Double E Ranch Management Plan

New Mexico Department of Game and Fish

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Double E Ranch Purchase

The Double E Ranch (Ranch) is a 5,827.8 acre property that was purchased in 2014 by the New Mexico Department of Game and Fish (Department) for $3 million using $1,525,000 of Natural Resource Damage Assessment and Restoration (NRDAR) funds and $1,645,053 of State Wildlife Grant (SWG) funds. NRDAR funding was provided by the New Mexico Office of Natural Resources Trustee (ONRT) and the U.S. Fish and Wildlife Service (USFWS) (collectively, the "Trustees"). The $145,053 balance of SWG funding and $25,000 of NRDAR funding was used to pay for due diligence activities (e.g., surveying) to facilitate the purchase. The sale of the Ranch to the Department by the Trust for Public Land occurred in two phases. Phase 1 transferred ownership of 1,982 acres for the price of $1,000,000, which included $500,000 of NRDAR funds and $540,000 of SWG funds. Phase 2 transferred ownership of 3,845.8 acres for the price of $2,000,000, including $1,000,000 of NRDAR funds and $1,105,053 of SWG funds.

Trustees awarded NRDAR funding to the Department as a result of a Natural Resource Damage Assessment and Restoration process for three copper mines near Silver City owned by Freeport-McMoRan Copper & Gold Inc. (FMI). The Trustees assessed and quantified damages and injuries to wildlife and their habitats from the mines operation. As a result, the Trustees were awarded a financial settlement from FMI to compensate the public for injuries to wildlife and wildlife habitat resulting from releases of hazardous substances at these mines. Damages were primarily to birds, so protecting and enhancing bird habitat was the main goal of selecting projects to fund through the NRDAR process (ONRT 2013).

The State Wildlife Grants Program provides federal funds for developing and implementing programs that benefit Species of Greatest Conservation Need (SGCN) and key habitats as identified in the Comprehensive Wildlife Conservation Strategy for New Mexico (NMDGF 2006). Both NRDAR and State Wildlife Grant funding sources used for the Ranch purchase share the goals of conserving and restoring wildlife and wildlife habitat.

The Specialty Warranty Deeds (Phases 1 and 2) for the sale of the Ranch to the New Mexico State Game Commission were recorded by the Grant County Clerk on 19 November 2014.

Site Description

The Ranch property is located adjacent to the southwestern edge of the Gila National Forest, approximately 6 miles east of the village of Gila, Grant County. Private fee lands total 5,827.8 acres. The Ranch includes the 3,644 acre Bureau of Land Management (BLM) Stone Canyon Grazing Allotment No. 04528, and the 2,493 acre State of New Mexico Grazing Lease No. GM-3017.

History

An 1885 General Land Office map shows three ranches along Bear Creek within what is now the Double E Ranch: Jensen's Ranch, Stone's Ranch, and Rowley's Ranch. The larger Township within which much of the Ranch deeded property occurs (Township 15 South, Range 16 West) was included in 1899 as part of the Gila River Forest Reserve, which was established by proclamation of President McKinley in 1899. The Gila River Forest Reserve later became the Gila National Forest. In 1935, one year after passage of the Taylor Grazing Act, Joe H. Hooker applied to the newly created Grazing Service for a grazing permit for the ranch. The Hooker family sold the ranch to Alan and Debbie Eggleston in 1996. In December 2013, the Trust for Public Land (TPL) purchased Phase 1 from the Egglestons, which included 1,982 acres of deeded land, portions of the State Land Office grazing lease, and the USFS Spar Canyon Allotment. In November 2014, TPL purchased Phase 2 from the Egglestons, which included 3,845.8 of deeded land, the remainder of the State Land allotment, and the BLM Stone Canyon Lease. Recent discussions with the Gila National Forest have indicated that USFS regulations preclude the Department from holding a United States Forest Service (USFS) grazing lease, so the Spar Canyon Allotment is no longer considered a part of the Ranch.

Archaeology

Bear Creek Canyon and tributary canyons within the Ranch contain numerous Mimbres, Apache, and historic homestead archaeological sites. The Department's archaeologist deemed at least eight of these sites culturally significant. For additional information on archaeological sites documented on the Ranch, see Appendix J.

General Management Goals

As stated in the Double E Ranch Conceptual Management Plan (CMP, see Appendix A), NRDAR and SWG funding was provided to the Department to purchase the Ranch to protect wildlife and restore wildlife habitat. Acquisition, management and long-term conservation of the Ranch fulfills the Department's Strategic Plan 2013-2018 goals and objectives. These include conserving and enhancing significant amounts of wildlife habitat (Objective 8) and attaining measurable progress toward the restoration of wildlife identified as being at the risk of depletion or extinction (Objective 10). Acquisition, management and long-term conservation of the Ranch also fulfills goals and objectives of the Department's 2006 Comprehensive Wildlife Conservation Strategy (CWCS) (NMDGF 2006) by conserving key habitats (aquatic and riparian) and a high diversity and abundance of SGCN. Continuing habitat restoration on the property will benefit an estimated 43 SGCN that are known to occur (26 documented), likely to occur, or may occur there.

Department habitat restoration goals and objectives for the aquatic, riparian and floodplain habitats of the Ranch include: 1) re-generating younger age classes of deciduous riparian trees

to replace the mature stands and continue recovery of Bear Creek to a fully functioning condition; 2) encouraging formation of a vegetative understory to provide nesting habitat for SGCN such as Southwestern willow flycatcher (*Empidonax extimus traillii*) and yellow-billed cuckoo (*Coccyzus americanus*); 3) managing Bear Creek to provide food, water and cover for species such as Gambel's quail (*Callipepla gambelii*) and wild turkey (*Meleagris gallopavo*); 4) establishing and/or maintaining wetlands and off-channel pools for persistence of aquatic and riparian obligate SGCN wildlife such as Chiricahua leopard frog (*Lithobates chiricahuensis*)[1]; and 5) protecting loach minnow (*Tiaroga cobitis*) designated critical habitat from destruction or adverse modification.

Department goals and objectives for the Ranch's Madrean pinyon-juniper and Mogollon chaparral upland habitats include managing these habitats to benefit nesting SGCN birds such as pinyon jay (*Gymnorhinus cyanocephalus*) and Montezuma quail (*Cyrtonyx montezumae*), and SGCN game species such as mule deer (*Odocoileus hemionus*) and Coues' whitetail deer (*O. virginianus couesi*).

Conservation Elements

Bear Creek Cottonwood and Sycamore Riparian Habitats

The Ranch includes approximately 3.0 miles of lower Bear Creek, which drains into the Gila River near the village of Gila, approximately 6 miles downstream of the western property boundary. The three miles of Bear Creek that flows through the Ranch includes perennial and intermittent reaches. Spring seeps occur in the main canyon and side canyons. Of the 5,828 deeded acres, riparian, floodplain and aquatic habitats are restricted to the Bear Creek floodplain and larger tributary side canyons. Riparian habitat on the ranch is composed of mature Fremont cottonwood (*Populus fremontii*) and Arizona sycamore (*Platanus wrightii*) stands with some areas of new regeneration from recent flood events, dense regenerating stands of Goodding's willow (*Salix gooddingii*) of different age classes, and seep willow (*Baccharis salicifolia*) and mixed herbaceous forbs and grasses that occur on sandy bars and terraces. Aquatic plants such as veronica (*Veronica* spp.) are evident in pools and slower runs of Bear Creek (Natural Heritage New Mexico 2015).

Bear Creek and its tributaries on the Ranch provide important wildlife habitat because about 80% of all vertebrates in New Mexico and Arizona are dependent on riparian habitats for at least part of their life cycle (Hubbard 1977). New Mexico and Arizona have lost an estimated

[1] Chiricahua Leopard Frogs have been documented on the Ranch, and occur on nearby private property in the same drainage system as the Ranch in one of the last remaining populations considered to be healthy in the state of New Mexico (R. D. Jennings, WNMU, pers. comm., USFWS files).

90% of their original riparian ecosystems (Krzysik 1990), and wetland and riparian habitats currently comprise less than 1% of New Mexico (Dahl 1990, Henrickson and Johnston 1986).

Department staff have documented a high diversity of SGCN that use the Ranch aquatic and riparian habitats, including loach minnow , Chiricahua leopard frog, Arizona toad (*Anaxyrus microscaphus*), Madrean alligator lizard (*Elgaria kingii*), white-nosed coati (*Nasua narica*), common black hawk (*Buteogallus anthracinus*), elf owl (*Micrathene whitneyi*), Bell's vireo (*Vireo bellii*), and Lucy's warbler (*Oreothlypis luciae*).

Madrean Pinyon-Juniper Woodlands, Mogollon Chaparral and Cliff Habitats

The U.S. Geological Survey's National GAP Analysis Program land cover viewer map (http://gis1.usgs.gov/csas/gap/viewer/land_cover/Map.aspx) identifies the Ranch upland habitats (including the BLM and State Land Office (SLO) allotments) as primarily Madrean pinyon-juniper woodlands, with inclusions of Mogollon chaparral patches. Madrean pinyon-juniper woodlands occur on foothills, mountains and plateaus in north-central Mexico, Trans-Pecos Texas, southern New Mexico and Arizona. Soils are generally dry and rocky. On the Ranch, the presence of two-needle pinyon (*Pinus edulis*), Mexican pinyon (*P. cemborides*) and/or other Madrean trees and shrubs is characteristic of this woodland. Alligator juniper (*Juniperus depeanna*) and one-seed juniper (*J. monosperma*) are abundant. Emory oak (*Quercus emoryi*), gray oak (*Q. grisea*) and other Madrean oak species are present, but generally less abundant than pinyon and juniper trees. A small stand of ponderosa pine occurs on the property (Gadzia 2015), which is consistent with this ecological system. A high diversity of shrubs and grasses is also present on the hill slopes.

Mogollon chaparral shrublands occurs across central Arizona (Mogollon Rim), western New Mexico, southern Utah and Nevada. It represents the common shrubland system along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into the southwestern mountains (3,300-7,200 ft. elevation). This habitat type occurs on foothills, mountain slopes and canyons in hotter and drier habitats below oak, pinyon-juniper and ponderosa pine woodlands. On the Ranch this habitat type occurs in patches of relatively dense shrublands with a mix of oak species such as shrub live oak (*Q. turbinella*), mountain mahogany (*Cercocarpus montanus*), and point-leaf manzanita (*Arctostaphylos pungens*). Honey mesquite (*Prosopsis glandulosa*) and wait-a-bit (*Mimosa aculeaticarpa*) are relatively common in these patches. Pinyon and juniper trees are present but less dense than in Madrean Pinyon-Juniper Woodlands. Most chaparral species are adapted to fires, growing from rootstock after burning or producing fire-resistant seeds. Patches of this habitat type on the Ranch may be a result of fires or heavy grazing activities within one mile of Bear Creek (Gadzia 2015).

Within Madrean pinyon-juniper woodlands and Mogollon chaparral, SGCN mule deer and Coues' whitetail deer feed on acorns from oaks and winter browse shrubs such as mountain mahogany. Documented SGCN bird species such as juniper titmouse (*Baeolophus ridgwayi*), black-throated gray warbler (*Setophaga nigrescens*), black-chinned sparrow (*Spizella*

atrogularis), and Montezuma quail nest in pinyon and juniper trees, shrubs, and/or grasses within these habitat types.

Significant cliff habitat occurs in the lower Bear Creek Canyon box near the western boundary of the Ranch. SGCN documented using these cliff habitats include Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*), Arizona gray squirrel (*Sciurus arizonensis*), golden eagle (*Aquila chrysaetos*), and peregrine falcon (*Falco peregrinus*).

Bear Creek Fremont cottonwood, Arizona sycamore and Goodding's willow riparian habitat. Photo: M. Watson

Double E Ranch Fremont cottonwood regeneration from flooding, Bear Creek side channel. Photo: M. Watson

Double E Ranch Madrean pinyon-juniper and Mogollon chaparral habitats. Photo: M. Watson

Double E Ranch Bear Creek lower box riparian and cliff habitats. Photo: M. Watson

Riparian and Range Health Assessments and Management Recommendations

Riparian Assessment

In the CMP (Appendix A), the Department committed to conduct a riparian assessment to determine baseline conditions of Bear Creek riparian and aquatic habitats. Natural Heritage New Mexico conducted the assessment from 15-17 September 2015 using the New Mexico Rapid Assessment Method for Lowland Riverine Wetlands (NMRAM). Based on the NMRAM assessment the Ranch riparian wetlands overall are currently in excellent condition (Natural Heritage New Mexico 2015). The report provides the following recommendations for riparian habitat management on the Ranch (see Appendix B for full report):

1. Maintain maximum possible base flows in the active river channel. In keeping with the property water rights, this should include protection from ground water pumping.
2. Do not maintain, or re-grade, the dirt road in the canyon bottom. Keep vehicles out of the active channel, and limit ORV traffic within the canyon.

3. If grazing of the Ranch is considered, livestock use should be carefully monitored, and access to the riparian zone and active channel should be limited to specific areas that can tolerate impacts or else be excluded.
4. Remove the few patches of tree of heaven and Siberian elm individuals on the ranch to prevent expansion of these species and future ecosystem disruption.

Range Health Assessment

In the CMP Plan (Appendix A), the Department committed to conduct a range health assessment to determine appropriate levels of livestock grazing that would either not impede or facilitate wildlife habitat restoration. The Department contracted with Kirk Gadzia of Resource Management Services LLC to conduct the assessment. The report evaluated the health of the Ranch deeded property and BLM and SLO lease lands. The resulting *Rangeland Health Evaluation Report NMDGF Double E Ranch October 2015* is attached as Appendix C. The report found that in general, rangeland health conditions varied from healthy to moderately unhealthy depending on the location of each transect. The two sites trending toward an unhealthy status were within a mile of the riparian zone. The best ratings were found on those sites at the highest elevations and farthest from the riparian area. These noticeable differences in range condition were identified as likely being the result of past livestock grazing influences, where continuous yearlong grazing converted grass/forb communities to invasive shrub dominance (Gadzia 2015).

The following is a summary of the Rangeland Health Evaluation Report's recommendations regarding infrastructure improvements needed to implement livestock grazing:

1. Install fences that will isolate the Bear Creek riparian area from upland pastures.
2. Reduce water gap fence length by locating these fences upstream from the intersection with Bear Creek where practical.
3. Ensure boundary integrity by completing fences on actual boundary survey line where practical. Consider upgrading existing old wood post fence to a permanent wildlife friendly steel post barbed/smooth wire fence.
4. Provide water for livestock by rehabilitating current wells with solar pumps, storage tanks, and troughs. Alternatively, water could be pumped from the creek to nearby upland locations; or selected access points to the river could be developed with hardened crossing spots for livestock and vehicles.
5. Develop and implement a plan for repairing and cleaning out all dirt stock tank ponds.
6. Rehabilitate at least one corral system on each side of the river.
7. Develop alternative watering points and gates that facilitate livestock movement between pastures.

8. Minimally improve road access and drainage on the main roads north and south of Bear Creek.

As stated in the CMP, if the Department determines that livestock grazing is feasible and appropriate for bird habitat conservation, the Department will develop a livestock management plan to facilitate implementation of livestock grazing based on recommendations from the range health and riparian assessments, and using riparian grazing best management practices such as those in Wyman et al. (2006). This determination will require consideration of existing infrastructure and needs for development of additional waters and fencing to manage livestock. Sustainable livestock grazing strategies that could be implemented include short duration grazing, rest-rotation grazing, and/or dormant season grazing. Herders may be needed to control utilization.

Observations and recommendations from both the range health (Gadzia 2015) and riparian (Natural Heritage New Mexico 2015) assessments concur regarding the need to restrict livestock grazing within the Bear Creek riparian corridor to short duration dormant season grazing or to limit livestock access to water to fenced and hardened crossings. Bear Creek through the Ranch is designated Critical Habitat for loach minnow and supports a population of federally Threatened Chiricahua leopard frogs. The Department will consult with the USFWS if livestock are grazed on the Ranch's deeded property, BLM and/or State Land Office lease land if livestock will have access to Bear Creek.

Forest Service Allotment

When the Department purchased Phase I of the Ranch from the Trust for Public Land (TPL), TPL held the permit to the 11,033 acre U.S. Forest Service (USFS) Spar Canyon Allotment. Annual rental on the allotment is $1,500. The most recent monitoring data indicates that the allotment is in satisfactory vegetative and watershed condition. The north part of the allotment has very rough broken terrain which makes it very difficult to manage livestock and has been closed to livestock grazing. There are multiple tanks and springs on the allotment's two fenced pastures. These conditions allow for growing season rest or deferment to provide for grazed plant recovery. Up to 75 Animal Unit Months (or equivalent use by other kind or class of livestock) of grazing are authorized for up to 12 months (year-round grazing).

Discussions with Gila National Forest staff reveal that USFS Handbook regulation 2209.13 precludes state agencies from holding a USFS grazing permit, and therefore also precludes state agencies from subleasing a USFS allotment.

However, because of the conservation goals of the SWG and NRDA funding that allowed the Department to purchase the Ranch, the Gila National Forest has agreed to work with the Department to ensure that any livestock grazing on the allotment is managed to benefit wildlife.

Gila National Forest staff advised the Department that the 3.5 mile boundary fence separating the Spar Canyon Allotment from the Ranch's deeded property is damaged.

The Department is implementing multiple fencing contracts to ensure that all outer boundary fences are constructed or repaired, and will cooperate with the Forest Service to ensure that the north boundary fence is replaced.

BLM Allotment

The BLM Las Cruces District's Stone Canyon Grazing Allotment 04528 consists of 3,644 acres in seven disjunct parcels within the Ranch boundary. The lease authorizes year-round grazing for 58 animal units. Annual rental on the allotment is $940.

The Stone Canyon allotment contains the Bear Creek Area of Critical Environmental Concern (ACEC) composed of approximately 1,480 acres in two separate parcels. The ACEC is managed to protect riparian values as stated in the Mimbres Resource Management Plan (RMP) (BLM 1993). The riparian portion of the ACEC includes approximately 20 acres along 1.25 miles of Bear Creek. The upland areas of the ACEC consist primarily of Madrean pinyon-juniper woodland. The Bear Creek ACEC is closed to OHV use. Although BLM Allotment No. 04528 includes the Bear Creek ACEC, the Mimbres RMP directs that the riparian area be fenced off to exclude grazing. Approximately 1/5 mile of fence was constructed in 2001 along the north and south ridges, paralleling Bear Creek, but end fences and water gaps tying the north and south ridge fences together are needed to exclude livestock from the Bear Creek ACEC. Maintenance is the responsibility of the allottee (BLM 2000).

A 1998 BLM riparian assessment determined that the Bear Creek riparian area within the ACEC was in non-functioning condition because of the lack of adequate riparian plant cover to dissipate the downstream energy of stream flows (BLM 2000).

The Department will assess the Stone Canyon allotment to determine habitat value for SGCN and management opportunities. The Department will consider the full range of options to maintain the potential use of livestock grazing as a tool to meet habitat management goals. BLM parcels will need to be fenced to control livestock access between the deeded and allotment parcels.

State Land Office Allotment

The State Lands Office Grazing Lease No. GM-3017 consists of 2,493 acres in four disjunct parcels within the Ranch boundary. Annual rental on the allotment is $1,565. The lease authorized 50 animal units from October 2009 to 30 September 2014. Lease renewal is on a 5-year rotation. The allotment is not tied to the Ranch base property.

The Department will assess State Land Office Lease No. GM-3017 to determine habitat value for SGCN and management opportunities. The State Land Office can issue commercial leases for longer than 5 years that designate wildlife habitat as the use. The Department will consider this and other feasible options to retain the potential use of livestock grazing as a tool to meet upland habitat management goals. Fencing may need to be constructed to control livestock.

Biological Surveys

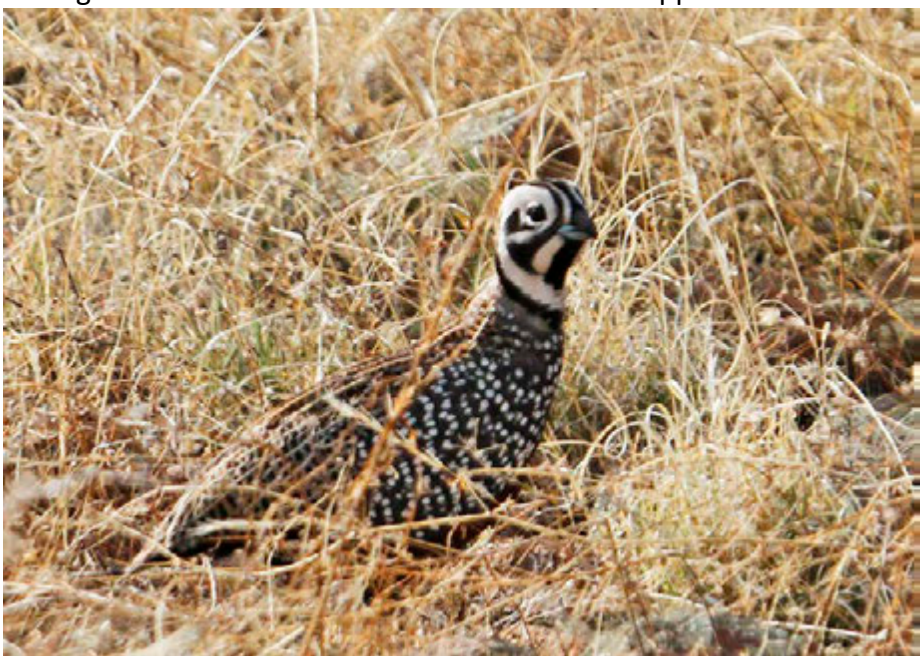
Department biologists conducted wildlife surveys to document baseline conditions and fulfill commitments of the Double E Ranch Conceptual Management Plan. The Ranch Wildlife List is attached as Appendix I. In summary, 26 SGCN have been documented on the Ranch.

Large Game Animal Surveys

The Department conducted large game animal surveys and habitat evaluations during the summer of 2015 to augment previous helicopter surveys. Mule deer, Coues' white-tailed deer, Rocky Mountain bighorn sheep, javelina (*Peccari tajacu*), black bear (*Ursus americanus*) and cougar (*Puma concolor*) have all been documented on the Ranch. Elk (*Cervus elaphus*) have been observed on the property but occur irregularly. Habitat improvement projects for big game animals will be developed in conformity with species management objectives and SGCN conservation needs. See Appendix D for game animal survey and habitat management information.

Upland Game Bird Surveys

Upland game bird surveys and habitat evaluations were conducted in July 2015. Upland game birds documented include Merriam's turkey, Montezuma quail, Gambel's quail, mourning dove (*Zenaida macroura*), and white-winged dove (*Z. asiatica*). Upland game bird nesting habitat could be maintained or improved with grazing if less than 50% of annual grass production is removed during average rainfall years (Kamees et al. 2008). Prescribed burning and/or pinyon-juniper thinning could be done to increase grass nesting cover and forbs for food. For habitat management and harvest recommendations see Appendix E.



SGCN Montezuma quail, Double E Ranch. Photo: M. Watson

Non-game Bird Surveys

Non-game bird surveys and habitat evaluations were conducted during the 2014 and 2015 breeding seasons. Fifteen bird SGCN were documented. SGCN non-game bird habitat management recommendations include implementing conservative livestock grazing practices (if grazing occurs), and maintaining minimum pinyon-juniper patch sizes for pinyon-juniper nesting species such as pinyon jay and juniper titmouse. For survey results and habitat management recommendations for several bird SGCN see Appendix F.

Western screech owl, Double E Ranch. Photo: M. Watson

Bear Creek Fish Sampling and Loach Minnow Critical Habitat

A fish survey was conducted on 9 June 2015 by Department biologists (see Appendix G for full report). Sampling covered the approximately three mile portion of Bear Creek that flows through the Ranch, and fish were collected throughout the perennial and intermittent reaches. All available habitat types were sampled and four fish species collected, including the state- and federally-Endangered loach minnow. Fish sampling efforts concluded that native longfin dace (*Agosia chrysogaster*) are abundant, native desert sucker (*Pantosteus clarkii*) and non-native fathead minnow (*Pimephales promelas*) are rare, and native loach minnow are very rare in the Bear Creek segment of the Ranch.

In 2012 the loach minnow was upgraded from federally Threatened to Endangered. Concurrently, 19.5 miles of Bear Creek, from its confluence with the Gila River upstream to the confluence with Sycamore and North Fork of Walnut Creek, was designated as Critical Habitat. The Critical Habitat extends approximately 13 miles upstream of the Ranch.

Loach minnow were first collected in Bear Creek in 2005, approximately nine miles upstream from the Ranch. Loach minnow are habitat-specific and require riffles with large cobble for breeding and foraging (Sublette et. al 1990). The Ranch has a limited amount of this habitat type. While it is likely that Bear Creek supports a small population of loach minnow, it is not

clear how much the Ranch portion of Bear Creek contributes to population persistence. Annual monitoring of two 200 meter long sites on the Ranch over the next five years will contribute to our understanding of the Bear Creek population and the importance of this section to loach minnow.

Bear Creek loach minnow, Double E Ranch, 9 June 2015. Photo: A. Monie

Bear Creek aquatic habitat with loach minnow. Photo: A. Monie

Potential Native Fish Management Actions

Debris flow lines along the canyon walls demonstrates that Bear Creek experiences high flows. The Ranch section of Bear Creek is dominated by sand and gravel substrates which in combination with high flows limit the potential for developing additional loach minnow habitat.

Depending on the persistence of flows, Bear Creek through the Ranch may be an appropriate location to repatriate another SGCN and state and federally Endangered fish, the spikedace (*Meda fulgida*). This species prefers sand and gravel substrates with shallow depths and clear water (Sublette et. al. 1990). Spikedace prefer swifter currents than what was present during the June 2015 survey, but it is unknown if those conditions are representative. Bear Creek should be evaluated as a potential spikedace repatriation location. Plans for stocking spikedace on the Ranch should be contingent on the evaluation of intermittency in the reach.

Additionally, there may be potential to develop a stock tank to hold water perennially, which would provide a location to hold a refuge population of Gila chub (*Gila intermedia*), a federal and state listed Endangered species.

Chiricahua Leopard Frog

During May 2014 Department biologists surveyed the Ranch aquatic habitats for Chiricahua leopard frogs and found a single frog metamorphosing from larval tadpole stage into adult stage. In September of 2015, a robust population of adult Chiricahua leopard frogs was documented throughout the Bear Creek portion of the Ranch. The Chiricahua leopard frog is a federally Threatened species and SGCN with federally designated Critical Habitat that occurs in the Gila, San Francisco and Mimbres watersheds. This species has been declining rapidly in New Mexico, with the loss of many populations likely due primarily to chytrid fungus (USFWS 2008).

The Chiricahua leopard frog requires different habitats at each stage in the species' life history to maintain a reproducing population. These habitats include:

- permanent or nearly permanent water that is free or relatively free from non-native predators and pollution;
- shallow water with emergent and perimeter vegetation that provides for egg deposition;
- tadpole and adult thermoregulation sites;
- foraging sites, which contain deeper water, root masses, and undercut banks that provide refuge from predators and potential hibernacula during the winter;
- a substrate that includes some mud that allows for the growth of alga and diatoms that provide food for tadpoles and hibernacula; and
- a diversity of nearby aquatic sites, including a variety of lotic and lentic aquatic habitats to provide habitat for breeding, post-breeding, and dispersing individuals (USFWS 2008).

Recovery and site specific habitat restoration needs include:

- removing threats such as non-native species (e.g., bullfrogs *L. catesbeiana*), which have been documented on the Ranch,
- improving water security and permanence,
- improving or expanding breeding and overwintering habitat (i.e., off channel pools, slow water pools, coarse woody debris),
- reducing effects of channel scouring from upland stressors, and
- removing non-native and/or encroaching native vegetation (e.g., juniper (*Juniperus* spp.) that can lower water tables (USFWS 2008).

Chiricahua leopard frog metamorph, 29 May 2014. Photo: J.N. Stuart

Chiricahua leopard frog adult, 16 September 2015 Photo: M. Watson

Aquatic Invertebrate Surveys

In June and July of 2015, four sites were surveyed and inventoried for aquatic invertebrates (Appendix H). Springsnails were the target species due to the presence of endemic springsnails in neighboring drainages. No endemic, Threatened, or Endangered taxa were identified. However, Bear Creek through the Ranch does appear to harbor a diversity of aquatic invertebrates, but specific management actions for invertebrates in this flood-prone creek are not currently recommended. Other unidentified springs on the Ranch may host additional taxa, so it is recommended that the springs on the ranch continue to be surveyed and inventoried for aquatic invertebrates, especially mollusks and crustaceans.

Hunting

The size and diversity of the Ranch enables it to potentially support a range of hunting opportunities. A variety of big game species are present, including mule deer, Coues' white-tailed deer, Rocky Mountain bighorn sheep, javelina, black bear, cougar, and elk (although elk presence is not reliable). Upland game bird species include Merriam's turkey, Montezuma quail, Gambel's quail, mourning dove, and white-winged dove.

The Department will assess hunting opportunities and develop sustainable hunting strategies that are compatible with the primary goal of property acquisition to benefit and conserve key habitats and SGCN.

If the Ranch is opened to big game hunting, public use would increase. The Department will identify restrictions to implement that will mitigate recreational impacts from hunting-related activities such as motorized vehicle use and the limited availability of camp sites. These restrictions could improve the quality of the experience for recreational users, as well as mitigate adverse effects to Threatened and Endangered species such as loach minnow and Chircahua leopard frog.

If hunters access the Ranch when Chiricahua leopard frogs could be active (generally February through October), and access must be through Bear Creek, the Department will identify and implement protocols to limit the potential transmission of chytrid fungus, the primary mortality factor for leopard frogs. These protocols could include requiring visitors to decontaminate boots and other gear that could harbor chytrid fungus and lead to contamination of the stream environment, or to avoid use of the creek bottom altogether.

Roads and Security

Historically, the primary access road into the Ranch has been up Bear Creek Canyon and has required multiple road crossings of Bear Creek. The previous landowner maintained this access road using a bulldozer or road grader. Depending on the frequency of flood events, the road

was re-graded one or more times a year. The south upland road accesses most of the southern half of the property, including tracts of BLM and State Land Office allotments. The north upland road accesses the northern half of the property, including State Land Office and the USFS Spar Canyon allotments. Both of these roads originate in the bottom of Bear Creek Canyon, and were accessed by the bladed road up Bear Creek. Both the north and south roads are in disrepair and may currently only be passable by off-highway vehicles (OHVs).

Department biologists began conducting wildlife inventories of the Ranch in May of 2014. In September of 2014, Tropical Storm Odile flooded Bear Creek Canyon and washed out the road throughout much of the canyon. Additional flood events have occurred since then. Currently there is no continuous road or two-track up Bear Creek Canyon, and Department personnel access has been by foot, horseback, or OHV; all of which requires crossing Bear Creek multiple times.

Because of the occurrence of loach minnow designated Critical Habitat and a population of federally Threatened Chiricahua leopard frogs in Bear Creek through the Ranch, the Department does not have plans to reconstruct the road through Bear Creek Canyon unless conditions dry to the point that no aquatic habitat would be adversely affected. The Department will seek alternative access points and vehicle routes into the Ranch uplands to provide access for Department personnel, hunters, and other recreationists.

For motorized access outside of Bear Creek Canyon, to the extent possible, existing roads will be used. If beneficial for habitat restoration and unnecessary for management purposes, some existing roads or tracks on deeded land may be allowed to naturally re-vegetate.

If motorized access up Bear Creek Canyon is required for future administrative or management activities, the Department will work with the USFWS to determine the methods and timing to avoid destruction or adverse modification of loach minnow Critical Habitat and take of loach minnows or Chiricahua leopard frogs. Activities will be designed and scheduled to minimize disturbance to wildlife during sensitive periods (e.g., the nesting period within the riparian corridor).

The Department will secure the property with signs and fences. Signs will be used to mark the property boundary identifying the State Game Commission as landowner and specify rules and regulations that apply to the property. These security measures will enable Department staff to enforce regulations and restrictions against unauthorized access and public use and natural and cultural resource damage.

OHV Use

OHV use will be limited exclusively to Department staff or contractors as needed for administrative management activities. If OHVs must be used by Department staff through Bear Creek for administrative activities when Chiricahua leopard frogs could be active (generally

February through October), recommended decontamination protocols will be implemented to preclude transmission of chytrid fungus.

Gaining Access Into Nature (GAIN) Program

The Ranch will be incorporated into the Department's Gaining Access Into Nature Program (GAIN) or alternative initiatives providing public access to State Game Commission owned properties. GAIN activities for the Ranch will be limited to minimally intrusive activities such as hiking, wildlife viewing and photography. Development of a trail network is not anticipated. Public access restrictions may be implemented, as needed, during sensitive periods to preclude disturbance in sensitive areas and habitats.

If recreationists access the Ranch during periods that Chiricahua leopard frogs could be active (generally February through October), and access must be through Bear Creek, a decontamination protocol to disinfect boots will be implemented to preclude transmission of chytrid fungus.

Conservation Education

The Ranch provides potential conservation education opportunities for youth and adults. Students and teachers may be instructed by Department personnel or contractors in a wide variety of wildlife-related outdoor education and recreation activities, such as wildlife identification and ecology, habitat management, citizen science ecological monitoring, hunting, fishing, trapping, shooting sports, and archery.

If teachers and students access the Ranch during periods that Chiricahua leopard frogs could be active (generally February through October), and access must be through Bear Creek, a decontamination protocol to disinfect boots will be implemented to preclude transmission of chytrid fungus.

Research

The Department will support scientific research on the Ranch that provides additional new information on wildlife and their habitats. The Department is already working with researchers from the University of Nebraska Kearney, Western New Mexico University and the University of New Mexico to set up long-term monitoring programs to assess wildlife and habitat status and trends.

If researchers access the Ranch during periods that Chiricahua leopard frogs could be active (generally February through October), and access must be through Bear Creek, a decontamination protocol to disinfect boots will be implemented to preclude transmission of chytrid fungus.

Water Plan

In the CMP, the Department committed to developing a water management plan as a component of the final management plan. The Department is determining the most effective and beneficial use of the water rights on the property. The Department will work with the local soil and water conservation district and the NM State Engineer's office to determine the most effective water usage to benefit aquatic, wetland and riparian habitat restoration and native fish and wildlife species.

The Department will investigate the potential to create wetland habitat and/or off-channel ponds. The Office of the State Engineer can make a written determination that wetland habitat restoration or creation is a beneficial use. Wetland and riparian habitat restoration activities at the Ranch can be authorized through a U.S. Army Corps of Engineers Nationwide Permit 27, Aquatic Habitat Restoration, Establishment and Enhancement Activities (expiration date 18 March 2017). Any changes in use for wetland habitat restoration or creation will be coordinated with the Office of the State Engineer.

Monitoring

The CMP states that periodic monitoring reports of the effects of recreational and restoration activities will be provided to the Trustees. Initially the Department will strive to provide annual progress reports. After 5 years, the Department will discuss with the Trustees an appropriate future reporting schedule.

The Department will coordinate continuing migratory bird, mammal, amphibian and reptile, lepidopteran and odonate surveys using Department staff, academic researchers, contractors, and citizen scientists and naturalists as needed and available.

As funding allows, the Department may also consider implementing additional rangeland health assessments using the Resource Management Services methodology (Gadzia 2015) and riparian assessments using the NMRAM methodology (Natural Heritage New Mexico 2015), to document upland and riparian habitat changes over time.

Because of the importance of the population of Chiricahua leopard frogs in Bear Creek, the Department will attempt to provide annual monitoring for chytrid fungus.

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Camera trap image of white-nosed Coatis at Double E Ranch, September 2015

Appendices

Appendix A: Double E Ranch Conceptual Management Plan

Appendix B: Double E Ranch Riparian Assessment

Appendix C: Double E Ranch Rangeland Health Evaluation Report

Appendix D: Double E Ranch Big Game Assessment

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Appendix F: Double E Ranch Non-game Birds Habitat Management Recommendations

Appendix G: Double E Ranch Bear Creek Inventory/Assessment and Management Plan

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Appendix A: Double E Ranch Conceptual Management Plan

New Mexico Department of Game & Fish

Double E Ranch Conceptual Management Plan

Introduction

The New Mexico Office of Natural Resources Trustee and the United States Department of Interior Fish and Wildlife Service (collectively, the "Trustees") engaged in a Natural Resource Damage Assessment and Restoration (NRDAR) process for Freeport-McMoRan Copper & Gold Inc. and its associated companies' three copper mine sites near Silver City, New Mexico. As part of the NRDAR, the Trustees assessed and quantified damages and injuries to wildlife and wildlife habitats from the operation of these three mine sites. As a result, the Trustees were awarded a financial settlement from Freeport McMoRan to compensate the public for injuries to wildlife and wildlife habitat resulting from releases of hazardous substances at these mine sites. Damages from releases were primarily to birds, so protecting and enhancing bird habitat was the primary goal for the selection of projects to fund through the NRDAR process (ONRT 2013).

The Trustees and the New Mexico Department of Game and Fish (Department) are providing funds for the acquisition of the Double E Ranch to protect wildlife and restore wildlife habitat. This conceptual management plan for the Double E Ranch will identify general guidelines by which activities will be conducted to benefit the wildlife and wildlife habitat that occur on the property.

Acquisition, management and long-term conservation of the Double E Ranch fulfills Department Strategic Plan 2013-2018 goals and objectives by conserving and enhancing significant amounts of wildlife habitat (Objective 8), and attaining measurable progress toward the restoration of wildlife identified as being at the risk of depletion or extinction (Objective 10). Acquisition, management and long-term conservation of the Double E Ranch fulfills goals and objectives of the Department's 2006 Comprehensive Wildlife Conservation Strategy (CWCS) (NMDGF 2006). The action preserves key habitats (riparian, aquatic, and Chihuahuan semi-desert grassland) and a high diversity and abundance of Species Greatest Conservation Need (SGCN) that are known to occur, likely to occur, or may occur as wildlife habitat restoration continues on the property.

Site Description

The Double E Ranch property is located along the southwestern edge of the Gila National Forest, approximately 4 miles east of Gila, New Mexico, Grant County. Private fee lands total 5,828 acres. The Double E Ranch includes the 11,033 acre U.S. Forest Service (USFS) Spar Canyon Allotment, the 3,644 acre Bureau of Land Management (BLM) Stone Canyon Grazing Allotment No. 04528, and the 2,493 acre State of New Mexico Grazing Lease No. GM-3017.

Conservation Elements

Approximately 3 miles of Bear Creek flows perennially through the Double E Ranch. Riparian habitat on the ranch is dominated by a rare, mature Fremont cottonwood (*Populus fremontii*) and Arizona sycamore (*Platanus wrightii*) community that provides habitat for a high diversity and abundance of wildlife, including an estimated 43 SGCN as identified in the CWCS. About 80% of all vertebrates in New Mexico and Arizona are dependent on riparian habitats for at least part of their life cycle (Hubbard 1977). Department goals and objectives for the riparian and aquatic habitats of Bear Creek are to continue the recovery of the riparian system to a fully functioning level. The current ranch owners have initiated recovery through their management practices. The Las Cruces District of the BLM has documented recovery of the riparian area to a fully functioning level within the BLM grazing allotment on Bear Creek.

Within a year of closing, the Department will conduct a riparian habitat assessment to determine baseline conditions of the Bear Creek riparian habitat. Riparian assessment methodologies that could be used include: 1) the New Mexico Environment Department's Rapid Assessment Method for Montane Riverine Wetlands (NMED 2011), 2) Visual Assessment of Riparian Health (Ward and Atwill 2003); or 3) User's Guide for the Rapid Assessment of the Functional Condition of Stream-Riparian Ecosystems in the American Southwest (Stacey et al. 2006).

Within a year of closing, the Department will also conduct aquatic (streams and springs), riparian, and upland habitat biological inventories to determine species diversity and establish a baseline of biological information to measure success of habitat restoration activities.

Livestock grazing

Deeded Land

Livestock grazing can be used as a management tool to improve habitat conditions for wildlife (U.S. Forest Service 1990). The Department's primary goal in purchasing Double E Ranch is to benefit SGCN, riparian and Chihuahuan desert grassland key habitats identified in the CWCS. Department goals will be to integrate livestock grazing pursuant to a grazing management plan designed to benefit SGCN and key habitats, and further the recovery of Bear Creek riparian and aquatic habitats to fully functioning condition.

Within a year of closing, the Department will initiate a range health assessment to determine potential appropriate methods and levels of livestock grazing that could facilitate wildlife habitat restoration. The assessment will also address existing infrastructure (e.g., existing fences). If the Department determines that livestock grazing is feasible, the Department will develop a livestock management plan to facilitate implementation of livestock grazing based on assessment recommendations. Sustainable livestock grazing strategies that could be implemented include short duration grazing, rest-rotation grazing, and/or dormant season grazing. Herders may be needed to achieve utilization goals. Determining the most appropriate course of action will require consideration of existing fencing, management costs, and the potential need to use fire as a habitat management tool.

Forest Service Allotment

The Spar Canyon allotment consists of 11,033 acres. Annual rental on the allotment is $1,500. The most recent monitoring data indicates that current conditions are in satisfactory vegetative and watershed condition. The north part of the allotment has very rough broken terrain which makes it very difficult to manage livestock. The allotment map shows this area surrounded by a natural topographic barrier of cliffs. Multiple tanks and springs occur on the allotment. Two pastures are fenced, which allows for growing season rest or deferment to provide for grazed plant recovery. Authorized grazing is for up to 75 Animal Unit Months (or equivalent use by other kind or class of livestock) for up to 12 months.

The Department will assess the Spar Canyon allotment to determine habitat value for SGCN and management opportunities. If appropriate, the Department will pursue development of an Memorandum of Understanding with the Gila National Forest that would allow the Department to cooperatively manage the allotment to benefit wildlife consistent with management of the Double E Ranch deeded property. Potential use of the allotment may include an emergency grass bank to local ranchers when conditions warrant.

BLM Allotment

The Las Cruces District's BLM Stone Canyon Grazing Allotment 04528 consists of 3,644 acres in multiple disjunct parcels within the Double E Ranch boundary. The lease authorizes year-round grazing for 58 animal units. Annual rental on the allotment is $940.

The Stone Canyon allotment contains the Bear Creek Area of Critical Environmental Concern (ACEC) composed of approximately 1,480 acres in two separate parcels. The upland areas consist of pinyon/juniper woodland located above a riparian area containing small cliffs and a box canyon. The ACEC is managed to protect riparian values as stipulated in the Mimbres Resource Management Plan (RMP)(BLM 1993b). The Bear Creek ACEC is closed to OHV use. The Bear Creek riparian area is approximately 20 acres and is located along approximately 1.25 miles of Bear Creek. Although BLM Allotment No. 04528 surrounds the Bear Creek riparian area, the 1993 Mimbres RMP directed that the riparian area be fenced off to exclude grazing. Approximately 1/5 mile of fence was constructed in 2001 and maintenance is the responsibility of the allottee (BLM 2000).

The Department will assess the Stone Canyon allotment to determine habitat value for SGCN and management opportunities. The Department will consider sub-leasing the allotment to maintain livestock grazing as a tool to meet habitat management goals.

State Lands Allotment

The State Lands Office Grazing Lease No. GM-3017 consists of 2, 493 acres in multiple disjunct parcels within the Double E Ranch boundary. Annual rental on the allotment is $1,565. The lease authorized 50 animal units from October 2009 to 30 September 2014. Lease renewal is on a 5-year rotation. The allotment is not tied to the Double E Ranch base property.

The Department will assess State Land Office Lease No. GM-3017 to determine habitat value for SGCN and management opportunities. The State Land Office can issue commercial leases for longer than 5 years that designate wildlife habitat as the use. The Department will consider this

as well as sub-leasing to retain the option for livestock grazing as a tool to meet upland habitat management goals.

Roads

The Double E Ranch, when combined with the USFS, BLM and SLO grazing allotments, covers approximately 23,000 acres of rough terrain. Road access is limited, and the main road up Bear Creek is subject to periodic flooding. Four-wheel drive off-highway vehicles (OHVs) or horseback are the two primary methods for accessing most of the ranch property, including the allotments.

The Department does not anticipate the need to develop new roads to facilitate ranch management. Existing roads will be used to the extent possible, and if beneficial to habitat restoration and not necessary for management purposes, some existing roads or tracks may be allowed to naturally re-vegetate.

If motorized access is required for future management activities such as construction of livestock exclusion fencing for portions of the Bear Creek riparian area, an assessment would be conducted to determine the path of least ecological disturbance (through Bear Creek Canyon or along ridges). Construction would be conducted using best management practices to reduce potential adverse effects to habitats such as erosion and stream sedimentation, leaks of petroleum-based products, and damage to vegetation. Activities would also be conducted to minimize disturbance to wildlife during sensitive periods (e.g., the nesting period within the riparian corridor).

OHV Use

Public OHV use is not being contemplated however OHVs may be used for ranch management activities by the Department.

Hunting

The Double E Ranch contains populations of large game animals and game birds such as mule deer, Coue's white-tailed deer, javelina, black bear, cougar, Rocky Mountain bighorn sheep, Merriam's turkey, Mearn's quail, Gambel's quail, and mourning dove. The Department will assess hunting opportunities and develop sustainable hunting strategies that support the primary goal of property acquisition to benefit and conserve key wildlife habitats and SGCN.

Gaining Access Into Nature (GAIN) Program

The Double E Ranch will be incorporated into the Department's Gaining Access Into Nature (GAIN) program. The GAIN program offers outstanding wildlife viewing and other activities on State Game Commission-owned wildlife management areas. GAIN activities will likely include minimally intrusive activities such as wildlife viewing, photography, hiking and horseback riding along existing roads, trails and two-tracks, and cross-country. All GAIN participants are required to have permits for the appropriate season and activity. Public access restrictions may be implemented during sensitive periods to preclude disturbance in sensitive areas and habitats such as during nesting season for state- or federally-listed bird species.

Conservation Education

The Double E Ranch will serve as a conservation education property and destination for K-12 students and teachers from throughout the state. Students and teachers will be instructed by Department personnel or contractors in a wide variety of wildlife-related outdoor education and recreation activities, such as hunting, fishing, trapping, shooting sports, archery, wildlife identification and ecology, habitat management, and citizen science monitoring.

The property does not currently include and building. The Department will identify and site a building envelope in a location that will minimize disturbance to wildlife habitat and ecosystem functions. The Department will construct facilities to house a permanent property manager as well as a shop and a small lodge, bunkhouse, or outdoor pavilion to accommodate conservation education, daily operations, and visitors.

Research

The Department will encourage scientific research on the Double E Ranch that provides additional knowledge about wildlife biology, ecology, and population status, wildlife habitat restoration techniques, potential effects of climate change on SGCN and key habitats, and other research needs as identified in the CWCS. Western New Mexico University and New Mexico State University have already communicated interest in initiating research opportunities on Double E Ranch.

Water Rights

Within a year of closing, the Department will develop a water management plan (as a chapter of the larger final management plan) to determine how water rights will be maintained for beneficial use. No additional diversions will occur that could deplete Bear Creek. The Department will investigate the potential to create wetland habitat as part of long-term Bear Creek restoration activities. Wetland habitat restoration or creation can be determined to be of beneficial use with written approval by the State Engineers office

Monitoring

Within a year of closing, the Department will 1) conduct or fund a riparian assessment to determine baseline conditions of the Bear Creek riparian habitats; 2) conduct aquatic (streams and springs), riparian and upland habitat biological inventories to determine species diversity and establish a baseline of biological information to measure success of future habitat restoration activities; 3) conduct a range health assessment to determine appropriate land management to facilitate wildlife habitat restoration and improvement. Reports will be provided to Trustees.

In addition, periodic monitoring reports of the effects of recreational and restoration activities will be provided to the Trustees. Initially the Department will strive to provide annual monitoring reports. After 5 years, the Department will re-initiate communication with the Trustees to determine appropriate future reporting schedule.

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Appendix B: Double E Ranch Riparian Assessment

Double E Ranch Riparian Assessment

A Survey of Current Ecological Conditions
to
Support Resource Management Planning

Natural Heritage New Mexico Report – 15-GTR-390
for
New Mexico Department of Game and Fish

November 2015

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Double E Ranch Riparian Assessment

A Survey of Current Ecological Conditions to Support Resource Management Planning[1]

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November 2015

Executive Summary

The New Mexico Department of Game and Fish (NMDGF) is developing a natural resources management plan for its newly acquired Double E Ranch property along Bear Creek in Grant County, NM. The long-term goals for the Double E Ranch are to maintain and improve riparian habitat for all wildlife species, including species of greatest conservation need (SGCN) and listed threatened and endangered species. To help meet these goals and support the planning process, this riparian assessment was conducted on Double E Ranch September 15 to 17, 2015 to provide baseline data on biotic and abiotic habitat conditions using the New Mexico Rapid Assessment Method for Lowland Riverine Wetlands (NMRAM). The NMRAM is a semi-quantitative and efficient approach to sampling and assessing the ecological status of riverine wetland and riparian areas. The NMRAM assessment uses a combination of mapping analysis and field surveys to measure 13 metrics that reflect landscape context, biotic, and abiotic attributes of the riparian ecosystem. These in turn are rolled-up into an overall ecological condition score by sampling area (SA) and averaged for the site as a whole.

Double E Ranch is located approximately 27 km (16 mi) northwest of Silver City, NM, and 8 km (5 mi) east of Gila, NM, in the north central portion of Grant County. The Double E property includes 5 km (3 mi) of Bear Creek, a tributary of the Gila River. Bear Creek on the Double E has sections which are perennial, however, surface flow in much of the canyon can be intermittent. The Double E Ranch has a diversity of riparian vegetation communities. Along the canyon edges and high terraces there are small patches of mature woodland stands dominated by Fremont's Cottonwood (*Populus fremontii*), Arizona sycamore (*Platanus wrightii*), and Goodding's willow (*Salix gooddingii*). Along some riverbanks and low terraces are shrublands, and on many of the sandy bars and terraces are mixed herbaceous stands of forbs and grasses. Associated with this diversity of vegetation communities is a wealth of fauna including the

[1] Final report Project Work Order Number EEP-150817, New Mexico Department of Game and Fish to the University of New Mexico.

endangered loach minnow (*Tiaroga cobitis*) and the threatened Chiricahua leopard frog (*Lithobates chiricauhuensis*).

On the Double E Ranch the most recent land uses were livestock grazing and tourism. The ranch also contains many archeological sites going back approximately 6,000 years. The previous ranch owner graded a road into the canyon bottom that crosses Bear creek in several places.

Based on the NMRAM assessment the Double E Ranch riparian wetlands overall are currently in excellent condition. The ranch average for both landscape context and abiotic metrics was also excellent. The biotic metrics were rated in the good category. The data from some individual metrics points out areas where management is recommended to maintain or improve the condition status of the ranch. The biggest concern hydrologically is protecting water sources, both surface and groundwater to sustain the biological resources of the riparian corridor. Additionally, soil and channel disturbance is a concern. The grading of the dirt road disturbed the channel structure and portions of the riparian zone. It is recommended that the road not be repaired, and future vehicle traffic be limited and kept out of the channel and riparian zone as much as possible. This will support channel morphology to recovery and help protect the two federally listed species that are active-channel dependent. Finally, two patches of tree of heaven, a pernicious State listed weed species, were observed during the NMRAM survey. It is strongly recommended that these patches be treated and removed, along with any other patches on the Double E. Spot treatment of Siberian elms is also recommended, although elms do not pose as great a threat to the ecosystem as a whole.

The recommendations from this assessment are:

1. Maintain maximum possible base flows in the active river channel. In keeping with the property water rights, this should include protection from ground water pumping.
2. Do not maintain, or re-grade, the dirt road in the canyon bottom. Keep vehicles out of the active channel, and limit ORV traffic within the canyon.
3. If grazing of the Double E is considered, livestock use should be carefully monitored, and access to the riparian zone and active channel should be limited to specific areas that can tolerate impacts or else be excluded.
4. Removal of the few patches of tree of heaven and Siberian elm individuals on the ranch is recommended to prevent expansion of these species and future ecosystem disruption.

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Cover: View downstream along Bear Creek near the west end of the Double E Ranch property (Photo by Y. Chauvin).

Introduction

The New Mexico Department of Game and Fish (NMDGF) is developing a natural resources management plan for its newly acquired Double E Ranch property along Bear Creek in Grant County, NM (Fig. 1). The long-term goals for the Double E Ranch are to maintain and improve riparian habitat for all wildlife species as well as species of greatest conservation need (SGCN) and listed threatened and endangered species (ONRT 2013). To help meet these goals and support the planning process, this riparian assessment was conducted on Double E Ranch September 15 to 17, 2015 to provide baseline data on biotic and abiotic habitat conditions using the New Mexico Rapid Assessment Method for Lowland Riverine Wetlands (NMRAM)[2].

The NMRAM is a semi-quantitative and efficient approach to sampling and assessing the ecological status of riverine wetland and riparian areas. For Double E Ranch, three sampling areas (SAs) were established for the assessment, distributed such that they captured the range of variation in riparian ecological conditions. The NMRAM assessment uses a combination of mapping analysis and field surveys to measure 13 metrics that reflect landscape context, biotic, and abiotic attributes of the riparian ecosystem. These in turn are rolled-up into an overall ecological condition score by SA and averaged for the site as a whole. Based on the information gathered in the NMRAM process—the individual metric scores and other observations made while on the site—we provide an assessment of current conditions with a discussion of the implications for maintaining and improving the riparian habitat of the ranch.

Figure 1. Bear Creek near the center of the Double E Ranch.

[2] The most current version of the NMRAM Handbook and Field Guides can be downloaded from the New Mexico Environment Department, Surface Water Quality Bureau, Wetlands Program website at https://www.env.nm.gov/swqb/Wetlands/NMRAM/. The Lowland draft manual should be available from the site in the late fall of 2015.

Study area

Location and hydrology

Figure 2. Scour pools are scattered within the canyon.

Double E Ranch is located approximately 27 km (16 mi) northwest of Silver City, NM, and 8 km (5 mi) east of Gila, NM, in the north-central portion of Grant County (Fig. 3). The Double E property includes 5 km (3 mi) of Bear Creek, a tributary of the Gila River. Bear Creek on the Double E includes perennial and intermittent sections, as well as few large scour pools that may hold water longer than the rest of the channel (see Fig. 1; Fig. 3). Below Double E the creek runs only intermittently, during periods of significant precipitation or spring snow melt (Menzie and Hopkins, 2009). Throughout the Double E, Bear Creek is confined to a canyon that has a width varying from 50-220 m (164-722 ft), and averaging 100 m (328 ft). There are five large, and many small, ephemeral tributaries that feed into Bear Creek within the property, the largest of which are Stone Canyon and Brushy Canyon. Within the property Bear Creek has an elevation range of 1,500 m (4,920 ft) at the eastern (upstream) boundary to 1,457 m (4,780 ft) at the western (downstream) boundary, resulting in a relatively low stream gradient (approximately 0.9%). The Double E is located in the lower portion of Bear Creek's drainage basin, which is approximately 420 km^2 (162 mi^2).

The Double E Ranch is in a semiarid hilly landscape, where mean annual temperatures range from 13° C to 20° C (55 ° F to 70° F) and mean annual precipitation ranges from 20 cm to 32 cm (8 in to 13 in). Additionally, precipitation is annually widely variable, with some years receiving only six inches of precipitation, and other years receiving more than 25 inches (Soles 2003).

There are no stream gages on Bear Creek. The nearest gage is on the Gila River at the town of Gila, NM (Gage Station 09430500) approximately 8 km (5 mi) west of the study site. It was used to provide a general understanding of the local hydrological regime and stream-flow history necessary to some of the NMRAM metric evaluations. Gage data was available for the years 1928 to Sept 2014. Stream flow shows bi-modal peak flows, with one peak occurring between February and March, and the other occurring in August (Fig. 4). The system is driven by both winter snowmelt and late summer/early fall precipitation, with both capable of

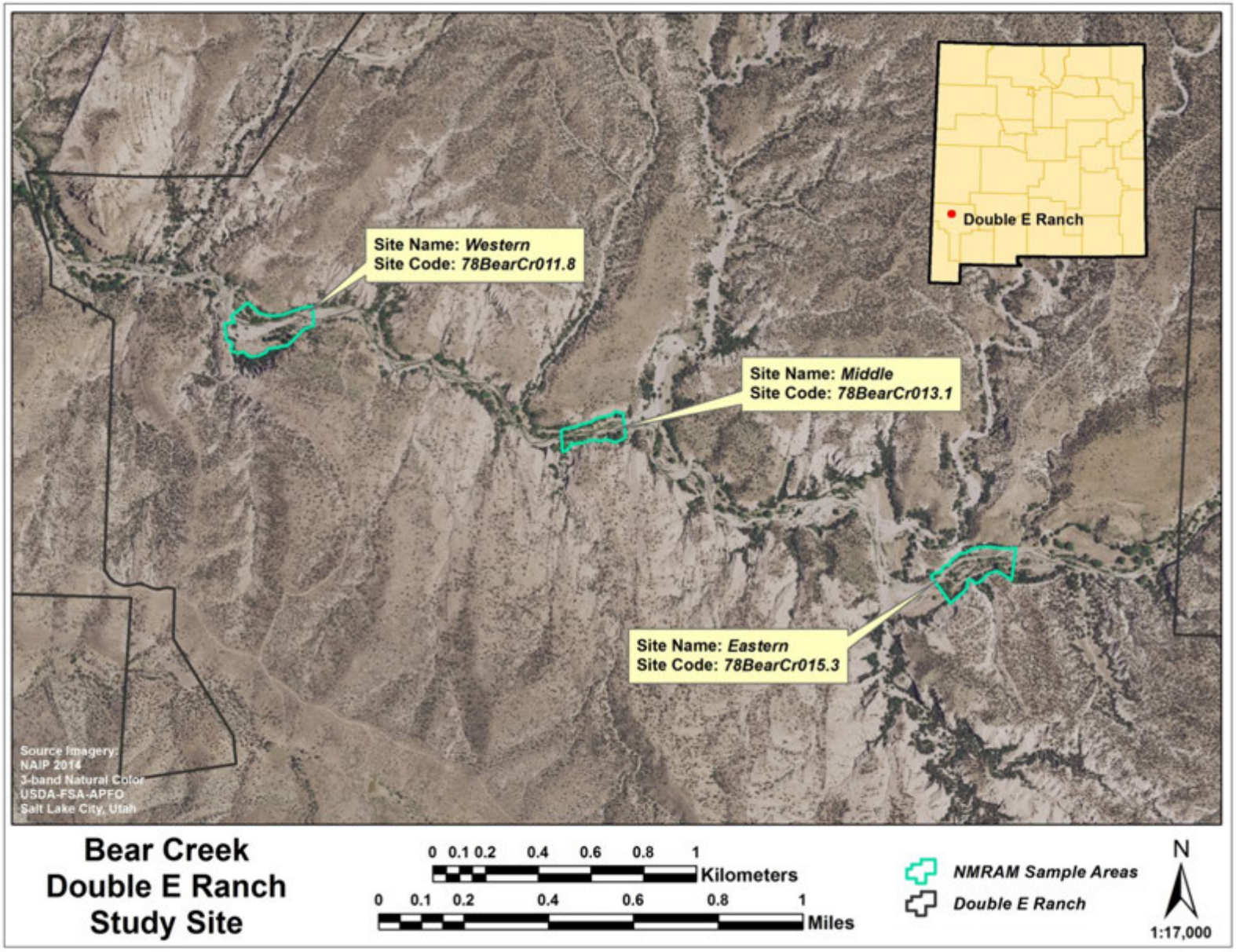

Figure 3. Double E Ranch study area showing three NMRAM Sampling Areas (SAs). Note that there is little development in or around the riparian corridor and that most of the surrounding landscape is open rangeland comprised of grasslands and woodlands.

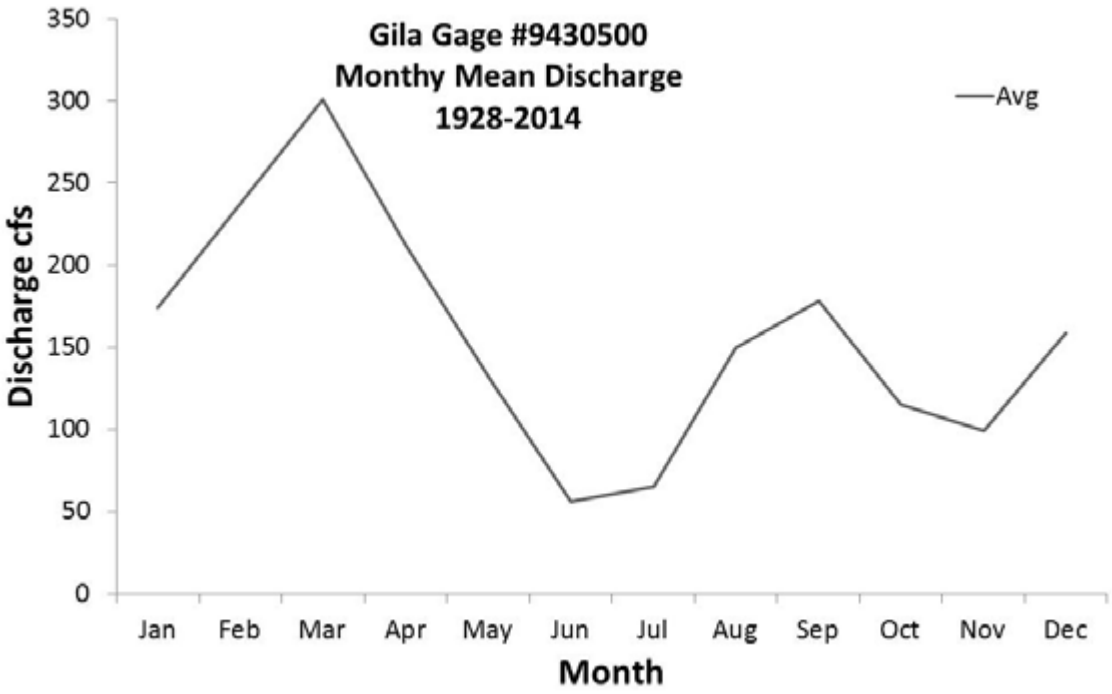

Figure 4. Average monthly discharge on the Gila River at Gila, NM (Gage Station 08477110). Gage period 1928 to 2014.

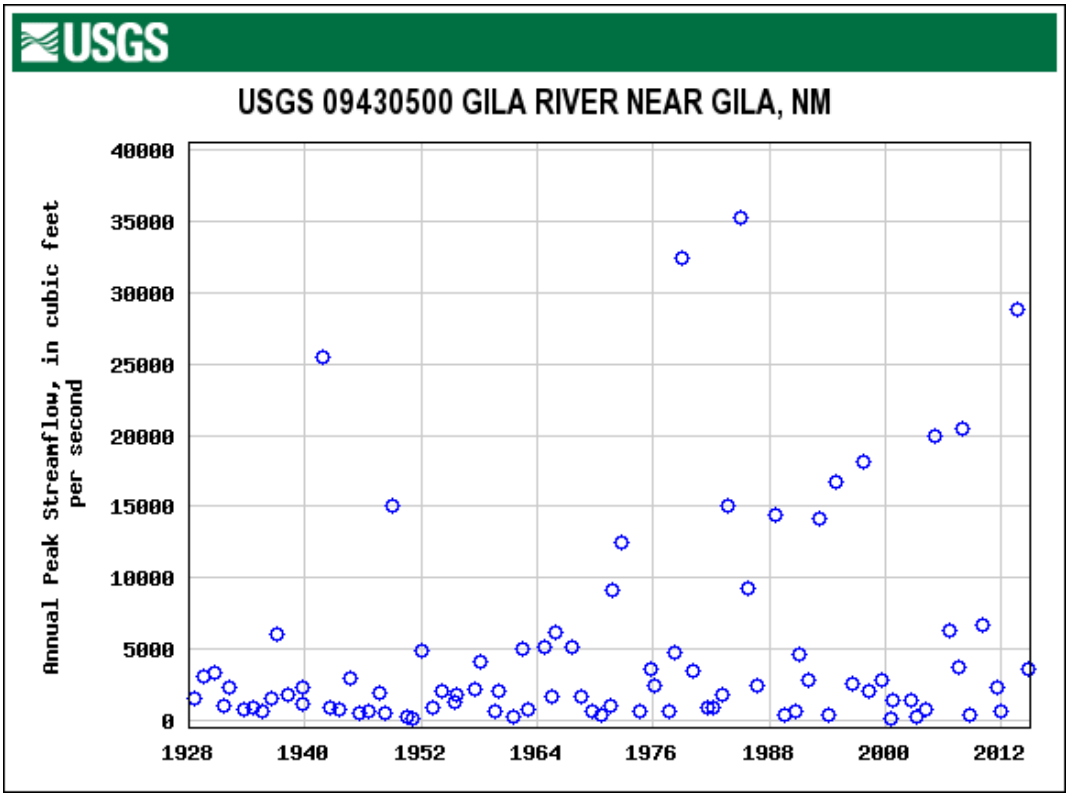

Figure 5. Annual peak flow in cfs for Gila gage from 1928 to 2014

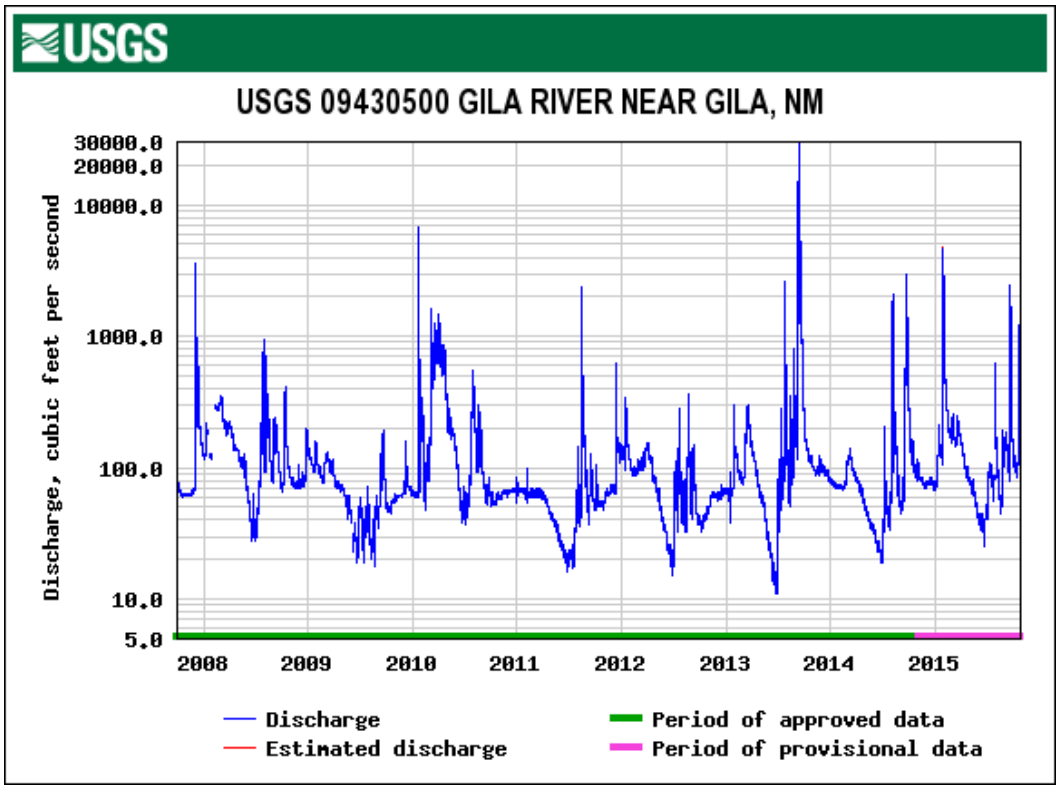

Figure 6. Daily discharge at Gila gage from Oct 2007 to Oct 2015.

producing large-magnitude flows. On September 15, 2013, the Gila gage recorded a peak-flow event of 28,800 cfs, (Figs. 5 and 6). Using the Gila gage return intervals provided in the Lowland NMRAM (Table 1) this is a 25-50-year return interval. The September 2013 event was driven by a state-wide major precipitation event, and Bear Creek likely had peak flows that were within the 25-50-year recurrence as well. Additionally, the Gila gage data indicates that there was a 3,590 cfs event on September 23, 2014 which is in the 2-10-year recurrence interval (Table 1). A similar event likely occurred on Bear Creek as evidenced by the removal of several portions of the dirt road graded into the canyon bottom.[3]

Table 1. Peak discharge (cfs) recurrence intervals that correspond to the rating tables for the Floodplain Hydrologic Connectivity metric (excerpted from NMRAM Lowland Field Guide, Appendix B).

Gage No.	Gage	Recurrence Interval (years)				
		Range	1-2	2-10	10-25	25-50
9430500	GILA RIVER NEAR GILA, NM	Min		2,140	11,800	22,500
		Max	<2,140	11,800	22,500	34,300

[3] Personal communication from Mark Watson, New Mexico Department of Game Fish.

Vegetation and Fauna

Figure 7. Bear Creek though the Double E Ranch supports a wide variety of riparian habitats.

The Double E Ranch has a diversity of riparian vegetation communities. There are scattered small patches of mature woodland dominated by Fremont's Cottonwood (*Populus fremontii*), Arizona sycamore (*Platanus wrightii*) and Goodding's willow (*Salix gooddingii*) (Fig. 7, see also Figs. 11-13). These communities are considered globally imperiled with a NatureServe status rank of G2[4] (Faber-Langendoen et al. 2012). There are also scattered shrublands along the river bank and on some alluvial terraces. These are dominated by seepwillows (*Baccharis salicifolia*) and young riparian trees. The native wetland herbaceous species water speedwell (*Veronica anagallis-aquatica*) dominates the active channel. In addition to the woodlands and shrublands, there are open herbaceous patches dominated by mixed ruderal herbaceous species such as yellow sweetclover, weakleaf bur ragweed, Canadian horseweed, tarragon, and bermudagrass. These occur on areas of sandy soil on high bars and terraces that are likely frequently disturbed by flooding. Nineteen vegetation patch types were identified and cross-walked to 13 plant associations of the U.S. National Vegetation Classification[5] (Table 2).

Associated with this diversity of vegetation communities is a wealth of fauna. For the ranch, 159 species have been reported, including 100 birds, 20 mammals, 13 reptiles and amphibians, and 26 dragonflies and damselflies.[6] Among these, 20 are on the New Mexico Species of Greatest Conservation Need list (SGCN).[7] Additionally, two species present on the Double E are listed as threatened or endangered by the U.S. Fish and Wildlife Service. The endangered loach minnow (*Tiaroga cobitis*) occurs in Bear Creek (Menzie and Hopkins 2009), and a portion of Bear Creek on the Double E is designated by USFWS as loach minnow critical habitat.[8] Additionally, the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*) has been recorded from within Bear Creek throughout the ranch (Fig. 8).

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[4] NatureServe Explorer: http://explorer.natureserve.org/servlet/NatureServe?sourceTemplate=tabular_report.wmt&loadTemplate=assoc_RptComprehensive.wmt&selectedReport=RptComprehensive.wmt&summaryView=tabular_report.wmt&elKey=687971&paging=home&save=true&startIndex=1&nextStartIndex=1&reset=false&offPageSelectedElKey=687971&offPageSelectedElType=communities&offPageYesNo=true&post_processes=&radiobutton=radiobutton&selectedIndexes=687971

[5] See http://usnvc.org/.

[6] Personal communication, Double E Ranch species list as of September 2015. Mark Watson, New Mexico Department of Game and Fish.

[7] Draft State Wildlife Action Plan June 24, 2015, New Mexico Department of Game and Fish.

[8] Personal communication Mark Watson, New Mexico Department of Game and Fish.

Table 2. Double E Ranch vegetation communities mapped in the 2015 survey, cross-walked to plant associations of the U.S. National Vegetation Classification (http://usnvc.org/).

1 Forest & Woodland		
1.B Temperate & Boreal Forest & Woodland		
1.B.3 Temperate Flooded & Swamp Forest		
D013 Interior Lowland West Flooded Forest Division		
M036 Interior Warm & Cool Desert Riparian Forest Macrogroup		
G797 Western Interior Riparian Forest & Woodland Group		
A3801 Platanus wrightii Flooded Forest & Woodland Alliance		
NVC Code	Plant Asoociations	Map Units
CEGL000937	*Platanus wrightii* Woodland	Woodland: Arizona sycamore - Oneseed juniper
		Woodland: Arizona sycamore - Goodding's willow
		Woodland: Arizona sycamore - Goodding's willow / Seepwillow
A3803 Populus fremontii - Fraxinus velutina - Salix gooddingii Flooded Forest & Woodland Alliance		
NVC Code	Plant Asoociations	Map Units
CEGL000661	*Populus fremontii* Forest	Woodland: Fremont's cottonwood - Oneseed juniper / Seepwillow
		Woodland: Fremont's cottonwood - Oneseed juniper
CEGL000665	*Populus fremontii - Platanus wrightii* Forest	Woodland: Fremont's cottonwood - Arizona sycamore
CEGL000944	*Populus fremontii - Salix gooddingii* Woodland	Woodland: Fremont's cottonwood - Goodding's willow
CEGL002683	*Populus fremontii - Salix gooddingii / Baccharis salicifolia* Forest	Woodland: Fremont's cottonwood - Goodding's willow/Seepwillow
CEGL003778	*Salix gooddingii* Woodland	Woodland: Goodding's willow / Seepwillow
M298 1.B.3.Nd.90 Interior West Ruderal Flooded & Swamp Forest		
G510 Interior West Ruderal Riparian Forest & Scrub		
NVC Code	Plant Asoociations	Map Units
Provisional	*Ailanthus altissima* Woodland	Woodland: Tree of heaven - Oneseed juniper

2 Shrub & Herb Vegetation									
	2.C Shrub & Herb Wetland								
		2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland							
			D032 Southwestern North American Warm Desert Freshwater Bosque & Marsh						
				M076 Warm Desert Lowland Freshwater Shrubland, Meadow & Marsh					
					G533 North American Warm Desert Riparian Low Bosque & Shrubland				
						A0933 Baccharis salicifolia Riparian/Wash Shrubland Alliance			
							NVC Code	Plant Asoociations	Map Units
							CEGL003549	*Baccharis salicifolia* Riparian Shrubland	Shrubland: Seepwillow/Gravel Bar
			D031 2.C.4.Nb Western North American Freshwater Shrubland, Wet Meadow & Marsh						
				M301 Western North American Ruderal Wet Shrubland, Meadow & Marsh					
					G524 Western North American Ruderal Wet Shrubland, Meadow & Marsh				
							NVC Code	Plant Asoociations	Map Units
							CEGL005463	*Cynodon dactylon* Western Ruderal Herbaceous Vegetation	Herbaceous: Bermudagrass/Sparse
							Provisional	*Aristida ternipes Ruderal Herbaceous Vegetation*	Herbaceous: Spidergrass / Goosefoot
							Provisional	*Artemisia dracunculus* Ruderal Herbaceous Vegetation	Herbaceous: Tarragon - Ragweed
							Provisional	*Melilotis officinalis* Ruderal Herbaceous Vegetation	Herbaceous: Sweetclover - Ragweed
5 Aquatic Vegetation									
	5.B Freshwater Aquatic Vegetation								
		5.B.2 Temperate & Boreal Freshwater Aquatic Vegetation							
			D049 North American Freshwater Aquatic Vegetation						
				M109 Western North American Freshwater Aquatic Vegetation					
					G544 Western North American Temperate Freshwater Aquatic Bed				
							NVC Code	Plant Asoociations	Map Units
							Provisional	*Veronica anagallis-aquatica* Aquatic Vegetation	Herbaceous: Water speedwell / Sweetclover
									Herbaceous: Water speedwell / Seep monkeyflower

Land use history

The upper watershed of Bear Creek includes the Pinos Altos Mining District, as well as the village of Pinos Altos. Accordingly, there has been intensive land use in the upper watershed that includes mining, residential development, roads, recreation and grazing. Gold was discovered in the Pinos Altos Mining District in 1870, which resulted in significant alterations to the upper watershed. Mining left waste rock and mill tailings, which are potential stream contaminants. At the same time high livestock numbers and timber removal, both to support the mining, denuded the uplands (Menzie and Hopkins 2009). Additionally, some mining activities directly altered the channel and stream banks. Some of the mines have been reclaimed, while others are being developed for residential homes. However, many old mines remain as potential sources of watershed pollution. Groundwater diversion for the residential development of Pinos Altos is an additional threat in the upper Bear Creek watershed.

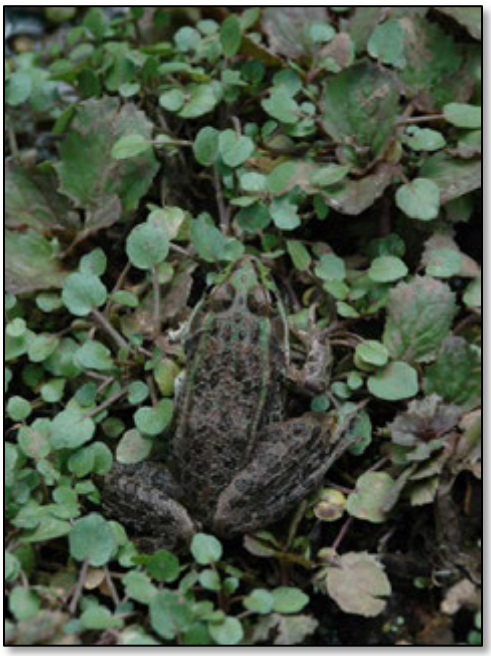

Figure 8. A Chiricahua leopard frog on water speedwell in Bear Creek on the east side of the Double E Ranch.

Figure 9. One of many places within the canyon where the road has been graded through the active river channel.

In addition, the prehistoric Mimbreño people built settlements within Bear Creek canyon, and surrounding canyons. Bear Creek canyon within in the Double E has archeological sites spanning 6,000 years to the present.[9] Within the historic period there were small Apache settlements and sacred sites, as well as homestead sites indicating ranching use. In the very recent past grazing and recreation were the major land uses, but the ranch also contains a few areas that have been

[9] Draft archeological report to NMDGF from Jack Young, personal communication from Mark Watson, NM Department of Game and Fish.

leveled either for use as home sites or fields, although all are now abandoned. The prior ranch owner graded a road through the riparian zone, following the canyon bottom, crossing Bear Creek multiple times from the western to the eastern boundary of the ranch (Fig. 9).

Sampling Design and Analysis

The New Mexico Rapid Assessment Method for Riverine Wetlands (NMRAM) was used to assess the current condition of the Riparian Wetlands on the Double E Ranch. This assessment method examines landscape context, biotic and abiotic attributes of a wetland of interest, and is based on a combination of mapping and field observations. Currently there are two modules of the NMRAM for unconfined riverine systems. One is for smaller montane streams with gradients above one percent occurring at higher elevations and associated with montane riparian vegetation; the other for larger lowland rivers with gradients less than one percent and dominated by desert riparian vegetation. Lower Bear Creek, while a relatively small river, occurs in a lowland setting with the type of vegetation and stream gradient that is consistent with the requirements of the Lowland module. Hence, data was collected using the Lowland module (version 1.0). Yet, because it is a small river we also employed a few components of the Montane module we thought might help in the assessment as supplemental information. Although the Lowland module was the best available fit, Bear Creek deviates somewhat from the assumptions on which the model is based, in that it is intermittent and its floodplain is moderately confined by the canyon, while the Lowland riverine NMRAM is designed for perennial rivers with broad floodplains.

NMRAM data collection occurs in discrete Sampling Areas (SA) with defined boundaries. For the Double E Ranch, three SAs were created. These SAs were distributed more or less equally from east to west across the property to obtain a representative sample of conditions on the ranch and to capture the range in variation across the property (see Fig. 3). There are 13 metrics distributed across three attribute categories: landscape context, biotic, and abiotic (Table 2). Each metric is assessed and assigned a rating based on the data. The data and the scores themselves are entered onto the NMRAM datasheets. The datasheet contains a roll-up table which takes all the individual scores and calculates overall scores by attribute categories, with the entire SA score then based on the attribute scores. The SA scores for a site are then averaged to produce an overall project score. Finally, the NMRAM datasheets include a series of stressor checklists, which although not used in calculating the final SA score, are included as ancillary information on factors that may be affecting the conditions of the wetland. Copies of the complete NMRAM datasheets along with all of the data collected are provided as part of the Digital Addendum, and summaries of the data are reported below.

All NMRAM metrics are rated using a ranking scale of A to D (4 to 1), with A representing a riparian wetland in Excellent ecological condition, B indicating Good condition, C indicating Fair condition, and D a riparian wetland in Poor condition. The implication is that wetlands in excellent condition are providing all of their expected functions and services, while wetlands in

poor condition are providing few to none of their expected functions and services. The NMRAM guidance documents that contain full descriptions of the methods for collecting NMRAM data and metric descriptions and rationale (NMRAM Montane Riverine Manual and Field Guide Version 2.0; Lowland Riverine Field Guide 1.0) can be obtained from the New Mexico Environment Departments website. (https://www.env.nm.gov/swqb/Wetlands/NMRAM/)

As part of the NMRAM biotic metric assessment process, a vegetation patch map was created for each SA. These were digitized in GIS and are provided as shapefiles in the Digital Addendum. Additionally, photographs of each vegetation patch were taken, as well as photographs of channel cross-sections, and other features. All photographs are provided in the digital addendum included with the report. The locations of some vegetation and abiotic features, as well as the channel cross-sections were recorded with a Garmin GPS with an accuracy of +/- 3 m (Digital Addendum). An electronic Data Addendum to this report contains all of the raw data in PDF files, along with the photo files and a PDF of this report.

Table 3. NMRAM Lowland Version 1.0 List of Metrics.

Attribute categories and metrics		*Score weights*	
		Attributes	*Metrics*
Landscape Context Metrics		**0.3**	
	1. Buffer Integrity Index		0.25
	2. Riparian Corridor Connectivity		0.25
	3. Relative Wetland Size		0.25
	4. Surrounding Land Use		0.25
Biotic Metrics		**0.35**	
	1. Relative Native Plant Community Composition		0.2
	2. Vegetation Horizontal Patch Structure		0.2
	3. Vegetation Vertical Structure		0.2
	4. Native Riparian Tree Regeneration		0.2
	5. Invasive Exotic Plant Species Cover		0.2
Abiotic Metrics		**0.35**	
	1. Hydrologic Connectivity		0.3
	2. Physical Patch Diversity		0.3
	3. Soil Surface Condition		0.1
	4. Channel Mobility		0.3

Results

NMRAM Scores

The NMRAM rating scores by attribute category and metric for each sampling area and the overall site scores are provided in Table 3. Each of the metrics measures a different aspect of riparian condition. Below we will present a summary of each metric measured on the ranch, along with the conditions that led to the scores.

Landscape Context

Landscape context metrics are designed to measure the conditions surrounding an SA, and are primarily assessed using a GIS with field confirmation. Since most of the landscape surrounding Double E is natural vegetation (mostly range land), the sites score high across all metrics, i.e., Excellent condition (see Fig. 3).

Buffer Integrity Index, which is composed of two sub-metrics*, Buffer Percent* and *Buffer Width*, is a measure of the amount of natural and semi-natural vegetated buffer on the lateral sides of the SA out to 250 m from the SA boundary (e.g., open range land). Vegetated buffers enhance wetland function and protect the wetland from anthropogenic environmental stressors. Overall, the buffers on the Double E Ranch were all intact and in excellent condition due to the lack of development in the surrounding landscape.

Riparian Corridor Connectivity measures the connectivity versus fragmentation of the riverine corridor upstream and downstream of the SA. Intact riparian corridors allow for unimpeded movement of wildlife, intact habitat, and propagation of plant communities. The ranch riparian corridor was intact except for a two-track road down the channel, but this was not considered a major fragmentation feature.

Relative Wetland Size is an index of reduction of the current wetland size relative to its estimated historical extent due to human-induced disturbances, particularly land-use conversions. Large reductions of area can alter hydrology and ecosystem processes, and may create ecological instability or reduce viability. On the ranch there was little evidence of housing or agriculture conversion, although there was one location on the very eastern edge where the floodplain had been reduced by an old field. This field was not large enough to reduce the rank from A-Excellent.

Surrounding Land Use measures the amount and intensity of human land use in the buffer zone surrounding the SA. The intensity of human activity in the landscape has a proportionate impact on the ecological processes of the riparian ecosystem. Beyond the one field and the two-track road there was little evidence of land-use impacts.

Table 4. NMRAM scores for all metrics by attribute categories for each sampling area and the overall ranch average.

River Ranch NMRAM Scores

	Sampling Areas			
	East	**Mid**	**West**	
	15.3	**13.1**	**11.8**	**Avg.**
Landscape Context Attributes				
Buffer Integrity Index	4	4	4	**4**
Buffer Percent	4	4	4	**4**
Buffer Width	4	4	4	**4**
Riparian Corridor Connectivity	4	4	4	**4**
Relative Wetland Size	4	4	4	**4**
Surrounding Land Use	4	4	4	**4**
Biotic Metrics				
Relative Native Plant Community Composition	3	3	2	**2.7**
Vegetation Horizontal Patch Structure	4	3	3	**3.3**
Vegetation Vertical Structure	3	3	3	**3**
Native Riparian Tree Regeneration	3	3	3	**3**
Invasive Exotic Plan Species Cover	3	4	3	**3.3**
Abiotic Metrics				
Hydrologic Connectivity (Multi-channel)	3	3	3	**3**
Physical Patch Diversity	4	4	4	**4**
Soil Surface Condition	3	3	3	**3**
Channel Mobility	4	4	4	**4**
Additional Montane Abiotic Metrics (Not in score roll-up)				
Hydrologic Connectivity (Montane)	*3*	*3*	*4*	***3.3***
Channel Stability	*3*	*3*	*4*	***3.3***
Stream Bank Stability and Cover	*3*	*3*	*4*	***3.3***
Landscape Context Score	4	4	4	**4**
Biotic Score	3.2	3.2	2.8	**3.1**
Abiotic Score	3.6	3.6	3.6	**3.6**
SA Weighted Wetland Condition Score	**3.58**	**3.58**	**3.44**	**3.53**
SA Wetland Rank	**A**	**A**	**A**	**A**

Biotic metrics

Biotic metrics measure key biological attributes within the wetland that reflect ecosystem integrity. These are primarily based on field mapping of vegetation communities (Figs. 11, 12, and13)

Relative Native Plant Community Composition is an index of the abundance of native-dominated versus exotic-dominated vegetation communities based on the most abundant species within each vegetation patch that was mapped. High native-plant species diversity generally indicates overall high biotic diversity, stability of wetland biotic communities, increased wildlife habitat and species diversity. The ranch received a Good score on relative native-plant community composition. There were large herbaceous patches dominated or co-dominated by exotic forbs and grasses. Woody dominants throughout the ranch were predominantly native, with the exception of one patch in the western SA dominated by tree of heaven (*Ailanthus altissima*), an introduced State listed noxious weed (Fig. 10).

Figure 10. Tree of heaven on the western SA.

Vegetation Horizontal Patch Structure is an assessment of general vegetation patch diversity and pattern complexity (interspersion) across an SA. Multiple plant patches that are more or less equally distributed across the SA indicate high biotic diversity and a history of dynamic fluvial processes. The ranch as a whole earned a Good rating on this metric. There was a moderate amount of different vegetation patches, but the amount of area per patch was often not equally distributed and interspersion of patches was low (i.e., patches were not highly intermixed) (see Figs. 11 and 12).

Vegetation Vertical Structure is an assessment of the vertical structural complexity and richness of the vegetation canopy layers across the SA. Vertical vegetation structure is an integral part of habitat diversity and is correlated with overall faunal biodiversity. The ranch earned a Good rating on this metric. The two most common structure types throughout the canyon were non-wetland herbaceous and patchy mature woodlands. There were also scattered young woodlands and shrublands, but these were never a majority structure type, which kept the rating from being higher.

Native Riparian Tree Regeneration assesses the abundance of riparian tree reproduction across the SA. Healthy functioning riverine wetlands should consist of a mosaic of woody

vegetation stands that include stands of both mature and young regeneration trees. Absence of young trees may indicate ecological dysfunction. Young trees were present throughout the canyon, but patches of recent reproduction were scattered, leading to a Good score rather than Excellent. Seedling native trees were often observed in the active channel as well as more isolated patches of saplings outside the channel, but the survivorship capacity was uncertain.

Invasive Exotic Plant Species Cover is a measure of the total percent cover of a set of exotic plant species that are considered invasive based on the New Mexico list of noxious weeds.[10] Invasive non-native species can have a significant impact on community diversity and function. High levels of invasive exotic species within a riparian plant community are a direct threat to maintaining wetland function and biodiversity. The ranch earned a Good rating on this metric. There were isolated Siberian elms observed throughout the canyon but of particular concern were two patches of tree of heaven (see Fig. 10). One patch was inside the western SA and is identified on the vegetation map (Fig. 11-13). The other patch was at the upstream end of the eastern SA and is noted on the field map.

Abiotic Metrics

The abiotic metrics address observable hydrological conditions, physical ecological complexity, and anthropogenic disturbances. The metric assessments are based on a combination of a reconnaissance survey (prescribed in the Lowland Riverine RAM) and stream channel cross-sections (per the Montane Riverine RAM).

Floodplain Hydrologic Connectivity is an assessment of the ability of water to flow into or out of the wetland or to inundate adjacent areas. Surface hydrological connectivity between a river and riverine wetlands formed on its floodplain supports key ecological functions and plant and wildlife habitat diversity by promoting an exchange of water, sediment, nutrients and organic carbon (Collins et al. 2008). For this metric on the Double E Ranch we used a combination of the Lowland module narrative rating protocol and channel cross-sections. The narrative approach is designed to detect evidence of recent (within five years) inundation of side channels and the floodplain and hence connectivity with the main channel surface flows. Using this method the ranch rated Good on Hydrologic Connectivity as a whole. The majority of back and side channels showed evidence of flow from the fall 2014 flood event, which was estimated to be a 2-10-year return event based on the Gila gage data (see Figs. 5 and 6, Table 1). Some large woody debris and older side-channel flood evidence observed was suspected to be from the September 2013 flood event, which was estimated as a 25-50-year return event. The rating of this metric is dependent on the return interval of the peak flood that has occurred within the last five years. Since the Gila gage data is our best approximation of return intervals locally, we opted for a conservative approach and used the 10-25 year ratings table that reflects the intermediate magnitude of the two largest recent flooding events in the basin. Of note, the

[10] List maintained by the New Mexico Department of Agriculture, last updated 2009. Available on the website http://www.nmda.nmsu.edu/apr/noxious-weed-information/.

Western SA showed more evidence of water flow through its floodplain and side channels and thus rated Excellent on Floodplain Hydrologic Connectivity.

In order to get a more complete picture of the Floodplain Hydrologic Connectivity, we also measured entrenchment of the active channel using the cross-section protocols from the Montane module. The degree of entrenchment, defined here as the ratio of flood-prone width to bankfull width, speaks to the ease or difficulty for water to move out of the main active channel and inundate the adjacent floodplain—as the quotient of the ratios goes up overbank flooding should be more prevalent, leading to greater connectivity. The Bear Creek SA entrenchment ratios with their ratings from the Montane module are provided in Table 4. As a whole, the ranch scored a Good rating on Floodplain Hydrologic Connectivity as measured by this method (only two suitable cross-section sites per SA were found and measured versus the three suggested by the protocol). However, there was enormous variability between cross-section scores, with every SA having one cross-section that scored a Poor rating and one that scored higher. The widest variability came from the Western SA, which had one D and one A.

Table 5. Entrenchment Ratios measured for cross-section and average for each SA. U=Upper cross-section, M=Middle cross-section, L=Lower cross section.

SA	Cross Section	Entrenchment Ratio	NMRAM Rating
Eastern (15.3)	U	2.17	3 (B)
	M	1.44	1 (D)
	L	-	-
	SA Average	**1.81**	**2 (C)**
Middle (13.1)	U	1.39	1 (D)
	M	1.85	2 (C)
	L	-	-
	SA Average	**1.62**	**2 (C)**
Western (11.8)	U	3.27	4 (A)
	M	-	-
	L	1.45	1 (D)
	SA Average	**2.36**	**4 (A)**
Bear Creek Average		**1.93**	**3 (B)**

Physical Patch Diversity describes the physical structural richness of riverine wetlands and associated channels (e.g., debris jams in channel, swales, depressional fluvial features on floodplains, woody wrack piles on the floodplain, pits and mounds, etc.). Variety in physical features leads to a varied and complex habitat that fosters biological diversity. Overall, Bear Creek had an Excellent rating for physical patch diversity, due in part to the high number of side and back channels as well as other physical patch types spread across the floodplain.

Soil Surface Condition is a measure of anthropogenic disturbance to the wetland and riparian soils which results in modification of soil characteristics. Disturbance to the soil can affect biological, physical and chemical processes and impede wetland function. All three SAs scored a Good rating on soil surface condition as a function of the dirt road graded into the river bottom by the prior owner (see Fig. 9). Outside of this, no other significant soil disturbances were observed.

Channel Mobility is an assessment of the dynamic capacity of a channel to laterally migrate or avulse. A channel that is armored by either anthropogenic means (levees, rip wrap, and jetty jacks) or non-native woody vegetation is unable to migrate or avulse and thus unable to create a dynamic patch mosaic of fluvial landforms that support wetland and riparian communities. Bear Creek scored an Excellent rating on channel mobility—there were no indications of anthropogenic modification of the channel banks and no armoring by non-native woody species.

Per the Montane module, we also collected *Channel Stability*, and *Stream Bank Stability and Cover* metric data. *Channel Stability* assesses the degree of channel aggradation or degradation based on the departure from characteristic pattern, profile, and dimension. Large, persistent changes to the flow or sediment regime caused by upstream land-use changes, alterations of the watershed, or climatic changes tend to destabilize the channel and cause it to change form (Collins et al. 2008). Channel Stability is rated using a series of indicator checkboxes based on features you might observed in a Montane stream system. Because of the difference in substrate (sand versus cobble/boulder), many of the indicator checkboxes were not applicable to Bear Creek. However, based on those indicators that were applicable, Bear Creek as a whole rated a Good on this metric, due to mild indications of aggradation.

Stream Bank Stability and Cover is a measure of stream bank soil/substrate stability and stream bank erosion potential that reflect overall stream bank stability. Greater stability and cover generally indicate less anthropogenic disturbance. Stable stream banks should support more perennial vegetation and more stable and healthy wetland communities. The ranch overall scored in the Good category on this metric, because, while generally well vegetated and stable, there were intermittent patches of poorly vegetated and unstable banks.

Overall Site Score

In summary, each SA had an overall rating of Excellent (see Table 4) with an overall average score for the site of 3.53, which places the Double E Ranch riparian wetlands in the lower third of the Excellent (A) ecological condition category (Table 6). This was bolstered by the natural-lands landscape context that offset lower scores of other metrics, particularly among the biotic attributes.

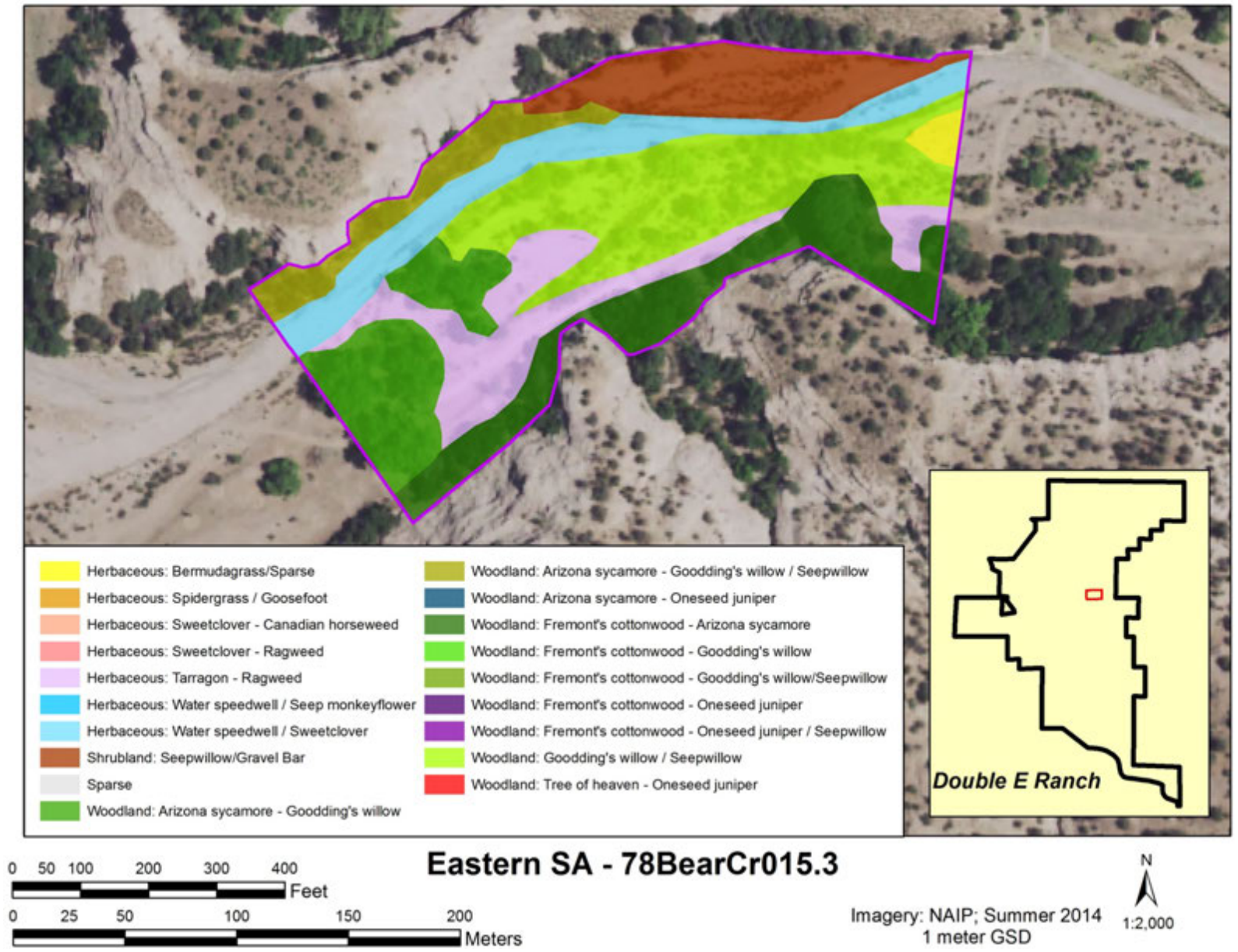

Figure 11. Vegetation Polygon Map for Eastern SA – 78BearCr015.3.

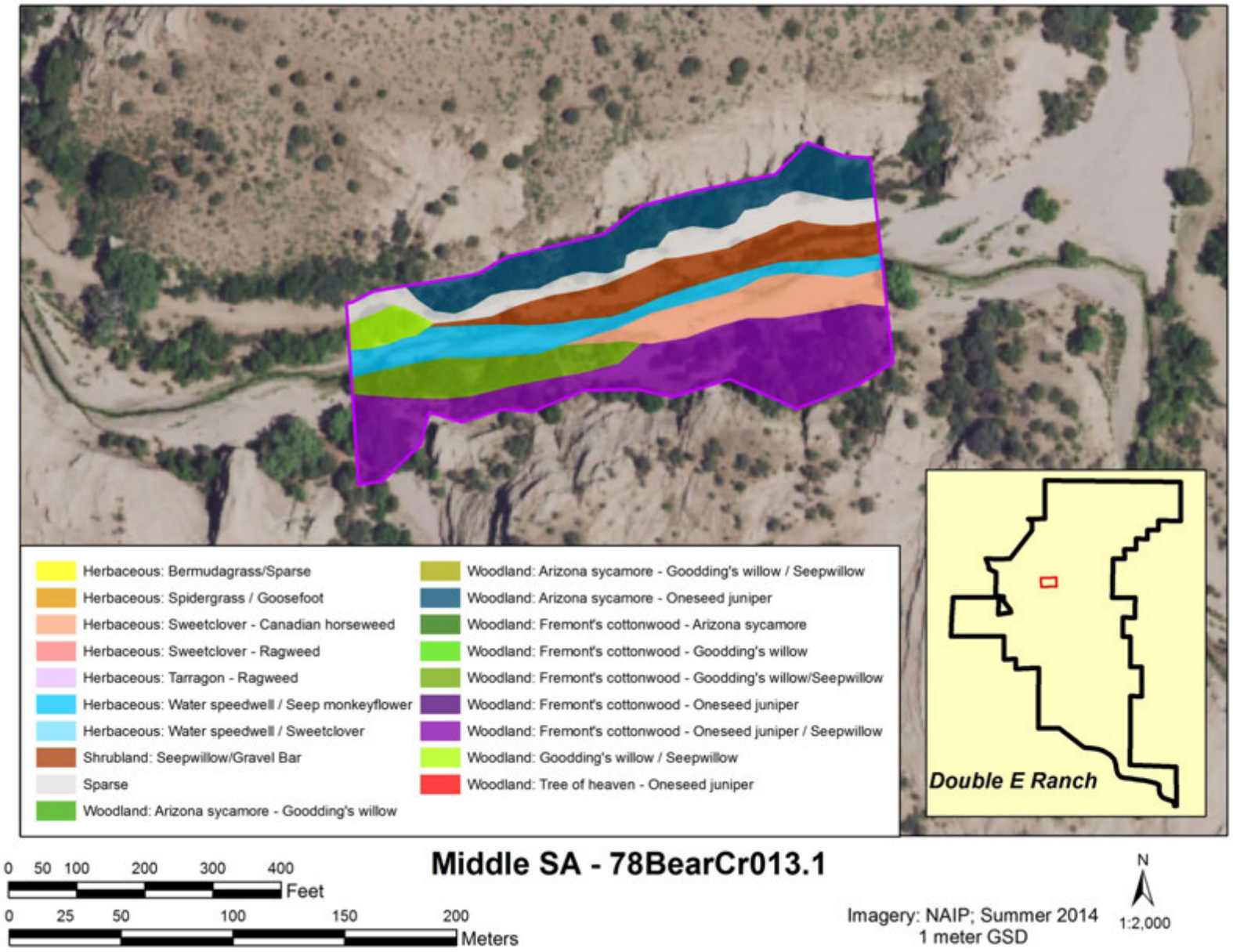

Figure 12. Vegetation Polygon Map for Middle SA – 78BearCr013.1.

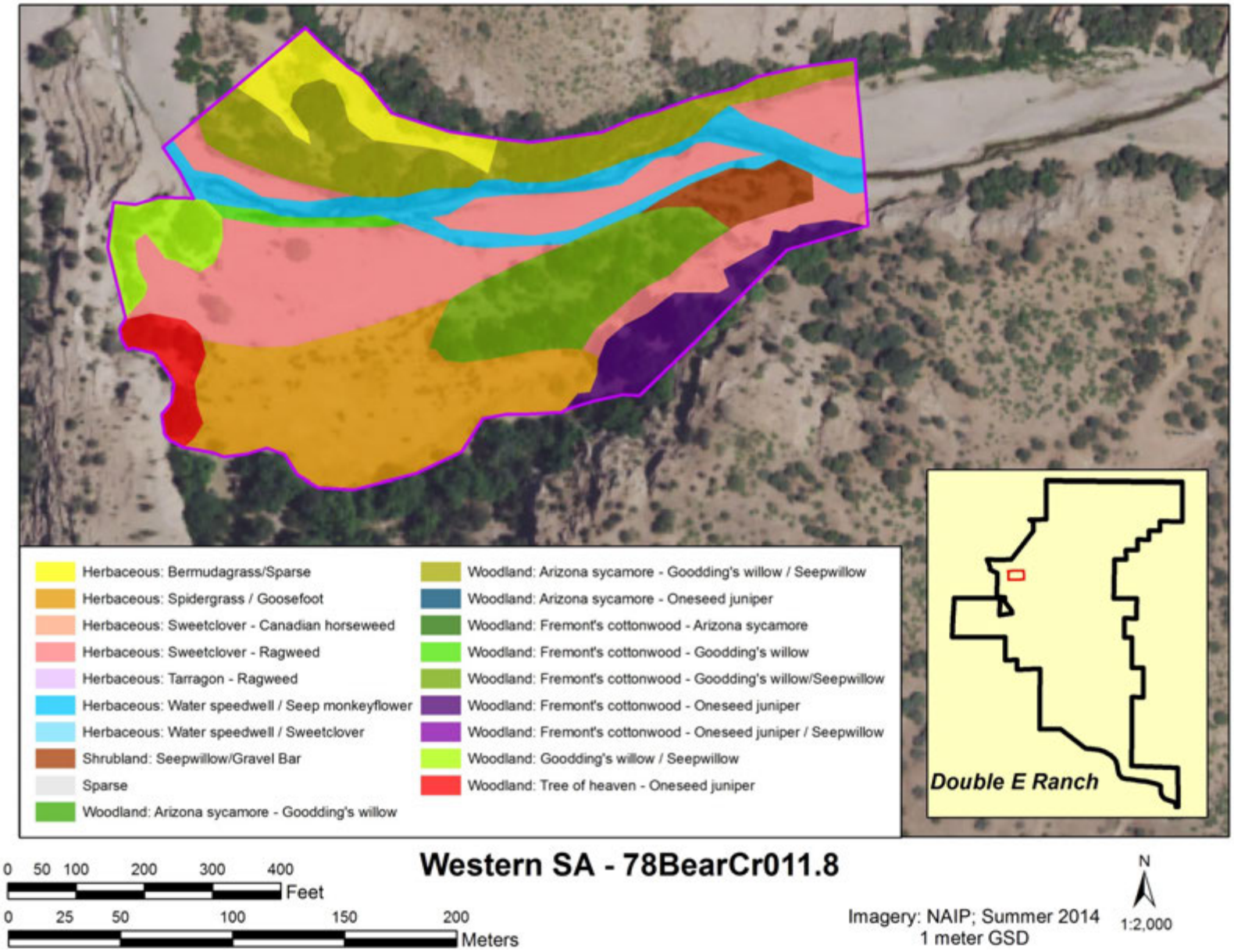

Figure 13. Vegetation Polygon Map for Western SA – 78BearCr011.8.

Table 6. Overall NMRAM site scoring rating table.

Rank	Score	Description
A	>3.25-4.0	Excellent Condition
B	>2.5-3.25	Good Condition
C	>1.75-2.5	Fair Condition
D	1.0-1.75	Poor Condition

Discussion

The remoteness of the Double E Ranch from urban and town centers provides favorable landscape context for the site and this is reflected by the high Landscape Context ratings. While the ranch is in overall excellent condition, and should remain so as long as it is protected from development, there are areas where particular management intervention is needed to maintain condition. The abiotic and biotic data point to a history of highly dynamic fluvial processes that lent to the inherent riparian vegetation and habitat diversity on the ranch. However, the biotic data indicate concerns over invasive species, while the abiotic data indicate protection of the water sources and limitation of anthropogenic soil disturbance are key to continued ecosystem health.

Bear Creek within the Double E has a narrow floodplain and an intermittent flow regime during portions of the year. Hence, it lies at the limit of what the NMRAM defines as a lowland, unconfined, perennial stream. Regardless, the Lowland NMRAM provides the best fit available for this system, however the NMRAM scores should be interpreted with the understanding that this is a system that deviates from the Lowland reference type. The narrower floodplain constrains to some degree the development of a complex vegetation patch mosaic, and this in turn lowers biotic and abiotic metrics such as Vegetation Horizontal Patch Structure, Vegetation Vertical Structure, and Physical Patch Complexity. In addition, because of the narrowness of the canyon and the large number of ephemeral tributaries, flash flooding on the Double E is probably both frequent and of a magnitude sufficient to fill the majority of the floodplain. This excessive disturbance may further limit the development of complex vegetation patches, particularly with regard to vertical vegetation complexity. Large flood events likely remove many young trees, shrubs and perennial herbaceous vegetation. This would explain why young woodland and shrubland patches throughout the canyon were small, and patchily distributed. The general lack of well-developed perennial herbaceous vegetation may also be due to the disruptive effect of large ephemeral flood events. The degree to which these ephemeral flash flood events exceed normal conditions as a function of upper watershed alterations is unknown at this time. That is, lowered scores could be a function of both the natural confinement of the canyon that limits wetland expression in the floodplain and watershed-scale stressors.

There were 19 different vegetation patch types mapped as part of the Biotic Metric data collection process (Figs. 11 to 13). These patches represent eight recognized plant communities and five provisional plant communities in the U.S. National Vegetation Classification[11] (Table 2). Although detailed community composition data was not collected as part of the NMRAM process, there is a wealth of published data available on the majority of the vegetation communities observed on the Double E Ranch. The ranch's forest communities, dominated by Fremont's cottonwood, Arizona sycamore and Goodding's willow, are all considered globally rare and highly threatened due to altered hydrologic regimes, flood control structures, and land conversion.

Figure 14. Very large Fremont's cottonwood in the Eastern SA, typical of scattered very large individuals throughout the canyon.

Small stands of globally rare and important riparian forest habitat types are scattered throughout the Bear Creek canyon on the Double E (see Figs. 11 to 13). While the size of these stands is limited by the narrowness of the canyon and the frequency of flood events, there are stands of both very large old trees and younger regeneration trees (see Fig. 11-13; Fig. 14). Shrublands throughout the ranch also tend to be small and patchy. While the frequency of large flood events likely plays a role, past livestock browsing and off-road vehicle traffic may have also reduced their extent. Accordingly, protecting the canyon from disturbance by livestock and off-road vehicles will allow shrub layers to reach the maximum extent possible within the physical and hydrological limitations of the canyon. Herbaceous wetlands were limited to communities dominated by water speedwell within the active channel and weedy (ruderal) communities on adjacent bars and terraces. The ruderal nature of the bar and terrace herbaceous communities may also be driven by flash-flood events through the narrow canyon. It was the prevalence of these ruderal herbaceous communities, often dominated or co-dominated by exotic species, that caused the Relative native plant community composition score for the ranch to be in the Good, rather than Excellent, category.

Invasive exotic weeds are a potential threat. While scattered individual Siberian elms were recorded in all three SAs, they are not as much of a concern as the two patches of tree of heaven (see Fig. 10). Tree-of-heaven is a pernicious root-sprouter, and can rapidly take over an area. Once established, tree of heaven is hard to eradicate and requires treatment with

[11] Available on http://usnvc.org/

herbicide, followed by mechanical removal, and repeated herbicide treatment on all resprouts.[12] We would recommend that the observed patches be treated to prevent their expansion and disruption of native habitat. We would also recommend a careful survey of the whole canyon for tree of heaven prior to treatment, to assure that all individuals are removed.

From the perspective of a multi-channel lowland system, the ranch appeared to be relatively well connected hydrologically (Good rating). A primary concern is that the ranch water sources be protected to ensure long-term sustainability of its biological resources. With two surface-water-dependent listed species present (loach minnow and Chiricahua leopard frog), keeping surface water in the channel throughout the year should be a priority. In addition, protecting the groundwater from being depleted by water withdrawals, and management aimed at limiting disturbance to the active channel and floodplain within the ranch should aid hydrologic connectivity in the long term.

The metrics for Hydrologic Connectivity, Channel Stability, and Stream Bank Stability and Cover all show a low level of impairment (Good rather than Excellent). But the intermittent nature of Bear Creek is not well understood for the riparian corridor of the ranch and the intermittency of flow is not well reflected in the NMRAM metrics designed for perennial rivers reference conditions. It is not known if Bear Creek has always been intermittent in this reach, or if it became intermittent due to upstream land uses (mining, fire suppression, past logging practices, grazing, etc) that altered run-off and sediment loads in the watershed. We know that there have been major changes in the upper watershed over the past 150 years. It is possible that lower Bear Creek was once perennial throughout and, thus, may have had more stable channel morphology, densely vegetated banks, and no aggradation. These questions are beyond the scope of an NMRAM assessment, but could be addressed by a more detailed hydrological analysis. The benefits of such an analysis would be a deeper understanding of the nature of the system, and better guidelines for management and potential restoration.

The presence of the legacy road graded through the stream channel should be addressed. Maintaining this road and re-grading it is a threat not only to overall soil surface condition and erosion, but also through the alteration of channel geometry, which may impact hydrological connectivity, vegetation patch structure on adjacent bars and terraces, and surface water availability. In addition, road repair and traffic on the road could lead to direct impacts on habitats and individuals of federally listed species. Thus, we recommend that the road be decommissioned through active restoration or simply not be repaired, and that vehicle traffic of all kinds be limited and kept out of the active channel wherever possible.

Summary of Recommendations

In summary, we make the following recommendations for riparian habitat management on the ranch:

[12] Personal communication from Chad McKenna, GeoSystems Analysis, Inc.

1. Protect the base flow in the active river channel throughout the year in keeping with the property's water rights. This will also help protect the ground water resources that are key to sustainability of the wetland ecosystems of the ranch.

2. Do not maintain the dirt road in the canyon bottom and develop a roadway restoration plan. As much as possible keep motorized vehicle traffic out of Bear Creek canyon, especially out of the active channel.

3. If grazing of the Double E is considered, livestock use should be carefully monitored, and access to the riparian zone and active channel should be limited or excluded.

4. Removal now of the scattered patches of tree of heaven, a highly invasive and exotic tree species, could save money and environmental disruption in the future when it may become more pervasive. Treatment should follow established protocols for tree of heaven, and be repeated for at least one growing season to be effective. If left in place these trees may interfere with native riparian tree reproduction.

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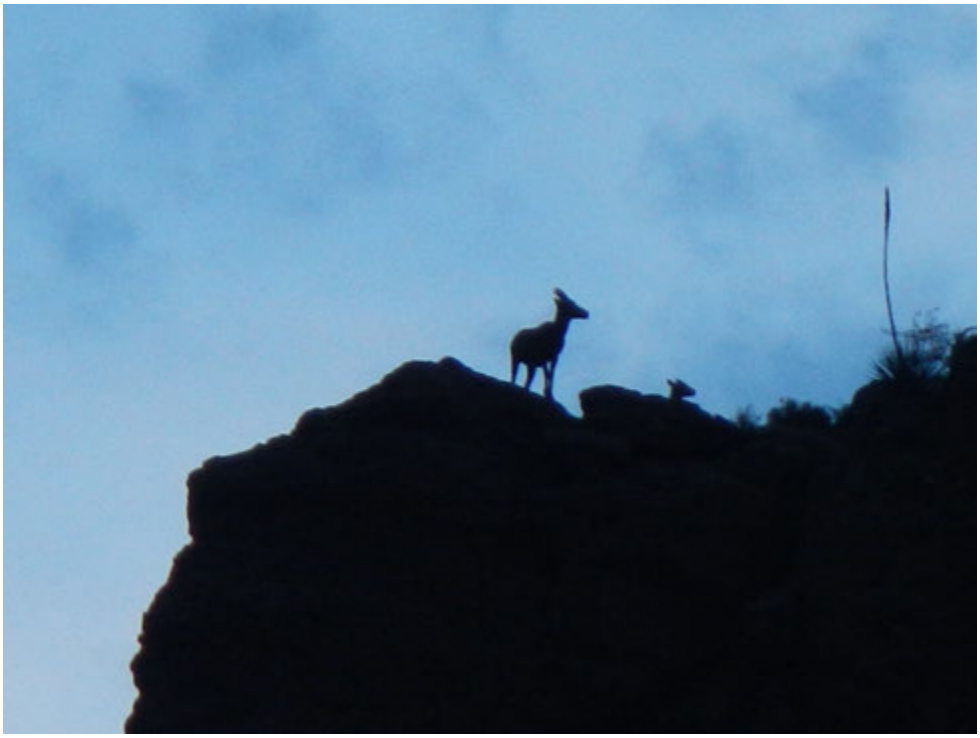
Appendix C: Double E Ranch Rangeland Health Evaluation Report



Rangeland Health Evaluation Report
NMDGF Double E WMA
October, 2015

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Executive Summary

In September of 2015, a contract was signed between the NMDGF (Department) and Resource Management Services, LLC (RMS) to conduct a *Rangeland Health Evaluation* and write a *Grazing Management Plan* for the Double E WMA located in Grant County, New Mexico. The purpose of the study and plan is to partially fulfill the commitments of the Department to the State and Federal Natural Resource Trustees that facilitated purchase of the Double E WMA as outlined in the Conceptual Management Plan (CMP) document of October, 2013.

The evaluation will help determine the current rangeland health status of the resource base and outline potential tools such as livestock grazing, fire, mechanical or other interventions which might improve the current health status. Particular emphasis will be placed on the creation of a flexible outline for a grazing management plan, should the department deem that livestock grazing is feasible. An initial inventory of infrastructure (fences, water, corrals, roads, etc.) was also evaluated in terms of the potential effect on implementing the grazing plan.

The evaluation included the Deeded land (5,828 acres), Bureau of Land Management Stone Canyon Allotment 04528 (3,644 acres) and the State Lands Office Grazing Lease GM-3017 (2,493 acres). The Forest Service Spar Canyon Allotment of 11,033 acres was not included in the evaluation at this time because USFS regulations do not allow a state agency to lease F. S. property.

An initial review of the Ecological Sites Descriptions (ESD's) on the Double E shows only 2 main types of ESD's: Breaks in the North and Hills in the South; with a small area of unrated type near the southern boundary of the property (see map on page 12). No sample site was placed in the unrated site. Five of the seven transects were located on Commission owned property and two were placed on BLM property. Because of the small amount of State Land Office lease, no transects were placed on State Land.

It should be noted that the highly varied topography of the Double E WMA created substantial differences within each of the ESD's considering the general soils, vegetation, and rangeland health attributes encountered during the study. Considerable thought went into placement of the 7 study sites. The percentage of each ESD on the property, accessibility for subsequent readings, and overall vegetative representation being the three main factors influencing the choices.

The transect sites were located within each ESD at low to higher elevations, with as much geographic spread as possible. The selection of each specific site was geared toward being representative of the attributes of a much larger area. Another factor influencing the choice of sites was suitability for grazing. Since much of the WMA is so steep and rocky, with minimal forage resources, these types of sites were not chosen as being representative of the study objectives.

Given this approach, the rangeland health summary appears sufficient to explain the general status of the various types of ESD's located and sampled on the property. However, despite the best effort to place study sites in representative areas, the variation within each site cannot be completely captured by a relatively small sample size of seven locations.

In general, the rangeland health conditions identified in the study varied from healthy to moderately unhealthy depending on the location of each transect on the property. It was noted that the two sites trending toward an unhealthy analysis were within a mile of the riparian zone. The best ratings were found on those sites at the highest elevations and farthest from the riparian area. This is probably

related to past grazing management influences, where continuous yearlong grazing converted herbaceous dominance to invasive shrubs.

None of the transect sites, including BLM or State land, had any prior data associated with it, so all readings were new. Despite this, the general picture that emerged from the rangeland health study is that much of the property is in a relatively healthy state, and appears to be in an upward trend. Most areas appear stable, and others appear to be degraded probably as a result of prior management.

Most likely due to the narrowness of the Bear Creek drainage, it is not classified as a separate ESD, but included within the Breaks designation. The canyon and its connected drainages are subject to periodic catastrophic flood events and evidence of this was abundant. Separate riparian health studies will be performed by the NM Department of Game and Fish (The Department), but in general there was good regeneration among the major tree species such as Arizona sycamore, cottonwood, oaks, and willows. Some specimens of Arizona sycamore in particular are quite spectacular and form a unique and beautiful part of the property.

The complete Ecological Site Descriptions (ESD's) used to compare the study sites at the ranch are included in this report under Appendix A. A map of the ESD's and their relative distribution and acreages across the ranch are found on pages 12-14. Four of the sites were placed in the Hills ESD, and three in the Breaks ESD.

Potential solutions to improve rangeland health on areas of the Double E WMA, that are in suboptimal condition, include mechanical or chemical treatments, planned livestock grazing, and/or continuing the current management strategy of primarily using rest as the main management tool. Because of the lack of vehicle access and the extremely rugged terrain, prescribed fire does not seem to be a viable management option at present.

The main reasons for using any of these management approaches would be to provide periodic disturbance and renewal within stagnant or over mature vegetation types. Reasons might include a high proportion of oxidizing grasses, too high a percentage of standing litter, lack of soil disturbance

and other factors. At some point in the future, it is likely that wildfire will play a big role in disturbance whether it starts on the property or enters from surrounding land. Interestingly, other than apparent lightning strikes on individual trees, no evidence of a large scale fire was seen.

The current state of the property infrastructure including fences, watering points, working facilities, and roads is best described as being in various states of disrepair. The boundary fence in some areas is non-existent or unable to contain livestock. Also most of the entire Bear Creek riparian corridor would have access to livestock at this time due to lack of fences or water gaps that are down. Fencing the entire riparian area would be a difficult and ongoing problem due to the frequent flood events and constant maintenance that will likely be required. Many cliffs that run on either side of the Bear Creek drainage are natural barriers and existing fences have made use of this feature, including the BLM Area of Critical Environmental Concern (ACEC) exclusion zone in Bear Creek.

Given the above considerations, and the very rugged topography of the property, the development of a viable grazing plan involving rotational management is problematic. This probably explains the apparent degradation that was observed closer to the Bear Creek drainage and other sources of more or less permanent water. It is likely that most of the continuous livestock grazing occurred in the vicinity of these areas. The result may be that the observed invasion of woody species, such as catclaw and mesquite, are thickest in these areas. In addition, erosion is most evident here where soils have sufficient depth to provide evidence of soil loss.

The contiguous deeded land portions of the ranch are mostly located north of Bear Creek, with a smaller area located on the south side of the drainage. The majority of these sites are identified as the Breaks ESD. Despite being in the same ESD, the condition of the sites are highly variable depending on slope, aspect, soil depth and substrate type. Similarly, those deeded lands located in the Hills ESD are also quite inconsistent because of similar factors. The relatively small acreage classified as “Not Rated or Not Available” was observed but no transect was placed here. It appears that this area is an unusual granite based outcrop with different vegetation, including Ponderosa pine which is found nowhere else on the property.

The livestock carrying capacity of the BLM and State lands are set at 58 and 50 Animal Units Year Long (AUYL) respectively. This represents an average of 57 acres per animal unit (AU). The study indicated fairly close similarity between the BLM, State and deeded land in terms of vegetative production. If this same carrying capacity is projected to the 5,828 acres of deeded land, the resulting AU capacity would be an additional 102 head. This would bring the total to approximately 210 AU’s. At one time, it was reported that around 200 head of cattle grazed the property, but it is unknown if this included the Spar Canyon Forest Allotment. Forest Service regulations do not allow a state agency to lease the allotment, so this resource would not be available for increased carrying capacity.

Adequate forage production may exist in favorable years to support 210 AU over the entire WMA, but this number does not seem sustainable in average production years. In addition, the distribution of water and access in very steep terrain would likely concentrate most cattle use to ridgetops and canyon bottoms within a mile radius of water sources.

The major criteria used to rate rangeland suitability are vegetative production, distance from water and slope. Areas generally characterized as dominated by slopes over 40 percent, and rock outcrops, are normally excluded as being unavailable for livestock grazing. A study of the topographic map of the Double E WMA shows this to be a significant portion of the land base. A

more reasonable carrying capacity number that takes these factors into account would be closer to 125 Animal Units year-long.
The current road access would dictate that most cattle work takes place on horseback in steep terrain. This includes the substantial amount of fence building and repair constantly needed to maintain any type of grazing management other than continuous grazing. Continuous livestock grazing rarely, if ever, has a positive effect on rangeland health. The only other potentially viable solution is to use herders with more or less a constant presence to keep cattle out of sensitive riparian areas and move them to grazing areas where there is forage, but limited water exists. Although possible, there are few examples where this is financially feasible for potential livestock numbers at the Double E property.

The Double E WMA is a ruggedly beautiful property with a unique combination of biological, geographical and cultural resources. It represents a challenging opportunity to further the goals of the Department in terms of wildlife conservation and in particular Species of Greatest Conservation Need (SGCN). Because of the current state of infrastructure, the management challenges will be in securing the boundaries, improving access, and implementing any grazing plan. The Rangeland Health Study shows that the majority of the ranch is currently in a relatively healthy state. It also points to the fact that with proper management that brings about a continuation of the observed trends, this status can be improved over time.

Large Specimen of Arizona Sycamore near West Entrance to WMA

Introduction

An initial site visit with Department personnel familiar with the areas and field conditions was completed in September of 2015. Rangeland Health Surveys were conducted in September of 2015 on seven selected sites within the deeded and public lands of the Double E WMA. The purpose of these studies was to determine the current health status of the resource base.

If the rangeland health rating was less than desirable for current goals and objectives, the report recommends the potential use of tools such as grazing, fire, mechanical or other interventions that could improve the rating if implemented. In addition to conducting the rangeland health analysis, grazing management planning options were also developed.

Methodology

Prior to the initial site visit, the Conceptual Management Plan, maps, and other information were provided for review by the Department. During the initial meeting at the property, a discussion of current access, map review, neighboring property owners, and a walking tour was conducted to begin the process of identifying the roads, access points, fences, vegetation types, and some of the infrastructure on the deeded land portion of the ranch.

The basic methodology chosen for the rangeland health survey was ***Bullseye! – Targeting Your Rangeland Health Objectives,*** by Kirk Gadzia and Todd Graham, V2. 0 February 2013. http://quiviracoalition. org/images/global/19-Bullseye%25202010%2520Web. pdf
A link for downloading this publication is shown above. The methodology is qualitative in nature, meaning that no data points are measured at the sites. Instead, an overall assessment is made of the site's rangeland health based on 14 specific indicators. This methodology was chosen because of its simplicity, affordability and general applicability to the situation for the properties at present.

Maps showing soil types and Ecological Site Descriptions (ESD's) were generated for all the land ownership areas of the ranch using the NRCS Web Soil Survey. In addition, the detailed ESD's narratives were printed and made available for field work. These ESD's are specific for the general soils, elevations, precipitation zones, vegetation species and other factors that can be expected under various conditions at each site. Some variability in the sites is expected but the evaluation locations were chosen to be generally representative of the ESD as a whole. The two ESD's used in this study are found in Appendix A. It should be noted that a portion of the ranch, consisting of approximately 400 estimated acres of State, BLM and a small amount of deeded land, has no ESD data available. The area is represented as "Not Rated or Unavailable".

No monitoring points were located in the Bear Creek riparian area because they are not broken out in the NRCS mapping units and represent a very small portion of the resource from a rangeland health perspective. This does not diminish their extreme importance to the habitat and other values the Department has for the Double E WMA property. The area should probably not be viewed as a grazing resource in the planning process. In addition, many Leopard Frogs (presumed to be Chiricahua Leopard Frogs) were observed in the riparian zone. The Chiricahua leopard frog was listed as a threatened species in 2002. This Species of Greatest Conservation Need (SGCN) may also have a bearing on grazing, access and other land management activities. A Canyon Tree Frog was also observed in YL Canyon.

For the other sites, the plant community descriptions in the Ecological Site Descriptions (ESD's) were used as part of the benchmark for measuring departure from healthy rangeland conditions. This was done by comparing the current plant community, and other rangeland health parameters, to the potential for the area. Departures from potential are noted in the Rangeland Health Target produced for each evaluation site. In most cases, the ESD identified on the map was a fairly good match to current conditions. Since the ESD's cover a wide range of transition states and variability, there was room for flexibility in the exact interpretation of the various plant communities encountered. Regardless, only two of the seven transects were found to be in a somewhat degraded state.

Both the initial reconnaissance visit and field survey were used to determine the evaluation site chosen for each location as being representative of the ESD in the area. Sites were also chosen based on the percentage of the ESD in the ranch acreage. A UTM coordinate reading was recorded at each evaluation site using a Garmin GPSMAP 62S. One digital overview photo of each site was taken from the GPS marker using a Nikon Coolpix AW100 digital camera. The direction of the photo was variable, but the aim was to include an easily recognizable feature on the skyline (such as a mountain peak) to show the direction of the photo. This should make re-taking subsequent photos from the site easier.

In addition to the overview photo, a digital photo was also taken of a 1M square plot at approximately five paces from the GPS coordinate location. The plot photo was paired with the directional photo and these are shown for each evaluation site location. The plot gives a direct reference to the vegetation cover, soil cover, litter, dung and other attributes measured in the subsequent methodology.

After monitoring and photo points were established, the rangeland health "Bullseye" method was conducted at each site to measure 14 different indicators of rangeland health. A "walkabout" of about an acre was done prior to filling out the scoring form to obtain a general feel for the area, rather than just evaluating the spot adjacent to the GPS coordinate.

A mark was placed on the spoke of each indicator within the Bullseye target. Either the **Gold** – *Achieving Goal*, **Silver** – *Moving Toward or Away From Goal*, or **Bronze** – *Not Achieving Goal*, category was marked to indicate the score for that attribute. The Score Guide on pages 26-27 of the *Bullseye* manual were used to aid in determining the location of each mark. Additionally, the ESD's were used to provide benchmarks for comparison where applicable. Upon completion of the 14 indicator score, the overall picture of the individual target placement marks created a visual record of Rangeland Health for each site.

A detailed survey of plant species was not conducted at each evaluation site, but the twelve most abundant plant species at each location were listed in order of relative abundance. The most common herbaceous and woody species were listed because of the importance of both types to the area. Emphasis was given to perennial plant species rather than annuals. A complete list of the plants encountered during the survey is found in Appendix D.

Noxious or invasive weed species were also investigated during the evaluation effort. Fortunately, no large infestations were noted. Tree of Heaven (*Ailanthus latissimus*) was noted in some areas along the river, but nowhere in a dense stand. Mesquite and Catclaw are probably the most prevalent invasive species, although they are native to the area. These species were seen as a component of nearly all sites visited, but varied in abundance from one or two individuals to dominance of the site. Fortunately, only a few areas were severely infested. Other weedy species such as cocklebur, moth

mullein and silver leaf nightshade were observed in some areas, but this may be due to good moisture conditions earlier in the year. These species are not considered noxious.

The combination of photo points, dominant vegetation and rangeland health measurements gives a fairly comprehensive view of the current rangeland health situation on the Double E WMA. Although technically a prior reading is needed to access the trend of the rangeland health, a judgment of apparent trend at each site is indicated in this report. The apparent rangeland trend is the author's opinion from the assessment about the direction or stability of the conditions at each site. Because this initial snapshot of conditions in 2015 will be available to measure against, subsequent evaluation efforts will give a much better indication of this trend.

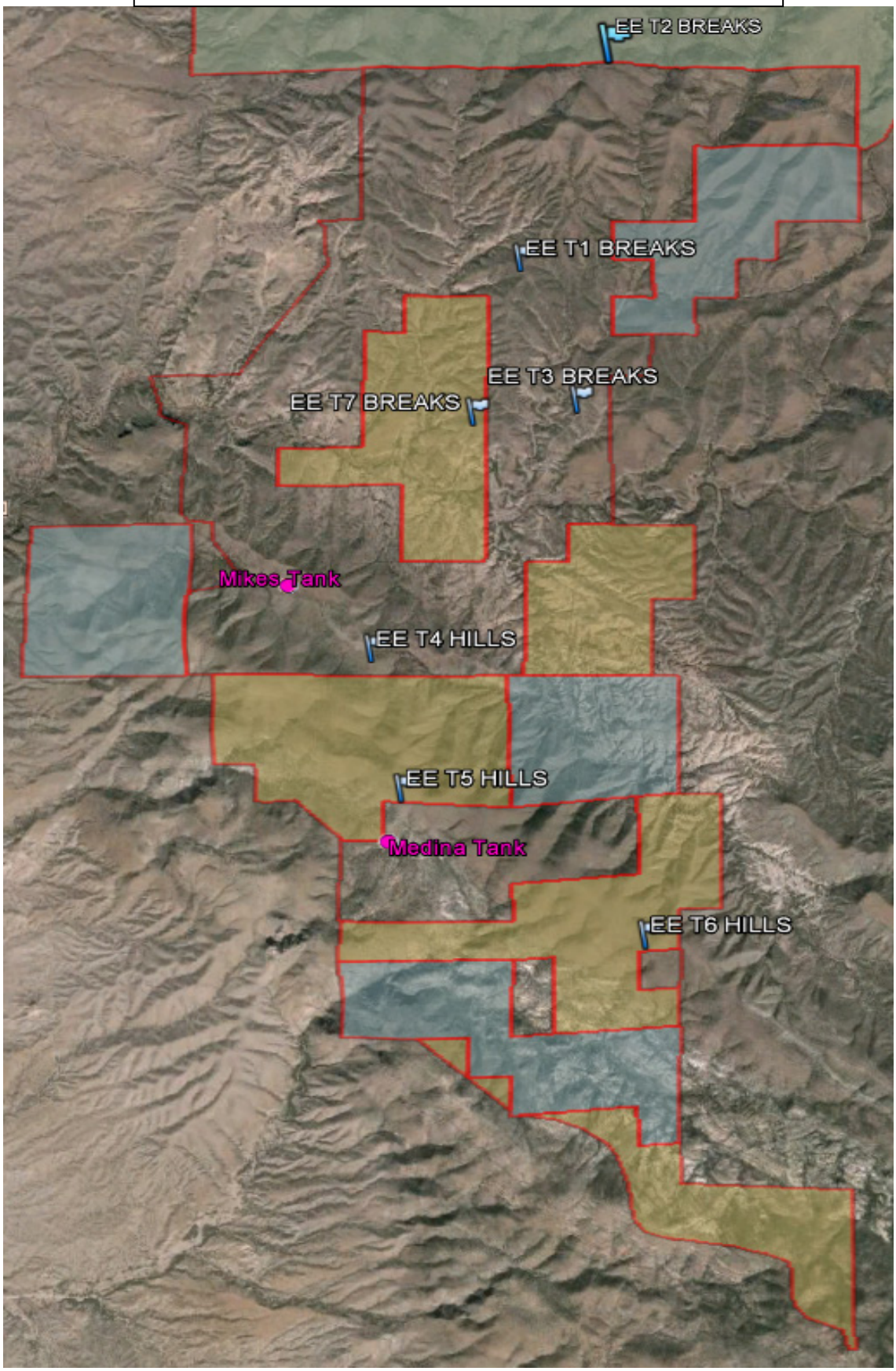
Evaluations were conducted in September. Although a rainfall total was unavailable, indications were that there had been good moisture this year in most areas and substantial growth was observed on most forage species.

The grazing management plan was developed after taking into account the conditions observed during the rangeland health survey. The plan is an outline of considerations and suggested management options rather than a strict calendar of grazing dates for different areas. The plans considered are relatively uncomplicated and do not require much new infrastructure. However, to be effective, they would require an exclusion of the riparian area and the renovation of many water sources and boundary fence.

NMDGF Double E WMA

Maps, Transect Locations, Rangeland Health Documentation, and Photo Points

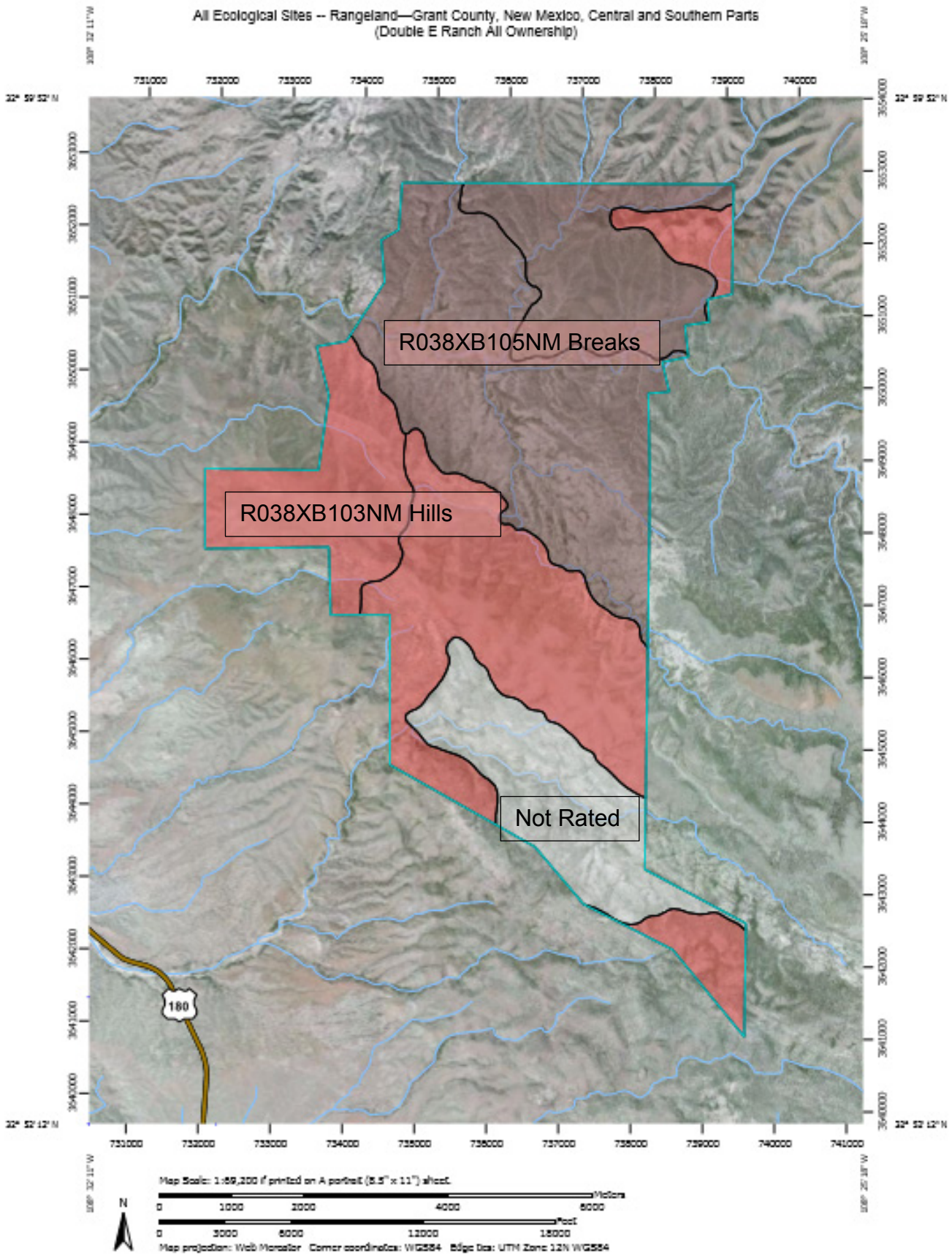
NMDGF Double E WMA
Rangeland Health Transect Locations



NMDGF Double E WMA - Rangeland Health Monitoring Points Data Collected September, 2015

UTM Format NAD 83 12 South

Point #	Northing	Easting	Elev. Ft.	Ecological Site Description - Photo Direction
EE T-1	0735993	3652627	5,203	MRLA 36, WP-3 Breaks R038XB105NM Photo 225 degrees SW to Hilltop
EE T-2	0736819	3654830	5,697	MRLA 36, WP-3 Breaks R038XB105NM Photo 360 degrees N to Canyon Peak on FS Allotment
EE T-3	0736562	3651125	5,132	MRLA 36, WP-3 Breaks R038XB105NM Photo 360 degrees N to Canyon Peak on FS Allotment
EE T-4	0734663	3648421	5,470	MRLA 36, WP-3 Hills R038XB103NM - Photo 360 degrees N to Canyon Peak on FS Allotment
EE T-5	0734992	3646952	5,901	MRLA 36, WP-3 Hills R038XB103NM - Photo 360 degrees N to Canyon Peak on FS Allotment
EE T-6	0737399	3645464	6,009	MRLA 36, WP-3 Hills R038XB103NM - Photo 360 degrees N to Canyon Peak on FS Allotment
EE T-7	0735568	3650973	5,058	MRLA 36, WP-3 Breaks R038XB105NM Photo 360 degrees N to Canyon Peak on FS Allotment


All Ecological Sites -- Rangeland—Grant County, New Mexico, Central and Southern Parts
(Double E Ranch All Ownership)
R038XB105NM Breaks
R038XB103NM Hills
Not Rated
180
N
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
9/16/2015
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- R038XB103NM
- R038XB105NM
- Not rated or not available

Soil Rating Lines
- R038XB103NM
- R038XB105NM
- Not rated or not available

Soil Rating Points
- R038XB103NM
- R038XB105NM
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:48,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Grant County, New Mexico, Central and Southern Parts
Survey Area Data: Version 11, Sep 26, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 19, 2010—Feb 23, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

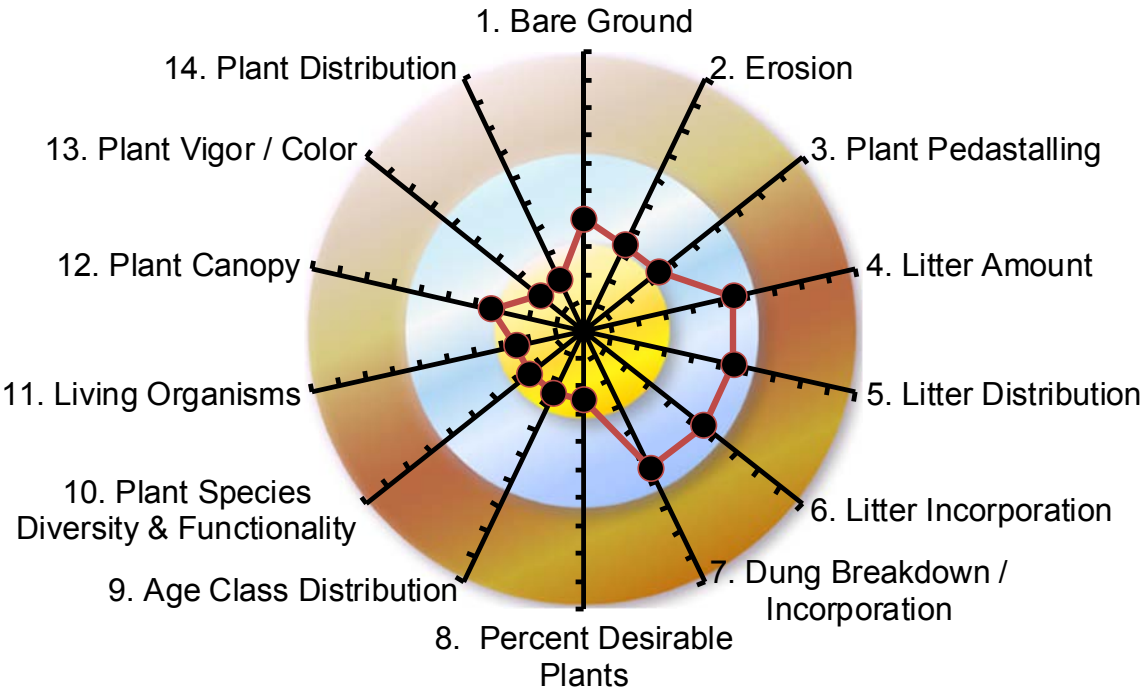
All Ecological Sites — Rangeland

Grant County, New Mexico, Central and Southern Parts					
Map unit symbol	Map unit name	Component name (percent)	Ecological site	Acres in AOI	Percent of AOI
29	Lonti-Ustorthents association, 5 to 60 percent slopes	Lonti (70%)	R038XB105NM — Breaks	1,435.9	13.7%
		Ustorthents (20%)	R038XB105NM — Breaks		
31	Luzena-Rock outcrop association, 10 to 35 percent slopes	Luzena (65%)	R038XB103NM — Hills	3,066.8	29.3%
		Rock outcrop (20%)			
37	Muzzler-Rock outcrop association, 25 to 45 percent slopes	Muzzler (60%)	R038XB103NM — Hills	1,304.8	12.4%
		Rock outcrop (25%)			
41	Orthents, 25 to 60 percent slopes	Orthents (100%)	R038XB105NM — Breaks	3,235.1	30.9%
53	Rock outcrop-Luzena association, 25 to 60 percent slopes	Rock outcrop (50%)		1,440.4	13.7%
		Luzena (30%)	R038XB103NM — Hills		
Totals for Area of Interest				10,483.0	100.0%

Double E WMA Rangeland Health Study

ESD: Breaks RO38XB105NM Transect EE T-1 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. **Silver**: Moving toward/away from goal. **Bronze**: Not achieving goal.



Transect Location GPS Coordintates
12S 0735993
3652627
Elevation 5,203 ft.
Photo direction SW to Hill on S side Bear Creek entrance to ranch.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Breaks site was chosen as being representative of most of the mid-elevation ridges greater than 1 mile north from Bear Creek drainage. Overall, the appearance of this site is an open woodland / savannah of scrub oak, pinon and juniper trees and a healthy grassland community unerstory. The site has a good diversity of grasses, forbs and excellent growth this season. Additionally, many new seedlings of desired species were seen in the transect area. Perhaps the only negative aspect was the relative lack of litter between many of the grass plants. However, these areas were not large and no erosion was noted on the site. Javelina and deer sign were noted at the site as well as several bird species.

Photo Points

EE T-1 Overview 9-2015

EE T-1 Plot 9-2015

An unusually friendly visitor to the transect site.

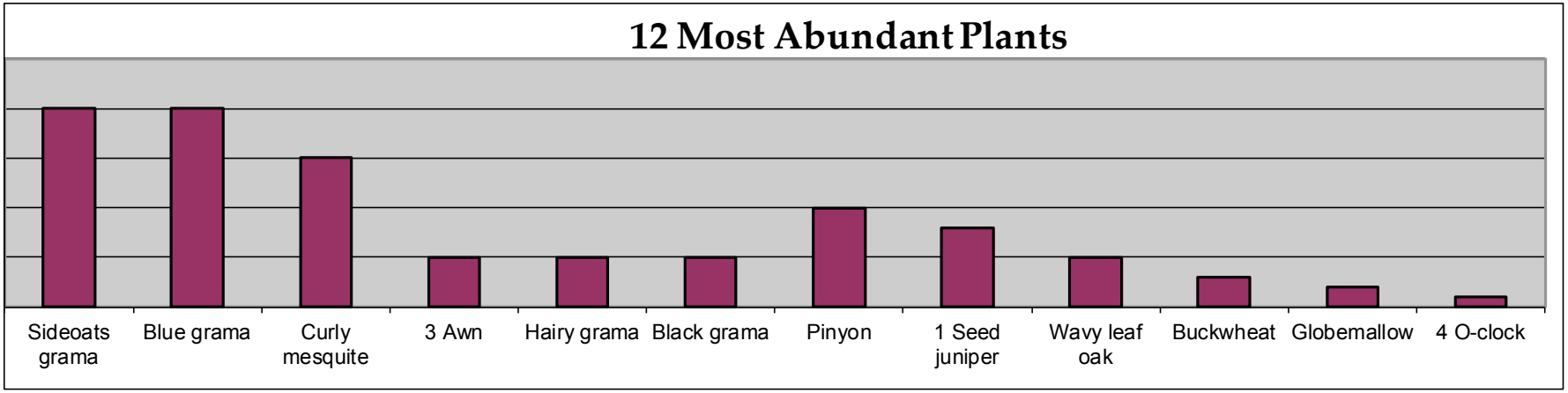
Healthy grass growth growing over prickly pear cactus.

Black grama and Sideoats grama coverage at site.

Javelina activity in vicinty of T-1.

Apparent range trend: Stable to upward trend because of healthy grass dominance and minimal bare

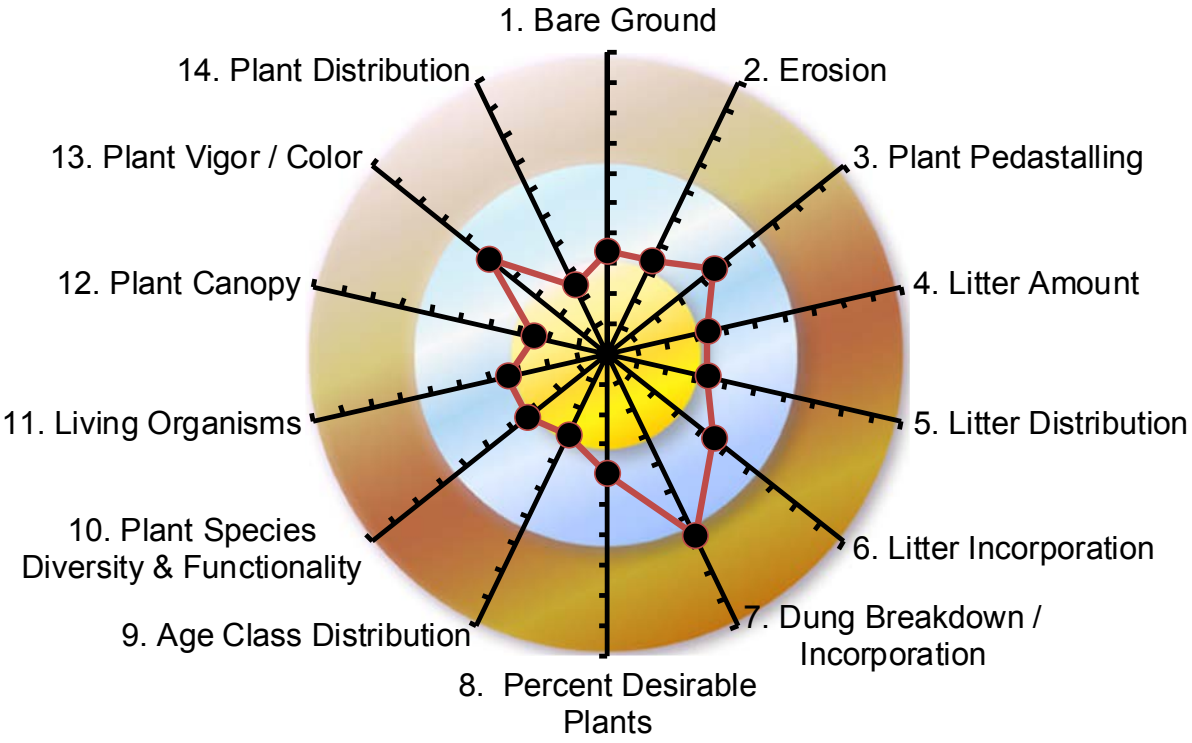
Notes: This site appears to be improving in health because bare ground percentage is low, climax grass species coverage is high, and few invasive shrubs occupy the site at present. There is a close correlation between the plant species mix noted in the Ecological Site Description and this survey documentation. Many birds, insects, and mammal signs were noted near the site. As noted in the photo above, a curious roadrunner came and perched within the site while the transect was being evaluated.



Double E WMA Rangeland Health Study

ESD: Breaks RO38XB105NM Transect EE T-2 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. **Silver**: Moving toward/away from goal. **Bronze**: Not achieving goal.



Transect Location GPS Coordintates
12S 0736819
3654830
Elevation 5,697 ft.

Photo N to Canyon Peak. Transect located 100 Yds South of FS Boundary Fence.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Breaks site was chosen as being representative of most of the upper-elevation ridges greater than 2 miles north from Bear Creek drainage. Overall, the appearance of this site is an open, healthy grassland community with scattered woodland and some mesquite shrub invasion. The site has an excellent diversity and cover of grasses, and forbs with a rocky mulch of varying size covering most of the ground. Litter amounts were good but there was little incorporation of the litter to the soil surface. No erosion was noted on the site.

Photo Points

EE T-2 Overview 9-2015

EE T-2 Plot 9-2015

FS Alottment Boundary Fence just north of transect 2 location.

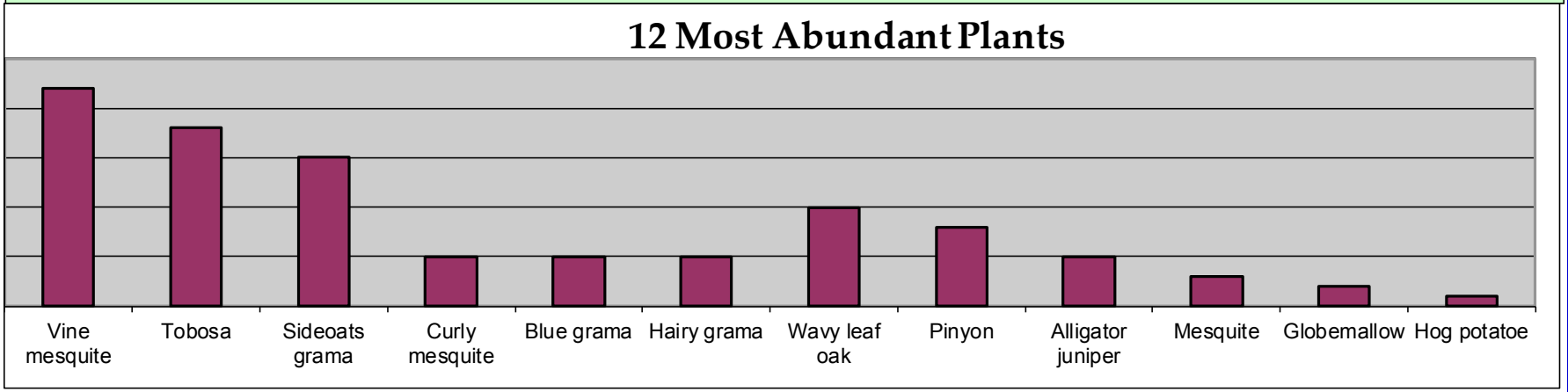
Fresh Black bear scat - Prickly pear cactus fruits were ripe.

Overview showing almost no bare ground and shrub/tree cover.

Very old cow manure with limited decomposition.

Apparent range trend: Stable to upward trend because of full ground cover and high species diversity.

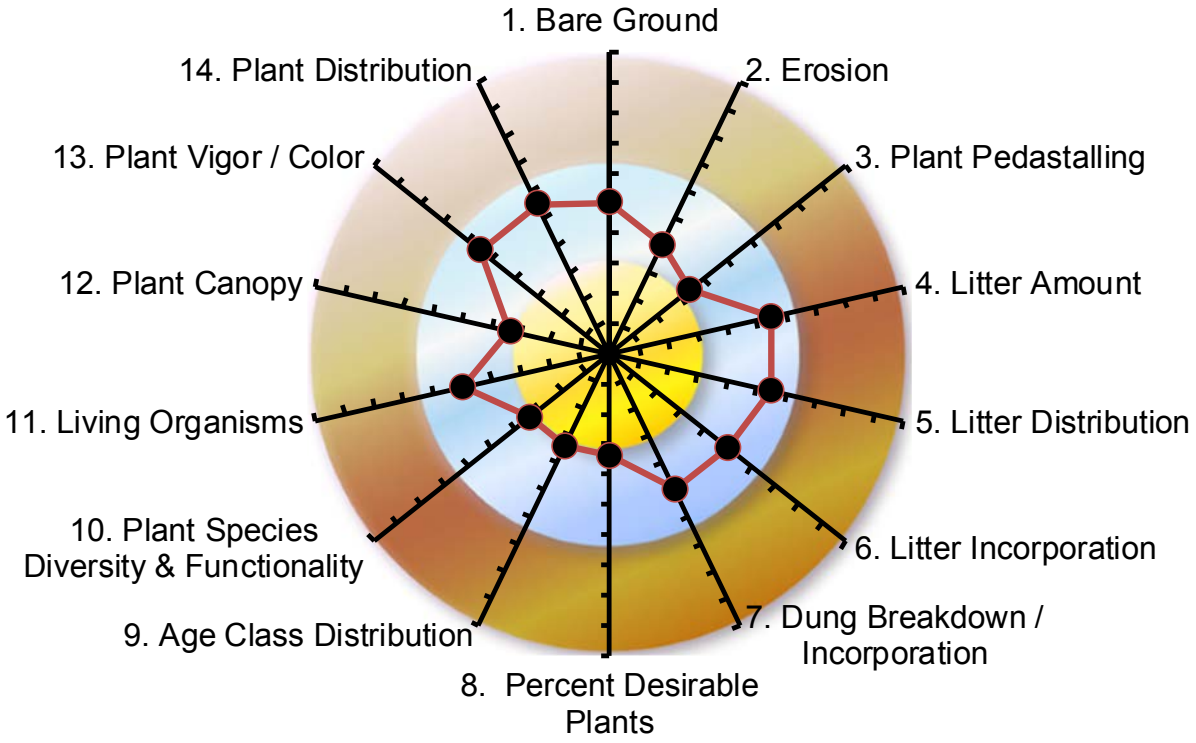
Notes: This site appears to be improving in health because bare ground percentage is almost nill, climax grass species coverage is very high, and the site appears quite stable. There is a close correlation between the plant species mix noted in the Ecological Site Description and this survey documentation. As noted above, the breadown of old cow manure was very slow and no recent sign of grazing was seen. Cycling of old plant material was slow due to lack of impact, but litter cover was good.



Double E WMA Rangeland Health Study

ESD: Breaks RO38XB105NM Transect EE T-3 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. **Silver**: Moving toward/away from goal. **Bronze**: Not achieving goal.



Transect Location GPS Coordintates
12S 0736562
3651125
Elevation 5,132 ft.

Photo N to Canyon Peak. Transect 20 Yds W of old road .

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Breaks site was chosen as being representative of some areas in the mid-elevation ridges about 1 miles north from the Bear Creek drainage. Like T-7, there is evidence of past grazing practices that may have led to the invasion of catclaw and mesquite with more bare ground than expected for the site. Fresh cattle manure and tracks were observed in the area of this transect. It is estimated that only 3-4 head were present. Some erosion was noted on the site. The site is quite variable with some areas of better cover interspersed in areas of low cover. Various degrees of rocky mulch also are apparent here.

Photo Points

EE T-3 Overview 9-2015

EE T-3 Plot 9-2015

Some discontinuous erosion was seen near this site.

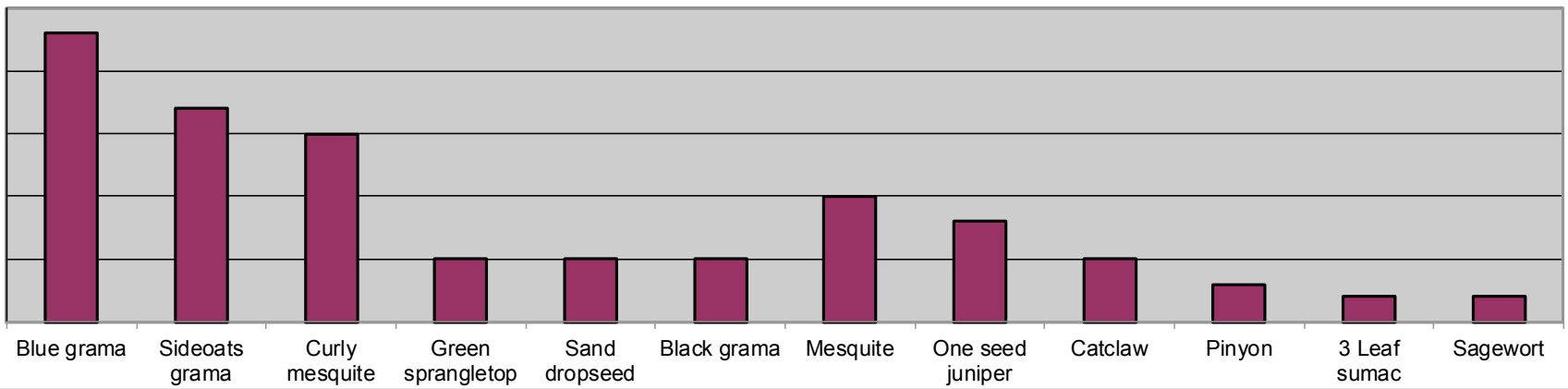
A boundary fence corner is located near this site.

Fresh cow manure noted near this site along the old road.

Nice stand of Porter's Muhly grass found near site.

Apparent range trend: Stable to downward trend because of the abundance of invasive shrubs and lack of cover in some areas.

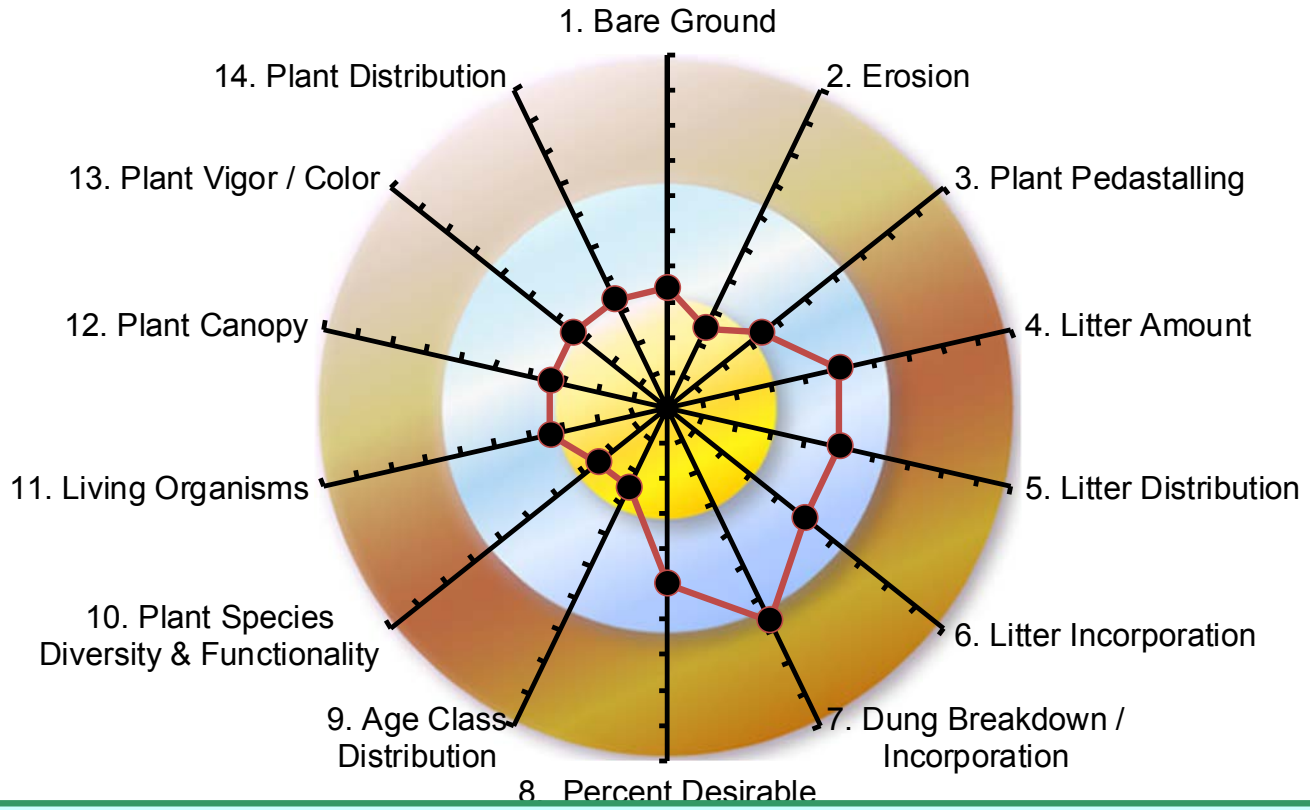
Notes: Grass species correlation between the plants noted in the Ecological Site Description and this survey documentation was fairly high. However, plant density was lower than expected. This was the only transect where recent grazing by a few head of cattle was noted. Few of the plants on the transect had been utilized. A rocky mulch helps protect the soil from erosion, but some was seen near the old road bed. The sight is marked by a rock cairn on the west side of the road.



Double E WMA Rangeland Health Study

ESD: Hills RO38XB103NM Transect EE T-4 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. Silver: Moving toward/away from goal. Bronze: Not achieving goal.



Transect Location GPS Coordintates
12S 0734663
3648421
Elevation 5,470 ft.
Private Land.

Photo N to Canyon Peak. Transect towards top of 1st Valley below road.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Hills site was chosen as being representative of Hills sites in the mid-elevation ridges about 1.5 miles south from the Bear Creek drainage. The site is about 1/2 mile away from Mike's tank which appears to be a good water source and at that time was completely full. Areas of this same valley (known as 1st Valley) which are closer to this water source show many more signs of erosion and the invasion of catclaw and mesquite. This same pattern was seen on the North side of Bear Creek drainage with close proximity to relatively permanant water. Overall this site had good grass cover, but with limited grass species diversity. A consistent rock mulch covered most areas between the plants.

Photo Points

EE T-4 Overview 9-2015

EE T-4 Plot 9-2015

T-4 located about 1/2 mile South East of Mike's tank.

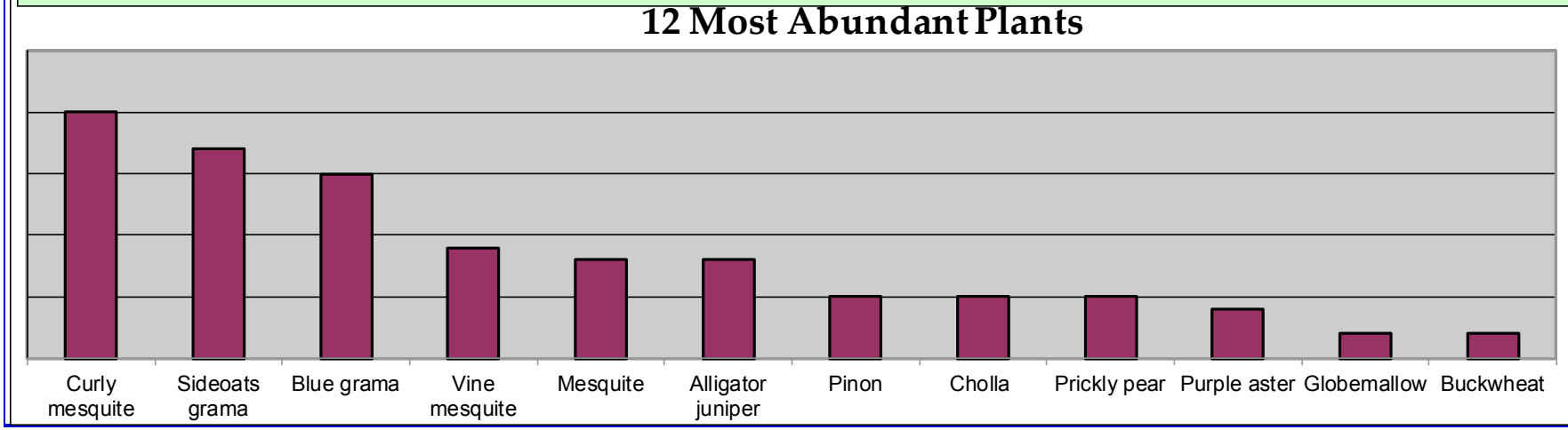
A large and well camoflauged horned toad lizard near the site.

View East from 1st Valley. T-4 located near top of this valley.

Pinon nuts ripening on some of the trees in this vicinity.

Apparent range trend: Stable to upward trend because of good plant cover and lack of erosion.

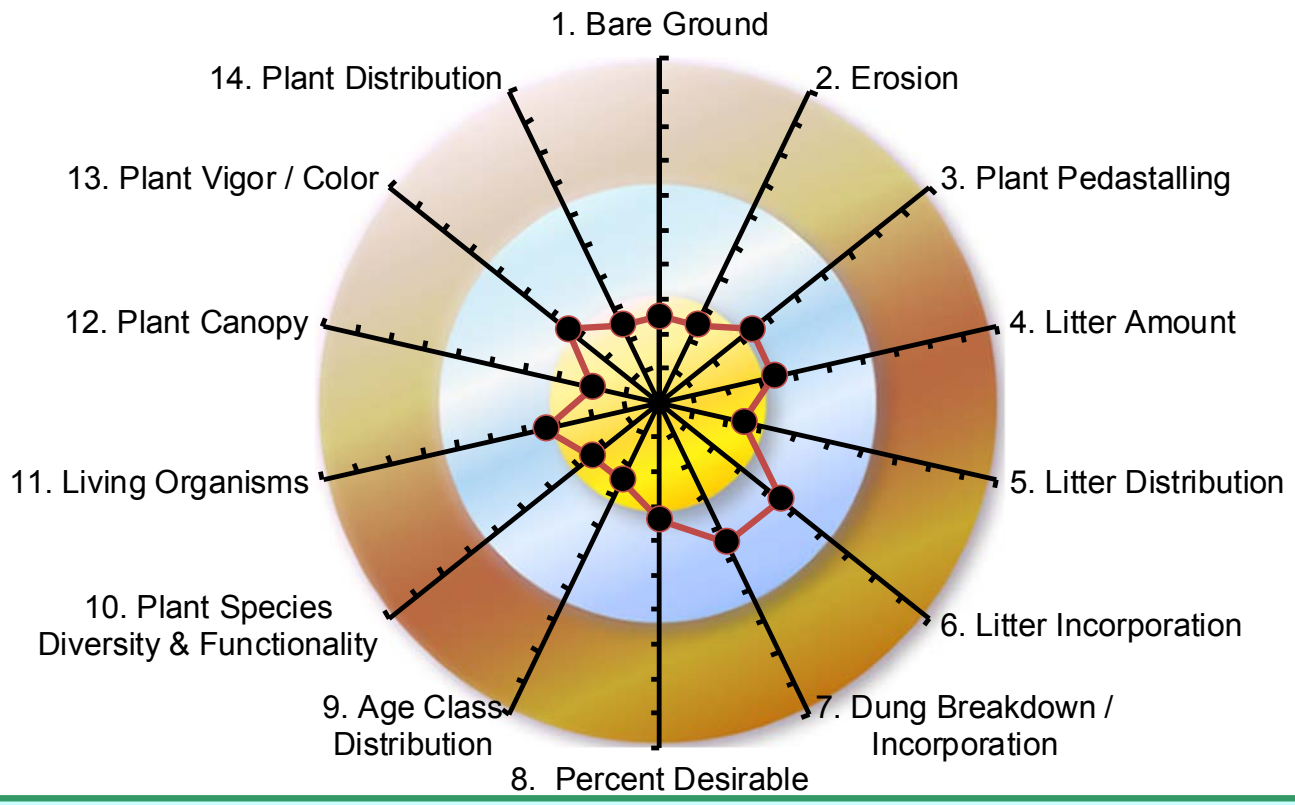
Notes: This was the first transect location in the Hills ESD. It should be noted that the HIils ESD 's are highly variable depending upon aspect, slope and soil dept. An effort was made to select sites that appeared representative of most of the elevation ranges. This site was charachteristic of mid- to lower elevation ridges and slopes in the Hills ESD. There was good correlation of the expected species and what was actually observed on the site.



Double E WMA Rangeland Health Study

ESD: Hills RO38XB103NM Transect EE T-5 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. **Silver**: Moving toward/away from goal. **Bronze**: Not achieving goal.



Transect Location GPS Coordintates
12S 0734992
3646952
Elevation 5,900 ft.
Private Land.

Photo SW to Peak. Transect located near road junction to Medina tank.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Hills site was chosen as being representative of Hills areas in the mid to higer-elevation ridges over 2 miles south from the Bear Creek drainage. The site is about 1/2 mile north from Medina tank which appears to be a spring fed permanent source of water. This site is in very good condition with only a few of the indicators not solidly located in the gold portion of the target. The site is located near the junction of the main road t o the east boundary and the spur road south to Medina tank. This is a beautiful grassland savannah charachterized by good cover and scattered mature Alligator juniper trees.

Photo Points

EE T-5 Overview 9-2015 (South to hill top)

EE T-5 Plot 9-2015

T-4 located about 1/2 mile North East of Medina tank.

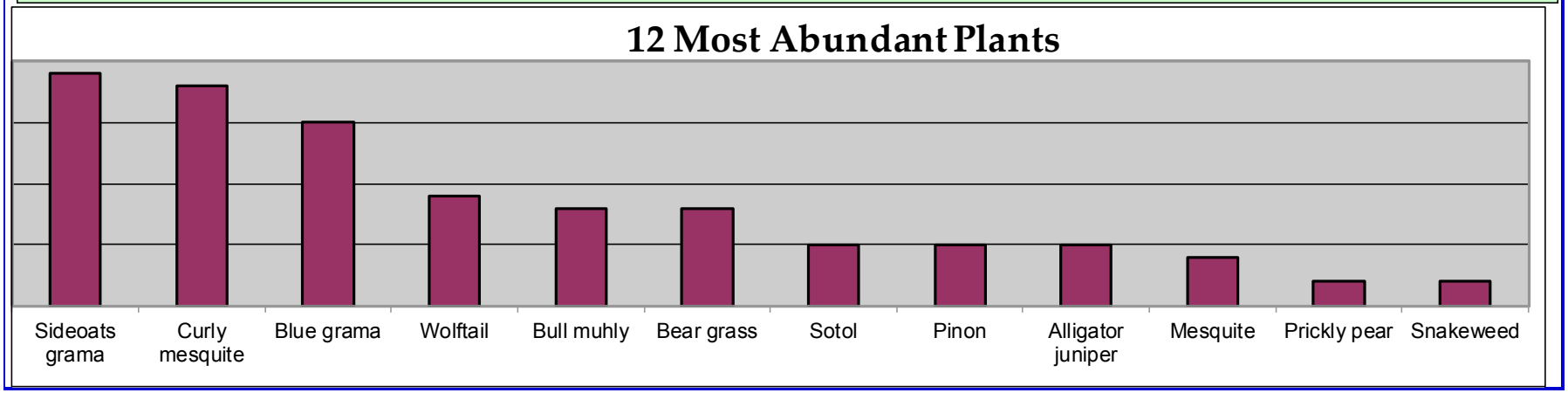
Golden grass is cool season Squirreltail - usually not in open.

View North down canyon to area known as Hells Half Acre

Young Alligator junipers invading in some areas.

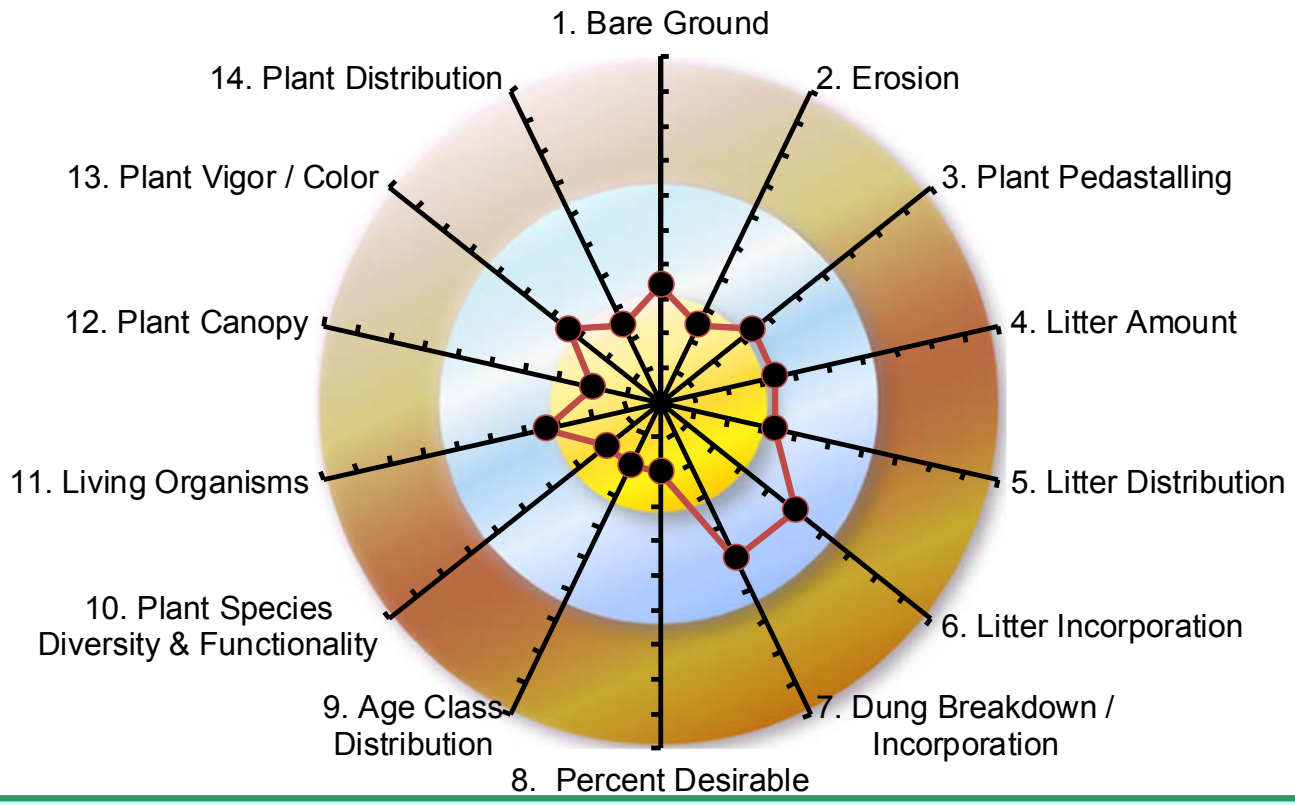
Apparent range trend: → Stable to upward trend because of good plant cover and lack of erosion.

Notes: This site was charachteristic of mid- to higher elevation ridges and slopes in the Hills ESD. There was an excellent correlation of the expected species and what was actually observed on the site. This area is in very good condition and almost no bare ground exists. Both cool and warm season grasses were found on the site and a species know as Bull muhly was also identified. This species looks like pampus grass and is sold as an ornamental in some areas. Bear grass and sotol are also found



ESD: Hills RO38XB103NM Transect EE T-6 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. Silver: Moving toward/away from goal. Bronze: Not achieving goal.



Transect Location GPS Coordintates
12S 0731379
3645464
Elevation 6,010 ft.
BLM Allotment

Photo to Canyon Peak. Transect located 1/4 mile W of gate on East side.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. This Hills site was chosen as being representative of Hills areas in the highest elevation ridges over 3 miles south from the Bear Creek drainage. The site is about 1/4 mile West from the East gate into the ranch on BLM property. This site is in excellent condition with only two of the indicators not solidly located in the gold portion of the target. The site is similar to T-5 but contains a different mix of species including Sprucetop grama.This grass is not found in most of New Mexico and is not listed in the "Grasses of New Mexico by Kelly Alllred. The cover from perrenial grass is complete except for litter and rock mulch.

Photo Points

EE T-6 Overview 9-2015 (N to Canyon hill)

EE T-6 Plot 9-2015

T-6 located about 1/4 mile West of East gate into property.

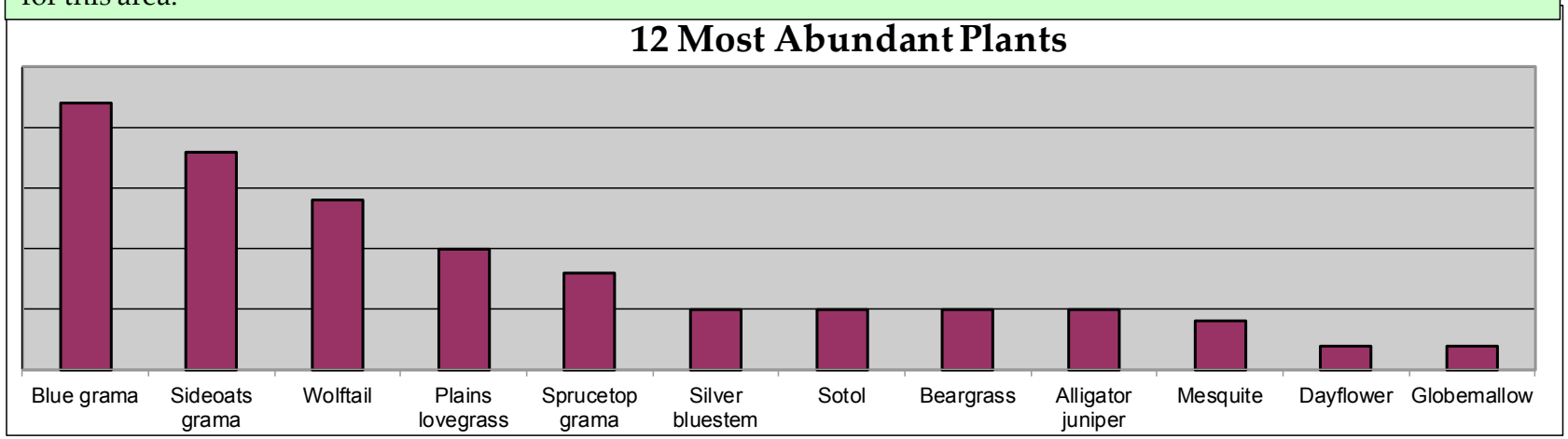
Very old Alligator juniper near T-6 location.

View South into what appears to be granite outcrops. The ESD for this area is classified as "Unknown".

Sprucetop grama (Bouteloua chondrosoides) located at T-6.

Apparent range trend: → Stable to upward trend because of good plant cover and lack of erosion.

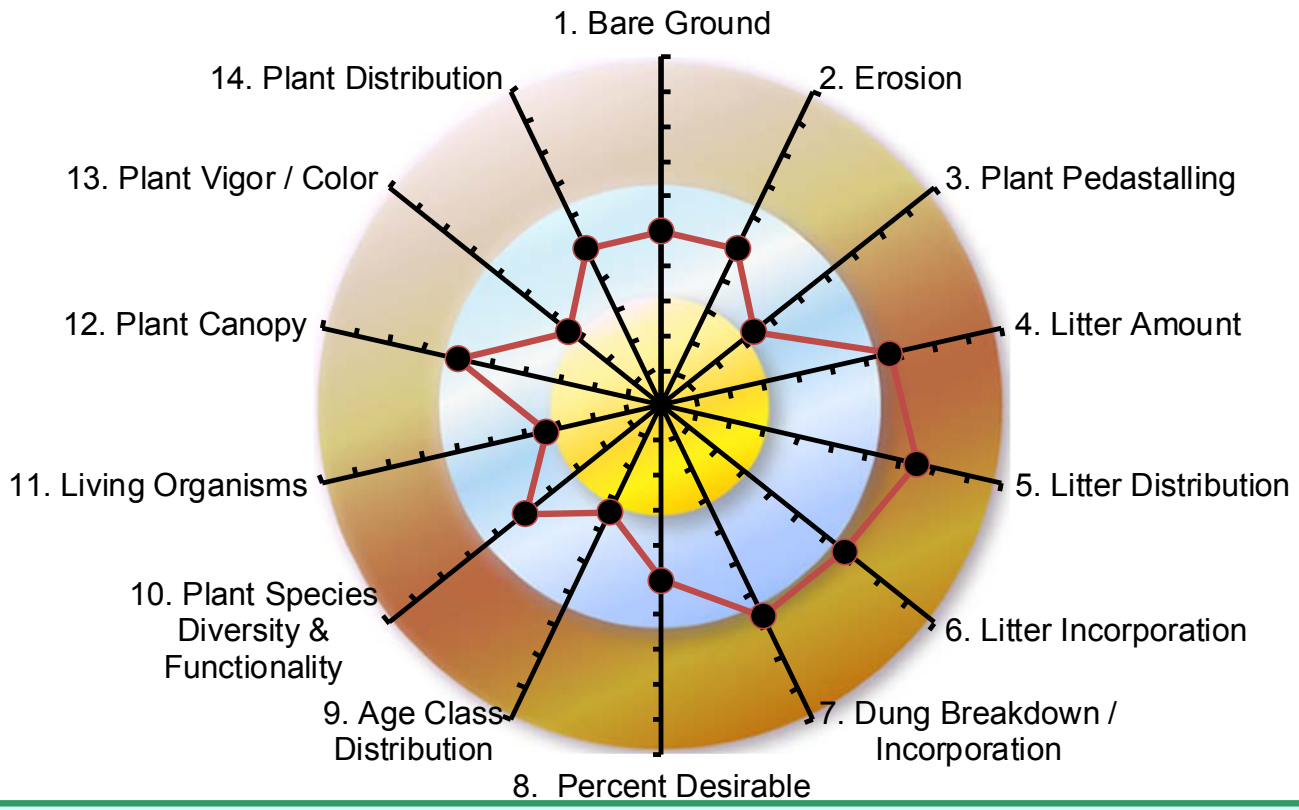
Notes: This site was charachteristic of the higher elevation ridges and slopes in the Hills ESD. There were many species of grass and forbs present on this site, many of which are not even listed in the Ecological Site Description. As noted above, Sprucetop grama was found in abundance on this site. It is not known from most areas of the state. Also, the ESD listed as "Unknown" was believed to be what looked like granite outcrops South of the transect. This is an unusual geological type for this area.



Double E WMA Rangeland Health Study

ESD: Breaks RO38XB105NM Transect EE T-7 Date: Sept. - 2015 Examiner: K. Gadzia

Gold: Achieving goal. **Silver**: Moving toward/away from goal. **Bronze**: Not achieving



Transect Location
GPS Coordintates
12S 0735568
3650973
Elevation 5,068 ft.
BLM Allotment

Photo North to Canyon Peak on FS allotment.

Goals include: wildlife habitat, Species of Greatest Conservation Need (SGCN), watershed, grazing management, and demonstration area.

This is the first rangeland health evaluation for this site. Judging by the 14 rangeland health indicators monitored, in 2015 this site is in a relatively healthy state. The site has large areas of bare ground. Catclaw and mesquite are invading the site. On the positive side, there are components of desirable plants such as Sideoats grama, Green sprangletop, and Black grama that appear to be increasing and may continue to do is representative of most of the lower ridges within 1 mile of the Bear Creek drainage. The dominance of catclaw and mesquite shrub cover may be a legacy of overgrazing withits close proximity to water. These areas are difficult to traverse on foot because of the high degree of thorny vegetation. Some control of these species may be warranted in the future. Location is on BLM lease land.

Photo Points

EE T-7 Overview 9-2015

EE T-7 Plot 9-2015

Catclaw density abnormally high and hinders travel with thorns.

Healthy grass growth on site, dominated by Sideoats grama.

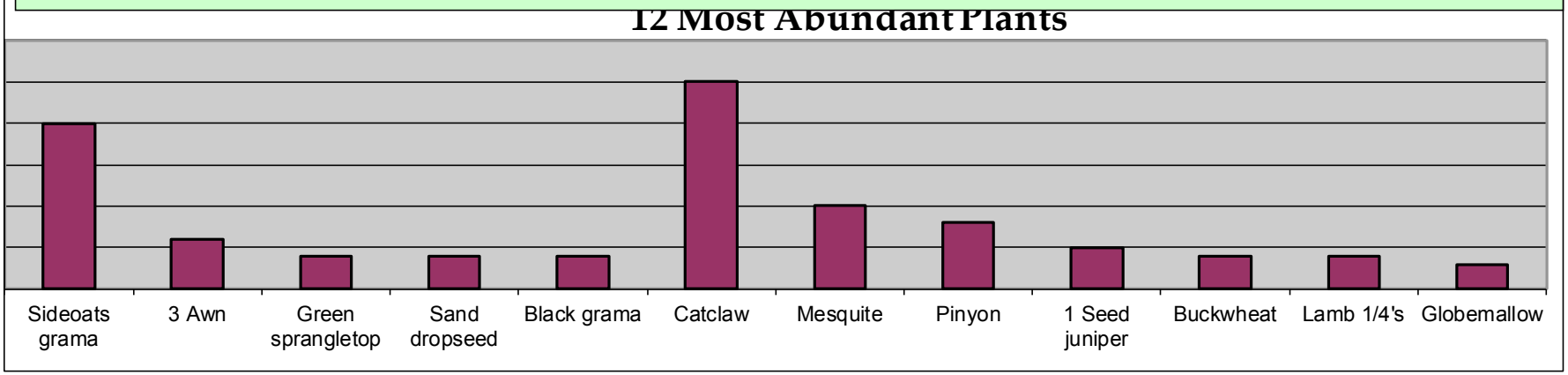
Mesquite beans ripening on T-7 area.

BLM Fenceline located in similar type to EE T-7

Apparent range trend: 

Stable to dowward trend because of shrub invasion & areas of bare ground.

Notes: This site appears to be declining in health. Bare ground percentage is high and catclaw and mesquite have invaded the area. It might be possible to improve this site with mechanical or chemical clearing of shrubs, but other areas may have a higher priority for treatment options. Despite past uses that probably degraded this site, it appears to be slowly healing in some ways, such as reduced erosion and establishment of desirable plants. Few signs of wildlife were seen on the site.



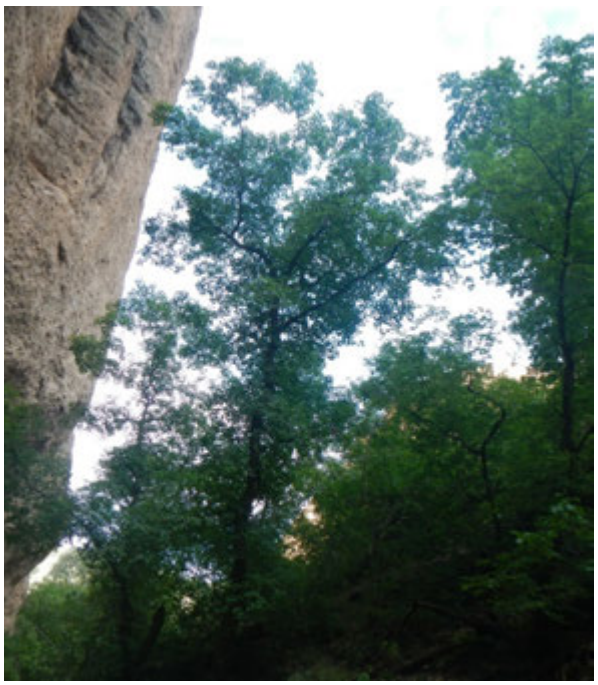
Rangeland Health Summary

Analysis of data from the seven evaluation sites, as well as walking surveys of the property indicate that the Double E WMA is in a stable to improving condition in most areas. There are some indications that areas of the land were once in poorer condition, as evidenced by the stabilizing gully erosion above Mike's tank in First Valley. Also, the relative abundance of invasive woody species such as catclaw and mesquite in areas close to water are also indicators that prior grazing management may have had negative impacts. The Bullseye targets indicate that most sites show room for improvement in land health, but the apparent range trend appears to be upward in the majority of cases.

As noted in the introduction, the Double E WMA has only two main ESD's; R038XB103NM Hills, and R038XB105 Breaks. There are approximately equal acreages of each type on the property. However, the majority of the deeded land is in the Breaks designation. Four of the seven transects were located in the Breaks type because it represents most of the deeded land ownership. Three of the transects were placed in the Hills ESD which is predominantly located in the south half of the property. A small area in the south of the property, located mostly on BLM and State Lease lands, is classified as "Not Rated or Not Available". This area was observed but no transect was placed there. It appears that this area is an unusual granite based outcrop with different vegetation including Ponderosa pine that is found nowhere else on the property.

Despite being in the same ESD, the condition of the sites in both the Breaks and Hills ESDs are highly variable depending on slope, aspect, soil depth and substrate type. Likewise, these conditions vary wildly within a small geographic area. In studying the documentation for each ESD, this variability is noted and also attributed to the various possible transition states which are influenced by management. For example, the shift to brush species such as catclaw and mesquite, shown on one transect, is a possible transition state due to prolonged periods of overgrazing. This trend is not easily reversible without brush control intervention.

Example of a Large Arizona Sycamore tree.



Rocky Mtn. Maples in Hells Half Acre.

Overall, the majority of the land in both ESD classifications appears to be in a moderately healthy condition at present. In general, the higher elevation areas and those furthest from the relatively permanent water in Bear Creek Canyon exhibited the higher scores. Cattle tend to graze closest to water and gentler slopes where possible. Often they do not travel to more inaccessible areas or away from water until all forage is depleted. If this pattern of relatively uncontrolled access is repeated for many years (continuous grazing), the result is often invasion of shrubby and less desirable vegetation. This study indicates that a zone about one mile wide above the Bear Creek drainage, exhibits this somewhat degraded condition. Other sites, such as portions of the area known as First Valley also show this tendency.

With the exception of one site, none of these areas show any sign of recent livestock grazing or fire. Wildlife sign was noted in most areas, but nowhere was abundant. A rather large group of 16 (mixed age) Bighorn sheep was observed near the west boundary of the property on the cliffs above Bear Creek. One of the females was collared. Only one group of elk pellets was observed in Stone Canyon. 8 mule deer were recorded at various locations around the property. No whitetail deer were sighted, but a shed was found (see photo below).

Bear sign was more abundant than expected for this lowland site. Perhaps this is because of the locally plentiful supply of Prickly pear fruits, pinon nuts, acorns and mesquite beans that were observed. Black Hawks were observed in the canyon on most days, but the wide variety of migratory species that must certainly utilize this habitat may have already left the area. A complete list of all observed species of fauna and flora is included in Appendix C.

Black Bear Tracks in Hell's Half Acre Drainage

Elk Pellets in Stone Canyon

The lack of disturbance from grazing and fire has produced an oxidized condition (dark gray coloration) of some of the grass plants in these sites. While this can be viewed negatively because of its impacts on mineral cycling and plant vigor, the fact that this does not appear to be negatively affecting soil health is an observation that must be considered in any grazing plan. Additionally, Black grama and Tobosa grass which are prevalent on these sites, have the ability to grow over their own old stems and increase cover over time without being choked out, as some bunch grasses are.

Healthy Tobosa Grass Stand at near 6,000 ft. elevation – note lack of bare ground.

Because of the steep topography, highly dissected terrain, remoteness and lack of vehicle access it would take many months of walking and/or horseback riding to become familiar with the entire property. Nevertheless, this study was able to place transects over a broad geographic area of the ranch and create what is believed to be a representative sample of the more typical and productive sites.

Some of the rugged cliffs found in the area known as Hells Half Acre

Other Notes and Observations

The overuse or improper use of any land management tool including livestock grazing, fire, mechanical or prolonged rest can have a negative effect on land health. The Double E WMA shows evidence of past overgrazing in limited areas, but damage is not extensive. The Grazing Management Plan which follows, discusses some of the management options in detail and is a starting point to develop the correct balance of management tools to produce the goals of the Department for the Double E WMA.

Grazing Management Plan Options

If grazing is determined feasible by the Department, it must be implemented through a sound grazing management plan. Essential elements of the grazing plan include the following:

Grazing Management Plan Goals:

1. To recover and restore the grazing infrastructure of water points, fences, corals, roads, and other improvements to ensure rest and recovery for any grazing areas
2. To insure that all improvements, but especially water, fences, and access roads are wildlife friendly and improve habitat values
3. To use grazing to improve the habitat for SGCN and associated species
4. To use grazing to improve the recovery of the Bear Creek riparian and aquatic habitats to return and / or remain in fully functioning condition
5. To use grazing to reduce fire hazards to ecologically and culturally significant resources such as the gallery groves of Arizona sycamore and cottonwood
6. To use grazing to improve the watershed and wildlife habitat of uplands surrounding the riparian corridor

Implementation of the grazing plan to achieve these goals will require a knowledgeable livestock operator with the ability to understand the objectives of the Department and balance livestock needs with the aforementioned goals. Accomplishing this may require some training in understanding the grazing planning process or finding a lessee with a proven track record of management towards similar goals.

Because the current vehicular access to the WMA is very limited, implementation of any grazing plan may require much of any cattle work and infrastructure repairs be done with horses and mules. This restriction also limits the complexity of any plan developed for grazing because moving animals frequently will likely prove to be unworkable. Likewise, the expense and maintenance required for extensive livestock fencing and water distribution is also a limitation for the foreseeable future. Nevertheless, the closer that grazing management can adhere to the following factors, the more successful it is likely to be in achieving the Department's goals for the Double E WMA.

General Grazing Management Plan Factors:

Because of yearly pattern variations in rainfall timing and amount, a rotational grazing plan must also be flexible. Some ideal guidelines in developing the plan each year include the following factors:

1. Any factors that influence SGCN habitat or other requirements such as critical times for breeding, nesting or other related dynamics. Other wildlife species needs such as cover and forage must also receive priority in the plan.

2. Any grazing in the actual riparian corridor should be restricted to dormant season use only. Watering points for upland areas might be provided in the riparian area, but access points would be limited (see photo on next page as an example).

3. Upland areas will generally receive use at varied times of year. Pasture use should be planned to provide growing season rest at least once every third season. Dormant season use when cooler temperatures prevail and livestock water needs are reduced is preferable for steeper areas which are further from water.

4. Grazing periods in active growth ideally should not exceed 30 days in any one pasture.

5. Recovery periods may be 6 months to over a full year, and some pastures may need even longer to achieve habitat requirement objectives.

6. Utilize one herd for grazing management if at all possible.

7. Placement of salt and/or minerals should be away from water points.

Example of limited livestock water access point in riparian area. Note use of temporary electric tape to create the water access. Tape is removed following grazing period. Date Creek Ranch, Arizona

Infrastructure Factors:
The current state of infrastructure including fences, watering points, corrals and roads are in various states of disrepair. Each separate item will be discussed below with recommendations made in regards to creating a functional grazing plan outline. A complete list of all springs, water developments and corrals is shown on page 46. Maps documenting locations of all improvements are shown on pages 54-56. A summary of management recommendations for potential grazing is found on page

Fences
Some of the fence infrastructure necessary for proper grazing management on the Double E WMA is deteriorated to the point of needing major repairs or complete rebuilding. Perhaps one of the greatest concerns would be that the boundary fence in many areas is not intact or non-existent.

A complete inventory of existing fences on the WMA has not yet been completed. The field work associated with this study showed that several of the fences that were visited were in poor repair and definitely in need of renovation before being classified as true livestock barriers. Most fences seen were constructed from old Juniper posts which are in various stages of rotting underground. At best, many sections would be classified as livestock deterrents, but posts and wire are down in many places and almost without exception, water gaps have been blown out and need to be replaced.

Down Fence Line Near the Entrance Gate Located ¼ Mile South of FS Boundary; West Side

The BLM allotment contains the Bear Creek Area of Critical Environmental Concern (ACEC) and it was fenced to exclude livestock grazing in 2001. The fence sections that were located on the upland are intact, but any sections that have water gaps such as in Stone Canyon and Bear Canyon itself, have been destroyed by flooding. Currently the entire riparian corridor, with the exception of a small area near the west entrance appears to have access to livestock at this time due to lack of fences or fences that are down. Prior to the implementation of any grazing plan, one of the main priorities for fence repair and construction must be to establish a riparian exclusion zone for livestock.

Portion of BLM Stone Canyon Allotment ACEC Riparian Area Exclusion Fence

One benefit of the rugged canyon terrain in the Double E WMA is that many natural barriers to livestock passage exist. A couple of the existing fences already tie into these natural barrier features, such as the one on the BLM Boundary in Section 28, just south of the Bear Creek along the old

access road to the south side of the WMA. In designing any new fence or repairing any existing fence as much use as possible should be made of these natural barriers to minimize costs and maintenance.

The survey and infrastructure examination also revealed fences that are in fair condition and still capable of preventing livestock from entering or leaving the WMA. These fences still need to be reworked in places, but do not need replacing at this time. Examples of this classification of fence are the north boundary with the Forest Service allotment and the west boundary fence in the vicinity of the south road exit to the deeded land east of the Double E WMA. The photos below show sections of the FS fence use of “fence jacks” because of rocky conditions and the locked gate and fence line at the south road exit mentioned above.

In order to implement a grazing plan the priorities for fencing would include the following:

1. Repair and or rebuild all degraded sections of existing boundary fence.

2. Design and build needed boundary fence for areas where it currently does not exist. It appears obvious from the maps and terrain that some rather large boundary areas will remain unfenced due to terrain and complete lack of accessibility. Fortunately, these same factors, plus distance from water sources, should limit much of the need for livestock control.

3. Design and build sections of fence that will isolate the Bear Creek drainage from grazing and create a riparian pasture. This boundary must include several water gaps in major drainages and tie into natural boundary features wherever possible. A good example of such a section exists in Section 28 just south of the Bear Creek drainage along the South Road. It actually appears that natural boundary exists from this point all the way east to YL Canyon which constitutes the BLM ACEC area in the south.

Livestock Water Points

The livestock watering points on the Double E WMA consist primarily of earthen dams (dirt tanks); wells with storage tanks and drinking troughs; and springs. It does not appear that water systems are connected by pipelines except for short distances from storage tanks to drinking troughs. A complete listing of all water points and their known status at this time is shown in Table 1 on page 47.

Dirt Tanks

There are nine dirt tanks. All but one of these dirt tanks are located in the south half of the WMA. Lee tank is the only one on the north half. Six of these tanks are located on EE WMA deeded land, with two on State land and the remaining one on BLM. With excellent rainfall this year, those tanks that are still functioning are holding water as of September 2015. Fortunately, only two of these tanks are silted in and/or the dam has been breached. All but two of the tanks have been visited and photographed.

View of Deer Tank Full of Water

View of Medina Tank. This tank is fenced to control access. Note old corrals in background

Wells, Storage Tanks, and Drinking Troughs

There are four wells on the WMA. Two of these wells are located on the north half of the property on WMA deeded land. The HR Canyon well on BLM land is non-functional and was probably decommissioned when the ACEC was established. The YL Canyon well on the south side is located on State Land. None of the wells currently appear to be functioning although water was present in some of the wells. The Brushy Canyon well has a solar setup and a storage tank with a drinking trough. The rest of the wells have no equipment or have windmills that are not functioning. Similarly, the storage tanks and drinking troughs on these locations are not serviceable and need to be replaced and upgraded to modern materials.

There are apparently three locations chosen for potential storage tank sites. Two of these sites are in the north half of the WMA and one is in the south half. These positions were not visited, but the UTM locations are all high elevation points not in the vicinity of current sources of water. Presumably there was a plan to pipe water to these storage tanks and gravity flow it through pipelines to water troughs. If such a plan does exist, it should be studied for feasibility and cost / benefit analysis.

YL Canyon Well, Storage Tank and Water Trough Located on State Land – Non-functioning

Springs

Three springs exist on the WMA. Bull Spring in the northeast corner of the property is on deeded land and is undeveloped. It flows into one of the tributaries of Brushy Canyon and surface flow quickly disappears into the sandy bottom. The flow is insufficient to water many livestock unless the site is developed and storage is provided.

YL Canyon Spring Development

Lee Spring is located approximately 1 mile southwest of Bull Spring in the same drainage. This site was not visited, but aerial views indicate there is no developed storage at the location given. A third spring was encountered approximately one quarter mile southeast of YL Canyon windmill. This spring is damned with concrete and is actively flowing. The rate of flow is unknown, but does not appear to be more than a couple of gallons per minute. No pipeline or drinker was seen.

Water Infrastructure Summary and Priorities

Other than the perennial intermittent flow in Bear Creek, the overall water situation for livestock grazing in the Double E WMA is presently very limited. This is especially true in the context of a

controlled grazing plan that aims to provide a season of rest to each pasture. With the wells, storage, and drinking troughs presently non-functional, spring flows at low rates of production, and dirt tanks providing the main (but unreliable) sources of water; much work will have to be done to create the water infrastructure necessary to implement even a relatively simple 4 pasture / 1 herd grazing plan.

In order to implement a grazing plan the priorities for water development would include the following:

1. Test production of and convert all wells to solar pumps. Provide a minimum of 2,500 gallons of storage at each location (fiberglass or poly storage tanks recommended) and at least one drinking trough and float per site. All troughs must have escape ramps.

2. Remove silt and repair existing dirt tanks to full capacity. Fence off dirt tank areas and provide access for livestock in one armored site or water trough if possible.

3. Investigate potential of spring development to provide additional sources of reliable water and create storage at each spring.

Corrals

Strong corrals are necessary for cattle work including sorting, weaning, vaccinations, branding, and shipping. There are five corrals located on the Double E WMA. Presently the only corral that would be serviceable is located at the west entrance gate. The remaining corrals are similarly constructed of juniper posts, but time and neglect has caused deterioration to the point they are not useable without major repairs.

The HR Canyon corral is located on the BLM ACEC property and should not be considered for future use. The remaining three corrals are located on deeded land and perhaps the one most useful to repair is located inside the fence surrounding Medina Tank. The Lee Canyon corral would provide a good location for cattle work when the livestock are grazing the north pastures. The YL Canyon corral is small and perhaps in the worst shape. Its location at the junction of Bear and YL canyons is not particularly useful if Bear Creek is excluded from grazing as recommended.

Corrals located at west entrance to Double E WMA

YL corrals located at the mouth of YL Canyon

Table 1. Double EE Wildlife Management Area Improvements - No Gila National Forest Improvements							
Name	**Zone**	**Easting**	**Northing**	**Land Status**	**Site Visit**	**Picture**	**Remarks, Repairs Needed**
Bear Tank	12S	734953	3648502	EE WMA	No		Have not visited
Bighorn Tank	12S	732655	3649591	State Land			Full as of 8/26/15 per Jack Young
Brushy Canyon Well	12S	736821	3652154	EE WMA		Yes	Solar Equipment Present, storage tank, drinker. Water in well.
Bull Spring	12S	738113	3654574	EE WMA	No		Have not visited
CCC Tank	12S	737213	3644621	State Land		No	Tank filled in, water below CCC rock/cement dam
Deer Tank	12S	733499	3649303	EE WMA		No	8/2015 full of water
HR Canyon Well	12S	734320	3650649	BLM		No	BLM at the mouth
HR Canyon Corral	12S	734362	3650627	BLM		Yes	Corral constructed out of juniper
Lee Corral	12S	737312	3653210	EE WMA		Yes	No water storage tank
Lee Spring	12S	737412	3653360	EE WMA	No		Have not visited
Lee Tank	12S	736836	3653231	EE WMA	No		Have not visited
Medina Tank	12S	734925	3646517	EE WMA		No	8/2015 full of water
Metal Drinker	12S	733583	3650691	EE WMA		Yes	Pipe and float missing 8/2015
Mikes Tank	12S	733852	3649201	EE WMA		No	8/2015 full of water
Rattlesnake Tank	12S	733840	3647821	BLM		No	Sediment needs to be cleaned out, dam repaired
Spar Canyon Spring	12S	733152	3655813	GNF	No		Have not visited
Stone Canyon Well	12S	735227	3652408	EE WMA		Yes	No equipment present, storage tank rusted, needs solar, storage and drinker. Water in well.
Storage Tank #1	12S	736534	3653625	EE WMA		No	Potential Location for Brushy Canyon Well Storage Tank
Storage Tank #2	12S	734495	3653195	EE WMA		No	Potential Location for Stone Canyon Well Storage Tank
Storage Tank #3	12S	736464	3646233	EE WMA		No	Potential Location for YL Canyon Well Storage Tank
Tire Drinker	12S	733725	3650301	EE WMA		Yes	Pipe and float missing 8/2015
Whitetail Tank	12S	735763	3645773	EE WMA		No	Sediment needs to be cleaned out, dam repaired
YL Canyon Corral	12S	735786	3649963	EE WMA	Yes	Yes	Mouth of YL Canyon
YL Canyon Well	12S	736334	3647985	State Land	Yes	Yes	Needs solar. Storage (open) needs cleaned out, drinkers in need of repair. Water in well.
YL Canyon Spring and Dam	12S	737041	3647450	State Land	Yes	Yes	Visited by K Gadzia, dam is silted but still holding water

Roads

As reported in the Conceptual Management Plan for the Double E WMA, road access for the property is limited. The main road up Bear Creek is passable only on foot, four wheel drive off highway vehicles (OHVs) or horseback. This access is subject to flooding from precipitation events both on and off the property.

The two main roads that spur south and north from the Bear Creek access are also 4WD OHV only access. The main problem with these two roads is the initial steep ascent from the canyon bottom, which could be repaired to make the access safer. Additionally, because of water entrapment, there are erosional problems on both roads. Simple treatments such as those outlined in the publication *Water Harvesting from Low Standard Rural Roads*, by Bill Zeedyk would do much to improve these roads. The book can be downloaded in PDF form at the following site:
http://quiviracoalition. org/images/pdfs/1888-A_Good_Road_Lies_Easy_on_the_Land. pdf

The south road gives access to most of the dirt tank waters and ultimately to a gate exiting the property on the east side. For the most part this road runs along a ridgeline and with the exception of one steep hill, is a fairly gentle grade. The north road is accessed from a point about one quarter mile east of YL Canyon and one quarter mile west of the eastern boundary on Bear Creek. This road also follows a ridgeline to the northeast and eventually enters the FS Spar Canyon Allotment near the NE corner of the WMA deeded property. This road does provide fairly close access to the eastern boundary fence as well as the Brushy well, Lee tank, spring and corrals.

As is outlined in the Conceptual Management Plan, construction or repair work requiring motorized access would need to be accomplished with minimal adverse effects to habitats, soils and runoff. Likewise, the work would be coordinated to minimize wildlife disturbance. Even with limited motorized access, livestock work could be done primarily by horseback to comply with the grazing plan.

Erosion caused by water entrapment with no turn out. Photo location is South road above gate.

General Infrastructure Improvements needed to Implement a Grazing Management Plan
The general plan to properly develop grazing infrastructure on the deeded land to achieve the goals of the Department would be to:

1. Complete fences that will insure isolation of the Bear Creek riparian area from the upland pastures.
2. Reduce water gap fence length by locating water gap fences upstream from the intersection with Bear Creek where practical.
3. Insure boundary integrity by completing fences on actual boundary survey line where practical. Consider upgrading existing old fence with wood posts to steel post with permanent wildlife friendly barbed / smooth wire fence.
4. Provide water for livestock by rehabilitating current wells with solar pumps and storage with troughs. Alternatively, water could be pumped from the creek to nearby upland locations; or selected access points to the river could be developed with hardened crossing spots for livestock and vehicles.
5. Develop and implement a plan for repairing and cleaning out all dirt stock tank ponds.
6. Rehabilitate at least one corral system on each side of the river.
7. Develop alternative watering points and gates that facilitate ease of livestock movement between pastures.
8. Minimally improve road access and drainage to the main roads north and south of Bear Creek.

Carrying Capacity:
The livestock carrying capacity of the BLM and State lands are set at 58 and 50 Animal Units Year Long (AUYL) respectively. This represents an average of 57 acres per animal unit (AU). The study indicated fairly close similarity between the BLM, State and Deeded land in terms of vegetative production. If this same carrying capacity is projected to the 5,828 acres of Deeded land, the resulting AU capacity would be an additional 102 head. This would bring the total to approximately 210 AU's. At one time, it was reported that around 200 head of cattle grazed the property, but it is unknown if this included the Spar Canyon Forest Allotment. As stated earlier, Forest Service regulations do not currently allow a state agency to lease the allotment, so this resource would not be available for increased carrying capacity.

Adequate forage production may exist in favorable years to support 210 AU over the entire Double E WMA, but this number does not seem sustainable in average production years. In addition, the distribution of water and access in very steep terrain would likely concentrate most cattle use to ridgetops and canyon bottoms within a mile radius of water sources.

The major criteria used to rate rangeland suitability for grazing are:
1. Vegetative production
2. Distance from water
3. Slope

Areas generally characterized as dominated by slopes over 40 percent, and/or rock outcrops, are normally classified as being unavailable for livestock grazing. These areas are excluded from the available acreage used to calculate carrying capacity.

A study of the topographic map of the Double E WMA shows potentially excludable areas to be a significant portion of the land base; perhaps as much as 50%. The majority of the State land property is especially steep, rocky and inaccessible. This initial slope analysis can be confirmed quantitatively using GIS technology and should be considered as a major factor in calculating a sustainable carrying capacity for livestock grazing on the Double E WMA. Given these factors, a more reasonable stocking rate through average wet and dry periods would be closer to 125 Animal units on a year-long basis.

Grazing Plan Options

Livestock grazing must always be carefully considered as a land management tool because the results will depend on continuous evaluation of the resource and animals depending on it. The unique goals of the Department, when combined with the infrastructure deficiencies identified in this study as well as the current stable to improving rangeland health conditions add even more weight to this consideration

The goals and factors for deciding whether or not to utilize livestock grazing as a management tool are covered at the beginning of this section on pages 40 and 41. Given all the complexities outlined above, any grazing plan must be kept fairly simple to have any hope of success. All of the following options assume that the Bear Creek will be excluded from grazing most of the time, except for prescribed dormant season grazing to achieve specific habitat management objectives.

Given the current situation the following options appear most applicable for developing a grazing plan on the Double E WMA:

1. **Dormant Season Grazing (DSG)** only. November – March seasonal grazing if adequate forage is produced in the prior growing season. Stocking rate would vary by year and be determined by a forage inventory in October.

2. **Rest Rotation Grazing (RRG):** with yearly rotation of grazing between the north and south halves of the property while the other half is rested from grazing.

3. **Deferred Rotation Grazing (DRG):** where the north or south side would be grazed for half the season and then moved to the other side for the remainder of the season. In year 3 the seasons are reversed to allow plant seeding of cool and warm season species on each half.

4. **Best Pasture Grazing (BPG):** where at least 4 pastures are needed. The animals are put on one pasture until 50% utilization is achieved, then they are moved to the next best pasture. This system works well on large arid areas where rainfall may be localized.

5. **Merrill Four-Pasture Rotation (M4PR):** also requires a minimum of 4 pastures. Here 3 pastures are grazed while one rests for a portion of the year. This pattern alternates in the following sequence:

Merrill Four Pasture Rotation Schedule

Year	Period	Pastures			
		1	2	3	4
1	Mar-June	Rest	Graze	Graze	Graze
	July-Oct.	Graze	Rest	Graze	Graze
	Nov.-Feb.	Graze	Graze	Rest	Graze
2	Mar-June	Graze	Graze	Graze	Rest
	July-Oct.	Rest	Graze	Graze	Graze
	Nov.-Feb.	Graze	Rest	Graze	Graze

Comparison of Options

Each of the 6 choices for developing a grazing plan has advantages and disadvantages**.** On the following page, Table 2 outlines the relative merits of each system.

Table 2 Grazing Plan Option Comparisons		
Option	**Advantages**	**Disadvantages**
DSG	Easy to implement. No new fence required. Can be combined with other systems or used infrequently as conditions warrant. Stocking rate based on forage that is grown in previous season.	Requires gathering and shipping of livestock each spring. Sometimes difficult to find lessee willing to graze for only 5 months. Typicaly cows are moved out before calving begins, so early calving does not work well unless animals are shipped early.
RRG	Fairly easy to implement. No new fence required. Entire herd on half of the ranch leads to more even utilization of pasture areas.	May lead to heavier utilization of forage on grazed area of the property. Water system must be able to support higher stocking rate for the entire year.
DRG	Shorter grazing season of use allows better recovery and seeding of plants. No new fence required. Periodically reversing season of use allows cool and warm season plants to recover.	Requires gathering and moving of livestock twice a year. Set rotation may lead to overgrazing in poor years.
B4PG	Utilization is closely monitored and grazing ceases when 50% threshold is reached. Moving to next best pasture works well in areas with monsoonal scattered rainfall patterns such as New Mexico.	At least 2 new fences are required. More frequent movement of livestock is required. Water systems must be able to support entire herd in roughly one fourth of the land base for several months.
M4PR	Rested pasture changes each season giving a different suite of plants recovery time. Water systems can be more scattered. Llivestock are on 3 of the 4 pastures. Frequent animal movements produces calmer livestock behavior.	At least 2 new fences are required. More frequent movement of livestock is required. Set grazing and recovery periods sometimes cause problems in climates with highly variable rainfall patterns.

Recommendations
As can be seen from the preceding comparison chart, each available choice has its relative merits and detractions. The first requirement, before choosing an option or combining options, is that the current situation of infrastructure is improved so that permanent water is available (not just dirt tanks relying on rainfall), and fenced boundaries are secured.

Continuous grazing is not recommended given the Department's goals and objectives for the WMA, and is therefore not listed as an option. The two four-pasture systems that require additional miles of fences (which must also be maintained) likewise seem counter to the minimizing conflict with wildlife.

Rest Rotation Grazing (RRG) and Deferred Rotation Grazing (DRG) produce similar results and both have livestock on some parts of the land for the entire year. Although the rest periods provide time for plant recovery, stocking rates must be low enough to provide adequate forage in dry years. In 1898, one of the first rangeland scientists named Jared Smith wrote "The maximum number of cattle that can be safely carried on any square mile of territory is the number the land will support during a poor season. Whenever this rule is ignored there is bound to be loss." (Habitat, soil, etc.)

Dormant Season Grazing (DSG) gets around many of the problems associated with all the other systems outlined above. The stocking rate for the season is based on forage that is already produced in the previous growing season, so there is no danger of overstocking. Also, DSG does not have to be repeated each year and can be put in place as needed to meet management objectives such as reducing fuel loads, treating over rested grass plants, or opening up areas of thick brush. Further it can be combined in a rotation so that only half of the property is dormant grazed at any time.

One challenge in implementing DSG is that a forage inventory should be done prior to contracting for cattle to be brought in. The forage inventory must be done by an experienced person used to estimating forage production in various conditions. Most NRCS personnel and private rangeland consultants have this type of experience. The stocking rate is recommended based on the utilization level desired for the existing dormant season forage base.

The second challenge is finding the right livestock operator who will be flexible enough to bring in the desired number of cattle for the preferred period of time. However, dormant season forage is often in short supply because Forest permits frequently require livestock be removed in winter. Hay costs are high and animals do best when grazing native vegetation. These factors can work in favor of finding a lessee who would work with the Department to achieve the grazing goals.

Other Management Options
Prescribed Fire
The challenging terrain and lack of motorized access make prescribed fire a very risky option for vegetation management. The difficulty of creating fire lines and the many canyons that dissect the area make stopping any fire, planned or wildfire, a difficult proposition. It was interesting that no signs of historic wildfire (burn scars on older trees, stumps, etc.) were observed.

A couple of burn scars were seen on trees, but these appeared to be lightning strikes that did not expand beyond the limited strike zone. Given forage production years like 2015, the fuel load will be adequate for wildfire to reset some areas naturally. The fire policy for the Department is probably property specific, but a "natural fire - let it burn" policy would make sense for this area. There are some areas where Juniper and Pinon are becoming fairly dense and fire would help reset these areas to a savannah type.

Young Juniper and Pinon Invading a Grassland Site

Mechanical and Chemical Treatment of Brush
It is fortunate that much of the ranch retains a dominance of grass. However, some areas have varied levels of brush encroachment, mainly by mesquite and catclaw. As these species become more dominant, changing habitat may affect some wildlife species negatively.

The use of machinery such as bulldozers, loaders or excavators to control invasive areas of mesquite and catclaw is an option on some areas of the ranch if access is created. The same areas would be candidates for herbicide application on a localized basis. The advantage of herbicide use is the lack of ground disturbance, but it may also kill non-target desirable species such as oak. The main reason for such treatments would be to prevent a negative shift in habitat, not to create more forage for livestock. In fact, as discussed in the paper by Holecheck; 1994, it seldom makes financial sense to control mesquite in New Mexico. The same would likely hold true for catclaw.

The two sites where Tree of Heaven (*Ailanthus latissimus*) was found in the Bear Creek drainage are fortunately not large infestations. These areas can probably be controlled by hand cutting and treatment of stumps with an herbicide type that prevents re-sprouting of the stumps. No other infestations of noxious invasive plants were encountered.

Continuation of Current Management
Continuation of current management practices seems unlikely to create severe negative consequences in the near future for the Double E WMA. Probably the most ecologically significant consequence of continuing to let the upland areas rest is that this strategy will create an increasing fuel load. Upland areas may become somewhat less productive with the buildup of old growth, but this is not an issue that needs to be addressed in the immediate future. Often this old growth is less palatable and less nutritious to grazing animals.

The recommended use of dormant season grazing when infrastructure is repaired and ready for service would definitely be a plus in reversing these trends and recycling of old plant material. Although this may be some years in the future, it should definitely be considered as a management tool.

Conclusions

Protecting and enhancing the unique habitats that exist on the Double E WMA must be the primary focus of any management plan for the property. Fortunately, the Rangeland Health Study that was conducted for this report shows that at present most areas are in a healthy condition.

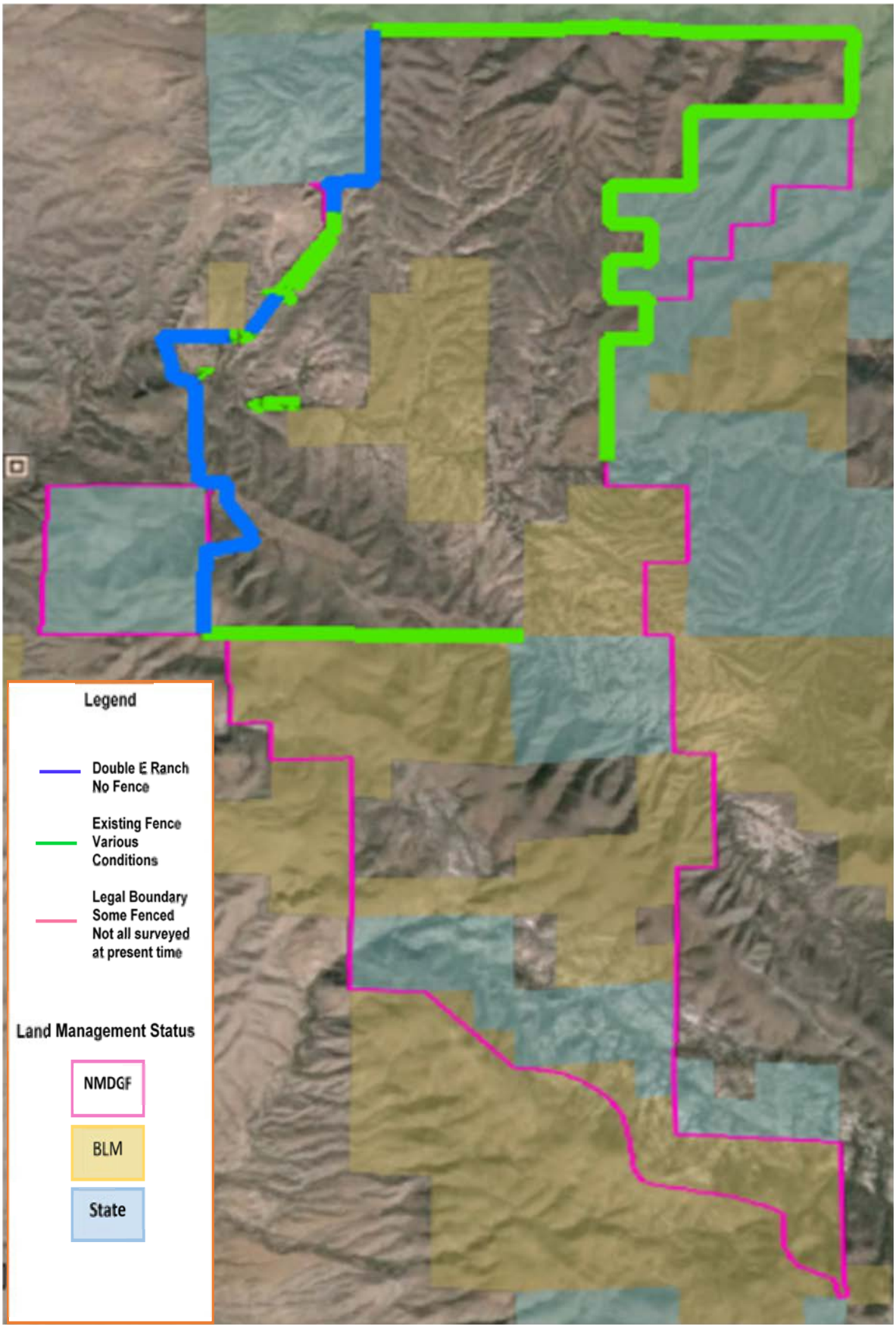
Livestock grazing is a useful tool for maintaining habitat when used properly, and in conjunction with other tools. Should livestock grazing be deemed an appropriate tool for management by the Department, the major difficulty may be finding the right operator to conduct proper grazing management for a limited season of use.

Dormant Season Grazing (DSG) is the recommended application of grazing on the Double E WMA because of its simplicity, low risk and flexibility. Currently, rest is the main tool being used on the ranch and is having some negative effects. However, it is not presently creating severe problems other than an increased risk of fire on some portions of the property.

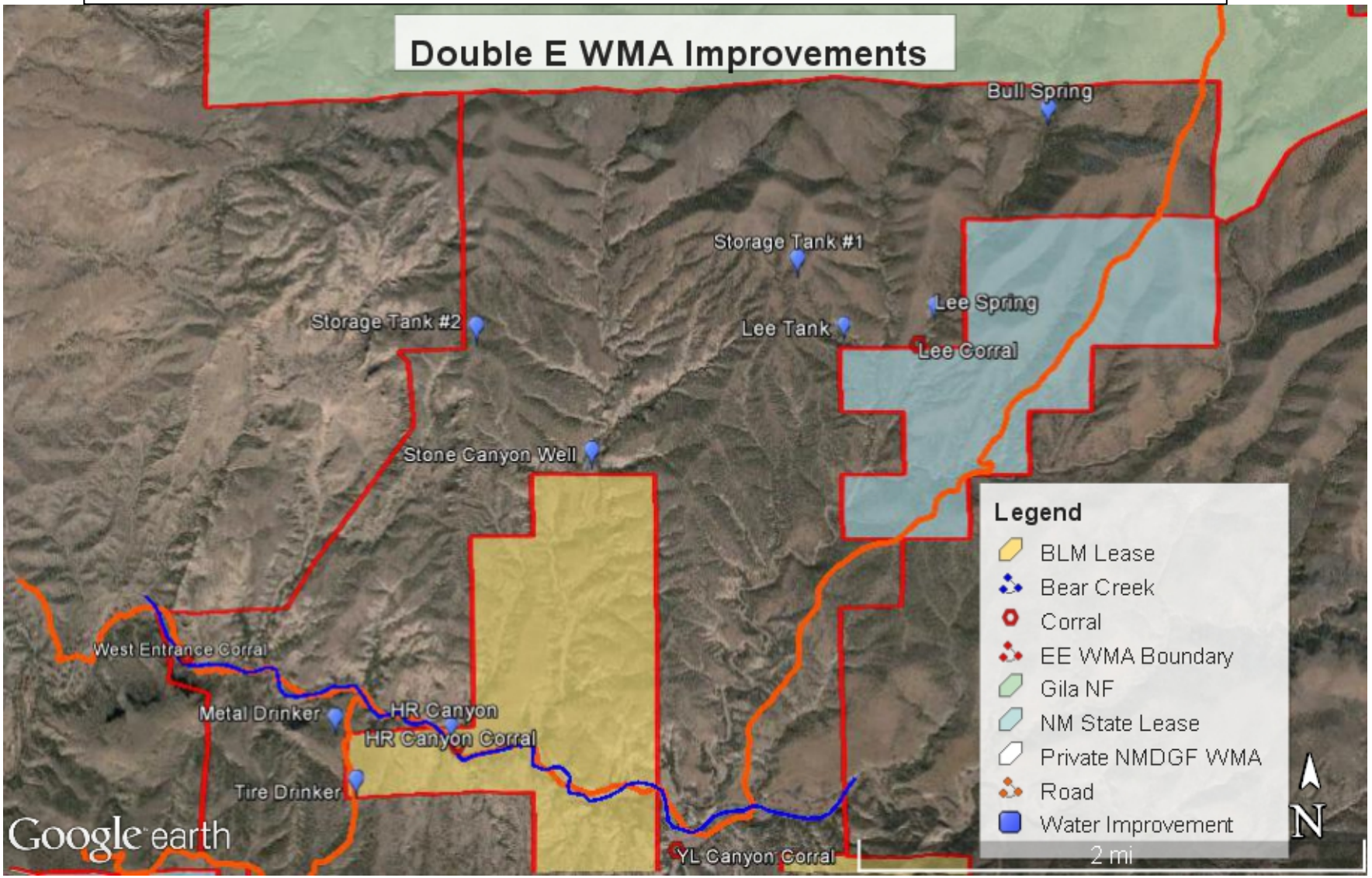
Finding the right mix of infrastructure that can protect the critical riparian corridor and allow for upland use seems of primary importance. Any fences that isolate this area should be placed well away from the normal flood zone except where water gaps must be erected. Because of the natural boundary areas in the canyon and the BLM ACEC exclusion zone, this may not be an extensive fencing undertaking, but will require water gap maintenance at regular intervals.

Livestock grazing can have a positive or negative effect on habitat objectives. Managed grazing with a plan for controlling grazing periods and providing adequate recovery for plants is the key to creating the positive effect desired.

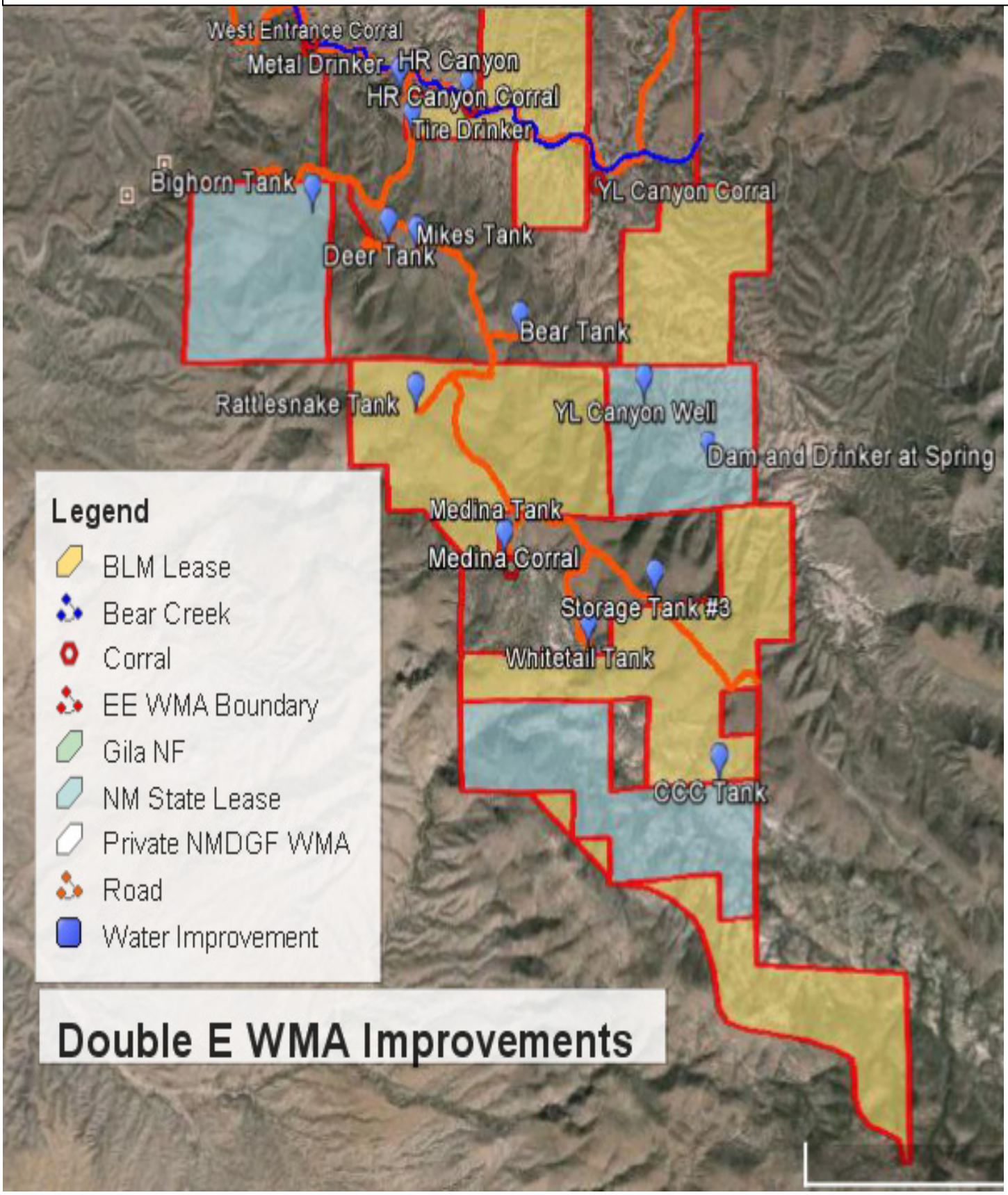
Double E WMA Fencing Map (Inventory Incomplete)



North Half of Double E WMA
Map of Locations for Existing Water, Corrals and Roads: Includes BLM, State, and Deeded



South Half of Double E WMA
Map of Locations for Existing Water, Corrals and Roads: Includes BLM, State, and Deeded



Appendix A: NRCS ESD's of upland areas of Double E WMA R038XN10NM Hills

United States Department of Agriculture
Natural Resources Conservation Service
Ecological Site Description

Section I: Ecological Site Characteristics

Ecological Site Identification and Concept

Site stage: Provisional

Provisional: an ESD at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

Site name: **Hills**
Site type: Rangeland
Site ID: R038XB103NM
Major land resource area (MLRA): 038-Mogollon Transition

Physiographic Features

This site is characterized by rolling to steep hills and mountain footslopes. Slopes range from a low of 15 percent to an extreme high of 75 percent, and exposure or direction of slope is variable. Elevation range from about 5,000 to 7,000 feet above sea level.

Landform: (1) Hill

	Minimum	Maximum
Elevation (feet):	5000	7000
Slope (percent):	15	75
Ponding		
Runoff class:	Negligible	Medium
Aspect:	No Influence on this site	

Climatic Features

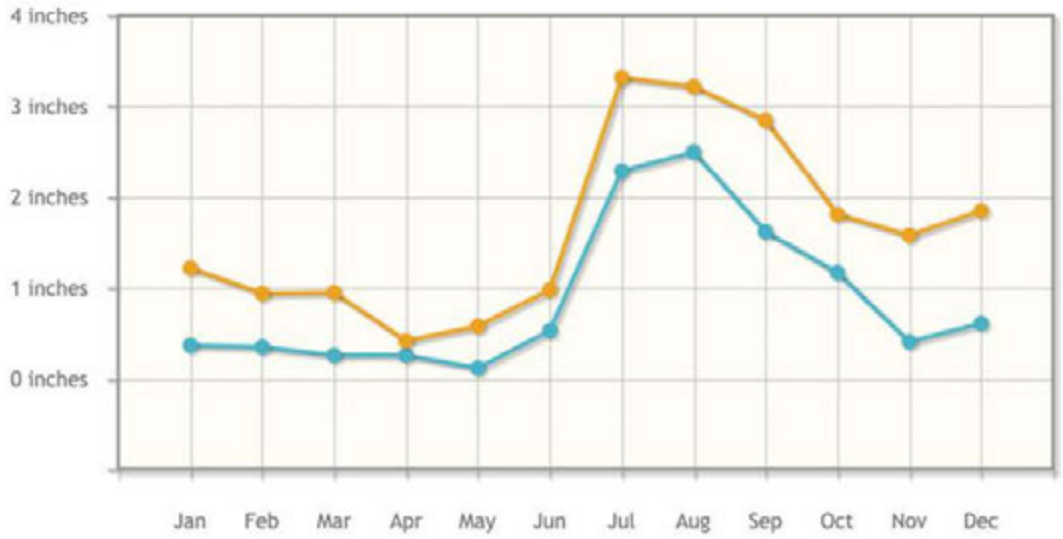
Average annual precipitation varies from about 12 inches to just over 16 inches. Substantial fluctuations from year to year are common, ranging from a low of about 6 inches to a high of over 30 inches. Approximately one-half of the annual precipitation comes in the form of rainfall during the months of July, August, and September, although wintertime precipitation in the form of snow, sleet, or rain is sometimes significant. Spring and late fall months are normally dry. The average frost-free period ranges from about 165 to 190 days and extends from approximately the third or fourth week in April to mid October. Average annual air temperatures are about 56 degrees F. Summer maximums can exceed 100 degrees F and winter minimums on occasion go below zero. Monthly mean temperatures generally exceed 70 degrees F for the period of June through August.

Growing conditions favor warm-season perennial vegetation, although late winter and late summer precipitation is adequate to foster a significant cool-season component in the potential plant community. Occasional wet springs also create good conditions for annual forb production, but frequent winds from the west and southwest are common during this time of year and tend to deplete soil moisture at a critical time for the growth of these plants. Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

	Averaged
Frost-free period (days):	156
Freeze-free period (days):	178
Mean annual precipitation (inches):	16.00

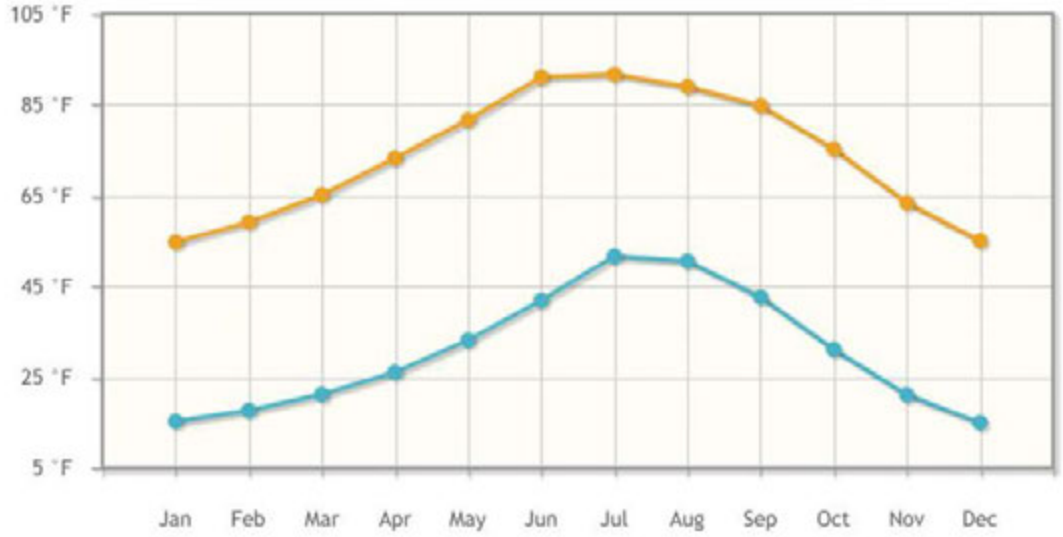
Monthly Precipitation (Inches):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	1.22	0.94	0.95	0.42	0.58	0.98	3.32	3.22	2.85	1.81	1.58	1.85
Low	0.37	0.35	0.26	0.26	0.12	0.53	2.29	2.50	1.62	1.17	0.41	0.61



Monthly Temperature (°F):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	55.6	60.1	66.1	74.2	82.6	92.0	92.6	89.9	85.7	76.2	64.4	55.9
Low	16.2	18.6	22.1	27.0	34.0	42.8	52.5	51.4	43.5	32.0	22.0	15.9



Climate stations: (1) 291910, Cliff 11SE, NM. Period of record 1937-2000
(2) 294009 Hood Ranger Stn., NM Period of Record 1924-2000
(3) 297386 Hood Ranger Stn., NM Period of Record 1954-2000
(4) 298324 Silver City, NM Period of Record 1961-2000
(5) 299806 New Mexico Period of Record 1949-2000

Influencing Water Features

Representative Soil Features

Soils characterizing this site are typically shallow, stony and/or cobbly with loams, clay loams, and sandy loams over bedrock. Included are occasional areas or pockets of deeper soils that are stony. They have water intake rates that are moderate and permeability that is moderately slow to moderately rapid. They occur on slopes of 15 percent or more.

Surface texture: (1)Stony Loam

Subsurface texture group: Loamy

	Minimum	Maximum
Surface fragments <=3" (% cover):	15	60
Surface fragments >3" (% cover):	15	60
Subsurface fragments <=3" (% volume):	3	57
Subsurface fragments >3" (% volume):	0	35

Drainage class: Well drained to excessively drained

Permeability class: Very slow to moderately rapid

	Minimum	Maximum
Depth (inches):	4	72
Available water capacity (inches):	1.00	3.00
Electrical conductivity (mmhos/cm):	0	2
Soil reaction (1:1 water):	5.6	8.4

Plant Communities

Ecological Dynamics of the Site

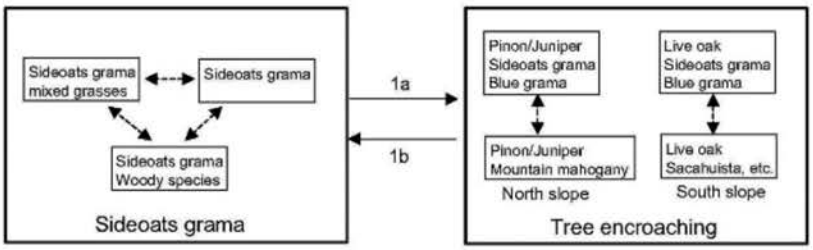
Overview

The hills site often intergrades with breaks sites and may border loamy sites. The historic plant community type is dominated by sideoats grama (Bouteloua curtipendula). Other grasses, including blue grama (Bouteloua gracilis) and black grama (Bouteloua eriopoda) may be subordinates depending upon aspect and hillslope position. Shrubs and trees, including one-seed juniper (Juniperus monosperma) and shrub oak (Quercus spp.) are more common on north-facing slopes. It unclear why trees such as juniper and piñon pine (Pinus edulis) become dominant at the expense of grasses in some cases. Regional increases in the relative amount of winter rainfall, decreases in fire frequency, or grazing may facilitate woody plant establishment, and subsequent erosion or competition may inhibit the recolonization of grasses.

No systematic studies of communities, states or transitions have been performed in the hills site.

State-and-Transition Diagram

State-Transition model: MLRA 36, WP-3, Low soil-depth group: Hills



Historic Climax Plant Community

State Containing the Historic Climax Plant Community

Sideoats grama: The expression of the historic community type depends upon aspect, slope position, and location within the subresource area. On south-facing slopes, black grama is more common as a co-dominant with sideoats grama. Black grama is also more common on the east side of WP-3 near the border with SD-2. On north-facing slopes or steep slopes where seeds are trapped and water infiltration and retention is increased by rock cover, sideoats grama is highly dominant and little bluestem (Schizachyrium scoparium), blue grama and hairy grama (Bouteloua hirsuta) are subordinates. Tobosa (Pleuraphis mutica) tends to occur at hill bases where run-on water is received. Woody plants and succulents, including sacahuista (Nolina spp.), one-seed juniper, alligator juniper (Juniperus deppeana), and mountain mahogany (Cercocarpus montanus) are present and may be more common on north-facing slopes and hilltops. Variation in plant community composition may occur in response to drought (e.g. reduction in woody plants) or grazing.

Diagnosis: Sideoats grama is dominant in most patches and perennial grass cover between trees and shrubs is more or less continuous. Evidence of erosion is infrequent.

Historic Climax Plant Community Plant Species Composition

Grass/Grasslike

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
1					141	188
		sideoats grama	BOCU		141	188

				Bouteloua curtipendula		
2					94	141
		blue grama	BOGR2	*Bouteloua gracilis*	94	141
3					9	28
		hairy grama	BOHI2	*Bouteloua hirsuta*	9	28
4					47	94
		black grama	BOER4	*Bouteloua eriopoda*	47	94
5					47	94
		cane bluestem	BOBA3	*Bothriochloa barbinodis*	47	94
		plains lovegrass	ERIN	*Eragrostis intermedia*	47	94
		green sprangletop	LEDU	*Leptochloa dubia*	47	94
		little bluestem	SCSC	*Schizachyrium scoparium*	47	94
6					47	94
		bullgrass	MUEM	*Muhlenbergia emersleyi*	47	94
		mountain muhly	MUMO	*Muhlenbergia montana*	47	94
		spike muhly	MUWR	*Muhlenbergia wrightii*	47	94
7					9	28
		prairie junegrass	KOMA	*Koeleria macrantha*	9	28
		wolftail	LYPH	*Lycurus phleoides*	9	28
8					9	28
		perennial threeawn spp.	ARIST	*Aristida*	9	28
9					47	94
		bottlebrush squirreltail	ELEL5	*Elymus elymoides*	47	94
		New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	47	94
10					28	47
		Graminoid (grass or grass-like)	2GRAM		28	47

Forb

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
11					28	47
		wild buckwheat	ERIOG	*Eriogonum*	28	47
		woolly plantian	PLPA2		28	47

			Plantago patagonica		
	threadleaf groundsel	SEFLF	Senecio flaccidus var. flaccidus	28	47
12				9	29
	Forb, annual	2FA		9	29
13				9	47
	Forb, perennial	2FP		9	47

Shrub/Vine

					Annual Production (pounds per acre)	
Group	Group name	Common name	Symbol	Scientific name	Low	High
14					28	75
		sacahuista	NOMI	Nolina microcarpa	28	75
		oak spp.	QUERC	Quercus	28	75
15					47	75
		mountainmahogany (hairy)	CEMOP	Cercocarpus montanus var. paucidentatus	47	75
		Wright's milkpea	GAWR	Galactia wrightii	47	75
		skunkbush sumac	RHTR	Rhus trilobata	47	75
16					9	47
		feather dalea	DAFO	Dalea formosa	9	47
		rubber rabbitbrush	ERNAN5	Ericameria nauseosa var. nauseosa	9	47
		Apacheplume	FAPA	Fallugia paradoxa	9	47
		broom snakeweed	GUSA2	Gutierrezia sarothrae	9	47

Tree

					Annual Production (pounds per acre)	
Group	Group name	Common name	Symbol	Scientific name	Low	High
17					47	75
		juniper spp.	JUNIP	Juniperus	47	75

Shrub/Vine

					Annual Production (pounds per acre)	
Group	Group name	Common name	Symbol	Scientific name	Low	High
18					9	28
		Shrub, deciduous	2SD		9	28

Annual Production by Plant Type

	Annual Production (lbs/ac)		
Plant type	Low	Representative value	High

Forb	46	75	104
Grass/Grasslike	403	657	910
Total:	449	732	1014

Structure and Cover:

Ground Cover (%)

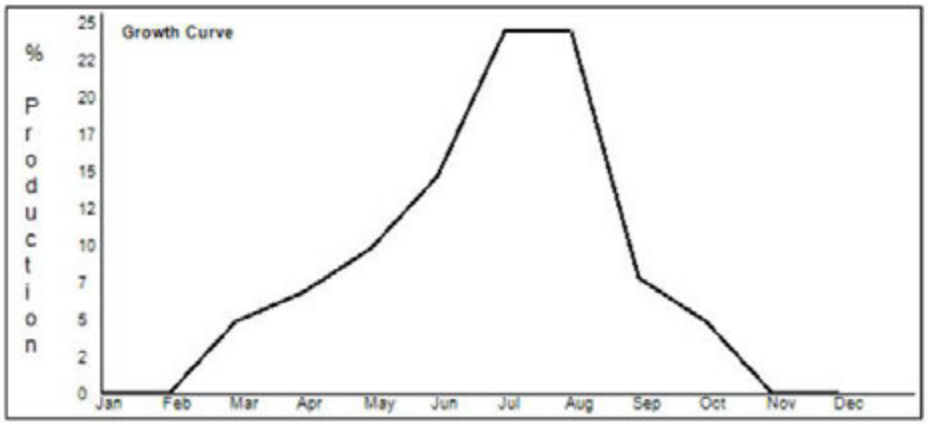
Vegetative Cover						Non-Vegetative Cover					
Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > 1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
		7 to 7	8 to 8			18 to 18					8 to 8

Plant Growth Curve

Growth curve number:	NM0603
Growth curve name:	R038XB103NM Hills HCPC
Growth curve description:	R038XB103NM Hills HCPC Mixture of plant communities dictated by exposure with north facing slopes have more trees and shrubs and south facing slopes are more grassland.

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	25	25	8	5	0	0



Transition to tree-encoaching state

Additional States:

Transition to tree-encoaching state (1a): It is unclear why woody plants become dominant, although it is likely that the subsequent decline in grasses is due to competition for water and nutrients and from erosional soil loss between woody plants. The formation of bare ground patches due to grazing, decreases in fire frequency, and increases in winter precipitation may be responsible either independently or in concert. The presence of grassland stands that are unburned and in which piñon and juniper have not invaded suggests that fire is not the sole limitation of tree encroachment.

Key indicators of approach to transition: Increases in bare ground, decreases in litter cover and grass cover, increased frequency of tree seedlings (threshold may have been crossed), decreased fire frequency.

Tree-encroaching: In this state, grass cover is reduced, shrubs and trees are dominant, and bare ground cover is high. Erosion rates may be relatively high. Grazing or summer drought may reduce grass cover within this state, but it can recover to subdominant status. On north-facing slopes, piñon and juniper tend to become dominants in this state, whereas south-facing slopes may be dominated by live oak and sacahuista. Mountain mahogany is an important subordinate on hilltops and north-facing slopes in this state. Blue grama is often the dominant grass.

Diagnosis: Oak, juniper, or piñon are common and bare patches are associated with trees and shrub clumps but also exist in interspaces where erosion has occurred. Bare ground may be interconnected such that runoff is not intercepted by grasses.

Transition to sideoats state

Transition to sideoats state (1b): Tree and shrub removal may release grasses from competition. Deferment of grazing may be used to allow grasses to recover and subsequent increases in fire frequency may be used to inhibit tree germination.

Information sources and theoretical background: Communities, states, and transitions are based upon information in the ecological site description and observations by Gene Adkins, NRCS.

Section II: Ecological Site Interpretations

Animal Community

Habitat for Wildlife:
This site provides habitat which can support a resident animal community characterized by mule deer, desert cottontail, rock squirrel, rock pocket mouse, brush mouse, white-throated woodrat, gray fox, bobcat, scrub jay, red-shafted flicker, cliff swallow, Bewick's wren, blue-grey gnatcatcher, rufous-crowned sparrow, scaled quail, mourning dove, red-spotted toad, collared lizard, tree lizard, short-horned lizard, alligator lizard, rock rattlesnake, black-tailed rattlesnake, and mountain patchnosed snake.

Where rock ledges and cliffs are present, prairie falcon, great horned owl, and golden eagle hunt over the site. Where the site is adjacent to ponderosa pine or mixed conifer areas, elk may range into this site to feed.

Plant Preference by Animal Kind

Animal kind: mature cow cattle

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
sideoats grama	*Bouteloua curtipendula*	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
black grama	*Bouteloua eriopoda*	Entire plant	P	P	P	D	D	D	D	D	D	D	D	P
blue grama	*Bouteloua gracilis*	Entire plant	D	D	D	D	P	P	P	P	P	D	D	D
mountainmahogany (hairy)	*Cercocarpus montanus var. paucidentatus*	Entire plant												
wild buckwheat	*Eriogonum*	Entire plant												
New Mexico feathergrass	*Hesperostipa neomexicana*	Entire plant	D	D	P	P	P	D	D	D	D	D	D	D
green sprangletop	*Leptochloa dubia*	Entire plant												
mountain muhly	*Muhlenbergia montana*	Entire plant												
spike muhly	*Muhlenbergia wrightii*	Entire plant												
little bluestem	*Schizachyrium scoparium*	Entire plant												

Animal kind: mature horse horses

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
sideoats grama	*Bouteloua curtipendula*		P	P	P	P	P	P	P	P	P	P	P	P

		Entire plant										
black grama	*Bouteloua eriopoda*	Entire plant	P	P	P	D	D	D	D	D	D	P	P
blue grama	*Bouteloua gracilis*	Entire plant	D	D	D	D	P	P	P	P	P	D	D	D
bottlebrush squirreltail	*Elymus elymoides*	Entire plant	U	U	D	D	D	U	U	U	D	D	D	U
New Mexico feathergrass	*Hesperostipa neomexicana*	Entire plant	D	D	P	P	P	D	D	D	D	D	D	D
green sprangletop	*Leptochloa dubia*	Entire plant												
bullgrass	*Muhlenbergia emersleyi*	Entire plant												
mountain muhly	*Muhlenbergia montana*	Entire plant												
spike muhly	*Muhlenbergia wrightii*	Entire plant												
little bluestem	*Schizachyrium scoparium*	Entire plant												

Legend: P=Preferred; D=Desirable; U=Undesirable; N=Not consumed; E=Emergency; T=Toxic; X=Used, but degree of utilization unknown

Hydrology Functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series----------Hydrologic Group
Abrazo----------D
Cascajo----------A
Chiricahua----------D
Encierro----------D
Gaddes----------C
Lithic Ustorthents----------D
Luzena----------D
Muzzler----------D
Oro Grande----------D
Puertecito----------D
Santa Fe----------D
Santana----------D

Recreational Uses

This site offers recreation potential for hiking, rock climbing, horseback riding, nature observation, photography, bird watching, and hunting for mule deer, quail and mourning dove.

During certain seasons, when favorable soil moisture conditions exist, the site displays a colorful array of wildflowers.

Wood Products

This site has a limited potential for firewood and fence-post production where sufficient juniper is present and where steepness of slope does not make harvesting prohibitive.

Other Products

Grazing:
This site is suitable for grazing in all seasons of the year, although most of the forage is produced during the summer months. It is adapted for cattle, sheep, goats, and horses, generally without regard to class of animal or season of use. Continuous yearlong grazing may, however, result in a decline or disappearance of cool-season grasses and preferred browse plants, especially if grazing use is prolonged and heavy. Because of the presence of significant amounts of both woody and herbaceous plants, the site is particularly suited to grazing by more than one species of animal (such as goats and cattle, sheep and cattle, and/or wildlife) to maintain a healthy balance of woody and herbaceous plants. Serious deterioration in the plant community may be characterized by heavy stands of juniper and oak brush, and the site is rarely suited to mechanical brush control or seeding.

Other Information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index Ac/AUM
100 - 76----------3.4 – 4.6
75 – 51----------4.3 – 6.8
50 – 26----------6.5 – 11.5
25 – 0----------11.5+

Supporting Information

Type Locality

State:	NM
County:	Catron

State:	NM
County:	Grant
State:	NM
County:	Hidalgo
State:	NM
County:	Sierra
State:	NM
County:	Socorro

Other References

Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus and Mesas 36 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Socorro, Sierra, Grant, Catron.

Characteristic Soils Are:
Luzena

Other Soils included are:
Abrazo, Cascajo, Chiricahua, Daze, Encierro Gaddes, Lithic Ustorthents, Luzena, Muzzler Oro Grande, Puertecito, Santa Fe, Santana Sedillo

Site Authors

Don Sylvester
Dr. Brandon Bestelmeyer
John Tunberg

Quality Assurance

Provisional Status Verified in Legacy System

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 038X **Ecological Site:** Hills R038XB103NM This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Composition (indicators 10 and 12) based on: Annual Production, Foliar Cover, Biomass

Indicators. For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community and natural distrurbance regimes within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness):**

10. **Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines:**
    Dominant:
    Sub-dominant:
    Other:
    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

---

14. **Average percent litter cover (%) and depth (inches):**

---

15. **Expected annual production (this is TOTAL above-ground production, not just forage production):**

---

16. **Potential invasive (including noxious) species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site:**

---

17. **Perennial plant reproductive capability:**

Appendix C: NRCS ESD's of upland areas of Double E WMA R038XN105NM BREAKS

United States Department of Agriculture
Natural Resources Conservation Service
Ecological Site Description

Section I: Ecological Site Characteristics

Ecological Site Identification and Concept

Site stage: Provisional

Provisional: an ESD at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

Site name: **Breaks**
Site type: Rangeland
Site ID: R038XB105NM
Major land resource area (MLRA): 038-Mogollon Transition

Physiographic Features

This site occurs on rough broken topography and is characterized by long ridges forming a break that is perpendicular to drainageways. Slopes vary considerably within a 15 to 70 percent range, although they average 35 percent or less. It has various degrees and directions of slope. Small amounts of badlands or rock outcrops may occur. Elevations range from just under 5,000 feet to about 7,000 feet above sea level.

Landform: (1) Scarp slope

	Minimum	Maximum
Elevation (feet):	5000	7000
Slope (percent):	15	70
Ponding		
Runoff class:	Negligible	Medium
Aspect:	No Influence on this site	

Climatic Features

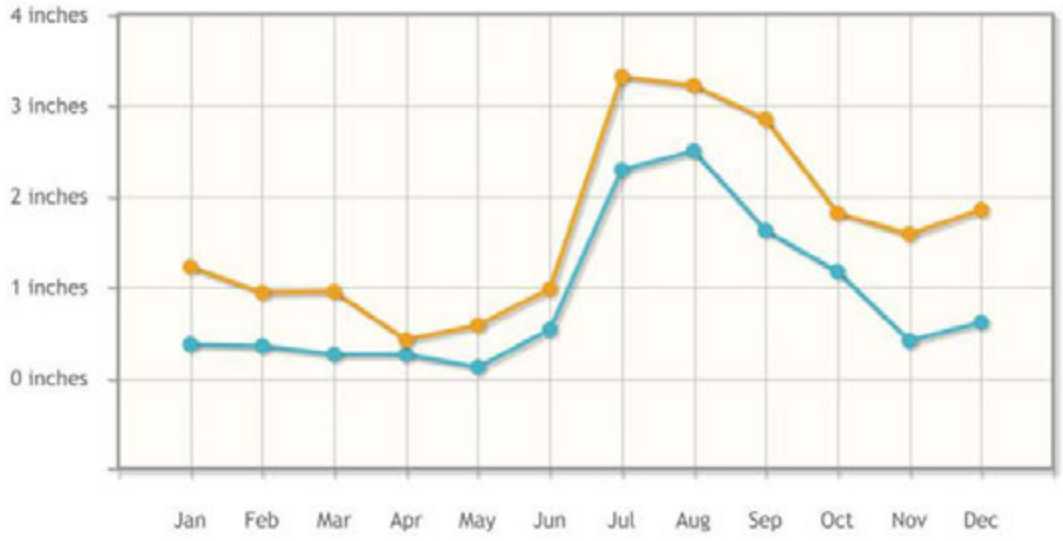
Average annual precipitation varies from about 12 inches to just over 16 inches. Substantial fluctuations from year to year are common, ranging from a low of about 6 inches to a high of over 30 inches. Approximately one-half of the annual precipitation comes in the form of rainfall during the months of July, August, and September, although wintertime precipitation in the form of snow, sleet or rain is sometimes significant. Spring and late fall months are normally dry. The average frost-free period ranges from about

165 to 190 days and extends from approximately the third or fourth week in April to mid October. Average annual air temperatures are about 56 degrees F. Summer maximums can exceed 100 degrees F and winter minimums on occasion go below zero. Monthly mean temperatures generally exceed 70 degrees F for the period of June through August. Growing conditions favor warm-season perennial vegetation, although late winter and late summer precipitation is adequate to foster a significant cool-season component in the potential plant community. Occasional wet springs also create good conditions for annual forb production, but frequent winds from the west and southwest are common during this time of the year and tend to deplete soil moisture at a critical time for the growth of these plants. Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

	Averaged
Frost-free period (days):	156
Freeze-free period (days):	178
Mean annual precipitation (inches):	16.00

Monthly Precipitation (Inches):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	1.22	0.94	0.95	0.42	0.58	0.98	3.32	3.22	2.85	1.81	1.58	1.85
Low	0.37	0.35	0.26	0.26	0.12	0.53	2.29	2.50	1.62	1.17	0.41	0.61



Monthly Temperature (°F):

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

High	55.6	60.1	66.1	74.2	82.6	92.0	92.6	89.9	85.7	76.2	64.4	55.9
Low	16.2	18.6	22.1	27.0	34.0	42.8	52.5	51.4	43.5	32.0	22.0	15.9

Climate stations: (1) 291910, Cliff 11SE, NM. Period of record 1937-2000
(2) 294009 Hillsboro, NM Period of Record 1924-2000
(3) 297386 Hood Ranger Stn., NM Period of Record 1954-2000
(4) 298324 Silver City, NM Period of Record 1961-1990
(5) 299806 Chloride Ranger Stn., NM Period of Record 1949-2000

Influencing Water Features

Representative Soil Features

Soils are deep to moderately deep and have surfaces and subsoils that are gravelly, cobbly, or stony fine sandy loams or clay loams. They are subject to severe water erosion when cover is inadequate. Plant, soil, and moisture relationships are generally good.

Surface texture: (1)Gravelly Sandy clay loam
(2)Cobbly Clay loam

Subsurface texture group: Clayey

	Minimum	Maximum
Surface fragments <=3" (% cover):	15	35
Surface fragments >3" (% cover):	15	35
Subsurface fragments <=3" (% volume):	4	57
Subsurface fragments >3" (% volume):	1	3

Drainage class: Well drained

Permeability class: Very slow to moderately rapid

	Minimum	Maximum
Depth (inches):	6	72
Available water capacity (inches):	1.00	6.00
Electrical conductivity (mmhos/cm):	0	4
Soil reaction (1:1 water):	6.6	8.4

Plant Communities

Ecological Dynamics of the Site

Overview

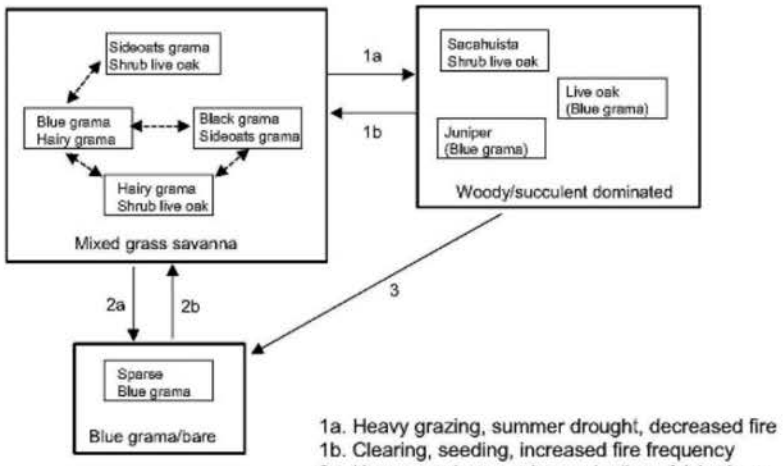
The breaks site intergrades with hills sites and often contain loamy sites occurring as narrow to broad drainageways. The historic plant communities of the breaks site are dominated by black grama (Bouteloua eriopoda)and sideoats grama (Bouteloua curtipendula) and/or blue grama (Bouteloua gracilis) among others, depending on soil types and aspect. Under heavy grazing pressure, especially on steeper slopes and on soils with strong argillic (clay-rich) horizons, erosion may lead to a persistent loss of vegetation. A decline in fire frequencies, or perhaps regional increases in the relative amount of winter rainfall or grazing, may lead to significant increases in the abundance of woody plants and succulents including sacahuista (Nolina microcarpa), shrub liveoak (Quercus spp.), and one-seed juniper (Juniperus monosperma). The established woody plants may compete with grasses and lead to persistent reductions in grass abundance.

No systematic studies of communities, states or transitions have been performed in the breaks site.

State-and-Transition Diagram

Plant Communities and Transitional Pathways (diagram)

State-Transition model: MLRA 36, WP-3, Gravelly site group: Breaks



1a. Heavy grazing, summer drought, decreased fire
1b. Clearing, seeding, increased fire frequency
2a. Heavy grazing, erosion, reduction of A horizon
2b. Erosion control, gully destruction
3. Clearing after erosion is severe

Historic Climax Plant Community

MLRA 36; WP-3; Breaks

Mixed grass savanna state


- Black grama, hairy grama, annuals
- Scattered oak and sacahuita
- High bare ground, following drought
- Lonti gravelly loam, Grant Co.

Mixed grass savanna state


- Blue grama, hairy grama
- Moderate oak and sacahuista density
- Lonti gravelly loam, Grant Co.

Woody/succulent-dominated state


- Sacahuista, oak, juniper dominant
- Scattered, small blue grama plants in interspaces.
- Bare ground high in interspaces
- Lonti gravelly loam, Grant Co.

MLRA 36; WP-3; Breaks

State Containint the Historic Climax Plant Community:

Mixed-grass savanna: The expression of the community depends upon aspect and soils. On south-facing slopes, black grama tends to dominate and there may be some sideoats grama among other grasses. On north-facing slopes, sideoats grama dominates, with blue grama and hairy grama (Bouteloua hirsuta) as subordinates; black grama occurs in smaller amounts. In some cases (especially west of Silver City), sacahuista (Nolina microcarpa) may be dense enough to be considered a secondary dominant. Live oak, sacahuista, and juniper exist in low densities giving the site a savanna aspect. Grazing and drought-induced mortality may lead to reductions in black and sideoats grama and dominance by hairy grama, blue grama, or annuals.

Diagnosis: Sacahuista, oak and juniper are present and scattered, most of the ground surface is grassy, with few large bare areas.

Transition to mixed grass savanna state (2b): The placement of structures (e.g. terraces) to retard erosion and that accumulate soil, in addition to the destruction of gullies, may be used to initiate the eventual recovery of perennial grass dominance.

Information sources and theoretical background: Communities, states, and transitions are based upon information in the ecological site description and observations by Gene Adkins, NRCS and Brandon Bestelmeyer, USDA-ARS Jornada Experimental Range.

Historic Climax Plant Community Plant Species Composition

Grass/Grasslike

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
1					185	221
		black grama	BOER4	*Bouteloua eriopoda*	185	221
2					74	111
		sideoats grama	BOCU	*Bouteloua curtipendula*	74	111
3					74	111
		blue grama	BOGR2	*Bouteloua gracilis*	74	111
4					37	111
		New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	37	111
5					7	37
		cane bluestem	BOBA3	*Bothriochloa barbinodis*	7	37
		vine-mesquite	PAOB	*Panicum obtusum*	7	37
		little bluestem	SCSC	*Schizachyrium scoparium*	7	37
6					7	37
		hairy grama	BOHI2	*Bouteloua hirsuta*	7	37
		Hall's panicum	PAHA	*Panicum hallii*	7	37
		sand dropseed	SPCR	*Sporobolus cryptandrus*	7	37
7					7	37
		perennial threeawn spp.	ARIST	*Aristida*	7	37
8					7	37
		Graminoid (grass or grass-like)	2GRAM		7	37

Forb

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
9					7	37
		wild buckwheat	ERIOG	*Eriogonum*	7	37
10					7	22
		Forb, annual	2FA		7	22

11				7	37
	Forb, perennial	2FP		7	37

Shrub/Vine

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
12					74	111
		sacahuista	NOMI	*Nolina microcarpa*	74	111
		oak spp.	QUERC	*Quercus*	74	111
13					0	22
		yerba-de-pasmo	BAPT	*Baccharis pteronioides*	0	22
		buckbrush ceanothus (Fendler's)	CEFE	*Ceanothus fendleri*	0	22
		mountainmahogany (hairy)	CEMOP	*Cercocarpus montanus var. paucidentatus*	0	22
		feather dalea	DAFO	*Dalea formosa*	0	22
		Apacheplume	FAPA	*Fallugia paradoxa*	0	22
14					7	22
		Shrub, deciduous	2SD		7	22
		broom snakeweed	GUSA2	*Gutierrezia sarothrae*	7	22
		pale wolfberry (desert thorn)	LYPA	*Lycium pallidum*	7	22
		cactus spp.	OPUNT	*Opuntia*	7	22
		yucca spp.	YUCCA	*Yucca*	7	22

Tree

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	High
15					7	22
		oneseed juniper	JUMO	*Juniperus monosperma*	7	22

Annual Production by Plant Type

Plant type	Annual Production (lbs/ac) Low	Representative value	High
Forb	30	59	88
Grass/Grasslike	293	576	858
Total:	323	635	946

Structure and Cover:

Ground Cover (%)

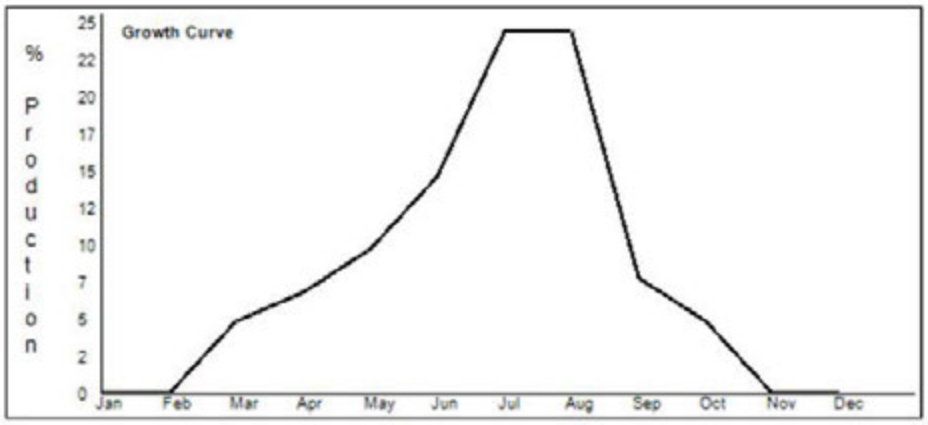
Vegetative Cover						Non-Vegetative Cover					
Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > 1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
		12 to 12	0 to 0			17 to 17					16 to 16

Plant Growth Curve

Growth curve number:	NM0605
Growth curve name:	R038XB105NM Breaks HCPC
Growth curve description:	R038XB105NM Breaks HCPC Mixed grassland/shrubland

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	25	25	8	5	0	0



Transition to woody/succulent-dominated state

Additional States:
Transition to woody/succulent-dominated state (1a): It is unclear why succulents or trees increase in abundance, although it is likely that the subsequent decline in grasses is due to competition for water and nutrients. The formation of bare ground patches due to grazing, decreases in fire frequency, and increases in winter precipitation, either independently or in concert, may be responsible for the transition.

Key indicators of approach to transition: Increases in bare ground, decreases in litter cover and grass cover, increased frequency of oak seedlings and small sacahuista

(threshold may have been crossed), decreased fire frequency.

Transition to woody/succulent-dominated state (1b): Thinning of woody or succulent species may release grasses from competitive suppression and grasses may colonize patches where trees or sacahuista were present. If erosion in interspaces has not been severe, recolonization may take place there over several years.

Woody/succulent-dominated: Grass cover is often highly reduced and shrubs, trees, or succulents become dominant. Bare ground cover is great, and scattered, small blue grama or hairy grama plants represent the dominant grass cover. West of Silver City, sacahuista tends to dominate in this state, and liveoak may or may not be a secondary dominant. In other cases, juniper or oak may dominate.

Diagnosis: Oak, sacahuista, and/or juniper are the dominant perennial species and the bare ground areas between them are interconnected. Grass clumps are small and scattered. Evidence of erosion (rills, water flow patterns, pedestalling) is common.

Transition to blue grama/bare state

Transition to blue grama/bare state (2a): Heavy grazing, especially in drought conditions on steeper slopes and on soils with shallow, strong argillic horizons (e.g. Lonti gravelly loam) may result in grass loss and subsequent erosion of the organic matter-rich A horizon.

Key indicators of approach to transition: Increases in bare ground, decreases in litter cover and grass cover, surface soil loss, water flow patterns, rills, pedestalling of plants and stones.

Transition to blue grama/bare state (3): Tree and succulent removal, especially on slopes, may accelerate erosion if grasses do not respond to the treatment and the soil is exposed to raindrop impact and erosion.

Blue grama/bare: This state is characterized by extreme erosion and tends to occur on steeper slopes. Bare ground cover is extreme, gullies may be present, and few small perennial plants, usually blue grama, are present. Trees and succulents are not especially abundant.

Diagnosis: Bare ground cover is interconnected, and trees and succulents are not especially abundant. Evidence of erosion is common, the mollic A horizon is very shallow (a few cm) or missing.

Transition to blue grama/bare state (3): Tree and succulent removal, especially on slopes, may accelerate erosion if grasses do not respond to the treatment and the soil is exposed to raindrop impact and erosion.

Section II: Ecological Site Interpretations

Animal Community

Habitat for Wildlife:
This ecological site provides habitat which can support a resident animal community characterized by mule deer, desert cottontail, Merriam's kangaroo rat, brush mouse, white-throated woodrat, gray fox, hognose skunk, Gambel's quail, roadrunner, scrub jay, Abert's towhee, alligator lizard, black-tailed rattlesnake, and Gila monster.

Where closely associated with riparian habitats of river valleys, this site provides hunting and foraging areas for vermilion flycatcher, Bullock's oriole, Lucy's warbler, summer tanager, cardinal, white-winged dove, blue grosbeak phainopepla, painted redstart, turkey vulture, and Swainson's hawk. The prairie falcon and golden eagle nest on cliffs and ledges.

Several species of riparian habitat dependent birds classified as endangered in New Mexico utilize this site for hunting and foraging where it is associated with river valleys.

Plant Preference by Animal Kind

Animal kind: mature cow cattle

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
cane bluestem	*Bothriochloa barbinodis*	Entire plant	U	U	U	U	U	P	P	U	U	U	U	U
sideoats grama	*Bouteloua curtipendula*	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
black grama	*Bouteloua eriopoda*	Entire plant	P	P	P	D	D	D	D	D	D	D	P	P
blue grama	*Bouteloua gracilis*	Entire plant	D	D	D	D	P	P	P	P	P	D	D	D
mountainmahogany (hairy)	*Cercocarpus montanus var. paucidentatus*	Entire plant												
vine-mesquite	*Panicum obtusum*	Entire plant	D	D	D	D	D	D	D	D	D	D	D	D
little bluestem	*Schizachyrium scoparium*	Entire plant												

Animal kind: mature deer deer

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
wild buckwheat	*Eriogonum*	Entire plant	U	U	D	D	D	D	D	D	U	U	U	U
New Mexico feathergrass	*Hesperostipa neomexicana*	Entire plant	U	U	D	D	D	U	U	U	D	D	D	U
oak spp.	*Quercus*	Entire plant												

Legend: P=Preferred; D=Desirable; U=Undesirable; N=Not consumed; E=Emergency; T=Toxic; X=Used, but degree of utilization unknown

Hydrology Functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations
Soil Series----------Hydrologic Group
Aridic Argiustolls----------C
Boysag----------D
Golddust----------C
Guy----------B
Ildefonso----------B
Jonale----------B
Lonti----------D
Muzzler----------D
Orthents----------B
Orthids----------B
Pena----------B
Plack----------D
Ustorthents----------B

Recreational Uses

This site offers recreation potential for hiking, horseback riding, picnicking, nature observation, photography, and hunting for deer and quail. Where associated with riparian habitats of river valleys, bird watching is a major recreational activity.

The site displays a colorful array of wildflowers during certain seasons and when favorable soil/moisture conditions exist.

Wood Products

This site has a very limited potential for firewood and fence postproduction where

junipers are present and where steepness of slope does not make harvesting prohibitive.

Other Products

Grazing:
This site is suitable for grazing in all seasons of the year. Cattle, sheep, goats, and horses can graze this site; class of livestock used is influenced by terrain. Although most of the forage is produced in the summer months, cool-season grasses such as New Mexico feathergrass and various browse plants provide green forage at other times as well. As retrogression occurs under continuous yearlong or prolonged heavy grazing or browsing, these plants are usually first to decline. Severe deterioration in the plant community can result in heavy stands of juniper, oak, or sacahuista, and the site is slow to recover through improved grazing management alone. It is generally not conducive to mechanical brush control or seeding, but grazing by more than one species of livestock (such as goats and cattle or sheep and cattle) is a means of maintaining a healthy balance of woody and herbaceous plants. It is highly erodible once vegetative cover is substantially reduced and is difficult to protect structurally.

Other Information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity Index----------Ac/AUM
100 - 76----------3.5 – 4.8
75 – 51----------4.5 – 7.0
50 – 26----------6.7 – 12.0
25 – 0----------12.0+

Supporting Information

Type Locality

State:	NM
County:	Catron
State:	NM
County:	Grant
State:	NM
County:	Hidalgo
State:	NM
County:	Sierra
State:	NM
County:	Socorro

Other References

Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus and Mesas 36 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: Socorro, Sierra, Grant, Catron.

Characteristic Soils Are:
Boysag, Guy

Other Soils included are:
Aridic Argiustolls, Chimayo, Ildefonso, Golddust, Jonale, Lonti, Muzzler, Orthents, Orthids, Pena, Plack, Plack Variant, Ustorthents, Ustorthents Dissected

Site Authors

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Quality Assurance

Provisional Status Verified in Legacy System

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 038X **Ecological Site:** Breaks R038XB105NM This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Composition (indicators 10 and 12) based on: Annual Production, Foliar Cover, Biomass

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Indicators. For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community and natural distrurbance regimes within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

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1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness):**

10. **Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines:**
    Dominant:
    Sub-dominant:

Other:
Additional:

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13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

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14. Average percent litter cover (%) and depth (inches):

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15. Expected annual production (this is TOTAL above-ground production, not just forage production):

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16. Potential invasive (including noxious) species (native and non-native). List Species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicator, we are describing what is NOT expected in the reference state for the ecological site:

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17. Perennial plant reproductive capability:

Appendix B: Plant, Bird, Mammal, Reptile and Amphibian Species Lists (Field work sightings in September, 2015)

	Grasses		
	Common Name	**Genus**	**Species**
1	Purple 3 Awn	Aristida	purpurea
2	Poverty 3 Awn	Aristida	divericata
3	Cane beardgrass	Bothriochloa	barbinoides
4	Blue grama	Bouteloua	gracilis
5	Sideoats grama	Bouteloua	curtipendula
6	Sprucetop grama	Bouteloua	chondrasoides
7	Hairy grama	Bouteloua	hirsuta
8	Black grama	Bouteloua	eriopoda
9	6 Weeks Grama	Bouteloua	barbata
10	Rescuegrass	Bromus	catharticus
11	Sedges	Carex	sp.
12	Sandbur	Cenchrus	ciliatus
13	Feather Fingergrass	Chloris	virgata
14	Common bermudagrass	Cynodon	dactylon
15	Barnyardgrass	Echinochloa	crus-galli
16	Western wheatgrass	Elymus	smithii
17	Stinkgrass	Eragrostis	cilianensis
18	Squirreltail	Elymus	elymoides
19	Lehmans lovegrass	Eragrostis	intermedia
20	Plains lovegrass	Eragrostis	elongatus
21	Weeping lovegrass	Eragrostis	curvula
22	Fluffgrass	Erioneuron	pulchellum
23	Curly mesquite	Hilaria	belangeri
24	Foxtail	Hordeum	jubatum
25	Bullrush	Juncus	sp.
26	Little Barley	Hordeum	pusillum
27	Junegrass	Koeleria	cristata
28	Green sprangletop	Leptochloa	dubia
29	Bullgrass	Muhlenbergia	emersleyi
30	Porter's muhly (hoegrass)	Muhlenbergia	porteri

Grasses Continued

	Common Name	Genus	Species
31	Deergrass	Muhlenbergia	rigens
32	Ring muhly	Muhlenbergia	torreyi
33	Creeping muhly	Muhlenbergia	repens
34	Fall wichgrass	Panicum	capillare
35	Hall's Panicum	Panicum	hallii
36	Vine mesquite	Panicum	obtusum
37	Pinyon ricegrass	Piptochaetum	fimbriatum
38	Tobosa	Pleuraphis	mutica
39	6 Weeks Bluegrass	Poa	annua
40	Rabbitsfoot grass	Polypogon	monspeliensis
41	Burrograss	Sclerepogon	brevifolius
42	Little bluestem	Schizachrium	scopaarium
43	Plains bristlegrass	Setaria	machrostachya
44	Clinging bristlegrass	Setaria	adhaerens
45	Sand Dropseed	Sporobolus	cryptandrus
46	Giant Sacaton	Sporobolus	giganteus
47	Spike dropseed	Sporobolus	contractus
48	New Mexico feathergrass	Stipa	neomexicana
49	Cattail	Typha	angustifolia
50			

	Forbs		
	Common Name	**Genus**	**Species**
1	Carelessweed	Amaranthus	palmeri
2	Western ragweed	Ambrosia	psilostachya
3	Ammocodon	Acleisanthes	chenopodiodie
4	Prickly poppy	Argemone	polyanthemos
5	Louisiana Sagewort	Artemesia	ludoviciana
6	Prostrate Euphorbia	Chamaesyce	prostrata
7	Lamb's Quarters	Chenopodium	sp.
8	New Mexico thistle	Cirsium	neomexicanum
9	Rocky Mtn. beeplant	Cleome	serrulata
10	Narrowleaf tick clover	Colongania	angustifolia
11	Field Bindweed	Convulvus	arvensis
12	Mare's Tail	Conyza	canadensis
13	Hawksbeard	Crepis	acuminata
14	Croton	Croton	texensis
15	Hiddenflower	Cryptantha	crassisepala
16	Buffalogourd	Cucurbita	foetidissima
17	Foxtail Prairie-clover	Dalea	leporina
18	Sacred Datura	Datura	wrightii
19	Purple Aster	Diteria	canescens
20	New Mexico daisy	Erigeron	neomexicana
21	Buckwheat	Eriogonum	sp.
22	Toothed poinsetta	Euphorbia	dentata
23	Gaura	Gaura	sp.
24	Sunflower	Helianthus	annus
25	Annual goldeneye	Heliomerus	longifolia
26	Showy goldeneye	Heliomerus	multiflora
27	Trumpet gilia	Ipomopsis	longiflora
28	Scarlet Morning Glory	Ipomea	hederifolia
29	Kochia	Kochia	scoparia
30	Stickseed	Lapula	occidentalis
31	Purple Aster	Machaeranthera	canescens
32	Horehound	Marrubium	vulgare
33	Yellow Sweetclover	Melilotus	officinalis
34	White Sweetclover	Melilotus	alba

Forbs Continued

	Common Name	Genus	Species
35	Blazing Star	Mentzelia	sp.
36	Monkeyflower	Mimulus	guttatus
37	Purple mat	Nama	hispidum
38	Hooker evening primrose	Oenothera	hookeri
39	Blue penstemon	Penstemon	sp.
40	Slimleaf lima bean	Phaeseolus	angustifolia
41	Knotweed	Phyllanthes	polygones
42	Ground Cherry	Physalis	sp.
43	Wooly plantain	Plantago	purshii
44	Prostrate Knotweed	Polygonum	aviculare
45	Devils claw	Proboscidia	parviflora
46	Straw everlasting	Pseudodognaphalium	straminium
47	False dandelion	Pyrrhopappus	pauciflorus
48	Watercress	Roripa	sinuata
49	Rosary bean	Rhynchosia	senna
50	Curly Dock	Rumex	crispus
51	Russian Thistle	Salsola	kali
52	Threadleaf groundsel	Senecio	flaccidus
53	Silver Leaf Nightshade	Solanum	eleagnofolium
54	Buffalo Bur	Solanum	rostratum
55	Goldenrod	Solidago	missouriensis
56	Sow Thistle	Sonchus	asper
57	Globemallow	Sphaeralcia	sp.
58	Navajo tea	Thelasperma	gracilis
59	Stinging nettle	Urtica	gracilenta
60	Mullein	Verbascum	thapsus
61	Verbena	Verbena	wrightii
62	Water speedwell	Veronica	aquatica
63	Slim vetch	Vicia	ludoviciana
64	Giant goldeneye	Viguera	dentata
65	Cocklebur	Xanthium	strumarium
66	Zinnia	Zinnia	grandiflora

	Shrubs & Vines		
	Common Name	**Genus**	**Species**
1	Beebush	Aloysia	wrightii
2	4 Wing Saltbush	Atriplex	canescens
3	Yerba de Pasmo	Bacharis	pteronoides
4	Brickelbush	Brickellia	Sp.
5	Fairyduster	Caliandra	humulis
6	Rubber Rabbitbrush	Chrysothamnus	nauseosus
7	Virgin's Bower	Clematis	drumondii
8	Indigobush	Dalea	formosa
9	Sotol	Dasylirion	wheeleri
10	Mormon tea	Ephedra	trifurca
11	Shrubby buckwheat	Eriogonum	wrightii
12	Apache plume	Fallugia	paradoxa
13	Mountain spray	Holodiscus	dumosa
14	drumondii+K11:M30	Hymenoclea	monogyra
15	Pale Wolfberry	Lycium	pallidum
16	Wait a bit (catclaw)	Mimosa	biuncifera
17	Beargrass	Nolina	macrocarpa
18	Prickly Pear	Opuntia	polycantha
19	Cholla	Opuntia	imbicata
20	Mariola	Parthenium	incanum
21	Virginia creeper	Parthenocissus	vitacea
22	Mesquite	Prosopis	glandula
23	3 Leaf Sumac	Rhus	trilobata
24	Snakeweed	Xanthocephalum	sorathorae
25	Soapweed Yucca	Yucca	glauca
26	Bannana Yucca	Yucca	bacata
27	Soaptree Yucca	Yucca	elata
28	Yucca Spanish Dagger	Yucca	sp.

	Trees		
	Common Name	**Genus**	**Species**
1	Rocky Mtn Maple	Acer	glabrum
2	Box Elder	Acer	negundo
3	Tree of heaven	Ailanthus	altissimus
4	Pointleaf manzanita	Arctostapylos	pungens
5	Hackberry	Celtis	reticulata
6	Mountain mahogony	Cercocarpus	montanus
7	Desert willow	Chilopsis	linearis
8	NM Olive	Foresteria	pubescens
9	Velvet Ash	Fraxinus	velutina
10	Arizona Walnut	Juglans	major
11	Alligator Juniper	Juniperus	deppeana
12	One Seed Juniper	Juniperus	monosperma
13	Mulberry	Morus	rubra
14	Pinon pine	Pinus	edulis
15	Arizona Sycamore	Platinus	wrightii
16	Cottonwood	Populus	wislizeni
17	Hoptree	Ptelea	trifoliata
18	Gambels oak	Quercus	gambelli
19	Emory Oak	Quercus	emoryi
20	Gray Oak	Quercus	grisea
21	Wavy leaf Oak	Quercus	turbinella
22	Soapberry	Sapundis	saponaria
23	Siberian Elm	Ulmus	pumila

	Birds		
	Common Name	**Genus**	**Species**
1	Great Blue Heron	Ardea	herodias
2	Turkey vulture	Cathartes	aura
3	Cooper'sHawk	Accipiter	cooperii
4	Red-Tailed Hawk	Buteo	jamaicensis
5	Common Black Hawk	Buteogallus	asnthracinus
6	American Kestrel	Falco	sparverius
7	Gambel's Quail	Calipepla	gambelii
8	Scaled Quail	Calipepla	squamata
9	Montezuma Quail	Cyrtonyx	montezumae
10	White Wing Dove	Zenaida	asiatica
11	Mourning Dove	Zenaida	macroura
12	Greater Roadrunner	Geococcyx	californicus
13	Western Screech Owl	Otus	kenicottii
14	Great Horned Owl	Bubo	virginianus
15	Common Poorwill	Phalaenoptilus	nuttallii
16	Common nighthawk	Cordeiles	minor
17	Belted kingfisher	Ceryle	alcyon
18	White throated swift	Aeronautes	saxatalus
19	Black-chinned hummingbird	Archilochus	aleandri
20	Broad tailed hummingbird	Selasphorus	platycerus
21	Rufous hummingbird	Selasphorus	rufus
22	Northern Flicker	Colaptes	auratus
23	Downy Woodpecker	Picoides	pubescens
24	Hairy Woodpecker	Picoides	villosus
25	Acorn Woodpecker	Melanerpes	formacivorus
26	Western Wood- Pewee	Contopus	sodidulus
27	Cassin's Kingbird	Tyrannus	vociferans
28	Loggerhead Shrike	Lanius	ludoviianus
29	Western Scrub-Jay	Aphelocoma	californica
30	Bushtit	Psaltriparus	minimus

Birds Continued

	Common Name	Genus	Species
31	Common Raven	Corvus	corax
32	Violet Green Swallow	Tachycinita	thalassina
33	Cliff Swallow	Petrochelidon	pyrrhonata
34	Bewick's Wren	Thryomanes	bewickii
35	Rock Wren	Salpinctes	obsoletus
36	Canyon Wren	Catherpes	mexicanus
37	Western Bluebird	Sialia	mexicanua
38	American Robin	Turdus	migratorius
39	Phainopepla	Phainopepla	nitens
40	MacGillivray's Warbler	Oporornis	tolmei
41	Yellow Warbler	Dendroica	petechia
42	Yellow-rumped Warbler	Dendroica	coronata
43	Wilson's Warbler	Wilsonia	pusilla
44	Blue Grosbeak	Passerina	caerulea
45	Canyon Towhee	Pipilo	fuscus
46	Spotted Towhee	Pipilo	maculitus
47	Blacked-throated Sparrow	Amphispiza	bilineata
48	Chipping Sparrow	Spizella	passerina
49	Clay Colored Sparrow	Spizella	pallida
50	Rufous-crowned Sparrow	Aimophila	ruficeps
51	Bullock's Oriole	Icterus	bullocki
52	Scott's Oriole	Icterus	parisorum
53	House Finch	Carpodacus	mexicanus

	Mammals (sighting, tracks, call, burrow, or scat)		
	Common Name	**Genus**	**Species**
1	unknown Bat	small	during evening hours
2	Black Bear	Ursus	americanus
3	Coyote	Canis	latrans
4	Raccoon	Procyon	lotor
5	Rock Squirrel	Citellus	variegatus
6	Merriam Kangaroo Rat	Dipodomis	merriami
7	Mexican Woodrat	Neotoma	mexicana
8	Javalina	Pecari	angulatus
9	Blacktail Jackrabbit	Lepus	californicus
10	Desert Cottontail	Sylvilagus	audoboni
11	Elk	Cervus	canadensis
12	Mule Deer	Odocoileus	hemionus
13	Whitetail Deer	Odocoileus	virginianus
14	Desert Bighorn sheep	Ovis	canadensis

	Amphibians and Reptiles		
	Common Name	**Genus**	**Species**
1	Greater earless lizard	Holbrookia	texana
2	NM Whiptail	Cnemidophorus	neomexicanus
3	Western Fence Lizard	Sceloporus	occidentalis
4	Short horned lizard	Phrynosoma	douglassii
5	Blacktailed Rattlesnake	Crotalus	molossus
6	Striped Whipsnake	Masticophis	taeniatus
7	Leopard frog	Rana	pipens
8	Canyon tree frog	Hyla	arenicala

Appendix E: Literature References

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Appendix D: Double E Ranch Big Game Assessment

Double E Ranch Management Plan-Big Game Assessment

Upland Biological Assessment

Big Game Species:

- Mule deer (*Odocoileus hemionus*)
- Coues' white-tailed deer (*Odocoileus virginianus couesi*)
- Rocky Mountain bighorn sheep (*Ovis Canadensis canadensis*)
- Javelina (*Pecari tajacu*)
- Black bear (*Ursus americanus*)
- Mountain lion (*Felis concolor*)
- Elk (*Cervus canadensis*)

Current Status

Mule deer, Coues' white-tailed deer, Rocky Mountain bighorn, javelina, and black bear have all been observed during helicopter and ground surveys on the Double E Ranch (Figure 1). Mountain lion sign is also regularly evident. Elk and elk sign have been observed on some portions of the property but their use is less common and inconsistent compared to the other listed species.

Future Considerations for Big Game Management

Monitoring- While the initial management plan stems from current knowledge of the cultural and natural resources present on the Double E, regular monitoring will be key to understanding how those resources change over time. Monitoring methods for big game species may include annual ground and/or aerial (helicopter or fixed-wing) surveys, camera traps, and radiocollar deployment. Surveys provide presence/absence data, minimum counts, and observation rates. When examined in the context of a historical dataset, these figures provide insight into trends and are very important to developing relevant management strategies. Additionally, the use of trail cameras throughout the year may supplement our understanding by recording trans-seasonal patterns in wildlife presence on the Double E. Lastly, the deployment of radiocollars or similar tracking devices could be highly informative. Collared individuals would allow the Department to document movements and causes of mortality according to species, thus contributing to the overall understanding of local population dynamics. Continual monitoring will aid the Department in its mission to manage the property in a way that both benefits the public and conserves the fish and wildlife therein.

Habitat Improvement- Thoroughly planned habitat improvement projects serve to directly benefit wildlife and subsequently increase big-game viewing and hunting opportunities on the Double E. Thinning is one management practice that would enhance habitat on the Double E. When performed in strategically selected areas, mechanical thinning and/or prescribed burning of woody vegetation would open and improve habitat, directly benefiting mule deer, bighorn sheep, and many other wildlife species (Albert et al. 1995, Smith et al. 1999). Fire is an important aspect of many ecosystems across the western United States. A reduction in fine fuels due to livestock grazing, as well as intentional suppression, has led to overgrowth of woody vegetation and negative impacts on bighorn visibility and predator detection (Wakelyn 1987, Huddleston-Lorton 2000). Mule deer may also benefit from improved visibility, but more importantly will gain from increased "edge" habitat and vegetative diversity associated with thinning (Short et al. 1977). Habitat treatments take considerable time and effort in their planning and execution. Any such undertaking should involve input from a variety of Department personnel as well as collaboration with the appropriate agencies.

Big Game Translocations- Translocations are an important tool used by fish and wildlife managers to restore populations. Value is realized in both the removal (often from an overabundant population) and the augmentation. In recent years, NMDGF has transplanted pronghorn antelope, Rocky Mountain and desert bighorn sheep, mule deer, and Gould's turkeys. The Double E Ranch is a potential destination for transplants of big game species, including bighorn sheep. Rocky Mountain bighorn in the Turkey Creek herd are already known to use some specific areas on the Double E. Restored in 1964, this herd has been subject to fluctuation, and is currently the smallest known bighorn population in New Mexico. Prerequisites to any big game release would likely include some level of habitat improvement and predator mitigation, such as pre-release mountain lion control that decreases in intensity as a herd becomes established. Mountain lion control has been a significant factor in the recovery of New Mexico desert bighorn (decreased total mortality by 52% [0.11] and mortality due to mountain lion predation by 71% [0.05] [NMDGF 2010]) and would greatly improve transplant success of bighorn or deer in the low elevation habitat of the Double E.

Hunting Assessment

Allowing the public access to the Double E Ranch will expand and enhance recreation in southwestern New Mexico. The considerable acreage and resource diversity on the Double E would support a range of hunting opportunities. A variety of big game species are present; including mule deer, Coues' white-tailed deer, Rocky Mountain bighorn sheep, javelina, black bear, mountain lion, and elk (although elk presence is less reliable).

The Double E Ranch is entirely within GMU 24, Bear Zone 10, and Cougar zone K. Desirable hunting areas near water sources (tanks, streams, and springs) can be found throughout the property. If opened to big game hunting, public use of the Double E would be expected to increase significantly. The Department may need to consider implementing some restrictions to

mitigate recreational impact, i.e motorized vehicle use, limiting camp sites. Such regulations would not only benefit the resources of the Double E, but would also improve the experience of recreational users.

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Figure 1. Aerial Turkey Creek Bighorn Surveys – sightings on the Double E						
Year	**Bighorn**	Mule Deer	White-tail Deer	Black Bear	Javelina	Coati
1987	**7**					
1992	**7**	34			11	
2000	**24**	2		2		
2001	**10**	30		2	7	
2002	**26**					
2004	**13**					
2008	**16**	8 (unk spp)			16	
2009	**30**	33	2		14	
2010	**11**					
2012		6				
2013	**4**	2			8	15

Figure 2. July 28th-30th, 2015 Ground Survey: Wildlife and Sign observed					
Species	**Group ID**	**Group Size**	**Group Description**	**General Location**	**Other Sign**
Black Bear	A	1	Young darker colored bear	Bear and scat at unnamed tank south of Medina Tank)	Scat, Trail Camera Photos of two black bears (Medina Tank)
Mule Deer	A	2	1 doe, 1 spike buck		
	B	1	unk		
	C	3	3 mature bucks		
	D	2	2 does		
	E	3	1 doe, 1 young forked buck, 1 mature buck		
	TOTAL	11			Tracks, scat
White-tailed Deer	A	2	2 bucks	Hill south of Medina Tank	
Elk	NA	NA	NA	Southern end	Several piles of scat observed near southern road and southern spring
Javelina	NA	NA	NA		Tracks

Appendix E: Double E Ranch Harvest Assessment Upland Game

Double E Harvest Assessment- Upland Game

Assess Hunting Opportunities and Develop Sustainable Hunting Strategies

- Kristin and Casey will conduct one assessment this summer. Input and possibly survey assistance will be obtained from area Field Ops (Derek Theobald and Mike Matthews)
- By September 15, they will produce an inventory of species that can be hunted now and species that may be huntable in the future, as well as management recommendations for sustaining or increasing populations.

This property has potential for some upland game harvest. Authorized upland game species recorded on the property includes Gambel's quail, Montezuma quail, white-winged dove, mourning dove, gray squirrel, and wild turkey. Of the authorized upland game species recorded on the property, harvest could be allowable for Gambel's quail, Montezuma quail, tree squirrel, white-winged dove, and mourning dove.

Gambel's quail harvest tends to be proportional to the density of birds present. In Arizona, it was found that no more than 25% of the population tends to be removed by hunting (Gallizioli 1965). The effect of harvest on Montezuma quail is not thoroughly understood, thus a more conservative approach to Montezuma quail should be followed when opening this property to upland hunting.

The impact of harvest on squirrel populations has not been thoroughly studied, but it is estimated that a 40% harvest of fall populations will not negatively impact eastern gray squirrel populations (Mosby 1969). Based on similar life history strategies, it is estimated that other tree squirrel species can sustain a similar harvest level.

As migratory birds, mourning doves and white-winged doves are managed at a federal level. State and federal regulations ensure that migratory birds are harvested sustainably. It has been suggested that white-winged dove harvest should not exceed 25% of the breeding population (Brown et al. 1977).

Harvest recommendation upland species present on the Double E Ranch:

- Open small game hunting to the public

-A conservative hunting approach could restrict hunting to walk-in access only

Upon the commencement of hunting, population monitoring should be conducted in the area, to ensure populations can sustain a harvest.

Harvest of wild turkey could be possible in the future. While assessing the riparian habitat in the deeded property, very little turkey sign was found. Several sightings of turkeys were made by individuals prior to entering the deeded land. This area was recently in a significant drought, and it is likely that turkey populations are at a low. With several years of normal precipitation, turkey populations should show a positive response. Prior to opening the property to turkey harvest, efforts should be conducted to estimate the turkey population

numbers on the property. Using known survival and reproductive rates from studies in the Midwest, a spring harvest of less than 30% of the total population should allow continued population growth (Vangilder 1992). This includes both males and females to account for incidental take of hens. This has been the basis for population management of wild turkey throughout much of the U.S. Research findings regarding population management from other geographic regions and subspecies provide a framework for harvest management of other subspecies. After the population has been assessed in the area, the impact of harvest could be properly assessed. To avoid overharvest, a conservative number of permits could be issued for the property.

Potential options for future wild turkey harvest:

- Special area draw hunt
- Special Youth hunt

Upon the commencement of hunting, population monitoring should be conducted in the area, to ensure populations can sustain a harvest.

Management recommendations for harvestable populations

Upland game species:

Managed grazing that leaves more vegetation at the end of the growing season could be beneficial for quail species during drought years. Having some grass from the previous growing season can provide nesting habitat in years when spring rains are lacking and new growth is limited. Leaving increased grass height may also benefit Montezuma quail, as they utilize areas with higher horizontal cover. Additionally, removing reducing juniper densities in some of the upland areas could stimulate additional grass and shrub growth, which could benefit quail species.

Turkey:

Improving riparian habitats through a low impact grazing regime could provide more nesting cover and additional food resources for turkeys. Riparian areas could be fenced off with gaps to allow cattle access to water, or winter dormant season grazing could be utilized to provide habitat improvements for turkeys/ Using mechanical treatments to clear some areas surrounding roost sites may also provide for better turkey habitat. Local National Wild Turkey Federation groups could be involved with habitat improvement projects. Several years of average to above-average precipitation may also increase turkey populations. Populations may still be low from the drought period. In the future, permitting a conservative number of hunting licenses for the area or allowing only spring harvest of toms may help turkey populations during poor weather and habitat conditions.

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Appendix F: Double E Ranch Non-game Birds Habitat Management Recommendations

Double E Ranch Nongame Birds Habitat Management Recommendations

Margaret "Peggy" Darr, NMDGF Nongame Avian Biologist

September 15, 2015

To date, 101 bird species have been documented on the Double E Ranch property, including 15 Species of Greatest Conservation Need (SGCN; See Appendix A). SGCN species were found in upland, riparian and cliff habitats. Below is a description of general habitat management recommendations for SGCN species in each habitat type. SGCN species with unique habitat management requirements are discussed separately.

Upland Habitats: The highest priority nongame bird species found on the Double E Ranch occur in the upland habitats. General recommendations for all upland nongame bird species include: limit ORV use to established trails and roads, limit harvest of berries and mast, including Pinyon Pine nuts, limit grazing to maintain adequate grass cover for species such as Black-chinned Sparrow *(Spizella atrogularis)*, and limit firewood removal. If limited firewood collection is allowed, this should not occur during the nesting season (May to July), and collectors should be encouraged to leave large, mature trees. They should also be encouraged to leave some large dead/dying trees. Below are species-specific management recommendations for the three highest priority species.

Pinyon Jay (Gymnorhinus cyanocephalus) and Juniper Titmouse (Baeolophus ridgwayi): Both of these species require mature Pinyon-Juniper habitat. Mature Pinyon Pine trees are particularly important for Pinyon Jay (provide cones/seeds for feeding) and mature Juniper trees are very important for Juniper Titmouse (provide cavities for nesting). Retention of mature Pinyon-Juniper patches of at least 7 square miles (average size of a Pinyon Jay flock home range) is recommended (Balda and Bateman 1971). If a Pinyon Jay nesting colony is located, ORV driving and other disturbances should be prohibited within 0.6 miles of the site (Gillihan 2006). If thinning activities are conducted, it is recommended at least 35% (30 trees per acre) mature tree canopy cover be retained (Miller et al. 1999). Some trees in younger age classes should also be retained for stand diversity. Mature trees should measure at least 12 inches at the root collar (Miller et al. 1999). Some areas of thicker mature Pinyon-Juniper should be retained for nesting activities and some small openings should be retained for foraging. Retention of dead/dying trees and downed logs is also necessary. There should be at least one large (10-inch diameter at root crown) dead standing tree per acre and at least 2 large (10-inch diameter and 10-feet long) downed trees per acre (Miller et al. 1999). Pinyon-Juniper woodlands are not fire adapted like Ponderosa Pine Forests (Gillihan 2006 and Romme et al. 2007), so prescribed fire is not recommended for management purposes. Pinyon-Juniper woodlands naturally lack the understory to carry a low-intensity ground fire, and historically had stand-replacing burns every few hundred years (Baker and Shinneman 2004 and Romme et al. 2007). The NMDGF bird program is working to refine habitat management prescriptions for both of these species, so consultation with the nongame avian biologist prior to any management activities in Pinyon-Juniper woodlands is recommended.

Black-chinned Sparrow: This species was found in numerous locations throughout the property. It is considered a shrub breeding species, usually inhabiting moderately open montane mountain slopes up to 8,000 feet in elevation (New Mexico Partners in Flight 2007). It requires moderately thick shrub cover, with shrubs averaging 3-7 feet in height. Interspaces between shrubs should have high grass/forb cover, and some large Pinyon or Juniper usually occur in appropriate habitat (New Mexico Partners in Flight 2007). Because it inhabits early successional montane habitats, some mechanical clearing or prescribed fire is recommended to maintain Black-chinned Sparrow habitat. Extreme caution should be taken to avoid negative impacts to Pinyon Jay and Juniper Titmouse by avoiding excessive clearing or prescribed fire in areas occupied by these species.

Riparian Habitats: Cattle grazing should be very limited in all riparian areas to allow for healthy recruitment of plant species, including the brushy undergrowth required by Bell's Vireo (*Vireo Bellii)* and other SGCN species. Limiting cattle grazing will also reduce cowbird parasitism rates, which can be very high for Bell's Vireo (Brown 1993). If limited livestock grazing is allowed, employing a rest and rotation schedule will reduce cowbird pressure on breeding pairs by allowing them time to breed without cowbird presence (Gillihan 2006). Fuelwood gathering should be limited to downed logs to maintain adequate snags for cavity nesting SGCN species such as Lucy's Warbler (*Oreothlypis luciae)* and Elf Owl (*Micrathene whitneyi;* Partners in Flight 2007). Some downed logs, however, should be retained to provide adequate insect prey base for woodpeckers and other insectivorous species. Truck and ORV use in the riparian area should be limited to designated roads and trails. The current road along Bear Creek can become overgrown with vegetation rapidly, resulting in difficult access by truck and ORV. Because of the difficulty in finding the road, drivers may inadvertently damage riparian vegetation while trying to locate it. Clearly marking the road is therefore highly recommended. The riparian areas along Bear Creek are not designated critical habitat for the federally listed Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) or Southwestern Willow Flycatcher (*Empidonax traillii extimus)*, and neither species has been documented to date.

Cliff Habitats: Golden Eagle (*Aquila chrysaetos*) and Peregrine Falcon (*Falco peregrinus*) were both documented. Nests were not located, but according to the previous property owner, a Golden Eagle pair has regularly nested in the canyon at the entrance gate to the property (See Appendix B). Care should be taken to reduce disturbance to these nesting eagles by reducing activities such as rock climbing or ORV use at the top edge of the canyon. Care should be taken around all steep walled canyons and cliffs on the property to avoid disturbance to nesting Golden Eagles and Peregrine Falcons.

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Appendix A: List of Bird Species Documented on the Double E Ranch*

Acorn Woodpecker
American Crow
American Kestrel
Ash-throated Flycatcher
Bell's Vireo (breeding)**
Bewick's Wren
Black Phoebe
Black-chinned Sparrow (breeding)
Black-headed Grosbeak
Black-throated Gray Warbler (breeding)
Black-throated Sparrow
Blue Grosbeak
Blue-gray Gnatcatcher
Blue-winged Teal
Bridled Titmouse
Broad-tailed Hummingbird
Brown-crested Flycatcher
Brown-headed Cowbird
Bushtit
Canyon Towhee
Canyon Wren
Cassin's Kingbird
Chipping Sparrow
Cliff Swallow
Common Black Hawk (breeding)
Common Nighthawk (breeding)
Common Poorwill
Common Raven
Common Yellowthroat
Cooper's Hawk
Downy Woodpecker
Dusky Flycatcher
Elf Owl (breeding)
Gambel's Quail
Golden Eagle (breeding)
Gray Catbird
Gray Flycatcher
Great Blue Heron
Great Horned Owl
Greater Roadrunner
Green-tailed Towhee

Hairy Woodpecker
Hepatic Tanager
Hooded Oriole
House Finch
House Wren
Hutton's Vireo
Juniper Titmouse (breeding)
Killdeer
Ladder-backed Woodpecker
Lark Sparrow
Lazuli Bunting
Lesser Goldfinch
Lincoln's Sparrow
Lucy's Warbler (breeding)
Mallard
Mexican Jay
Montezuma Quail (breeding)
Mourning Dove (breeding)
Nashville Warbler
Northern Cardinal
Northern Flicker
Northern Mockingbird
Northern Pygmy Owl
Orange-crowned Warbler
Osprey
Painted Redstart (migrant in riparian area)
Peregrine Falcon (breeding)
Phainopepla
Pinyon Jay (breeding)
Plumbeous Vireo
Red-naped Sapsucker
Red-tailed Hawk
Rock Wren
Ruby-crowned Kinglet
Rufous Hummingbird
Rufous-crowned Sparrow
Say's Phoebe
Scaled Quail
Scott's Oriole
Sharp-shinned Hawk
Spotted Towhee
Summer Tanager
Townsend's Warbler

Turkey Vulture
Verdin
Violet-green Swallow
Virginia's Warbler (migrant in riparian area)
Warbling Vireo
Western Kingbird
Western Screech-Owl
Western Scrub-Jay
Western Tanager
Western Wood-Pewee
White-breasted Nuthatch
White-throated Swift
White-winged Dove
Wild Turkey
Wilson's Warbler
Yellow Warbler
Yellow-breasted Chat

*Species listed in Alphabetical Order by Common Name

** Names in bold are Species of Greatest Conservation Need

Appendix G: Double E Ranch Bear Creek Inventory/Assessment and Management Plan

Double E Ranch Bear Creek Inventory/Assessment and Management Plan 11 Aug 2015

Initial Survey:

On 9 June 2015 NMDGF biologist Andrew Monié and intern Cody Johnston surveyed Bear Creek, a tributary of the Gila River in the Cliff-Gila Valley. Sampling was done with a 4x10 foot drag seine. Sampling covered the approximately three mile portion of Bear Creek that flows across NMDGF's Double E Ranch. Flow was not continuous through the property, but became more perennial in the downstream half. Fish were collected throughout the perennial and intermittent portions. We sampled all available habitat types with a total of 44 seine hauls and collected four fish species (Table 1).

Table 1. Inventory of fish species collected in Bear Creek on the Double E Ranch, 9 June 2015.

Species		**NM Status**	**Federal Status**
Longfin Dace	*Agosia chrysogaster*	Not listed	Not listed
Desert Sucker	*Pantosteus clarkii*	Not listed	Not listed
Loach Minnow	*Tiaroga cobitis*	Endangered	Endangered
Fathead Minnow	*Pimephales promelas*	Nonnative	

Assessment of Bear Creek:

- Bear Creek flows intermittently though the Double E Ranch from east to west, becoming perennial toward the downstream property boundary.
- Bear Creek is shallow with abundant algal mats and emergent vegetation.
- Backwater or isolated pools form at canyon wall rock faces, often covered with duck weed.
- Substrate of sand and gravel most common with limited areas of cobble.
- Native Longfin Dace are abundant, native Desert Sucker and non-native Fathead Minnow are rare, and native Loach Minnow are very rare in Bear Creek on the EE Ranch.

Management for Native Fishes:

Loach Minnow are habitat specific and require riffles with large cobble for breeding and foraging (Sublette et. al., 1990). The Double E Ranch has a limited amount of this habitat type. Loach Minnow were first collected in Bear Creek approximately nine miles upstream in 2005. While it is likely that Bear Creek supports a small population of Loach Minnow it is not clear how much the Double E Ranch section contributes to the population. Annual monitoring of two 200 meter long sites on the Double E Ranch over the next five years will contribute to our understanding of the Bear Creek population and the importance of this section to Loach Minnow. The two sites identified on the map (Figure 1) include the location of the 2015 Loach Minnow collection and another site upstream that includes the largest in-stream pool habitat on the ranch (U.S. Bureau of Land Management inholding).

Sampling should include a combination of seining and electrofishing, whichever is most appropriate per mesohabitat. Sampling would include collecting fish and habitat data from each mesohabitat present at both sites. The length, width, depth, substrate, water velocity and cover availability would be recorded. All fish would be enumerated by species and morphometric data would be collected on the first 50 fish of each species. The survey should occur in June, which is usually after Loach Minnow have completed spawning and before the monsoon rains start.

Intermittency data for the entire reach of Bear Creek through the Double E Ranch would be recorded at the time of annual monitoring. Depending on the persistence of flows Bear Creek may be an appropriate location to repatriate another federally endangered fish, the Spikedace.

Potential Native Fish Management Actions:

Spikedace prefer sand and gravel substrates with shallow depths and clear water (Sublette et. al. 1990). They prefer swifter currents than what was present during the June 2015 survey, but it is unknown if those conditions are representative. Bear Creek should be evaluated as a potential Spikedace repatriation location. Plans for stocking Spikedace on the Double E Ranch should be contingent on the evaluation of intermittency in the reach.

Bear Creek experiences high flows as evidenced by debris flow lines at the canyon walls. In the Double E Ranch section Bear Creek is dominated by sand and gravel substrates. The combination of substrates and high flows make the potential for developing additional Loach Minnow habitat unlikely.

There may be potential to develop a stock tank to hold water perennially. If this were to occur it may provide a location to hold a refuge population of Gila Chub, a federal and state listed endangered species.

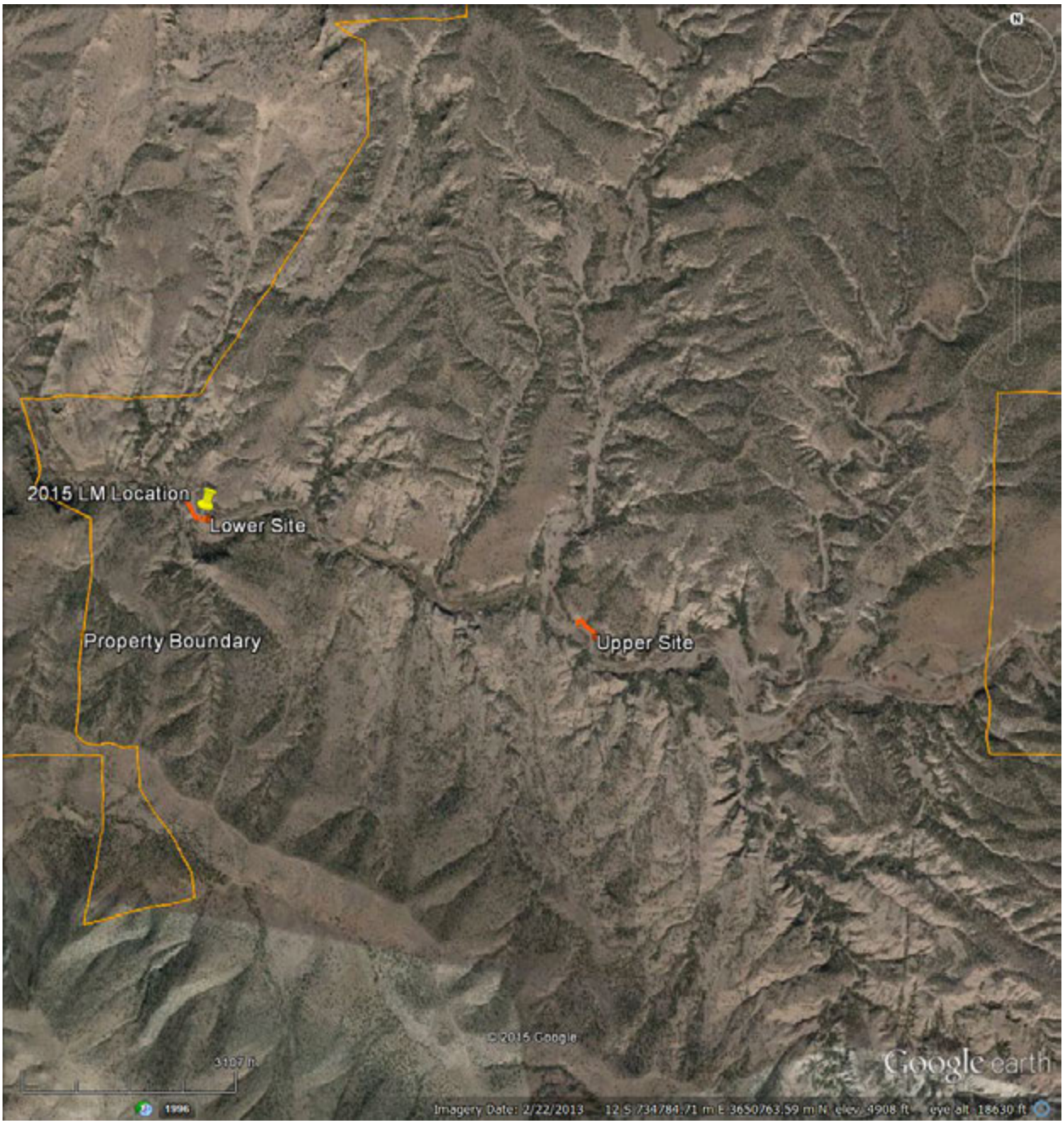


Figure 1. Location of proposed annual fish survey sites in Bear Creek on the Double E Ranch.

Table 1. Universal Transverse Mercator (Zone 12S, NAD 83) points for upstream and downstream ends of Monitoring sites.

Site	Downstream end	Upstream end
Lower Site	733191E, 3651041N	733312E, 3650930N
Upper Site	734997E, 3650487N	735079E, 3650358N

Literature Cited:

Sublette, E. J., D. M. Hatch, and M. Sublette. 1990. The Fishes of New Mexico. University of New Mexico Press, Albuquerque.

Appendix H: Double E Ranch Invertebrate Section

Invertebrate Section, EE management Plan

Four sites total were sampled on the EE Ranch (Table 1, Figure 1). Spring snails and other sensitive mollusks were the target species due to the presence of endemic spring snails in neighboring drainages. In addition, determining if federally listed mollusks and crustaceans were present was a priority. A kitchen sieve was used to collect invertebrates at each site and all collections were preserved in Whirl-paks with 95% ethanol. Each sample was returned to the lab at the New Mexico Department of Game and Fish headquarters office and sorted. Mollusks were identified to species when possible and arthropods were identified to order. No endemic, threatened, or endangered taxa were present in the samples.

Taxa List

Mollusks:

- Physa acuta
- Planorbella sp.

Arthropod orders:

- Coleoptera (beetles)
- Zygoptera (damselflies)
- Anisoptera (dragonflies)
- Hemiptera (true bugs)
- Hydrocarina (water mites)
- Ostracoda (seed shrimp)
- Ephemeroptera (mayflies)
- Trichoptera (caddisflies)
- Diptera (flies)

Assessment:

- Bear Creek appears to harbor a high diversity of aquatic invertebrates. However, specific management actions for invertebrates in this flood-prone creek are not currently recommended.
- EE spring # 1 (UTM Zone 12s; 737200 E, 3644600 N) hosted a high diversity of aquatic invertebrates including snails.
- Lea Spring consists of several seeps along a canyon bottom and along a sandstone wall. This spring did not have high aquatic invertebrate diversity and management needs will be limited.
- Additional unidentified springs on the ranch may host additional taxa. As such, it is recommended that the springs on the EE continue to be inventoried and surveyed for aquatic invertebrates, specifically mollusks and crustaceans.

Monitoring Plan:

No specific plan for monitoring of aquatic invertebrates is recommended. If a rare or imperiled mollusk or crustacean is discovered on the EE ranch, a monitoring plan for that species should be established and incorporated into the EE Management Plan.

Table 1. Locations and dates of invertebrate sampling on the EE Ranch.

Date	Site name	UTM (NAD83, Zone 12S)
6/25/2015	Bear Creek 1 (BC1)	734840, 3650504
6/25/2015	Bear Creek 2 (BC2)	735001, 3650508
7/29/2015	EE Spring 1	737200, 3644600
7/29/2015	Lea Spring	737397, 3653331

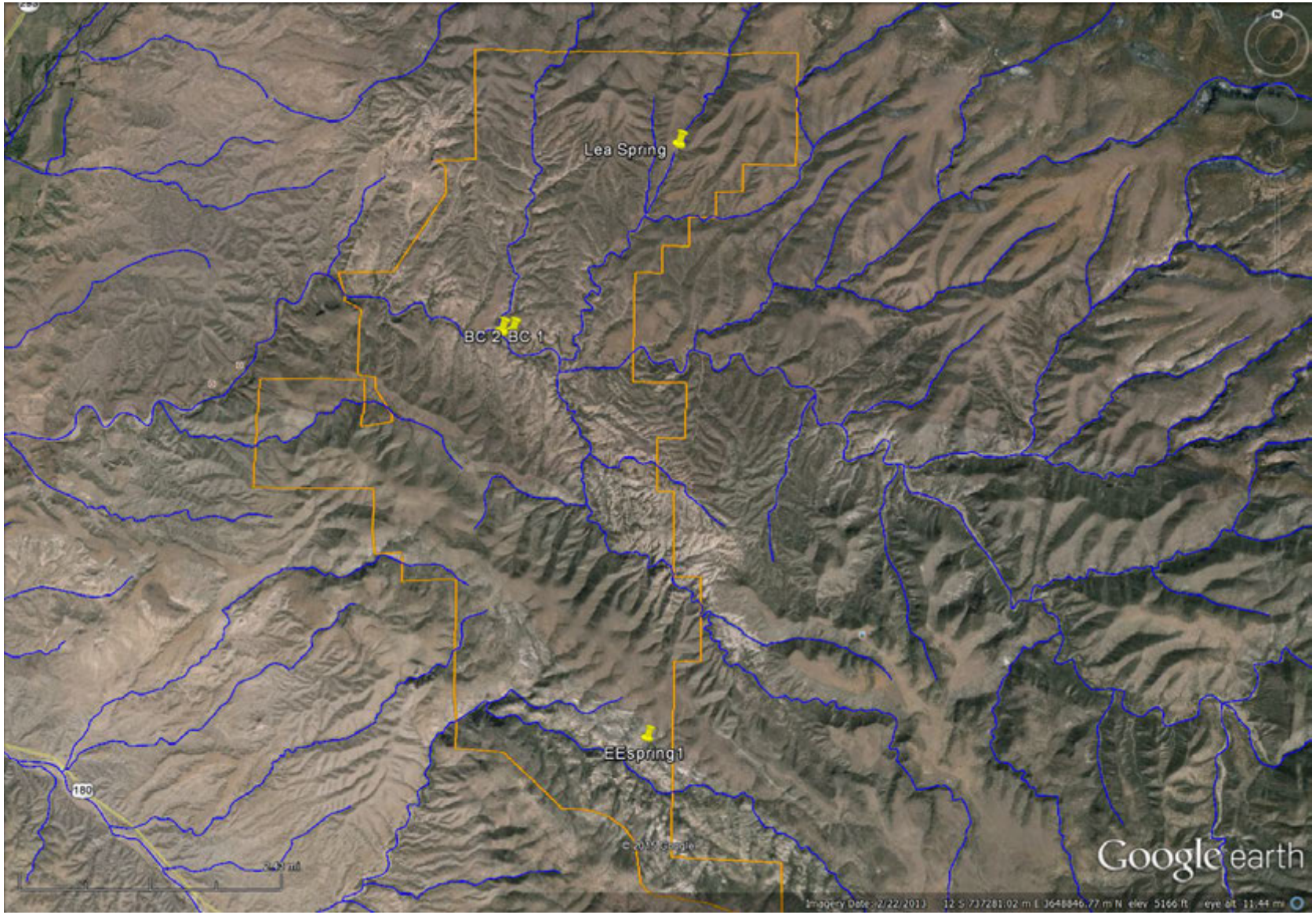


Figure 1. Invertebrate sampling locations on the EE Ranch.

Appendix I: Double E Ranch Documented Wildlife Species

Wildlife Observed on Double E Ranch, BLM and USFS Allotments

As of August 2016

Peggy Darr, Jim Stuart and Mark Watson, NMDGF

(**Bold** = Current or previous Species of Greatest Conservation Need)

Birds

Mallard (*Anas platyrhynchos*)

Blue-winged Teal (*Anas discors*)

Gambel's Quail (*Callipepla gambelii*)

Montezuma Quail (*Cyrtonyx montezumae*)

Scaled Quail (*Callipepla squamata*)

Merriam's Turkey (*Meleagris gallopavo*)

Great Blue Heron (*Ardea herodias*)

Turkey Vulture (*Cathartes aura*)

Osprey (*Pandion haliaetus*)

Cooper's Hawk (*Accipiter cooperii*)

Sharp-shinned Hawk (*Accipiter striatus*)

Red-tailed Hawk (*Buteo jamaicensis*)

Black Hawk (*Buteogallus anthracinus*)

Golden Eagle (*Aquila chrysaetos*)

Peregrine Falcon (*Falco peregrinus*)

American Kestrel (*Falco sparverius*)

Killdeer (*Charadrius vociferous*)

White-winged Dove (*Zenaida asiatica*)

Mourning Dove (Zenaida macroura)

Greater Roadrunner (*Geococcyx californianus*)

Northern Pygmy Owl (*Glaucidium gnoma*)

Western Screech-Owl (*Megascops kennicottii*)

Elf Owl (*Micrathene whitneyi*)

Great Horned Owl (*Bubo virginianus*)

Common Nighthawk (*Chordeiles minor*)

Common Poorwill (*Phalaenoptilus nuttalli*)

White-throated Swift (*Aeronautes saxatalis*)

Broad-tailed Hummingbird (*Selasphorus platycercus*)

Rufous Hummingbird (*Selasphorus rufus*)

Ladder-backed Woodpecker (*Picoides scalaris*)

Hairy Woodpecker (*Picoides villosus*)

Downy Woodpecker (*Picoides pubescens*)

Acorn Woodpecker (*Melanerpes formicivorus*)

Red-naped Sapsucker (*Sphyrapicus nuchalis*)

Northern Flicker (*Colaptes auratus*)

Western Wood Pewee (*Contopus sordidulus*)

Dusky Flycatcher (*Empidonax oberholseri*)

Gray Flycatcher (*Empidonax wrightii*)

Black Phoebe (*Sayornis nigricans*)

Say's Phoebe (*Sayornis saya*)

Ash-throated Flycatcher (*Myiarchus cinerascens*)

Brown-crested Flycatcher (*Myiarchus tyrannulus*)

Cassin's Kingbird (*Tyrannus vociferans*)

Western Kingbird (*Tyrannus verticalis*)

Bell's Vireo (*Vireo bellii*)

Plumbeous Vireo (*Vireo plumbeus*)

Warbling Vireo (*Vireo gilvus*)

Hutton's Vireo (*Vireo huttoni*)

Mexican Jay (*Aphelocoma woolweberi*)

Pinyon Jay (*Gymnorhinus cyanocephalus*)

Western Scrub Jay (*Aphelocoma californica*)

Common Raven (*Corvus corax*)

American Crow (*Corvus brachyrhynchos*)

Violet-green Swallow (*Tachycineta thalassina*)

Cliff Swallow (*Petrochelidon pyrrhonota*)

Bridled Titmouse (*Baeolophus wollweberi*)

Juniper Titmouse (*Baeolophus ridgwayi*)

Verdin (*Auriparus flaviceps*)

Bushtit (*Psaltriparus minimus*)

White-breasted Nuthatch (*Sitta carolinensis*)

Canyon Wren (*Catherpes mexicanus*)

Bewick's Wren (*Thryomanes bewickii*)

Rock Wren (*Salpinctes obsoletus*)

House Wren (*Troglodytes aedon*)

Ruby-crowned Kinglet (*Regulus calendula*)

Blue-gray Gnatcatcher (*Polioptila caerulea*)

Gray Catbird (*Dumetella carolinensis*)

Northern Mockingbird (*Mimus polyglottos*)

Phainopepla (*Phainopepla nitens*)

Lucy's Warbler (*Oreothlypis luciae*)

Yellow Warbler (*Setophaga petechial*)

Black-throated Gray Warbler (*Setophaga nigrescens*)

Painted Redstart (*Myioborus pictus*)

Virginia's Warbler (*Oreothlypis virginiae*)

Orange-crowned Warbler (*Oreothlypis celata*)

Wilson’s Warbler (*Cardellina pusilla*)

Nashville Warbler (*Oreothlypis ruficapilla*)

Townsend’s Warbler (*Setophaga townsendi*)

Yellow-breasted Chat (*Icteria virens*)

Common Yellowthroat (*Geothlypis trichas*)

Spotted Towhee (*Pipilo maculatus*)

Canyon Towhee (*Melozone fusca*)

Green-tailed Towhee (*Pipilo chlorurus*)

Song Sparrow (*Melospiza melodia*)

Rufous-crowned Sparrow (*Aimophila ruficeps*)

Chipping Sparrow (*Spizella passerine*)

Black-chinned Sparrow (*Spizella atrogularis*)

Lark Sparrow (*Chondestes grammacus*)

Lincoln’s Sparrow (*Melospiza lincolnii*)

Black-throated Sparrow (*Amphispiza bilineata*)

Summer Tanager (*Piranga rubra*)

Western Tanager (*Piranga ludoviciana*)

Hepatic Tanager (*Piranga flava*)

Northern Cardinal (*Cardinalis cardinalis*)

Black-headed Grosbeak (*Pheucticus melanocephalus*)

Blue Grosbeak (*Passerina caerulea*)

Lazuli Bunting (*Passerina amoena*)

Brown-headed Cowbird (*Molothrus ater*)

Hooded Oriole (*Icterus cucullatus*)

Scott’s Oriole (*Icterus parisorum*)

House Finch (*Haemorhous mexicanus*)

Lesser Goldfinch (*Spinus psaltria*)

Mammals

Brazilian Free-tailed Bat (*Tadarida brasiliensis*)

Big Brown Bat (*Eptesicus fuscus*)

Silver-haired Bat (*Lasionycteris noctivagans*)

Canyon Bat (*Parastrelluss hesperus*)

Brazilian Free-tailed Bat (*Tadarida braziliensis*)

Cave Myotis Bat (*Myotis velifer*)

Desert Cottontail (*Sylvilagus audubonii*)

Rock Squirrel (*Otospermophilus variegatus*)

Arizona Gray Squirrel (*Sciurus arizonensis*)

Cliff Chipmunk (*Tamias dorsalis*)

Unidentified wood rat (*Neotoma* sp.)

Unidentified kangaroo rat (*Dipodomys* sp.)

Brush Deermouse (*Peromyscus boylii*)

White-footed Deermouse (*Peromyscus leucopus*)

Rock Pocket Mouse (*Chaetodipus intermedius*)

Raccoon (*Procyon lotor*)

White-nosed Coati (*Nasua narica*)

Hognose Skunk (*Conepatus leuconotus*)

Striped skunk (*Mephitis mephitis*)

Gray Fox (*Urocyon cinereoargenteus*)

Black Bear(*Ursus americanus*)

Cougar (*Felis concolor*)

Mule Deer (*Odocoileus hemionus*)

Coue's Whitetail Deer (*Odocoileus virginianus couesi*)

Rocky Mountain Bighorn Sheep (*Ovis canadensis*)

Amphibians and Reptiles

Arizona Toad (*Anaxyrus microscaphus*)

Canyon Treefrog (*Hyla arenicolor*)

Chiricahua Leopard Frog (*Lithobates chiricahuensis*)

Bullfrog (*L. catesbeiana*)

Greater Earless Lizard (*Cophosaurus texanus*)

Short-horned Lizard (*Phrynosoma hernandesi*)

Clark's Spiny Lizard (*Sceloporus clarkii*)

Tree Lizard (*Urosaurus ornatus*)

Desert Grassland Whiptail Lizard (*Aspidoscelis uniparens*)

Unidentified Whiptail Lizard (*Aspidoscelis* sp.)

Madrean Alligator Lizard (*Elgaria kingii*)

Mountain Patchnose Snake (*Salvadora grahamiae*)

Rock Rattlesnake (*Crotalus lepidus klauberi*)(Brian Miller, surveyor, photograph)

Fishes

Loachminnow (*Tiaroga cobitis*)

Longfin dace (*Agosia chrysogaster*)

Desert sucker (*Pantosteus clarkia*)

Fathead minnow (*Pimephales promelas*)(non-native)

Mollusca

Physa acuta

Planorbella sp.

Lepidotera

Orange Skipperling (*Copaeodes aurantiaca*)

Bordered (Crocale) Patch (*Chlosyne lacinia*)

Hackberry Emperor (*Asterocampa celtis*)

Queen (*Danaus gilippus*)

Spring Azure (*Celastrina argiolus* syn. *ladon*)

Checkered White (*Pontia protodice*)

Common Buckeye

California Sister? See photo

Odonata (Dragonflies and Damselflies)

Dragonflies:

Serpent Ringtail (*Erpetogomphus lampropeltis*)

Gray Sanddragon (*Progomphus borealis*)

Pale-faced Clubskimmer (*Brechmorhoga mendax*)

Western Pondhawk (*Erythemis collocata*)

Plateau Dragonlet (*Erythrodiplax basifusca*)

Flame Skimmer (*Libellula saturata*)

Red Rock Skimmer (*Paltothemis lineatipes*)

Filigree Skimmer (*Pseudoleon superbus*)

Variegated Meadowhawk (*Sympetrum corruptum*)

Damselflies:

Great Spreadwing (*Archilestes grandis*)

Spreadwing (*Lestes* sp.; probably Spotted Spreadwing, *L. congener*)

American Rubyspot (*Hetaerina americana*)

Canyon Rubyspot (*Hetaerina vulnerata*)

Sooty Dancer (*Argia lugens*)

Powdered Dancer (*Argia moesta*)

Springwater Dancer (*Argia plana*)

Painted Damsel (*Hesperagrion heterodoxum*)

Desert Firetail (*Telebasis salva*)

Appendix J: Double E Ranch Archaeology Report

Bear Creek canyon / Double E is a cultural resource rich area. The cultural occupation noted within the Double E Wildlife Recovery Area (WRA) Purchase spans approximately 6000 years to the present. Professional cultural resources research in and around Bear Creek is minimal to nonexistent in the past before coming under the jurisdiction of the NMSGC (New Mexico State Game Commission). Upon purchase of the WRA by the NMSGC the need to secure boundaries and planning the use of the WRA has fueled a need to understand the cultural resources and historic use of the Bear Creek canyon and the upland aspects surrounding the canyon.

Land jurisdiction within the WRA proper is mixed between the Bureau of Land Management (BLM), United States Forest Service (USFS), NMSGC and the New Mexico State Land Office (NMSLO). Respectively all cultural resources will be managed by the sitting land jurisdiction; hence requiring those cultural resources to either be managed under dictate the National Antiquities *Act 16 USC 431-433 1906*, National Historic Protection Act *Public Law 89-665-16 USC 1966*, and /or the Native American Graves and Repatriation Act *25 USC 301-3013 1990* for all federal holdings, or The New Mexico Cultural Properties Act and the New Mexico NMAS 18-6-1 Unmarked Burial Act NMAS 18-6-11.2 for all state jurisdiction.

Bear creek holds a substantial amount of Classic Mimbres archaeological sites, Historic Homestead remnant, Historic Apache representation and some Archaic and transitional cultural evidence. Most Mimbres activity has been noted within and adjacent to Bear Creek and tributary canyons as Y-L and Hells Half acre. These sites range from large aggregated (Pueblo) sites to smaller Pit-house villages. Some sacred Mimbres sites and specialized utilitarian/storage sites are also throughout the area adjacent to Bear Creek and tributary canyons. Homestead sites are represented by corrals, structural foundations, tanks, roads and camps. Homestead and early 20th century improvements 50 years or older are broadcast throughout the WRA. Apache cultural manifestations in the Bear creek area have been noted in small settlement occupations and sacred sites. Those noted locations have ranged from the Uplands to the north of Bear Creek and within Bear Creek canyon. Potential Archaic representation within the Bear creek area is the lowest cultural representation, Archaic preservation is seen more in the Uplands of the WRA and is manifested in Lithic scatters and Isolated tools.

Risk and damage to these resources maybe high due to the exposure to the public and could result in adverse effect if not managed. Observations have shown that a large amount of cultural resources in Bear Creek have been subject to surface artifact collection by individuals either trespassing on the area due to poor fences, by private owner and owner sanctioned agents when the resources were under private jurisdiction. Additional a substantial amount of individual and mechanical damage has occurred to cultural resources under private stewardship.

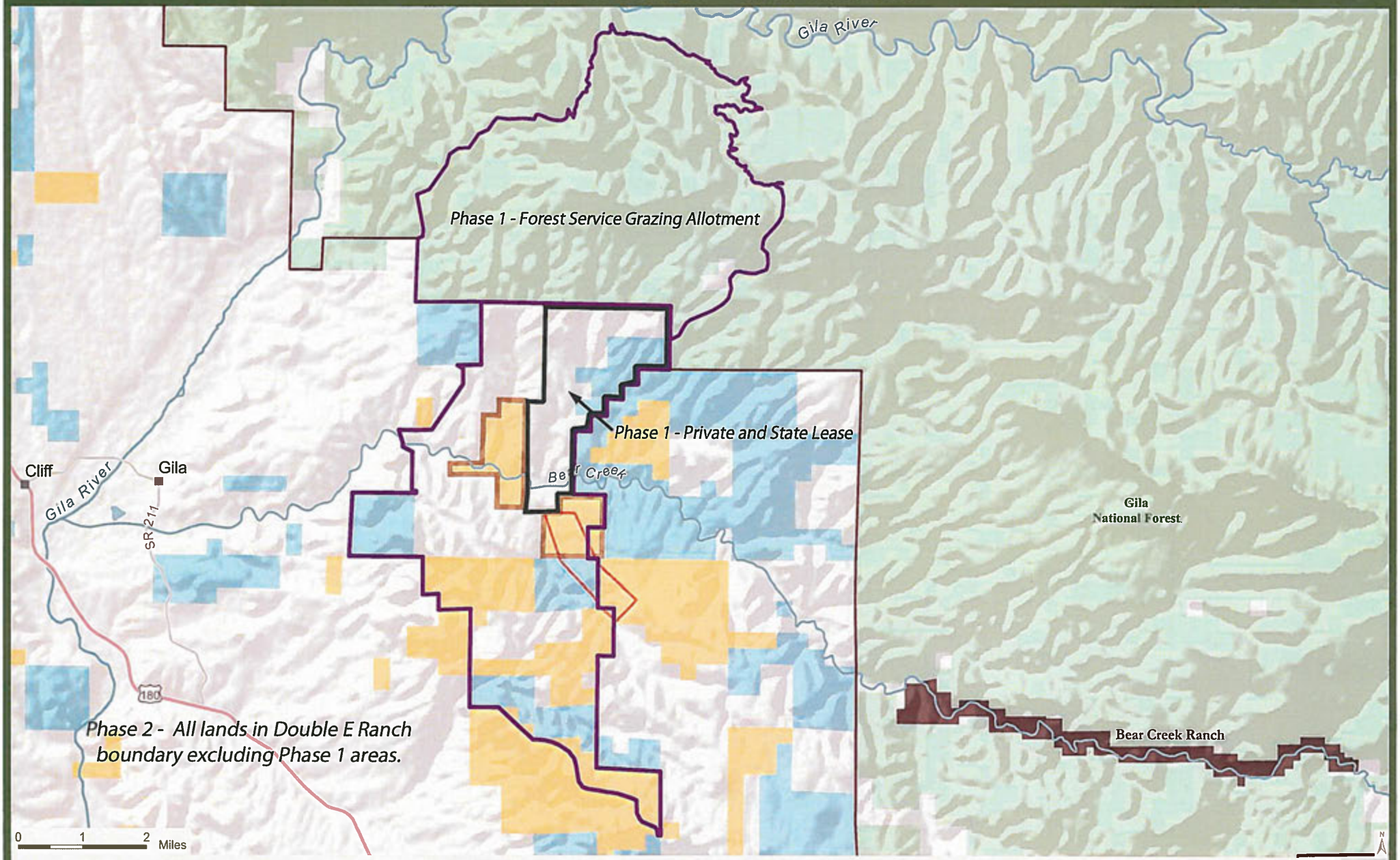
Public access will expose cultural resources to risk. To prevent theft and damage to known cultural resources a cultural resource management plan of avoidance of cultural resources by development, fencing for protection and regularly patrol to prevent looting needs to be established. Within NMSGC jurisdiction management the cultural resources will be undertaken by the New Mexico Department of Game and Fish (NMDGF) Archaeologist. NMDGF will adhere to all Guidelines for management subject to NMSA 18-6-1-11. If NMDGF is utilizing Federal funding all protocols subject to project specific aspects

will be subject to federal statutes. NMDGF will cooperate with cultural resource management with the other Federal and State agencies holding jurisdiction within the WRA concerning any joint cultural resource ownership and access.

Appendix K: Double E Ranch Map (by Trust for Public Lands)

Double E Ranch Project

Grant County - New Mexico



The Trust for Public Land conserves land for people to enjoy as parks, gardens, and other natural places, ensuring livable communities for generations to come.

- Double E Ranch Boundary*
- Completed TPL Project Location
- Bear Creek ACEC
- Hell's Half Acre
- US Forest Service Boundary
- USFS National Forest
- Bureau of Land Management
- State Land

*Project boundary includes US Forest Service grazing/range allotments.

June 24, 2013
Cartography by
The Trust for Public Land
www.tpl.org

GILA CONSERVATION COALITION

THE TRUST for PUBLIC LAND