporary, minor surface disturbances. Prior to initiating ground disturbance for new fence construction in new locations, surveys for the presence of potential cultural resources would be carried out in order to safeguard against effects on such resources. However, no cultural resource inventory is necessary prior to approving and authorizing this undertaking to proceed. If, upon issuance of a grazing permit and/or a change of the kind of livestock, conscientious grazing practices are in effect, a finding of "No Historic Properties Affected" (per 36 CFR 800) would be warranted.

1.6.3 Invasive/Nonnative Species

The change in use should not increase the potential for invasive species within the proposed area because land health standards would continue to apply, and the class of livestock does not materially change weed spread vectors. Further discussion regarding the potential for spread of invasive or noxious plant species that could be transferred across grazing allotments via livestock is contained in **Section 3.4.7**, Vegetation.

1.6.4 Soils

The additional season of use would occur when soils are typically snow covered, frozen, and/or dry; therefore, effects would be minimized. The greatest amount of precipitation, historically, is received in May, June, and first part of July. Also, Standards for Rangeland Health would continue to be met, ensuring that soil health would be maintained. Soils in the uplands provide for the capture, storage, and safe release of water. As with the current permitted kind of livestock, there would be areas that get impacted, such as around water, fence corners, and trails, but, overall, throughout the allotment, soil health would be maintained.

1.6.5 Visual Resources

While the proposal to remove interior fences would create a change from the current condition of the viewshed, this change would be minimal to moderate and would conform to the goals and objectives of BLM Visual Resource Management classifications.

1.6.6 Grazing District Boundaries

The TGA authorized the Secretary of the Interior to establish grazing districts and modify the boundaries of grazing districts on lands that are chiefly-valuable-for-grazing and raising forage crops. Grazing districts have long been established, and the obligation under that provision has been fulfilled. Because the Secretary has already made the original classification required by the TGA, there is no need for the BLM to continually re-determine whether the lands remain chiefly-valuable-for-grazing. Per Solicitor Opinion M-37008 (issued on October 4, 2002), a chiefly-valuable-for-grazing determination is required only when the Secretary is considering creating or changing grazing district boundaries. Such an action is outside the scope of this EA. The proposal to graze domestic indigenous animals is consistent with the authorities of the TGA.

This page intentionally left blank.

Chapter 2. Alternatives

2.1 COMPONENTS COMMON TO ALL ALTERNATIVES

The BLM allotments considered in this EA are Telegraph Creek, Flat Creek, White Rock, East Dry Fork, French Coulee, and Garey Coulee, all in Phillips County, Montana. The Box Elder allotment is associated with the grazing proposal because it would be combined with the Telegraph Creek Allotment, deeded land, and State leases to form APR's Sun Prairie Unit (see **Section 2.3** for more detail). It is, therefore, discussed below, but no change is requested to the permit and no action is needed regarding this allotment.

Under all alternatives, the BLM would continue to permit 7,969 AUMs. Actual AUM use could vary from year to year based on a number of factors, such as permittee management and rangeland conditions. In no case will actual AUM use exceed authorized permitted use of 7,969 AUMs.

All alternatives would adhere to Greater Sage-Grouse land use requirements as outlined in land use plans (BLM 2015a). Additionally, the decision from the Beauchamp Management Area Grazing Permit Renewal EA would be common to all alternatives for allotments or projects renewed in that EA.

2.2 ALTERNATIVE A (CURRENT MANAGEMENT)

Alternative A represents the current management and conditions, which would persist if the proposal were not approved. Under this alternative, the permits would be unchanged by this action, and the permittee would be allowed to continue grazing cattle as authorized in the terms and conditions currently in place until the existing permits expire. These current terms for allotments within the project area are identified in **Table 1**.

The current fencing configuration would also remain. There are currently 197.4 miles of fencing in the project area. Current range improvement cooperative agreements would remain in place, and project construction, maintenance, or abandonment would occur on a case-by-case basis depending on condition of improvements and conformance with goals and objectives of allotment management as it relates to standards and guidelines for rangeland health.

Table 1
Alternative A (Current Grazing Terms and Conditions)

Allotment	Allotment Number	Acres	Season of Use	Max Number of Livestock	Type of Livestock[1]	AUMs[2]
East Dry Fork (Pastures 1 and 3)[3]	5617	11,506	5/1–11/30	225	C	1,584
French Coulee	5616	72	3/1–2/28	1	C	7
Garey Coulee	5447	3,011	3/1–2/28 5/1–11/30	3 74	C	40 521
Box Elder[4]	5655	7,185	3/1–2/28	235	I	1,158
Telegraph Creek[4]	5654	10,518	3/1–2/28 3/1–2/28	2 112	I	17 1,344
Flat Creek	5439	13,064	3/1–2/28 5/1–11/15	2 187	C	21 1,222
Whiterock Coulee	5417	16,721	3/1–2/28 5/1–10/31	16 416	C	193 1,862

[1] C = Cattle, I = Indigenous (bison)
[2] The sum of the AUMs from the Authorization Schedule Information may not equal the Active AUMs for each authorization or allotment due to rounding in the AUM calculation.
[3] This allotment is currently shared with another lessee. East Dry Fork Pasture 2 accounts for 7,233 acres.
[4] Box Elder and Telegraph Creek Allotments are currently approved for use by bison and a grazing season of 3/1-2/28. APR is not requesting these prior decisions be reconsidered in the analysis. It should be noted that Telegraph Creek, while operated under a year-round grazing permit, is currently managed under a pasture rotation system.

Terms and Conditions Applicable to All Permits and Leases

1. Grazing permit or lease terms and conditions and the fees charged for grazing use are established in accordance with the provisions of the grazing regulations now or hereafter approved by the Secretary of the Interior.

2. They are subject to cancellation, in whole or in part, at any time because of:

    a. Noncompliance by the permittee/lessee with rules and regulations.

    b. Loss of control by the permittee/lessee of all or a part of the property upon which it is based.

    c. A transfer of grazing preference by the permittee/lessee to another party.

    d. A decrease in the lands administered by the BLM within the allotment(s) described.

    e. Repeated willful unauthorized grazing use.

    f. Loss of qualifications to hold a permit or lease.

3. They are subject to the terms and conditions of allotment management plans if such plans have been prepared. Allotment management plans MUST be incorporated in permits or leases when completed.

4. Those holding permits or leases MUST own or control and be responsible for the management of livestock authorized to graze.

5. The authorized officer may require counting and/or additional or special marking or tagging of the livestock authorized to graze.

6. The permittee's/lessee's grazing case file is available for public inspection as required by the Freedom of Information Act.

7. Grazing permits or leases are subject to the nondiscrimination clauses set forth in Executive Order 11246 of September 24, 1964, as amended. A copy of this order may be obtained from the authorized officer.

8. Livestock grazing use that is different from that authorized by a permit or lease MUST be applied for prior to the grazing period and MUST be filed with and approved by the authorized officer before grazing use can be made.

9. Billing notices are issued, which specify fees due. Billing notices, when paid, become a part of the grazing permit or lease. Grazing use cannot be authorized during any period of delinquency in the payment of amounts due, including settlement for unauthorized use.

10. The holder of this authorization must notify the authorized officer immediately upon the discovery of human remains, funerary objects, sacred objects, or objects of cultural patrimony (cultural items), stop the activity in the area of the discovery, and make a reasonable effort to protect the remains and/or cultural items.

11. Grazing fee payments are due on the date specified on the billing notice and MUST be paid in full within 15 days of the due date, except as otherwise provided in the grazing permit or lease. If payment is not made within that time frame, a late fee (the greater of $25 or 10 percent of the amount owed but not more than $250) will be assessed.

12. Members of Congress may not enter into a grazing permit or lease. 41 US Code 6306 (2014). Further, no officer, agent, or employee of the DOI, other than members of Advisory committees appointed in accordance with the Federal Advisory Committee Act (5 US Code App. 1) and Sections 309 of the FLPMA (42 US Code 1701 et. seq.) shall be admitted to any share or part in a permit or lease for grazing or derive any benefit to arise from a permit or lease for grazing.

13. A Livestock Control Agreement or Pasturing Agreement must be filed with the authorized officer and approval received prior to any grazing use for livestock which graze the public lands that are being subleased or are not owned by the permittee or lessee (43 CFR 4130.7(d)).

14. In order to improve livestock and rangeland management on the public lands, all salt and/or mineral supplements must be located at least 0.25 mile from water located on public land (any riparian area, wet meadow, or watering facility) (43 CFR 4130.3-2(c)).

15. Numbers of livestock may vary within the permitted season of use as long as the total permitted AUMs are not exceeded (HiLine RMP; BLM 2015a).

16. If requested by BLM, an Actual Livestock Grazing Use Report must be submitted to the Malta BLM Office within 15 days after livestock are removed from the allotment(s).

17. All range improvements shall be installed, used, maintained, and/or modified on the public lands, or removed from these lands, in a manner consistent with multiple use management, and as agreed to in a Cooperative Agreement (43CFR 4120.3-l(a)).

18. All water developments and tanks will include functional wildlife escape ramps.

19. Per Appendix B of the HiLine RMP (BLM 2015a), all fences within 1.2 miles of Greater Sage-Grouse leks should be marked to decrease the chance of Sage-Grouse collisions.

20. The authorized officer may modify terms and conditions of the permit or lease when the grazing use or related management practices are not meeting the land use plan, allotment management plan or other activity plan, or management objectives, or is not in conformance with the provisions of subpart 4180 Resource Advisory Council Standards and Guidelines (43 CFR 4130.3-3).

***Terms and Conditions for all Active Use*[5]**

1. The Operator has the flexibility to apply to turn out earlier or stay later up to 14 days on the allotment provided AUMs allocated are not exceeded. The application must be submitted to the BLM before the grazing use occurs, reviewed by BLM specialists and approved by the authorized officer.

2. Authorizations with *after-the-fact billing:* Actual Use Reports (Form 4130-5) are due with 15 days after completing grazing use as specified on grazing permit. Actual use reports must reflect livestock movements for the current grazing year for the specified allotment. Billing shall be due upon issuance. Repeated delays in payment, delayed submission of actual use reports, or noncompliance with the terms and conditions of the allotment management

[5] *Type Use* can be found listed on the permit line of the grazing permit (Form 4130-2a) and on grazing bills in column 7.

plan and permit shall be cause to revoke provisions for after-the-fact billing (43 CFR 4130.8-1(e)).

Terms and Conditions for all Custodial Use

1. Authorized for the permitted AUMs on public lands.

2. Authorized for custodial use in conjunction with the base property.

Terms and Conditions for Box Elder Allotment

The permittee will keep actual use records and submit them to the BLM within 15 days at the end of the grazing season but will not be used for billing purposes.

The terms and conditions may be modified if additional information indicates that revision is necessary to the Standards of Rangeland Health, as described in 43 CFR 4180 (Code Public Lands)

Terms and Conditions for Telegraph Creek Allotment

Licensed for the surveyed AUMs on the public lands within the base pasture. Pastures 1-4 are authorized in conjunction with the terms and conditions in the Telegraph Creek Allotment Management Plan implemented in 1970, as amended by DOI-BLM-MT-090-04-026-EA.

The permittee will keep actual use records and submit them to the BLM within 15 days at the end of the grazing season but will not be used for billing purposes.

The terms and conditions may be modified if additional information indicates that revision is necessary to the Standards of Rangeland Health, as described in 43 CFR 4180 (Code Public Lands)

Terms and Conditions for Flat Creek Allotment

Licensed for the surveyed AUMs on the public lands in base pasture in Flat Creek Allotment. There are no restrictions on livestock numbers as long as the resource values on the public lands are not damaged.

This entry is authorized in conjunction with the terms and conditions in the Flat Creek Allotment Management Plan implemented in 1974.

Terms and Conditions for East Dry Fork Allotment

This entry is authorized in conjunction with the terms and conditions in the East Dry Fork Allotment Management Plan implemented in 1982.

This permit or lease may be canceled, suspended, or modified, in whole or in part, to meet the requirements of applicable laws and regulations.

Terms and Conditions for French Coulee Allotment

Licensed for the surveyed AUMs on the public lands in French Coulee allotment. There are no restrictions on livestock numbers as long as the resource values on the public lands are not damaged.

This permit or lease may be canceled, suspended, or modified, in whole or in part, to meet the requirements of applicable laws and regulations

Terms and Conditions for Garey Coulee Allotment
Pasture 2: Licensed for the surveyed AUMs on the public lands in Pasture 2 in Garey Coulee Allotment. There are no restrictions on livestock numbers as long as the resource values on the public lands are not damaged.

Pasture 1: Licensed for only the specified season, numbers, and class of livestock on public lands in Pasture 1 in Garey Coulee allotment.

Terms and Conditions for Whiterock Coulee Allotment
Licensed for the surveyed AUMs on the public lands.

This entry is authorized in conjunction with the terms and conditions in the Whiterock Coulee Allotment Management Plan implemented in 1975.

The terms and conditions may be modified if additional information indicates that revision is necessary to the Standards of Rangeland Health, as described in 43 CFR 4180 (Administration of Grazing on Public Lands).

2.3 Alternative B (Applicant Proposed Alternative)

Alternative B represents the APR's revised proposal in response to public concerns related to bison year-long continuous grazing. This request also better reflects APR's expected bison stocking plans for at least the next 10 years, based on their desire to keep bison management operations centralized and to have herds of at least 400 animals to maintain genetic diversity.

Under Alternative B, the BLM would issue a 10-year grazing permit for cattle and indigenous livestock (bison) on the Telegraph Creek, Flat Creek, White Rock, East Dry Fork, French Coulee, and Garey Coulee allotments. Some allotments would be combined with other allotments, state leases, and/or deeded lands to form "APR Grazing Units." Permit renewals on the French Coulee and Garey Coulee allotments may be subject to a final decision issued following completion of the Beauchamp Management Area Grazing Permit Renewal EA. Alternative B includes modifications to the proposal submitted by APR on September 24, 2019 and reduces the season of use compared with the current grazing permit. Terms and Conditions for all BLM Grazing Permits within the Beauchamp Management Area are as follows:

1. A *Livestock Control Agreement* or *Pasturing Agreement* must be filed with the authorized officer and approval received prior to any grazing use for livestock which graze the public lands that are being sub-leased or are not owned by the permittee or lessee (43 CFR 4130.7(d)).

2. In order to improve livestock and rangeland management on the public lands, all salt and/or mineral supplements must be located at least 0.25 mile from

water located on public land (any riparian area, wet meadow, or watering facility) (43 CFR 4130.3-2(c)).

3. Numbers of livestock may vary within the permitted season of use as long as the total permitted AUMs are not exceeded (HiLine RMP; BLM 2015a).

4. If requested by the BLM, an Actual Livestock Grazing Use Report must be submitted to the Malta BLM Office within 15 days after livestock are removed from the Allotment(s).

5. All range improvements shall be installed, used, maintained, and/or modified on the public lands, or removed from these lands, in a manner consistent with multiple use management, and as agreed to in a Cooperative Agreement (43CFR 4120.3-l(a)).

6. All water developments and tanks will include functional wildlife escape ramps.

7. Per Appendix B of the HiLine RMP (BLM 2015a), all fences within 1.2 miles of Greater Sage-Grouse leks should be marked to decrease the chance of Sage-Grouse collisions.

8. The authorized officer may modify terms and conditions of the permit or lease when the grazing use or related management practices are not meeting the land use plan, allotment management plan or other activity plan, or management objectives, or is not in conformance with the provisions of subpart 4180 Resource Advisory Council Standards and Guidelines (43 CFR 4130.3-3).

9. Failure to pay grazing bills within 15 days of the due date specified in the bill shall result in a late fee assessment of $25.00 or 10 percent of the grazing bill, whichever is greater, but not to exceed $250.00. Payment made later than 15 days after the due date shall include the appropriate late fee assessment. Failure to make payment within 30 days may be a violation of 43 CFR 4140. l(b)(l) and shall result in action by the authorized officer under 43 CFR 4150.1 and 4160.1-2 (43 CFR 4130.8-l(t)).

10. All permits and leases shall be made subject to cancellation, suspension, or modification for any violation of these regulations or of any term or condition of the permit or lease (43 CFR 4130.3-l(b)).

The Box Elder allotment is associated with the grazing proposal and included in the discussion below because it is part of the Sun Prairie Unit, but no change is requested to the permit and no action is needed regarding this allotment. Year-long grazing of bison was approved on the allotment in 2014.

In addition to modifying the type of livestock permitted on allotments, the permits would modify the grazing season for bison and authorize the reconstruction or construction of identified exterior fences before the allotment is stocked with bison and the removal of select interior fences (see **Appendix A**, Maps).

Fencing changes would be as follows and would result in a total of 172.2 miles of fencing:

- Existing fencing to be retained: 87.4 miles
- Fencing to be reconstructed: 43.9 miles
- Fencing to be reconstructed as electric only: 35.7 miles
- New fencing to be constructed: 5.2 miles
- Existing fencing to be removed: 30.4 miles

Additional Terms and Conditions

Additional terms and conditions would be the same as under Alternative A, as applicable. In addition, in Greater Sage-Grouse habitat, the following additional terms and conditions would be added.

If on-the-ground monitoring determines that livestock grazing has prevented suitable habitat conditions for Greater Sage-Grouse on more than half of three or more than three key monitoring sites within an allotment, livestock numbers will be reduced by 10 percent. They may be reduced another 10 percent the following year if habitat conditions remain unimproved. Livestock numbers would only be restored to full numbers when a management action plan is in place to correct the reason(s) for the failure. Desired Conditions for Greater Sage-Grouse Habitat are found in Table 2.3-2 of the HiLine RMP (BLM 2015a).

Additional Description of Actions

Specifications for grazing seasons, fencing, AUMs, and other requirements would vary among APR Grazing Units. The proposed stipulations for each allotment considered in this proposal are described below.

The following specifications would apply to all permits:

- The permit would allow for any combination of cattle or indigenous livestock during the season of use.
- Tagging or identification of individual bison would meet the requirements of Montana Department of Livestock.
- Disease testing would meet Montana Department of Livestock requirements.
- Except where otherwise indicated, allotments would be fenced as shown on fence maps (see **Appendix A**, Maps), and fences would be maintained per specific standards (see **Appendix B**, Fence Design

and Maintenance). For instance, interior and exterior fences would be constructed, reconstructed, or modified according to Montana Department of Fish, Wildlife, and Parks' (MFWP) wildlife friendly standards with a four-wire fence, a second from the top high tensile electric wire, and the installation of solar charging panels. Electric fence notification signs would be required at gates and cattle guards. Single cattleguards would be replaced with double cattleguards. Proper signage indicating electrified wire would also be installed. Gates would be non-electrified. Additional features to further ensure public safety would also be incorporated into project design, as needed.

- To ensure adequate public vehicular access, gates and/or cattleguards should be installed in fences on every publicly accessible road or trail. Additional gates would be installed along fences where access is recommend by BLM. As a general rule, at least one gate should be installed every 0.50 mile and in sharp angle corners. APR will be required to install additional gates, stiles, or fence ladders where additional public access may be needed in order to ensure public safety.

Box Elder and Telegraph Creek Allotments (Sun Prairie Unit)

Year-long continuous bison grazing is already approved for the Box Elder Allotment. Bison grazing is already approved for the Telegraph Creek Allotment and State leases. State lease #4873 is fenced out and is not being grazed at this time.

The Telegraph Creek Allotment and State Lease #4873 would be fenced, and fences would be maintained. Some fence would be removed so there would be three pastures, instead of four, on BLM-administered land, as shown on the maps (see **Appendix A**, Maps). Grazing would be allowed on a year-long and continuous basis on the three pastures that comprise the Telegraph Creek Allotment. State Lease #4873 is currently fenced out and not being grazed by bison. Grazing permits for both allotments would be renewed with modifications to reduce the season of use compared to the current grazing permits.

Box Elder Allotment 5655 (Authorization number: 2500017; Current Authorization; No Change Requested)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current/Proposed	235	1	3/1	2/28	41	1,158

Telegraph Creek Allotment 5654 (Authorization number: 2501506; Current Authorization; No Change Requested)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current/Proposed	2	1	3/1	2/28	100	17
	112	1	3/1	2/28	100	1,344

Flat Creek (Sun Prairie North Unit)

The grazing season would run from 4/1 to 9/30, and from 3/1 to 2/28 on small custodial parcels. On the Flat Creek Allotment and State Lease #8171, some fencing would be removed so there would be four pastures, instead of five, on BLM-administered land (see **Appendix A**, Maps). This allotment would be grazed as a four-pasture rest–rotation system where one pasture is rested each year and one pasture is deferred during the growing season each year. The rest and deferred pastures would be different each year of the 4-year cycle (US Department of Agriculture, Natural Resources Conservation Service 2003).

The number of AUMs and animals on the current BLM permits and State Leases would be retained.

Flat Creek Allotment 5439 (Authorization number: 2504616)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	2	C	3/1	2/28	100	21
	187	C	5/1	11/15	100	1,222
Proposed	2	C/I	3/1	2/28	100	21
	187	C/I	4/1	9/30	100	1,222

East Dry Fork, French Coulee, and Garey Coulee Allotments (Dry Fork Unit)

The grazing season for the western portion of French Coulee and all small custodial parcels that are fenced in with deeded land would be kept as 3/1–2/28. On the East Dry Fork allotment, the grazing season would run from 4/1 – 9/30. A 4/1 start date would allow bison to be put out prior to calving. A 9/30 end date would allow bison calves of the year to exit BLM-administered land before they turn 6 months old. The East Dry Fork allotment would be split so that Jacobs and APR each have their own allotment, not a shared or run in common allotment. APR would construct and maintain new fencing to split pasture 3 into two portions. APR would have pasture 1 and a portion of pasture 3. Jacobs have pasture 2 and a portion of pasture 3. Pastures 2 and 3 would be modified to give the Jacobs their additional 200 AUMs. APR would build and maintain new fence between pastures 2 and 3. All three of the East Dry Fork pastures have been grazed every year for some time now, and the lessees have not all been running in common. State leases #9266 and #9267 would be transferred to the Jacobs, instead of being shared by APR and Jacobs.

APR's two East Dry Fork pastures would be combined with the Garey Coulee pasture to create a three-pasture deferred rotation system where one pasture is deferred during the growing season (see **Appendix A**, Maps). The deferred pasture would be different each year of the 3-year cycle.

The Garey Coulee Allotment and State Lease #9650 would be combined with APR's two East Dry Fork pastures to create a three-pasture deferred rotation system where one pasture is deferred during the growing season (see **Appendix A**, Maps). The deferred pasture would be different each year of the 3-year cycle.

The number of AUMs and animals on the current BLM permits and State Leases would be retained.

French Coulee 5616 (Authorization number: 2500276)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	1	C	3/1	2/28	100	7
Proposed	1	C/I	3/1	2/28	100	7

East Dry Fork 5617 (Authorization number: 2500276)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	225	C	5/1	11/30	100	1,584
Proposed	225	C/I	4/1	9/30	100	1,584

Garey Coulee 5447 (Authorization number: 2500611)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	3	C	3/1	2/28	100	40
	74	C	5/1	11/30	100	521
Proposed	3	C/I	3/1	2/28	100	40
	74	C/I	4/1	9/30	100	521

Whiterock Coulee (White Rock Unit)

The grazing season would run from 4/1–9/30 and 3/1–2/28 on small custodial parcels.

On the White Rock Allotment and State Lease #9361, some fencing would be removed and some constructed so there would be three pastures, instead of four, on BLM-administered land (see **Appendix A**, Maps). This allotment would be grazed as a three-pasture deferred rotation system where one pasture is deferred during the growing season each year. The deferred pasture would be different each year of the 3-year cycle.

The number of AUMs and animals on the current BLM permits and State Leases would be retained.

Whiterock Coulee 5417 (Authorization number: 2500511)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	16	C	3/1	2/28	100	193
	416	C	5/1	10/31	74	1,862
Proposed	16	C/I	3/1	2/28	100	193
	416	C/I	4/1	9/30	74	1,862

2.4 ALTERNATIVE C

Under Alternative C, the BLM would issue a 10-year grazing permit for cattle and bison on the grazing permits listed below. Current fencing structures and pasture configurations would remain, and the BLM would allow APR to upgrade to electrical fencing to ensure bison containment. All other aspects of the alternative, season of use, stocking rate, and AUMs would remain the same as under Alternative A.

This alternative is a combination of APR's proposal with the current management in response to issues raised regarding bison year-long continuous grazing. In particular, the season of use would stay the same; hence, a typical rest–rotation system would be followed.

Box Elder Allotment 5655 (Current Authorization; No Change Requested)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current/Proposed	235	I	3/1	2/28	41	1,158

Telegraph Creek Allotment 5654 (Current Authorization; No Change Requested)

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current/Proposed	2	I	3/1	2/28	100	17
	112	I	3/1	2/28	100	1,344

Flat Creek Allotment 5439

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	2	C	3/1	2/28	100	21
	187	C	3/1	2/28	100	1,222
Proposed	2	C/I	3/1	2/28	100	21
	187	C/I	41	9/30	100	1,222

French Coulee 5616

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	1	C	3/1	2/28	100	7
Proposed	1	C/I	3/1	2/28	100	7

East Dry Fork 5617

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	225	C	5/1	11/30	100	1,584
Proposed	225	C	5/1	11/30	100	1,584

Garey Coulee 5447

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	3	C	3/1	2/28	100	40
	74	C	5/1	11/30	100	521
Proposed	3	C/I	3/1	2/28	100	40
	74	C/I	5/1	11/30	100	521

Whiterock Coulee 5417

Authorization	# of Livestock	Type of Livestock	Begin Date	End Date	% Public Land	BLM AUMs
Current	16	C	3/1	2/28	100	193
	416	C	5/1	10/31	74	1,862
Proposed	16	C/I	3/1	2/28	100	193
	416	C/I	5/1	10/31	74	1,862

Additional Terms and Conditions

Additional terms and conditions would be the same as under Alternative A, as applicable. In addition, in Greater Sage-Grouse habitat, the following additional terms and conditions would be added.

If, due to livestock grazing, habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment, livestock numbers will be reduced by 10 percent. They may be reduced another 10 percent the following year if habitat conditions remain unimproved. Livestock numbers would only be restored to full numbers when a management action plan is in place to correct the reason(s) for the failure occurring. Desired Conditions for Greater Sage-Grouse Habitat are found in Table 2.3-2 of the HiLine RMP (BLM 2015a).

2.5 ALTERNATIVE D

Under Alternative D, the BLM-administered land acreage within the allotments considered in this EA would be devoted to a public purpose, which precludes livestock grazing. The grazing permits would be canceled on all seven allotments included in the application (as well as for the Box Elder allotment, where no change is requested to the permit), and use of the allotments by domestic livestock would be discontinued. The permittee would be given 2 years' prior notification before their grazing permit and grazing preference would be canceled, as provided for in 43 CFR 4110.4-2.

No domestic livestock grazing would be authorized after the termination date unless a new environmental analysis is completed that determined that domestic livestock grazing could be authorized on all or some portion of the area. Private lands included in the allotment could continue to be grazed at the landowner's discretion. The landowner would be required to keep their livestock off BLM-administered lands, and it is likely that additional fencing would be needed for landowners to keep their cattle from trespassing on BLM-administered lands. Livestock-related range improvements on BLM-administered land would be abandoned and/or removed and reclaimed where there is no clear benefit to other resources.

Although no issues or conflicts have been identified to warrant the complete elimination of livestock grazing across the project area, a no grazing alternative is considered in order to compare livestock impacts between alternatives, as outlined in the Hi-Line Approved RMP (BLM 2015a) and BLM Instruction Memorandum MT-2012-042.

2.6 SUMMARY COMPARISON OF ALTERNATIVES

	Alternative A	Alternative B	Alternative C	Alternative D
Class of Livestock	Cattle	Cattle and bison	Cattle and bison	N/A
Total Miles of Fence	197.4 miles	172.2 miles (5.2 miles constructed) (30.4 miles removed)	197.4 miles	At least 139.2 miles remain following removal of interior fencing
Season of Use	Variable by Allotment	Variable by Allotment	Variable by Allotment	N/A

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

2.7.1 Reduced Grazing

The BLM considered an alternative that would reduce livestock grazing in the decision area by various amounts. The analysis of other alternatives to reduce grazing by additional levels is not needed; this is because the BLM has considerable discretion through its grazing regulations to determine and adjust stocking levels, seasons-of-use, and grazing management activities and to allocate forage to uses of the public lands in RMPs. A no-grazing scenario is analyzed under Alternative D.

From 1956 through 1972, the BLM conducted a classification of public lands to estimate the amount of available forage in the decision area. From this AUM adjudication survey project, the BLM generated multiple subbasin reports, which provided the carrying capacities by AUMs for all BLM-administered lands at the time of survey. The BLM, in cooperation with grazing advisory boards, used the information to make adjustments to the AUMs allocated to grazing permits and leases. This cooperation resulted in making appropriate changes to grazing permits in the planning areas. Generally, livestock allocation levels were estimated to be approximately 30 to 50 percent of the annual vegetation production of area landforms. These changes were implemented before 1975.

These historical grazing allocations have been adjusted over time and are validated periodically, which can occur independently or can coincide with the renewal of each 10-year grazing permit or lease.

Following initial surveyed forage allocations, the basis for increasing or decreasing permitted use has been land health evaluations, inventories, and monitoring data (vegetative and levels of use). Measures to reduce or eliminate livestock grazing could become necessary in specific situations where livestock grazing causes or contributes to conflicts with protecting or managing other resource values or uses. No basis for decreasing permitted use was documented during the land health evaluation process; therefore, further analysis is not warranted at this time.

2.7.2 Shortened-term Grazing Permits

The BLM considered an alternative that allows the modifications requested in the APR's proposal, but in which the permit would be valid for less than 10 years in order to determine if the proposed changes are harmful to soil, vegetation, and water of the region. This alternative was dismissed because the proposed action and the alternatives considered are not expected to materially affect rangeland vegetation, because livestock management adjustments cause change in vegetative communities slowly on the glaciated plains. Land health standards are currently being met and are expected to continue to be met. Periodic monitoring of rangeland conditions would occur and, should any harmful degradation occur, the BLM has authority make changes as necessary under the grazing regulations.

2.7.3 Area-wide Year-round Grazing

The BLM considered an alternative that would allow all allotments in the area to be open to year-round livestock grazing; however, this was outside the scope of the EA. This alternative was dismissed because allotments operate on individual permits, and the permits would have to be formally modified. The permittees would have to request modifications to their permits on an individual basis.

2.7.4 Alternative Fencing Proposals

The BLM considered an alternative that modifies APR's proposal to retain certain fence improvements to ensure bison are limited to topography where they are more likely to be contained and not escape onto neighboring ownerships. This alternative was dismissed because the likelihood for bison escape would be the same regardless of where the fences are placed. Under the proposed action, APR would install perimeter fencing on bison pastures that is designed to keep bison confined within the pasture while meeting Montana Fish Wildlife and Parks' standards for wildlife friendly fencing and the State of Montana's definition of a "legal fence."

2.7.5 Conversion to Bison, Season-long without Modifications to Range Improvements

The BLM considered an alternative in which the permit allows for season-long grazing and conversion to bison on all seven allotments, but rangeland improvements are not permitted. This alternative was dismissed because the lack of range improvements, such as maintaining livestock water source infrastructure and reconstructing fences, would be expected to reduce rangeland health.

2.7.6 Common Allotment Grazing

The BLM considered an alternative in which the permit would allow for grazing in common of APR bison with cattle from other permittees on BLM-administered lands. This alternative was dismissed because such an alternative would not fully meet the purpose of and need of the proposed action, which is to respond to an external proposal submitted to modify terms and conditions on BLM-administered grazing permits and includes changes in class of livestock for cattle and/or indigenous animals (bison); changes to the authorized seasons-of-use, construction, reconstruction, and/or removal of range improvement projects; adjustments to allotments (such as combining pastures); and administrative actions (such as issuing 10-year grazing permits).

Chapter 3.
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides a description of the human and environmental resources that could be affected by the four alternatives (A–D) considered in Chapter 2, Alternatives. It also presents comparative analyses of the direct, indirect, and cumulative effects on the affected environment stemming from the implementation of the alternatives.

3.2 Analysis Assumptions

Issuance of a grazing permit and/or change in kind of livestock are actions that generally do not involve any direct surface disturbance. For analysis purposes in this EA, the BLM assumed that the federal action of issuing the 10-year grazing permit would not result in major surface-disturbing activities that differ markedly from impacts that occur with the current permitted kinds of livestock. Impacts from bison, such as around water, fence corners, and trails, would be comparable to those from currently permitted kinds of livestock, and landscape and soil health would be maintained throughout the allotments. Analysis of the allotments in this EA was conducted by subject matter specialists who relied on professional knowledge of the areas involved and review of current databases, file information, and inventories. The following analysis assumptions guide the impact analysis:

- Management of the permitted allotments by the BLM would be subject to applicable federal laws that regulate all grazing, regardless of livestock type.
- Existing land uses on adjacent, nonfederal lands, including current livestock grazing, would be maintained, provided that any necessary authorizations from the State are obtained by permittees or lessees.
- Livestock grazing would continue on all allotments within the project area. Stocking rates, livestock type, and grazing management systems

would be similar to what is currently occurring within the temporal scope of this analysis.

- Minor adjustments and changes are constantly occurring in the livestock industry due to a variety of factors, including the effects of climate, variable market conditions, and changing land ownership. These minor changes have occurred in the past and are expected to continue.

3.3 Cumulative Impacts

Cumulative effects are defined in the CEQ regulations (40 CFR 1508.7) as "...the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

3.3.1 Cumulative Impacts Analysis Area

The geographic extent of cumulative impacts is the lands and resources contained within Phillips County, as well as four surrounding counties within which APR currently holds title to property included in a previous, withdrawn proposal submitted on November 20, 2017. The counties include Choteau, Fergus, Petroleum, and Valley, although it should be noted that APR holds title to additional properties outside of this area. The temporal boundary for the cumulative analysis is the 10-year time frame beginning with the initiation of the 10-year grazing permit and the ensuing 10-year period.

3.3.2 Past, Present, and Reasonably Foreseeable Future Actions

Cumulative impacts are those resulting when added to other past, present, or reasonably foreseeable actions. Past and present uses include land use authorizations issued by the State of Montana for grazing and other activities. Reasonably foreseeable future actions considered in the cumulative impact analysis are:

- Range improvement projects constructed on private, state, and BLM-administered land in the vicinity of the grazing allotments to facilitate the management and control of livestock grazing
- Modifications to the landscape occurring within the grazing allotment as part of past and current management activities, such as road construction and maintenance, unauthorized routes created by off-road vehicles, and range improvement project construction and maintenance (e.g., fences, reservoirs, pipelines, and developed springs)
- Potentially modified grazing lease terms for the Garey Coulee, French Coulee, and East Dry Fork allotments, subject to a final decision issued following completion of the forthcoming Beauchamp Management Area Grazing Permit Renewal EA and Finding of No Significant Impact

- The influence of nonnative plants and invasive weed species on vegetation potential and the disappearance of native species resulting from direct competition between native plants and areas dominated by exotic plants (nonnative and invasive weeds)[6]
- Grazing on adjacent non-BLM-administered lands and continued livestock grazing authorizations issued by the State. In additional to the seven BLM-administered allotments considered in this EA, APR currently operates on other federal and nonfederal ranch lands. APR reports deeded holdings of 104,600 acres and 315,000 acres of state and federal leases (APR 2020). The potential exists for future interest from APR to convert these leases from cattle to cattle or bison grazing on these federal and nonfederal lands. In a previous, withdrawn proposal submitted on November 20, 2017, APR proposed the BLM issue a 10-year grazing permit for cattle and/or indigenous animals (bison) for 31,893 AUMs of federal grazing permitted use on the following 20 BLM-administered allotments:

  Phillips County

  - Beauchamp Creek (5628)
  - Burnt Lodge (5667)
  - Upper C.K. Creek (5621)
  - East Dry Fork (5617)
  - French Coulee (5616)
  - Garey Coulee (5447)
  - Box Elder (5655)
  - Telegraph Creek (5654)
  - Flat Creek (15439)
  - Upper First Creek (5445)
  - White Rock Coulee (5417)

  Chouteau County

  - Deadman Coulee (9778)
  - Starve Out Flats (9808)

  Fergus County

  - Dog Creek (15124)
  - Judith River (15125)
  - PN (9798)
  - PN Sag (15123)

  Valley County

  - Carpenter Creek (4595)

[6] Reduced species richness is most strongly correlated with greater exotic herbaceous cover and also has a negative correlation with native woody species richness (Kudray et al. 2004).

Petroleum County

- Upper/Lower 79 Trail (4964)
- Two Crow RR (15028)

3.4 Analysis of Resource Issues

3.4.1 Fish, Wildlife, and Special Status Species

Affected Environment

General Fish and Wildlife

The project area provides habitat for a wide variety of wildlife species, including big game species, nongame mammals, migratory birds, raptors, amphibians, reptiles, and invertebrates. Riparian and wetland systems, as well as reservoirs, provide habitat for amphibians and native fish. Some areas within the allotments provide important habitat for breeding waterfowl. For instance, the White Rock Coulee allotment has been identified as providing habitat for up to 60 breeding pairs per square mile. The area of winter habitat and migration areas for big game species such as elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), and pronghorn antelope (*Antilocapra americana*) that occur within the project area, as well as mountain lion (*Puma concolor*) and white-tailed deer (*Odocoileus virginianus*), are shown in **Table 2**.

Table 2
Big Game Winter Habitat/Migration in the Project Area

Species	Percent of Project Area
Elk	5
Mountain Lion	10
Mule Deer	33
Pronghorn Antelope	48
White-tailed Deer	4
Total	**100**

Source: MFWP 2012

Regionwide (i.e., the cumulative impacts analysis area) and in sagebrush ecosystems across the western US, the alteration of sagebrush ecosystems and habitat fragmentation has resulted from habitat conversion for agriculture, road construction, oil and gas development activities, and other construction activities. The loss or alteration of sagebrush ecosystems has led to declines in species diversity and has facilitated the spread and establishment of invasive species. Over the long term, changes in plant community composition have occurred from grazing and browsing by livestock and wildlife, wildfire, suppression of wildfire, increase in recreation use, and noxious weeds. Despite these larger factors, the existing habitats within all assessed grazing allotments are maintaining conditions that are capable of sustaining healthy, productive, and diverse populations of native plant and animal species, including special status species (BLM 2017).

Special Status Species

BLM special status species are those listed or proposed for listing under the ESA and those requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA; the latter species are designated as BLM sensitive by BLM state directors. All federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as BLM sensitive species.

Species listed as endangered are in danger of extinction throughout all or a significant portion of its range. Species listed as threatened are likely to become endangered throughout all or a significant portion of its range. The BLM's management of threatened and endangered species is guided by the principle that the continued existence of these species, as well as those that are proposed or are candidates for listing, will not be jeopardized by BLM activities. The BLM continues to implement actions that further the management, protection, and recovery of special status plant and animal species. It accomplishes this through coordination with the US DOI, Fish and Wildlife Service (USFWS) and MFWP. The BLM must initiate ESA Section 7 consultation with the USFWS before approving or implementing any action that could affect listed species or designated critical habitat. In doing so, the BLM manages habitat for these species in such a manner that actions it authorizes, funds, or carries out do not contribute to the species becoming listed under the ESA.

BLM sensitive species are those designated by the Montana/Dakotas BLM state director. The BLM Sensitive Species list is required to be reviewed every 5 years, per BLM Manual 6840 direction. Species designated as BLM sensitive must be natives found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and one of the following applies:

- There is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that its viability or a distinct population segment of the species is at risk across all or a significant portion of the species range.
- The species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Table 3 lists special status species with potential to inhabit the project area and their status. There is no USFWS designated critical habitat within the project area (USFWS 2020).

The area of mapped habitat for sensitive species is shown in **Table 4** below.

Table 3
Special Status Species in the Project Area

Common Name (*Scientific Name)*	BLM Sensitive Species	Federally Listed Species*
Amphibians		
Great plains toad (*Anaxyrus cognatus*)	X	
Reptiles		
Greater short-horned lizard (*Phrynosoma hernandesi*)	X	
Plains hog-nosed snake (*Heterodon nasicus*)	X	
Western milksnake *(Lampropeltis gentilis)*	X	
Mammals		
Black-footed ferret (*Mustela nigripes*)	X	FEXN
Black-tailed prairie dog (*Cynomys ludovicianus*)	X	
Eastern red bat (*Lasiurus borealis*)	X	
Fringed myotis (*Myotis thysanodes*)	X	
Gray wolf (*Canis lupus*)	X	
Hoary bat (*Lasiurus cinereus*)	X	
Pallid bat (*Antrozous pallidus*)	X	
Spotted bat (*Euderma maculatum*)	X	
Swift fox (*Vulpes velox*)	X	
Townsend's big-eared bat (*Corynorhinus townsendii*)	X	
Birds		
American bittern (*Botaurus lentiginosus*)	X	
Baird's sparrow (*Ammodramus bairdii*)	X	
Bald eagle (*Haliaeetus leucocephalus*)	X	
Black tern (*Chilodonias niger*)	X	
Black-billed cuckoo (*Coccyzus erythropthalmus*)	X	
Brewer's sparrow (*Spizella breweri*)	X	
Burrowing owl (*Athene/Speotyto cunicularia*)	X	
Caspian tern (*Hydroprogne caspia*)	X	
Chestnut-collared longspur (*Calcarius ornatus*)	X	
Common tern (*Sterna hirundo*)	X	
Ferruginous hawk (*Buteo regalis*)	X	
Forster's tern (Sterna forsteri)	X	
Franklin's gull (*Leucophocus pipixcan*)	X	
Golden eagle (*Aquila chrysaetos*)	X	
Greater Sage-Grouse (*Centrocercus urophasianus*)	X	
Horned grebe (*Podiceps auritus*)	X	
Loggerhead shrike (*Lanius ludovicianus*)	X	
Long-billed curlew (*Numenius americanus*)	X	
McCown's longspur (*Rhychophanes mccownii*)	X	
Mountain plover (*Charadrius montanus*)	X	
Peregrine falcon (*Falco peregrinus*)	X	
Red-headed woodpecker (*Melanerpes erythrocephalus*)	X	
Sage thrasher (*Oreoscoptes montanus*)	X	
Sprague's pipit (*Anthus spragueii*)	X	
Veery (*Catharus fuscescens*)	X	
White-faced ibis (Plegadis chihi)	X	

Common Name (*Scientific Name*)	BLM Sensitive Species	Federally Listed Species*
Insects		
Western bumble bee (*Bombus occidentalis*)	X	
Fish		
Iowa darter (*Etheostoma exile*)	X	
Northern redbelly X finescale dace (*Chrosomus eos x Chrosomus neogaeus*)	X	
Northern pearl dace (*Margariscus nachtriebi*)	X	
Sturgeon chub (*Macrhybopsis gelida*)	X	

Source: BLM 2020a, 2020b; USFWS 2020
* FEXN denotes that the local population is an experimental, nonessential population (USFWS 2020).

Table 4
Special Status Species Habitat Acreage on BLM-administered Lands in the Project Area

Species Name	Habitat Area (Acres)
Animals	
Baird's sparrow *(Ammodramus bairdii)*	20
Black-crowned night-heron *(Nycticorax nycticorax)*	40
Black-footed ferret *(Mustela nigripes)*	12,460
Black-tailed prairie dog *(Cynomys ludovicianus)*	4,240
Brewer's sparrow *(Spizella breweri)*	4,600
Burrowing owl *(Athene cunicularia)*	51,520
Chestnut-collared longspur *(Calcarius ornatus)*	2,590
Ferruginous hawk *(Buteo regalis)*	5,030
Golden eagle *(Aquila chrysaetos)*	1,200
Great blue heron *(Ardea herodias)*	5,990
Greater Sage-Grouse *(Centrocercus urophasianus)*	69,310
Hoary bat *(Lasiurus cinereus)*	5,310
Iowa darter *(Etheostoma exile)*	20
Little brown myotis *(Myotis lucifugus)*	3,840
Loggerhead shrike *(Lanius ludovicianus)*	1,100
Long-billed curlew *(Numenius americanus)*	23,740
McCown's longspur *(Calcarius mccownii)*	2,120
Mountain plover *(Charadrius montanus)*	2,830
Northern redbelly dace *(Chrosomus eos)*	20
Sage thrasher *(Oreoscoptes montanus)*	620
Sprague's pipit *(Anthus spragueii)*	1,190
Townsend's big-eared bat *(Corynorhinus townsendii)*	4,800
Townsend's big-eared bat roost (non-cave) *(Corynorhinus townsendii)*	1,520
Western milksnake *(Lampropeltis gentilis)*	1,040
Plants	
Scribner's ragwort *(Senecio integerrimus var. scribneri)*	400
Slender-branched popcorn-flower *(Plagiobothrys leptocladus)*	40
Suckley's saltbush *(Atriplex suckleyi)*	920

Source: USFWS 2020
Note: As some species' habitat overlap, acreages sum to greater than the total decision area.

The project area provides habitat for Greater Sage-Grouse, including leks, General Habitat Management Areas, and Priority Habitat Management Areas (**Table 5**). Upland vegetation in the Flat Creek, East Dry Fork, Garey Coulee, Whiterock Coulee, and Telegraph Creek allotments provide nesting and brood-rearing habitat for Greater Sage-Grouse and other BLM sensitive species and meets Health Standard 5, as described in the 2016 Malta Field Office Rangeland Assessment Report (BLM 2017).

Table 5
Greater Sage-Grouse Habitat on BLM-administered Lands in the Project Area

Habitat Type	Habitat Area (Acres)
General Habitat Management Area	2,560
Priority Habitat Management Area	66,750
Total	**69,310**

Source: BLM Geographic Information Systems (GIS) 2020

According to the Greater Sage-Grouse adaptive management plan in the HiLine RMP (BLM 2015a), the BLM will utilize hard and soft adaptive management triggers to identify when potential management changes are needed to continue meeting Greater Sage-Grouse conservation objectives. Annual surveys of leks in Whiterock Coulee, Flat Creek, and Box Elder allotments conducted from 2015 to 2020 have recorded varying population trends across the allotments. This discrepancy in lek trends can be seen throughout south Phillips County with most leks showing steady or increasing numbers, while others have seen reduced numbers in recent years. Given that the overall Greater Sage-Grouse population for south Phillips County has been relatively stable (MFWP 2020b) this variance in individual lek trends may indicate there is some movement between leks. While the reason for this movement is unknown, no hard or soft triggers have been tripped that would indicate any need for a specific change in management for the any allotments in south Phillips County, including the APR allotments within this project area, at this time (BLM 2020e).

Environmental Consequences

Alternative A (Current Management)

<u>Direct and Indirect Effects</u>
With continuation of current management under Alternative A, habitat conditions for wildlife within the project area would continue along current trends. Therefore, there would be no immediate change in the conditions of big game migration and winter range or special status species habitat, Greater Sage-Grouse habitats, due to grazing under this alternative.

Allotments would be periodically checked to ensure compliance with the terms and conditions of grazing permits and that Standards for Rangeland Health (43 CFR 4180) and desired conditions for Greater Sage-Grouse habitat from the

HiLine RMP (BLM 2015a) are being met. If these conditions are not being met, necessary adjustments would be made to address the deficiencies. This could lead to improved winter grazing for big game, but would not directly impact big game migration unless the corrective actions include changes in grazing infrastructure.

Although assessed grazing allotments are maintaining conditions that are capable of supporting native plant and wildlife species, including special status species (BLM 2017) regionwide (i.e., the cumulative impacts analysis area), sagebrush and riparian ecosystems are being altered from agricultural uses, including livestock grazing, on private and State lands. Long-term consequences of continuing the current trend of conditions in the allotments may result in degradation of riparian habitat where livestock utilization is evoking excessive trampling and stabilizing vegetation is failing to establish or survive. Upland habitat conditions would remain similar barring any wildfires or catastrophic weather events. Species diversity and distribution would not change substantially due to continued livestock grazing.

Cumulative Impacts

As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include modifications to the landscape occurring within or in the vicinity of the project area (such as road construction, off-road vehicle use, and range improvements); potentially modified grazing lease terms for the Garey Coulee, French Coulee, and East Dry Fork allotments; the influence of nonnative plants and invasive weed species on vegetation; and continued livestock grazing authorizations on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). These actions would contribute to alterations of wildlife and special status species habitat.

With continuation of current grazing allocations under Alternative A, the ongoing effects of domestic livestock grazing on wildlife and special status species would persist. Specifically, these effects may include changes to the extent and condition of wildlife habitat, particularly riparian and wetland areas. When considered within the context of past, present, or reasonably foreseeable actions, Alternative A would contribute incrementally to cumulative adverse effects on wildlife and special status species. However, the severity of cumulative effects would be minimal within the context of the wider regional landscape (i.e., across the range of the species considered).

Alternative B (Applicant Proposed Alternative)

Direct and Indirect Effects

Under Alternative B, the BLM would issue a 10-year grazing permit for cattle and indigenous livestock (bison) on the Telegraph Creek, Flat Creek, White Rock, East Dry Fork, French Coulee, and Garey Coulee allotments.

Alterations to habitat conditions for wildlife would generally correspond to changes to riparian-wetland habitat and vegetation, as described in **Sections 3.4.5** and **3.4.7**. Issuance of a 10-year grazing permit for cattle and bison may impact vegetation height and canopy cover if grazing utilization is not adequately monitored and swift actions are not taken to address deficiencies, such as concentrated use in important wildlife habitat. However, BLM-administered lands within all allotments would still be required to meet the Standards of Rangeland Health (43 CFR 4180) and the desired conditions for Greater Sage-Grouse habitat from the HiLine RMP (BLM 2015a). As long as these requirements are met, allotments would continue to provide quality wildlife habitat.

The removal of 30.4 miles of interior fences (approximately 15 percent of the total 197 miles of existing fencing) would decrease wildlife habitat fragmentation; this reduced barrier to movement would improve big game migration and also improve habitat for special status species, such as Greater Sage-Grouse, that rely on large and contiguous areas of habitat to support home ranges and/or migration routes (Connelly et al. 2011). Fence removal would also decrease the availability of perches for avian predators in the area, which would potentially decrease mortality of Greater Sage-Grouse and other special status wildlife species that are vulnerable to avian predation.

Modifying or reconstructing 79.6 miles of fencing (43.9 miles reconstructed and 35.7 miles reconstructed as electric only) to meet specific standards according to MFWP's wildlife friendly standards (**Appendix B**, Fence Design and Maintenance) would improve the condition of big game migration habitat because standards would facilitate wildlife passage (Paige 2012).

Other range improvements, such as water developments and tanks, would be installed, used, maintained, and/or modified in a manner consistent with multiple use management, and as agreed to in a Cooperative Agreement (43 CFR 4120.3-1(a)); impacts from such activities would not change relative to Alternative A.

As described in **Section 3.4.7**, bison grazing across large landscapes that include variation in topography and vegetation communities may lead to improvements in vegetation heterogeneity within the project area (Kohl et al. 2013). Diversified vegetation and an increase in native plant species (Knapp et al. 1999) would generally increase the availability, quality, and continuity of wildlife habitat by providing habitat features for a greater diversity of wildlife and more areas suitable for foraging, nesting, and cover. Greater-Sage Grouse may benefit from an increase in native forbs. Ultimately, habitat conditions for wildlife species may improve from movement towards a mosaic of successional stages on the landscape, which is considered beneficial to many wildlife species (including wintering big game species).

Because additional terms and conditions would apply involving reduction of livestock numbers by 10 percent if habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment, alterations to wildlife habitat would occur at a slower rate. This is because the reduction of livestock numbers may result in more limited use of certain areas.

Also as described in **Section 3.4.5**, Alternative B may result in improved conditions of existing riparian-wetland areas due to the nature of bison to use riparian areas less intensively than cattle (Kohl et al. 2013). This would improve habitat conditions for aquatic and riparian wildlife species, such as amphibians and riparian birds, by increasing the availability of habitat features, such as canopy cover and nesting sites, due to increased riparian vegetation diversity and abundance. Reduced erosion and sedimentation would improve in-stream habitat by improving water quality and hydrological function, which are important habitat characteristics for some special status fish species (**Table 3**).

Regarding disease transmission, both brucellosis and bovine tuberculosis are actively monitored in wildlife herds throughout the state by MFWP. The transmission of disease from domestic livestock to wildlife herds, were it to occur, would result in adverse impacts on big game species. However, the potential for transmission of these diseases to wildlife would not be measurably greater under the proposed change of use in livestock compared to that which exists under current conditions, which already provide for authorized livestock grazing.

<u>Cumulative Impacts</u>

Effects from other ongoing and reasonably foreseeable management activities on wildlife and special status species would be the same as those described under Alternative A. When considered within the context of these regional plans and actions, the proposed action, Alternative B, would contribute incrementally to beneficial cumulative effects on wildlife and their habitat. The proposed action is similar to management that has been implemented on other allotments in the surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). Continued removal or modification of fences, along with their conservative grazing utilization thus far, should lead to improved habitat conditions for most wildlife species. Specifically, impacts would include improved habitat conditions due to increased vegetation diversity and improved riparian conditions.

Alternative C

<u>Direct and Indirect Effects</u>

Under Alternative C, the BLM would issue a 10-year grazing permit for cattle and bison on all grazing permits, as well as allowing modifications to fencing for use by bison. Impacts from modifications to fencing to allow the use for bison would be the same as those described in Alternative A, given that the fence/pasture boundaries would remain unchanged. Impacts on wildlife from grazing of bison under Alternative C would also be similar to those as described under Alternative B.

Similar to Alternative B, less-intensive use of riparian areas by bison (Kohl et al. 2013) may improve habitat conditions for aquatic and riparian wildlife species. However, where interior fencing created areas of high utilization near or within riparian corridors, these benefits would not occur and riparian habitat conditions may decrease.

The BLM-administered lands within the allotments would be required to meet the Standards of Rangeland Health (43 CFR 4180) and desired conditions for Greater Sage-Grouse habitat. Over the long term, this could lead to improved or desired conditions for all or most wildlife in the area.

Cumulative Impacts

Effects from other ongoing and reasonably foreseeable management activities on wildlife and special status species would be the same as those described under Alternative A, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). When considered within the context of these regional plans and actions, Alternative C would contribute incrementally to beneficial cumulative effects on wildlife and their habitat, but the magnitude of the contribution would be slightly lower than Alternative B due to the potential for reduced livestock numbers. Specifically, impacts would include potentially improved habitat conditions due to increased vegetation diversity and structure and improved riparian conditions. However, the magnitude of cumulative effects would be minimal within the context of the wider regional landscape (i.e., across the range of the species considered).

Alternative D

Direct and Indirect Effects

Over time, diversity and distribution of many wildlife species would be impacted by removal of livestock grazing as the availability of different habitat characteristics would shift due to lack of grazing. For example, without grazing, there would be an accumulation of aboveground biomass and plant litter; excess plant material could reduce bare ground area and increase fire intensity if a wildlife were to occur. Over time, dense litter can choke out the new growth of grasses and forbs, and more intense fires could reduce or eliminate certain key forbs and big sagebrush that some special status species rely on (i.e., Brewer's sparrow and Greater Sage-Grouse) (Brooks et al. 2015). Changes in wildfire regime can also alter and simplify plant communities, leading to increased homogeneity of landscapes (Balch et al. 2013; West 2000).

Species such as chestnut collared longspur and long-billed curlew that are associated with open grassland and moderate to heavy grazing would be expected to decline on BLM-administered lands, whereas species associated with denser grasses and shrubs, such as Sprague's pipit and Baird's sparrow, may increase in numbers and distribution (Vold et al. 2019). Greater herbaceous cover associated with lack of grazing could increase the abundance and diversity of insects, thus impacting food sources for many special status species (Rambo and Faeth 1999). Species that depend on riparian habitat would benefit from improved water quality and quantity, as well as recovery of wetland/riparian vegetation over time (Krausman et al. 2009).

Approximately 139.2 miles or more of fencing would remain following removal of interior fencing under the no-grazing scenario. It is anticipated that exterior allotment fences would remain in place but not be maintained, while interior fences would be removed. Lack of fence maintenance could impact movements of big game species by opening up new areas for big game species to enter, thereby indirectly increasing the chances of vehicle collisions, as well as entanglements with improperly-maintained fencing. Over time, the density of range improvements on BLM-administered land would likely decrease and provide for easier movement of big game and other species. However, the density of range improvements, such as fences and water features, would likely increase on the adjacent private lands. These range improvements may not be constructed to wildlife-friendly standards, so the overall impact on some wildlife species could be detrimental. For example, while the amount of fencing that would be added to adjacent private lands is unknown, the need for additional fencing to be constructed by landowners to prevent livestock trespass on BLM-administered lands could result in indirect impacts on Greater-Sage Grouse, including increased fragmentation, increased collisions with fences, and increased raptor predation from inappropriate fence location and design that provides for raptor perches (BLM 2013).

Cumulative Impacts

Effects from other ongoing and reasonably foreseeable management activities on wildlife and special status species under Alternative D would be the same as those described under Alternative A. When considered within the context of these regional plans and actions, Alternative D would contribute incrementally to beneficial cumulative effects on wildlife and their habitat, but the magnitude of contribution would be slightly lower than Alternative B due to overgrowth from lack of grazing. Specifically, impacts would include improved habitat conditions due to recovery of upland and riparian areas. However, the magnitude of cumulative effects would be minimal within the context of the wider regional landscape (i.e., across the range of the species considered).

3.4.2 Common Allotment Management

Affected Environment

Allotment Management

Of the seven allotments under consideration in this EA, one allotment, East Dry Fork (Dry Fork Unit, Allotment #5617), has been held in common by multiple permittees. This allotment is located in Phillips County approximately 35 miles southwest of Malta. Land ownership on the allotment is 99 percent BLM-administered and 1 percent state land. Historically, the allotment was combined with what is now called West Dry Fork Allotment and was grazed by both cattle and sheep until 1970. After 1970, the two allotments were fenced separately and only cattle have grazed the allotment. The East Dry Fork allotment contains several reservoirs, three of which were constructed in 1980 and 1981. Interior fences were constructed in 1981 to form three pastures within the allotment, and a three-pasture deferred-rotation grazing system was initiated in 1982. Current permitted use by land status for the East Dry Fork allotment is provided in **Table 6**.

Table 6
Permitted Use by Land Status for East Dry Fork Allotment

Permittee	Number of Livestock	Type of Livestock	Percent BLM-administered Land	BLM AUMs
American Prairie Reserve (2500276)	225	Cattle	100	1,584
Jacobs Ranch, Inc. (2500359; 2500372)	173	Cattle	100	1,050

Source: BLM 2019b

Fencing and Shared Grazing
Information pertaining to the effectiveness of fencing related to bison comes from those who are attempting to contain domestic bison and deter their natural instinct to move to better habitat. Properly constructed and maintained electrified 3-, 4-, and 5-wire high-tensile fencing is highly effective in containing captive bison herds. When evaluating a fence's ability to contain domestic bison, consideration should be given to the ability of the herd to access the proper quality and quantity of food and water (MFWP 2012). APR has effectively contained bison within two allotments using 4-wire high tensile and electrified fence with few documented breeches.

As with any species, bison may carry a number of pathogens or parasites. The following diseases may infect bison and are transmissible to other livestock: anthrax, bluetongue, bovine anaplasmosis, bovine brucellosis, bovine spongiform encephalopathy, bovine tuberculosis, bovine viral diarrhea, Johne's disease, and malignant catarrhal fever. In Montana, brucellosis is the main disease of concern that affects the management of bison. Observed interactions between bison and livestock indicate that bison and cattle can coexist on the landscape. Free-ranging bison and cattle have coexisted within the same regions of the Henry Mountains in Utah since the 1940s where cattle are managed within a traditional fencing system and the bison are able to move across the landscape. Observations of interactions between the two species have shown that they will sometimes graze within close proximity of one another (MFWP 2012). Bison are authorized and managed as livestock and must comport with all Montana Department of Livestock regulations pertaining to disease control and sanitation. Cooperation with state agencies is required pursuant to BLM grazing regulations at 43 CFR 4120.5-2. For example, on December 11, 2020, APR entered into an agreement with the Phillips Conservation District, which includes a commitment to provide disease testing for 325 bison annually for the first 5 years, scaling back to 150 bison a year for the following 5 years, as part of a disease identification and management plan (Phillips County Conservation District Board of Adjustment 2020).

Environmental Consequences

Alternative A (Current Management)

<u>Direct and Indirect Effects</u>
Alternative A would result in no effects on common allotment management. With continuation of current management, there would be no change in the number of AUMs authorized for the permittees or their type of livestock. The East Dry Fork allotment would continue to be held in common by multiple permittees. Ongoing requests for changes by operators to their current BLM Grazing Permit or Lease would be addressed by BLM on a case-by-case basis.

<u>Cumulative Impacts</u>
As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include continued livestock grazing authorizations on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). With continuation of current grazing allocations under Alternative A, there would be no measurable contribution to cumulative effects on common allotment management.

Alternative B (Applicant Proposed Alternative)

<u>Direct and Indirect Effects</u>
Under Alternative B, the East Dry Fork allotment would be split via the installation of an electric fence so that Jacobs and APR each have their own allotment, not a shared or run-in-common allotment. APR would construct and maintain new fencing to split pasture 3 into two portions. APR would have pasture 1 and a portion of pasture 3 (see **Appendix A**, Maps). Jacobs have pasture 2 and a portion of pasture 3. Pastures 2 and 3 would be modified to give the Jacobs over 200 additional AUMs. APR would build and maintain new fence between pastures 2 and 3. All three of the East Dry Fork pastures have been grazed every year for some time now, and the lessees have not all been running in common. State leases #9266 and #9267 would be transferred to the Jacobs, instead of being shared by APR and Jacobs.

The proposed action would permit cattle and bison grazing on the Telegraph Creek, Flat Creek, White Rock, East Dry Fork, French Coulee, and Garey Coulee allotments. Under Alternative B, no impacts on the management of allotments for either cattle or bison herds would occur from installation of fencing to separate pastures. The grazing of cattle and bison in close proximity would fit within the character of existing grazing of cattle that occurs in allotments surrounding APR properties and occurs without incident. There is no indication that bison pasturing in close proximity to cattle poses a health risk to cattle. Moreover, competition for shared resources, such as forage, would be minimal. A study by Ranglack and others (2015) demonstrates that, despite the common misperception of bison as a high-level competitor with cattle, lagomorphs (hares and rabbits) can account for over 34 percent of the total grass biomass removed by all herbivores on shared ranges, compared to approximately 14 percent for bison and 52 percent for cattle.

Modifying or reconstructing 79.6 miles of fencing (43.9 miles reconstructed and 35.7 miles reconstructed as electric only) would provide for the secure containment of bison within designated pastures and adequate separation from adjacent allotments. Other range improvements, such as water developments and tanks, would be installed, used, maintained, and/or modified in a manner consistent with multiple use management, and as agreed to in a Cooperative Agreement (43 CFR 4120.3-l(a)).

Compared with Alternative A, impacts on common allotment management from modifications to fencing would be minimal. Existing structural improvements on BLM-administered land that support livestock grazing, such as stockwater reservoirs and interior fences (pasture fences) that are currently maintained by the grazing permittee or lessee, would remain in place and provide access to livestock grazing within respective allotments.

Cumulative Impacts

When considered within the context of regional plans and actions described in **Section 3.3.2**, including grazing by APR on other federal and nonfederal ranch lands in the four surrounding counties within which APR currently holds title to property, the proposed action would contribute incrementally to cumulative effects on common allotment management. The proposed action is similar to management that has been implemented in the Box Elder and Telegraph Creek Allotments in South Phillips County. It is reasonable to assume that APR would continue to remove interior fences across lands they manage and convert livestock type from cattle to cattle or bison. Other past, present, or reasonably foreseeable actions include modifications to the landscape occurring within the grazing allotments, range improvement project construction in the vicinity, and continued livestock grazing authorizations, including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands. When considered within the context of these regional plans and actions, the continued removal or modification of fences, along with their conservative grazing utilization thus far, would not result in considerable cumulative effects on common allotment management.

Alternative C

Direct and Indirect Effects

Impacts on common allotment management under Alternative C would be the same as those described under Alternative A.

Cumulative Impacts

Cumulative impacts on common allotment management under Alternative C would be the same as those described under Alternative A.

Alternative D

Direct and Indirect Effects

Eliminating livestock grazing on BLM-administered land under Alternative D would require construction of fences along property lines and/or intensive riding and herding to prevent unauthorized grazing on BLM-administered land. Surveying the boundary of private, state, and other lands where it borders BLM-administered land could be required to identify property lines. The BLM would inherit some portion of the maintenance and repair costs from former grazing permittees for fences required for public safety. Private landowners would be required to construct and maintain fences along public-private boundaries. Unauthorized use compliance, investigation, and enforcement costs for the BLM would increase annually. Any structural improvements on BLM-administered land that support livestock grazing, such as stockwater reservoirs and interior fences (pasture fences) that are currently maintained by the grazing permittee or lessee, would be abandoned and/or removed and reclaimed where there is no clear benefit to other resources.

Cumulative Impacts

As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include continued livestock grazing authorizations on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). Under Alternative D, which would remove grazing on the allotments, there would be no measurable contribution to cumulative effects on common allotment management.

3.4.3 Public Health and Safety

Affected Environment

Bison Encounters with People

Bison are kept as livestock throughout the US, and domestic bison in private herds account for over 93 percent of the bison in North America. Similar to other large ungulates, including moose (*Alces alces*), elk, and range cattle, bison pose small but manageable risks of personal injury (MFWP 2012). For this reason, many graziers and public land agencies use social media, printed materials, workshops, and field days to further inform the public about the reasons for grazing and to help with safely navigating areas with livestock (Wolf et al. 2017).

Proper bison pasture management can also involve the use of electric fencing, which, while effectively preventing escape, can pose challenges to safe public access during seasonal opportunities for recreational hunting on public lands. The incorporation of publicly accessible gates to provide safe access points for retrieval of big game during hunting seasons is an appropriate method of ensuring public safety. The incorporation into project design of signage and regular access via gates is described in **Section 2.3**.

Bison pasturing itself does not present a great risk to public health and safety when managed appropriately, and bison can be observed by the public from a safe distance; however, bison may be dangerous to humans and can charge and gore people if approached too closely. Such incidents of human injury are most common in areas with high levels of visitation, such as Yellowstone National Park (YNP), where bison constitute a major visitor attraction. Because bison, like other prey species, perceive human disturbances as analogous to predation risks, the likelihood of bison reacting with physical force increases with increased human disturbance.

Reported bison encounters at YNP between 2000 and 2015 resulted in injuries to persons in cases where human proximity to bison before injury ranged from 0.1 to 20 feet and averaged 11 feet (Cherry et al. 2018). By contrast to YNP, Phillips County receives comparably much lower levels of visitation on BLM-administered lands. Neither the BLM Malta Field Office nor APR have received any reports of personal injury related to bison on any allotments permitted by BLM for indigenous livestock grazing.

Potential for Disease Transmission to Humans

In Montana, brucellosis is the main disease of concern that may infect bison (MFWP 2012). Humans are susceptible to brucellosis, and the most common way to be infected is by eating or drinking contaminated, unpasteurized milk products. If the milk is not pasteurized, these bacteria can be transmitted to people who consume dairy products made from it. Humans can also contract the disease when slaughtering infected animals or when processing contaminated organs from freshly killed, brucellosis-infected livestock and wildlife. Transmission from bison to humans can occur from hunter contact with organs of an infected animal because the disease is localized in tissues that are removed during field dressing. Farmers, ranchers, veterinarians, and packing plant workers are most vulnerable to becoming infected because they come into direct contact with infected animals and tissues from those animals.

People infected with the brucellosis organism usually develop symptoms similar to a severe influenza. The disease caused from brucellosis, called undulant fever, persists for several weeks, months, or longer and may get progressively worse if it is not treated. The initial symptoms are fatigue and headaches, followed by high fever, chills, drenching sweats, joint pains, backache, and loss of weight and appetite. Although undulant fever does not often result in fatality, long-term effects can include arthritis, internal organ swelling, depression, chronic fatigue, and recurrent fevers (US Department of Agriculture 2020). For both imported bison and bison birthed on APR properties, APR is subject to Montana Department of Livestock procedures for detecting and eradicating any brucellosis infection that could arise in its herd. All bison imported to establish APR's herd come from source herds that have been free of brucellosis for at least 3 decades, and all imported animals are confirmed to be free of brucellosis before their release on APR lands.

Bovine tuberculosis is another disease that is potentially transferrable to humans through direct contact with internal organs of slaughtered animals, although the most commonly reported means of transport is through consumption of unpasteurized dairy products. Bovine tuberculosis is a slow-developing, chronic disease, and infected animals may not show clinical signs. In people, symptoms of bovine tuberculosis (the disease caused by the *M. bovis* mycobacterium in people) are similar to common symptoms caused by the *M. tuberculosis* mycobacterium; this can include fever, night sweats, and weight loss. However, the probability of disease transmission to hunters, managers, or researchers who handle infected animals is low (Demarais et al. 2002).

On December 11, 2020, APR entered into an agreement with the Phillips Conservation District that includes a commitment to provide disease testing for 325 bison annually for the first 5 years and scaling back to 150 bison a year for the following 5 years as part of a disease identification and management plan (Phillips County Conservation District Board of Adjustment 2020). The agreement also includes tagging of all tested bison, ongoing brucellosis vaccinations, a treatment plan for escaped bison, and annual meetings providing the opportunity for wide-ranging discussions related to bison and grazing.

Traffic Accidents Caused by Cattle and Bison

Data on the potential for bison-vehicle collisions and frequency of bison encountered on roadways is limited due to the relatively low volumes of domestic and wild herds in the US compared to that of cattle. The primary regions of Montana where wild bison are found and where there have been reports of bison-vehicle collisions are the areas north and west of YNP. The highways near West Yellowstone transect highly used bison habitats and cut directly through the bison's winter migratory path, creating a high level of bison cross-traffic. Based on Montana Department of Transportation's data on crashes involving bison, the majority of collisions occurred in the evening or early morning hours. In 2010, there was one vehicle collision in the state that occurred with a domestic bison. There were four incidents between 2010 and 2014, none of which resulted in human injury (MFWP 2020a).

It should be noted that these statistics reflect conditions where populations of free-roaming and wild bison occur, which is not representative of conditions within the project area. Bison herds within the project area are domesticated, and major roadways throughout the project area are not heavily trafficked. Additionally, while some BLM-administered roads are not fenced, existing fencing on major roadways, such as county roads in Phillips County, prevents livestock entry onto motorized routes with higher traffic volumes. As a result, the potential for vehicle collisions with livestock is relatively low. Although the available data do not specify how many incidents are attributable to livestock, between 2010 and 2019, there were 148 reports of "animal involved" crashes in Phillips County, 11 of which resulted in injuries to motorists, and none of which involved fatalities (Montana Department of Transportation 2020).

Environmental Consequences

Alternative A (Current Management)

<u>Direct and Indirect Effects</u>
Under Alternative A, there would be no noticeable change to current conditions affecting public health and safety.

<u>Cumulative Impacts</u>
As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include continued livestock grazing authorizations on adjacent federal and nonfederal lands, including grazing by APR on ranch lands within the four surrounding counties within which APR currently holds title to property. With continuation of current grazing allocations under Alternative A, there would be no measurable contribution to cumulative effects on public health and safety extending to the four surrounding counties comprising the cumulative impacts analysis area (Choteau, Fergus, Petroleum, and Valley counties).

Alternative B (Applicant Proposed Alternative)

<u>Direct and Indirect Effects</u>
BLM-administered lands in the seven allotments are open to the public. As a result, members of the general public could encounter bison when engaged in recreational activities such as hunting and hiking, just as they might encounter other livestock such as cattle. However, the potential for close, direct bison encounters with people would be largely limited to qualified staff for the purpose of handling bison populations on the seven allotments. Therefore, the potential for direct bison encounters with the general public would be relatively low. Appropriate levels of fencing would also continue to be maintained for the safe containment of captive bison herds, as described in **Section 3.4.2**, Common Allotment Management.

Montana Department of Livestock procedures for detecting and eradicating any brucellosis infection would be adhered to, as required by law, and bison would be handled by experienced and trained personnel, which would limit the risk of injuries to the general public via bison encountered. Although actual percentages of animal-involved vehicle collisions attributable to livestock are not available, such incidents would presumably continue to occur under Alternative B and would involving bison in numbers comparable to that of cattle. Overall, there would be no adverse effects on public health and safety from implementation of Alternative B.

Cumulative Impacts

Cumulative impacts on public health and safety under Alternative B would be the same as those described under Alternative A. With allowances for bison grazing on allotments under Alternative B, there would be no measurable contribution to cumulative effects on public health and safety extending to the four surrounding counties comprising the cumulative impacts analysis area (Choteau, Fergus, Petroleum, and Valley counties).

Alternative C

Direct and Indirect Effects

Impacts on public health and safety under Alternative C would be the same as those described under Alternative B.

Cumulative Impacts

Cumulative impacts on public health and safety under Alternative C would be the same as those described under Alternative A. With allowance of modifications to fencing for use by bison under Alternative C, there would be no measurable contribution to cumulative effects on public health and safety extending to the four surrounding counties comprising the cumulative impacts analysis area (Choteau, Fergus, Petroleum, and Valley counties).

Alternative D

Direct and Indirect Effects

Under a no-grazing scenario, fencing deterioration due to lack of allotment fence maintenance could allow for an increased frequency of breaches of enclosures and increased movement of big game species. Such movement would occur over a long-term period. Alternative D would not contribute substantially to increased likelihood of wildlife-involved vehicle collisions; however, and such incidents would be localized and occur within the wider context of grazing and ongoing fence maintenance, which would also continue on other allotments in the area.

Cumulative Impacts

Under Alternative D, with prohibition of grazing under Alternative D, there would be no measurable contribution to cumulative effects on public health and safety extending to the four surrounding counties comprising the cumulative impacts analysis area (Choteau, Fergus, Petroleum, and Valley counties).

3.4.4 Rangeland Health

Affected Environment

Grazing management activities occurring on BLM-administered land must meet Standards and conform to Guidelines. Rangeland health standards are physical or biological conditions or functions required for healthy, sustainable rangelands. They address watershed function; nutrient cycling and energy flow; water quality; air quality; habitat for threatened, endangered, proposed, or special status species; habitat quality for native plant and animal populations and communities; and soil health. Standards apply to all resource uses on BLM-administered lands. Standards are the same as goals and are observed on a landscape scale. The achievement of a standard is determined by measuring appropriate indicators. For example, the amount of bare ground, plant cover, and litter are indicators that could be used in determining whether or not a standard is being met. Guidelines are management practices and tools designed to maintain or achieve land health standards on BLM-administered lands. Guidelines can be grazing strategies, range improvement projects, and best management practices that help to achieve standards.

The BLM regularly performs monitoring and compliance evaluations to ensure that permittees are stocking at specific rates prescribed on individual permits. In addition, during periods of reduced forage (e.g., during drought and following wildfires), AUMs are managed according to procedures described in existing BLM policy (**Appendix C**). During periods of drought or wildfire, permittees may be required to remove animals from BLM-administered land. During regular monitoring and compliance evaluations, the BLM assesses conformance with the existing land use plan, which contains the following objective for water resources (BLM 2015a): "Ensure water quality and availability for authorized beneficial uses and proper watershed, wetland, riparian, and stream channel functions."

The Standards for Rangeland Health and Guidelines for northcentral Montana (BLM 1997) were developed in cooperation with the Central Montana Resource Advisory Council. The following five standards apply to allotments on BLM-administered land considered in this EA:

Standard #1—Uplands are in Proper Functioning Condition (PFC).[7]

Standard #2—Riparian and wetland areas are in PFC.

Standard #3—Water quality meets Montana state standards.

Standard #4—Air quality meets Montana state standards.

Standard #5—Habitats are provided to maintain healthy, productive, and diverse populations of native plant and animal species, including special status species federally threatened, endangered, candidate, or Montana species of

[7] The Proper Functioning Condition (PFC) methodology is utilized by the BLM to assess the physical functioning of riparian-wetland areas. The term PFC is used to describe both the assessment process and a defined, on-the-ground condition of a riparian-wetland area.

special concern, as defined in BLM Manual 6840, Special Status Species Management.

Existing conditions with regard to rangeland health on the seven allotments under consideration in this EA are described in land health assessments conducted by the Malta Field Office in 2016 and 2019 and are summarized below. All allotments are generally meeting land health standards.

Dry Fork Unit: East Dry Fork Allotment (Pastures 1 and 3) – #5617
East Dry Fork was assessed as part of the 2016 Land Health Assessment Report (BLM 2017) and was found to be meeting all Rangeland Health Standards at that time. In 2016, a complete riparian inventory of Dry Fork Creek within Allotment 5617 was conducted with implementation of the newest PFC evaluation protocol, which found that, although the reaches within the allotment were still Functioning at Risk in the midst of a declining water table, Dry Fork Creek did exhibit a positive trend. The riparian area was expanding, as obligates established in the wetter portions of the channel and mature stabilizing communities were observed in clumps. The age classes of herbaceous vegetation, especially obligates, were not only being maintained, but were showing recovery (BLM 2019a).

Two upland sites in the East Dry Fork Allotment were rated as None to Slight (NS) Departure from Expected in all three attribute ratings using the 17 Indicator methodology (Interpreting Indicators of Rangeland Health, Technical Reference 1734-6 [BLM 2005]). One site rated as having NS Departure from Expected in the soil and site stability and hydrologic function attributes, and a Slight to Moderate Departure from Expected rating in the biotic integrity attribute. The Slight to Moderate rating in the biotic integrity attribute was due to the lack of litter on the sight and historic grazing pressure. Range Condition Scoring conducted at two of the sites resulted in ratings of greater than 75 percent, indicating that both sites were considered to be near a potential natural community (BLM 2017).

Dry Fork Unit: French Coulee Allotment – #5616
According to Rangeland Health Assessments completed for the Beauchamp Watershed, Rangeland Health Standards are being met (BLM 2019a). A 724.6 acre wetland complex along an Unnamed Tributary to Beaver Creek resides across the allotment boundary of Allotments 5616 and 5617. Approximately 10.2 acres of this large wetland cover the BLM-administered land within Allotment 5616; this includes the aquatic bed wetlands within the tailwaters of an impoundment that has been constructed on private surface, and that extends onto BLM-administered lands (BLM 2019a).

Dry Fork Unit: Garey Coulee Allotment – #5447
Garey Coulee was assessed as part of the 2016 Land Health Assessment Report (BLM 2017) and was found to be meeting all Rangeland Health Standards at that time. Numerous acres of palustrine wetland are supported across Allotment 5447 by constructed water impoundments and depressional features. The BLM-

developed livestock watering areas are all functioning well to provide livestock water and to support livestock distribution across the allotment. BLM-constructed facilities include Never Retention Reservoir; Phillips County Retention Reservoirs #91, #228, #315, and #316; Rattler Retention Reservoir; Nesbit Retention Reservoir; and Terry Retention Reservoir (BLM 2019a).

Two upland sites in the Garey Coulee Allotment were rated as having NS Departure from Expected in all three attribute ratings using the 17 Indicator methodology. In addition, Range Condition Scoring conducted at both sites resulted in ratings of 70 percent, indicating that both sites were considered to be near a potential natural community (BLM 2017).

Sun Prairie Unit: Box Elder Allotment – #5655

The Box Elder Allotment was assessed as part of the 2016 Land Health Assessment Report (BLM 2017) and was found to be meeting all Rangeland Health Standards at that time. It was noted, however, that while riparian areas met Standard 2 in the upper reaches, they did not meet that standard in the lower reaches, although they were making significant improvement in the lower reaches at the time. During a riparian assessment of Box Elder Creek within the allotment, the lower reach was determined to have experienced historically severe grazing pressures prior to the current permittee, such that several reaches have been unnaturally altered and channelized/incised. Greatly decreased grazing pressures have resulted in improvements in riparian vegetation to include recruitment of woody species—both willow (*Salix*) and cottonwood (*Salicaceae*)—and channel stability. The assessment resulted in a PFC assessment in the upper reach and a Functional-at-Risk rating with an apparent upward trend in the lower reach (BLM 2017).

Sun Prairie Unit: Telegraph Creek Allotment – #5654

The Telegraph Creek Allotment was described in the 2016 Land Health Assessment Report (BLM 2017) as meeting Standards 1, 2, 4, and 5. An interdisciplinary team conducted a Lentic Assessment on Indian Lake within the Telegraph Creek Allotment and found it to be in PFC (BLM 2017).

Four sites in the Telegraph Creek Allotment were rated as having NS Departure from Expected in all three attribute ratings using the 17 Indicator methodology (BLM 2017).

Sun Prairie North Unit: Flat Creek Allotment – #5439

The Flat Creek Allotment was described in the 2016 Land Health Assessment Report (BLM 2017) as meeting Standards 1, 2, 4, and 5. However, water quality was not meeting Standard 3. It was noted, however, that it was unlikely that BLM grazing management was altering heavy metal or phosphorus levels and that ongoing improvements in riparian conditions were anticipated to help improve water quality for dissolved oxygen and suspended solids (BLM 2017).

Two upland sites in the Flat Creek Allotment were rated as having NS Departure from Expected in all three attribute ratings using the 17 Indicator methodology (BLM 2005). Range Condition Scoring on this site resulted in a rating of 35 percent, indicating a mid-seral state (BLM 2017).

White Rock Unit: Whiterock Coulee Allotment – #5417

The Whiterock Coulee Allotment was described in the 2016 Land Health Assessment Report (BLM 2017) as meeting Standards 1, 4, and 5. Riparian areas were meeting Standard 2 or making significant improvements towards meeting the standard throughout most of the allotment. It was noted that no water quality impairment determinations were made for the streams within this allotment, and that maintaining and improving riparian health in these reaches will help minimize potential degradation (BLM 2017).

Two upland sites in the Whiterock Coulee Allotment were rated as having NS Departure from Expected in all three attribute ratings using the 17 Indicator methodology. Range Condition Scoring resulted in ratings of 60 percent and 40 percent. The higher-rated site was considered to be near a potential natural community. The lower-rated site had a higher-than-expected shrub component on the site due to the methodology and was not considered to be an issue for ecological health (BLM 2017).

Environmental Consequences

Alternative A (Current Management)

<u>Direct and Indirect Effects</u>

With continuation of current management, it is expected that grazing allotments currently meeting Standards for Rangeland Health would continue to meet those standards, and that any grazing allotments not meeting those standards would continue to make improvements. Upland ecological processes would continue to function within a natural range of variability and support specific plant communities. Upland soils would continue to remain stable and provide for capture, storage, and safe release of water appropriate to soil type, climate, and landform. Ecological processes including hydrologic cycle, nutrient cycle, and energy flow would likely be maintained across upland terrain to support healthy biotic populations.

<u>Cumulative Impacts</u>

With continuation of current management under Alternative A, the ongoing effects of domestic livestock grazing on rangeland health would persist. The quantifiable association between the existing water infrastructure and actual or hypothetical hydrologic regimes on BLM-administered land across the allotments does and could continue to impact biogeochemical interactions and the BLM's ability to steward ecosystem protection. However, allotments and riparian areas on BLM-administered lands in the four surrounding counties comprising the cumulative impacts analysis area (Choteau, Fergus, Petroleum, and Valley counties) are managed to meet or make progress toward meeting land health standards, including PFC for riparian areas. The BLM makes changes to allotment management when over-utilization of riparian areas occurs. Given these protections, continued utilization of riparian zones by livestock would not further induce the loss of stabilizing vegetation and contribute cumulatively to declines in rangeland health.

Alternative B (Applicant Proposed Alternative)

<u>Direct and Indirect Effects</u>

Implementation of the proposed action would create changes in the class of livestock permitted on seven allotments constituting approximately 69,310 acres of BLM-administered lands that provide 7,969 AUMs of permitted use. Changes would result in allowances for cattle and/or bison, as well as changes to the authorized seasons-of-use, construction, reconstruction and/or removal of range-improvement projects, adjustments to allotments (such as combining pastures), and administrative actions. It is anticipated that, with the introduction of bison, existing vegetation communities could experience improvements in vegetation community species richness and diversity (McMillan et al. 2019). Transition from cattle grazing to bison pasturing is thus not anticipated to result in measurable adverse effects on uplands, riparian areas, water quality, or habitats for native plant and animal species. There would therefore be no reduction in the ability of allotments to meet prescribed Rangeland Health Standards.

Because additional terms and conditions would apply involving reduction of livestock numbers by 10 percent if habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment, pressure from both cattle and bison on riparian resources would be reduced, as described in further detail in **Section 3.4.5**, Riparian-Wetland Habitat. Where impacts from grazing are greater than the recovery response, detrimental changes would occur in the riparian system, resulting in a reduced ability to meet Rangeland Health Standards. Conversely, where the recovery of the vegetation or site is greater than the disturbance, then recovery should occur, thereby enhancing the ability of allotments to meet Rangeland Health Standards.

<u>Cumulative Impacts</u>

As the issuance of a 10-year grazing permit for cattle and bison on the seven allotments is implemented under the proposed action, other ongoing and reasonably foreseeable management activities would continue. These activities include grazing on adjacent non-BLM-administered lands and continued livestock grazing authorizations issued by the State, as well as conversion of other APR lands and permits to bison or cattle in the four surrounding counties within which APR currently holds title to property. Additional conversion of livestock type from cattle grazing to bison and cattle pasturing on these federal and nonfederal lands would contribute cumulatively to potential impacts on rangeland health.

When considered within the context of these regional plans and actions, the proposed action would contribute to declines in rangeland health where grazing results in localized pressure from both cattle and bison on riparian resources. However, the severity of cumulative effects on rangeland health would be minimal within the context of the wider regional landscape.

Alternative C

Direct and Indirect Effects

Impacts on rangeland health under Alternative C would be the same as those described under Alternative B.

Cumulative Impacts

Cumulative impacts on rangeland health under Alternative C would be the same as those described under Alternative B.

Alternative D

Direct and Indirect Effects

Elimination of grazing on all seven allotments included in the application (as well as for the Box Elder allotment, where no change is requested to the permit) would affect rangeland health. No grazing would likely increase litter and decrease bare ground. The amount or percentage of change and how quickly areas would improve would depend on the soil type, climatic factors, and other site characteristics. Natural processes of recovery would be achieved through cycles of wetting and drying, shrinking and swelling, freezing and thawing, root growth, and the reworking of compacted layers by animals and plants. Plant canopies and root masses would enlarge and plant litter would accumulate on soil surfaces where additional soil organic matter protects against the effects of wind and water erosion. Physical soil impacts from hoof action would be eliminated. Increased accumulations of plant litter would contribute to fuel loads on the landscape and result in increased risk of wildfire and enhanced fire intensity.

Cumulative Impacts

Other past, present, or reasonably foreseeable actions, as described in **Section 3.3.2**, include modifications to the landscape occurring within the grazing allotment, range improvement projects constructed in the vicinity of the grazing allotments, and continued livestock grazing authorizations, including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). Discontinuation of use of the allotments by domestic livestock under Alternative D would result in effects on rangeland health. Specifically, beneficial effects would include the movement of allotments towards meeting riparian and water quality standards where functional health currently consists of degraded condition due to the presence of livestock. Adverse effects would include increased risks of wildfire, as accumulated fuels can increase fire intensity. Fire could be detrimental to watershed function and water quality. When considered within the context of past, present, or reasonably foreseeable actions, Alternative D would contribute to cumulative adverse effects on rangeland health. However, the severity of cumulative effects would be minimal within the context of the wider regional landscape.

3.4.5 Riparian-Wetland Habitat

Affected Environment

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Depressional wetlands, slope wetlands, and human-built/artificial wetlands are three types of wetlands found in Montana. Riparian areas are plant communities associated with perennial, intermittent, and ephemeral rivers, streams, or drainage ways. They have one or both of the following characteristics: distinctively different vegetative species than adjacent areas; and/or species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Streamside forests, woody draws, and streamside shrublands and herbaceous areas are the major types of riparian areas in Montana (Ellis and Richard 2008).

Wetlands and riparian areas provide habitat for various species of native fish, amphibians, birds, and vegetation, including some threatened or endangered species. These areas provide recreational opportunities, such as birdwatching, fishing, hiking, and floating. Riparian and wetland areas are important resources for flooding and erosion control, and they act as a natural filter to reduce the amount of pollution that enters lakes, streams, groundwater, and, ultimately, drinking water. Riparian vegetation also plays an important role in shading streams to improve or maintain water temperatures for fisheries by narrowing channels and intercepting solar radiation (DOI 2006).

The most common wetland type within the project area is the Freshwater Emergent Wetland, followed by Riverine. Wetland habitat areas cover significantly more acreage than riparian habitat areas across the project area. However, it should be noted that acreage attributed to wetlands includes human-made excavations and impoundments for purposes of livestock use and that wetlands established for these uses have different values compared to natural kettle-lake or depressional type wetlands.

Riparian and wetland areas were mapped using USFWS National Wetlands Inventory data throughout the project area, and the acres of each are shown in **Table 7**.

Table 7
Riparian and Wetland Habitat Areas in the Project Area

Type	Acreage (natural)	Acreage (excavated / impounded)	Total Acreage
Wetland Areas			
Freshwater Emergent Wetland	2,070	200	2,270
Freshwater Forested/Shrub	0	0	0
Freshwater Pond	20	170	190
Lake	220	20	240
Riverine	700	0	700
Riparian Areas			
Forested Shrub/Riparian	2.4	N/A	2.4
Herbaceous Riparian	0.2	N/A	0.2
Total	**3,012.6**	**390**	**3,402.6**

Source: National Wetlands Inventory data, as provided in BLM GIS 2020

Riparian areas are often the primary, and sometimes the only, watering places for livestock grazing on pastures and rangeland (DOI 2006). Livestock can indirectly and directly affect stream condition in riparian areas through soil compaction, bank shearing, or severing of roots of riparian vegetation, which are needed for plant survival and bank stability (Behnke and Raleigh 1978).

Depending on site, soil, and substrate characteristics, riparian channel degradation generally occurs in the following ways: where restrictive soils (claypan, organic, or bedrock) occur in the channel bed, bank erosion causes channel widening, and stream depth decreases; or where restrictive soil layers are lower, the channel can downcut, and the stream gradient and energy can increase and move excessive sediment downstream. In the latter scenario, water cannot access the floodplain as well or at all, the water table is lowered, and associated meadows dry up and become much less productive. Stream temperature may also rise and affect aquatic habitat when flood flows can no longer access the floodplain. In such cases, little water is retained in the streambanks for later use by vegetation or delayed release back into the stream (DOI 2006). Conversely, livestock grazing that promotes and is compatible with healthy riparian vegetation contributes to sustainable levels of aboveground biomass, root growth, and root strength in streambanks. Through overbank flows, riparian vegetation is naturally defoliated or buried by stream and sediment deposition. Livestock can contribute to the maintenance of vegetation by defoliating dormant or dead growth in between these overflow events, thus increasing green matter and hence root strength and growth. If the root strength of riparian vegetation and the surface roughness is sufficient, sediments will be deposited, not eroded away. Depending on herd density, ungulates and other wildlife occurring within the region that utilize riparian zones can also serve in a functional capacity to promote healthy riparian vegetation with the same beneficial effects as those describe above.

The PFC methodology, as defined in **Section 3.4.4**, Rangeland Health, is utilized by the BLM to assess the physical functioning of riparian-wetland areas. The term PFC is used to describe both the assessment process and a defined, on-the-ground condition of a riparian-wetland area. The PFC assessment provides a consistent approach for assessing how well the physical processes are functioning in wetland and riparian areas through consideration of hydrology, vegetation, and soil/landform attributes (BLM 2015a).

Proper functioning condition of riparian areas, as defined by Prichard and others (1998), exists when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality
- Filter sediment, capture bedload, and aid floodplain development
- Improve floodwater retention and ground-water recharge
- Develop root masses that stabilize streambanks against cutting action
- Develop diverse ponding and channel characteristics to provide the habitat and water depth duration, and temperature necessary for fish production, waterfowl breeding, and other uses
- Support greater biodiversity

"Functional–at risk" riparian areas are still functioning; however, an existing attribute (soil, water, vegetation) makes them susceptible to degradation. Riparian areas that are clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energy, improve floodwater retention and ground-water recharge, and stabilize streambanks are "nonfunctional" and cannot sustain desired values (DOI 2006).

In 2016, the BLM Malta Field Office assessed the Whiterock Creek, East Dry Fork, and Flat Creek grazing allotments to determine whether their riparian and wetland areas were in PFC (BLM 2017). These allotments were either maintaining PFC by meeting Rangeland Health Standard 2 or making improvements towards meeting standards that would minimize the destruction, loss, or significant degradation of wetlands.

The riparian assessment of Flat Creek Allotment resulted in a Functional–at risk (upward) rating with an apparent upward trend. The allotment had been rested from grazing for a period of 3 years in 2016, resulting in improvements in riparian vegetation, including some woody recruitment, as well as streambank stabilization.

The riparian assessment of Whiterock Creek Allotment resulted in a Functional–at Risk (upward) rating with an apparent upward trend for the lower reach of Whiterock Creek, while the upper reach of Whiterock Creek was in PFC. The lower reaches of Whiterock Creek are deeply incised and have largely become incapable of functioning to support a riparian area; however, in some areas, lateral cutting has enabled a new floodplain and riparian area to develop and include recruitment of healthy woody communities in certain locations.

A riparian assessment of Dry Fork Creek within the East Dry Fork Allotment resulted in a Functional–at Risk (upward) rating with an apparent upward trend. Some factors preventing the attainment of PFC are outside the control of management, but cattle grazing could be limiting the recovery of woody species re-establishment, especially willows.

Riparian and wetland areas within Telegraph Creek, French Coulee, and Garey Coulee Allotments were not assessed for PFC in this study (BLM 2017).

Additionally, the BLM Malta Field Office assessed the East Dry Fork and Flat Creek grazing allotments to determine whether they met water quality standards for the state of Montana (see Table 1, Standard 3, in BLM 2017). Water quality within the East Dry Fork Allotment met Standard 3.

Flat Creek from its headwaters to its mouth (confluence with Beaver Creek) has been listed as water quality impaired by Montana Department of Environmental Quality, but a total maximum daily load has not been completed. Causes of impairment are heavy metals, nitrate/nitrate, phosphorus, dissolved oxygen, and suspended solids. Land uses in the drainage include cattle grazing and some dryland crops. Dewatering, bank instability, and lack of riparian vegetation may exacerbate these impairments. Water quality in Flat Creek did not meet Rangeland Health Standard 3; however, it is unlikely that BLM grazing management is altering heavy metal or phosphorus levels.

The Montana Department of Environmental Quality did not make water quality impairment determinations for streams within the Telegraph Creek, French Coulee, and Garey Coulee Allotments (BLM 2017). The HiLine RMP (BLM 2015a) and the Malta Field Office Land Health Assessment Report (BLM 2017) provide more detailed information on riparian and wetland resources in the area.

Environmental Consequences

Alternative A (Current Management)

Direct and Indirect Effects

With continuation of current management under Alternative A, current upward trends in riparian function would continue along with ongoing effects of domestic livestock grazing on riparian areas. Because livestock tend to spend more time near the riparian zone than they do in the upland portion of most pastures, over the long term, and particularly if precipitation trends are more droughty, negative impacts on the function of riparian corridors and wetlands may occur as a result of selective grazing and livestock hoof action, and the potential for riparian zone degradation from livestock would exist where high erosion rates are likely. Overall, however, riparian function is expected to continue under normal conditions, with stream reached achieving ratings of PFC or Functional–at risk with an apparent upward trend.

Cumulative Impacts

As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include modifications to the landscape occurring within the grazing allotment, range improvement projects constructed in the vicinity of the grazing allotments, and continued livestock grazing authorizations, including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). With continuation of current management under Alternative A, allotments and riparian areas on BLM-administered lands would be managed to meet or make progress toward meeting land health standards, including PFC for riparian areas. Where it is determined that Standards of Rangeland Health are not being met and current livestock grazing is a causal factor, action is taken by the BLM as soon as practicable. Given these protections, continued utilization of riparian zones by livestock would not further induce the loss of stabilizing vegetation and contribute cumulatively to declines in riparian function.

Alternative B (Applicant Proposed Alternative)

Direct and Indirect Effects

Under Alternative B, on allotments considered in this EA, it is anticipated that existing Functional–at risk riparian areas could experience improvement with changes in class of livestock. In contrast to cattle, which demonstrate a strong selection for riparian areas, lowlands, and water resources, bison will select higher elevations for grazing. Kohl and others (2013) noted that cattle spent significantly more time at water than bison and demonstrated strong selection for water resources and low elevations, while bison selected for water sources and areas of higher elevation, while avoiding roads and steeper slopes. The year-round distribution of bison has been demonstrated to be away from higher-elevation steep-slope areas, and they tend to utilize more level areas available throughout the year. Bison also feed almost exclusively on grasses (McCullough 1980, in Gates et al. 2010).

With the establishment of bison on the landscape, the functioning condition of riparian coverage in the allotments with Functional–at risk ratings (East Dry Fork and Flat Creek) would be expected to continue along their apparent upward trend over both the short and long term. The rate of improvement would heavily depend on the various riparian zones' resilience after reduction of disturbance by cattle. Specific site potential, as well as hydrology associated with climatic events, would determine the length of time required for impaired riparian areas to revegetate with hydric plant species and develop proper functioning conditions.

While Functional–at risk conditions along riparian zones within the allotments may not be exclusively livestock caused, the minimization of hoof action within the riparian zones would benefit vegetation establishment and the development or conservation of improving trends or PFC. The less time livestock spend within riparian areas, the more likely the system is to develop and maintain different age classes of plant species and sustain the complex of vegetation cover necessary to minimize trampling damage and reduce the erosive effects of runoff events. Streambanks that are stabilized and absent of livestock hoof shearing would serve to support the amount and kind of vegetation required to trap and hold sediment deposits during runoff events and to rebuild streambanks. By providing for more bison within allotments and thereby reducing the ratio of cattle, Alternative B would reduce the amount of time that livestock spend within riparian areas.

Because additional terms and conditions would apply involving reduction of livestock numbers by 10 percent if habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment, pressure from both cattle and bison on riparian resources would be further reduced. Where impacts from grazing are greater than the recovery response, detrimental changes would occur in the riparian system. Conversely, where the recovery of the vegetation or site is greater than the disturbance, recovery should occur. Excess herbivory or trampling damage can lead to greater erosion or deposition, changes in channel geomorphology, and less soil moisture (DOI 2006). A change in management, such as a deferred-rotation system following a late winter-early spring grazing strategy, would allow for riparian system recovery. Under Alternative B, in areas where livestock concentrations are lowered and the resultant riparian corridor utilization is lessened, impacts would be of lesser severity and riparian areas would be allowed additional time to recover from grazing-related impacts. Conversely, where interior fencing created areas of high utilization near or within riparian corridors, impacts would be more pronounced.

<u>Cumulative Impacts</u>

As the issuance of a 10-year grazing permit for cattle and bison on the seven allotments is implemented under the proposed action, other ongoing and reasonably foreseeable management activities would continue. These activities include grazing on adjacent non-BLM-administered lands and continued livestock grazing authorizations issued by the State. Additional conversion from cattle grazing to bison pasturing on these federal and nonfederal lands would contribute cumulatively to potential impacts on riparian and wetland habitat. When considered within the context of these regional plans and actions, the proposed action, upon establishing bison on the landscape, would contribute to apparent upward trends in the functioning condition of riparian coverage in the allotments. However, the severity of cumulative effects on riparian-wetland habitat would be minimal within the context of the wider regional landscape. Additionally, short- and long-term cumulative improvements in the functioning condition of riparian coverage in allotments would occur as a result of reduced frequency of livestock within riparian areas.

Alternative C

Direct and Indirect Effects

Impacts on riparian-wetland habitat under Alternative C would be similar to those described under Alternative B. Additional fence construction, fence removal, and pasture modifications would result in effects on riparian or wetland areas in areas where livestock concentrations are lowered and the resultant riparian corridor utilization is lessened, in which case impacts would be of lesser severity and riparian areas would be allowed additional time to recover from grazing-related impacts. Conversely, where interior fencing created areas of high utilization near or within riparian corridors, impacts would be more pronounced.

Cumulative Impacts

Other past, present, or reasonably foreseeable actions include modifications to the landscape occurring within the grazing allotment, range improvement projects constructed in the vicinity of the grazing allotments, and continued livestock grazing authorizations. Grazing authorizations would include additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). When considered within the context of these regional plans and actions, Alternative C would contribute to declines in riparian function where grazing results in localized pressure from both cattle and bison on riparian-wetland resources. However, the severity of cumulative effects on riparian-wetland habitat would be minimal within the context of the wider regional landscape.

Alternative D

Direct and Indirect Effects

Elimination of grazing under Alternative D would result in the greatest potential of all alternatives to meet or make progress towards meeting riparian standards where functional health currently consists of degraded condition due to the presence of livestock. Removing livestock would enable riparian health to improve more rapidly than other alternatives, as recovery of streambanks and functional riparian plant communities would be enabled. Other than possibly in areas specified by the BLM upon request by livestock producers desiring to trail their livestock across BLM-administered land, livestock hoof action would be discontinued and would no longer cause direct and indirect effects on riparian functional health through soil compaction, bank shearing, or severing of riparian vegetation roots across riparian zones on BLM-administered land. The only persistent grazing disturbance of the riparian and wetland areas would occur from wildlife. Elimination of livestock grazing disturbances could enable natural processes to either restore or initiate progress towards restoring riparian ecosystems.

If trailing of livestock across BLM-administered land continued, it is expected that no notable impacts on riparian areas would arise. Continued trailing does not allow livestock time to congregate at streams or wetlands. They may browse while passing through, but not at a level that would impact the health or vigor of the riparian vegetation. Stream-crossing locations would be identified through a presentation to the BLM of livestock passage intentions prior to the action in order to identify streambank locations that are most capable of withstanding temporary streambank alterations from hoof impact associated with trailing. Such alterations would recover over the short term as sediment is captured within the existing vegetation during seasonal high-flow events.

Removal of livestock grazing from BLM-administered land could result in increased risks of wildfire, as accumulated fuels can increase fire intensity. Wildfire effects can promote riparian health and restoration, as well as adversely impact riparian areas. Accumulated fuels can increase fire intensity and watershed effects leading to debris flows and flooding. Flood damage could likely be more severe where riparian vegetation has been consumed in hot fires fueled by accumulated wood (DOI 2006). Severe fire can be detrimental to watershed function and water quality by killing vegetation, burning the organic matter in litter and soil, and forming impervious soil layers that accelerate runoff from the watershed. Sediment yields increase markedly, particularly where riparian vegetation is burned.

It should be noted, however, that there are few zones along riparian areas within the allotments that support dense wood production. Moreover, land management agency actions to reduce hazard fuel loads in fire-prone areas would serve to reduce wildfire intensity.

Cumulative Impacts

Other past, present, or reasonably foreseeable actions, as described in **Section 3.3.2**, include modifications to the landscape occurring within the grazing allotments, range improvement projects constructed in the vicinity of the grazing allotments, and continued livestock grazing authorizations, including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). Discontinuation of use of the allotments by domestic livestock under Alternative D could result in both beneficial and adverse effects on riparian and wetland habitats. Specifically, beneficial effects would include the movement of allotments towards meeting riparian and water quality standards where functional health currently consists of degraded condition due to the presence of livestock. Adverse effects would include increased risks of wildfire, as accumulated fuels can increase fire intensity. However, when considered within the context of past, present, or reasonably foreseeable actions, Alternative D would not measurably contribute to cumulative adverse effects on riparian health. The severity of cumulative effects would be minimal within the context of the wider regional landscape.

3.4.6 Socioeconomics

Affected Environment

The socioeconomic area of analysis for this EA is defined as Phillips County because most direct and indirect economic effects from the proposed action would accrue at the county level. The following narrative is focused on this geographic level of analysis and describes local economic conditions relevant to the proposed action within the context of Phillips County. It should be noted that a discussion of the recreation economy and special recreation permits is not within the scope of this EA, which is focused primarily on grazing.

Economic data presented in this discussion include annual averages for the most recent reporting periods. As such, they do not reflect the recent widespread economic effects of the recession brought about by the 2020 global COVID-19 pandemic, subsequent economic stimulus packages, and related widespread effects on population and local economies in 2020. These events may have affected the regional economy of the planning area in ways seen in other areas of the US economy: through severe short-term reductions in employment and industrial output, the effects of which are still ongoing and not evenly distributed across industries. While it remains to be seen to what level economic effects will be fully incurred from the pandemic, service-oriented activity, such as retail and tourism, as well as energy development and ancillary support sectors, have been most affected.

Population

County-level population demographics provide one measure of economic conditions within the socioeconomic area of analysis. The population within Phillips County has been declining since 2000 and is expected to grow at a slower rate compared to that of the state. As shown in **Table 8**, the population in Phillips County fell by 8 percent between 2000 and 2010, while the population of Montana increased by approximately 10 percent during the same period. Between 2010 and 2018, the population decrease occurred at a slower rate (3 percent). During the same period, population growth of approximately 5 percent occurred at the state level. The population is expected to increase in both the county and the state through 2035, with projected growth of approximately 10 percent at the county level and 13 percent at the state level between 2020 and 2035.

Table 8
Historic and Projected Population for Phillips County and Montana

	Phillips County	State of Montana
Historic Population		
Population 2000	4,601	902,195
Population 2010	4,253	989,415
2000–2010 Percent Change	-7.6%	9.7%
Population 2018	4,124	1,041,732
2010–2018 Percent Change	-3.0%	5.3%
Projected Population		
2020 Population	4,146	1,082,994
2025 Population	4,242	1,138,897
2020–2025 Percent Change	2.3%	5.2%
2035 Population	4,554	1,223,707
2020-2035 Population Percent Change	9.8%	13.0%

Sources: US Census Bureau 2000, 2010, 2018a; Census and Economic Information Center, Montana Department of Commerce 2020

Local Area Economy

Agricultural Employment

As shown in **Table 9**, employment and earnings in the agricultural sector are higher in Phillips County than the State of Montana overall. Farm employment accounts for approximately 21 percent of employment in the county, compared to approximately 4 percent at the state level. Similarly, county-level earnings in the farm sector are just over 4 percent higher than that of the state. Overall, this demonstrates the comparative importance of agriculture within the economy of Phillips County.

Table 9
State- and County-level Agricultural Employment and Earnings

	Phillips County	State of Montana
Agricultural Employment (percent of total employment)		
Farm Employment	21.3%	4.3%
Nonfarm Employment	78.7%	95.7%
Earnings (percent of total earnings)		
Farm Earnings	5.7%	1.6%
Nonfarm Earnings	94.3%	98.4%

Sources: US Bureau of Economic Analysis 2018a, b

County-level Agricultural Production

Pastureland in Phillips County in 2017 accounted for over 1.4 million acres, nearly 4 percent of the state total, and provided land for 222 cattle operations that together represented just over 2 percent of the state total (National Agricultural Statistics Service 2017). **Table 10** provides additional details on total inventory and sales of cattle within the county, which were each approximately 3 percent of the state total. The market value of cattle products sold in the county was nearly $23 million more than crop production, signaling the importance of livestock over other types of farming.

Table 10
Phillips County Agricultural Production

	Phillips County	Percent of State
Pastureland[1], total acres	1,401,113	3.6%
Pastureland[1], total operations	333	1.8%
Number of operations[2] (cattle)	222	2.1%
Inventory (cattle)	51,592	3.4%
Market Value of Agricultural Products Sold (cattle)	$47,987,000	2.8%
Market Value of Agricultural Products Sold (crops)	$25,376,000	1.6%

Source: National Agricultural Statistics Service 2017
[1] Excluding cropland and woodland
[2] Includes only operations with inventory

Livestock Grazing in Montana

Livestock grazing is a historical land use throughout Montana. BLM-administered surface estate in Montana (approximately 8 million acres) accounts for approximately 12 percent of the state's grazing lands (Montana Department of Natural Resources and Conservation 2020a). The 1934 TGA enabled the creation of federal grazing districts and local advisory boards. In response to the passage of the TGA, the State of Montana passed legislation to enable the creation of Cooperative State Grazing Districts, of which there are currently 27. The BLM has memorandums of understanding with the Cooperative State Grazing Districts regarding cooperation, coordination, and consultation on the administration of public land allotments (Montana Department of Natural Resources and Conservation 2020b). Use of BLM-administered lands for livestock grazing is currently allowed per the TGA, as amended. Grazing permits are issued under Section 3 of the TGA for areas within grazing districts established at the time of the act. Leases are issued under Section 15 of the TGA for areas outside established grazing districts. The specific terms and conditions of permits and leases are based on available forage and other considerations.

<u>Cattle and Bison Production Farm Budgets</u>

Farm budgets for cattle and bison production operations can differ in terms of specific expenditures on forage and infrastructure maintenance, such as fencing. It should also be noted that, while production is not the stated goal of bison pasturing on APR lands, such operations do take place within the context of the regional market. However, the path to market for bison on APR lands differs from that of cattle (e.g., bison would bypass sale yards and contribute to recreational hunting or be transferred as a commodity to other entities). For the purposes of this analysis, information used in modelling socioeconomic impacts was obtained from bison enterprise budgets (Foulke et al. 2001) (see **Appendix D**¸ Economic Modelling Technical Approach).

Traditional Ranching and Existing Livelihoods

Ranching was one of the first modern industries to occur in Montana and remains a traditional way of life for many people, providing a livelihood for much of the population in Phillips County and the surrounding region. Before statehood, ranchers settled in the valleys of what is today western Montana to supply beef to early mining towns. These ranchers relied on the practice of "open range" whereby cattle were grazed on large plots of unsettled lands. With the introduction of the Homestead Act of 1862 and its expanded 1909 iteration, which promised large parcels of land (160 and 320 acres, respectively) to applicants who could improve the land through agriculture, open range practices transitioned to intensive management of herds and fenced enclosures on private land. The 1934 adoption of the TGA further enforced orderly use of BLM-administered lands by establishing the US Grazing Service, which was later merged with the General Land Office to form the BLM, for the purposes of regulating over-grazing and resolving disputes related to BLM-administered land use. The State of Montana originally had over 100 grazing associations. In order to unify the newly dependent ranching communities in Montana, the state passed legislation in 1935 that created the Montana Grass Conservation Commission, followed by the Montana Grass Conservation Act in 1939. Many of the historic ranching communities in Phillips County and the surrounding region are still operated today by the descendants of original families who settled in the area and pursued ranching in the mid-1800s (Montana Department of Natural Resources and Conservation 2020a).

Livestock Grazing on BLM-Administered Lands

Current Allotment AUMs

Table 11 presents information for grazing allotments within Phillips County. The total BLM-administered acres contained within allotments and total current permitted AUMs are also displayed.

Table 11
BLM Livestock Grazing Allotments and AUMs in Phillips County

Field Office	Total Allotments	Total BLM-administered Acres	Permitted AUMs
Glasgow	1	162 *(MT15348, #15348—162 acres)*	34
Havre	3	18,192 *(North Woody Island, #6024—9,840 acres)* *(Cabin Creek, #5609—7,241 acres)* *(North Cabin Creek, #5607—1,111 acres)*	3,478
Upper Missouri River Breaks National Monument	1	44,347 *(Antelope Creek, #5610—44,347 acres)*	4,121
Malta	355	991,763 *(multiple allotments)*	169,560

Sources: BLM GIS 2020; BLM 2020c

Box Elder and Telegraph Allotments

The Box Elder (5655) and Telegraph (5654) allotments are currently permitted for indigenous livestock grazing. These allotments had historically been grazed by cattle, having been originally permitted for cattle grazing, but were subsequently converted to indigenous livestock (Box Elder in 2008 and Telegraph in 2015). They are currently being used for indigenous livestock (bison) by the permittee.

County Tax Revenue from Grazing Fees

Forage use is described in terms of AUMs, which represent the level of forage needed to sustain one cow/calf pair or five ewes for a period of 1 month. Leasing pasture allows a livestock owner to use land for livestock grazing purposes for a fee. The fee is typically based on the number of acres in the arrangement ($/acre) or the number of animals allowed to graze the land ($/AUM). Grazing leases on state lands in Montana are administered by the Montana Department of Natural Resources and Conservation. Grazing lease rates on state lands in Montana averaged $13.41 per AUM in 2021 (Montana Department of Natural Resources and Conservation 2021). In 2019, the federal grazing fee was $1.35 per AUM. Congress determines the grazing fee. The formula used for calculating the grazing fee was established by Congress in the 1978 Public Rangelands Improvement Act and has remained in use under a 1986 presidential executive order. Comparing the BLM fee with state and private fees is complicated, due to factors including the purposes for which fees are charged and whether other nonfee costs are considered. TGA Section 3 receipts are distributed as follows: 50 percent to the BLM, 37.5 percent to the US Treasury, and 12.5 percent to the State/Counties. TGA Section 15 receipts are distributed as follows: 50 percent to the BLM and 50 percent to the State/Counties. Bankhead-Jones Act receipts are distributed as follows: 50 percent to the BLM, 25 percent to the Federal Treasury, and 25 percent to the State/Counties.

Potential Environmental Justice Communities

Executive Order 12898 states "each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…" The purpose of Executive Order 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, or Indian tribes that may experience common conditions of environmental exposure or effects associated with a plan or project.

Table 12 identifies the percentage of the population in poverty and the percentage of minorities in the state and county population. Based on an examination of minority and poverty statistics, Phillips County does not contain minority populations or populations below poverty with a meaningfully greater percentage[8] living below the poverty level, compared with the state level. Thus, the proposed action would not occur in an area considered to contain environmental justice populations.

Table 12
Environmental Justice Consideration for Phillips County

Geographic Area	Racial or Ethnic Minority Population as Percentage of Total Population	Population Below Poverty as Percentage of Total Population
State of Montana	13.7%	12.9%
Phillips County	15.7%	15.2%

Sources: US Census Bureau 2018a, 2018b

Environmental Consequences

Alternative A (Current Management)

Direct and Indirect Effects

The no action alternative would result in continuation of current management, including the renewal of existing permits with the same mandatory terms and conditions as the previous permits. This alternative would not have significant effects on the allotment proposed for a change in use. Under this alternative, there would be no change in the number of AUMs authorized for the permittees or their type of livestock. This would result in no noticeable change to socioeconomic conditions in Phillips County.

The estimated baseline economic contributions from current grazing on the allotments include direct, indirect, and induced labor employment, resulting in approximately 24 jobs within the Phillips County workforce, approximately $291,500 in direct labor income, and approximately $1.8 million in direct economic output at the county level. Approximately 17 of these jobs are in agricultural occupations in the following sectors: Wholesale; Crop farming; Support activities for agriculture and forestry; and Veterinary services (IMPLAN 2019). This represents a relatively minimal proportion of total employment in Phillips County.

Grazing receipts are distributed in accordance with federal law and BLM regulations for TGA Section 15 leases that allocate 50 percent of the receipts to the State and 50 percent to the BLM's range improvement fund, as well as TGA Section 3 permits that allocate 12.5 percent of the receipts to the State.[9] Based

[8] For this analysis, low-income and minority populations are defined as 50 percent or more of the population in the affected area being non-white and/or below the poverty level, or populations with at least 5 percent more people meeting either criteria relative to the state average level in poverty. "Meaningfully greater," for the purpose of analysis in this EA, is defined as more than 5 percent higher than the comparison population at the state level.

[9] TGA Section 3 receipts are distributed as follows: 50 percent to the BLM, 37.5 percent to the US Treasury, and 12.5 percent to the State/Counties. TGA Section 15 receipts are distributed as follows: 50 percent to the BLM and 50 percent to the State/Counties. Bankhead-Jones Act receipts are distributed as follows: 50 percent to the BLM, 25 percent to the Federal Treasury, and 25 percent to the State/Counties.

on the 2019 federal grazing fee of $1.35 per AUM, an estimated $1,345 to $5,479 would continue to be distributed annually to the State of Montana.

Continuation of current grazing under Alternative A would not result in impacts on traditional ranching and existing livelihoods within the project area because, as described above, there would be relatively limited economic changes that would occur compared with the existing baseline economic conditions. Moreover, continuation of current management would not result in any adverse effects on disadvantaged communities that meet the criteria for consideration under environmental justice, including tribal entities.

Cumulative Impacts

There are no past, present, or reasonably foreseeable future plans and/or actions in the cumulative impact analysis area that, when combined with the above-described effects of continued management, would result in adverse cumulative impacts on socioeconomics. As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include continued grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property. Continuation of current management would not result in cumulative contributions to socioeconomic effects resulting from other economic activities in the project area.

Alternative B (Applicant Proposed Alternative)

Direct and Indirect Effects

Alternative B would entail a potential conversion of use from cattle to indigenous livestock on a total of 5,450 AUMs on five allotments currently permitted for cattle. In addition, the 2,519 AUMs that occur on the two allotments that are currently permitted for indigenous livestock would be retained. Assuming full conversion of all 5,450 AUMs to indigenous livestock use, the estimated economic contributions from following the change in use, as well as the proposed construction, modification, or removal of fencing, include the direct, indirect, and induced employment, labor income, value added and total output.[10] These are presented in **Table 13**. Implementation of the proposed change in use would result in a gain of the equivalent of four full-time jobs at the county level (up from 24 jobs under Alternative A to 28 jobs under Alternative B), while labor income, value added, and total output would all see increases at the county level. The modest job gains would occur in the industry categories of veterinary services, crop farming, and non-cattle animal production.

[10] The bison farm budget provided in Foulke and others (2001), which reflects the best available science and published information on the topic, was used to estimate modeled inputs for the current analysis. It should be noted that this source is based on a production-oriented enterprise and is likely to overestimate the potential effects from non-production-oriented, wildlife management focused bison grazing on APR lands. Moreover, this would not capture the full breadth of economic contributions associated with agricultural tourism-oriented operations, which constitute an important component of APR's business model. A detailed breakout of model inputs based on cattle and bison operations is contained in the project record.

Table 13
Economic Contributions of Alternative B (Applicant Proposed Action)

	Employment (Number of Jobs)	Labor Income (in 2019$)	Value Added (in 2019$)	Output (in 2019$)
Direct	21	365,299	574,113	2,070,762
Indirect	5	133,806	181,664	562,188
Induced	2	46,419	95,311	201,298
Total	28	545,524	851,088	2,834,248
Change from Alternative A				
Total	+12.0%	+19.9%	+22.1%	+12.6%

Source: IMPLAN 2019

The distribution of grazing receipts for leases in accordance with federal law and BLM regulations would not be affected by the proposed action. Existing BLM-administered permits under TGA Sections 3 and 15 would continue under this alternative, with estimated state receipts remaining as described under Alternative A. Although the permits would undergo a change in use, there would be no resulting loss in grazing receipts, as the authorizations would continue to be subject to the required federal grazing fees, which are levied on a per-AUM basis.

Additional terms and conditions involving possible reduction of livestock numbers by 10 percent if habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment would not, in and of themselves, exert a measurable effect on local economies or communities, compared with effects described above. However, in the event that these terms and conditions would come into effect, the reduction of livestock numbers by 10 percent would result in a corresponding reduction in local economic contributions.

Change in use from cattle to indigenous livestock under Alternative B would not impact traditional ranching and existing livelihoods within the project area because, as described above, there would be relatively limited economic changes that would occur, compared with the existing baseline economic conditions. Moreover, continuation of current management would not result in any adverse effects on disadvantaged communities that meet the criteria for consideration under environmental justice, including tribal entities.

Cumulative Impacts

There are no past, present, or reasonably foreseeable future plans and/or actions in the cumulative impact analysis area that, when combined with the above-described effects of a change in use from cattle to indigenous livestock, would result in adverse cumulative impacts on socioeconomics. As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property. Change in use from cattle to indigenous livestock under Alternative B would not result in cumulative contributions to socioeconomic effects resulting from other economic activities in the project area.

Alternative C

Direct and Indirect Effects

Impacts on socioeconomics under Alternative C would be the same as those described under Alternative B. The number of AUMs converted to indigenous livestock use would be the same as under Alternative B, resulting in no changes in economic contributions compared with Alternative B.

Cumulative Impacts

Cumulative impacts on socioeconomics would be the same as those described under Alternative B.

Alternative D

Direct and Indirect Effects

The no grazing alternative would result in a loss of economic output from grazing operations associated with the seven allotments in the project area and a corresponding loss in agricultural workforce. As stated above, this economic output includes direct, indirect, and induced labor employment resulting in approximately 24 jobs within the Phillips County workforce, approximately $291,500 in direct labor income, and approximately $1.8 million in direct economic output at the county level. BLM grazing permits and leases provide forage for rancher's livestock and economic stability for ranchers. Eliminating grazing on BLM-administered land could result in increased grazing pressure on associated private, tribal, and state land or the conversion of native rangeland to cropland. Prohibiting grazing on BLM-administered lands would also result in a reduction in the current livestock herds that are dependent on BLM-administered land grazing. As a result, there would be a ripple effect on the economy, where one would see a comparable drop in the use of local goods and services. Because BLM-administered land livestock grazing has historically provided forage for approximately 6 months, while the permittees' base of operations provides the other 6 months of grazing, permittees would be faced with either reducing the size of their herds by up to 50 percent or moving their livestock to alternative forage.

The distribution of grazing receipts for leases in accordance with federal law and BLM regulations would also be affected under this alternative. The discontinuation of existing BLM-administered permits under TGA Sections 3 and 15 would result in an estimated loss of $1,345 to $5,479 per year in grazing receipts to the State of Montana and $5,479 per year to BLM based on the 2019 federal grazing fee of $1.35 per AUM. Given the relatively small amount of revenue loss attributable to the allotments in question, however, impacts on federal tax revenues would be negligible in the context of all federal revenue derived from gazing receipts.

<u>Cumulative Impacts</u>

There are no past, present, or reasonably foreseeable future plans and/or actions in the cumulative impact analysis area that, when combined with the above-described effects of the no grazing alternative, would result in adverse cumulative impacts on socioeconomics. As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include continued grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property. The elimination of grazing on the allotments would not result in cumulative contributions to socioeconomic effects resulting from other economic activities in the project area.

3.4.7 Vegetation

Affected Environment

There are a wide variety of plant community and habitat types occurring within the project area. Land cover types were mapped using the Montana State Land Cover/Land Use data (State of Montana 2020); the acres of each type in the project area are shown in **Table 14**.

Table 14
Land Cover Types in the Project Area

Land Cover Type	Acres
Upland and Sagebrush Plant Communities	
Forest and Woodland Systems	70
Grassland Systems	31,180
Human Land Use	5,040
Recently Disturbed or Modified	1,120
Shrubland, Steppe, and Savanna Systems	67,017
Sparse and Barren Systems	20
Woody Draw Communities	
Open Water / Wetland and Riparian Systems	3,403
Total	**107,850**

Source: State of Montana 2020

The most common land cover type is the shrubland, steppe, and savanna systems, covering 62 percent of the project area, followed by grassland systems (29 percent of the project area). These land cover types are characterized predominately by a sagebrush-grassland vegetation community, which occur on nearly level to rolling upland slopes and on open ridges in timbered areas. Vegetation typically has a canopy of Wyoming big sagebrush (*Artemisia tridentata subsp. wyomingensis*) with an herbaceous understory dominated by rhizomatous grasses, junegrass (*Koeleria macrantha*), and Sandberg bluegrass (*Poa secunda*). Bunchgrasses, such as bluebunch wheatgrass (*Agropyron spicatum*) and green needlegrass (*Nassella viridula*), are present in smaller amounts. Green needlegrass appears more in areas receiving additional moisture, such as along swales or coulee bottoms. Bluebunch wheatgrass prefers well-drained loamy soils or shallow to moderately deep clayey soils over paralithic shale and is most common on south-facing slopes. Rhizomatous grasses, mostly western wheatgrass (*Pascopyron smithii*) and some thickspike wheatgrass (*Agropyron dasystachyum*), are common. In some areas the shrub canopy also includes small percentages of rubber rabbitbrush (*Ericameria nauseosa*), an important big game browse species (BLM 2010).

Grassland plant communities, where grass species are the dominant plant, occur in upland areas and along the creeks and rivers. Forested areas include ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) habitat types. Douglas-fir is more common on north-facing (wetter) slopes, whereas ponderosa pine tolerates drier sites, such as south- and west-facing slopes. Riparian and wetland areas are discussed in **Section 3.4.5**, Riparian-Wetland Habitat.

The existing vegetation and ground cover within all assessed grazing allotments are maintaining soil conditions that are capable of sustaining natural biotic communities (see Standards 1 and 5 in Table 1 of BLM 2017).

Environmental Consequences

Alternative A (Current Management)

Direct and Indirect Effects

Long-term effects of domestic livestock grazing involve changes in the structure, composition, and productivity of vegetation at community, ecosystem, and landscape scales. With continuation of current management under Alternative A, the ongoing effects of domestic livestock grazing on vegetation communities would persist. Direct impacts from livestock grazing may include the removal and/or trampling of vegetation. Indirect impacts result from changes in plant community composition, structure, and productivity of vegetation communities. Livestock would continue to graze as authorized under the terms and conditions currently in place until the existing permits expire. Existing vegetation and ground cover, dominated by shrubland, steppe, and savanna and grassland systems would likely continue within the grazing allotments. Evidence indicates that vegetation conditions on uplands are meeting all Rangeland Health Standards (**Section 3.4.4**, Rangeland Health). Upland ecological processes would continue to function within a natural range of variability and support specific plant communities. Although all grazing allotments are improving from a Functional-at-Risk status or are currently in PFC for Rangeland Health Standard 2, continued utilization of riparian zones by domestic livestock may have the potential to induce the loss of stabilizing vegetation because riparian habitats are often grazed disproportionately as compared to upland areas. The current fencing configuration, which exists on allotments under consideration in this EA, would also remain, and impacts on existing vegetation would be negligible from ongoing surface-disturbing activities such as construction, maintenance, or abandonment of fencing.

<u>Cumulative Impacts</u>

As described in **Section 3.3.2**, other past, present, or reasonably foreseeable actions include modifications to the landscape occurring within the wider region and on adjacent grazing allotments (such as off-road vehicle use, project construction, and other developments), competition between native plants species and nonnative or invasive weeds, and continued livestock grazing authorizations on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property (Choteau, Fergus, Petroleum, and Valley counties). With continuation of current grazing allocations under Alternative A, the ongoing effects of domestic livestock grazing on vegetation communities would persist. Specifically, these effects may include removal/trampling of vegetation (especially in riparian zones), as well as potential changes in plant community composition, structure, and productivity. Ongoing maintenance of fences and water pipelines would not cumulatively impact vegetation communities across the landscape due to implementation of design features, best management practices, and/or mitigation measures. The contribution of grazing in adjacent non-BLM-administered lands would not affect the grazing on these seven allotments; however, at the regional scale, vegetative cover and species composition may change over time as a result of grazing. However, the severity of cumulative effects would be minimal within the context of the wider regional landscape.

Alternative B (Applicant Proposed Alternative)

<u>Direct and Indirect Effects</u>

The proposed action would involve issuance of a 10-year grazing permit for cattle and bison on the Telegraph Creek, Flat Creek, White Rock, East Dry Fork, French Coulee, and Garey Coulee Allotments. Under Alternative B it is anticipated that, with the introduction of bison, existing vegetation communities could experience improvements in vegetation community species richness and diversity (McMillan et al. 2019). This would occur because unlike cattle, bison tend to graze in patches, revisiting areas throughout the season and selectively graze on dominant grasses, avoiding forbs and woody species. The result is a patchy distribution of vegetation that encourages plant species diversity by allowing forbs to flourish (Knapp et al. 1999).

Compared to cattle, bison do not demonstrate a strong selection for riparian areas, lowlands, and water resources. Impacts from minimizing hoof action within riparian zones may be beneficial to riparian vegetation by allowing the system to develop and maintain different age classes of plant species and sustain the complex of vegetation cover necessary to minimize trampling damage.

Compared with Alternative A, impacts on vegetation from modifications to fencing (including construction of an additional 5.2 miles of fencing) would be minimal. The loss of vegetation from surface-disturbing activities associated with fence construction would not be measurable on the overall vegetation species composition and diversity throughout the allotments. However, removing 30.4 miles of existing fencing may increase the likelihood of proliferation of invasive or noxious plant species that could be transferred across grazing allotments via livestock.

Because additional terms and conditions would apply under Alternative B involving reduction of livestock numbers by 10 percent if habitat conditions for Greater Sage-Grouse fail to be achieved on more than half of three or more than three key monitoring sites within an allotment, pressure from both cattle and bison on vegetation resources would occur at a slower rate than Alternative A. Where impacts from grazing are greater than the recovery response, degradation on vegetation communities would occur. Conversely, where the recovery of the vegetation is greater than disturbance, then recovery would occur.

Cumulative Impacts

As the issuance of a 10-year grazing permit for cattle and bison on the seven allotments is implemented under the proposed action, other ongoing and reasonably foreseeable management activities would continue. These activities include grazing on adjacent non-BLM-administered and state lands. Additional conversion from cattle grazing to bison pasturing on these lands would contribute cumulatively to potential impacts on vegetation communities. When considered within the context of these regional plans and actions, the proposed action would contribute incrementally to beneficial cumulative effects on vegetation communities across the landscape. Specifically, impacts would include short- and long-term improvements in the species richness and diversity of vegetation communities in bison-grazed allotments. Bison feed almost exclusively on grasses, which, because they grow rapidly, tend to out-compete other plants. Bison's selective grazing behavior can produce higher plant biodiversity because it helps plants that are normally dominated by grasses, to coexist, therefore, creating a more diverse mosaic of vegetation communities (Moran 2019). Additionally, ongoing maintenance activities, such as fence construction, repair, or replacement, would contribute incrementally to cumulative adverse effects on vegetation communities across the landscape. Cumulative effects from continued livestock grazing across the landscape may also include reductions in the amount and diversity of native plant species. Disappearance of native plant species across the region over time could occur as a consequence of continued grazing pressure combined with ongoing competition from exotic plants species. Over time, incremental reductions in the distribution of native plants could occur in areas once dominated by native plants.

Alternative C

Direct and Indirect Effects

Impacts on vegetation under Alternative C would be similar to those described under Alternative B, with patterns of use similar to no action (Alternative A) due to the fact that 197.4 miles of fences would remain.

Cumulative Impacts

Other past, present, or reasonably foreseeable actions include modifications to landscape occurring within the grazing allotment, range-improvement projects, continued livestock grazing authorizations (including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property [Choteau, Fergus, Petroleum, and Valley counties]), and the influence of nonnative and invasive plant species on native vegetation communities. When considered within the context of these regional plans and actions, Alternative C would contribute incrementally to changes in vegetation community composition and structure where grazing results in localized pressure from both cattle and bison on vegetation resources. However, the magnitude of cumulative effects would be minimal within the context of the wider regional landscape.

Alternative D

Direct and Indirect Effects

Elimination of grazing on all seven allotments included in the application (as well as for the Box Elder allotment, where no change is requested to the permit) would result in increased litter, enlarged plant canopies and root masses, and accumulated plant litter. These effects would result in increased fuel loads and a higher potential for more frequent fire intervals. While some fire is beneficial, wildfires could cause loss of forage and wildlife habitat, damage soils, damage structures such as fences, and have high suppression costs. Many rangeland ecosystems have evolved with disturbances, including fire and grazing (Fuhlendorf and Engle 2001). Beneficial effects would include vegetation recovery since, in the absence of disturbance from both cattle and bison, increased rest periods would result in greater regeneration of vegetation over time. However, in the absence of fire and grazing, standing dead vegetation can build up making the area less desirable for livestock and wildlife due to the abundance of unpalatable, structural plant material (Cooperative Extension System 2020). Grazing removes older leaves and stems, stimulating new growth and producing more nutritious young leaves. The elimination of grazing on BLM-administered lands could lead to deterioration of sagebrush/grassland plant communities in the long term due to the eventual decadence of individual plants from lack of disturbances to stimulate new growth. It is expected that an increase in this decadent plant material would lead to a more frequent fire return interval. The absence of grazing to remove some of the vegetation could increase the severity of any fires and potentially lead to detrimental environmental consequences including, but not limited to, increased erosion and potential loss of both upland and sagebrush plant communities and woody draw communities. Additionally, litter buildup from no grazing is likely to occur on some ecological sites. Excessive litter accumulation will enhance Japanese brome (*Bromus japonicus*), particularly, and cheatgrass (*Bromus tectorum*) seedling establishment. This in turn is likely to increase the density of Japanese brome and cheatgrass brome stand density invasions (Beck 2009).

Cumulative Impacts

Other past, present, or reasonably foreseeable actions, as described in **Section 3.3.2**, include modifications to landscape occurring within adjacent grazing allotments, range improvement projects, continued livestock grazing authorizations (including additional conversion from cattle grazing to bison pasturing on adjacent federal and nonfederal lands, including grazing by APR on other federal and nonfederal ranch lands within the four surrounding counties within which APR currently holds title to property [Choteau, Fergus, Petroleum, and Valley counties]), and the influence of nonnative and invasive weed species on native vegetation communities. Discontinuing the use of allotments by domestic livestock under Alternative D would result in both adverse and beneficial effects on vegetative communities.

Adverse effects would include increased risks of wildfire, as accumulated fuels can increase wildfire severity, intensity, and frequency. Fire could be detrimental to native vegetation, wildlife, and infrastructure (such as existing fencing). Beneficial effects would include vegetation recovery since, in the absence of disturbance from both cattle and bison, increased rest periods would result in greater regeneration of vegetation over time.

When considered within the context of past, present, or reasonably foreseeable actions, Alternative D would contribute incrementally to cumulative adverse effects on vegetation communities. However, the severity of cumulative effects would be minimal within the context of the wider regional landscape.

This page intentionally left blank.

Chapter 4.
Consultation and Coordination

Prior to preparation of this EA, the public was notified of the proposed action via news release on March 21, 2018, announcing a public scoping period from April 9 to May 9, 2018. The news release also provided notice of a series of four BLM-hosted open house-style public meetings, which were held on April 9 and 12, 2018, in communities in north-central Montana. On May 2, 2018, in response to requests from the public, the BLM issued a subsequent news release extending the public scoping period through June 11, 2018. A 60-day public comment period followed the release of the Preliminary EA.

4.1 Preparers

This document has been prepared by Environmental Management and Planning Solutions, Inc. (EMPSi) under the review and direction of interdisciplinary staff at the BLM Malta Field Office, in cooperation with staff from the BLM North Central Montana District and the BLM Montana State Office. Coordinating parties include MFWP and the Montana Department of Natural Resources and Conservation.

This page intentionally left blank.

References

APR (American Prairie Reserve). 2020. Building the Reserve. Internet website: https://www.americanprairie.org/building-the-reserve. Accessed on December 21, 2020.

Balch, J. K., B. A. Bradley, C. M. D'Antonio, and J. Gómez-Dans. 2013. "Introduced annual grass increases regional fire activity across the arid western USA (1980–2009)." Global Change Biology 19: 173–183.

Beck, K. G. 2009. Downy Brome (*Bromus tectorum*) and Japanese Brome (*Bromus japonicus*) Biology, Ecology, and Management Literature Review. Colorado State University. 57 pp. Internet website: https://www.nwcb.wa.gov/pdfs/Downy_brome_and_Japanese_brome_literature_review_Colorado_DRMS_Dec_09.pdf.

Behnke, R. J., and R. F. Raleigh. 1978. Grazing and the riparian zone: Impact and management perspectives. Proceedings of the symposium: Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Callaway Gardens, GA. General Technical Report WO-12. US Department of Agriculture, Forest Service. pp. 262-267.

BLM (US Department of the Interior, Bureau of Land Management). 1997. Environmental Impact Statement Record of Decision for Standards for Rangeland Health and Guidelines for Livestock Grazing Management in Montana, North Dakota, and South Dakota.

______. 2005. Interpreting Indicators of Rangeland Health, Technical Reference 1734-6, Version 4. Internet website: https://www.blm.gov/documents/national-office/blm-library/technical-reference/interpreting-indicators-rangeland-health.

______. 2010. Antelope Creek Grazing Allotment #05610. Grazing Permit Modification Environmental Assessment DOI-BLM-MT-L070-2010-0008-EA. Phillips County, MT.

______. 2013. Lewistown Field Office Greater Sage-Grouse Draft Resource Management Plan Amendment and Environmental Impact Statement. Internet website: https://eplanning.blm.gov/public_projects/lup/36877/44814/48325/Draft_RMP_Amendment/EIS.pdf.

______. 2015a. HiLine District Office Approved Resource Management Plan. BLM, HiLine District Office, Great Falls, MT.

______. 2015b. HiLine District Office Proposed RMP/Final Environmental Impact Statement. BLM, HiLine District Office, Great Falls, MT.

______. 2017. 2016 Land Health Assessment Report. BLM, Malta Field Office, Malta, MT. July 27.

______. 2019a. Beauchamp Watershed Area Land Health Assessment Report. BLM, Malta Field Office, Malta, MT. April 3.

______. 2019b. Movement Map for the 2020-2022 grazing seasons and existing Allotment Management Plan for East Dry Fork Allotment #05617. Provided on October 31st, 2019. BLM, Malta Field Office, Malta, MT.

______. 2020a. Bureau of Land Management Montana/Dakotas Special Status Species List, 2020. BLM, Malta Field Office, Malta, MT.

______. 2020b. Bureau of Land Management Species Occurrence by Field Office, 2020. BLM, Malta Field Office, Malta, MT.

______. 2020c. Rangeland Administration System Reports. Internet website: https://reports.blm.gov/reports/RAS/. Accessed on March 5, 2020.

______. 2020d. Lewistown Proposed Resource Management Plan and Final Environmental Impact Statement. Analysis of the Management Situation. BLM, Lewistown Field Office, Lewistown, MT.

______. 2020e. Memorandum dated June 3, 2020. Subject: Status of Greater Sage-Grouse (GRSG) Population and Habitat Adaptive Management Triggers within Montana and South Dakota in 2019.

BLM GIS (US Department of the Interior, Bureau of Land Management Geographic Information Systems). 2020. GIS data used in the American Prairie Reserve EA alternatives, affected environment, and impact analysis. Last edit date June 2020. BLM, Lewistown Field Office, Lewistown, MT.

British Columbia Conservation Foundation. 2010. Wildlife collision prevention program. Internet website: http://www.wildlifeaccidents.ca/default.htm. Accessed on March 5, 2020.

Brooks M. L., J. R. Matchett, D. J. Shinneman, and P. S. Coates. 2015. Fire Patterns in the Range of the Greater Sage-grouse, 1984-2013—Implications for conservation and management (No. 2015–1167). US Geological Survey, Sacramento, CA.

Census and Economic Information Center, Montana Department of Commerce. 2020. State of Montana Population Projections. Internet website: https://ceic.mt.gov/Maps/Demographics/Population. Accessed on March 5, 2020.

Cherry, C., K. Leong, R. Wallen, and D. Buttke. 2018. Risk-enhancing behaviors associated with human injuries from bison encounters at Yellowstone National Park, 2000–2015. One Health 6 (2018) 1–6.

Connelly, J. W., E. T. Rinkes, and C. E. Braun. 2011. "Characteristics of Greater Sage-Grouse habitats: A landscape species at micro- and macroscales." In: Greater Sage-Grouse: Ecology of a landscape species and its habitats" (S.T. Knick and J.W. Connelly, editors). pp. 69–83. Cooper Ornithological Union, University of California Press, Berkeley, CA.

Cooperative Extension System. 2020. Prescribed Fire Community Information. Internet website: https://prescribed-fire.extension.org/are-fire-and-grazing-interrelated/. Accessed on October 2, 2020.

Demarais, S., R. W. DeYoung, L. J. Lyon, E. S. Williams, S. J. Williamson, and G. J. Wolfe. 2002 "Biological and Social Issues Related to Confinement of Wild Ungulates." Wildlife Society Technical Review 2–3.

Derner, J. D., and G. E. Schuman. 2007. Carbon Sequestration and Rangelands: A Synthesis of Land Management and Precipitation Effects. Journal of Soil and Water Conservation. 62(2).

DOI (United States Department of the Interior). 2006. Riparian area management: Grazing management processes and strategies for riparian-wetland areas. Technical Reference 1737-20. BLM, National Science and Technology Center, Denver, CO. Internet website: https://www.blm.gov/or/programs/nrst/files/final_tr_1737-20.pdf. Accessed on October 2, 2020.

Economic Impact Analysis for Planning (IMPLAN). 2019. Regional input-output model. Unpublished modeling report.

Ellis, J., and J. Richard. 2008. A Planning Guide for Protecting Montana's Wetlands and Riparian Areas. Revised edition. Bozeman, MT, Montana Watercourse, publication MTW-01-03, 105 pp. Internet website: https://www.usbr.gov/gp/mtao/loweryellowstone/EA/Final%20EA/Support/Ellis%20and%20Richard%202008%20Planning%20Guide%20Wetlands%20and%20Riparian%20Areas.pdf. Accessed on March 5, 2020.

Foulke, Thomas; Torok, S.; Tatlor, T. and E. Bradley. 2001. Enterprise Budget: Bison Cow-Calf. Cooperative Extension Service, University of Wyoming. January 2001

Fuhlendorf, S., and D. Engle. 2001. Restoring Heterogeneity on Rangelands: Ecosystem Management Based on Evolutionary Grazing Patterns. BioScience. Vol. 51 No. 8. August.

Fuller, K., and J. Mosley. 2016. Grazing Leases. Montana State University Extension. MT201601AG. Internet website: https://store.msuextension.org/publications/AgandNaturalResources/MT201601AG.pdf and https://aglease.msuextension.org/Grazing.html. Accessed on March 5, 2020.

Gates, C. C., C. H. Freese, P. J. P. Gogan, and M. Kotzman. (eds. and comps.). 2010. American Bison: Status Survey and Conservation Guidelines 2010. Gland, Switzerland: IUCN.

Knapp, A., J. Blair, J. Briggs, S. Col ins, D. Hartne], L. Johnson, and E. Towne. 1999. The keystone role of bison in north American tallgrass prairie - Bison increase habitat heterogeneity and alter a broad array of plant, community, and ecosystem processes. Bioscience 49:39-50.

Kohl, M., P. Krausman, K. Kunkel, and D. Williams. 2013. Bison Versus Cattle: Are They Ecologically Synonymous? Journal of Rangeland Ecology Management Vol 66. Pp. 721–731. November.

Krausman, Paul R., D. E. Naugle, M. R. Frisina, R. Northrup, V. C. Bleich, W. M. Block, M. C. Wallace, and J. D. Wright. 2009. Livestock Grazing, Wildlife Habitat, and Rangeland Values. Society for Range Management. October 2009. Pp. 15-19.

Kudray, G., P. Hendricks, E. Crowe, and S. Cooper. 2004. Riparian Forests of the Wild and Scenic Missouri River: Ecology and Management. Report to the BLM Lewistown Field Office. Montana Natural Heritage Program, Helena, MT. 29 pp.

Liebig, M. A., J. R. Gross, S. L. Kronberg, R. L. Phillips, and J. D. Hanson. 2010. Grazing Management Contributions to Net Global Warming Potential: A Long-term Evaluation in the Northern Great Plains. *Journal of Environmental Quality*, Vol. 39, pp. 799-809.

McMillan, Nicholas A., K. E. Kunkel, D. L. Hagan, D. S. Jachowski. 2019. Plant community responses to bison reintroduction on the Northern Great Plains, United States: a test of the keystone species concept. *Restoration Ecology*, Volume 27, Issue 2. March 2019. Pp. 379-388.

MFWP (Montana Department of Fish, Wildlife, and Parks). 2012. Background Information on Issues of Concern for Montana: Plains Bison Ecology, Management, and Conservation. Internet website: http://fwp.mt.gov/fwpDoc.html?id=55766. Accessed on March 5, 2020.

______. 2020a. Open Data Portal. Big Game Migration/Distribution Datasets. Internet website: https://gis-mtfwp.opendata.arcgis.com/. Accessed on March 5, 2020.

______. 2020b. Memorandum dated July 9, 2020. Subject: 2020 Phillips County Sage Grouse Lek Surveys.

Montana Department of Natural Resources and Conservation. 2020a. Ranching in Montana. Internet website: http://dnrc.mt.gov/divisions/cardd/rangeland-resource-program/montana-grass-conservation-commission/ranching-in-montana. Accessed on March 5, 2020.

______. 2020b. Grazing Districts. Internet website: http://dnrc.mt.gov/divisions/cardd/rangeland-resource-program/montana-grass-conservation-commission/grazing-districts. Accessed on March 5, 2020.

______. 2021. Montana State Land Grazing Rate, 2021. Internet website: http://dnrc.mt.gov/divisions/trust/agriculture-and-grazing/GrazingRateDocumentforWebsite2021.pdf. Accessed on March 17, 2021.

Montana Department of Transportation. 2020. Preliminary 2010-2019 Roadway Crash Data. Internet website: https://www.mdt.mt.gov/publications/datastats/crashdata.shtml. Accessed on March 5, 2020.

Moran, M. D. 2019. Bison are back, and that benefits many other species on the Great Plains. Internet website: https://theconversation.com/bison-are-back-and-that-benefits-many-other-species-on-the-great-plains-107588#:~:text=Bison's%20selective%20grazing%20behavior%20produces,a%20diverse%20mosaic%20of%20habitats.

National Agricultural Statistics Service. 2017. 2017 Agricultural Census. Internet website: https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/1/table/1. Accessed on March 5, 2020.

Paige, C. 2012. A Landowner's Guide to Wildlife Friendly Fences. Landowner/Wildlife Resource Program, Montana Fish, Wildlife and Parks, Helena, MT. pp 44. Internet website: http://fwpiis.mt.gov/content/getItem.aspx?id=34461. Accessed on March 5, 2020.

Phillips County Conservation District Board of Adjustment. 2020. Phillips County Conservation District Settlement Agreement in the matter of American Prairie Reserve's Petition for Variance from Phillips Conservation District Ordinance 2016-1. December 11.

Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. Riparian area management: A user guide to assessing proper functioning condition and the supporting science for lotic areas. TR1737-15. US Department of the Interior, Bureau of Land Management, National Applied Resource Sciences Center, Denver, CO. 126 pp.

Rambo, J. L., and S. H. Faeth. 1999. Effect of vertebrate grazing on plant and insect community structure. Conservation Biology 13:1047–1054.

Ranglack, D., S. Durham, and J. du Toit. 2015. Competition on the range: science vs. perception in a bison–cattle conflict in the western USA. Journal of Applied Ecology 2015, 52, 467–474.

Sanderson, J. S., C. Beutler, J. R. Brown, I. Burke, T. Chapman, R. T. Conant, J.D. Derner, M. Easter, S. D. Fuhlendorf, G. Grissom, J. E. Herrick, D. Liptzin, J. A. Morgan, R. Murph, C. Pague, I. Rangwala, D. Ray, R. Rondeau, T. Schulz, and T. Sullivan. Cattle, conservation, and carbon in the western Great Plains. Journal of Soil and Water Conservation. January/February 2020, Vol. 75, No. 1, pp. 5A-12A.

State of Montana. 2020. Montana Government open data portal, 2020. Statewide land cover data including vegetation and human usage. Internet website: http://geoinfo.msl.mt.gov/home/msdi/land_use_land_cover.aspx. Accessed on March 5, 2020.

Tribby, K. 2020. Kathy Tribby, Wildlife Biologist, BLM, Malta Field Office. Comments submitted on internal draft affected environment. September 21.

US Bureau of Economic Analysis. 2018a. Table CAEMP25N: Total Full-Time and Part-Time Employment by NAICS (North American Industry Classification System) Industry. Internet website: https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1. Accessed on March 5, 2020.

______. 2018b. Table CAINC5N Personal Income by Major Component and Earnings by NAICS (North American Industry Classification System) Industry. Internet website: https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1. Accessed on March 5, 2020.

US Census Bureau. 2000. Decennial Census, Summary File 1. Table P001: Total Population. Internet website: https://data.census.gov/cedsci/advanced. Accessed on March 5, 2020.

______. 2010. Decennial Census, Summary File 1. Table p1: Total Population. Internet website: https://data.census.gov/cedsci/advanced. Accessed on March 5, 2020.

______. 2018a. American Community Survey (ACS) 5-Year Estimates, 2014-2018. Table DP05: Data Profiles. Internet website: https://data.census.gov/cedsci/advanced. Accessed on March 5, 2020.

______. 2018b. Small Area Income and Poverty Estimates, 2018. Internet website: https://data.census.gov/cedsci/advanced. Accessed on March 5, 2020.

US Department of Agriculture. 2020. Animal and Plant Health Inspection Service. National Brucellosis Eradication Program. Facts about brucellosis. June 2. Internet website: https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/cattle-disease-information/national-brucellosis-eradication. Accessed on March 5, 2020.

US Department of Agriculture, Natural Resources Conservation Service. 2003. National Range and Pasture Handbook. Internet website: https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/landuse/rangepasture/?cid=stelprdb1043084. Accessed on May 18, 2021.

USFWS (United States Department of the Interior, Fish and Wildlife Service). 2020. Information for Planning and Consultation (IPAC) report generated for American Prairie Reserve project area. Internet website: https://ecos.fws.gov/ipac/. Accessed on July 16, 2020.

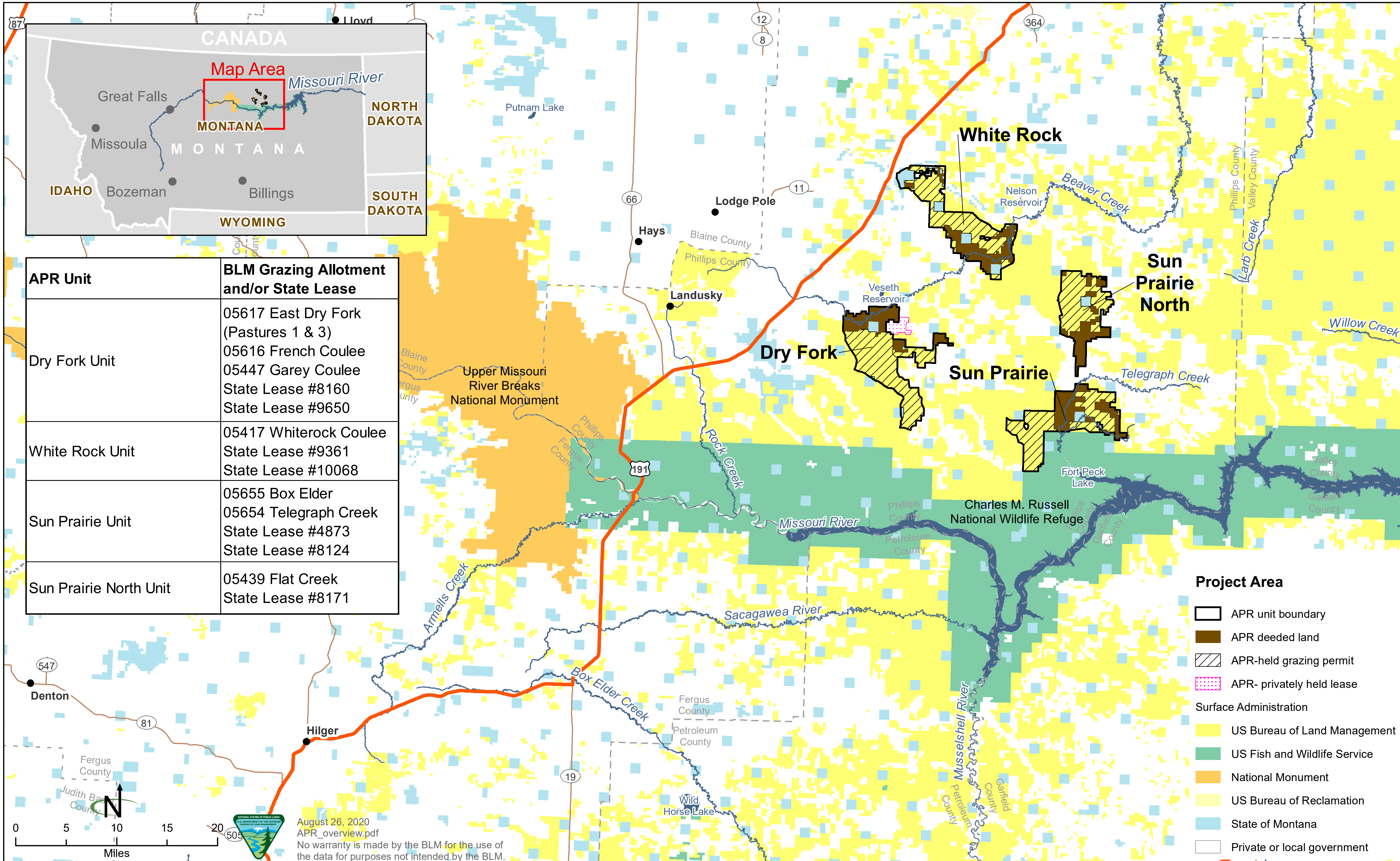
Vold, S. T., L. I. Berkeley, and L. B. McNew. 2019. Effects of Livestock Grazing Management on Grassland Birds in a Northern Mixed-Grass Prairie Ecosystem. Rangeland Ecology & Management; Vol. 72, Issue 6, November 2019. pp. 933-945.

West, N. E. 2000. Synecology and disturbance regimes of sagebrush steppe ecosystems, p. 15–26. In P. G. Entwistle, A. M. DeBolt, J. H. Kaltenecker, and K. Steenhof [compilers], Proceedings: sagebrush steppe ecosystems symposium. US DOI, Bureau of Land Management Publication BLM/ID/PT-00100111150, Boise, ID.

Wolf, K., R. Baldwin, and S. Barry. 2017. Compatibility of Livestock Grazing and Recreational Use on Coastal California Public Lands: Importance, Interactions, and Management Solutions. Rangeland Ecology & Management. Vol. 70, pp. 192–201.

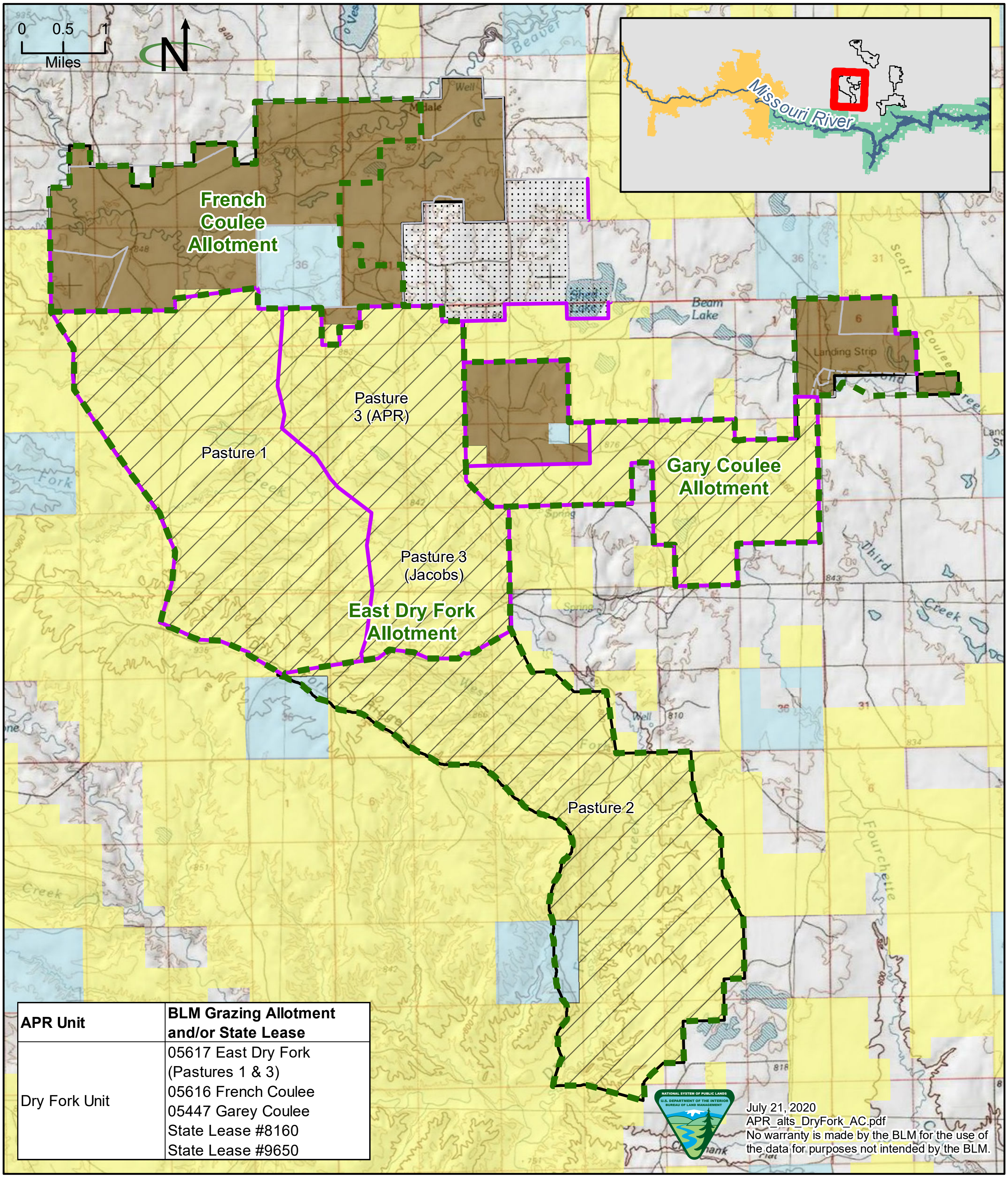
Appendix A

Maps



APR Unit	BLM Grazing Allotment and/or State Lease
Dry Fork Unit	05617 East Dry Fork (Pastures 1 & 3) 05616 French Coulee 05447 Garey Coulee State Lease #8160 State Lease #9650
White Rock Unit	05417 Whiterock Coulee State Lease #9361 State Lease #10068
Sun Prairie Unit	05655 Box Elder 05654 Telegraph Creek State Lease #4873 State Lease #8124
Sun Prairie North Unit	05439 Flat Creek State Lease #8171

This page intentionally left blank.



APR Unit	BLM Grazing Allotment and/or State Lease
Dry Fork Unit	05617 East Dry Fork (Pastures 1 & 3) 05616 French Coulee 05447 Garey Coulee State Lease #8160 State Lease #9650

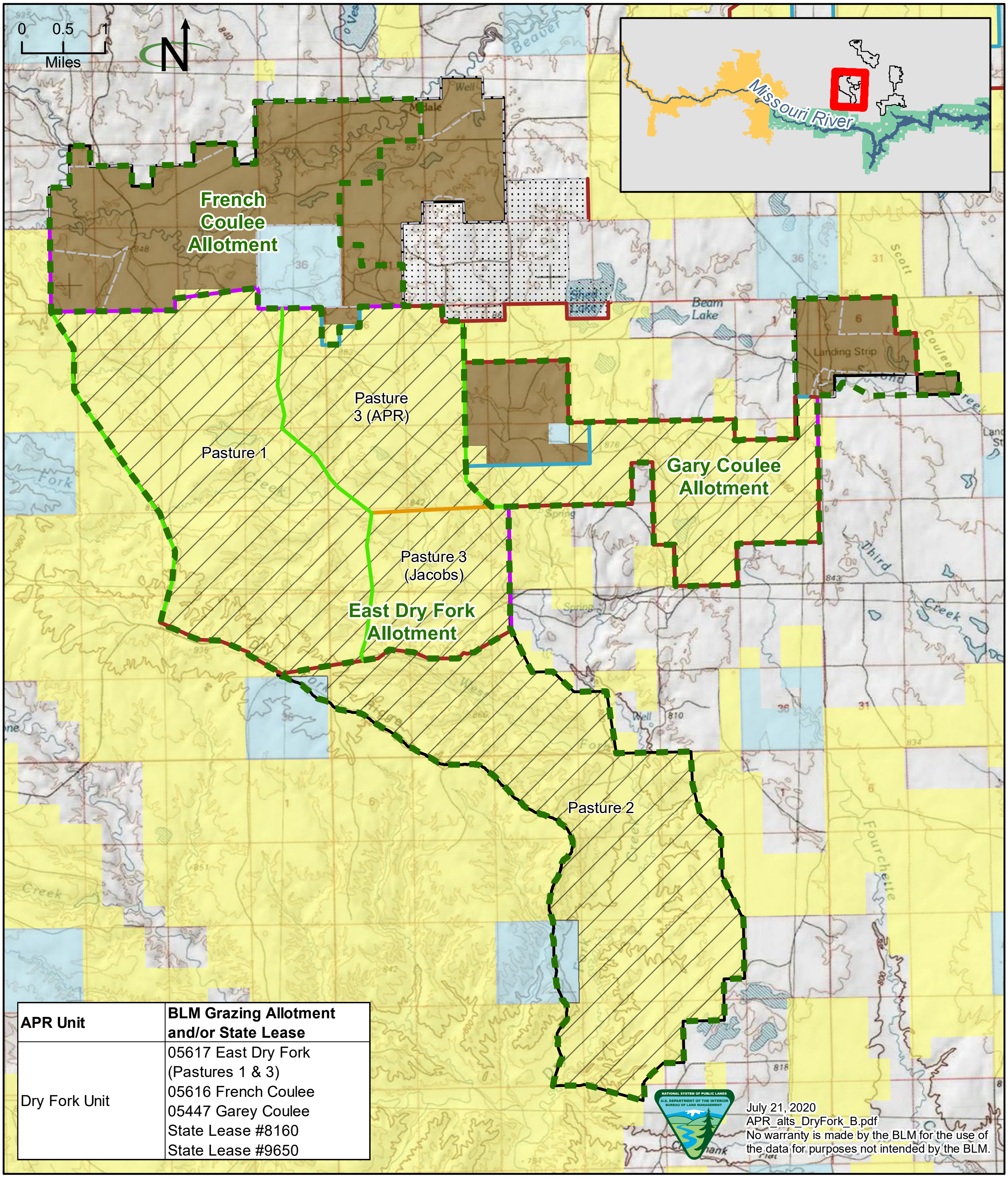
Alternatives A and C - Dry Fork Unit

Fencing Alignment
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit
- APR- privately held lease

Surface Administration
- State of Montana
- US Bureau of Land Management

Alternative B - Dry Fork Unit

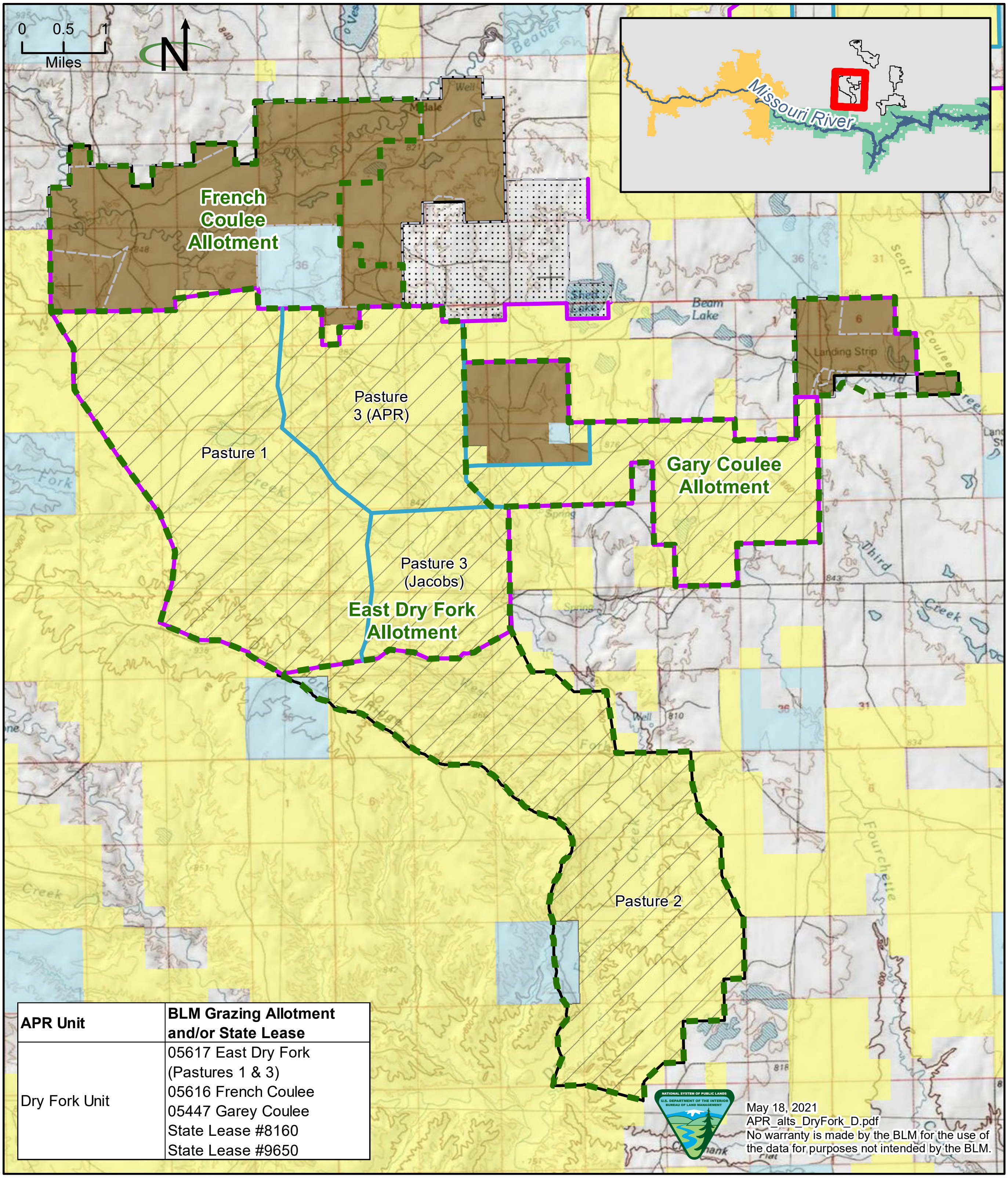


APR Unit	BLM Grazing Allotment and/or State Lease
Dry Fork Unit	05617 East Dry Fork (Pastures 1 & 3) 05616 French Coulee 05447 Garey Coulee State Lease #8160 State Lease #9650

Fence Alignment
- Construct
- Electrify
- Reconstruct
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit
- APR- privately held lease

Surface Administration
- State of Montana
- US Bureau of Land Management



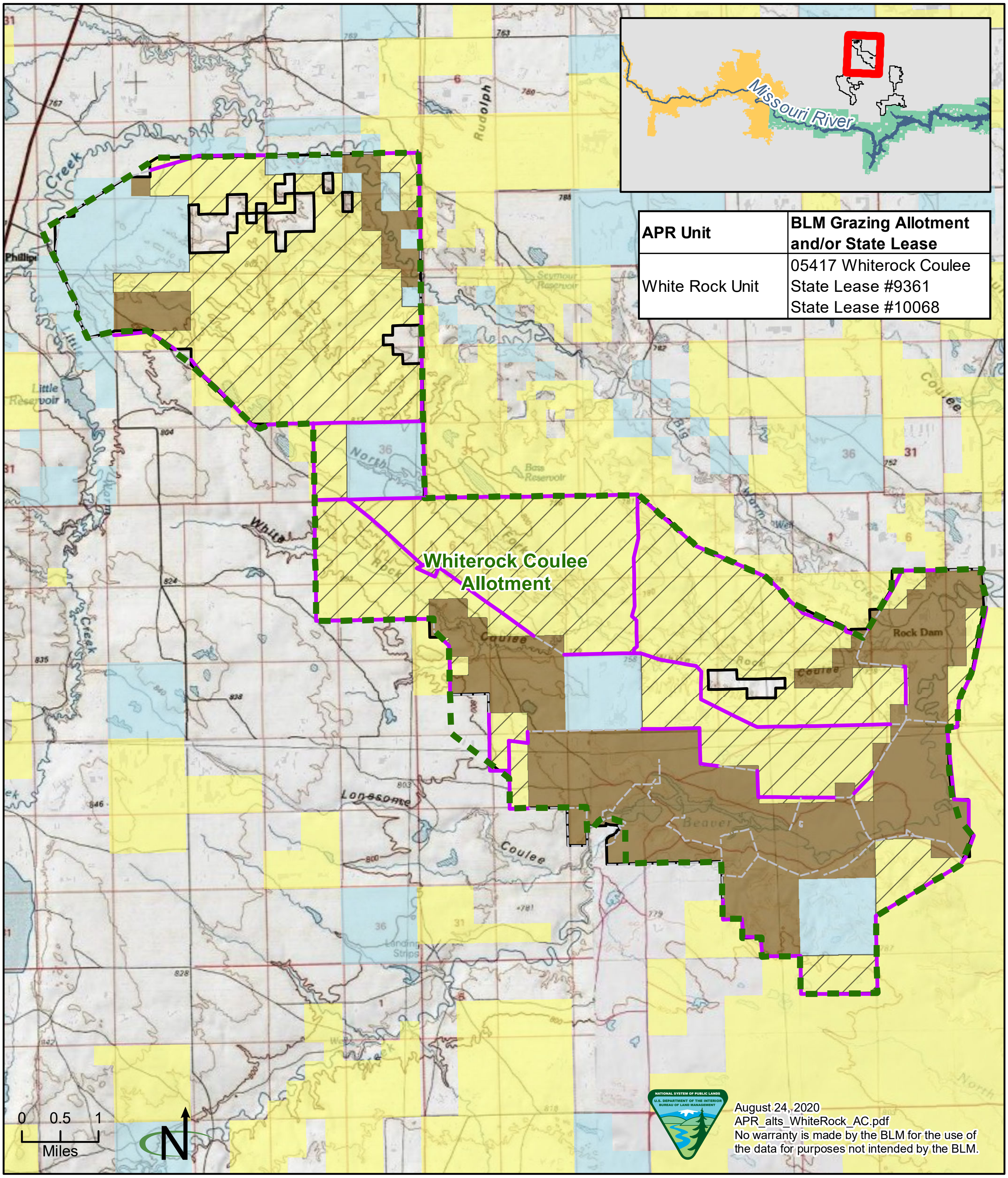
APR Unit	BLM Grazing Allotment and/or State Lease
Dry Fork Unit	05617 East Dry Fork (Pastures 1 & 3) 05616 French Coulee 05447 Garey Coulee State Lease #8160 State Lease #9650

Alternative D - Dry Fork Unit

Fencing
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit
- APR- privately held lease

Surface
- State of Montana
- US Bureau of Land Management



Alternatives A and C - White Rock Unit

Fencing Alignment

Retain

Fence on non-BLM land not included in decision

BLM allotment or pasture boundary

APR unit boundary

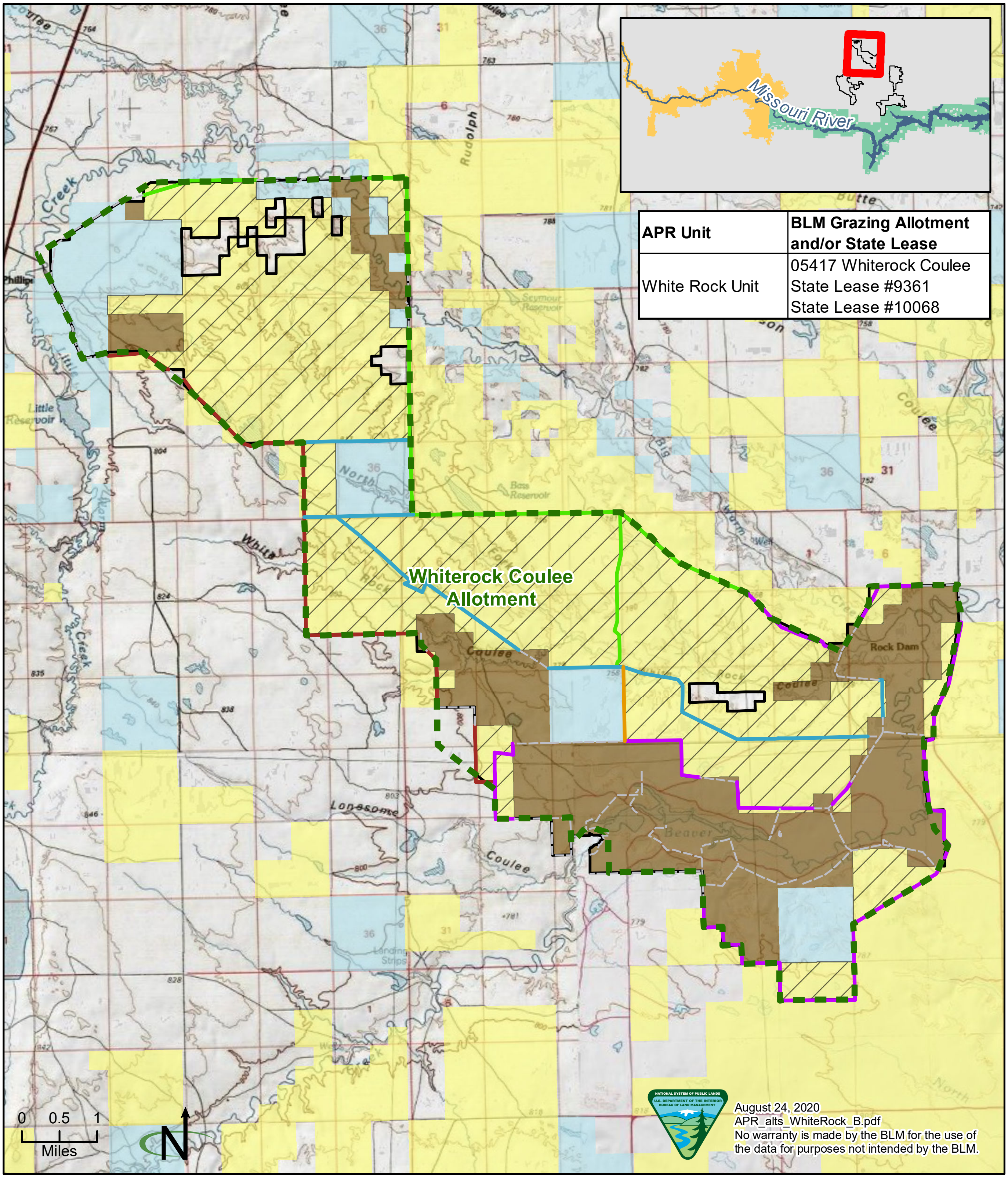
APR deeded land

APR-held grazing permit

Surface Administration

State of Montana

US Bureau of Land Management



Alternative B - White Rock Unit

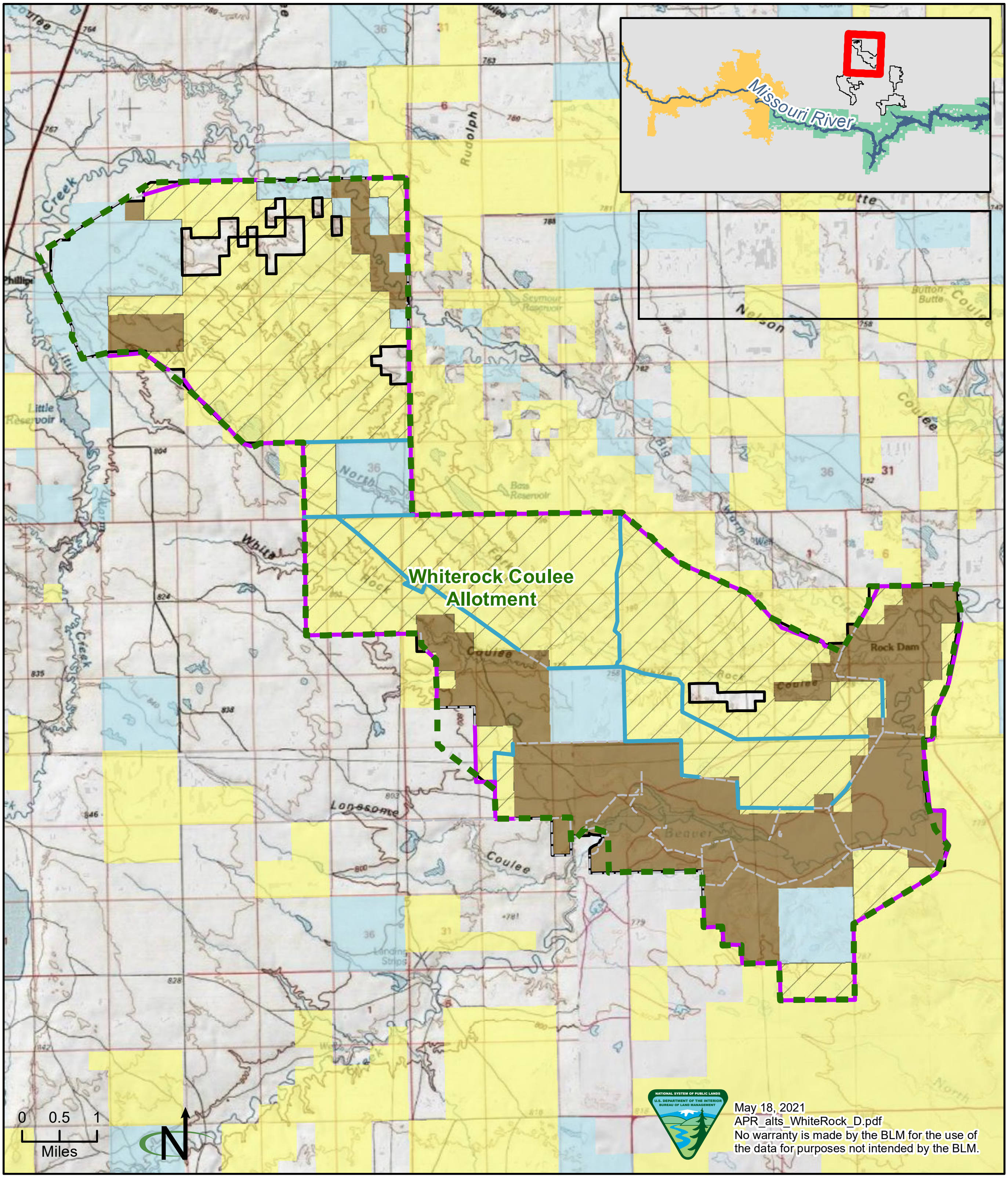
Fence Alignment

- Construct
- Electrify
- Reconstruct
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit

Surface Administration

- State of Montana
- US Bureau of Land Management

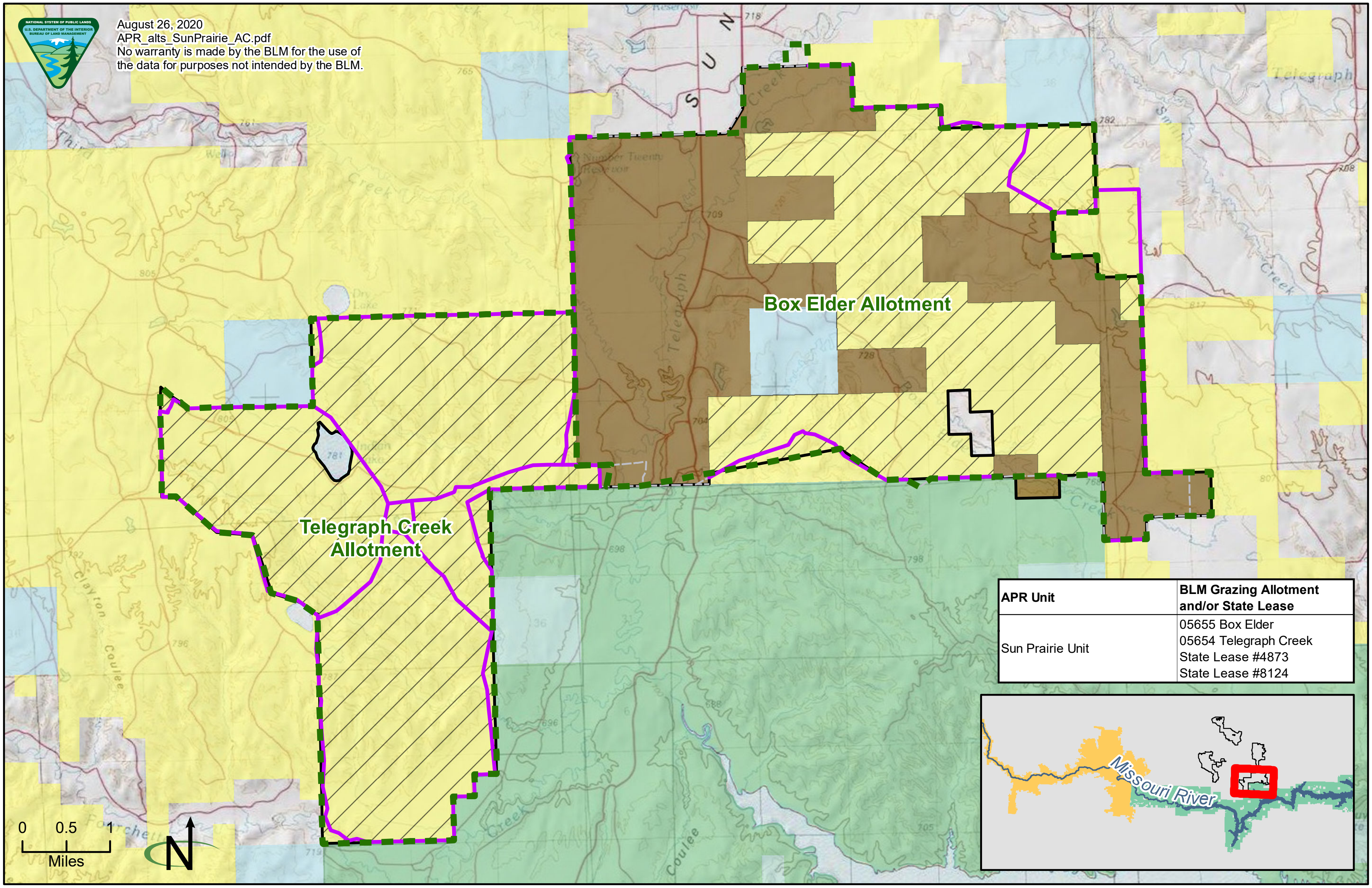


Alternative D - White Rock Unit

Fence Alignment
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit

Surface Administration
- State of Montana
- US Bureau of Land Management

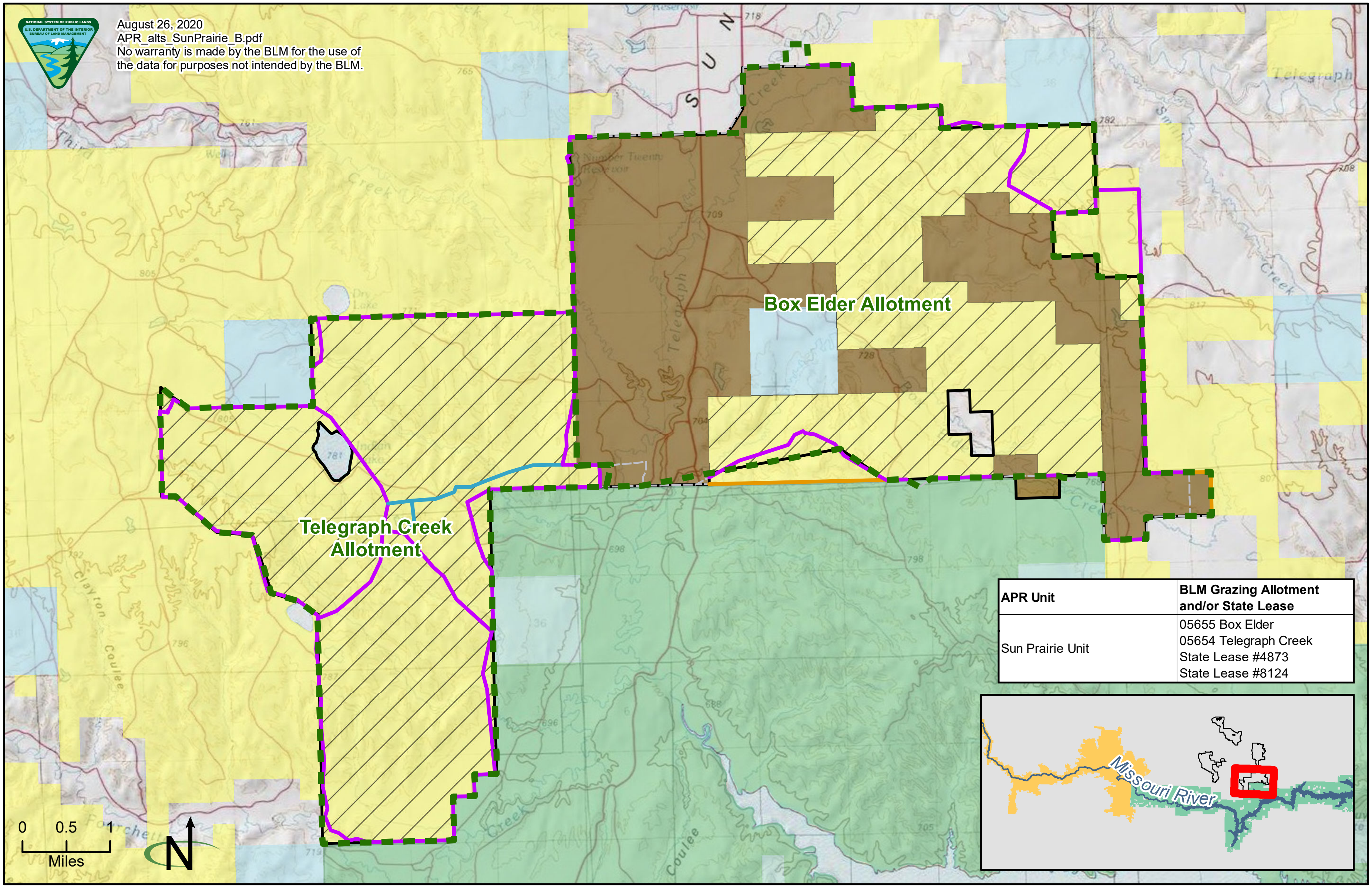


Fence Alignment
Retain
Fence on non-BLM land not included in decision

BLM allotment or pasture boundary
APR unit boundary
APR deeded land
APR-held grazing permit

Surface Administration
State of Montana
US Bureau of Land Management
US Fish and Wildlife Service

Alternatives A and C - Sun Prairie Unit



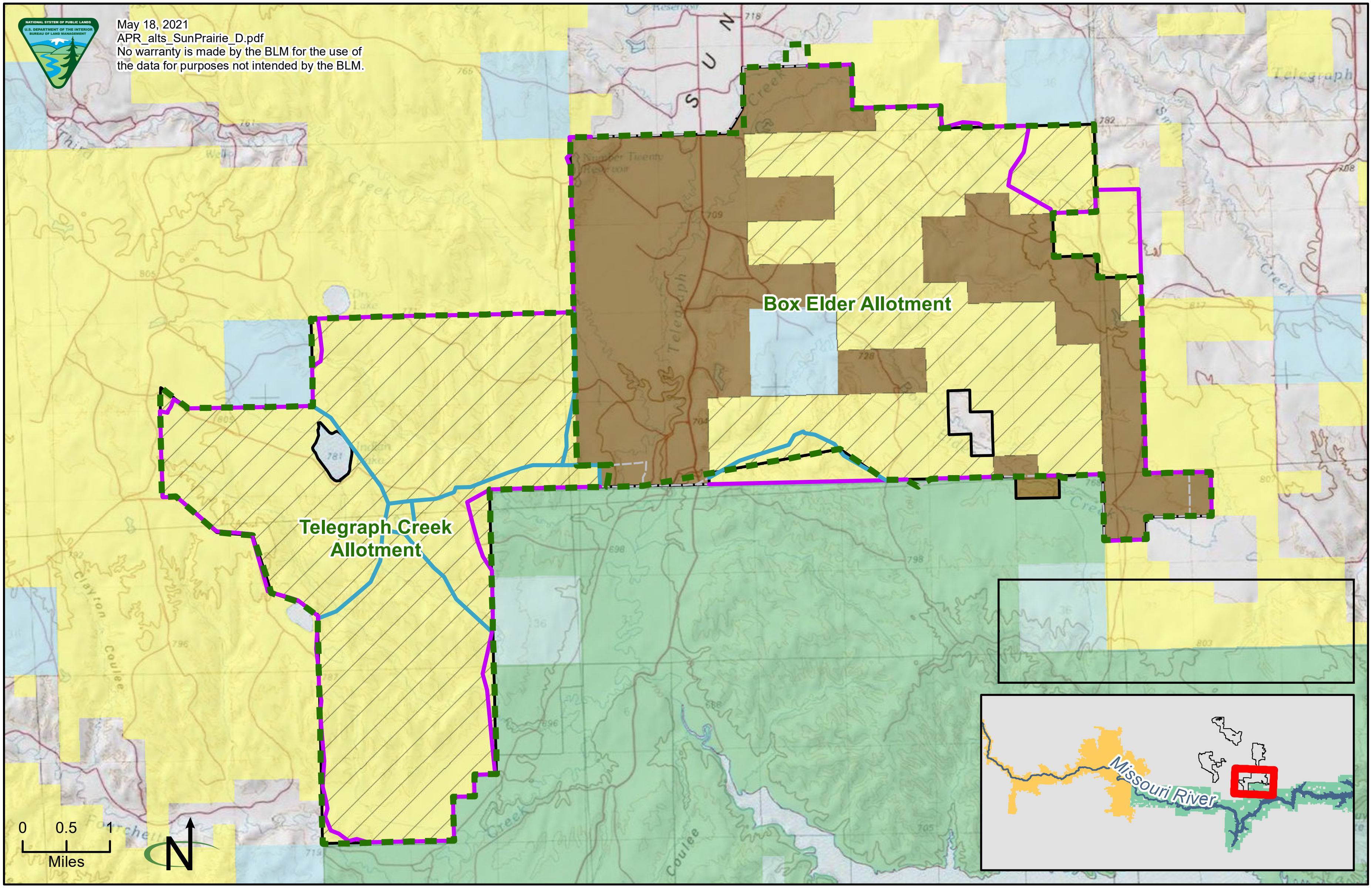
APR Unit	BLM Grazing Allotment and/or State Lease
Sun Prairie Unit	05655 Box Elder 05654 Telegraph Creek State Lease #4873 State Lease #8124

Fence Alignment
- Construct
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit

Surface Administration
- State of Montana
- US Bureau of Land Management
- US Fish and Wildlife Service

Alternative B - Sun Prairie Unit

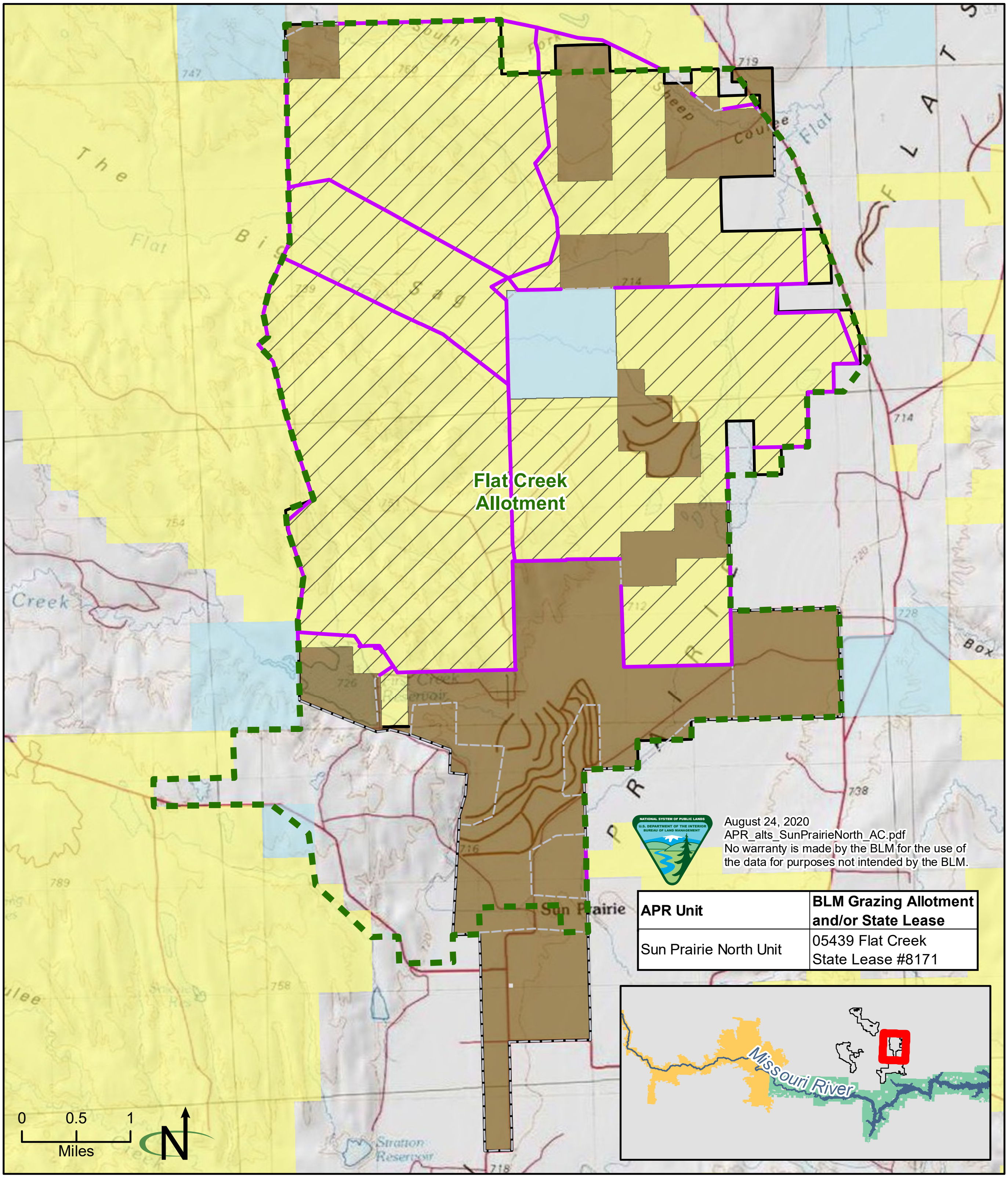


Fence Alignment
- Remove
- Retain
- Fence on non-BLM land not included in decision

BLM allotment or pasture boundary
APR unit boundary
APR deeded land
APR-held grazing permit

Surface Administration
- State of Montana
- US Bureau of Land Management
- US Fish and Wildlife Service

Alternative D - Sun Prairie Unit



APR Unit	BLM Grazing Allotment and/or State Lease
Sun Prairie North Unit	05439 Flat Creek State Lease #8171

Alternatives A and C - Sun Prairie North Unit

Fencing Alignment

Retain

Fence on non-BLM land not included in decision

BLM allotment or pasture boundary

APR unit boundary

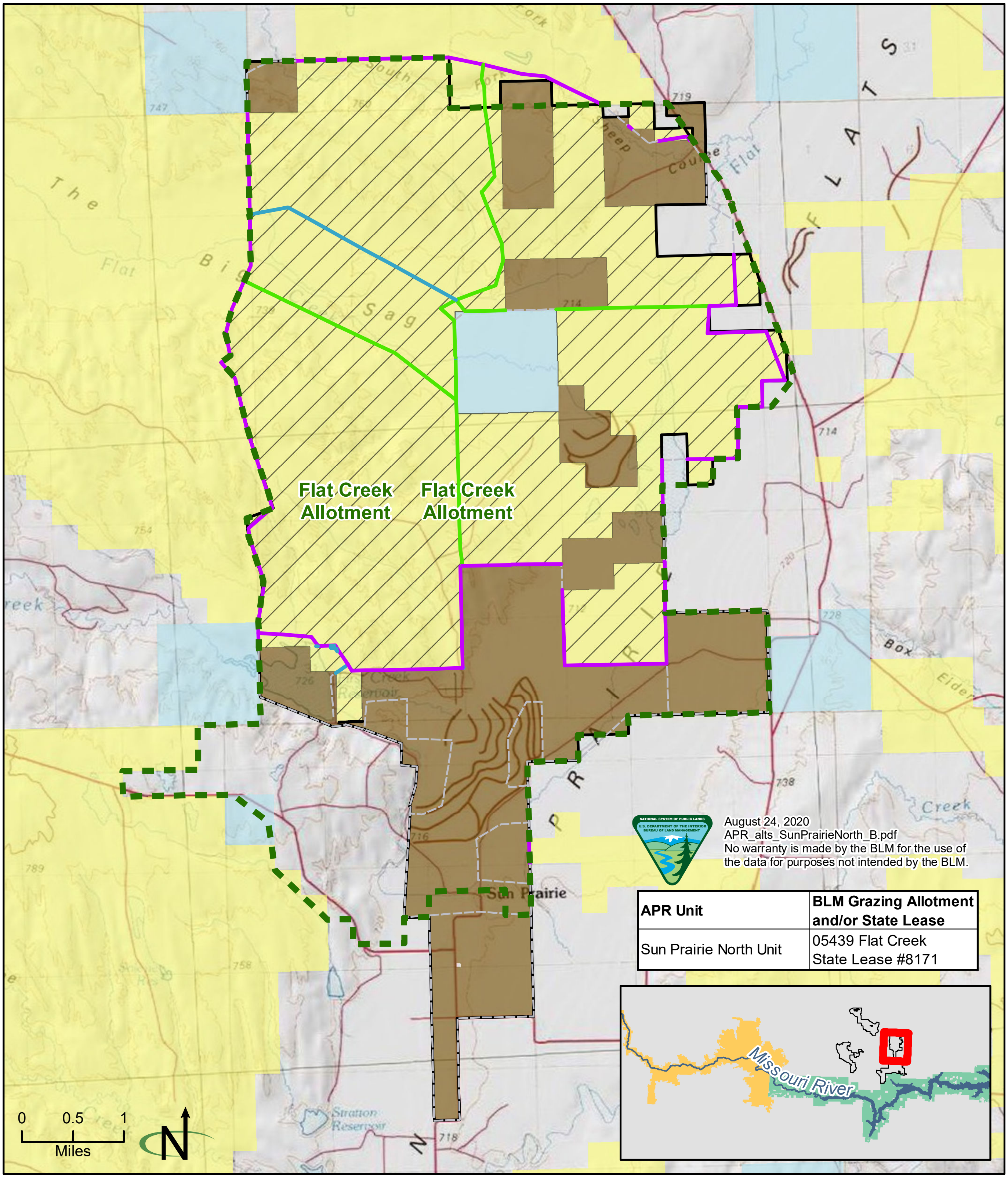
APR deeded land

APR-held grazing permit

Surface Administration

State of Montana

US Bureau of Land Management



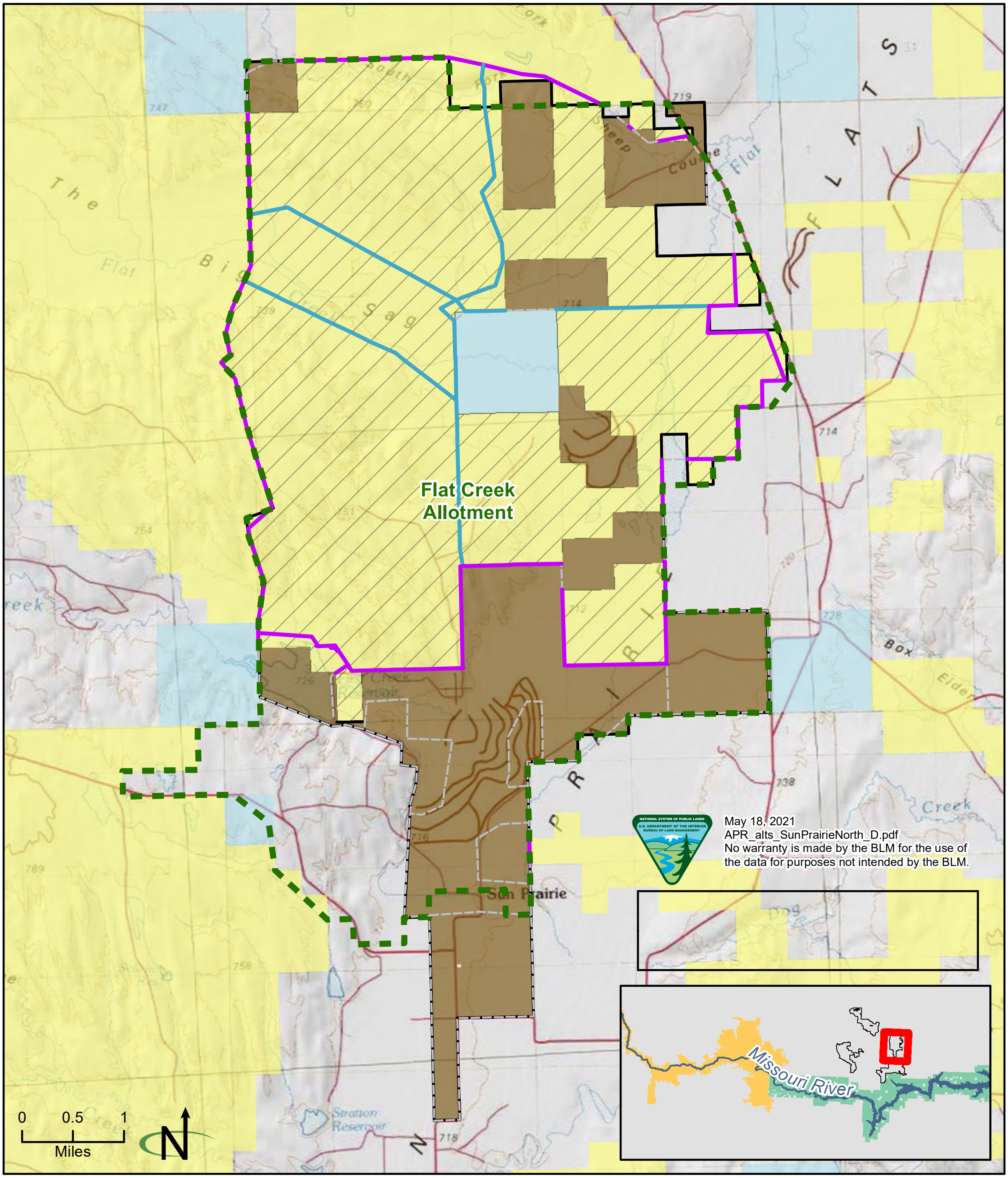
APR Unit	BLM Grazing Allotment and/or State Lease
Sun Prairie North Unit	05439 Flat Creek State Lease #8171

Alternative B - Sun Prairie North Unit

Fence Alignment
- Electrify
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit

Surface Administration
- State of Montana
- US Bureau of Land Management



Alternative D - Sun Prairie North Unit

Fence
- Remove
- Retain
- Fence on non-BLM land not included in decision

- BLM allotment or pasture boundary
- APR unit boundary
- APR deeded land
- APR-held grazing permit

Surface
- State of Montana
- US Bureau of Land Management

Appendix B
Fence Design and Maintenance

A Landowner's Guide to Wildlife Friendly Fences:

How to Build Fence with Wildlife in Mind

SECOND EDITION
REVISED AND UPDATED
2012

http://fwp.mt.gov/fwpDoc.html?id=34461

Montana Fish, Wildlife & Parks

Acknowledgements

Since the original publication of *A Landowner's Guide to Wildlife Friendly Fences* in 2008, the idea of "building fence with wildlife in mind" has taken off like wildfire across the West. Other states have built on that original publication and produced their own fence manuals, and this author wrote a companion volume for Wyoming, *A Landowner's Guide to Fences and Wildlife,* published by The Wyoming Land Trust.

For this second edition, the material has been revised and updated, benefitting from the creative ideas and practical experience of landowners and resource professionals who have adopted a wildlife friendly approach to their operations. Joe Weigand, Montana Fish, Wildlife & Parks private land wildlife specialist, provided department funding and personal guidance for the project, as well as his extensive expertise from testing various fence solutions with landowners.

A special thanks to everyone who contributed their insights, research, photographs and manuscript reviews. Chris and Leo Barthelmess, Ralph Burchenal, John Kountz, Jeff Laszlo, Marina Smith, Wayne Ternes, Juanita Vero, the Anaconda Gun Club and the Rocky Mountain Elk Foundation partnered with Montana Fish, Wildlife & Parks to test fence designs in various livestock and wildlife situations and offered invaluable insights and suggestions. FWP biologist Jay Kolbe provided fence specifications, photos and other invaluable contributions to the project. Steve Primm and Seth Wilson of People and Carnivores, and FWP bear biologists Kim Annis, Tim Manley, and Mike Madel, contributed their expertise on fencing to exclude predators. Shawn Cleveland and Andrew Jakes shared their experiences and photos from the Transboundary Pronghorn Project. Montana Department of Transportation provided photos, specifications, and experiences with highway right-of-way fence.

Bryce Andrews conducted interviews and wrote many of the profiles detailing landowner and ranch manager experiences. Many other landowners, biologists, and resource professionals in Montana and throughout the U.S. also contributed their expertise, references, and photographs, considerably adding to the breadth of innovative ideas.

My deep appreciation to Ed Jenne for his wonderful illustrations and to Nancy Seiler for her beautifully creative talent in layout and design. Any errors in this manual are mine alone.

Montana Fish, Wildlife & Parks

Christine Paige

Author
Christine Paige
Ravenworks Ecology
Jackson, WY
chrispaige@gmail.com

Editor/Publisher
Joe Weigand
Private Land Wildlife Specialist
Montana Fish, Wildlife & Parks
Helena, MT
joweigand@mt.gov

Graphic Design
Nancy Seiler
Missoula, MT
nancy@nancyseiler.com

Illustrations
E.R. Jenne Illustration
Missoula, MT
edjenne@earthlink.net

Citation
Paige, C. 2012. A Landowner's Guide to Wildlife Friendly Fences. Second Edition. Private Land Technical Assistance Program, Montana Fish, Wildlife & Parks, Helena, MT. 56 pp.

Cover Photo: Jeffrey P. Strickler; inset photo: donaldmjones.com

Table of Contents

Christine Paige

Why build wildlife friendly fences?

Fences are essential for controlling livestock and trespass, and countless miles of fence crisscross the West like strands of a spider's web. Fences define and separate ranches and farms, outline property boundaries, enclose pastures and rangelands, and prevent livestock from straying onto highways.

Yet those miles of fence can also create hazards and barriers for wildlife, from big game animals to birds. Fences can block or hinder daily wildlife movements, seasonal migrations, and access to forage and water. Wildlife may avoid areas with too many fences to negotiate. For example, pronghorn choose seasonal ranges with lower fence densities (Sheldon 2005). When animals collide with or become entangled in fences they can be injured or killed, and wildlife damage to fences can be costly and frustrating for landowners.

MANY WILDLIFE FRIENDLY FENCE DESIGNS ARE EASY AND LOW-COST, OR SAVE MONEY BY REDUCING FUTURE FENCE REPAIR.

Not all fences create problems for wild animals. By tailoring fence design and placement, you can reduce wildlife injuries and decrease damage to your fence. Many of these methods are low-cost or can save money in the long-run by reducing the need for future fence repair.

This guide will help you construct and modify fences and crossings that are friendlier to wildlife while still meeting fencing needs. It will also help you with sources for technical assistance and possible cost-share opportunities.

Christine Paige

Fence Law in Montana

Fence In or Fence Out?

Most of Montana is classified as open range, which means that by law landowners are responsible for "fencing out" neighboring livestock, and a livestock owner is not liable for trespass or damage if a property is not adequately fenced. This custom has deep roots in Montana's history and ranching traditions. However Montana's open range law applies only to cattle. Bison, sheep, and other livestock must be fenced in (Mont. Code Ann. § 81-4-201).

If the area you live is classified as "closed range," however, the livestock owner is responsible for "fencing in" all livestock. Incorporated cities and towns are classified as closed range. Counties may also create "herd districts" in unincorporated rural areas that are classified as closed range. If you're unsure if your area is open or closed range, contact the Montana Department of Livestock (MDOL; **www.liv.mt.gov.**)

In practice, many livestock operators fence their property and pastures to better manage their livestock and range resources. Where their pastures adjoin federal lands, livestock owners are also responsible for preventing their livestock from illegally trespassing on those lands.

Along railroads, the railroad company must build and maintain fences to keep livestock from wandering onto the tracks. Similarly, the Montana Department of Transportation (MDT) can construct fences along highways to prevent livestock from wandering into the right-of-way.

Legal Fence

Montana Code defines a legal fence as one of several possible designs (Mont. Code Ann. § 81-4-101). Generally, a legal fence is one constructed well enough to keep out or contain livestock. While the code defines heights for a legal fence, it also stipulates that "all other fences made of barbed wire, which shall be as strong and as well calculated to protect enclosures" as the standards specified are also legal. All "rivers, hedges, mountain ridges and bluffs, or other barriers over or through which it is impossible for stock to pass" are also included as legal fence.

Posting Against Trespass

In Montana, notice against trespass on private land must be placed on a post, structure, or natural object, either by written notice or with at least 50 square inches of fluorescent orange paint. For metal fence posts, the entire post must be painted. Notice must be placed at each outer gate and normal point of access to the property, including both sides of a water body wherever it intersects an outer boundary line (Mont. Code Ann. § 45-6-201).

Other Regulations

Check your local covenants and county and city offices for specific fence regulations. If your property adjoins a state highway, contact MDT regarding options for modifying highway right-of-way fences for wildlife (**www.mdt.mt.gov**).

Problem Fences

Deer, elk, moose, bighorn sheep, and pronghorn are all capable of jumping fences, but many common fence designs and situations can snare and injure these and other wildlife.

Wire strands can readily entangle legs, especially if wires are loose or spaced too closely together. Deer, elk, and other wildlife often bear scars from wire barbs. A torn ligament, strained leg, or infection can reduce an animal's chance of survival, and if animals can't pull free at all, they die slowly of trauma and dehydration.

Animals can be blocked by fences that are too high, impermeable, buried in deep snow, or on steep slopes. Young, pregnant, or winter-stressed animals may have a particularly difficult time clearing fences.

Cory Loecker

Some fences, especially woven wire fence, can be a complete barrier to fawns and calves even if adults can still jump over. Separated from their mothers and stranded from the herd, the youngsters often curl up and die of exposure and dehydration. Woven wire can snare and strangle medium-sized animals and livestock if they push their heads through the wire mesh, and may block animals such as bears and bobcats that are too large to slip through.

If woven wire is topped with one or more strands of barbed wire, the fence becomes a complete barrier, especially for fawns, calves, pronghorn and other animals that are incapable or unwilling to jump over such a fence. Animals trying to leap a woven wire fence topped by barbed wire are even more likely to tangle a leg between the top barbed wire and the stiff woven wire.

Colorado Parks and Wildlife

WINTER-STRESSED, PREGNANT AND YOUNG ANIMALS MAY ESPECIALLY HAVE TROUBLE CLEARING FENCES. AN INJURY OR INFECTION FROM TANGLING WITH FENCES CAN REDUCE AN ANIMAL'S CHANCE OF SURVIVAL. IF ANIMALS CAN'T PULL FREE AT ALL, THEY DIE OF TRAUMA AND DEHYDRATION.

In urban areas, fences topped with barbs or pointed spikes, such as decorative iron fences, can trap or impale leaping deer and other animals.

Large, low-flying birds, too, may collide with fences and break wings, impale themselves on barbs, or tangle in wires. Ducks, geese, cranes, swans, grouse, hawks, and owls are especially vulnerable. Waterfowl fly into fences that run near or across waterways, and hawks and owls may careen into fences when swooping in on prey.

Mark Gocke

Sheila Lamb

Problem Fences

Jack Jones

Jeremy Roberts, Conservation Media

Tom Campbell

What kinds of fence cause problems for wildlife?

Fences that:

- are too high to jump;
- are too low to crawl under;
- have loose or broken wires;
- have wires spaced too closely together;
- can impale or snag a leaping animal;
- are difficult for running animals or birds to see;
- create a complete barrier;
- create a 3-dimensional obstacle.

Doug Wood

Above: This peregrine falcon died when it collided with a fence while diving on killdeer. Many birds are vulnerable to fence collisions.

Chris Mayne

Above: After crossing a highway, a black bear desperately searches for a way through a woven wire fence, finally climbing a power pole to leap over.

Tom Kroenig, Colorado Parks and Wildlife

The Bottom Line: Hard Numbers

Recently, researchers at Utah State University completed a study of wildlife mortality along more than 600 miles of fences in the rangelands of northeastern Utah and northwestern Colorado (Harrington 2005, Harrington and Conover 2006). By repeatedly driving and walking fencelines over two seasons, they tallied the number of mule deer, pronghorn, and elk carcasses they found caught in fences and lying next to fences. They also studied which fence types caused the most problems.

The Jackson Hole Guide

Here are their key findings:

Snared and Entangled

- On average, one ungulate per year was found tangled for every 2.5 miles of fence.
- Most animals (69% of juveniles and 77% of adults) died by getting caught in the top two wires while trying to jump a fence.
- Juveniles are 8 times more likely to die in fences than adults.
- Mortalities peaked during August, when fawns were weaned.
- Woven wire fence topped with a single strand of barbed wire was the most lethal fence type, as it easily snared and tangled legs between the barbed wire and rigid woven wire.
- 70% of all mortalities were on fences higher than 40".

Steve Primm

Bryce Andrews

Elk, deer, and other ungulates often die if their legs tangle in wire fences. Woven wire topped with barbed wire was found to be the most lethal type of fence, especially for young wild ungulates.

Randy Gazda

TIP:
IF YOU ATTEMPT TO RESCUE A TANGLED AND STRUGGLING ANIMAL, AND YOU CAN SAFELY DO SO, COVER ITS HEAD WITH A CLOTH OR COAT TO HELP CALM IT.

Above: This badly tangled pronghorn was fortunately freed by the photographer, who was able to clip the wires.

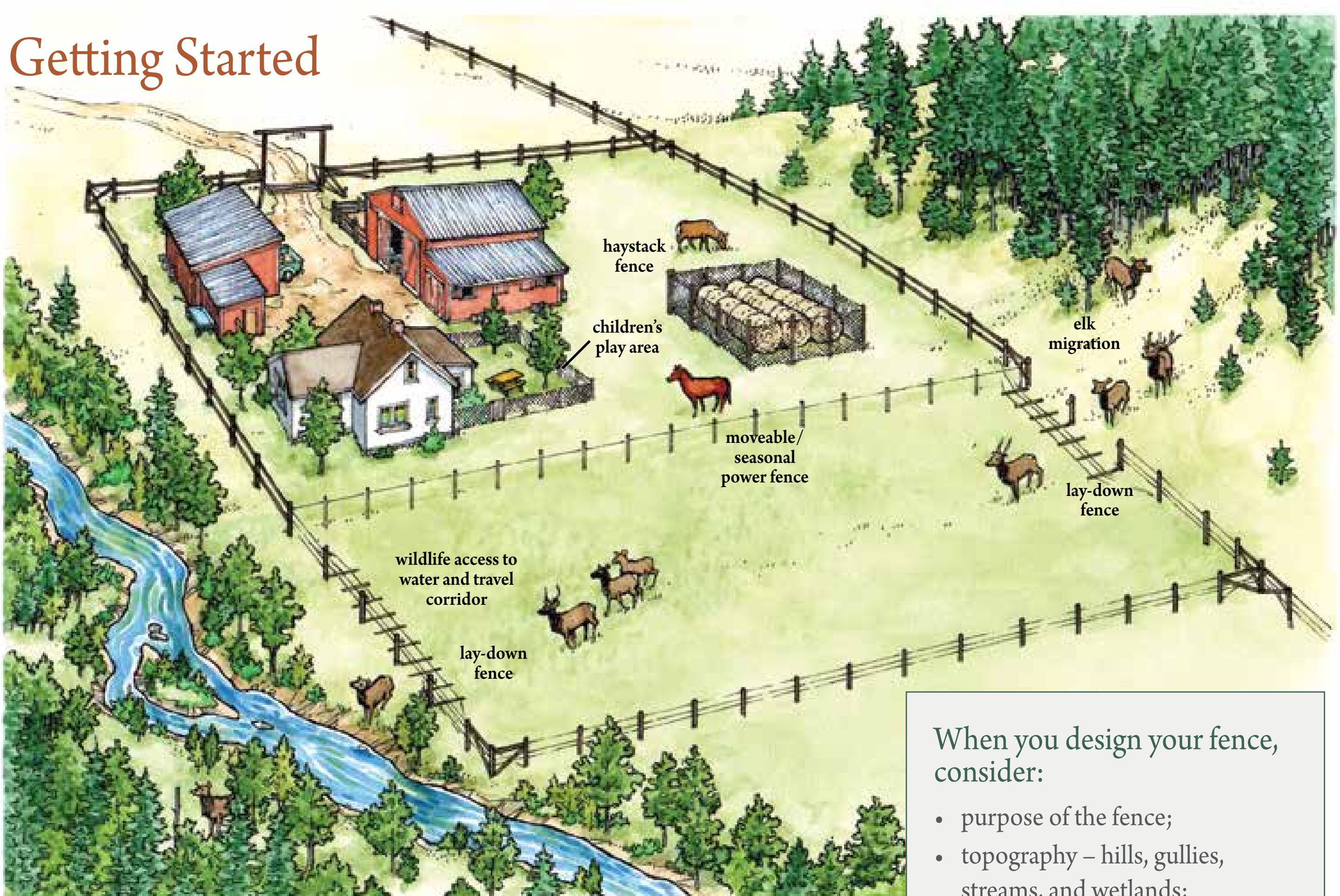
Blocked and Stranded

- Where ungulates were found dead next to but not in fences, on average one ungulate per year died for every 1.2 miles of fence.
- 90% of these carcasses found near fences were fawns lying in a curled position – probably separated from their mothers when they could not cross.
- Most of these indirect mortalities were found next to woven wire fences.

Tim Stevens

Antlered animals can become fatally tangled in poly rope fence and loose barbed wire. Maintaining fence tension and using high-tensile wire for electric fences can help prevent such losses.

Getting Started



The best situation for wildlife is open habitat with no fences at all. Wherever possible, remove obsolete fences that are no longer needed.

Where you need to fence, less fence is better. Established fences can be modified to allow easier passage, and new fence can be designed with wildlife in mind.

To get started, consider your needs and create a plan. You can tailor any of the designs in this guide to your specific needs.

First consider these questions:

1. **What is the purpose of the fence?** Do you need to mark a boundary? Deter trespass? Enclose or exclude livestock? If your fence is for livestock, what kind, in what seasons, and for how long? ***Your purpose should determine your fence design and placement.***
2. **What is the topography?** Are you fencing on hills, in rocky country where posts cannot be driven, or near or across streams or wetlands? ***Design your fence to avoid creating traps for wildlife.***
3. **Which wildlife species are in your area?** ***Build fence or crossings that both young and adult animals can negotiate.***

When you design your fence, consider:

- purpose of the fence;
- topography – hills, gullies, streams, and wetlands;
- species of wildlife present;
- daily or seasonal wildlife movements in the area;
- presence of water, food, and cover for wildlife;
- presence of young animals.

4. **What are the daily or seasonal wildlife movements in the area?** Do animals calve or nest nearby? Does wildlife migrate through to winter or breeding areas? ***Allow movement and access through natural corridors and habitats.***

Most fences can be designed or modified to allow easier and safer passage for wildlife.

Fence and Crossing Placement

Placement of fences is just as important as the type of fence used.

Fences need not restrict wildlife movement everywhere on your property. Wherever possible, design your fence to provide wildlife free travel to important habitats and corridors, as well as access to water. Wetlands and riparian habitats are especially important for all wildlife.

Watch for daily and seasonal wildlife movement patterns and look for trails. Use impenetrable, special-purpose fence only in specific areas where it is critical, such as calving or lambing pastures, haystacks, gardens, orchards, children's play areas, or kennels.

Design property boundary fence so wildlife can easily cross, or with gaps or lay-down sections for wildlife passage whenever and wherever livestock are not present.

Work with your land's topography. Swales, gullies, ridges, and stream corridors can funnel wildlife through an area. Keep these open to allow wildlife passage and avoid topography traps.

A fence of any height is more difficult to cross when placed across a steep slope or next to a deep ditch. As ground slope increases, the height an animal must jump to clear the fence increases considerably. For instance, a 42" fence may be passable on level ground, but a slope of only 10% increases the effective fence height to 48.6"; a slope of 30% increases effective height to 62"; and on a 50% slope animals encounter an obstacle 75" high. **Fences on steep slopes become nearly impossible for animals to jump over without injury.**

Christine Paige

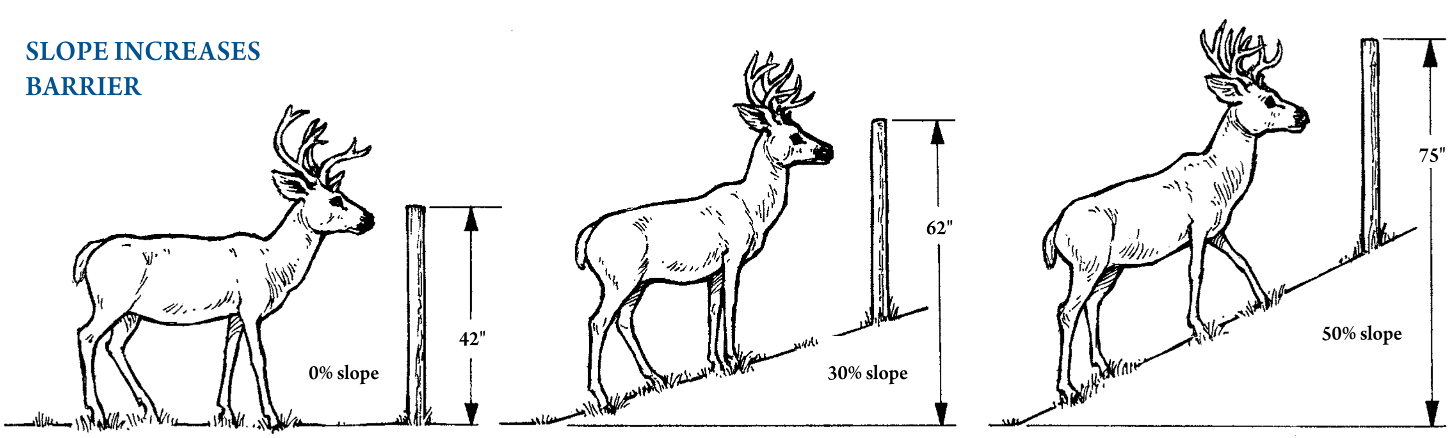
Tailor your fences to specific needs and allow wildlife access to water, important habitats, and travel corridors.

Christine Paige

Good Fence Placement Tips

- Look for wildlife trails and watch for seasonal patterns.
- Provide wildlife access to riparian habitats, water holes, and other high quality habitats.
- Provide passage along swales, gullies, ridges. and stream corridors.
- Use the appropriate fence design for each activity.
- On slopes and in natural travel corridors, plan for wildlife crossings.

SLOPE INCREASES BARRIER



An Ideal Fence

A fence that is friendly to wildlife should:

- Allow animals to jump over and crawl under easily without injury;
- Be highly visible for both ungulates and birds.

You can combine or tailor many of the ideas presented in this guide to your specific situation.

The top wire or rail should be low enough for adult animals to jump over, preferably 40" or less, and no more than 42" high. The distance between the top two wires should be no less than 12" apart. Deer and elk easily tangle their back legs if the top wires are closer together.

The bottom wire or rail should be high enough for adult pronghorn and young wild ungulates to crawl under. The bottom wire should be a minimum of 16" from the ground and preferably at least 18." Take advantage of small dips, swales, and gullies to provide a slightly larger gap below the fence and allow animals to pass under easily. Many cattle ranchers have found that although a small calf may slip under the higher bottom wire, it can also easily slip back again to its mom and not be stranded on the wrong side of the fence.

ALTHOUGH CALVES MAY SLIP UNDER A HIGHER BOTTOM WIRE, THEY CAN ALSO SLIP BACK AGAIN TO MOM AND NOT BE STRANDED.

Increasing visibility using a top rail, high-visibility poly-wire, flagging, or other markers can help ungulates and birds better avoid or navigate fences. Using smooth wire – such as barbless twisted wire – for the top and bottom strands will prevent snagging and injuries.

Use electric tape or braid only for temporary applications. It should be removed or lowered to the ground when livestock are not present.

In some situations, fence stays can help maintain distance between strands, prevent sagging, and reduce the chance of entanglement. However, wire stays are easily bent over, collapsing the fence and creating a three-dimensional hazard, and need to be regularly maintained. An alternative is a stiff plastic or composite stay or fiberglass post that flexes but maintains its shape.

In wildlife migration areas, drop-down fence, lay-down fence, or other crossings can be incorporated into fence sections for seasonal wildlife passage. **Good husbandry practices go hand-in-hand with wildlife friendlier fences. Livestock that have good forage and the security and companionship they want are much less likely to test or challenge fences.**

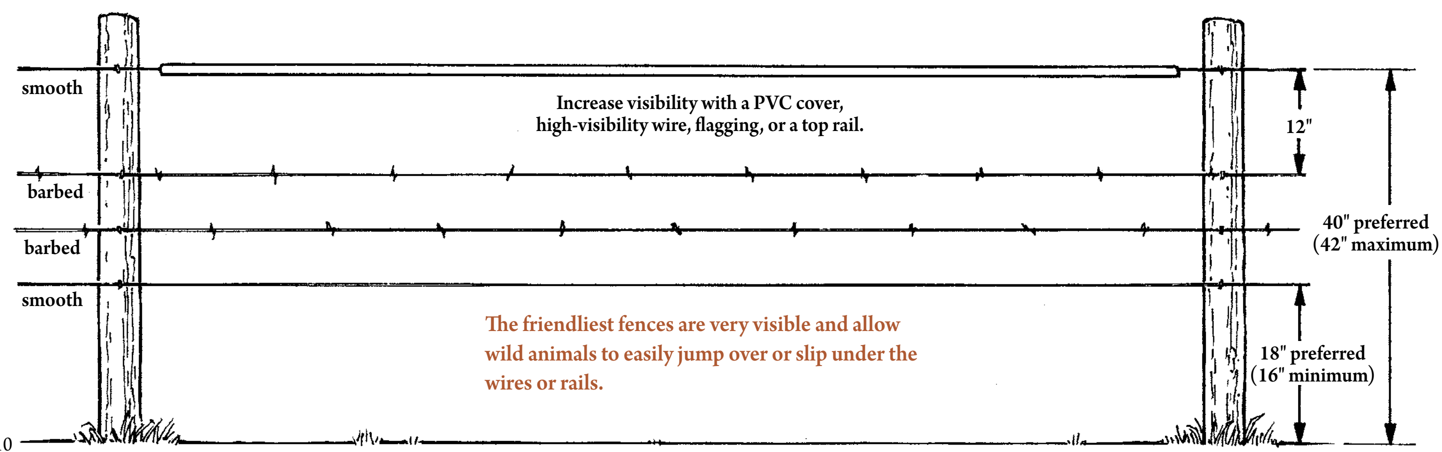
The Wildlife Friendly Fence: A Livestock/Wildlife Compromise

These standards will control cattle in most situations and allow for easier wildlife passage.

Fences should have top wires low enough for adult animals to jump, bottom wires high enough for wildlife to crawl under, and minimize the chance of tangling. We recommend:

- A top wire or rail preferably no more than 40" and a maximum of 42" above the ground;
- At least 12" between the top two wires;
- A bottom wire or rail at least 16" and preferably 18" above the ground;
- Smooth wire or rail for the top, smooth wire on bottom;
- Preferably, no vertical stays. If used, consider stiff plastic or composite stays, or regularly maintain wire stays that are easily bent;
- Posts at 16.5-foot intervals;
- Gates, drop-downs, or other passages where wildlife concentrate and cross.

IDEAL WILDLIFE FRIENDLY FENCE



Christine Paige

Jay Kolbe

Visibility

Running animals and low-flying birds may not see a wire fence clearly against the landscape. Making a fence highly visible prevents collisions, and can help animals judge the height of a fence for jumping.

One solution is a top rail. A rounded rail is preferable as it sheds snow more easily – heavy snow buildup can sometimes deter elk and deer from crossing. For wire fences, an inexpensive modification is to slip sections of small-diameter PVC pipe over the top strand.

Smooth wire fences, especially high-tensile wire, may be essentially invisible to animals. Depending on the type of fence, these can be made more visible by adding PVC pipe, flagging, fence markers, or highly-visible polywire or polytape on the top strand. Twisted barbless cable is more visible than a single wire strand, and high-visibility wire is available in many forms – tape, braid and polymer-coated wire – many of which can be electrified if needed. White wire is the most visible in summer, but black and white wire or tape makes the fence visibly obvious against both summer vegetation and snow.

High visibility helps wildlife negotiate fences. It is especially important in grasslands and near creeks and wetlands to protect low-flying birds, such as grouse, owls, and swans. PVC pipe, flagging, or black and white wire or tape all help wildlife see fences.

Montana Fish, Wildlife & Parks

Fence Flags for Grouse and Other Birds

Fence flags or markers dramatically increase visibility of wire fences for wildlife, especially birds, and help animals avoid and negotiate fences.

RESEARCH ON SAGE-GROUSE IN WYOMING, IDAHO, AND MONTANA HAS SHOWN THAT FENCE MARKERS CAN REDUCE FENCE COLLISIONS BY 70% TO MORE THAN 80%.

Research on sage-grouse and other prairie grouse has shown that fence collisions are common and widespread, especially near breeding areas.

Grouse fly fast and low into their mating areas (called “leks”) just before dawn and, in the dim light, are vulnerable to colliding with nearby fences.

However marking fence for visibility can dramatically reduce collisions by 70% to 83% (Christiansen 2009; Stevens et al. 2012b).

Jeremy Roberts, Conservation Media

Mark Gocke

Markers for Wire Fence

For barbed or woven wire fence:

- Cut several 12′ strips of “undersill” or trim strips of white vinyl siding, available at home hardware centers.
- Cut strips to 3" pieces. Use tin snips for small projects or, with proper ventilation, use a 10" miter saw with a 200-tooth blade to cut up to 16 pieces at a time for larger projects.
- One 12′ siding strip yields 48 pieces.
- For extra visibility, add reflective tape to both sides of the markers, which increases detection in low light. Or use both black and white markers for visibility against snow and vegetation.
- Snap pieces onto fence wires – they are held in place between barbs. **Wyoming Game and Fish has found that, for each 16' section of fence, a minimum of two pieces with reflective tape on the top wire is effective.** Or, alternate four pieces of black and white markers on the top wire. Marking a lower or bottom wire will increase visibility for pronghorn and other wildlife.

For smooth wire fence:

- To keep the vinyl siding markers from sliding, crimp a ferrule, twist a small spring, or tighten a UV-resistant zip-tie (tie-wrap) onto the wire on each side of the marker. Although this adds time to installation, it keeps the markers in place. Crimping the marker itself causes the marker to wear and break.
- An alternative is to make flags from reflective tape that can adhere to the wire. (Note, however, that reflective tape will conduct power on a hot wire.)
- Some commercially made markers available online or in ranch supply outlets may work better on smooth wire.
- Place a minimum of two flags per 16' section of fence on the top wire; or up to four on the top wire and three on the middle or bottom wire.

Not every mile of fence needs to be marked for grouse. Marking is most important where there are high densities of birds: within 1.2 miles of a lek and in wintering areas. Also, sage-grouse are most vulnerable to collisions in open, flat, or rolling country, and in areas with many fences (>1.5 miles of fence per square mile; Stevens et al. 2012a, 2012b).

A relatively inexpensive and durable marking technique uses 3" flags cut from vinyl "undersill" or trim siding strips. The undersill siding has a lip that can be snapped onto barbed wire fence, with the barbs keeping the markers from sliding.

As an alternative, commercially produced fence markers can be purchased through a number of retail and mail order outlets.

For example, the Firefly Diverter (**www.fireflytechproducts.com**) has UV-visible reflective tape. Fly Safe (**www.flysafellc.com**) works on barbed wire. The See-A-Fence marker (**www.knifesedgellc.com/seeafence.html**) and Fence-flag (**www.fenceflag.com**) work on smooth wire fence.

While marking the top wire only is effective for grouse, adding markers to lower wires may also help pronghorn and other wildlife that slip under fences.

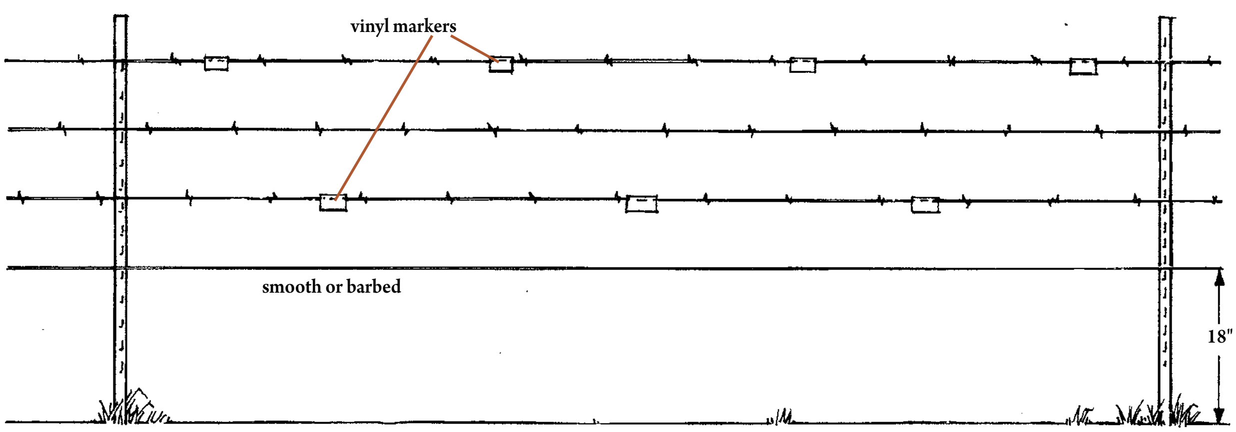
Durable and lightweight fence markers can be cut from strips of vinyl siding trim. The trim strip has a lip that easily snaps onto fence wires.

Tom Christiansen

Bruce Waage

Christine Paige

DURABLE MARKERS ON WIRE FENCE



Sites with Low or Seasonal Livestock Use

Not all situations require a 5-strand barbed wire or woven wire fence. Many situations with low or seasonal livestock use can be fenced with a 3-strand smooth wire fence, various types of post and rail fences, or moveable electric fence. Seasonal pastures, cross fences, and horse pastures lend themselves to designs that are much more permeable for wildlife.

3-Strand Smooth Wire Fence

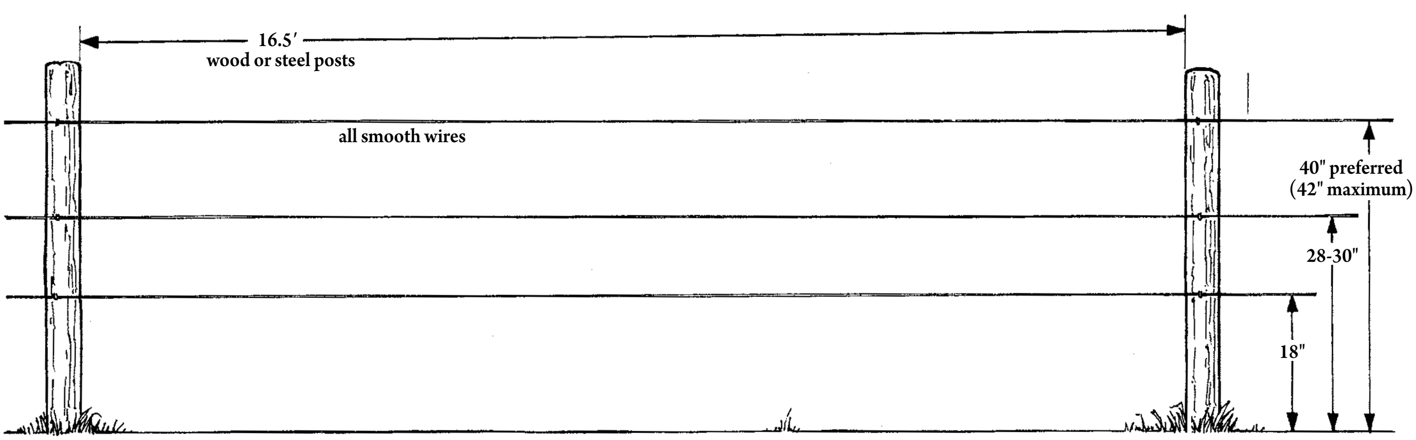
Use 3 strands of smooth (barbless) wire. To increase visibility, use coated wire or barbless twisted cable – the latter can also be more durable than single strand smooth wire. (Note that high-tensile wire should only be used for electrified applications. High-tensile can also be difficult for animals to see, and horses can sometimes be cut by high-tensile wire.)

Christine Paige

Christine Paige

In the center of bighorn sheep winter range, this smooth wire fence replaced old 4- and 5-strand barbed wire fence. The fence is 3-strand smooth wire with a 39" top wire and 16" bottom wire. Bighorn sheep now readily hop over and duck under the fences.

3-STRAND SMOOTH WIRE FENCE



FENCE SOLUTIONS PUT TO THE TEST

Wildlife Friendly Klick Ranch

"When I drove in here yesterday, I parted mountain sheep like Moses did the Red Sea." Dick Klick is talking about the road to his place at Castle Reef, 23 miles west of Augusta, Montana. Dick and his wife, Nancy, winter their horse herd here, and have made some adjustments to deal with the bighorn sheep, deer and elk that share their property.

On their winter place, the Klicks build mostly four-wire fence. The top two wires are barbed, while the bottom two are smooth. The top wire is hung 54" from the ground, and the wires are spaced 10" apart (24"–34"–44"–54" spacing). The fence hangs from six foot steel posts spaced on 17-foot centers.

Although the top wires are very high, the high clearance under the bottom wire allows wildlife to easily slip under and avoid accidental entanglement. When Dick notices an area that is used consistently by wildlife, he often pulls staples on sections of his bottom wire, raising it up to the level of second wire to make crossing even easier. Even modified this way, the fences effectively contain his horses.

In the summer, the Klicks graze their horses at the head of the Gibson Reservoir,

Christine Paige

on a 3,000-acre Forest Service allotment bordering the Bob Marshall Wilderness. Their place is remote, accessible by jet boat or horse depending on the season.

On the doorstep of the Bob Marshall, the Klick's allotment is used extensively by wildlife. In summer and early fall, the horses share the range with a large number of elk. Wherever possible, the Klicks have relied on natural barriers such as cliffs, steep slopes, and box canyons to contain their horses. To keep wildlife from damaging the three miles of fence they've built on the allotment, Dick and Nancy have experimented extensively with design, location, and wire spacing.

On their summer place, the layout they favor is two barbed wires, the top wire at 48", the bottom wire 8" below that at 40", leaving ample clearance below. "It's 99% good for holding horses," says Dick. "The bull elk jump it, and everything else goes under easily, without even causing a ripple."

Dick stresses the importance of fence visibility in reducing wildlife conflicts. **He finds that fencing through dense trees often results in wildlife damage.** Because of this, he generally leaves a buffer zone between his fence and the tree line in meadows. When forced to go through trees, and if his Forest Service lease allows it, **Dick clears a pathway on either side of the fence to increase its visibility to wildlife.**

Replacing old fence with new, more wildlife friendly designs takes thought and effort, but Dick seems happy with the balance he's struck. The new fences are easier to maintain, and stand up better to wildlife crossings and snow drifts. "I'm getting older," Dick says. "I don't like to see a quarter-mile of fence strewn across the place by wildlife. We must work with animals up here."

– Bryce Andrews

Christine Paige

Seasonal Electric Wire Fence

A flexible electric fence that allows passage for elk and other ungulates can still be effective for livestock, particularly horses trained to electric fence. It can be laid down seasonally to allow free wildlife passage. This fence is useful for keeping livestock out of sensitive habitats or for short-duration grazing where permanent fence isn't desired.

To work properly, this fence needs to flex as elk and other animals pass over it. Install as few rigid post supports as possible, and use the minimum recommended wire tension. Placing the energizer toward the middle of the fence will afford the greatest electrical efficiency.

Seasonal Electric Wire Fence

- Use pre-drilled 72" x 1" heavy fiberglass posts.
- Drive posts 24" into the ground at a 32-foot spacing (a t-post pounder can be used if ground is soft).
- Use treated wooden posts for bracing at ends and center.
- Place a top wire of conductive high-visibility tape, braided wire, or polymer-covered wire no higher than 42" height, electrically charged (medium-tensile 12-gauge plastic-coated wire is satisfactory).
- Place a second grounded strand of high-tensile wire at 30".
- Attach strands to fiberglass posts with wire clips that can be removed when fence is laid down.
- Use insulators for attaching hot top wire to wooden posts; grounded wire can be stapled or clipped directly to wooden posts.
- Use a solar electric energizer (size and placement depends on the run length of fence).
- Hard-wiring is an option when a power source is readily available.

Jay Kolbe

This 2-strand seasonal power fence can be used where livestock are trained to electric fence. Wooden posts brace the ends. The fiberglass posts can be laid down when the fence is not in use.

Jay Kolbe

FENCE SOLUTIONS PUT TO THE TEST

Collaboration in the Blackfoot Valley

“Zero maintenance – it’s been amazing,” says Juanita Vero of her new stretch of electric fence. Juanita, the fifth-generation owner and manager of the E Bar L guest ranch in Montana's Big Blackfoot Valley, has fixed her share of damaged fence. On the E Bar L, 80 head of horses share 4,000 acres of range with large numbers of deer and elk.

> When I asked my 91-year-old grandfather if the fence project was a success, he quipped, “We wouldn’t do it if it wasn’t gonna work.”
>
> – Juanita Vero

Juanita Vero

The vast majority of fences on the property are built with three- or four-barbed-wires hung from steel posts. Though these designs worked well on some parts of the ranch, they often failed when built across elk migration corridors. One particularly troublesome stretch ran for a half mile along the edge of an irrigated hay pasture. Elk crossed the fence on their daily circuit between the Blackfoot River and a stand of timber, frequently causing damage. The Veros were ready for an innovative approach to fencing, and they sought the help of Jay Kolbe, Montana Fish, Wildlife & Parks biologist, to help design the project.

Under an agreement to evaluate the design, and splitting costs and labor, FWP and the Veros built a two-wire electrified fence on 1" diameter fiberglass posts spaced approximately 32' apart. The top wire, hung 48" off the ground, is a high-visibility, plastic-sheathed, conductive wire designed especially for horses. The lower ground wire, hung at 40", is standard 12.5 gauge high-tensile steel.

The new fence works well. “Elk go right through it,” Juanita says. “When nobody is putting pressure on them, even the big bulls go under with no problem.” It holds their herd of horses well, too, although Juanita remains uncertain whether the fence would adequately contain other types of livestock.

The Veros have experimented successfully on other parts of the ranch. They use temporary electric fence to divide pastures into smaller units, allowing them to better control the way their herd grazes. Because this polywire fence is a single-strand design, it is highly permeable to wildlife.

Although most fence on the property remains barbed-wire, and the cost of replacing it with electric fence is high enough to be prohibitive, Juanita is upbeat about the potential for future innovation: “The best thing of all is that we have good agency people like Jay to work with, and a history of collaborative conservation in the Blackfoot Valley to build on.”

– Bryce Andrews

Photo: Dave Hucker

Moveable Electric Wire Fence

Moveable electric fence can be used for short-duration grazing, to keep livestock out of sensitive areas such as wetlands, or for other situations where livestock need to be temporarily controlled. This fence works well for livestock that have been previously trained to electric fence.

The design can be tailored to your situation, but a simple fence can be constructed using high-visibility tape or "turbo wire" and fiberglass posts or plastic-insulated steel posts. A moveable fence can use either a single hot wire (when there is sufficient moisture for an adequate ground) or two wires, the top one hot and the lower wire grounded. Moveable posts on the market include designs with hooked or pigtail tops for quickly stringing wire, and a tread-in base. These can be rapidly set up and moved as needed.

Moveable Electric Wire Fence

- Use 40" to 42" fiberglass or plastic-insulated steel posts, designed with hooks or loops for wire and tread-in spikes at the base.
- Place one to two strands of high-visibility tape or polymer-covered turbo wire. If using two wires, the top should be hot, the lower wire grounded. Top wire should be no higher than 42"; lower wire no lower than 18".
- Use a solar electric energizer (size and placement depends on the run length of fence).

Tips on Electric Fences

Most electric fence problems are caused by poor grounding. Follow the manufacturer's specifications for grounding the energizer and fence for your fence type and conditions. The number of ground rods needed may vary; a maximum reading of 0.2kv on a volt meter in dry conditions indicates an adequate ground. Wooden and steel fence posts require insulators for attaching hot wires; ground wires can be stapled or clipped on directly. Fiberglass and plastic line posts do not need insulators, but do require special clips for attaching wires. Check the fence regularly to be sure it is charged.

Seth Wilson

Christine Paige

A temporary electric fence can be used to keep livestock out of sensitive areas or to manage pasture use, and is easily negotiated by most wildlife.

Post and Rail Fence

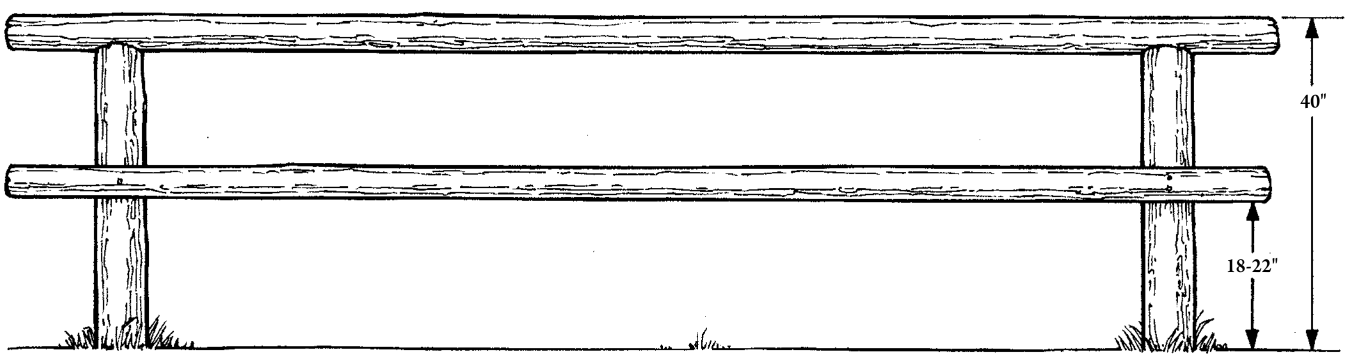
A post and rail fence is highly visible to wildlife and can be constructed for situations with or without livestock. Rail fences can either use a top rail with wires below, or two to three rails total. A 2-rail fence is preferable to a 3-rail fence for wildlife. Unless the fence is quite low, use rounded poles for the top rail rather than a square or split-rail to prevent too much snow build-up in winter, which can deter elk and deer. Also, unless the fence is low enough to be easily jumped over and there is ample clearance underneath, boards or planks are not recommended, as these can create a visual barrier.


Christine Paige

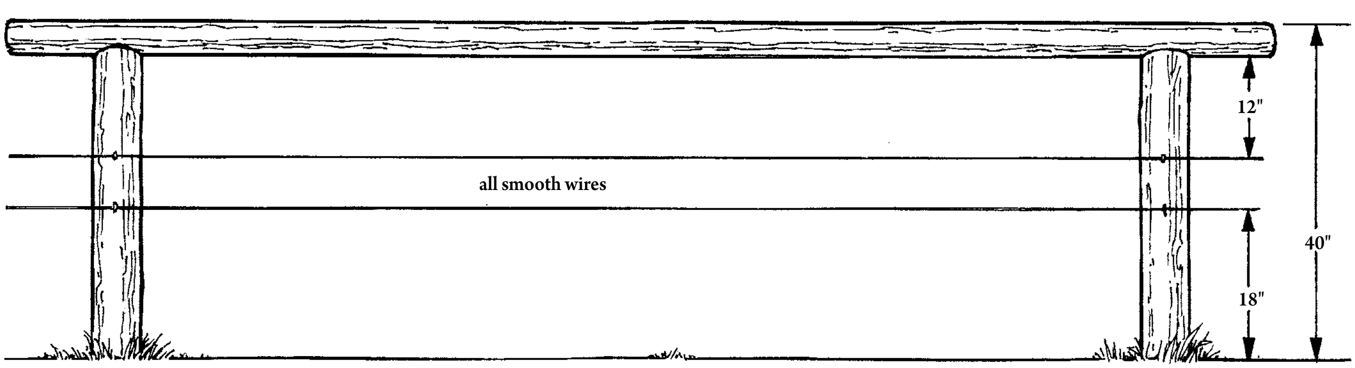
Post and Rail Fence

- Use pressure-treated 6′ to 8′ posts, spaced 10′ to 14′ apart.
- Use pressure-treated poles for top rail, placed no more than 40" above the ground. A half-round rail will attach more snugly and require shorter bolts.
- Place smooth lower wires at 18" and 28" above the ground. Second wire should be at least 12" below top rail.
- OR use pressure-treated poles for lower rails, the bottom rail placed with at least 18" clearance from the ground.

POST AND RAIL FENCE



POST AND WIRE FENCE



Sites with High or Continuous Livestock Use

Most livestock pastures do not require a 5- to 6-strand barbed wire fence. In many situations, a 3- or 4-strand barbed wire fence, a combination of smooth and barbed wire, or a high-tensile electric fence will work well for livestock control, particularly if the pasture quality inside the fence is as good or better as outside the fence.

Tips for Livestock Fences

Sheep, bison, and cows with calves may require a more impermeable fence for control. If you must use fences with woven wire or more than four wires follow these tips:

- Consider the placement of the fence perimeter carefully, and limit the extent of impermeable fence wherever possible.
- Avoid excluding wildlife from streamsides and water sources, or cutting off migration and travel corridors.
- Keep the fence height to a maximum of 40" to 42" and create periodic crawl-openings for fawns and calves by raising the bottom 18" from the ground, placed where animals typically travel.
- Avoid topping woven wire fences with barbed wire. In any situation, allow 12" between the top wire and the next wire below – whether barbed or woven wire.
- Create seasonal openings using lay-down fence sections or gates to open the fence during months when livestock are not present.

Christine Paige

Christine Paige

Create seasonal openings by leaving a gate open, lowering rails or wires, or using sections of lay-down fence during months when livestock are not present.

4-Strand Wire Fence for Cattle or Sheep

Woven wire fence, the most commonly-used type of fence on sheep range, is also the most problematic for wildlife. It can block wildlife passage, particularly for fawns, calves, pronghorn, and medium-sized animals unable to jump fences. When combined with barbed wire, it has the highest rate of entanglements for wildlife.

An alternative for sheep and cattle range is a 4-strand barbed wire fence that controls livestock but still allows for passage of pronghorn, deer, moose and elk.

For cattle, use a wire spacing of 18"–22"–28"–40"/42". The top wire should be at 40" to 42" or less. Allow 12" between the top two wires and 18" between the bottom wire and the ground. Use a smooth bottom wire.

Sheep require a low fence that would block most wildlife from crawling beneath the fence. However, a 4-strand fence for sheep can have a top wire no more than 32" high, which is low enough for most wildlife to jump. Allow at least 10" between the top two wires. A lower fence is easier for deer and elk to jump over, and the 10" spacing between top and second wire will usually be adequate. The bottom wire should be smooth wire and at least 10" above the ground.

A bottom smooth wire aids passage for pronghorn and other wildlife.

Sheep and Cattle 4-Strand Barbed Wire Fence

(Adapted from Wyoming Game and Fish Dept., 2004)

Recommended Wire Heights Above the Ground

	Cattle	Sheep	Sheep and Cattle
Top wire	40" to 42" barbed	32" barbed	38" barbed
2nd wire	28" barbed	22" barbed	26" barbed
3rd wire	22" barbed	16" barbed	18" barbed
4th wire	16" to 18" smooth	10" min. smooth	10" min. smooth

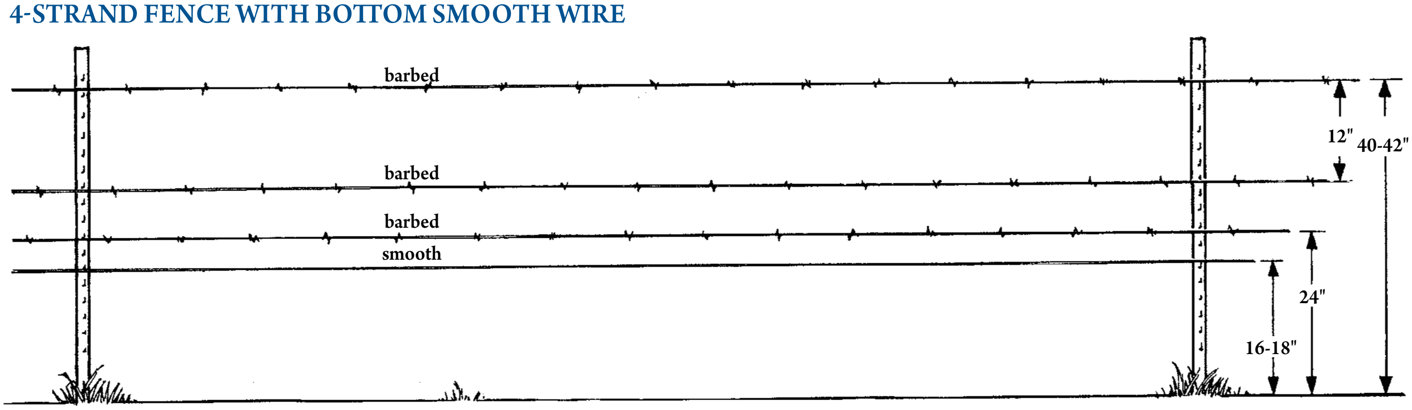
Combination Smooth and Barbed Wire Fence

In many situations, a combination of smooth wire and barbed wire can effectively contain livestock and allow for easier wildlife passage. Smooth wire can be used for the top and bottom wires and one to two barbed wire strands are used for the center strands. Barbless twisted cable wire or coated wire will increase visibility for wildlife. The top wire should be 40" to 42" high or lower, and the bottom wire at least 18" above the ground to provide wildlife clearance. Allow at least 12" between the top and second wires.

Combination Smooth and Barbed Wire

- Place top smooth wire at 40" to 42" maximum height – barbless twisted cable wire or coated wire is recommended.
- Allow at least 12" between top and second wires.
- Place bottom smooth wire at least 18" from the ground.
- Use barbed wire for center two wires.

4-STRAND FENCE WITH BOTTOM SMOOTH WIRE



Wire Suspension Fence

Suspension fences have been used successfully on ranches for decades, and with modern materials they are proving to be durable, long-lasting, and low-maintenance. Wires are suspended across a long run between anchor posts, with fence stays placed at regular intervals to keep the wires from tangling. The fence is flexible and resilient when struck by large animals, allowing elk, deer, and moose to pass over easily, yet immediately returns to shape and effectively contains livestock.

A wildlife friendly suspension fence uses no more than four wire strands. Anchor posts are spaced at least 50' apart, up to a maximum of 100' apart, or much closer in uneven terrain. Adequate bracing is essential to maintain wire tension. Posts may be treated wood, metal, or one of the commercially available bracing systems (for an example, see Southwest Fence Systems braces at **www.swfence.com**).

To maintain wire spacing, light-weight wood, fiberglass, or composite stays are evenly spaced between the posts. Be sure stays hang free of the ground and won't catch on vegetation and twist the fence as animals pass over. The stays also reduce tangling and improve visibility for wildlife and livestock. Twisted wire stays are not recommended, as they are easily bent by wildlife passing over the fence, increasing fence maintenance and the risk of entanglement.

Jeff Laszlo

This suspension fence has a top smooth wire and the stays are unanchored poles, allowing the fence to flex as wildlife passes over or under. Fiberglass or composite stays can also be used.

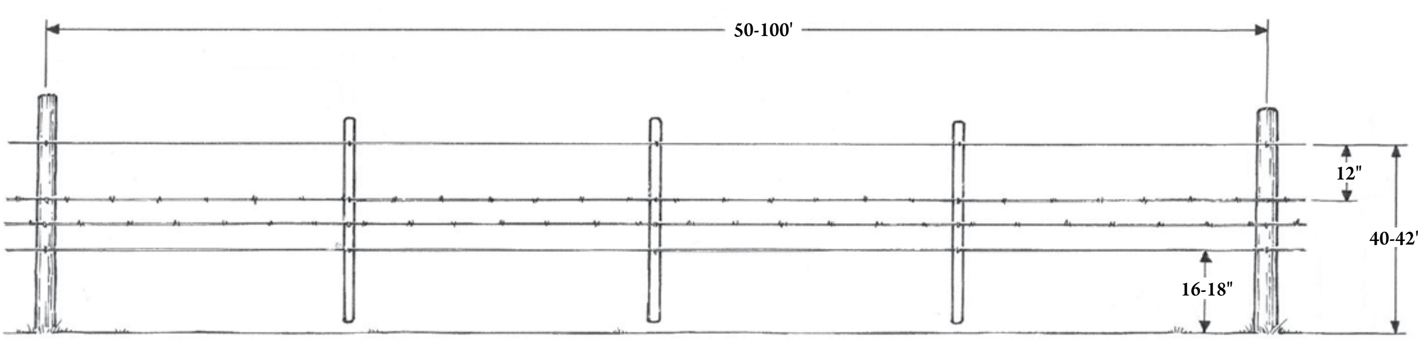
Place the top wire no higher than 40" to 42", the bottom wire at 18", and maintain 12" between the top two wires. A variety of barbed and smooth wire combinations can be used, depending on the situation. For example, use a bottom smooth wire where pronghorn or young deer, elk, or moose are present. A top smooth wire will aid passage for adult deer, elk, or moose. Use smooth wire for both bottom and top wires in areas with both pronghorn and elk, or both adult and young animals.

Suspension fence has the advantages of using far fewer posts than conventional fence – a savings in materials and labor, and a benefit where posts are difficult to drive. It also reduces or nearly eliminates long-term maintenance.

Wire Suspension Fence

- Place anchor posts 50' to 100' apart; closer in uneven terrain.
- Use sufficient bracing to maintain wire tension.
- Use a maximim of 4 wires: maximum 40" to 42" top wire, minimum 18" bottom wire, and 12" between the top two wires.
- Evenly space lightweight fence stays (wood, fiberglass, or composite) between the anchor posts. Easily bent wire stays are not recommended.
- Use smooth wire on top and bottom to ease wildlife passage.
- Suspension fence should be periodically checked for twisting, especially during peak migration/movement periods.

WIRE SUSPENSION FENCE



Better Grazing, Thriving Streams and More Wildlife on the Granger Ranches

Jeff Laszlo is the fourth generation to operate the Granger Ranches, his family's traditional cattle ranch in Montana's Madison Valley. Spanning 13,000 acres between the soaring Madison Range and trout-laden Madison River, the ranch is a significant corridor for wildlife that move daily and seasonally through the valley, north and south, east and west.

In Jeff's grandfather's day, the family operated under the best understanding of husbandry of the time, draining wetlands, diverting streams, and creating a system of ditches to irrigate pastures. Today Jeff has taken a different approach to managing the ranch resources.

"We were looking for new ways to do business," he explains. In 2005, Jeff and his family undertook a long-term wetland and stream restoration project across the ranch. With technical expertise and financial help from a wide variety of non-profit, state and federal agency partners, Jeff has restored nearly 700 acres of river-bottom wetlands and 10 miles of spring-fed stream channels. The spring creeks once again hold trout, and in less than five years the birds have flourished from only 10 species to more than 100.

As part of the project, Jeff installed wildlife friendly suspension fence to keep his cattle out of the rejuvenating wetlands and streams while allowing wildlife to move through. FWP biologist at the time, Craig

On the Granger Ranches, extensive restoration of spring creeks and wetlands plus broad use of wildlife friendly fences have not only improved grazing and increased habitat for wildlife, but reduced fence maintenance.

Jeff Laszlo

"We were looking for a new way to do business," says Jeff Laszlo, 4th-generation owner of the Granger Ranches, seen here with his niece Caitlyn.

Jourdonnais offered help with the Granger Ranches' fence projects. "Working together leads to a lot of interesting possibilities," says Jeff. He liked the design so much he has installed wildlife friendly fence throughout the ranch, wherever old fences need replacement.

Jeff uses a 4-wire suspension fence, with his top wire no higher than 40" and bottom wire at 18" off the ground, the middle wires evenly spaced. Treated wood anchor posts are driven 50' apart and 3 wooden stays keep the wires spaced and taut. The fence then flexes and rebounds as elk, deer, or pronghorn pass over or under it.

On the uplands, where they have a lot of pronghorn, Jeff uses a smooth bottom wire to make passage under the fence easier. On the river bottom, they have more moose, so he reverses the design and uses a smooth top wire with three lower barbed wires.

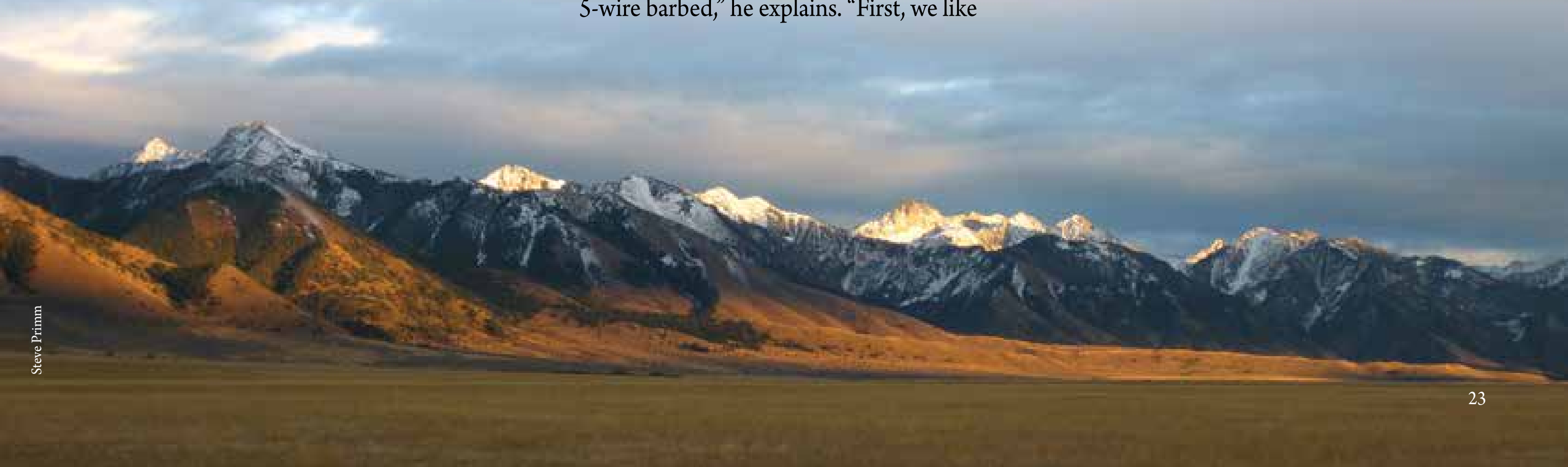
"It's a better way to fence than standard 5-wire barbed," he explains. "First, we like wildlife and have a lot on the ranch, and second, the suspension fence requires a lot less maintenance."

In addition to the permanent suspension fences, Jeff (in partnership with the Madison River Foundation) uses seasonal single poly-wire electric fence to intensively manage his grazing, especially in the river bottom where annual freezing and overflows make permanent fencing impossible to maintain. The seasonal fence allows Jeff to rotate pastures, control exactly where his cattle graze, and closely manage his grass.

"It produces better calves and leaves the land in better condition," Jeff explains. "It's important to me financially, but also important to me to leave better habitat. People value owning property with great wildlife values."

The intensive grazing management, he continues, "is especially important in a year like this with dry conditions and short grass. It's important to use the grass efficiently and not overuse it, which would potentially create costly issues – such as weeds and ground left less productive for future years."

"The typical ranch can't do this type of thing without partnerships, and that requires developing trust." Jeff adds. "I was willing to try a few things and learned there's a lot of common ground. We really appreciate the support that FWP has given the ranch. It has resulted in benefits for us as a ranch and for FWP's management of wildlife resources. It really makes sense for agricultural producers to use wildlife friendly fences, as they are less costly, allow for flexibility, and seem to last longer."



Steve Primm

3-Wire High-Tensile Electric Fence

Researchers in Wyoming found that a flexible 3-wire high-tensile fence (with a hot – ground – hot configuration) is not only effective for containing cattle and bison, but also allows elk, mule deer and pronghorn to traverse the fence. They found that wild ungulates usually were not deterred by electric fences even with charges ranging from 0.5 and 4.5 joules, perhaps because of the insulating properties of their hair. Although wild ungulates were occasionally shocked when they nosed or bit a wire, or touched hot and grounded wires together, most animals readily negotiated the fences (Karhu and Anderson 2003, 2006).

Further, the researchers determined that 3-wire fences effectively contained bulls separated from cows coming into estrus, and calves from cows in the fall. Also, they found that a 3-wire fence was just as effective for containing bison as a 4-wire fence. A 2-wire fence can be used for areas without weaning calves but, curiously, pronghorn showed a high aversion to 2-wire fences, perhaps because of the novel height and their general reluctance to jump fences rather than crawl under (Karhu and Anderson 2003, 2006).

High-tensile fences require proper construction techniques, including adequate braces, proper tensioning, care not to kink or break wire, and proper attachments and insulators for line posts and braces. The flexibility of the fence is key to allowing wildlife to pass over and through the fence. Fiberglass posts are used for all line posts, and wooden posts are used only for braces, direction changes, and gates.

High-tensile fences need minimal maintenance, provide great strength, can be easily electrified, and will outlast most other fences. For technical details, see the Natural Resources Conservation Service (NRCS) specifications for permanent power fence (NRCS 2006a).

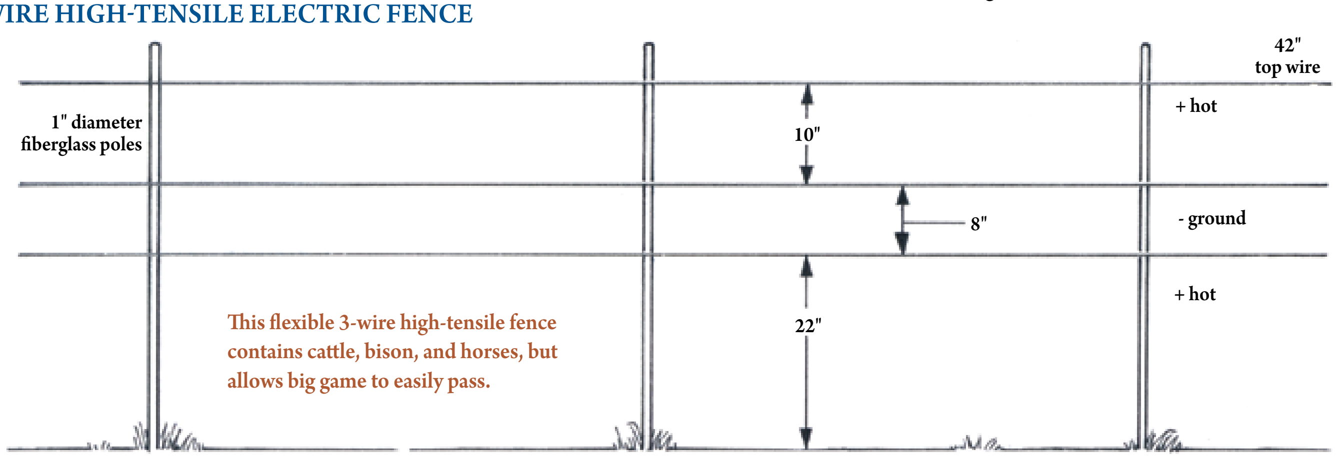
Rory Karhu

A 3-wire high-tensile electric fence is effective even for separating bulls from cows in estrus, and for containing bison. Using high-tensile wire at the proper tension is key to prevent wildlife damage.

Note that smooth high-tensile wire can be difficult for animals to see. Adding markers or survey flagging to the top wire can help. Commercial examples that work on smooth wire include the See-A-Fence flag (**www.knifesedgellc.com/seeafence.html**) and Fence-flag (**www.fenceflag.com**).

Keeping the fence powered prevents wildlife from leaning into it. If power is off, consider laying the fence flat to the ground if it will not create an entanglement hazard.

3-WIRE HIGH-TENSILE ELECTRIC FENCE



This flexible 3-wire high-tensile fence contains cattle, bison, and horses, but allows big game to easily pass.

Rory Karhu

3-Wire High-Tensile Electric Fence

Maintaining fence flexibility is key to allowing wildlife to traverse the fence.

- Use fiberglass line posts no greater than 1" in diameter.
- Brace fence with wood posts at least 5" in diameter; brace all corners, gates, and direction changes greater than 15 degrees. Appropriate insulators are needed with wooden posts.
- Space line posts 45' to 60' apart and do not use stays. Fence stays make it harder for wildlife to pass between the wires, and may cause the fence to flip.
- Smooth, 12.5-gauge, Class III galvanized wire with a tensile strength of 170,000 PSI and breaking strength of 1,308 lbs. is adequate.
- Increase visibility by using flagging, fence markers, or high-tensile wire coated for visibility.
- Top wire is hot; second wire is grounded; bottom wire is hot.
- Space wires at 22"–30"–40"/42" from the ground. The top wire should be no higher than 42", with 10" between the top two wires. The 10" spacing is necessary for cattle to contact both hot and ground wires, but poses little hazard for wildlife due to the fence's flexibility and lack of barbs. A bottom wire at 22" allows both young and adult wild animals to pass under easily.
- Connect wires to posts with metal clips or fasteners designed for electric fences; use porcelain insulators on wooden braces.
- Tighten wires to 150 lbs. tension. If too tight, the wires are more likely to break. Although high-tensile wire has a high breaking point, it is also more brittle, and breaks easily if tightly bent or kinked.
- Place solar energizer according to manufacturer recommendations.
- Ground fence properly according to the energizer instructions, and add extra ground rods as needed. Locate rods at fence ends and intermittently in between.
- Ground rods are relatively cheap, and extra rods will ensure the fence will be effective.
- When livestock aren't present, either drop the wires flat to the ground or keep the fence electrified to prevent wildlife damage. (Keeping the fence powered can also prevent the battery from freezing and prolong battery life.)
- Securely attach electric fence warning signs intermittently along the fence and at gates and crossing points.

FENCE SOLUTIONS PUT TO THE TEST

Power Fences on the Sun Ranch

Sun Ranch manager James Stuart and his crew keep pretty busy. The 18,000 deeded acres of the ranch, situated in the foothills of the Madison Range in southwest Montana, provide critical fall, winter, and spring habitat for thousands of elk, and year-round range for deer and pronghorn. All this wildlife traffic, combined with a summer grazing operation that brings on nearly 2,000 head of cattle, puts a lot of pressure on the fences.

Over the past decade, the Sun Ranch management has tried out innovative fence designs to improve wildlife passage without sacrificing the ability to hold cattle. To make room for experimentation, ranch staff has torn out more than 30 miles of problematic barbed wire fence over the course of the last decade, often with the help of volunteers from conservation groups like the Rocky Mountain Elk Foundation and Greater Yellowstone Coalition.

One of the simplest and most effective ways of reducing wildlife conflicts, James found, was using temporary fence wherever possible. His preferred design is a single strand of polywire – a woven mix of plastic strands and conductive wire about the diameter of baling twine – hung 36" high from fiberglass posts on 50-foot centers. Using a specially equipped wire buggy, two ranch hands can build this fence at a rate of half a mile per hour, and pick it up again at a rate of two miles per hour. The ranch owns about 8 miles worth of posts, polywire, and solar-powered energizers, which they use extensively through the summer grazing season.

Bryce Andrews

Temporary single-strand electric poly-wire fence allows for easy manipulation of grazing patterns and highly permeable wildlife passage, while reducing fence maintenance.

James stresses that the electrified polywire is a psychological barrier rather than a physical one, and that it helps to train cattle to respect it in a controlled environment. To do so, the crew builds a short stretch of power fence in a corner of their shipping pens, and expose new cattle to it as they arrive on the ranch. "One good shock," James says, "and they get the idea."

As a single-strand fence, the polywire is easy for wildlife to negotiate. Although elk and deer can damage it, especially if they come through in the night, James believes that temporary fence has been an extremely effective tool for improving wildlife passage, manipulating livestock grazing patterns, and reducing time spent repairing fence in the spring.

Where the crew built new permanent fences, two designs emerged as especially effective. One is a three-wire let-down electric fence built with wood posts and pin-lock insulators. Following the grazing season, all three high-tensile wires are dropped to the ground, where they stay all winter. **The extra work of raising and lowering these fences twice a year, says James, is nothing compared to patching elk damage in traditional barbed wire fences.**

The other key design is a two-wire electric fence hung from one-inch diameter fiberglass posts on 50-foot centers. The top wire is hot, and hung 32" from the ground. The grounded bottom wire runs 12" below it. "Pronghorn go under easily, and everything else goes over. Because the fiberglass posts can flex, the fence tends to bend instead of break", James says. **Although a two-wire fence may seem like an insubstantial barrier, James stresses that it contains cattle very well, and that he'll be building more of it in the future.**

– Bryce Andrews

Steve Primm

Openings, Crossings, and Passes

You can include crossings in any fence design to allow passage for wildlife, especially when livestock are not present. Short sections can be altered to wildlife friendly standards to help wildlife cross, or gaps, openings and jumps can be added.

Fence passes keep fawns and calves from being stranded, provide openings for other animals unable to jump fences, and help wildlife cross when snow hinders passage over or under fences.

Wildlife crossings are especially important when fawns and calves are small, from June 1 through the summer, and for seasonal wildlife movements and ranges. Such openings can considerably reduce wildlife damage to fences and decrease maintenance costs.

Scott Nicolarsen

Elk and other wildlife readily travel through seasonal fence openings. Here a wildlife gate is installed on an elk trail.

Christine Paige

Bert Lindler

Christine Paige

Fence alterations can include:

- Lowering the top wire or rail to 42" or less.
- Increasing the distance between top and second wires to 12".
- Raising the bottom wire or rail to 16" minimum, and preferably 18" or more.
- Replacing the bottom and top wires with smooth wire.
- Increasing visibility with a top rail, PVC pipe, high-visibility tape, braid, or markers.

Wildlife openings and passes can include:

- Gates secured open.
- Dropped rails and wildlife jumps.
- Sections with adjustable wires or rails.
- Sections of seasonal lay-down fence.
- PVC modifications for big game and pronghorn passage.

Use your local topography and patterns of wildlife travel to help you determine the best placement for crossings. Look for signs of wildlife use and travel such as game trails, tufts of hair caught on fence wires, trails to water, or gullies and swales that act as wildlife corridors.

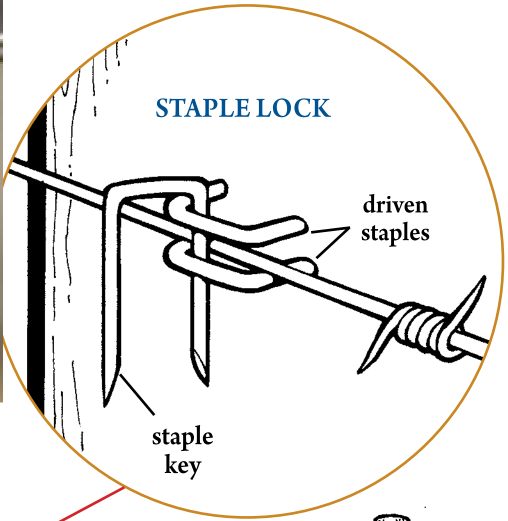
Adjustable Wire Fence

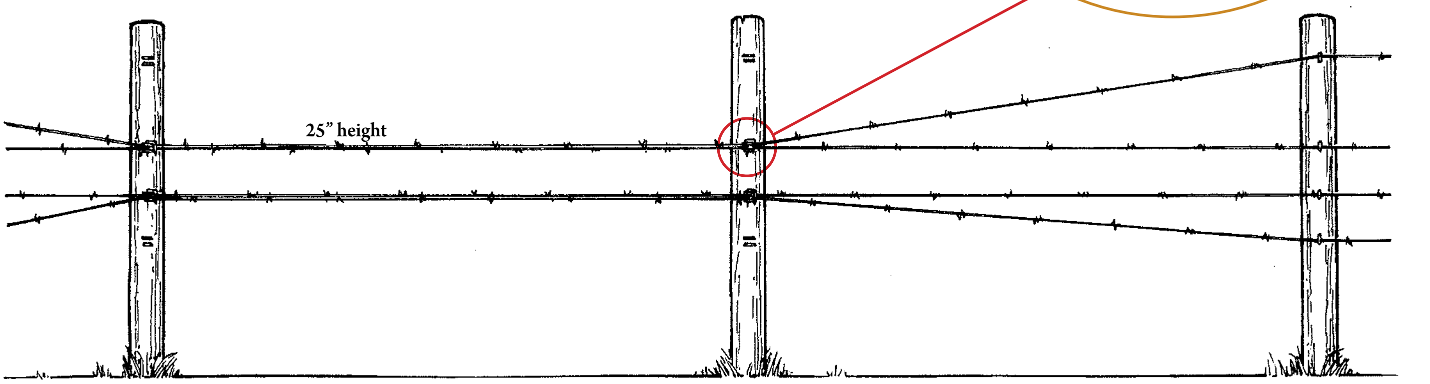
Adjusting the height of one or more wires is an easy and effective way to allow animals to cross during migration periods if livestock aren't present. Drop the top wire to the level of the second wire, either in sections or along an entire run of fence, to allow wildlife to jump over easily. Lowering the top wire to 25" or less allows elk and deer to hop over easily in almost all conditions. Raise the lowest wire in the same way to help wildlife crawl under. A simple staple lock allows wires to be rapidly adjusted from one level to another, and the wires can be adjusted by only one person.

Christine Paige

Existing fences can be readily modified by installing staple locks to create a drop wire so wire height can be adjusted when livestock are not present.

ADJUSTABLE FENCE FOR SEASONAL WILDLIFE PASSAGE





Staple lock for wooden posts

- Install two fence staples horizontally and less than an inch apart on each post at the level of both the top wire and the second wire.
- Slip the fence wire between the two staples.
- Secure it in place by hooking a third staple through the paired staples vertically, like a latch.

Marina Smith

Searching for Solutions in the Madison Valley

Marina Smith knows as well as anyone how difficult it is to reconcile the needs of livestock and wildlife: she's been managing ranches at the south end of the Madison Valley for years. The properties in her charge sit astride an antelope migration corridor and provide crucial habitat for elk and deer.

Initially, these lands had woven wire and jackleg fence, and wildlife conflicts were commonplace. On one occasion, a black bear was stranded between a highway and a woven wire fence. Panicked, the bear tested the fence repeatedly, unable to pass through or over it.

Marina's challenge was to replace fences like this one with new designs more permeable to wildlife, but that would also reliably hold cattle for summer grazing.

Marina has torn out close to 30 miles of old fence. She has experimented with various fence designs – with mixed results. On the Elk Meadows property, she installed stretches of high-tensile electrified fence. These fences were highly effective for livestock containment when fully charged. However, many of the electric fences ran through areas with steep topography, rocky soil, and much wildlife traffic, making them susceptible to wildlife damage and difficult to maintain.

Marina also theorizes that wildlife have a hard time seeing the electric fences, as they can be built with thinner posts and fewer wires than traditional fences. Wildlife collisions frequently grounded out the fence, reducing its ability to hold cattle. (This problem might be mitigated by using high-visibility wire, flagging, or other markers.) Sections of suspension fence, where posts were set at relatively long distances from each other and the wire spans were stiffened with wire or wood stays, fared even worse. In the process of crossing, elk would often cause the fence to twist. When inverted, the stays would catch on the ground, compromising the fence.

Marina found that the design that best balances her livestock production needs with her desire to enhance and protect wildlife habitat is a four-strand barbed-wire fence with a drop-down top wire. The top wire is hung at 42" inches and secured with a staple lock; the bottom wire is 18" from the ground. During fall and winter, in areas that serve as movement corridors for wildlife, Marina drops the top wire to 36". **Observing the way animals interact with the drop-wire fence has led Marina to conclude that these wire heights are critical for allowing wildlife passage.**

– Bryce Andrews

Ranch manager Marina Smith found that a seasonal drop-down top wire allows migrating elk to easily pass over the fence in fall and winter.

Christine Paige

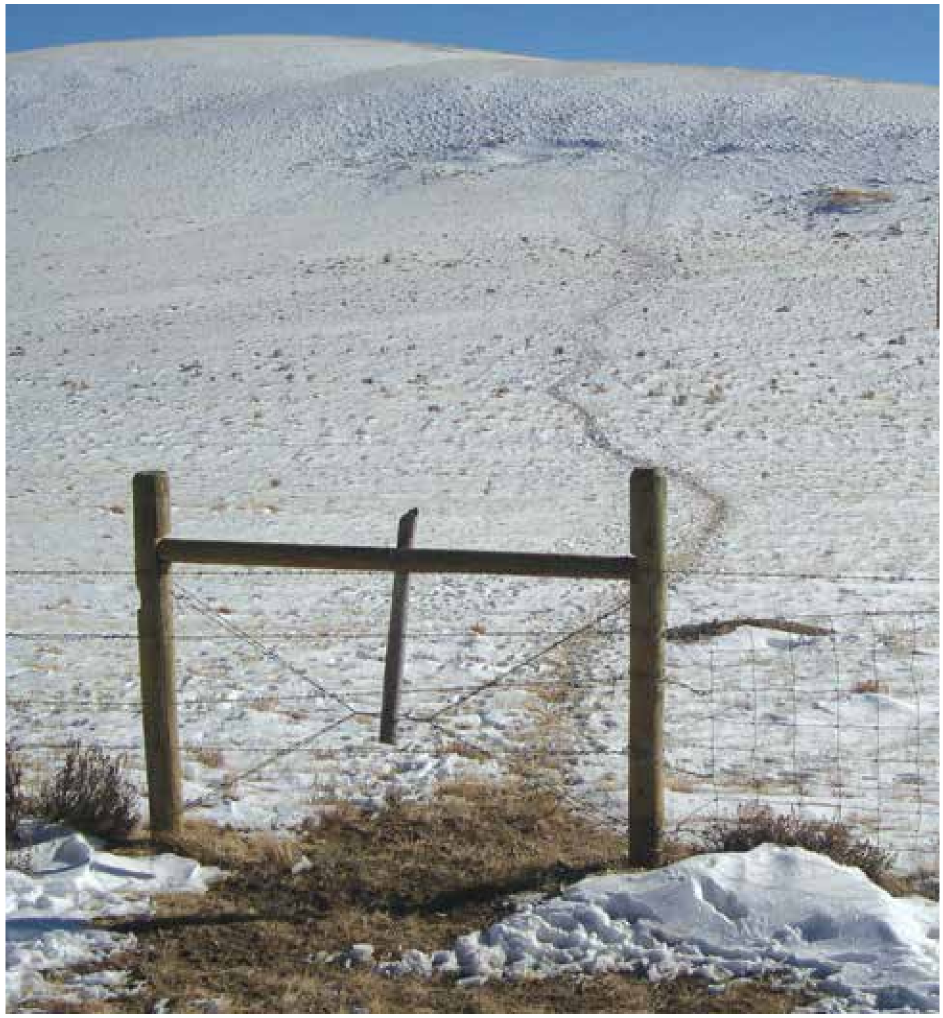
Pronghorn Underpass or "Goat Bar"

Although capable of jumping even high fences in extreme situations, pronghorn prefer to crawl under fences, and almost seem unaware of their ability to "high jump." They will often run for miles looking for fence openings or spots to crawl under a fence, and have been known to die of starvation in winter when blocked by a fence they see as impassable.

In Sheep Range:

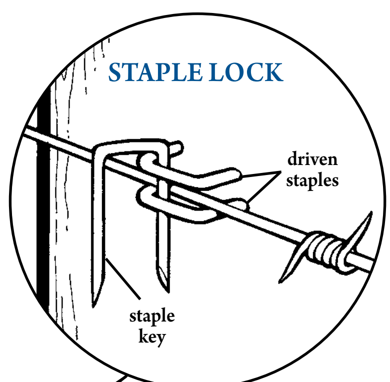
Pronghorn have the greatest difficulty negotiating sheep fence, which either uses barbed wire strands lower than cattle and horse fence, or is typically made of woven wire. However, a pronghorn "underpass" can be created by raising the bottom strand in selected fence sections.

- For sheep, space wire strands at 10"–16"–22"–32" above the ground, the top three strands barbed wire, the bottom strand smooth wire.
- In selected sections, raise the bottom smooth wire on two posts to the height of the third wire, securing in place with a staple lock. The smooth wire can be dropped again if needed.

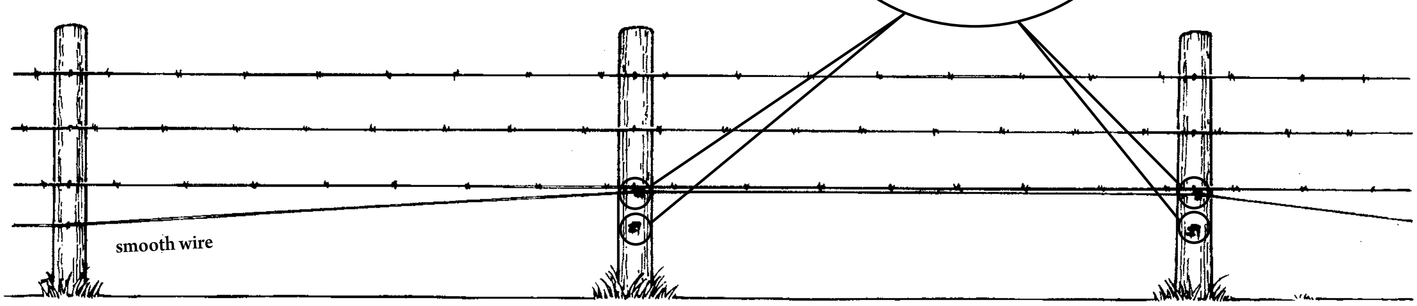


Randy Gazda

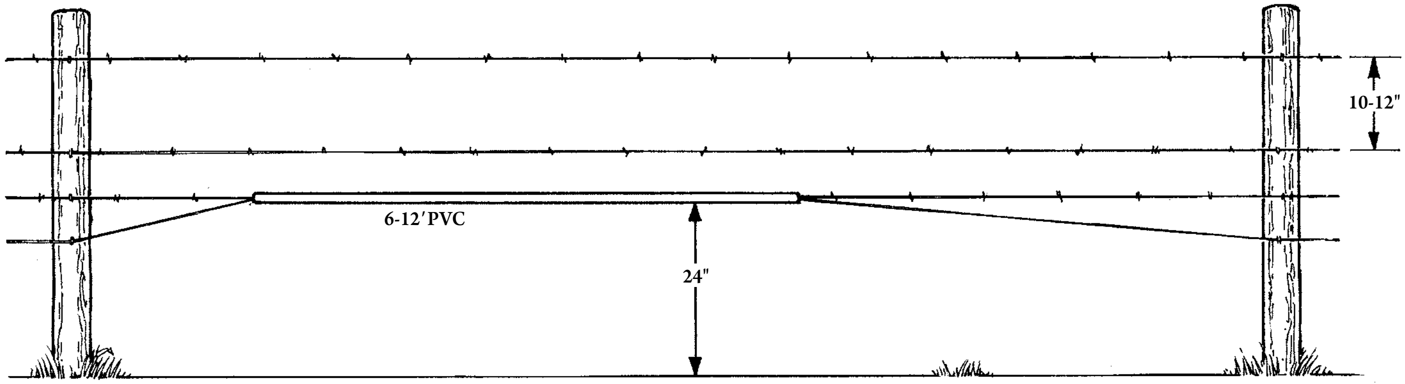
Pronghorn will readily use any section with a slightly raised bottom wire to crawl under a fence.



PRONGHORN UNDERPASS FENCE WITH RAISED WIRE



PRONGHORN UNDERPASS FENCE WITH GOAT BAR



In Cattle and Horse Range:

Where cattle or horses share the range with pronghorn, a PVC underpass, or "goat bar," can be created by simply gathering the bottom two wires in a PVC pipe to make a higher clearing for pronghorn of any age to crawl under. Despite the underpass, the fence remains effective for controlling horses and cattle. This design has been used extensively in pronghorn habitat.

- Space fence wires heights at 18"–24"–30"–40"; use smooth wire on the bottom.
- Cut several 6′ to 12′ lengths of PVC pipe.
- With a table saw, cut a ¼" slot the length of each PVC pipe. Note that a ¼" cut can be made by matching up two ⅛" wide blades and using a wood guide.
- Grip the bottom two fence wires together, and feed the PVC pipe onto the wire from one end of the pipe. If the pipe gets hung up on a barb at the fore-end, work the barb into the end of the pipe and continue. Once the pipe has been adequately started, grip the pipe near the fore-end and begin pulling down the length of the wire.
- Space these underpasses intermittently along the fence, and especially in fence corners where pronghorn may be directed by the run of fence.
- Add a PVC pipe threaded onto the top wire or top two wires to allow passage for deer and elk as well. The PVC greatly reduces the chance of snagging, injury and entanglement.
- Use two or three cable zip-ties to close up the gap on the PVC.

Pronghorn will seek places they can easily pass under a fence. Keep brush clear and take advantage of small gullies and swales to provide pronghorn passage.

Wyoming Land Trust

FENCE SOLUTIONS PUT TO THE TEST

Pronghorn Know No Boundaries

The music of the wind is a constant companion on the sweep of native prairie that stretches across Montana, Alberta, and Saskatchewan. Once covered by glaciers, these northern plains are now blanketed by grasslands and sagebrush shrub-steppe, dimpled with pothole wetlands and gouged by craggy badlands. Late into the 19th century, massive herds of bison flowed across this landscape, and with them elk, pronghorn, mule deer, and their predators. Although the great bison herds are gone, pronghorn have held on in this northern limit of their range, claiming dual citizenship as they migrate across the international border between seasonal ranges.

Today the glacial soils of this wide-open country support grain farms and ranches, but the fences that divide and protect croplands and rangeland prove a constant challenge to pronghorn as they follow their ancient migration paths.

Pronghorn Pathways

In 2007, state and provincial wildlife agencies in Montana, Alberta, and Saskatchewan formed the Northern Sagebrush Steppe Initiative (NSSI). The goal was to help sustain the northern prairie's wildlife populations by sharing data and promoting collaborative research. In 2008, the NSSI and researchers at the University of Calgary launched the Transboundary Pronghorn Project with support from the Alberta Conservation Association, Saskatchewan

Shawn Cleveland

Ken Plourde, University of Montana wildlife biology student, lends a hand rolling up old woven wire that was replaced with pronghorn-friendly fence.

Ministry of Environment, U.S. Bureau of Land Management, and World Wildlife Fund. The project uses data from two recent studies of GIS-collared pronghorn in Alberta (72 individuals) and Montana/Saskatchewan (111 animals) to understand their seasonal movements and pathways across the entire region.

Maps of the collared animals' daily and seasonal movements clearly show where pronghorn are hindered by fences, sometimes spending several days attempting to find a way through or around. Because pronghorn are adapted to open grass ranges and sagebrush steppes, where the tallest objects are sagebrush, they are usually reluctant to jump over fences. Despite an ability to jump, they prefer instead to crawl under and are often blocked by woven wire fence or barbed wire fence with wires low to the ground.

Cooperative Solutions

Removing obsolete fences or modifying existing fence can allow pronghorn to slip through without missing a beat. A collaboration among the University of Calgary researchers, the Montana Chapter of The Nature Conservancy (TNC), FWP, and area livestock growers is removing the barriers for pronghorn once again.

TNC has a long history of partnership and stewardship with private landowners in northeastern Montana. On the Conservancy's Matador Ranch, a 60,000-acre preserve in Phillips County, TNC runs a program of community grassbank leases. Under the program, local ranchers help manage the grassbank and pay discounted fees to graze their cattle on the Matador Ranch in exchange for wildlife conservation practices on their own operations, including wildlife friendly fencing. TNC also works with private landowners to develop conservation easements to sustain native grasslands and working lands.

TNC was awarded a grant to integrate the NSSI pronghorn research into on-the-ground conservation. Using the data to identify specific sites where pronghorn meet barriers, TNC works with private landowners to remove or modify fences.

Shawn Cleveland

Cattle, sheep, and pronghorn

On the Barthelmess Ranch, run by brothers Leo and Chris Barthelmess, the family has partnered with TNC, National Resources Conservation Service (NRCS), and FWP on several projects to sustain pronghorn migration. The family has a tradition of sustainable ranching – using best-management practices to provide for their livestock and protect the soil and water resources. They also highly value the wildlife on their ranch, from large game to birds.

"Why do this? There are three reasons," says Leo. "One is that wildlife is important to our community and us. A second reason is we are seeing reduced maintenance on fences that are modified to allow for wildlife passage. And third, there are people and agencies that will invest resources to help us do this."

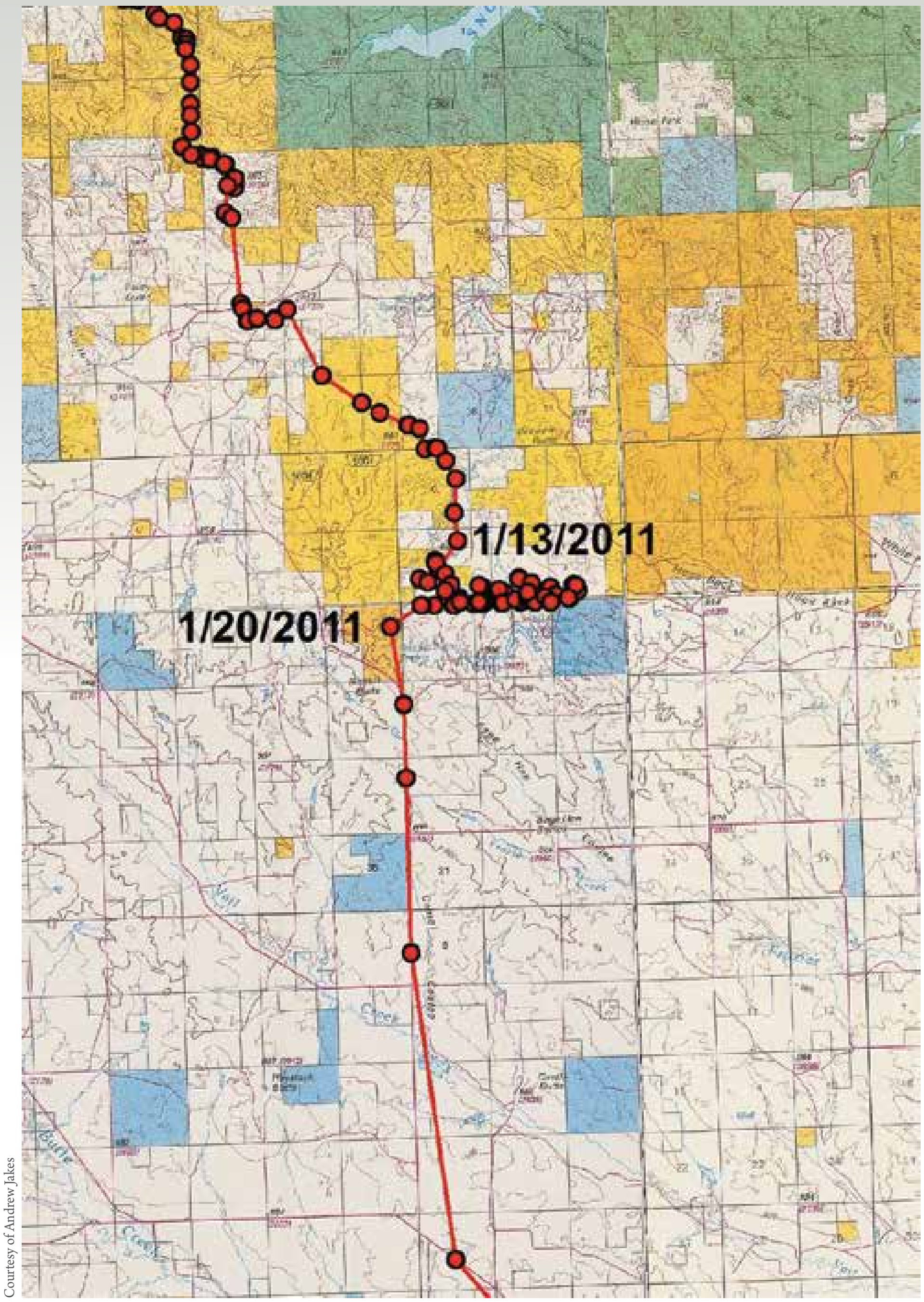
One project removed one-half mile of woven wire fence and replaced it with a combination of smooth and barbed wire fence that meets wildlife friendly standards. The new fence uses a smooth wire on the bottom, a top wire no higher than 42", and at least 12" between the top two wires. Although the family raises sheep in addition to cattle, they have eliminated all woven wire fence on their ranch. Yet the new fence design effectively contains their livestock, which do not pressure the fences due to good husbandry and plentiful forage.

"Recently, I spent a day maintaining an old fence line that had not yet had the wire spacing modified for wildlife migration" says Leo. As I came to areas that indicated substantial antelope migration – the bottom wire was broken or stretched far off line – I raised the bottom wire until it was 18 or more inches off the ground. I anticipate in the future that there will be little need for additional maintenance on these portions because of wildlife damage. In the future, I will monitor these fence adjustments and see if the antelope consistently use these crossing areas as opposed to making new ones."

Leo concludes, "It is our best hope that these efforts will aid in the survival of wildlife migration routes and help us continue to ranch sustainably in the future."

Samantha Howlett

A pronghorn doe slips easily under a fence modified so the bottom wire is at least 16" to 18" off the ground.



Courtesy of Andrew Jakes

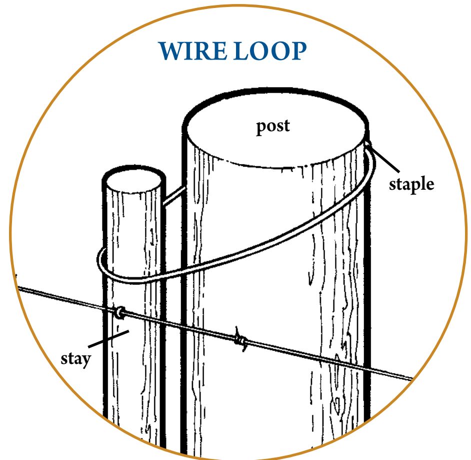
Telemetry research on collared pronghorn show distinctly where animals are hindered by fences along their migration, sometimes delaying them by several days.

Lay-Down Fence

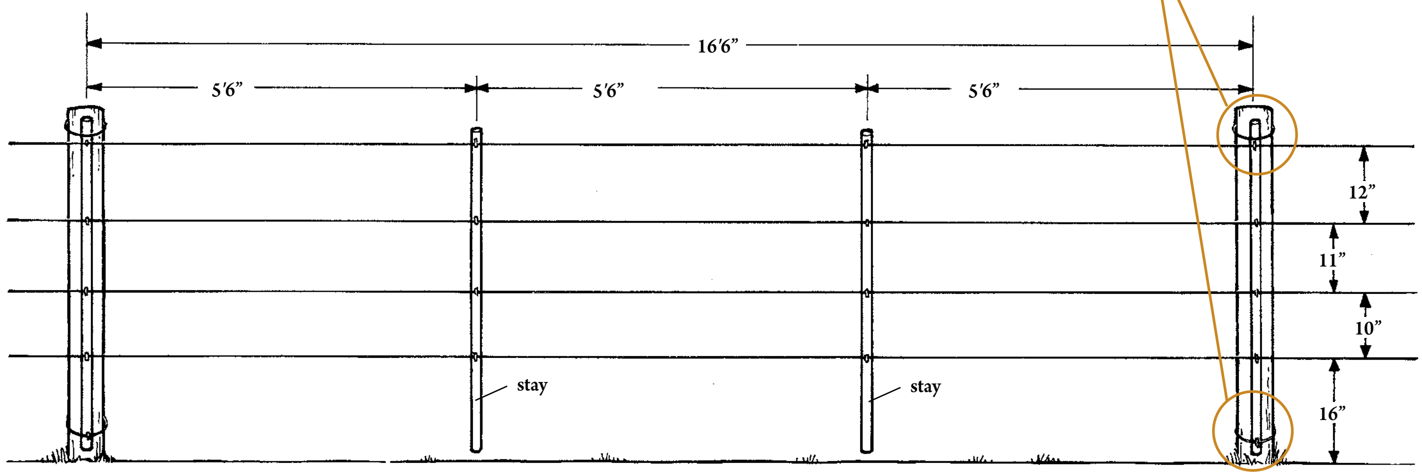
A lay-down fence is a standard 3-wire or 4-wire fence that can be laid on the ground as a unit to allow ungulates to pass through during migration or seasonal use. A lay-down fence can also reduce snow and wildlife damage and save maintenance costs. Most designs allow a single person working alone to let the fence down or put it back up.

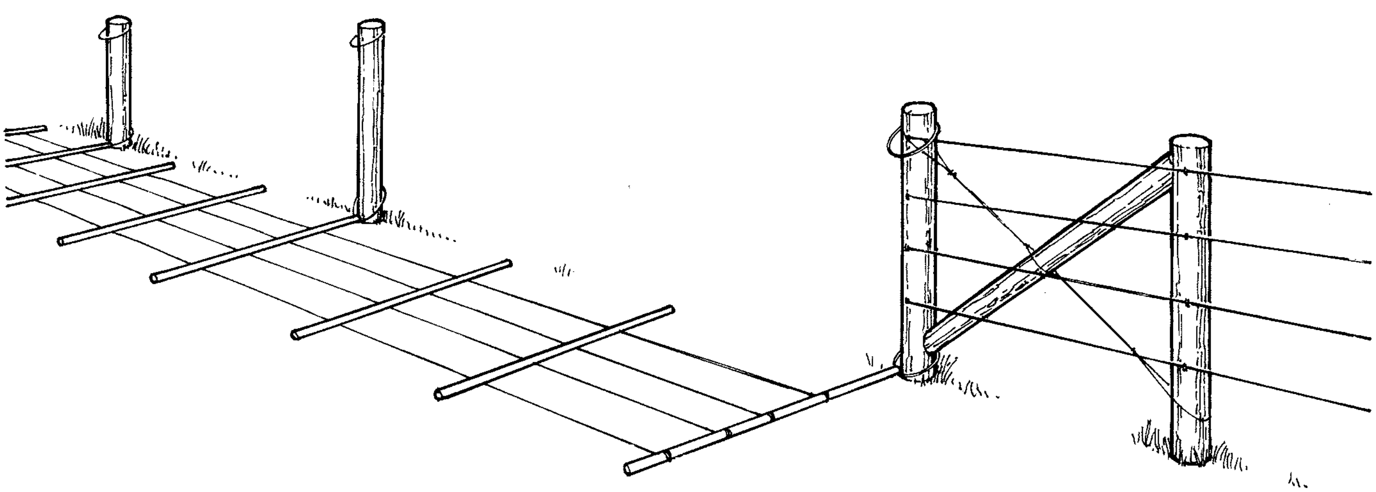
Lay-down fence can be constructed from smooth wire or barbed wire. Fence posts can be wooden or steel, but wood is more durable in heavy snow areas. Posts should be spaced at 16.5′ intervals.

For barbed or smooth wire fence, one to two stays are needed between fence posts, plus a stay lined up with each fence post. Wire loops, secured at the top and bottom of the fence posts, support the fence stays. The lay-down section can then be dropped by flipping up the top loop and lifting the stays out of the bottom loop.



LAY-DOWN FENCE





Montana Fish, Wildlife & Parks

Jay Kolbe

Christine Paige

This lay-down fence using 4-strand smooth wire was constructed along 1.5 miles of fenceline next to the Blackfoot-Clearwater Wildlife Management Area in Montana to allow winter passage for elk. The number of elk tracks attest to the design's success.

Durable PVC Big Game Passage

Installing PVC pipe over bunched fence wires is an inexpensive way to allow elk, deer, and antelope to freely cross existing barbed wire fence with minimal risk. **This design is especially useful where elk, moose, or other ungulates cross heavily traveled roadways and have difficulty crossing a fence. This delays them from moving out of danger, particularly in spring and summer when calves are small.** Along roads, the PVC passage should be installed on both sides of the right-of-way.

PVC pipe threaded over bunched fence wires creates an effective and durable big game passage, especially on road right-of-ways.

Montana Fish, Wildlife & Parks

Montana Fish, Wildlife & Parks

PVC Game Passage for Wire Fence

These instructions are for a metal t-post, 5-strand barbed wire fence, with no livestock present, but can be adapted for other situations.

Materials:

To modify two 60′ sections of barbed wire fence.

- Twenty 10′ sections of 1.5" OD PVC pipe
- One 100-count bag of large (7" or 11") UV-resistant plastic cable ties
- #16 or larger soft wire
- fencing pliers, wire cutter, leather gloves

Before Installation:

With a table saw, cut a ¼" slot the entire length of each PVC pipe. Note that a ¼" cut can be made by matching up two ⅛"-wide blades and using a wood guide.

Installation:

Step 1: Remove all wire clips from about 60′ or three fence posts and allow wire to hang freely.

Step 2: Beginning near first post, with clips removed, grip the top three strands of wire and pinch together. Locate a space between barbs that will allow you to thread on the PVC pipe. Push pipe onto wire (not wire into pipe) concentrating on fore-end of pipe. If the pipe gets hung up on a barb at the fore-end, work barb into end of pipe and continue. Once the pipe has been adequately started, grip pipe near the fore-end and begin pulling down the length of the wire. The wire will feed itself into the pipe. Pull pipe down the wire until about 8′ from where posts with clipped wires resume.

Step 3: Repeat with three more pipes. Space the joint between two pipes at a post where possible. This will allow you to clip the three wires together to a post.

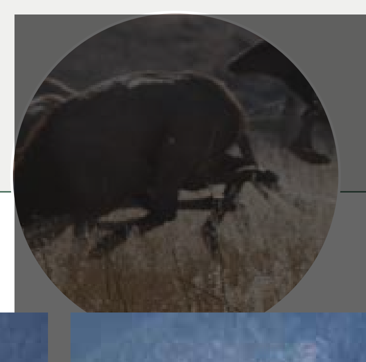
Step 4: The last (fifth) pipe must be installed in the reverse direction. Starting near the end of the fourth pipe, find a space between barbs and install pipe as in Step 2, push into place 8′ from where posts with clips resume.

Step 5: Repeat steps 2 through 4 with the bottom two wires.

Step 6: Using #16 or larger soft wire, attach the top PVC pipe to posts no more than 40" above the ground. Attach the bottom pipe at 18" above the ground, or dropped closer to the ground to create a larger middle gap for deer fawns or elk calves to go through rather than under. Where a joint between pipes is located at a post, enough space can be left to clip the wires to the post.

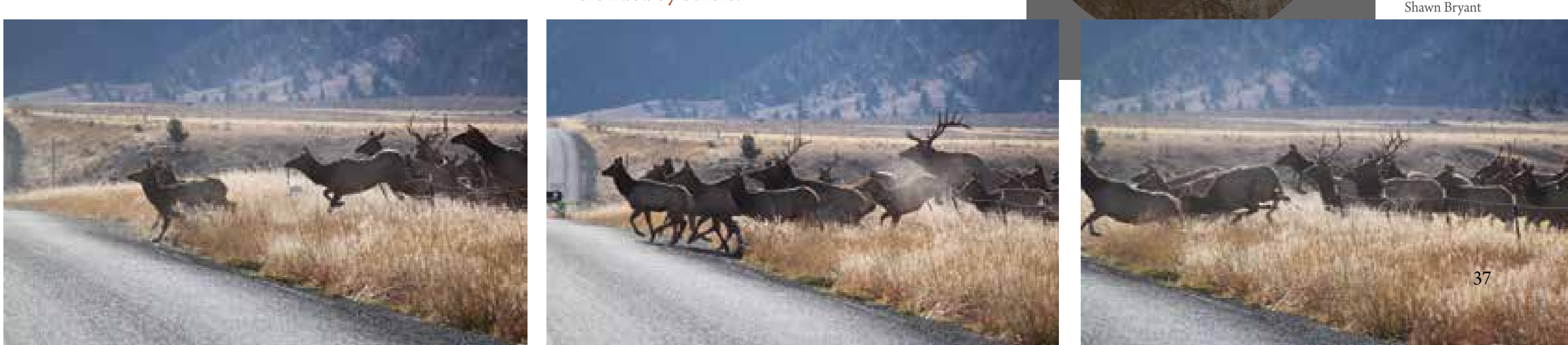
Step 7: Attach three cable ties per 10′ section of PVC pipe, one near each end and one in the middle. Squeeze PVC pipe while pulling cable tie tight. Gap from cut will not be completely closed but will be small enough to allow the pipe to roll and not work its way off the wire. Clip tag end of cable tie.

Step 8: Repeat on opposite side of right-of-way.



An elk herd races to cross a highway. Animals are especially vulnerable to tangling when alarmed or crowded by others.

Shawn Bryant



Highway Right-of-Way Fence

Fences along state highway right-of-ways (ROW) present special challenges for landowners and wildlife. While fences protect livestock and crops, and keep livestock from entering the ROW and endangering motorists, some types of fence can restrict wildlife passage and migration, and animals trapped within the ROW are more likely to collide with vehicles.

Montana Department of Transportation (MDT) encourages the use of wildlife friendly fence designs that promote permeability for wildlife, allow animals to pass quickly out of the highway ROW, and minimize animal-vehicle collisions. Ideally, similar fence types should be placed opposite each other on either side of the ROW.

Depending on the situation, MDT can opt to:

1) replace existing and functional fence with a fence that is no more restrictive to wildlife movement than existing fence;
2) encourage landowners with functional ROW fence to replace the fence with wildlife friendly fencing in whole or at select locations;
3) replace dilapidated and non-functional ROW fencing with wildlife friendly fencing; or
4) not replace the dilapidated fence at all.

MDT currently offers several designs for wildlife friendly fence. The preferred design is four strands with top and bottom smooth wire and two center barbed wires; the top wire at 42," a 12" spacing between top and second wire, and bottom wire at least 16" off the ground. Landowners can choose to use one of MDT's standard designs or propose other wildlife friendly specifications that will work with their land use practices. MDT encourages landowners to use wildlife friendly fence either along the full length of their property along the ROW, or at a minimum at regular intervals and known game pathways to provide crossings.

MDT is open to innovative solutions and will work with landowners to find solutions that accommodate their needs while providing wildlife movement across the highway corridor. Contact MDT Environmental Services for more information: (406) 444-7228.

Wildlife Friendly Highway ROW Fence

Wildlife friendly fence and crossings should be placed on both sides of the ROW to allow animals to move quickly out of harm's way. Using wildlife friendly fence along highways:

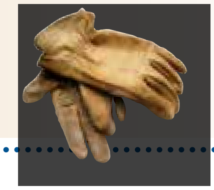
- Allows wildlife to cross roadways easily and quickly.
- Reduces the time animals spend in the ROW.
- Reduces the chance of animals being trapped in the ROW.
- May reduce the number of animal/vehicle collisions.
- Maintains habitat connectivity for wildlife.
- Restrains domestic livestock from entering the ROW.
- Reduces wildlife damage to fences, reducing the need for fence maintenance.

Courtesy Montana Dept. of Transportation

Top and bottom smooth wires provide wildlife friendly passage where the Manley Ranch borders the Hwy 271 ROW near Helmville, Montana. The family reports that their cows respect the fence, wildlife pass through easily, and the fence hasn't required any maintenance.

Montana Fish, Wildlife & Parks

Wires gathered into PVC pipes create an easy big game passage on either side of the ROW when cattle are not present.



MDT Options for Wildlife Friendly Highway Right-of-Way Fence

John Carlson

Bert Lindler

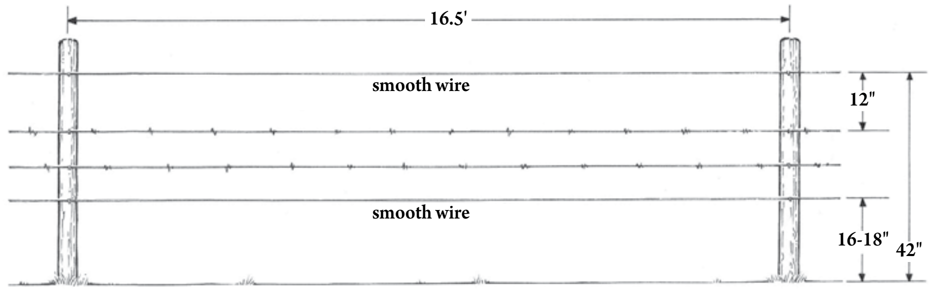
An elk crossing with plastic-coated top and bottom wires allows quick passage out of the right-of-way, while center barbed wires still hold cattle.

Christine Paige

In some situations, the highway department may install wildlife jumps, which are one-way ramps that allow animals to escape the highway ROW.

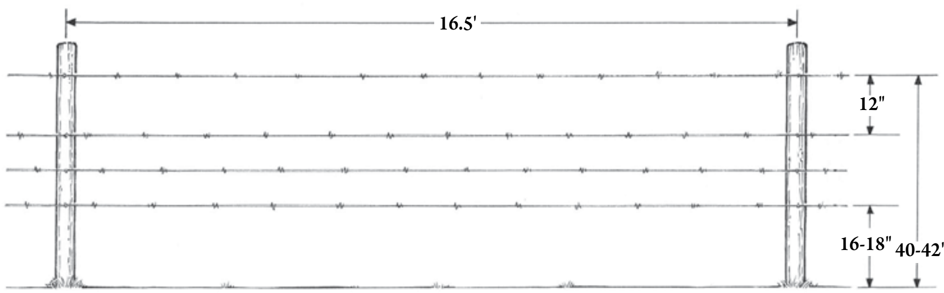
Preferred Fence

Top and bottom smooth wires allow the easiest passage for wildlife. The standard wire heights are 16" - 18" bottom wire, 40" - 42" top wire, and 12" between the top two wires to minimize entanglements.



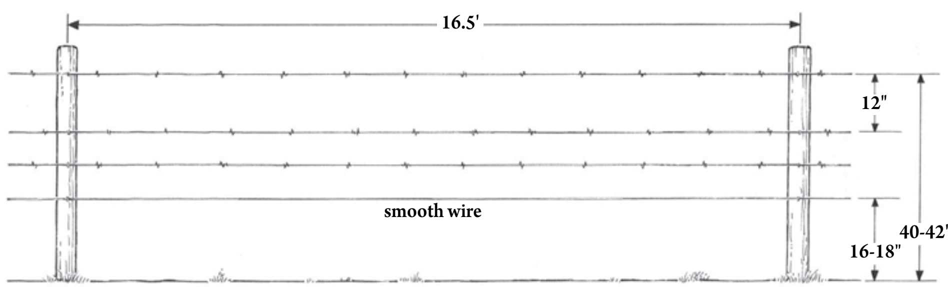
Basic All-Barbed Wire

In cases where all-barbed wire is needed, adjusted wire heights can make wildlife passage easier.



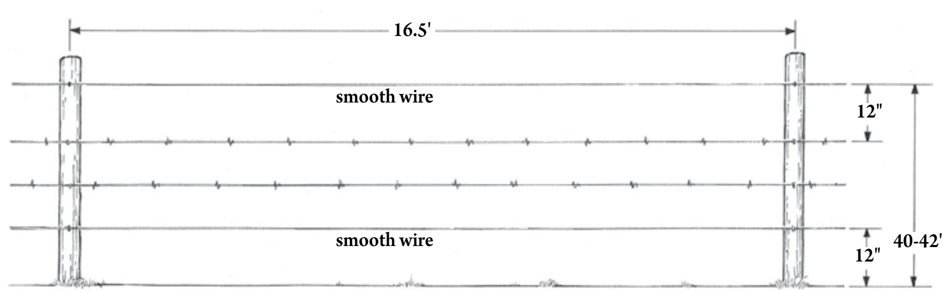
Pronghorn Fence

A smooth bottom wire at 16" - 18" minimum above the ground is recommended for pronghorn country, or where young ungulates are common.



Fence for Sheep and New Calves

A 12" bottom wire should only be used in areas without pronghorn, or for operations where a low wire is necessary, such as for sheep and very young calves.



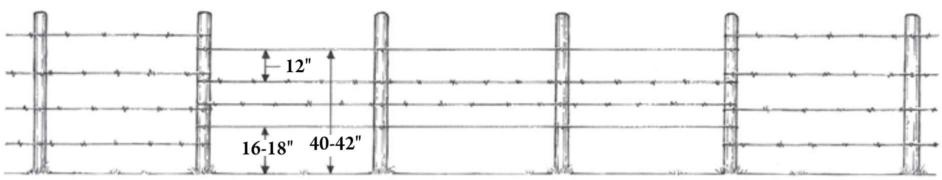
Wildlife Crossings for Established Fences Along Highway ROW

Wildlife Jumps, Underpasses, and Overpasses

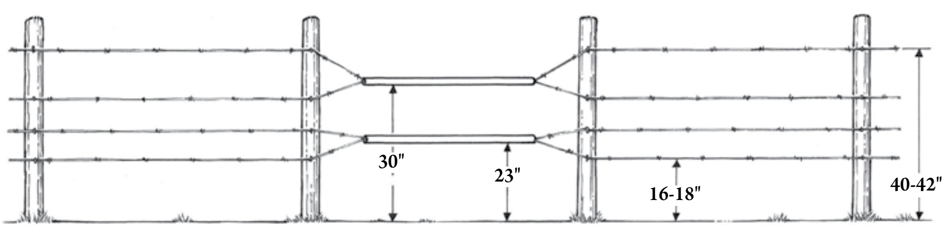
Along major highways with high-speed traffic, the highway department may opt to install tall barrier fence with wildlife underpasses, overpasses, or jumps. This solution is very costly and should only be employed where the risk of vehicle/wildlife collision is very high.

Underpasses and overpasses are major construction projects, and require thoughtful design and an understanding of wildlife behavior to be effective. Wildlife jumps are ramps that allow animals to escape the highway ROW but prevent entry. Jumps should be placed at frequent intervals to minimize the time animals are searching for a way out of the ROW.

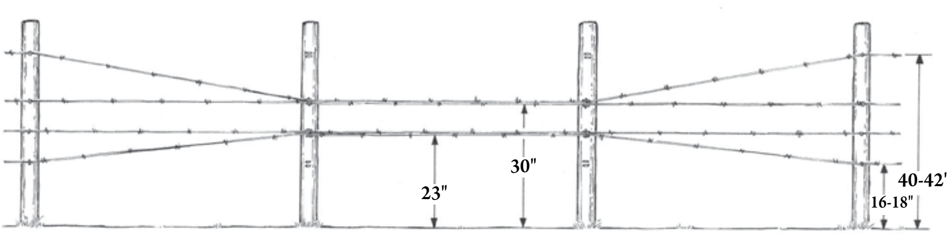
Wildlife friendly section: short of modifying an entire fence, sections of wildlife friendly design can be used in areas of known migration or movement.



PVC wildlife passage: the top two and bottom two wires are gathered into PVC covers to create an easy passage. See full description on pages 37-38.



Dropped wire passage: staple locks can be used to drop top wire and/or raise the bottom wire for passage. See full description on page 29.



Working With MDT

MDT encourages the use of wildlife friendly designs, but will work with landowners to install appropriate fences for their land-use needs.

For each project, an MDT biologist considers the impacts of the ROW fence on wildlife movement patterns and landscape connectivity. The biologist evaluates the surrounding topography, road geometry, traffic volumes, adjacent habitat and land-use practices, existing fence types, animal-vehicle collision, and roadkill data. Based on this information, the biologist makes recommendations for wildlife mitigation strategies, including fence configurations.

An MDT ROW agent will meet with the landowner to negotiate ROW acquisitions for the project, and negotiate the type of ROW fence to be used along the property. The ROW agent and biologist coordinate to recommend an appropriate fence design that will work both for wildlife and the landowner. The biologist is also available to meet with landowners to discuss fencing recommendations or alternative solutions.

Currently, the ROW fencing is negotiable with the landowner. In some instances, MDT has placed the fencing on the MDT ROW in order to ensure implementation of the recommended fence design. If a fence is installed within the ROW, MDT maintains the fence, while the landowner is responsible for maintenance of the fence if it is placed on their property or at the ROW boundary.

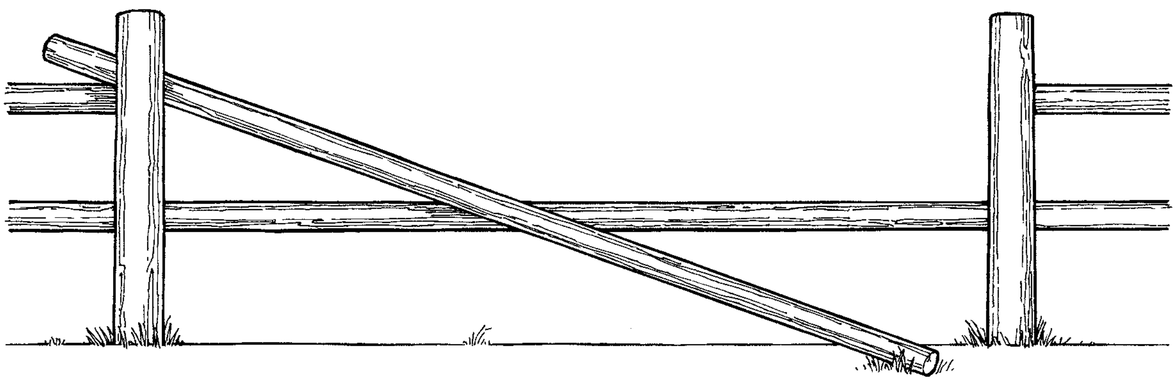
Dropped Rail Wildlife Passage

Christine Paige

Buck and rail or jackleg, post-and-rail, and worm or zigzag fences are often used for property boundary fences, but may be difficult for wildlife to negotiate. Often these fences are built too high, too wide, with extra wire, or with rails spaced too closely together for wildlife to pass through.

An occasional gap in the fence can provide a crossing, particularly when livestock are not present. Simply drop the top rails to the ground intermittently, such as every 100', to allow animals to step across. Animals will often move along the length of a fence seeking an opening. Rails should be dropped where there are signs of wildlife passage, such as game trails, and in stream corridors, gullies, or other natural funnels.

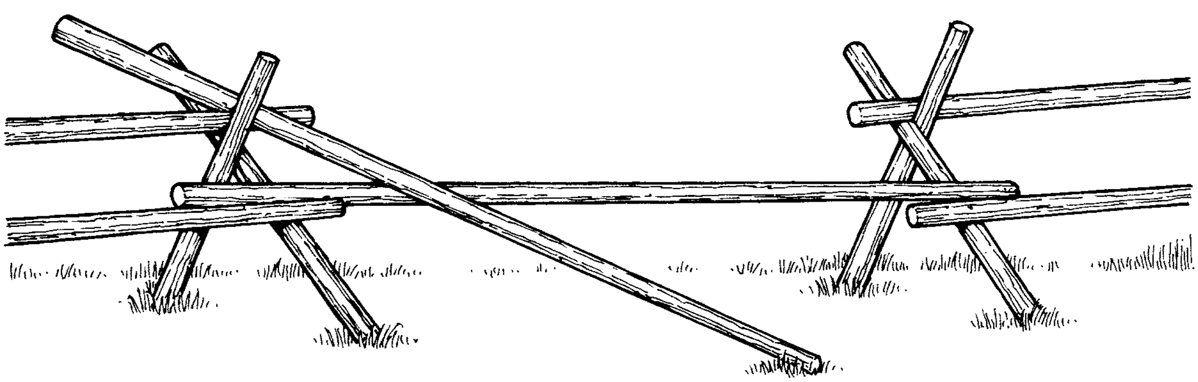
DROPPED RAIL FOR WILDLIFE JUMP



Wildlife can often see openings in a fence from a distance and will quickly learn to use these passages.

Christine Paige

DROPPED RAIL IN JACKLEG



Remedies for Existing Fences

How can you make existing fences more wildlife friendly?

Fence maintenance, modifications, and removal can all help wildlife.

You can modify nearly any existing fence to be friendlier for wildlife. If you do not plan to completely replace an existing fence, you can alter individual sections to wildlife friendly standards to create crossings and easier passage.

Scott Nicolarsen

Remedies for Existing Fence

Maintenance:

- Keep wires tight. Sagging wires and neglected fences create a hazard for both domestic animals and wildlife. Loose wires can snare animals as they attempt to cross; tight wires reduce the chance of entanglement.

Modifications:

- Replace barbed wire with smooth wire, particularly for top and bottom strands. Smooth wire reduces the chance of animals getting snared on barbs and fatally entangled.
- Adjust the height of the top wire: preferably no more than 40" and a maximum of 42" above the ground.
- Increase the distance between the top two wires to 12" to reduce entanglements.
- Reduce the number of wires to three, or at most four.
- Add a top rail, high-visibility top wire, a PVC cover on the top wire, or flagging to increase visibility and prevent collision or entanglement.
- Raise the bottom wire to at least 16" and preferably 18" above the ground to allow animals to slip under.
- In selected fence sections, raise the bottom wire to the level of the third wire and secure with a staple lock.
- For pronghorn, gather bottom wires in a PVC pipe to create a "goat bar" underpass.
- Add wildlife crossings where wildlife trails cross fences by using dropped wires, dropped rails, lay-down fence, or underpasses, as described earlier.
- When livestock aren't present, secure gates open to allow free passage for wildlife.
- Provide wildlife access to rivers, streams, wetlands, and water holes, and through seasonal migration areas.

Removal:

- Remove old fences that are in disrepair or no longer in use. Remove any unnecessary interior fences.
- Bale and carry away piles of wire. Some recycling centers will recycle old wire. Never leave wire on the ground.
- Many volunteer groups are interested in helping with fence removal projects to help wildlife, such as local chapters of sportsman's groups, scout troops, 4-H, and others.

Christine Paige

3-Dimensional Buck Fence

Buck and rail (also called jackleg) or buck and wire fence designs should be avoided as they create a formidable barrier and hazard to wildlife. Any 3-dimensional design is especially hard to leap over or crawl through, and animals can tumble and break legs. Often, these fences are built too high, too wide, and with rails or wires placed too closely together for animals to negotiate easily.

Three-dimensional buck and barbed wire fence creates a particular entanglement hazard. If buck and rail is also combined with woven wire or barbed wire, or the fence is placed on steep terrain, it presents a complete barrier to wildlife.

Buck or jackleg fence also requires high maintenance: the wooden bucks and rails rot and collapse under snow loads and winds, and long stretches of wire may be pulled down by wildlife.

Some landowners like the look of buck and rail because it evokes tradition and history. However, buck fence should only be used for very short reaches and specific situations, such as wet or very rocky soils. Frequent crossings should be provided for wildlife.

Modifications for Buck and Rail Fence

- Place the top rail no higher than 40" and preferably lower.
- Allow a minimum of 18" between the bottom rail and the ground.
- Allow a gap of at least 18" between rails.
- Eliminate the horizontal rub rail in several sections or completely. It is not needed for fence stability, and wildlife can negotiate the fence more easily.
- Never add woven wire or barbed wire to the fence.
- Create frequent crossings for wildlife by dropping one end of the top rail to the ground, or using a section with two rails at 18" and 36".

Worm Fence

Worm fences, also called zigzag or snake fences, were used by early settlers because they are easy to construct and require no posts. Worm fences are still popular in some areas for their rustic nature, especially as boundary fences. They are not used to contain large livestock.

Although worm fences are more easily negotiated by wildlife than three-dimensional jackleg or buck and rail fences, they can still be a barrier to fawns, calves, and other animals. Other drawbacks include rotting, the excessive number of rails needed, the considerable space the fence takes up on the ground, and maintenance.

Worm fence is simply constructed of rails stacked alternately on top of one another, with the rails interlocked like laced fingers where the ends meet. The fence zigzags to give it stability, and it can be used where posts can't be driven into the ground. These fences are usually only 2' to 3' high, and are most often used in areas where local timber is readily available and the terrain tends to be rocky and uneven. If you use a worm fence, create openings for wildlife to cross by intermittently dropping rails to the ground.

Christine Paige

A low worm fence is easily hopped by most ungulates. Drop the top rail to the ground every few hundred feet to allow smaller animals to cross.

Worm Fence

- Use three to four stacked rails per section, 8′ to 11′ long.
- Logs or split rails can be used. Rails split in a triangular manner add stability.
- Set the ends of each bottom rail on a rock or short log slightly above the ground to postpone decay.
- Interlace the rails at joints at a 30-degree angle.
- Stack rails only up to 2′ to 3′ high.
- If extra stability is needed, fasten rails together with 6" nails or spikes, and drive 4′ lengths of ½" rebar into the ground on either side of the joint, flush with the top rail.
- Drop rails to the ground every 400′, and in swales and at stream crossings for easy wildlife passage.

Wildlife "Death Pipes"

Open vertical pipes are silent and overlooked killers of birds and small animals. Hollow metal and plastic (PVC) pipes serve a wide variety of purposes, from ventilation pipes for buildings, outhouses, or irrigation systems, to fence posts, corner posts, gate uprights, and mining claim markers.

Birds, small mammals, and reptiles will investigate hollow pipes, especially for potential nest sites. Once inside they become fatally trapped, unable to find purchase on the pipe's smooth walls. In 2009, for example, a biologist at the Audubon California Kern River Preserve found more than 200 dead birds in a fallen 50-year-old irrigation standpipe.

Most victims were cavity-nesting birds, such as bluebirds, woodpeckers, kestrels, and small owls. Because open pipes are so prevalent across our landscapes, the overall toll on birds and small animals may be in the millions.

Easy Fixes for Death Pipes

- Remove unused obsolete pipes.
- Permanently cap or fill pipes used as fence posts, gate uprights, sign posts, claim markers, or monuments. These can be capped with concrete, or entirely filled with sand, gravel or concrete. Chain link fence posts can be capped with commercial caps.
- Cover ventilation pipes on buildings, irrigation systems, and outhouses with galvanized hardware cloth held in place by steel pipe clamps, or install commercial vent caps.

Sean Rowe

Capping or screening open vertical pipes prevents birds and other small animals from becoming fatally trapped.

Jeff King

Sean Rowe

Sean Rowe

Residential Fences

Fences serve many functions around homes, both aesthetic and practical: they may define a boundary, create a play space, contain pets, or discourage wildlife from yards and gardens.

Avoid fences with spikes, pickets, or barbs that protrude above the top bar. Many wrought iron fence designs have decorative spikes on top. Gauging a jump by the uppermost horizontal bar, animals can misjudge the fence height and be lethally caught or impaled on the fence.

Any tall residential fence, whether wrought iron, plank, picket, or chain-link, should be used only for small areas around the home, and not for larger perimeter fences. If a fence provides a complete barrier, an open gate may allow animals to find a way in but not out. Be sure vertical planks or bars are spaced closely enough that animals will not try to push through and become trapped. Check city and county ordinances for fence regulations.

Many residential areas are in wildlife winter range. Using landscaping instead of fencing, or using only low, very permeable fences, allows wildlife to move freely through neighborhoods.

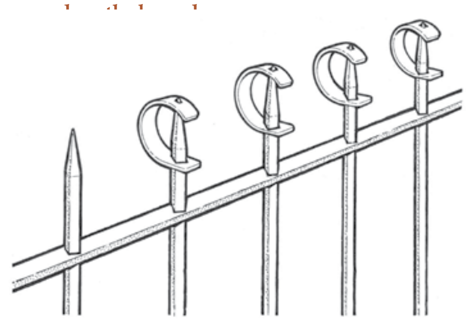
Photos below: Low, decorative yard fences pose little hazard or barrier to wildlife.

Christine Paige

Christine Paige

Colorado Parks and Wildlife

Iron fences with spikes or pickets are a lethal hazard for deer and other ungulates that wander neighborhoods. Cutting off or covering the spikes



International Chimney Corporation created customized deer shields to modify a historic iron spiked fence for a client.

Christine Paige

A solid top rail and narrow vertical bars on this iron fence reduce hazards to wildlife.

Fence Alternatives

Hedgerows

If you do not need a fence to contain or exclude livestock, consider other creative ways to define boundaries and discourage trespass.

A line of shrubs or trees can mark a boundary line, beautify your landscape, and provide nest sites for birds and food and cover for wildlife. Depending on the site, a wide range of native and ornamental shrub species can be used to create an effective hedgerow – from lilacs and honeysuckle to willows, alder, and big sagebrush. Your County Cooperative Extension Office can help find local sources for plants and choose appropriate species for your site.

Many native shrubs are suitable for hedges and enhance wildlife habitat.

Beware using some non-native species that can become difficult or impossible to manage.

Mix it up: consider using several species, varying the width of the hedgerow, or using plants of different heights to create a natural and wildlife friendly hedge. Once established, hedgerows require minimal maintenance unless you want a highly manicured look.

Christine Paige

Boundary Markers

Where you do not need a fence, consider marking property boundaries with signs, flexible fiberglass or plastic boundary posts, or fence posts spaced at intervals but without cross wires.

Property boundaries can also be marked with steel t-posts or flexible fiberglass or plastic posts such as Carsonite (**www.carsonite.com**) or Flexstake posts (**www.flexstake.com**), available through survey and forestry suppliers. Commercial fiberglass and plastic marker posts are highly visible and durable. However, the cost per post can be greater than a heavy-duty steel fencing t-post.

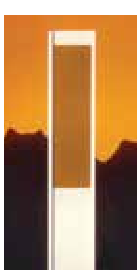


Photo courtesy of Carsonite Composites

Posts can mark a boundary where fences are not needed. Flexible plastic posts can be ordered with reflective tape or custom lettering.

Barrier Posts

Barrier posts or bollards are short, stout posts spaced to prevent access by vehicles. They can be used to define a driveway or parking area, or edge an expanse of lawn. Posts can be spaced closely together, or placed farther apart and connected with a heavy chain, cable or rail, from two to three feet high. Bollards and posts with low chains or rails pose little deterrent or hazard for wildlife.

Bollards can be made of wood, concrete, brick, stone, cast iron, aluminum, or steel; a row of boulders serves the same function. Some can be installed as fixed or removable posts. A wide variety of bollard designs and ornamental covers are also available commercially.

Christine Paige

Christine Paige

A row of boulders or bollards (concrete or wooden posts) can prevent vehicle access but poses no barrier to wildlife.

If You Must Exclude

There are times when it is necessary to use exclusion fence to keep wildlife out.

If you must put up an exclusion fence, avoid fencing a large area that includes wildlife habitat. Focus exclusion fences on small areas for specific purposes, such as fencing around play areas, vegetable gardens, beehives, calving and lambing areas, or haystacks. Keep exclusion fence close to the activity you need protected, and allow wildlife to use other parts of the property.

For any exclusion fence, place gates at corners: an animal that inadvertently finds itself trapped inside is more likely to find escape through an open corner gate than through a side gate.

Christine Paige

Use chainlink fences only for specific purposes, such as play areas and dog kennels.

Wooden Plank Fence and Chainlink Fence

Chainlink fences and wooden fences with closely spaced vertical planks are especially unfriendly to wildlife and can create a complete barrier to animals of all sizes, from turtles to moose. If you must use chainlink or plank fences, limit their use to small enclosures.

Yard fences and play area fences often do not need to be more than 4′ high. If higher, be sure gates are kept secured to prevent animals from finding their way in.

For small chainlink dog kennels, attach a roof to prevent wild animals from becoming trapped inside. A roof also provides shade and shelter for your pets.

Christine Paige

Deer and Elk Exclusion Fence

A permanent non-electric exclusion fence for deer and elk should be 7′ to 8′ high. A 7′ to 8′ wooden fence that animals can't see through is typically used around housing areas. For gardens, vineyards, and other agricultural plots, 8′ woven wire fence is more often used with posts set at 8′ to 20′ intervals, and the wire is brought tight to the ground. Make the top highly visible by using a top rail, high-visibility wire, or flagging. Place gates at corners, where an accidentally trapped animal is more likely to find an escape.

A 7' to 8' fence is an effective barrier to elk, but should be used only for specific needs, such as gardens or haystack yards. Make the top highly visible with flagging, white tape or wire, or a rail.

Haystacks and Hay Yards

Several options exist for protecting haystacks from wildlife damage. These include electric, non-electric, temporary, and permanent designs.

Montana Fish, Wildlife & Parks

Deer-D-Fence

Temporary Solutions

A simple and cost-effective solution is to wrap haystacks with heavy-duty plastic mesh netting, such as Deer-D-Fence (**www.tizergardens.com/distributing.html**), a 2x2" durable plastic mesh that is strong, lightweight, and easy to handle. Haystacks and large bales can be wrapped quickly, and the netting is readily lifted off when not needed. This netting is especially useful for temporary applications, rapid installation, and remote settings.

Plastic netting can also be used instead of woven wire as fencing, and installed on wood or steel posts using UV-resistant zip-ties. The plastic is UV-resistant and durable, and materials cost is comparable to woven wire. However, labor costs for fence construction can be greater than with traditional materials.

Increase visibility by adding poly-coated wire, tape, or flagging when using plastic mesh as fencing. Although the mesh would cause little harm to most large animals, it is nearly invisible when erected and should be flagged to be visible to birds.

Permanent Fences

Many landowners prefer to protect a large haystack yard with a permanent fence. The traditional stackyard fence is at least 8′ high and uses woven wire with wood posts or a combination of wood and steel posts. One-way gates should be placed in the corners to allow animals that might be inadvertently trapped inside to find a way out more easily.

A permanent electric fence, 6′ to 7′ high, is also effective for protecting stackyards from game damage. This fence is constructed with high-tensile smooth wire spaced at 10" intervals with alternating hot and grounded wires.

A 7-wire fence 72" high with strands at 10" intervals is adequate for elk. Deer, on the other hand, require a higher fence of 84", with 8 to 9 wires.

Christine Paige

A traditional 8′ woven wire fence can protect a stackyard from game damage. An alternative is a permanent 7-strand electric fence.

Larry Feight, High Country Ag. Marketing

Haystack Fence

- Use 10′ pressure-treated wooden line posts, 3" to 4" in diameter, driven 2.5′ into the ground, and spaced at 30′ intervals.
- Use 10′ pressure-treated wooden brace posts, 4" to 5" in diameter, driven 3′ into the ground.
- Use 12.5-gauge, smooth Class III galvanized wire with a tensile strength of 170,000 PSI and breaking strength of 1,308 lbs. To increase visibility, use white poly-coated wire with the same specifications.
- Space seven strands at 10" intervals; the top wire at 72" for elk or 84" for deer; wooden posts require using insulators.
- Alternate hot and ground wires: bottom wire is grounded and top two wires are hot.
- Place solar energizer according to manufacturer recommendations.
- Ground fence properly according to the energizer instructions.
- Install electric fence warning signs.

Joe Weigand, Montana Fish, Wildlife & Parks

A permanent electric fence is an effective alternative to woven wire fence. A 6' fence with 7 strands at 10" intervals is adequate for elk.

3-D Deer Fence for Yards and Gardens

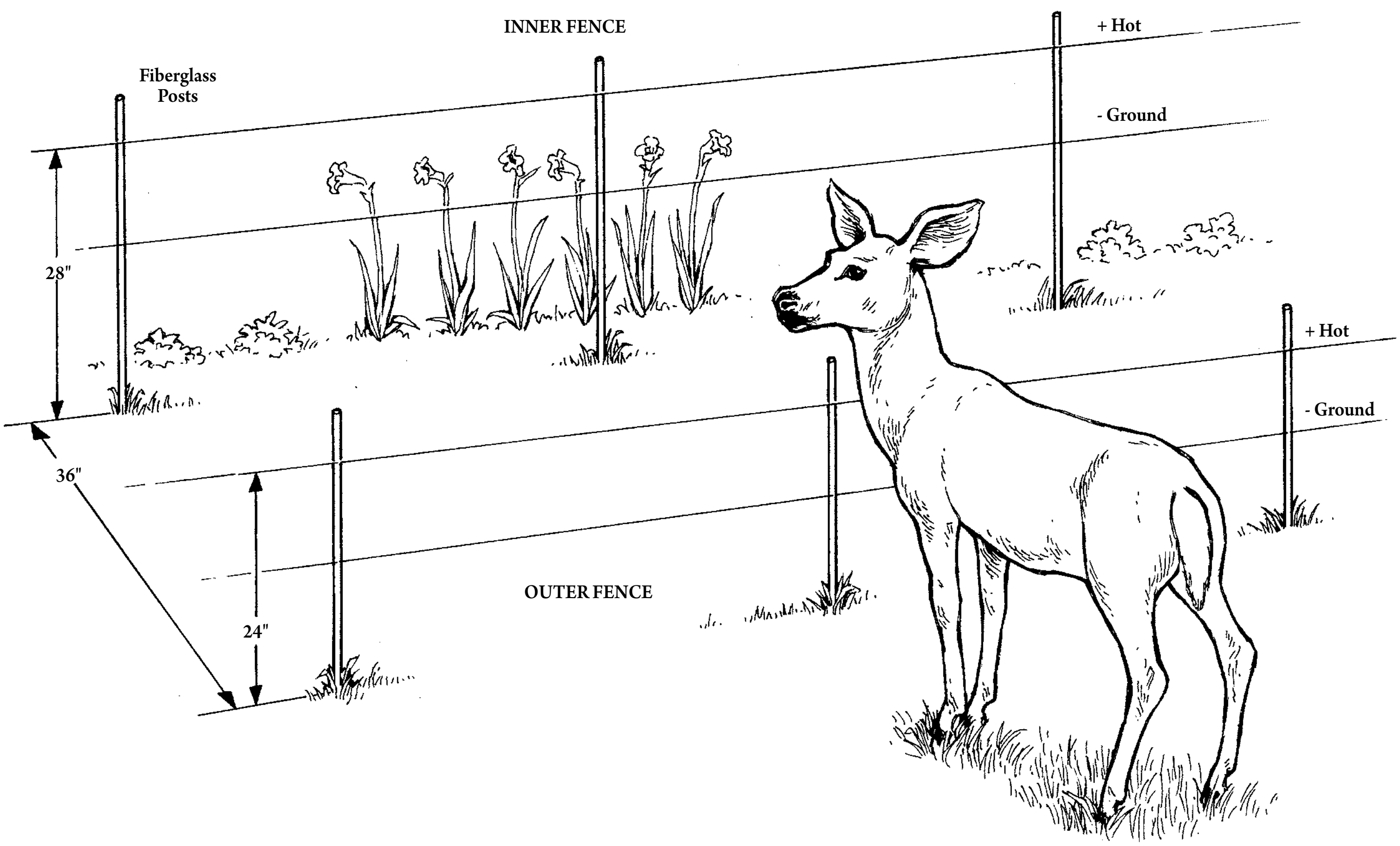
Deer are not comfortable jumping fences with both height and depth, and are wary of fences that are not flat and regular. **A staggered picket fence or leaning fence can be an effective deer deterrent.** Another is to add tall vegetation – tall perennials, shrubs and trees – along a fence to increase the perceived depth of the barrier.

Another alternative is a 3-D electric deer fence, which can be effective for keeping white-tailed deer out of orchards and vegetable gardens. This fence is basically two parallel fences only 36" to 38" apart, the outside slightly shorter than the inside fence. The 3-D fence can be constructed as a permanent fence with high-tensile wire or as a temporary fence with poly-rope or tape and moveable posts.

3-D Deer Fence

- Place two separate lines of 4′ fiberglass posts, the lines spaced 36" to 38" apart. Drive posts 16" to 18" into the ground.
- On the inner fence, string two 12.5-gauge high-tensile smooth wires at 12" and 28" above the ground.
- On the outer fence, place two wires at 12" and 24" above the ground.
- Make sure there is at least a 12′ clearing in front of the outer fence so deer will see the fence. Flagging or high-visibility wire also help both deer and people see the fence.
- Install a solar energizer according to manufacturer's instructions.

3-D ELECTRIC DEER FENCE FOR YARDS AND GARDENS



Deterring Large Predators

Many different permanent and temporary electric fence designs can deter large predators. These fences are used primarily for small-scale operations, such as beehives, dumpsters, lambing or calving areas, corrals, bone piles, and other small areas in need of protection from scavenging or predation. **A 7-wire permanent electric fence from 42" to 54" high is most commonly used to deter bears and wolves.** In special situations, a higher 9-wire or 11-wire fence might be used. In dry, rocky soils, the fence should have alternating charged and grounded wires, with both top and bottom wires hot. In this setup, an animal must touch both a hot and a ground wire to receive a full shock. Use a grounded bottom wire if the wire is likely to touch vegetation. A fence with all hot wires can be used in areas with damp or moist soil that will provide sufficient grounding when the animal touches a hot wire.

The table at right shows specifications developed by the NRCS in cooperation with Montana Fish, Wildlife & Parks (NRCS 2006b). *(continued)*

© Henry H. Holdsworth/wildbynaturegallery.com

Seth Wilson

Predator deterrent fencing should be used only around specific areas, such as corrals and beehives. Always hang warning signs on electric fences.

Seth Wilson

Bear and Wolf Deterrent Fencing

(Adapted from NRCS 2006B)

Charge and Recommended Wire Heights from Ground Level

	Bear[1] 7-wire	Bear & Wolf[2] 7-wire	Beehive or Chicken Coop[3] 7-wire	Wolf & Bear[4] 9-wire (corral or home areas)	Wolf & Bear[4] 11-wire (away from corral or home areas)
Top wire	(+) 42"	(+) 54"	(+) 54"	(+) 60"	(+) 72"
2nd wire	(-) 36"	(-) 42"	(-) 42"	(-) 50"	(-) 64"
3rd wire	(+) 30"	(+) 32"	(+) 32"	(+) 42"	(+) 56"
4th wire	(-) 24"	(-) 24"	(-) 24"	(-) 36"	(-) 48"
5th wire	(+) 18"	(+) 18 "	(+) 18 "	(+) 30"	(+) 40"
6th wire	(-) 12"	(-) 12"	(-) 12"	(-) 24"	(-) 32"
7th wire	(+) 6"	(+) 6"	(+) 6"	(+) 18"	(+) 26"
8th wire				(-) 12"	(-) 20"
9th wire				(+) 6"	(+) 15"
10th wire					(-) 10"
11th wire					(+) 6"

Bear[1] (42") 7-wire: Primary use is to deter grizzly and black bears; allows deer and elk passage.
Bear & Wolf[2] (54") 7-wire: Primary use is to deter grizzlies, black bears, and wolves from calving and lambing areas, but where wolf activity is low to moderate or there is potential for wolf activity.
Beehive or Chicken Coop[3] (54") 7-wire: Primary use is is deter grizzly and black bears from apiaries.
Wolf & Bear[4] (60-72") 9- or 11-wire: Primary use is to deter wolves and bears when predator activity or risk is high. Also useful for situations where ungulate damage to a lower fence (54") might be anticipated, or there is a predator issue.

© Henry H. Holdsworth/wildbynaturegallery.com

Deterring Large Predators

(continued)

Key to the success of electric fences is to erect them before the attractant level is high, so that animals are "trained" to a fence early on. **Also, the amount of energy your setup can deliver over the full distance of the fence is crucial.** Because of predators' thick fur, the system must deliver enough shock to deter them. For grizzlies, the system should deliver 6,000 volts or more, and will require an energizer with a rating of at least 0.7 joules. Be sure your energizer can deliver adequate power over the distance you need. Vegetation touching the wires and other factors can cause energy drain. Regularly check the voltage on every hot wire with a high-quality voltage tester, especially midway and at the farthest distance from the energizer. In addition, **always install warning signs on the fence.**

For more complete instructions and appropriate designs, see *Bears and Electric Fencing* published by Montana Fish, Wildlife & Parks, available online at **http://fwp.mt.gov/fishAndWildlife/livingWithWildlife/beBearAware/bearAwareTools.html** (Annis 2010). Also see *Practical Electric Fencing Resource Guide: Controlling Predators* published by the Living with Wildlife Foundation and available online at **http://www.lwwf.org** (Thompson, et al. 2005).

Tim Manley

Chicken coops and beehives can be irresistible to bears, but a high-energy electric fence is effective protection.

Fladry to Deter Wolves

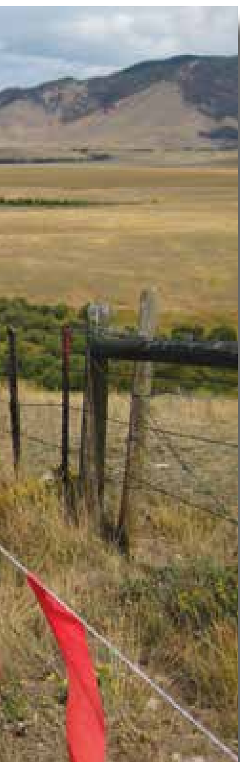
Fladry is a line of wire strung with long flags or streamers used to deter predators from livestock. Fladry's advantage is that it is portable, temporary, and requires comparatively little planning. It serves best as a short term deterrent until a more permanent fence can be planned and installed.

Steve Primm

Steve Primm

© Henry H. Holdsworth/wildbynaturegallery.com

Steve Primm



Deployed around temporary pastures, fladry has been shown to deter wolves for up to 60 days, and much longer if electrified. Be aware that this technique can have considerable problems with deployment, tangling, power drain, general availability, and high initial capital and labor costs. However, because it is portable and temporary, a number of western ranchers have found it to be an effective tool to protect livestock from wolves (Primm and Robinson 2011).

Fladry

- Use a large spool or reel (6" minimum diameter and 11" minimum width) to coil and deploy fladry. Handling by hand is enormously time-consuming.
- Electrified fladry ("turbo fladry") has a longer period of effectiveness, and deters livestock from trampling the line.
- Use 3⁄8" x 4′ fiberglass rod posts. Tip: Carry these in an old golf bag to deploy in the field.
- Line height should be no higher than 28," and fladry flags should hang above the ground. In spring and summer it is difficult to keep flags from touching vegetation.
- To secure the line, use a "harp clip," which allows the fladry flags to slide through the clip. See **http://www.premier1supplies.com** for an effective harp clip.
- For anchor posts, use thicker composite posts with wire clips, steel t-posts with insulators, or insulators on permanent wooden posts of existing fence.
- Create gates using anchor posts and good quality electric fence handles connected to an eye-bolt on the post.
- Electrify with an energizer that will provide an output of at least one joule per mile of fladry.
- A "wide impedance" energizer will deliver more consistent voltage under adverse conditions, such as dry soils, dry snow, cold temperatures, and long insulating fur.

Getting Help

Montana Fish, Wildlife & Parks Private Land Technical Assistance Program can contribute information, technical assistance, staff support, and sometimes cost-share to projects that reduce conflicts with wildlife and enhance wildlife habitat on private lands. Other FWP game damage and habitat enhancement programs may also be avenues to find support for wildlife friendly projects. Contact FWP Wildlife Bureau at (406) 444-3065 or your local FWP field office.

The Natural Resources Conservation Service (NRCS) offers cooperative programs to address natural resource concerns, including improvements to wildlife habitat. NRCS can provide technical and financial assistance for many types of enhancement projects, including wildlife friendly fence construction and modification. The NRCS works on a voluntary basis with private landowners. See **www. mt.nrcs.usda.gov** to learn more about their programs and contact information for your local NRCS Field Office.

The Montana Department of Transportation works cooperatively with landowners to construct or modify fences along state highway right-of-ways to wildlife friendly standards. Contact MDT Environmental Services for more information at (406) 444-7228.

In addition, check with your local County Cooperative Extension Office for technical assistance and information on landowner programs. If you share a boundary with federal lands or lease a federal grazing allotment, contact the agency's local office to inquire about opportunities for cooperative projects to replace or modify fences to be wildlife friendly.

Many sportsmen's clubs, civic groups, or conservation organizations may also be interested in helping to provide either cost-share support or volunteers for wildlife friendly fencing projects to enhance wildlife habitat.

Scott Nicolarsen

Mark Gocke

Bert Lindler

Many land trusts, sportsmen's clubs, community groups, and conservation organizations may be able to help with technical assistance, staff support, and small grants on wildlife friendly projects.

Sources

Allen, G.T. and P. Ramirez. 1990. A review of bird deaths on barbed wire fences. Wilson Bulletin 102(3)553-558.

Annis, K. 2010. Bears and Electric Fencing: A starter's guide for using electric fencing to deter bears. Montana Fish, Wildlife & Parks. 12 pp. Available online at: http://fwp.mt.gov/fishAndWildlife/livingWithWildlife/beBearAware/bearAwareTools.html.

Christiansen, T. 2009. Fence marking to reduce greater sage-grouse *(Centrocercus urophasianus)* collisions and mortality near Farson, Wyoming – summary of interim results. Wyoming Game and Fish Department, Green River, WY. 3 pp.

Colorado Division of Wildlife. 2007. Fencing with wildlife in mind: understanding the impact on wildlife when fencing your property. Colorado Division of Wildlife, Living With Wildlife Program. Brochure, 9 pp. Available online at: http://wildlife.state.co.us/NR/rdonlyres/B0D65D61-6CB0-4746-94F1- 6EE194E1C230/0/fencing.pdf.

Ehmke, C. 2009. If You Fence It, They'll Stay out: Fencing Out Stock in Wyoming. Univ. Wyoming Cooperative Extension Service. 2pp. Available online at: uwadmnweb.uwyo.edu/CESFRM/IfYouFenceIt.pdf.

George Miksch Sutton Avian Research Center. 2006. Fence marking for lesser prairie-chickens: a cooperative conservation solution. Sutton Avian Research Center, Bartlesville, OK. 2 pp. Available online at: http://www.suttoncenter.org/fence_marking.html.

Gillihan, S.W. 2000. Barbed wire fence fatal to burrowing owl. J. Colorado Field Ornithologists. 34(4)220-221.

Harrington, J.L. 2005. Characteristics of ungulate behavior and mortality associated with wire fences. Master's thesis, Utah State University, Logan, UT. 48 pp.

Harrington, J.L., and M.R. Conover. 2006. Characteristics of ungulate behavior and mortality associated with wire fences. Wildlife Society Bulletin 34(5)1295-1305.

Karhu, R. and S. Anderson. 2003. Evaluation of high tensile electric fence designs on big game movements and livestock containment. Final Report April 2003. Wyoming Cooperative Fish and Wildlife Research Unit. Laramie, WY. 27 pp.

Karhu, R. and S. Anderson. 2006. The effect of high-tensile electric fence designs on big-game and livestock movements. Wildlife Society Bulletin 34(2)293-299.

Karsky, Dick. 1988. Fences. Publication #8824 2803. U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center, Missoula, MT. 210 pp. Second printing 1999. Available online at: http://www.fs.fed.us/eng/pubs/pdfpubs/pdf88242803/pdf88242803dpi300.pdf.

Montana Code Annotated. 2011. § 81-4-101. Legal fences defined.

Montana Code Annotated. 2011. § 81-4-201. Animals running at large.

Montana Dept. of Fish, Wildlife & Parks. 2002. Fencing specifications for FWP properties. Internal document. 4 pp. MT Dept. of Fish, Wildlife & Parks, Helena, MT. October 25, 2002.

Mosley, J. 2011. Livestock fence laws: in versus out. Big Sky Small Acres 5(2):12-13.

Nero, R.W. 1974. Great gray owl impaled on barbed wire. Blue Jay 32(3)178-179.

Nesbitt, S.A. and D.T. Gilbert. 1976. Powerlines and fences hazards to birds. The Florida Naturalist. April: 23.

North Dakota Game and Fish Dept. 2006. Pronghorn management guide-2006: Biological and management principles and practices designed to sustain pronghorn populations from Canada to Mexico. North Dakota Game and Fish Department. 158 pp. Available online at: http://gf.nd.gov/multimedia/pubs/prong-mgmt-guide-pdf-ndx.html

NRCS. 2006a. Natural Resources Conservation Service Conservation Practice Specification: Permanent Power Fence. Code 382(b)-1of 5. May 2006. Natural Resources Conservation Service, Wyoming. 7 pp.

NRCS. 2006b. Natural Resources Conservation Service General Specification Power Fence. Fence (Feet) Code 382. Specification MT-382 (Power Fence), April 2006. 3 pp. Natural Resources Conservation Service Montana. Available online at: http://efotg.nrcs.usda.gov/references/public/MT/382_spec_Power_ 2006.pdf.

NRCS. 2010. Animal Enhancement Activity – ANM27 – Wildlife friendly fencing. Natural Resources Conservation Service. 2 pp.

Paige, C. 2008. A Landowner's Guide to Wildlife Friendly Fences. Landowner/Wildlife Resource Program, Montana Fish, Wildlife & Parks, Helena, MT. 44 pp.

Patla, S. and D. Lockman. 2004. Considerations and prescriptions for the design, construction and management of shallow water wetlands for spring through fall use by trumpeter swans *(Cygnus buccinator)* in western Wyoming. Report, Nov. 2004. Wyoming Game and Fish Department, Jackson, WY and Wildlife Services of the Rockies, Cheyenne, WY. 9 pp.

Primm, S. and A. Robinson. 2011. Electrified fladry for deterrence of gray wolves *(Canis lupus)*: an evolving manual of best practices. People & Carnivores Program, Northern Rockies Conservation Cooperative & Sun Ranch Institute. 15 pp. Available online at: http://peopleandcarnivores.org/.

Quitmeyer, C.J., J.A. Bopp, R.M. Stephens, R. Karhu and S. Anderson. 2004. High tensile electric fence: phase 2 – liability issues, maintenance costs, and containment of bison. Final Report December 2004. Wyoming Cooperative Fish and Wildlife Research Unit. Laramie, WY. 85 pp.

Schmidt, L. and J. Knight. 2000. Electric fencing to control deer and elk on Montana's farms and ranches. Montana State University Extension Service. 4 pp. Available online at: www.co.yellowstone.mt.gov/extension/ag/pubs/mt200010.pdf. html.

Sheldon, D.P. 2005. Movement and distribution patterns of pronghorn in relation to roads and fences in Southwestern Wyoming. Master's thesis, Department of Zoology and Physiology, University of Wyoming, Laramie, WY. 140 pp.

Stevens, B.S. 2011. Impacts of fence on greater sage-grouse in Idaho: collision, mitigation and spatial ecology. Master's thesis, College of Graduate Studies, University of Idaho, Moscow, ID. 210 pp.

Stevens, B.S., J.W. Connelly and K.P. Reese. 2012a. Multi-scale assessment of greater sage-grouse fence collision as a function of site and broad scale factors. J. Wildlife Management. doi: 10.1002/jwmg.397

Stevens, B.S., K.P. Reese, J.W. Connelly, and D.D. Musil. 2012b. Greater sage-grouse and fences: Does marking reduce collisions?. Wildlife Society Bulletin. doi: 10.1002/wsb.142.

Thompson, S., J. Jonkel and P. Sowka. 2005. 2005 Edition Living with Predators Guide. Practical Electric Fencing Resource Guide: Controlling Predators. Living With Wildlife Foundation, Swan Valley, MT. 38 pp. Available online at: http://www.lwwf.org.

Washington Dept. of Fish and Wildlife. 2004. Make your fence wildlife friendly. Crossing Paths Newsletter, Fall 2004.

Wolfe, D.H., M.A. Patten, and S.K. Sherrod. 2009. Reducing Grouse Collision Mortality by Marking fences (Oklahoma). Ecological Restoration 27(2)141-143.

Wyoming Game and Fish Dept. 2004. Fencing guidelines for wildlife. Revised version. Habitat Extension Bulletin No. 53. Wyoming Game and Fish Dept. 12 pp.

For more information or assistance, contact your local FWP office, wildlife biologist, or warden.

Joe Weigand, Private Land Wildlife Specialist,
can also be reached at (406) 444-3065, or email joweigand@mt.gov.

donaldmjones.com

Montana Fish, Wildlife & Parks

1420 East 6th Avenue
P.O. Box 200701
Helena, MT 59620-0701

Printing of this document was funded with sportsmen's license dollars.
Information regarding print costs can be obtained by writing to Montana Fish, Wildlife & Parks.

Appendix C
Drought Policy

Appendix C. Drought Policy

Bureau of Land Management
POLICY FOR ADMINISTERING PUBLIC LAND GRAZING
IN
MONTANA, NORTH AND SOUTH DAKOTA
DURING PERIODS OF DROUGHT

C.1 Introduction

Livestock grazing is but one of the activities that BLM manages on the public lands. Drought stresses many resources and resource uses including recreation, soils, timber, vegetation, watersheds, and wildlife as well as livestock forage. However, only livestock and human activities can be readily controlled or restricted from access to public lands. The other resources are either immobile or not readily controlled. This policy deals with livestock use and implements provisions of current laws and regulations. Other uses that may require special consideration during severe drought may be addressed in separate policy statements or actions.

Vegetation cover is one part of productive rangelands because it strongly affects soil moisture. When drought reduces the total forage produced and the normal residual vegetation (standing and down plant material) is used by livestock, insects, and other grazing animals, soil moisture and temperature are affected. Soil temperatures are lowered by the residual cover during warm periods and are raised by the residual cover during cold periods. Moisture intake and penetration into soils is keyed to the amount and type of residual cover found on a soil/ecological site. In fact, with little or no residual cover on rangelands, moisture events will likely produce little effective penetration into the soil. Residual cover provides protection for soils, vegetation, wildlife, watersheds, and for the many other resources dependent upon good vegetation and livestock management.

C.2 Authority

This document implements provisions of:

- Taylor Grazing Act of June 28, 1934, as amended;
- Federal Land Policy and Management Act of 1976, as amended;
- Public Rangelands Improvement Act of 1978;
- Regulations in 43 code of Federal Regulations, Group 4100 (43 CFR 4100).

C.3 Policy

This policy is meant to supplement the national drought policy as set forth by Washington Office Instruction Memorandum 2013-094.

It is the policy and objective of the BLM to: manage the public lands and authorize livestock grazing under the principles of multiple use and sustained yield; provide for the orderly administration of grazing by domestic livestock on the public lands; and provide for productive and healthy soil and vegetation resources as well as other environmental values.

Accomplishment of these objectives becomes more difficult during periods of range depletion caused by drought. Normal grazing schedules and livestock management practices may have to be modified. Additional coordination, consultation, and data exchange between livestock operators and Bureau personnel will be required, over and above the level normally practiced. Appropriate local, state and Federal agencies and the interested public will have to be involved at times and consistently kept informed.

The principal thrust of the policy and procedures in this document, and other regulatory and procedural requirements not repeated here, will be for the livestock operator and BLM to jointly develop strategies for livestock use on public land during and following drought. Strategies selected should be those that best protect rangeland resources while minimizing impacts on the operator to the extent possible. To that end, every degree of flexibility provided by the laws and implementing regulations will be available to authorized officers of the Bureau.

Voluntary adjustments in livestock use of public lands should be sought at the earliest date it becomes apparent that "normal" grazing schedules cannot be followed, or, if followed, would result in long-term resource degradation. The earlier an agreement can be reached or a decision made that "normal" grazing schedules cannot be followed, the more opportunities livestock operators will have to consider alternatives to minimize impacts on his or her operation. Waiting until the last minute before scheduled turnout to make a determination or decision will reduce the options available to both the operator and the Bureau.

An interdisciplinary approach (within the confines of scarce skills availability) to identify natural resources and other applicable public values vulnerable to drought will be used to prioritize allotments for attention. Second, efforts to manage public rangeland under drought conditions will be directed next to allotments with resource concerns—typically "I" category allotments. Specific allotments in the "M" and "C" categories can also be considered high priority when resource values or conditions so require. Regardless of the category assigned to an allotment, operators should be aware of the procedures and flexibilities available for dealing with drought conditions.

BLM fully expects that the vast majority of livestock operators will recognize the need and voluntarily make adjustments in livestock use of public lands the longer a drought persists. These adjustments will be recognized during the application process and grazing bills will be adjusted accordingly. Adjustments in grazing use may include but are not limited to reducing livestock numbers, shortening the season of use, altering pasture move dates, changing pasture rotations, authorizing water hauling (after documenting NEPA compliance), closing allotments to grazing use, or allowing use in vacant allotments.

- Regulatory mechanisms to voluntarily implement grazing use changes include approval of applications for voluntary non-use (43 CFR 4130.2(g)), or approving applications for changes within the terms and conditions of permits and leases (43 CFR 4130.4(b)), or some combination.
- Line officers also have the option to implement needed changes through a formal agreement between the BLM and grazing operator (which is recommended to be implemented by decision) that specifies the drought-related grazing adjustments (43 CFR 4110.3-3(a)), or by temporarily suspending or otherwise modifying use via a decision that may be put into immediate effect, if necessary (43 CFR 4110.3-2(a) and 3-3(b)).[2]

- If using an agreement or decision, indicate within it the intended duration of the drought-related adjustments and include supporting rationale for the indicated timeframe.
- Regulation 43 CFR 4130.6-2 provides the mechanism for the BLM to authorize use in vacant allotments. Do not modify permits and leases (43 CFR 4130.3-3) to make drought responsive short-term grazing use adjustments.

Offices are required to screen any proposed drought mitigation strategies and actions to determine if they trigger the requirement for National Environmental Policy Act (NEPA) compliance documentation and if so, whether existing documentation is adequate or whether additional analysis is needed. Addressing drought management in Resource Management Plans or Allotment Management Plans, or preparing programmatic drought action plans, provides pro-active opportunities to address potential conditions and contingencies.

In those situations where agreement cannot be reached, authorized officers of the Bureau have the final responsibility and accountability for ensuring that public lands are not permanently damaged by improper use. If issuance of a decision concerning livestock use becomes necessary, the procedure specified in 43 CFR 4160 will be followed. It should be further understood that final decisions can be modified or rescinded, if the conditions that existed when the decision was issued no longer exist. If significant amounts of precipitation occur during the growing season, producing significant changes in the amount of moisture available to plants, this may cause decisions to be reconsidered. The consultation, cooperation, and coordination process will be used to obtain livestock operator and stakeholder involvement in such cases.

C.4 Procedures and Guidelines

The following guidelines and procedures are intended to provide the data, flexibility and direction for public land managers and livestock operators to develop strategies and make decisions during drought conditions. Consultation and coordination with livestock operators and other interested parties will be carried out during all procedural steps.

C.4.1 Winter Assessment (Late-October - February)

Analysis

1. Review the past season's monitoring results. Analyze plant growth, actual use, insect infestation occurrences, utilization, use pattern maps, residual cover, and especially the use of "rest" pastures. Review the past season's land health assessments in areas of concern.
2. Analyze precipitation records and distribution patterns from the National Weather Service, the Montana Drought and Water Information website, the North Dakota Drought website, the South Dakota Drought website, local cooperators, BLM, and other agencies. Tabulate moisture departures from normal levels and timing of precipitation in relation to past years' growing season.
3. Determine whether currently available data is sufficient to inform and support drought responsive actions.
4. In identified priority or "I" allotments where there is concern because there is limited residual cover, effective precipitation well below normal, rest pastures already used, abnormally high utilization or use patterns, etc., field offices may opt to measure soil moisture in representative areas for additional data. Where available, use RAWS/OMNI sites, existing soil moisture

stations, NRCS SCAN soil climate monitoring sites, etc. Additional soil moisture samples are to be taken at the rooting depth of major forage species in representative areas using techniques found in agency manuals/handbooks, the professional literature and extension publications.

Action

1. Where it is apparent resource degradation might occur if drought continues, begin to notify operators through letters and news releases that the coming year's livestock grazing could be affected.
2. Set up range user meetings in affected communities to discuss available information and possible actions to prevent range resource damage.
3. Encourage operators to make needed changes in their grazing schedules, including applying for non-use. If non-use is taken, but activated later should conditions change, BLM will waive the $10 service fee in accordance with 43 CFR 4130.8.3. Authorized officers may issue refund or credit of grazing fees under 43 CFR 4130.8-2(b).
4. Meet with individual operators when available information indicates a particular allotment is affected by severe drought condition. Attempt to reach agreement on alternative grazing strategies if conditions do not change.

C.4.2 Late Winter and Spring Assessment (February - April)

Analysis

1. Review precipitation and soil moisture data for winter and early spring.
2. Review the effects of winter grazing use; snow pack influence for stock water, soil temperatures, etc.
3. Continue soil moisture measurements or monitoring where problems are apparent or in areas of concern. Measurements at rooting depth to measure available water for plants will be especially important during this period.
4. Assess availability of livestock water, in consultation with permittees.
5. Assess the availability of water for wildlife.

Action

1. If drought conditions are continuing, or becoming more severe, follow up winter letters and news releases with updates and attachments to grazing applications. Conduct meetings with Cooperative State Grazing Districts and Resource Advisory Councils. Meetings are encouraged with other concerned individuals and agencies as a part of the grazing management strategy.
2. Contact remaining operators who have not voluntarily made needed changes. Where you believe you have enough information to indicate an allotment is in severe drought condition, meet with the operator to review and explain the information you have and attempt to reach agreement on a grazing strategy. If an agreement cannot be reached and, especially if the allotment has a relatively early turnout date, issue a proposed decision. The extent of use adjustment contained in this decision (delayed turnout, reduction in numbers or duration, total exclusion, etc.) will depend on your assessment of all the factors involved. These include past grazing use, range condition, residual cover, precipitation, soil moisture and the land use objectives for the allotment.

3. If soil moisture is very dry and tending to blow away (Quick Assessment), or below the average soil moisture between field capacity and wilting point (Volumetric Measurement), delay turnout until key forage plants have grown to the 3-4 leaf stage (approximately one-half their normal height--for most of our native grass species about 6 inches). (Manske 2003, Manske 2011, Fraser 2003)

C.4.3 Continuing Assessment (throughout grazing season)

Analysis

1. Continue to closely monitor precipitation in "I" allotments and areas of concern. Attention is directed to determining effective (soil moisture) growing season precipitation.
2. Closely monitor utilization of key plant species and key areas. Remember to consider management objectives when selecting key species and areas.
3. Continue to monitor soil moisture in "I" allotments and areas of concern.
4. Monitor factors other than livestock grazing, such as insect infestations, congregations of wildlife, availability of livestock water, etc.
5. Monitor forage, habitat and water needs for wildlife. Consult with state wildlife agencies as needed.

Action

1. If soil moisture drops below the average soil moisture between field capacity and wilting point (Volumetric Measurement) and utilization has reached objective levels or a maximum of 30 percent utilization has occurred, livestock are to be removed.
2. If soil moisture remains unacceptable (completely dry and blows away (Quick Assessment)) or below wilting point soil moisture levels (Volumetric Measurement) during most of the spring and early summer with little or no growth in primary forage species for livestock (i.e., range readiness has not been reached), advise affected permittees that fall and winter ranges may not be available for use during the current year. Also advise that production in subsequent years may be affected if plant basal areas and density have been severely reduced.
3. For those permittees in "I", allotments with AMPs having available standing forage in rest pastures or fall or winter use pastures, advise the permittees that livestock must be removed from public lands when consumption of standing forage has reached objective levels or a maximum of 50 percent.
4. Adjust monitoring plans to collect data concerning residual cover, plant death, loss of basal area, density, and yield for analysis and use in later years.
5. Utilize interdisciplinary teams to ensure wildlife forage and water requirements are considered when determining adjustments.

C.4.4 Other Considerations

1. The use of salt, mineral, and certain mineral supplements as necessary to overcome natural shortages of minerals in rangeland forage may be authorized as necessary to provide for proper range management(4130.3-2(c)).

2. Maintenance feeding on public lands is not authorized except under very unusual short-term conditions and by permit only. Maintenance feeding during drought conditions is specifically excluded.
3. Applications for a maintenance feeding permit due to poor forage conditions associated with drought should be denied and livestock removed or not allowed.
4. Review RMP guidance on wildlife habitat objectives.

C.4.5 Definitions

Available water: That portion of water in a soil that plants can extract from the soil—generally measured per unit volume of soil; the amount of water in a soil between field capacity and permanent wilting point.

Basal area (range): The area of ground surface covered by the stem or stems of a range plant, usually measured 1 inch above the soil in contrast to the full spread of the foliage.

Density: (1) The number of individual plants per unit area; (2) Refers to the relative closeness of plants to one another.

Field Capacity: The maximum amount of water held in a soil, measured a few days after it has been thoroughly soaked and allowed to drain freely.

Flexibility: The ability to alter the grazing management plan to meet changing conditions.

Flushing: Feeding female animals a concentrated feed shortly before and during the breeding period for the purpose of stimulating ovulation.

Growing season: In temperate climates, that portion of the year when temperature and moisture are usually most favorable for plant growth.

Key species: (1) Forage species whose use serves as our indicator to the use of associated species; (2) Those species which must, because of their importance, be considered in the management program.

Maintenance feeding: Supplying feed to range animals when available forage is too limited to meet their minimum daily requirement (examples are cubes, pellets, baled or loose hay).

Permanent Wilting Point (PWP): The soil water content at which water is no longer available to plants, causing them to wilt because they cannot extract enough water to meet their requirements.

Phenology: The study of periodic biological phenomenon such as flowering, seeding, etc., especially as related to climate.

Range readiness: The defined stage of plant growth at which grazing may begin under a specific management plan without causing permanent damage to vegetation or soil.

Supplemental feed: A feed which supplements the forage available from the public lands and is provided to improve livestock nutrition and good animal husbandry and rangeland management practices. An example is salt or mineral block. Creep feeders to supplement feed for calves and supplemental feeding to "flush" cattle and sheep for breeding may be authorized on public lands when compatible with the resource management objectives.

C.4.6 Soil Moisture Monitoring Methods Appendix

Quick Assessment

Soil moisture readings taken from 3 rooting depths of key forage species (e.g., 4-6 inches, 10-12 inches, 16 inches up to 3 feet) will indicate whether various key forage species have adequate moisture for growth. Squeeze the soil in your hand. Does it form a ball? If so, you probably have adequate soil moisture for growth. If it doesn't form a ball, but your hand feels cool, you probably have some soil moisture left. If the soil is completely dry and blows away, there is likely not enough moisture to sustain plant growth. (Howery 1999).

% **Available water remaining**	**Coarse (Sand - Loamy Sand)**	**Light (Sandy Loam)**	**Medium (Loam, Silt Loam, Silty Clay Loam, Clay Loam, Sandy Clay Loam)**	**Heavy (Sandy Clay, Silty Clay, Clay)**
0 (PWP or drier)	Dry, loose, single grained, flows through fingers	Dry, loose, flows through fingers	Powdery, dry, sometimes slightly crusted but easily breaks down into powdery condition	Hard, baked, cracked, sometimes has loose crumbs on surface
< 50	Still appears to be dry; will not form a ball with pressure	Still appears to be dry; will not form a ball	Somewhat crumbly but will hold together from pressure	Somewhat pliable, will ball under pressure
50-75	Still appears to be dry; will not form a ball with pressure	Tends to ball under pressure but seldom will hold together	Forms a ball, somewhat plastic, will sometimes slick slightly with pressure	Forms a ball, will ribbon out between thumb and forefinger

(Table adapted from Manitoba 2013)

Volumetric Measurement

The soil moisture content may be expressed by weight as the ratio of the mass of water present to the dry weight of the soil sample, or by volume as ratio of volume of water to the total volume of the soil sample. To determine any of these ratios for a particular soil sample, the water mass must be determined by drying the soil to constant weight and measuring the soil sample mass after and before drying. The water mass (or weight) is the difference between the weights of the wet and oven dry samples. The criterion for a dry soil sample is the soil sample that has been dried to constant weight in an oven at temperature between 100 – 110°C (105°C is typical). Normally drying is conducted on samples for at least 24 hours. A precision balance scale is needed (±0.001 g.) Volumetric soil moisture can then be determined.

$$\text{Gravimetric soil moisture (W\%)} = \frac{\text{wt. (wet soil)} - \text{wt. (oven dry soil)}}{\text{wt. (oven dry soil)}} \times 100\%$$

Volumetric soil moisture (θ%) = gravimetric soil moisture x bulk density
{Note: Bulk densities for specific soils can be obtained from the Web Soil Survey.}

Soil moisture measurements can then be compared with water content-15 bar and water content 1/3 bar data for a specific soil from the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/). Water content, 15 bar, is the amount of soil water retained at a tension of 15 bars, expressed as a volumetric percentage of the whole soil material. Water retained at 15 bars is significant in the determination of soil water-retention difference, which is used as the initial estimation of available water capacity for some soils. Water retained at 15 bars is an estimation of the wilting point. Water content, one-third bar, is the amount of soil water retained at a tension of 1/3 bar, expressed as a volumetric percentage of the whole soil. Water retained at 1/3 bar is significant in the determination of soil water-retention difference, which is used as the initial estimation of available water capacity for some soils. Water retained at 1/3 bar is the value commonly used to estimate the content of water at field capacity for most soils.

As soil moisture levels approach the wilting point of a soil, the less water available for plants. Plant growth becomes marginal and the plant is stressed. If the plant is further stressed by removal or damage to the top growth, it will begin to lose vigor, roots and thus its ability to grow. It is not unusual to reach this moisture level during late summer in much of Montana, Dakotas, and other semi-arid areas.

Other Soil Moisture Considerations

When monitoring soil moisture the following information should be kept in mind:

1. Soil moisture is measured at the depth of plant roots or to a root limiting layer. It will vary by plant(s) and soil type.
2. Soluble salts, gravel and heavy clay will decrease plant available water capacity.
3. Organic matter, good soil structure will increase plant available water capacity (The capacity increases about 1 percent for each 1 percent of organic matter).
4. Soils with water restricting layers like naturally compact subsoil, shallow bedrock or stratification can increase plant available water capacity of the overlying soil layers.
5. Soils that are deep, medium textured and uniform can have decreased plant available water but allow for deeper rooting.

C.4.7 References

Fraser, D. A. 2003. Using range readiness criteria. Forest Practices Branch, British Columbia Ministry of Forests, Victoria, B.C. Rangeland Health Brochure 5.

Howery, Larry. 1999. Rangeland Management Before, During, and After Drought, AZ1136 University of Arizona Cooperative Extension, 6p. ag.arizona.edu/pubs/natresources/az1136.pdf.

Manitoba Agriculture Food and Rural Initiatives Soil Management Guide, table 3-2, website accessed April 2013, http://www.gov.mb.ca/agriculture/soilwater/soilmgmt/fsm01s03.html

Manske, L.L. 2003. Biologically Effective Management of Grazinglands, NDSU Dickinson Research Extension Center, Rangeland Research Extension Program 4005. 268p.

Manske, L.L. 2011. Biologically Effective Grazing Management Reduces the Detrimental Effects from Drought Conditions on Grasslands--2nd Edition. NDSU Dickinson Research Extension Center. Range Science Report. 7p.

Appendix D
Economic Modelling Technical Approach

Appendix D.
Economic Modelling Technical Approach

The following provides an overview of the rationale and approach to modelling bison farm budget and fencing costs associated with various alternatives under consideration in the American Prairie Reserve Bison Change of Use Environmental Assessment (EA). An input-output model, Impact Analysis for Planning (IMPLAN), which provides a quantitative representation of the production relationships between individual economic sectors, was used to simulate economic effects to local economies from implementation of the change in use. Model inputs included direct spending related to the no action alternative and each of the action alternatives. Resulting estimated local economic impacts by alternative were presented in the analysis in the EA.

The model inputs described below are based on a standard bison farm budget. It should be noted that this source is based on a production-oriented enterprise and is likely to overestimate the potential effects from non-production-oriented, wildlife management focused bison grazing on APR lands. As such, limitations exist in the application of a standard bison farm budget given that APR does not operate exclusively for the purpose of raising bison to market. Nevertheless, it is assumed that the bison farm budget provided in Foulke et al (2001), which reflects the best available science and published information on the topic, represents an appropriate and conservative measure of estimated contributions and can be used in lieu of more detailed APR-specific operational budgets to estimate modelled inputs for the current analysis.

D.1 Livestock/AUM Conversion

As shown in **Table D-1**, the value for indigenous livestock was converted to value per AUM. Bison/Cattle AUMs are assumed an equivalency of 1 to 1 per NRCS (1997). According to Workman (1986), it takes 16 AUMs to produce a marketable cow.

Table D-1
Value of an AUM for Bison Production

Value of Production Per Bison[1]	AUMs Per Bison[2]	Value of Production Per AUM
$1,322.07	16	$82.63

[1] Value based on data from National Bison Association (2020)
[2] According to Workman (1986), it takes 16 AUMs to produce a marketable cow. Bison/Cattle AUMs for cattle and bison are assumed an equivalency of 1 to 1 per NRCS (1997).

D.2 FARM BUDGET

Direct value per AUM was entered into IMPLAN based on component parts of the bison farm budget provided in Foulke et al 2001. These component parts are presented in **Table D-2**.

Table D-2
Farm Budget Costs

Enterprise Budget, bison cow-calf*		Proposed IMPLAN sectors identified			
Category	**Price/cost per head, as a percent of gross value**	**IMPLAN 546 Code**	**IMPLAN 546 Description**	**2017 NAICS Code**	**NAICS Description**
Buildings, improvements and equipment	12.9%	235	Prefabricated metal buildings and components manufacturing	332311	Farm buildings, prefabricated metal, manufacturing
Purchased Livestock	1.1%	400	Wholesale - Other nondurable goods merchant wholesalers	424520	Auction markets, livestock (except horses, mules), merchant wholesalers
Retained Livestock	20.7%	467	Veterinary services	541940	Livestock inspecting and testing services, veterinary
Machinery and vehicles	11.0%	453	Commercial and industrial machinery and equipment rental and leasing	532490	Farm equipment rental or leasing
Land Resources	1.5%	447	Other real estate	531190	Agricultural property rental or leasing / Farmland rental or leasing
Overhead	15.1%	441	Monetary authorities and depository credit intermediation	521110	Banking, central
Native Hay; Protein cake (14%); Corn (whole-bulk); Mineral; Salt	15.9%	10	All other crop farming	111940	Hay farming (e.g., alfalfa hay, clover hay, grass hay)

Enterprise Budget, bison cow-calf*		Proposed IMPLAN sectors identified			
Category	**Price/cost per head, as a percent of gross value**	**IMPLAN 546 Code**	**IMPLAN 546 Description**	**2017 NAICS Code**	**NAICS Description**
Freight/trucking	2.3%	417	Truck transportation	484110	Trucking, general freight, local
Advertising	0.5%	152	Printing	323111	Advertising materials (e.g., coupons, flyers) commercial printing (except screen) without publishing
Veterinary medicine	0.2%	467	Veterinary services	541940	Livestock veterinary services
Machinery (fuel, lube, repair)	3.8%	515	Commercial and industrial machinery and equipment repair and maintenance	811310	Agricultural machinery and equipment repair and maintenance services
					Farm machinery and equipment repair and maintenance services
Vehicles (fuel, repair)	3.0%	400	Wholesale - Other nondurable goods merchant wholesalers	424690	Automotive chemicals (except lubricating greases, lubrication oils) merchant wholesalers
Equipment (repair)	0.7%	515	Commercial and industrial machinery and equipment repair and maintenance	811310	Agricultural machinery and equipment repair and maintenance services
Housing and improvements	1.5%	516	Personal and household goods repair and maintenance	811411	Small engine repair and maintenance shops
Hired labor	13.2%	19	Support activities for agriculture and forestry	115115	Crew leaders, farm labor
Interest on operating capital	2.9%	441	Monetary authorities and depository credit intermediation	521110	Banking, central
Returns to capital, risk and management	10.0%	14	Animal production, except cattle and poultry and eggs	112990	Bison production

*per Foulke et al 2001

D.3 FENCING COST

Total regional contributions were calculated based on direct contributions per mile of fencing. According Foulke et al (2001), fencing estimates run from $3,500 to $6,000 per mile. A value of $4,500 per mile for 16 miles was used to represent the fencing investment in that study. Input costs per mile, adjusted to 2020 dollars are provided in **Table D-3**. IMPLAN sectors identified for fencing costs are also identified.

Table D-3
Fencing Cost

Category	Cost per mile (2020 dollars)*	IMPLAN 546 Code	IMPLAN 546 Description	2017 NAICS Code	NAICS Description
Fencing	$6,617.29	396	Wholesale - Other durable goods merchant wholesalers	423390	Fencing (except wood) merchant wholesalers; Wire fencing and fencing accessories merchant wholesalers

*per Foulke et al 2001
Note: This amount does not include labor costs associated with fence construction

D.4 REFERENCES

Arland, Jessica. 2014. Bison Production; An analysis of species, production potential, market trends and management considerations. Department of Agricultural and Applied Economics; University of Wyoming. April 26, 2014

Foulke, Thomas; Torok, S.; Tatlor, T. and E. Bradley. 2001. Enterprise Budget: Bison Cow-Calf. Cooperative Extension Service, University of Wyoming. January 2001.

National Bison Association. 2020. July 2019 to February 2020 sale results. Online: https://bisoncentral.com/wp-content/uploads/2020/02/Sales2.13.20.pdf

Metzger, Steve. 1996. Commercial Bison Production: Economic Analysis and Budget Projections. Carrington Research Extension Center. North Dakota State University. Online: https://www.ag.ndsu.edu/archive/carringt/98beef/comm.htm

Natural Resource Conservation Service (NRCS). 1997. National Range and Pasture Handbook. September, 1997.

Workman, John. *Range Economics*. 1986. New York: Macmillan Co.