Southern Utah – Northern Arizona
Mule Deer Initiative

SUNAMI

Fawn recruitment is key to maintaining or expanding mule deer populations and current habitat conditions in many areas have declined in recent decades.

Dense stands of pinyon-juniper in the Buckskin Mountains, limit food resources for mule deer, and limit the population density that can be maintained in this interstate mule deer herd.

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BACKGROUND:

Mule deer and black-tailed deer (*Odocoileus hemionus*) are uniquely North American members of the deer family that occur in many biotic communities in western North America from Alaska, southward to Zacatacas Mexico. This species' range extends eastward as far as the Great Plains region of Canada and the United States (Heffelfinger and Messmer 2003). Mule deer are an important species from several aspects including their impact to economic, aesthetic, and social factors, and along with other members of the deer family have been important to man the hunter (Putnam 1988).

Humans have long relied on deer for survival and mule deer were an important food source for Native Americans and earlier explorers/settlers of the West (Heffelfinger 2006). So intricately tied are humans to deer that in many portions of the north temperate world, prehistoric man relied on deer as their main source of meat and hides, and this relationship was so deeply intertwined that deer often became important to humans from a spiritual standpoint (Putnam 1988).

Mule deer live in many biotic communities with great diversity in climate and vegetative communities, but there are basic life history requirements that are common to all areas that mule deer occupy. Although mule deer will consume a wide variety of plant species, they are primarily browsers shrubs being an important year-round component of their diet and forbs seasonally important (Heffelfinger and Messmer 2003, Heffelfinger 2006).

Nutrition plays a fundamental role in many life processes for mule deer including important reproductive events such as ovulation and conception, and supporting fawn development via lactation (Wakeling and Bender 2003). Nutrition can also play a role in survival rates and movement patterns. Simply, since mule deer are selective, concentrate feeders, and having high quality food resources are key to population trajectory and mule deer populations respond favorably to early succession seral stages (Wakeling and Bender 2003).

Human-related factors such as fire suppression and excessive herbivory have adversely influenced mule deer habitat throughout the West, and likely altered the number of mule deer that occupy impacted habitats (Lutz et al. 2003). Several key mule deer habitats have been adversely impacted. Forests and woodlands, key summer and winter ranges for mule deer, occupy about 444 million acres in western North America (Lutz et al. 2003). Densities of younger trees have increased in ponderosa pine forests since about 1900, corresponding with changed fire suppression regimes (Crocker-Bedford et al. 2003, Cunningham et al. 2003, deVos and McKinney 2003). This habitat change reduces food resources and increases the likelihood of stand-converting forest fires (Swetnam and Baisan 1996), which can have long-term detrimental impact on mule deer habitat and population persistence.

Another important adverse impact to mule deer habitat is the expansion in distribution and increased density in juniper (*Juniperus* spp.) and pinyon pine (*Pinus* spp.) woodlands since the late 1800s in western North America (Tausch et al. 1981; Miller and Wigand 1994; Miller and Rose 1995, 1999; West 1999; Lutz et al. 2003). Expansion of these woodlands has been facilitated by multiple factors, including climate change, fire suppression, livestock grazing, and human modifications (Jameson 1987, Lutz et al. 2003). As this expansion has occurred, species composition has changed and important forage species for mule deer have declined.

Sagebrush (*Artemesia* spp.) occurs on around 91 million acres in the western United States, and distribution has not changed much during the last century, although human

intervention, has been a primary factor affecting sagebrush and associated mountain shrub communities (Lutz et al. 2003). Livestock grazing and fire suppression have been key factors contributing to broad changes in sagebrush and shrub communities, which continue to become less productive as plants continue to become less vigorous (Lutz et al. 2003).

These changes in biotic communities have all occurred to winter range used by migratory mule deer herds from the Kaibab Plateau in northern Arizona and the Paunsaugunt area of southern Utah, which likely has reduced the number of mule deer in these key mule deer herds.

When evaluating the importance of habitat rehabilitation on the Colorado Plateau within the context of mule deer management, it is important to remember that forage quality and quantity are critical factors when evaluating habitat quality for mule deer. This is particularly relavent in light of recent mule deer research from Colorado where Bishop et al. (2005) demonstrated that improved nutritional status for pregnant does on winter range can increase early fawn survival the following summer. Further, fawns with higher nutritional advantage have over-winter survival rates even when predation is a primary cause of mortality. It is important to note that even a modest increase in fawn survival rates is capable of causing a significant population increase (Watkins et al. 2007).

PROBLEM STATEMENT:

The Kaibab Plateau and Puansaugunt mule deer herds are premier mule deer herds in the western United States and there is concern that habitat quality on the winter range for this Interstate herd currently limits the number of mule deer in these herds. The concern for winter range quality decline is justified based on research in this area (Haywood et al. 1989) and elsewhere in the western United States (deVos et al. 2003), and improving winter range is a recommended action where migratory mule deer herds occur (Heffelfinger et al. 2003).

Extensive movement studies of mule deer on the Kaibab Plateau (Haywood et al. 1989) and the Puansaugunt region of southern Utah (Carrel et al. 1999) have documented migratory patterns for these important mule deer herds. The Kaibab Plateau herd migrated primarily to the west and east of the Plateau but with some movement to the north to the Buckskin Mountains. The Pausaugant herd moved to the south to winter ranges in Arizona with many occupying the Buckskin Mountains.

While the quality of winter range used by this Interstate mule deer herd has not been well studied, Haywood et al. (1989) documented very patchy use of winter range (34% of defined winter range included in winter use areas) by telemetered Kaibab mule deer and suggested that this patchy use pattern was related to limited isolated patches of usable habitat, with the unused portion being poorly suited mule deer habitat. Further, much of the area of the Buckskin Mountains is comprised of mature stands of pinyon-juniper with limited browse species which limits the number of mule deer that the area can support.

Watkins et al. (2007) point out that anthropogenic landscape changes are quickly becoming problemmatic in the Colorado Plateau Ecoregion and managers must address these changes in the very near future. Failing to implement landscape-scale habitat rehabilitation projects will only worsen conditions for mule deer on winter range in the project area, which in turn will continue to reduce the number of mule deer that the region can support and stay within the capacity of the land.

PROJECT SCALE AND DURATION:

The Mule Deer Working Group, which was established by the Western Association of Fish and Wildlife Agencies, concluded the following approach was needed to provide a population-level response by mule deer when considering habitat rehabilitation projects (Mule Deer Working Group 2003:4); "One factor that the Group identified as being problematic to effective management of mule deer and their habitat is that many management practices are designed for implementation at a small scale. One value of using an ecoregional approach in developing management plans is to allow designing management programs at a scale large enough to effect a population level response by the target population."

One of the most successful examples of landscape scale habitat is found in the waterfowl joint ventures. As an example, the Pacific Coast Joint Venture, with a project focus on coastal areas from Alaska southward to California, has been able to afford protection to more than 440,000 acres, restored ecological function to more than 74,000, with a total value of more than $1.2 billion. There are a multitude of successful joint ventures for waterfowl and more recently, for programs such as the Intermountain West Joint Venture has expanded focus to include habitat restoration for all bird species. One of the goals of this joint venture is to conserve at least 1.5 million acres for avian species.

Given the guidance of the Mule Deer Working Group relative the need for large-scale habitat rehabilitation projects to be effective at achieving a population level response in the target population (in this case mule deer), using a joint venture approach is the logical model. The map below (taken from Carrel et al. 1999) represents the game management unit boundaries in Arizona and Utah where these two mule deer herds reside and clear boundaries for the overall project proposed here. During the first year of the project, habitat rehabilitation efforts will focus on the Bureau of Land Management administered lands within Buckskin Mountains (AZGFD Game Management Unit 12 B) as this area comprises important winter range for both the Paunsaugunt and Kaibab mule deer herds.

This regional approach is consistent with the recently completed Memorandum of Understanding completed between key federal agencies and the Western Association of Fish and Wildlife Agencies to implement improved mule deer habitat and population management strategies. One of the key parts of this MOU is found in the following sentence "Management of mule deer and their habitat has traditionally been done at a relatively small scale, and managing this species at a regional basis will benefit population recovery and will allow financial resources to be applied at a scale that will maximize the benefit of habitat restoration projects."

While this proposal proposes a landscape scale approach to habitat rehabilitation, it is important to recognize that consistent with the joint venture concept, accomplishing this project scale will require multiple years and that annual project statements will be necessary. As outlined below, the first year project proposal is to treat approximately 2,000 acres in the BLM-administered section of the Buckskin Mountains in a fashion to reduce pinyon-juniper density and to increase mule deer forage within the treated area. The total acreage treated under this proposal will depend on funding, but the target is to restore ecological function in an area not less 20,000 acres, with treatments in both Arizona and Utah and will require at least 10 years to complete.

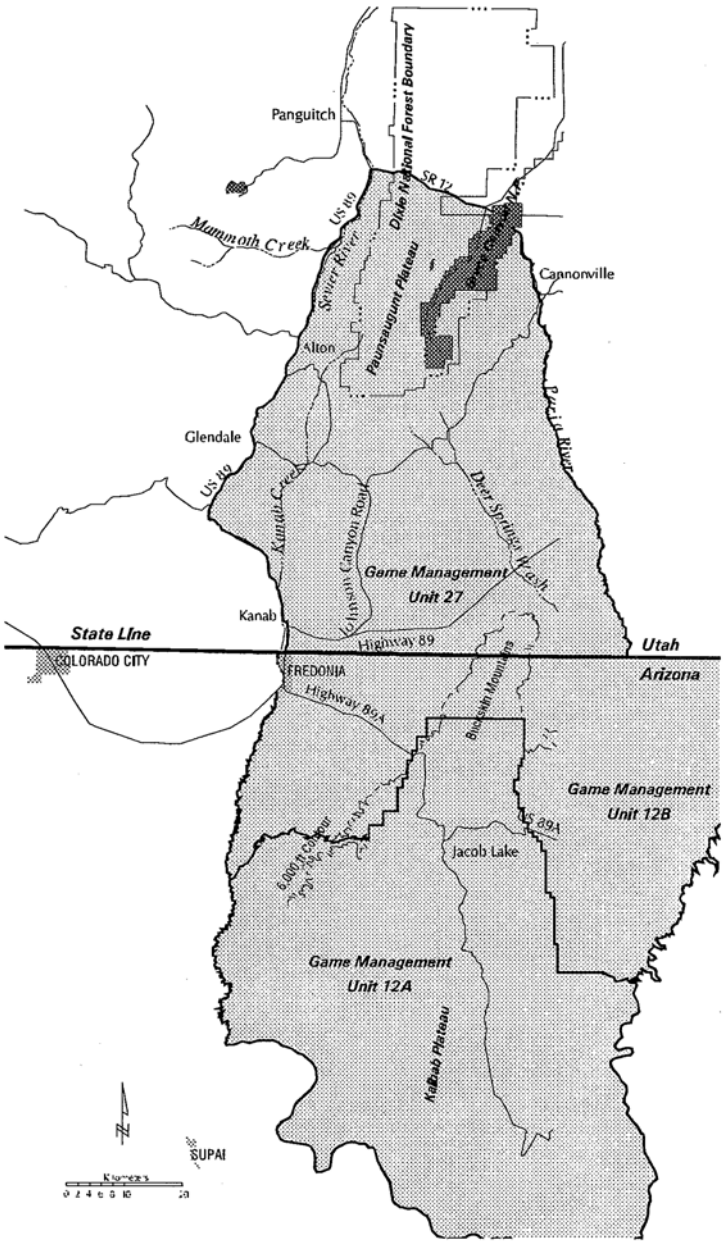

Figure 2. Game management unit (GMU) boundaries for Utah's GMU 27 and for Arizona's GMUs 12A and 12B on the Paunsaugunt Plateau-Buckskin Mountains study area.

PROJECT BENEFITS:

The Western Association of Fish and Wildlife Agencies' Mule Deer Working Group has concluded that although there are many factors that regulate mule deer populations, long-term changes in habitat capacity has resulted in mule deer populations that have declined to levels that are socially unacceptable and this decline has adversely impacted the credibility of these management agencies. Further, many rural economies have suffered due to the decline in mule deer hunting. The Mule Deer Working Group has provided guidelines for habitat management of Colorado Plateau Ecoregion (Watkins et al. 2007). This document identifies three key impacts to mule deer habitat in this ecoregion that play a role in reducing the habitat quality for mule deer. These impacts include:

- ❖ Vegetative species composition has been modified
  - Both invasive species such as cheatgrass and native species such as pinyon and juniper have increased due to successional changes, largely due to fire suppression and these changes reduce habitat quality on winter range.
- ❖ Vegetative structure has been modified
  - Fire suppression on winter range has allowed maturation of woody species and decreased understory diversity, which in turn, reduces winter forage for mule deer.
- ❖ Nutritional quality has decreased
  - As plants become senescent, as has occurred in the absence of habitat disturbance, plant nutritional quality decreases, which makes it more difficult for mule deer to meet their energetic demands, particularly on winter range.

These conclusions of the Mule Deer Work Group reaffirm those of Carpenter and Wallmo (1981) who concluded that mule deer numbers are limited in this ecoregion by forage quality and quantity. In that carefully planned habitat rehabilitation can reverse these three factors and increase the land's capacity to support mule deer, this proposed project will reverse decades of habitat degradation, with a resultant benefit to both mule deer and the public that enjoys their presence.

In addition to the benefits described for mule deer winter range, it is important to point out that the project will have other direct benefits to the overall environment including, but not limited to the following:

- ❖ Reduced fuel load has built to an unnatural level due to fire suppression. This reduces the potential for stand-converting catastrophic fire which would adversely impact ecological conditions in the area.
- ❖ Several other species of wildlife use the sage-steppe habitat in the area and the expansion of the pinyon-juniper woodland in the Buckskin Mountains as adversely impacted many species of wildlife. Restoring portions of this area to pre-settlement conditions would benefit these species in addition wo mule deer.

APPROACH AND LOCATION:

As indicated, full implementation of this project will require multiple years to accomplish given the desire to meet the Mule Deer Working Groups recommendation that ecologically important habitat rehabilitation projects be completed at a landscape-scale. The approach to any particular rehabilitation project is dependent upon many factors including topography, project objective, budget, social acceptance and others (Watkins et al. 2007).

In general, there are three primary approaches to habitat rehabilitation projects; mechanical treatments, chemical application, and prescribed burning. Each of these has advantages and disadvantages and specific treatments need to weigh all of the factors related to the project and select the most appropriate approach.

There are a variety of mechanical type treatment options including draging anchor chains to crush woody vegetation and disturb soil beds, roller/choppers which crush woody vegetation, brush beaters which are used on a tractor to selectively shatter specific trees, and agra-axes which chop specific trees at their base. Advantages of mechanical treatments are that the treatment area can be easily defined, these methods can be used in proximaty to human infrastructures where fire or chemical treatment would be unacceptable, and some of these methods allow reseeding to occur concurrent with the treatment.

Chemical treatments offer many advantages including the ability to use this method where topography precludes mechanical treatments, is selective and can be applied to individual plants, is relatively inexpensive, and treatment does not disturb soil (Watkins et al. 2007). This is a particularly effective option to controll resprouting of undesirable plants after either mechanical or prescribed fire treatments have reset ecological conditions to early seral stages.

Fire was once a common occurance in most western rangelands and forests (Covington and Moore 1994) and exclusion has adversely impacted these resources in many ways including increased fuel loads which have greatly increased the frequency of stand-converting fires. As a result of public concern over the consequences of these stand-converting fires and with notorious instances where prescribed fires escaped and became much larger than planned, use of prescribed fire is sometimes controversial. Even with this, the use of low-intensity planned fire is an essential tool in restoring ecological function to much of the mule deer habitat in the Colorado Plateau and when well planned and implemented, provide a cost-effective tool for habitat managers.

To accomplish the goals of this proposal, it is essential that all of these tools be used by habitat managers as each has utility in particular applications. During the first phase of this project, which will treat approximately 2,000 acres in blocks ranging from 500-1,000 acres.

The project area within the Buckskin Mountains is best described as a pinyon *(Pinus edulis)* and juniper (*Juniperus osteosperma)* woodland. Elevation is approximately 6,500 ft with annual precipitation at 12-16 inches/year. Trees within the project are mostly mature climax seral stage, with some immature young saplings interspersed throughout. Trees are non-sprouting, multi-stem and single stem trees, with average density of approximately 150 trees per acre with 75% juniper to 25% pinyon.

The preferred site for this project has been previously identified by the Bureau of Land Management for treatment and is located as follows: The preferred site for the first segment is located as follows, however, final selection will depend on an evaluate of the current cheatgrass distribution. If the area has been invaded by cheatgrass, an alternative site will be selected. The Buckskin project area is tentatively located in portions of T 41, 42 N R 2 E Sections 4, 5, 6, 7, 8, 9, 22, 23, 26, 27, 28, 33, 34 and 35, however, if this site is unacceptable for any reason, we will identify an alternate site located within 5 miles of this site.. The project is within GMU 12 B on the Arizona Strip District of the BLM.

One of the key considerations in habitat rehabilitation on the Colorado Plateau is to minimize the risk of allowing cheatgrass or other annual weeds to become established during

or after the treatments are implemented. As pointed out by researchers at the Ecological Restoration Institute (2007) any treatment has a risk associated with it and avoiding restoration efforts because of the risk of cheatgrass invasion does not abate the risk of stand-converting fires and continues reduced wildlife values in untreated areas.

With this caution as a guide, we propose the following approach for this project:

1. Evaluate identified treatment areas with no or very low density of cheatgrass as recommented by Ecological Restoration Institute (2007). This will minimize the risk of inadvertently expanding the presence of this species in the project treatment area.
2. Utilize Hydro-ax based brush-beating mechanical treatment to reduce woody invasive species in two areas that comprise approximately 1,000 acres each to open canopy cover to facilitate herbaceous growth. The treatments will be done in a mosaic pattern to optimize the edge to treatment ratio. To provide thermal cover in the area, any juniper with a basal diameter greater than 24 inches, and any pinyon greater than 20 inches basal diameter will be left.
3. Obtain sufficient native browse seed (optimally, seed will be collected locally) to reseed approximately 50% of each treated area to facilitate herbaceous recovery. Seeds from species such as cliffrose *(Cowania mexicana),* antelope bitterbrush *(Purshia tridentata),* and sage species *(Artemesia spp.)* provide the deer with forage in winter and will be the focus of seed collect, but not to the exclusion of other desireable shrubs if they are available. It will be essential to monitor species composition and density both between the seeded and unseeded portions of the project and to detect establishment of invasive annual grass species. If these species become established, treatment to elimate these invasive species is essential using an appropriate herbacide such as Plateau or Oust.
4. Successful implementation of this project, particularly the establishment of browse species and other herbaceous species is dependent upon deferring livestock grazing for a period of 3-5 years depending on rainfall patterns. Failure to implement this step would likely

BENEFITS OF USING HYDRO-AX TREATMENTS

Few issues have generated as much interest in recent years as has the concept of reducing woody invasive species in a fashion that eliminates the problem of leaving heavy woody debris in the project area. When heavy woody debris is left in place, fire danger is still great, visual obstruction for wildlife remains, and the time needed to breakdown the organic matter is great. Much of the early experimentation used a shearing tool to cut trees near their base and leave them on-site. While this reduces live trees, it doesn't meet the needs of reduced visual barriers and rapid decomposition of woody debris. More recently, the development of an attachment for the hydro-ax which uses a rapidly turning drum with heavy teeth to shatter trees into small, easily decomposed wood debris that lays close to the ground. An added benefit of this approach is the fact that the small woody debris that is left provides a more moist, protected microclimate to facilitate growth of seeds that may be contained in the soil seed-bank. Further, if seed is available, it can be planted in these protected microclimates where sprouting/growth would be enhanced. The following is a series of photos that demonstrate the efficiency of this approach.

This is an example of an area along a powerline in northern Arizona that was subsequently treated with the hydro-ax rotary tool to reduce woody vegetation in a wildlife-friendly fashion.

This is the same area as that in the photo above. Key to this photo is how the vegetation was reduced greatly from the density found prior to treatment. Although this treatment doesn't mimic what we propose for the Buckskin Mountains, it does demonstrate the ability of this tool to effectively reduce woody species where they are at biologically unacceptable densities.

This is an area that has been treated with the hydro-ax rotary tool. Note the debris from the tree is spread widely in the area where the tree was located with the mulch being left in a fashion to facilitate seed deposition and retention and with a much higher potential for moisture retention.

ESTIMATED PROJECT COSTS

It is estimated that full implementation of the first phase of this project will cost approximately $100,000. This estimate is based upon information from several potential contractors where they estimate the cost per acre to be approximately $50/acre when the largest trees are left for cover.

NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

Any NEPA documentation for this project will be prepared by the project proponents and submitted to the appropriate state/federal agencies for concurrence with the NEPA report prepared.

PROJECT COOPERATORS:

One of the keys of existing joint venture projects is the large number of cooperators that bring both funding and technical expertise to implement the on-the-ground projects. This project is dependent on involvement of a wide variety of cooperators. A list of potential cooperators is as follows:

Arizona Sportsmen for Wildlife Conservation
Utah Sportsment for Wildlife
Arizona Deer Association
Mule Deer Foundation
Bureau of Land Management
Arizona Game and Fish Department
Utah Division of Wildlife

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