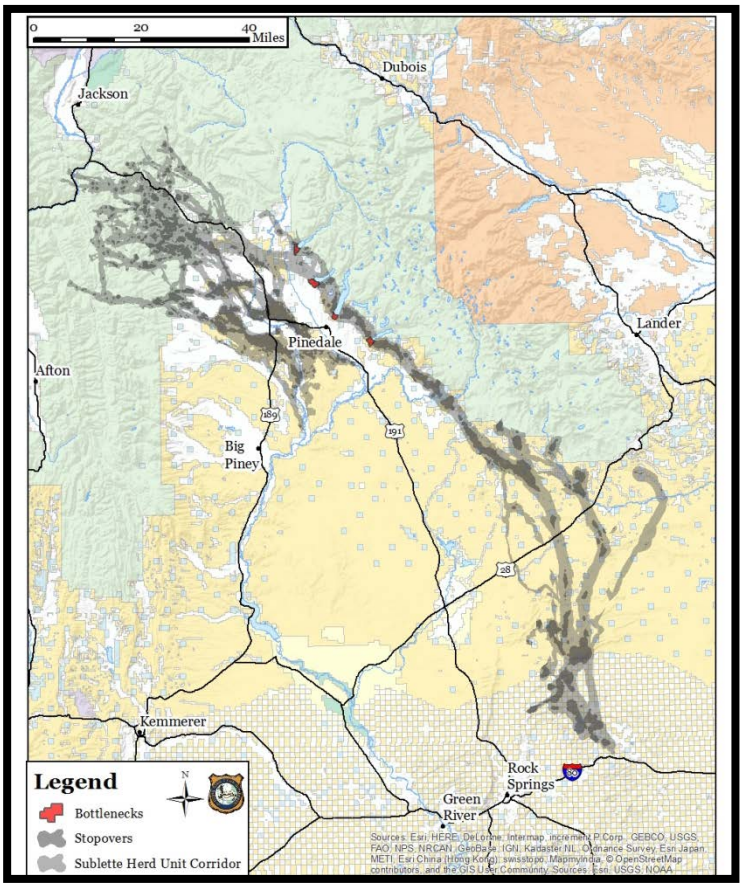
WYOMING GAME AND FISH DEPARTMENT

Sublette Mule Deer Migration Corridor Assessment

June 22, 2017



Wyoming Game and Fish Department. 2017. Sublette Mule Deer Migration Corridor Assessment. Cheyenne, Wyoming, USA.

Wyoming Game and Fish Commission (WGFC) Mitigation Policy recognizes big game migration corridors, stopover areas, and bottlenecks as Vital (WGFC Policy VII H). Vital habitats are defined as those areas that directly limit a wildlife community, population, or subpopulation. This recognition places migration habitats on a level with more commonly recognized habitats such as crucial winter ranges or crucial winter/yearlong ranges. Under the WGFC Mitigation Policy definition of Vital habitat, the Wyoming Game and Fish Department is directed by the WGFC to recommend no significant declines in species distribution or abundance or loss of habitat function. Some modification of habitat characteristics may occur, provided habitat function is maintained. This recognition constitutes Action 1 of the Department's Ungulate Migration Corridor Strategy (UMCS).

Designation of ungulate migration corridors is Action 2 of the UMCS, and ungulate migration corridors, stopover areas, and bottlenecks are included in the Department's Standardized Definitions for Seasonal Wildlife Ranges. As such, the Department recently designated Ungulate Migration Corridors for the Sublette Mule Deer Herd Unit (Figure 1).

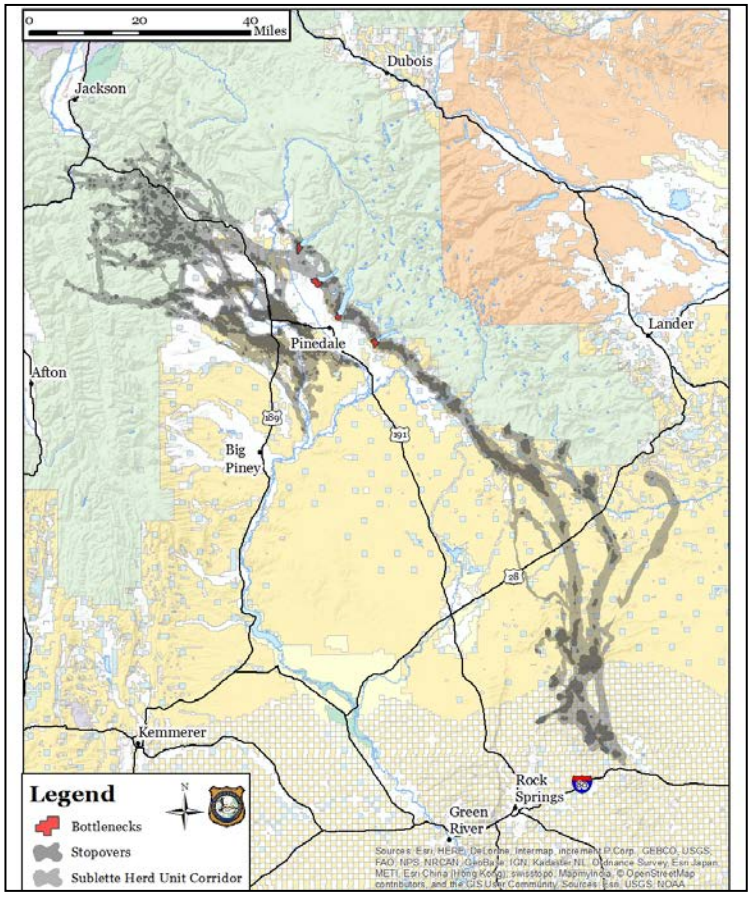


Figure 1. Sublette Mule Deer Migration Corridor.

Following the designation of an ungulate migration corridor, Action 3 of the UMCS directs the Department to conduct a risk assessment that includes an analysis of existing and potential threats, as well as existing protections. Part of this analysis includes working with stakeholders to review existing information and collect additional data. Each corridor assessment includes a Geographic Information System (GIS) analysis of existing data layers (Figure 2). Because the Sublette Mule Deer Migration Corridor is quite extensive, it was divided into 11 management segments to facilitate analysis and presentation of results (Table 1 and Figure 3).

Action 3 also directs the Department to engage with stakeholders to identify research needs, determine appropriate management actions, and explore opportunities for proactive conservation actions to conserve migration corridors. The effectiveness of conservation actions will be evaluated through an informal and adaptive process that will evaluate the continued passage of animals, which will include seasonal movement and population monitoring. Such an approach does not preclude additional, detailed monitoring/research, but does not require it.

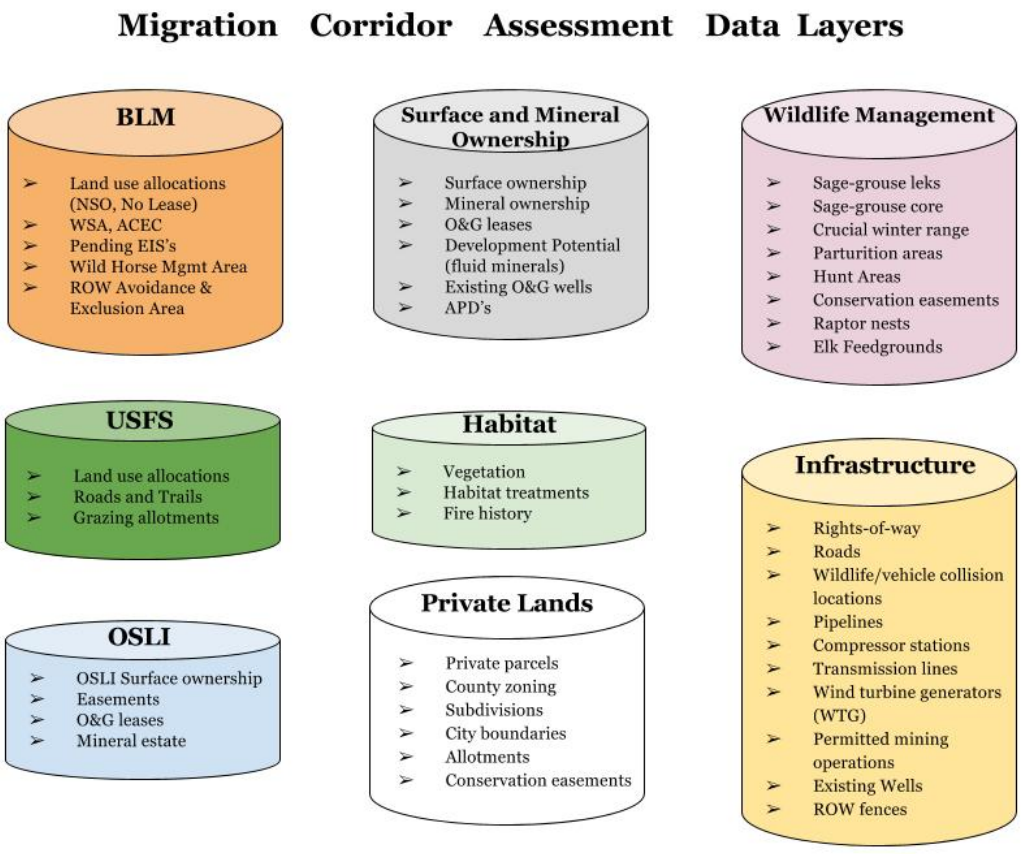


Figure 2. Sublette Mule Deer Migration Corridor assessment data layers.

Table 1. Sublette Mule Deer Migration Corridor segment detail.

Segment Name	Description	WGFD Office - Biologist	Acres
BTNF Summer	Summer range on the Bridger-Teton National Forest	Pinedale/Fralick	491,552
Mesa/Soaphole	Lands between U.S. Hwy 189 and U.S. Hwy 191 and West of U.S. Hwy 189-191	Pinedale/Clause	216,118
Ryegrass/Beaver Ridge	U.S. Hwy 189-191 to the Bridger-Teton National Forest Boundary	Pinedale/Fralick	203,316
Big Sandy	Big Sandy River to Wyoming Hwy 28	Pinedale/Clause	189,911
Checkerboard	Steamboat Mountain to I-80	Green River/Burke	152,286
East Fork	Scab Creek Rd (BLM Road 5324) to Big Sandy River	Pinedale/Clause	71,549
Finger Lakes	Wyoming Hwy 352 to Scab Creek Rd (BLM Road 5324)	Pinedale/Clause	141,347
Long Gulch/Continental Peak	South Pass to Alkali Draw	Green River/Burke	130,635
Oregon Buttes	Wyoming Hwy 28 to Checkerboard	Green River/Burke	115,454
Red Desert	Wyoming Hwy 28 to Steamboat Mountain	Green River/Burke	149,460
Sweetwater	Wyoming Hwy 28 to Sweetwater River	Pinedale/Clause	76,582

Although not contained within this assessment, Action 4 of the UMCS specifies a case-by case approach to providing recommendations on federal surface projects and land use planning efforts. Zero development is not sought as an outcome, or necessarily required to maintain migration corridors. Oil and gas surface occupancy within a designated big game migration corridor will be supported if a conservation plan detailing the avoidance, minimization, rectification, and/or restoration of the corridor is developed by operators and the BLM (in consultation with the Department). The emphasis is to ensure that activities occur in a manner that maintain habitat function and result in no significant declines in species distribution or abundance. The Department confirms our comments on land use planning documents will be to manage proposed disturbances on a project specific basis, and not through a set of prescriptive recommendations.

And although focus tends to center on federal lands, private lands are extremely important and ranching in particular is conducive to the maintenance of ungulate migration corridors. Maintaining the integrity of ranching operations will benefit the continued movement of animals across the landscape, and consequently efforts to conserve ranches within the migration corridor will conserve the corridor itself. It goes without saying that any conservation efforts on private lands will only occur with landowner participation and cooperation.

The Department will use the risk assessment as a tool to help identify areas where additional review and coordination are desired to address migration corridor concerns and develop site-specific solutions. The Department plans to address this direction by diligently reaching out to affected stakeholders when site specific recommendations are being developed.

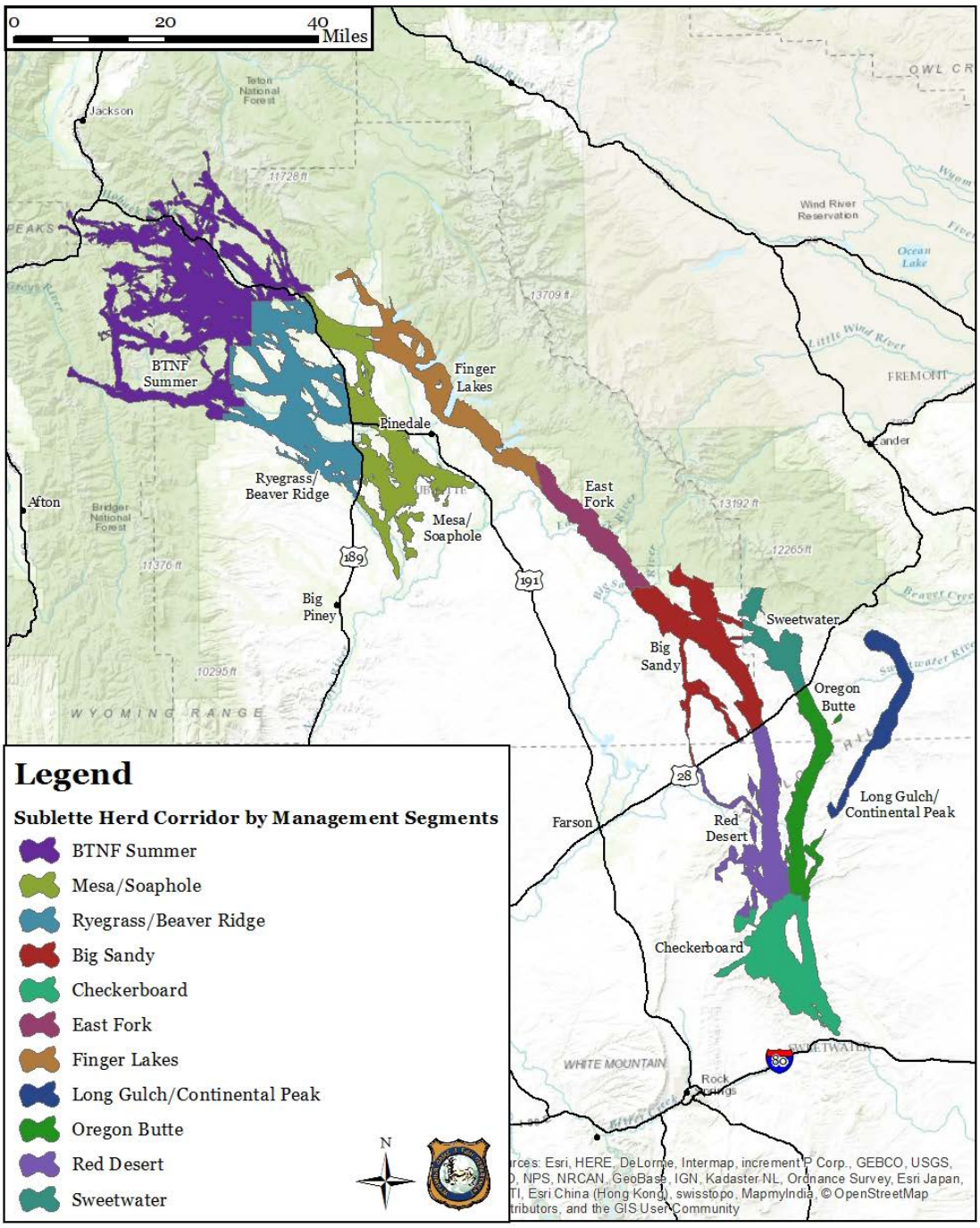


Figure 3. Sublette Mule Deer Migration Corridor segments.

Background

Migration in ungulates provides nutritional benefits and can also reduce the risk of predation (Fryxell and Sinclair, 1988). Movement away from seasonal ranges where denning predators are localized while rearing their young, can lessen exposure to predation (Fryxell et al. 1988), while

the ability to follow highly digestible emerging vegetation enhances accumulation of fat and increases reproduction (Cook et al. 2004, Parker et al. 2009).

Long known as important for migratory birds, stopover sites were recently identified in migratory mule deer and are recognized as an important component of their migratory strategy (Sawyer and Kauffman, 2011). In this study (conducted within the Sublette Mule Deer Migration Corridor), deer capable of completing migrations in a matter of days took an average of three weeks and spent 95% of that time in stopover sites that provide higher forage quality than movement corridors in general (Sawyer and Kauffman, 2011). And although timing and duration may vary annually with environmental conditions, the same stopover sites are used every year. These investigations and others are creating an understanding that migration corridors are not merely a link between seasonal ranges, but important foraging habitats that influence individual fitness, population dynamics, and potentially carrying capacity (Aikens et al. 2017, Sawyer et al. 2016).

Although the influence of human developments on particular seasonal habitats such as crucial winter ranges has been well documented (Johnson et al. 2017, Sawyer et al. 2006, 2009, 2017), how these same developments might affect migrating ungulates is less understood. Impermeable barriers obviously negatively affect migrating ungulates, but recent work has shown that semi-permeable barriers can also have adverse impacts at very intensive levels of development, usually through increased rate of travel, reduced use of stopover sites, and deviation from established routes (Lendrum et al. 2013, Sawyer et al. 2013).

Big game migration corridors, stopover areas and bottlenecks are designated Vital in the WGFC Mitigation Policy (Policy Number VII H), as well as specifically addressed in the Department's Strategic Habitat Plan and the Department recognizes the importance these habitats have in the management and conservation of big game in Wyoming. The Sublette Mule Deer Herd in western Wyoming covers a large geographical area with seasonal migrations that cross multiple jurisdictional boundaries throughout Teton, Sublette, Lincoln and Sweetwater Counties. It contains 14 hunt areas (130, 131, 138-142, 146, 150-156).

The Sublette Mule Deer Herd Migration Corridor represents mule deer movements that exceed anything previously recorded (Sawyer et al. 2005, 2014) and is approximately 160 miles in length and encompasses 834,645 acres (Figure 1). The migration corridor designation was derived from:

- 111 migration sequences (58 spring, 53 fall) collected from 34 mule deer in the southeastern portion of the Sublette Mule Deer Herd Unit and;
- 141 migration sequences collected from 70 mule deer and 67 migration sequences from 27 mule deer in the west central portion of the herd unit Sawyer (2014).

A Brownian Bridge Movement Model (BBMM; Horne et al. 2007) was used to estimate individual routes and population-level migration corridors from Global Positioning System (GPS) collar data. The BBMM approach was also used to discern stopover areas (i.e., foraging and resting habitat) from those portions of the corridor used primarily for movement. In many instances these mule deer stopover sites overlap with delineated crucial winter range

habitat due to extensive movement into and through some winter habitats to access winter habitats elsewhere within this herd unit.

Sublette Mule Deer Migration Overview

The health, viability and sustainability of the Sublette Mule Deer Herd have evolved around migration. The ability of mule deer to move between low elevation shrub (sagebrush) dominated habitat during winter and higher elevation forb, grass and mountain shrub habitats during the summer/fall period provides the seasonal nutrition that allows this mule deer herd to persist. Migration of this herd is complex and dynamic with some mule deer migrating extensive distances (150+ miles) while others migrate relatively short distances (20 miles). Several distinct winter range complexes exist, and GPS based telemetry studies have demonstrated that not only do individual mule deer have strong fidelity for the same winter ranges every year, they also use the same migration corridors and summer ranges. During migration periods, some mule deer only use two or three of the identified migration corridor segments (e.g., mule deer summering in the north end of the Wyoming Range and wintering on the Mesa), while other mule deer might use six to seven corridor segments (e.g., mule deer summering in the Hoback and wintering in the Red Desert). No individual mule deer use all of the eleven identified migration corridor segments.

The fall migration pattern for the Sublette Mule Deer Herd is best described as mule deer first moving from the mountains into foothill habitat within the upper Green River Basin, then moving through foothill and basin habitats, and then into sagebrush winter range habitat. The spring migration entails mule deer movements in the opposite direction as described in the fall, but the overall time spent along this migration corridor is longer and delayed, regulated by receding snow levels and plant green-up.

Although the majority of mule deer within this herd unit migrate, some non-migrant (resident) mule deer live within lower elevation river bottom areas (e.g., Green River and Horse Creek riparian corridors) and others just drop in elevation from the mountains to mountain valleys (e.g., near Jackson, and Snake River Canyon).

A similar migration assessment document (Sawyer et al., 2014) published by the Wyoming Migration Initiative and the University of Wyoming describes a portion of the migration corridor, from Red Desert to the Hoback Basin.

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CHECKERBOARD SEGMENT

Wyoming Game and Fish Department Green River Region
Wildlife Biologist Patrick Burke and Habitat Biologist Jill Randall

Segment Description:

The Checkerboard Segment extends from near the southernmost portion of the herd unit starting in the Leucite Hills just north of U.S. Interstate 80 (I-80) east of Rock Springs near the town of Superior, and extending to the north up to Steamboat Mountain (Figure 4). As the name of this segment would imply, it is made up entirely of a checkerboard landownership pattern with alternating sections of public and privately owned land. This segment contains much of the winter range used by the longest distance migrants in the herd. The Checkerboard Segment also provides important stopover habitat used by mule deer in the spring and fall seasons as well as providing important topographic relief and forage diversity during harsh winter conditions (Figure 5).

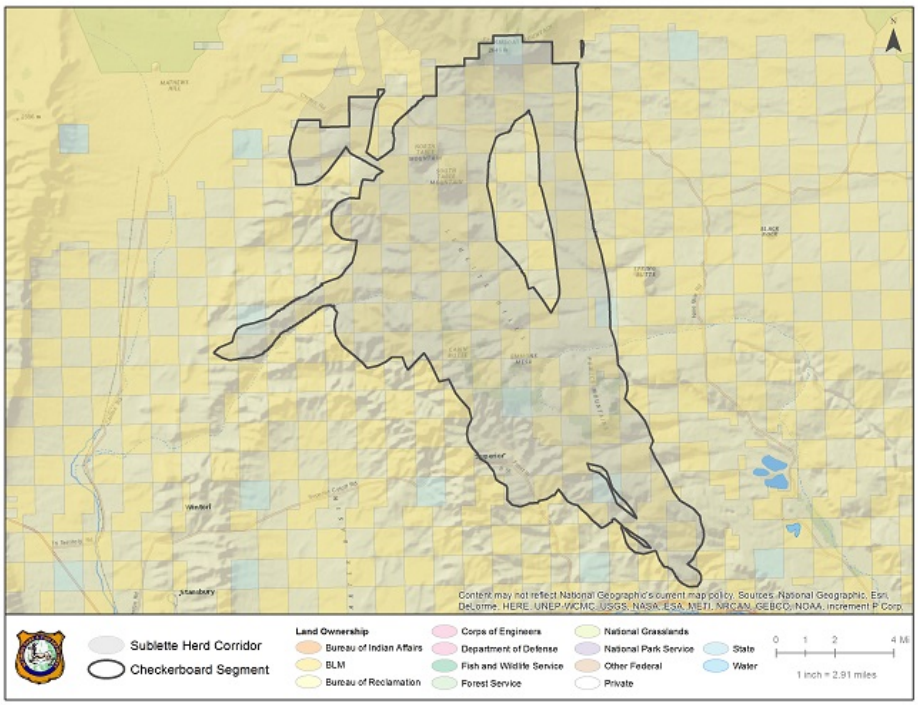

Figure 4. Sublette Mule Deer Migration Corridor Checkerboard Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Checkerboard Segment.

- **Physical Barriers**

  The Checkerboard Segment lies on lands split about evenly between the Bureau of Land Management (BLM) and private landowners. Despite the alternating landownership pattern there are few physical barriers to mule deer movement as the private land sections are not fenced. This lack of fences or other physical barriers to movement in this segment makes this potential risk non-existent at this time.

  It should be noted that while it is not technically in the Sublette Mule Deer Migration Corridor, I-80 functions as a nearly impermeable barrier to mule deer movement. During severe winters, mule deer tend to move south until they encounter the interstate, which prevents them from migrating further south. While we are not aware of any mule deer movement data prior to construction of the interstate, it is probable that mule deer migrated further south, especially during harsher winters. If mule deer were able to cross I-80 and move further south, it is possible that mortality rates during severe winters could be reduced.

- **Wildlife Use and Habitat Treatments**

  This segment of the corridor overlaps significantly with mule deer crucial winter range (also designated Vital in the WGFC Mitigation Policy) and contains many important stopover areas (Figure 5). Some of these important stopover areas found in the Checkerboard Segment include parts of Zirkel and Emmons Mesa, and the North and South Table Mountain areas.

  In addition to overlapping crucial ranges for mule deer, the Checkerboard Segment also contains crucial winter range designations for pronghorn and elk, as well as sage-grouse core areas (all designated as Vital habitat in the WGFC Mitigation Policy, Figure 6). Between mule deer, pronghorn, and elk crucial range designations and sage-grouse core habitat, the majority of the Checkerboard Segment overlaps with other Vital habitats.

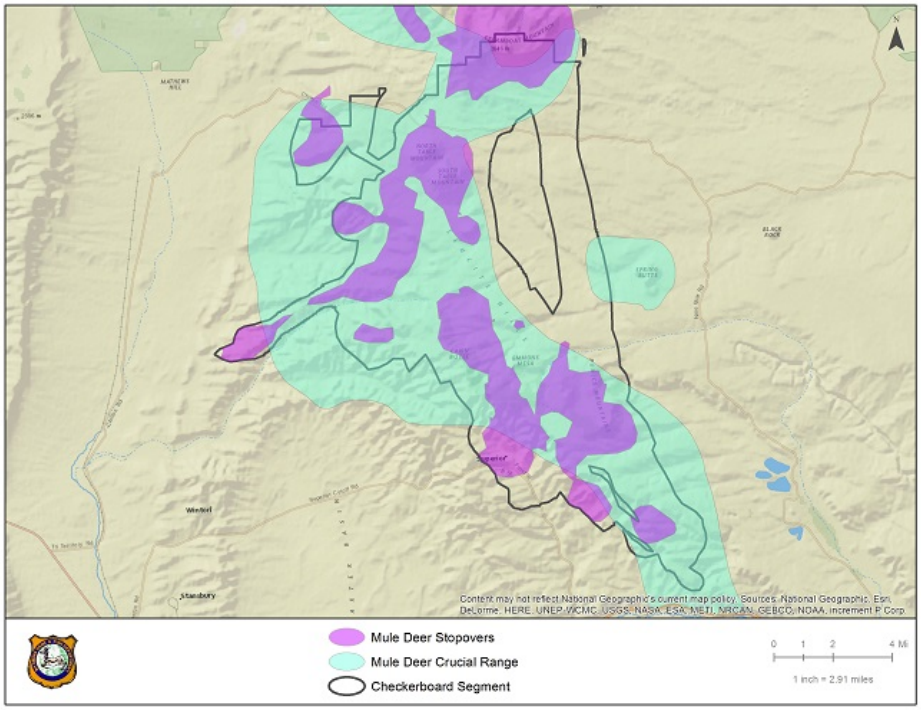

Figure 5. Mule deer crucial range designation and stopover areas in the Checkerboard Segment.

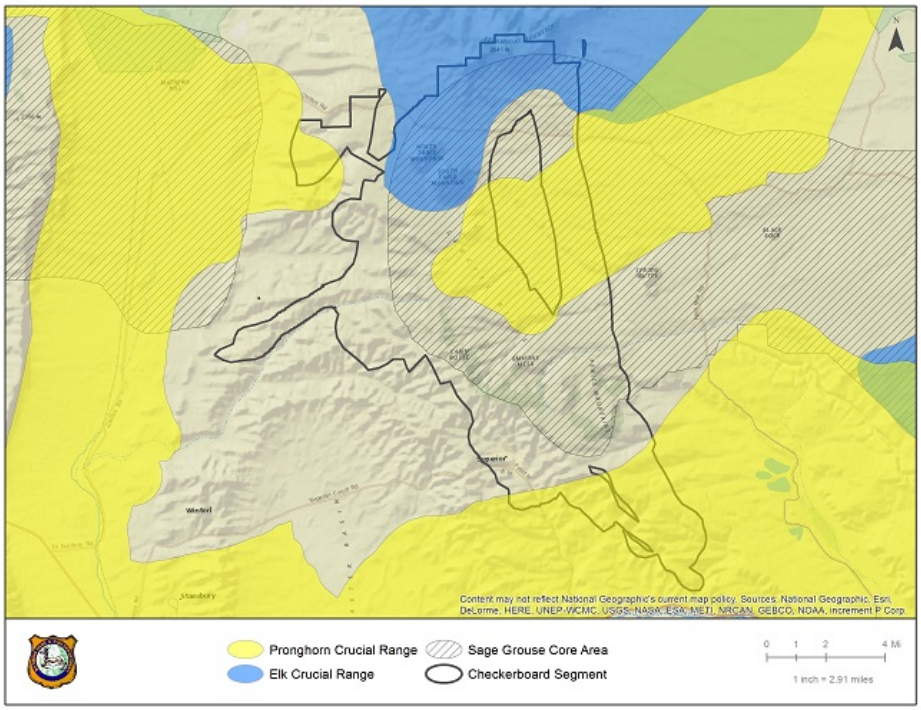

Figure 6. Crucial range designation for pronghorn, elk, and sage-grouse core habitat in the Checkerboard Segment.

Because most of the migration segment is in sagebrush dominated landscapes, there have not been any recent habitat treatments conducted in this corridor segment. The limited acreage of bitterbrush habitat within mule deer winter range is a potential limiting factor for wintering mule deer. Efforts should be made to preserve and enhance those habitats. Habitat treatment objectives would be to improve age class diversity and annual leader production to meet long-term forage requirements for mule deer. However, treatments in areas with mixed landownership require intensive collaboration.

There are also some small isolated aspen stands in this segment. Because of their small, island-like nature, these stands receive heavy ungulate browsing which appears to have suppressed regeneration and is endangering stand persistence. Efforts to preserve and improve limited bitterbrush and aspen habitats would benefit mule deer utilizing this segment.

- **Land Use:**
  This corridor segment is approximately half public land and half private lands and is used primarily for livestock production, both cattle and winter sheep grazing. Since the private land sections are all controlled by just a few owners and since the entire segment resides in just one grazing allotment, we suspect the risk of wide spread subdivision development is low.

  Currently there is some limited oil and gas development on the edges of this segment, but there is potential for future expansion (Figure 7). There is also an active coal mining operation just east of the segment and mining permits are present on and near the segment edge (Figure 7). Since there are no known historical data available on mule deer movements prior to the development of the current mining operations, it is unknown if mule deer previously used those areas as migration habitat. Mule Deer use of the corridor could be impacted if surface mining operations expand. The extent of impact would depend on the level of development within the corridor.

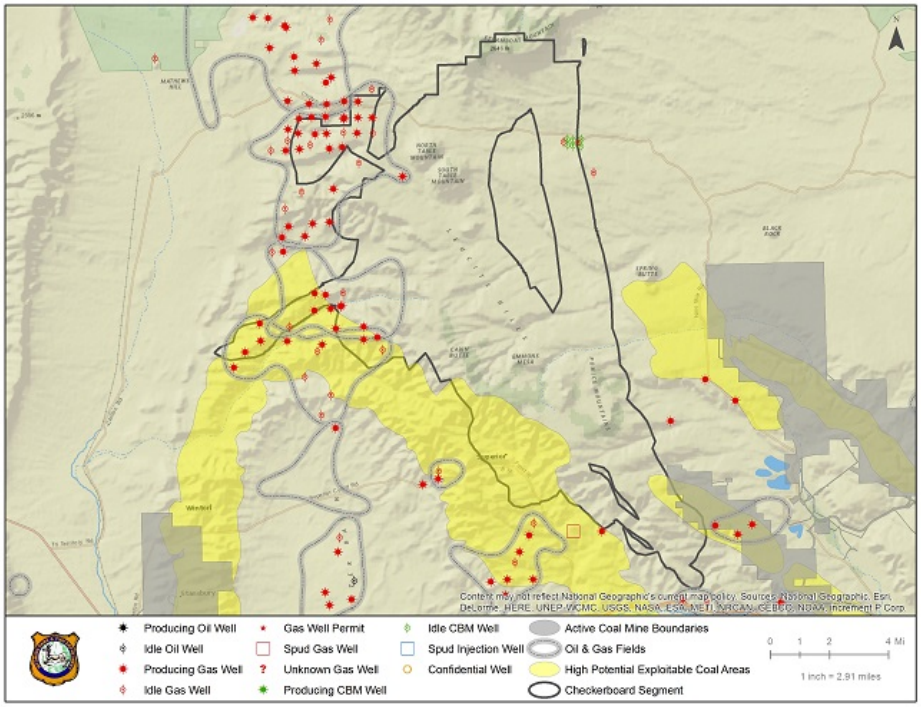

Figure 7. Mineral development in the Checkerboard Segment.

Proactive Planning:

In general, the Checkerboard Segment is intact and functioning. Therefore, the main focus in this section of the migration corridor should be to conserve what currently exists. The mule deer that utilize this segment could benefit from improvements to existing bitterbrush and aspen habitats. However, because of their limited nature and arid conditions, extreme caution is warranted prior to any treatment.

The Rock Springs BLM Field Office is currently revising their Resource Management Plan (RMP) that directs future management for this area. The Department has and will continue to provide wildlife input and recommendations for consideration into BLM planning documents on a case by case basis.

Assessment Summary:

Protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners and continuing to collaborate with BLM on land use planning on a project specific basis. Overall, since the landscape in the Checkerboard Segment is mostly unaltered, the existing and projected risks to this segment appear limited. If current conditions are maintained, functional migration habitat should persist in this segment.

RED DESERT SEGMENT

Wyoming Game and Fish Department Green River Region
Wildlife Biologist Patrick Burke and Habitat Biologist Jill Randall

Segment Description:

The Red Desert Segment extends from the southern rim of Steamboat Mountain, north through the Antelope and Jack Morrow Hills and across the Pacific Creek Drainage, before reaching Wyoming Highway 28 (Figure 8). This segment consists almost entirely of lands owned and managed by either the BLM or the State of Wyoming. The Red Desert Segment is made up mostly of sagebrush basins alternating with rolling topographic features.

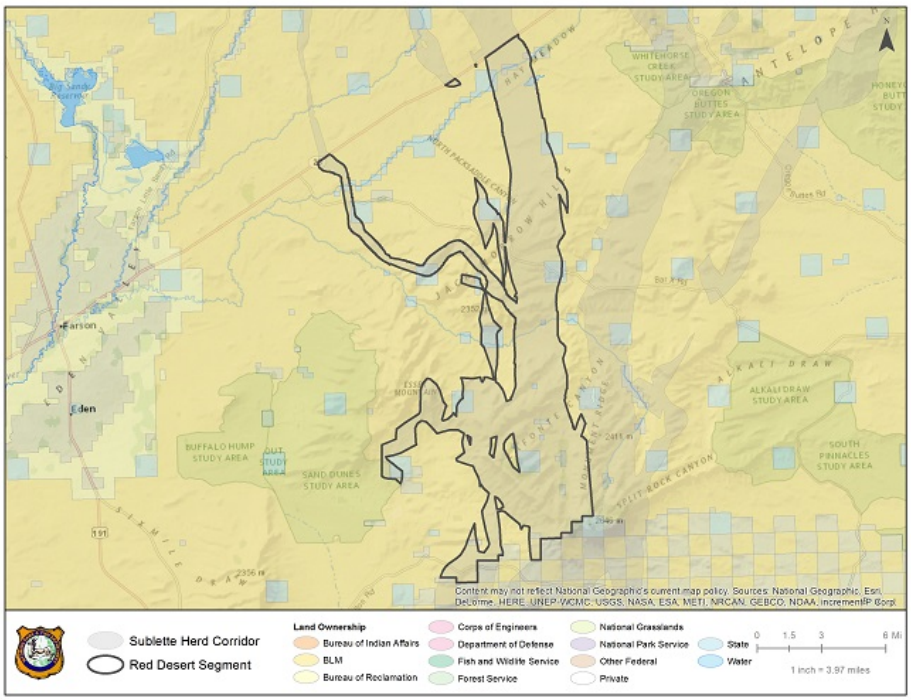

Figure 8. Sublette Mule Deer Migration Corridor Red Desert Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Red Desert Segment.

- **Physical Barriers**
  The Red Desert segment lies predominantly on Federal lands managed by the BLM's Rock Springs Field Office. There are few physical barriers to mule deer movement present in this segment until its northern boundary at Wyoming Highway 28.

Wyoming Highway 28 is a paved, two-lane highway with four-strand right-of-way fences on both the north and south sides of the highway. While mule deer/vehicle collisions have not been a major problem where the corridor crosses the highway, increasing traffic volumes do pose the potential for the highway to become a larger barrier to mule deer movements. The right-of-way fences appear to be a bigger obstacle for later migrants. During years when deeper snow conditions are present, mule deer have been seen congregating on the northern side of the right-of-way fence during their fall migration, seemingly having difficulty negotiating the right-of-way fence.

- **Wildlife Use and Habitat Treatments**
  This segment has limited overlap with mule deer crucial winter range but does contain several important migration stopover areas in the Steamboat/Essex Mountain areas (Figure 9). It is dominated by Wyoming big sagebrush and salt desert shrub communities of the Red Desert. Very important habitat communities in the southern half of this segment include the three LaFonte Canyon Springs which are spring-created aspen and willow communities. These areas are virtual islands due to the xeric conditions found elsewhere in this segment providing vertical structure and mesic forage in an otherwise desert landscape.

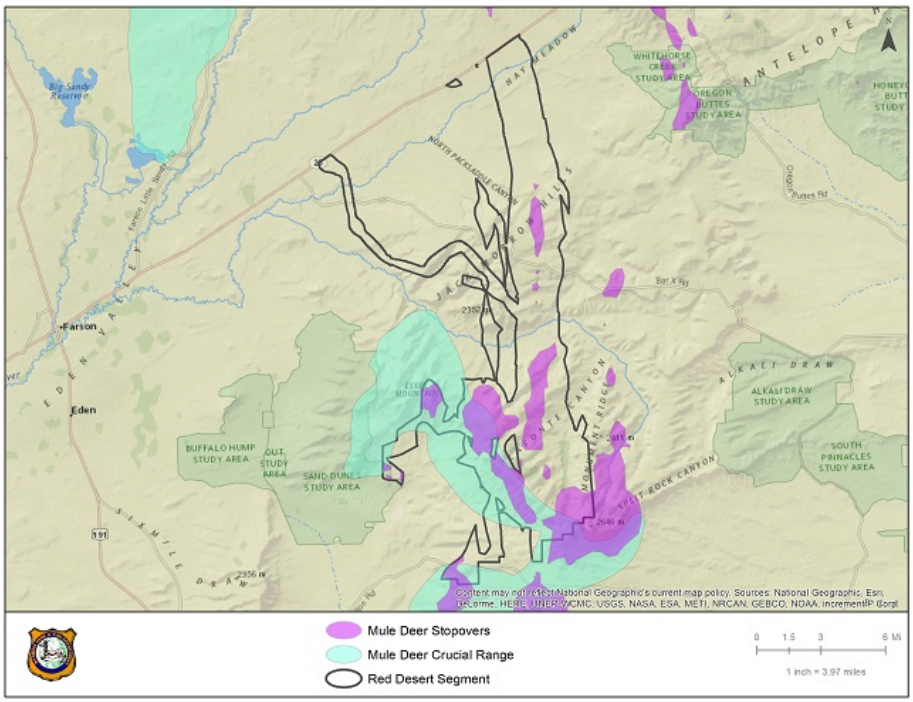

Figure 9. Mule deer crucial range designation and stopover areas in the Red Desert Segment.

This segment overlaps pronghorn and elk crucial winter range, a large elk parturition area as well as a sage-grouse core habitat (Figure 10). Between mule deer, pronghorn, and elk crucial winter range and sage-grouse core habitat, the entire length of the Red Desert Segment overlaps other Vital habitat as designated in the WGFC Mitigation Policy.

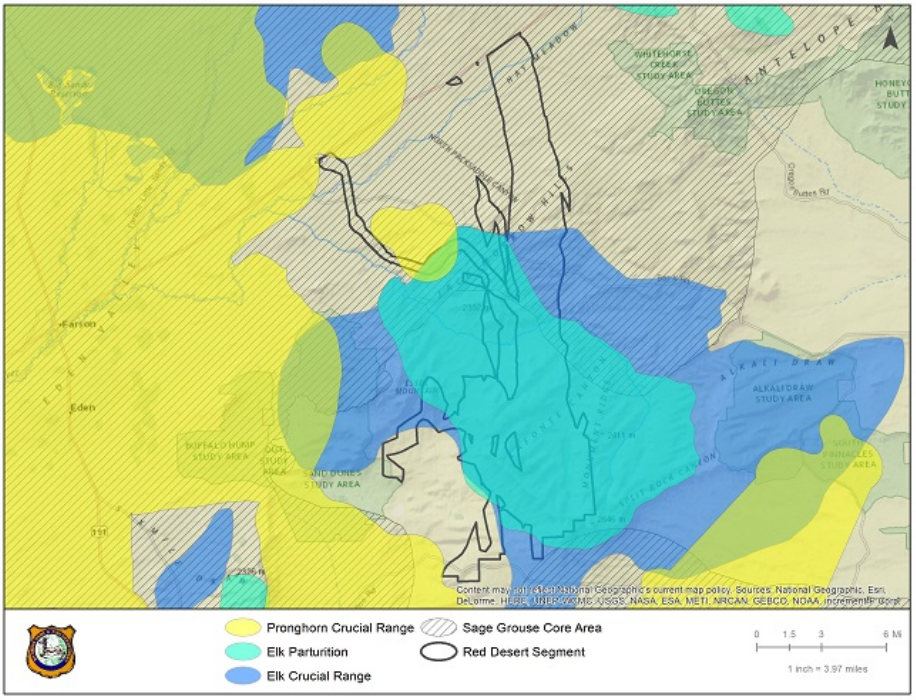

Figure 10. Crucial range designation for pronghorn and elk, elk parturition areas, and sage-grouse core habitat in the Red Desert Segment.

Because most of this segment is in sagebrush dominated landscapes with limited production potential due to low annual precipitation, few planned vegetation treatments have been completed. Efforts that optimize ground cover and maintain diversity of herbaceous species will help maintain soil moisture and prevent erosion and may improve forage conditions for mule deer in stopover sites. Like the Checkerboard Segment, the Red Desert Segment also contains a few isolated aspen stands in the Steamboat Mountain area that are in danger of dying out if steps are not taken to enable stand regeneration. Enhanced stand health and persistence would benefit mule deer utilizing this segment.

- **Land Use:**
  The main land use in this segment is livestock production, with most comprised of summer cattle grazing. Since this segment is mostly under BLM management, the potential for future subdivision development is very low.

  There is some oil and gas development occurring on the edges of this segment, but the majority of mule deer use is east of the current development (Figure 11).

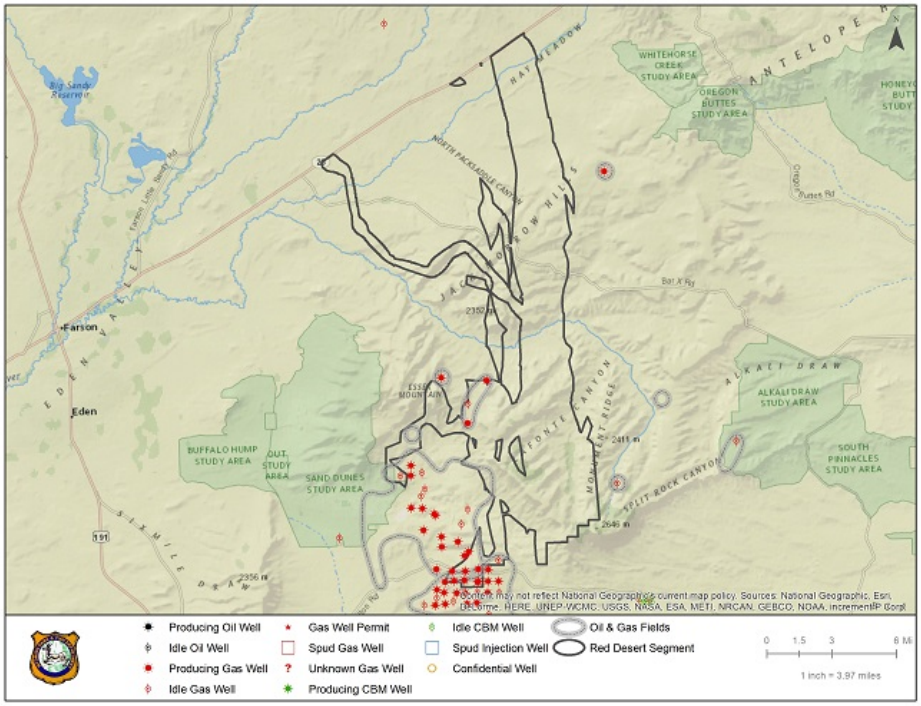

Figure 11. Mineral development in the Red Desert Segment.

The Red Desert Segment has been managed according to guidance set forth in the BLM Jack Morrow Hills Coordinated Activity Plan (JMH CAP). This plan was developed to provide additional management guidance in an area of overlapping resource values, Areas of Critical Environmental Concern (ACEC) and Special Management Areas (SMA) around Steamboat Mountain and the Jack Morrow Hills. Under the JMH CAP, portions of the area in and around the Red Desert Segment were designated as areas where new leases would not be offered and areas of no surface occupancy (Figure 12). Although not specifically designed to, these measures currently provide protection for the migration corridor.

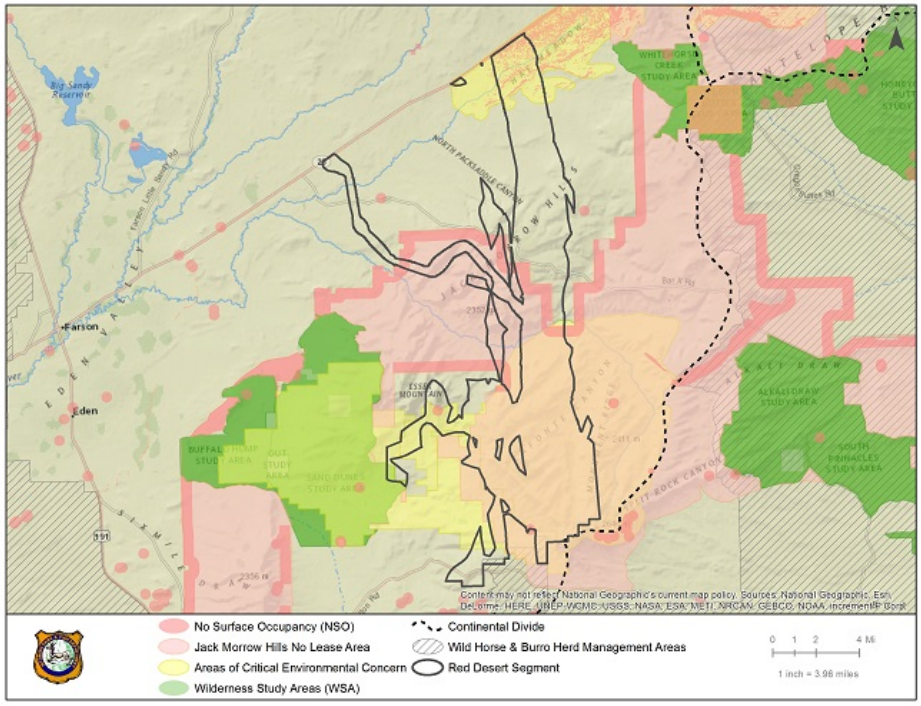

Figure 12. Designated management areas in the Red Desert Segment.

Proactive Planning:

The Red Desert Segment's landscape has been generally unaltered and serves as quality habitat for many wildlife species and for mule deer migration. However, low precipitation makes this area vulnerable to damage from overuse. Many of the isolated habitat features discussed above are also favored recreation areas. Protection of these isolated habitat features from human recreation and overuse by wild and domestic ungulates would enhance their long term persistence on the landscape.

Opportunities to improve passage across Wyoming Highway 28 should be explored, but only with collaboration and coordination of livestock permittees and WYDOT.

The Rock Springs BLM Field Office is currently revising their RMP that directs future management for this area. The Department has and will continue to provide wildlife input and recommendations for consideration into BLM planning documents on a case by case basis.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with livestock permittees, continuing to collaborate with BLM on land use planning, and collaborating with WYDOT to explore opportunities to improve passage across Wyoming Highway 28. The landscape in the Red Desert Segment is mostly unaltered, the existing and projected risks to this

segment appear limited, and substantial protections exist, so functional migration habitat in this segment should be maintained.

OREGON BUTTES SEGMENT

Wyoming Game and Fish Department Green River and Lander Regions
Wildlife Biologists Patrick Burke and Stan Harter and Habitat Biologist Jill Randall

Segment Description:

The Oregon Buttes Segment extends from the southern rim of Steamboat Mountain, north and northeast through the Jack Morrow and Antelope Hills up to the Whitehorse Creek and Oregon Buttes Wilderness Study Areas, before continuing up to Wyoming Highway 28 (Figure 13). This segment consists almost entirely of lands owned and managed by either the BLM or the State of Wyoming. It is made up mostly of sagebrush basins alternating with rolling topographic features. The segment also contains some small stands of aspen and dark timber in the Oregon and Pacific Butte areas.

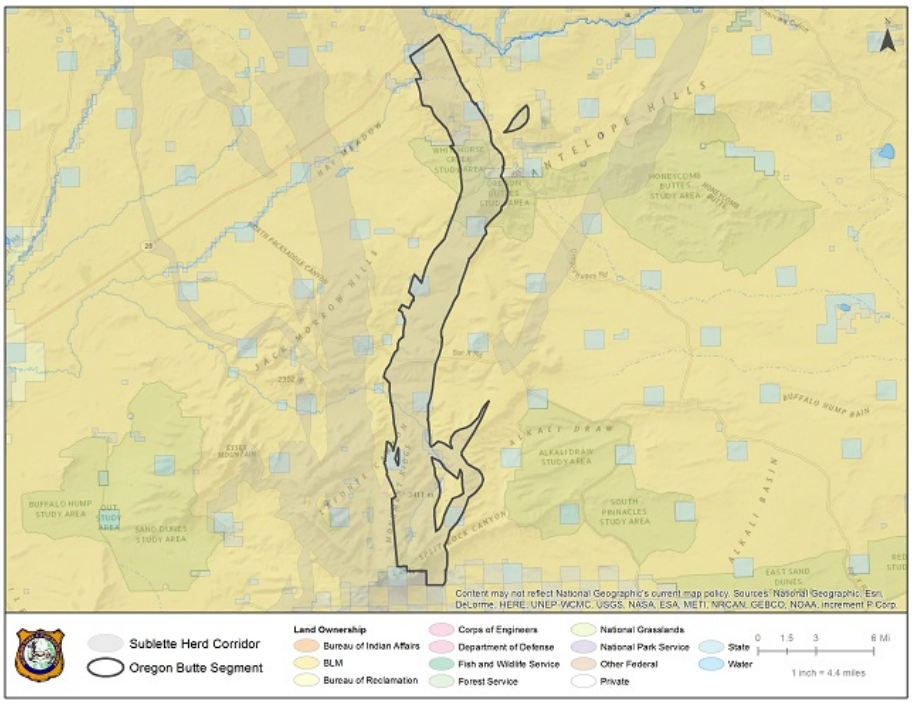

Figure 13. Sublette Mule Deer Migration Corridor Oregon Buttes Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Oregon Buttes Segment.

- **Physical Barriers**
  The Oregon Buttes Segment lies predominantly on Federal lands managed by the BLM Rock Springs Field Office. There are few physical barriers to mule deer movement present in this segment until its northern boundary at Wyoming Highway 28.

  Wyoming Highway 28 is a paved, two-lane highway with four-strand right-of-way fences on both the north and south sides. While, mule deer/vehicle collisions have not been a major problem in this segment, increasing traffic volumes may result in the highway becoming a barrier to mule deer movements.

  This segment is largely unfenced, with the exception of Wyoming Highway 28 and a few range fences north of the Oregon Buttes. Because of this, mule deer are able to move freely within the corridor.

- **Wildlife Use and Habitat Treatments**
  This segment has very little overlap with mule deer crucial winter range, overlapping only on the southern edge by Steamboat Mountain. It does contain several important migration stop-over areas in the Monument Ridge, and Oregon and Pacific Butte areas (Figure 14).

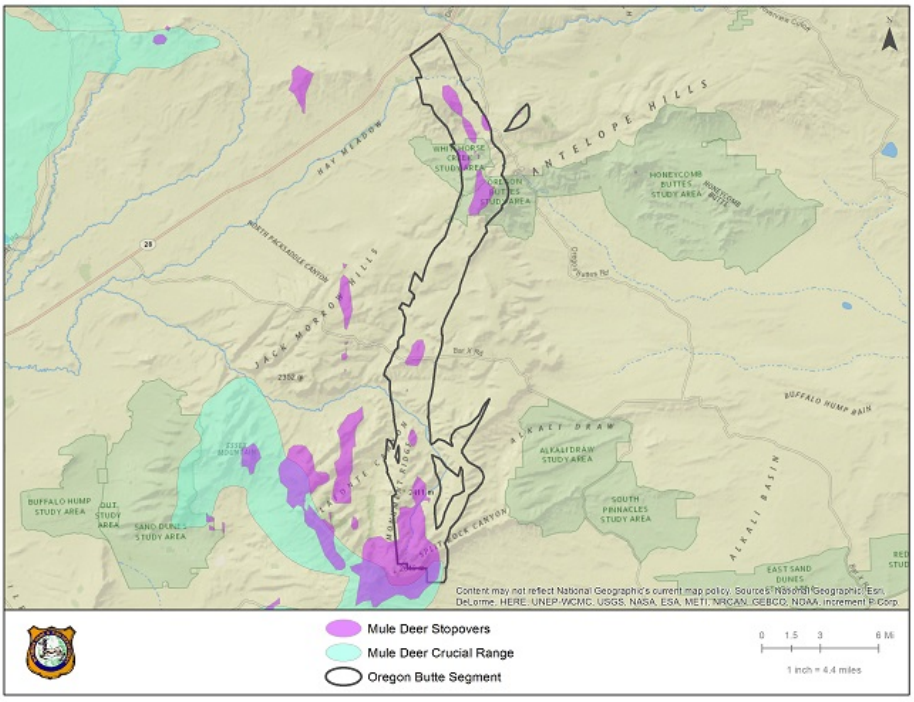

Figure 14. Mule deer crucial range designation and stopover areas in the Oregon Buttes Segment.

This segment is dominated by Wyoming big sagebrush and salt desert shrub communities of the Red Desert. Important habitat communities in the southern half of this segment include the Monument Ridge and Steamboat Mountain Springs which contain spring-created aspen

and willow communities. These areas are virtual islands of vertical structure and mesic forage. They are also favored recreation areas that would benefit from protective measures designed to maintain them on the landscape. This area has experienced few planned vegetation treatments due in large part to the remote location and the arid conditions that limit production potential of the shrub habitat. Efforts that optimize ground cover and maintain diversity of herbaceous species will help maintain soil moisture and prevent erosion and may improve forage conditions for mule deer in stopover sites.

This corridor segment overlaps elk crucial winter range, several elk parturition areas and sage-grouse core habitat (Figure 15). Between mule deer, and elk crucial winter range and sage-grouse core habitat, the entire length of this overlaps other Vital habitat as designated in the WGFC Mitigation Policy.

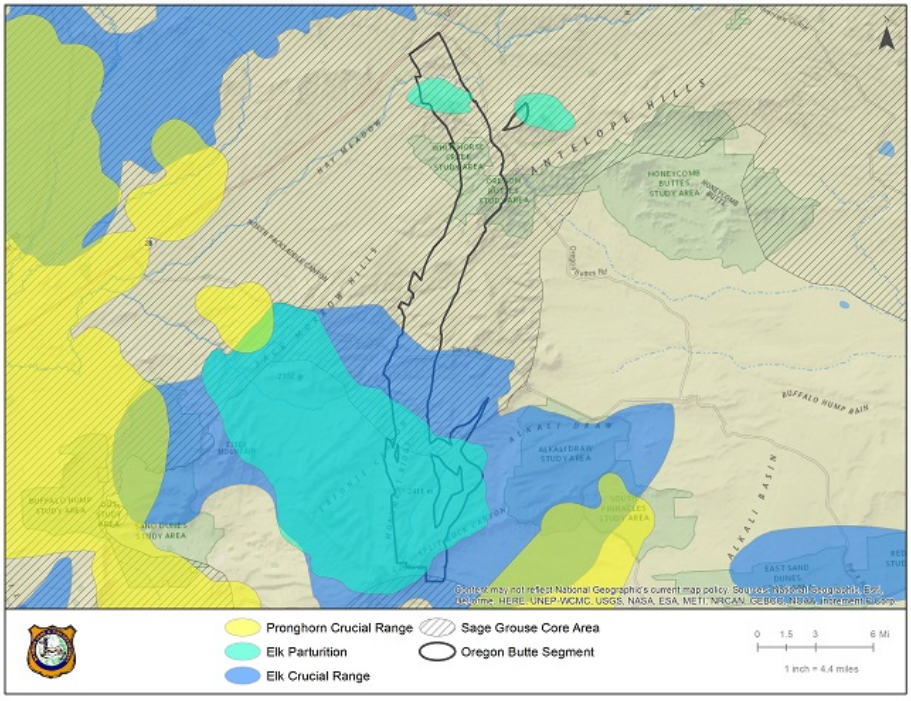

Figure 15. Crucial range designation for pronghorn and elk, elk parturition areas, and sage-grouse core habitat in the Oregon Buttes Segment.

Similar to the Checkerboard and Red Desert Segments, the Oregon Buttes Segment also contains isolated aspen stands in the Monument Ridge and Oregon/Pacific Butte areas. Like other aspen stands south of Wyoming Highway 28, aspen stands in this segment have little to no regeneration due to low precipitation and ungulate browsing pressure, including some that receive wild horse use in the Pacific Butte area. If their condition is not improved, they will disappear from the landscape. Conservation of these aspen stands would benefit mule deer utilizing this segment as well as other resident and migratory wildlife species.

- **Land Use:**
  The main use in this segment is livestock production, with most of that use being summer cattle grazing. Since this segment is mostly under BLM management, the potential for future subdivision development is low.

  There is some oil and gas development in and on the edges of this segment, however development does not currently pose a risk for this segment (Figure 16).

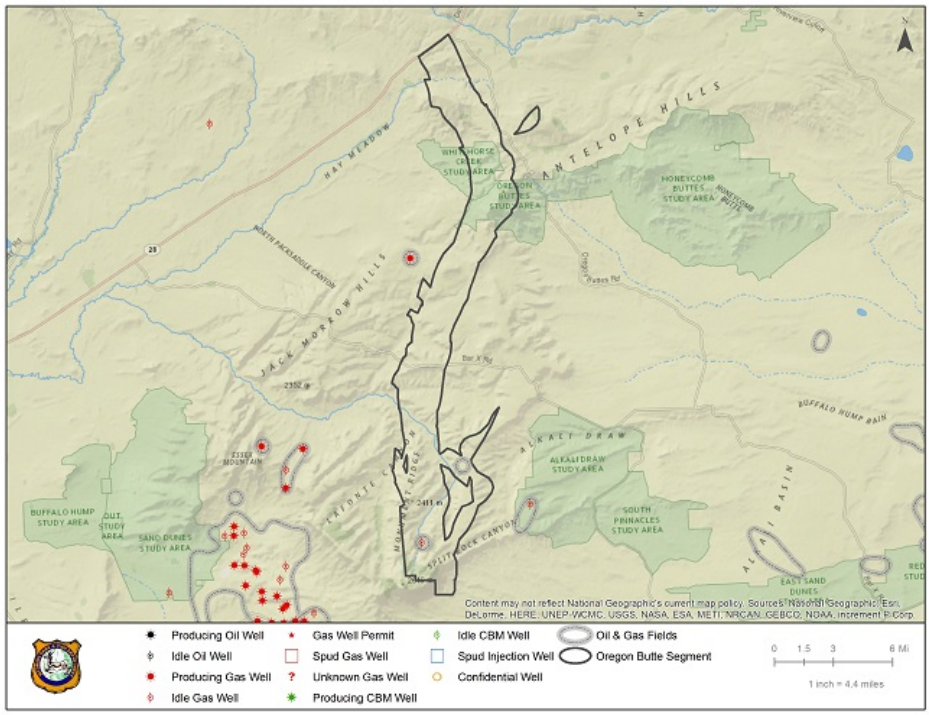

Figure 16. Mineral development in the Oregon Buttes Segment.

Most of the Oregon Buttes Segment has been managed according to guidance set forth in the BLM Jack Morrow Hills Coordinated Activity Plan (JMH CAP). This plan was developed to provide additional management guidance in an area of overlapping resource values, Areas of Critical Environmental Concern (ACEC), and Special Management Areas (SMA) around Steamboat Mountain and the Jack Morrow Hills. Under the JMH CAP, some portions of the area around the Oregon Buttes Segment were designated as areas where new leases would not be offered and as areas where no surface occupancy would be allowed (Figure 17). Although not specifically designed to, these measures currently facilitate function of the migration corridor.

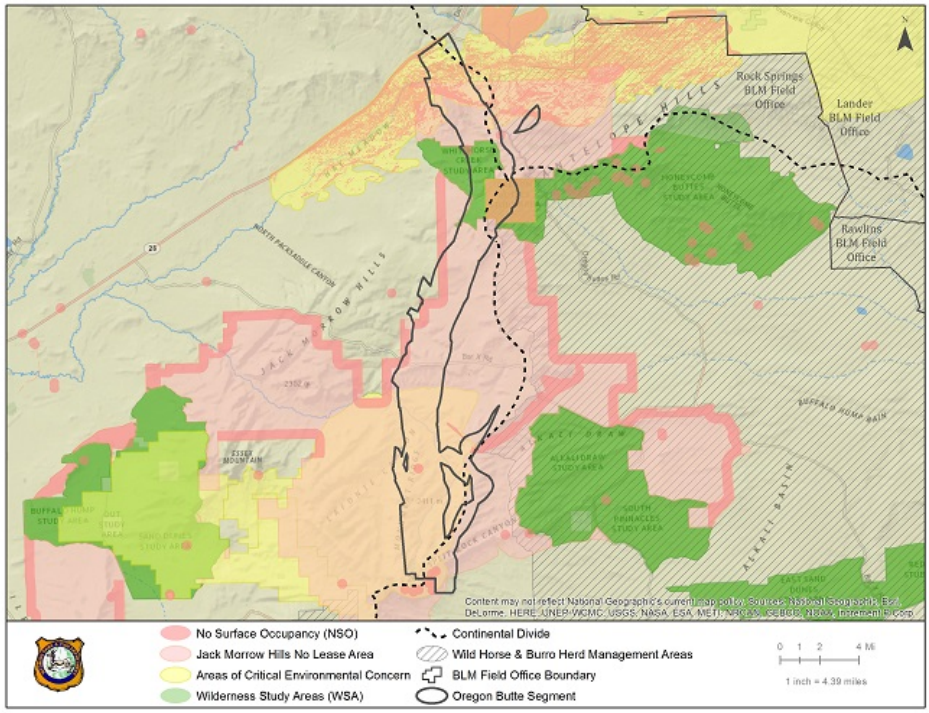

Figure 17. Designated management areas in the Oregon Buttes Segment.

Proactive Planning:

The Oregon Buttes Segment's landscape has been generally unaltered and serves as quality habitat for many wildlife species and for mule deer migration. However, low precipitation makes this area vulnerable to damage from overuse. Many of the isolated habitat features discussed above are also favored recreation areas. Protection of these isolated habitat features from human recreation and overuse by wild and domestic ungulates would enhance their long term persistence on the landscape.

Opportunities to improve passage across Wyoming Highway 28 should be explored, but only with collaboration and coordination of livestock permittees and WYDOT.

The Rock Springs BLM Field Office is currently revising their RMP that directs future management for this area. The Department has and will continue to provide wildlife input and recommendations for consideration into BLM planning documents on a case by case basis.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's, WSA's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with livestock permittees, continuing to collaborate with BLM on land use planning, and collaborating with WYDOT to explore opportunities to improve passage across Wyoming Highway 28. The landscape in the Oregon Buttes Segment is mostly unaltered, the existing and projected risks to

this segment appear limited, and substantial protections exist, so functional migration habitat in this segment should be maintained.

LONG GULCH SEGMENT

Wyoming Game and Fish Department Green River and Lander Regions
Wildlife Biologists Patrick Burke and Stan Harter and Habitat Biologist Jill Randall

Segment Description:
The Long Gulch Segment extends from just east of Joe Hay Rim northeast of Steamboat Mountain and extends northeast through the Honeycomb Buttes Wilderness Study Area before crossing the Sweetwater River and up Willow Creek towards South Pass (Figure 18). This segment consists of lands managed by BLM, State of Wyoming and privately held parcels, especially along the Sweetwater River and Willow Creek sections.

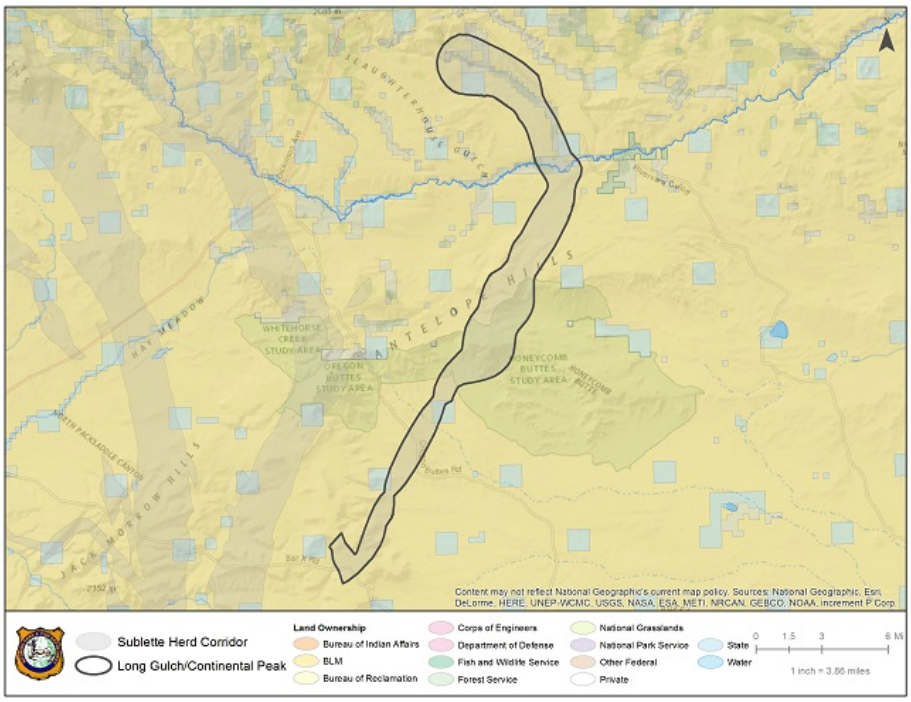

Figure 18. Sublette Mule Deer Migration Corridor Long Gulch Segment.

GIS Analysis:
Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Long Gulch Segment.

- **Physical Barriers**
  The Long Gulch Segment lies predominately on Federal Lands managed by BLM Rock Springs and Lander Field Offices. Aside from a few fences in the Willow Creek area there are few barriers in this segment (Figure 19).

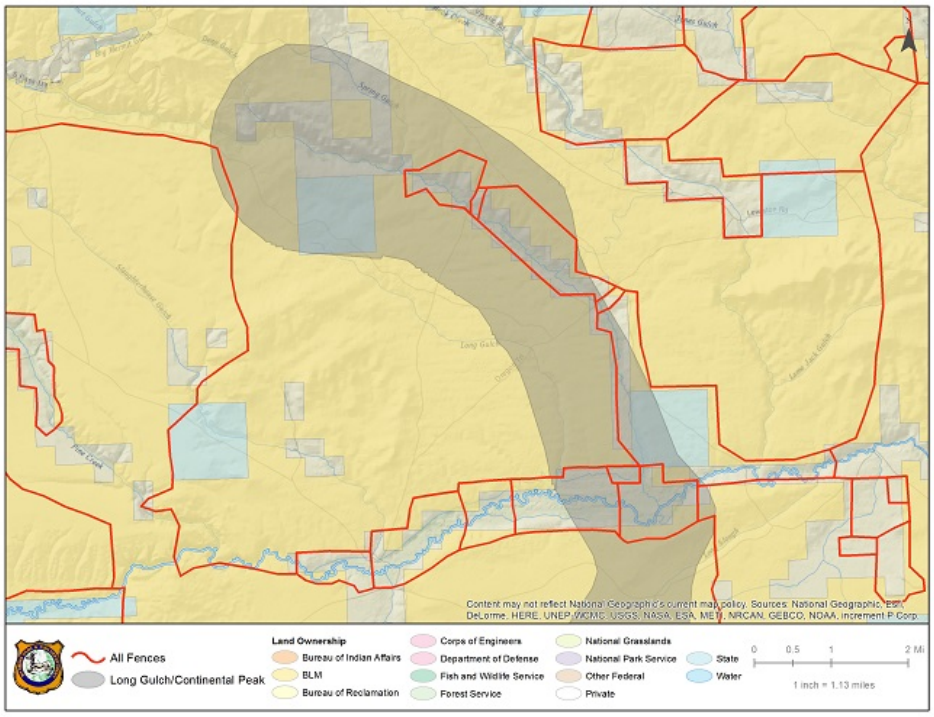

Figure 19. Fences in the Long Gulch Segment.

- **Wildlife Use and Habitat Treatments**

Unlike the other segments south of Wyoming Highway 28, the Long Gulch Segment does not contain any mule deer crucial winter range designations or any migration stopover areas (Figure 20). The apparent disjointed nature of the Long Gulch Segment is caused by the variable movement paths of deer from their winter range before converging onto the Long Gulch Segment. In other words, The Long Gulch Segment is connected to the "main" corridor, but the path deer use to access this particular corridor is rather diffuse. However, deer do mix once on winter range.

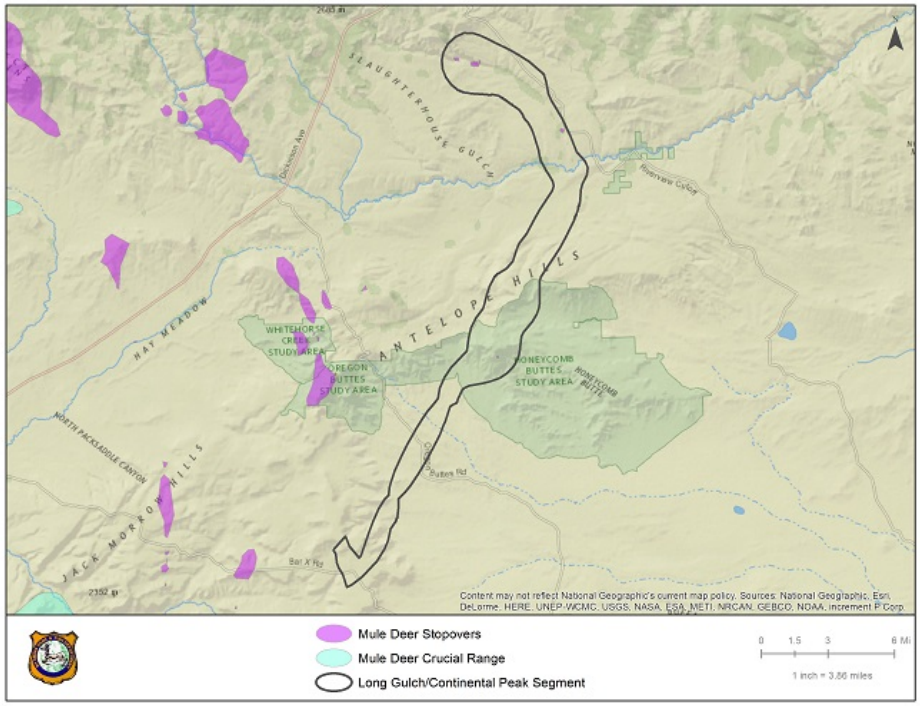

Figure 20. Mule deer crucial range designation and stopover areas in the Long Gulch Segment.

Important habitat communities on the southern end of this segment include the North Bush Rim and Chicken Springs which are spring-created aspen and willow communities. These areas are virtual islands due to the vertical structure and mesic forage they provide in the desert. These aspen-willow communities are also favorite recreational areas and would benefit from steel jack fencing or other protective measures to maintain them on the landscape. This area has experienced few planned vegetation treatments due in large part to the remote location and the arid conditions that limit production potential of the shrub community. Efforts that optimize ground cover and maintain diversity of herbaceous species will help maintain soil moisture and prevent erosion and may improve forage conditions for mule deer in stopover sites. The green zones contained within the riparian corridors of this segment are important in spring months and are sought out by mule deer for the topographic and forage variety they provide in this arid landscape.

While this segment doesn't overlap with any crucial mule deer winter range areas, it does contain a small section of elk crucial range at its southern tip and overlaps with moose crucial range along the Sweetwater River and Willow Creek drainages, as well and significant overlap with sage-grouse core habitat (Figure 21). The majority of the Long Gulch Segment overlaps designated critical habitat for some other species with the exception of a stretch that is outside of sage-grouse core habitat where the migration segment crossed the Oregon Buttes Road south of Continental Peak.

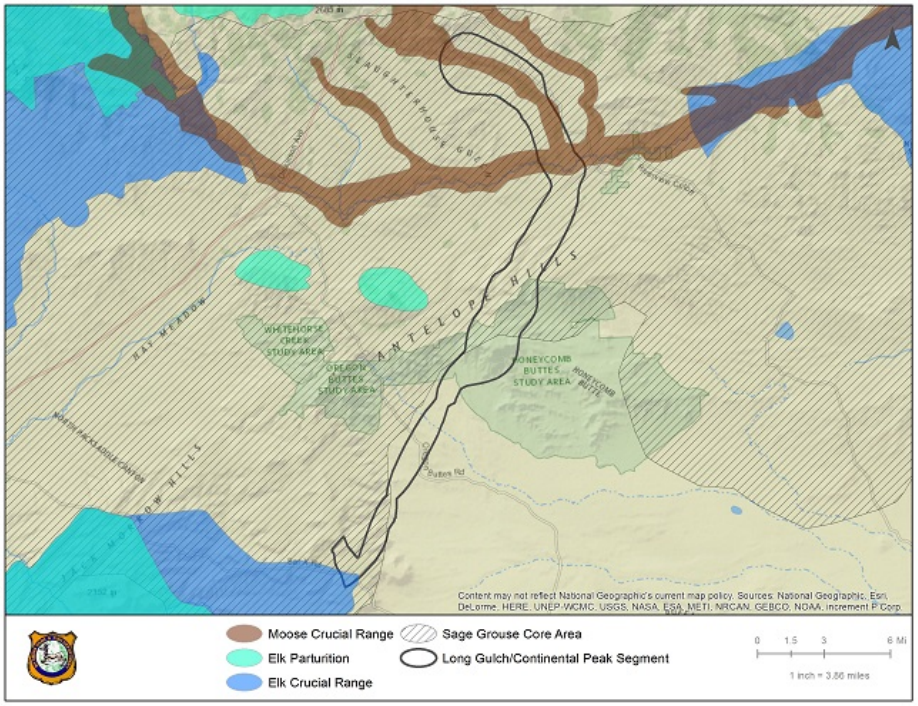

Figure 21. Crucial range designation for elk and moose, elk parturition areas, and sage-grouse core habitat in the Long Gulch Segment.

- **Land Use:**
  The majority of lands in this corridor segment are managed for multiple use. These include livestock grazing, energy development, motorized recreation, as well as non-motorized use in the Honeycomb Buttes Wilderness Study Area.

  Currently there is no active oil and gas development in or around the Long Gulch Segment. Since there is currently limited mineral industry interest in this area, energy development does not currently pose a risk for this section of the migration corridor.

  Since the southern portion of this segment is mostly under BLM management, the potential for future subdivision in that portion of the segment is very low. From the Sweetwater River north however, land ownership patterns change with several large privately owned sections overlapping the migration corridor segment (Figure 22). Some of these parcels currently have conservation easements on them, which should provide protection from subdivision development. However, the private sections along the Sweetwater River do not have conservation easements on them, which could potentially make them vulnerable if the owners choose to divide those properties in the future.

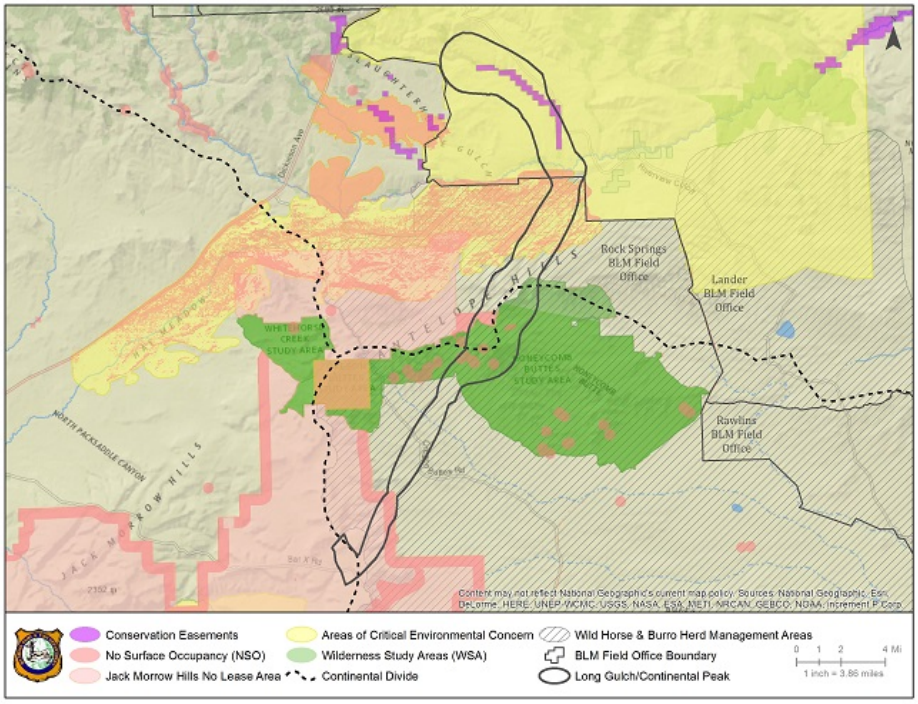

Figure 22. Designated management areas, including conservation easements, in the Long Gulch Segment.

Proactive Planning:

The Long Gulch Segment's landscape has been generally unaltered and therefore serves as a functioning landscape that allows for mule deer migration. This segment of the migration corridor does contain a slightly more complicated land ownership pattern than some of the other corridor segments south of Wyoming Highway 28. Because of that, efforts should be made to coordinate both with Federal land managers, livestock permittees, and private land owners to ensure that obstacles to mule deer movement are not increased along the Long Gulch Segment. There may be opportunities to make fence modifications along the Sweetwater River and Willow Creek that may make it easier for mule deer to traverse through this portion of the segment.

The Rock Springs BLM Field Office is currently revising their RMP that directs future management for this area. The Department has and will continue to provide wildlife input and recommendations for consideration into BLM planning documents on a case by case basis.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's, ACEC's, WSA's, conservation easements). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with livestock permittees, private landowners, and continuing to collaborate with BLM on land use planning on a case by case basis. The landscape in the Long Gulch Segment is mostly unaltered, the existing and projected risks to this segment appear

limited, and substantial protections exist, so functional migration habitat in this segment should be maintained.

SWEETWATER SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Dean Clause and Habitat Biologist Jill Randall

Segment Description:

The Sweetwater Segment is bordered to the south by the Oregon Butte Segment and extends approximately 15 miles from Wyoming Highway 28 north to into the Sweetwater River drainage ending in spring-summer-fall habitats on the Bridger-Teton National Forest (BTNF). This segment is located through broken foothill terrain on the south end of the Wind River Mountain Range and comprised of riparian, sagebrush, juniper, aspen, and conifer communities (Figure 23). The Sweetwater Segment is a wide and relatively short migration corridor that overlaps into an adjacent mule deer herd unit, the South Wind River Deer Herd located east of the Sweetwater River. Overall, this segment receives a moderate amount of outdoor recreational use during the summer and fall months, with light human activity occurring during migration periods.

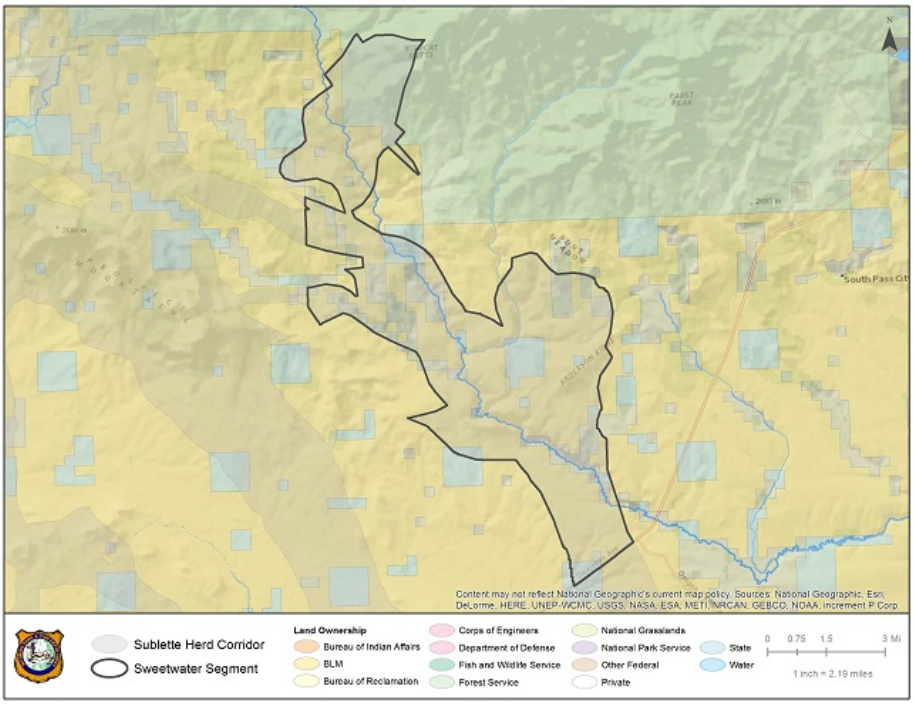

Figure 23. Sublette Mule Deer Migration Corridor Sweetwater Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Sweetwater Segment.

- **Physical Barriers**
  The Sweetwater Segment is composed almost entirely of public lands (86%) with smaller privately owned parcels along some of the riparian areas. No identified barriers exist within the segment and there are very few fences. Some property and grazing allotment fences intersect this migration corridor, and no identified fences are known to impede migration.

  Very few improved roads intersect the Sweetwater Segment. The improved gravel roads include The Lander Cutoff Road (CR132/422), and the Sweetwater Gap Road (BLM Road 4105). The only paved road is Wyoming Highway 28 located on the south end of this corridor segment. Wyoming Highway 28 has a four-strand right-of-way fence on both the north and south sides (WYDOT Type E fence). While mule deer/vehicle collisions have not been a major problem in this segment, increasing traffic volumes may result in the highway becoming a barrier to mule deer movements in the future

- **Wildlife Use and Habitat Treatments**
  Important mule deer habitats include crucial winter ranges, stopover sites, and possibly some parturition (fawning) areas which are not mapped (Figure 24). Other important wildlife habitats within or near the Sweetwater Segment include: elk and moose crucial winter range; elk parturition range, and a portion of the Greater South Pass Sage Grouse Core Area (Figure 25), all designated as Vital in the WGFC Mitigation Policy. As a result, almost this entire segment overlaps other Vital habitats.

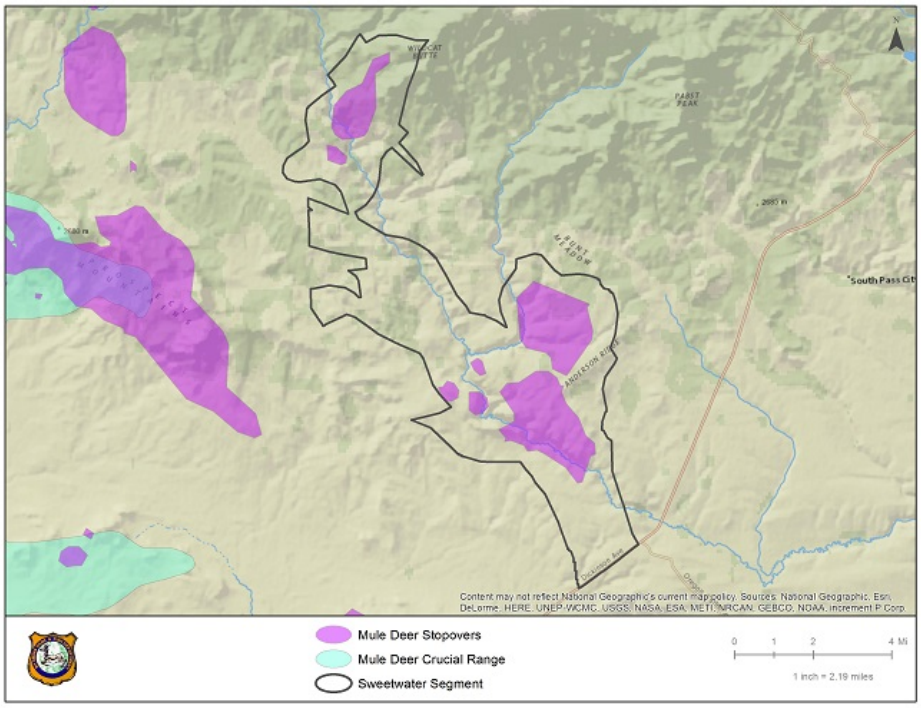

Figure 24. Mule deer crucial range designation and stopover areas in the Sweetwater Segment.

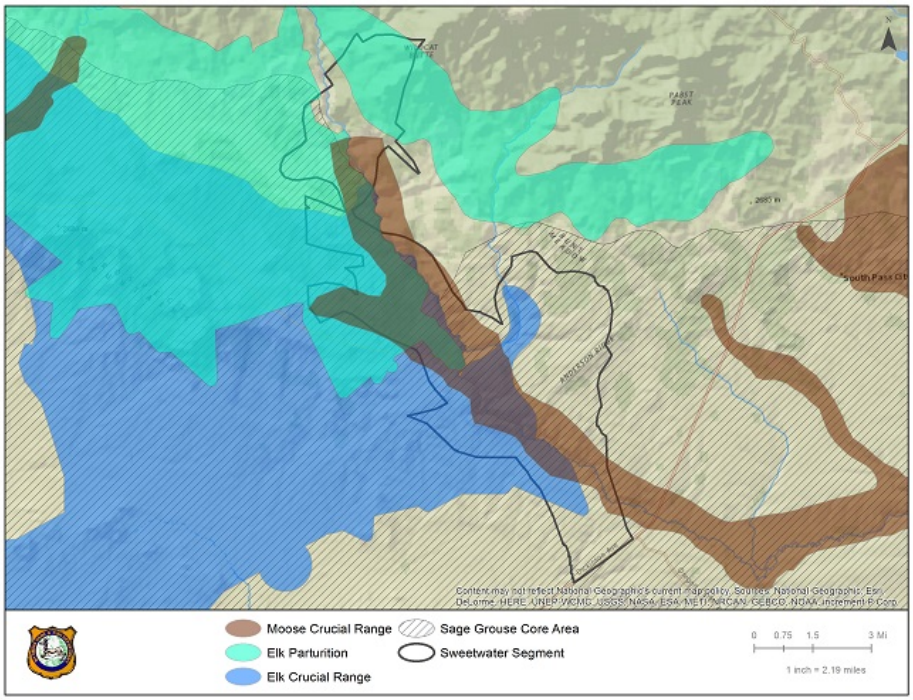

Figure 25. Crucial range designation for elk, moose, elk parturition areas, and sage grouse core habitat in the Sweetwater Segment.

This segment covers many diverse habitats that primarily correspond with elevation changes. At lower elevations, vegetation is dominated by Wyoming big sagebrush and includes interspersed riparian areas along the Sweetwater River and its tributaries. At higher elevations, the sagebrush gives way to aspen, limber pine, and lodgepole pine dominated communities toward the BTNF. Habitat management priorities for this segment include partnering with livestock operators and managing rangelands in a way that produces optimal levels of early grass green-up. There are opportunities to conduct vegetation treatments to improve the age structure and leader production of shrubs in an effort to maintain healthy rangelands into the future. Additionally, aspen treatments could be conducted on the BTNF to promote recruitment of young age classes and to limit competition with conifers.

- **Land Use:**
  As mentioned earlier, this segment is almost all public lands managed primarily by the BLM (70% BLM, 10% USFS, and 6% Office of State Lands and Investments (OSLI)). The primary commercial use is public land livestock grazing which permits a mix of cattle and sheep trailing use within three grazing allotments. No residential sub-divisions are located within this segment but there are some seasonal (summer) homes located on the scattered private land parcels in the Gold Creek, Lander Creek, and Blucher Creek areas. No known conservation easements exist on any of the private land parcels that comprise 14% of this corridor segment.

A portion of this segment is designated as the Wind River Front Special Management Area (SMA) (Figure 26). The management objective is to maintain and improve wildlife habitats, big game migration corridors and bottlenecks, scenic quality, recreation values and uses, and protect the integrity of the U.S. Air Force Detachment 489 Seismic Monitoring Station. Oil and gas leasing is unavailable within the Wind River Front SMA.

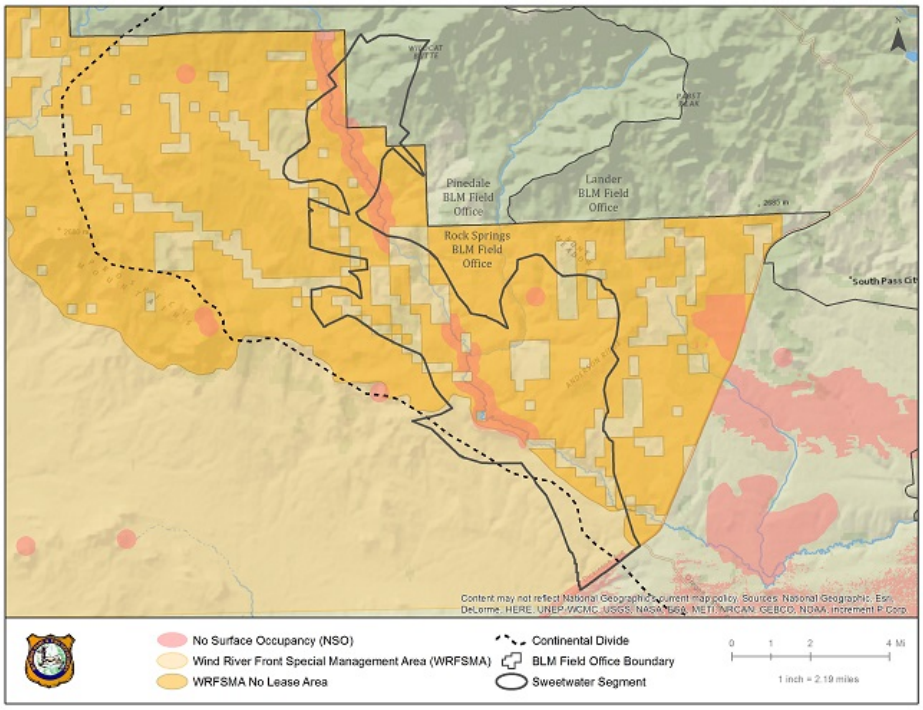

Figure 26. Designated management areas in the Sweetwater Segment.

Proactive Planning:

Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management, and habitat management. In addition, the Department will continue to provide wildlife input and recommendations for consideration into BLM and USFS planning documents on a case by case basis.

With respect to Wyoming Highway 28, local managers have identified the need to install paired gates and/or other fence designs that can be easily modified during winter and migrating periods to allow for easier big game (mule deer, antelope, and elk) crossing. Local managers will coordinate and collaborate with WYDOT and livestock permittees to explore such opportunities in this area.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners,

Non-Governmental Organizations (NGO's), the public, and continuing to collaborate with public land managers.

BIG SANDY SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Dean Clause and Habitat Biologist Jill Randall

Segment Description:

The Big Sandy Segment extends approximately 25 miles from Wyoming Highway 28 north to the Big Sandy River through contiguous broken sagebrush terrain located southwest of the Wind River Mountain Range (Figure 27). The Big Sandy segment is wider compared to other migration segments, is predominately public land managed by the BLM with very few fences, and is located within and adjacent to the largest wintering concentrations for the entire Sublette Deer Herd. Significant stopover areas have been delineated within this segment as many mule deer spend the winter in this general area while others migrate through. With predominately unfenced public land and suitable habitat, this migration segment currently has not been extensively influenced by human development. This segment receives a moderate amount of outdoor recreational use and travel with increased activity pulses associated with spring antler hunting, summer recreation in the mountains, and fall bird and big game hunting.

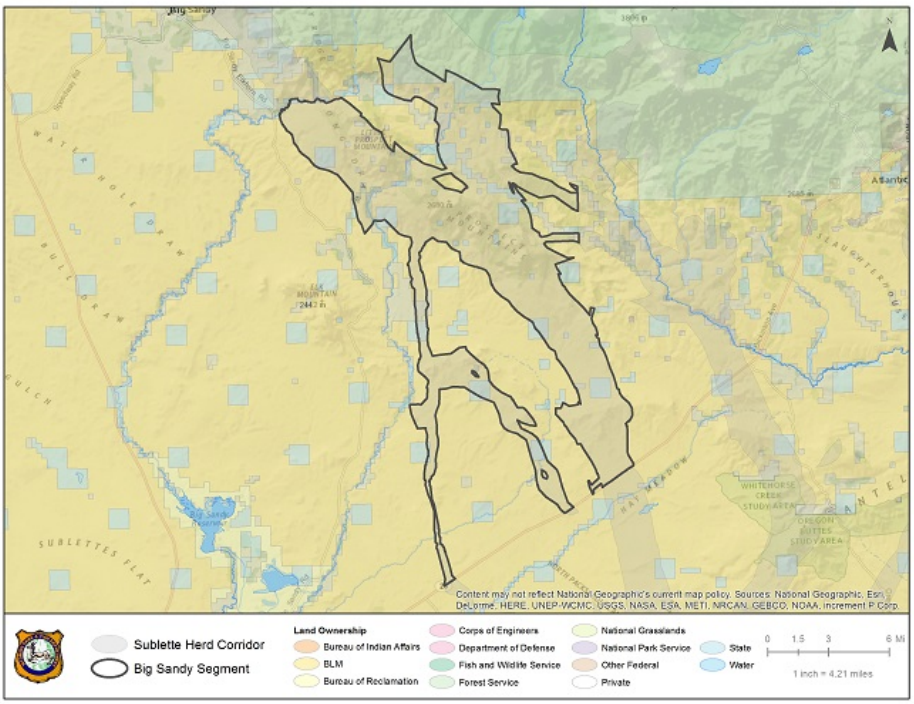

Figure 27. Sublette Mule Deer Migration Corridor Big Sandy Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Big Sandy Segment.

- **Physical Barriers**

  The Big Sandy Segment is composed almost entirely of public lands (97%) with only 3% of the migration corridor privately owned. No identified barriers exist within the segment along with very few fences. Some small portions of net wire fence exist near the Little Sandy River associated with current and historic sheep use in the area.

  Several improved gravel and county roads access the Wind River Mountains and foothills within this segment. These improved gravel roads include, the Big Sandy-Elkhorn Junction Road (CR 118 and BLM Road 4108), The Lander Cutoff Road (CR132), and the Squaw Creek Road (BLM Road 4106). The only paved road is Wyoming Highway 28 located on the south end of the Big Sandy Segment. Portions of right-of-way fences on the northwest side of Wyoming Highway 28 have been modified at this migration segment and similar modifications are warranted on the southeast side.

- **Wildlife Use and Habitat Treatments**

  Important mule deer habitats include stopovers and crucial winter range located mainly in the north portion of this corridor segment (Figure 28). Other important wildlife habitats within or near the Big Sandy Segment include elk, antelope, and moose crucial winter range, and a portion of the Greater South Pass Sage Grouse Core Area (Figure 29), all designated as Vital habitat in the WGFC Mitigation Policy. The entirety of this segment overlaps other Vital habitats.

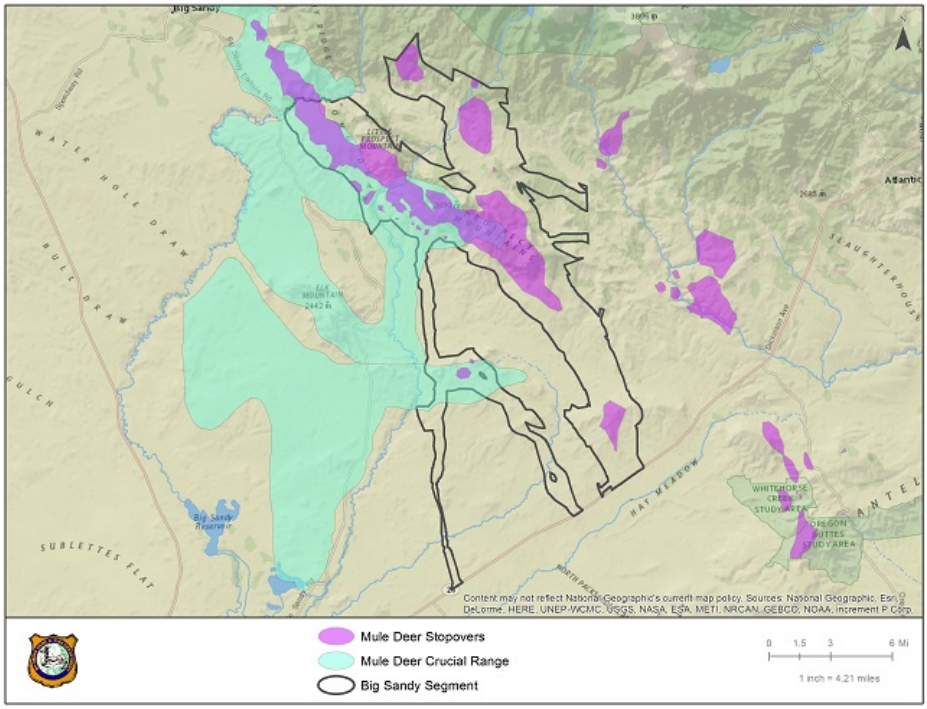

Figure 28. Mule deer crucial range designation and stopover areas in the Big Sandy Segment.

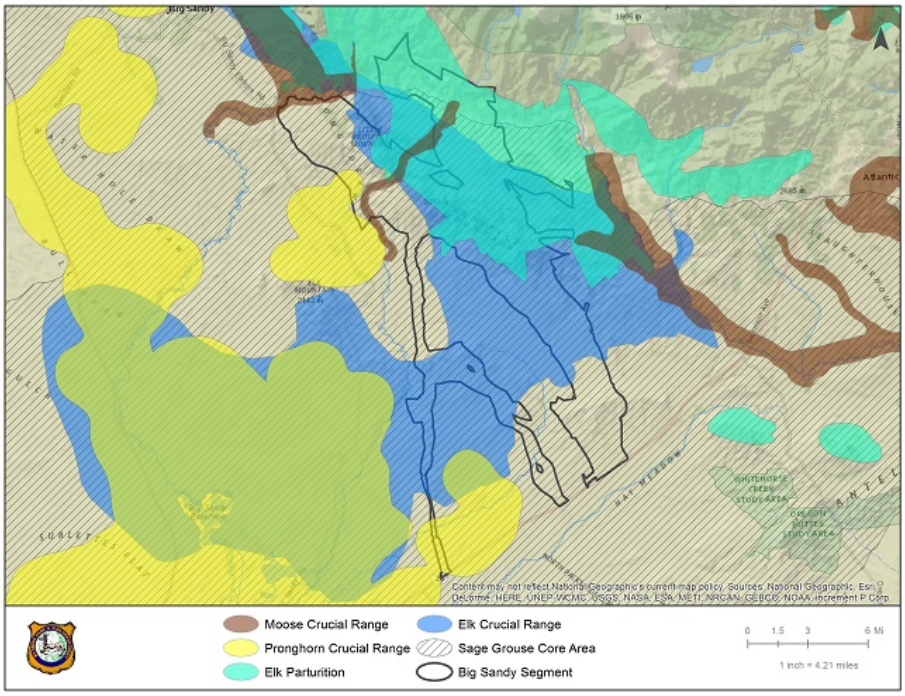

Figure 29. Crucial range designation for elk, moose, antelope, and sage grouse core habitat in the Big Sandy Segment.

The primary habitat management opportunities in this segment include efforts to enhance mixed mountain shrub, Wyoming big sagebrush and aspen communities around the Prospect Mountains. Shrub conditions are generally old and heavily hedged which do not provide the potential forage value these communities are capable of producing. An additional priority for this segment would be partnering with livestock operators to prevent overuse of bitterbrush. Annual leaders of these shrubs and healthy rangelands capable of early grass green-up will benefit mule deer during transitional seasons. Cheatgrass treatments have and will continue to occur on the north portion of the segment as well as along roads which serve as vectors for the spread of the invasive grass. Previous vegetation treatments are generally lacking within this segment.

- **Land Use:**
  As mentioned earlier, this segment is almost all public land managed primarily by the BLM. The primary commercial use is public land livestock grazing which permits a mix of cattle, sheep and horse use throughout various grazing allotments. Private lands comprise of 3% of the area and there are no residential properties (sub-divisions) located within the segment and no conservation easements exist on any of the private lands.

  The Wind River Front SMA occurs within this segment (Figure 30). Management objectives for this SMA include maintain and improve wildlife habitats, big game migration corridors and bottlenecks, scenic quality, recreation values and uses, and protect the integrity of the U.S. Air Force Detachment 489 Seismic Monitoring Station. Oil and gas leasing is unavailable within this Wind River Front SMA.

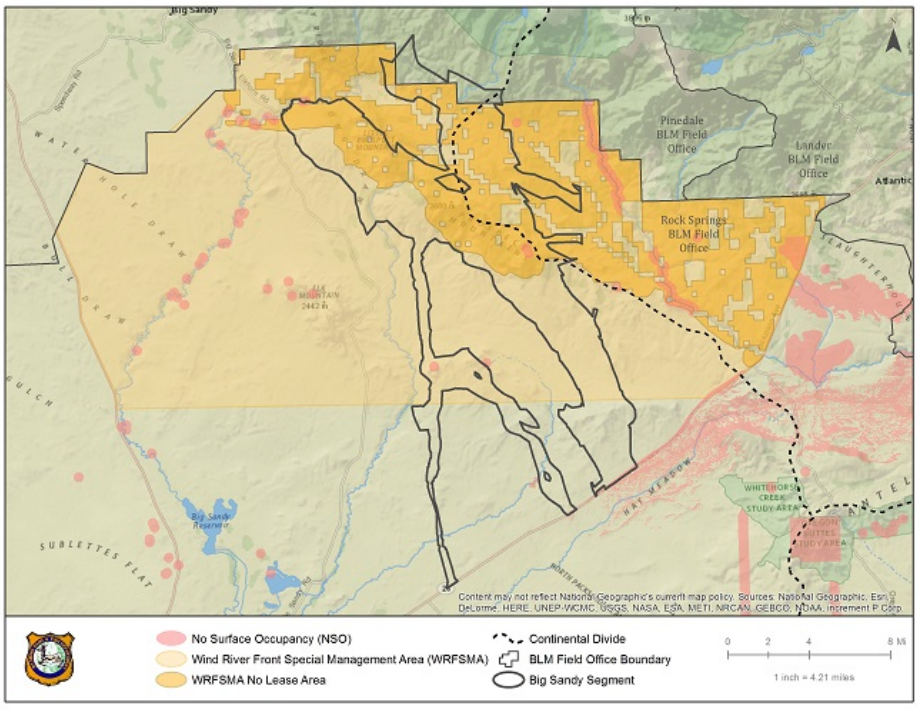

Figure 30. Designated management areas in the Big Sandy Segment.

Proactive Planning:

The Department will work cooperatively with landowners, public land managers, and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve migration corridors. In the Big Sandy Segment, collaborative efforts are necessary for the overall goal to maintain/improve the function of the migration corridor. Interagency and NGO collaborative efforts are also continuing to insure future passage of mule deer through this area. Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management.

Net wire fence modifications near the Little Sandy River could be explored as opportunities and funding dictate. Coordination and collaboration with livestock permittees and private landowners would be necessary. With respect to Wyoming Highway 28, local managers have identified the need to install paired gates and/or other fence designs that can be easily modified during winter and migrating periods to allow for easier big game (mule deer, antelope, and elk) crossing. Local managers will coordinate and collaborate with WYDOT and livestock permittees to explore such opportunities in this area.

At the current time, the Rock Springs BLM Field Office is revising their RMP that directs future management for this area. The Department has and will continue to provide wildlife input and recommendations for consideration into BLM and USFS planning documents on a case by case basis.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners, NGO's, the public, and continuing to collaborate with public land managers to ensure mule deer migration remains unimpeded as much as possible. Habitat management is also of great importance since crucial mule deer, antelope, and elk winter habitat, sage grouse year long habitat, and permitted livestock grazing exists throughout portions of this migration segment.

EAST FORK SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Dean Clause and Habitat Biologist Jill Randall

Segment Description:

The East Fork Segment extends approximately 25 miles from the Big Sandy River north to the Scab Creek Road (BLM Road 5324) located along the foothills of the west slope of the Wind River Mountains (Figure 31). This East Fork Segment is one of the more narrowly identified segments compared to the remainder of the Sublette Mule Deer Migration Corridor. This migration corridor segment has intermingled private and public lands (BLM, USFS, and OSLI) dominated by sagebrush habitat and numerous fences. Several small acreage 10-40 acre residential fenced parcels exist within and adjacent to the migration corridor adding to overall miles of fences within this segment. This segment receives a moderate amount of outdoor recreational use and travel.

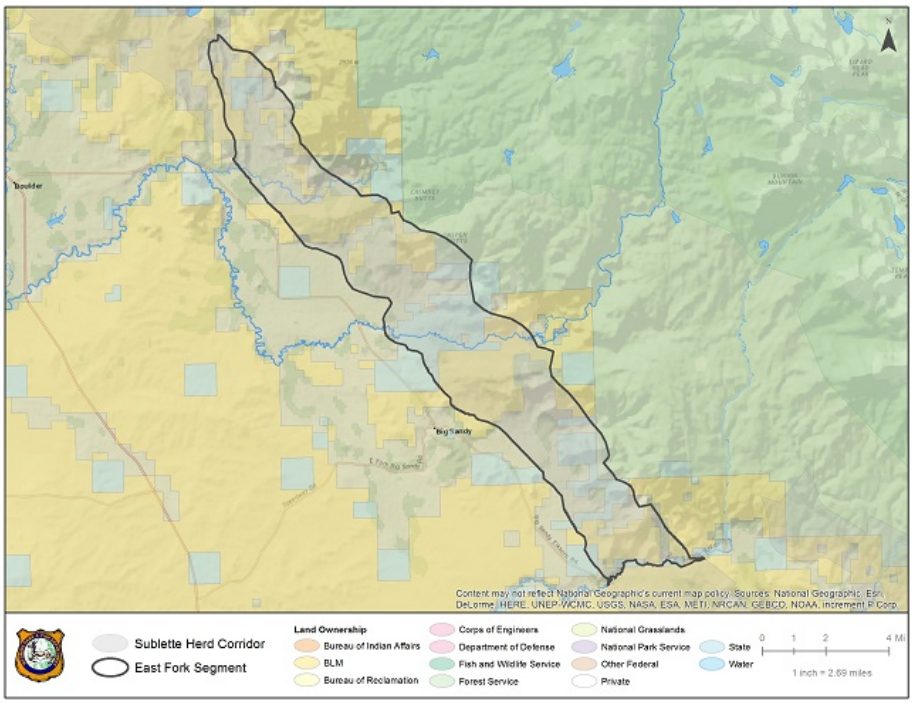

Figure 31. Sublette Mule Deer Migration Corridor East Fork Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the East Fork Segment.

- **Physical Barriers**
  The East Fork Segment is composed of mixed land ownership with around 43% privately owned lands and 57% public lands (managed by four different management agencies) resulting in many fences. The only true identified barriers within this migration segment are two 8' tall net wire elk containment fences across the Muddy Creek drainage below the Muddy Creek elk feedground. These two fences total two miles in length and were built by the Department in 2005 to retain a spatial buffer between elk and cattle to reduce risk of brucellosis transmission. Although this 8' tall elk fence is essentially a barrier to mule deer movement, the short overall length and north-south design has relatively little effect on migrating mule deer. In addition, gates and jumps can be utilized seasonally along this fence. Jumps are an opening in the fence that allows big game passage in one direction, primarily useful during fall mule deer migration at this location. Other management efforts to help maintain mule deer accessibility through this fence include leaving gates open when feasible during the migration periods.

  A "Wildlife Friendly Fence Initiative" was funded and implemented in 2006-2007 in an effort to inventory and then modify/re-construct fences that did not meet wildlife friendly fence standards within Sublette County. During the past 10 years a few private and public fences near Pocket Creek and East Fork River within this segment have been modified (Figure 32). Currently efforts are being made to secure funding to continue this fence modification/re-construction work throughout this segment within Sublette County. One ranch currently has funding approved for fence modifications and at least one other landowner has granted approval for fence modifications within the East Fork Segment.

  Although most of residential subdivisions in or near this segment are located on larger (10+ acres) parcels, they have likely contributed to the narrow width of this migration segment today. Fence permeability within these subdivisions is an important factor for maintaining habitat function within this segment.

  Several improved gravel and county roads access the Wind River Mountains and private lands within this segment. No paved roads are located within this segment, and roads with higher traffic volumes are associated with public recreational use. Access to popular hunting, fishing, and trailhead locations is found within this segment on the Scab Creek Road (BLM Road 5423) and Irish Canyon Road (FS Road 870). The Pocket Creek Road and Muddy Creek Road (FS Road 869) also receive some amount of public use. Overall, traffic and activity is fairly light during the mule deer migration period.

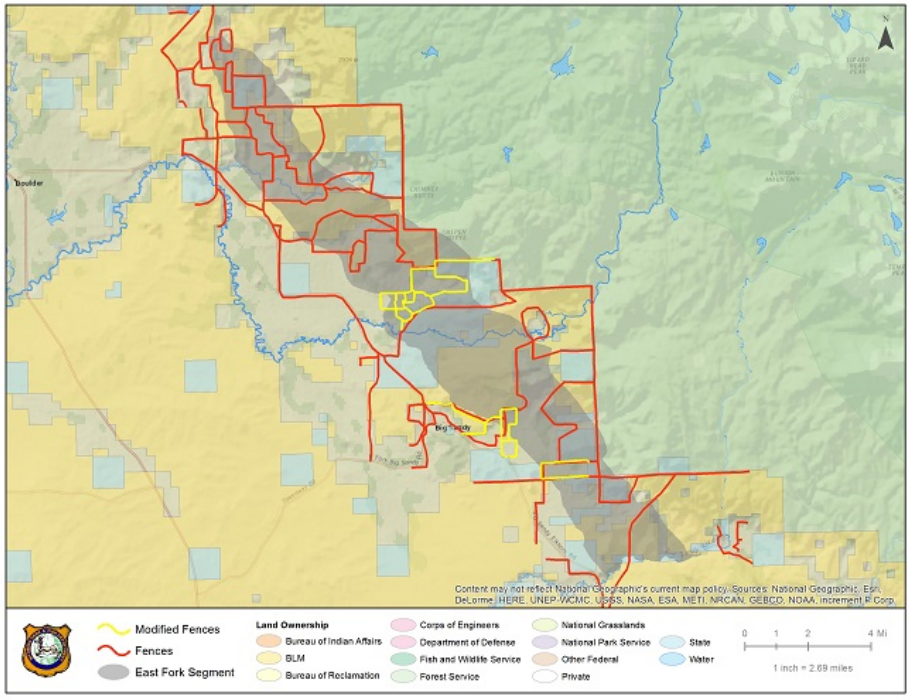

Figure 32. Fences in the East Fork Segment.

- **Wildlife Use and Habitat Treatments**
  Important mule deer habitats include stopovers and crucial winter range located throughout this corridor segment (Figure 33). Other Vital wildlife habitats within or near the East Fork Segment include the Scab Creek and Muddy Creek elk feedgrounds, elk, antelope, and moose crucial winter range, and a portion of the Greater South Pass Sage Grouse Core Area (Figure 34). The entirety of this corridor segment overlaps other Vital habitats.

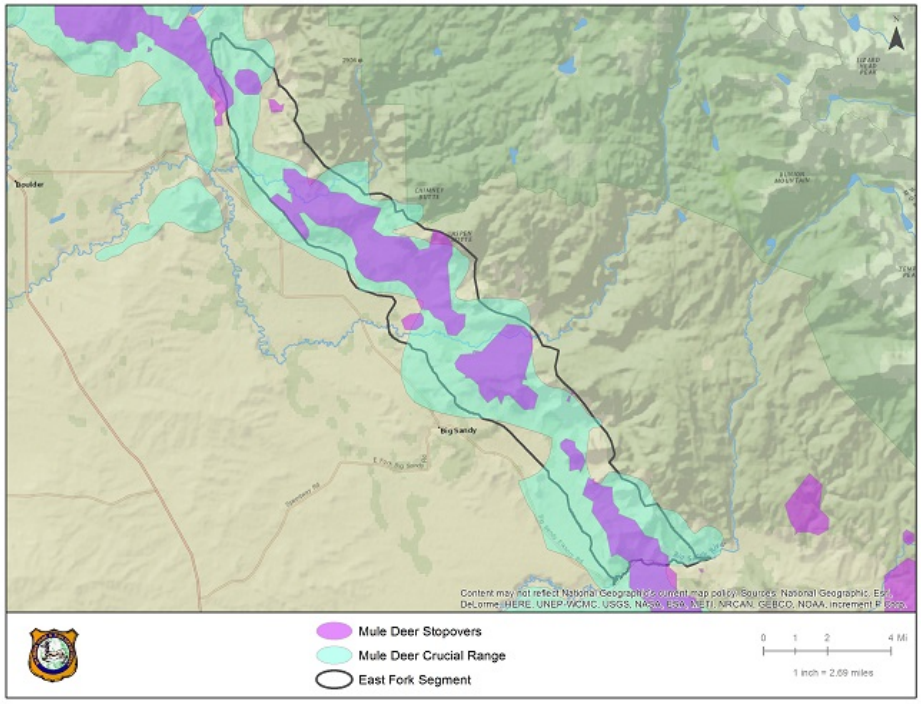

Figure 33. Mule deer crucial range designation and stopover areas in the East Fork Segment.

This segment is dominated by mountain big sagebrush and bitterbrush communities. Cheatgrass infestations are the primary habitat concern in this segment. Coarse soils with relatively steep southern aspects, or those areas with previous disturbance, are the areas with highest prevalence of cheatgrass. Native rangelands at all elevations in this segment are prone to cheatgrass invasion. In many places, 50% or greater canopy cover of cheatgrass is co-dominant with native species. However, these areas are prone to wildfire, which could eliminate the sagebrush component in these communities. A significant cheatgrass treatment project is underway and spearheaded by Sublette County Weed and Pest with the Department, BLM, OSLI, and private landowners cooperating on implementation. An additional habitat priority for this segment would be partnering with livestock managers to prevent overuse of bitterbrush plants that are important forage for mule deer in fall and winter months. Annual leaders of these shrubs and healthy rangelands capable of early grass green-up will benefit mule deer during transitional seasons. Previous treatments in this segment include a 2015 sagebrush mowing on private land in Irish Canyon, the 2002 East Fork Wildfire, and the 1998 Cottonwood (sagebrush) prescribed burn.

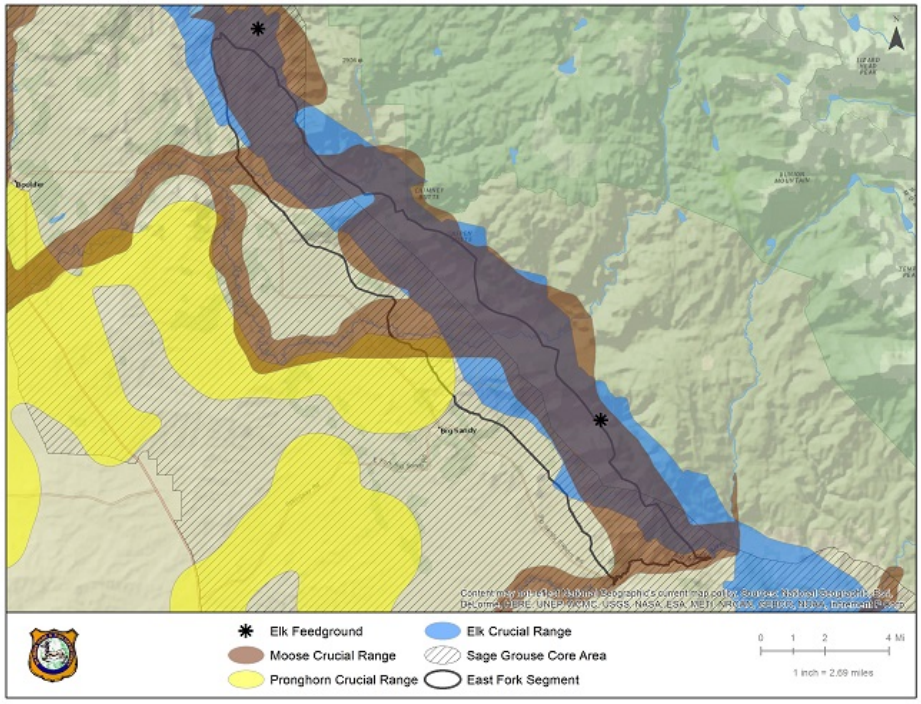

Figure 34. Crucial range designation for elk, moose, antelope, and sage grouse core areas in the East Fork Segment.

- **Land Use:**
  This 25 mile segment crosses a mix of landownership including private (43%), BLM (37%), OSLI (19%), and USFS (1%) lands. The majority of private land is used for agricultural purposes, such as hay production and livestock grazing. Some residential property (sub-divisions) is located within this segment near Pocket Creek and the East Fork River. Approximately 16% of the private lands have a conservation easement in place restricting future development/fragmentation (Figure 35). These easements are located in the Scab and Silver Creek areas. However, the potential for working ranches to be subdivided, developed, or fenced into multiple smaller parcels presents a long-term risk to portions of this migration segment.

  Over half the lands within this segment are public, managed under State or Federal control. The BLM and OSLI account for almost all public land and it is imperative that communication and coordination occur among these agencies on proposed projects and management plans to maintain the functionality within this migration corridor.

  Several designated Management Areas are located within this migration segment (Figure 35). The Wind River Front Special Management Area (SMA) is located within this corridor with a management objective to maintain and improve wildlife habitats, big game migration corridors and bottlenecks, scenic quality, recreation values and uses, and protect the integrity of the U.S. Air Force Detachment 489 Seismic Monitoring Station. Oil and gas leasing is unavailable within the Wind River Front SMA. Most of the Scab

Creek Special Recreation Management Area (SRMA) designated lands (18,460 acres) lie outside but adjacent to the northern portion of this segment which has management objectives to provide opportunities for the public to achieve targeted, high-quality recreation activities. Similar to the Scab Creek SRMA, a 7,710 acre Scab Creek Wilderness Study Area (WSA) overlaps a small portion of this corridor with the goal to protect wilderness characteristics. Currently there are no active oil and gas leases on federal lands and no mineral extraction activities on any known private lands within this corridor segment.

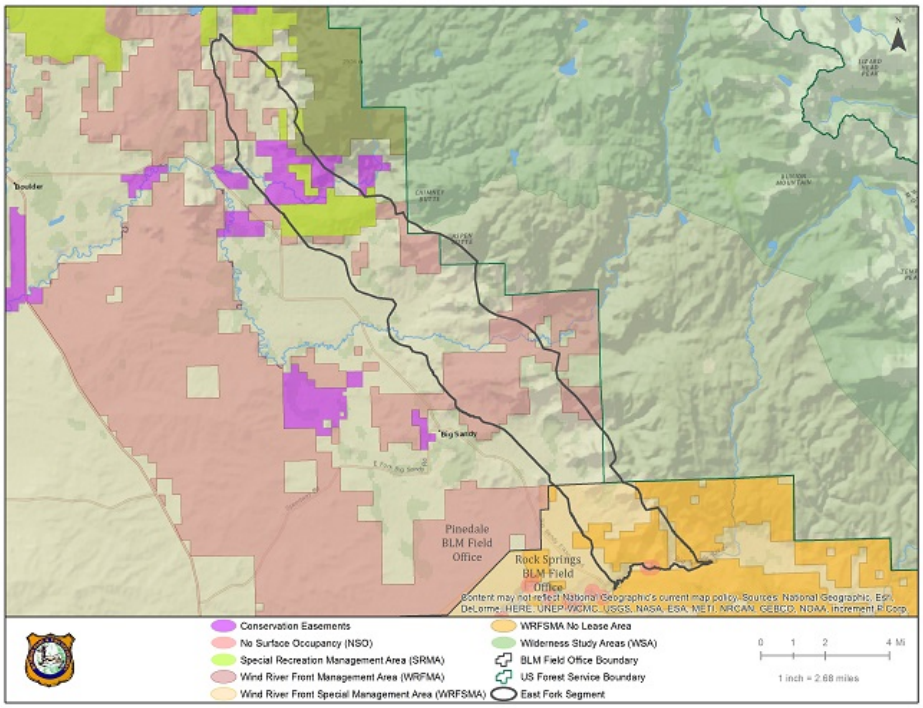

Figure 35. Designated management areas, including conservation easements, in the East Fork Segment.

Proactive Planning:

The Department will work cooperatively with landowners, public land managers, and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve migration corridors in the East Fork Segment. Collaborative efforts are currently being taken to modify fences, conserve and enhance important habitats, and implement activities to minimize barriers with the overall goal to maintain/improve mule deer migrations. Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management.

Assessment Summary:
Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's, SRMA's, ACEC's, conservation easements). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners, NGO's, the public, and continuing to collaborate with public land managers to ensure mule deer migration remains as unimpeded as possible. Fence modifications throughout the corridor and managing potential residential impacts will provide benefits as well.

FINGER LAKES SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Dean Clause and Habitat Biologist Jill Randall

Segment Description:
The Fingers Lake Segment extends approximately 40 miles from the Scab Creek Road (BLM 5324) north to Wyoming Highway 352 located along the foothills of the west slope of the Wind River Mountains with a slender corridor extending to the northwest across Wyoming Highway 352 and the Green River into the Twin Creek drainage (Figure 36). The Finger Lakes Segment is a narrow corridor segment, and possibly the most significant for ensuring mule deer migration into the future.

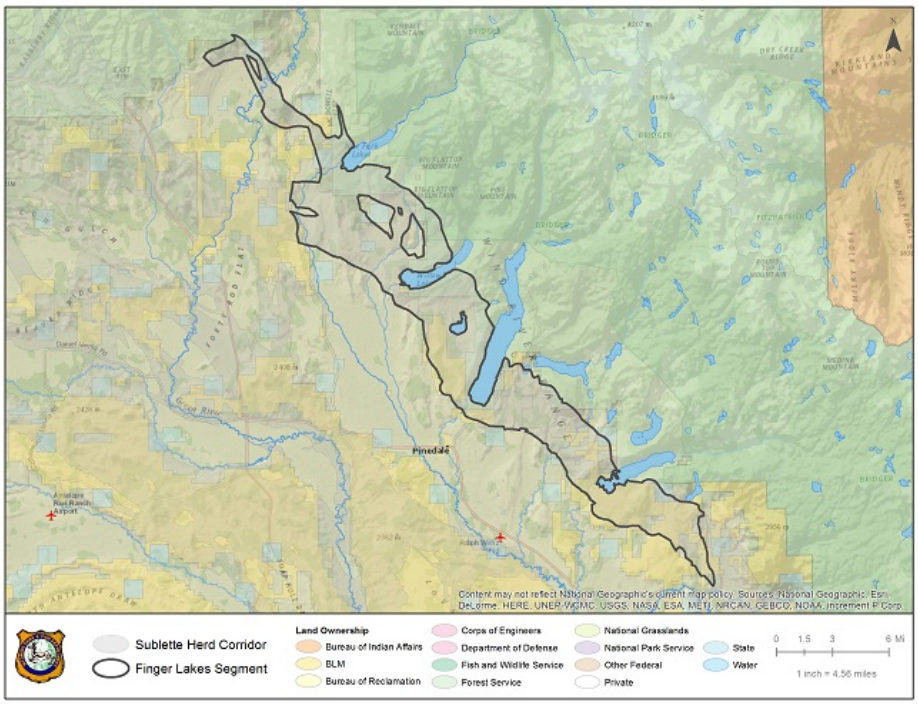

Figure 36. Sublette Mule Deer Migration Corridor Finger Lakes Segment.

This corridor segment has intermingled private lands and public lands (BLM, USFS, OSLI, and the Department) dominated by either hay meadows or sagebrush habitat, and numerous property boundary fences, including an 8' tall elk drift fence located between Fremont and Willow Lakes. Several narrow bottlenecks are located within this segment due to large linear lakes (Boulder, Fremont, and Willow Lakes) with further confinement due to residential development and public recreation at the Fremont Lake Bottleneck. This segment receives a high amount of outdoor recreational use and travel.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Finger Lakes Segment.

- **Physical Barriers**

  The Finger Lakes Segment is composed of mixed land ownership with nearly 50% privately owned lands and 50% public lands with many fences (Figure 37). One impediment within this migration segment is an 8' tall net wire drift fence that was built in the 1960's to funnel elk to the Soda Lake Feedground during the late fall and winter. This 20 mile-long fence was built on the interface between private lands and public lands (USFS, BLM, and Department) and is located between Fremont and New Fork Lakes. The initial purpose of the fence was to keep elk out of stored hay on private lands in the Willow and New Fork drainage bottoms. A recent benefit of this fence is reducing risk of brucellosis transmission among elk and cattle by eliminating co-mingling. Although this 8' tall elk fence restricts animal movements there are gates, jumps, and low depressions under the net wire that allow mule deer to pass. Mule deer have navigated through or around this fence for over 50 years. Past and current management efforts to help maintain mule deer accessibility through this fence include leaving gates open when feasible, dirt work on jumps to make them more mule deer friendly, removal of cattle guards at gate locations, and fence re-alignment near the outlet of Fremont Lake. Potential projects on this elk fence could be to install more mule deer accessible gates and jumps so this section of fence becomes more permeable during migration periods while still preventing comingling of elk and cattle in winter.

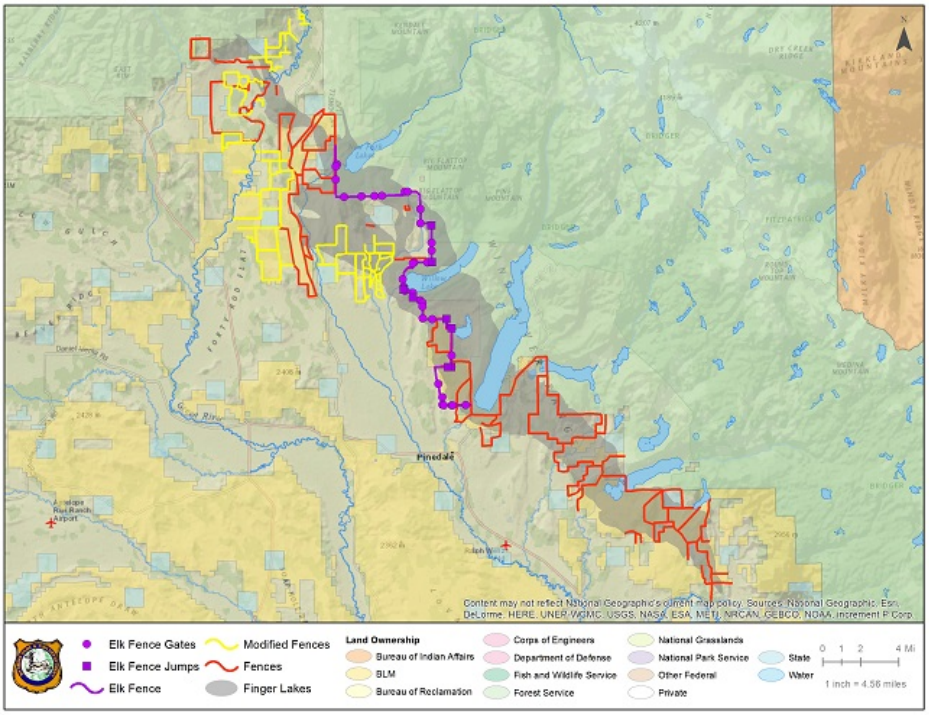

Figure 37. Fences in the Finger Lakes Segment.

A "Wildlife Friendly Fence Initiative" was funded and implemented in 2006-2007 in an effort to inventory and then modify/re-construct fences that did not meet wildlife friendly fence standards within Sublette County. During the past 10 years some private and public fences within this Finger Lake Segment have been modified on the north end. Currently efforts are being made to secure funding to continue this fence modification/re-construction work throughout this segment. One ranch currently has funding approved for fence modifications and another landowner has granted approval for fence modifications. Fence modifications and re-construction projects are taking place to maintain wildlife friendly fences within WGFC owned lands (Soda Lake and Half Moon Wildlife Habitat Management Areas (WHMA's). A portion of Wyoming Highway 352 from mile post 8 - 12 is scheduled for fence modification by the Wyoming Department of Transportation (WYDOT) in 2017.

The town of Pinedale is not within this corridor segment, but the town itself and residential subdivisions north of town have contributed to the narrow migration bottleneck that exists today around the outlet of Fremont Lake. In addition to residential development, a bike/walking/skiing path was built approximately 10 years ago for recreational activities from Pinedale to Fremont Lake. During the establishment of this trail, there was an agreement made with the Sublette County Recreation Board to eliminate trail grooming for cross-country skiing during identified mule deer migration periods. The U.S. Forest Service (USFS) seasonally prohibits camping within the Fremont Lake Bottleneck along Pine Creek near the outlet. Recent interpretive signing along this recreational trail is intended to make the public aware of mule deer migration periods and how to minimize impacts. Large

informational signs located at parking areas are still being developed. During spring migration through this bottleneck, mule deer mortalities occasionally occur due to soft ice or shelf ice along the shore between the Fremont Lake outlet and the irrigation/dam control structure.

Several improved gravel and county roads access the Wind River Mountains and lakes that intersect this segment. The only paved roads are located north of the town of Pinedale known as Skyline Drive area (CR 154 and FS 740 and FS 741) and have the highest traffic volumes due to recreational use associated with Fremont and Halfmoon Lakes, White Pine, and Elkhart Park Trailhead. Occasional mule deer mortalities occur from vehicle collisions on Skyline Drive. Recent and ongoing road improvement to widen and straighten this road will result in higher vehicle speeds and additional road mortalities. Access to other popular hunting, fishing, and trailhead locations are found within this segment, although overall recreational activity is relatively low during the mule deer migration period.

- **Wildlife Use and Habitat Treatments**
  Important mule deer habitats include stopover areas and crucial winter range located in the southern half of this corridor segment (Figure 38). Other Vital wildlife habitats within or near this Finger Lakes Segment include the Soda Lake and Fall Creek elk feedgrounds, elk and moose crucial winter range, and a portion of the Greater South Pass and Daniel Sage Grouse Core Areas (Figure 39). Almost the entire segment overlaps other Vital habitats.

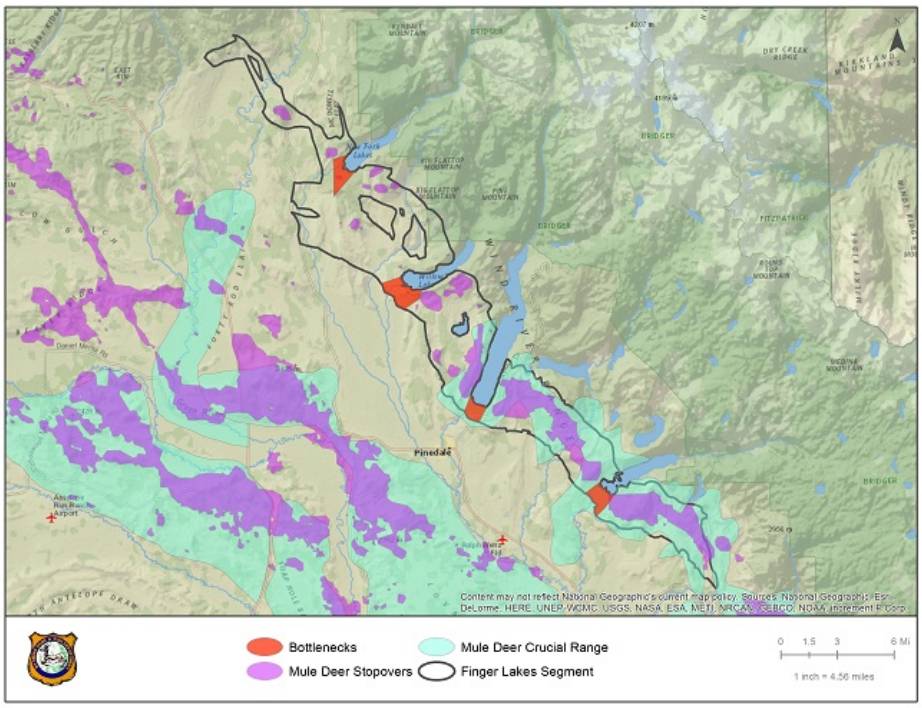

Figure 38. Mule deer crucial range designation, including migration bottlenecks, and stopover areas in the Finger Lakes Segment.

This segment contains a diverse mix of vegetation communities ranging from mountain big sagebrush and bitterbrush communities to aspen dominated foothills. Cheatgrass infestations are a significant habitat concern for portions of this segment (Figure 40). Coarse soils with relatively steep southern aspects, or those areas with previous disturbance, are the areas with highest prevalence of invasion. In many places, 50% or greater canopy cover of cheatgrass is co-dominant with native species. However, these areas are prone to wildfire, which could convert these communities to not having a sagebrush component. A significant cheatgrass treatment project is underway and spearheaded by Sublette County Weed and Pest with Department, BLM, and private landowners cooperating on implementation. Additionally, BTNF is currently considering a National Environmental Policy Act (NEPA) process to allow aerial application of herbicide to control cheatgrass which would significantly improve management options in this segment. There have been significant treatments in this segment including aspen enhancements (1990-2008) in the Soda Lake and Little Flattop areas, sagebrush prescribed burns and herbicide treatments (1989-2005) in the New Fork Lake, Fremont Lake and Boulder Lake areas, and wildfires including the 1996 Fayette Ranch, 2007 Pole Creek and 2008 New Fork Wildfires.

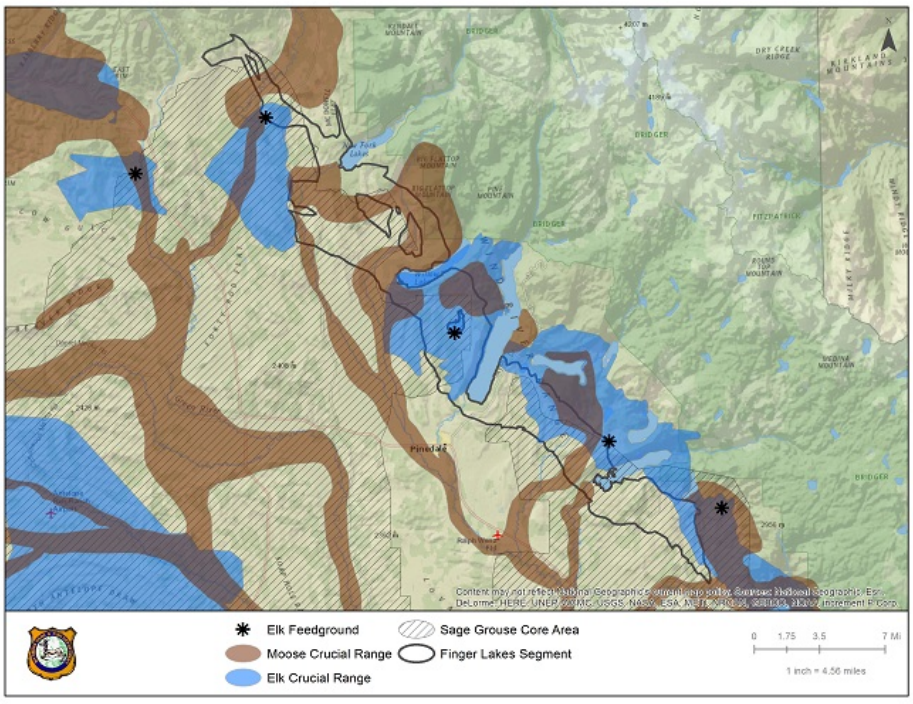

Figure 39. Crucial range designation for elk, moose, and sage grouse core habitat in the Finger Lakes Segment.

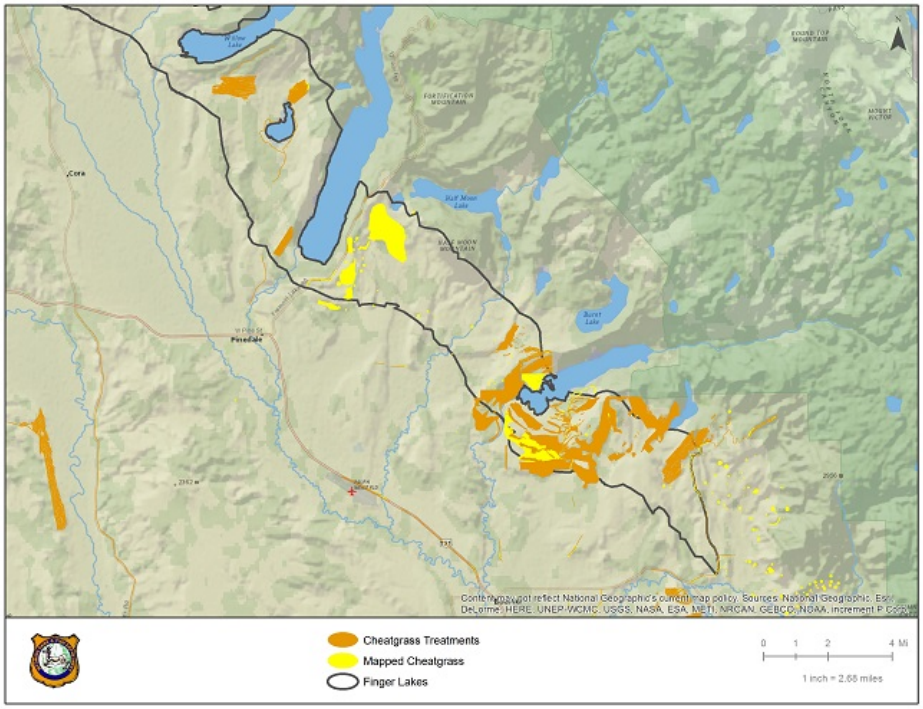

Figure 40. Mapped and treated cheatgrass locations in the Finger Lakes Segment.

- **Land Use:**
  This 34- mile segment crosses mixed landownership of private, BLM, USFS, OSLI, and Department lands. About half of this segment is private land with the majority used for agricultural purposes, such as hay production and livestock grazing. Some residential properties (sub-divisions) are located near Fremont Lake and Willow Creek, and numerous residential areas located west of this corridor. Roughly 9% of the private lands have a conservation easement in place restricting future development/fragmentation on those lands (Figure 41). These easements are located in the Green River, New Fork, and Willow Creek areas. However, the potential for working ranches to be subdivided, developed, or fenced into multiple smaller parcels presents a long-term risk to portions of this migration segment.

  Just over half the lands within this segment are public, managed under State or Federal control. The BLM comprises nearly 30%, USFS about 14%, and State (OSLI and Department) at 10%. With such a diverse group of agencies is imperative that communication and coordination occur on proposed projects and management plans to maintain the functionality within this segment.

  Several designated Management Areas are located within this segment (Figure 41). The Wind River Front SMA is located on the southern portion of this corridor with a management objective to maintain and improve wildlife habitats, big game migration corridors and bottlenecks, scenic quality, recreation values and uses, and protect the integrity of the U.S. Air Force Detachment 489 Seismic Monitoring Station. Oil and gas

leasing is unavailable within this Wind River Front SMA. The 5,790 acre Boulder Lake Special Recreation Management Area (SRMA) designated lands within this segment has the management goal to provide substantial personal, community, economic, and environmental benefits to local residents and visitors through recreational uses of public lands. The CCC Pond SRMA (1,040 acres) is located at the Fremont Lake bottleneck with a management objective to provide opportunities for the public to achieve targeted, high-quality recreation activities and experiences that produce benefits to the public. The northern extent of this segment intersects The New Fork Area of Critical Environmental Concern (ACEC), established for the purpose of protecting unique pothole habitat for wildlife. This segment also includes 7,600 acres of Wildlife Habitat Management Areas (WHMA) owned by the Department (Fall Creek and Soda Lake WHMA) managed to benefit wildlife. Currently there are no active oil and gas leases on federal lands and no mineral extraction activities on any known private lands within this corridor segment.

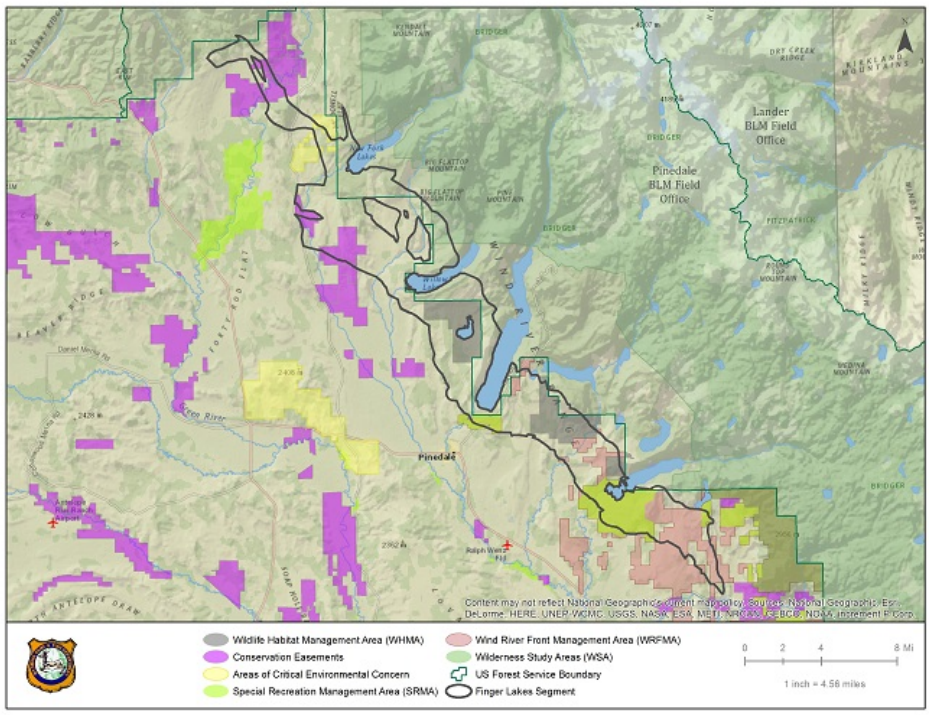

Figure 41. Designated management areas, including conservation easements, in the Finger Lakes Segment.

Proactive Planning:

The Department will work cooperatively with landowners, public land managers, and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve migration corridors. In the Finger Lakes Segment, collaborative efforts are currently being made to modify fences, educate the public, conserve and enhance important habitats, and implement activities to minimize barriers with the overall goal to maintain/improve mule deer migrations. Interagency and NGO collaborative efforts are also continuing in Fremont Lake Bottleneck to insure future

passage of mule deer through that area. Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management.

Assessment Summary:
Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SMA's, SRMA's, ACEC's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners, NGO's, the public, and continuing to collaborate with public land managers to ensure mule deer migration remains unimpeded as much as possible. Maintaining open space through conservation easements on private lands, project-specific management planning on public lands will benefit this Finger Lakes Segment the most. Fence modifications throughout the corridor and managing recreational impacts near the Fremont Lake Bottleneck will provide benefits as well.

MESA/SOAPHOLE SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Dean Clause and Habitat Biologist Jill Randall

Segment Description:
The Mesa/Soaphole Segment extends approximately 36 miles from the southwest end of the Mesa near Wyoming Highway 351 north to the Hoback Rim along U.S. Highway 191 and ending to the west on U.S. Highway 189/191 (Figure 42). The Mesa/Soaphole Segment is broad and patchy with several identified corridors. Mule deer that use the very north end of this migration segment typically use the Finger Lakes and East Fork migration segments to access winter range along the Pinedale Front and Prospect Mountains, while mule deer using the remainder of the Mesa/Soaphole Segment spend the winter west and southwest of the town of Pinedale. This segment is comprised of private and public lands (BLM and OSLI) dominated by either hay meadows or sagebrush habitat, and numerous property boundary and grazing allotment fences exist. One main bottleneck at Trapper's Point is located within this segment, although other constricted routes exist due to developed residential areas. Crossing structures have recently been installed along a 12-mile stretch of Wyoming Highway 191 to reduce big game highway mortalities and human safety. The entire south end of this segment is within and surrounded by mule deer crucial winter habitat where migration ends in the fall and begins in the spring. Highways, gas field and residential development, fences, and a large river system have all influenced the Mesa/Soaphole Segment.

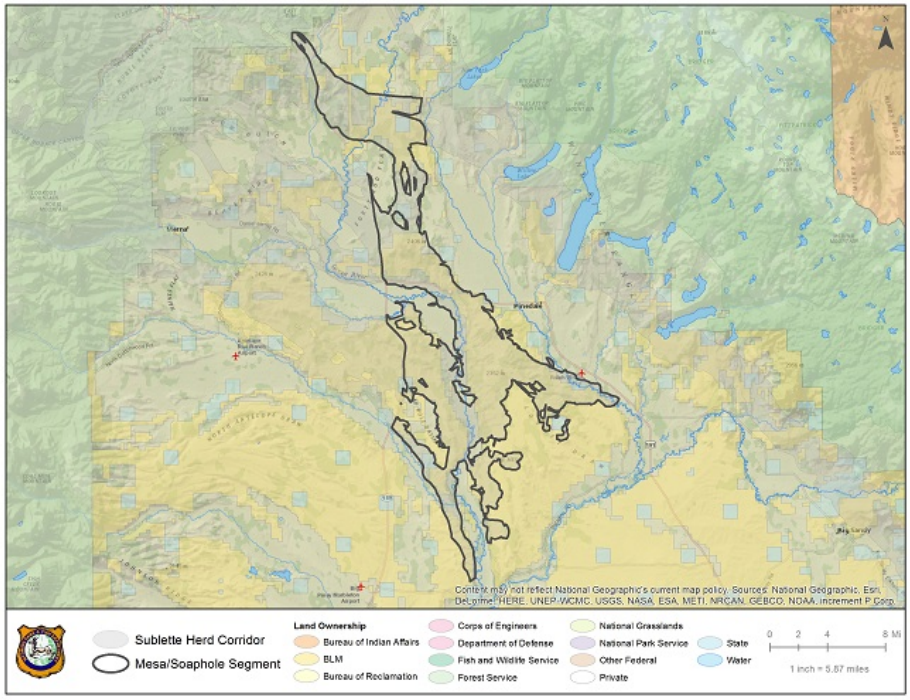

Figure 42. Sublette Mule Deer Migration Corridor Mesa/Soaphole Segment.

GIS Analysis:

Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Mesa/Soaphole Segment.

- **Physical Barriers**

  The Mesa/Soaphole Segment is composed of mixed land ownership with 68% public lands (65% BLM and 3% OSLI) and 32% private land ownership. An 8' tall net wire right-of-way fence along a 12-mile stretch of U.S. Highway 191 was designed and constructed to funnel mule deer and antelope through two overpass and six underpass crossing structures near Trapper's Point. The Trapper's Point Project (TPP) was completed in 2013 and was designed to reduce animal/vehicle collisions for big game benefit and human safety. An estimated 3,700 mule deer and 2,700 antelope use these TPP crossing structures during both the spring and fall migration periods and recent monitoring has reported big game collisions have declined by nearly 90%. A bison ranch located east of Cora Butte along this migration segment has a tall multi-strand electric fence that most likely is a barrier that migrating mule deer currently move around.

  A "Wildlife Friendly Fence Initiative" was funded and implemented in 2006-2007 in an effort to inventory and then modify/re-construct fences that did not meet wildlife friendly fence standards within Sublette County. A more recent fence modification project was funded and implemented on the Mesa (southern portion of this segment). Private and public

fences within the Mesa/Soaphole Segment have been modified in the Forty Rod, Cora Butte, and Mesa areas (Figure 43). Currently efforts are being made to secure funding to continue this fence modification/re-construction work throughout this Sublette Mule Deer Migration Corridor within Sublette County. Wyoming Highway 352 lies between the Finger Lakes segment and this Mesa/Soaphole Segment, and a portion of this highway fence from mile post 8 - 12 is scheduled for modification by WYDOT in 2017. Other identified fence modification projects are located along U.S. Highway 191 in the Forty Rod Flat area north of TTP 8' fence, and near Aspen Ridge (mile post 122 to 128).

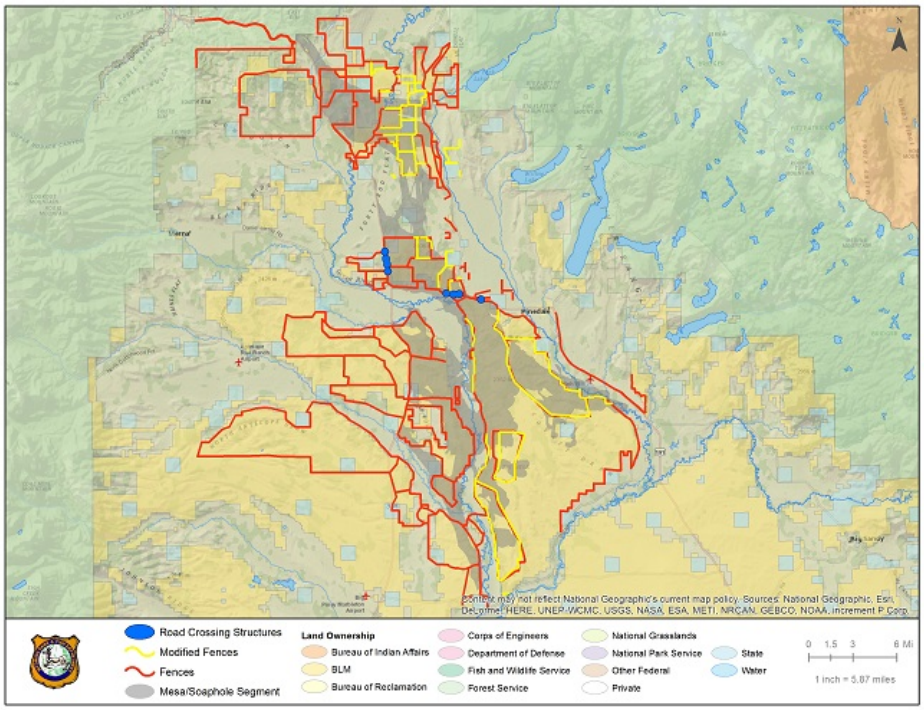

Figure 43. Fences in the Mesa/Soaphole Segment.

Residential subdivisions within this corridor segment appear to function as a semi-permeable barrier having deflected mule deer movements around them. Many residential sub-divisions exist in the northern portion of this migration segment (Figure 44), which include Cora Y (U.S. Highway 191 & Wyoming Highway 352 junction), Calico (between Cora Butte and Wyoming Highway 352), Forty Rod Flat (east of U.S. Highway 191), and Green River Ranches (east of U.S. Highway 191 and the Green River). Any residential development expansion in the vicinity of Forty Rod Flat area will likely impact mule deer (and antelope) migration within this segment.

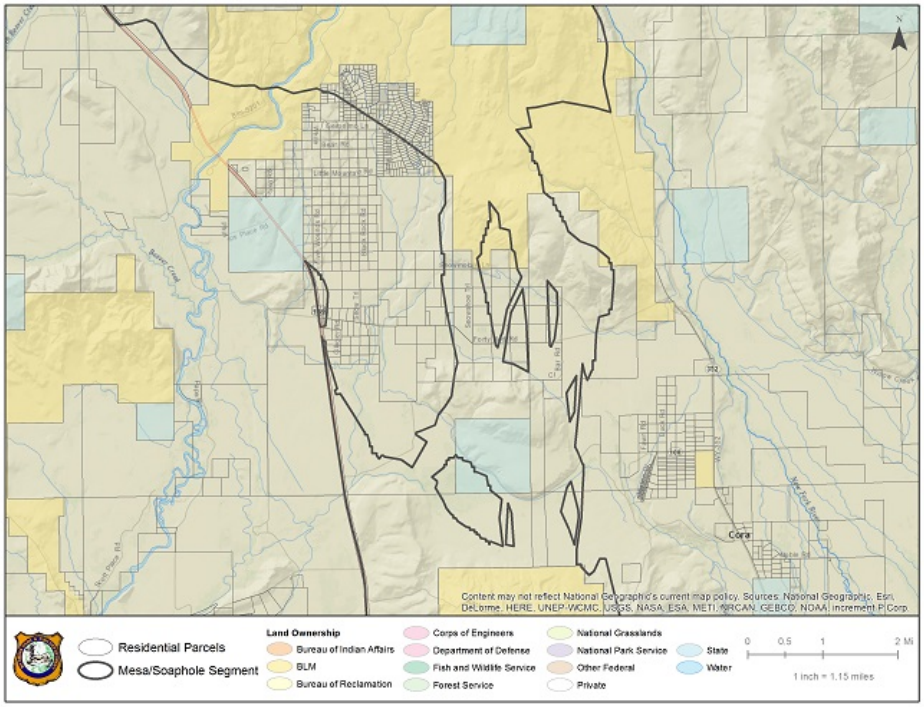

Figure 44. Residential land ownership in the Forty Rod Flat area of the Mesa/Soaphole Segment.

Several improved gravel and county roads traverse through this segment which includes the East Green River Road (CR110), Grindstone Butte Road (CR187), and Forty Rod Road (CR149 - paved). As mentioned earlier, U.S. Highway 191 bisects this migration corridor and big game crossing structures are in place through a 12-mile stretch located west of Pinedale northwest to Forty Rod Flat. Many other important mule deer migration crossings exist along U.S. Highway 189 and between the Mesa/Soaphole and the Ryegrass/Beaver Ridge Segments.

- **Wildlife Use and Habitat Treatments**
  Important mule deer habitats include stopovers and crucial winter range located mainly in the southern portion of this corridor segment (Figure 45). Other Vital wildlife habitats within or near the Mesa/Soaphole Segment include elk, antelope, and moose crucial winter range, antelope migration corridors, and a portion of the Daniel Sage Grouse Core Area (Figure 46). Some suspected antelope migration routes located within this segment overlap with those of mule deer. Nearly the entire segment overlaps other Vital habitats.

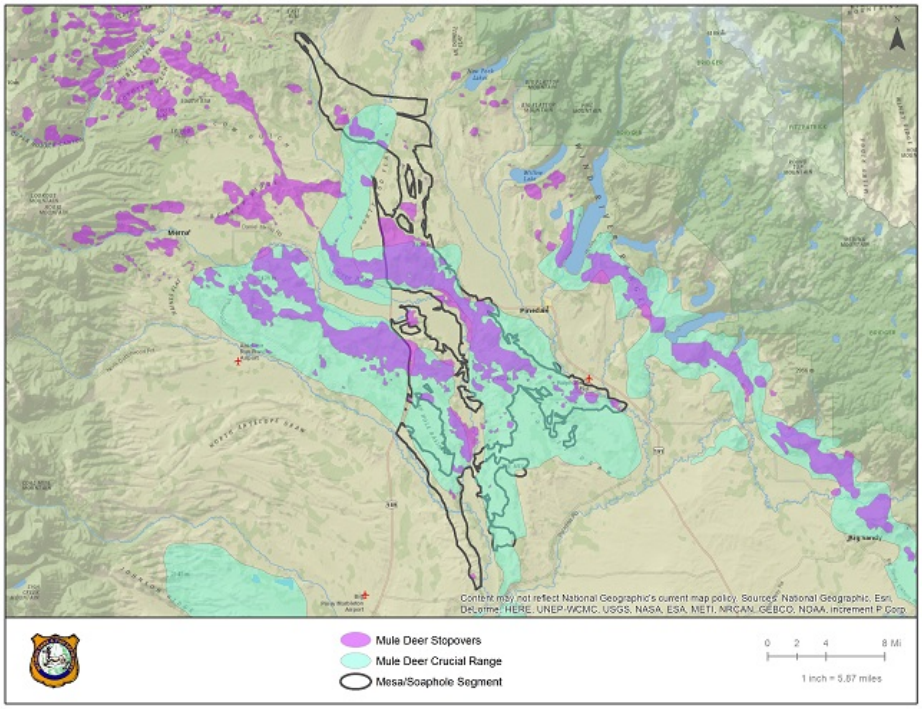

Figure 45. Mule deer crucial range designation, including migration bottlenecks and stopover areas in the Mesa/Soaphole Segment.

This segment is generally typified by Wyoming big sagebrush communities interspersed with wetter micro-sites of mixed-mountain shrubs (serviceberry, chokecherry, and silver leaf buffaloberry). Lack of disturbance over the last several decades in this segment has resulted in these key plant communities for mule deer progressing into late-seral states. These late-seral state communities generally exist in a sub-optimal condition in terms of mule deer forage, as overall productivity of the more palatable species and in younger age classes has diminished significantly. The Department and its federal, state, and private partners are currently undertaking landscape-scale efforts across this segment to curtail plant succession by implementing a diverse array of habitat treatments with a focus on disturbance ecology. Cheatgrass exists in this segment, although it is generally only found on major roadways and in other, easily controlled, isolated locations. However, threats of significant cheatgrass invasion remain, as significant acreage exists in adjacent segments.

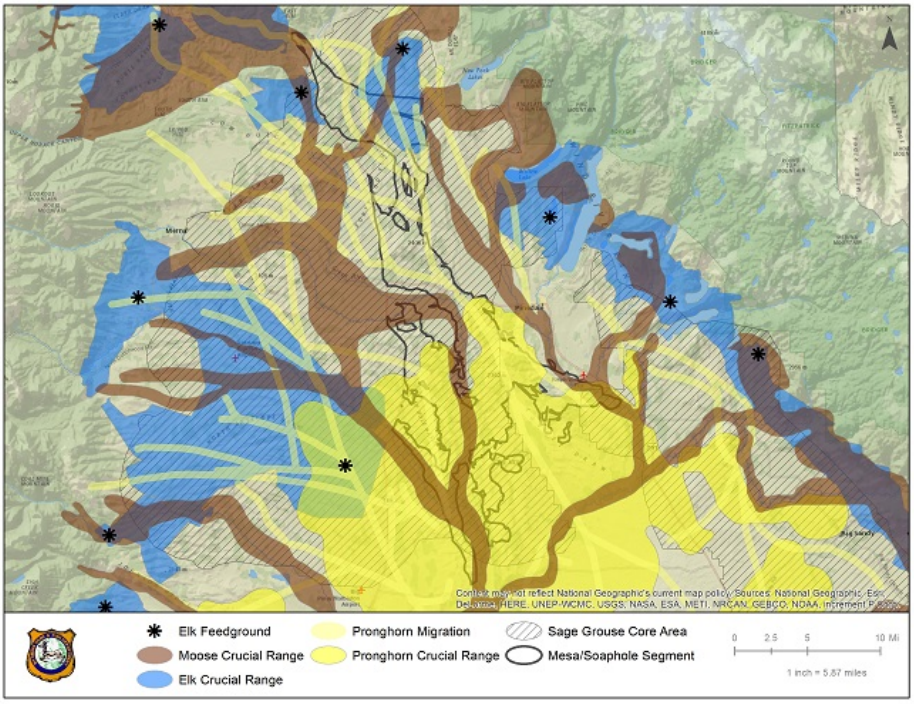

Figure 46. Crucial range designation for antelope, elk, moose, and sage grouse core habitat in the Mesa/Soaphole Segment. Also depicted are suspected antelope migration routes generated by GPS-collared animals.

- **Land Use:**
  This 36- mile segment crosses a mix of landownership of private, BLM, and OSLI lands. About one-third of this segment is private land with mixed uses for agricultural purposes, such as hay production and livestock grazing, and residential property. The majority of this private land is located along the Green River, and in the uplands of the Forty Rod Flat area. The potential for working ranches to be subdivided, developed, or fenced into multiple smaller parcels presents a long-term risk to portions of the migration segment.

  Roughly two-thirds of the lands within this segment are public, managed mainly by the BLM. These public lands are managed under multiple use directives. The southern portion of this Mesa/Soaphole Segment overlaps the Pinedale Anticline Project Area (PAPA) gas field (Figure 47). In 2000 the first PAPA Environmental Impact Statement (EIS) Record of Decision (ROD) was completed followed by another ROD on the PAPA Supplemental EIS in 2008. The result of these decision documents allowed for year round gas drilling and production activities in a phased manner with several geographic areas within the PAPA boundary. To date, this gas development may influence, but does not appear to impede migration (Sawyer et al. 2013). Studies have concluded mule deer avoid habitats within and near gas developments resulting in lower overall mule deer numbers using this portion of the mule deer winter range (Sawyer et al. 2006, 2009, 2017).

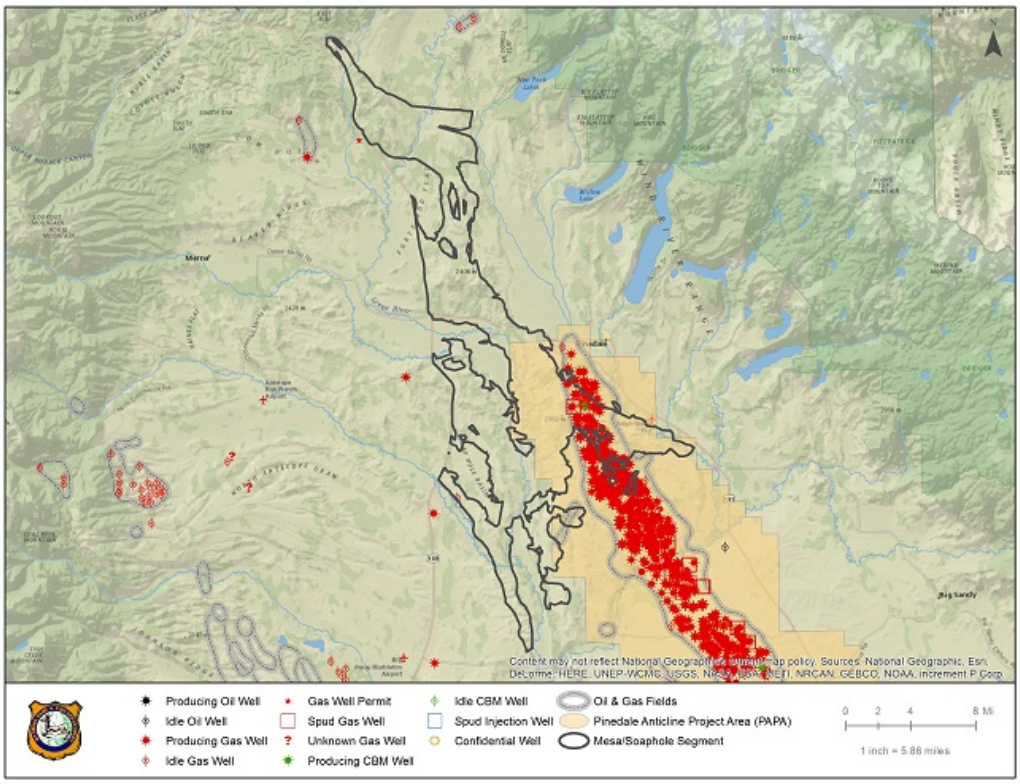

Figure 47. Mineral development in the Mesa/Soaphole Segment.

Two designated Special Management Areas are located within this migration segment (Figure 48). A portion of the Green and New Fork Rivers Special Recreation Management Area (SRMA) designated lands lie within this segment along the Green River upstream from Warren Bridge at U.S. Highway 191. The overall management goal for SRMA's is to provide substantial personal, community, economic, and environmental benefits to local residents and visitors through recreational uses of the public lands. The Trapper's Point ACEC (9,540 acres) is located around the Trapper's Point Bottleneck, and has a goal to preserve the viability of big game migration through the bottleneck, as well as preserving cultural/ historic resources, and important livestock trailing uses. This ACEC prohibits surface disturbing activities, land disposal, additional fencing, oil and gas leasing, and Off-Highway Vehicle (OHV) use from November 15 – April 30. Less than 10% of the private lands have a conservation easement in place restricting future development/fragmentation. The larger conservation easements are located along the Green River west of the Mesa within this segment (Figure 48).

The Sublette County Comprehensive Plan has a County Policy specific to migration corridors which states; "Consider migration corridors, crucial winter ranges, and other important habitats when evaluating land use proposals. In some cases, the migration corridors that link summer and winter ranges are already tightly constricted. These areas are recognized as being very sensitive and their integrity should be protected. There are many tools available, beyond County zoning regulation, to shelter the function of

important wildlife areas." Recognition in such a plan is evidence of the value local residents place on migratory ungulates.

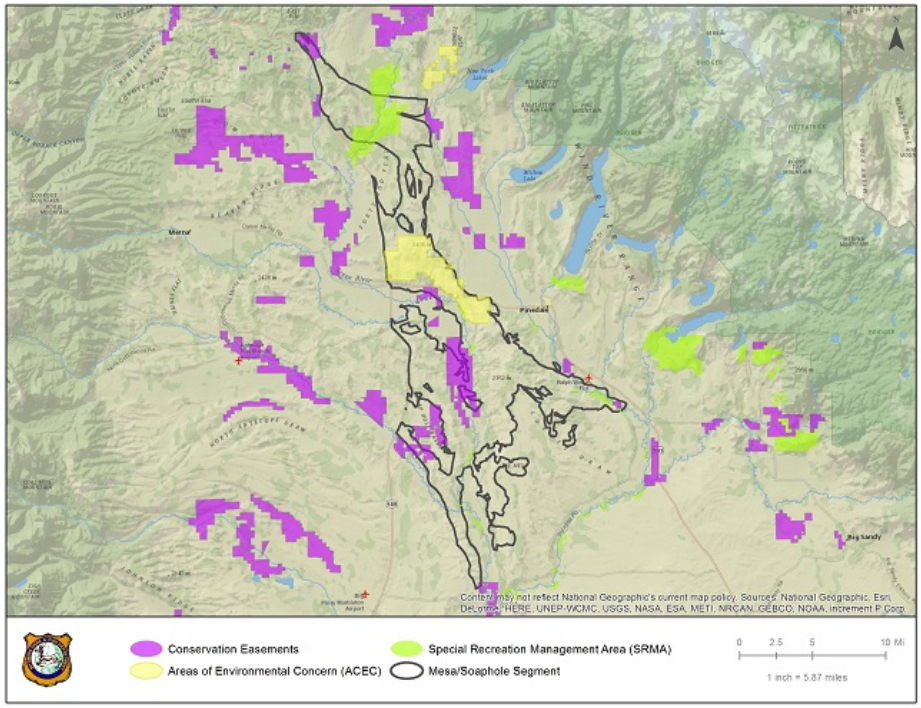

Figure 48. Designated management areas, including conservation easements, in the Mesa/Soaphole Segment.

Proactive Planning:

The Department will work cooperatively with landowners, public land managers, and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve migration corridors. In the Mesa/Soaphole Segment, collaborative efforts are being taken to modify fences, educate the public, conserve and enhance important habitats, and implement activities to minimize barriers for the overall goal to maintain/improve the ability for mule deer migration. Interagency and NGO collaborative efforts are also continuing at the Trapper's Point bottleneck to insure future passage of mule deer and antelope through that area. Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management. Oil and gas industry efforts to minimize disturbance include directional/multi-pad drilling and concentrated liquid gathering systems, and should be recognized.

Assessment Summary:

Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, SRMA's, ACEC's). Managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners, NGO's, the public, and continuing to collaborate with Sublette County officials, public land managers and energy development companies to ensure mule deer migration remains unimpeded as much as possible. Maintaining open space through conservation easements on private lands, and project-specific management planning on public lands will benefit the Mesa/Soaphole Segment. Fence modifications throughout the corridor will continue to provide benefits as well.

RYEGRASS/BEAVER RIDGE SEGMENT

Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Gary Fralick and Habitat Biologist Phil Damm

Segment Description:
The Ryegrass Beaver Ridge Segment extends approximately 20 miles from U.S. Highway 189/191 west by northwest to the BTNF Boundary (Figure 49). Within this segment mule deer from the Sublette and Wyoming Range mule deer herds combine on their migration to summer ranges in the Hoback Basin, Greys River and Salt River watersheds. This segment has the potential for substantial land use changes as 54% is in private ownership. Hence potential changes in fence designs, subdivision development and changes in agricultural operations could jeopardize unrestricted mule deer movement to and from seasonal ranges. Habitat treatments over the last 10 years have targeted dead and decadent sagebrush communities. These treatments and others in the future are an integral component in assuring and perpetuating healthy plant communities within this segment.

GIS Analysis:
Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Ryegrass/Beaver Ridge Segment.

- **Physical Barriers**
  This segment falls primarily on privately owned lands, BLM, and State of Wyoming owned lands. Private property encompasses approximately 63,200 acres or 54%, BLM manages approximately 46,400 acres or 39% and the State of Wyoming owns 7800 acres or 7%. Mule deer spend approximately 90% of their annual migration traveling through and stopping over on the mixed private/BLM lands. Mule deer must navigate an array of allotment boundary fences on BLM and private lands as well as Sublette County and WYDOT Right-of-Way fences along county and state roads. The segment crosses U.S. Highway 189 south of Daniel as well as Wyoming Highway 354 northwest of Daniel. Both roadways are bounded by right-of-way fences. Allotment fences on BLM-managed lands are wildlife friendly type and adhere to BLM fence standards.

Department personnel are actively working with WYDOT, Sublette County Planning and Zoning and private landowners to coordinate and communicate the importance of constructing wildlife friendly fencing in any highway project, livestock grazing pasture, or subdivision development plans.

Mule deer-vehicle collisions are common along U.S. Highway 189 because of the volume and speed of traffic during the spring and fall migration periods. Department personnel have placed portable dynamic flashing signs along specific stretches of this highway to alert motorists of mule deer on or along the highway right-of-way.

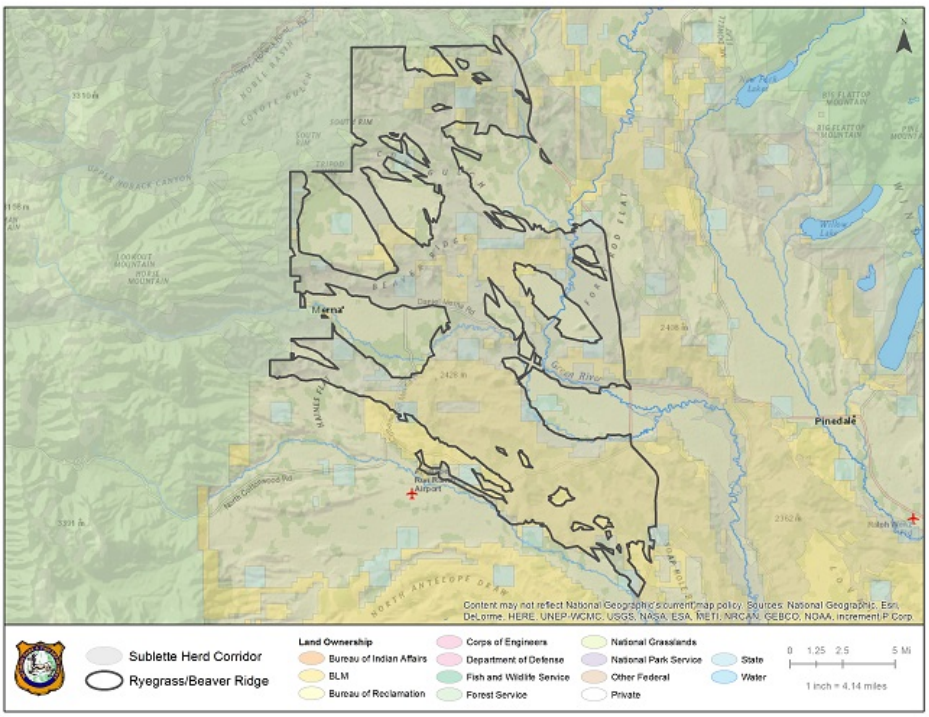

Figure 49. Sublette Mule Deer Migration Corridor Ryegrass/Beaver Ridge Segment.

- **Wildlife Use and Habitat Treatments**
  This segment contains substantial areas of mule deer crucial winter range, as well as numerous important stopover areas (Figure 50). Other Vital habitats include moose and elk crucial ranges (Figure 51). Habitat treatments targeting sagebrush have been implemented and much of the segment is sage-grouse core habitat, as well as brood rearing, and winter habitat. There are numerous active sage-grouse leks located in this segment. The majority of this segment overlaps other Vital habitats.

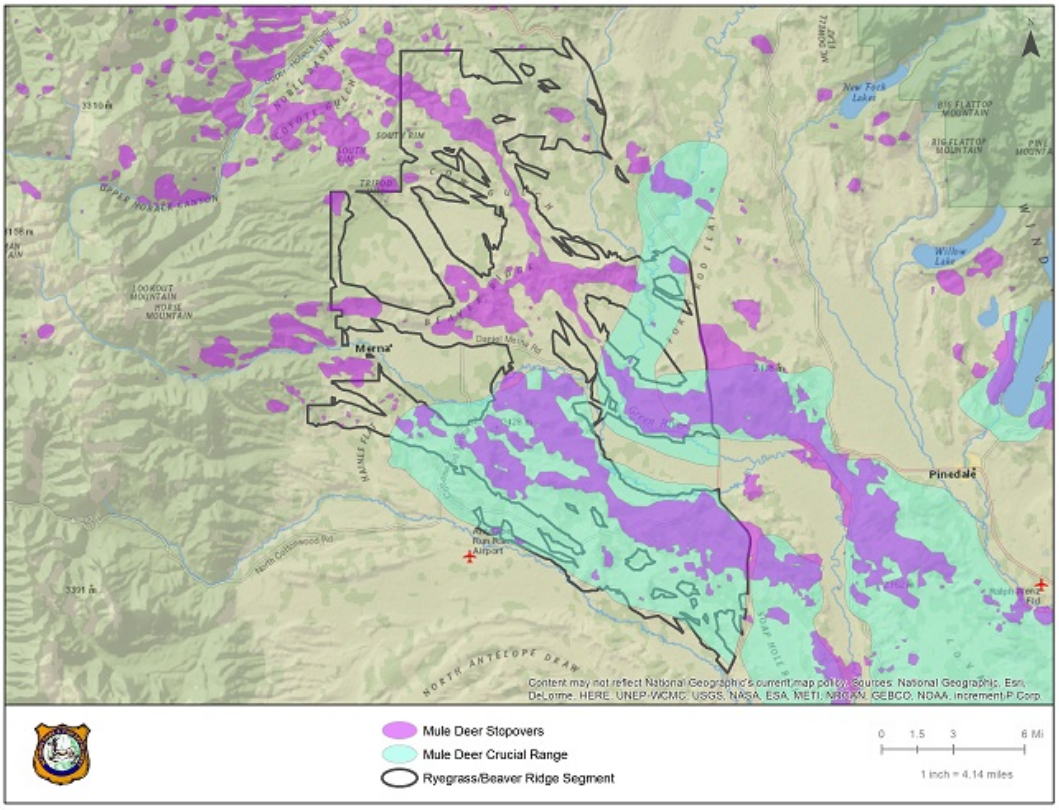

Figure 50. Mule deer crucial range designation and stopover areas in the Ryegrass/Beaver Ridge Segment.

The bulk of this segment is typified by Wyoming and mountain big sagebrush communities interspersed with areas of antelope bitterbrush and mixed-mountain shrubs (serviceberry and chokecherry). The western end of the segment contains larger areas of forested community types, particularly aspen stands, in more traditional spring-summer-fall habitats for mule deer. Lack of disturbance over the last several decades in this segment has resulted in these key plant communities for mule deer progressing into late-seral states. These late-seral state communities generally exist in a sub-optimal condition in terms of mule deer forage, as overall productivity of the more palatable species and younger age classes are reduced. The Department and its federal, state, and private partners are currently undertaking landscape-scale efforts across this segment to curtail these effects of plant succession by implementing a diverse array of habitat treatments with a focus on disturbance ecology. Cheatgrass exists in this segment, although it is generally only found along major roadways and in other, easily controlled, isolated locations. However, threats of significant cheatgrass invasion remain, as significant communities exist in adjacent segments of the migration corridor.

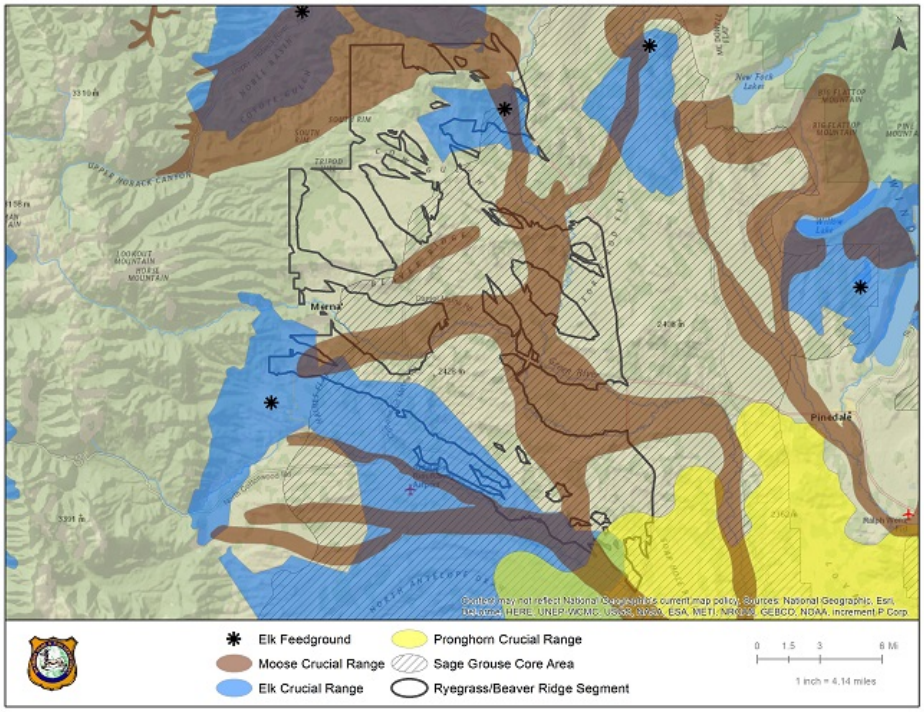

Figure 51. Crucial range designation for elk, moose, pronghorn, and sage grouse core areas in the Ryegrass/Beaver Ridge Segment.

- **Land Use:**
  This segment crosses a mix of private and BLM lands. The majority of private lands are used for agricultural purposes, such as hay production and livestock grazing. The potential for working ranches to be subdivided, developed, or fenced into multiple smaller parcels remain long-term risks to portions of this segment.

  Federal lands in this segment are administered by the BLM, Pinedale Field Office. Guidance for management of the BLM lands is provided in the Pinedale RMP. The mineral extraction and fossil fuels extraction potential is governed, in part, by the amount of acres suitable for oil and gas leasing. In this segment approximately 4,138 acres of BLM managed lands are leased. A total of 33,321 acres are designated No Surface Occupancy (NSO) (Figure 52). Currently there are no ACECs or SMAs identified by the BLM in this migration segment. Approximately 19,000 acres of private land are protected by Conservation Easements (Figure 53).

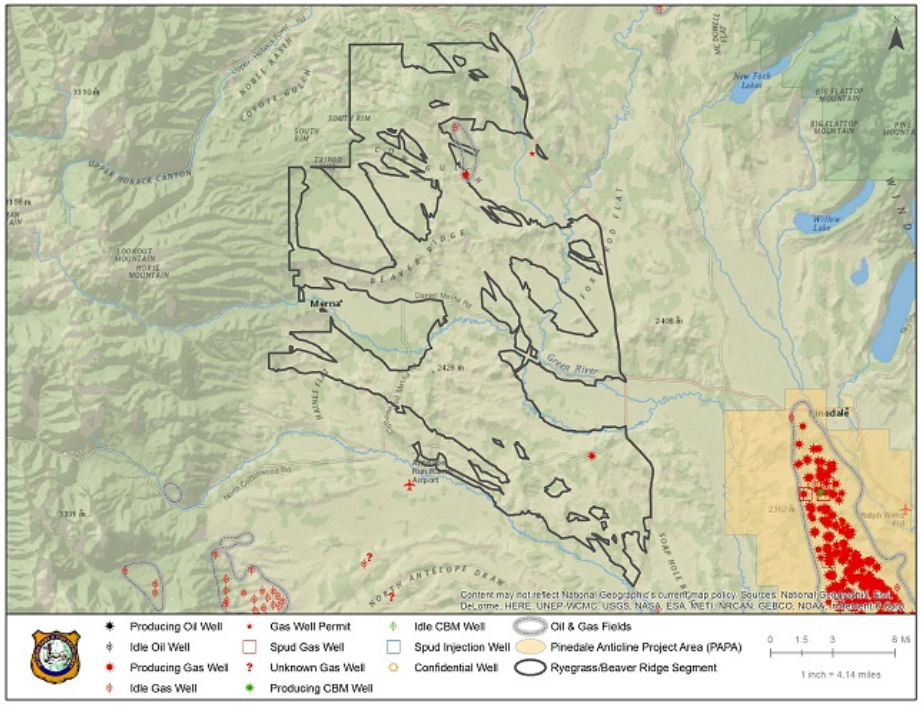

Figure 52. Mineral development in the Ryegrass/Beaver Ridge Segment.

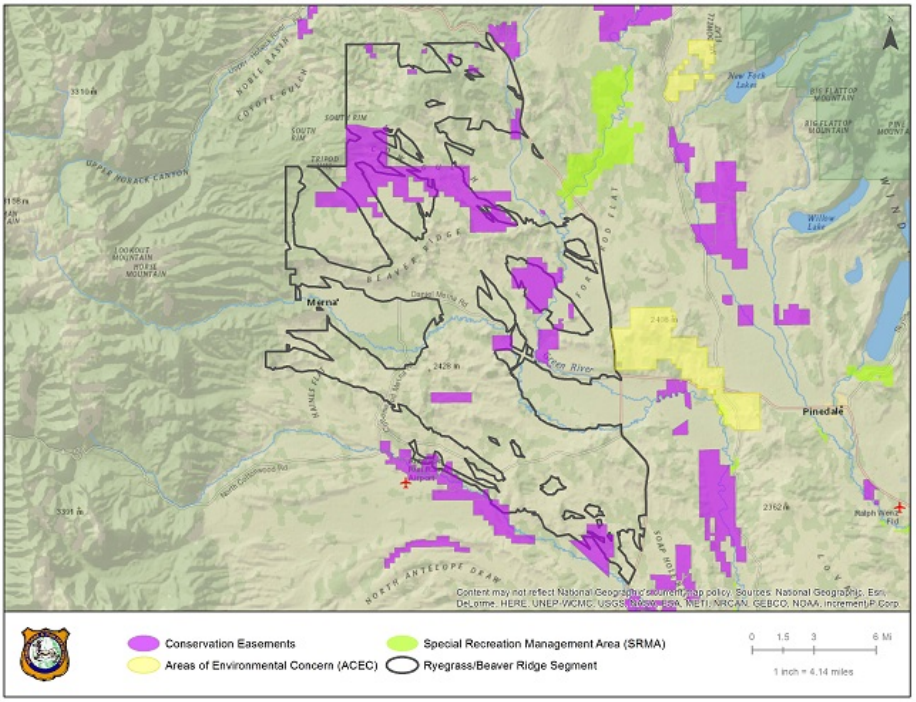

Figure 53. Designated management areas, including conservation easements, in the Ryegrass/Beaver Ridge Segment.

Proactive Planning:
The Department will work cooperatively with federal land managers and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve this migration segment.

In this segment, collaboration between federal and state agency personnel and private landowners have resulted in the implementation of aspen and sagebrush treatments to enhance mule deer fawning habitat. Interagency efforts are also continuing in the upper Beaver Creeks to identify potential fence modifications where allotment fences may not be meeting wildlife friendly standards. Field managers will also continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management.

Assessment Summary:
Substantial protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, conservation easements). Field managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners and continuing to collaborate with BLM on project-specific land use decisions. The current risks in this segment includes identifying fences that have the potential to impede mule deer movements, rejuvenating dead/decadent aspen stands and mountain shrub communities, minimizing mule deer and vehicle collisions, promoting additional conservation easements, ensuring any wildlife stipulations are adequately addressed in land use decisions, and managing motorized use on crucial winter ranges, parturition areas, and stopover areas.

BRIDGER-TETON SUMMER SEGMENT
Wyoming Game and Fish Department Pinedale Region
Wildlife Biologist Gary Fralick and Habitat Biologist Jill Randall

Segment Description:
The Bridger-Teton Summer Segment extends approximately 30 miles from the BTNF Boundary near the Hoback Rim and hydrographic divide between the Green River and Greys River, northward to the confluence of the Snake River and Hoback River south of Jackson (Figure 54). This segment is essentially the only portion of the corridor that is comprised of primarily National Forest System Lands. The Bridger-Teton Summer Segment is quite broad and sinuous, and represents summer range for many migratory deer, while others continue to migrate to more distant summer ranges. Although almost entirely National Forest System lands, there are private lands associated with the riparian corridors of the Hoback Basin. This segment receives a high amount of outdoor recreational use and travel.

GIS Analysis:
Available data layers identified in Figure 2 have been analyzed to determine existing and potential threats, existing protections, and opportunities for conservation actions. The following issues have been identified for the Bridger-Teton Summer Segment.

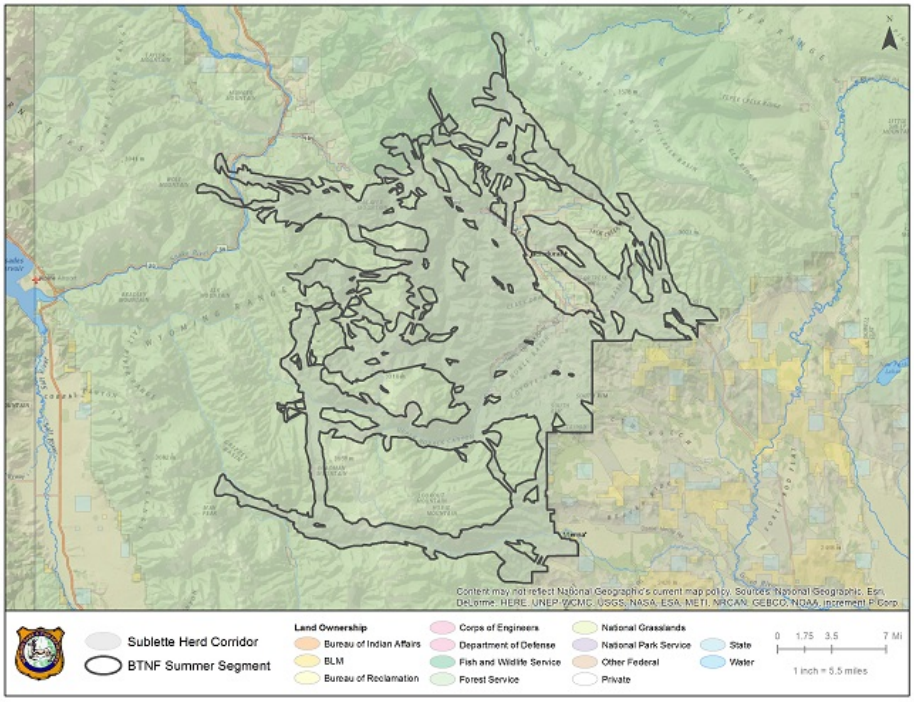

Figure 54. Sublette Mule Deer Migration Corridor Bridger-Teton Summer Segment.

- **Physical Barriers**
  This segment falls primarily on BTNF and private lands. Mule deer cross private land fences near the Upper Hoback and Bondurant as well as BTNF grazing allotment fences. Currently there are allotment fences across the migration corridor in the Noble Basin area, Clark Draw, Monument Ridge, and the Cliff Creek and Kilgore Creek tributaries of the Hoback River. The segment of the corridor crosses US 189/191, which has right-of-way fencing on both sides. Mule deer are exposed to substantial mortality from vehicle collisions along U.S. Highway 189/191 from Daniel to Bondurant during the fall and spring migration periods. The Upper Hoback Road is unpaved and has a lower volume of traffic, thereby minimizing mule deer-vehicle collisions.

  Bison proof fences in the Upper Hoback impede mule deer movements requiring mule deer to navigate around, or through the fenced portion of the property if gates are opened prior to migration (Figure 55). With some lands already fenced for bison, the potential exists for additional lands to be converted from traditional cattle operations to bison or other class of stock that may require fences that would further restrict mule deer movements.

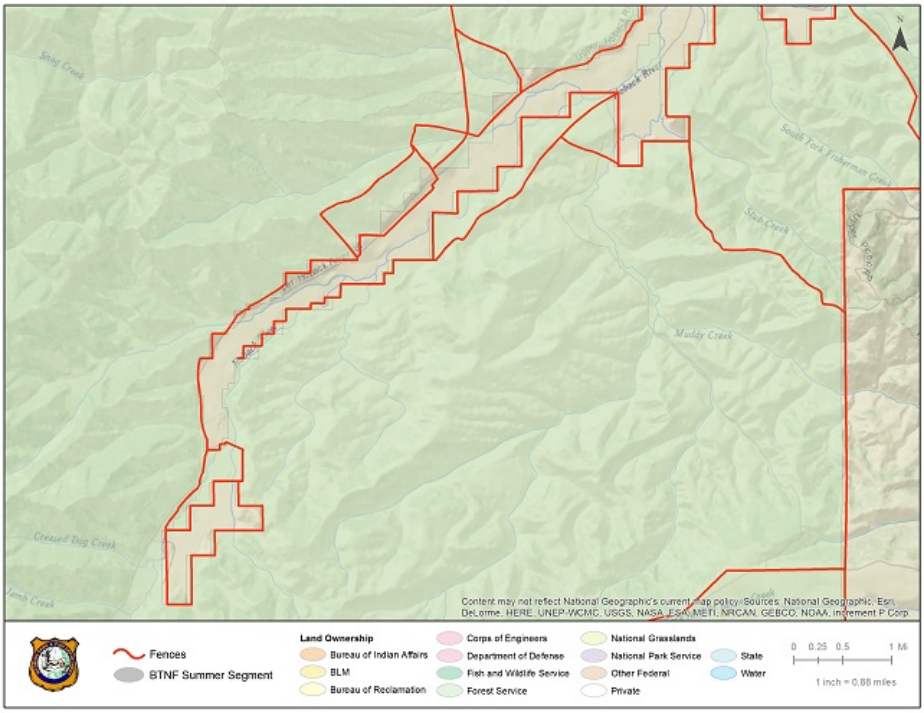

Figure 55. Location of fences on private and USFS managed lands in the Upper Hoback area of the Bridger-Teton Summer Segment.

While the Snake River may appear to be a barrier, especially in the spring, mule deer readily cross. The entire Snake River from Bailey Creek on the south to Horse Creek on the north is an active mule deer river crossing area. There is a well-known Snake River crossing point at Astoria. The potential for migrating mule deer to be struck by vehicles appears to be greatest during the spring migration when mule deer are actively moving towards summer ranges. The Astoria section is private property and therefore subject to the potential for expansion of subdivision development. Although not within the mapped migration corridor, the section of U.S. Highway 26/189/191 north of Hoback Junction will be reconstructed. A wildlife proof fence will be constructed along its entirety from Hoback Junction to South Park, and wildlife crossing structures will be configured to facilitate daily and seasonal mule deer movements beneath the road surface. Department personnel have been actively involved with WYDOT during development of this project.

- **Wildlife Use and Habitat Treatments**
  This segment does not contain substantial areas of mule deer crucial winter range, but encompasses numerous important stopover areas (Figure 56). This segment of the corridor also overlaps moose and elk crucial ranges (Figure 57), and encompasses the McNeel and Dell Creek elk feedgrounds. Habitat treatments focused on treatment of dead and decadent sagebrush communities, and future treatments will target conifer encroached and decadent aspen communities in the Noble Basin area. Although sage grouse occur in the Hoback Basin, the Bridger-Teton Summer Segment is outside of designated sage grouse core habitat.

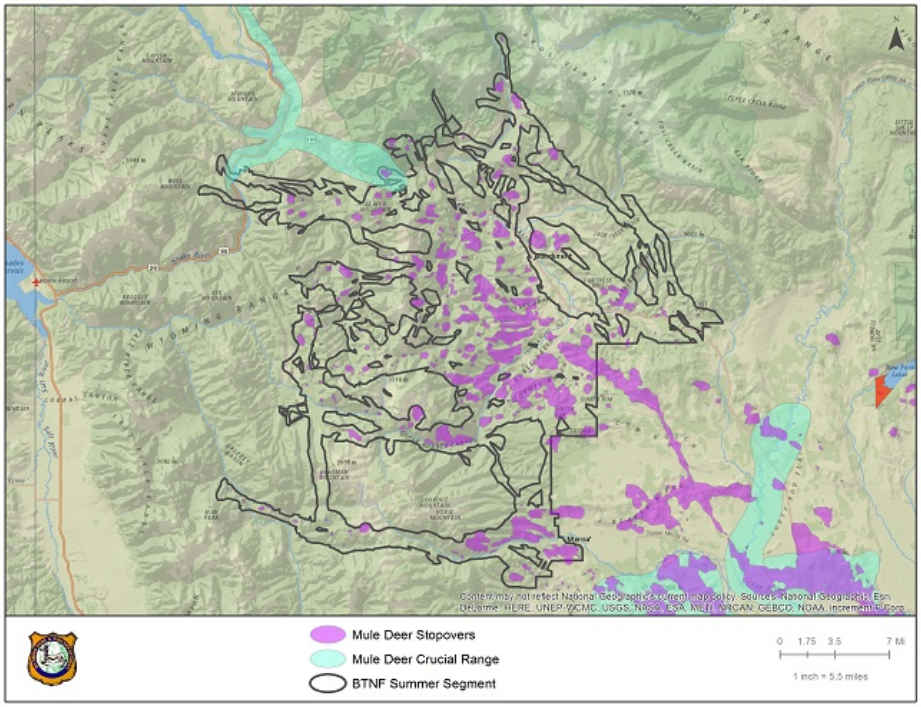

Figure 56. Mule deer crucial range designation and stopover areas in the Bridger-Teton Summer Segment.

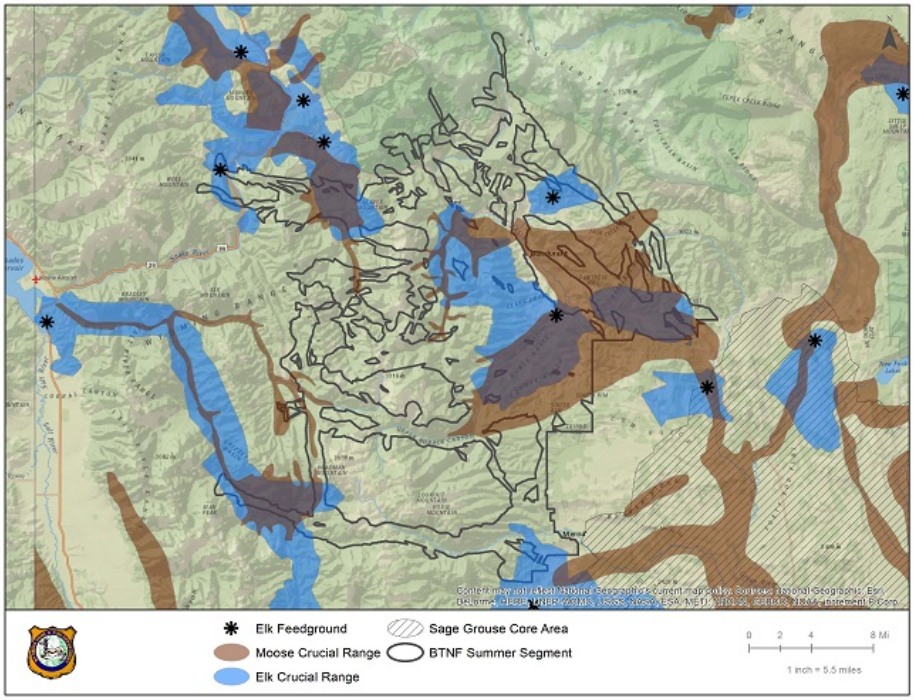

Figure 57. Crucial range designation for elk, moose, and sage grouse core habitat in the Bridger-Teton Summer Segment.

A substantial portion of the segment is designated crucial moose and elk winter range in addition to parturition areas for elk. Much of this segment is higher elevation with diverse habitats including mountain big sagebrush, mixed conifers, aspen, and riparian communities. Mule deer use this segment during the summer season and habitat treatments and vegetation disturbance opportunities are a high priority. Managers want to maximize nutritional gains in high quality habitat prior to entering winter season and while does are fawning/lactating in early summer. Treatments should improve age class diversity of shrubs, increase recruitment of aspen suckers and improve forb understory for forage value. Tall forb communities are also present in the western half of the segment. These communities are very important foraging areas for mule deer and historic management has resulted in vegetation that is below forage/habitat potential value for mule deer. The potential for wildfires remains high for much of this segment. In 2016, the Cliff Creek Wildfire burned a portion of this segment. These disturbances can greatly benefit mule deer as long as post-fire management maximizes vegetation restoration. Additional prescribed fires and vegetation enhancements in the Upper Hoback, Monument Ridge and Fisherman Creek areas could enhance aspen and shrub communities. Previous treatments include the Monument Ridge sagebrush prescribed burns in 2006 and 2010.

- **Land Use:**
  This 37-mile segment crosses a mix of private and USFS lands. The majority of private lands are used for agricultural purposes, such as hay production and livestock grazing. The potential for working ranches to be subdivided, developed, or fenced into multiple smaller parcels presents a long-term risk to portions of the corridor. Currently there are three conservations easements that encompass 4,000 acres (Figure 58).

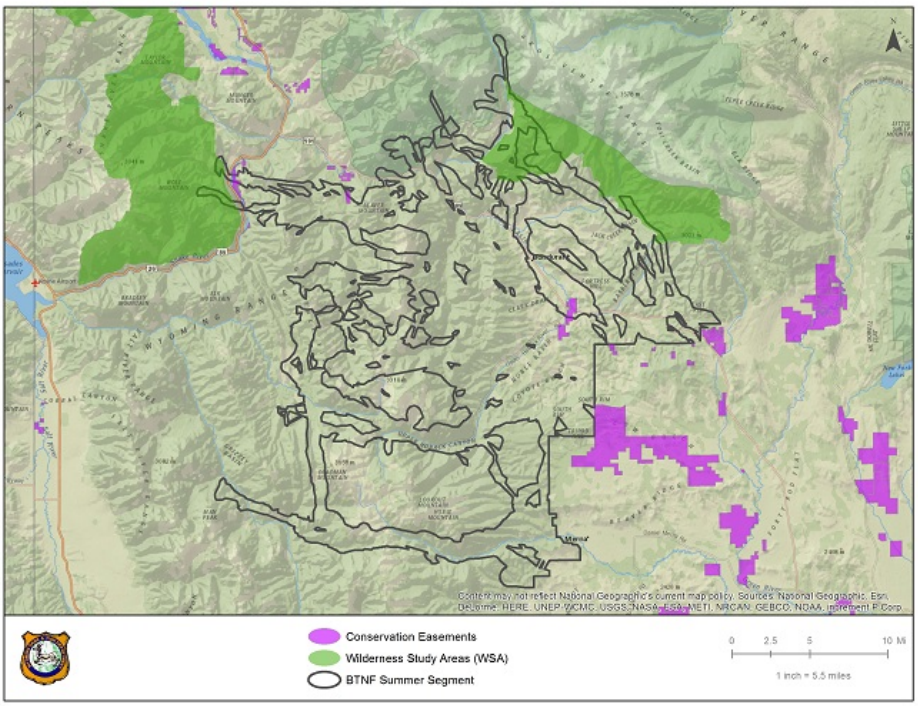

Figure 58. Designated management areas, including conservation easements, in the Bridger-Teton Summer Segment.

The USFS lands in this segment are administered by the BTNF. Guidance for management of the USFS lands is provided in the BTNF Land Use Management Plan (LUMP). The segment is designated Desired Future Conditions 1B, 10, and 12 in the BTNF LUMP.

In 2009 the Wyoming Range Legacy Act was enacted by Congress and resulted in the withdrawal of 1.2 million acres of lands managed by the BTNF from future oil and gas leasing. In 2013, the Trust For Public Land (TPL) purchased the leases from Plains Exploration and Production that retired 58,000 acres from future leasing in the Noble Basin area. In 2017, the Forest Service retired the remaining 40,000 acres of active oil and gas leases that were located on BTNF lands in the Hoback Basin and southward along the east slope of the Wyoming Range to South Piney Creek. The potential for future oil and gas leasing on the Bridger-Teton Summer Segment is low.

Proactive Planning:

The Department will work cooperatively with Federal Land Managers and stakeholders to identify related research and proactive conservation actions (e.g., conservation easements; fence modifications; habitat improvement projects) to conserve migration corridors.

In the Bridger-Teton Summer Segment, collaborative aspen treatments in the Upper Hoback Basin are being considered to enhance mule deer fawning habitat. Interagency efforts are also

continuing in the Upper Fisherman Creek to identify potential fence modifications and wildlife friendly fences will be built in areas of the 2016 Cliff Creek fire where allotment fences were recently destroyed. Field managers will continue to work with private landowners by providing expertise and identifying funding sources that may be available to assist landowners with land use decisions, livestock management and habitat management.

Assessment Summary:

Some protections currently exist in this segment that minimize potential threats to migration (overlap with other Vital habitats, WSA's, conservation easements). Field managers believe the risks mule deer face in this segment can be addressed through maintaining relationships with private landowners and continuing to collaborate with BTNF on project-specific land use management decisions. The current risks in this segment includes identifying fences that have the potential to impede mule deer movements, rejuvenating dead/decadent aspen stands and mountain shrub communities, minimizing mule deer and vehicle collisions, promoting additional conservation easements and managing motorized use on crucial winter ranges, parturition areas, and stopover areas.

Literature Cited

Aikens, E.O., M.J. Kauffman, J.A. Merkle, S.P.H. Dwinnell, G.L. Fralick, and K.L. Monteith. 2017. The greenscape shapes surfing of resource waves in a large migratory herbivore. Ecology Letters 20:741-750.

Cook, J.G., B.K. Johnson, R.C. Cook, R.A. Riggs, T. Delcurto, L.D. Bryant, and L.L. Irwin. 2004. Effects of summer-autumn nutrition and parturition date on reproduction and survival of elk. Wildlife Monographs 155:1-61.

Fryxell, J.M., J. Greever, and A.R.E. Sinclair. 1988. Why are migratory ungulates so abundant? American Naturalist 131:781-798.

Fryxell, J.M. and A.R.E. Sinclair. 1988. Causes and consequences of migration by large herbivores. Trends in Ecology & Evolution 3:237-241.

Horne, J. S., E. O. Garton, S. M. Krone, and J. S. Lewis. 2007. Analyzing animal movements using Brownian Bridges. Ecology 88:2354-2363.

Johnson, H.E., J.R. Sushinsky, A. Holland, E.J. Bergman, T. Balzer, J. Garner, and S.E. Reed. 2017. Increases in residential and energy development are associated with reductions in recruitment for a large ungulate. Global Change Biology 23:578-591.

Lendrum, P.E., C.R. Anderson, K.L. Monteith, J.A. Jenks, and R.T. Bowyer. 2013. Migrating mule deer: effects of anthropogenically altered landscapes. PLoS ONE 8(5):e64548. Doi:10.1371/journal.pone.0064548.

Parker, K.L., P.S. Barboza, and M.P. Gillingham. 2009. Nutrition integrates environmental responses of ungulates. Functional Ecology 23:57-69.

Sawyer, H., N.M. Korfanta, R.M. Nielson, K.L. Monteith, and D. Strickland. 2017. Mule deer and energy development-ling-term trends of habituation and abundance. Global Change Biology 1-9.

Sawyer, H., A.D. Middleton, M.M. Hayes, M.J. Kauffman, and K.L. Monteith. 2016. The extra mile: ungulate migration distance alters the use of seasonal range and exposure to anthropogenic risk. Ecosphere 7(10):1-11.

Sawyer, H. 2014. Seasonal distribution and habitat use patterns of mule deer in the Red Desert and Jack Morrow Hills Planning Area Final Report. Western Ecosystems Technology, Inc. Cheyenne, Wyoming.

Sawyer, H., M. Hayes, B. Rudd, and M.J. Kaufmann. 2014. The Red Desert to Hoback Mule Deer Migration Assessment. University of Wyoming, Laramie, Wyoming, USA.

Sawyer, H., M.J. Kauffman, A.D. Middleton, T.A. Morrison, R.M. Nielson, and T.B. Wyckoff. 2013. A framework for understanding semi-permeable barrier effects on migratory ungulates. Journal of Applied Ecology 50:68-78.

Sawyer, H. and M.J. Kauffman. 2011. Stopover ecology of a migratory ungulate. Journal of Animal Ecology 80:1078-1087.

Sawyer, H., M. Kauffman, and R.M. Nielson. 2009. Influence of well pad activity on winter habitat selection patterns of mule deer. Journal of Wildlife Management 73:1052-1061.

Sawyer, H., R.M. Nielson, F. Lindzey, and L.L. McDonald. 2006. Winter habitat selection of mule deer before and during development of a natural gas field. Journal of Wildlife Management, 70:396-403.

Sawyer, H., F. Lindzey, and D. McWhirter. 2005. Mule deer and pronghorn migration in western Wyoming. Wildlife Society Bulletin 33:1266-1273.