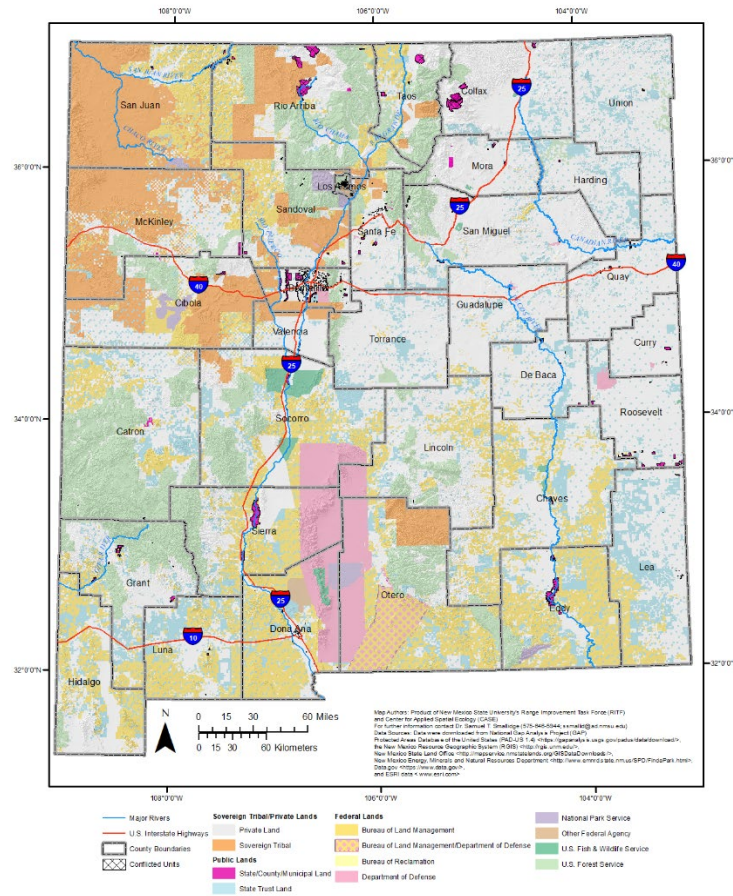


A report to the New Mexico Livestock Board:

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Spatial examination of New Mexico public lands as applied to the New Mexico Wild Horse Act (NMSA 77-18-5).

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Executive Summary

- 1) **Implementation of the New Mexico wild horse statute (NMSA 77-18-5, 2007) has been controversial, due in part, to confusion over how New Mexico wild horses are defined in context to New Mexico public lands.**
- 2) **New Mexico public lands are owned and managed by the state and have specific purposes.**
- 3) **Three maps identify and examine spatial information relative to New Mexico public lands. Of 921 sites identified as New Mexico public lands, 14 sites were identified with no potential conflicts in implementation of the New Mexico wild horse statute. The majority of sites representing possible conflicts were due to small size or juxtaposition to human population centers representing human health and safety concerns. Maps are available online at: <https://aces.nmsu.edu/programs/ritf/free-ranging-horses.html>**
- 4) **Also contributing to uncertainty is poor understanding of what constitutes range able to support a New Mexico wild horse herd.**
- 5) **Public lands and associated habitats on which New Mexico wild horses occur represent temporally and spatially varying ecological carrying capacities.**
- 6) **Carrying capacities were estimated to provide a broad understanding of ecologically sustainable numbers of New Mexico wild horses.**
- 7) **A horse band was defined as two horses requiring an estimated 70 to 176 acres and 44 to 110 acres at 25% and 40% ecologically sustainable grazing use levels, respectively.**
- 8) **Site-specific assessment of habitat attributes is recommended for reliable estimates of wild horse carrying capacities where they occur.**
- 9) **State land management agencies provided information (Maps 2a and 2b) on opportunities and challenges related to identified New Mexico public lands in context to implementation of the New Mexico wild horse statute.**
- 10) **The New Mexico State Legislature, New Mexico Governor's office and state agencies may consider prioritizing the purposes of New Mexico's public lands in relation to implementation of the New Mexico wild horse statute. Ultimately, the New Mexico State Legislature has the authority to capitalize on opportunities and address challenges to implementation of the New Mexico wild horse statute (NMSA 77-18-5, 2007).**
- 11) **Outcomes provide a platform for further discussions and examination of potential opportunities and conflicts for implementation of the New Mexico wild horse statute (NMSA 77-18-5, 2007).**

Introduction

There are three types of free-ranging horses in New Mexico: 1) federally defined wild horses, 2) state-defined wild horses, and 3) feral horses. Management of wild horses has become increasingly controversial and complicated with legislation, legal action, and public opinion playing a role in management outcomes. The New Mexico wild horse statute (NMSA 77-18-5, 2007) defines certain free-ranging horses as New Mexico wild horses (NMWH) and determines their disposition under specific criteria. Differing interpretation of statute language, legal action, public opinion and political processes contribute to uncertainty and controversy surrounding management of NMWH and NM agencies' ability to implement the statute.

The New Mexico wild horse statute is located in the livestock code in New Mexico statute (NMSA 1978) and falls under the jurisdiction of the New Mexico Livestock Board (NMLB). Past NMLB interpretation and implementation of the statute has been challenged with political pressure and legal action regarding its efforts. A consistent point of confusion regarding implementation of the statute is the definition of a "New Mexico wild horse". The statute defines a New Mexico wild horse as an unclaimed horse on public land that is not an estray (77-18-5 A(4); Appendix A). The statute defines public land as not including federal lands managed by the Bureau of Land Management, Forest Service or state trust lands controlled by the state land office (77-18-5 A(1)).

The NMLB, through funding provided by the New Mexico State Legislature, enlisted the services of the Range Improvement Task Force and Center for Applied Spatial Ecology at New Mexico State University to develop information on spatial distribution of New Mexico public lands. Additionally, general information regarding the ecological carrying capacity of NM public lands to support wild horses was requested. Our objectives were to identify location and extent of NM public lands (77-18-5 A(1)), determine carrying capacity estimates for free-ranging horses (77-18-5 A(2)) and identify NM public lands representing opportunities and challenges in implementation of New Mexico's wild horse statute. We developed a series of three maps to address objectives, including:

- Map 1: Identified land stewardship of New Mexico by federal agency, state agency, state trust, sovereign tribe, or non-government entity with emphasis on NM public lands.
- Map 2a: Identified land units that qualified as NM public lands and those with potential opportunities or conflicts regarding the NM wild horse statute.
- Map 2b: Highlighted land units where potential conflicts regarding the NM wild horse statute were not identified.

Public Lands

The phrase public land is often used and considered in a variety of land statuses and is rooted in federal statutes and policy. Up into the 1970s, public land referred to lands in the public domain, belonging to the U.S. Government, unappropriated and not reserved for any government or public purpose and were subject to sale or other disposal under general laws (<https://legal-dictionary.thefreedictionary.com/Public+Lands>; accessed 22 August 2019). Congress reserved all remaining public domain lands (public lands) through the Federal Land Policy and Management Act (FLPMA) of 1976 (Bureau of Land Management 2001). Today, most lands held and managed by the federal government are referred to as public or federal lands.

Reference to public land occurs multiple times in New Mexico law, although there is no unifying definition of public land regarding its use in statute. Public lands may refer to federal lands, New Mexico State Trust Lands as well as state, county and municipal lands. As used in the Noxious Weed Management Act (NMSA 76-7D-1, 1998) public land means land controlled or supervised by an agency of government (NMSA 76-7D-3, 1998). Following government reservation of all remaining public domain lands, public lands were lands with designated government or public purposes with associated restrictions to effect achievement of those commitments. Prior to FLPMA, lands were “reserved” with specific goals and purposes that regulate the management of these lands. The purpose of public lands may be singular, a national park to conserve nature for current and future generations, or multiple-use, to provide for mining, recreation, timber and agriculture production, as examples. If a use does not conflict with the statutory purpose, it may be allowed under policy; however, individual designations will often specify particular uses or restrictions. Almost universally, public lands fulfill the purposes for which they were established through management intended to ensure environmental sustainability or ecological restoration after exploitation. In general, public lands are controlled and managed by government and have specific purposes.

With few exceptions, the New Mexico State Legislature has ultimate authority to direct the purpose of New Mexico public lands, while state agencies are responsible for the creating regulations to implement the Legislature’s directives. State agencies responsible for management of NM public lands have specific knowledge of the purpose of the areas they manage. The purpose ascribed to a specific public land parcel is often established when it became a public asset. Much like federal lands, these purposes limit or direct the use and management of a specific NM public land parcel. Some NM public lands are leased from other entities such as the federal government or private landowners and limits how those lands may be used. Further, some NM public lands are juxtaposed in a manner that may limit uses because of potential conflicts relative to population centers and associated human health and safety concerns.

The Office of the Governor of New Mexico and the New Mexico Judiciary also play important roles in managing NM public lands. The Office of the Governor selects agency directors and provides direction to state agencies regarding management of NM public lands. The New Mexico Judiciary provides decisions regarding legal issues that impact management of New Mexico’s public resources. Each branch of New Mexico government plays an important role in management of NM public lands.

State management agencies are responsible for managing public lands under their jurisdiction for the purpose established by the NM Legislature. They necessarily assess statutes, including the NM wild horse statute, in context to extant mandates and management guidance to determine practical opportunities or challenges of statute implementation. Obstacles to implementation of a statute may be concrete, practical or perceived as well as internal or external to the agency. In some cases, obstacles may be addressed by NM State Legislature action, administratively through the Office of the Governor, through infrastructure development, or resource acquisition. Identifying opportunities and challenges that agencies face in implementing the NM wild horse statute will be useful in finding solutions to conflicts with effective implementation.

Carrying Capacity

The number of individuals that the resources of a habitat can support sustainably is called ecological carrying capacity (Anderson 2002, Ricklefs 1979). Ecological carrying capacity is the maximum number of individuals that can inhabit a defined area under existing environmental conditions. Carrying capacity is not static but varies within a season and annually due to several factors that affect constituent elements of habitat: food, water, shelter. Social or cultural carrying capacities are based on human preferences that may differ by the interests or needs of various groups of people and often fall below the level of ecological carrying capacity. In the context to grazing animals such as livestock, wildlife, and free-ranging horses, carrying capacity is the number of animals an area of land may sustain compatible with management objectives and site-specific attributes (Bedell 1998). Under natural conditions, the population growth rate decreases (fewer births and increased mortality) as the population per unit area grows (density) because fewer resources are available per individual. Large herbivore populations typically grow closer to ecological carrying capacity before population density related mechanisms noticeably alter population growth rates (Gaillard et al. 2000). Variability in environmental conditions may increase the potential for habitat degradation to occur when large herbivore populations are nearing extant ecological carrying capacity.

In the Southwest's arid climate, high variability in annual precipitation quantities and regimen may have substantial and rapid impacts on carrying capacity for grazing animals within seasons and among years. Large-bodied animals persist longer under adverse conditions, which increases their potential to negatively impact habitat attributes in the short- and long-term. Because of these considerations, estimates of carrying capacity are valuable to assess the capacity of an area to support one or multiple species of grazing animals sustainably through time. Carrying capacity estimates are point-in-time assessments and may not be accurate given the highly variable nature of arid southwestern habitats. Carrying capacity estimates are most accurately quantified over multiple years for a specific area of land.

Horses

New Mexico wild horses represent a unique status with human society compared to other forms of wild-living animals. Wild horses are revered as cultural icons heralding a glorious historical legacy (Linnell et al. 2016). Some people may admire wild horses for their beauty and majesty with little consideration of historical or cultural affiliations. Horses living wild on western rangelands represent, to many, a freedom and beauty that speaks to the stature horses occupy in the collective human mind. Horse domestication profoundly changed human society (Clutton-Brock 1992, Olsen et al. 2006, Kelekna 2009) and the individual and societal bonds developed over millennia canonized its revered status with humanity. The status and statutes surrounding wild horses and the realities of domestication and subsequent escape or release to self-sustained living populations adds to the complexities of free-ranging horse management.

All free-ranging horses in North America, living in a self-sustained wild state come from a history of domestication, and regardless of legal status, are feral (Clutton-Brock 1992, Kelekna 2009, Linnell et al. 2016). A fundamental outcome and defining attribute of domestication is change to the genetic composition of a species through selective breeding. Free-ranging horses possess a genetic framework altered by about 5,500-years of selective breeding (Outram et al. 2009) which is not nullified once living in a self-sustained wild state, even for 500 years. For example, Grange et al. (2009) observed free-ranging horses maintained reproductive rates even as adult mortality rates increased, something not observed in wild ungulates (Gaillard et al.

2000), when horse abundance approached ecological carrying capacity. However, these scientific facts may have little influence on societal perspective and broader discussions about free-ranging horses, but are meaningful for effective management and management planning.

Methods

Mapping New Mexico Public Lands

We used ArcMap 10.6.1 (ESRI 2018) to develop Map 1, Map 2a, and Map 2b. We set the projection to USA Contiguous Albers Equal Area Conic USGS, with a central meridian of -107.0, and map scale to 1:500,000. We determined surface ownership based on multiple datasets and shapefiles to estimate the most accurate acreage for state lands. The USGS Protected Areas Database United States 1.4 (PAD-US; U.S. Geological Survey Gap Analysis Program 2016) served as the base layer for all maps. The USGS and the Federal Lands Working Group designed PAD-US to be the best database of aggregated Federal land ownership and management designations for the preservation of protected lands. Moreover, PAD-US 1.4 designated municipal/county lands not apparent in other databases and contained detailed information on unit ownership. PAD-US 2.0 was considered but did not contain surface ownership coverages for Sovereign Tribal lands. We removed smaller units completely overlapped by larger units with the same owner (e.g. Lower San Francisco Wilderness Study Area or Aldo Leopold Wilderness within the Gila National Forest) and duplicate units with multiple owners/managers to obtain more accurate acreage estimates. However, our total acreage estimates should still be considered approximations, as we did not remove units that partially overlapped with differing owners.

We used the BLM Surface Ownership 2018 shapefile (U.S. Bureau of Land Management - New Mexico State Office 2018) to append public state lands that were underestimated in PAD-US. We erased the BLM Surface Ownership 2018 features that overlapped the PAD-US 1.4 features and merged the output features that were not redundant with the original PAD-US 1.4 layer. Any public state land from BLM Surface ownership 2018 not associated with an existing unit identified by PAD-US 1.4 was designated as “Unknown State Land” and requires additional verification to determine its status. Additionally, we included the Valles Caldera National Reserve, which was missing in PAD-US 1.4. We used the New Mexico State Trust Lands by Subdivision shapefile, developed by the Public Land Survey System/NM State Land Office (New Mexico State Land Office 2018), to append State Trust lands that were underestimated in the previous shapefiles, using the same methods described above for public state lands. Finally, we used the NM State Park Boundaries 2018, developed by New Mexico State Parks, to obtain the most accurate estimates of State Park units. Attribute data was acquired from the PAD-US 1.4 shapefile and updated when more-accurate information was provided by an agency. We labeled any area not designated by PAD-US 1.4 as private, which was corroborated by the BLM Surface Ownership 2018 shapefile. Fields consisted of the following: owner type, local owner, manager name, unit name, classification, acreage, potential conflicts and reason for the potential conflicts (Table 1). Attribute tables were exported directly from ArcGIS to Microsoft Excel.

Major cities/county seats (U.S. Department of Commerce, U.S. Census Bureau, Geography Division 2011) and county boundaries (U.S. Department of Commerce, U.S. Census Bureau, Geography Division 2008) were downloaded from RGIS, with cities being converted to point files from the CDP2010_Census shapefile. Major rivers were acquired from ESRI ArcGIS Online and major roads (U.S. Census Bureau, Department of Commerce 2014) were downloaded

from data.gov. We obtained BLM wild horse herd areas (U.S. Bureau of Land Management 2019a) from data.gov and USFS wild horse territories (USDA Forest Service 2014) from data.fs.usda.gov. We developed the hillshade for New Mexico from 1/3 arc second (10 meter) digital elevation models (DEM) downloaded from the USGS National Map (U.S. Geological Survey 2017). All shapefiles and attribute data were stored in a geodatabase, with appropriate metadata, clipped to the boundaries of New Mexico, and projected within the appropriate coordinate system.

We designated state land as any land that was not federal, private, or sovereign tribal owned land, regardless of if the unit was managed by state agencies. Within state lands, we designated NM public lands as any non-state trust land. New Mexico public lands falling within or abutting municipalities were excluded for human health and safety considerations. Moreover, we excluded public lands less than 100 acres, as they may be unable to support a minimum horse band size of two horses. State agencies responsible for management of remaining available NM public land units were contacted to determine if there were potential opportunities or conflicts to implementation of the NM wild horse statute for specific NM public land units (Table 1).

Table 1. Attribute fields for surface ownership of Map 2a and Map 2b.

Field	Description
Owner_Type	Identifies the owner or deed holder of the property, including: federal, state, local (county or municipality), tribal, or private
Local_Owner	Names federal, state, county, municipal agency, specifies tribe or listed as "private" if privately owned
Manager_Name	Any federal, state, county or municipality responsible for the management of the tract
Unit_Nm	Name of specific land tract if one is available
Classification	Classification code describing unit ownership as it appears on the map including: BIA (Bureau of Indian Affairs/Sovereign Tribal) BLM (Bureau of Land Management) BLM/DOD (Bureau of Land Management/Department of Defense) CNTY (County) DOD (Department of Defense) FWS (U.S. Fish and Wildlife Service) MUNI (Municipal) NPS (National Park Service) OFA (Other Federal Agency) PVT (Private/Non-governmental Organization) SGF (State Game & Fish) SPR (State Parks and Recreation) STATE (State of New Mexico/State Land Board) STATE TRUST (State Trust Land)

	USBR (U.S. Bureau of Reclamation) USFS (U.S. Forest Service)
Acres	Estimated acres based on existing geographic data assembled for this project
Potential Conflict	Field designating if the unit was identified as having a potential conflict due to either being located within or adjacent to municipalities, less than 100 acres, or for reasons specified in "Reason for Potential Conflict"
Reason for Potential Conflict	Reason for potential conflict (e.g. deed restrictions, land is leased from federal or other agency, wild horses incongruent with existing management plan, etc.)

Production Estimates

We obtained rangeland production values from the NRCS Soil Survey Geographic Database (SSURGO; USDA Natural Resources Conservation Services 2019). SSURGO was developed using soil data from the National Cooperative Soil Survey and includes information regarding each soil type within surveyed areas across the United States. There was a total of 49 survey areas within New Mexico, generally delineated by county (Soil Survey Staff, Natural Resources Conservation Service). Of those, 43 survey areas had rangeland production estimates for most of the soil types found within the survey area. Since the rangeland production values were for individual soil types, we calculated a weighted average by multiplying the soil type's rangeland production values by its percentage of acres and summed results across all soil types.

Ecological Sustainability of Rangeland Habitats

While more research is needed to document the range of potential impacts of free-ranging horses, existing research supports the need for effective management in determining and maintaining a balance between horse abundance and habitats' ability to support them. Management consistent with ecological sustainability is complicated in multiple use landscapes when free-ranging horses are not managed similarly to wildlife and livestock sharing rangelands (Kaweck et. al. 2018, Scasta et. al. 2018). Consequences of horse presence on semi-arid and arid landscapes should not be considered equivalent to cattle (Beever 2003), as horse physiology and morphological adaptations differ from cattle and other ruminants. In areas exclusively occupied by free-ranging horses, Beever and Brussard (2000) observed decreased vegetation diversity, cover and species richness as well as decreased wild rodent burrows. In riparian habitats accessed by free-ranging horses and minimally accessed by mule deer and pronghorn, increased bare ground and decreased visual obstruction from grazing vegetation was quantified (Boyd et. al. 2016). While free-ranging horses and cattle can negatively impact riparian ecosystems, free-ranging horses impacted riparian systems more than cattle when examined on an individual basis (Kaweck et. al. 2018). Free-ranging horses increased risk of erosion and decrease sagebrush density and recruitment, which may limit greater sage-grouse habitat and other sagebrush wildlife associates (Davies et. al. 2014). In areas where horses were experimentally excluded, sites exhibited increased shrub cover, increased total plant cover, species richness and frequency

of native plants (Beever et. al. 2008). Many of these outcomes may result from lack of management for free-ranging horses.

Water is a fundamental component of habitat, and access to water is particularly poignant in arid and semi-arid ranges of New Mexico. Watering behavior of free-ranging horses differs from livestock and native wildlife (Beever and Brussard 2000). Native wildlife spent less time at water sources frequented by free-ranging horses (Hall et. al. 2016). Although no direct competition was observed, presence of horses reduced water use by desert big horn sheep at preferred watering sites (Ostermann-Kelm et. al. 2008). Direct competition with feral horses prevented elk from acquiring water during spring when both were present at a natural water source (Perry et. al. 2015). Similarly, interband dominance played a key role in access to limited water supplies among free-ranging horses with subdominant bands waiting up to 5 hours to access water (Miller and Denniston 1979). Water availability and distribution plays an important role in ecologically sustainable use of habitat resources.

Science has improved our ability to manage grazing to maintain or improve ecological processes over long periods (Holechek et al. 2011). Managed grazing decisions must consider several factors to achieve ecologically sustained use of rangeland habitats and include wildlife, kind and class of livestock, climate, topography, water availability, and long-term forage production among others (Holechek et. al. 2011). Grazing intensity, the cumulative effect of grazing over a given time period (Holechek et. al. 1998), is considered a crucial factor in assessing grazing outcomes in relation to ecological sustainability (Holechek et. al. 1994, Holechek and Galt 2000). Properly managed grazing is consistent with sustainability of ecological processes (Johnson 1953, Paulsen and Ares 1961, Valentine 1970, Cable and Martin 1975, Skovlin et al. 1976, Milchunas et. al. 1998, Holechek et al. 1999, Navarro et al. 2002, Holechek et al. 2003, Holechek et al. 2006, Khumalo et al. 2007, Molinar et al. 2011, Holechek et al. 2011). Based on research of grazing outcomes at various grazing intensities, we selected grazing use levels consistent with ecological sustainability in arid and semi-arid New Mexico rangelands.

Carrying Capacity Estimates

To estimate land area necessary to support free-ranging horses in an ecologically sustainable manner we estimated carrying capacity using a formula (Figure 1) with the following three parameters: 1) annual forage demand, 2) annual forage production in pounds per acre and 3) annual forage allocation, based on an ecologically sustainable forage grazing use levels. Carrying capacity estimates tend to overestimate the actual number of animals that may be sustained by an area (Holechek and Pieper 1992). Forage demand is the estimated amount of forage needed to support a specified number of grazing animals over time (Holechek et al. 2011). Forage production is the amount of aboveground herbaceous biomass that may be food for grazing animals that grows in an area over a period of time (Cook and Stubbendieck 1986, Holechek et al. 2011). Annual forage production is measured after vegetation senescence in autumn (Bonham 1989). Forage allocation refers to the amount of forage apportioned to different kinds of animals (Holechek et al. 2011).

$$\frac{\text{Acres}}{\text{Horse}} = \frac{\text{annual forage demand} \left(\frac{\text{lbs}}{\text{Ac}} \right)}{\left(\text{annual forage production} \left(\frac{\text{lbs}}{\text{Ac}} \right) \times \text{annual forage allocation} \right)}$$

Figure 1. Formula to estimate land area necessary to support a free-ranging horse for one year.

Free-Ranging Horse Band Size

Providing an area for a single free-ranging horse would not allow the horse to fulfill fundamental biological adaptations (Waring 2003), especially those related to social animals (Zeeb 1981, Keiper 1986, Waring 2003). While immature horses may be solitary for some time, even months, and immature males may form bachelor groups that form and dissolve over years, the tendency for free-ranging horses is to form bands (Linklater et al. 2000, Waring 2003, Boyd et al. 2016). Band sizes for free-ranging horses are highly variable with observed band sizes including 2-21 (Fiest 1971), 2-12 (Welsh 1975), 3-16 (Salter 1978), 2-6 (Keiper 1986), 10-16 (Keiper and Sambras 1986), 2-17 (Linklater et al. 2000), 4-12 animals (Boyd et al. 2016), and have been observed as high as 28 (Keiper 1986) and 35 (Pacheco and Herrera 1997) with bands expressing high female-biased sex ratios. Horse bands comprised of one or more stallions and multiple mares tend to be more stable than other band compositions (Miller 1979, Stevens 1990).

Minimum stable band sizes are highly variable according to the literature and depend upon multiple characteristics including forage and water availability, terrain, sex and age distributions of horses and interactions with adjacent horse bands. We selected two horses to represent the minimum number of horses to comprise a band. We did not consider genetic conservation in selection of minimum horse band size for making carrying capacity estimates.

Results

Mapping New Mexico Public Lands

We developed Map 1 to reflect the surface ownership of lands in New Mexico. Designations were based solely on the boundaries of the aforementioned datasets, with the exception of the NM State Park Boundaries 2018 shapefile, with the accuracy based on data sets and limitations defined within appropriate metadata. Otero Mesa, on Fort Bliss, was designated as both Department of Defense and BLM due to conflicting ownership data between PAD-US 1.4 and the BLM Surface Ownership 2018 shapefiles. Map 2a (Figure 2) and 2b (Figure 3) were designed to identify NM public lands and potential opportunities or conflicts regarding the implementation of the NM wild horse statute based on area size, proximity to municipalities, or other reasons identified by the responsible agency. These maps were subsequently refined as communication with state agencies provided additional datasets and unit boundaries, such as the NM State Park Boundaries 2018 shapefile. Most notably, the Elephant Butte and Caballo Lake boundaries were altered, with the majority of land re-designated as owned by the U.S. Bureau of Reclamation as opposed to NM State Parks. Additionally, the unit known as Coyote Creek State Park in Map 1 was re-designated as being unknown state land, as the State Park boundaries for Coyote Creek were located north of the area identified on the map.

For the purposes of these maps, we designated 1,139 discrete surface units across the state of New Mexico (Table 2). Of those, 921 sites were identified as New Mexico public land, with 14 units having no expressed potential for conflict in implementing the NM wild horse

statute (Table 3; Appendix B). Potential conflicts with implementation of the NM wild horse statute included: units below the minimum 100 acreage estimate (768; Figure 4), units not owned or only partially owned by the state/county agency (65), units within or abutting municipalities (40), units with high human and horse recreational use (8), and units with other possible conflicts (26; e.g. currently closed to the public, fish rearing facility, etc.; Appendix C).

Sites with no identified conflicts were comprised of municipal lands (3), state park lands (5), and lands with unknown designations (6). The acreages ranged from 132 to 7,306, with only 4 units larger than 640 acres. The largest unit was classified as an unknown state land (7,306 acres, Mora Co.), erroneously identified as Coyote Creek State Park by PAD-US 1.4, located east of the Santa Fe and Carson National Forests and northwest of Interstate 25. The NM State Park Boundaries 2018 shapefile identified Coyote Creek State Park (456 acres, Mora Co.) as being approximately 9 km north of the unknown state land. Three municipal units were identified east of Santa Fe, including two units (271 & 345 acres, Santa Fe Co.) only identified as “Park” and another unit (208 acres, Santa Fe Co.) identified as “Private Land”, despite being designated as a municipal land. Additionally, Hyde Memorial State Park (365 acres, Santa Fe Co.) was located within this area. Two sites with unknown ownership were located in the Carson National Forest, northwest of Santa Fe, with the unit identified as Phase I (2,220 acres, Rio Arriba Co.) being managed by the State. The other unit identified as Vallecitos Refuge (132 acres, Rio Arriba Co.) being managed by the State Department of Natural Resources is situated just northwest of the Jarita Mesa Wild Horse Territory. Two more sites were located near Navajo Lake State Park: 1) 160 acres (San Juan Co.) located east of the San Juan River and northwest of Navajo Lake State Park, and 2) 477 acres (Rio Arriba Co.) located within the boundaries of the BLM’s Carracas Mesa Wild Horse Area. Another site, Bluewater Lake State Park (2,244 acres, McKinley Co.), was located south of Interstate 40 between the cities of Gallup and Grants. Another site with unknown ownership but possibly managed by the state was located in the northeast spur of the Gila National Forest and identified as Horse Springs – Phase I (5,001 acres, Catron Co.). Oliver Lee State Park (638 acres, Otero Co.), located south of Alamogordo, and Manzano Mountains State Park (188 acres, Torraine Co.), located southeast of Albuquerque, were also identified as having no conflicts with the implementation of the NMWH statute. Errors in the data resulted from classification incongruences existing between BLM Surface Ownership 2018 and PAD-US 1.4 databases. All sites classified as unknown state lands require additional investigation into ownership to assess the accuracy of these designations.

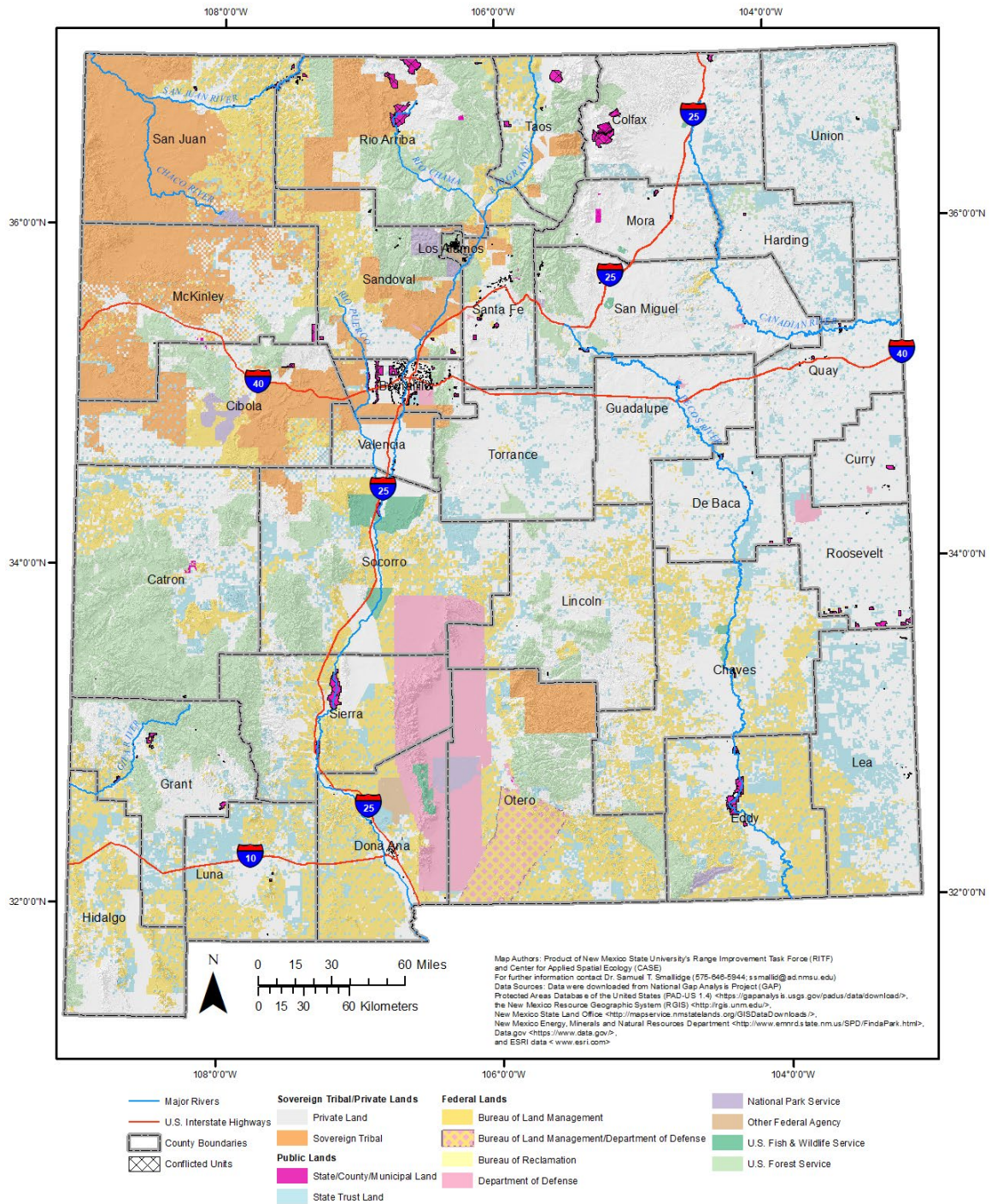


Figure 2. Map 2a illustrates land stewardship of New Mexico, including U.S. Interstates, major rivers, and counties.

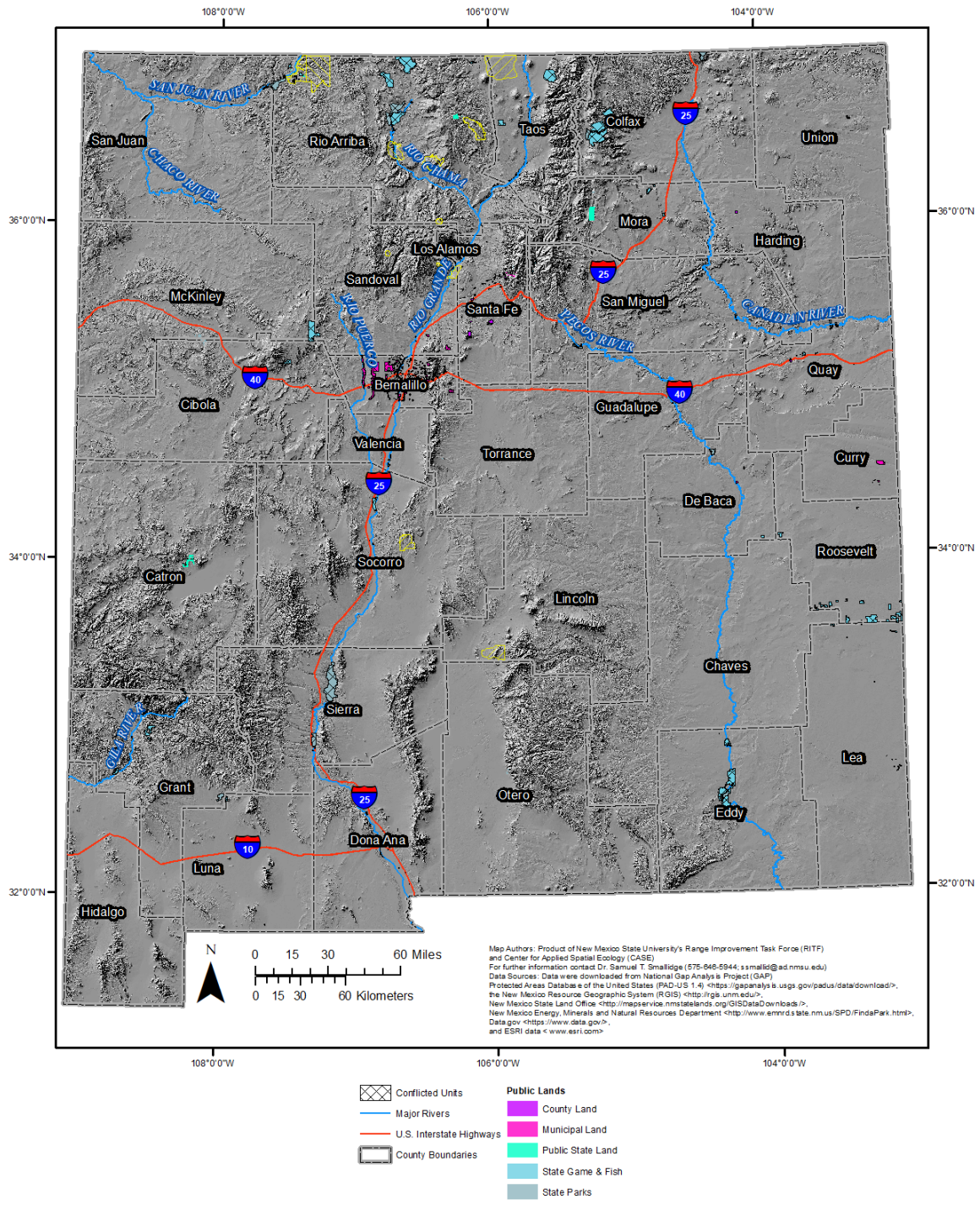


Figure 3. Map 2b illustrates New Mexico public lands Mexico by land management agency.

Table 2. Acreage estimates for ownership by agency. Standard errors were not calculated for responsible agencies with a single unit (BLM/DoD) or when the majority of units were consolidated into a single unit with no defining information (Private/State Trust).

<i>Surface Owner</i>	<i>Total Acreage</i>	<i>Mean Acreage</i>	<i>Standard Error</i>
Bureau of Land Management (BLM)	13,489,281	843,080	352,320
BLM/DoD	696,190	696,190	NA
County	9,430	33	9
Department of Defense (DoD)	2,682,143	157,773	128,210
Municipal	57,018	113	48
National Park Service	477,655	23,883	9,644
Other Federal Agency	135,505	67,752	41,506
Private ¹	33,954,923	390,286	NA
Sovereign Tribal	8,247,841	217,048	77,295
State	203,094	2,308	253
State Game & Fish	99,063	3,002	956
State Park & Recreation	16,101	1,342	1,747
State Trust	9,153,872	4,576,936	NA
U.S. Bureau of Reclamation	80,166	8,017	3,326
U.S. Fish & Wildlife Service	427,382	22,494	11,950
U.S. Forest Service	9,221,171	1,536,862	424,361
Grand Total	78,950,835	69,316	NA

¹Includes New Mexico land grants. New Mexico land grants are private property as well as subdivisions of government, in recognition of their unique rights. Some land grants allow public access. New Mexico land grants may contain NM public land units within or adjacent to their boundaries.

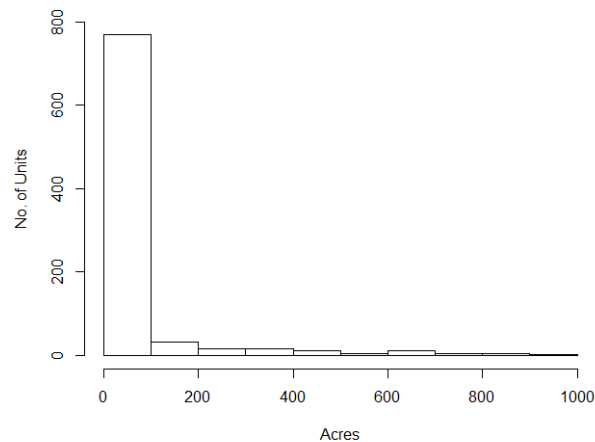


Figure 4. Histogram of acreage estimates for 865 designated New Mexico public lands (total 921) less than 1,000 acres. Fifty-six NM public land units were greater than 1,000 acres.

Table 3. Public lands with no expressed potential for conflicts regarding implementation of the New Mexico wild horse statute (NMSA 77-18-5, 2007). Units with “Unknown” ownership are potentially NM public lands as they were identified as managed by state agencies or were designated as owned by the State in the BLM Surface Ownership 2018 shapefile but not the PAD-US 1.4 shapefile. These sites require additional verification to determine if they are indeed NM public lands.

<i>Local Owner</i>	<i>Manager Name</i>	<i>Unit Name</i>	<i>Acres</i>
City Land	Municipal	Park	271
City Land	Municipal	Park	345
City Land	Municipal	Private Land	208
NM State Parks	NM State Parks	Oliver Lee State Park	638
NM State Parks	NM State Parks	Coyote Creek State Park	456
NM State Parks	NM State Parks	Bluewater Lake State Park	2,244
NM State Parks	NM State Parks	Hyde Memorial State Park	365
NM State Parks	NM State Parks	Manzano Mountains State Park	188
Unknown	State	Horse Springs - Phase I	5,001
Unknown	Unknown	Unknown	477
Unknown	NM State Parks	Unknown (Misabeled as Coyote Creek)	7,306
Unknown	Unknown	Unknown	160
Unknown	State Dept. Of Natural Resources	Vallecitos Refuge	132
Unknown	State	Phase 1	2,220

Estimated Production

The SSURGO database contained 49 survey sites across New Mexico; however, only 43 sites contained range production estimates. Areas not represented in range production estimates were federally managed lands and included the Gila National Forest, sections of the Cibola National Forest, White Sands National Monument, White Sands Missile Range, the Lincoln National Forest, Mescalero-Apache lands, sections of the Santa Fe National Forest, and sections of the Carson National Forest. Annual average forage production estimates for New Mexico ranged from 443 ± 26 lbs./acre to 1109 ± 69 lbs./acre ($n = 43$; Figure 5). These numbers may be misleading as production in some areas of New Mexico may produce greater or lesser amounts of forage depending on environmental conditions. Further, production estimates may represent vegetation not present in horse diets as well as fail to include dietary items they do consume. Estimated forage production was derived from the geodatabase developed as part of this effort and were not ground-truthed for accuracy. Further, accuracy of forage production information on a statewide basis was not determined and was based on available information found in the SSURGO geodatabase and represent unknown time frames and annual precipitation accumulations, which may not be realistic as long-term averages for the state. Specific areas in which NMWH occur should have initial quantitative assessments to estimate carrying capacities and regular monitoring to establish reliable long-term carrying capacity estimates.

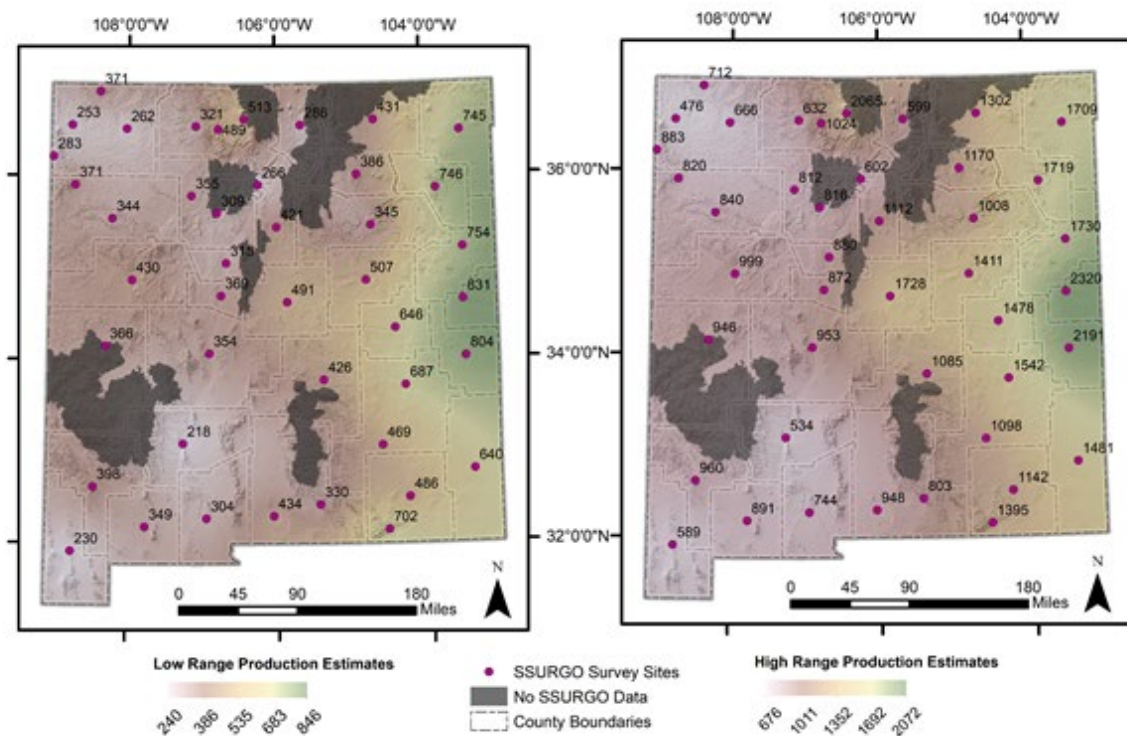


Figure 5. SSURGO range production maps, estimated through kriging, with low production estimates (left) and high production estimates (right). SSURGO survey sites, with the average production estimate, are represented as purple circles, while areas with no survey data are gray-shaded.

Carrying Capacity Estimate Assumptions

We calculated carrying capacity as a range of land areas able to support NMWH based on average statewide estimates of forage production. These estimated carrying capacities only provide a broad understanding of land area needed to support free-ranging horses. Estimating a range of land areas NMWH need to thrive in an ecologically sustainable manner required several assumptions (Table 4). We assumed an average horse weight of 900 pounds, 3% of body weight daily-dry-matter intake (Holechek et al. 2011) and assumed horse presence yearlong. We did not adjust the carrying capacity estimate for considerations of water, fencing, terrain or presence of other grazing animals. We assumed reproduction equaled mortality; or alternatively, horse numbers are managed in accordance with changing ecological carrying capacities. Forage production is highly variable in New Mexico and site-specific assessments of specific environmental and animal attributes must be made to develop reliable carrying capacity estimates for areas supporting NMWH.

Table 4. Assumptions used in estimating land area necessary to support 2 free-ranging horses.

- 1) Horses live in a wild state.
 - 2) Weigh 900 pounds on average.
 - 3) Adequate water is available and accessible throughout the year.
 - 4) Adjustments for terrain were unnecessary.
 - 5) Populations do not exceed carrying capacity.
 - 6) No other grazing animal is present or competing for forage resources.
 - 7) A minimum of two horses comprise a band.
-

Forage Intake

Estimating the range of land area generally needed to support free-ranging horses requires understanding the annual amount forage eaten by a horse, estimating annual forage production, and determining an ecologically sustainable level of allowable use. Amount of forage needed to support an Animal Unit is well established in the scientific literature (see reviews by Cordova et al. 1978 and Holechek et al. 2011), and is based on an average intake of 2% of metabolic weight daily dry matter (DDM) intake for ruminant animals. Dry matter is vegetation with most of the moisture removed through a standardized drying process. The definition of an Animal Unit (AU) is a 1000-pound cow dry or with calf to 6-months of age (Holechek et al. 2011). Therefore, daily intake of an AU is 2% of 1000 pounds, or 20 pounds DDM. An Animal Unit Month is the amount forage an AU eats in 1 month, or 600 pounds of dry matter forage. Different kinds of animals have an Animal Unit Equivalency (AUE) established to understand and estimate forage needs among different species. As non-ruminants, horses consume more forage, which equates to 3% of body weight DDM range-forage intake (Holechek et al. 2011). A domestic horse weighing 1200 pounds has an estimated AUE of 1.8, meaning 1.8 times more forage than an AU, which equals 36 pounds DDM forage intake (Holechek 1988, Holechek et al. 2011). Free-ranging horses weigh about 900 pounds (Berger 1986, BLM 2019b) and have an estimated AUE of 1.35, requiring about 27 pounds of DDM forage intake. A free-ranging horse would eat about 810 pounds of forage per month and 9,720 pounds of dry matter forage annually.

Ecologically Sustainable Grazing

We selected a grazing use level consistent with ecological sustainability on New Mexico rangelands. We defined ecological sustainability as the level of total grazing animal use and associated grazing outcomes consistent with long-term preservation of ecological function and services for New Mexico rangeland habitats. We assumed NMWH would live in a wild state with minimal human interference to affect survival (e.g., providing food and water). We recognize that horse bands or herds will require management to maintain band or herd numbers consistent with ecological sustainable use levels. Grazing research indicates that grazing use

levels of 30% to 40% of annual forage production sustains or improves ecological range conditions (Valentine 1970, Martin and Cable 1974, Holechek et al. 1994, Galt et al. 2000, Holechek et al. 2003, Holechek et al. 2006, Holechek et al. 2011) depending on extant ecological status. Galt et al. (2000) indicated that 25% use of annual forage production might represent a use level more appropriate for some arid western rangelands. Holechek et al. (2011) provides a thorough review of the science behind grazing management in desert and short-grass steppe rangelands. Regardless of grazing species, grazing outcomes need to be similar to promote ecologically sustainable use on New Mexico’s rangelands. We selected grazing use levels of 25% and 40% to use in estimating ecologically sustainable carrying capacities for NMWH.

Estimated Carrying Capacity

General range of acreages to support two free-ranging horses in New Mexico in an ecologically sustainable manner were estimated to be 70 to 176 acres at a 25% grazing use level and 44 to 110 acres at a 40% grazing use level (Table 5). These broadly generalized estimates may not accurately estimate carrying capacity at specific sites. Site-specific assessments would be needed to determine horse abundance to promote ecological sustainability. Estimates may vary substantially based on site-specific attributes, horse band composition and existing habitat conditions.

Table 5. Estimated acres necessary to support two free-ranging horses in New Mexico at ecologically sustainable 25% and 40% grazing use levels.

Estimated Long-Term Average Low and High NM forage Production (lbs./Acre)	Acres necessary for two 900-pound horses at 25% grazing use level	Acres necessary for two 900-pound horses at 40% grazing use level
443 ± 26	176	110
1109 ± 69	70	44

Forage production in New Mexico varies with the amount and timing of precipitation. Table 6 provides a range of carrying capacity estimates based on different forage production values for 2 wild horses. Vegetation growth may vary from near zero during extended drought to well above long-term average in wet years. Table 6 illustrates the relationship between changes in forage production and acres needed to support 2 wild horses. One management strategy to account for variability in forage production would be to maintain wild horse abundance below the long-term carrying capacity. Long-term carrying capacity estimates require assessing forage production and monitoring ecological outcomes of grazing over multiple years.

Table 6. Estimate of the number of acres necessary to support two 900-pound free-ranging horses for one year at light (25%) to conservative (40%) utilization levels consuming an estimated 9,720 pounds of dry matter forage annually.

Estimated Forage Production (lbs./Arce)	Estimated acres to support two horses for one year at 25% grazing use level	Estimated acres to support two horses for one year at 40% grazing use level
300	259	162
400	197	122
500	156	97
600	130	81
700	111	69
800	97	61
900	86	54
1,000	78	49

Table 7 illustrates the effect of forage production on the number of acres needed to support wild horses at different abundances in an ecologically sustainable manner. For example, it would require between 30,300 and 48,600 acres to support 1,000 wild horses in areas where forage production averaged 800 lbs. per acre. Areas necessary to support free-ranging horses vary considerably depending on long-term forage production and numbers of animals.

Table 7. Estimated acres needed to support New Mexico free-ranging horses at different long-term average forage production levels at ecologically sustainable grazing use levels of 25% and 40%.

Average long-term forage production (lbs./Arce)	Acres at 25% grazing use level¹				Acres at 40% grazing use level¹			
	10 horses	100 horses	1,000 horses	5,000 horses	10 horses	100 horses	1,000 horses	5,000 horses
200	1,944	19,440	194,400	972,000	1,215	12,150	121,500	607,500
300	1,296	12,960	129,600	648,000	810	8,100	81,000	405,000
400	972	9,720	97,200	486,000	608	6,075	60,750	303,750
500	778	7,776	77,760	388,800	486	4,860	48,600	243,000
600	648	6,480	64,800	324,000	405	4,050	40,500	202,500
700	555	5,554	55,543	277,714	347	3,471	34,714	173,571
800	486	4,860	48,600	243,000	304	3,038	30,375	151,875
900	432	4,320	43,200	216,000	270	2,700	27,000	135,000
1,000	389	3,888	38,880	194,400	243	2,430	24,300	121,500
1,100	353	3,535	35,345	176,727	221	2,209	22,091	110,455
1,200	324	3,240	32,400	162,000	203	2,025	20,250	101,250

¹ Ecologically sustainable use levels may vary based on site-specific habitat attributes.

Implications

We examined spatial distribution and extent of NM public lands. Distribution of NM public lands among lands representing varied ownerships may contribute to the challenges and opportunities in implementation of the NM wild horse statute to an unknown extent. Presence of federally defined wild horses, unwanted horses and owned horses add complexity to administrative and natural resources management challenges associated with NMWH. Human health and safety considerations, recreation, and agriculture add further to this complexity. Central to addressing challenges associated with implementation of the NM wild horse statute is recognizing a core objective of managing horses in an ecologically sustainable manner in a multiple use landscape.

Because most public lands are designated with a specific purpose, we asked NM public land management agencies to identify specific NM public land sites representing potential opportunities or conflicts regarding implementation of the NM wild horse statute under existing management paradigms. Of 921 NM public land sites identified, 14 sites had no expressed potential for conflict. These sites would benefit from site-specific assessment to confirm no conflicts with statute implementation exist, possible resolution of any identified conflicts, and assess ecological capacity to sustain a specific number of NMWH. Of the 14 sites identified, 6 were classified as unknown ownership. These will need further investigation to determine ownership. Potential conflicts associated with NM public lands included those related to area (limited carrying capacity for two NMWH, $n = 768$), ownership ($n = 65$), juxtaposition to municipalities ($n = 40$), recreation ($n = 8$) and other ($n = 26$). This initial effort to identify potential opportunities and conflicts associated with NM public lands require review and further examination with respect to implementation of the NM wild horse statute. The New Mexico State Legislature, New Mexico Governor's office and state agencies may consider prioritizing the purposes of each New Mexico public land unit with respect to the NM wild horse statute. Ultimately, the New Mexico State Legislature has the authority to capitalize on opportunities and address potential conflicts with implementation of the NM wild horse statute (NMSA 77-18-5, 2007).

We provided a range of carrying capacity estimates that represent a broad understanding of the area needed to support NM wild horses. These estimates may not be accurate when considering specific NM public land areas and are provided only for general understanding of ecologically sustainable carrying capacities. Regular site-specific carrying capacity estimates over multiple years will provide the best opportunity to estimate reliably the number of horses an area can ecologically sustain. Additionally, regular estimation of NM wild horse population abundance will be necessary to assess management outcomes relative to estimated carrying capacities. Ecological consequences of horse abundance exceeding the carrying capacity of an area may result in long-term impacts to rangeland habitats.

Free-ranging horse management often focuses singularly on application of agricultural or wildlife management techniques. These approaches often conflict with public opinion regarding free-ranging horses and generate controversy. Effective management of free-ranging horses will require a hybrid approach with application of agricultural and wildlife management techniques (Linnell et al. 2016). Development and scientific testing of hybrid and innovative strategies is needed to determine their efficacy in managing New Mexico wild horses. For example, reproductive management of free-ranging horse populations may include surgical sterilization and contraception management techniques, which are untested regarding their applicability

across a broad landscape of unconfined wild horses. For effective management of NM wild horses to occur, a variety of existing and innovative techniques will need identified and integrated in their application. Management techniques include reproductive management, horse gathers, adoption or sales programs, private and public horse sanctuaries, and lethal measures. Lack of planning and effective management may lead to habitat degradation that has long-term consequences to habitat productivity affecting New Mexico's wild horses, wildlife, and human endeavors.

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Appendix A

New Mexico Wild Horse Act (2007)

77-18-5. Wild horses; conformation, history and deoxyribonucleic acid testing; Spanish colonial horses; birth control.

A. As used in this section:

- (1) "public land" does not include federal land controlled by the bureau of land management, the forest service or state trust land controlled by the state land office;
- (2) "range" means the amount of land necessary to sustain a herd of wild horses, which does not exceed its known territorial limits;
- (3) "Spanish colonial horse" means a wild horse that is descended from horses of the Spanish colonial period; and
- (4) "wild horse" means an unclaimed horse on public land that is not an stray.

B. A wild horse that is captured on public land shall have its conformation, history and deoxyribonucleic acid tested to determine if it is a Spanish colonial horse. If it is a Spanish colonial horse, the wild horse shall be relocated to a state or private wild horse preserve created and maintained for the purpose of protecting Spanish colonial horses. If it is not a Spanish colonial horse, it shall be returned to the public land, relocated to a public or private wild horse preserve or put up for adoption by the agency on whose land the wild horse was captured.

C. If the mammal division of the museum of southwestern biology at the university of New Mexico determines that a wild horse herd exceeds the number of horses that is necessary for preserving the genetic stock of the herd and for preserving and maintaining the range, it may cause control of the wild horse population through the use of birth control and may cause excess horses to be:

- (1) humanely captured and relocated to other public land or to a public or private wild horse preserve;
 - (2) adopted by a qualified person for private maintenance; or
 - (3) euthanized; provided that this option applies only to wild horses that are determined by a veterinarian to be crippled or otherwise unhealthy.
-

Source: Section 77-18-5 NMSA 1978, <<https://laws.nmone.com/w/nmos/Chapter-77-NMSA-1978#!b/77-18-5>>, accessed on 08/21/2019.

Appendix B

**New Mexico public lands with no identified potential conflicts to the New Mexico Wild
Horse Act (2007)**

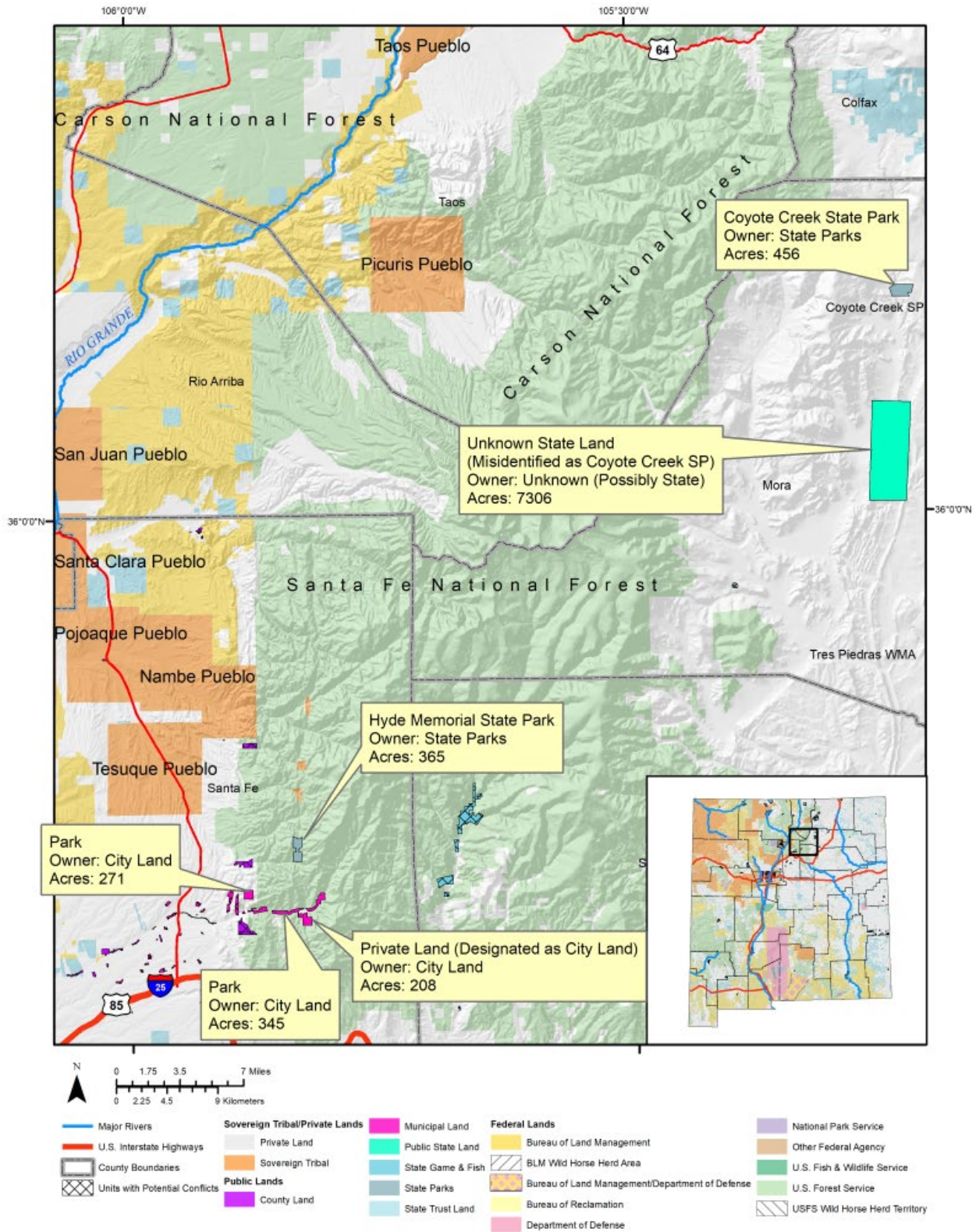


Figure B1. New Mexico public lands with no identified conflicts near Santa Fe, NM.

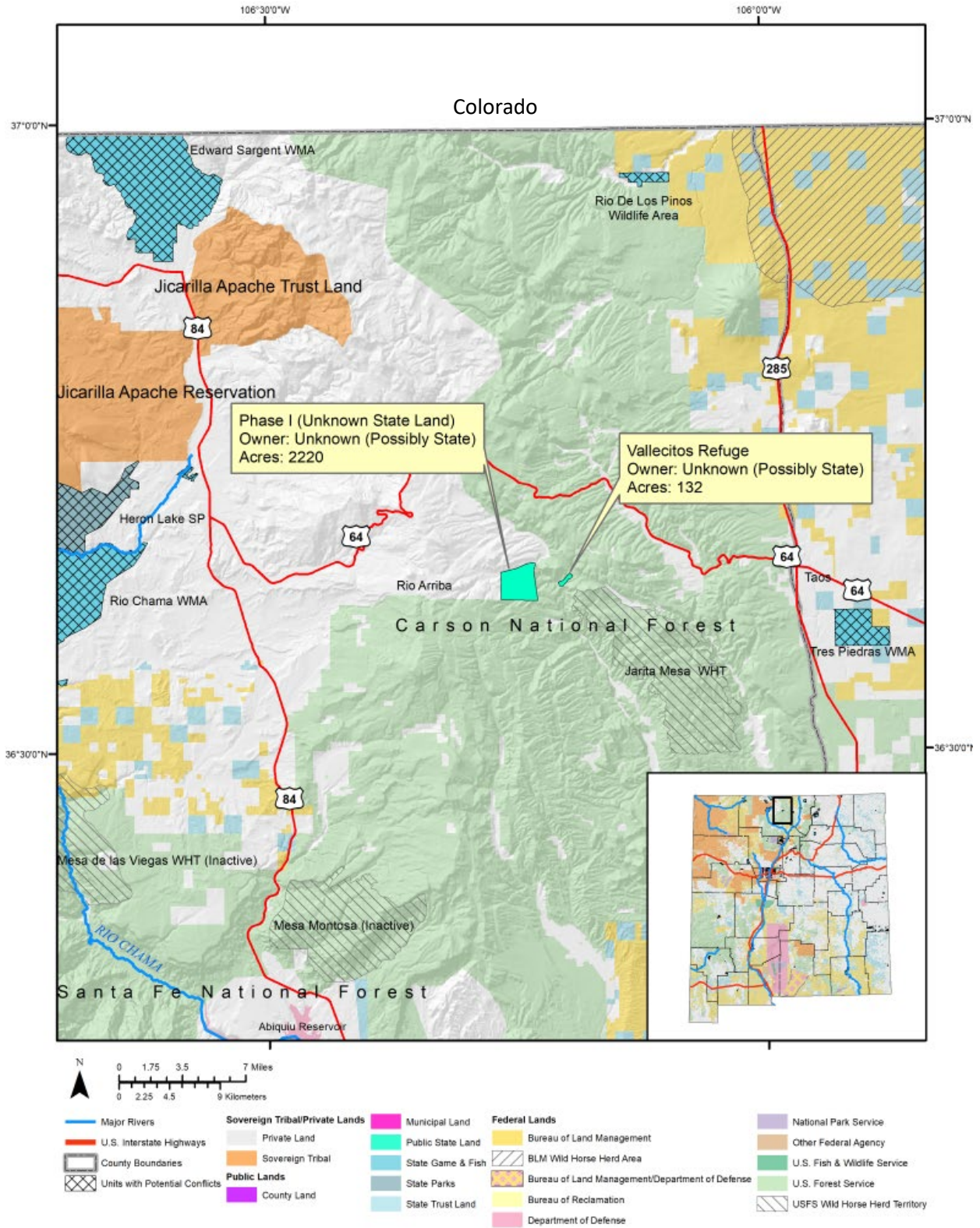


Figure B2. New Mexico public lands with no identified conflicts east of Taos, NM.

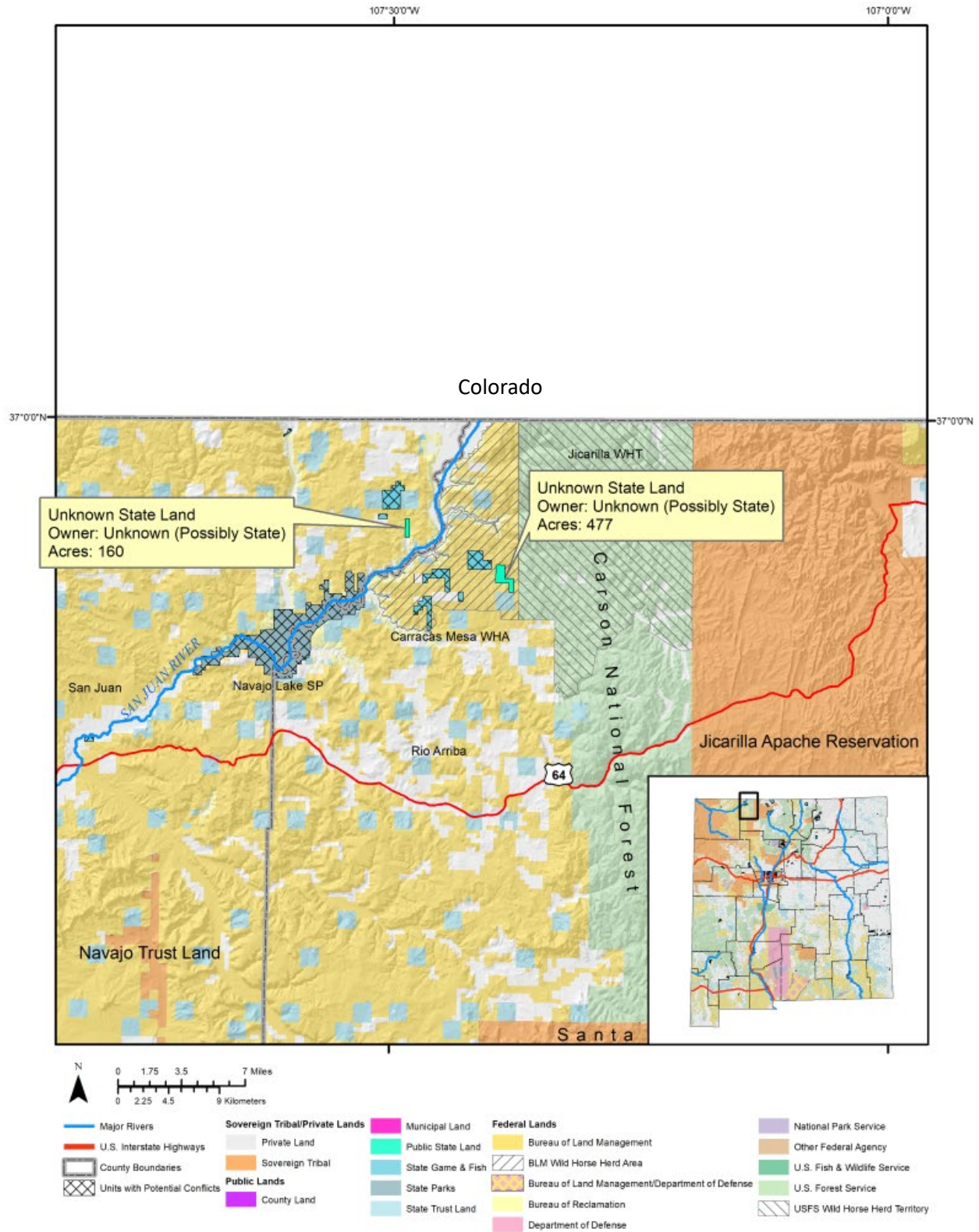


Figure B3. New Mexico public lands with no identified conflicts near Navajo Lake State Park.

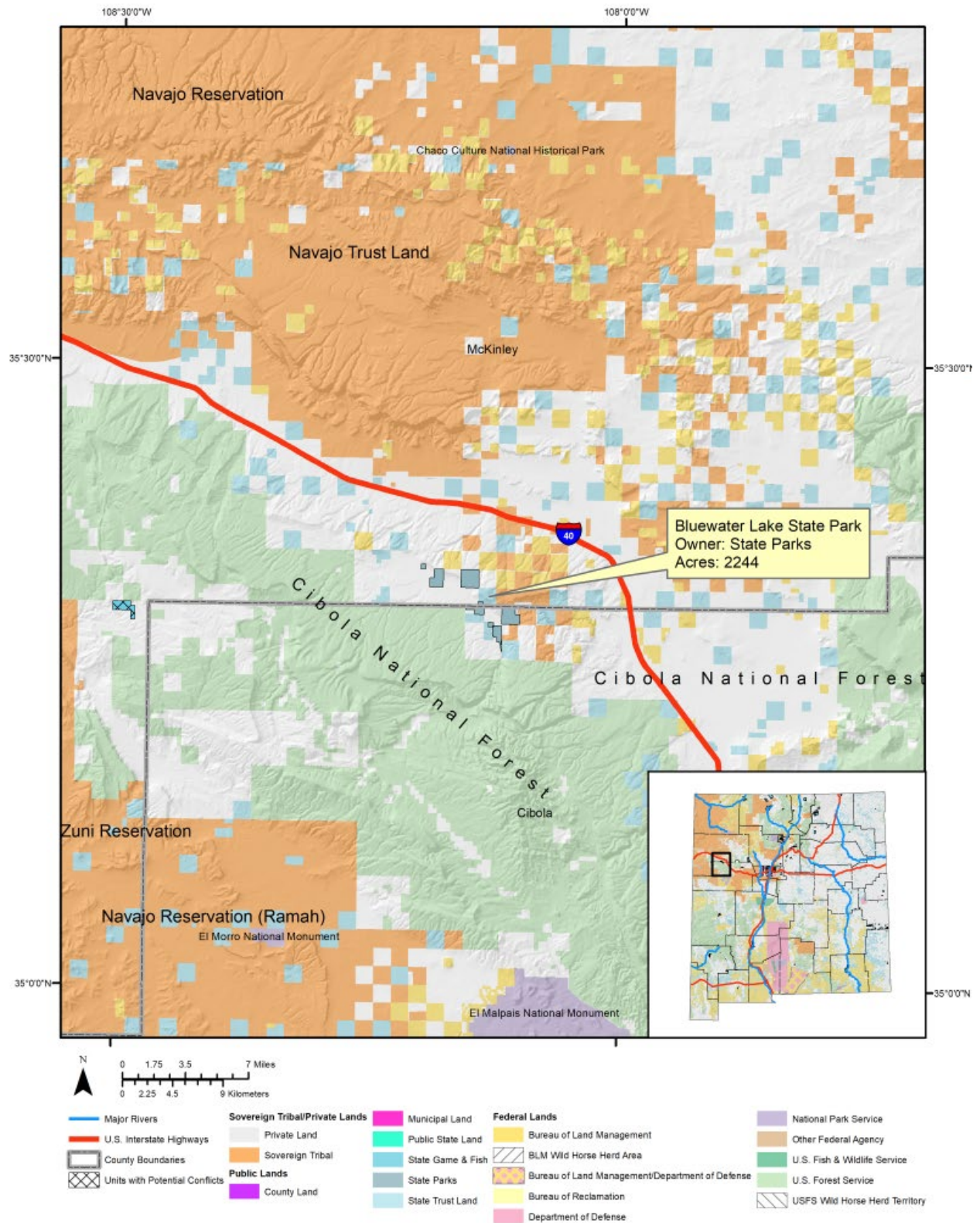


Figure B4. New Mexico public lands with no identified conflicts west of Albuquerque, NM.

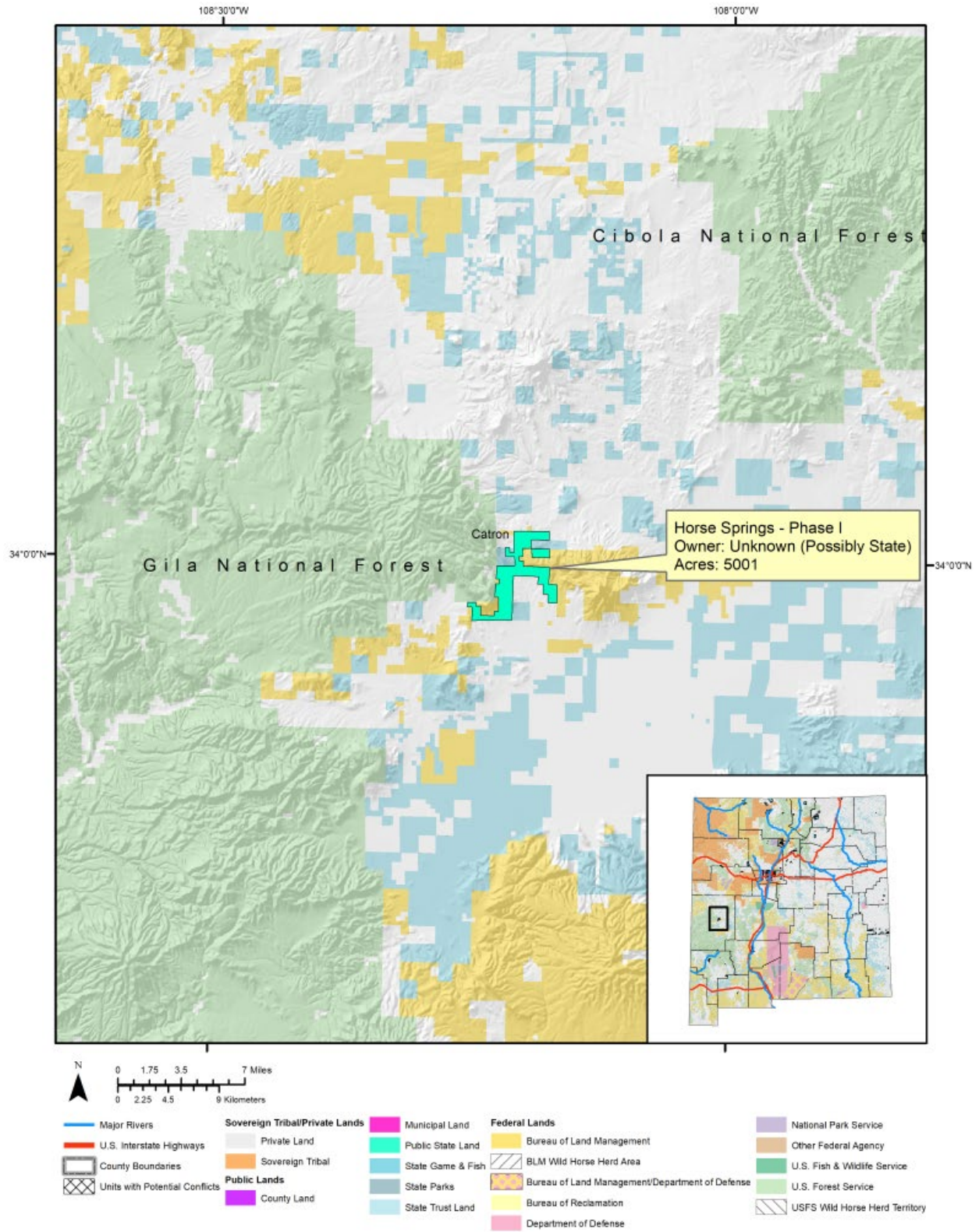


Figure B5. New Mexico public lands with no identified conflicts northeast of the Gila National Forest.

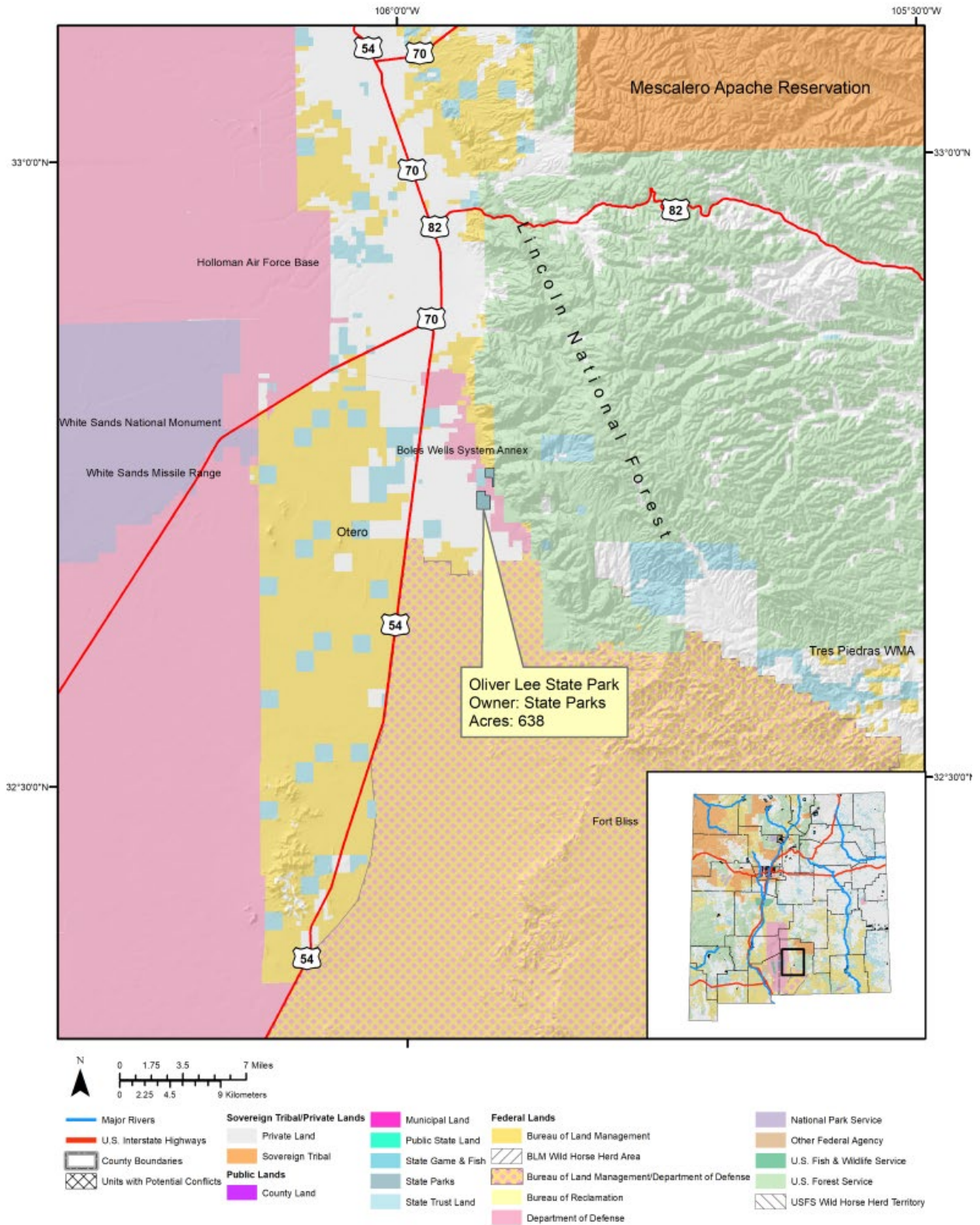


Figure B6. New Mexico public lands with no identified conflicts south of Alamogordo, NM.

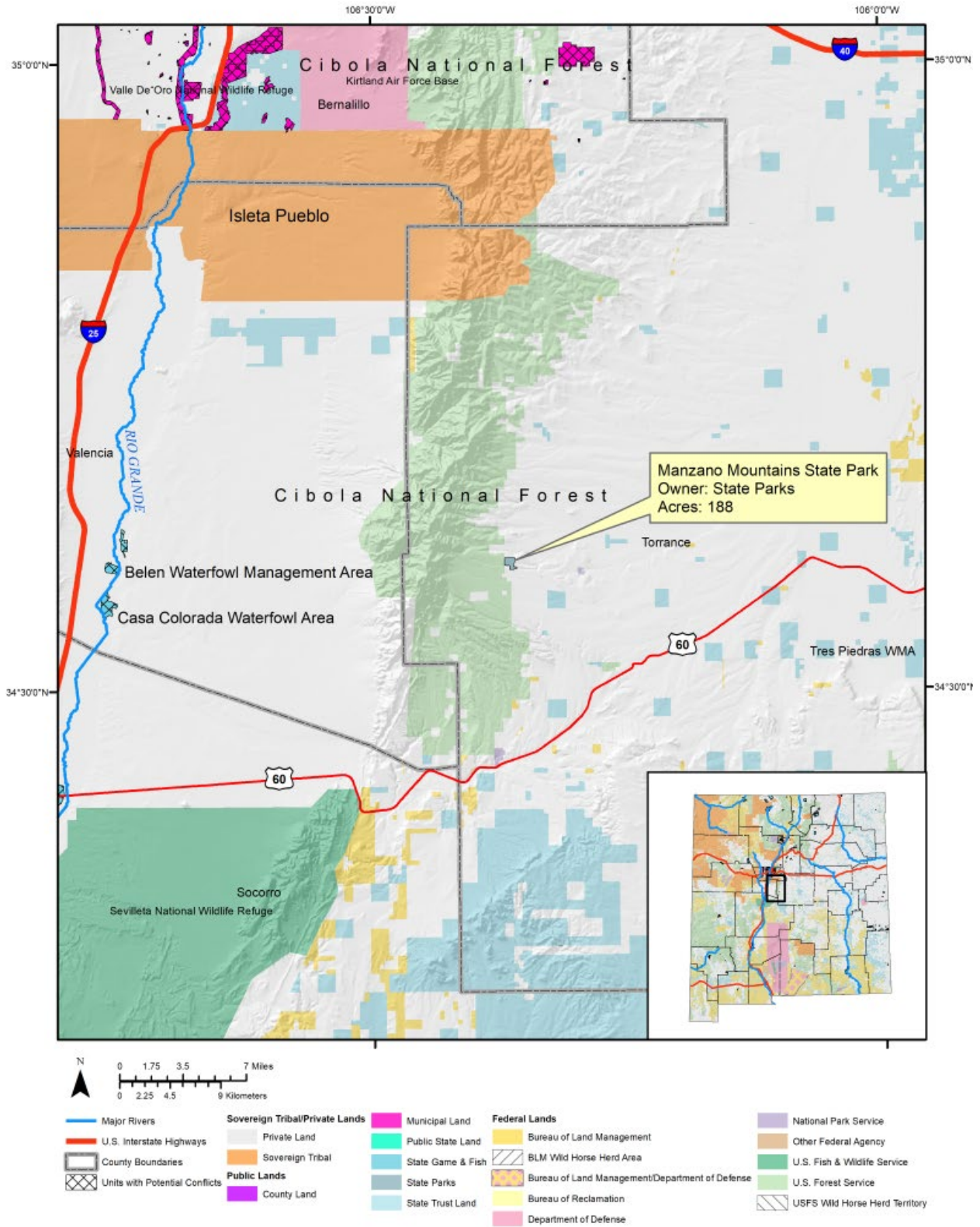


Figure B7. New Mexico public lands with no identified conflicts southeast of Albuquerque, NM.

Appendix C

New Mexico Public Lands with potential conflicts regarding the implementation of the NMWH statute, not included were units below the estimated minimum acreage (100 acres) or those within or abutting municipalities.

Local Owner	Unit Name	Reason for Potential Conflict
NM Game Commission	Navajo Axtell	Acquired as mitigation for the loss of wildlife habitat from the creation of Navajo Lake
NM Game Commission	Navajo Axtell	Acquired as mitigation for the loss of wildlife habitat from the creation of Navajo Lake
NM Game Commission	Navajo Axtell	Acquired as mitigation for the loss of wildlife habitat from the creation of Navajo Lake
Santa Fe County	Thornton Ranch	Cultural resource protection and future recreation use, equestrian recreation
Bernalillo County	Carlito Springs	Currently in renovation and closed to Public. When open will resume very high recreation, established trails; other wildlife frequent; historic orchard; Thinning complete as of last year, within or abutting municipalities
US Bureau of Reclamation	Elephant Butte Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Caballo Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Heron Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	El Vado Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Brantley Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Navajo Lake State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Leasburg Dam State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Percha Dam State Park	Federal Land - NMSA 77-18-5 A.1
US Bureau of Reclamation	Sumner Lake State Park	Federal Land - NMSA 77-18-5 A.1, within or abutting municipalities
US Army Corp of Engineers	Santa Rosa Lake State Park	Federal Property
US Army Corp of Engineers	Conchas Lake State Park	Federal Property
NM Game Commission	Red River State Hatchery	Fish Rearing Facility
NM Game Commission	Red River State Hatchery	Fish Rearing Facility
City of Albuquerque	Elena Gallegos picnic area	Heavy recreation use and presence of domestic horse recreation
City of Albuquerque	Guitierrez Canyon	Heavy recreation use and presence of domestic horse recreation
Santa Fe County	Parker Open Space	Heavy recreational use
Santa Fe County	Rio En Medio	Heavy recreational use
Santa Fe County	Picacho Peak	Heavy recreational use
Santa Fe County	Tesuque Creek Open Space	Heavy recreational use
City of Fort Sumner	Bosque Redondo Lake	Heavy recreational use

DeBaca County	DeBaca County Local Other or Unknown	High recreational activity
Bernalillo County	Sabino Canyon	High value wildlife and flowers; historic/archeological sites; established trails, within or abutting municipalities
Harding County	Chicosa Park	Leased land, cattle and horses
NM Game Commission	Bill Evans Lake	Managed as a Fishing Lake
NM Game Commission	Silva Tract	Managed by the Nature Conservancy
NM Game Commission	Bert Clancy Fishing Area (pecos Estates)	Managed for Fishing and Camping Recreational Opportunities
NM Game Commission	Brantley Wildlife Area	Not owned by State Game Commission
Santa Fe County/NM State Parks	Cerrillos Hills State Park	Only (.67) acres is owned by the State Parks, heavy recreational use
Village of Logan	Ute Lake State Park	Only (253) acres is owned by State Parks, within or abutting municipalities
City of Raton/State Parks	Sugarite Canyon State Park	Only (541.1) acres owned by State Parks
Storrie Lake Water Assoc./NM State Parks	Storrie Lake State Park	Only (84.24) acres is owned by State Parks
Santa Fe County	Mount Chalchihuitl Open Space	Private property
NM Game Commission	Farmers Home Prairie Chicken Area	Protected by Several Covenants to ensure management is for conservation purposes
NM Game Commission	Antelope Flats	Protected by Several Covenants to ensure management is for conservation purposes
NM Game Commission	Little Dipper	Protected by Several Covenants to ensure management is for conservation purposes
NM Game Commission	Bledsoe Prairie Chicken Area	Protected by Several Covenants to ensure management is for conservation purposes
NM Game Commission	Double E WMA	Purchased with Federal Funds and Natural Resources Damage Assessment Funds for Wildlife
NM Game Commission	Double E WMA	Purchased with Federal Funds and Natural Resources Damage Assessment Funds for Wildlife
NM Game Commission	Charette Lake Fishing Area	Purchased with Federal Funds for Fishing Opportunity and Waterfowl
NM Game Commission	South Bluit Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Marshall	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species

NM Game Commission	Black Hills Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	North Blutt Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Crossroads Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Sandhill Prairie Conservation Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Milnesand	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Sandhill Prairie Conservation Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Claudell Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Crossroads Prairie Chicken Area (PCA)	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	Gallinas Wells Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species

NM Game Commission	Liberty Prairie Chicken Area	Purchased with Federal Funds for Lesser Prairie Chicken, an ESA Candidate Species
NM Game Commission	La Joya Waterfowl Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Bernardo Waterfowl Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Belen Waterfowl Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Marquez Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Urraca Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	William A. Humphries Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Wagon Mound Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Jackson Lake Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Tres Piedras WMA	Purchased with Federal Funds for Wildlife
NM Game Commission	Heart Bar Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Bluebird WMA	Purchased with Federal Funds for Wildlife
NM Game Commission	Edward Sargent Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Huey Wildlife Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Rio De Los Pinos Wildlife Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Casa Colorada Waterfowl Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Elliott Barker Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Rio Chama Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Colin Neblett Wildlife Management Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Water Canyon Wildlife Area	Purchased with Federal Funds for Wildlife
NM Game Commission	Red Rock Wildlife Management Area	Purchased with Federal Funds. Desert Bighorn Sheep Rearing Facility
NM Game Commission	River Ranch WMA	Purchased with Share with Wildlife Funds encumbered by a Conservation Easement
NM Game Commission	Iron Bridge	Split title with TNC. Natural Land Protection Act Acquisition
NM Game Commission	Unknown	State Game Commission

NM Game Commission	Cimarron Canyon State Park	State Game Commission
NM Game Commission	Clayton Lake State Park	State Game Commission
NM Game Commission	Rio Abajo	State Game Commission owns 93 acres. Split deed with VCSWCD
USDA Forest Service/NM Game Commission	Fenton Lake State Park	State Game Commission; Federal Land - NMSA 77-18-5 A.1
NM Game Commission/NM State Parks	Eagle Nest Lake State Park	State Game Commission; Only (851) acres owned by State Parks
State Land Office/NM State Parks	Bottomless Lakes State Park	State Land Office - NMSA 77-18-5 A.1 (313.85 acres)
State Land Office/NM State Parks	Oasis State Park	State Land Office - NMSA 77-18-5 A.1 (33.44 acres)
State Land Office/NM State Parks	City Of Rocks State Park	State Land Office - NMSA 77-18-5 A.1 (680 acres)
State Land Office/NM State Parks	Rockhound State Park	State Land Office - NMSA 77-18-5 A.1 (80 acres)
Santa Fe County	Ortiz Mts Open Space	Steep, difficult access, nature preserve
Bernalillo County	Sedillo Ridge	Thinning started and planned for. Closed to public. Future plan for user groups, including equestrian, mountain biking, and hiking
NM Game Commission	Tucumcari Lake	Wetland Managed for Wildlife and Recreation
Ancones Ranch	Ancones	Wildlife Conservation Easement