National Park Service
US Department of the Interior
Big Bend National Park

Trespass Livestock Management Plan
Environmental Assessment

May 2018

Trespass cattle in Big Bend National Park below Punta de la Sierra

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TRESPASS LIVESTOCK MANAGEMENT PLAN

ENVIRONMENTAL ASSESSMENT

SUMMARY

The National Park Service (NPS) at Big Bend National Park (BIBE or park) proposes to protect park resources from the adverse impacts of domestic trespass livestock that enter the park from adjacent lands in Mexico and the US. These trespass livestock include horses, burros, and cattle. Trespass livestock damage the park's natural resources via grazing on and trampling vegetation; causing soil erosion from hoof disturbance, trail creation, and wallowing; and threatening cultural resources by trampling archeological and historic sites and rubbing against historic structures and rock art panels.

This environmental assessment (EA) evaluates two alternatives: the No Action Alternative and an action alternative, the Proposed Action. The No Action Alternative would continue current, individually applied management activities to control target trespass livestock. This limited approach is not preventing damage to park resources and the visitor experience over the long-term. The action alternative, the Proposed Action, would use an integrated approach to manage trespass livestock in the park. No lethal methods would be used. This EA examines the potential environmental impacts associated with the two alternatives and 1) analyzes a reasonable range of alternatives to meet objectives of the proposal; 2) evaluates potential concerns and impacts to the park's resources and values; and 3) identifies best management practices (BMPs) and other mitigation measures to avoid, reduce, or eliminate adverse effects.

Park managers conducted internal scoping with NPS staff and contractors and external scoping with agencies, organizations, and the public to identify resource concerns. The following resource topics were retained for analysis in this EA: soils, vegetation, wilderness, and archeological resources and historic structures.

PUBLIC COMMENT

If you wish to comment on this EA, you may post comments online at http://parkplanning.nps.gov/bibe, via email at bibe_planning@nps.gov, or mail comments to the name and address below. This EA will be on public review for 30 days. Before including your address, telephone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Superintendent
Attention: Trespass Livestock Management Plan and EA
P.O. Box 129
Big Bend National Park, Texas 79834-0129

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LIST OF ACRONYMS

AHPA	Animal Health Protection Act
APHIS	Animal and Plant Health Inspection Service
BMPs	Best Management Practices
BIBE	Big Bend National Park
BA	Biological Assessment
BO	Biological Opinion
CAA	Clean Air Act
CEs	Categorical Exclusions (NEPA)
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CONANP	Comisión Nacional de Áreas Naturales Protegidas
dBA	decibel (A-weighted)
DO	Director's Order
DOI	Department of Interior
EA	Environmental Assessment
EPA	Environmental Protection Agency
EO	Executive Order
ESA	Endangered Species Act
GMP	General Management Plan
IDT	Inter-Disciplinary Team
kg	kilogram
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
SHPO	State Historic Preservation Office
SOPs	Standard Operating Procedures
TPWD	Texas Parks and Wildlife Department
UAS	Unmanned aerial system
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
USDA	United Stated Department of Agriculture
USFWS	United States Fish and Wildlife Service
WMA	Wildlife Management Area
WMRDG	Wilderness Minimum Requirements Decision Guide

1. PURPOSE AND NEED

1.1 PURPOSE AND PROPOSAL

The National Park Service (NPS) at Big Bend National Park (BIBE or park) proposes to control and manage domestic trespass livestock that enter the park from adjacent lands in Mexico and the US. These trespass livestock include horses, burros, and cattle. Trespass livestock are known to damage native vegetation, increase soil erosion, and threaten cultural resources. As mandated by NPS Management Policies (2006), BIBE is required to manage non-native, exotic species that do not serve a park purpose.

The purpose of the proposal is to protect park resources and the visitor experience in wilderness from the adverse impacts of trespass livestock. More specifically, the action would protect the park's natural and cultural resources from trespass livestock and enhance the visitor experience of wilderness. The project would accomplish the following specific objectives:

1. Adhere to federal regulation and policy regarding livestock on NPS lands and along the international border.
2. Protect native species and habitats from damage by trespass livestock.
3. Restore soils and water resources in areas adversely impacted by trespass livestock.
4. Protect and preserve cultural resources from damage caused by trespass livestock.
5. Enhance the visitor experience by reducing direct impacts of trespass livestock upon visitor activities and by protecting native scenery.

Due to the difficulty of managing trespass livestock, a variety of actions is required to control their populations and thus reduce negative impacts to park resources and values. Actions include ground-based controls, aerial assisted controls, monitoring, and recordkeeping.

1.2 BACKGROUND

Regional Setting

Big Bend National Park (park) was established on June 20, 1935 by an act of Congress. The park covers more than 801,000 acres of south Brewster County in Southwest Texas. The "big bend" of the Rio Grande forms the park's southern international boundary with Mexico. The park has national significance as the largest protected area of Chihuahuan Desert topography and ecology in the United States (NPS 2004) and has international significance as a designated US Biosphere Reserve (UNESCO 2002).

The park's desert, mountain, and river environments support an extraordinary richness of biological diversity. The park is contiguous with or adjacent to the Rio Grande Wild and Scenic River, Big Bend Ranch State Park (more than 300,000 acres to the west of the park), Black Gap Wildlife Management Area (WMA) to the east (103,000 acres), and three flora and fauna protected areas in Mexico managed by the Comisión Nacional de Áreas Naturales Protegidas (CONANP) (Áreas de Protección de Flora y Fauna Cañón de Santa Elena, Maderas del Carmen,

and Ocampo). In 1994, the Mexican government created the Cañón de Santa Elena (approximately 685,000 acres) and Maderas del Carmen flora and fauna protected areas. In 2009, the Mexican government created the Ocampo Flora and Fauna Protected Area (approximately 826,000 acres), which links the two areas above and creates a contiguous protected area covering more than two million acres of desert and forest ecosystems. The Rio Grande Wild and Scenic River and the companion Monumento Rio Bravo in Mexico join the park to the Mexican protected areas. Altogether, these form an important ecological corridor that includes 240 miles of the Rio Grande. The combined US and Mexican reserves constitute a 3.3-million-acre conservation landscape. These international protected lands also share many common threats to natural and cultural resources (Wesson et al. 2014).

CEMEX is a multi-national cement company that developed a conservation program to buy and protect lands on both sides of the US/Mexico border in the Big Bend area (approximately 494,000 acres). The extensive CEMEX properties in the Maderas del Carmen Protected Area in Mexico and in the US between Black Gap WMA and the park makes CEMEX an important corporate conservation partner. The CEMEX Proyecto El Carmen in the Maderas del Carmen protected area, includes much of Boquillas Canyon. In Texas, the company owns the former Adams Ranch, adjacent to the park and downstream of Boquillas Canyon.

Neighboring US communities include Study Butte, Terlingua, Lajitas, and the Terlingua Ranch subdivision; all west of the park. Along the Rio Grande in Mexico are the small villages of Paso Lajitas, Santa Elena, San Vicente, and Boquillas. Large private ranches also share the US park boundary, and small Mexican ranches and community grazing lands (ejidos) occupy much of the land just south of the border.

Figure 1 depicts the park and surrounding areas. Trespass livestock can travel to and from these areas.

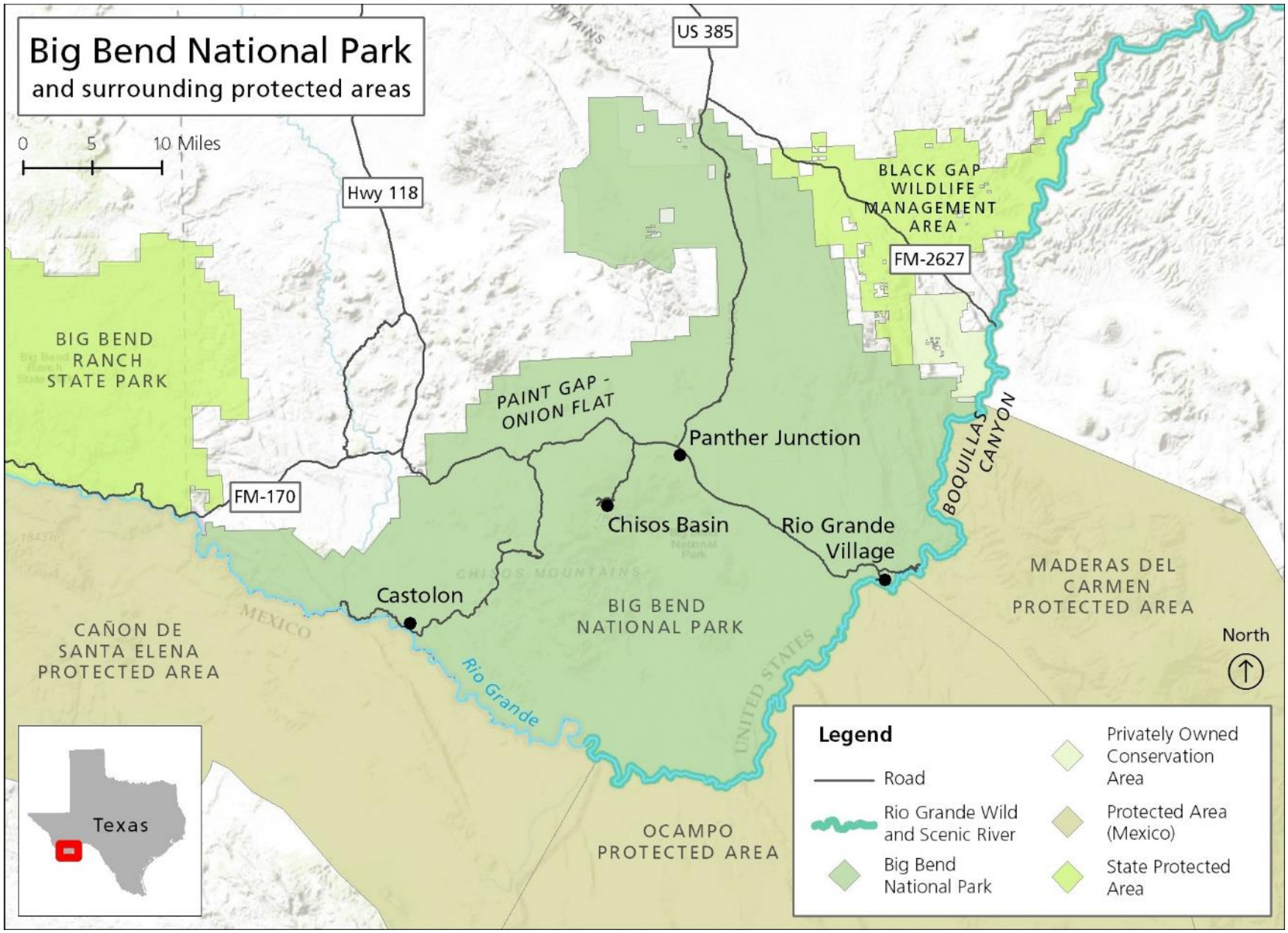


Figure 1 – Big Bend National Park and Surrounding Protected Areas

History of Trespass Livestock

Since the park was established in 1935, domestic horses, burros, and cattle have entered the park from neighboring lands in Mexico and the US and have damaged park resources. US law, specifically Title 36 Code of Federal Regulations (CFR) Part 2, Section 2.60, makes it illegal for livestock to be herded, driven across, pastured on, allowed on, or to run-at-large on park lands. There are exceptions to this requirement, but none apply to the trespass livestock in the park.

Results of fixed-wing and helicopter surveys conducted by the NPS from 2010 through 2015 indicate an average minimum of 93 head of livestock (cattle, horses, burros), graze the river zone of the park at any one time (NPS 2012, 2013, 2014, 2016c). Additionally, surveys have confirmed that a minimum of 12 horses consistently occupy the Paint Gap/Onion Flat zone of BIBE. Thus, a minimum average of 105 trespass livestock occupied the park during 2010 through 2014. The composition is 60% horses, 38% cattle, and 2% burros. The livestock are distributed almost entirely within two miles of the Rio Grande (NPS 2012, 2013, 2014, 2016c). The two-mile-wide corridor encompasses an area of 183 square miles, based on Geographic Information System (GIS) data. However, livestock within this zone are not distributed evenly due to landscape ruggedness, accessibility, and occupancy patterns in Mexico. Some areas are used more often or by greater numbers of livestock than others, resulting in resource-impact variability and patchiness throughout the corridor.

The primary sources of livestock that enter the park are ejidos, which are unfenced community lands in Mexico. Some are from larger private Mexican ranches. Trespass livestock are domestic, not wild, animals. Their owners are Mexican farmers and ranchers. Most trespass livestock that wander or are herded into the park have indicators of their domestic status, including but not limited to brands, ear-tags, collars, horseshoes, and occasionally bells. Given the economically challenged condition of ejido communities and farmers in Mexico, it has long been advantageous for livestock owners in Mexico to make use of grazing opportunities in the park when possible. Sometimes this is inadvertent, but often it is intentional (Carrera 1996). In all cases, it is illegal. The park's 118-mile-long boundary with the Rio Grande is not fenced because periodic flooding would damage or destroy fencing and create hazards to river navigation, and would block wildlife access to drinking water.

In addition to pushing horses and cattle onto the park to graze illegally, livestock owners in Mexico also bring burros into Boquillas Canyon, where workers harvest the candelilla plant, which is used to make wax. The workers use the burros in Mexico to transport heavy bundles of the plant to processing locations at river's edge in Boquillas Canyon. The harvest occurs during cooler months of the year. At the end of the production season, owners release burros to roam in the canyon, untended until the next production season. In general, the burros remain within a mile of the Rio Grande, which is their only source of water, and roam both sides of the river. Some burros have reproduced in the canyon, and not all are recaptured at the beginning of the next wax production season.

On the US side of the border, lands adjacent to the park are fenced, except in the Deadhorse Mountains where rugged terrain generally deters livestock from entering the park. On rare occasions, trespass livestock originate from US properties. More specifically, a small group of horses from an adjacent US ranch entered in the late 1980s or early 1990s and has remained in the park's Paint Gap/Onion Flat area. Current ranch owners in the area do not claim the animals

and terrain ruggedness has thwarted NPS efforts to remove them via traditional mounted wrangler methods.

The NPS conducted trespass livestock roundups over 18 roundup-days in 2012, 19 in 2013, 9 in 2014 and 9 in 2015 (NPS 2016c). Thus, roundup days averaged 13 per year. The total number of hours NPS horses were ridden in the field by roundup staff for trespass livestock management purposes is recorded as NPS horse-hours. In 2012 there were 64 NPS horse-hours used during trespass livestock roundups, 561 hours in 2013, 324 hours in 2014, and 64 hours in 2015. Thus the average yearly horse-hours was 253 during those years. Figure 2 illustrates the locations of trespass livestock captures in 2012 and 2013, which are typical.

In August 2007, the NPS conducted an aerial survey of Boquillas Canyon. The survey identified 120 burros, 12 horses, and one cow within one mile of the Rio Grande. Between 2010 and 2015, the NPS conducted six aerial surveys of BIBE trespass livestock. Helicopter surveys for trespass livestock were conducted in 2010 and 2012 (NPS 2016c). Fixed-wing surveys occurred in 2012, 2013, 2014, and 2015. The 2014 fixed-wing survey, limited to 79 miles of the 113-mile BIBE river corridor, produced the lowest trespass livestock count, at 10 animals. The 2012 helicopter survey of the entire BIBE river corridor produced the largest result, documenting 287 trespass livestock, mostly cattle, in the BIBE river corridor. The survey data indicates the average minimum number of trespass livestock present in the park at one time is 105. NPS survey data also document that on average 60% are horses, 38% are cattle, and 2% are burros. Figure 3 depicts locations of trespass livestock observations from 2007 through 2013.

During recent decades, frequency and intensity of livestock removal efforts on the park have been highly variable due to NPS and US Department of Agriculture (USDA) funding limitations and other priorities. Without sustained, regular roundup efforts, there is little livestock owner motivation to prevent livestock from trespassing in the park. As described above, the population appears to decline after an increase in roundup-days (NPS 2016c). During periods of increased NPS vigilance and roundup efforts, owners appear to increase efforts to keep their animals in Mexico. Park and USDA staff cannot pursue trespass livestock into Mexico.

To date, only ground-based, mounted wrangler methods have been used to control trespass livestock in the park. Those methods have proven unsuccessful in removing trespass livestock from very rugged and/or remote areas, such as Boquillas Canyon and Paint Gap/Onion Flat (see Figure 1), or to maximize removal of wary and fleeing animals in remaining areas. Even in less rugged areas, the unfenced nature of the park makes livestock capture challenging. This has resulted in trespass livestock being continually present in the park despite ongoing traditional efforts to reduce their numbers. The addition of helicopter assistance to roundups, and use of temporary traps, would increase effectiveness of trespass livestock removal. Where there is no ongoing source of new trespass livestock, such as Paint Gap / Onion Flat, removal of existing animals would result in a permanent livestock-free zone. The current management of trespass livestock has sporadically reduced the number of trespass livestock in the park, but has not adequately protected natural and cultural resources, or the visitor experience.

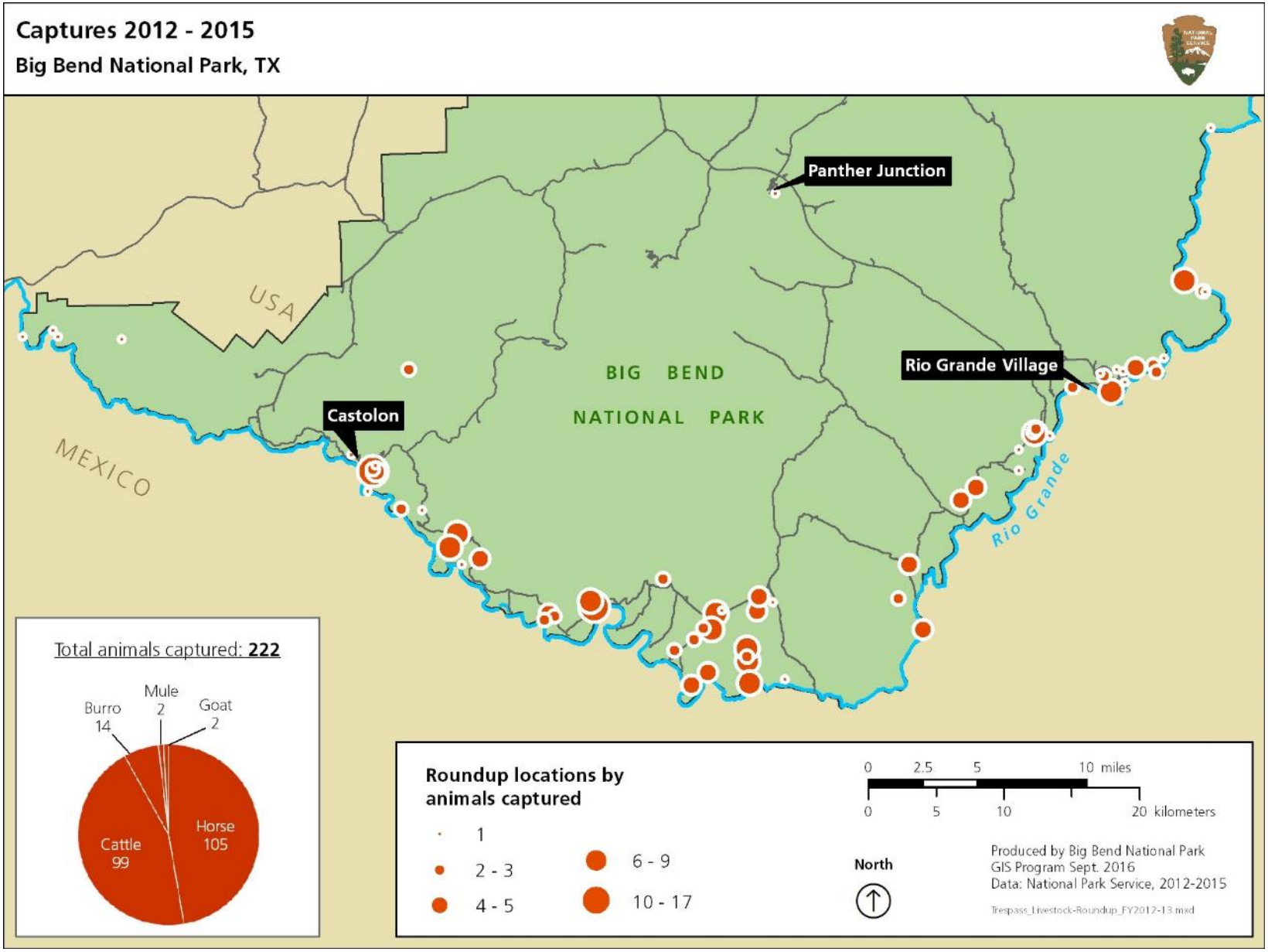
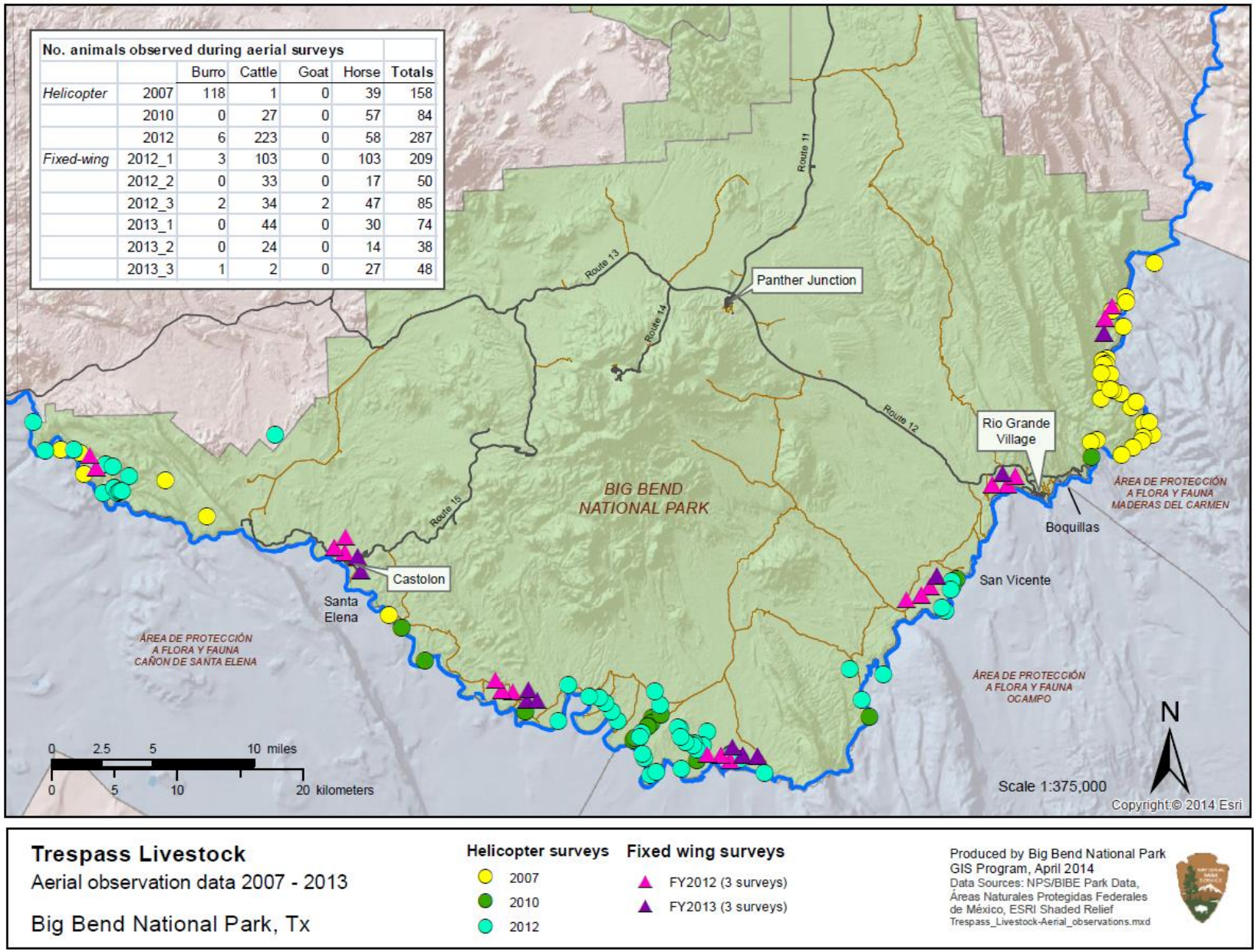


Figure 2 - Trespass Livestock Captures by NPS and USDA on BIBE, 2012-2013.



No. animals observed during aerial surveys						
		Burro	Cattle	Goat	Horse	Totals
Helicopter	2007	118	1	0	39	158
	2010	0	27	0	57	84
	2012	6	223	0	58	287
Fixed-wing	2012_1	3	103	0	103	209
	2012_2	0	33	0	17	50
	2012_3	2	34	2	47	85
	2013_1	0	44	0	30	74
	2013_2	0	24	0	14	38
	2013_3	1	2	0	27	48

Figure 3 - Trespass Livestock Observations on BIBE, 2007-2013

1.3 NEED AND KNOWN IMPACTS

Trespass livestock are known to cause soil erosion through hoof disturbance, trail creation, and wallowing, as well as damaging soil crusts. Long-term livestock use of steeply-sloping park terrain has created a spider web of trails and ridges that densely crisscross hillsides in some locations (NPS 2014). These networks of trails and ridges are known as terracettes (Trimble and Mendel 1995). Terracettes represent highly altered soil and vegetation conditions, with the livestock trample zone comprised of compacted soils and the edge of the terracettes comprised of sorted stones which create a "riser" effect on the edges. Root-zone soil disruption and heavy long-term grazing make native desert vegetation sparse in terracette areas. Photo 1 illustrates terracettes caused by trespass livestock in BIBE. Photo 2 illustrates a livestock trail through a cultural resource site.

Photo 1. Terracettes caused by trespass livestock, on Mesa de Anguila.

Photo 2. Livestock trail through an archeological site featuring fire-cracked rock midden.

Remote sensing was completed in 2016 using Google Earth Pro to evaluate the extent of terracette development in the park. At least 5.7 square miles of park lands exhibit severe terracette development (NPS 2016b). The most severely affected areas are 2.4 square miles near the Rio Grande between Lajitas and Santa Elena Canyon along with several slopes within Boquillas Canyon comprising an area of 3.3 square miles (NPS 2016b).

Trespass livestock damage native vegetation by grazing and trampling, during which they sometimes trample rare plants. Hoof action, trailing, and wallowing by livestock erodes and compacts soils, which impedes seedling establishment and normal growth of existing vegetation. Trespass livestock also deposit feces which transport invasive plant seeds.

One of the biggest impacts within BIBE from trespass livestock is damage to archeological and historic sites by creating trails through sites and rubbing against historic structures and rock art panels. Figures 4 and 5 illustrate damage to cultural resource sites from trespass livestock.

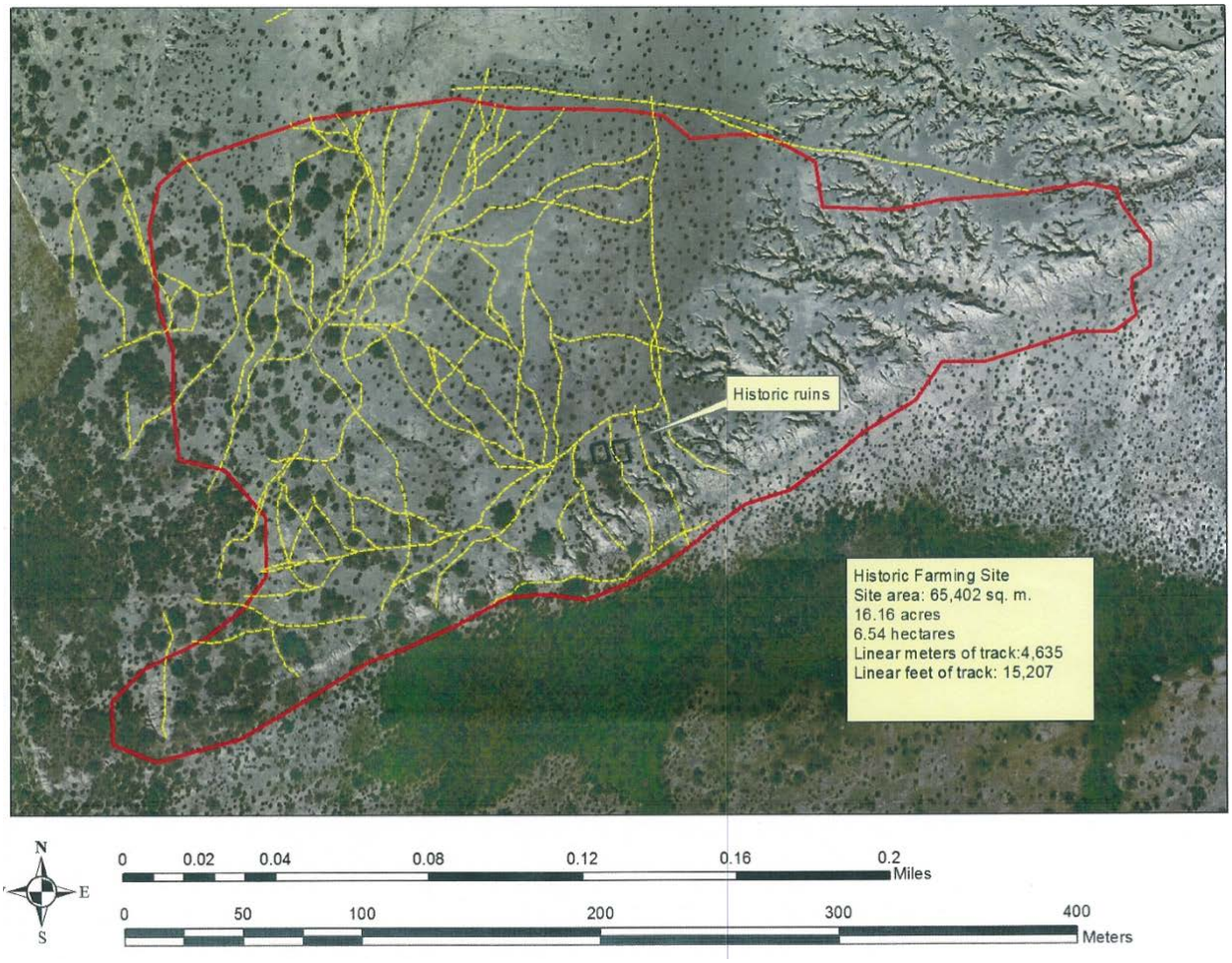


Figure 4 - Example of Trespass Livestock Trails in a Historic Site (16 acres), 2016

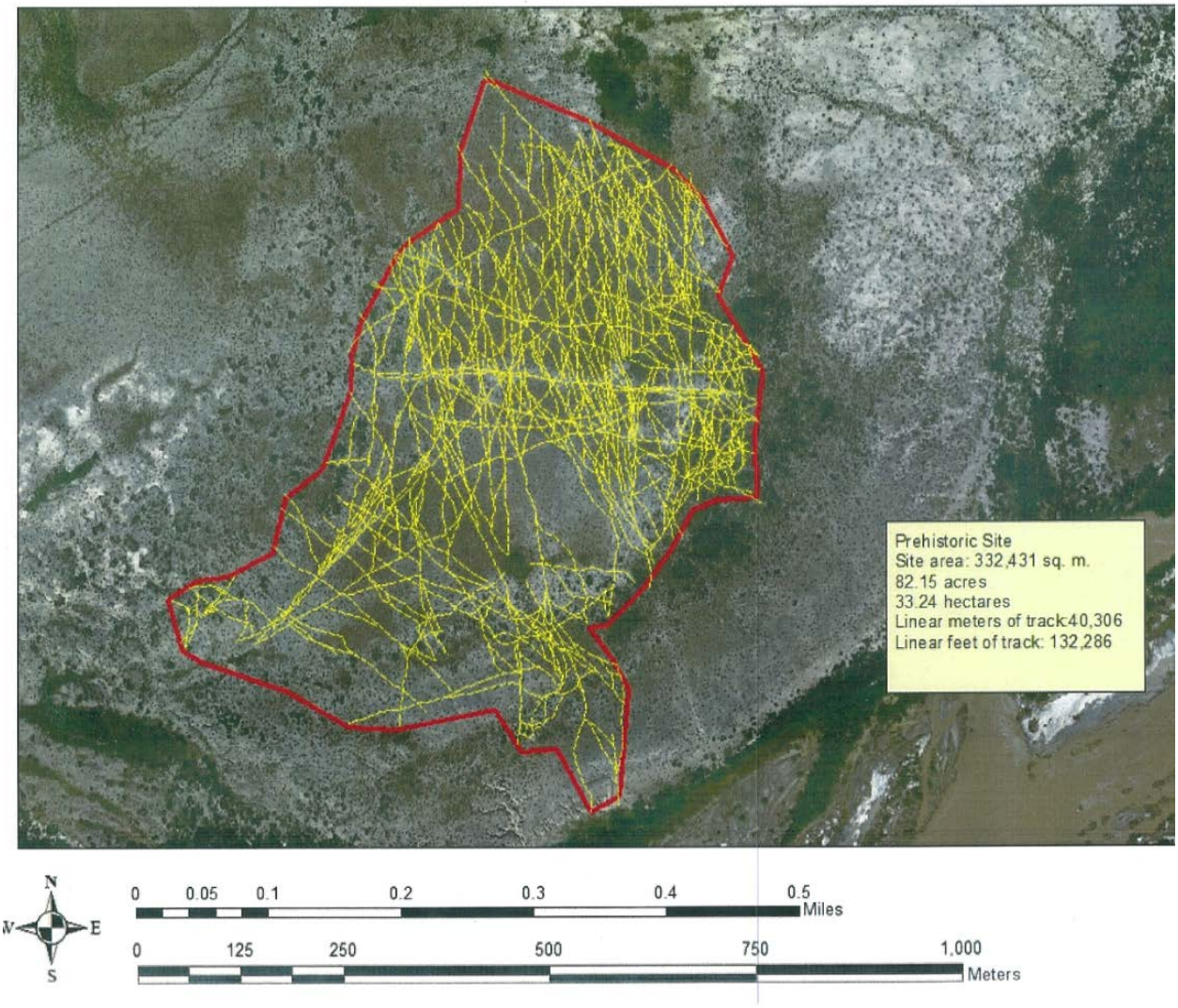


Figure 5 - Example of Trespass Livestock Trails in a Prehistoric Site (82 acres), 2016

Finally, trespass livestock detract from the visitor experience by creating trails and wallows in campsites; by littering campsites, parking areas, and roadways with feces; entering occupied campsites and disturbing visitors; and intruding on the visual scene.

1.4 IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS

Impact topics for this proposal were identified based on known or potential impacts from feral hogs and aoudads or their management. Input from other conservation organizations in the region, public input, and NPS knowledge of resources at BIBE was used to determine the impacts. Impact topics that are carried forward for further analysis in this EA include:

- Soils
- Vegetation
- Wilderness
- Archeological Resources and Historic Structures

1.5 IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

This section provides a limited evaluation and explanation of why some impact topics are not evaluated in more detail.

Air Quality

BIBE is located in an area classified by the US Environmental Protection Agency (EPA) as being in attainment for all six criteria air pollutants. However, BIBE is also known to have some of the worst visibility-reducing haze (primarily due to sulfate releases from power plants) of any western US national park (NPS 2004). Activities associated with trespass livestock and their management that could result in criteria air pollutant emissions would be limited to vehicle use and would not contribute to sulfates. Pollutants relevant to vehicle use include carbon monoxide, nitrogen oxides, volatile organic compounds, and particulate matter. Trespass livestock do not contribute to criteria air pollutants. The limited vehicle use for the No Action is much lower than for the Proposed Action. The NPS quantified the magnitude of additional annual emissions associated with exotic ungulate management under the Proposed Action. Those results were then used to determine if additional air quality modeling was necessary.

Under the Proposed Action, airplane use would be limited to 6 hours a day for 5 days per year; helicopter use would be limited to 8 hours a day for up to 20 days per year; and vehicle use would be intermittent over up to 30 days per year for trespass livestock management activities. This results in a maximum 30 additional hours airplane use, 160 hours helicopter use, and 240 additional hours vehicle use per year. The maximum likely emissions would be less than 0.5 ton per year of carbon monoxide, less than 0.05 ton of nitrogen oxides, volatile organic compounds, and particulate matter (EPA 2008; US Air Force 2013).

For comparison, existing airplane use generates less than 0.1 ton of all these except carbon monoxide which is less than 3 tons per year. Existing ground vehicle use by visitors and park operations results in estimated total annual emissions of less than 5 tons per year of carbon monoxide, less than 1 ton each per year of nitrogen oxides and volatile organic compounds, and almost no particulate matter. Table 1 summarizes the estimated maximum likely emissions under both the No Action and the Proposed Action.

Table 1 – Criteria Air Pollutants Estimated Maximum Likely Emissions (in tons per year)

Pollutant	No Action	Proposed Action (additional to No Action)	Regional Benchmark
Carbon Monoxide	< 8	< 0.5	1,426
Nitrogen Oxides	< 1	< 0.05	1,338
Volatile Organic Compounds	< 1	< 0.05	123,445
Particulate Matter	< 0.1	< 0.05	28,452

Source: Calculated based on data available in EPA 2008 and US Air Force 2013. Regional benchmarks obtained for Brewster County, Texas from the EPA National Emissions Inventory for 2014 from https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data.

The Proposed Action represents an increase of approximately 5-6 percent for any particular pollutant. If unmanned aerial systems (UAS) are eventually used instead of airplanes or helicopters for some of the Proposed Action, emissions would be even lower. Given this low annual emissions level under either the No Action or Proposed Action, daily pollutant concentrations resulting from trespass livestock management are anticipated to be extremely low and there would not be a noticeable change in overall air quality. Thus, this topic was dismissed from further analysis in this EA.

Biosphere Reserves

The park is a designated US biosphere reserve. Biosphere reserves are terrestrial or coastal/marine ecosystems or a combination, internationally recognized within the framework of the United Nations Educational, Scientific and Cultural Organization's (UNESCO) program on Man and the Biosphere. Biosphere reserves are established to promote and demonstrate a balanced relationship between humans and the biosphere. Neither alternative alters the ability of BIBE to serve as a biosphere reserve. BIBE would continue to serve the same functions for conservation, sustainable development, and logistic support of research functions. Thus, this topic was dismissed from further analysis in this EA.

Environmental Justice

Trespass livestock in the Big Bend region are not used by minority or low income populations within the US or its territories for food or income. They are used by populations within Mexico, but those impacts are not analyzed in this EA. Under the Proposed Action, none of the management activities are expected to impact minority or low income populations in the US. The park would remain available for use by all people regardless of race or income, and any contract support would not be hired based on race or income. Furthermore, the park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors. As both alternatives would similarly affect park residents and residents of surrounding communities in the US, no disproportionate effects would occur. Neither alternative would result in any impacts to minority populations or low-income populations in the US. Thus, this topic was dismissed from further analysis in this EA.

Wild and Scenic River

Of the Park's 118-mile BIBE reach of the Rio Grande, the lower 71 miles is within the Rio Grande Wild and Scenic River, designated in 1978 under the National Wild and Scenic Rivers Act of 1968. Descriptively, the designation within BIBE begins upstream of Mariscal Canyon and extends downstream to the park boundary below Boquillas Canyon, for ¼ mile within the park boundary. The designation was made because of its "outstandingly remarkable" scenic, geologic, fish and wildlife, and recreational values. The Act itself and the outstanding remarkable values for the Rio Grande Wild and Scenic River do not preclude the presence of agriculture, livestock, and / or other traditional uses. Both the national park status of the reach and the Proposed Wilderness status of portions of the park adjacent to the river within Mariscal and Boquillas Canyons are more restrictive than the Wild and Scenic River designation. Presence of trespass livestock does not jeopardize the outstanding remarkable values or the designation of this reach as a Wild and Scenic River nor does management of trespass livestock. Thus, this topic was dismissed from further analysis in the EA.

Natural Soundscapes

Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in an NPS unit, together with the physical capacity for transmitting natural sounds. The range of frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units, as well as potentially within each NPS unit, being generally greater in developed areas and less in undeveloped areas.

Activities described in this document, in both the No Action and Proposed Action Alternatives, include use of motorized equipment. The No Action Alternative would not modify the natural soundscapes from what currently occurs. Under the No Action alternative, approximately 400 hours would continue being flown annually for various BIBE purposes. These would be in addition to overflights by Border Patrol, military, commercial tours, and private aircraft. Hours flown by other agencies are not reported to nor tracked by NPS; however, military overflights generally average 4,800 flights per year.

The Proposed Action would add 30 hours a year to the 400 hours flown annually by the BIBE airplane. Aircraft noise impacts to natural soundscapes and visitor experience would be minimized through appropriate flight planning and voluntary compliance with the minimum altitudes in FAA Advisory Circular AC 91-36D (flight typically 2000-5000 feet above ground level). The Proposed Action would also add a maximum of 160 hours helicopter use per year during daylight hours. Helicopters may fly at lower altitudes (as low as 200 feet during control operations but higher in transit), when needed, and are more likely to generate noise sufficient to impact natural soundscapes. Helicopters most likely to be used in the Proposed Action are the Bell Jet Ranger, or similar models with similar noise profiles. These helicopters generate approximately 87 A-weighted decibels (dBA) at 200 feet above ground level and 50 dBA at 4,000 feet above ground level (Newman et al. 1982). If unmanned aerial systems are eventually used instead of airplanes or helicopters for some of the activities (primarily monitoring), noise levels would be approximately 30 decibels lower at the same altitudes.

Natural soundscapes would return immediately after each aerial event and the total period with potential increase in noise impacts due to trespass livestock management across the park would be only 0.02 percent of the year (an additional 30 hours of airplane and 160 hours of helicopter use). During any given year, only a small area of the park will experience a temporary noise increase during any control activity. Flight paths for helicopter use would be at a higher elevation from the Panther Junction helibase or other designated in-park landing site, or from a starting point outside the park, to the target destination, then a zig-zag herding pattern would be flown through each control zone. The helicopter would then make a return flight to the helibase for a total 3 hours maximum per flight. Even with these temporary adverse impacts, the natural soundscape would generally remain high quality throughout the park.

Other sources of noise under the Proposed Action include ground vehicles. Noise from ground vehicle use would largely be similar to existing ground vehicle use and be restricted to existing roads. For comparison, a chainsaw is typically 100 decibels at typical range, a large jet 100 feet above ground level is 130 decibels, while quiet wilderness is approximately 10 decibels (from Acoustical Society of America website). Under typical conditions, aircraft sounds would not be heard more than 3 miles away from the source.

In both the Paint Gap/Onion Flat area, and a portion of Boquillas Canyon, which are each roughly 1,280 acres, helicopter noise would be limited to the first year or two while the existing populations are removed. After that there would be no need for further helicopters in Paint Gap/Onion Flat as no new trespass livestock are likely to reinvade that area and only rarely (possibly 1 day per year for 8 hours) in Boquillas Canyon. The majority of helicopter use would be along the Rio Grande Corridor (approximately 105,000 acres) where trespass livestock are most common and regularly reinvade the area. Locations within this zone could experience helicopter noise up to 20 days per year (between 3 and 8 hours per day). The remainder of the park would only experience helicopter noise if trespass livestock have invaded, which is less likely with more effective control efforts along the Rio Grande. Overall, this is a relatively small portion of the entire park (more than 800,000 acres) and the number of hours a year where helicopter noise would occur is small.

While the Proposed Action does generate more noise than the No Action, neither alternative would generate sufficient adverse effects to alter the overall high quality of the natural soundscape. Thus, the topic was dismissed from further analysis in this EA. Effects of Proposed and No Action alternatives on soundscape specifically in the Wilderness context are addressed under the topic of Wilderness and in the Wilderness Minimum Decision Requirement Guide (Appendix A).

Wildlife

Trespass livestock have created adverse impacts on wildlife habitat, including habitat for birds protected under the Migratory Bird Treaty Act (MBTA), by trampling, browsing, and soil disturbance. Approximately 34 square miles of desert and riparian wildlife habitat would be impacted under the No Action Alternative. While this is a sizeable area, it is a small area of wildlife habitat relative to the larger 5,150 square miles of protected area in the Big Bend region, plus additional wildlife habitat present on other types of lands. In addition, most wildlife can move on an individual basis to find undamaged habitat or to avoid interacting with trespass livestock. Therefore, the No Action alternative would have very limited to no adverse effects on wildlife, including birds protected under MBTA.

The use of horses for NPS operations in BIBE already occurs for a variety of reasons, corrals would be placed away from any occupied breeding habitat and generally away from wildlife habitat, and helicopters and aircraft land and take off from established areas. The use of helicopters for up to 8 hours during the day up to 20 days per year will generate some additional noise, primarily along the Rio Grande. There are birds protected under MBTA that use this area for foraging and breeding. Individual wildlife may notice a helicopter but a helicopter would not remain in one place for more than a few minutes (in rare occasions near a corral possibly up to 1 hour) during a particular control event. That same area (and wildlife within) is likely to not experience further noise from trespass livestock management more than a few times per year at most. Therefore, exposure and potential impact from the noise of trespass livestock management on individual wildlife is limited to a few minutes to an hour per year, primarily along the Rio Grande.

Implementing the Proposed Action would have beneficial impacts on wildlife, including birds protected under MBTA, due to recovery of wildlife habitat after removal of trespass livestock. In addition, mitigation measures and BMPs used to protect special status species (see below), particularly in the Rio Grande corridor, would benefit other wildlife who breed and forage

during the same time of year and in the same habitat. When accounting for the regional conservation lands and additional wildlife habitat available throughout the Big Bend region, neither alternative is expected to have adverse effects on wildlife or their populations within BIBE or the region. Thus, this topic was dismissed from further analysis in this EA.

Special Status Species

Ten federally listed species (1 mammal, 5 birds, 4 plants) identified as occurring in Brewster County by USFWS and/or TPWD were dismissed from analysis because they were determined by NPS and USFWS to not occur in BIBE, nor do they have potential habitat in BIBE. For a complete discussion of these species and why there were dismissed, refer to Table 5 in Section 6 of the *Biological Assessment for Exotic Species Management Plans, Big Bend National Park* (NPS 2015).

Due to location, size, connectivity with other protected lands, and high quality habitat, there are a large number of federally and state-listed animal species known to the park. Table 2 lists the federal- and state-listed special status species that are known or have potential to exist in the park. It does not include federal or state-listed species that have been documented in Brewster County but are either confirmed to not occur in the park or are highly unlikely to occur in the park. For more details on these species and their occurrence and habitat in BIBE, refer to the *Biological Assessment for Exotic Species Management Plans, Big Bend National Park* (NPS 2015).

Table 2 – Listed and Protected Animal Species Known or Likely to Occur in BIBE

Common Name	Scientific Name	Status
Big Bend gambusia	*Gambusia gaigei*	Federal Endangered
Rio Grande silvery minnow	*Hybognathus amarus*	Federal Endangered (Experimental, Non-essential)
Texas hornshell	*Popenaias popei*	Federal Candidate
Mexican long-nosed bat	*Leptonycteris nivalis*	Federal Endangered
Yellow-billed cuckoo	*Coccyzus americanus*	Federal Threatened and Proposed Critical Habitat (both for Western DPS only)
Southwestern willow flycatcher[1]	*Empidonax traillii extimus*	Federal Endangered
Mexican spotted owl[1]	*Strix occidentalis lucida*	Federal Threatened
Black-capped vireo	*Vireo atricapillus*	Federal Endangered
Bunched cory cactus	*Coryphantha ramillosa*	Federal Threatened
Chisos Mountain hedgehog cactus	*Echinocereus chisoensis chisoensis*	Federal Threatened
Lloyd's Mariposa cactus	*Echinomastus mariposensis*	Federal Threatened
Guadalupe fescue	*Festuca ligulata*	Federal Candidate and Proposed Critical Habitat
Golden eagle	*Aquila chrysaetos*	Federal Bald and Golden Eagle Protection Act
Bald eagle	*Haliaeetus leucocephalus*	Federal Bald and Golden Eagle Protection Act; State Threatened
Common Name	**Scientific Name**	**Status**
Gray hawk	*Asturina nitida*	State Threatened
White-tailed hawk	*Buteo albicaudatus*	State Threatened
Zone-tailed hawk	*Buteo albonotatus*	State Threatened

Common Name	Scientific Name	Status
Common black-hawk	*Buteogallus anthracinus*	State Threatened
Swallow-tailed kite	*Elanoides forficatus*	State Threatened
Reddish egret	*Egretta refescens*	State Threatened
American peregrine falcon	*Falco peregrinus anatum*	State Threatened
White-faced ibis	*Plegadis chihi*	State Threatened
Rose-throated becard	*Pachyramphus aglaiae*	State Threatened
Tropical parula	*Parula pitiayumi*	State Threatened
White-nosed coati	*Nasua narica*	State Threatened
American black bear	*Ursus americana*	State Threatened
Spotted bat	*Euderma maculatum*	State Threatened
Reticulated gecko	*Coleonyx reticulatus*	State Threatened
Texas tortoise	*Gopherus berlandieri*	State Threatened
Texas horned lizard	*Phrynosoma cornutum*	State Threatened
Trans-Pecos black-headed snake	*Tantilla cucullata*	State Threatened
Mexican stoneroller	*Campostoma ornatum*	State Threatened
Blue sucker	*Cycleptus elongatus*	State Threatened
Chihuahua shiner	*Notropis chihuahua*	State Threatened
Salina mucket	*Potamilus metnecktayi*	State Threatened

[1] Species not documented in the park but potential habitat is found in the park.

NPS, unpublished data BIBE Natural History Field Observation records; in-house survey and mapping, (verified November 2017). Likely federally listed species confirmed with USFWS as part of Biological Assessment in 2015 and verified through USFWS and TPWD County List website in November 2017.

As with wildlife, both alternatives would have very limited to no impacts on special status animal species. Aquatic species (both federally and state-listed) would not be impacted by either trespass livestock or their management under either alternative. These include Big Bend gambusia, Rio Grande silvery minnow, Texas hornshell, Mexican stoneroller, blue sucker, Chihuahua shiner, and salina mucket. Big Bend gambusia are almost entirely fenced off and protected from trespass livestock and no trespass livestock management will occur in the ponds. The remaining aquatic species all occur in the Rio Grande, and possibly a short distance up Terlingua Creek. Livestock are unlikely to step on or harm directly any individual and the sediment resulting from livestock presence under either alternative is small in relation to the overall volume of water and sediment load from upstream that flows through the Rio Grande daily and is unlikely to impact aquatic species.

A number of federally and state listed species are associated with the Chisos Mountains, where trespass livestock are not found and where it is unlikely trespass livestock management would ever be performed. These include Mexican long-nosed bat, Mexican spotted owl, black-capped vireo, American black bear, and Trans-Pecos black-headed snake.

There are also a number of federally and state listed species that occur throughout the park and would generally not likely be impacted by trespass livestock or their management. These include all raptors (i.e., eagles, hawks, falcon, and kite), tropical parula, spotted bat, reticulated gecko, and Texas horned lizard. Use of airplanes would be limited and bird strikes are not generally known with helicopters. Bird species in general would not likely be affected by trespass livestock management, with the exception of infrequent and short duration helicopter noise

impact. Given the short duration of control activities in any one location and the general avoidance of occupied habitat, control activities are unlikely to have a long-term effect on any individual or population. Spotted bats are nocturnal and would not be out at BIBE during management activities. Reticulated geckos and Texas horned lizards are both cryptic species that are usually well hidden and would just freeze or hide while any trespass livestock or management activities pass through their area.

Neither eagle is known to nest in BIBE. Up to several wintering golden eagles forage broadly over BIBE each year. Wintering bald eagles are documented less than once in several years on average. Helicopter noise could temporarily disrupt eagle foraging behavior, although the likelihood of an eagle being present and impacted by a control activity in any given year is very low. Given the short duration of control activities in any one location, and eagle mobility, control activities are unlikely to have a long-term effect.

There are four federally listed plant species, with no additional state-listed species. No effects under either action would be likely on the Lloyd's mariposa cactus, Chisos hedgehog cactus, or Guadalupe fescue as trespass livestock are either rare or do not occur in the same locations and no control activities would occur in habitat for these listed plants. Bunched cory cactus occur near trespass livestock along the Rio Grande. Livestock are known to cross through bunched cory cactus populations while moving between grazing areas; however, livestock generally just pass through and generally would avoid stepping on a cactus. During control activities, livestock may move in any direction and occasionally enter bunched cory cactus habitat; however, wranglers do not enter cactus habitat and direct livestock away from these populations. Control activities (i.e., ground-based removal activities, corrals, traps, etc.) would avoid all known cactus populations, which would reduce the likelihood of accidental trampling of bunched cory cactus to a discountable (extremely unlikely) effect.

The federally and state listed species most likely to be impacted by either trespass livestock or their management are those terrestrial species found along the Rio Grande. These include yellow-billed cuckoo, southwestern willow flycatcher, reddish egret, white-faced ibis, rose-throated becard, and white-nosed coati. The cuckoo and flycatcher are discussed below; the remaining species are uncommon in the park and can avoid any management activities while they are occurring and would not be likely to be affected by trespass livestock themselves.

For more details on survey results, population data, and known locations within BIBE, refer to the *Biological Assessment for Exotic Species Management Plans, Big Bend National Park* (NPS 2015). The impacts of this Plan on federally listed species were also analyzed in this Biological Assessment (BA). The BA was prepared for activities related to trespass livestock management, as well as for activities related to managing exotic animals, exotic plants, and direct management activities associated with federally listed species. The BA concluded that there would be either no effect or indirect beneficial effects of trespass livestock management (Proposed Action) on federally listed species, with the exception of two species (yellow-billed cuckoo and southwestern willow flycatcher). The BA noted that, under the Proposed Action, helicopter use during livestock roundup would have the potential to disturb western yellow-billed cuckoos and, should they exist in the area, southwestern willow flycatchers. Helicopter noise may cause temporary disruption of foraging. Helicopter use would likely be in these species' habitat as trespass livestock routinely occur along the Rio Grande and Terlingua Creek. Helicopter use near or in potential habitat would be limited to 3-8 hours per day up to a maximum of 20 days per year. Helicopter use parkwide for trespass livestock management would be limited to 20

days per year. Much of that would be along the Rio Grande. Overall, removal of trespass livestock would be beneficial to western yellow-billed cuckoos and southwestern willow flycatchers by preventing habitat damage. Helicopter noise effects would generally be either insignificant (limited duration) or discountable (unlikely).

The USFWS concurred with the above determinations in a Biological Opinion dated December 15, 2015 (USFWS 2015), and confirmed by the USFWS in January 2017. USFWS consultation is summarized in Section 4.1.

In addition, the BMPs (Appendix D) and mitigation measures (Section 2.2) would ensure that management actions would not adversely impact listed animal species. Impacts to listed animal species from trespass livestock are unlikely or of small magnitude and only occur in a portion of the park, primarily along the Rio Grande. These impacts are most likely under the No Action Alternative as there would be more intensive control efforts in the Proposed Action, so trespass livestock numbers would be lower. In summary, because the potential effects on state and federally listed species or proposed critical habitat would be either non-existent, highly unlikely, or temporary as described above, this topic was dismissed from further analysis in this EA.

Surface Water

Surface water in BIBE includes the Rio Grande, streams, wetlands, and natural springs. There are 118 miles of the Rio Grande within park boundaries. Tornillo Creek and Terlingua Creek are large, named tributaries of the Rio Grande within the park. Additionally, there are dozens of additional small, unnamed tributaries (based on National Atlas geographic data). In addition to the Rio Grande and its tributaries, the park features more than 350 discrete sources of surface water, including springs (NPS, unpublished data, 2008), and other natural catchment that hold water for extended periods. There are 69 springs within the 2-mile-wide zone along the Rio Grande, including Boquillas Canyon. There are 10 springs in the Paint Gap/Onion Flat area (NPS springs database, unpublished data, 2017).

Intermittent streams and wetlands have not been mapped in BIBE. Wetlands generally occur as small fringes along springs, seeps, and streams. Wetlands within the 2-mile-wide river zone include springs/wetlands near Rio Grande Village and wetlands associated with Tornillo Creek and Terlingua Creek. Before establishment of the park, agricultural development degraded the extensive wetlands and springs near Rio Grande Village. Pre-park agricultural development resulted in containment of springs, diversion into irrigation systems, and removal of beaver populations. When Rio Grande Village campground, roads, and maintenance facilities were established, they were placed in areas cleared by decades of agricultural use. Five decades of protection and removal of former infrastructure have allowed some natural re-establishment of wetlands in the area. Warm springs supply two artificial ponds and a beaver pond with water to support the only habitat of endangered Big Bend mosquitofish. These wetland areas have high NPS and visitor presence and almost no trespass livestock.

NPS staff noted trespass livestock disturbance during a 2010-2012 inventory of springs and during a 2014-2016 pilot monitoring study (NPS 2016f). Based on these inventories, the springs in the Paint Gap/Onion Flat area did not show impacts from trespass livestock, but 5 of 24 surveyed springs in the Rio Grande corridor had signs of trespass livestock disturbance such as browsing, hoof impact, and scat (NPS 2016f). The signs generally were mild with browsed

vegetation and a few hoof impacts and feces. Only one spring had disturbance with clear vegetation trampling and damage to banks of the spring.

Under the No Action Alternative, trespass livestock would continue to show signs of visiting a small number of springs and occasionally trampling vegetation near a spring. These are relatively small impacts (e.g., hoofprints visible on the water's edge, a few plants pushed over/stepped on but not killed) in a very small number of locations (20%) and all within 2 miles of the Rio Grande.

Trespass livestock walking in the Rio Grande or crossing the Rio Grande would contribute a negligible amount of additional sediment above that already present in the Rio Grande. Livestock are not creating or eroding crossing points on the Rio Grande. Under the Proposed Action, mitigations and BMPs would avoid and protect surface waters during trespass livestock management by ensuring activities avoid them. Removal of trespass livestock would eliminate or reduce the few impacts that are occurring at or near surface waters. Neither alternative is expected to alter the surface waters present on BIBE. Thus, this topic was dismissed from further analysis in this EA.

Paleontological Resources

The park is known to contain an abundance and diversity of paleontological resources representing an uninterrupted 35 million-year fossil record, which includes fossil remains of dinosaurs, crocodiles, turtles, plants, fish, amphibians, and early mammals. Mitigation measures and BMPs have been established (Section 2.2 and Appendix D) to protect paleontological resources. Under both the No Action and Proposed Action, if previously unidentified paleontological resources should be found during ground-disturbing activities associated with the proposal, work would stop in the area of discovery and an NPS paleontologist would determine the appropriate treatment of those resources in accordance with *NPS Management Policies 2006*, NPS Reference Manual 77, and the *Paleontological Resources Protection Act* of 2009. Because known paleontological resources would be avoided and mitigation measures implemented to manage any potential discovery of paleontological resources, it is anticipated that neither alternative would have impacts on paleontological resources. Thus, this topic was dismissed from further analysis in this EA.

Cultural Landscapes

Cultural landscapes in the park contain physical evidence of the full spectrum of human use in the Big Bend region, including aboriginal hunting and gathering by American Indians, Spanish colonial military and exploration, European and American settlement, military encampments, ranching, farming, and mining. The only designated cultural landscape that is eligible for listing on the National Register of Historic Places within the area of potential effect of this proposal is the Mission 66 cultural landscape at Rio Grande Village. Neither alternative is expected to alter the Village's cultural landscape since trespass livestock generally do not occur within the Rio Grande Village development. Thus, this topic was dismissed from further analysis in this EA.

Ethnographic Resources

In February 2017, consultation letters were sent to sixteen Native American tribes affiliated with BIBE. The letters requested tribal input to determine if there were cultural resources, sacred

sites, or natural resources within the park that warrant further avoidance or protective measures (beyond those described in plan mitigations). Thirteen of the tribes responded verbally by telephone or in writing. All thirteen either indicated support for the Proposed Action with mitigations, or chose to offer no comment. Thus, this topic was dismissed from further analysis in this EA.

Indian Trust Resources and Sacred Sites

Indian trust resources are assets held in trust by the US for Native Americans. The federal Indian trust responsibility is a legally-enforceable fiduciary obligation on the part of the US to protect tribal lands, assets, resources, and treaty rights. There are no Indian trust resources or sacred sites identified in BIBE, and no tribes have requested use of BIBE sites for ceremonial or sacred purposes. The presence of trespass livestock or their management would not affect the ability of a tribe to access sacred sites within the park, if requested in the future. Thus, this topic was dismissed from further analysis in this EA.

Health and Safety

NPS policies and safety management systems prescribe established health and safety analysis, planning, and decision protocols, applicable to all actions and activities undertaken by NPS personnel. When applied appropriately these mechanisms ensure staff and visitor safety. These protocols are applicable to the various activities included under all alternatives. Many of the activities identified in the described alternatives are also performed in the park for purposes other than trespass livestock management (e.g., horseback mounted activities, using planes and helicopters, managing administrative livestock in corrals, etc.). Required NPS safety management systems and protocols would be applied regardless of purpose.

Qualified NPS personnel could on occasion ride in helicopters certified through the DOI Aircraft Management Division for Aerial Capture, Eradication, and Tagging of Animals (ACETA) for the activities described in the proposed actions. Non-DOI certified contract or other-agency craft may participate, but NPS staff would not ride in, or work within the risk perimeter of such aircraft. While no activity is without risk, and risk is a recognized component of livestock management and aviation activities, appropriate application of established NPS risk management systems and protocols reduces such risk to the level of a negligible adverse effect for the purpose of this analysis. Neither alternative alters the level of risk to NPS personnel or users, therefore, this topic was dismissed from the EA.

Visitor Experience

Every year, more than 300,000 people visit the park, including more than 15,000 overnight backpackers in 2016. Over 400,000 people visited the park in 2017. The average stay in the park is three days, two days longer than the typical stay at national parks nationwide. The most common visitor use in trespass livestock management zones is driving relatively short stretches of paved road. About 15 miles of paved road lies within two miles of the Rio Grande. Next is driving the unpaved River Road (45 miles, all unpaved). Drive-in camping is third, with Rio Grande Village (130 sites) and Cottonwood (at Castolon, 24 sites) campgrounds, both adjacent to the river and paved-road access. There is also drive-in camping at 22 designated campsites spread out along the unpaved River Road. River use for day and overnight float trips is a common activity, with most people floating one of the three major canyons (Santa Elena,

Mariscal, Boquillas). The least common visitor activity within trespass livestock management zones are backpacking and backcountry trail hiking; nonetheless, hiking is a popular recreational activity in the park.

Trespass livestock are rarely found in high-use campsites and developed areas, such as Castolon or Rio Grande Village. Visitors most likely to be affected by trespass livestock or their management are those staying overnight in backcountry areas and those using the river for overnight trips.

In 2015, there were approximately 3,500 user-days associated with river trips; 2,777 user-days in drive-in back-road campsites within 2 miles of the Rio Grande (Zone 2); 557 overnight backpackers along the Rio Grande, mostly on the Marufo Vega trail of Boquillas Canyon (Zone 1); and 143 user-days in the Paint Gap/Onion Flat area (Zone 3). Given the low use of the Paint Gap/Onion Flat area, visitor encounters with trespass livestock are unlikely there. There are several locations along the River Road where visitors have been known to directly encounter livestock, encounter their feces, or discover vegetation and soil damage caused by livestock. In 2016, the number of surveyed drive-in campsites surveyed affected by this was modest (7 out of 25). And some users do not perceive these signs or encounters as a negative experience (NPS 2016a).

Under the Proposed Action, park managers would use the park website, radio, local press, signage, notices at visitor centers, and adjoining agencies and local communities to inform visitors of any planned closures or other activities related to management of trespass livestock. Such notices would reduce inconveniences, promote safety, and provide information to aid understanding about trespass livestock influences and related management activities in the park. Mitigation measures and BMPs designed to protect the visitor experience and reduce safety risk to visitors would be implemented (see Section 2.2 and Appendix D).

All management actions under the Proposed Action would be designed to minimize impact upon the visitor experience by avoiding high visitor use areas and times of year. Visitation patterns would be a key consideration in determining timing of such control activities, both seasonally and daily. Use restrictions in or closures of backcountry areas due to helicopter-assisted management might last several hours to a day for up to 20 days annually; however, these restrictions/closures would affect few visitors as they would primarily occur in areas visitors rarely use or at times of low visitor use. Regardless, when one area is temporarily closed, other similar areas would remain available for use. In addition, as the trespass livestock population declines, there would be fewer days and areas with closures each year. Given recent visitor use statistics and timing of control activities during low visitor use periods, approximately 20 visitors per year (out of more than 400,000) could be affected by control activities due to backcountry trail and off-trail area closures.

Take-off and landing sites for helicopters would be limited to the Panther Junction administrative area (in the center of the park), and a limited number of other designated sites. With landing sites primarily within park administrative areas closed to the public, there would be very limited take-off and landing related impact on visitor experience.

Neither alternative has more than negligible impacts to visitor experience, therefore, this topic was dismissed from further analysis in this EA.

2. ALTERNATIVES

For the purposes of this plan, trespass livestock include horses, burros, and cattle.

2.1 ALTERNATIVES CARRIED FORWARD

Alternative A – No Action, Continue Using Current Treatments

Under the No Action Alternative, park managers would continue to:

- Use existing trespass livestock control methods; and
- Monitor and study trespass livestock and associated impacts as funding permits.

Human safety, livestock safety, and humane livestock treatment would continue to be priorities. However, on rare occasions, unintentional livestock injury or death may be unavoidable. Additionally, euthanasia of individual injured or incapacitated animals for humane purposes would occasionally be warranted. Such euthanasia would continue to be guided by the humane euthanasia guideline adapted from US Bureau of Land Management guidance for similar purposes (Appendix B). The animal welfare standards for this plan are included in Appendix C.

As discussed above in *Purpose and Need*, the AHPA seeks to protect US citizens, livestock, and wildlife from diseases that foreign livestock may carry. AHPA requires any livestock entering the US to do so at approved ports of entry and meet health and disease certification requirements. The USDA would continue to be responsible for management and disposition of livestock that enter via non-compliant means or locations from Mexico. Any animals captured in the park would continue to be transported to the nearest USDA- Animal and Plant Health Inspection Service (APHIS) quarantine and holding facility as soon as possible. The USDA facility serving the park area is near the US/Mexico Port of Entry in Presidio, Texas, which is located approximately 90 road miles from park headquarters. In keeping with AHPA, all animals turned over to the USDA would be quarantined and given health and disease checks and veterinary care.

The USDA allows Mexican owners to retrieve their livestock only once. Per border-wide USDA guidelines, the first capture of an animal would result in impoundment in a USDA facility, and if the owners pay lab, handling, and feed bills and compensate for any property damage, the animal would be returned to the owner. However, in reality, it is extremely rare for Mexican owners to pay for and retrieve their livestock because the roads between Presidio and Mexico adjacent to the park are unpaved, rugged, and often impassable except for four-wheel-drive vehicles. Thus, horses and burros would be likely to continue to be processed and sold at auction and cattle sold for slaughter.

Due to AHPA requirements, the lack of a legal mechanism for local cross-border movement of livestock, and a history of animals that have been returned to Mexico repeatedly re-entering the park, the NPS would not return captured livestock directly to Mexico.

Control Methods

Existing control methods fall into three categories: exclusion, capture of the trespass livestock, and disposition of those livestock captured. Park managers would adhere to the NPS minimum

requirements policy where trespass livestock management overlaps wilderness areas. All capture, handling, and transport of trespass livestock would follow the animal welfare standards included in Appendix C.

Exclusion: Fencing

Big Bend National Park has 130 miles of non-river boundary, of which approximately 105 miles are fenced. This fencing would continue to serve as the primary livestock control measure in these areas. A few reaches of US boundary totaling approximately 25 miles would continue to remain unfenced, generally in very rugged areas of the Deadhorse Mountains, where livestock is unlikely to enter the park due to terrain ruggedness. There are no plans to fence these areas. Fenced and unfenced reaches include posts with federal boundary signs and markers.

Of the 105 fenced miles, fence condition ranges from extremely poor, where little to no fence maintenance has recently occurred, to high quality, where the adjoining landowner takes primary responsibility for maintaining the fence in a livestock-proof condition. Given the illegality of allowing livestock to enter the park and the difficulty of retrieving livestock in the generally roadless park, livestock owners take primary responsibility for livestock-fence maintenance.

Livestock production on adjacent properties has decreased steadily over the years since BIBE was established. BIBE staff estimate that 25 miles or less of the non-river boundary is adjacent to properties with livestock. Due to the reduced need for livestock-proof fencing, the NPS does not attempt to maintain the fence in a livestock-proof condition. Instead, NPS seeks to maintain evidence of the boundary and to mark the boundary in a manner that makes people aware of and respectful of park protection and activity requirements.

NPS staff occasionally ride horseback or walk along fenced portions of the boundary to patrol for poachers, maintain a visible staff presence, assess fence condition, post federal boundary markers, and make minor fence repairs as required to maintain a visible boundary. This activity does not include substantial livestock-proof fence repair or maintenance.

Access roads for livestock-fence repair are on the private property-side of the boundary. Should NPS staff need to install a post or insert a small amount of wire into a non-livestock-proof fence in order to maintain a visible boundary, material transport would occur by road with permission from the adjacent landowner, or from within the park via foot or riding and pack animals.

Capture: Roundup by Mounted Wranglers

Control methods have historically consisted of roundups by mounted wranglers. The park maintains riding horses and mules for administrative purposes, including trespass livestock roundups. Park rangers and other staff with horse use training and/or experience, and professional USDA employees primarily conduct the roundups. Private wranglers under contract to the NPS or USDA also are employed on occasion, and when suitable, use trained livestock herding dogs.

Livestock numbers in one roundup locality typically range from one to a dozen, with occasions of more than a dozen. A roundup day may include repeating the process at several locations along park roads near the Rio Grande.

When qualified staff are available, park managers would continue to transport horses in trailers via park roads to the proximity of identified groups of trespass livestock. They would bring corral panels to be formed into a corral near the road. Roundup (and use of portable temporary corrals) would occur on up to 18 days per year. Corrals would generally be 40 x 40 feet in size or smaller. These corrals would typically be in place only one day, but occasionally up to three days. Park rangers and/or USDA staff, on horseback, and occasionally with US Border Patrol and/or contracted wranglers, would herd the livestock into the corrals. Trained herding dogs managed by their handler could assist, and the dogs would be retrieved at the end of every control event.

The park's fixed-wing airplane could be used on the day prior to a roundup to confirm current locations of trespass livestock before a roundup begins. The plane could be used on roundup days to locate livestock and transmit location information to ground crews, but would not be used for herding animals. The airplane would also be used 3-5 days per year to conduct more extensive livestock surveys.

Disposition: Holding and Processing

Any captured trespass livestock would be kept in permanent NPS corral facilities until they could be transported to the USDA-APHIS quarantine facility in Presidio, Texas. There are three permanent corral facilities on BIBE, for the primary purpose of year-round holding and maintenance of government-owned horses and mules used for administrative purposes by the NPS and US Border Patrol. Each of the three corral facilities include secure holding pens made of welded steel pipe, shade structures, water troughs and feeding cribs. Each also includes a larger, wire-fenced enclosure that allows resident government stock to move and exercise more freely. Stock feed, supply and tack storage buildings are associated with each location.

The primary trespass livestock holding location would continue to be Panther Junction. The Panther Junction facility includes a segregated corral for trespass livestock. There would continue to be three corrals used for government-owned livestock totaling approximately 8,200 square feet. The corral used for trespass livestock is approximately 3,540 square feet. Two additional, smaller corrals would continue to be maintained at Rio Grande Village and Castolon. These corrals would continue to be used on occasion following a roundup, as needed, to hold animals until they are moved to Panther Junction. All these corrals have been in place since prior to 1970. There would continue to be two corrals totaling approximately 3,215 square feet at Rio Grande Village and four corrals totaling approximately 7,500 square feet at Castolon.

Once in the USDA Presidio quarantine facility, captured livestock would be tested for diseases. Horses and burros would be tested for equine immune anemia, Coggins, piroplasmosis, dourine, and glanders. Horses and burros that test negative for disease would be put up for auction. Cattle would be tested for brucellosis and tuberculosis. All cattle that test negative for disease would be sold for slaughter, unless claimed by an owner. Livestock that test positive for any disease of concern would be either euthanized or sold for slaughter.

Disposition: Return to Owner

On rare occasions, intense rainstorms or other weather events damage park boundary fences to the point that livestock from neighboring US lands can enter the park. When unintentional fence failure occurs and livestock enter the park from neighboring US lands, a viable treatment option is herding and/or capturing and then transporting the livestock back to the owner's property.

After initial detection park managers would communicate with the owner(s) if known, and after receiving proof of ownership, would allow the owner or owner's representatives to walk or ride horseback onto park land to retrieve the animals, or to gain control of the animals, and transport them from the park on existing roads. The NPS would also, if necessary and appropriate, provide mounted staff to cooperate with the owner in moving the animals out of the park.

Disposition: Return with Penalty
Should neighboring landowners in the US intentionally push livestock onto park lands, or neglect their livestock and the livestock wander onto park lands, park managers would consider penalizing the livestock owner(s) per Title 36 CFR provisions regarding livestock on park lands.

Disposition: Management as Abandoned and Unclaimed Property
Should trespass livestock not from Mexico occur in the park, NPS would exercise due diligence to determine ownership, including making contacts with neighboring US landowners. Should these means prove unsuccessful, park managers would invoke the federal abandoned and unclaimed property regulations, Title 36 CFR, Part 2 and Title 41 CFR, Part 102-41, which provide for disposition through public sale, retention for federal use, and other options.

Monitoring and Recordkeeping

Limited monitoring of trespass livestock would continue, with aerial surveys conducted from an airplane only 3-5 days per year. Studies that meet conditions for NEPA categorical exclusion could occur as funding and initiatives allow. Other opportunistic observations of trespass livestock and impacts to resources by park employees and visitors would continue to be recorded for monitoring purposes.

Alternative B – Develop and Implement a Trespass Livestock Management Plan (NPS Preferred Alternative and Proposed Action)

Under Alternative B, the preferred alternative and Proposed Action, the NPS would use an integrated approach to protect park resources and manage trespass livestock. All activities described under Alternative A would continue under Alternative B, unless specifically noted otherwise. Alternative B adds helicopter-assisted control, additional equipment, and treatment options. The initial goal would be to entirely eliminate trespass livestock populations in the Paint Gap/Onion Flat area and to reduce livestock populations in Boquillas Canyon and along the rest of the Rio Grande by at least two-thirds. Annual control efforts after the initial population reduction would limit spread and keep the populations small. See Action Thresholds above for more information. Individual management practices or combinations of these practices would be implemented. Each of these practices is discussed in additional detail in the following sections.

The Proposed Action would include the following components:

- Identified management zones and priorities
- Control methods
    - Exclusion
    - Capture
    - Disposition
- Monitoring and recordkeeping

Management Zones

Four management zones have been delineated for planning purposes, based on known populations of trespass livestock. Figure 2 depicts these management zones, which include:

- **Zone 1 – Boquillas Canyon:** Medium-to-High Priority. This zone supports compatible conservation goals on adjacent Black Gap WMA and Mexico's Maderas del Carmen Protected Area, and US/Mexico CEMEX conservation properties. This area is fairly inaccessible and achieving removals may take some time, but the target population reduction is to approximately 3/4 of current population. This area is 21,270 acres.
- **Zone 2 – Rio Grande River Corridor:** High Priority. Area along the Rio Grande which is generally unfenced and which would experience continued use by trespass livestock. Annual treatments would be implemented in this zone, with an expected reduction to approximately 2/3 of the current population. This area is 95,600 acres (not including Boquillas Canyon).
- **Zone 3 – Paint Gap and Onion Flat:** Medium Priority. Area located in the northwestern portion of the park has an existing horse population that has been present for many years. Following initial treatment to remove the existing horse population from the Paint Gap/Onion Flat area, additional treatments would not be necessary unless new trespass livestock enter the area. This area is 14,250 acres.
- **Zone 4 – Rest of Park:** Low Priority (assuming no imminent threat to a high priority sensitive resources, such as a federally protected species). Areas outside of the Zones 1-3 rarely contain trespass livestock. If trespass livestock are identified in this zone, park managers would assess feasibility of control and prioritize treatment actions relative to the other zones in the park.

Much of the park is managed as wilderness in accordance with The Wilderness Act of 1964 and *NPS Management Policies 2006*. The 1978 BIBE Wilderness Study resulted in 538,250 acres recommended as wilderness and 44,750 acres recommended as potential wilderness. An assessment finalized in 2005 determined an additional 62,700 acres in the North Rosillos addition to be eligible for wilderness. This results in approximately 80 % of the park being managed as wilderness. Figure 7 depicts proposed and recommended wilderness areas in the park. All of the management zones depicted in Figure 6 contain at least some wilderness areas. The Wilderness Act and NPS policies require treatments proposed in recommended, potential, and eligible wilderness zones be considered through the Wilderness Minimum Requirements Decision Guide (WMRDG). Appendix A includes this plan's WMRDG.

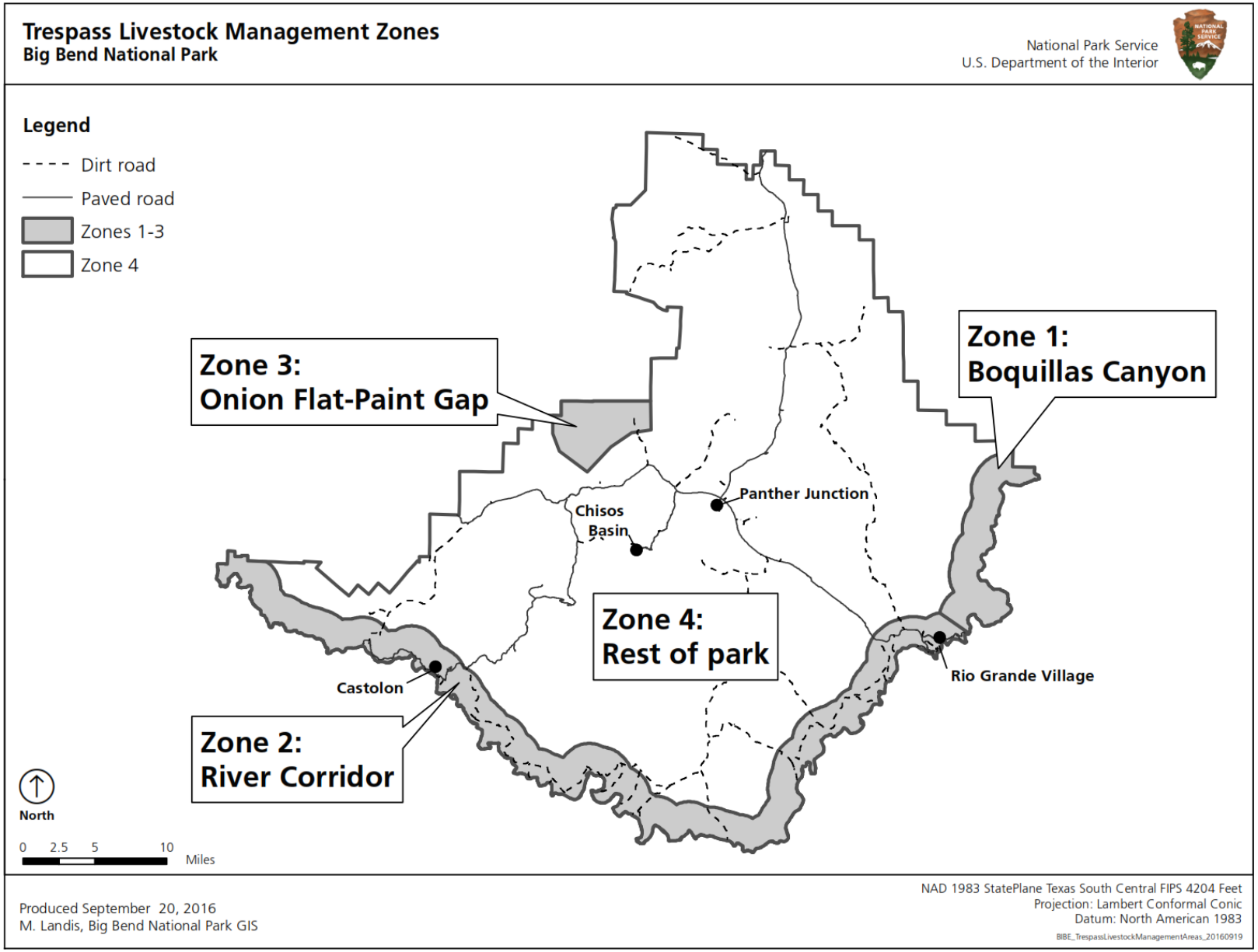


Figure 6 – Trespass Livestock Management Zones

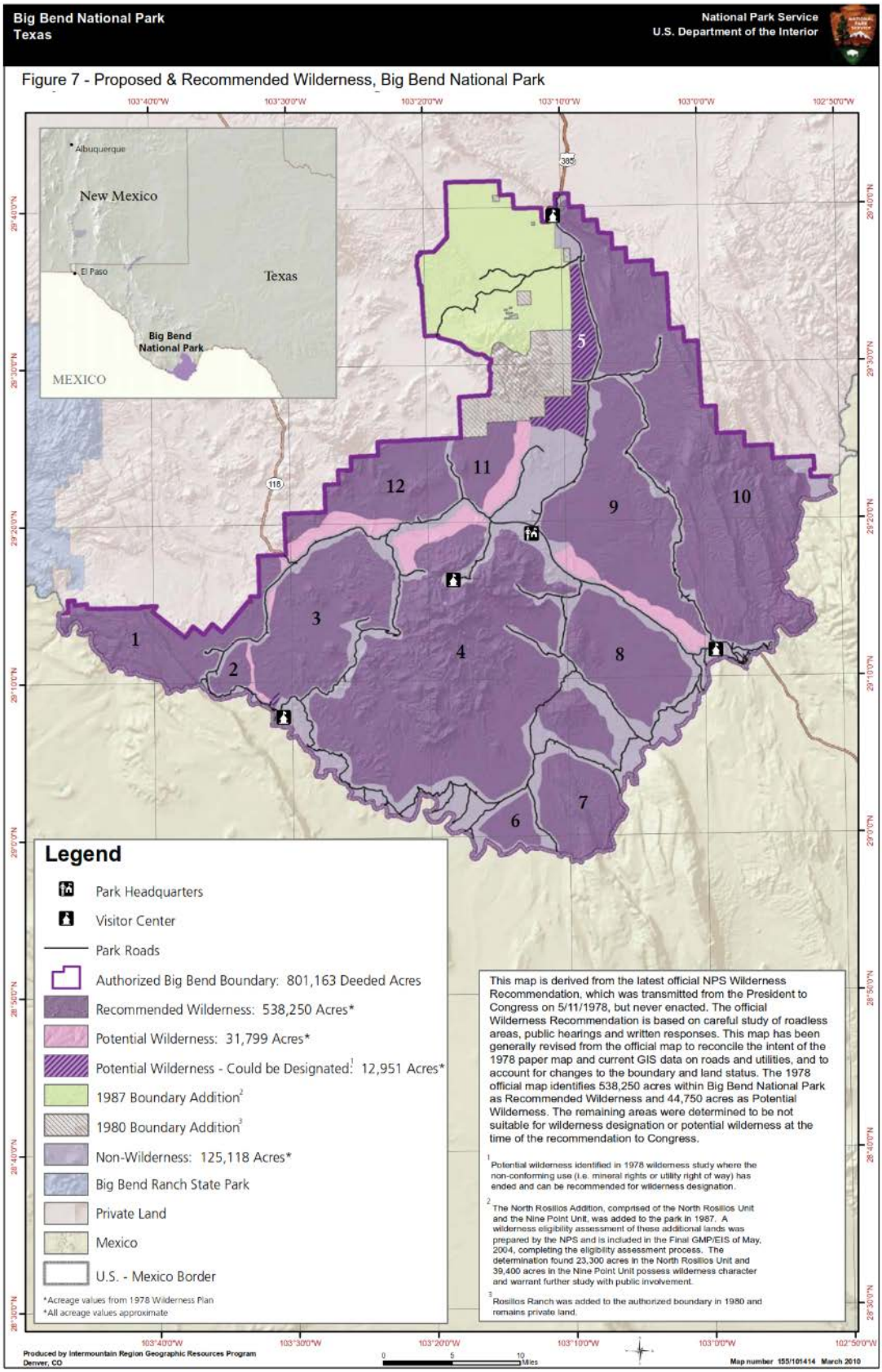


Figure 7 – Proposed and Recommended Wilderness Areas

Control Methods

There would be several treatment methods available for managing trespass livestock in the park. Methods would vary depending on location, accessibility, terrain ruggedness, proximity to roads, animal evasiveness, and resistance to capture. Disposition methods would vary depending on whether animals entered from Mexico or from adjacent US lands, as described above in *Purpose and Need*. Trespass livestock generally enter the park from adjacent Mexico and occasionally from neighboring US lands.

There would be an increase of ground-based roundup activity, if funding and staff levels allow, from the recent maximum of 18 days in a year to a maximum of approximately 30 roundup-days per year, representing up to 900 administrative horse-use hours per year. Under Alternative B, Helicopter-assisted roundup, not previously used at BIBE, would be implemented. There would be up to 20 days of helicopter use per year for trespass livestock management. Treatments and activities for managing trespass livestock would include the following categories, the options within each are described below:

- Exclusion (Fencing)
- Capture (Roundup by Mounted Wranglers, Aerial-assisted Roundup, and Trapping)
- Disposition (Return to Owner, Return with Penalty, and Management as Abandoned and Unclaimed Property) – same as Alternative A

Backcountry permit issuance for public use of the local area of control activities would be suspended for the duration of aerial activities. Take-off and landing sites for helicopters would be limited to the Panther Junction administrative area (in the center of the park) and to locations near the temporary corrals and, therefore, would have limited impact on visitor experience. All capture, handling, and transport of trespass livestock would follow animal welfare standards included in Appendix C.

Exclusion: Fencing

Park managers would continue to maintain existing boundary fences as described under Alternative A (No Action). Small fence segments (generally less than 250 yards each) could be placed in areas of strategic livestock entry or travel routes to locally restrict livestock movement and impacts. In other words, where larger grazing and livestock impact zones are accessible by livestock only through a narrow canyon or other restricting terrain feature, that narrow route would be blocked with modest strategic fencing that would prevent livestock access but would not exclude wildlife. This type of fencing would be in place a few months to a year and until the requisite livestock control activities could be applied. Such fencing would be placed during times of high trespass livestock prevalence at the locality and/or eminent risk to a sensitive resource (e.g., cultural resource site or core breeding habitat). On average, there would be no more than five segments of such fence in place at a time.

Capture: Roundup by Mounted Wranglers

Roundups of trespass livestock by mounted wranglers would be conducted in the same manner as described under Alternative A, except there would be up to 30 roundup days per year instead of the maximum of 18 days under Alternative A.

Capture: Aerial-assisted Roundup

Helicopters would be employed to assist mounted wrangler roundups. Small, maneuverable helicopters with experienced pilots are proven effective in livestock roundup. This method would use contracted helicopter services, or those of a cooperating agency such as USDA. Helicopter assistance would be of primary value in areas where distance from roads is substantial, terrain ruggedness prevents adequate access by mounted wranglers, and for livestock particularly wary or evasive of mounted wranglers. The helicopter would push livestock into areas accessible to mounted wranglers, who would then take over the primary herding activity and complete the process of bringing livestock into a temporary corral accessible by road, as described above under mounted roundups. Under some circumstances the helicopter may herd animals into the corral without mounted wrangler assistance. However, ground-based staff would still assist in completing the capture process.

Options for implementing aerial-assisted roundup include: use of cooperating agency (particularly USDA) helicopter services in conjunction with NPS and USDA ground crews; contracted private helicopter and pilot in conjunction with NPS and USDA ground crews; and use of private livestock gathering contract company(s) that provide helicopter services, wranglers, riding stock, trucks, trailers and portable corrals. Private contractor requirements would be ensured by an NPS Contracting Officer's Representative in compliance with NPS contract management requirements. Fixed-wing aircraft would still participate, but only to locate animals and provide location information to helicopter and ground-based participants.

Appendix A includes the WMRDG, which analyzes the impacts of the proposed action on wilderness values. As described in the WMRDG, the use of helicopters in wilderness areas (which is generally prohibited) is essential for removing livestock from some wilderness areas and reducing livestock in other wilderness areas of the park. In areas where permanent removal is possible (i.e., Paint Gap/Onion Flat), NPS anticipates approximately 10 days of helicopter use in that area, possibly over 2 years, after which helicopter use should be required on a less-than annual basis. During the first few years, up to 10 days per year would be spent in Boquillas Canyon to reduce the livestock there. Once the livestock are removed from Paint Gap/Onion Flat and reduced in Boquillas Canyon, most or all of the 20 days per year will be along the Rio Grande Corridor, with 1-2 days per year to maintain Boquillas Canyon livestock-free and the occasional 1-2 days elsewhere in the park when trespass livestock happen to invade an area not historically known to have trespass livestock.

Capture: Trapping

Live trapping would consist of baiting with attractants such as feed, mineral blocks, or in some cases water until the animal reaches a level of comfort that allows it to enter and linger in a corral or pen trap. Subject livestock could be wary, and require habituation to the trap over days to weeks until they enter the trap and are secured.

Trap design may include an open gate that allows animal entry and exit until attending personnel manually close a gate; and auto-trapping styles, which allow animals to enter through a one-way entry and preclude exit. Temporary traps would be approximately 70 x 70 feet in size. Most live trapping would occur within walking distance of a road. However, trapping could occur at permanent facilities, such as the fenced Cottonwood Campground group site, when no visitor use of the facility is occurring.

Remote area live trapping could also occur at temporary pens placed in rugged, inaccessible areas away from road access, such as in Boquillas Canyon or Paint Gap/Onion Flat. Traps could be in place a year or longer, although they would be removed after target livestock are captured. Captured animals would then be led overland to a road access point. Temporary corrals would be used as described under mounted roundups above. No more than three traps would be deployed at one time.

Monitoring and Recordkeeping

Monitoring and recordkeeping of trespass livestock would be consistent, with annual reports, unlike that described under Alternative A. Aircraft (planes, helicopters), and likely eventually including UAS, would be used to monitor and assess trespass livestock populations, as part of the 20 days per year of aircraft use associated with trespass livestock management.

2.2 MITIGATION MEASURES

The following mitigation measures were developed to avoid, reduce, or eliminate adverse effects on park resources and values due to management of trespass livestock. Park managers would implement these measures, as needed, during all trespass livestock management activities associated with Alternative B. Some of these measures would also be followed during activities associated with Alternative A. Measures that only apply to Alternative B are noted in the list below. Additional best management practices (BMPs) that the park follows generally for all projects are listed in Appendix D. These BMPs generally contribute to avoiding and minimizing impacts to sensitive resources.

Mitigation measures applicable to multiple resource topics

1) Minimization of management impact on park resources would consist of careful site selection and planning in consultation with the park botanist, wildlife biologist, and cultural resource specialist. Site selection would avoid known or suspected sensitive resources, and include appropriate buffer zones. Planning would include seasonal and weather considerations to minimize risk of unintended impacts.

Soils

2) To minimize impacts on soils, traps would be sited to minimize erosive soil loss, such as in flat areas and in soils less susceptible to erosion. (Alternative B only)

Native Vegetation

3) All ground-based personnel involved in trapping would be provided protocols to avoid spread of non-native plant species. Protocols include clothing and equipment cleaning, identification of non-native plants, methods to minimize soil disturbance, and monitoring for areas with soil disturbance to ensure no non-native plants appear. (Alternative B only)
4) Livestock feed bait would be selected to minimize the chance of non-native plant invasion. (Alternative B only)

Water Resources

5) Trapping and other control operations would be prevented from harming water resources by advance consultation with the park hydrologist/physical scientist to

establish buffer zones (determined on case-by-case basis), and identify activity-specific measures to avoid and minimize impacts (avoiding water sources and aquatic habitat, and avoiding contamination).

6) Any animals euthanized for humane purposes (Appendix B) would be disposed of away from aquatic environments.

Sensitive Wildlife

7) Lead ammunition would not be used for euthanization.
8) Baits and bait stations (Alternative B only) would not include toxic chemicals or poisons.
9) Animals euthanized (Appendix B) would be disposed of away from federally listed species and their known habitats.
10) Personnel managing and implementing control actions would be sensitive to native wildlife behaviors and characteristics, and control would be planned to minimize and avoid impacts on sensitive species, locations and phases. Measures could include 1) identify sensitive species, locations, and phases (e.g., peregrine falcon nesting locations and times, desert bighorn during lambing season); 2) identify actions for a specific control event that have potential to impact sensitive species; 3) determine buffer zones (time and/or space) required to avoid impact; and 4) avoid actions within the identified buffer zone and/or time of potential impact.
11) If dogs are used to herd trespass livestock, only trained herding dogs would be used and handlers would manage them to avoid effects on wildlife and ensure they are gathered after a control activity.
12) If a special status species is unexpectedly located in an area where a treatment is underway, work shall stop and a qualified biologist will be consulted before proceeding.

Cultural Resources

13) As required by NHPA, ground-disturbing activities, such as digging or trap placement, would not occur until the site(s) are determined by a BIBE cultural resources specialist to not include known or potential archeological resources or historic structures.,
14) Immediately prior to implementing approved actions, procedures for working in and protecting cultural resource sites would be reviewed with trespass livestock management personnel. Examples of potential procedures, depending on the specific action, include 1) training to identify surface-visible cultural resources with potential to occur in the action area (e.g., hearths, earth ovens, pictographs/petroglyphs, historic structures or ruins); and 2) training to walk or ride around rather than through or over cultural resources.

Visitor Experience and Safety

15) Conducting activities in high visibility areas would be avoided.
16) Activities would be timed to coincide with lower visitor use periods.
17) Staff and the public would be informed of the various control projects and the purpose and reasons for use of particularly noticeable techniques, such as helicopter use.
18) Each livestock gathering event would utilize the federal-standard Incident Management System, and include an event-specific Incident Management Plan (IMP). IMPs would include pre-plans for Objectives and Organization, Safety (including hazard identification and avoidance), Medical Response, Communications, Air Operations including crash rescue, and other issues relevant to specific event circumstances.

19) Visitors would not be present in safety risk zones of aerial activities or livestock capture and confinement. This would be achieved primarily by implementing temporary closures as warranted.
20) Clear warning and explanation signs would accompany any traps set in areas with potential for visitor use (Alternative B only).

Special Status Species

21) In addition to measures shown in this section that support federally listed species, the USFWS Biological Opinion (USFWS 2015) for BIBE exotic species management includes an Incidental Take Statement. That statement responds to actions under Alternative B (Proposed Action) of this EA, and prescribes required Reasonable and Prudent Measures, and Terms and Conditions for each RPM, and makes discretionary Conservation Recommendations. See Appendix E for those measures, conditions and recommendations.

2.3 ALTERNATIVES CONSIDERED AND DISMISSED

This section describes alternatives that were considered but dismissed from further analysis. According to the CEQ, alternatives may be dismissed if they:

- Are technically or economically infeasible;
- Are unable to meet purpose and need for taking action;
- Are redundant with less environmentally-damaging or less costly alternatives;
- Conflict with an up-to-date and valid park plan, statement of purpose and significance, or other policy such that a major change in the plan or policy would be necessary for implementation;
- Require a major change to a law, regulation, or policy;
- Represent too great an environmental impact;
- Address issues beyond the scope of the NEPA review; or
- Would not be allowed by another agency from which a permit is required.

Use Only Cooperative and Incentive-Driven Methods

This alternative would entail strong coordination with Mexican government authorities to provide economic incentives for keeping trespass livestock out of the park. This might include agencies, individuals, and/or non-profits developing water resources in Mexico as an alternative to livestock using the Rio Grande for water (and subsequently entering the park), and encouraging fencing strategic locations in Mexico to prevent livestock from entering the park. Other economic incentives could have the goal of successfully converting livestock-based Mexican economies and cultural standards to alternative eco-tourism or other economic models.

Water resources in the desert landscape are exceedingly rare and may not be available for development. The livestock's natural behavior and instinct would continue to lead them to the Rio Grande, which is the largest natural water source in the region.

Other than Boquillas crossing, which does not allow vehicle crossing and is the park's only international access point, the nearest legal ports of entry between the US and Mexico are

situated in Presidio and Del Rio, Texas. Presidio is more than 100 miles upstream from Rio Grande Village and Del Rio is more than 180 miles downstream. These long distances are unlikely to foster a successful tourism program at Mexican villages other than Boquillas.

Using only cooperative and incentive-driven methods to reduce livestock trespass from Mexico is not technical or economically feasible and would not meet the purpose and need for taking the action. Thus, it was dismissed from further consideration.

Use Lethal Means to Control Trespass Livestock

Lethal control would include professional ground-based shooting and aerial shooting of trespass livestock. There is no law or regulation prohibiting lethal control of horses, burros, and cattle in units of the National Park System. However, at this time park managers and key collaborators believe that protecting park resources from trespass livestock can be accomplished via non-lethal means, thus it was dismissed from further consideration at this time.

Additional Border Fencing

The 118-mile border along the park between the US and Mexico is also the Rio Grande River. The flood-prone, dynamic nature of the river channel and floodplain would make fencing near the river subject to frequent damage and loss, and washed-out fencing would become hazards to river recreation and navigation. Therefore, extensive livestock fencing is not technically or economically feasible. Thus, it was dismissed from further consideration.

Aerial Capture and Transport

Although appealing as an option for extremely rugged and inaccessible areas of the park, where traditional, even helicopter-assisted roundup is not likely feasible, this alternative was dismissed because undertaking the necessary components (i.e., helicopter net-gunning or darting, inserting workers, preparing the livestock in nets for transport, securing slings to helicopters, and recovering workers) in rugged and remote terrain presents unacceptable risk to involved persons. In addition, horses and burros are highly prone to uneven and unpredictable reactions to drugs, particularly when concurrent with chase, noise, and capture. Thus, both human and animal injury risk and humane treatment concerns are unacceptable, and alternatives with likelihood of success are available Therefore, aerial capture and transport was dismissed from further consideration.

2.4 ALTERNATIVE SUMMARIES

Table 3 - Summary of major components of Alternatives A and B.

Alternative Elements	Alternative A No Action	Alternative B Implement Trespass Livestock Management
Exclusion Methods	Maintain existing park boundary fence	Same as Alternative A plus localized, strategic fencing to protect vulnerable and sensitive resources
Capture Methods	Coordinate with USDA, perform periodic roundups to remove trespass livestock	Same as Alternative A plus • Aerial-assisted roundups • Trapping with bait
Disposition Methods	• Livestock from Mexico - keep temporarily in dedicated, permanent NPS corrals until transport to USDA quarantine facility in Presidio • US livestock - return to owner when unintentional trespass occurs; return via herding, or capturing and transporting • US livestock - return to owner with penalty if intentional or repeat trespass occurs; return via herding or capturing and transporting • Unclaimed/abandoned US livestock – dispose of through public sale, retention for federal use, or other options	Same as Alternative A
Monitoring and Recordkeeping	• Monitoring would continue on a limited, opportunistic basis as funding and resources are available • Opportunistic observation/reporting of trespass livestock and impacts to by park employees and visitors • Records would be kept regarding captured livestock	Same as Alternative A, plus • Aerial surveys to monitor livestock prevalence • Monitoring effects of management to ensure objectives are met and to use in adaptive management • Consistent annual reporting
BMPs and Mitigation Measures (Section 2.2)	#1, 5, 6, 7, 9-19 plus the BMPs in Appendix D.	Mitigation measures in Section 2.2, BMPs (Appendix D), and Conservation Measures in the BA (NPS 2015). All items from Alternative A, plus #2, 3, 4, 8, 20, 21

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment, which includes the existing setting or baseline conditions, and analyzes the potential environmental consequences, such as impacts or effects, that would occur as a result of implementing the No Action Alternative and the Proposed Action. The potential impacts analyzed here are quantified where possible and analyzed qualitatively and with best professional judgment where quantitative analysis is not possible. The level of detail and depth of analysis is limited to the minimum needed to determine whether there would be significant environmental effects.

3.1 CUMULATIVE IMPACT SCENARIO

CEQ regulations require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the No Action and Proposed Action.

Cumulative impacts were determined by combining the impacts of the alternative with other past, present, and reasonably foreseeable future projects and actions. Thus, this identifies other past, on-going or reasonably foreseeable future projects and actions in the park and, if applicable, the surrounding region. To determine potential cumulative effects, the geographic scope for this analysis includes projects primarily inside the park's boundaries; however, in areas around the park, there are activities by TPWD and private entities in the US and by the Mexican government and private entities in Mexico that have potential to contribute to cumulative impacts. The temporal scope is based on the duration of resource effects of the alternative and varies by resource.

The following projects were identified for the purpose of cumulative effects analysis, listed from past to future. There are other projects in the park and region but without nexus to effects being analyzed here.

Past Projects and Actions

- **Livestock Grazing Prior to the 1940s:** Ranchers' cattle, goats, and sheep grazed throughout what is now the park. Horses, mules and burros were common on pre-park ranches, being raised for sale/trade, and as riding and/or pack stock.
- **Boat Ramps, 2010:** Boat ramps were constructed at Rio Grande Village and near Santa Elena Canyon.
- **Earthen Berm Removal at Rio Grande Village, 2016**: Two pre-park earthen pond berms were flattened using heavy equipment, and the former pond sites were filled with the soil. The old pond sites, encompassing five acres, were re-contoured to approximate natural soil contours. The work allows a return to natural surface water distribution and

movement and allows for expansion of native grassland and riparian trees to the disturbed sites.

Present Projects and Actions

- **Livestock Production in Mexico, pre-1940s to present:** Livestock production has occurred on the arid lands of northern Mexico, adjacent to what is now the park, since Spanish occupancy began in the late 1700s. Since Native American presence was ended in the late 1800s, livestock production has been a dominant industry and factor on the border landscape. The activity and its influence would likely continue for the foreseeable future.
- **Exotic Plant Control, 1980s to present:** NPS, State of Texas, and Mexico are implementing exotic plant control efforts, including chemical treatments and biocontrol of saltcedar with Tamarisk leaf beetle. The initial efforts were mostly mechanical removals with occasional spot treatment for other species. The biocontrol releases for saltcedar were done in 2009 in cooperation with USDA. Giant cane control experiments have occurred in recent years, using prescribed fire and herbicide treatment of post-fire resprouts.
- **Barbary sheep and Feral Hog Control in Neighboring Areas, 1990s to present:** TPWD efforts to control Barbary sheep on Black Gap and Elephant Mountain WMAs and Big Bend Ranch State Park and cooperating private lands, and neighbor efforts, that include USDA assistance, to control feral hogs on some private lands are helping to manage these species.
- **Trespass Livestock Management, 1980s to present:** USDA participates with NPS staff to round-up trespass livestock. Recent surveys have documented as many as 250 cattle, horses and burros illegally in the park, with the average number being 105. These livestock continuously graze and trample vegetation several miles into the park north of international border. Trespass livestock have been removed from the park since park establishment.
- **Reintroduction of Desert Bighorn Sheep, 1980s to present:** Desert bighorn sheep are being reintroduced in the Black Gap WMA, Big Bend Ranch State Park, and in the Maderas del Carmen Protected Area by TPWD and other partners.
- **NPS and US Border Patrol Administrative Livestock Use, Ongoing**: The NPS maintains five horses and eight mules to support NPS operations. NPS horses are used primarily for park-wide backcountry patrol; and also for trespass livestock round-up, primarily near the Rio Grande. In 2014, NPS staff used horses for 240 hours over 18 days for trespass livestock management. NPS mules support backcountry trail maintenance, primarily on the High Chisos trail system, and occasional other backcountry routes. A typical string of 5 mules makes an average of four, single-day trips per month, November through April. US Border Patrol maintains three horses in the park, used for backcountry, border security, and mounted patrol purposes park-wide, and on occasion assists with NPS trespass livestock roundup events. Horses have been used for administrative purposes since park establishment.
- **Visitor Use of Park, Ongoing:** There are an average of 300,000 persons per year who visit the park. Many engage in backcountry off-trail hiking, camping, riding horses, boating, and other park recreation activities.
- **Visitor Use of Backcountry, Ongoing:** Backcountry (away from roads and developments) day-hiking trips and overnight backpacking trips are popular visitor

activities in the park. Hiking on and off-trail is allowed park-wide. Overnight camping by backpackers is allowed in backcountry throughout the park. An analysis of backcountry camping permits for 2014 shows overnight backpackers accounted for 3,491 person-days spent in backcountry outside of the Chisos Mountains, and 5,793 person-days spent in the High Chisos backcountry. Backcountry day-hiking data is not available, but staff report it vastly exceeds overnight use.

- **Lajitas International Airport, 2001 to present:** Lajitas Capital Partners, LLC owns the Lajitas International Airport, which began operating in 2001 and is located approximately 10 miles west of the park's western entrance. Charter and private planes fly over the park on their approach to the Lajitas Airport and conduct sightseeing flyovers of the park.
- **US Border Patrol Aviation Operations, 1980s to present:** US Border Patrol regularly uses aircraft in and around the park, with an increase in presence since 2006.
- **NPS Aircraft Program, 1995 to present**: Big Bend National Park has had a park-based NPS fixed-wing aircraft (airplane) and pilot to support park operations. The program results in approximately 400 flight-hours per year over the park. In 2014 these flights occurred on 240 days of the year. The majority of flights support law enforcement, but include search-and-rescue, trespass livestock, and cultural and natural resource-related missions.
- **Commercial Air Tours, 2013 to present:** The Federal Aviation Administration Modernization and Reform Act of 2012 required commercial air tour operators to begin reporting tour flights over NPS units. Forty-six flights were reported over the park in 2014, and 47 were reported for 2015. Commercial air tours are expected to increase annually.
- **Boquillas Crossing Port of Entry, 2012 to present:** To re-establish the historic international crossing, the port of entry was constructed in late 2011. In 2012, the formal station for border crossings was opened for those seeking entrance to the US.
- **Research Permits:** Each year, the park issues approximately 80 permits for research projects that study plants and animals and other natural and cultural resource topics.
- **Prescribed Burns:** Prescribed burns are conducted in the park based on prescriptions in the Fire Management Plan and there is an EA associated with the Fire Management Plan.
- **Rio Grande Upstream Activities:** Upstream agricultural, industrial, and other activities along the Rio Grande are affecting the river's water quality and ecosystem in the park.
- **International Conservation Initiative, 2011 to present:** In October 2011, US Secretary of the Interior Ken Salazar and his Mexican counterpart, Secretary of Environment and Natural Resources Juan Elvira, met to break ground for the Boquillas Port of Entry and to confirm an international intent to increase conservation cooperation in the Big Bend border region. This international cooperation would continue, including conservation studies, projects and other activities on the US and Mexican sides of the border.

Reasonably Foreseeable Future Projects and Actions

- **Habitat Restoration:** Several earthen berms at Rio Grande Village were removed in summer 2016. The soil was recontoured and native grassland and riparian habitat established.
- **Exotic Plant Management Plan and EA, In Development:** Park managers are planning for control of non-native, exotic plants in the park. Control activities include removing the exotic plants and restoring native species.

- **Exotic Animal Management Plan and EA, In Development:** Park managers are planning for control of non-native, exotic Barbary sheep and feral hogs in the park.

3.2 SOILS

Affected Environment

The soils in the park occur in an orderly pattern related to the geology, landforms, relief, and climate and influence natural vegetation of the area. The following discussion focuses on soils situated in trespass livestock management zones 1 through 3, which includes the 2-mile-wide zone along the Rio Grande (Zone 2), including Boquillas Canyon (Zone 1); and the Paint Gap/Onion Flat area (Zone 3). See Figure 2. None of the common soil types in the areas currently inhabited by trespass livestock are considered hydric soils nor experience ponding.

In flat areas, livestock damage the organic crusts which protect the surface of these fine soil types. Although slopes in these areas are not steep, once the organic crusts have been trampled, the soils erode readily as there is little to no organic matter to hold the soils in place. In steep areas, the soils are coarser and contain more rock. These areas still erode following livestock trampling because the slopes. Overall, organic topsoil in the park is limited to virtually nonexistent, with most soils less than 1% organic matter and the remainder less than 7% (NRCS 2015). Instead, subsoils containing higher concentrations of calcium carbonate and sodium are exposed. This is an important factor hindering efforts to revegetate disturbed areas, especially in more arid areas of the park.

Currently, trespass livestock are found primarily within the 2-mile-wide zone along the Rio Grande because of their need for water. The primary soil unit types near to the Rio Grande (Zone 2) are Vincente, Lomapelona, and Castolon (NRCS 2015). All three are located on floodplains and river valleys. These soils are either well-drained or moderately well-drained and are frequently to occasionally flooded. Other common soil unit types near the Rio Grande that trespass livestock encounter include Chillon, Corazones, Ninepoint, Strawhouse, and Stillwell (NRCS 2015). These soils are well-drained and are not flooded, although Chillon soils are rarely flooded. There are numerous drainages entering the Rio Grande from the park, and trespass livestock likely spend time in these areas, especially when water is present. A common soil unit type in these drainages is Pantera (NRCS 2015). The Pantera soil is located on arroyos in intermontane basins. This soil is well-drained and frequently flooded.

Boquillas Canyon (Zone 1) is primarily Blackgap soils with rock outcrops and steep slopes (10-70 %). These soils are well-drained and not flooded. Common soil types in the Paint Gap/Onion Flat area (Zone 3) include Solis and Lingua soils (both with rock outcrops), as well as Chilicotal soils (NRCS 2015). These soils are well-drained and not flooded.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion. For both the corridor along the Rio Grande and the Paint Gap/Onion Flat area, factor K values range from 0.1 to 0.35, indicating some areas are more susceptible to water erosion than others, but none are in the most susceptible category (NRCS 2015). This means that if disturbance is removed, the soils should be able to stabilize. Many of the

soils in these areas are also susceptible to wind erosion once disturbed; in some cases as much as 86 tons/acre/year are lost to wind erosion (NRCS 2015). The soils in the Paint Gap/Onion Flat area are not prone to wind erosion and have generally low factor K values, primarily due to the rock outcrops and bedrock near the surface.

NRCS provides a summary of the erosion hazard for soils, which indicates the hazard of soil loss in off-road and off-trail areas after disturbance activities that expose the soil surface (NRCS 2015). The ratings are based on slope and soil erosion factor K. The 2-mile-wide corridor along the Rio Grande has about equal amounts (40% each) of areas with slight erosion hazard and severe erosion hazard, with approximately 20% of the area with a moderate erosion hazard. The remainder is either floodplains, water, or rock outcrops. Overall, this area is prone to erosion after disturbance. Boquillas Canyon, which is the easternmost part of this 2-mile-wide corridor, has 66% severe and 10% moderate erosion hazard due primarily to the steep slopes. This is in contrast to most of the rest of the Rio Grande corridor and makes this area more erosion prone than the rest of the corridor; the erosion hazard is part of why this management zone is a medium-high priority for trespass livestock removal. Paint Gap/Onion Flat zone generally has only a slight erosion hazard.

Long-term livestock use of steeply-sloping park terrain has created a spider web of trails and ridges, called terracettes, that densely crisscross hillsides in some locations and are described more in Section 1.3 (Trimble and Mendel 1995). Remote sensing in 2016 documented park lands with severe terracette development (NPS 2016b). The most affected areas are 2.4 square miles near the Rio Grande between Lajitas and Santa Elena Canyon along with 3.3 square miles along several areas within Boquillas Canyon (NPS 2016b). Both areas are rugged, inaccessible areas of steep terrain where trespass livestock roundup and removal has historically proven very difficult.

Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, the NPS would continue to monitor trespass livestock presence and distribution and remove livestock on an opportunistic basis. The primary administrative soil impact is associated with NPS horses ridden during trespass livestock roundups. NPS records demonstrate an average 324 NPS horse-hours per year were applied during trespass livestock roundups from 2012 through 2015, covering a maximum of 18 days in a year. Although there are occasional short periods of galloping, the vast majority of roundup horse-hours are applied at a walking gait. Assuming this would continue under the No Action alternative, administrative soil impact under the no-action alternative produces horse-related soil damage commensurate with 2,330,000 horse-steps per year. This equates to roughly 5 acres of impacts occurring over the course of a maximum of 18 days. The impacts to soils would also be limited to surface impacts and generally do not affect the volume of soils present. The overall area throughout which a roundup occurs varies from as little as 5 acres or as much as 1,000 acres for a particular roundup event; only a small percentage would experience soil impacts from the roundup activities. Given control activities would be occurring in areas already impacted by trespass livestock, the additional damage done by NPS horse use during management is negligible compared to damage done by the already present trespass livestock.

Soil damage would continue to occur from the activities of the trespass livestock themselves. Trespass livestock can damage soil resources by causing erosion and compaction from their hoof action, trail creation, and wallowing, especially in and near water resources such as springs, gullies, and riparian zones. Hoof action and trampling causes soil compaction and dislodges soil

particles. This reduces the space between soil particles and decreases water infiltration and oxygen diffusion (Thurow 1991; Vallentine 1990). Soil particles become dislodged (i.e., erode) when horses or cattle slide or scuff their hooves across the soil surface. Erosion can increase after trampling because soil compaction decreases infiltration and the movement of hooves dislodges soil particles. Additionally, trespass livestock may traverse steeper slopes while grazing, and in doing so, they would likely cross and disturb some soils with moderate to severe erosion hazard, thereby increasing potential for soil erosion.

The extent of soil impacts from livestock hoof action vary considerably due to animal weight, hoof size, and the amount or repetition of trampling. However, the exposed desert soils and sandy Rio Grande floodplain soils, both of which lack organic matter that might mitigate impacts, are be particularly vulnerable to trampling (see photographs, Section 1.3). Horses moving at a walking gait take approximately 120 steps per minute (http://www.3gaits.org/hippotherapy.htm) and 160 steps per minute at a full gallop (Marcella 2007).

Given the sparse Chihuahuan desert vegetation, trespass livestock must move frequently (at a walking pace) in search of grazing opportunity. Even when grazing consistently occurs in a single area, livestock are constantly shifting and repositioning with small steps (Chapinal and Tucker 2012), which increases impact in a confined zone. Horse and cattle hooves each exert approximately 24 lbs per square inch pressure when standing (Lull 1959) – this value is greater when livestock are walking or trotting. The soil contact surface of a small horse hoof is approximately 13 square inches and when walking the hoof exerts a minimum 312 lbs of pressure per hoof-step. In contrast, an average 150-lb. human has a 25 square inch foot surface and exerts 6 lbs. of pressure per square inch when walking. Assuming trespass livestock in the park spend as little as two hours walking per day, the average estimated 105 trespass horses, cattle, and burros create hoof-related soil damage commensurate with at least 560,000,000 livestock-steps per year, which is equivalent to approximately 1,165 acres of damage a year. Actual impacts may be multiples of this minimum estimate. Every step crushes the soil surface, damages soil crusts on flats, and breaks up soils on slopes – all resulting in erosion regardless of slopes, creation of trails wherever livestock persist, and formation of terracettes on slopes. See photographs in Section 1.3 for illustrations of damage.

Recovery time from soil damage varies depending on whether the area is repeatedly damaged. In areas with occasional damage, soil can recover within a few weeks to a few months. In areas with repeated damage, the soil does not recover until the livestock are removed and may take as long as 10 years to fully recover (NPS 2016g).

Areas of soil disturbance created by trespass livestock would generally be limited to zones along the Rio Grande and its tributaries, along with an area near Paint Gap/Onion Flat (Figure 2). These soil disturbances would continue year-round annually, and intensify when large numbers of livestock are present in a small area. The area that could be disturbed by trespass livestock during any given year is highly variable, since it is dependent upon the Rio Grande water level, rainfall, and number of livestock present. As described above in Affected Environment, the current impacts would continue under this alternative, with approximately 6 square miles impacted by severe terracette development. Based on representative sample locations (of sensitive cultural resources sites, Section 3.8), it is typical for 6-7% of the surface area in the Rio Grande corridor to have livestock trails, not including additional erosion that results from the trails. Estimating this across the entire 183 square mile Rio Grande corridor, roughly 11 square miles of trails may occur throughout that zone. The percent of affected surface area may be

higher within Boquillas Canyon, which has more erosive soils and steeper slopes. The percent of affected surface area may be lower in the Paint Gap/Onion Flat area, given less erosive soils and few slopes. Erosion that results from the trails can affect as much as 50% of a particular area (based on the sensitive cultural resources sites analyzed), but typically is lower than that.

Impacts of the No Action Alternative on soils would be adverse impacts on about 6 square miles due to the creation of terracettes and another 11 square miles of livestock trails. This includes impacts of soil damage from hoof prints equivalent to approximately 1,165 acres of damage per year within the Rio Grande corridor (Zones 1 and 2) and the Paint Gap/Onion Flat area (Zone 3). While the damage can be severe to soils in areas heavily used by trespass livestock within the zone along the Rio Grande, that zone is a small portion of the overall park (much less than 1%) and the soil types are common within the region.

Cumulative Effects: Present or reasonably foreseeable future projects and actions that could have measurable adverse effects on soils in the park include use of roads, visitor use of amenities along the river, and campsites, due to exposure of soils by users of those areas. Intensity and duration of these activities fluctuate according to visitor use patterns, but generally include soil disturbance and compaction in the immediate vicinity of visitor use. Temporary adverse effects on soils could also be caused by management of exotic plants and animals as well as prescribed burns. Generally, adverse effects of temporary soil disturbance due to exotic plant and animal control and prescribed burns (use of hand tools, parking vehicles on road shoulders, and/or trap placement) would occur only during a control activity and recover within a year of the activity, often with a long-term beneficial effect to soils.

Active habitat restoration efforts (to restore grasslands and riparian areas) provide a benefit by protecting soils and reducing erosion. Exotic plant and animal management is not always accompanied by active habitat restoration; in those cases, once the exotic species is removed, the soils recover naturally from the damage caused by the exotic species. In addition, the areas of the park managed as wilderness with little to no soil disturbance and other areas with sensitive resources that are protected from soil disturbance far exceed areas where soils have been adversely impacted, with an overall beneficial impact on soil resources within the park.

While some past, present, and reasonably foreseeable future actions (use of roads, campsites and other amenities along the river, exotic plant and animal management, and prescribed burns) would lead to some short-lived (days to months) soil disturbance, overall the cumulative actions would benefit soils. Habitat protection from livestock would allow recovery of soil crusts and vegetation. Continued management of large areas of the park as wilderness and best practices that avoid sensitive areas would result in little to no soil disturbance.

However, when the adverse impacts of the No Action Alternative are combined with the impacts of these other past, present, and reasonably foreseeable future actions, an overall adverse impact is expected, particularly along the Rio Grande, where trespass livestock have created adverse terracette impacts on about 6 square miles and on another 11 square miles of livestock trail impact. This includes hoof impact damage to soils equivalent to approximately 1,165 acres per year within the Rio Grande corridor (Zones 1 and 2) and the Paint Gap/Onion Flat area (Zone 3). Outside of these zones, the overall impact on soils would be beneficial as trespass livestock do not occur regularly or in large numbers. Therefore, presence of trespass livestock under the No Action Alternative would be the adverse cumulative impact in the Rio Grande corridor and the Paint Gap/Onion Flat area.

Impacts of Alternative B (Proposed Action)

In implementing the Proposed Action, the NPS would use an integrated management approach to manage trespass livestock that enter the park. Soils are expected to experience long-term, beneficial impacts under the Proposed Action, though they could also experience short-term, site-specific, adverse impacts associated with ground-disturbing treatment methods.

Reductions in soil erosion and disturbance due to trespass livestock activity would be expected to follow successful control efforts. This is because fewer livestock would be present for shorter periods of time. The minimum goal for the reduction of the population of trespass livestock under the Proposed Action would be to reduce the population by 2/3 of current size. Greater reduction could occur if regular removal of trespass livestock prompts livestock owners to increase efforts to keep their animals from crossing into the park. In some areas, such as Paint Gap/Onion Flat, the goal is to remove trespass livestock completely. If successful, areas already damaged by trespass livestock could recover and additional soil losses would be prevented. Where trespass livestock would be removed completely, soils could eventually recover completely. For example, observations on BIBE indicate that organic crusts can form in less than 10 years once disturbance ceases (NPS 2016g). In addition, vegetation recovery would facilitate faster stabilization of the soil.

Based on the current levels of impacts summarized under the No Action Alternative, a reduction in the trespass livestock herd to 1/3 its current size should result (after recovery of already damaged areas) in only 1/3 of the current impacts. These impacts would be approximately 2 square miles of terracettes and 4 square miles of trails, spread throughout the Rio Grande corridor; and approximately 387 acres of other impact from hoof-related damages. Areas such as Paint Gap/Onion Flat would experience complete recovery once the livestock are removed. Some areas within Boquillas Canyon and the Rio Grande corridor may no longer experience any trespass livestock, while other areas may experience the same level of impact as they do currently. On average, however, the level of impacts should be reduced to 1/3, proportional to the population reduction. As noted earlier, it may take as long as a decade before the soils with organic crusts have recovered fully from the current damage.

As with the No Action Alterative, soil compaction and erosion impacts from NPS actions would occur primarily through use of NPS horses during roundups, and from the equipment and methods used to contain the trespass livestock, including corrals, fencing, baiting, and trapping. Impacts from equipment (i.e., corrals, traps, fencing) and methods would be very localized and near roads. Impacts would cover less than 2 acres overall (see analysis of vegetation under Alternative B for more details), and would recover within a year.

While total horse-hours due to NPS horse use may increase initially while livestock are being removed from Paint Gap/Onion Flat, once those livestock are removed the NPS horse-hours would be reduced to zero for trespass livestock management in those areas. For Boquillas Canyon and the Rio Grande corridor, NPS horse-hours may increase the first few years of increased removals, but as the trespass livestock population declines, NPS horse-hours needed for control activities would also decline.

In addition, by including aerial assistance, the area potentially impacted by NPS horses, and the total NPS horse-hours would also be reduced over time. The amount of these impacts would

depend on the duration, location, and extent of control activities, but full recovery would generally occur within weeks to one year.

Given control activities would occur in areas already impacted by trespass livestock, the additional damage done by NPS horses is negligible compared to damage done by the already present trespass livestock. The permanent holding pens used to temporarily hold livestock while they await transport out of the park have been in place for many decades and do not show signs of increasing soil deterioration. Therefore, initial, temporary impacts of administrative horse use may be more than the 5 acres that would occur under the No Action (but less than 10 acres), the long-term impacts would be less than 5 acres, as administrative horse use would decline with helicopter support and fewer livestock to remove each year.

The above impacts would produce beneficial results throughout the Rio Grande riparian area, Boquillas Canyon, and Paint Gap/Onion Flat. Complete removal of trespass livestock from Paint Gap/Onion Flat would allow for halting livestock-related soil degradation over time. The anticipated 2/3 decrease in the trespass livestock population in Boquillas Canyon and the Rio Grande corridor would result in halting degradation and beginning the recovery process on approximately 4 square miles of terracettes and 7 square miles of trails, and reduce annual soil damage by nearly 800 acres. Temporary adverse impacts on soils would continue from NPS control activities, as well as long-term, adverse impacts from continued presence of some trespass livestock within the Rio Grande corridor, although at much lower densities. These adverse impacts would be reduced because the overall area affected by trespass livestock would be reduced and areas would have a better chance of recovering from damage from livestock. In addition, the reduced area affected by trespass livestock would be an even smaller percentage of the overall park than the area affected in Alternative A.

Cumulative Effects: Impacts from other past, present, and reasonably foreseeable future actions would be the same as those described above under Cumulative Effects of the No Action Alternative and would be mainly beneficial as a result of exotic plants and animal management, habitat restoration, and protection as wilderness. The Proposed Action would result in localized soil disturbance due to trespass livestock control activities and trespass livestock that would escape capture. These adverse effects would be mitigated after control activities if they would not recover naturally and would be short-lived. More importantly, the Proposed Action would result in long-term benefits to soils because creation of terracettes and trails would be reduced as a result of reducing the trespass livestock by at least 2/3 of current population. Under the Proposed Action, some soil resources could recover over time as the population and soil damage decreases. The control activities would contribute relatively small adverse impacts.

Although there would be some limited adverse impacts associated with the cumulative actions and the Proposed Action, when the beneficial impacts of soils from the reduction of the trespass livestock population are realized and combined with other past, present, and reasonably foreseeable future actions, the overall cumulative impacts on soils would be beneficial. The incremental impacts of the Proposed Action to the overall beneficial impacts on soils in the Rio Grande corridor and Paint Gap/Onion Flat area would be substantial.

3.3 VEGETATION

Affected Environment

Park elevations range from approximately 1,700 feet along the Rio Grande to approximately 7,800 feet in the Chisos Mountains. The diverse elevations and topography support 1,200 plant species, including 60 cacti species. Chihuahuan desert scrub, desert grasslands, montane oak-juniper woodlands, and riparian zones constitute the primary vegetation types in the park. Desert scrub covers more than 50 percent of the park and extends between the low-lying floodplains and the mid-elevation desert grasslands. High desert grasslands cover approximately 40 percent of the park. Forests and woodlands contain many taxa and habitats despite covering approximately two percent of the park. Rising to over 7,000 feet above sea level, forests include a mix of grassy woodlands and conifers. Scattered through the mountains are meadows containing a mix of grasses, forbs, semi succulents, shrubs, and tree species. Shrub and grass-dominated communities occupy the Chisos foothills and most of the Deadhorse Mountains. Floodplain riparian habitats exist along the Rio Grande. Floodplain riparian areas and upland springs create unique and productive habitats for native wildlife and plants.

Organic topsoil is limited to virtually nonexistent in the park. This is an important factor in efforts to revegetate disturbed areas, especially given the persistent arid conditions. In addition, aoudads and feral hogs often utilize existing animal trails, and if not controlled they could partially maintain livestock trails and terracettes and concurrent vegetation impacts.

Vegetation communities represented in the various management zones are:

- Boquillas Canyon (Zone 1) – 17, 634 acres of desert scrub; 3,265 acres of sotol grassland; and 360 acres of river floodplain - 21,260 acres total
- Rio Grande Corridor (Zone 2) – 73,146 acres of desert scrub; 11,361 acres of *Echinocereus* cactus habitat; 8,795 acres of river floodplain; and 3,257 acres of sotol grassland - 96,600 acres total
- Paint Gap/Onion Flat (Zone 3) – 6,820 acres of desert scrub and 7,429 acres of sotol grassland - 14,250 acres

Trespass livestock damage vegetation resources by grazing and trampling native plants. Hoof action, trailing, and wallowing by livestock erodes and compacts soils, which impedes seedling establishment and normal growth of existing vegetation. Livestock tend to congregate near water, such as along the banks of the Rio Grande, affecting riparian vegetation and associated soils in these high-value resource areas. As described under soils, above, approximately 6 square miles of terracettes and 11 square miles of livestock trails currently exist on BIBE, and approximately 1,165 acres of damage from hoof impact annually. At a minimum, this same area shows impacts to vegetation, although vegetation trampling and selective foraging by trespass livestock likely impacts an equivalent area beyond those with obvious soil impacts. Livestock could trample, eat, break, and otherwise damage vegetation without damaging the soils underneath. Thus, approximately 34 square miles are impacted by trespass livestock within the Rio Grande corridor and Boquillas Canyon (Zones 1 and 2).

Livestock also foster exotic plants by creating disturbance suitable for weed establishment and carrying weed seeds on hair, hooves, and in feces. For example, buffelgrass (*Pennisetum ciliare*) is

prevalent within the Rio Grande management zone (Zone 2) and after summer rains is heavily grazed by trespass livestock. Resulting soil damage reduces native plants and creates disturbed soil, which heavily favors further invasion by buffelgrass. In addition, livestock transport the seed via their feces. The current area impacted by buffelgrass is well over 100 acres and expanding. Russian thistle (*Salsola kali*) and Lehmann's lovegrass (*Eragrostis lehmanniana*) may also be spread by trespass livestock, but the interaction with trespass livestock is less clear than with buffelgrass.

Impacts of Alternative A (No Action Alternative)

The areas and extent of changes in vegetation would be generally limited to Zones 1 and 2 along the Rio Grande and its tributaries within the park and an area of Zone 3 near Paint Gap/Onion Flat (Figure 2). Livestock activities that impact vegetation could occur year-round and could be extensive (e.g., leaving little vegetative cover) when large numbers of livestock are present in a small area. As indicated in Purpose and Need, the average number of illegal trespass livestock in the park documented during surveys is 105. As described under the Affected Environment, trespass livestock damage vegetation as they move and forage on the vegetation itself.

Natural Resource Conservation Service (NRCS) grazing management data suggests a standard healthy horse consumes 32.5 pounds (dry weight) of forage per day and an adult, non-lactating cow consumes 24 pounds of forage per day (NRCS 2003). While local variables may increase or decrease forage consumption, the NRCS estimates provide a suitable estimate for impacts in the park. Based on these estimates and the number of each kind of trespass livestock in the park, trespass horses consume 2,860 pounds of vegetation, cattle consume 1,224 pounds of vegetation, and burros, if estimated at 1/2 the horse rate, would consume 48 pounds of vegetation per day. Thus, the average trespass livestock herd is estimated to consume 4,132 pounds of park vegetation per day. On a yearly basis, this is 1,508,180 pounds of vegetation consumed.

As there would be no net reduction of trespass livestock under the No Action Alternative, these livestock would continue to adversely impact vegetation resources via grazing, trampling and wallowing, particularly within the 2-mile-wide zone along the Rio Grande. Seedling establishment and normal growth of existing vegetation, particularly where trespass livestock congregate along the Rio Grande, would continue to be absent in those areas with soil erosion and compaction caused by hoof impact, trailing, and wallowing (as described above in Section 3.2 Soils). Increased erosion in and near the banks of the Rio Grande could expose root systems and lead to even more impacts to vegetation via loss of soil stability (i.e., washing away of vegetation) and death of plants due to root exposure.

Trespass livestock would continue to spread exotic plants through selective native plant consumption, soil disturbance, and dispersing weed seeds. This would occur over 34 square miles (17% of these zones, only 3% of the entire park) throughout the 183 square mile Rio Grande corridor (Zones 1 and 2), as well as the 20 square mile Paint Gap/Onion Flat zone (Zone 3). Trespass livestock would consume approximately 1.5 million pounds of vegetation per year and damage individual plants. Rare plants are not common in these areas and, while damage would occur in these areas, no vegetation communities would be impacted to the point they would no longer occur within the park. In addition, these impacts would continue to be generally limited to the three livestock management zones as livestock rarely occur outside of those areas.

Cumulative Effects: Present or reasonably foreseeable future projects and actions that could affect park vegetation include desert bighorn sheep recovery, prescribed burning, habitat restoration (grassland and riparian), and exotic plant and animal management. Desert bighorn sheep were introduced on nearby state and private lands and managers of both have conducted aoudad control in recent decades. Desert bighorn sheep populations in the region are still small, so impacts to vegetation are of small magnitude. Prescribed burns would continue to have a negative short-term impact on vegetation when plants are consumed during a fire, but generally would have beneficial long-term impacts as plants regrow and recolonize with a more natural plant community.

Active habitat restoration efforts (to restore grasslands and riparian areas) provide a benefit to native vegetation by removing non-native plants and supporting recovery and vigor of native plants. Exotic plant and animal management is not always accompanied by active habitat restoration; in those cases, once the exotic species is removed, the vegetation recovers naturally from the damage caused by the exotic species.

While some past, present, and reasonably foreseeable future actions (management of exotic plants and animals, prescribed burns, desert bighorn sheep recovery) would lead to some short-lived (days to months) disturbance of vegetation, overall the long-term impacts from NPS stewardship and management would be beneficial.

As described above, impacts of the No Action Alternative on vegetation would be adverse because trespass livestock consume approximately 1.5 million pounds of vegetation per year and increase damage to vegetation. Additional impacts would continue to occur along the Rio Grande, in Boquillas Canyon, and in the Paint Gap/Onion Flat area, where trampling, grazing, rooting and wallowing not only negatively impact the seed bank and establishment of native vegetation, but could also encourage spread of exotic vegetation.

However, when the adverse impacts of the No Action Alternative are combined with the impacts of these other past, present, and reasonably foreseeable future impacts, an overall beneficial effect is expected due to the existing NPS management for native vegetation throughout the park. The cumulative beneficial effects would be reduced but not eliminated along the Rio Grande, in Boquillas Canyon, and in the Paint Gap/Onion Flat area, where trespass livestock are impacting vegetation, but the overall beneficial effects of NPS management would still outweigh these adverse effects.

Impacts of Alternative B (Proposed Action)

In implementing the Proposed Action, the NPS would use an adaptive management approach to manage trespass livestock that enter the park. Control activities impacting vegetation would include trampling during roundups by mounted wranglers; strategic, local fencing; and trap construction (both for use during roundups and for live trapping with bait). Personnel involved in roundups and trapping would be sufficiently trained in appropriate tactics to prevent inadvertently spreading exotic plant species. Baits would be selected to minimize chance of additional exotic plant invasion. The permanent facilities used to contain livestock while they await pick up and transport out of the park have been in place for decades and do not show signs of increasing vegetation deterioration.

Roundup activities at any one site would be limited to a maximum of 3 days per year. Any trampling of vegetation due to roundup people or horses would recover within a weeks to months (NPS 2016g). Corrals, trapping, and strategic fencing locations would avoid fragile riparian vegetation resources and other sensitive areas by using buffer zones in consultation with park botanists.

Temporary portable corrals would be 40 x 40 feet in size or smaller and bait traps would be approximately 70 x 70 feet. Temporary portable corrals would only be in place from a few hours to, on rare occasions several days, long enough to initially contain then assist loading captured livestock for transport. Temporary portable corrals would generally be set up adjacent to a road due to the weight of the component pieces and need to be accessible by truck for removal of livestock via livestock trailer. Temporary portable corrals would only be set up to support each specific roundup event, and removed after each roundup event. Thus, temporary portable corral use for all roundup locations and events in a single year would generally occur on no more than 30 days per year. Digging is not required to place temporary portable corrals. Bait traps could be in place a year or longer, although they would be removed after area livestock are captured. Traps would be made out of lighter weight material and would likely be located away from roads. No more than three traps would be deployed at any one time. Traps may require the digging of several post holes, but are generally constructed using drive-in posts.

If the temporary portable corral was moved to a new location for every roundup-day and if three bait traps were deployed, the total area affected each year would be approximately 70,000 square feet (less than 2 acres). Damage to vegetation during temporary corral placement and use should recover quickly (i.e., a few weeks to months) (NPS 2016g). Damage to vegetation from baited traps (and livestock use of them) may take longer to recover (because there is more ground disturbance, more vegetation removal, and traps are in place longer) depending on rainfall and extent of damage but is expected to recover within a year after removal based on similar activities within the park (NPS 2016g).

Similar to traps, strategic fencing to reduce livestock damage to sensitive resources may be in place for an extended period, but only while needed to protect a sensitive resource from trespass livestock. Trampling may occur during construction and removal of these fences (less than 250 yards long) and vegetation damaged (broken branches, damaged stems or flowers) would be expected to recover within weeks to months of construction/removal. No fencing of this nature would be deployed during most years. If 5 fence segments were in place simultaneously, the area affected would be approximately 22,500 square feet.

Although no roundup or trapping actions would be expected to cause more than negligible damage to vegetation, any damage over a large area would be promptly addressed through re-vegetation with native plants or other appropriate mitigation techniques (e.g., soil protection).

Reduction of the trespass livestock herd to 1/3 of its current size would mean that approximately 500,000 pounds of vegetation would be consumed per year instead of 1,508,180 pounds, and there would be fewer areas where the soil impacts would be severe enough to indirectly impact vegetation.

The adverse impacts of the Proposed Action on vegetation would be minimized by BMPs and mitigation measures during management actions and the area affected by these activities is small relative to the entire park (a few acres versus over 800,000 acres). Over the long term, the

beneficial impacts of the Proposed Action through reducing the livestock population and reduction of adverse effects by 2/3 would be more substantial than the damage caused by control activities. There would be beneficial impacts within the livestock management zones from reducing grazing pressure and the allowing vegetation to recover faster. Paint Gap/Onion Flat area would have only beneficial impacts in the long-term, as all trespass livestock would be removed and control activities would cease.

Cumulative Effects: Impacts from other past, present, and reasonably foreseeable future actions would be the same as those described above under Cumulative Effects of the No Action Alternative and would be mainly beneficial as a result of NPS management for native plants. The Proposed Action would result in localized temporary vegetation damage from control activities due to trampling. If areas adversely effected do not recover naturally after control activities, they would receive mitigating restoration measures, thus the adverse effects would be short-lived. More importantly, the Proposed Action would result in long-term benefits to vegetation as a result of reducing trespass livestock by at least 2/3 in the river zone, and removal of all livestock in the Paint Gap/Onion Flat area. Under the Proposed Action, native vegetation would recover over time as the livestock population decreases. Control activities would contribute relatively small adverse impacts.

Although there would be some limited adverse impacts associated with cumulative actions and the Proposed Action, when the beneficial impacts to vegetation from the reduction of the trespass livestock population are realized and combined with other past, present, and reasonably foreseeable future actions, the overall cumulative impacts on vegetation would be beneficial. The incremental impacts of the Proposed Action Alternative to the overall beneficial impacts on vegetation in the Rio Grande corridor and Paint Gap/Onion Flat area would be substantial.

3.4 WILDERNESS

Affected Environment

In general, the presence of trespass livestock would not affect a visitor's ability to find outstanding opportunities for solitude or primitive and unconfined recreation in wilderness areas of the park. However, trespass livestock have been known to damage campsites through trampling, grazing, and feces deposition and, occasionally, livestock are known to enter a campsite and interfere with visitors; thus, trespass livestock adversely impact recreational experiences in general.

Untrammeled wilderness is essentially unhindered and free from the intentional actions of modern human control or manipulation. Natural conditions are defined as substantially free from the effects of modern civilization. All of the trespass livestock are present in the park because of historic or modern human transport and/or release, intentionally or accidentally, leading to livestock presence in the park. Since being in the park, trespass livestock have eroded soils, removed and degraded vegetation, contaminated water resources, created trails, and fostered proliferation of non-native species. In sum, the human-caused presence of trespass livestock threatens the untrammeled quality of the park's wilderness areas and degrades the wilderness areas' natural conditions, at least in those areas where the trespass livestock occur - within two miles of the Rio Grande (including Boquillas Canyon) and Paint Gap/Onion Flat.

The 1978 BIBE wilderness study resulted in a recommendation to Congress that 538,250 park acres be designated as wilderness with an additional 44,750 acres recommended as potential wilderness. After a park expansion in 1987, the NPS prepared a wilderness eligibility assessment, which found that 62,400 acres in the new North Rosillos addition are suitable for wilderness consideration and warrants further study. Thus, the majority of park roadless areas are recommended, potential or suitable wilderness areas.

While these areas have been identified, none have been designated as wilderness. However, as mentioned in *Purpose and Need*, it is NPS policy to manage recommended, potential, and suitable wilderness in the same manner as designated wilderness. Thus, BIBE wilderness management zones (Figure 7) are managed in accordance with the Wilderness Act of 1964 and NPS Wilderness Policies. All these categories are referred to as wilderness (lower case) in the remainder of this plan.

All the trespass livestock management zones are considered at least half wilderness, as summarized below.

- Boquillas Canyon (Zone 1) – 19,767 acres (93% of zone)
- Rio Grande Corridor (Zone 2) – 47,543 acres (50% of zone)
- Paint Gap/ Onion Flat (Zone 3) – 13,579 acres (95% of zone)

The Wilderness Act mandates preservation of wilderness character and the NPS uses an interagency wilderness character framework to assess impacts of proposed management actions on wilderness character (Landres et al. 2015). The five qualities that contribute to wilderness character are untrammeled, undeveloped, natural, opportunities for solitude or a primitive and unconfined recreation, and other features of value (such as scientific, educational, scenic and historical values). Relevant aspects of these qualities are summarized below.

Untrammeled Quality. The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man," and "generally appears to have been affected primarily by the forces of nature." Therefore, wilderness is essentially unhindered and free from the actions of modern human control or manipulation. This quality is influenced by any activity or action that is intended to control or manipulate the components or process of ecological systems. Actions that are taken to preserve or restore natural qualities often degrade the untrammeled quality, even though these actions are taken to protect natural qualities and conditions.

Natural Quality. The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." Ecological systems within wilderness are to be substantially unaffected by modern civilization. This quality aims to preserve native species, patterns, and ecological and evolutionary processes, and allow us to understand and learn from natural systems. The natural quality is degraded by such things as loss of native species and alteration of natural ecological processes (such as fire). The natural quality of BIBE has been diminished by the presence of exotic plants and animals and trespass livestock.

Trespass livestock are present in the park because of historic or modern human transport and/or release somewhere in the region, followed by their movement into the park. Trespass livestock have damaged soils and vegetation. In sum, the human-caused presence of trespass livestock

threatens the untrammeled quality of park wilderness areas and degrades natural wilderness conditions, primarily along the Rio Grande but also in the Paint Gap/Onion Flat area.

Undeveloped Quality. The Wilderness Act defines wilderness as "an area of primeval character and influence, without permanent improvements or human habitation.... where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." Wilderness is to retain its primeval character and influence. This quality is affected by what are commonly called prohibited uses – the presence of structures and the use of motor vehicles, motorized equipment, or mechanical transport. Removal of structures and avoiding these prohibited uses preserves or improves this quality. Few prohibited uses are conducted within BIBE wilderness (e.g., emergency responses, less than annual motorized equipment use for a specific task) and park wilderness retains its undeveloped quality.

Opportunities for Solitude or Primitive and Unconfined Recreational Quality. The Wilderness Act states that wilderness offers "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality is influenced by factors that affect these opportunities. It provides for primitive recreation, the use of traditional skills, personal challenge, risk, and self-discovery, and freedom from constraints of modern life. Wilderness managers can preserve or improve this quality by reducing visitor encounters, signs of modern civilization, facilities, and management restrictions on visitor behavior.

In general, presence of trespass livestock would not affect a visitor's ability to find outstanding opportunities for solitude or primitive and unconfined recreation in the wilderness areas of the park.

Other Features of Value. The Wilderness Act states that a wilderness "may also contain ecological, geological, or other features of scientific, education, scenic, or historical value." These may include paleontological features, cultural resources, or even structures that are of wilderness-enhancing historical value. This fifth quality captures important elements or "features" of a particular wilderness that are not covered by the other four qualities. The types of features that would be preserved under this fifth quality may or may not occur within a wilderness, thereby making each wilderness unique from one another. There are no identified other features of value within park wilderness.

Impacts of Alternative A (No Action Alternative)

In implementing the No Action Alternative, park managers would collect incidental information on trespass livestock. No sustained approach would be developed to control and monitor trespass livestock. As summarized above, the majority of trespass livestock management zones 1 and 3 (Boquillas Canyon and Paint Gap/Onion Flat) are managed as wilderness, while about half of Zone 2 (Rio Grande corridor) is managed as wilderness.

Under the No Action Alternative, roundup activities do not impact wilderness values as horseback riding is allowed and no helicopters would be used. Any motorized vehicle support would be on existing roads or from higher elevation airplanes; therefore, neither activity would represent substantial impacts within the wilderness areas and would not degrade wilderness qualities. Most roundup activities under the No Action Alternative would continue to be along the Rio Grande, which is only partially wilderness. When roundup activities do occur in

wilderness, they can cover as little as 5 acres but up to 1,000 acres of terrain, depending on how the livestock are distributed and the type of terrain present.

Airplanes would continue to be used for aerial surveys approximately 3-5 days per year, primarily along the Rio Grande corridor, which is partially wilderness. Park managers would not use helicopters to locate or perform low-elevation herding, nor otherwise use helicopters over wilderness areas. Roundup activities within wilderness areas would be accomplished via mounted wranglers with no motorized vehicle support within wilderness and, therefore, would not affect the undeveloped quality.

Temporary corrals would only be placed along roads and not in wilderness areas. These activities would occur for a maximum of 20 days per year throughout the entire park. Boundary fence repairs would continue to be performed on foot or horseback, or would continue to be completed by neighbors from their property. Any control activity would follow all BMPs and mitigation measures and also would be infrequent and short duration, with limited potential to impact wilderness values.

As described in affected environment, trespass livestock would continue degrading the natural wilderness values wherever the animals occur within wilderness, as their presence as an exotic species indicates the natural community is being impacted. They also damage native vegetation and cause erosion and other soil damage.

There would be no impacts on untrammeled quality, solitude, unconfined or primitive recreation, undeveloped values, or other features of value under the No Action Alternative. The adverse impacts of the No Action Alternative on wilderness values would be vary, depending on location within the park. Areas with higher densities of trespass livestock would experience greater adverse impacts (i.e., larger areas of disturbance, more visible signs of their presence) due to continued impacts to the natural conditions within wilderness areas; however, this would primarily be within two miles of the Rio Grande.

The wilderness character of BIBE is fundamental to the significance of the park, offering outstanding opportunities for visitor experiences including extended solitude, natural quiet, and a lack of development. Trespass livestock degrade the natural quality of the wilderness and adversely impact the natural qualities of the vegetation and soils.

Cumulative Effects: Past projects and actions affecting wilderness in the park have stemmed from human populations within and around the park, and the resulting release of exotic species. Much of the development located near wilderness areas was established before the areas were proposed for wilderness and generally are located outside the trespass livestock zones. Exotic plants and animals (including but not limited to aoudad, feral hogs, buffelgrass, Lehman's lovegrass), all introduced by humans, would continue to impact wilderness areas. Overall, these past actions would continue to cause adverse impacts to natural wilderness conditions and values in a similar manner as those described above for trespass livestock.

Present or reasonably foreseeable future projects and actions that would have impacts on park wilderness include trail construction and maintenance, exotic plant and animal management, prescribed burns, NPS and US Border Patrol operations involving aircraft, and commercial air tours. Trail maintenance by five to ten-person seasonal crews using hand tools and mules would continue to occur in wilderness areas, resulting in temporary increases in noise impacts to the

outstanding opportunities for solitude and primitive and unconfined recreation during the day from October through April. The crews would camp in previously used sites and cause impacts similar to any other campers, such as trampling vegetation and disturbing wildlife while present.

Temporary adverse effects on wilderness qualities also could be caused by exotic plant and animal management, and prescribed burns. Generally, these adverse effects caused by the presence of people, equipment, and noise would occur only during a management activity that would be as brief as a few hours and occur for no more than 3-5 days in one area. These activities would temporarily negatively impact opportunities for solitude and undeveloped qualities. As soon as the management activity is complete, impact to wilderness would change to beneficial due to resulting improvements in the natural conditions.

Presence and noise of aircraft used by NPS, US Border Patrol, US Air Force and commercial air tours would cause short-term adverse impacts to wilderness by reducing opportunities for solitude and primitive and unconfined recreation. In all cases, aircraft use is brief (a few minutes at most) in any one location and rare during the course of a year. The NPS airplane flies about 400 hours per year, with an additional 120 annual hours of helicopter use anticipated from various management activities. Overflights by US Border Patrol, US Air Force, powerline maintenance, and similar entities contribute additional noise impacts in wilderness areas, but these are all generally for no more than a few minutes in any one location and have no permanent impacts to the opportunities for solitude and primitive recreation. All areas of the park may be affected by one or more of these aviation sources.

While some past, present, and reasonably foreseeable future actions (e.g., trail construction and maintenance, exotic plant and animal management, prescribed burns, NPS and US Border Patrol operations involving aircraft, and commercial air tours) would lead to some adverse impacts on the wilderness values of outstanding opportunities for solitude and primitive and unconfined recreation in the short-term, the overall long-term impacts from NPS stewardship and management (i.e., preventing use of mechanized equipment, avoiding construction or other development, minimizing noise) result in long-term beneficial impacts on wilderness values.

As described above, impacts of the No Action Alternative on wilderness would be adverse because of the continued presence of trespass livestock and their impacts upon natural conditions and visitor experience in wilderness areas. However, when the adverse impacts of the No Action Alternative are combined with the impacts of other past, present, and reasonably foreseeable future impacts, an overall beneficial effect is expected due to NPS management for wilderness. The cumulative beneficial effects would be reduced along the Rio Grande corridor and in the Paint Gap/Onion Flat areas where trespass livestock are impacting the natural qualities of wilderness in those areas, but the overall beneficial effects of NPS wilderness management would still outweigh those adverse effects.

Impacts of Alternative B (Proposed Action)

In implementing the Proposed Action, park managers would develop and implement a cohesive plan to control and monitor trespass livestock populations in the park. Because livestock management zones include wilderness, park managers would adhere to the NPS minimum requirements analysis policy for activities in wilderness areas. Equipment that would be used for control activities include fixed-wing aircraft, helicopters, ground-based traps, temporary corrals, and motorized vehicles (on established roads outside of wilderness areas). Park managers would

ensure that all equipment would be on-site only temporarily (no more than three days for a specific control event, typically only one day).

Much of the same equipment described under the No Action Alternative, would be used under the Proposed Action, including fixed-wing aircraft for livestock spotting and survey, and ground-based equipment such as riding stock, on-road motorized vehicles and trailers (outside of wilderness areas), fences, and temporary portable corrals. The Proposed Action would not include placing permanent structures or equipment. Impacts on wilderness from these activities would be the same as described under the No Action Alternative.

The Proposed Action would increase the natural quality of wilderness by promoting native species and natural ecosystem processes previously degraded by trespass livestock. Implementing the Proposed Action would increase natural character over the long term by providing a more natural, less degraded landscape of higher ecological integrity and natural quality. Trespass livestock would be eliminated from the Paint Gap/Onion Flat area and all adverse effects would be eliminated there. Trespass livestock would be reduced in Boquillas Canyon and along the Rio Grande and, therefore, reduce the adverse impacts to natural values, although much of the river zones are not wilderness.

The Proposed Action would temporarily reduce the undeveloped quality of wilderness by use of temporary box and corral traps, and other short-term activities and equipment that are part of various control activities that would give the impression of development. Traps would affect at most 2 acres for 2 years, not all in wilderness and generally placed in areas not visible to visitors. All other activities would be for less than 3 days at a time in any one location (which would generally be less than 1/4 acre).

The Proposed Action would temporarily reduce opportunities for solitude or primitive and unconfined recreation when visitor use is restricted for safety purposes during some control activities (which means restrictions for usually several hours to 1 day, but on rare occasions up to 3 days). The presence and noise of helicopters would cause short-term, adverse impacts to the undeveloped quality as the helicopter passes by, but such impacts would typically last as few as 5 minutes for an aircraft passing overhead to as long as two hours while a helicopter-based control event is conducted in a larger area of the park. This impact would be minimized as much as possible by undertaking control activities during periods of low visitor use or in low visitor use areas of the park. Over the long term, however, reduction of trespass livestock and their impacts would improve the natural values of wilderness areas.

The Proposed Action would not impact other features of value in park wilderness. The adverse impacts described above (temporarily reduction of undeveloped quality and opportunities for solitude or primitive recreation) would be short-term (a few minutes to a few days) in any given location each year. The beneficial impacts to natural quality would be long-term and widespread as trespass livestock populations in affected wilderness areas are reduced over time.

In the long-term, the Proposed Action would be expected to improve the natural conditions of wilderness, since trespass livestock populations and their impacts would be reduced or removed, allowing the ecosystem to recover. Under the Proposed Action, Paint Gap/Onion Flat (Zone 3) would eventually be free of trespass livestock, so the improvement to those wilderness areas would be permanent. Along the Rio Grande (Zone 2) and in Boquillas Canyon (Zone 1), trespass livestock populations would not be completely eliminated but reduced to 1/3 of the current

population. This would reduce the frequency and density in which trespass livestock would occur in wilderness areas within those zones.

As described under No Action, wilderness character is fundamental to the significance of the park. Compared to current conditions, the Proposed Action would create a measurable improvement to natural qualities by allowing vegetation and soils to recover from the impacts of trespass livestock. Compared to the No Action, the Paint Gap/Onion Flat area would recover completely from trespass livestock while the Rio Grande corridor would recover mostly but not completely as some trespass livestock would still occur there. Some of the control actions would create adverse impacts on undeveloped quality and opportunities for solitude or primitive and unconfined recreation. Use of aircraft and installation of temporary structures would create adverse impacts, but they would be relatively small compared to the total wilderness within the park and temporary.

Cumulative Effects: Impacts from other past, present, and reasonably foreseeable future actions would be the same as those described above under Cumulative Effects of the No Action Alternative and would be adverse on the wilderness value of outstanding opportunities for solitude and primitive and unconfined recreation in the short-term, but would result in beneficial impacts on untrammeled and natural values over the long-term. The Proposed Action would result in temporary impacts resulting from control activities, particularly aircraft use and presence of people performing management, on opportunities for solitude. More importantly, these adverse effects would be offset by long-term beneficial impacts on natural quality after removal and reduction of trespass livestock.

Although there would be some limited adverse impacts associated with cumulative actions and the Proposed Action, when the beneficial impacts to wilderness from the reduction of the trespass livestock population are realized and combined with other past, present, and reasonably foreseeable future actions, the overall cumulative impacts on wilderness values would be beneficial. The incremental impacts of the Proposed Action to the overall beneficial impacts to wilderness values in the Rio Grande corridor and Paint Gap/Onion Flat area would be substantial.

3.5 ARCHEOLOGICAL RESOURCES AND HISTORIC STRUCTURES

Affected Environment

History

Although the park is famous for natural resources and recreational opportunities, it is also rich in cultural history. Native peoples lived in and passed through this area for thousands of years. Pictographs and archeological sites are evidence of their presence. In the last 500 years, six different nations – Spain, France, Mexico, the Republic of Texas, the Confederate States of America, and the United States of America have claimed the park area (NPS 2004a).

Pre- and proto-historic indigenous people of Big Bend were culturally related to Uto-Aztecan cultures of Northern Mexico. Throughout the prehistoric period, humans found shelter and maintained open campsites throughout the present-day park. The archeological record reveals a nomadic hunting and gathering culture and lifestyle that remained virtually unchanged for

several thousand years. Archeological discoveries indicate archaic period (8,000 to 10,000 BC) occupation in the Chisos Mountains (NPS 2004a). Arid conditions and dependence on water for agricultural and horticultural activities prompted many past human inhabitants to settle near the river.

Each successive group to enter and colonize the region met conflicts with previous inhabitants. The 1848 Treaty of Guadalupe Hidalgo made the area US territory and led to an influx of Euro-Americans bent on exploration, natural resource exploitation, and settlement. Conflicts with Native American occupants led to decimation of Indian populations. Opening the Southern Pacific Railroad from San Antonio to California in 1882 and changes in land laws paved the way for pioneers of European descent to ranch and farm in the Big Bend region. Historic homesteads, corrals, fences, and watering points from this period are attractions for modern visitors wishing to understand park history. President Roosevelt's New Deal and the Civilian Conservation Corps of the 1930s constructed adobe and stone cottages, rustic stone structures along the Chisos Basin road, and several trails in the Chisos Mountains.

Archeological and Historic Sites

Based on a 2002 park-wide Archeological Site Estimation Project, the park features 26,000 archeological and historical sites dating from 8000 B.C. to approximately 1950 (NPS 2004a). Two archeological sites and one archeological district (Burro Mesa) are listed on the National Register of Historic Places, with another site and the Glenn Springs Cavalry Outpost in the nomination process.

The park includes 69 historic structures on the List of Classified Structures, with 49 of these on the National Register of Historic Places but only 26 in good condition (NPS 2004). The 49 structures are in nine National Register Districts or Sites. There are 25 listed structures in livestock management zone 2 along the Rio Grande, but the rest are outside of the primary livestock management zones. Three other sites are being nominated, and many others are evaluated and preserved as time and resources permit. The park also includes approximately 400 additional unlisted and unevaluated structures for which preservation management strategies have not been developed. These unlisted and unevaluated structures must be protected until they can be formally evaluated for National Register status.

Throughout human history in the Big Bend, the Rio Grande has remained a focus of human activity. Particularly in the past two or three millennia, humans relied most heavily on the water, flora and fauna of the Rio Grande and its major tributaries, including Boquillas Canyon. Of the 118 miles of Rio Grande within the park, only 25 miles (21%) of the river corridor have been surveyed for cultural resources, yet these studies reveal that the highest density of significant prehistoric and historic sites lie within 1/2 mile of the riverbank (Keller et al. 2016). These surveys confirm that almost every accessible terrace above the active floodplain contains evidence of human occupation, particularly at the confluences of tributaries and the Rio Grande.

Four out of eight National Register Districts (with 25 listed structures) in the park are located in the river corridor and several are included in the NPS Vanishing Treasures properties. Notably, the Castolon Historic District, Hot Springs Historic District, Rancho Estelle (Sublett Farm), and Daniel's Farmhouse are near the Rio Grande (Zone 2).

Within one survey area (a ½ mile zone along 25 river-miles), there are 386 prehistoric, historic, or mixed prehistoric/historic component sites documented, with another 115 sites already

documented elsewhere within the two mile buffer (Keller et al. 2016; BIBE Site Record Data, accessed May 2016). Assuming the remaining 79% of the river corridor is similar in site complexity and density, there would be an estimated 1,800 sites within the ½ mile buffer along the Rio Grande within the park (NPS 2016e). The density of sites farther away from the river may be lower, but a conservative estimate would be potentially 6,000 sites within two miles of the Rio Grande. Of those sites within two miles of the Rio Grande, 94 have been assessed. Only nine were rated in good condition (roughly 10%) and none were rated in excellent condition (Keller et al. 2016; BIBE Site Record Data, accessed May 2016).

Impacts of Alternative A (No Action Alternative)

Under the No Action Alternative, trespass livestock would continue to disturb (i.e., trample) and create incised trails (i.e., trailing) through archeological resources and historic sites. In addition, soil disturbance caused by trespass livestock would continue to impact archeological resources and historic structures by increasing erosion and exposing previously protected elements (See Section 3.2 above for more on soils impacts). Trespass livestock trample prehistoric archeological sites and break ancient lithic artifacts important in dating sites. Livestock trampling can dislocate hearths, roasting pit features, and other rock alignments to the point they are no longer identifiable, effectively destroying the site. Wandering livestock create trails (through repeated use), damaging sites. Wallowing by livestock can destroy evidence of archeological and historic features on the ground. Rubbing against rock art motifs and historic structures have an adverse effect in almost every instance.

The most common archeological resource in livestock management zones are archeological sites with surface features and some subsurface elements. These types of sites are and would continue to be readily impacted by livestock trampling and disturbing surface features and creating trails and associated erosion, thus exposing subsurface elements. The park is currently monitoring two archeological sites and one historic site for damage from trespass livestock (NPS 2016d; Figures 2 and 3 illustrate two of these sites).

- Prehistoric site: 82-acre site with 132,300 linear feet of trespass livestock track
- Prehistoric site: 5-acre site with 5,700 linear feet of trespass livestock track
- Historic site: 16-acre site with 15,200 linear feet of trespass livestock track

Assuming an average track/trail width of 2 feet, this translates into continued impacts to approximately 6% of each of the three sites above, with additional impacts on as much as 50% of a site due to changes in water flow and expanding erosion over the surrounding area (not just the tracks/trails themselves). The trails would cause increasing incision into the soils and exposure of subsurface elements. Once the trail is incised, it would affect the water flow and create additional erosion. Current erosion impacts are discussed under soils (Section 3.3). As more and more trails and associated erosion occurs, site integrity is increasingly threatened.

The archeological resources and historic structures most likely to be impacted are those within the 2-mile corridor (500 documented sites with 6,000+ potential sites) of the Rio Grande. Paint Gap/Onion Flat and Boquillas Canyon under the No Action Alternative would also experience trampling and disturbance of surface features and creation of trails as discussed above. Under the level of control proposed with the No Action Alternative, trespass livestock would not be reduced considerably and current impacts to archeological resources would continue.

The Rio Grande corridor represents only 14% of the total park area but 23% of the park's archeological and historical sites occur there. Of historic sites listed on or eligible for the National Register, four out of eight (50%) of the listed sites occur in the Rio Grande corridor. Additionally, given that 10% of known prehistoric archeological sites in the Rio Grande corridor are considered in eligible condition, 600 out of a potential 6,000 sites occurring within the Rio Grande corridor are likely eligible for the National Register.

Any management activities would follow established BMPs and mitigation measures and avoid impacts to known archeological resources and historic structures. Coordination would also occur in case a new area is targeted for management so an archeological or historic survey would be completed prior to the management activity.

The No Action Alternative would result in long-term, adverse impacts on the park's archeological and historic resources from trampling, trailing, and other site destruction in areas where livestock occur. Livestock continue to make new trails on these sites and approximately 6% of sites in the Rio Grande corridor receive direct adverse impacts and 50% of these sites receive indirect adverse impacts. As livestock continue to create new paths, these adverse impacts will increase. These impacts are occurring in an area that contains approximately 23% of the park's historic and archeological resources and at least half of the parks' Historic Districts. The impacts would continue to be restricted to primarily those sites with surface and shallow subsurface elements and near water sources.

Cumulative Effects: Present or reasonably foreseeable future projects and actions that could have measurable effects on archeological resources and historic structures in the park are exotic plants and animals, NPS management actions, and visitor use. NPS management of exotic plants, exotic animals, and prescribed burns generally avoid known archeological resources and historic structures. After implementing BMPs and mitigation measures, these NPS management actions and projects would not have measurable adverse impacts.

Given the frequency of archeological resources and historic structures near water resources and the high frequency of exotic animals near water resources, there has been some adverse impacts on archeological resources and historic structures from exotic animals (primarily trespass livestock but likely including feral hogs and aoudads). Non-livestock exotic ungulates are primarily in areas separate from trespass livestock, where there are fewer archeological and historic resources. Management actions to reduce exotic ungulates would reduce their adverse impacts upon cultural resources.

Although uncommon, human vandalism is an occasional and direct impact upon archeological resources and historic structures. Vandalism impacts can vary from minimal and correctable to complete destruction or removal of one or more site components.

Collectively, effects of past, present and reasonably foreseeable future actions have had adverse impacts on archeological resources and historic structures in the park.

As described above, the impacts of the No Action Alternative on archeological resources and historic structures would be long-term and adverse. Creation of trails by trespass livestock and associated disturbances (e.g., soils and vegetation) impact as much as 50% of any given archeological or historic site. Six percent of three sites being monitored for livestock impacts were damaged. When the effects of the No Action Alternative are combined with other past,

present, and reasonably foreseeable future impacts, the cumulative impacts on archeological resources and historic structures in the park would be long-term and adverse. The incremental impacts of the No Action Alternative would increase adverse impacts to the archeological resources and historic structures in the park beyond other impacts already occurring, especially in the Rio Grande corridor.

Impacts of Alternative B (Proposed Action)

Implementing the Proposed Action to reduce trespass livestock would have beneficial impacts, while some of the proposed treatment methods would have potential adverse impacts on archeological resources and historic structures. Within a few years, trespass livestock would be removed completely from the Paint Gap/Onion Flat area (Zone 3) eliminating potential future impacts in that area.

Reduction in trespass livestock of the Rio Grande corridor, including Boquillas Canyon, by approximately 2/3 of the current population would substantially reduce the level of impact to archeological resources and historic structures in those areas. This could be estimated as a reduction in area impacted per site. For example, the three sites discussed above under the No Action could experience additional disturbance only over 2% of the site, and potentially soil and vegetation could recover in other parts of the site and prevent further degradation over a larger area. The smaller livestock population would impact a smaller area of the Rio Grande corridor, so some sites currently impacted may no longer be visited or damaged by trespass livestock.

Other sites may be visited less frequently which would help protect subsurface and some surface features. In this case, future damage on potentially 2/3 of currently impacted sites could be halted. In either scenario (or more realistically a combination of the two), there would be fewer impacts to archeological sites and historic structures as a result of stabilization of soils and reduced erosion. Damage already done to an archeological resource or historic structure would not be reversed, but the rate of further damage would be reduced.

Although the total number of days for control activities and the range of control activities is increased under the Proposed Action, the same BMPs and mitigation measures would be followed with respect to archeological resources and historic sites, so there would not be impacts from the management activities themselves.

The Proposed Action would be expected to have long-term, beneficial impacts on the park's archeological resources and historic structures due to reduced livestock populations and reduced (or completely eliminated) site disturbance by trespass livestock.

Cumulative Effects: As described under the Cumulative Effects of the No Action Alternative above, the past, present, and reasonably foreseeable future actions have had or would have long-term, adverse impacts on archeological resources and historic structures in the park. As described above, the impacts of the Proposed Action would be local, long-term, and beneficial as a result of reducing impacts to archeological sites and historic structures. This benefit would result from reducing the current livestock population by 2/3, thus reducing future impacts from trails in cultural sites or perhaps eliminating impacts to some sensitive resources altogether.

As it would reduce or eliminate future impacts from trespass livestock, the Proposed Action would reduce cumulative adverse impacts on archeological resources and historic structures.

Impacts from livestock management activities would be unlikely as park staff would avoid potential archeological resources and known historic structures.

When the effects of the Proposed Action are combined with other past, present, and reasonably foreseeable future impacts, cumulative adverse impacts would be reduced by at least 2/3 of current impacts in the Rio Grande Corridor including Boquillas Canyon and eliminated in Paint Gap/Onion Flat. The incremental impacts of the Proposed Action would generally reduce cumulative adverse impacts to archeological resources and historic structures in the three priority livestock management zones.

4. CONSULTATION AND COORDINATION

4.1 AGENCY CONSULTATION

As part of a Section 7 consultation under the Endangered Species Act the NPS and USFWS participated in scoping meetings during January 2010 to discuss potential impacts of exotic species management proposals (trespass livestock, exotic animal, and exotic plant) to federally-listed special status species. The USFWS attended an additional scoping meeting October 29 and 30, 2014 at BIBE. A BA and request for formal consultation was provided to the USFWS on May 21, 2015. The USFWS provided a Biological Opinion on December 15, 2015 and confirmed the continued validity of that Biological Opinion on February 9, 2017. The BA and Biological Opinion included activities associated with managing trespass livestock, exotic animals, exotic plants, and activities for directly managing federally listed species. The NPS is required to provide an annual report of management activities for all programs to USFWS.

In accordance with Section 106 of the NHPA, consultation with the Texas State Historic Preservation Office (SHPO) on aspects of this plan and EA with potential to affect cultural resources occurred in September 2016. The consultation document described and summarized planned actions as well as BMPs to be implemented to prevent and minimize impacts to cultural resources. The Draft Trespass Livestock Management Plan was provided for SHPO reference and review. On October 6, 2016, the Texas SHPO provided a letter concurring with the NPS finding that plan actions, including protective measures, would result in no adverse effects upon historic properties.

4.2 NATIVE AMERICAN CONSULTATION

In February 2017, consultation letters were sent to sixteen Native American tribes affiliated with BIBE. The letters requested tribal input to determine if there were cultural resources, sacred sites, or natural resources within the park that warrant further avoidance or protective measures (beyond those described in plan mitigations). Thirteen of the tribes responded in writing or verbally by telephone. All thirteen either indicated support for the Proposed Action with mitigations, or chose to offer no comment.

5. REFERENCES

Bengeyfield, P
2007 "Quantifying the Effects of Livestock Grazing on Suspended Sediment and Stream Morphology." In *Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference (General Technical Report PNW-GTR-689)*, edited by Michael J. Furniss, Catherine F. Clifton, and Katheryn L. Ronnenberg, 1:85–93. San Diego, CA: US Forest Service, Pacific Northwest Research Station. http://www.fs.fed.us/pnw/publications/pnw_gtr689/volume1.pdf#page=103.

Carrera, JA
1994 "Alternatives for the Use of the Natural Resources of the Region between Santa Elena and Boquillas, Mexico. Profauna A.C." Translated by JT LaBaume, Sul Ross State University. Big Bend National Park Texas: Protección de la Fauna Mexicana A.C. and National Park Service.

Chapinal, N, and CB Tucker
2012 "Validation of an Automated Method to Count Steps While Cows Stand on a Weighing Platform and Its Application as a Measure to Detect Lameness." *Journal of Dairy Science* 95 (11): 6523–28.

Environmental Protection Agency (EPA)
2008 *Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks*. EPA420-F-08-024. US Environmental Protection Agency.

Hubbard, RK, GL Newton, and GM Hill
2004 "Water Quality and the Grazing Animal." *Journal of Animal Science* 82: 255–63.

Hughes, PB, and KJ Mickey
1993 "A Reanalysis of Recreational and Livestock Trespass Impacts on the Riparian Zone of the Rio Grande, Big Bend National Park, Texas." Alpine, TX: Sul Ross State University.

Kauffman, JB, and WC Krueger
1984 "Livestock Impacts on Riparian Ecosystems and Streamside Management Implications. A Review." *Journal of Range Management* 37 (5): 430–38. doi: 10.2307/3899631.

Keller, DW, WA Cloud, SS Cason, RW Gray, RW Walter, TC Alex, BL Alex, et al.
2016 "A Sampling of Archeological Resources in Big Bend National Park, Texas." In Prep. Alpine, TX: Center for Big Bend Studies, Sul Ross State University. Report to the National Park Service.

Landres, P, C Barns, S Boutcher, T Devine, P Dratch, A Lindholm, L Merigliano, N Roeper, and E Simpson
2015 *Keeping It Wild 2: An Updated Interagency Strategy to Monitor Trends in Wilderness Character across the National Wilderness Preservation System*. General Technical

Report RMRS-GTR-340. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. https://www.treesearch.fs.fed.us/pubs/49721.

Lull, HW
1959 *Soil Compaction on Forest and Range Lands*. Washington DC: US Department of Agriculture, Forest Service. https://archive.org/stream/soilcompactionon768lull/soilcompactionon768lull_djvu.txt.

Marcella, K
2007 "Out of the Gait." *Veterinary News DVM360*. http://veterinarynews.dvm360.com/out-gait.

Mungall, EC, and WJ Sheffield
1994 *Exotics on the Range: The Texas Example*. College Station, Texas: Texas A&M University Press.

National Park Service (NPS)
1993 "A User Study of the Rio Grande River Corridor in Big Bend National Park." Prepared by WP Stewart, BS Anderson, and PS Dunfee, on file at Big Bend National Park. National Park Service.

2004 *Big Bend National Park Final General Management Plan Environmental Impact Statement*. 1551FES04028. Big Bend National Park, Texas: US Department of Interior. https://www.nps.gov/bibe/learn/management/gmp.htm.

2006 *Management Policies*. US Department of the Interior. http://www.nps.gov/policy/mp2006.pdf.

2012 "Effects of Undocumented Aliens and Illegal Border Activity on Big Bend National Park Resources – 2012 Survey." Prepared by S Wick, R Skiles, T Alex, and D Corrick, on file at Big Bend National Park. Big Bend National Park, Texas: National Park Service.

2013 "Effects of Undocumented Aliens and Illegal Border Activity on Big Bend National Park Resources - 2013 Survey." Prepared by TC Alex, S Wick, B Brauch, BL Alex, and K Mullen, on file at Big Bend National Park, Texas: National Park Service.

2014 "Effects of Undocumented Aliens and Illegal Border Activity on Big Bend National Park Resources - 2014 Report." Prepared by S Wick, T Alex, B Peyton, and J Spalding, on file at Big Bend National Park. Big Bend National Park, Texas: National Park Service.

2015 "Biological Assessment for Exotic Species Management Plans, Big Bend National Park." Prepared by J. Sirotnak and R. Skiles, on file at Big Bend National Park. Big Bend National Park, Texas: National Park Service.

2016a "A Survey of Trespass Livestock Impact on River Road Campsites, Big Bend National Park, Texas." Prepared by A Davis and D England, on file at Big Bend National Park, Texas: National Park Service.

2016b "Big Bend National Park Terracette Estimation Using Google Earth Pro Visualization and Polygon Area Calculation." Prepared by R Skiles, on file at Big Bend National Park. Big Bend National Park, Texas: National Park Service.

2016c "Quantifying Trespass Livestock in Big Bend National Park, 2010 through 2015." Prepared by R Skiles, on file at Big Bend National Park. Big Bend National Park Texas: National Park Service.

2016d Email Message from Tom Alex, Archeologist, to Raymond Skiles, NPS Wildlife Biologist, April 14, 2016, Regarding Cultural Resources and Trespass Livestock.

2016e Email Message from Tom Alex and Connie Gibson, Archeologists, to Raymond Skiles, NPS Wildlife Biologist, May 18, 2016, Regarding Cultural Resources near the Rio Grande.

2016f Email Message from Cheryl McIntyre, Hydrologist, to Raymond Skiles, NPS Wildlife Biologist, June 8, 2016, Regarding Springs and Livestock Use Based on NPS Chihuahua Desert Network Monitoring Data.

2016g Email Message from Joe Sirotnak, Botanist, to Raymond Skiles, NPS Wildlife Biologist, April 14, 2016, Regarding Soil Recovery after Trespass Livestock.

Natural Resource Conservation Service (NRCS)

2003 *National Range and Pasture Handbook*. Fort Worth, TX: US Department of Agriculture, Natural Resources Conservation Service, Grazing Lands Technology Institute. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17734.wba.

2015 *Soil Survey*. *Area: Big Bend National Park,* Texas Survey Area Data: Version 17, Nov 16, 2015 Soil Survey Area: Brewster County, Texas (Main Part) Survey Area Data: Version 21, Nov 16, 2015. http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Newman, JS, EJ Rickley, and TL Bland

1982 *Helicopter Noise Exposure Curves for Use in Environmental Impact Assessment*. Report No. DOT-FAA-EE-82-16. Washington, DC: Federal Aviation Administration.

Schmidly, DJ, and RB Ditton

1976 "A Survey and Analysis of Recreational and Livestock Impacts on the Riparian Zone of the Rio Grande in Big Bend National Park." Report to the National Park Service. College Station, TX: Texas A&M University and Texas Agricultural Experiment Station.

Thurow, TL
1991 "Hydrology and Erosion." In *Grazing Management: An Ecological Perspective*, edited by REC Heitschmidt and JW Stuth, 141–59. Portland, OR: Timber Press.

Trimble, SW, and AC Mendel
1995 "The Cow as a Geomorphic Agent - A Critical Review." *Geomorphology* 13: 223–53.

UNESCO
2002 *Biosphere Reserve Information - United States of America - Big Bend*. United Nations Educational, Scientific and Cultural Organization. http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=USA+02.

US Air Force
2013 *Air Emissions Guide for Air Force Mobile Sources*. Lackland AFB, TX: Air Force Civil Engineer Center, US Air Force. http://www.dtic.mil/dtic/tr/fulltext/u2/a577276.pdf.

US Fish and Wildlife Service (USFWS)
2015 "Biological Opinion on the National Park Service's Proposed Big Bend National Park (BBNP) Exotic Species Management Plan and Other Management Actions for the Benefit of Federally Listed Threatened and Endangered Species." Austin, TX: US Fish and Wildlife Service. Completed December 15, 2015.

Vallentine, JF.
1990 *Grazing Management*. San Diego, CA: Academic Press, Inc.

Wesson, MD, J Bennett, C Sifuentes, AM Roberson, J Karges, and GP Garrett, eds.
2014 *Conservation Assessment for the Big Bend-Rio Bravo Region: A Binational Collaborative Approach to Conservation*. Montreal, Quebec: Commission for Environmental Cooperation.

Williams, PB, and JL Marion
1997 "Assessment of Backcountry Campsite Conditions in Big Bend National Park." Report to the National Park Service, Big Bend National Park, Texas. Blacksburg, VA: Virginia Tech Cooperative Park Studies Unit.

APPENDIX A: WILDERNESS MINIMUM REQUIREMENTS DECISION GUIDE

Originally Signed October 2015, Revised December 2016

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

WILDERNESS MINIMUM REQUIREMENTS DECISION GUIDE

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– The Wilderness Act, 1964

Project Title: Big Bend National Park Trespass livestock Management Plan

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.

Since Park establishment, domestic livestock, particularly horses, burros and cattle, have, contrary to federal regulations and NPS policy, entered the park from neighboring lands and damaged Park resources and the visitor experience. Consequently, Park managers have for decades struggled to prevent livestock entry, remove the stock from Park land, and protect Park resources from their damage.

The primary source of horses, burros and cattle that trespass onto Park lands is from Mexican villages, ranches and farms. On rare occasions, livestock from neighboring U.S. properties move onto park lands.

Regardless of source, trespass livestock create unacceptable damage to Park natural and cultural resources and the visitor experience (Schmidly and Ditton 1976, Hughes and Mickey 1993, Williams and Marion 1997, Stewart et. al. 1993, Wick et. al. 2012, 2013, 2014). They damage vegetation by grazing and trampling; cause soil erosion through hoof disturbance, trail creation, and wallowing; contaminate and degrade water sources and banks with trampling, grazing and feces; threaten cultural resources by trampling archeological and historic sites and rubbing historic structures and rock art panels; and impact the visitor experience by creating trails and wallows in campsites, littering campsites, parking areas and roadways with feces, entering occupied campsites, and intruding on the visual scene.

Aerial surveys and patrol reports by staff suggest as many as 200 head of livestock, and often more, may be trespassing upon Park land and damaging Park natural and cultural resources at any given time.

Following recognition that trespass livestock had increased dramatically, possibly in response to severe drought conditions, the Park made a concerted capture effort in late 2011 and early 2012. During this period, NPS and USDA staff, using traditional mounted wrangler methods, captured 99 animals (50 horses, 42 cattle, 7 burros), between Boquillas and Santa Elena Canyons. All 99 appeared to be of Mexican origin. Of animals captured, 46 had brands or tags.

Much of Park land adjacent to Mexico is remote, rugged, and isolated backcountry within the park's wilderness management zones. Most livestock from Mexico remain within a few miles of the river. A small herd of horses, originally from an adjacent U.S. ranch, have evaded traditional mounted wrangler capture efforts while living in the in the north central part of the park. This is also proposed wilderness.

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages by answering Yes, No, or Not Applicable and providing and explanation.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: ☒ **No:** ☐

Explain:

Management and control of trespass livestock via cultural practices, education and neighbor collaborations with U.S. and Mexican owners outside of wilderness and the Park is important, but the livestock that threaten wilderness resources are partially or entirely within wilderness.

The purpose of this plan and MRDG includes protecting native natural and cultural resources and the visitor experience within park wilderness and non-wilderness zones. Thus the unacceptable damage being inflicted upon park resources, and NPS protection of those resources, is inherent to wilderness zones.

Management of trespass livestock only outside wilderness will not address animals and threats that occur within wilderness, and will allow proliferation of livestock in both wilderness and non-wilderness backcountry.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows or requires consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: ☐ **No:** ☐ **Not Applicable:** ☒

Explain:

There are no special provisions that apply in The Wilderness Act (1964). However the following sections form the basis for analysis:

Section 2 (a) Wilderness "shall be administered … in such manner as will leave them unimpaired for future use as wilderness, and so as to provide for the protection of these areas [and] the preservation of their wilderness character…"

Section 2 (c) An area of wilderness is…an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable…"

Section 4 (c) Prohibition of certain uses "…except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act…there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain:

The NPS Organic Act (1916) directs the service to preserve the scenery and the natural and historic objects and the wild life therein and to provide for enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

The Redwood National Park Expansion Act of 1978 reiterated this mandate by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 U.S.C.§ 1 a-1).

Executive Order 13112 (1999) , Section 2 directs federal agencies to use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

The Endangered Species Act (1973) states that all federal departments and agencies shall seek to conserve endangered species and threatened species.

The Animal Health Protection Act (2003) restricts and prohibits importation of livestock into the United States other than legal entry through a Port of Entry, including checks and quarantine to prevent the introduction into or dissemination within the United States of any pest or disease of livestock.

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain:

NPS Management Policies (2006) state that trespass livestock will not be allowed to displace native species if displacement can be prevented, and that all exotic plant and animal species that are not maintained to meet an identified park purpose will be managed – up to and including eradication.

NPS-77, Natural Resources Management Guideline (1991) provides guidance for implementing Management Policies regarding trespass livestock, including management of existing species and prevention of invasion by species not yet present.

Director's Order 12, National Park Service

DO-12 states the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all CEQ regulations for implementing NEPA. In some cases, NPS has added requirements under DO-12 that exceed the CEQ regulations. Briefly, DO-12 mandates that the evaluation of NPS actions involves:

> "…meaningful participation by the public and other stakeholders; development and critical evaluation of alternative courses of action; rigorous application of scientific and technical information in the planning, evaluation and decision-making processes; use of

NPS knowledge and expertise through interdisciplinary teams and processes; aggressive incorporation of mitigation measures, pollution prevention techniques; and other principles of sustainable park management in all actions".

Big Bend National Park General Management Plan (2004) states "the NPS will inventory and monitor trespass livestock, reverse the destructive effects of trespass livestock, study livestock to assess threats and prioritize actions, research strategies to prevent introduction and establishment of livestock, control or eliminate trespass livestock where there is a reasonable expectation of success and sustainability, manage exotic diseases and pests, and educate park visitors and neighbors on preservation of native species."

Director's Order 41: Wilderness Management Guideline: This guideline provides additional detail about NPS wilderness management policies not found in NPS Management Policies.

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: Untrammeled, Undeveloped, Natural, Outstanding opportunities for solitude or a primitive and unconfined type of recreation, or other unique components that reflect the character of this wilderness area?

1. **Untrammeled:**
   Yes: ☒ No: ☐ Not Applicable: ☐

   Explain:

The untrammeled quality of this wilderness area is degraded by the human-caused presence and impacts of exotic trespass livestock. All of the livestock species considered in this plan are present in the park because of historic or modern human transportation and/or release, intentionally or accidentally; leading to direct or indirect introduction and spread into the Park. Soil erosion, overgrazed vegetation, water contamination, trail creation, loss of native species, and proliferation of non-native species all represent "Trammeling" as defined by the Wilderness Act. Under this definition, untrammeled wilderness is essentially unhindered and free from the actions of modern human control or manipulation. This untrammeled quality is influenced by any activity or action that controls or manipulates the components or processes of ecological systems inside the wilderness.

2. **Undeveloped:**
   Yes: ☐ No: ☒ Not Applicable: ☐

   Explain:

No management action is necessary that would affect the undeveloped nature of the wilderness area.

3. **Natural:**
   Yes: ☒ No: ☐ Not Applicable: ☐

   Explain:

The presence of trespass livestock interferes with the natural conditions of the wilderness resource. The natural qualities of this wilderness area is threatened by the presence and impacts of livestock, including soil erosion, overgrazed vegetation, water contamination, trail creation, and loss or reduction of native species and their genetic integrity, among other impacts, all represent degradation of natural conditions as defined by the Organic Act, NPS Policies, and the Wilderness Act.

4. **Outstanding opportunities for solitude or a primitive and unconfined type of recreation:**
   Yes: ☒ **No:** ☐ **Not Applicable:** ☐

   Explain:

In general, the presence of trespass livestock reduces opportunities for unconfined recreation by degrading campsites (trailing, erosion, waste products), creating hazards (direct intrusion into occupied campsites, contaminated water sources), or simply creating unnatural conditions that reduce desire to visit impacted locations.

5. **Other unique components that reflect the character of this wilderness:**
   Yes: ☐ No: ☐ Not Applicable: ☒

   Explain: None identified for this area

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to be consistent with one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

1. **Recreation:**
   Yes: ☒ No: ☐ Not Applicable: ☐

   Explain:

The presence and impact of trespass livestock species degrades the quality of the recreation experience by reducing the opportunity to observe native species and unimpaired natural conditions and processes and by degrading campsites and other recreational sites (trailing, erosion, waste products), creating hazards (direct intrusion into occupied campsites, contaminated water sources), or simply creating unnatural conditions that reduce desire to visit impacted locations.

2. Scenic:

Yes: ☒ No: ☐ Not Applicable: ☐

Explain:

The presence of trespass livestock degrades the scenic value of wilderness by reducing the opportunity to observe native species, landscapes, natural conditions, and natural processes, and by introducing non-native components (livestock) into park and wilderness scenes.

3. Scientific:

Yes: ☒ No: ☐ Not Applicable: ☐

Explain:

Ecosystem degradation by trespass livestock reduces opportunity to scientifically study and document natural conditions and processes. While the presence of trespass livestock creates additional opportunity for study of degraded ecosystems, these are not uncommon outside of parks, and the higher scientific value of wilderness areas is the study and documentation of conditions that have not been degraded.

4. Education:

Yes: ☒ No: ☐ Not Applicable: ☐

Explain:

Educational opportunities, including the ability to demonstrate natural ecosystem components and dynamics, are reduced by ecosystems and wilderness areas degraded by trespass livestock. Conversely, presence and impacts of trespass livestock presents opportunities to educate about these degradation factors. However, such degraded conditions are prevalent outside Park and wilderness areas, thus the higher value of wilderness area education are the values of a higher quality, more intact natural system.

5. Conservation:

Yes: ☒ No: ☐ Not Applicable: ☐

Explain:

Trespass livestock impacts that degrade native species, natural resources and the natural function of ecosystems are in direct conflict with classical definitions of conservation, including preserving and restoring native species and ecosystems. Trespass livestock impacts are counter to conservation mandates under NPS law and policy

6. Historical use:

Yes: ☐ No: ☒ Not Applicable: ☐

Explain:

While livestock grazing within fenced pastures was conducted prior to park establishment, those purposes were always by owners or designees legally entitled to such use of the land. Upon land acquisition and conversion to park purposes, no livestock grazing was authorized to continue on federal property. Although the pre-park ranching and livestock production era is a component of park interpretive programs, no "living history" livestock presence has occurred. No grazing rights have been perpetuated within the park. Allowable historical uses of livestock in the park have been restricted to riding and pack stock use with permit, and administrative uses. Park visitor use and administrative purposes have been, and continue being use of riding and pack horses and burros as a means of deriving park and wilderness values.

Step 2: Is any administrative action necessary in wilderness?

Yes: ☒ **No:** ☐ **More information needed:** ☐

Explain:

Without trespass livestock control and monitoring as appropriate, infestations will spread and will not be contained or minimized. This perpetuates and increases a permanent change from native- to exotic- dominated ecosystems. Because livestock infestations occur both within and outside of wilderness, implementing actions only outside of wilderness will not be adequate to preserve wilderness character. Other legislation, such as the Endangered Species Act, mandate protective management in listed species habitat, including within wilderness.

Opting to take no action is not consistent with preserving the wilderness character, or the public purposes of wilderness. Additionally, a no-action alternative is inconsistent with other laws and regulations, NPS policy, and park purposes.

If action is necessary, proceed to Steps 3 and 4 to determine the minimum activity.

Step 3: Describe and Analyze the Alternatives

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Actions Common to All Alternatives:

1) Compliance with regulatory measures: All actions will be consistent with NEPA, NHPA, ESA, OSHA and other regulations.
2) Boundary fencing: The park boundary fence will be maintained where currently in existence. Most of the boundary between the Park and U.S. neighbors is fenced. The Rio Grande boundary with Mexico is not fenced.

3) Education and Interpretation programs: NPS staff will continue to inform and teach visitors about effects of trespass livestock on native ecosystems, species, and cultural resources.
4) Collaboration measures: NPS will coordinate with neighbors, state and federal agencies, NGO partners, and Mexican stakeholders in any actions taken.
5) Early detection and monitoring: NPS and partners will continue to monitor new trespass livestock infestations and spread of existing populations.
6) Safety: All activities will be performed with primary emphasis on staff and visitor safety.

Mitigations Common to All Alternatives

Regardless of alternative selected, the following mitigations would apply in order to ensure human safety and minimize impacts to natural and cultural resources and the visitor experience.

- During any trespass livestock control activity, public and employee / applicator safety would be the primary consideration.
- Each significant livestock gathering event will be conducted utilizing the federal-standard incident management system, and include implementation of an event-specific incident management plan (IMP). IMP's will including standard pre-plans for objectives and organization, safety (including hazard identification and avoidance), medical response, communications, air operations including crash rescue, and other issues relevant to specific event circumstances.
- Job hazard analyses would be developed and followed for all control activities.
- Visitation patterns would be a prime consideration, in determining the timing and methods of control activities.
- Control activities would be performed by professionals, aware of the need for the utmost caution and discretion when operating in a National Park setting.
- Visitors would not be present within safety risk zones of aerial activities or livestock confinement. This would be achieved primarily by implementing temporary closures as warranted.
- Planning and timing of flights would include wildlife biologist consultation to minimize and avoid impact upon sensitive species, locations and phases, such as peregrine falcon nesting, and desert bighorn lambing.
- In cases where injured or incapacitated livestock must be euthanized for humane treatment reasons, park euthanasia guidelines would be followed (**Appendix XXX**).
- If dogs are used to herd trespass livestock, only trained stock dogs would be used, and handlers would manage them to minimize affects upon wildlife.
- To minimize impacts on soils, traps would be sited to minimize erosive soil loss.
- Trapping effects on vegetation would be mitigated by site selection in consultation with Park botanists.
- Livestock feed bait would be selected to minimize the chance of non-native plant invasion.
- Clear warning and explanation signs would accompany any traps set in areas with potential for visitor use.
- Planning and consultation among the Park's resource specialists would minimize potential impacts to water resources.

- Traps, trapping, and other control activities would be prevented from harming water resources by establishment of buffer zones, and emphasizing care around backcountry water resources.
- To avoid impacting cultural resources, staff managing control operations would consult the Park's archeologist to identify suitable staging and corral trap sites, and other ground-disturbing activities.
- Should Alternative 2 unearth previously unknown cultural resources, control activities in the area of discovery would stop and the NPS would consult the SHPO and the Advisory Council on Historic Preservation, as necessary, according to 36 CFR 800.13, Post Review Discoveries.
- If human remains are found, the NPS would consult American Indian tribes as required by the Native American Graves Protection and Repatriation Act.

Alternative # 1 – No Change. Continue Traditional Primarily Non-Mechanized Approach

Description:

Manage trespass livestock, and reduce their impacts upon Park resources using primarily non-mechanized, non-motorized methods, that include minimal fixed wing aircraft assistance for spotting, but does not include helicopter-assisted roundups, and do not include permanent installations (fencing) inside wilderness management zones except in rare circumstances.

This alternative, other than exclusion of the above methods, would be similar to Alternative 2. This alternative includes reduced intrusive impacts upon the wilderness experience of visitors when compared to Alternative 2.

Under this alternative, impacts to wilderness and the wilderness experience primarily include use of riding stock, occasional use of trained herd dogs, temporary corral or strategic fencing structures, and potential for temporary visitor use restrictions during ground-based control operations.

Trespass livestock spotting and documentation would occur primarily from roadways, and by staff hiking or riding horseback. The park's fixed-wing aircraft, already in use for other purposes, would occasionally assist livestock spotting. No helicopter-assist to livestock roundups would occur. No helicopter-based spotting or roundup activities would occur over wilderness management areas.

Placement and removal of temporary corral traps or strategic fencing and baiting away from roads would be accomplished, as feasible, using human and livestock transport.

No permanent installations would be employed. All traps, and feeders, which might be considered "installations," would be deployed only during episodes or seasons of capture opportunity, dictated by each particular geographic location of trespass livestock infestation, movement patterns, temporary climatic conditions, and/or NPS and cooperator staffing and

funding cycles. Unlike in Alternative 2, no longer-term facilities, such as strategic fencing, or long-term stationary traps, would be constructed.

Alternative 2 includes application of proposed techniques to the existing priority livestock species, but is not limited to those species. If new species of similar biology and management requirements invade the Park, the plan and this MRDG would be applicable to such livestock as well.

Given existing status of several trespass livestock populations in rugged mountain and canyon terrain of the Park, strictly ground-based control would likely not succeed in appreciably reducing those populations. Additionally, any degree of success would require substantially more time and staff, and create additional human safety risks.

Trespass livestock control in less rugged terrain, generally near road access would likely be modestly successful, as in the past. However, it would not be possible to remove all trespass livestock from even accessible areas, as some livestock are capable of evading traditional ground-based mounted wrangler methods.

Thus, this alternative would result in only partial control of trespass livestock in the Park.

Given the higher reliance upon ground-based, human and horse-based effort, and the significantly more time those methods would require when not assisted by helicopter, visitor use restrictions and area closures would be lengthened.

Effects:

Wilderness Character:

Untrammeled

Control activities and equipment would, by their presence, represent some "trammeling" of wilderness character. Low-impact, ground-based control of trespass livestock would require more lengthy implementation periods, and thus longer trammeling.

Trespass livestock populations would be only partially controlled, and would persist. Thus, trammeling by human-caused trespass livestock, including animal presence, grazing, wallows, erosion, water source contamination, impact to cultural resources, and compromise of natural conditions and ecosystems would be partially but not completely reduced.

Undeveloped

No permanent or long-term developments would be installed. Helicopter herding, and permanent fencing or corral traps would not be used, thus reducing trespass livestock control–related impacts to wilderness values.

Natural
This alternative helps increases the natural quality of wilderness by promoting native species and natural ecosystem processes, which would be degraded by presence and proliferation of trespass livestock and impacts. However given limitations on effectiveness of solely ground-based control, degradation of natural qualities would persist in most areas of historic trespass livestock infestations in the park. Degradation of natural values by trespass livestock impacts include grazing, trampling, trailing, soil erosion, water source contamination, and compromise of natural conditions and ecosystems would be partially reduced, but reduction would not be as extensive as would result from Alternative 2.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation

Under this alternative, impacts to wilderness and the wilderness experience primarily include temporary intrusion by traditional mounted wrangler operations and potential for temporary visitor use restrictions during primarily ground-based, non-mechanized control operations.

For temporary periods and in select temporary locations, recreation opportunities would be restricted for safety purposes. These would be minimized in accordance with Mitigations listed above. Over the long term, however, reduction of trespass livestock and their impact would preserve or increase opportunity for unconfined recreation by reducing recreational deterrent factors caused by trespass livestock. Ground-based control would be more effective in areas near roads, and less effective in remote and rugged portions of the Park.

Additionally, restriction due to trespass livestock impacts would persist in more areas due to limitations and reduced effectiveness of primarily ground-based control methods.

Other unique components that reflect the character of this wilderness
No other unique components reflect the character of this wilderness.

Heritage and Cultural Resources

Trespass livestock directly impact historic resources by trampling, pawing, and wallowing in or on ground surface features; and rubbing on constructed features and vertical surfaces such as historic structures, ruins and rock art panels.

Alternative 1 would somewhat reduce risk and damage by trespass livestock to heritage and cultural resources, however, given the limitations of strictly ground-based approaches, more livestock would remain uncontrolled, and broad protection of Park cultural resources would not be expected.

Maintaining Traditional Skills
Transport by, and use of horses and burros are traditional skills, given the area history of such use for transport and livestock production in the Big Bend area. Mounted riding and herding would

continue to be the primary method by which trespass livestock are managed in the park. NPS and cooperator staff would continue using, and being trained in the use of riding and maintaining stock for round-up purposes. No change would occur to the primary park uses of pack stock, that of supporting NPS trail construction and maintenance. Some additional use of pack stock would be fostered in supporting remote backcountry or wilderness trespass livestock removal operations.

Special Provisions

No Special Provisions have been identified.

Economics and Timing Constraints

In most park areas subject to trespass livestock invasion from Mexico, regular monitoring and occasional treatment using traditional mounted wrangler methods have been, and would continue being conducted by existing NPS and USDA staff and base budgets.

However, significant control in the several rugged, remote park areas (Boquillas Canyon, Mesa de Anguilla, and Onion Flat) that have proven beyond the capacity of traditional mounted wrangler methods would likely not be controlled.

Cost Savings to NPS: It is not anticipated that methods described in this alternative would incur cost savings. This alternative would not incur the substantial costs of initial and follow-up aerial-assisted controls as in Alternative 2. However, ground-based controls would require significantly longer periods and more staff investment than aerial-assist options, and result in lower control success.

Alternative # 2 – Implement Trespass Livestock Management Plan Preferred Alternative - Traditional Methods Plus Helicopter Assists, Minor Fencing, Trapping

Description:

Implement Alternative B as described in the attached Environmental Assessment. The alternative provides an integrated approach and means to control trespass livestock

Under this alternative, a suite of methods is proposed, including minor short-to-medium-term strategic fencing, live-trapping, roundup by mounted wranglers, and aerial-assisted (helicopter herding/fixed-wing spotting) roundup.

However, potential impacts to wilderness values would primarily include: infrequent and short-term use of aircraft to spot and herd animals and to transport control-related materials and equipment; temporary trap and bait-station installations including minor use of fencing; traditional round-up by mounted wranglers; and the potential for temporary visitor use restrictions in select areas.

Helicopter operations under this plan, including both initial treatments and annual maintenance operations would be accomplished in a maximum of 20 days park-wide per year. Planning and timing of flights would include wildlife biologist consultation to minimize and avoid impact upon sensitive species, locations and phases, such as peregrine falcon nesting, and desert bighorn lambing.

Effects:

Wilderness Character:

Untrammeled
Implementation of Alternative B would reduce the untrammeled quality of wilderness for the short term through the various control activities such as helicopter use (up to 20 days annually) and ground / corral trapping (could occur at a few sites for up to several months annually). In the long term, the untrammeled quality would be improved by the removal of human-introduced trespass livestock and their impacts upon the natural landscape and ecological integrity.

Undeveloped
Although temporary, short-term use of otherwise prohibited equipment, primarily helicopter use, would affect the undeveloped quality, giving the impression of development activities. Additionally, very limited proposed use of otherwise prohibited constructed elements, such as strategic fencing, corral traps, and bait stations would include introduce intrusion of development features. No habitations are proposed.

Natural
This alternative increases the natural quality of wilderness by promoting native species and natural ecosystem processes, which would be degraded by presence and proliferation of trespass livestock infestations and impacts. Potential short-term impacts upon wildlife, such as aircraft noise during peregrine falcon nesting or desert bighorn sheep lambing will be mitigated (see Mitigations, above) by minimizing exposure, or avoidance, during sensitive periods. Over the long term, implementing this alternative would increase natural character by providing a more natural, less degraded landscape of higher ecological integrity.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation
For temporary periods and in select locations, recreation opportunities would be restricted for safety purposes. There could also be short-term impacts of aircraft noise upon solitude. These would be minimized in accordance with Mitigations listed above. Over the long term, however, reduction of trespass livestock and their impact would preserve or increase opportunity for unconfined recreation by reducing recreational deterrent and degradation factors caused by trespass livestock. These include degrading campsites (trailing, erosion, waste products), creating hazards (direct intrusion into occupied campsites, contaminated water sources), or simply creating unnatural conditions that

reduce desire to visit impacted locations and be subject to degraded recreational experiences.

Other unique components that reflect the character of this wilderness
No other unique components have been identified.

Heritage and Cultural Resources

Surveys have demonstrate the Park has a high density of native American cultural sites, including representations of rock art, quarry, tool processing, pre-historic campsites, lithic scatters, hearths and ceremonial features. Historic resources include Anglo and Mexican pioneer village, farm, ranch, residential and commercial sites and structures in a diversity of conditions. All the above are also to be found in wilderness zones of the Park.

Trespass livestock directly impact historic resources by digging, trampling, pawing, and wallowing in or on ground surface features; and rubbing on constructed features and vertical surfaces such as historic structures, ruins and rock art panels.

Alternative 2 would reduce risk and damage by trespass livestock to heritage and cultural resources.

Maintaining Traditional Skills

Use of horses and burros for transport and packing are traditional wilderness management skills. Mounted riding and herding would continue to be the primary method by which trespass livestock are managed in the park. NPS and cooperator staff would continue using, and being trained in the use of riding and maintaining (shoeing, grooming, etc.) stock for round-up purposes. No change would occur to the primary park uses of pack stock and packing skills - supporting NPS trail construction and maintenance. Some additional use of pack stock could be fostered in supporting remote backcountry or wilderness trespass livestock removal operations.

Special Provisions

No Special Provisions have been identified.

Economics and Timing Constraints

In most park areas subject to invasion from Mexico, regular monitoring and occasional treatment via traditional mounted wrangler methods have been, and would continue being conducted by existing NPS and USDA staff and base budgets.

However, significant initial control actions in the several rugged, remote park areas (Boquillas Canyon, Mesa de Anguilla, and Onion Flat) that have proven beyond the capacity of traditional mounted wrangler methods will require substantial grants and special-project funding. Base Park funding does not allow for frequent or even regular use of helicopter support for control operations.

Experience in other areas by the Bureau of Land Management indicate substantial aerial control operations required to produce initial treatment in the rugged Boquillas Canyon, Onion Flat, and Mesa de Anguilla areas could be accomplished in 10 – 20 days. After initial treatment, follow-up maintenance in those areas, and helicopter-assisted traditional mounted wrangler round-ups in various other park locations would be limited to 20 days helicopter use per year.

Cost Savings to NPS: It is not anticipated that prescribed methods would incur cost savings. However, no treatment methods that are lower in cost are available. The initial treatments requiring helicopter assistance will be costly. Also, traditional mounted wrangler operations will continue. While some interior park infestations (Onion Flat) would not likely require follow-up treatments, most of the park's river zone would require annual follow-up treatments. Of river areas, only lower Boquillas Canyon could eventually become an international livestock-free zone, since current Mexican conservation owners share NPS livestock removal goals.

Additional Wilderness-specific Comparison Criteria
No additional comparison criteria have been identified.

Safety of Visitors, Personnel, and Contractors

While safety would be be the primary consideration of all alternatives, risks of Alternative 2 include use of aircraft; riding horses, working with and around livestock, and conducting activities outdoors in the backcountry of the rugged Park environment. All these activities include inherent safety risks. Staff safety would be ensured through project and activity safety plans, job hazard analyses, and supervision that places human safety as the highest priority, even above trespass livestock removal goals.

Alternative Not Analyzed: Manage Trespass Livestock with no Section 4(c) Prohibited Uses, i.e. No Use of Aviation, Fencing, Corral or Bait Stations Assists

Rationale for excluding the alternative:

Using ground-based trespass livestock control alone, without mechanization or even temporary installations, means that only workers mounted horseback or afoot would attempt to adequately control trespass livestock. The alternative could include assistance by herd dogs, but would not include aircraft assistance of any kind, and would not include even minimum use of installations such as fencing, corral traps or baiting of traps. Long-term experience at the park indicate such an approach would likely require several months annually at a minimum, and a significantly larger number of workers. Even then, given terrain ruggedness and inaccessibility, and increasing animal wariness in response to incomplete gathering events, such ground – based operations alone would not result in substantial livestock control in most trespass livestock use areas, much less in the many remote, rugged and distant areas inaccessible to mounted wranglers. In more accessible areas, such ground-based control alone would result in only partial collection of existing trespass

livestock. Additionally, the significantly increased exposure to rugged terrain, desert conditions and temperatures, and riding stock would significantly increase risk of injury.

Comparison of Alternatives

It may be useful to compare each alternative's benefits and adverse effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

Wilderness Character Components	Alternative 1 – No Change, Continue Traditional Non-Mechanized Approach	Alternative 2 – Implement Plan
Untrammelled	- Longer control ops impacts (long term) + Some livestock control (long term) - Some livestock impact (long term)	+ Controls livestock impacts (long term) - Control Ops Impacts (short term)
Undeveloped	+ Fewer prohibited uses (short or long-term)	- More prohibited uses (short & long-term)
Natural	+ some livestock control (long term) - some livestock impact (long term)	+ Livestock & impacts controlled (long term)
Solitude, Primitive, Unconfined Recreation	+ Some livestock impacts controlled (long term) - Some control ops impacts (long term)	+ Livestock impacts controlled (long term) - Control ops Impacts (short term)
Unique components	N/A	N/A
WILDERNESS CHARACTER SUMMARY	This alternative has fewer short term impacts to the qualities of wilderness character; but has greater long-term degradation of untrammeled, natural, and undeveloped qualities because of the continued presence of trespass livestock.	This alternative has more short term impacts to wilderness character due to use of aircraft; but provides the greatest long-term benefits to untrammeled, natural, and undeveloped qualities because of trespass livestock removal.

Other Criteria	Alternative 1 – No Action	Alternative 2 – Implement Plan
Heritage & Cultural Resources	+ Some livestock impacts on cultural resources controlled (long term) - Some livestock impacts on cultural resources persists (long term)	+ Livestock impacts on cultural resources controlled (long term)
Maintaining Traditional Skills	+- No change to traditional skills	+- No change to traditional skills
Special Provisions	NA	NA
Economics & Timing	- Less aircraft use lengthens control time, similar cost (long term)	+ More aircraft use shortens control time, similar cost (long term)
Additional Wilderness Criteria	NA	NA
OTHER CRITERIA SUMMARY	This alternative doesn't affect traditional skills, is costly, lengthens action, and reduces effectiveness.	This alternative doesn't affect traditional skills, is costly, shortens action, and increases effectiveness.

Safety Criterion	Alternative 1 – No Action	Alternative 2 – Implement Plan
SAFETY (PUBLIC AND WORKERS)	Less worker risk associated with aircraft use. More lengthy worker risk from lengthy climate, livestock,	More worker risk associated with aircraft use (short term). Continued worker risk of climate, livestock, backcountry travel (long term)

	backcountry travel & work risk factors. (long term)	

Step 3: Decision - Select the Minimum Activity and Describe Rationale

Selected alternative:

6. Alternative 2 – Implement Trespass Livestock Management Plan, including aerial and ground-based methods.

Rationale for selecting this alternative:

Alternative 2 provides the most effective and efficient control among alternatives considered. While short-term impacts to wilderness character components may be of higher intensity than other alternatives, they would be of much shorter duration, and provide the greatest long-term protection to all wilderness character components over the long term. This allows available funds to provide more extensive protection of natural values inherent to the wilderness and the park in general than would other alternatives.

Given the negative impacts of trespass livestock, and the regulatory and policy mandates to protect both wilderness components and park values, the No Action (continue existing methods) alternative is not a desirable approach and does not adequately protect park resources and the visitor experience.

The primary differences between the two alternatives are that alternative 2 includes:

1) Short-term use of helicopters to assist ground-based spotting and livestock herding, and to provide primary herding in areas not accessible to ground-based methods.
2) Increased temporary use of short-to-medium term corral traps and bait stations.
3) Include a minor amount of strategic fencing.

The following provides more detail on unique components of the selected alternative:

Given the vast, largely roadless Park landscape, terrain ruggedness, and sometimes wary and evasive animals; the aerial, helicopter-assisted components provide rapid and effective locating and the ability to access and quickly herd livestock from areas challenging or inaccessible to mounted wranglers. Aerial assistance can, in particularly rugged and inaccessible areas, provide the only option for moving livestock. Helicopter herding can also improve capture effectiveness when terrain is not particularly rugged, but distances to be covered are a deterrent to ground-based herding.

Similar methods have been applied on U.S. Bureau of Land Management tracts in the western U.S. Those precedents indicate livestock populations in the several rugged, remote areas (Boquillas Canyon, Onion Flat, and Mesa de Anguilla) could be initially controlled in 10-20 days. Once complete, Onion Flat would not require follow-up or annual maintenance. Boquillas Canyon would require less than annual maintenance, and Mesa de Anguilla would likely require annual maintenance of 2-4 days.

Traditional mounted wrangler roundups of more accessible areas, particularly near road-accessible areas along the Rio Grande, would continue, and require substantial repeated effort annually. Helicopter assistance of traditional ground-based efforts would be occasional, and repeated annually. All helicopter use for livestock management purposes would not exceed 20 days annually.

By comparison, similar accomplishment using ground-based trespass livestock control alone would likely require several months annually at a minimum, and a significantly larger number of workers. Even then, given terrain ruggedness and inaccessibility, and increasing animal wariness in response to incomplete gathering events; ground – based operations alone would not likely result in substantial livestock control in areas inaccessible to mounted wranglers. In more accessible areas, ground-based control alone would result in only partial collection of existing trespass livestock.

Due to heat constraints upon humans and livestock, the vast majority of trespass livestock control activities would occur during the cooler seasons, September through May. However, activities would be scheduled to avoid busy visitor use periods such as holidays and busy weekends and/or to avoid areas of substantial visitor use.

The more lengthy and less-effective application periods required for primarily ground – based livestock control alone would result in substantially greater restriction and impacts upon visitors and wilderness users than would be required under the combined ground / aerial approaches.

While there are safety risks inherent to aerial, particularly helicopter operations, it's much shorter duration and existing, established safety requirements for any aerial activity under operational control of federal employees would minimize human risk. Department of Interior nation-wide safety statistics for all DOI agencies (National Business Center, Aviation Management Directorate) demonstrate there were 13 helicopter accidents between 2001 and 2010, resulting in three serious injuries and four deaths. The helicopter accident rate for the period was 4.01 accidents per 100,000 flight hours. This compares to a DOI-wide fixed-wing accident rate of 7.09 per 100,000 flight hours over the same period.

In comparison, ground-based travel, including that associated with riding horseback, over the rugged and vast Park terrain would also include inherent risk, increasing with more staff and more lengthy ground operation requirements. DOI or NPS – wide accident and injury data specific to such activity is not available. However, from 2005 through mid-2011, ten injuries requiring medical attention and/or subsequent restricted duty were sustained by Big Bend National Park staff while working in Park backcountry. Several of those injuries, and additional near-misses, were in association with Park-owned horses being trailered or ridden.

More extensive reliance on off-trail, ground-based travel and work in the Park's rugged terrain under Alternative 1 would increase the risk and likelihood of injury. Although far less frequent, aviation-related accidents are likely to be more severe.

Local and interagency (primarily Bureau of Land Management) experience has demonstrated that strictly ground-based control of unconfined horses and burros - without use of aerial options, is far less effective.

Monitoring and reporting requirements:

Monitoring of treatment results will be conducted in all treatment areas to determine effectiveness and guide decisions regarding future treatments.

Check any Wilderness Act Section 4(c) uses approved in this alternative:

- ☒ mechanical (helicopter) transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☒ landing of aircraft
- ☐ temporary road
- ☒ structure or installation

Any authorizations of Wilderness Act Section 4(c) uses will include recording and reporting according to agency procedures.

Approvals	Signature	Position	Date
Prepared by:	Raymond Skiles Raymond Skiles	BIBE Wildlife Biologist / Wilderness Coordinator	12/14/16
Recommended:	David H. Larson David Larson	Chief, Division of Science & Resource Management	12/15/16
Approved:	Cindy Ott-Jones Cindy Ott-Jones	Superintendent	12/15/16

References Cited

Hughes, P.B., and K.J. Mickey. 1993. A reanalysis of recreational and livestock trespass impacts on the riparian zone of the Rio Grande, Big Bend National Park, Texas. Sul Ross State University, Alpine, Texas. Report to the National Park Service, Southwest Region, Santa Fe, New Mexico. 144 pp.

Schmidly, D.J. and R.B. Ditton. 1976. A survey and analysis of recreational and livestock impacts on the riparian zone of the Rio Grande in Big Bend National Park. Texas A&M University and Texas Agricultural Experiment Station. Report to the National Park Service, Southwest Region, Santa Fe, New Mexico. 160pp.

Stewart, W.P., B.S. Anderson and P.S. Dunfee. 1993. A user study of the Rio Grande river corridor in Big Bend National Park. Report to Big Bend National Park, National Park Service, Southwest Region. 149 pp.

Wick, S., R. Skiles, T. Alex, D. Corrick. 2012. Effects of undocumented aliens and illegal border activity on Big Bend National Park resources – 2012 Survey. Internal Report, National Park Service, U.S. Department of Interior. 19 pp.

Wick, S., T. Alex, B. Brauch, B.L. Alex, K. Mullen. 2013. Effects of undocumented aliens and illegal border activity on Big Bend National Park resources – 2013 Survey. Internal Report, National Park Service, U.S. Department of Interior. 19 pp.

Wick, S., T. Alex, B. Peyton, and J. Spalding 2014. Effects of undocumented aliens and illegal border activity on Big Bend National Park resources - 2014 Report. N.P.S. Internal Report, National Park Service, U.S. Department of Interior. 11 pp.

Williams, P.B., and J.L. Marion. 1997. Assessment of backcountry campsite conditions in Big Bend National Park. Virginia Tech Cooperative Park Studies Unit, Blacksburg, Virginia. Report to the National Park Service, Big Bend National Park, Texas.

APPENDIX B: EUTHANASIA GUIDELINE

Signed September 2013

United States Department of the Interior
NATIONAL PARK SERVICE
BIG BEND NATIONAL PARK
P.O. Box 129
Big Bend National Park, Texas 79834-0129

S14 (7138)

September 18, 2013

Memorandum

To: All Employees, Big Bend National Park

From: Superintendent, Big Bend National Park

Subject: Euthanasia and Humane Killing of Trespass Livestock for Reasons Related to Health, Safety, Handling and Humane Treatment

The National Park Service is mandated to protect park resources and the visitor experience from degradation by non-native species. At Big Bend National Park (BIBE), trespass livestock frequently wander or are pushed onto park lands from Mexico, and occasionally enter the park from adjacent U.S. properties. NPS Policies (2006) and the Code of Federal Regulations (Title 36, part 2.60) mandate we protect park resources from impact by non-native species. Thus, we are committed to an active trespass livestock roundup and removal program. Trespass livestock in the park have historically included horses, burros and cattle. On rare occasion, other domestic species have occurred.

There will be occasions when staff encounters sick or injured livestock in the field. And, although we will seek to prevent injury to captured animals during roundup, holding and transport, there may be occasions when livestock injuries are sustained during those activities. There may also be occasions when trespass livestock present a safety risk to human beings.

Humane treatment of these animals will on occasion necessitate euthanasia or humane killing. By definition, euthanasia is generally possible only when the animal is confined. When animals are unconfined or in field situations, the goal is humane killing rather than euthanasia. The following are excerpted from American Veterinary Medical Association (AVMA) Guidelines for the Euthanasia of Animals, 2013 Edition:

> "Euthanasia is derived from the Greek terms *eu* meaning good and *thanatos* meaning death. The term is usually used to describe ending the life of an individual animal in a way that minimizes or eliminates pain and distress."

"Gunshot is acceptable with conditions for euthanasia of free-ranging, captured, or confined wildlife, provided that bullet placement is to the head (targeted to destroy the brain). Gunshot targeted to the heart (chest)... presents challenges for accurate placement, but may be the best option for free-ranging or other settings where close approach is not possible...Based on domestic animal models, gunshot to the chest or neck may not result in rapid death and may be considered humane killing, rather than euthanasia."

This policy is to establish a process for euthanasia and humane killing decision-making, implementation and reporting.

Euthanasia and humane killing will be performed when necessary, in a timely manner, and will be carried out following the procedures described herein.

Authorized Officers

Appropriate park personnel, designated as Authorized Officers, will be delegated authority to make and implement euthanasia and humane killing decisions regarding specific animals.

Authorized Officers will be designated in writing by the Chief, Division of Visitor and Resource Protection, and to qualify must be agency-certified for firearms use, and have successfully completed training by a large animal veterinarian in gunshot euthanasia and humane killing techniques recognized and approved by the AVMA. The park's designated Trespass Livestock Coordinator, in the Division of Visitor and Resource Protection, will maintain documentation associated with Authorized Officer designation and qualification.

Additionally, Authorized Officers may supervise euthanasia or humane killing by other staff who are agency-certified for firearms use when the Authorized Officer is in a position to provide direct, on-scene guidance.

Documentation

Each action taken under this policy will be documented. Euthanasia and humane killing records will be maintained by the BIBE Trespass Livestock Coordinator. Data will be also entered into a database for reference and analysis. The death record will specify:

- Date of the death
- Location of the occurrence
- Animal description / identity
- Reason for euthanasia or humane killing
- Person performing euthanasia or humane killing, and assisting personnel

Additionally, a database for Trespass Livestock management tracking has been established on the park network or shared drive. Data from actions taken under this policy will be updated and made available on that database.

Conditions for Euthanasia or Humane Killing

A NPS Authorized Officer will apply or supervise application of euthanasia or humane killing when one or more of the following conditions exist:

1. An animal is affected by a chronic or incurable disease, injury, lameness or serious physical defect (includes severe tooth loss or wear, club foot, and other severe acquired or congenital abnormalities);

2. Has an acute or chronic illness, injury, physical condition or lameness that cannot be treated or has a poor or hopeless prognosis for recovery;

3. Is incapable of maintaining a Henneke body condition score (see Attachment) of 3 or greater, in its present environment;

4. Exhibits dangerous characteristics beyond those inherently associated with domestic or feral livestock;

5. Where a State or Federal animal health official orders the humane destruction of the animal(s) as a disease control measure.

Some conditions may require consultation with a veterinarian. A USDA Animal and Plant Health Inspection Service (APHIS) veterinarian is available in Presidio, Texas for consult regarding trespass livestock originating from Mexico.

Field situations (includes on-the-range and during roundups):

It is understood that there will be cases when this decision must be made in the field and cannot always be anticipated.

1. If an animal is affected by a condition as described in 1-5 above that causes pain or suffering and immediate euthanasia or humane killing would be an act of mercy, the Authorized Officer will promptly apply such treatment to the animal.

2. The Authorized Officer will release, euthanize, or humanely kill trespass livestock that will not tolerate the stress associated with capture, transportation or holding. However, the Authorized Officer should, as an act of mercy, euthanize or humanely kill - not release, any animal which is affected by a condition that meets the criteria of 1-5 above (including significant tooth loss or wear) to the extent their quality of life would suffer if released or removed from the range.

Documentation will include a brief description of the animal as well as the animal's condition with reference to the applicable criteria (including 1-5 above or other provisions of this policy). If euthanasia or humane killing is performed in the field during routine patrols or monitoring, the Trespass Livestock Coordinator and Chief Ranger will be notified of the incident as soon as practical after returning from the field.

At Holding Facilities:

Trespass livestock with pre-existing conditions that require immediate euthanasia or humane killing as an act of mercy should not arrive at permanent NPS corrals. However, problems can develop during or be exacerbated by transportation, handling or short-term holding at one of these locations. Other conditions that are not acutely affecting an animal's welfare, may not be immediately apparent during roundup or capture, need additional evaluation over time, or could be more thoroughly assessed in a holding facility may best be addressed after an animal is in a short-term NPS holding facility. In these captive and confined situations, euthanasia (rather than humane killing applicable in field situations) will be applicable, as follows:

1. If an animal is affected by a condition described in 1-5 above that causes acute pain or suffering and immediate euthanasia would be an act of mercy, the Authorized Officer will promptly euthanize the animal.

2. If an animal is affected by a condition described in 1-5 above, but is not in acute pain, the Authorized Officer has the authority to euthanize the animal, but should first consult a veterinarian. For example, if the animal has a physical defect or deformity that would adversely impact its quality of life, but acute suffering is not apparent, a veterinarian should be consulted.

3. If the Authorized Officer concludes, after consulting with a veterinarian, that an animal in short-term holding is affected by a condition as described in 1-5 or cannot tolerate the stress of transportation, USDA processing or long-term holding, then the animal should be euthanized.

Unusually Dangerous Animals

Unusually aggressive livestock can pose an unacceptable risk of injury when in confined or enclosed spaces where some level of handling is required. There may also be field situations, such as in thick vegetation without clear and safe retreat routes for personnel, when aggressive livestock could pose unacceptable human safety risk. When an animal is unusually dangerous, and clearly represents an immediate risk to handling personnel, it may be killed immediately.

When no immediate risk is present, but when deciding to euthanize a captive animal because it is unusually dangerous, the Authorized Officer will consult a veterinarian if feasible, and must determine that the animal poses a *significant and unusual danger to people or other animals beyond that normally associated with domestic or trespass livestock.* The Authorized Officer will document the aspects of the animal's behavior that make it unusually dangerous and include this documentation in the record.

Multiple Animals

If lethal treatment of multiple animals is anticipated, such as may be prescribed under USDA U.S./Mexico border quarantine requirements for management of disease outbreak, the likely

course of action should be identified and outlined in advance and addressed through the federal Incident Management System and an accompanying Incident Action Plan. Arrangements should be made for a USDA / APHIS or other qualified veterinarian to visit the site, examine the animals, and consult with park managers and the Incident Manager on euthanasia and humane killing decisions. The consultation should be documented with a detailed, written evaluation of the conditions, circumstances or history of the situation and the number of animals involved.

Planning and Communication

A euthanasia and humane killing plan of action should be included in each livestock management event Action Plan, and will be applicable during roundups, during transport, and at holding facilities. The plan will address practical considerations such as (1) who will have designated authority to make decisions regarding euthanasia and humane killing, (2) who will perform the procedure, (3) what method(s) will be used, and (4) how carcass disposal will be addressed.

Who Will Perform Euthanasia and Humane Killing

Euthanasia and humane killing will only be performed by an Authorized Officer or other staff with agency certification for firearms use under on-site supervision by an Authorized Officer. Appropriate firearms equipment is described below.

Staff of cooperating agencies may also perform euthanasia and humane killing if known to have the required training, skill, experience and equipment.

If contractors are performing trespass livestock management, the NPS Contracting Officer's Technical Representative (COTR), Incident Manager and Authorized Officer shall be responsible for ensuring trained personnel are available to perform the procedure at all times if necessary.

Use of Non-Lead Ammunition

To avoid potential for lead poisoning of scavenger and carrion-feeding wildlife, and to meet NPS directives (NPS 2009, 2011) regarding lead in the environment, animals to be left in the field (see Disposal of Remains, below) will be shot using non-lead ammunition. The park will maintain a separate protocol for use of non-lead ammunition.

How Euthanasia Will be Performed

When necessary, euthanasia and humane killing will be performed in a manner recognized and approved by the AVMA in their Guidelines for Euthanasia: 2013 Edition.

A properly placed gunshot to the brain of a calm and still or humanely restrained animal produces an unconscious state instantly followed by a painless and humane death. Advantages of this method for livestock include that only a minimum of handling and restraint is often needed

to perform the procedure, and when performed on-the-range there is no concern for drug residues poisoning wildlife or entering the environment following carcass disposal.

1. Captive, restrained or incapacitated animals:

   The optimal placement of a gunshot is from in front of the animal, perpendicular to the skull at a point one inch above the intersection of two imaginary diagonal lines drawn like an "X" from the ears to the eyes. Typically when euthanizing an animal in this manner the animal will be approached to within 5-6 feet and the gun will be held within a few inches or up to 2-3 feet from the animal. For familiarity among operators the preferred firearm for routine use will be a 22 magnum caliber revolver. A 22 long rifle caliber revolver may also be used and some other types and calibers of firearms typical for law enforcement or self defense use (.308, 9mm, 38, 357, 40 or 45 caliber) may be used if they are familiar to the operator. The 22 magnum is highly effective and offers the lowest risk of ricochet or having the bullet exit the carcass. Carbine rifles in these same calibers can also be effective only if used at the same distances described above for handguns.

   To maximize tissue destruction while minimizing risk of ricochet or having the bullet exit the carcass, only hollow point or other controlled expansion bullets should be used. Animals may be euthanized while standing calmly in a trailer or in a chute if the operator has adequate visual and physical access from above the animal. Animals may need to be restrained in a chute or tied if required for safety and effectiveness. Euthanasia should not be attempted when animals are freely moving about a pen.

2. Animals in the field:

   As recognized by the AVMA, there are circumstances with free-roaming animals where capture and physical restraint prior to euthanasia may not be practical and may only serve to prolong or exacerbate the distress of an injured or suffering animal. Under these conditions, and when an animal cannot be approached to within a few feet, the most humane course of action may be to kill the animal as quickly and humanely as possible using methods typical of hunting big-game animals in an ethical and responsible manner.

   It is not appropriate in these instances to use smaller caliber rifles or other weapons targeted at the brain from longer distances. High powered rifles targeted at the heart/lung or shoulder areas of an animal standing still and at typical hunting distances will be used in this circumstance. For familiarity among operators the preferred firearm for this action will be a 30-06 caliber, scoped, bolt-action rifle. Other types and calibers of firearms typical for hunting North American big-game animals (7 mm magnum, 270, 338 Magnum, etc.) may be used if they are familiar to the operator.

   To maximize tissue destruction and minimize the risk of ricochet only hollow point or other controlled expansion types of bullets should be used. It is not appropriate to substitute use of a high powered rifle from a distance for euthanasia using a gunshot to the brain when an animal can be restrained.

3. Scene Management

As noted by the AVMA Panel on Euthanasia, the psychological response experienced by people when observing euthanasia or death in any form is an emotional one dependent on the background of the observer. Grief and distress over the loss of life are the most common reactions. Expert technique and maintaining a calm and professional atmosphere during the procedure can help minimize these reactions in the persons who must perform the procedures as well as co-workers or bystanders. Staff involved in or observing the process should conduct themselves in a respectable, dignified and discrete manner.

While these considerations should not outweigh the primary responsibility of using the most rapid and painless method possible under the circumstances, animals should be euthanized or humanely killed away from public view whenever possible. Manipulation and transport of carcasses should be similarly sensitive. For safety as well as discretion, only mission critical persons should be nearby when euthanasia or humane killing is performed using a firearm, and animals may need to be moved off site prior to implementing the procedure. In some circumstances the use of tarps or vehicles as a visual screen may also be indicated.

Circumstances may arise that are not clearly covered by any policy or set of guidelines for euthanasia or humane killing. Whenever such situations arise, a USDA/APHIS or other veterinarian experienced with livestock should be consulted for their professional judgment and expert knowledge of acceptable technique. Professional judgment in these circumstances will take into consideration the animal's species-specific physiologic and behavioral characteristics as well as its size, approachability and degree of suffering. In all circumstances, the method should be selected and used with the highest ethical standards and conscience for minimizing the suffering and distress of the animal.

Disposal of Remains

In accordance with NPS Policies (4.4.2.1, 4.4.4.2) remains should be disposed of in a manner that minimizes potential impacts upon park visitors, considers scavenger presence and impact, and potential disease factors.

1. Field Situations:

Remains should be left in place if the event occurs in remote or backcountry areas of the park when the location is off-road, and not within view of common visitor activity areas or routes, and where avian or mammal scavengers that congregate at the site will not adversely affect human use activities and patterns. In some instances, and where possible, remains may be moved from near roads or trails to nearby appropriate field locations when staff have the means to do so in a safe and appropriate manner.

2. Captive situations:

Should euthanasia be required during transport, or in holding facilities, remains will be removed to the park landfill for disposal. Trespass livestock management staff will contact

Facility Management for assistance in moving remains as required. Facility management will provide heavy equipment (forklift, truck) and certified equipment operators to load, transport, and deposit remains in the park landfill or other isolated location accessible by service roads not generally accessible to the public. When remains are deposited in the park landfill, Facility Management staff will bury the animal in accordance with state landfill animal carcass burial requirements (Texas Administrative Code 2007).

Should any treated animal exhibit disease characteristics, a USDA/APHIS or other veterinarian will be consulted for appropriate disposal instructions.

Contact: Questions regarding this memorandum should be directed to the BIBE Chief Ranger, at (432) 477-1185, or the Park's designated Trespass Livestock Coordinator.

References

American Veterinary Medical Association. 2013. AVMA Guidelines for the Euthanasia of Animals: 2013 Edition. https://www.avma.org/KB/Policies/Documents/euthanasia.pdf. 102 pp.

National Park Service. 2011. January 28 Memorandum on Lead Reduction in National Park Service Natural Resource Activities. Issued by Deputy Director Daniel Wenk. Washington, D.C., 2pp.

National Park Service. 2009. March 4 Memorandum on Get The Lead Out! An Initiative to Address Lead Reduction in National Park Service Natural Resource Activities. Issued by Acting Director Daniel Wenk. Washington, D.C. 2pp.

Texas Administrative Code. 2007. Title 4, Part 2, Chapter 59, Rule 59.12. Texas Animal Health Commission, General Practices and Procedures, Carcass Disposal Requirements.

Attachment

Henneke body condition (1 pg) **Henneke Body Condition Index** (Adapted from Henneke et.al. 1981, Texas A&M University)

Condition Score 1: Emaciated

Bony structures of neck, shoulders and withers easily noticeable. Spinous processes, along the ribs, topline, point of hip and point of buttock all project prominently, with an obvious ridge down the back. Individual vertebrae may be identifiable. There is significant space between inner buttocks ("twist"). The animal is extremely emaciated; no fatty tissue can be felt.

Condition Score 2: Very Thin

Bony structures of the neck, shoulders and withers are faintly discernible. Spinous processes, ribs, topline, point of hip and buttock are prominent. Noticeable space between inner buttocks. Animal is emaciated.

Condition Score 3: Thin

Neck, withers and shoulder are accentuated, but not obviously thin. Tailhead is prominent. Slight fat cover over ribs, but still easily discernible. Spinous processes, point of hip and point of buttock are rounded, but easily discernible. Twist is filled in, but without noticeable deposition of fatty tissue.

Condition Score 4: Moderately Thin

Neck, withers and shoulders are not obviously thin. Ribs are faintly discernible. Point of hips and buttocks are not visually discernible. Fat can be felt around the tailhead, prominence somewhat dependent upon confirmation. There is a slight negative crease (a ridge) along the topline, especially over the loins and hindquarters.

Condition Score 5: Moderate

Neck, withers and shoulder appear rounded and blend smoothly into the body. Ribs cannot be seen but are easily felt. Back is level with neither a ridge nor a gully along the topline. Fat around tailhead is beginning to feel spongy. Slight amount of discernible fat deposited between buttocks (twist).

Condition Score 6: Moderately Fleshy

Fat beginning to be deposited along the neck, withers and shoulders. Fat over the ribs beginning to feel spongy, ribs cannot easily be felt. Fat around tailhead feels soft. May be slight positive crease (gully) along the topline. Noticeable fat deposition between buttocks

Condition Score 7: Fleshy

Fat deposited along neck and withers and behind shoulder. Individual ribs can be felt, but with noticeable filling between ribs. Slight positive crease down back. Fat around tailhead feels soft.

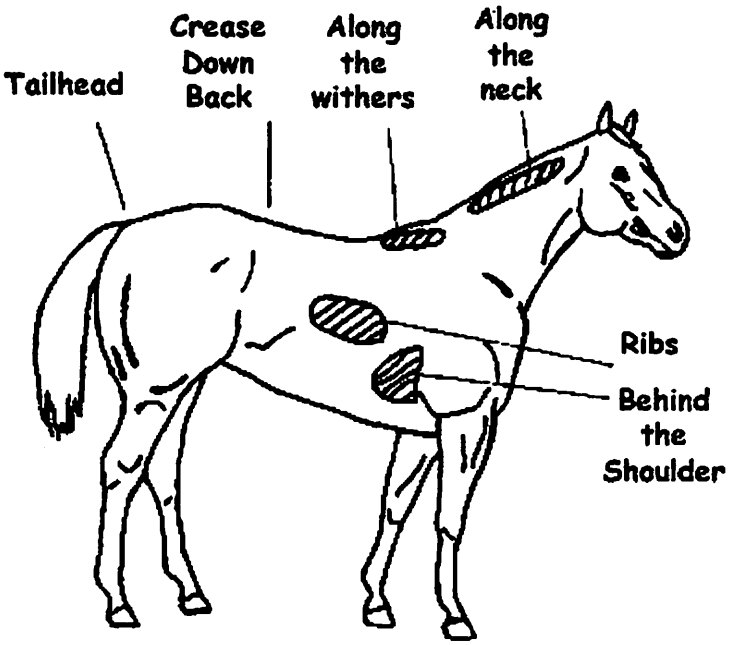
Condition Score 8: Fat

Noticeable thickening of neck. Area along withers is filled with fat, area behind shoulder is filled in flush with body. Ribs cannot be felt, noticeable positive crease down back, fat around tailhead is very soft. Significant fat deposited along inner buttocks.

Condition Score 9: Extremely Fat

Bulging fat along neck, shoulders and withers. Flank is filled in flush. Patchy fat appearing over ribs, obvious positive crease down back. Obvious fat deposited along inner buttocks.

Figure 1: Diagram of Areas Emphasized in Condition Score



APPENDIX C: ANIMAL WELFARE STANDARDS FOR TRESPASS LIVESTOCK MANAGEMENT

Big Bend National Park
Animal Welfare Standards for Trespass Livestock Management

Abbreviations:
COR - Contracting Officer's Representative
IC - Incident Commander

A. Facilities

Permanent livestock facilities for temporary holding of trespass livestock are located at Panther Junction, Rio Grande Village, and Castolon. Portable panels are used to construct temporary capture pens. Traps are temporary fenced enclosures used to capture livestock attracted to bait.

1. Pens, panels and fences must be not less than 5 feet high, and bottom rails or strands must not be more than 12 inches from ground level.
2. Holding and capture pens must have a sufficient number of enclosures to separate animals according to species, gender, age, temperament, or physical condition as warranted.
3. Enclosures must have no holes, gaps or openings, protruding surfaces, or sharp edges that are likely to facilitate escape or result in injury.
4. Livestock in a single temporary holding pen should occupy no more than half the pen area when at rest.
5. Hinged, rigid gates must be used in all permanent livestock facilities.
6. Temporary capture pens should be placed as close to trespass livestock locations as feasible to minimize the distance animals need to travel.
7. Temporary capture pens and bait traps should be assembled with rounded corners.
8. One-way funnel gates, if used on livestock traps, must not be constructed of materials that have sharp ends (such as "T" posts, sharpened wood poles) that may cause livestock injury.
9. During capture and handling operations, non-essential personnel and equipment must be located at an adequate distance to minimize disturbance to livestock.
10. Trash, debris, and reflective or noisy objects should be eliminated from capture pen locations, trap sites and temporary holding facilities.

B. Loading and Unloading

Captured livestock are transported in single-level goose-neck or ball-hitch trailers. Loading and unloading occurs at enclosure gates.

1. Loading/unloading gates at permanent pens must be maintained in a safe and proper working condition.
2. Should loading ramps be used, ramps must have a non-slip surface and be maintained in a condition to prevent slips and falls. There must be no holes in the flooring or items that can cause an animal to trip.
3. Trailers must be properly aligned with loading gates and ramps (if present) and panels secured such that no gaps exist that would likely contribute to livestock injury.
4. When loading or unloading, stock trailers should be positioned so there is no more

than 18" between the ground and the trailer floor for horses and 12" for burros.

C. Routine Capture Techniques

Trespass livestock may be gathered on a routine basis using: helicopter-assisted capture; mounted wrangler herding and capture; direct placement of a rope or halter by hand or with an extension pole (on adequately domesticated animals); and trapping with bait. Livestock may not be routinely captured by snares or net gunning. Chemical immobilization may only be used in capture under exceptional circumstances by a qualified veterinarian or an NPS immobilization practitioner certified to immobilize livestock working under supervision of a veterinarian.

D. Helicopter assisted capture

1. Helicopter herding would use pressure-and-release methods and should not repeatedly evoke erratic behavior in the livestock that is likely to cause injury or exhaustion.
2. Animals must not be pursued to a point of exhaustion.
3. The IC/COR must be vigilant to detect signs of animal exhaustion.
4. The rate of movement and distance the animals are made to travel must not exceed limitations set by the IC/COR, who would consider terrain, physical barriers, access limitations, weather, and animal condition.
5. Weak or debilitated livestock must be identified by NPS staff and another appropriate capture technique applied as determined by the IC/COR.
6. Rate of movement and travel distance must not result in exhaustion at the capture site, with the exception of animals requiring capture that have a previously existing compromised condition.
7. Where compromised animals cannot be left on the range or where doing so would only serve to prolong their suffering, euthanasia would be performed in accordance with the BIBE livestock euthanasia policy.
8. Livestock must not be pursued repeatedly by a helicopter such that the rate of movement and distance traveled exceeds limitation set by the IC/COR. In such cases, abandoning the pursuit or application of alternative capture methods may be considered by the IC/COR.
9. The herding helicopter must not come into physical contact with any animal.
10. Livestock may escape or evade herding while being moved by a helicopter. If there are female/dependent young pairs in a group being brought to a capture site and half of an identified pair is thought to have evaded capture, multiple attempts by helicopter may be used to bring the missing half of the pair to the trap or to facilitate capture by ground-based herding or roping. In these instances, animal condition and fatigue must be evaluated by the IC/COR on a case-by-case basis to determine the number of attempts that can be made to capture an animal.
11. Horse and burro captures must not be conducted when ambient temperature at the capture site is above 100°F without approval of the IC/COR. The IC/COR would not approve captures when the ambient temperature exceeds 105 °F.

E. Roping

1. Roping of any livestock must be approved prior to the procedure by the IC/COR.
2. Livestock may be roped for (but not limited to) the following reasons: to lead an adequately domesticated animal to a capture facility, reunite a female with her dependent young; capture nuisance, injured or sick animals or those that require

euthanasia; weather that creates exigent circumstances, public and animal safety, and legal mandates for removal.

3. Mounted ropers should attach the rope (dally) to the saddle horn such that animals can be brought to a stop as slowly as possible, and to allow quick release for safety reasons. Ropers must not intentionally pull animals off their feet.

F. **Bait Trapping**

Trespass livestock may be lured into a temporary trap using bait (i.e. feed, mineral supplement, water). Traps may be of a type to require on-site staff to close a gate for capture, or may be an automatic closure / capture type. The following requirements apply:

1. The period of time water is not available to an animal trapped in the livestock trap must not adversely affect the well-being of the animal, including trapped non-target wildlife, as determined by the IC/COR.
2. Unattended automatic-closing traps must not be left unobserved for more than 12 hours.

G. General Livestock Care

1. Adult livestock held in traps or temporary holding facilities for longer than 12 hours must be fed every morning and evening with water available at all times.
2. Water must be provided at a minimum rate of ten gallons per 1000 pound animal per day, adjusted for larger or smaller animals and environmental conditions.
3. Good quality hay must be fed at a minimum rate of 20 pounds per 1000 pound adult animal per day, adjusted accordingly for larger or smaller animals.
4. Hay placement must allow all livestock to eat simultaneously.
5. All livestock in confinement must be observed at least once daily to identify sick or injured livestock and ensure adequate food and water.
6. Dependent young must be reunited with their mothers at the temporary holding facility within four hours of capture unless the IC/COR authorizes a longer time.
7. Non-ambulatory livestock must be located in a pen separate from the general population and a veterinarian must be consulted as soon as possible.
8. Alternate pens must be made available for livestock that are weak or debilitated and females with dependent young.
9. Aggressive livestock causing serious injury to other animals should be identified and relocated into alternate pens.
10. Livestock in pens at the temporary holding facility should be maintained at a stocking density such that when at rest all livestock occupy no more than half the pen area.
11. Livestock showing signs of infectious disease should not be mixed with healthy livestock at capture pen, temporary holding facilities, or during transport.

H. General Handling

1. Livestock should be handled to enter loading chutes and trailers in a forward direction.
2. Livestock should not remain in single-file alleyways, runways, or chutes longer than 30 minutes.
3. Equipment except for helicopters should be operated and located in a manner to minimize flighty behavior.

I. Handling Prohibitions and Restrictions

1. Hitting, kicking, striking, or beating any animal in an abusive manner is prohibited.
2. Dragging a recumbent animal without a sled, slide board or slip sheet is prohibited.
3. Ropes used for moving the recumbent animal must be attached to the sled, slide board or slip sheet, not the animal.
4. There should be no deliberate driving of livestock into other animals, closed gates, panels, or other equipment.
5. There should be no deliberate slamming of gates and doors on livestock.
6. There should be no excessive noise (e.g., constant yelling) or sudden activity causing livestock to become unnecessarily flighty, disturbed or agitated.

J. Handling Aids

1. Flags and shaker paddles may be used as handling aids for driving and moving livestock during handling and transport procedures.
2. Contact of the flag or paddle end of such handling aids with livestock is allowed.
3. Ropes looped around the hindquarters may be used from horseback or on foot to assist in moving an animal forward or during loading.
4. Electric prods must not be used routinely as a driving aid or handling tool.
5. Electric prods may be used in limited circumstances, only if approved by the IC/COR. When used the following guidelines are to be followed:
   a. Electric prods must only be a commercially available make and model that uses DC battery power and batteries should be fully charged at all times.
   b. The electric prod device must never be disguised or concealed.
   c. Electric prods must only be used after three attempts using other handling aids (flag, shaker paddle, voice or body position) have been tried unsuccessfully to move the livestock.
   d. Electric prods must only be picked up when intended to deliver a stimulus; these devices must not be constantly carried by the handlers.
   e. Space in front of an animal must be available to move the animal forward prior to application of the electric prod.
   f. Electric prods must never be applied to the face, genitals, anus, or underside of the tail of an animal.
   g. Electric prods must not be applied to any one animal more than three times during a procedure (e.g., sorting, loading) except in extreme cases with approval of the IC/COR. Each exception must be approved at the time by the IC/COR.

K. Transportation - General

1. All sorting, loading, or unloading of livestock should be performed during daylight hours except when unforeseen circumstances develop and the COR/PI approves after-dark activities using supplemental light.
2. Transport time from the capture site to permanent holding pens must not exceed 10 hours.
3. Livestock should not wait in stock trailers at a standstill for more than a combined period of three hours during the entire journey.

L. Transportation - Trailers and Vehicles

1. Two-tiered or double deck trailers are prohibited.

2. Livestock must have adequate headroom during loading and unloading and must be able to maintain a normal posture with all four feet on the floor during transport without contacting the roof or overhead bars.
3. Livestock transport vehicles must have a covered roof or overhead bars so that livestock cannot escape.
4. The width and height of all gates and doors must allow livestock to move freely through.
5. All gates and doors must open and close easily and be able to be secured in a closed position.
6. The rear door(s) of trailers must be capable of opening the full width of the trailer.
7. Loading and unloading ramps when used must have a non-slip surface and be maintained in proper working condition to prevent slips and falls.
8. Transport vehicles more than 18 feet and less than 40 feet in length must have a minimum of one partition gate providing two compartments. Transport vehicles 40 feet or longer must have at least two partition gates to provide a minimum of three compartments.
9. All partitions and panels inside of trailers must be free of sharp edges or holes likely to cause livestock injury.
10. The inner lining of all trailers must be strong enough to withstand livestock kicking without failure that would lead to injuries.

M. Transportation - Care of Livestock During Transport

1. Livestock that are loaded and transported from the capture location to a holding facility must be fit to endure travel.
2. Livestock that are non-ambulatory, blind in both eyes, or severely injured must not be loaded and transported unless it is to receive immediate veterinary care or euthanasia.
3. Livestock that are weak or debilitated must not be transported without approval of the IC/COR.
4. Appropriate actions for their care during transport must be taken, under direction of the IC/COR.
5. Livestock should be sorted prior to transport to ensure compatibility and minimize aggressive behavior that may cause injury.
6. Trailers must be loaded using minimum space allowances in all compartments as follows: twelve square feet per adult horse, six square feet per dependent horse foal, eight square feet per adult burro, and four square feet per dependent burro foal.
7. Roundup saddle horses must not be transported in the same trailer with trespass livestock.

N. Euthanasia or Death

See Appendix B, Euthanasia Guideline: Euthanasia and Humane Killing of Trespass Livestock

APPENDIX D: STANDARD BEST MANAGEMENT PRACTICES AT BIBE

This appendix describes those activities implemented for regulatory compliance with one or more laws and regulations and/or as standard best management practices at the park that have some applicability to managing trespass livestock. Mitigation measures specific to managing trespass livestock are included in Section 2.2.

Best management practice applicable to all projects

1) All natural resources management operations and their NPS participants would adhere to NPS Safety Management guidelines, Standard Operating Procedures (SOPs) and safety protocols, including but not limited to job hazard analysis, project safety planning, safety briefings, and tailgate safety sessions.
2) Personnel involved with aircraft operations are trained and certified, and all aviation operations are managed under guidelines, Standard Operating Procedures (SOPs), and safety protocols of the NPS Aviation Management Program.

Soils

3) Vehicles are not driven off-road and parking is limited to areas immediately adjacent to roads.
4) Minimize ground disturbance from parking and staging operations, as much as possible.
5) Vehicles used in management projects are inspected to ensure no fuel or oil leaks.

Native Vegetation

6) Minimize off-road, non-motorized equipment use, as much as possible.
7) Inspect equipment, and clean if necessary, before entering a different area of the park, to reduce the potential for accidentally introducing exotic plants from another area.
8) Any control activities that cause damage to vegetation, would be promptly re-vegetated with native species and/or other appropriate restoration (e.g., soil protection, fencing, etc.).
9) Horses used during management activities would have weed-free food and bedding to prevent spread of exotics.

Water Resources

10) Planning and consultation among the park's resource specialists would minimize potential impacts to water resources by identifying practices/methods that avoid water resources.
11) Drive vehicles only on established roads and not in stream channels or off-road.
12) Minimize the number of vehicles, to the extent possible.

Sensitive Wildlife

13) Avoid activities in potential breeding habitat for federally listed species or migratory birds during their breeding season. Follow requirements in the BOs and Incidental Take Permits applicable to the park.

Cultural Resources

Natural resources management staff, in consultation with the park archeologist, develop annual work plans to ensure that proposed treatment areas have been surveyed in compliance with Section 106 of the NHPA and approved for use. The surveys would identify important cultural resources, particularly archeological resources and historic structures, and ensure that activities avoid these resources.

14) During the planning phase of management projects, consult park managers to identify sensitive areas and determine acceptable levels of disturbance.
15) Evaluate and choose equipment for re-vegetation and restoration projects that is determined to be the most effective to accomplish restoration goals while causing the least disturbance to cultural resources.
16) Should management activities unearth previously unknown cultural resources, treatment activities would stop in the area of discovery and consult with the BIBE Archeologist/Cultural Resources Program Manager. If deemed necessary, the NPS would consult the State Historic Preservation Officer (SHPO), according to 36 CFR Part 800.13, *Post Review Discoveries*.

Visitor Experience and Safety

17) Require all park employees, volunteers, and contractors to follow approved safety plans.
18) Use appropriate personal protective equipment when implementing control techniques.
19) Before implementing management activities, review all standard operating procedures and complete a Job Hazard Analysis.

APPENDIX E: REASONABLE AND PRUDENT MEASURES, TERMS AND CONDITIONS, AND CONSERVATION RECOMMENDATIONS

This appendix describes activities to be implemented subsequent to NPS consultation (NPS 2015) with USFWS associated with BIBE exotic species management, required under the Endangered Species Act. That consultation resulted in a USFWS Biological Opinion (USFWS 2015). The following Reasonable and Prudent Measures, Terms and Conditions, and Conservation Recommendations associated with this Plan/EA are excerpted from the Biological Opinion.

Reasonable and Prudent Measure 2
Minimize harm and harassment of black-capped vireo and western distinct population segment of yellow-billed cuckoo by avoiding when possible species management activities near occupied habitat during the breeding season and ensuring conservation of woody plant species used by these species throughout the duration of this consultation.

Term and Condition 2 for RPM2
The National Park Service will follow the conservation measures described in the biological assessment, exotic species management plan, and trespass livestock plan and: (a) continue to assess and monitor habitats used by black-capped vireos and yellow-billed cuckoos in the western distinct population segment; (b) update maps and GIS coverages for vireo and cuckoo habitats regularly, (c) ensure that management of exotic species and trespass livestock avoids habitats occupied by black-capped vireos and yellow-billed cuckoo to the maximum practicable extent, and (d) when habitat for these species cannot be avoided during the breeding season, the National Park Service will minimize the amount of habitat that may be adversely affected by proposed activities as well as minimizing the duration of the disturbance.

Term and Condition 3 for RMP 2
The monitoring of black-capped vireos in BBNP should endeavor to: (a) quantify nesting success and productivity and (b) track and report on the local abundance of cowbird species (*Molothrus* spp.) in BBNP and specifically in and near black-capped vireo habitat.

Term and Condition 4 for RMP 1 and 2
The National Park Service will summarize activities covered by this consultation on a calendar year basis and report on the areas treated for exotic plants, summarize management efforts for exotic animals and trespass livestock and describe the current status of species covered by this consultation in Big Bend National Park. The report summarizing the previous year should be provided to the Service annually by February 28.

Conservation Recommendation 1
The National Park Service is encouraged to continue its assistance and cooperation with conservation efforts in Coahuila and Brewster County outside BBNP, including monitoring of threatened and endangered species: bunched cory cactus, Lloyd's mariposa cactus, black-capped vireo, and yellow-billed cuckoos.