

Arizona Statewide Pronghorn Management Plan



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INTRODUCTION

Pronghorn antelope (*Antilocapra americana*) were once common throughout all grassland areas of northern and southern Arizona at elevations ranging from 1,000-8,000 feet. Unregulated market and subsistence hunting as well as wide spread overgrazing by livestock took their toll on pronghorn populations during the late 19th century as Arizona became settled. By 1907 Mearns reported "*the pronghorn antelope is already a rare animal in the region of the Southwest, where it ranged in the thousands 25 years ago.*"

Three subspecies of pronghorn occur in Arizona today. American pronghorn, the most abundant of the subspecies, are found mainly in the north-central portion of the state. Small, scattered herds of Chihuahuan pronghorn occur in southeastern Arizona and the endangered Sonoran pronghorn are found in southwestern Arizona. Sonoran pronghorn are not addressed in this document, but are addressed in a separate recovery plan for this federally endangered subspecies. Most pronghorn in Arizona are found between 3,000-7,000 feet elevation. Sometimes, northern herds occur as high as 10,000 feet during summer. This range in elevation encompasses a variety of grassland habitats ranging from desert grasslands to forest and mountain meadows. Pronghorn prefer flat, open grassland areas, but also use rolling or broken hills and mesa tops of less than 20 percent slope. They also use such diverse habitats as sparse deserts, woodlands, and open forests. Pronghorn home range estimates are quite large, and can vary from 20-40 mi². The current statewide pronghorn population is estimated at 11,000 post-hunt adults, with 21,000 mi² of occupied habitat.

The Department's Pronghorn Antelope Management Goal is to maintain and, where possible, enhance pronghorn antelope populations at levels that provide diverse recreational opportunities, while avoiding adverse impacts to the species and its habitat. Specific objectives for pronghorn management include increasing the statewide population of adult pronghorn, maintaining an annual harvest of 500 or more, and providing recreational opportunity for 900 or more hunters per year at 4,000 or more hunter days per year; maintaining existing occupied habitat with emphasis on retention of medium and high quality habitat, and restoring the historical range in Arizona by repopulating through translocations. These objectives are to be accomplished through several strategies identified in the Department's *Pronghorn Management Guidelines*. These strategies are:

- Manage and enhance habitat through partnerships with public agencies, property owners, lessees, and conservation organizations.
- Improve conditions of declining or low-density herds through research, conservative hunt management, supplemental transplants, and predator management.
- Establish self-sustaining pronghorn populations at all transplant sites.
- Identify important habitats for populations and determine where protection and improvement are possible, in cooperation with land management agencies, property owners, and lessees.
- Use population surveys and modeling to assist in permit recommendations.
- Provide hunter recreation that stresses the quality of the hunting experience.

This plan is intended to provide a template for management of pronghorn populations and will be updated as needed, but generally not less than every other year coinciding with the development of elk and pronghorn hunt recommendations.

Plan Goal:

Develop the framework for pronghorn management and issue resolution consistent with the Department's *Wildlife 2020 Strategic Plan*, *Game Program Operational Plan*, *Pronghorn Management Guidelines*, and the *Guidelines for the 2014-2015 and 2015-2016 Hunting Seasons*, and *Statewide Pronghorn Habitat Evaluation* (Ockenfels et al. 1996).

Plan Objectives:

- 1 Identify all occupied or potential pronghorn habitat. Manage pronghorn populations under a herd unit or management unit basis; whichever best facilitates achievement of management objectives.
- 2 Survey pronghorn populations using a standardized survey protocol that produces survey-generated population estimates. Estimate current populations within each pronghorn management area using population modeling in conjunction with survey-generated population estimates.
- 3 Use habitat and issue assessment to identify major issues and opportunities relative to pronghorn herd or management unit populations.
- 4 Use the *Guidelines for the 2014–2015 and 2015–2016 Hunting Seasons* to direct annual hunt recommendations.
- 5 Recommend management objectives and identify specific strategies for each pronghorn herd-management unit to address priority issues and opportunities.
- 6 Report on completed management actions.

Future Management Needs:

Population modeling will be used in making pronghorn hunt recommendations. Additional research should be conducted to facilitate improved accuracy and precision of population models, especially in the areas of annual survival rates for bucks, does and fawns (pre-hunt to pre-hunt) and survey methodology to provide accurate age and sex ratios. Improved survey methods and efforts will be implemented as appropriate.

Population objectives can be further tailored for each herd unit by analyzing: total numbers surveyed during pre- and post-hunt surveys; standardizing aerial flights using Global Positioning System (GPS) technology; mark-resight population estimation using simultaneous double-count survey methodology, and using observed pre-hunt fawn to doe ratios as an indicator of habitat quality and rate of recruitment.

STATEWIDE SUMMARY

Population Status:

Arizona has experienced tremendous human population growth over the past decade and current projections indicate growth will continue at a rate of 2-4% per year over the next 10 years (Arizona DES Population Projections). Beginning in the late 1980s, the Arizona Game and Fish Department expressed concern over the loss of high quality pronghorn habitat that was being eliminated at an alarming rate through urban sprawl and population expansion into rural areas. Throughout the 1990s, continued loss of habitat caused some local pronghorn populations to be drastically reduced or eliminated. An example is the Willow Lake herd that is located within the city limits of Prescott. Over 80% of the habitat for this herd has been lost since 1973. Attempts to monitor and relocate the Willow lake population were met with considerable controversy due to the high visibility of this herd and "adoption" of these pronghorn by local residents. This herd continues to decline and it is anticipated that the population will eventually be eliminated. The Department realized this type of problem has the potential to increase and spread into other areas of the state. It became evident that there was a need to identify factors affecting pronghorn populations and develop a plan to address these issues and to begin a process for working on the most critical problems. In 2002, the Arizona Game and Fish Commission directed the Department to create plans for all pronghorn populations in the state.

Declining pronghorn populations in portions of Arizona continues to be a concern. The statewide pronghorn population estimate in 1987 was nearly 12,000 post-hunt adults; by 1999 this estimate declined to less than 8,000. The Department conducted a statewide evaluation of pronghorn habitat in 1995 (Ockenfels et al. 1996). In that analysis, the quality of pronghorn habitat was quantified and ranked according to a variety of parameters. Pronghorn occupied an estimated 21,000 mi² of habitat across the state in 1999. About 250 mi² of this land was classified as high quality habitat.

Causes of decline in pronghorn herds across Arizona are numerous, but generally consistent. Paramount to the persistence of any wildlife species is presence of quality habitat. Continued urban sprawl and associated highway construction has fragmented and damaged quality pronghorn habitat (the latter continues to cause direct mortality via collision with vehicles). Grasslands, historically dependent upon predictable fire regimes, have been reduced in size by invasion of juniper and shrub species resulting from decades of fire suppression. Past livestock grazing and historic fencing practices have reduced habitat quality and created barriers that pronghorn cannot cross. Finally, persistent drought and predation has affected pronghorn populations to varying degrees statewide. The combination of these factors has led to a reduction in habitat availability and quality, a substantial decline in fawn recruitment, and a correlated increase in efficiency of pronghorn predators.

Survey Efforts:

Pre-hunt fixed-wing aircraft surveys are conducted each year to obtain pronghorn age and sex ratios as well as population estimates using simultaneous double count methodology. The observed buck:doe and fawn:doe ratios are used for the dual purposes of a) assessing the unit's age and sex ratios in relation to hunt guideline criteria for the purposes of buck-only hunting opportunity and b) obtaining age and sex ratio inputs for population modeling. The precision of

the survey data set is evaluated through statistical confidence interval analysis. Units with higher confidence intervals may require additional sampling effort to observe additional groups and/or a change in methodology.

Population estimates for pronghorn management units are modeled by computer simulation using surveyed buck to doe and fawn to doe ratios as well as hunter-reported harvest data. Yearly mortality rates for adult males and females as well as young are initially entered within the model using accepted normal ranges from published studies, but these values are tested and adjusted along with starting numbers of bucks and does to derive a best-fit relationship between observed and model-calculated buck to doe ratios. While computer simulation models are valuable tools in estimating populations for management purposes, they are only as accurate as the input data (survey and harvest) and assumptions (starting numbers, mortality rates) entered. Unfortunately, many of our data inputs and assumptions lack the accuracy and precision for reliable model estimates, and therefore should only be taken as gross estimates and not as absolute numbers. A final confounding factor is that very few of our management units represent truly closed populations. Immigration and emigration of pronghorn is unmeasured adding another limitation to modeling accuracy.

The pre-hunt adult pronghorn population in 2013 was estimated at 11,000 animals statewide, exclusive of Indian reservations. The statewide pronghorn population estimate is primarily based on the sum of regional and management unit estimates and not on a stand-alone statewide model simulation.

Management Issues and Opportunities:

The following paired issues and opportunities are the most significant factors effecting the management of pronghorn now and into the future. Future achievement of management goals and objectives can only be obtained through the successful resolution of these issues.

Private Land Access

Issue: In parts of the state, some ranches have closed their private lands to hunting which often locks up large portions of public lands. Access can also be very difficult because a large amount of the land is checker-boarded state and private land. These lands, both private and public, often encompass the best quality pronghorn habitat. The access issue is compounded by some landowners charging high entry fees and restricting hunter numbers.

Opportunity: Continue to work with landowners to seek solutions to hunter access. The Department has formed a committee to work with landowners and actively find solutions that will be beneficial to the landowner and the sportsman of Arizona.

Habitat Loss to Development

Issue: Many of the grassland habitats occupied by pronghorn in Arizona occur within privately owned or State Trust and private checkerboard lands. As human populations continue to

grow, privately-owned rangelands suitable for pronghorn will continue to be subdivided and built upon for human habituation resulting in a direct loss of suitable habitat for pronghorn. Pronghorn are incapable of adapting to most human developments. Developed rangelands totally lose their value for continued pronghorn use. Even 40-acre size rural developments are unsuitable for pronghorn.

Opportunity: Much work is needed in the areas of county and municipal land use planning, and State Lands strategic planning. Privately-owned priority habitats will only be maintained as suitable for pronghorn into the future through direct acquisition, conservation easements or other non-development agreements. High quality checker-board State Trust and private lands must be preserved through land exchanges and/or other land protection measures to form continuous blocks of State Trust land habitats.

Population Fragmentation - Highways

Issue: Recent pronghorn movement studies have determined that highways present significant and almost total barriers to pronghorn movement, increasing population fragmentation and genetic isolation. Research continues to assess effective mitigation efforts to create movement corridors across highways.

Opportunity: Implement mitigation measures including right-of-way fence removal or realignment; or the creation of over-under passes. It is possible that significant resources may need to be committed in the future to reconnect small isolated herds and open avenues for pronghorn movements to obtain seasonally available resources.

Population Fragmentation - Fences

Issue: Pronghorn traverse fences by passing under, rather than over the fence; woven wire or fences with bottom wires below 20 inches act as barriers to pronghorn movements. Keeping a smooth bottom wire ≥ 20 inches above ground level or equipping the bottom wire with plastic pipe "goat bars" facilitates pronghorn movement through fences. Fences become more impervious barriers to pronghorn movement when they are placed near high-traffic roads.

Opportunity: Work to make all fences in pronghorn habitats compliant with pronghorn fencing standards. Refer to the most recent *Wildlife Development Standards* published by the Arizona Game and Fish Department Development Branch for current fencing standards.

Population Fragmentation – Population Size

Issue: Isolated populations become increasingly vulnerable to extirpation as population size decreases. Genetic consequences are commonly considered, but stochastic events like predation, disease, and climatic events have greater likelihood of causing extirpations.

Opportunity: Combined efforts at reducing barriers and creating movement corridors are needed to reconnect fragmented populations. Where population isolation can't be mitigated through other means, consider periodic transplants from separate herds to bolster numbers and provide genetic variability.

Predation

Issue: Predation by coyotes is the single greatest cause of pronghorn fawn mortality in many of Arizona's pronghorn herds. Arizona's pronghorn populations chronically suffer from low fawn recruitment rates, resulting in population declines. Reasons for excessive coyote predation are many and difficult to assess. Habitat quality and quantity affect doe nutrition, fetus development as well as fawning cover; all making fawns more susceptible to predation. Social and regulatory changes have resulted in decreased coyote removal and increased coyote populations. Government and livestock producer coyote control efforts have significantly declined over the past 30 years with changes to lawful livestock protection practices (ban of 1080 and other poisons, ban of foot-hold traps on public lands). The prohibition of foot-hold traps on public lands by public referendum during 1994 in conjunction with falling fur prices have also significantly reduced the take of coyotes by licensed trappers and hunters. All of these habitat, social and regulatory changes combined result in situations where coyote populations are limiting or regulating pronghorn populations.

Opportunity: Develop and implement creative techniques for coyote population suppression. Use predator management plans as a vehicle to implement control measures.

Fawning Cover

Issue: Fawning cover is generally provided by herbaceous vegetation that is >11 inches in height, with little shrub cover. Inappropriate grazing management or drought may adversely impact fawning cover.

Opportunity: Encourage livestock grazing practices and that result in desired vegetation cover in key fawning areas as practical and appropriate.

Tree and Shrub Encroachment

Issue: Pronghorn generally occupy open grassland or shrub-steppe habitats. Encroachment of shrubs or trees have reduced suitability of habitat, resulted in habitat abandonment, and isolated herds from historic interchange.

Opportunity: Pursue pronghorn habitat restoration projects to reduce canopy cover to <20% and tree density to <15/acre. Prescribed fire and mechanical removal are both suitable methods for restoring grasslands invaded by woody species.

Forage Quality and Quantity

Issue: Pronghorn rely on forbs as the predominant food item, although shrubs may be important seasonally. Optimal vegetative composition should be short (<25 inches tall) shrubs (10-35% ground cover) and forb and grass (30-50% ground cover), emphasizing a diversity of forb species. Nutritional considerations of digestibility, quality, and nutrient levels are also important.

Opportunity: Encourage livestock grazing practices and habitat manipulations that favor desired forbs and shrubs as practical and appropriate.

Water Distribution

Issue: Optimal water distribution is 1 water source within each mi² of occupied habitat with little screening vegetation nearby.

Opportunity: Pursue water development projects in areas where water distribution is less than desired. Pursue partnerships with livestock producers to develop and maintain waters where mutually beneficial to both pronghorn and livestock.

Translocations:

The translocation of pronghorn from sources both within and outside of the state has long been used to supplement existing populations as well as to found new ones. While translocations will continue to be used as an effective management tool into the future, source origin of the translocated animals will be critically assessed to avoid genetic dilution of extant populations. As a general rule, pronghorn from the Rocky Mountain States will only be translocated to areas north of the Colorado River or to units that have previously received animals from these sources (e.g. Unit 21). Pronghorn from New Mexico may be translocated to any of the southern Arizona herds in Region 5. Translocations to other herds or areas within the state that have not been genetically intermingled will only be from similar genetic stock within the state.

REGION 1**Unit 1**

Pronghorn distribution and population densities in Unit 1 are seasonal. The largest areas of grassland habitat, which are occupied year round, are between State Route 260 and US Highway 60, and north of Escudilla Mountain from the New Mexico State Line to US Highway 191. Summer ranges vary across the unit but include higher elevation grasslands near Big Lake, Wahl Knoll, Crosby Crossing, Lee Valley, and Greens Peak area. Pronghorn have also been observed in the mixed grassland and forest habitats at P.S. Ranch, Kettle Holes, along Black River, and along Mineral Creek. A transplant population persists at Sipe Wildlife Area; marked animals from the initial releases have been observed in Units 2C and 27 and the Vernon area.

Population Information:

The pronghorn population in Unit 1 appears to have declined sharply from 2000 when 744 animals were observed during survey flights to 237 animals observed in 2008. Since 2008 the population has remained stable around 300 animals. Though the overall population trend was down prior to 2005, the largest decline during this period seems to have occurred between 2001 and 2002 when extreme drought conditions prevailed. Current information suggests that this declining trend has flattened considerably since then.

Recruitment continued to be low and the ratio of fawns: 100 does had not been within or even near Department guidelines until 2010 when we observed 46 fawns:100 does. In 2011, the ratio of fawns:100 does dropped off again to below guidelines. Poor habitat conditions, which are exacerbated by drought and grazing regimes and predation, are likely the driving factors behind low recruitment.

Specific Concerns:

The lower elevation grasslands between State Route 260 and US Highway 60 and north of Escudilla Mountain between New Mexico and US Highway 191 are used year round with increased densities during winter. Pinyon-juniper as well as some ponderosa pine encroachment has substantially altered and fragmented areas of this formerly more contiguous grassland habitat. Fire suppression is likely the leading cause of this grassland habitat conversion. Also, the loss of historic grassland components and functions such as the presence of cool season grass species and forbs and the historic fine fuel components to allow for the return of appropriate wildfire has negatively affected this habitat type. Timing, frequency, and intensity of livestock grazing may be a factor.

Though several miles of right-of-way fence have been modified for easier pronghorn passage, predicted increases in highway traffic may create increased barriers to pronghorn movement within the unit and Unit 2C. Additionally, potential migration corridors to higher elevation summer ranges may become unusable to pronghorn due to woody species encroachment.

Large portions of State Land and especially undeveloped private land within the unit may be susceptible to future development. This has recently begun to occur, though on a very small scale, between Springerville and Vernon.

Management Objectives:

- Continue coordination with the Arizona State Land Department and the USFS as well as the Springerville–Alpine HPC to implement large scale habitat improvement projects in the north part of the unit which would include thinning and prescribed burns.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.
- Implement a research study to identify migration and travel corridors as well as possible barriers through use of GPS radiocollars.
- Continue to modify right-of-way fencing along State Route 260 and ensure that any new fences or old fences being replaced along other highway right-of-ways are built to wildlife passable specifications.
- Protect pronghorn habitat from future development where possible.

Unit 2AHistory:

Pronghorn distribution and population densities are relatively similar across Unit 2A, with the exception of the area north of I-40, where pronghorn occur in minimal numbers.

Population Information:

According to the last winter survey (in 1996), the overall pronghorn density for this unit was 0.50 pronghorn/mi². The 2011 survey classified 17 bucks, 69 does, and 6 fawns for a population estimate of 272 pronghorn and a density of 0.44/mi².

Specific Concerns:

The Petrified Forest National Park (the Park) purchased the Hatch Ranch in T18N Ranges 25E and 26E in September, 2011 they also took over management of several blocks of Bureau of Land Management property around the Park. This land acquisition will eliminate or land lock approximately 113 mi² from access to hunters and Arizona Game and Fish Department management. The Park will be trying to purchase the Arizona State lands Department property within the new Park boundaries.

Numerous fences occur throughout pronghorn range in Unit 2A. Most fences are older 4-wire fences, which normally allow for adequate wildlife movement. But a few fences need to be modified to increase the movement of pronghorn through them. I-40 and the Santa Fe Railroad cross the northern part of this unit. These 2 routes parallel each other, generally within a mile or so, and each has right-of-way fences. The interstate and railroad with the combined 4 fences is a very impervious barrier to pronghorn trying to move north or south.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers). All are dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators.

The rangeland within this unit is normally grazed yearlong, with some having livestock movement between pastures as needed and other pastures being heavily grazed. Range

conditions vary greatly with rainfall pattern and associated livestock stocking rates. Excessive forage use is a concern in this unit.

During the 1960s, about 100 sections were subdivided within this unit. This would be about 7% of the unit and 14% of the private land within the unit. There is high turnover of residents with people moving in and out, associated fences being built and other fences falling down. However, these barriers still have a detrimental effect on the pronghorn. Within the last 5 to 10 years, about 60 sections have been subdivided. This approximates 11% of the unit and about 22% of the private land being subdivided. As more of the private land is sold off for subdivisions, a greater negative effect will be placed on the pronghorn population.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Consider using coyote control efforts when fawn ratios are below threshold levels to enhance fawn survival.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.
- Consider Unit 2A as a pronghorn transplant recipient location.

Unit 2B

History:

Pronghorn distribution and population densities are higher in southern Unit 2B shifting from a more even distribution in previous years. Aerial coyote control was conducted in portions of Unit 2B in 1995, 1996, and 1997.

Population Information:

According to the last winter survey (1997), the overall pronghorn density for this unit was 0.81 pronghorn/mi². Population estimates have declined by 42% over the past 5 years.

Specific Concerns:

The number of occupied ranchettes has increased over the past few years bringing with it increased vehicular traffic and pets at large in the unit. The development of CO² wells and exploration for geothermal and wind energy has also contributed to increased traffic.

Numerous fences occur throughout the pronghorn range in Unit 2B. Most of the fences are older 4-wire fences, which normally allow for adequate wildlife movement. But there are a few fences

that need to be modified to increase the movement of pronghorn. Subdivision of large areas is increasing fence densities, and designs can impede or prevent pronghorn movements.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers). All are dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators. Waters developed by ranchers and natural water sources would probably provide adequate water distribution, if all were available all of the time. However, with this many factors affecting the water distribution (i.e., various rainfall patterns, droughts, water sources shut down when livestock are moved or not present, manmade water sources not maintained), water availability could easily be a limiting factor in parts of the unit for pronghorn in some years. Critical waters for pronghorn have not been identified for this unit. Based on the factors listed above, the availability of water is always changing.

In many portions of Unit 2B, encroachment from pinyon and juniper trees is a concern. This encroachment is causing a loss of grassland habitat.

The rangeland within this unit is normally grazed year round, with some having some livestock movement between pastures as needed, other pastures being heavily grazed, and a small portion with livestock removed during the summer. Range conditions vary greatly with rainfall patterns and associated livestock stocking rates. There is concern with forage overuse, especially during droughts and prior to pronghorn fawning.

During the 1960s, about 20 sections were subdivided within this unit. This comprised about 2% of the unit and almost 6% of the private land within the unit. Within the last few years about 145 sections have been subdivided or are in the process of being subdivided. This is about 20% of the unit and about 47% of the private land being subdivided and converted from livestock grazing.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Consider using coyote control efforts when fawn ratios are below threshold levels to enhance fawn survival.
- Remove pinyon and juniper trees as needed and as opportunities arise in and adjacent to occupied habitats.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.
- Consider Unit 2B as a pronghorn transplant recipient location.

Unit 2C

History:

Pronghorn distribution and population densities are more abundant in the southern half of Unit 2C. In 1996 Research Branch published data on Unit 2C's pronghorn habitat suitability. This unit scored well with 125 mi² rated as moderate and 88 mi² rated as high quality habitat.

Population Information:

The only winter survey conducted in this unit (in 1991) indicated an overall pronghorn density of 1.2 pronghorn/mi².

Specific Concerns:

Several wind energy companies have been studying southern Unit 2C as a potential site for wind farms and 1 company indicated possible development in the near future.

Numerous fences occur throughout the pronghorn range in Unit 2C. Most of the fences are older 4-wire fences, which normally allow for adequate wildlife movement. But there are a few fences that need to be modified to increase the movement of pronghorn. Subdivision of large areas is increasing fence densities, and designs can impede or prevent pronghorn movements.

All of the waters for pronghorn in this unit are either natural occurring (very limited) or water sources built for livestock operations (dirt tanks, windmills, water lines with drinkers). All are dependent on rainfall patterns and/or on maintenance of the systems by the livestock operators. Waters developed by ranchers and natural water sources would probably provide adequate water distribution, if all were available all of the time. However, with this many factors affecting the water distribution (i.e., various rainfall patterns, droughts, water sources shut down when livestock are moved or not present, manmade water sources not maintained), water availability could easily be a limiting factor in parts of the unit for pronghorn in some years. Critical waters for pronghorn have not been identified for this unit. Based on the factors listed above, the availability of water is always changing.

During the 1960s, at least 14 sections were subdivided within this unit. This comprised about 4% of the unit and almost 11% of the private land within the unit. Most of these subdivisions are smaller lots than the subdivisions in Units 2A and 2B. Within the last few years about 28 sections have been subdivided or are in the process of being subdivided. This makes a total of 13% of the unit being subdivided and about 33% of the private land being used for residential purposes. Most of the development is on the west and southwest portions of the unit.

In the southwest portion of Unit 2C, encroachment from pinyon and juniper trees is a concern. This encroachment is causing a loss of grassland habitat.

Rangeland within this unit has mixed grazing practices, with some having livestock removed during the summer months, some with movement between pastures as needed, and other pastures being heavily grazed year around. Range conditions vary greatly with rainfall pattern and associated livestock stocking rates. There is concern with forage overuse, especially during droughts and prior to pronghorn fawning.

Management Objectives:

- Increase forage conditions in "moderate" and "low" quality habitats.
- Evaluate and improve wildlife water distribution.
- Develop cost share agreements with livestock operators to redevelop and enhance water systems.
- Coordinate with landowners and livestock operators to leave waters available to wildlife when livestock are absent.
- Work with new landowners on building wildlife friendly fences and evaluate and modify current livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Consider using coyote control efforts when fawn ratios are below threshold levels to enhance fawn survival.
- Remove pinyon and juniper trees as needed and as opportunities arise in and adjacent to occupied habitats.
- Use Heritage funds to acquire key pronghorn habitat, providing for parcels of significant size to allow for enhanced management opportunities.
- Consider Unit 2C as a pronghorn transplant recipient location.
- Work with wind energy companies on access issues and pronghorn management.

Unit 3AHistory:

Pronghorn are distributed throughout undeveloped areas within Unit 3A. Pronghorn occupy Great Basin grasslands, plains grasslands, and open areas of Great Basin Conifer Woodlands within the unit. Seasonal variation in distribution is influenced primarily by rainfall patterns and livestock grazing which produce variations in the quality and quantity of available forage. There is no distinction between winter and summer ranges.

Pronghorn habitat in Unit 3A is comprised of private, State Trust, Bureau of Land Management (BLM), and USFS lands, with the majority of pronghorn habitat in the unit located on private land. The east half of the unit (that portion of the unit which lies east of State Route 77) is about 75% private land and the western half of the unit (west of State Route 77) is about 60% private land. In 1996, the Research Branch evaluated pronghorn habitat quality throughout the unit. The evaluation indicated the majority (50%) of pronghorn habitat in the unit was moderate quality, followed by 20% evaluated as low quality and 15% unsuitable.

Population Information:

Pronghorn density within the unit has fluctuated over the last 15–20 years, although population status derived from survey trends and animals observed per hour does not conclusively show that the population has either increased or decreased during this period. Like many of the surrounding units, annual fawn survival and recruitment are often fair to poor. Surveyed fawn:doe ratios in Unit 3A are frequently below the Department's guidelines (30–40 fawns:100 does). However, a notable increase to the unit's fawn:doe ratios and population index was observed after several years of good precipitation and the implementation of a 3-year predator management effort (aerial coyote gunning) from 2003 to 2005. After this 3-year predator

management was concluded, the surveyed fawn ratio again dropped below 20 fawns per 100 does, which spurred the need for subsequent predator management. Coyote gunning was conducted again in the western portion of Unit 3A during spring 2008 and 2009. The 2013 pronghorn population estimate for Unit 3A is 603 pronghorn.

Specific Concerns:

Habitat loss and fragmentation as a result of private land development is a primary concern in eastern Unit 3A. The east half of the unit has been inundated with residential developments; primarily 40 acre fenced ranchettes. Much of the development has occurred without provisions for easements and travel corridors for pronghorn. Development has not been as widespread on the west half of the unit. Though there is some development spreading north from Snowflake along the State Route 77 corridor and development planned southwest of Holbrook off State Route 377.

In 2009 construction began on Arizona's first large scale power generating wind farm in western Unit 3A near the Dry Lake area. Approximately 30 wind turbines were erected as part of the development's phase I. A second and larger phase II was completed north of Snowflake and west of SR 77 in 2010. A third phase is still being proposed north of phases I and II. There are concerns that such a large scale wind farm will affect local pronghorn populations by possibly disrupting movement patterns, degrading fawning areas, and fragmenting habitat. It is also suspected that pronghorn may avoid turbine fields during their construction. As a result, the Department initiated a 2 year movement study of pronghorn in the western portion of Unit 3A where the wind energy development has been taking place. In November of 2010, 15 pronghorn (10 does and 5 bucks) were captured, fitted with GPS tracking radiocollars and released. In September 2011, 9 more radiocollars were deployed to compensate for mortalities of study animals that occurred during the first year. The study will evaluate movement of the pronghorn in relation to the wind turbines as well as provide habitat use data in western 3A and adjacent units.

Another potential impact to pronghorn habitat in Unit 3A is the extraction of potash in the eastern portion of the unit. One company has already completed exploratory activities and is now moving forward with plans for underground mining. The Department will be working with these developers to evaluate and minimize potential adverse impacts to pronghorn as a result of the activities and land uses precipitated by the potash mining.

Forage conditions and plant diversity are a critical issue throughout the unit. Heavy livestock use coupled with frequent drought periods act to reduce the forb component and decrease forage species diversity during the growing season. Additionally, late season or winter season grazing could affect critical hiding cover for fawns in the summer.

Numerous fences occur throughout the pronghorn range in Unit 3A. Most of these fences need to be modified to be pronghorn passable. Fences and fenced highways, which surround (State Routes 277 and 377 and US Highway 180) and bisect (State Route 77) Unit 3A, were said to be the most pressing problem for pronghorn management in the unit by the 1996 "Statewide Evaluation Of Pronghorn Habitat in Arizona" (Ockenfels et. al. 1996).

Management Objectives:

- Coordinate with land management agencies (USFS Black Mesa Ranger District, Safford BLM Field Office, and the Arizona State Land Department) and private landowners to insure key pronghorn habitat is identified and enhanced through pinyon-juniper removal, development of additional wildlife waters and other applicable management activities.
- Continue to coordinate with the Safford BLM Field Office, Navajo County, and wind-solar development entities to ensure existing and planned wind and solar farms do not adversely impact pronghorn habitat or prevent occupancy of habitat. Continue to coordinate with and provide regional support with the Department's Contracts Branch pronghorn movement study in the Dry Lake Wind Farm area.
- Inventory and modify, where necessary, fences within the unit including right of way fencing along State Routes 77, 277, and 377 and US Highway 180. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Protect pronghorn habitat from future development where possible. Identify and protect travel corridors in areas where private land development is planned. In developed areas frequented by pronghorn, modify existing fences not built to wildlife standards to make the fences pronghorn passable.
- Continue to use predation management (aerial coyote gunning) in the west side of the unit to improve fawn survival and recruitment.
- Use Heritage funds to acquire key pronghorn habitat, providing for conservation easements or parcels of significant size to allow for enhanced management opportunities.
- Continue efforts to improve perennial water distribution in western Unit 3A thru renovation of Arizona Game and Fish Department catchment #1023 and Continued development of perennial livestock-wildlife water sources in cooperation with private landowners in the unit.

Unit 3BHistory–Population Information:

According to the population model, the total population in 2013 prior to the hunt was 83 animals in Unit 3B-South and 102 animals in Unit 3B-North. The population is divided into a north and south herd by US Highway 60 which has a fenced right-of-way, experiences a lot of commuter traffic, and is a significant barrier to interchange between these 2 populations. South of US Highway 60, the population is at minimal numbers and probably declining due to loss of habitat from development and encroachment on grassland habitat by pinyon-juniper woodlands, however a good portion of this is USFS. North of US Highway 60, this population is declining for the same reasons, but on a much larger scale due to human-related development. Results from surveys show fawn:doe ratios have been below guidelines since 2000 and the total number of animals surveyed has declined since a peak at 350 animals in 1995.

Specific Concerns:

Habitat loss and fragmentation from private land development is a primary concern in northern Unit 3B. This part of the unit has been inundated with residential developments and small ranchettes. Development in this area has occurred without provisions for easements and travel corridors for pronghorn.

Another concern is loss of pronghorn habitat to juniper encroachment. Most historical meadows are filling in with young juniper trees. There is little that can be done to slow the developmental encroachment, but the juniper recruitment is being addressed through a variety of funding sources and projects. In addition to the Woolhouse projects in the early 2000s, several other projects are in the infant stages in Unit 3B-North that will address maintenance of previous pushes from the 1960s. Large-scale, landscape type improvements have been proposed to link corridors for less restrictive movement of the herds throughout the northern half of the unit. Improvement of the habitat on the USFS land in Unit 3B will become increasingly important as Unit 3B-North is subdivided and developed. Currently, lack of NEPA clearance by the USFS is preventing any work from being completed. And, due to urban interface issues on the forest being a higher priority for Lakeside Ranger District, it doesn't appear that any grassland restoration will take place in the near future.

The hunt structure for pronghorn addresses human encroachment problems by restricting the firearm type to muzzleloader. Muzzleloader hunts were recommended and approved for the pronghorn hunts beginning in fall 2008.

Numerous fences occur throughout the pronghorn range in Unit 3B. Some of these fences need to be modified to be pronghorn passable. This needs attention on a case-by-case basis.

Pinyon–juniper encroachment is an issue on the southern parts of the pronghorn habitat. This mainly occurs on USFS land. Grassland maintenance and expansion needs have been addressed during USFS Management Planning processes, but NEPA clearances are unlikely to be completed for some time.

Predation primarily by coyotes and harassment and/or predation by feral dogs are always a concern, especially with so much human disturbance.

Management Objectives:

- Maintain and enhance current pronghorn population and distribution in suitable habitat in Unit 3B.
- Continue coordination with the USFS Lakeside Ranger District and private landowners to implement treatment of live pinyon–juniper trees and remnant carcasses (including mechanical thinning, fuel wood treatments, and prescribed burning) to maintain and expand existing pronghorn habitat. Tree removal should also be conducted in an effort to maintain existing pronghorn travel corridors and to create new corridors to improve connectivity of the isolated blocks of pronghorn habitat located throughout the unit.
- Promote fence modifications with agency and private individuals who own land within pronghorn range in Unit 3B to reduce barriers to pronghorn movement. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.

Unit 3C

History:

Pronghorn in Unit 3C occupy Great Basin grasslands and open areas (both natural and man-made) within Great Basin Conifer Woodlands. There may be some seasonal migration of animals from Great Basin Conifer woodlands north to the grasslands resulting from snow in the winter months, but most pronghorn movement is to take advantage of higher quality forage that results from variable or "spotty" rainfall patterns. Pronghorn habitat and distribution is almost exclusively restricted to that portion of Unit 3C that lies north of State Route (SR) 260. However, since the Rodeo-Chediski fire in 2002, a few pronghorn have been observed south of SR 260 in open areas created by the fire. North of SR 260, pronghorn are found from SR 77 west to Phoenix Park Wash.

The majority of the pronghorn habitat in Unit 3C is comprised of USFS lands. In the north part of the unit, where the higher quality pronghorn habitat lies, there are 22–23 sections of private land and about 9 sections of State Trust Land. The 1996 Research Branch report on pronghorn habitat ratings classified 40 mi² as low, 34 mi² as moderate and 5 mi² as high habitat quality. About 80% of Unit 3C was ranked as unsuitable or poor. As additional areas within the Rodeo-Chediski Burn become more open, through removal of fire-killed trees and natural processes, we may begin to see a slight increase in suitable pronghorn habitat within the unit.

Population Information:

Prior to 1991, Unit 3C was managed in conjunction with Unit 3B. Over the last 20 years, the pronghorn population in 3C has gone through several cycles of increasing numbers followed by decline. Recently, the population has been in a period of decline with uncharacteristically low fawn to doe ratios. The 2013 population estimate is 150 pronghorn.

Unit 3C has often yielded a higher fawn recruitment rate, when compared to adjacent units, though over the last 3 years fawn to doe ratios have been alarmingly low. Lack of suitable habitat is most likely the primary limiting factor that prevents this population from increasing. Due to the small size of the pronghorn herd in Unit 3C, environmental influences can have substantive effects on the pronghorn population. As a result, permit numbers have been kept at a level that maintains a conservative harvest while providing a diverse hunting opportunity.

Specific Concerns:

Loss of habitat to rural development is not a significant limiting factor to the pronghorn population in Unit 3C, as is with herds in Unit 3A, since the majority of pronghorn habitat in the unit comprises USFS lands. However, juniper encroachment continues to be a leading cause of habitat loss in the unit. The increased tree density in grasslands can decrease forage production and deter pronghorn from using areas as a result of increased visual obstructions created by the trees. USFS is very aware of the tree encroachment issue and supports removal of some stands to retain and enhance the grassland communities. However, lack of funding and support for cultural resource clearances continue to be the greatest obstacle in prohibiting tree mastication and grassland restoration projects within the unit.

Due to the limited amount of suitable pronghorn habitat found in Unit 3C, local pronghorn herds are at a higher risk of habitat loss through fragmentation. Three major roads transect the pronghorn habitat in the Unit from north to south. These roads are the Pinedale–Taylor road (FR 129), the Pulpmill road (FR 147), and the Aripine road (FR 332). Currently the Pulpmill road is the only paved road of the 3. None of these major roads have right-of-way fences and currently are not considered significant barriers to pronghorn movement within the Unit. Presently the Lakeside Ranger District and Navajo County have long-term plans to pave the Pinedale-Taylor Road and erect right-of-way fences on both sides of the pavement. The Region has significant concerns about the implications of this project in relation to restriction of pronghorn movement and considerable fragmentation of the already isolated habitat blocks within the unit. The Region has initiated negotiations with these agencies to determine an alternative that will not restrict pronghorn movement.

Numerous fences occur throughout the pronghorn range in Unit 3C. Most of these fences were not built to wildlife standards. Fences along State Routes 277 and 77 restrict movement of pronghorn among Units 3A, 3B, and 4B.

Disturbance from human activity may also be a limiting factor in some portions of pronghorn habitat in Unit 3C. As expected, the areas surrounding the urban areas receive more human activity. In addition, the portion of the unit from Clay Springs to Aripine has increased in popularity for OHV recreation and can receive substantial use on weekends. Reduction of forest road density, both marked routes and wildcat trails, would facilitate a reduction in human disturbance.

Management Objectives:

- Continue coordination with the USFS Lakeside and Black Mesa Ranger Districts and private landowners to implement treatment of live pinyon–juniper trees and remnant carcasses (including mechanical thinning, fuel wood treatments, and prescribed burning) in order to maintain and expand existing pronghorn habitat. Tree removal should also be conducted in an effort to maintain existing pronghorn travel corridors and to create new corridors to improve connectivity of the isolated blocks of pronghorn habitat located throughout the Unit. An HPC project was completed in 2013 which resulted in the removal of invading pinyon–juniper trees on 2,467 acres in northeastern Unit 3C.
- Explore opportunities to plant–seed browse and forbs in conjunction with future juniper treatments.
- Promote fence modifications with agency and private individuals who own land within pronghorn range in Unit 3C to reduce barriers to pronghorn movement. Ensure that any new fences being built or old fences being replaced are being built to wildlife passable specifications.
- Continue to address pronghorn concerns when evaluating Allotment Management Plan revisions.
- Establish dialogue with the USFS and within the Department to begin to address off highway vehicle recreation in and near pronghorn habitat. Potential actions may be a project to gauge volume and effects of such use, seasonal closures and/or an outreach program in key areas. Dialogue should also continue to prevent, where possible, additional habitat fragmentation from road improvements in the unit.

Unit 4A

History and Background:

Pronghorn Distribution and population densities in Unit 4A remain constant throughout the year. The primary use area includes everything north of the forest boundary. On USFS land, pronghorn distribution remains adjacent to the forest boundary from Chevelon Canyon to East Clear Creek. Pronghorn generally range about 2 to 4 miles south of the forest boundary. Pronghorn sightings rarely occur further south on the forest in the ponderosa pine habitat.

Habitat Description:

The majority of the pronghorn habitat in Unit 4A is comprised of private and leased Arizona State Trust Lands. The private land habitat is comprised of 3 major landowners. They include the Hopi Indian Tribe, the Ohaco Family, and Molly McCauley. Within the McCauley Ranch there are several small parcels of land that are developed. Unit 4A pronghorn habitat is comprised of roughly 263 sections of land. Livestock management on these 263 sections of land is managed by: Hopi Indian Tribe - 63%, Ohaco - 27%, McCauley - 7%, and USFS - 3% (State sections are included in the lessee's percentage).

1. The 1996 Research Branch report on Pronghorn Habitat Evaluation for Determination of Habitat Quality classified Unit 4A with 23 mi² of low, 206 mi² of moderate and 25 mi² of high-quality habitat.

Population Information:

The Unit 4A pronghorn population has increased over the last 4 years. This herd is very isolated from adjacent units with Chevelon Canyon and Clear Creek Canyon as barriers from movement. In 2009, a significantly low fawn (7 fawns:100 does) triggered predator control efforts. The 5-year predator control program helped boost fawn recruitment the last 4 years (42, 29, 54, and 46 fawns:100 does). Currently the population model tracks this herd at about 450 total animals. This is up about 100 animals since 2009.

Specific Concerns:

As with most pronghorn populations the biggest concern in Unit 4A is the loss of habitat. The land ownership throughout most of the pronghorn habitat is private, State Land, and Hopi Trust. Current partnerships have kept the private land (Ohaco Ranch) from any large developments which could devastate this herd. The Hopi Tribe has not expressed any plans other than to maintain a cattle ranch on their land within Unit 4A. As long as these 2 ranches continue with current practices the pronghorn habitat should remain in check. The wind farm on the Ohaco Ranch that was in the preliminary stages of development has been set aside.

Management Issues:

1. Fences:

Numerous fences occur throughout the pronghorn range in Unit 4A. Some of these fences need to be modified to be pronghorn passable. This needs attention on a case-by-case basis. In 2013, the Hopi Ranch worked on a large portion of their fences. They used a wildlife standard for all their wire fence work.

2. Water Availability:

Water distribution in Unit 4A is highly variable throughout the year. The 3 main ranches use wells and dirt tanks to provide water for their livestock. These same waters make up all the available wildlife waters. There are a couple of exclusive wildlife waters on USFS land, which are used by pronghorn.

There are now 8 wells and numerous dirt tanks distributed across the Hopi Ranch. Water distribution on this ranch is good especially when the dirt tanks contain water. Without water in the dirt tanks, the ranch relies on 8 wells for water. Currently, there are 2 water systems developed off these wells, so water distribution has improved from past years. Of the many dirt tanks on this ranch, 7 dirt tanks are considered very important to maintain good water distribution for wildlife. All 7 tanks are functional and have the capacity to provide long-term water for wildlife. In most cases when these tanks reach 75% capacity or better in the summer, they sustain themselves until the next summer. These reliable tanks are Chevelon, Corbet, Big, Red, Antelope, Twenty-eight Mile, and Broken tank. The 8 wells on the Hopi Ranch assist in water distribution across this ranch. Today, all the wells on the Hopi Ranch use submersible pumps and portable generator to get water to the surface. In 2007-2008, the Hopi Ranch installed a water line off Big Windmill well. This water system consists of about 5 miles of pipeline and 4 drinker locations. In 2010, the Hopi Ranch installed a second water system from the Aja HQ well. This water system is plumbed into the Chevelon and River pastures. These pastures are at the far northern part of the Ranch. In 2013, the Hopi Ranch drilled a new well near Big Tank. This well is currently being developed. Other operational wells on the Hopi Ranch include Fidel Windmill, White Tank, Red Hill, Pablos, and Mitchell Windmill.

There are no real water distribution issues on the Ohaco Ranch and USFS lands. The Ohaco Ranch uses several wells tied into many miles of pipeline to provide excellent water distribution for wildlife and livestock on their Ranch. High Point Well and Ellsworth Well supply the 2 main water delivery systems. These water systems are in service and provide water to livestock and wildlife yearlong. There are also numerous dirt tanks on the Ohaco Ranch. Most dirt tanks on the Ohaco Ranch are functional and assist in excellent water distribution. However, these dirt tanks are not as important as the dirt tanks on the Hopi Ranch due to the 2 water systems on this ranch. When these dirt tanks catch water, they greatly reduce the time and cost associated with the well operations.

The McCauley Ranch often experiences poor range conditions. During very wet years, the few dirt tanks and some natural sinks provide water.

3. Tree-Shrub Encroachment:

Pinyon-juniper encroachment on USFS lands have been addressed during USFS Management Planning process. The USFS has implemented a couple of projects in grassland habitat that retreated pinyon-juniper using a tree shearer. In 2007-2008 the Department implemented about 2,000 acres of pinyon-juniper treatment in existing openings. The method of treatment for this project is to use a drum grinder.

In 2006, a project was implemented on the Ohaco Ranch to address pinyon-juniper encroachment on about 9,000 acres of private land. In 2007, this project was expanded to about 13,000 acres of both private and State Land on both the Ohaco and Hopi 3-Canyon ranches. Currently there has been about 31,600 acres of land on the both the Ohaco and Hopi Ranches funded for pinyon-juniper treatments. Treatment prescriptions include retreating existing openings to creating brand new openings. By the summer of 2009 about half of these acres were complete. The method of treatment for this project is to use a drum grinder.

4. Plant Diversity:

Forage conditions and plant diversity is a year-to-year issue. With the majority of pronghorn habitat on checker boarded private and state land, overgrazing can be an issue. Overgrazing becomes an issue during the last trimester of the doe's pregnancy and the fawning period. Pronghorn does rely on the spring forbs to maintain a high quality body condition through their last trimester. Fawns rely on the residual summer grasses for hiding cover from predators (mainly coyotes). When winter and spring precipitation reaches normal levels, forb production is good. However, to maintain adequate ground cover, it is important to have widespread summer rains. When Unit 4A experiences this type of rainfall, the ranching operations can use some pastures during the winter while leaving other pastures ungrazed. These ungrazed pastures become very important for fawns in the spring. If summer rains are scattered there is not always enough feed to leave any ungrazed pastures by fawning season. Without this ground cover fawn predation can be a limiting factor.

5. Habitat juxtaposition:

Habitat juxtaposition seems to be adequate at the present time. There are currently no major develop plans in the north part of Unit 4A.

6. Recreation:

Recreational use of and effects on the core pronghorn habitat is low. Citizens from the town of Winslow to the north do travel on Highway 99 to reach the USFS lands.

7. Human Encroachment:

Human activity is currently low. An exception is Highway 99, which runs north and south through a majority of the better-rated habitat. Most of the highway does not have a right of way fence, which is a definite benefit to the pronghorn. The development on the McCauley Ranch has a limited impact, since the surrounding habitat is of low quality.

8. Translocation:

Pronghorn from Wyoming have been transplanted into Unit 4A during the 1980s.

9. Predation:

Predation primarily by coyotes is a concern. Control efforts have been conducted in this unit on several occasions, with some marked improvements in fawn recruitment. In 2009 the Department implemented a coyote control effort once again in Unit 4A. Coyote control efforts were continued into the spring of 2013.

10. Agency Coordination:

The Department coordinates pronghorn management activities with USFS personnel, owners of the Ohaco Ranch and the Hopi ranch manager, and recently with the Hopi Indian Tribe. Most pronghorn management on USFS land centers on clearing of encroaching pinyon and juniper woodlands and wildlife water distribution. In the mid-1990s the Department worked collaboratively with the USFS and the Ohaco Ranch owners to install a major water delivery system across the southwest portion of the pronghorn habitat.

In December 2008, most of the deeded sections of land on the Hopi Ranch had a change in land status. Most of these lands are now Federal Lands in Trust of the Hopi Indian Tribe. The Department continues to work with the Hopi Indian Tribe to maintain hunting access on these Trust lands.

Management Goals:

Maintain and enhance current pronghorn population and distribution in suitable habitat in Unit 4A. Become an active partner in the management of the wildlife on the Hopi Ranch.

Management Objectives:

Objective 1: Maintain and enhance large contiguous blocks of pronghorn habitat.

Strategy 1a. Promote pinyon-juniper treatment in and around existing pronghorn habitat to reduce cover for predators and increase forage production for pronghorn. Even with the amount of area treated over the last 3 years, there are small portions of land on the Ohaco Ranch in need of treatment. There are large tracts of USFS lands that are in need of treatment.

Strategy 1b: Promote fence modifications with the 3 major landowners.

Strategy 1c: Become an active partner with the Hopi Nation to assist in designing livestock grazing regimes that benefit the pronghorn and the livestock operation.

Objective 2: Increase water availability and distribution.

Strategy 2a: Promote tank maintenance and well development on the Hopi Ranch. Seek funding through the many different programs that will continue to assist the development of water systems on this ranch.

Objective 3: Continue to maintain a viable pronghorn population across all suitable habitats.

Strategy 3a: Continue to promote coyote control on the Hopi and Ohaco Ranches during periods of low fawn recruitment

Strategy 3b: Continue to coordinate with the USFS on land management issues that may impact or benefit pronghorn populations.

Strategy 3c: Strive to develop ongoing communication with the Hopi Nation concerning management activities on their ranch. Offer to provide management guidance where possible to promote sound pronghorn management activities.

Recent Work Accomplished in Unit 4A Pronghorn Habitat:

- In 2006, 9000 acres of pinyon-juniper removal were funded for a project on the Ohaco Ranch. Funding was through the LIP Program and HPC grants.
- In 2007, 2 sections of treatment for the Ohaco Project were complete.
- In 2006, funding through USFS Partners Program was granted to the Hopi 3-Canyon Ranch to treat 2 section of pinyon-juniper.
- In 2007, 1 section of treatment was completed on the Hopi 3-Canyon.
- In 2007 additional funding through the EQIP program was granted to treat pinyon-juniper on about 4 sections of land on both the Hopi 3-Canyon and Ohaco Ranches.
- In 2007, the Department funded \$75,000 dollars to treat pinyon-juniper on USFS land adjacent to the Ohaco Ranch. The HPC funded an additional \$75,000. This project treated about 2,000 acres of pinyon-juniper.
- In 2007, Hopi 3-Canyon use EQIP funds to drill a new well at the Big Windmill site. This well project is complete and has a new submersible pump. In 2008 the Hopi Ranch installed about 5 miles of pipeline and 4 drinkers from this well.
- In 2008, 9500 acres of Private and State land on the Ohaco Ranch was funded for pinyon-juniper treatment. The treatment area will include the area on the far west side of the ranch to the Chevelon Butte Area. This project was funded through the LIP, EQIP, and Landowner funds.
- In 2008, 9400 acres of Private (now Hopi Trust Land) and State land on the Hopi Ranch was funded for pinyon-juniper Treatment. The treatment area will include the area from the County Well, in the middle of the Ranch, and will move south towards the sections that have been treated over the last couple of years. This project was funded through the LIP, EQIP, and Landowner funds.
- In 2010, the Hopi Ranch installed a water system from the Aja HQ well. This water system provides water in the Chevelon and River pastures.
- In 2013, the Hopi Ranch worked on many miles of fence. They installed smooth bottom wire and used wildlife standards on all fence work. This work was done on the entire fence along Territorial Road, the entire fence along Az Hwy 99 from Territorial road to the Ohaco Ranch, and the fence between White tank and Fidal pastures.
- In 2013, the Hopi Ranch drilled a new well near Big Tank. A water system has not currently been developed.

Unit 4B

History:

This population is bisected by I-40 in the northern portion of the unit. Most pronghorn in this population reside south of the interstate and north of the Sitgreaves USFS boundary. A smaller number of animals do use available habitat south of the USFS boundary and a few north of I-40. Starting in 1977 survey efforts observed 164 pronghorn in Unit 4B. In 2007, 146 pronghorn were observed. Pronghorn survey observations have ranged as high as 335 in 1999 and as low as 81 in 1991. No reintroductions or population augmentations have been implemented in 4B to date.

Population Information:

The largest contiguous area of suitable pronghorn habitat in Unit 4B is located between the USFS boundary and Chevelon Canyon to the west, north to the Little Colorado River. Unit 4B pronghorn population estimates show a slightly declining to stable population over the last 10 years with an increasing trend over the last 3 years. Unit 4B fawn recruitment was the highest it had been in 10 years peaking at 48:100 in 2005. Fawn recruitment then decreased to 23:100 in 2006 and 28:100 in 2007 to a low of 12:100 in 2009. Fawn recruitment then again increased to 37:100 in 2010 and 2011 and 44:100 in 2013. Consecutive years of increased recruitment should continue to stabilize or increase population in Unit 4B. Continued monitoring and improvement of range conditions throughout the unit will help this population to continue to grow.

Specific Concerns:

According to the Statewide Pronghorn Habitat Evaluation, modifications to livestock and wildlife grazing may be necessary to increase plant species richness. Low annual rainfall in the northern portions of the unit hinders recovery of this richness. One factor that can be addressed is the grazing regimes (numbers, species, duration, and rotation) currently employed in Unit 4B. Prescribed burns and mechanical treatments of juniper could also be used to increase diversity, but coordination with permittees, landowners and land managers is necessary to develop a plan under current land ownership.

Juniper densities are increasing along the transition zone between woodland and shrub-grassland types found in the unit. The size and connectivity of open areas throughout the unit should be enlarged and connected to other treated or existing grassland areas. Identifying movement corridors and high use areas is important and can be done using aerial survey information. The information collected can then be incorporated into a strategic plan for tree removal. Maintaining current juniper pushes and connectivity to open grasslands is also needed.

Water availability throughout the unit is questionable, with low average rainfall and high evaporation potential. Livestock waters are numerous but do not appear to be reliable yearlong sources for pronghorn. During drought conditions, these are not capable of holding water yearlong. This is especially noticeable north of I-40. Higher elevation waters, that are more reliable, are not found in preferred pronghorn habitat and so do little to provide yearlong support for pronghorn.

Fences in and around Unit 4B inhibit movement of pronghorn within the unit as well as in and out of the unit. I-40 to the north prevents the movements of pronghorn herds into and out of the northern portion of the unit. State Routes 377, 77, and 277, which make up the eastern boundary, carry less traffic than I-40 and so fence modifications and/or removal in some areas would help mitigate their fragmentation effect. Other modifications could include moving fences further away from roadways and replacing lower strands of barbed wire with smooth strands at least 41-46 cm above the ground. Coordination with landowners, permittees, transportation agencies, and landowners can determine which fences could be modified to facilitate movement of pronghorn. Livestock fences within Unit 4B are numerous. Most of the common barbed wire fences could easily be modified to improve movement of pronghorn by replacing lower strands of barbed wire with smooth wire at least 41-46 cm above the ground. North of I-40, fence modification should occur before reintroduction efforts occur. Other livestock fences within the unit may no longer

be necessary for sound livestock management and should be removed. Coordination with allotment permittees, landowners, and land managers could identify which fences are still necessary, need modification, or can be removed.

Recreation throughout most of the pronghorn habitat is minimal most of the year. Higher levels of disturbance caused by recreation activities are typically around the developing areas of Chevelon Retreat, Chevelon Ranch, and at higher elevations not typically used by pronghorn.

Development within Unit 4B has typically been located along the boundaries and consists of Winslow, Holbrook, Joseph City, Heber-Overgaard, and Forest Lakes. These areas have not yet substantially expanded into pronghorn habitat and pose minimal impact on pronghorn. Within 4B, the areas of Chevelon Retreat, Chevelon Arces, Antelope Valley and Chevelon Ranch continue to be developed into ranchette type developments. The associated roads, fences, and increased disturbance will affect pronghorn movement and available habitat. Continued coordination with developers, and county and city municipalities will be needed to minimize negative impacts on pronghorn within the unit.

Management Objectives:

- Maintain pronghorn habitat and travel corridors through cooperation with land management agencies and private or other landowners.
- Evaluate and modify livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Continued and increased removal of encroaching juniper or pinyon-juniper woodland types through mechanical methods, fuel wood cuts and prescribed burning.
- Encourage predator management by private landowners and sportsmen.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- All public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- Repair and/or improvement of earthen tanks to maintain water holding ability and capacity.
- If existing waters are lost to development, new waters should be created for use by pronghorn.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.
- Continued involvement in regional planning efforts, including federal, county and city municipality planning.

Unit 27

History:

Pronghorn in Unit 27 are located primarily within the Upper Eagle Creek watershed. The population consists of a small indigenous herd that received a supplemental transplant of 55 pronghorn in 1999. Pronghorn typically range from the Mud Springs area south to Sunflower

Mesa, and have been seen as far east as Four Bar Mesa. Many pronghorn travel back and forth onto the San Carlos Indian Reservation.

The majority of the pronghorn habitat in Unit 27 is composed of USFS lands. There are some small private lands along Eagle Creek.

Population Information:

Aerial surveys are conducted annually for pronghorn in Unit 27. Anywhere from 12 to 38 animals are classified. No realistic population estimate is available due to the transient nature of this herd across the San Carlos Apache Reservation boundary. In recent years, pronghorn have been observed in the northern portion of the unit along the Black River in Rocky Prairie. These pronghorn most likely immigrated from Unit 1.

Specific Concerns:

Numerous fences occur throughout the pronghorn range in Unit 27. These fences separate public and private land, allotments, and pastures within those allotments. Fencing that does not meet game standards is common. Efforts are being made on public lands to modify or replace existing fences to make them more suitable to pronghorn movement. Fences on private lands will be dealt with on a case-by-case basis. Any new fences on public land will be built to wildlife passable specifications.

Tree and shrub encroachment is a concern in Unit 27. Pinyon and juniper continue to invade grassland areas that are critical to pronghorn. With such a small fraction of the unit suitable for pronghorn use, it is important that these areas are maintained.

Forage conditions and plant diversity could affect pronghorn on USFS allotments if overuse of these areas occurs. Overuse of the forb component could affect nutrition for pregnant pronghorn, and late season grazing could affect critical hiding cover for fawns.

Human activity may be a limiting factor along Eagle Creek, however it is not considered to be a widespread problem. The area does receive a fair amount of deer hunting pressure, which may influence pronghorn use areas. This hunter influence is of short duration and is not during the critical fawning period.

Predation of fawns is a concern. Since this is such a small population, it is even more important to maintain fawn survival at or above maintenance levels. Given the close proximity to steep terrain and dense cover, this herd is susceptible to predation from many predator species. They include mountain lions, bobcats, Mexican wolves, coyotes, and golden eagles.

Most pronghorn habitat in Unit 27 is managed by the USFS. The Clifton Ranger District supports continued efforts to increase the pronghorn population. Pronghorn needs are considered when evaluating livestock grazing management.

Management Objectives:

- Maintain and enhance current pronghorn population and distribution in Eagle Creek portion of Unit 27.

- Maintain and enhance large blocks of pronghorn habitat.
- Modify livestock fences to wildlife standards.

REGION 2

Units 5A and 5B – Anderson Mesa Herd

History and Background:

Units 5A and 5B contain the Anderson Mesa pronghorn herd. The boundaries of the herd area are I-40, East Clear Creek Canyon, Ponderosa Pine habitat type on Coconino National Forest in Unit 5A, I-40, Forest Highway 3, and Walnut Canyon. The herd area includes the northern half of Unit 5A and 5B. Pronghorn north of I-40 are functionally connected to pronghorn herds in Units 4A and 7.

The pronghorn habitat in the Anderson Mesa Herd Area varies from ponderosa pine to great basin grasslands. This herd has historically been much larger than it is currently, and has fluctuated a great deal. The herd has suffered die offs and had large increases since 1900.

In 2009, the Department began working with the Hopi Tribe to develop a hunt framework for Hopi New Lands in portions of Units 5A and 5B where there is a checkerboard of Hopi and State Trust Lands. The goals of the program are to develop collaborative and shared wildlife management; provide seamless wildlife surveys, season dates and permit numbers; and provide access to both Hopi and State hunters. Since 2010, a specific number of pronghorn permits have been allocated to Hopi tribal members each year based on the number of acres that they own.

Survey and Harvest Trends:

The pronghorn in these units are functionally split in 2 herds; documented through GPS telemetry data. One group of pronghorn spends the winter at lower elevation lands and spends the rest of the year on Anderson Mesa. The second group lives yearlong in the lower elevation habitat. These herds are functionally separate because they breed and give birth while in separate areas. They all winter in the same grasslands and shrub lands, primarily on State, private, and Hopi lands. We know very little about interchange of pronghorn between these herds.

Specific Concerns:

The primary management issue for the Anderson Mesa Pronghorn Herd is low fawn recruitment. Pronghorn literature suggests that most does conceive and carry twin fawns to parturition, although low fawn recruitment has several potential causes including predation, competition, disease, nutrition, and disturbance. From 1991 to 2000, surveyed fawns per 100 does varied from between 1 and 21. The point where recruitment exceeds mortality is most likely to be in the range of 20 to 35 fawns per 100 does. A long period of low recruitment occurred in the 1990s, possibly in response to increasing average age of does. Increasing hiding cover for fawns could improve fawn survival. Leaving grass cover standing in the fall in selected pastures can provide fawn hiding cover the next spring under some conditions. After wet winters the residual pronghorn fawn cover may not be as useful if the grass cover is packed down by snow and ice. The other source of fawn hiding cover is new growth from the current spring. The amount of

growth before fawns are born appears to vary with weather.

Three methods have been proposed for improving nutrition for Anderson Mesa pronghorn: 1) burning; 2) cutting pinyon, juniper, and pine where trees have invaded grasslands or have become denser on savannas; and 3) altering grazing practices.

Fawn:doe ratios in Units 5A and 5B have been above guidelines the last few years. However, predation on pronghorn fawns has been shown to be a serious problem on Anderson Mesa in the past. One remedy that may improve fawn survival during years of good precipitation is to remove coyotes. However, the effects of coyote removal on fawn survival may only be short-term.

Water is available on USFS lands on top of Anderson Mesa and is fairly dependable. On USFS lands below the mesa water sources are far less dependable. The Jacket Fire effectively created several thousand acres of pronghorn habitat, but without more reliable water sources its potential is limited. On the State, private, and Hopi lands water availability is highly variable. All waters in these areas are livestock wells and dirt tanks, thus they are only seasonably available. The largest question is not so much whether a stock tank is present but whether the tank is likely to hold water in normal or drought conditions during the fawning season.

Another issue is fences. While most fences in the Anderson Mesa area are wildlife-friendly, there are still numerous fences needing modification. These are identified on a case-by-case basis, and often modified through joint cooperation between the private ranch and the Department.

Management Objectives:

Our objective is to manage to increase pronghorn numbers for Anderson Mesa. Use population modeling, double-count population estimates, and number of pronghorn observed per hour during survey flights to monitor this goal. The focus should be on increasing fawn recruitment through habitat project funding and cooperation between the Department, USFS, State Land Department, Hopi Tribe, ranchers, and other stakeholders. Numerically, the objective is to maintain 200 or more does observed on survey and greater than 25 fawns per 100 does.

- Improve forage diversity and health, and fawn hiding cover in pronghorn habitat
 - Continue to remove juniper, pinyon and ponderosa pine trees from invaded grasslands and savannas.
 - Evaluate grassland burning on a variety of soils and grassland vegetation types on Anderson Mesa by burning 1,000 acres.
 - Target 60,000 acres of pronghorn habitat treatment (including both woody vegetation removal and burning of woodland, slash, and grasslands, within 10 years on USFS lands.
 - Encourage and assist the USFS, State Land Department and Diablo Trust in developing and implementing fire plans for areas of pronghorn habitat.
 - Target 20,000 acres of treatment (including both woody vegetation removal and burning) on State Land Department, Hopi, and private lands within 10 years.
 - In the last decade, 11,000 acres of pinyon and juniper have been treated on the Bar T Bar allotment, and nearly 13,000 acres on the Clear Creek Ranch.

- Manage elk herds with the intent of avoiding substantial negative impacts on pronghorn forage or fawning cover.
 - Manage elk at a level where elk impacts on pronghorn forage or fawning cover are not significant through the fawning period.
 - Continue to maintain reduced elk numbers that use winter range during the summer. Summer elk surveys indicate the Limited Opportunity hunts on State and private lands to address residential elk on winter range have been successful.
- Improve forage availability for pronghorn on Anderson Mesa ephemeral wetlands.
 - Modify fences as needed to permit passage by pronghorn and to improve durability.
 - Record use of ephemeral wetlands by pronghorn when incidentally observed to provide information about the timing of use.
- Improve distribution of pronghorn, access migration routes and access to forage by improving fences.
 - Complete inventory of fences on USFS and private (with permission) lands on Anderson Mesa.
 - Meet or exceed 18 inch bottom wire standard on all fences on the Raymond Wildlife Area.
 - The Hopi 3 Canyon Ranches have successfully modified all their existing fences to wildlife friendly standards. This not only includes all interior fences, but all boundary fences as well.
 - Investigate the potential for removing or modifying fences (such as with let-down panels) in movement corridors, such as from Anderson Mesa to winter range.
- In conjunction with other objectives, use predator management when appropriate to reduce predation with emphasis on predation on pronghorn fawns.
- Improve water availability
 - Continue to update the Department Regional drought plan in response to pronghorn concerns as information becomes available. Include consideration of emergency water distribution system for Pine Hill, which may minimize water-hauling effort.
 - Improve access to waters by modifying water lot fences in pronghorn habitat in cooperation with ranchers.
 - In 2012, a pipeline with 6 wildlife drinkers was installed on the Clear Creek Ranch within the 12,000 acres of pinion-juniper habitat that was returned to grassland.

Unit 6A

History and Background:

Pronghorn were abundant and well distributed throughout Unit 6A in the 1950s, but since 1962 the numbers have dwindled and some herds have disappeared. Historically, pronghorn were abundant on Mud Tank Mesa, Cedar Flats, White Mesa, Apache Maid area, and in the open

parks throughout the ponderosa pine habitat from Upper Lake Mary to Mahan Park.

With the development of I-17 and the paving of State Route 260 in the late 1960s and early 1970s, much of the interchange between summer and winter habitat for pronghorn was fragmented. Pronghorn could no longer use much of the Verde Valley as winter range; areas like Jacks Point were isolated, and herds began to decline. As human development in the Verde Valley increased, more habitat was fragmented and lost. Human development and increased livestock fencing in the pine type reduced pronghorn use of that habitat.

In September 2011, a pronghorn herd was observed on the east side of Highway 89A. This is the first known occurrence of pronghorn in this area in the last 35 years. This group probably originated from Fry Park, likely crossing the new Wildlife Urban Interface timber thinning treatment.

Habitat Description:

Unit 6A covers about 1,172 mi² but only 23 mi² are considered high or moderate quality pronghorn habitat. The unit lies in the area south of Flagstaff and north of Camp Verde. The majority of the pronghorn habitat in Unit 6A is within the Coconino National Forest. A small percentage of the available habitat is privately owned.

Vegetation within the unit comprises mixed conifer woodlands, pine-oak woodlands, pinyon-juniper woodlands, and grassland-desert-scrub communities. Elevations range from less than 4,000 feet in the southern portions of the unit to over 8,000 feet in the higher areas. The unit contains some very large canyons (Beaver Creek, West Fork of Clear Creek) that likely pose barriers to pronghorn movement. Water is well distributed throughout the unit in the form of lakes, creeks, and earthen stock tanks designed to support livestock grazing operations.

Above about 6,800 feet elevation, the unit is dominated by ponderosa pine forests with natural meadows scattered throughout. Between 4,500–6,800 feet elevation, the vegetation is dominated by pinyon-juniper woodlands. Historically, many areas were chained or pushed to create new grasslands or enhance natural grasslands to benefit livestock grazing. Below 4,500 feet elevation, the pinyon-juniper transitions into a mesquite-grassland community.

Specific Concerns:

The pronghorn in Unit 6A occupy grassland–desert scrub habitats, pinyon–juniper woodland–grassland habitats and less traditional pine–oak woodland habitats. Much of the available pronghorn habitat in Unit 6A is being invaded by pinyon–juniper and pine causing the degradation of habitat by a decreased plant diversity and forage value. Invading species also increase vertical structure making pronghorn more vulnerable to predation.

Land management practices including fire control and grazing have enhanced the growth of less desirable native and exotic plant species. Less desirable species have thrived while many desirable species have decreased in abundance. As woody species encroachment occurs, the herbaceous understory has suffered from increased canopy cover and direct competition for water and nutrients. Wildland Urban Interface forest treatments around Flagstaff have opened the forest canopy and pronghorn have begun to use these areas.

Habitat fragmentation is a key issue in Unit 6A as in other areas of the state. The barriers provided by right-of-way fences and highways such as I-17, Forest Highway 3 and State Route 260 have greatly reduced the ability of Unit 6A pronghorn to use the available habitat. The barriers provided by roads and fences likely reduce opportunity for ingress from adjacent pronghorn populations. Geographic barriers such as steep canyons also tend to fragment the available habitat as does the increasing tree density due to woody plant invasion.

Livestock grazing has necessitated the construction of allotment and pasture fences. These fences have provided additional barriers to pronghorn movement.

Past heavy grazing by livestock and wildlife has tended to reduce available forage, reduce plant species diversity, and limit fawning cover.

Water is generally well distributed in Unit 6A with earthen tanks being well distributed throughout the unit. Additionally, Upper and Lower Lake Mary and Mormon Lake provide water in the eastern portion of the unit. However, sustained drought greatly decreases the amount of available water as stock tanks and even lakes dry up for extended periods. Livestock further deplete the available water during drought.

Although only a fraction of the pronghorn habitat in Unit 6A is privately owned, many parks in the pine-oak woodland habitat types have been developed and the remaining private holdings are in jeopardy.

Management Objectives:

Human development has caused permanent loss of pronghorn habitat, mostly in the Verde Valley. Major highways have further fragmented habitat causing additional losses. Options to recover this pronghorn population need to focus on reducing competition with other grazers, reducing shrub encroachment, improving forage quality and plant diversity, removing fences, and possibly managing predation. All of these options are within the control of the USFS or Department and, therefore, can be addressed if those 2 agencies make a commitment to recovering this pronghorn herd. Currently, no commitment has been made nor any project priorities established.

Units 6B and 8 Herd

Management Objectives:

The pronghorn herds in Units 6B and 8 function as metapopulations centering on warm-season habitat at Garland Prairie and winter-yearlong habitat east of US Highway 89. US Highway 89 (Sullivan Lake to Ash Fork, west boundary of Unit 8) and I-40 (north boundary of Units 6B and 8) isolate the herd from pronghorn in adjacent Units 7, 10, and 19B. Physical obstacles, such as the Mogollon Rim and Woody Ridge, block pronghorn interchange to the east and south in Unit 6B. Documented interchange across the Verde River Canyon west of Perkinsville allows genetic diversity to flow through this population-permeable barrier between Units 8 and 19A. Managing obstacles to ease pronghorn movement will aid gene flow and ensure seasonal migration capability. Both units face 3 critical management objectives:

- Maintain and restore grassland-savanna habitats,
- Consolidate habitat and maintain travel corridors linking grasslands-savannas, and
- Reduce barriers to movement.

The western extension of the Mogollon Rim divides Unit 6B into a northern upland plateau and a southern valley grassland savanna. The northern half supports summer seasonal habitat of about 150 square miles occupied by a pronghorn herd with linkage to Garland Prairie in Unit 8. The southern half is consistent with the general Verde Valley pronghorn habitat and covers about 100 square miles.

The northern upland of Unit 6B is a plateau with some rolling hills and small, steep volcanic mountains. Elevation generally exceeds 7,000 feet and Woody Mountain and Volunteer Mountain both reach 8,000 feet. Ponderosa pine forest dominates the vegetative communities in the north half of Unit 6B often in association with Gambel oak. Inclusions of mixed conifer occupy north aspects of canyon terrain and the north slope of Volunteer Mountain. A unique mixed conifer savanna occupies limited acreage near Volunteer Canyon at Camp Navajo. Small grasslands up to 2,000 acres interrupt the forest canopy on Camp Navajo, at Rogers Lake, Fry Park, and Mill Park. Other smaller linear meadows add some diversity.

A rating system evaluated pronghorn habitat by sections within the area: 88% as poor quality, 4% as low quality, 8% as medium quality, and none as high quality. The 150 sections of potential pronghorn habitat in the northern half of Unit 6B center on moderate quality habitat around Rogers Lake, Mill Park, and Fry Park. A total of 160 sections of habitat were rated by Ockenfels as potentially suitable pronghorn habitat, including 9 sections in Unit 11M that were part of Unit 6B in 1996.

The Unit 6B pronghorn population tends to use the 3 core areas of medium quality habitat. These areas include Rogers Lake, Mill Park, and Fry Park. Additionally, they frequently use the grasslands and savannas found at Camp Navajo. During drought periods, the spike-rush-wet meadow plant community at Rogers Lake attracts high use. Ponds constructed to support grazing of livestock adequately supplement natural water sources.

The Windmill Ranch occupies the central core of the pronghorn range in the north half of the unit. The ranch has been supportive of pronghorn management activities, participating in the Wheatfield juniper control project in the south half of Unit 6B. The Windmill Ranch in Unit 6B was purchased by another private landowner in 2011. The new owners continue to cooperate on pronghorn management, as did the previous owners. The range is grazed during the warm season (June-October), and range condition plots indicate a static trend in ground cover and species diversity. The Manterola Sheep Ranch leases summer range flanking the Windmill Ranch on the east and west. Allotment boundary fences of net wire between Windmill and Manterola allotments persist as an obstacle to pronghorn movement. Camp Navajo was leased for warm-season cattle grazing through 2002, but grazing has since been terminated. The strategy of Camp Navajo to add multiple live-fire ranges may compromise some pronghorn habitat.

Unit 6B

A pronghorn telemetry project initiated in 1999 tracked the Garland Prairie herd in Units 6B and 8. A migration corridor linking Garland Prairie to Wagon Tire Flat skirts south and west of Bill Williams Mountain to access lowland (about 4,000 feet elevation) winter habitat along the west boundary of Unit 8. Telemetry data from a Unit 6B pronghorn indicate that the North Unit 6B (including Unit 11M pronghorn at Dry Lake) herd follows this migration route, often staging at Garland Prairie and/or Hat Ranch during the migration seasons.

The north herd in Unit 6B contains about 40 pronghorn, primarily using Rogers Lake, Mill Park-Yellow Flat, Fry Park, and Camp Navajo. Wildland Urban Interface fuel treatments on the Northern Arizona University Centennial Forest and Coconino National Forest Woody Ridge have reduced ponderosa pine stand basal area to increase pronghorn use of the boundary area of Units 6B and 11M (Flagstaff Well Field, Fisher Tank- Budweiser, Rogers Lake adjacent). The Woody Ridge project south to Fry Park, created a link between the meadows and allowed pronghorn to disperse east from Fry Park to cross State Route 89A into GMU 6A.

Pronghorn range in the south half of Unit 6B occupies juniper savanna and desert grassland habitat between Sedona and Cottonwood. Pronghorn activity centers include Wheatfield Flat, Duff Flat, Upper Sheepshead Valley, Windmill Ranch headquarters, and White Flat. The Sedona Wastewater treatment facility adjacent to the White Flat and Windmill HQ provide spray-irrigated acreage that buffers the worst effects of severe summer drought for this pronghorn herd unit. This herd population tends to vary from approximately 35 to 55 pronghorn. A Verde River crossing site on the west edge of Duff Flat allows potential gene exchange with the small Cement Plant pronghorn herd unit in Unit 19A. Both the Wheatfield-Windmill herd and the Cement Plant herd have been highly vulnerable to predation by mountain lions.

Beginning in 2010, Unit 6B featured an archery hunt with 10 tags in the northern portion of the Unit and 2 general permits in the southern portion. Harvest has averaged 3 bucks annually.

Specific Concerns:

- Juniper encroachment into grassland habitat in the Putney Flat (Unit 8) and Perkinsville area has impacted habitat quality.
 - Prescott and Kaibab National Forests have an effective juniper management strategy prioritizing treatment of travel ways to aid habitat connections.
- Threats to movement corridors.
 - Identify and enhance potential pronghorn movement corridors by removing juniper and ponderosa pine and modifying fences.
- Poor habitat-range conditions.
 - Work with the USFS and livestock operators to develop livestock rotation plans which leave vegetative cover in key pastures during the critical pronghorn fawning season.
 - Work with the USFS and State Land Department to prioritize pronghorn habitat in their prescribed burn program.

- Urbanization of habitat
 - Work with local government planners to retain maximum pronghorn habitat capability in the Sheepshead Valley near Cottonwood. In 2009, the city of Cottonwood proposed an annexation-development plan for about 7 sections of State Trust land vital to the southern 6B pronghorn herd. This block of land is critical to future of this herd unit.
- Isolated populations may become non-viable due to reduced size, lack of genetic variability, and lack of emigration-immigration.
 - Determine potential pronghorn corridors between subpopulations and enhance them to encourage pronghorn movement.
 - Use transplanted pronghorn to bring genetic variability into isolated populations.

Unit 8

Specific Concerns:

- Continue pronghorn movement research (Units 6B, 8, and 19A) to identify herd movement corridors
- Reduce use of electric fences if they are a mortality factor
- Modify fences along roads to facilitate pronghorn movement (i.e., wildlife specification fencing, goat bars, staging areas) and resist fencing along roads on migration corridors (Perkinsville Road)
- Modify fences along railroads to facilitate pronghorn movement
- Remove juniper from Rabbit Bill to Putney Flat and in the Perkinsville area
- Encourage wider utility corridors through juniper woodlands in pronghorn habitat
- Encourage predator control when appropriate

Units 7 and 9 Herd

History and Background:

Land status includes private land (including local municipalities), State Trust Land, and federal land managed by the Coconino and Kaibab National Forests. The BLM manages only about 3 sections in Units 7 and 9. Management of federal and private-state checkerboard lands under the management of Babbitt Ranches and McNelly Ranches offer special opportunities as these private entities are cooperative in efforts to enhance conditions for pronghorn.

In early 1995, the Department's Research Branch conducted a statewide evaluation of pronghorn habitat. The units contain about 3,239 mi² of occupied pronghorn habitat, consisting of about 11 mi² of high quality habitat, 548 mi² of moderate quality habitat, 670 mi² of low quality habitat, and 1,913 mi² of Poor Quality or Unsuitable habitat. The evaluation found that the grasslands had some understory diversity, but areas of short shrub (sage brush and rabbit brush) invasion should be kept in check. Additionally, tall shrub and tree (pinyon-juniper) encroachment poses a threat to the continued integrity of the grassland. Finally, the evaluation found that habitat quality posed the single greatest concern for pronghorn in the area, while wire fences and lack of water during drought are also very serious.

The Unit 7 and 9 herd can generally be broken into 3 distinct herds with little interchange between them. One portion occurs east and north of Flagstaff between I-40 and Highway 89. Another portion resides from Highway 89 west to Highway 64 and south to I-40. The last portion resides west of Highway 64. Each portion of this herd has its unique issues.

Unit 7

The 1995 habitat evaluation in Unit 7 revealed about 1,576 mi² of pronghorn habitat. About 5.5 mi² of the Unit were classified as high quality pronghorn habitat and 380 mi² are considered to be of moderate quality habitat. Most favorable habitats for pronghorn are located in the upper elevation grasslands-parks interspersed in the ponderosa pine type (in both Unit 7 East and 7 West) and at lower elevations in moderately grazed grasslands.

A research project initiated in 2006 by the Department found that Highway 89 was a barrier to pronghorn, although there was some movement across the Highway. In 2010, about 1 mile stretch of fence was removed along the highway with portions of Wupatki National Monument on either side. Telemetry data showed that pronghorn movement was quickly enhanced.

In 2012-2013, several fence projects were initiated along Highway 180 and Highway 89. These projects increased the distance of the fences from the highway to create a larger buffer zone to allow the pronghorn to cross with less stress. Along with widening, the fences were improved to be more wildlife friendly with smooth bottom wires and goat bars.

Another project that has been in effect is the IDA Grassland Restoration Project in conjunction with the USFS and several NGO's such as the Arizona Elk Society and the Arizona Antelope Foundation. This objective of this project is to combat juniper encroachment and restore native grassland habitat to benefit winter range for wildlife, including pronghorn.

Since 1990, general pronghorn permits have averaged between 40–65 permits and harvest has ranged from 33 to 52 pronghorn annually. In 2009, a 5-permit archery hunt was added.

Specific Concerns:

- Juniper encroachment into historic grassland habitat:
 - The Kaibab National Forest has identified 3 areas in 7 West for grassland maintenance. They are in priority, IDA (45,345 acres) and Government Prairie and Clark (28,730 acres). IDA is scheduled to be complete by 2014, if funding is secured.
 - Planning treatment for the other 2 areas has not started. Additionally, the Community Tank Project on the east and south side of Moritz Ridge which connects the IDA project toward Government Prairie is proceeding through the NEPA analysis.
 - A tree-thinning project is ongoing in the Slate Mountain area. Additional tree-thinning in Unit 7 is being planned in the Four Forest Initiative extending from Government Prairie to Kendrick Park and east and north to the forest boundary.
 - All tree-thinning projects will increase-enlarge existing habitat and preserve identified movement corridors.

- Improve forage conditions where possible.
 - Work with the USFS in developing livestock rotation plans which leave vegetative cover in key pastures during the critical pronghorn fawning season.
 - Work with the USFS and State Land Department to prioritize pronghorn habitat in their prescribed burn program where applicable.
- Fences.
 - Identify and modify fences where ever possible in pronghorn habitat that need modification or could be removed. Work with USFS range program and private land owners to ease pronghorn movement.
- Loss of habitat to human development.
 - Actively participate in land-planning efforts from the USFS or Coconino County to preserve, prevent, or mitigate the lost of pronghorn habitat and movement corridors.
- Water distribution.
 - Identify water available for pronghorn and plan accordingly to keep or expand water sources where water distribution is lacking.
 - Work with land managers and private landowners to provide access to heavily fenced livestock waters. Providing water sources outside the enclosed livestock water may be necessary.

Unit 9

History and Background:

The 1,645 mi² in Unit 9 include only 5 mi² of high-quality pronghorn habitat and 164 mi² of moderate quality habitat. Most of the suitable habitat is situated along the western boundary. The majority of the pronghorn in Unit 9 reside on the west side of the Unit and they generally stay year-round on the state and private checkerboard land along Cataract Canyon. The West side of the Unit includes the area north of Valle and west of State Route 64 to Cataract Canyon. It includes the Tusayan Ranger District of the Kaibab National Forest and state and private checkerboard land. The pronghorn occasionally cross back-and-forth through the shallow portions of the southern end of Cataract Canyon into Unit 10.

The majority of the pronghorn on the east side of State Route 64 in Unit 9 range as far north as Ten X Ranch near Tusayan and south along the Highway 180 into the Coconino National Forest. The eastern boundary of the Unit is the Navajo Reservation, which is of low habitat quality. Additionally, there is a small herd of pronghorn located in the Upper Basin, which is north of the Coconino Rim, and South of the State Route 64 between Forest Road 307 and the Desert View Entrance to the Grand Canyon National Park. This herd is isolated due to surrounding topography and roadways.

Livestock fencing is present in most of the sections throughout the unit. The western portion of Unit 9 has a greater occurrence of woven wire fence, especially in the area of Little Harpo Canyon. Several of the earthen tanks have 7-wire, 10-wire, and woven-wire fences surrounding them.

Several projects have been completed to help improve pronghorn habitat and populations in the Unit including fence, agra-axe, and water projects. The Department plans to continue to propose projects using brush hogs, agra axes, native reseeding projects, removing unnecessary woven wire fences and 7- and 10-wire fences around waters, and increasing the availability of year-round water sources especially in established fawning grounds.

Management Concerns:

Some of the areas' primary threats to the pronghorn population are drought (poor quality habitat conditions), range management (competition with livestock and other wild ungulates), predation, loss of habitat by development, and the resulting fragmentation and isolation. Habitat protection and improvement is the number one priority. Habitat improvements will probably not increase the pronghorn population dramatically, though they will help ensure a stronger and healthier population. Making greater efforts to capitalize on the mitigation and research opportunities that present themselves will allow the Department to make advancements in producing quality habitat.

Management Objectives:

- Woody species invasion.
 - Map soil types and lands that formally supported grasslands and savanna habitat types.
 - Work with wildlife organizations, land managers, and other publics to develop land management plans to restore grasslands for grassland species.
 - Work through the HPCs and other private organizations and land managers to fund pinyon-juniper and ponderosa removal from invaded grasslands and savannas at all elevations. Target the most productive sites initially.
 - Aggressively support and encourage prescribed burning of grasslands by land managers (e.g., burning of Government Prairie by the Kaibab National Forest).
 - Develop plans for maintaining a mosaic of connected openings in areas burned by wild fires in the ponderosa pine belt. In these designated areas, pile and burn down and standing timber and periodically burn to retain open condition.
- Forage needs.
 - Initiate "water harvesting" on the private lands of cooperating ranchers. "Water harvesting" is a technique that creates numerous shallow depressions in the ground to disturb soil and capture water run-off. The depressions are of varying sizes, 1 to 3 feet deep and are one-tenth to one-half acre in size. "Water harvesting" would break dominance by blue grama in treated areas and would allow a better mix of vegetation needed by pronghorn and other grassland species.
 - Disc grassland flats dominated by blue grama on private lands to increase plant diversity. Seeding of disturbed sites with cool season grasses and desirable browse like saltbush and winter fat could benefit the range. Monitor disturbed sites for the presence of undesirable species. Again, ground disturbance on public lands is difficult to achieve.

- Forage overuse.
 - On winter range, remove competing pinyons and junipers from areas supporting desirable browse plants.
 - Manage livestock and elk use to protect desirable browse on winter range.
- Predation
 - Lion predation on pronghorn is most often associated with cover in some form. Reduce woody cover in areas managed for pronghorn to limit lion predation effectiveness.
 - Reducing the lion population in areas managed for pronghorn may also benefit pronghorn.
 - Free ranging dogs are not uncommon in Unit 7 East and in the Woodland Ranch and Red Butte areas of Unit 9. These dogs harass and may kill pronghorn and other wildlife.
- Fences.
 - Map fences in pronghorn range that need modification or could be removed. Work with landowners and lessees to implement modifications.
 - Evaluate new cross-fence construction by land managers. Educate land managers about the problem fences pose for pronghorn.
- Loss of habitat to human development.
 - Document examples of losses and educate the public about the problem.
 - Investigate federal programs and educate Department employees about those programs (e.g., conservation easements) so they can explain them to landowners. Some landowners are vitally interested in maintaining their ranching heritage.
 - Educate people in subdivisions about the needs of wildlife like pronghorn to help people live with wildlife.
 - Actively participate in land-planning efforts (e.g., Coconino County Planning) to provide information and influence on behalf of the needs of pronghorn.
- Fragmentation of habitat.
 - Map movement-migration corridors used by pronghorn.
 - Work with the USFS to open up forests and woodlands in movement corridors used by pronghorn.
 - Work with landowners and land managers to remove unneeded fences and to provide "goat bars" in required fences to lessen the impacts of fences on pronghorn movements, with an emphasis on migration corridors.
- Water distribution.
 - Map surface waters available for pronghorn and plan construction of new waters where distribution of waters is lacking. Pursue grants (e.g., HPC funding) for new construction.
 - Improve, rebuild, and repair key existing water facilities. Pursue grants for funding.
 - Work with land managers and private landowners to provide access to heavily fenced livestock waters. Providing small water sources outside the enclosed livestock water

may be required. Such water could be shut off and emptied of water during livestock gathering operations.

Units 12A and 12B

History and Background:

Pronghorn were historically present in the Great Basin grasslands of House Rock Valley in Unit 12A and 12B. This population has been cyclic in a direct relationship with precipitation. Post survey population estimates have varied from 20 pronghorn to 90 over the last 10 years. During periods of drought, poor fawn survival has resulted in low recruitment and, conversely, during normal to above normal precipitation years, fawn survival and recruitment increase.

Habitat Descriptions:

House Rock Valley is primarily public land managed by the USFS and BLM. There is a small 30-acre wildlife area managed by the Department in the southern part of House Rock Valley and a few small private land holdings in the northern part of House Rock Valley. There are 3 working ranches in House Rock Valley with grazing allotments on the public lands. Overall, pronghorn habitat in these units is small compared with the rest of the state.

- Total area for Unit 12A is 1,664 mi².
- Suitable pronghorn habitat in 12A is 81 mi² with only 46 mi² being moderate and 0 being high quality.
- Total area for Unit 12B is 1,168 mi².
- Suitable pronghorn habitat in 12B is 359 mi² with 146 mi² being moderate and 2 mi² being high quality (roughly 3/4 of this occurs in House Rock Valley).

Pronghorn habitat in House Rock Valley is primarily Great Basin Grassland with areas of sagebrush, shrub, and some juniper encroachment. House Rock Valley has been identified as a reduced species richness grassland. Grasses include Indian ricegrass, blue grama, three-awn, and cheatgrass. Big sagebrush is primarily responsible for the invasion of the grassland with large monotypic stands becoming prevalent in the southern portion of House Rock Valley. Other shrubs found in House Rock Valley include snakeweed, rabbitbrush, saltbush, Mormon tea, and fringed sagebrush. Some of the eastern fingers of the Kaibab Plateau are also used by pronghorn. These fingers have open stands of grasslands being encroached upon by closed canopy woodlands of junipers and pinyon pine.

Management Concerns:

Typical of small populations, the House Rock Valley herd is very susceptible to limiting factors, such as lack of plant diversity and overgrazing. Other limiting factors that have been identified are predation, fragmentation of habitat, fences, and lack of fawn hiding cover. Many of these limiting factors are directly and indirectly related to one another. Also, drought has long been identified as having a direct affect on pronghorn populations in Arizona.

While there is little encroachment from pinyon-juniper, there are large monotypic stands of sage encroaching upon the grasslands. This results in loss of habitat, decrease in forage species richness, blocking of travel corridors, and an increase in predation.

Besides the encroachment of shrubs, low plant species diversity was identified as 1 of the main limiting factors for pronghorn in the moderate to low quality habitat in House Rock Valley. Low species diversity also relates to lack of fawning cover.

Excessive livestock grazing is detrimental to pronghorn habitat. House Rock Valley is in the rain shadow of the Kaibab Plateau, so forage production is limited. Rangeland managers should carefully consider stocking rates and seasons of use as they directly affect forage availability and fawning cover for pronghorn.

Miles of fences do not meet game standards and restrict pronghorn movement and survival. Most of these nongame standard fences occur in northern House Rock Valley. The Grand Canyon Trust is working to replace fences with ones that meet the AZGFD guidelines for wildlife fences. They have also removed fences that are no longer needed. They intend to continue this fence work in the future.

Coyote predation on fawns has been identified as a probable limiting factor to pronghorn recruitment, especially during prolonged drought periods when fawning cover is limited. While predator control may work over the short term, it must be maintained to be effective.

While illegal harvest of pronghorn has not been documented in this area, the illegal harvest of other game species in the area has been documented and would lead one to believe that there is illegal take on this pronghorn population. Because of this population's size, illegal take could substantially limit this population's productivity if this removal involves primarily the take of female pronghorn.

Increase in human disturbance not only degrades the habitat, it can also affect fawn survival. Fall (hunting season) and spring (shed antler "hunting" season) are the times of highest use. However, House Rock Valley receives little pressure due to its remote location.

House Rock Valley may not have an adequate supply of yearlong water sources for pronghorn. A water source is within 1-4 miles of most of the suitable habitat. The primary source of water along the southern portion of House Rock Valley is a water line that feeds multiple tanks on USFS and Department properties. The catchments and pipeline need to be monitored frequently for damage as they are continually needing repairs. There are also yearlong water sources on BLM land, however these waters are maintained for livestock use and some have fencing surrounding them that may exclude pronghorn.

Management Objectives:

- Tree-shrub encroachment
 - Identify key areas of sagebrush encroachment and implement management strategies to restore those areas to historic grasslands. Southern House Rock Valley has already been identified as an area with large monotypic stands of sagebrush that is in need of reclamation. Suggested management strategies for this area include prescribed burns and/or mechanical removal.
- Livestock grazing strategies.

- Coordinate with public land stewards and their permittees to maintain progressive rangeland techniques to address the issues of plant diversity, adequate forage, and fawning cover.
- Fences
 - Continue to replace old fences with pronghorn-friendly fences that meet Department standards
 - Continue to look for ways to remove tumbleweeds along the fenceline to promote pronghorn movement throughout the Valley
- Water
 - Evaluate the need for additional water sources.
- Augmentation.
 - Use transplants when opportunities arise to maintain a viable pronghorn population.
- Illegal harvest.
 - Continue law enforcement patrols to deter illegal take.
- Recreation
 - Enforce Off-Highway Vehicle laws to eliminate the propagation of wildcat roads, damage to vegetation, and to reduce animal disturbance.

Units 13A, 13B, and 12B West

There is currently a draft Management Focus Area Plan for 13A and 13B, so this portion of the management plan was not updated.

REGION 3

Units 10

There is currently a draft Management Focus Area Plan for 10, so this portion of the management plan was not updated.

Units 15A and 15B

Background and History

The objective for Units 15A and 15B is to maintain a population of between 70 and 100 post-hunt adults and to have an annual harvest of between 3 to 5 animals. These goals will be more difficult to reach as habitat losses reduce the Department's ability to effectively manage pronghorn and their habitat in the area. Starting with moderate pronghorn habitat and taking into account the effect of prolonged drought and deteriorating habitat conditions these goals will be even harder to obtain.

Habitat Description

This section describes administrative boundaries and pronghorn habitats in the Kingman area. The planning unit is comprised of Units 15A and 15B. Land status includes private, State Trust Land, and federal BLM land. Neighboring units are covered under separate chapters in this plan.

Major habitat types in the area include semi-desert grasslands, great basin desert scrub, pinyon-juniper woodland, and interior chaparral. Quality rank of pronghorn habitat in the planning unit, and each unit is contained in the following table. Habitat quality maps and a description of each unit are outlined below.

Quality rank of pronghorn habitat (mi²) in Units 15A and 15B, in northwest Arizona*

Unit	Habitat Rank					Total
	High	Moderate	Low	Poor	Unsuitable	
15A	0	46.6	91	59.7	328.1	525.4
15B	0	138.1	420.9	321.8	925.1	1,805.9
Totals	0	184.7	511.9	381.5	1253.2	2,331.3

Ockenfels et al. 1996

Unit 15A

This unit encompasses about 525.5 mi² of Mohave County in northwest Arizona. The northern boundary is the Colorado River from Pearce Ferry to the Hualapai Indian Reservation. The eastern boundary borders a portion of the Hualapai Indian Reservation from the Colorado River, south to State Route 66. State Route 66 west to Antares Road is the southern boundary, and Antares Road and Pearce Ferry Road form the western boundary. The unit is composed of a mix of grassland, closed canopy-pinyon-juniper woodland, chaparral, and Mohave Desert habitat types (Brown 1994). Rugged canyons, mesas, rolling hills, and grassland characterize the terrain. Elevations range from 6,768 ft in the Music Mountains to 2,953 ft on Grapevine Mesa above Pearce Ferry. Most pronghorn in Unit 15A reside in the Grapevine Canyon Area, Truxton Area, and the Hualapai Valley-Antares Road vicinity. The Truxton and Grapevine Canyon areas are primarily BLM lands; Hualapai Valley-Antares Road area is a checkerboard pattern of BLM and private land.

Unit 15B

This unit encompasses about 1,806 mi² of Mohave County. The northern boundary is Lake Mead, from Pearce Ferry, west to Hoover Dam. The western boundary is Highway 93, south from Hoover Dam to I-40, then east on I-40 to Hackberry Road. The eastern boundary is Hackberry Road, from I-40 north to State Route 66. This boundary then veers west along State Route 66 to Antares Road, and continues north along Antares Road to Pearce Ferry Road. The remainder of the eastern boundary proceeds northeast from the Antares–Pearce Ferry Road junction, and terminates at the Colorado River (Lake Mead). Three major mountain ranges are located in Unit 15B, the Peacocks, Cerbats, and Black Mountains. The area is composed of a mix of grassland, closed-canopy-pinyon-juniper woodland, chaparral and Mohave Desert habitat types. Rugged canyons, mesas, boulder-strewn terrain, rolling hills and grassland characterize the terrain. Elevations vary from 6,890 ft in the Cerbat Mountains to 2,953 ft in Detrital Valley.

Pronghorn Distribution and Population Trends

Units 15A and 15B

The pronghorn herd in this planning unit is distributed among 4 areas: in grasslands west of Hackberry road, portions of the Hualapai Valley, north and west of the town of Truxton and on

top of the Music Mountains in areas north and east of Grapevine Canyon. Distribution of pronghorn within each subunit is discussed below (subunits are listed in order of importance based on the percentage each contributes to the overall population)

Hackberry Road

The Hackberry road runs between State Route 66 and I-40 east of the town of Hackberry, and east of the Peacock mountain range. The east side of the Hackberry road is Unit 18A and the subpopulation of pronghorn that reside west of the Hackberry road travel back and forth across the road between the 2 game management units. The terrain is flat to undulating and is characterized by shrub invaded grasslands and juniper woodlands. The invasion of shrubs and junipers in this area has lessened the potential quality of the habitat along Hackberry Road. Water sources are adequate, but livestock fencing that does not meet game standards and housing developments threaten pronghorn habitat in this area. Hackberry Road has moderate to heavy use creating vehicular disturbance and pronghorn readily travel between Unit 15B and Unit 18A.

Southern Hualapai Valley

The Hualapai Valley boundaries consist of the area north of State Route 66, south of the Pearce Ferry Road. The valley lies between the Cerbats on the west side and the Music and Peacock Mountain ranges on the east side. The terrain is mostly flat or undulating and is characterized by shrub-grasslands. The habitat quality is low due to reduced species richness and the amount of invasive shrubs. The populations of pronghorn that reside in the Hualapai Valley are divided by State Route 66 and the AT&SF railroad. The southern population is located on the Grounds Ranch and frequently cross I-40 into Unit 16A. State Route 66 and the AT&SF railroad, which follows State Route 66, are significant barriers to the movement of pronghorn due to numerous fences and considerable traffic. Livestock fences are also present which do not meet game standards. The Department's statewide evaluation of pronghorn habitat in 1995 stated that developing a management plan for pronghorn in the Hualapai Valley would be difficult. Historically there have been a lot more pronghorn seen in these areas. Due to the deterioration of the habitat conditions, mainly shrub and juniper encroachment, overgrazing and fire suppression, the population has declined.

Northern Hualapai Valley-Antares Road

The population of pronghorn that resides in the northern portion of Hualapai Valley is located in habitat that exists between the Antares Road and the Grand Wash Cliffs along the western side of the unit. The terrain is mostly flat to gently sloping with numerous small ridges as elevation increases towards the Grand Wash Cliffs and occasional mountain ridges extending from the cliffs. Development of the town of Valle Vista north into Hualapai Valley also has created an increase in the amount of disturbance and loss of pronghorn habitat. Vegetation is characterized by shrub and cacti-invaded grassland. Many of the shrubs were excellent forage, but shrub height and cover increase visual obstructions and decrease habitat quality. Grasses are not abundant in this area. Perennial water is a limiting factor in this area and livestock fencing does not meet game standards. Development is increasing in this area leading to a disturbance problem with vehicular travel on the Antares Road and subsequent loss of habitat.

Truxton

The Truxton area is situated in the southeast corner of the Music Mountains, bordered by the Grand Wash Cliffs, State Route 66 and the Hualapai Indian Reservation. The terrain is characterized by undulating hills, broken rocky plateaus, and steep canyons along Grand Wash Cliffs. Occupied pronghorn habitat in this area is comprised of a reduced-species shrub grassland, which progresses to a juniper-woodland towards the mountains. Although a good diversity of shrubs are present, much of the grassland habitat is overgrazed and provides little cover or forage for pronghorn. Water sources in the area appear adequate, but several fences effectively prevent pronghorn movement. Urbanization near the town of Truxton and adjacent to State Route 66 also compromise the quality of pronghorn habitat. An estimated 30-50 pronghorn use this area on a fairly regular basis. These animals migrate east onto the Reservation, and south across State Route 66 into Unit 18A.

Grapevine Canyon

This area is located on top of the Music Mountains, south of the Colorado River, and north of Grapevine Canyon, bordering the Hualapai Indian Reservation. Broken, low hills and canyons characterize the terrain. The vegetative cover is juniper woodlands or drought-tolerant shrubs. Various sized shrub-grasslands exist in the area and shrub and cactus species richness is good. Grass species richness, however, is lacking. Water availability in this area may be limiting. The fence marking the Reservation boundary does meet not game standards and pronghorn in this area are known to cross back and forth between the Reservation and the unit. Development and disturbance in this area are minimal due to its remote location and presence of a few low-use dirt roads.

Specific Issues and Proposed Management Actions

Because of the mixed land ownership, cooperative management options between landowners, land management agencies, and the livestock permittees are essential. Management actions should address effects on populations that are confined in small areas resulting from developments in pronghorn habitat that isolate herds.

Habitat Management

The primary challenge to pronghorn management in Units 15A and 15B is the continued degradation of habitat that is rated only as moderate. This issue is compounded by the consortium of permittees and land managers. With land ownership consisting of state trust, BLM, and private lands, working through issues will demand cooperation among all parties involved.

- Loss of water sites due to development and drought conditions. Another consideration is the placement of livestock troughs within waterlot fencing. Pronghorn are reluctant to use fenced waters, which can also provide an opportunity for entrapment and predation. Location, quality and reliability of waters in pronghorn habitat need to be established. Working with landowners and management agencies waters need to be developed and/or improved in areas where needed.
- Past land exchanges have disposed of public lands eliminating potential pronghorn habitat.

- Fence crossings were installed along the Hualapai Indian reservation in July of 2000 to enhance movement and compensate for loss of habitat to 40 acre lot development in the immediate area. These fence crossings need to be monitored.
- Follow-up and evaluate the 7 proposed multi-use exclosures in Hualapai Valley to describe impacts of grazing on wildlife habitat. Studies should include determining range condition, trend, potential and habitat rate recovery (Cerbati-Music Habitat Management Plan).

Game Management

- Explore the possibility of supplemental transplants into areas with isolated populations and use surplus animals from other areas.
- Continue muzzleloader and archery hunts to accommodate hunting in proximity to developed areas.
- Establish more accurate estimates of subunit pronghorn populations.
- Evaluate movement of pronghorn on to Hualapai Indian Reservation and into adjacent game management units.

Planning

In the past, land exchanges have occurred within pronghorn habitat resulting in the loss of that habitat (e.g., Hualapai Mountains 1988 Land Exchange). Some habitat in this area has not been deemed significant in the long-term survival of pronghorn in northern Arizona (Hualapai Mountains Land exchange EIS). Every portion of pronghorn habitat should be considered valuable for the prolonged maintenance of these small populations.

- Develop comprehensive grassland ecosystem management plan with land management agencies, NGOs, and landowners to improve specific blocks of pronghorn habitat.

Unit 17A

Background and History

- Maintain a population of 125-175 post-hunt adult pronghorn with an annual harvest of 5 bucks, with the majority of these animals residing in the New Water area of the Unit.
- Work with landowners to ensure continued access to Unit 17A.
- Protect and enhance habitat and travel corridors by working with landowners and land management agencies.

Habitat Description

Unit 17A covers about 305 mi² (195,200 acres) of Yavapai County, in northwest Arizona. The eastern boundary is the Williamson Valley Road from the junction of the Camp Wood Road north to the Prescott National Forest boundary. The USFS boundary serves as the northern and western boundaries for the Unit. The Camp Wood Road is the southern boundary from the Williamson Valley Road to the USFS boundary. The city of Prescott sits about 25 miles southeast of the southern boundary of Unit 17A. Seligman is located about 15 miles north of the northern boundary of the Unit.

Unit 17A is composed of a mix of ponderosa pine-oak woodland, pinyon-juniper woodland, chaparral and grassland habitat types. Rugged mountains, canyons and mesas, rolling hills and flat open grassland savannas characterize the terrain in Unit 17A. Elevations vary from 4,600 to 7,272 feet above sea level. Most pronghorn in Unit 17A reside in the northwestern portion of the unit. A few additional animals occur on limited habitat in the southeastern and southwestern corners of the unit.

Quality rank of pronghorn habitat in mi² for Unit 17A

Unit	Habitat Rank					Total
	High	Moderate	Low	Poor	Unsuitable	
17A	6	24	20		84*	134

Ockenfels et al. 1996

*Poor and Unsuitable habitat were combined for Unit 17A.

The Yavapai Ranch takes in roughly the northern half of Unit 17A including New Water. The New Water area, which accounts for the majority of pronghorn habitat in Unit 17A, is located in the northwestern portion of the Unit. This area encompasses the western one third of the Yavapai Ranch and is about 45 mi² in size. Elevations range from about 5,600 to 6,500 feet above sea level. The area is composed of a mix of grassland and pinyon-juniper interspersed with cliffrose and other browse species. Land ownership is a checkerboard of USFS and private land owned by the Yavapai Ranch. A land trade proposal is currently under consideration, which would result in a large portion of the pronghorn habitat in the New Water area becoming USFS lands if accepted in its current form. The only structure located in this area is the Ranch’s west side headquarters. Landforms include open plains, rolling hills and small plateaus. Natural water is very scarce with permanent sources supplied in dirt tanks and ranch pipelines. Most of the area is used as grazing land for livestock.

In early 1995, the Department’s Research Branch conducted a statewide evaluation of pronghorn habitat. Within the above-mentioned area, about 38 percent (10,944 acres or 17.1 mi²) rated as moderate quality, 22% (6,336 acres or 9.9 mi²) as low quality and 40% (11,520 acres or 18 mi²) as poor quality. The evaluation found that the grasslands were shrub (snakeweed) invaded and lacked species richness. Shrub diversity in the open woodland areas was good, although most were tall enough to obstruct pronghorn vision. The evaluation further suggested that juniper and tall shrub encroachment had greatly reduced the amount of open grassland and that these areas would benefit from removal of these plants.

A small amount of pronghorn habitat is located in the southeastern corner of Unit 17A on the Las Vegas Ranch. Ten to 12 pronghorn regularly use this area and likely move in and out of Units 19B to the east and 17B to the south. In southwestern Unit 17A, a small number of pronghorn are occasionally observed on the Yolo Ranch. These animals move in and out of Unit 18B to the west. Also in southwestern Unit 17A, a small number of pronghorn are occasionally observed on the 7-Up Ranch. These animals move in and out of Unit 18B to the west.

Pronghorn Distribution and Population Trends

The pronghorn located in Unit 17A are primarily found in 3 distinct areas. These are the southeastern corner, the southwestern corner and the northern portion of the Unit. The New Water area, located in northwestern 17A provides the majority of the pronghorn habitat and thus is home to most of the pronghorn in the Unit. New Water is not a closed population and substantial movement is known to occur between Units 18B to the south and west and 18A to the west and north. Pronghorn habitat loss, caused by development to the west and north, will increase the importance of the New Water area and the Baca Float to the south. Pronghorn use habitat in the southwest corner of 17A intermittently. This area offers fragmented grasslands that suffer from heavy tall shrub and tree invasion. These pronghorn spend most of their time to the north and west in Unit 18B. The southeastern corner of 17A is a mix of deeded private and State Trust land. A few pronghorn use this area and move back and forth to the south into Unit 17A and to the east into Unit 19B.

The long-term average (1973-2002) of fawn survival in Unit 17A is 27 fawns per 100 does. For the past 5 years the average is 29 fawns per 100 does. After several years near zero in the late 1980s, fawn survival increased dramatically in 1991. This followed 2 years (1990-1991) of coyote control in the New Water area. As the effects of the coyote control dissipated, both fawn survival and total observations began a steady downward trend that lasted most of the 1990s. Fawn survival, however, has shown an increase in the past few years. Total observations have also increased recently, but may simply be a result of habitat loss and disturbance to the north and west. While these surveys do not attempt to estimate total population numbers, they do provide trend information based on repetitive survey effort on a yearly basis.

Pronghorn have been surveyed in Unit 17A since at least 1957, at which time survey data were combined with 17B and 19B. Unit 17A data were not separated until 1973 and the New Water data were not separated out until 1983. Pronghorn have been hunted in Unit 17A since at least 1958, when the unit was again combined with Units 17B and 19B. Starting in 1989, Unit 17A was removed from the multi-unit hunt structure and has stood alone as a separate hunt since. There have also been archery hunts in 17A in the past.

Lack of recruitment drove the downward trend in the New Water pronghorn population during the 1990s. Some of the factors negatively affecting recruitment include, but are not limited to: predation, precipitation patterns, water distribution, barriers to movement, forage (nutrition) availability, shrub encroachment, and lack of fawn hiding cover. Many of these factors can be improved through cooperative habitat management.

Management Goals

Habitat Management

Issue 1 – Sections of land within Unit 17A are at risk for potential urban development pending the outcome of a proposed land trade between the Yavapai Ranch and Prescott National Forest.

Issue 2 – Border fences along southwest corner of Yavapai Ranch (New Water) are not to wildlife specifications.

Strategy 2a. – Work with Yavapai, ORO, and OO Ranches and modify fence by either restringing bottom 2 strands of wire or installing "goat bars."

Issue 3 - The Yavapai Ranch is planning a large wind farm on the western portion of the the Ranch. This has the potential to negatively affect pronghorn.

Strategy 3a. – Work with Ranch and NextEra Energy Company for mitigation measures. Possibilities include creating new wildlife waters and radiocollaring pronghorn to evaluate effects of project.

Game Management

Issue 1 – Apparent high level of predation by coyotes, ravens and mountain lions in New Water portion of Yavapai Ranch.

Strategy 1a. – Encourage individual sportsmen and varmint calling clubs to hunt coyotes in this area through information and education efforts.

Strategy 1b. – Encourage local sportsman (houndsman) to hunt mountain lions in this area through information and education efforts.

Unit 18A

Habitat Description

Unit 18A covers about 1,236 mi² in northwest Arizona. The unit boundaries are Highway 66 and the southern boundary of the Hualapai Indian Reservation from Seligman west to the Hackberry Road; Hackberry Road and Highway 93 south to Trout Creek; Trout Creek and the Prescott National Forest boundary east to the Williamson Valley Road and north to Seligman.

The unit is composed of a mix of grassland, pinyon-juniper and chaparral and lower desert habitat types. Elevations range from about 2,380 to 6,742 feet above sea level. Most of the unit lies between 4,300 and 5,300 feet above sea level. Landforms include open plains, rolling hills, plateaus, and mountains. About 325 mi² of Unit 18A could be considered pronghorn habitat. Natural surface water is very scarce in pronghorn habitat. Most water is supplied by dirt tanks and ranch pipelines designed to support livestock grazing operations.

Quality rank of pronghorn habitat in mi² for Unit 18A

Unit	Habitat Rank					Total
	High	Moderate	Low	Poor	Unsuitable	
18A	0	138	233		577*	948

Ockenfels et al. 1996

*Poor and Unsuitable habitat were combined for Unit 18A.

About 44% (535 sections) of Unit 18A is controlled by the ASLD and leased to various ranches for livestock grazing. The Bureau of Land Management (BLM) manages about 8% (99 sections) of Unit 18A. About 50 sections of pronghorn habitat south of the town of Truxton, AZ

amounting to about 15% of the unit's pronghorn habitat in the northwest portion of Unit 18A is managed by the BLM. This area is included in the "Crozier Ranch" allotment leased by local ranchers. About 20 % of the unit's pronghorn population is usually observed on Truxton Flat.

About 48% of Unit 18A is private land. There are about 400 mi² of remote real estate subdivision within Unit 18A. Communities within Unit 18A include Seligman, Truxton and Valentine. Most of the Unit 18A pronghorn population is located on the Double O Ranch, the X-One Ranch and Bureau of Land Management public lands on Truxton Flat, Crozier Allotment. There are smaller amounts of pronghorn habitat on the Denny Ranch, the Echeverria Ranch, Fort Rock Ranch and the Cofer Ranch. All or portions of 10 major ranches have been subdivided and sold. Land ownership is extremely fragmented over most of the unit.

The Double O Ranch is located in the eastern half of Unit 18A. The ranch accounts for about 40% (130 sections) of the unit's pronghorn habitat and a little over half of the unit's pronghorn population. Nearly half of the Double O ranch is leased State Lands. Most of the rest of the ranch is subdivision that is rapidly developing. Housing development has entered pronghorn habitat and has already affected a significant portion of the available habitat. There is 1 about 40 mi² area south-southwest of Seligman that is presently undeveloped. Further development, even in this latter area, is imminent and threatens the viability of this population and any hunting of pronghorn on the east side of the unit.

The X-One Ranch is located in central Unit 18A, running east to west, lengthwise. The eastern portion and the western portion both contain pronghorn habitat. The ranch contains about 55 sections of pronghorn habitat or about 17% of the unit's pronghorn habitat. Close to 20% of the unit's pronghorn population resides on this ranch. The owners of the X-One Ranch have chosen to block access to hunters on all private land portions of the ranch in an attempt to run a guided hunting operation. The X-One Ranch contains 1 block of about 25 sections of State Land that is undeveloped. This block of land is probably a big enough area to ensure the future of a pronghorn population and limited hunting into the future.

The Denny Ranch, comprised of about 65 sections was in past years an important pronghorn area within Unit 18A. At the present most of the ranch is subdivided and pronghorn numbers as well as use by pronghorn is considerably less than in past years. The ranch is still of importance to pronghorn but it appears to be used more in the winter than in the summer.

The following ranches contain lesser amounts of pronghorn habitat as well as fewer pronghorn: Blake Ranch, Cofer Ranch, Fort Rock Ranch, Echeverria Ranch, and the Miller Ranch. All or parts of the following ranches have been subdivided and sold: Blake Ranch, Cofer Ranch, Double O Ranch, Denny Ranch, Echeverria Ranch, Fort Rock Ranch, Miller Ranch, Willows Ranch, Windmill Ranch, and the X-One Ranch.

Pronghorn Distribution and Population Trends

Goals and objectives similar to the Statewide Management Guidelines can be applied to Unit 18A. The Department desires to maintain a population of between 400-700 pronghorn in Unit 18A with a desired harvest of between 15-40 bucks annually.

Pronghorn located in Unit 18A are primarily found in 6 distinct areas. The areas are: 1) the Chino Wash Drainage; 2) the Aubrey Valley; 3) the Seventy Four Plains (including Munds Well Flat and the Red Lake Drainage); 4) Denny Ranch; 5) Truxton Flat; 6) Round Valley.

All of the areas are now mostly open to pronghorn harvest. All areas have also shown a decline in population numbers in recent years due to a number of reasons. At this point in time subdivision development may reduce hunting opportunity as much as population trends.

The long term average for fawn survival in Unit 18A equals 27 fawns per 100 does from 1963 to the present. Unit 18A has recently experienced a dip in fawn survival, falling below desired guidelines levels, as low as zero fawn in 2010.

Management Goals

Habitat Management – Issues here are the same as in Unit 10. One change specific to Unit 18A would be that Truxton Flat, the block of State land on the Seventy Four Plains and the Chino Wash area near the Double O Ranch Headquarters should be protected as much as possible as these are the only areas left in Unit 18A that will be undeveloped in the not too distant future.

Unit 18B

Planning Unit Description

Unit 18B covers about 1,214 mi² (777,062 acres) of Yavapai and Mohave Counties, in northwest Arizona. The eastern boundary is the Prescott National Forest and the Camp Wood Road. The southern and western boundary is Highway 93 and the northern boundary is Trout Creek and the Davis Dam-Prescott power line. The town of Bagdad is located in the southeastern portion of the unit, and Wikieup is located off of Highway 93 on the western boundary. The unit is characterized by a variety of topographical features and vegetation types. Major landmarks include Bozarth Mesa and Strotjost Flat to the east and Goodwin Mesa to the west. Burro Creek flows through the middle of the unit between the mesas. Interior portions in Unit 18B contain a mosaic of varied vegetation types including, semi-desert grassland, interior chaparral, madrean evergreen woodlands, pinyon-juniper woodland, and isolated ponderosa stands. Lower elevations consist of Sonoran Desert Scrub habitat. Canyons and drainages provide several well-developed riparian communities of cottonwood, willow, sycamore, ash and walnut. Elevations range from 1,000 to 5,500 feet. The Baca Float (ORO Ranch) also has a sizable pronghorn population but it is not available to most hunters. Most pronghorn habitat occurs across 4 areas in 18B: Goodwin Mesa, Bozarth Mesa, and Strotjost Flat, and the on Anvil Rock Ranch in the northern portion of the Unit. Quality rank of this habitat is contained in the following table.

Quality rank of pronghorn habitat in mi² for Unit 18B

Unit	Habitat Rank				Total
	High	Moderate	Low	Poor	
18B	4	161	49	278*	492

Ockenfels et al. 1996

*Poor and Unsuitable habitat were combined for Unit 18B.

Goodwin Mesa comprises most of the pronghorn habitat in Unit 18B. This area is located in the west central portion of the unit and encompasses the eastern one third of the Francis Creek Ranch. The habitat is about 82 mi² in size. Landforms include open plains, rolling hills and small plateaus. Elevations range from 4,200 to 5,700 feet. The area is primarily composed of semi-desert grassland. Land ownership is almost entirely BLM; 2 small private parcels are owned by the Francis Creek Ranch. No residential structures are found in this area; however, several water-holding tanks are in place to support summer livestock operations. Natural water sources are limited, but permanent sources are supplied in dirt tanks and ranch wells. In 2010, the Bureau of Land Management did a grassland restoration burn on the east section of the mesa. In 2011, The Francis Creek Ranch added some cattle waters on the west end of Goodwin Mesa. The Department is currently working with BLM to build 3 proposed waters in Unit 18B, specifically for pronghorn.

The Bartmus Flat-The Island area is located north of Goodwin Mesa. This area encompasses portions of the southern and eastern boundary of the Wagon Bow Ranch, the western boundary of the Mohon Ranch, and the northern and eastern boundary of the SV Ranch. The area contains about 66 mi² of semi-desert grassland. Landforms include open plains and rolling hills. Land ownership is a checkerboard of private and BLM sections. Although the majority of habitat in this area is currently closed to the public, the Department continues to survey pronghorn because the area serves as a travel corridor between the Anvil Rock and Goodwin Mesa populations. Wagon Bow Ranch encompasses the majority of the area and was closed to public access until recently when they signed a Conservation Access Agreement with the Department. Mohon Ranch is owned and operated by the ORO Ranch and is also closed to the public. The Francis Creek Ranch accounts for about 23 mi² open to public access and hunting. There are numerous residential structures located in this area. Natural water sources include Gonzales Wash and Francis Creek. Permanent water sources are also supplied in dirt tanks and ranch wells. Several man-made water holding tanks are in the area to support summer livestock grazing.

The Bozarth Mesa area comprises the second largest concentration of pronghorn habitat in the east central portion of the Unit. This area encompasses the western portion of the Yolo Ranch (purchased by Freeport-McMoRan in 2011) and is about 78 mi² or 49,920 acres in size. The area is primarily composed of semidesert grassland. Elevations range from about 4,200 to 4,950 feet. Land ownership is almost entirely State Land Trust Land; BLM has about 8 mi² and there are a few small private parcels owned by the Yolo Ranch. The Bozarth line camp is a residential structure located on the southern end of the mesa. Natural water is available year round in Wilder Creek; however, pronghorn only use developed dirt tanks on the mesa. Natural water is very scarce with permanent sources supplied in dirt tanks and ranch wells. Most of the area is used as grazing land for livestock.

The Windy Ridge-Strotjost Flat area comprises the highest density of pronghorn east of Burro Creek. This area encompasses portions of the Yolo Ranch and the 7up Ranch, and is about 16 mi² or 10,240 acres in size. Landforms include open plains, and rolling hills. Elevations range from about 4,900 to 5,740 feet. The area is composed of a mix of primarily semidesert grassland intermixed with invading juniper. Land ownership is almost entirely State Trust Land with about 3 mi² of private parcels owned by the Yolo Ranch. The Yolo Ranch manager's headquarters is

located in this area. Natural water can be found in Pine Creek with permanent sources supplied in dirt tanks and ranch wells. Most of the area is used as grazing land for livestock.

The Behm and Contreras Mesa’s accounts for a small population of pronghorn and is located south of Windy Ridge and east of Bozarth Mesa. This area encompasses portions of the Yolo and Kellis Ranch and is about 30 mi² or 19,200 acres in size. Elevations range from about 4,000 to 5,038 feet. Landforms include open plains, rolling hills and small plateaus. The area is composed of primarily semidesert grassland. Land ownership is almost entirely State Land; there are also a couple of very small private parcels. There are no residential structures located in this area. The only manmade structures consist of water holding tanks. Natural water is very scarce with permanent sources supplied in dirt tanks and ranch wells. Most of the area is used grazing land for livestock.

The Anvil Rock Ranch area is located in the northern most portion of the unit, north of the Baca Float. This area encompasses portions of the Anvil Rock and Double O Ranches and is about 23 mi² or 14,720 acres in size. Elevations range from about 5,400 to 6,000 feet. The area is primarily composed of semi-desert grassland with bands of encroaching juniper intermixed. Landforms include open plains, and rolling hills. Land ownership is a checkerboard of State Trust Land and private. The Anvil Rock Ranch headquarters is located in this area. Natural water is very scarce with permanent sources supplied in dirt tanks and ranch wells. Most of the area is used as grazing land for livestock. Livestock grazing has deteriorated range conditions and pronghorn habitat in the area. Subdivision of private land is also problematic.

The Sanders and Nelson Mesas are located just north of the town of Bagdad on the Kellis Ranch near the Bagdad Airport. The area is used only when pronghorn are forced off of Bozarth, Behm, and Contreras mesas during extreme winter conditions. The area is about 14 mi² or 8,960 acres in size. The elevation is about 3,700 feet. Landforms include open plains and plateaus composed of semidesert grassland. Land ownership is a checkerboard of State Trust Land, private, and BLM. Natural water is very scarce with permanent sources supplied in dirt tanks and ranch wells. Most of the area is used as grazing land for livestock. The percentage and quality of available pronghorn habitat is presented below in the following table. Sanders Mesa lost nearly half (.4 mi²) of its habitat due to the introduction of a large solar plant in 2011.

Rank of available pronghorn habitat (as a percent of the total) among areas across Unit 18B

Location	Habitat Rank (% of available)				
	High	Moderate	Low	Poor	Unsuitable
Anvil Rock		44	30	26	
Goodwin Mesa	5	63	6	26	
Bartmus		23	24	53	
Bozarth Mesa		68	13	19	
Windy Ridge		56	31	13	
Behm-Contreras Mesa		67	20	13	
Sanders-Nelson				71	29

Pronghorn Distribution and Population Trends

Since the early 1950s the Unit 18B pronghorn population has had a peak post hunt population estimate of over 500 pronghorn and a low estimate of fewer than 100. The population reached its peak in the late 2000s and its low in the early 1990s. The populations have been influenced primarily by weather conditions, range conditions, and predation. Unlike many other habitats in the Kingman Region, the Unit 18B pronghorn populations are not significantly impacted by urban sprawl.

The long term average (1953-2011) for fawn survival in Unit 18B is 42 fawns per 100 does. For the last 5 years the average is 31 fawns per 100 does. Fawn survival for the unit has remained steady for the most part. In 1990, it reached a low of 17 fawns per 100 does but after a successful aerial coyote gunning campaign the fawn survival rate quickly increased. In 2011, it reached another low of 18 fawns per 100 does. The Anvil Rock Ranch area has accounted for the lowest fawn recruitment over the last few years. The lack of recruitment can be attributed to a high coyote population and encroaching junipers that obstruct pronghorn vision and provide cover for predators. The Department is preparing to conduct coyote removal to boost pronghorn fawn survival.

The long term average for buck survival in Unit 18B is 38 bucks per 100 does. For the last 5 years the average is 27 bucks per 100 does. Buck populations have fluctuated a great deal in the unit during the last 48 years. The fluctuation is due to hunting permits and the availability of the bucks to be surveyed. If the range conditions are better on the ORO or Wagon Bow the buck to doe population estimates may vary from what was expected. While these surveys do not attempt to estimate total population numbers, they do provide trend information based on repetitive survey effort on a yearly basis.

Specific Issues and Proposed Management Actions

Habitat Management

- Construction of additional waters.

- Fence modification.

- Juniper treatments (e.g. agra-axe, pushes, burns, chainings, herbicides and cuttings) to maintain existing and open past grassland habitat.

- Reconnect scattered sections of pronghorn habitat by opening travel corridors through the removal of trees (junipers).

- Burn or remove dead and down tree piles.

- Small scattered burns to increase species diversity.

Game Management

- Aerial gunning to control predators.

- Encourage coyote hunters and trappers through information and education efforts.

- Pronghorn herd supplementation.

- Supplemental feeding coyotes during critical fawning period.

- Supplemental feeding pronghorn during times of high nutritional requirements.

Research

- Cumulative effects of multiple predators (mountain lion and coyote) on the long-term survival of a pronghorn population relative to populations with only 1 significant predator (coyote).
- Comparison of pronghorn use between 2 adjacent ranches with different management strategies.
- Vegetative analysis of habitats that are currently preferred vs. nonpreferred.
- Identify current grazing practices and impacts on preferred browse plants.

Mitigation Opportunities

- Private property developers maintain travel corridors for pronghorn.
- If existing waters are lost to development, new waters shall be created for pronghorn use.
- Vegetation treatments (juniper eradication) of areas equal in size to area being lost, resulting in no net loss of pronghorn habitat.
- Limitations on road development within areas of pronghorn use (grasslands).
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.

Avoid additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement.

Units 17B, 19A, and 19B – Central Yavapai County Herd

Planning Unit Goals and Objectives

- Maintain all viable populations of pronghorn in this planning unit.
- Maintain or increase hunting opportunity.
- Protect and develop movement corridors.
- Use existing healthy or dwindling populations for translocation efforts.
- Use area as a public education tool regarding pronghorn issues.

Habitat Description

This section describes administrative boundaries and pronghorn habitats in the Prescott, Prescott Valley, Chino Valley, and Paulden areas, collectively known as Central Yavapai County in north central Arizona. The planning unit is comprised of 3 Units: 17B, 19A, and 19B. Land status in the area includes private land (including local municipalities), Arizona State Trust Land (State Trust Land) managed by the Arizona State Land Department, and federal land managed by the Prescott National Forest (PNF) and the Bureau of Land Management (BLM). Major habitat types in the area include interior chaparral, Mohave desertscrub, Great Basin conifer woodland and desert scrub, pinyon-juniper woodland, and semi-desert grassland. The planning unit contains about 2,191 mi² of land. Of this, about 1,362 mi² is habitat occupied by pronghorn. Of pronghorn habitat ranked as high quality statewide, about 30% is contained in this planning unit. There are 75.5 mi² of high quality pronghorn habitat in Central Yavapai County and 372 mi² (Ockenfels et al. 1996).

The Central Yavapai County planning area supports 1 of the highest density pronghorn populations in the State. About 10–20% of the statewide pronghorn population can be found in this area.

Unit 17B

Management Objectives

- Maintain a population of 150-225 post-hunt adult pronghorn, annually harvesting 5 to 8 bucks.
- Work with landowners to ensure continued access to Unit 17B.
- Create and enhance grassland habitat and travel corridors by working with landowners and land management agencies.

This unit encompasses 671.6 mi². The eastern boundary is formed by Williamson Valley Road from the junction of Camp Wood Road, south to Iron Springs Road in Prescott. The County highway between Prescott and Bagdad comprises the southern boundary, while Camp Wood Road from Bagdad to Williamson Valley Road encloses the rest of the Unit. Prescott and Bagdad are located at the southeastern and southwestern corners of the unit, respectively. The unit is composed of a mix of grassland, pinyon–juniper woodland, chaparral, ponderosa pine–oak woodland, and Sonoran desert habitat types. Numerous rugged canyons and associated mesas, rolling hills, and flat open grassland characterize the terrain. Elevations vary from 1,800 to 6,466 feet.

The area is primarily comprised of mid elevation (4,620 foot average) open grassland mixed with sparse oak, algerita, pinyon, and juniper stands. A natural seep feeds a meandering wetland that provides water for pronghorn and other wildlife, and habitat for waterfowl. Windmills and dirt stock-tanks provide additional water sources. Most of the area is used as grazing land for livestock. One lightly traveled paved road (Fair Oaks Road) bisects this area. About 41 mi² (26,240 acres) of pronghorn habitat exists in the northeastern portion of Unit 17B. Most of this habitat is located on 2 ranches: the Long Meadow and Las Vegas. Las Vegas Ranch is comprised of a few sections of State Trust and PNF land, but most of the 28,880-acre ranch is privately owned. Long Meadow Ranch is situated immediately south of the Las Vegas. Recent sale of the Long Meadow has resulted in subdivision, and subsequent deterioration of pronghorn habitat.

A limited amount of pronghorn habitat is also present on adjacent ranches in Unit 17B. The Bar U Bar Ranch lies directly south of the Long Meadow and provides a small amount of habitat. The Yolo is a large ranch located in the northwestern Unit 17B, southwestern Unit 17A, and eastern Unit 18B. A small amount of habitat exists on this ranch but juniper encroachment compromises its' quality. Indian Rock Ranch contains pronghorn habitat, but much of this area is limited by lack of water and juniper invasion. Tank Creek Mesa, located on Indian Rock Ranch in south-central Unit 17B also contains pronghorn habitat. Much of this area is limited by lack of water and deteriorated habitat conditions due largely to shrub and tree encroachment.

Unit 19A

The majority of pronghorn habitat in Unit 19A occurs on 6 ranches that comprise 172 mi² or 120,320 acres of land. The ranches are the Fletcher, Perkins, Wells, Deep Well, Granite Dells,

and Fain. The Fletcher Ranch is located in the northeastern portion of Lonesome Valley north of Highway 89A. The ranch is composed of primarily public lands (State Trust and PNF) with some private. Several large pastures on the ranch were ranked as high quality pronghorn habitat, but yearlong water sources are limited in these pastures. Perkins Ranch, situated in the northern portion of Lonesome Valley, contains 9,600 acres of private and 1,300 acres of State Trust Land. Wells Ranch is located along the eastern edge of Lonesome Valley and is a checkerboard pattern of private (3,800 acres), and State Trust Land (2,500 acres). A portion of the Deep Well Ranch is located on the western edge of Lonesome Valley along highway 89. This ranch consists of 3,800 acres of private, and 1,900 acres of State Trust Land.

Granite Dells Ranch is located roughly in the center of Lonesome Valley and extends south across highway 89A to Glassford Hill. It consists of about 18,500 acres of private, and 4,500 acres of State Trust Land. This ranch contains extremely high quality pronghorn habitat. The Granite Dells Ranch changed ownership in early 2013 and the southern portion of the ranch is slated for commercial development (approximately 7,000 acres). The new ownership does not have any current plans for development of the remainder of the property. Fain Ranch is located south of Highway 89A and east of Prescott Valley. This ranch consists of about 16,600 acres of privately owned and 11,520 acres of State Trust Land.

Unit 19B

Unit 19B currently has severely limited access for sportsmen. The following ranches are all closed to public access: The Chino Grande (CV/CF) Ranch, the K-4 Ranch, the Campbell Ranch, the T-2 Ranch, and the Lobo Ranch. The latest ranch closure, the Chino Grande, prompted the Commission to zero out pronghorn tags for the 2011 hunts. The above mentioned ranches remain closed or allow limited access as of this date. The Deep Well Ranch manager currently allows sportsman foot access to hunt antelope. Archery hunters also access State Trust Land sections in and near the town of Chino Valley, but the habitat is severely fragmented by residential development.

This unit covers about 763 mi² and roughly forms a triangle in the planning unit with corners at Prescott, Seligman, and Ash Fork. The unit is composed of a mix of grassland and pinyon–juniper woodlands. Landforms include open plains, rolling hills, mesas, and buttes. Big Chino Valley, high desert grassland, dominates the center of the unit. The majority of this valley provides a historic representation of southern areas in the planning unit that are now urbanized. Water is well distributed throughout the unit, in the form of earthen stock tanks built to support livestock grazing operations. Elevations in the unit range from 4,360 to 7,168 feet. Most pronghorn habitat is found between 4,400 to 5,100 feet in elevation.

Most pronghorn habitat in Unit 19B occurs on 3 large ranches: The K-4, Chino Grande (CV/CF), and Campbell. The K-4 Ranch is located in Big Chino Valley and occupies the southwestern half of the unit. This ranch contains 83 mi² or about 25% of the pronghorn habitat within this unit. Land ownership is private, State Trust Land, and PNF. Chino Grande (CV/CF) Ranch is the northern portion of Big Chino Valley. Land ownership is 30,000 acres of private, and 20,000 acres of State Trust Lands. This ranch constitutes about 51 sections or 15% of the unit's pronghorn habitat. Subdivision of this ranch has been recently proposed. The Campbell Ranch is located in the north and northwestern portion of the unit, and is comprised of 55

sections of land. About 38 sections are considered pronghorn habitat, or about 11% of the unit's total. Twenty-two sections lie south of I-40 and are included in this report. I-40 effectively prevents north-south movement of pronghorn on the ranch.

The majority of historic pronghorn habitat that was south of the Atchison, Topeka, and Santa Fe Railroad is now residential housing. Isolated pronghorn habitat is present, but most is threatened by continued subdivision. Several ranches exist in this area and continue to provide some habitat for pronghorn. The Deep Well Ranch is semi-isolated from adjacent open grasslands due to its location between Prescott and Chino Valley proper. It contains about 20 sections or 6% of the pronghorn habitat within the unit. Ownership is a mixture of private and State Trust Land. The Lobo Ranch is an open grassland ranch in Big Chino Valley. Although smaller than adjacent ranches, about 8 mi² contains important pronghorn browse that is required during drought. The T-2 Ranch is adjacent to the Lobo Ranch and contains pronghorn habitat that is similar in value; its' 12 sections contain Big Chino Wash, adjacent grasslands, and juniper woodlands.

Juniper Woods Estates is a former ranch located southwest of Ash Fork. After the ranch's private property was sold to developers, State Trust land was also converted to private ownership *via* land trade. Presently, its approximate 131 mi² are all private lands subdivided into 40 acre or less residential lots. This area contains about 50 sections of pronghorn habitat. Human occupancy varies with access, but significant damage to pronghorn habitat has resulted. The actual pronghorn use area was substantially reduced following creation of this subdivision. About 5 sections of open juniper woodland on the Kaibab National Forest between Juniper Woods Estates and State Route 89 remain suitable for pronghorn. Pronghorn use on these sections varies throughout the year, and is sometimes very low.

Pronghorn Distribution and Population Trends

Unit 17B

Most pronghorn in Unit 17B are located primarily on deeded private land within the Las Vegas and Long Meadow ranches. These pronghorn move along north-south routes between Unit 17A and along west-east routes into Unit 19B. Continued development and the associated traffic volumes on Williamson Valley Road increasingly impact pronghorn movement patterns described above.

A small number of pronghorn use Tank Creek Mesa in the south-central part of the unit and Strotjust Flat in the northwestern corner. That population contains 12-15 animals and has steadily declined in recent years. Other small populations, such as the pronghorn on the Bar U Bar are actually migrants from the Las Vegas-Long Meadow population. Pronghorn that occur in the Strotjust Flat area are mainly associated with a population located in Unit 18B. The animals found on the Yolo Ranch are a part of the Unit 18B population that migrates into Unit 17B.

Pronghorn have been surveyed in Unit 17B since at least 1957; however, survey data were combined with Units 17A and 19B until 1973. Pronghorn have been hunted in Unit 17B since at least 1958, when the unit was combined with Units 17A and 19B. Beginning in 1989, Unit 17B was removed from the multi-unit hunt structure and has been a separate hunt since. Mean legal harvest from 1978 to 2000 was 7 per year. Desired annual harvest is 5 to 8 bucks. Additional bucks are available for harvest; however, access restrictions on private property are limiting.

Since the hunt in Unit 17B was combined with Units 17A and 19B until 1989, hunter days and harvest could have varied dramatically from unit to unit on a yearly basis depending on where the animals were. The harvest trend follows the total observations for the same time period. Permits were significantly reduced in 1992 resulting in a corresponding reduction in harvest.

Mean fawn survival in Unit 17B (1973-2001) was 40 fawns per 100 does; the most recent 5-year mean was 43:100. Population modeling estimated 166 post-hunt adult pronghorn in the area during 2000. Mean buck:doe ratio during this time was 45:100. Pronghorn numbers during the past 30 years was highest from 1986-1989. The target population of post-hunt adult pronghorn in Unit 17B is 150 to 225 animals.

Unit 19A

Approximately, 800 post-hunt adult pronghorn inhabit Unit 19A in 7 distinct subpopulations. Geographical features, urban developments, and Highways functionally isolate these subpopulations. The Orme population resides north of Cordes Junction, between Highway 69 and I-17. Much of the habitat occupied by this group consists of a mix of interior chaparral and grassland. Pure grassland habitat is present only in small pockets. The group is threatened by isolation from larger herd units and habitat to the east in Unit 21 by I-17; and from the Lonesome Valley area to the west by State Route 169 expansion. Invasion of chaparral into grassland habitats is also problematic for this herd. An additional 15-25 animals (Cherry subpopulation) reside north of Highway 169 and west of I-17 on PNF land; the herd similarly has limited connectivity with animals in the Verde Valley. Juniper encroachment also jeopardizes this group.

Continuing west, Fain Ranch is bisected north to south by Fain Road, a 4 lane, double fenced road connecting Highways 89A and 69. The highway design incorporates right-of-way fencing that pronghorn cannot maneuver. A Highway Bypass is also slated to be constructed through the center of the ranch in the next 10-20 years. Continued habitat fragmentation, an increase in road kills, and herd reduction will result. The expansion of Glassford Hill Road and Highway 89A west of Fain Ranch has already impacted a herd of approximately 50-70 pronghorn (the Prescott Valley Subpopulation) in the manner described above. This small herd has been extirpated due to loss of habitat from urban development.

The Antelope Hills subpopulation occupies the lower north slope of Mingus Mountain in the vicinity of the Phoenix Cement Plant. This small group is decreasing in numbers, and is currently part of a study to determine movement corridors and population interchange. Land status is private and Prescott National Forest. Pronghorn occupy a small area of habitat seasonally on Little Black Mesa. Pronghorn possibly use this area as a movement corridor between Lonesome Valley and areas north of the Verde River.

Glassford Hill is an extension of Granite Dells Ranch south of US Highway 89A. US Highway 89A to the north, Glassford Hill Road to the east, and Highway 69 to the south isolate pronghorn occupying the Glassford Hill area. Land status is State and private. Historically, as many as 175 pronghorn may have occupied this area, however the 2013 survey data indicated about only 30-50 pronghorn currently occupy the area. The area was removed from the Unit 19A hunt structure in 2002. This area is also slated for commercial development in the next 5-10 years

which will effectively extirpate this population. A pronghorn population in Lonesome Valley is confined by Highway 89A to the south, Mingus Mountain to the east, Highway 89 to the west, and the Verde River to the north. Land Status is predominately private and State. Pronghorn do occupy some PNF land to the north and east.

Unit 19B

The Unit 19B pronghorn herd is distributed among 4 subunits: Big Chino Valley (including the Campbell Ranch), Juniper Woods Estates, Deep Well Ranch, and Willow Lake. The area north of I-40 (the Strip) is functionally isolated from other subunits by the interstate highway, and is not included in this discussion. The Big Chino Valley and Juniper Woods Estates subunits have no or unknown access for sportsmen. Based on the 2011 surveys, the pre-hunt pronghorn population for Unit 19B is 566 individuals. Distribution of pronghorn within each subunit is discussed below (subunits are listed in order of importance based on the percentage each contributes to the overall population).

The Big Chino Valley grassland valley extends northwest from Paulden to Picacho Butte and the Juniper Mountains. The area historically provided about 230 mi² of habitat. Rural residential housing now comprises 12 mi² around Paulden. Continued development on checker-boarded sections of private land significantly reduces pronghorn use on adjacent, undeveloped State Trust sections. Invasion of juniper trees into grassland habitat is also problematic. Although the Campbell Ranch lies north of this valley, it is included within the Big Chino analysis because of pronghorn use of a small grassland mesa that separates the 2. All ranches in the Big Chino Valley subunit are currently closed to public access. With the latest closure, the Chino Grande Ranch, the commission chose to zero out pronghorn tags for Unit 19B in 2011. The Department is in discussions with the Chino Grande Ranch regarding access.

The Juniper Woods Estates subunit has extensive pronghorn habitat (50 mi²) which extends south and west from Ash Fork, and gradually transitions to juniper woodlands. Over the past 22 years, scattered occupancy of 40-acre lots has greatly reduced pronghorn distribution and numbers. As such, limited management opportunities currently exist with this herd and development trends will likely continue.

The Deep Well Ranch subpopulation is threatened by habitat fragmentation. Presently, the ranch is semi-isolated from adjacent open grasslands by urban infrastructure in Prescott, the Town of Chino Valley, and State Route 89. As of 2013, the Deep Well Ranch comprises the majority of pronghorn habitat accessible by sportsmen.

The Willow Lake herd represents a prime example of pronghorn isolation caused by urbanization. This declining subpopulation of <50 pronghorn persists within the Prescott city limits near the Willow Lake-Prescott Lakes area in the southern portion of the unit. The herd occupies habitat that is being rapidly converted to a residential housing-golf course development. Historical dispersal or migration from this area likely influenced the number of pronghorn in the area. However, construction of 2 roads (and associated fencing) more than 30 years ago created the first major barrier to movement on the northern border of the area. Continued urban development has reduced habitat from 10 mi² in 1990 to less than 2 mi² in 2000. Although the

Willow Lake Park is city property, most of the remaining pronghorn habitat is private property that will be developed in the near future.

Pronghorn survey data has been collected in Unit 19B since 1961. Specific hunter harvest data for this unit are not available until 1989 because the area was historically combined with adjacent units.

Pre-hunt population estimates were compiled from annual hunt recommendations from 1988 to 2011. Pronghorn buck numbers have remained relatively stable during this time period, ranging from an estimated low of 125 in 1996 to a previous high of 290 in 1994. The doe population ranged more widely from 602 in 1996 to 1,083 in 1994. Population estimates generally coincide with survey data collected in this unit. Number of pronghorn surveyed was lowest in 1972, 1996, and 2000. Peaks occurred in survey numbers at 2 to 3 year intervals just prior to each low point. Annual hunter harvest in this unit is typically 50-60 animals. Hunt success for general seasons averages about 90%. Archery hunt success typically averages about 20-25% however this may drastically increase in drought conditions, e.g. 73% success in 2002. Fawn survival averages about 30 fawns per 100 does, however survival during the 1996 and 2002 droughts dropped to 2 and 4 fawns per 100 does, respectively.

Specific Issues and Proposed Management Actions

The prevailing threat to pronghorn populations in this planning unit is loss and degradation of available habitat to urban development associated with a rapidly expanding human population. Yavapai County is the fourth largest county in Arizona by population, following only Maricopa, Pima and Pinal counties. The town of Prescott Valley is the seventh largest growing incorporated area in the state, with 161.5% growth occurring between 1990 and 2000. Much of this growth has occurred in high-quality pronghorn habitat, and much more development is forecasted. Ancillary impacts to pronghorn are often common to many areas; however, others may be site specific. This section identifies threats common to multiple subpopulations, which were discussed in the introduction of this document. Threats and issues specific to the 14 subpopulations that occur in this planning unit are detailed in this section.

Habitat Management

Issue 1 – Loss of grassland habitat to development on American Ranch (Unit 17B).

Strategy 1a. – Work with American Ranch developers to ensure fencing is constructed to wildlife specifications thus allowing emigration of resident pronghorn.

Issue 2 – Loss of grassland habitat to development on Long Meadow Ranch (Unit 17B).

Strategy 2a. – Educate new landowners as to the importance of constructing new fence to wildlife specifications to allow for movement of pronghorn.

Strategy 2b. – Work with neighboring ranches and land management agencies to create and enhance grassland habitat adjacent to Long Meadow ranch.

Issue 3 – Fragmentation of habitat by paved double fenced roadways in Unit 19A

Strategy 3a. – Participate in the roadway planning process to align paved roadways in a way that minimizes fragmentation of key habitat

Strategy 3b. – Ensure right-of-way fences meet or exceed wildlife specifications. Use gap fencing, overpasses or other measures to allow pronghorn to cross paved roadways.

Issue 4 – Annexation of northern Lonesome Valley by the town of Chino Valley

Strategy 4a. – Work with city planners to pursue mitigating measures such as land exchanges or conservation easements to maintain large blocks of grassland habitats.

Issue 5 – Expansion of Prescott Valley into Fain Ranch

Strategy 5a. – Work with city managers to plan development in a way that does not fragment or isolate blocks of habitat.

Issue 6 – Range Conditions-Fawning Habitat

Strategy 6a. – Work with livestock operators to manage grazing in a way that maximizes cover during fawning period in key fawning areas.

Issue 7 – Mortality of adult pronghorn on newly opened or widened roads, specifically the new section of highway 89A and the soon to be opened Fain Road alignment.

Strategy 7a. – Work with ADOT and the county or have pronghorn crossing signs installed at key locations. Ensure right-of-way fences are built to pronghorn specifications and have setbacks at key locations.

Strategy 7b. – Investigate ways to keep monsoon runoff from creating green-up along roads during drought conditions – supplemental feedlots and watering stations?

History of Management Actions

Unit 17B

- In 1963, most of the Las Vegas and Long Meadow Ranches were root plowed to remove snakeweed.
- The Las Vegas Ranch routinely employs cholla cactus removal practices.
- The Las Vegas Ranch has completed numerous juniper treatments in the past.
- Juniper treatment (cutting with hydraulic shears) near Strotjust Flat (Units 18B and 17B) scheduled for July of 2001.
- Juniper treatment (cutting with hydraulic shears) on state trust land within Las Vegas Ranch. Approximately 470 acres in Section 4 of T16N, R4WResearch Branch personnel evaluated pronghorn habitat in 1995.

Unit 19A

- Fain Ranch Capture for translocation, January 2000.
- Juniper chaining in Little Black Mesa, Del Rio Area.
- Two Granite Dells Ranch Captures for translocation, 2007 and 2009
- Glassford Hills Bypass study, Research Branch, 2009

Unit 19B

- Juniper management has been conducted on the Campbell Ranch to increase habitat and increase movement between the Campbell Pasture and Juniper Woods Estates.
- Documentation of open space change within Yavapai County from 1988 and 1997 (USGS contract: <http://TerraWeb.wr.usgs.gov/projects/OpenSpaces/>).
- Water source mapping and classification of all waters (AGFD, Region 3 "Critical Waters Project") completed in 2000.
- Fence mapping and classification within Big Chino Valley (April 1996).
- Landscape-level pronghorn habitat evaluation (September 1996).

Units 6B, 8, and 19A – Verde Valley HerdBackground and History

The pronghorn herds in the Verde Valley function as metapopulations. Physical obstacles such as the Verde River and Highway 89A separate distinct herd units. Documented interchange between population centers allows genetic diversity to flow through these population-permeable barriers. Managing these obstacles to ease pronghorn movement will add gene flow to improve marginal herd genetics.

The units face 3 critical management objectives:

1. Maintain genetic viability,
2. Consolidate habitat and maintain travel corridors, and
3. Reduce predation.

Habitat Description

Pronghorn were historically widespread throughout the Verde Valley. The journal of E.A. Mearns (1985) while stationed at Fort Verde commented on the frequency of pronghorn observations in the Beaver Creek, Oak Creek area (Brown, D.E., editor, Wildlife Views). Pronghorn used winter range at Wingfield Mesa and Cottonwood Basin, east of Camp Verde in Unit 6A into the 1970s (Andrews, S. and Kohls, R., personal communication).

The residual pronghorn populations in the Verde Valley use habitat in Units 6B, 8, and 19A. The range straddles the Verde River as it flows southeast from Perkinsville to Camp Verde. Units 6B and 8 are administered through the Department's Region 2 office in Flagstaff, while Unit 19A is managed through the Department's Region 3 office in Kingman. The United States USFS (i.e., Coconino, Kaibab, and Prescott National Forests) manages most pronghorn habitat in Units 6B and 8. Arizona State Trust Lands managed by the State Land Department occupy about 35 sections, mostly in the northern third of Unit 6B. The checkerboard arrangement of the

State Land sections and State ownership of Rogers Lake expand their value to pronghorn beyond their spatial imprint. Coconino County and/or the city of Flagstaff through Arizona Preserve Initiative strategies may purchase Rogers Lake for conservation-open space objectives. About 6 sections of private inholdings retain value as pronghorn habitat, most notably at Hat Ranch, Garland Prairie, and Rogers Lake. Camp Navajo, a 28,300-acre military facility (Arizona National Guard) occupies the northwest corner of Unit 6B.

The USFS manages most pronghorn habitat in the Valley. Coconino National Forest's Sedona Ranger District manages the east side of the river, and the Prescott National Forest's Camp Verde and Chino Valley Districts manage the area west of the river. Arizona State Trust Lands and private lands (including local municipalities) occupy less of the range.

Unit 6B

The western extension of the Mogollon Rim divides Unit 6B into a northern upland plateau and a southern valley grassland savanna. The northern half supports summer seasonal habitat occupied by a pronghorn herd with linkage to Garland Prairie in Unit 8. The southern half consistent with the general Verde Valley pronghorn habitat covers about 100 mi², roughly bordered by Dry Creek and Boynton Pass Road on the east, Highway 89A, Verde River and Sycamore Canyon. Telemetry observations of marked pronghorn indicated linkage between subpopulations in Units 6B and 19A contiguous to the Verde River (Luedeker, L. 2001).

Vegetative communities in the south half of Unit 6B include semi-desert grassland, juniper savanna, and pinyon-juniper woodland. Skeleton Bone Ridge separates Wheatfield Flat and Duff Flat and supports pinyon-juniper woodland in broken and eroded terrain. The USFS Sedona District has implemented juniper reduction projects near Wheatfield Flat.

A rating system evaluated pronghorn habitat by sections within the area: 70% was rated as poor quality; 20% was rated as low quality; 10% was rated as medium quality; none was rated as high quality. The 100 sections of potential pronghorn habitat in the southern half of Unit 6B center on moderate quality habitat (Ockenfels, 1997) around Wheatfield Flat, Duff Flat, and Upper Sheepshead Valley. A total of 124 sections of habitat were rated by Ockenfels as potentially suitable pronghorn habitat.

The Unit 6B pronghorn population herd tends to use the 3 core areas of medium quality habitat. Additionally, they frequently use the area south and west of the Windmill Ranch headquarters. During drought periods, effluent-irrigated forage at the Sedona Wastewater plant attracts high use. Ponds and water pipelines constructed to support grazing of livestock adequately supplement natural water sources.

The Windmill Ranch occupies the entire pronghorn range in the south half of the unit. The ranch has been supportive of pronghorn management activities, participating in the Wheatfield juniper control project. The range is grazed during the winter season, and the range condition plots indicate an improving trend in ground cover and species diversity.

Unit 8

Unit 8, encompassing 643 mi², but only 50 mi² is considered moderate or better quality pronghorn habitat. The northern boundary of the Unit 8 is I-40, from the northwestern of the Navajo Army Depot until its junction with Volunteer Canyon, 10 following the canyon until Sycamore Creek, and finally Sycamore Creek to the Verde River. The southern boundary is the Verde River, from Sycamore Creek east until junction with US 89. The well-defined western boundary is US 89, from the Verde River to I-40.

Much of the northern portion of the unit is higher elevation (>7,000 ft) covered with ponderosa pine forest. Much of the landscape in the south and west covered with pinyon-juniper woodland. No highways bisect Unit 8. The only major road is the Perkinsville Road, which bisects Unit 8 in a north-south direction from Williams to FR 492. From Paulden, the Arizona Central Railroad bisects the extreme southern portion of the unit Perkinsville, where it enters the Verde River. Within Unit 8, development occurs at Drake-Paulden area, Sherwood Forest Estates, and in Garland Prairie.

Land ownership in Unit 8 is mostly Kaibab National Forest with scattered, small, private in holdings. Two large, private inholdings occurred in the northern portion: 1 at Hat Ranch west of Bill Williams Mountain and the other at the southern end of Garland Prairie. The southwestern corner, near Paulden was equally divided between private and State Trust lands. No substantial human-related fragmentation of habitat because of highways was observed in Unit 8.

Overall, most of Unit 8 was closed canopy, ponderosa pine forest or pinyon-juniper woodland. The higher elevation area provided high quality summer habitat, whereas yearlong habitat occurred in the western and southern portions of Unit 8, (note-W and SW area use dependent on range conditions, water availability and summer monsoon season). Numerous small openings occurred throughout the unit. These openings provided limited habitat for pronghorn. Large grassland areas occurred at Garland Prairie, Hat Ranch, Wagon Tire Flat, and a series of opening along US 89 south of Ash Fork to the Paulden area.

Summer Range: Garland Prairie.

Terrain was gently, rolling hills consisting of large open to semi-open grassland surrounded by ponderosa pine forest. Stringers of pine extended into the grassland meadows. Grass species richness was good. Shrub species richness was low. Stock tanks are abundant and accessible throughout much of the prairie area. Shultz Lake on the west end of the prairie consistently holds water during severe drought conditions and currently is not used for domestic stock use. Development is on goings on private in holdings with continuing improvement on the road systems in the surrounding area. Woven-wire fence exists around private sheep pastures, all on the Manterola property. Other fence and structure impediments occur around the private inholdings near Pine-air Estates and area on the south end of the prairie.

Pine Hill Area.

This area included Pittman Valley, McDougal Flat, and Davenport Lake. Areas consist of small isolated grassland pockets surrounded by ponderosa pine forest. A stock tank generally exists in each of the described area. An important part of use of these areas is highly dependent of

corridors that the pronghorn have learned to use. Although these areas may be small in size, they are very productive in relationship to fawning areas.

Hat Ranch-Flat Mesa Area

Just west of Bill Williams Mountain and north to the Matterhorn, the terrain was gentler, with flats and small canyons, than the Bill Williams Mountain area. This opening was where the forest intergraded into pinyon-juniper woodland, and it provided decent summer range, and moderate quality winter range. Previous treatments to pinyon-juniper in the area. Development was low, with ranch headquarters occurring at the eastern edge of the grassland. Livestock fences varied, including electric, game standard, and most not game standard. Water sources were well spaced and available to pronghorn.

Yearlong Range:

Ash Fork-Putney Flat

This area included the grassland and juniper woodland hillsides from the Welch Interchange west to Ash Fork and south to Hell Canyon. West of Flat Mesa-hat Ranch, the elevation dropped off enough to provide winter and yearlong range for pronghorn. Most of the area was a mixture of dense juniper woodland, with a reduced species richness understory, or open juniper woodland, with a good understory of grasses and shrubs. Considerable areas of old juniper pushes occurred along with narrow grasslands, each providing suitable pronghorn habitat. The push areas were being recolonized by junipers and tall shrubs, substantially lessening their suitability for pronghorn. There have been several projects in the area to address these concerns. None of the opening was large in size. Overall, the terrain ranged from rolling hills, but some sites were rugged bluffs and small canyons to the east. Development was low in the area, but recreational uses of the 2-track roads somewhat lessened the suitability for pronghorn. Furthermore, many of the openings were along US 89, and traffic disturbance lessened their suitability. Few reliable water sources existed in this area. Although water sources were well distributed, few had the capacity to continually retain water.

Wagon Tire Flat Area

Topography south to Hell Canyon was mostly flat to undulating, with prominent drainages and some canyons. This area comprised the majority of the winter range for pronghorn in Unit 8. Vegetative cover was a mixture of dense juniper woodland, with some open woodland and shrub-grassland. In the open areas, grass species richness was often greater than 4 species, but shrub species richness was low, except in the drainage's and disturbed sites.

The Drake-Perkinsville Road cut through the southern end of Wagon Tire Flat, which decreased disturbance levels and somewhat lessened the suitability of the area for pronghorn. Livestock fences were present in most sections and did not meet game standards. Stock tanks were abundant and accessible to pronghorn. There have been concerns with the new grazing operational plans and the increase of pasture division with electric fences. Several mortalities of radiocollared pronghorn occurred after the initial construction of the new fence. Only 1 of the radiocollared pronghorn mortality could be definitely attributed to the electric fence. The animal appeared to break its neck by running into it.

Page Flat

Along US 89, from Hell Canyon south to the Verde River, some shrub-grassland openings occurred in the Page Flat area. Most of the openings in the juniper woodland-chaparral vegetation were small and provided limited habitat for pronghorn. Here, the terrain was flat to undulating, but vegetative characteristics lessened its suitability for pronghorn. Tall shrubs were prevalent in the woodland areas and invaded the openings. Near Paulden, the shrub-grassland areas increased. There is a vegetation project of 5000 acres to treat invasion trees as of 2002.

Human disturbances increased near Paulden, with considerable housing scattered along US 89. Further, the Atchison Topeka and Santa Fe (AT&SF) railroad bisected the area just east of the highway after entering this unit north of Drake. The railroad right-of-way is fenced, but thus only minimally affected pronghorn movements. Livestock fencing occurred in most sections and did not meet game standards. Water sources were abundant and accessible to pronghorn. Waterlot fencing is of concern relative to access to water.

Unit 19A

Unit 19A covers about 750 mi² in Yavapai County, central Arizona. The boundaries are I-17 from Camp Verde, south to Cordes Junction, Highway 69 northwest to Prescott, Highway 89 north to the Verde River at Sullivan Lake, and the Verde River southeast to Camp Verde. Mingus Mountain lies in the center of the Unit.

Portions of the Verde Valley area are located on the eastern edge of Unit 19A. Elevations range from 3300 feet at Camp Verde to 4500 feet at the top of Copper Canyon. The area is composed of grassland mixed with mesquite in the valley and near Cordes Junction, with juniper on the upper slopes. Land ownership is mostly USFS with large blocks of developed private land in the towns of Jerome, Clarkdale, Cottonwood, and Camp Verde. The Orme area consists of USFS, State Land Department, and Bureau of Land Management lands with minor private land in holdings. Most water used by pronghorn in this area is from earthen stock tanks.

The USFS Jerome Allotment and private lands of the Phoenix Cement Company are located near Clarkdale and hold the majority of pronghorn distribution in the Verde Valley portion of Unit 19A. This area is not typical pronghorn habitat; it is fairly steep with rocky hills and drainages. Pronghorn also use the Cienega Allotment near the I-17-Hwy 169 intersection, and occasionally the Verde Allotment at Hayfield Draw, between Cottonwood and Camp Verde.

Pronghorn Distribution and Population Trends

Pronghorn classification surveys are conducted between June 1 and September 15 annually. Pronghorn surveys in Region 3 are typically flown in June, while those in Region 2 are usually flown in July. Due to the small herd sizes in the Verde Valley populations, survey observations and resulting buck:100does:fawn ratios are erratic. The pronghorn habitat in the Valley is often contiguous to municipalities, and in other areas associated with intensive recreational use. These factors make aerial gunning of coyotes an unsuitable alternative.

Unit 6B

A pronghorn telemetry project initiated in 1999 has tracked members of the Cement Plant (Unit 19A) and Wheatfield (Unit 6B) herds. A travel corridor across Highway 89A in Unit 19A (with

8 documented crossings) has been identified, as well as a travel corridor across the Verde River between Units 6B and 19A (2 documented uses).

The Wheatfield herd in Unit 6B contains about 40 pronghorn, primarily using Wheatfield Flat, Duff Flat, and upper Sheepshead Valley. Individuals from this herd seldom crossed Highway 89A into Unit 6A, but increased traffic loads and reconstruction of the highway to a 4-lane divided standard probably will eliminate crossings. A radiocollared doe pronghorn crossed the Verde River north of Perkins Ranch into Unit 19A during the spring of 2001.

Unit 19A

Pronghorn in the 19A portion of the Verde Valley are found in several separate areas. Starting at the north, about 30 pronghorn are located west of the Verde River from S.O.B. Canyon to Clarkdale at the Phoenix Cement Plant-Highway 89A. These lands are a combination of private and USFS (Jerome Allotment). These pronghorn possibly interact with pronghorn in western Unit 19A at Little Black Mesa. In dry years, pronghorn have been observed at Red Flat Tank, between these 2 known herd areas. Pronghorn cross Highway 89A, in the rolling grassy hills east of Jerome, to reach the Haskell Springs area (also on the Jerome Allotment). Up to a dozen pronghorn may reside here at any given time. Continuing southeast through the Verde Valley, up to half a dozen pronghorn have been observed at Hayfield Draw on the Verde Allotment. These observations are believed to be of transient pronghorn, possibly connected to the Haskell Springs herd, and definitely connected to the Cherry herd (northwest of the I-17-Cherry Road [Highway 169] intersection), as confirmed by radiotelemetry.

The Cherry pronghorn herd consists of about 15 animals, down from about 25 pronghorn in the early 1990s. This herd is located on the Cienega Allotment. Although Highway 169 interferes with pronghorn movement, occasional movement to the south is suspected. South of Highway 169 to Cordes Junction are the Orme North and Orme South pronghorn herds (names are consistent with previous AGFD research and survey subunits). About 30 pronghorn comprise these 2 herds, in which interaction is suspected but not documented. Most of these pronghorn are located on the V Bar Allotment, but some are also on the Cienega and Ash Creek Allotments.

Although annual pronghorn population surveys are conducted in Unit 19A, these specific areas are rarely included. Low pronghorn numbers, dispersed herds, thick vegetation, and steep topography here result in low cost-effectiveness and highly variable results.

Pronghorn harvest annually occurs in Unit 19A, however, few are taken from these specific areas. The portion of Unit 19A south of Highway 169 has been closed to harvest for about 2 decades, due to low pronghorn numbers. A few bucks in the Cherry herd have been harvested during archery hunts of the 1990s. The pronghorn herds near Clarkdale have received little hunting pressure because the Phoenix Cement Plant prohibits trespass for this purpose. In each of these areas, predation from mountain lions and coyotes has been shown to occur.

Management Goals

Habitat Management

Issue 1 – Juniper encroachment into grassland habitat in the Wheatfield Flat – Anderson Butte area has impacted habitat quality.

Strategy 1a. – Continue work with the USFS. The Sedona District has begun an effective juniper management strategy.

Issue 2 – Threats to movement corridors.

Strategy 2a. – Identify and enhance potential pronghorn movement corridors through juniper, mesquite, desert shrub removal and fence modification.

Issue 3 – Poor habitat-range conditions.

Strategy 3a. – Work with the USFS and livestock operators to develop livestock rotation plans which leave vegetative cover in key pastures during the critical pronghorn fawning season.

Game Management

Issue 1 – Isolated populations may become non-viable due to reduced size, lack of genetic variability, and lack of emigration-immigration.

Strategy 1a. – Determine potential pronghorn corridors between subpopulations and enhance them to encourage pronghorn movement.

Strategy 1b. – Use transplanted pronghorn to bring genetic variability into isolated populations.

Law Enforcement

Issue 1 – Unlawful harvest of pronghorn.

Strategy 1a. – Promote the Department’s Operation Game Thief Program in the Verde Valley.

Information and Education

Issue 1 – Lack of understanding by the public of pronghorn values to the community and state.

Strategy 1a. – Participate in media and out-reach opportunities whenever appropriate.

Planning

Issue 1 – No current comprehensive strategy to improve pronghorn habitat.

Strategy 1a. – Use the results of the on-going pronghorn movement research to identify and prioritize areas where habitat treatments could facilitate pronghorn movement between isolated populations.

Research Opportunities within Unit

- Measure physiological effect of tour operators on pronghorn (hot air balloons, other aircraft)

- Evaluate pronghorn response to mineral supplements (selenium, copper)
- Evaluate seeding of native forbs palatable to pronghorn
- Investigate "triggers" for seasonal migration and random long-range movement
- Identify and improve travel corridors to encourage interchange between herd units
- Supplemental transplants
- Continued pronghorn movement research (Units 6B, 8, and 19A) to identify herd movement corridors
- Modify road fences to facilitate pronghorn movement (i.e. wildlife specification fencing, goat bars, staging areas)

Mitigation Opportunities

- Require fence modification (set-backs) along fenced road rights-of-way as a feature of major upgrades or renovation
- Use Red Rock Demonstration Projects funds to restore and protect areas impacted by recreationists
- Encourage wider utility corridors through juniper vegetation to facilitate pronghorn movement
- Use standard wildlife-specification fencing, goat bars, and road set-backs to facilitate pronghorn movement
- Construct water developments
- Haul water to troughs during drought periods
- Habitat improvements (juniper removal, prescribed burns)

REGION 4

Unit 20C (Hillside–Kirkland Herd)

History and Background:

Unit 20C contains the Hillside-Kirkland area pronghorn herd. The boundaries of this area are the Weaver Mountains to the south, Date Creek Road to the west, Kirkland Creek and County Road 96 to the north and east. This area, located in the northern portion of 20C, represents only a small part of this unit. It is not known whether these pronghorn are significantly connected to pronghorn herds to the northeast. There is some indication that there is movement between this herd and the Bismark Mesa pronghorn herd. The pronghorn occurring in the Hillside-Kirkland area are the result of transplants by the Arizona Game and Fish Department in 1984, 1993, and 1998. There were no pronghorn inhabiting this location immediately prior to the 1984 transplant. A total of 110 pronghorn have been released at this location.

In December 2008, 2 adult pronghorn were fitted with spread spectrum radiocollars for the purpose of tracking their movements in order to determine if a movement corridor exists with pronghorn habitat to the north. Each radiocollar was programmed to record 2 locations per day. Monthly ground monitoring was conducted during the life of the radiocollars. Both radiocollars functioned properly and provided much needed insight into the pronghorn movements from December 2008 until March 2010. Both radiocollared animals remained in the original capture location and did not move from the Hillside area. Waypoint data from the radiocollars showed

that pronghorn locations were tied to the most reliable water sources proximate to the best habitat. The East Windmill was the most preferred water site. Ground monitoring identified a known population of 6 pronghorn including survival of 1 female fawn to adulthood.

Habitat Description:

The pronghorn habitat in the Hillside-Kirkland area is a semi-desert grassland and shrubland mixture. Only limited portions of this area could be described as pure grasslands. Glinski (1984) described this area (about 90 miles northwest of Phoenix) covering about 70 mi² as rolling grassland 3,600-4,500 ft in elevation. Areas included in this analysis are located west of the Santa Fe Railroad-Date Creek Road, Kirkland Valley to the east, and the more broken and steeper topography to the north. The field monitoring of these transplants that included radio tagged individuals revealed limited pronghorn use in the steeper areas. Eliminating the rougher topography reduces the available area for pronghorn use to less than 50 mi².

Arizona Game and Fish Department has evaluated pronghorn habitat statewide (Ockenfels et al. 1996). In the Hillside-Kirkland area, 2 sections rated moderate quality, 19 sections were rated low quality, and the remainder was rated as poor quality pronghorn habitat. This pronghorn habitat evaluation model describes low quality vegetation as "A severe shrub-invaded grassland or savanna; shrub richness-diversity low. If shrubs short (<24in), density >30% cover, or if shrubs tall (>24 in) density >20% and visibility a problem." Except for several small patches most of the area within the Hillside-Kirkland area is best described as a shrub-grassland mix. For the most part shrubs are short and exceed 20% density.

Population Information:

There are no references during recent time claiming pronghorn inhabited the Kirkland-Hillside area. Knipe (1944) included this area in the distribution of pronghorn in northern Arizona, but delineates it as an area of little or no "pronghorn drift," and shows pronghorn herds only north of the Santa Maria River.

On December 6, 1984, 51 pronghorn from Douglas, Wyoming were released just outside of Hillside. Between 1985 and 1989, winter surveys located about 35 pronghorn in the Hillside area. On February 8, 1993, 54 pronghorn from Sheridan, Wyoming were released in the Hillside area supplementing the 22 pronghorn observed during the January survey. Surveys in 1994 only found 22 pronghorn; this declined to 12 by 1996 and 10 by 2005. A third transplant of 5 male pronghorn was accomplished in 1998. There have been years when no pronghorn were observed during winter surveys and in most instances those pronghorn observed were in a single herd.

Specific Concerns:

Habitat.—Historically, pronghorn may have inhabited the Hillside-Kirkland area. Ockenfel's (1996) statewide pronghorn habitat analysis indicated the Hillside-Kirkland area is marginal to low quality pronghorn habitat. This area now supports a moderate density mule deer and javelina population. Kirkland, Peoples Valley, and Skull Valley may also have been pronghorn habitat but now contain numerous small horse and cattle ranches with many roads, homes, and fences.

Fences.—Radiocollar movement data from 2008 indicate that the existing fences are permeable. All the fences have barbed bottom wires less than 16 inches and pronghorn most likely are restricted to crossing at specific locations.

Water Availability.—Water availability during summer months is most likely restricting habitat usage. Cattle waters are prone to failure and are not always maintained during the summer months when cattle are not on portions of the range. Also, cattle waters on the mesa typically have multiple fences and corrals associated with the water making it difficult for pronghorn to access. Typically cattle waters are located in depressions or drainages where water is more available but brush is thicker and visibility is limited making them less favorable for pronghorn use.

Population Connectivity.—It is not known to what degree pronghorn move to and from the Hillside area to pronghorn populations to the north in Units 17A, 17B, and 18B. In 1995 a marked pronghorn from the Hillside transplant was taken during a hunt on the Las Vegas Ranch some 30 miles to the north. In 2007 a credible report indicated 14 pronghorn were in the Hillside area after all indications and recent observations showed the population had all but disappeared. During 15 months from 2008–2010, 2 radiocollars provided GPS locations twice per day. None of the locations were outside of the Hillside area and monthly ground monitoring confirmed that no pronghorn immigrated nor emigrated from the Hillside area for any extended length of time.

Translocations.—Pronghorn from the 2 large transplants in 1984 and 1993 have exhibited wide-ranging movements. These movements add to the reduction in pronghorn in the Hillside–Kirkland area during winter surveys. It appears that ineffectiveness of the 1993 transplant to increase the population was mainly due to the expansion of pronghorn into unsuitable and low quality habitat away from the Hillside area as documented in the chart below.

Pronghorn released at Hillside but later observed outside the release area.

Date	Pronghorn	Location and Distance from Hillside
1-5-85	2	Cotton field near Aguila – 36 mi sw
3-23-93	2	Skull Valley (radio tagged) – 16 mi ene
8-31-93	6	Kirkland Valley (radio tagged) – 9 mi e
4-12-93	2	Quail Valley Ranch – 24 mi sse
8-21-93	1	OX Ranch alfalfa field – 11 mi sw
10-22-93	2	Diamond 2 Ranch (Hassayampa River) – 25 mi sw
9-22-95	1	Las Vegas Ranch (#53 ear-tagged buck taken in pronghorn hunt) – 33 mi nw

Management Goals:

- Maintain and increase population size of the existing pronghorn herd in the Hillside area.
- Identify movement corridors that may link the Hillside population with existing populations to the north.
- Improve habitat quality.

Management Strategies:

- Translocate pronghorn from central Arizona for release on Hillside Mesa in Unit 20C. Translocating animals from central Arizona will hopefully reduce capture-related mortalities as well as post-release mortalities due to their familiarity of the habitat type and reduced transport time between the capture and release site, 2 factors that plagued previous transplant efforts. In addition, the current population has herd knowledge of their range and will be instrumental in familiarizing new animals with critical knowledge of water sources, fences and possible movement corridors.
- Radiocollar pronghorn to track movements, mortalities and habitat usage.
- Use GPS radiocollar data to make recommendations for habitat enhancement projects such as brush clearing and fence improvements in migration corridors, development of wildlife waters and use of controlled fires to expand habitat usage.
- Work with livestock permittees to reduce disturbance and maintain hiding cover at fawning grounds during fawning season as well as maintain water at cattle drinkers during critical summer months.

REGION 5**Unit 28 (Day Ranch)**History:

This population is bisected by the Arizona-New Mexico border. Most pronghorn in this population reside in New Mexico, but a few bands totaling 20-30 animals are consistently located in Arizona east of the Peloncillo Mountains. The population was estimated at 20-25 in 1966, and at less than 20 in 1973. Because of its small size this population is not surveyed aerially each year. A supplemental transplant in 1986 added 36 Texas pronghorn to this population. In January 2010, 47 pronghorn were released on the Lazy Branch in Unit 28. These pronghorn were captured in Chino Valley near Prescott, Arizona in Unit 19A using a corral trap and a helicopter. The summer 2011 survey yielded 1 pronghorn. Due to the small overall population size, no pronghorn hunt currently takes place in Unit 28.

Population Information:

This is the largest contiguous area of suitable pronghorn habitat in Unit 28. In December 1986, 36 pronghorn were released on the Lazy-B ranch in Unit 28, along the New Mexico border south of Duncan. Survey flights were conducted each year, between 1993 and 1998, however, a relatively low number of animals were observed each year. During these yearly flights, the average observation was 18 pronghorn. This is far below the estimated 200 animals the area was thought to be able to support. In 1999 it was decided that no annual fixed wing surveys would be conducted. In 2004, a survey was conducted and 10 animals were observed (2 bucks, 7 does and 1 fawn). December 7, 2006 a winter survey was completed to survey the population when they are in more gregarious. Only 2 bucks and 11 does were seen on that survey. Even after the addition of 47 pronghorn in January 2010, only 1 pronghorn was seen during the survey in August 2011.

Specific Concerns:

According to the Statewide Pronghorn Habitat Evaluation, forage diversity is lacking in this area. In some areas shrubs are high and dense enough to hinder pronghorn visibility and escape, but for the most part are not yet a major problem. Development is minimal and consists of ranch headquarters and airstrip, livestock facilities, and low-use, dirt roads, scattered homes, pipelines and power lines. The BLM has a designated rock hound area, with a primitive campground in the eastern side close to the border. Waters are abundant and most are easily accessible.

Livestock fences are minimal in Unit 28 and the only area where they would be a major concern would be the grassland area south of Duncan. Not game, game standard, and electric fences are found in this grassland, but pastures are large and these fences are probably not a major problem at this time (Ockenfels et al. 1996). However, pronghorn currently use this area and therefore, not game standard fences should be identified and modified, especially before reintroducing pronghorn into new areas.

An overall concern is the lack of enough habitat to support a large population of pronghorn on the Arizona side of the state line. This is not something that can be overcome and we will just have to work with what we have. There are areas of intensive grazing locally causing degradation of habitat quality. If the population is as low as indicated (and has been at a low level for some time), then the lack of genetic diversity and inbreeding depression may be a suppressing effect on this isolated population.

Management Objectives:

- Maintain pronghorn habitat and travel corridors through cooperation with land management agencies and private or other landowners.
- Evaluate and modify livestock fences to pronghorn specifications.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Encourage predator management by private landowners and sportsmen.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- All public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- If existing waters are lost to development, new waters should be created for use by pronghorn.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.

Unit 30A (San Bernardino Valley)History:

This large block of excellent pronghorn habitat once teemed with pronghorn, but remained vacant for many years after being extirpated around the early 1900s. Long-term residents in the valley reported that pronghorn persisted until around 1910 near the settlement of Apache. In November

1984, 32 pronghorn from west Texas were released in the San Bernardino Valley. These animals were supplemented with 67 more from the same source in December 1986.

Population Information:

After good fawn recruitment in the early 1990s, this population built up to be the most robust in the Southeastern Arizona. A hunt was initiated in 1992 with 2 General permits. Because of trends in population indices and buck:doe ratios, the number of permits was increased to 5 for the 1993 season and then to 10, before dropping down to 6 in 2001 and back to 10 in 2011. Fewer than 91 animals were observed on surveys prior to 1991. More than 150 were observed from 2002 to 2005 and 179 animals were seen on August 2010 surveys. The August 2013 survey yielded only 85 animals.

Specific Concerns:

Valley vegetation is reduced in species richness, tobosa dominated, semidesert grassland, but with some areas of good vegetative diversity. Good habitat is also present on the northern side of the Tex Canyon Road in Unit 29. Unfortunately, pronghorn seldom, if ever, use this habitat because stranded fence along State Route 80 impedes or prevents movements across. This entire grassland appears to have the potential for greater vegetative diversity, given adequate precipitation. The vegetation in the peripheral foothills of the surrounding mountains merged into a closed canopy shrubland dominated by mesquite, acacias, and creosote. These tall shrubs are slowly invading this grassland and without some form of shrub will eventually dominate the valley. The southern end of this grassland turned into a closed canopy shrubland within 8 km of the Mexican border, including the San Bernardino National Wildlife Refuge (Ockenfels et al. 1996).

The San Bernardino Valley will eventually be shrub invaded, if current shrub encroachment is not kept in check. Pronghorn habitat in the San Bernardino Valley could be expanded to include the western side of the mountains, if shrubs were pushed back between the southern end of the Pedregosas and the northern end of the Perillas to allow pronghorn to use the grasslands along US Highway 191.

These shrub invasions are likely the result of long-term fire suppression and inappropriate livestock use. Shrub invasion can be controlled and dense stands pushed back by using controlled fire, chemical treatments, and cabling, root plowing, or chaining.

Livestock fences are abundant and are not game standard. Fence densities are high near ranch headquarters. State Route 80 is fenced on both sides with not game standard fences. Currently, State Route 80 is the only highway affecting pronghorn movements, because pronghorn have not been reestablished in other areas of the unit.

Water sources are adequate and well distributed, but most are sometimes dry. The tank in section 23 of T23S, R30E was too tall for pronghorn to use. An extended drinker from this tank would aid pronghorn accessibility. Although waters are abundant in most areas, they are not full year round, especially during dry spells, when they would be of greatest value to wildlife. Maintaining waters in this valley is necessary for fawn survival, since droughts most likely occur during fawning season.

Low species richness was prevalent in most of the grassland areas, probably due to fire suppression and inappropriate livestock use, compounded with lack of precipitation. We believe that grass and short-shrub diversity of the San Bernardino Valley would increase in response to precipitation, if fire and grazing were used as tools to restore the grasslands. Appropriate livestock grazing plans for the precipitation levels would greatly benefit vegetative diversity.

Management Objectives:

- Reduce predation on fawns to restore population to former levels.
- Work with landowners to ensure continued access to these areas to the greatest extent possible.
- Identify and recommend specific travel corridors to Cochise County Planning and Zoning to avoid predicted herd isolation.
- Evaluate and improve wildlife water distribution.
- Gap fencing along highways.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Cooperate with non-governmental organizations, such as The Arizona Antelope Foundation and The Malpais Group, to participate in grassland conservation and management.
- All fences in the San Bernardino Valley, including the Geronimo Road, should be modified or removed to facilitate pronghorn movements.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.
- Evaluate use of pronghorn translocations to expand or enhance populations.

Unit 31-32 (Sulphur Springs Valley north of Willcox)

History:

The pronghorn were once very abundant throughout the entire valley, but now inhabit the grassland north of Willcox, east of the Galiuro and Winchester Mountains and west of the Pinalenos. A portion of the population also ranges on Allen Flat to the southwest of the Winchester Mountains. Raymond Wildlife Area-Chavez Pass pronghorn were released here (22 in 1943, 6 in 1944, 40 in 1945). In 1954, the Sulphur Springs and San Rafael valleys were open to legal hunting with 50 permits issued. Pronghorn seasons in southern Arizona were closed again 1955-57 and reopened in the Sulphur Springs Valley in 1959 with 20 permits. All of the pronghorn habitat in these units occur on either State Trust lands or deeded lands.

Population Information:

Throughout the mid-1990s more than 200 pronghorn were seen each year on surveys. Observation numbers have had a steady decline since the late 1990s and have been below 100 animals with the exception of 2007 when 101 animals were observed. The year 2007 was the middle of a 3 year coyote control program. The August 2013 observation number of 74 is consistent with the 5-year average, but much lower than this population has been in the past. Cloudy conditions occurred on both survey days and light rain occurred on the second survey day. The number of firearms permits have been reduced from 15 to 3 in the last 10 years.

Specific Concerns:

This area has highways along its eastern and southern sides (US 191 and I-10), and these roads restrict pronghorn movements, isolating them from suitable habitat in Unit 28 to the east and 30A to the south. Pronghorn can move between units 31 and 32 in a narrow band of habitat at the northern end of the valley, where low and moderate quality habitat exists in both units. However, it would be difficult to access Unit 31 at the southeastern end, because of agriculture, fences, and development.

Southwest of the Allen Flat area, fences are not as abundant. These fences are not game standard and modifying them to game standard would enhance these areas for pronghorn, by permitting easier movements to better forage and available water. The Antelope Ranch which is in the Allen Flat area, consists of about 11 sections of pronghorn habitat has been sold to developers and plans are to subdivide the 6 sections of private land for development purposes.

All waters available to pronghorn are either from dirt tanks or rancher's water systems in which case all drinkers are designed for cattle use. Tanks may dry up during droughts in this area when water is needed most. Yearlong waters should be made available to pronghorn, especially during spring when pregnant does may leave good fawning habitat without water for areas of lesser quality with water. This lack of water could lessen fawn survival. Many of the water sources in the grasslands south and southeast of the Pinaleno Mountains are located in or near washes, but these washes, even in otherwise open areas, are usually surrounded by thick mesquite. These tall, dense shrubs and small trees may reduce pronghorn use of otherwise accessible waters. Tall shrub removal around these tanks would greatly improve them for pronghorn use.

Most of the historical grassland areas in this unit have been lost to shrub invasion. Shrub invasion was likely the result of long-term fire suppression, coupled with rangeland practices inappropriate for the arid conditions. In the southern end of this unit, invasive shrubs, such as snakeweed, yuccas, and shrub-form mesquite, are rapidly invading the remaining grassland areas.

Decreased species richness was also a problem in this valley, with historical uses and abuses resulting in poor rangeland diversity, with numerous invasive shrubs in some areas.

Prescribed burns and an appropriate livestock grazing plan are necessary to prevent the remaining grasslands in this area from becoming shrublands, like the rest of this unit. Fluctuations in local precipitation must be considered when determining livestock stocking rates, and timing and duration of use. Coordination with permittees and land managers can determine the best strategy to improve the carrying capacity of Units 31 and 32. This would benefit pronghorn and livestock.

Management Objectives:

- Work with landowners to ensure continued access to these areas to the greatest extent possible.
- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.

- Remove shrubs along the periphery of the grassland areas to increase visibility, as well as improving forage diversity.
- Livestock grazing plans should be modified to consider fluctuating precipitation when determining livestock grazing capacities, season, duration, and timing of use.
- Prescribed burns, chemical treatments, and mechanical treatments should be used in combination to remove or thin areas invaded by shrubs.
- Identify and recommend specific travel corridors to Cochise and Graham County Planning and Zoning to avoid predicted herd isolation.
- Evaluate and improve wildlife water distribution.
- Evaluate and modify livestock fences to pronghorn specifications.
- Removal of non-functional old fences.
- Predator management to enhance fawn survival.
- Establish more accurate estimates of subunit pronghorn populations.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Avoid any additional fence construction, especially along Fort Grant Road. If additional or replacement fence is necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision (especially in Allen Flat).
- Use pronghorn translocations to expand or enhance populations.
- Work with Arizona Department of Transportation and Federal Highways to reduce potential fragmentation associated with proposed highway alignments.

Unit 34B (Empire Cienega)

History:

The desert grassland area northeast of Sonoita supported antelope historically with early explorers mentioning antelope throughout the area. In 1851, Colonel Graham reported seeing "a great many antelope" grazing in the luxuriant grassland between the Whetstones and the Santa Rita Mountains. By the early 1900s, these antelope disappeared from this area north of Highway 82. In November 1981, 51 pronghorn (10B:21D:20F) trapped near Marfa, Texas where released on the Empire Ranch in Unit 34B. At the time the ranch was owned by the Anamax mining company, but was sold to the BLM along with the adjacent Cienega Ranch in 1989. After some initial mortality (approximately 20%) and a slow start reproductively, the population began to increase steadily, hovered around 60-80 animals through the 1990 and 2000s.

Population Information:

After the release, there was some initial mortality (about 20%) and a slow reproductive start, but the population began to increase steadily before stagnating in the 1990s. Between 20 and 50 animals have been observed each year for the last 5 years during standard fixed-wing surveys. Recently, antelope have been observed consistently on the west side of State Route 83 (Unit 34A), as some animals apparently dispersed into unused (in recent times) habitat. Also, pronghorn movements across State Route 82 east of Sonoita has been reported by Wildlife Managers. In 1988, this unit was opened to legal harvest with an archery, muzzleloader, and firearms permit.

This population has supported 2-3 permits in recent years. The 5-year average (2008-12) number of pronghorn seen on summer surveys is 45, and we observed 37 in 2013.

Specific Concerns:

Highways are a major concern for pronghorn in Unit 34B. Suitable pronghorn habitat within Unit 34B is separated from pronghorn habitat in adjacent units (34A, 35A, and 35B) by paved, fenced highways along the southern and western perimeters. Of greatest importance was the fragmentation of the Empire Cienega grassland from similar grassland in adjacent units. The lack of movements among units, combined with increased development, hindered seasonal pronghorn movements.

The majority of livestock fences in this unit are not game standard. Coordination with local ranchers, land managers, and permittees-landowners should be continued to determine which fences may be modified or removed to facilitate pronghorn travel.

A pressing issue for pronghorn in this unit in the past was the lack of yearlong water sources in the grasslands. It appeared as though fawns and adults must typically travel long distances to reach water. Even though numerous potential water sources exist and several have been added, many are sometimes dry. Reduced water distribution limits areas for fawning, causing females to fawn in areas of lower quality fawning habitat in order to have access to available water. Concentrating pronghorn around few waters makes them vulnerable to predators and reduces the quality and quantity of available forage. Repairing existing water developments or constructing new ones and ensuring that water is available to pronghorn is necessary to improve the quality of the habitat in this unit. A map of water sources attributed with data on seasonal water levels would assist in the placement of new waters.

Tree and shrub encroachment is a major concern in Unit 34B, which has greatly reduced the size of the grasslands in this area. Many areas in Unit 34B have a moderate quality, grassland understory, but are heavily invaded by mesquite. Reducing the mesquite, through prescribed fires or mechanical means would enhance this area for pronghorn and provide additional grasslands for pronghorn; cattle ranching in the area would also benefit. If the mesquite were removed or reduced in the northcentral area (T17S, R19E), a corridor could be opened up between this area and the existing high quality grasslands making a much larger area of the unit suitable for pronghorn.

Ranchette-style housing developments have been and continued to be constructed in 3 major areas: along State Route 83 north of Sonoita, along State Route 82 east out of Sonoita, and along the western foothills of the Whetstone Mountains. Land has been parcelled for development in the grasslands areas, and if housing occurred, it would reduce the quantity of good quality grasslands left. Development adds fences, roads, traffic, dogs, and other disturbances and dangers. While stopping development is not likely, encouraging orderly development, with smaller lots and requiring people to construct game standard fencing, if any, would lessen the impact to pronghorn already in the area.

Management Objectives:

- Maintain and enhance pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.
- Evaluate and improve wildlife water distribution.
- The fences along both sides of SR 82, from east of the Upper Elgin Road turnoff west to Fort Canyon Wash, should be modified to game standard by replacing the bottom strand with a smooth wire placed >41-46 cm from the ground. Similarly, the same fence modifications should be made to the fences along State Route 83, from I-10 south to State Route 82. Evaluate and modify livestock fences to pronghorn specifications.
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.
- Cooperatively work with city and county planning and zoning departments to identify and mitigate the predicted isolation of pronghorn populations by roads and residential housing.
- Provide public information on viewing opportunities for pronghorn.
- All Public and state lease lands must maintain water sources year round. During drought conditions, water must be left in earthen tanks for wildlife.
- Any changes in public land grazing plans shall incorporate the annual and seasonal habitat requirements of pronghorn.
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision.
- Use pronghorn translocations to expand or enhance populations.

The Mesquite Stewardship Project began in 2005, and is removing mesquite using chemical and mechanical treatment, with prescribed fire used as the maintenance tool. The areas Resource Management Plan has identified 20,000 acres of mesquite invaded grassland that need treatment and as of 2011, 2100 acres have been treated. Resident pronghorn are observed readily using the newly treated sections of the restored grasslands. The Pima County Sonoran Desert Conservation Plan includes portions of the Las Cienegas and 2 ranches have been acquired by Pima County, which will be managed for multiple use and natural resource enhancements and protection. Pima County is interested in making the portions of both ranches Pronghorn friendly.

Units 35A and 35B (San Rafael Valley)History:

This native population was greatly reduced by 1920 and was subsequently supplemented with 13 northern Arizona antelope in 1945 and an additional 57 in 1951. In addition to these supplements, 72 and 18 northern antelope were released on Fort Huachuca Military Reservation in 1949 and 1951, respectively. Between 50-100 animals were consistently surveyed from the late 1950s to the late 1960s when the population declined and remained low for nearly a decade. From 1968 to 1977, an average of only 23 pronghorn were observed each year during surveys. In the late 1970s, the population slowly recovered to a level similar to the 1950s.

The San Rafael Valley was then opened to regulated hunting for the first time since 1913 as a separate block in the 1958-59 season with 5 firearm permits resulting in a harvest of 5 antelope

bucks. The next year (1959), permits were increased to 15, then stayed between 6-10 until it was closed in 1972 because of concerns over low numbers of antelope observed. The season reopened in 1979 and continued until it was closed for the 2013 season in anticipation of a supplemental release of pronghorn. This is again being attempted for the winter of 2013-14.

Population Information:

Along with the standard summer survey, a winter survey was conducted during February 2007. This survey was flown only in the northern part of the units comprising the Sonoita-Elgin herd. A total of 59 pronghorn were observed, consisting of 12 bucks, 42 does, 4 fawns, and 1 unclassified. Aerial surveys during August 2013 resulted in 70 pronghorn being observed, consisting of 9 bucks, 43 does, and 18 fawns for a buck:doe:fawn ratio of 21:100:42. This total is much improved from the 26 observed in 2011 and due to intensive predator control.

Specific Concerns:

Fenced State Route 82 impedes pronghorn movements to the north onto the Empire Cienega in Unit 34B. Pronghorn would be more likely to cross this low to moderate-use highway if these fences were modified with a smooth bottom strand (41-46 cm above ground) and set further back from the roadway. The best area for pronghorn to cross this highway is just east of Sonoita, where reduced speed limits may be feasible. Additionally, fenced State Route 83 impedes pronghorn movements within this unit in the Babocomari grassland area and should also be modified to facilitate pronghorn movements.

Fenced State Route 82 prevents pronghorn movements from the Elgin area to the large block of Empire Cienega pronghorn habitat, in Unit 34B on the northern side of this highway. State Route 82 is a moderate-use highway, therefore, pronghorn movements would be facilitated if the fences along this highway were modified to game standard.

Many of livestock fences in this unit are not game standard. Fence modifications should be made where needed in both of the major grasslands. The northern end of the San Rafael Valley contains some electric fences, but most fences are 4-5 strand, barbed wire. Fences that require attention includes some of the northern perimeter fence of the Babocomari. Some of this fence was modified by the Arizona Antelope Foundation, but more should be done to maximize habitat connectivity. Additionally, a Savory grazing system along the western boundary of Fort Huachuca also could be improved to aid in pronghorn movements.

The area where the northwestern end of the Fort Huachuca grassland met the Babocomari grassland would provide a suitable travel corridor; however, the woven-wire fence along the Fort's boundary blocked pronghorn movements. Most game management areas on the Fort are delineated by roads, but livestock fences between some are not game standard. These fences should be replaced with a 2-strand, wire fence or a fence that exceeds game standards.

There are many waters in this unit for pronghorn to use. However, several of these waters are situated in washes and are surrounded by tall bunchgrasses, mesquite, and whitethorn acacia. These waters should be kept void of vegetation that subject watering pronghorn to ambush by predators. Additional yearlong water sources should be installed on the Research Sanctuary and on the northern end of the West Range of Fort Huachuca. Existing waters at the southern end of

the Fort should be cleared of surrounding, tall vegetation. Coordination with the landowners and land managers can determine which waters can be modified to improve access for pronghorn.

Encroachment of trees into the grasslands below has eliminated pronghorn travel corridors to neighboring grasslands. Additionally, a corridor needs to be opened at the northeastern side of the Huachucas to permit pronghorn travel around the western side of the business-housing area of Fort Huachuca to the grasslands at the southern end of the Fort. Whitethorn acacia and tall yucca are restricting the remaining grassland in the Elgin area. Since the western end of the Elgin grassland is the only place connecting this grassland to others further south, we recommend aggressive removal of invasive shrubs using herbicides, chaining, or fire to prevent further encroachment and to open up existing shrub-invaded grasslands.

Oak and juniper trees invaded the 2 major grassland areas: Elgin-Babocomari and the San Rafael. The majority of trees present are old trees; thus, it did not appear that most of the encroachment is recent. Trees already separated the 2 grasslands (the northern from the southern) in this unit.

Additionally, the tall shrubs in the low wash areas of the Babocomari need to be reduced to improve visibility for pronghorn traveling through these areas. Coordination with landowners and land managers can determine which habitat mitigation features are most appropriate for each treatment area.

The eastern side of the Babocomari River on the Babocomari Land Grant is invaded by tall whitethorn acacia. Shrub removal in this area of the Babocomari would greatly benefit pronghorn, as well as livestock. Tall shrub and tree invasion is also occurring in the Bald Hill area, which has good potential for pronghorn. The tall shrubs and trees along the periphery of this area should be pushed back and kept from further encroachment onto grasslands.

Reduced species richness is likely the result of historical livestock overuse and fire suppression. Proper rangeland management includes adjusting livestock grazing plans to be appropriate for local precipitation patterns. This has largely been done in most of the habitat these pronghorn use. Much of these grasslands would benefit from burns to open up the under story, thereby permitting forb growth and the reestablishment of desirable perennial grasses and shrubs.

The western side of the San Pedro River drainage is no longer pronghorn habitat because of the development of Sierra Vista, Fort Huachuca, and associated communities. Better planned development in the Sonoita-Elgin communities is required to prevent complete fragmentation of some of the remaining pronghorn habitat.

Management Objectives:

- Work with landowners and land management agencies to facilitate a healthy, robust grassland community which benefits wildlife and livestock interests.
- Use pronghorn translocations to expand or enhance this population.
- Work with landowners to ensure continued access to these areas to the greatest extent possible.

- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with city and town governments, land management agencies, and private or other landowners.
- Evaluate and improve wildlife water distribution.
- Use of electric fences for future fence construction should be encouraged, because pronghorn can cross them easier than a 4-5 strand barbed-wire fence.
- Greater use of controlled burning to restore grassland habitat and increase plant species diversity.
- Provide landowners information about conservation easements to protect grasslands from housing developments to maintain their ranching heritage.
- Provide public information on viewing opportunities for pronghorn.
- Require developers to fund vegetation treatments (brush eradication) of area equal in size to area being lost, resulting in no net loss of pronghorn habitat.
- Avoid any additional fence construction, but if necessary, it should meet Department criteria to allow for pronghorn movement (wildlife specification fencing).
- Coordinate with landowners, organizations, and agencies to keep viable agriculture and livestock operations in place to avoid sale and subdivision.

Units 36A and 36B (Altar Valley)

History:

Pronghorn in this valley in the late 1880s disappeared in the early part of the 20th century. In 1945, 15 pronghorn from northern Arizona were transplanted near Arivaca with little success and then in 1987, 87 pronghorn were captured in Texas and released 2 miles south of the headquarters. In the first 6 weeks after the release at least 6 adult pronghorn were killed by coyotes. A year after the release only 50 pronghorn were seen on surveys. This population increased slowly to about 75 individuals. A total of 88 pronghorn were released in 2 locations in the Altar Valley on January 11, 2000. Half of those were released in the southern Altar Valley (Unit 36B). Forty-four (27M:13F) were taken to the release site near Round Hill Tank, 3 miles north of the Refuge headquarters (January 11, 2000). The success of this release was much lower than hoped for. More than half the animals were likely lost in the first few months.

Population Information:

Fawn survival has been low in this population. There have not been enough fawns born each spring to "swamp" the predators during the first few critical weeks after parturition. A few years of good fawn survival would probably boost the total population to a level that could withstand the present predation pressure on fawns.

In 1959, the only legal hunt in the Altar Valley since the statewide closure in 1913 was conducted. That year 10 permits were issued and 9 hunters harvested 2 pronghorn. That hunt was closed the next year and remains closed today. Only 4 pronghorn were observed in the 2011 and 2012 surveys in 36B. The number has declined continually and no more than 10 animals have been seen in the last 6 years.

Specific Concerns:

Water sources appear to be plentiful throughout Unit 36B, but pronghorn would have to travel through thick mesquite to get to most of them. Water sources on the Buenos Aires NWR

(BANWR) are well distributed and accessible to pronghorn, but are dry most of the year due to inadequate runoff resulting from dense vegetation that could be removed by fire or other impacts to improve water flow. Telemetry locations of released pronghorn on the refuge revealed that pronghorn are found only near open water in the hot summer months. On the BANWR, Department pronghorn researchers reported that in the summer of 2001 only 3 of 30+ water sources had water due to the drought. There are additional water catchments planned for the BANWR in Units 36A and 36B.

Tree and shrub encroachment is the major problem that reduces the suitability this valley for pronghorn. Shrub-form mesquite has invaded the grasslands in this unit, leaving few open areas remaining. Long-term fire suppression and inappropriate grazing (historically) are likely causes of this invasion. Substantial habitat manipulations are necessary to prevent further invasion and restore historical grasslands. Mechanical treatment, chemical treatment, and repeated fires can be used to reduce these mesquite invasions, however, adult mesquites are resistant to fire and readily resprout. Aggressive and repetitive habitat management, employing multiple methods, should be used in the remnant grasslands to prevent mesquite invasion, increase the size of the remaining grasslands, provide corridors to other grasslands, and restore some historical grassland areas. Coordination with refuge personnel, permittees (outside of BANWR), and land managers should be used to develop a restoration plan.

Management Objectives:

- Prescribed burns, chemical treatments, and mechanical treatments should be used in combination to remove or thin areas invaded by shrubs.
- Increase population to level where it will provide hunter harvest opportunity.
- Maintaining and enhancing pronghorn habitat and travel corridors through cooperation with the BANWR, other landowners, and permittees.
- Evaluate and improve wildlife water distribution.
- Evaluate the few remaining livestock fences and modify to pronghorn specifications or remove (on the BANWR).
- Encourage local sportsman groups through information and education efforts to hunt predators at select times and locations to increase fawn survival.
- Assure the inclusion of pronghorn habitat needs and harvest opportunity in the BANWR Comprehensive Conservation Plan and Habitat Plan.
- Assure roads are not improved to the detriment of pronghorn (i.e., increased speeds resulting in collision mortality).
- Encourage non-governmental organizations, such as The Arizona Antelope Foundation and The Nature Conservancy, to participate in grassland conservation and management.
- Provide public information on viewing opportunities for pronghorn.
- Evaluate use of pronghorn translocations to expand or enhance populations.

REGION 6**Unit 21***Background:*

Unit 21 is located in central Arizona just north of Phoenix and encompasses about 1,215 mi² of mainly rugged terrain. The primary pronghorn habitat within the unit is located between I-17 and the Tonto National Forest Service boundary to the east, and south of Camp Verde to Perry Mesa. Geographic division of this area includes the northern range (Big Flat Well) and the southern range (Perry Mesa).

Multiple transplants have taken place in Unit 21 and have been considered essential to the viability of this herd.

Pronghorn continue to be radiocollared with GPS and VHF radiocollars; the pronghorn are monitored to determine habitat use and movement corridors with the goal of identifying significant barriers such as I-17 on the west side of the unit, tree and shrub encroachment within the unit, and fencing. Results may define areas for habitat improvement projects including juniper thinning and establish baseline research that will inform ADOT on where to locate pronghorn friendly crossing structures when I-17 is expanded between Cordes Junction and Camp Verde.

Habitat Description:

Major landscape features in Unit 21 are: (1) Pine Mountain; (2) New River Mountains; (3) Agua Fria River drainage; (4) the southern end of the Black Hills, which forms an escarpment along the Verde River; and (5) the Perry Mesa grasslands. Terrain is broken and rocky throughout most of the unit. Pine Mountain is the highest point in the unit at 1974m. A small ponderosa pine-oak forest occurs on top of Pine Mountain, but the area is predominately pinyon-juniper woodland. The lowest elevation, 467m occurs along the Verde River in the southeast corner of the unit, which is a creosote flat.

The Bloody Basin Road and Dugas Road bisect Unit 21 pronghorn habitat in an east to west direction. New River, Black Canyon City, and Cordes Junction occur on the western edge of the unit. Camp Verde occurs along the northern boundary. Phoenix and its suburbs are along the southern boundary. No communities exist within the interior of the unit, although the town of Cordes Junction is expanding along the central–western edge of the unit, and a possible new development is projected west of Dugas.

Landownership in Unit 21 includes Prescott National Forest in the northern portion and Tonto National Forest in the central portion and southeastern corner. BLM lands occur near the Dugas Road south to Black Canyon City, and State Trust lands occur south of Black Canyon City and around Cordes Junction. Private in-holdings occur primarily along Sycamore Creek and within the Agua Fria drainage.

About 235 mi² of Unit 21 is suitable pronghorn habitat composed of semidesert grassland arranged in 2 substantial areas of moderate – high quality habitat. To the south is the Perry Mesa

area within the Agua Fria National Monument and to the north are several complexes of mesa and basins including Yellowjacket, Cottonwood, and Marlow mesas; East Pasture; and the Cedar Mill-Reimer and Draw-Hooker Basin area. These 2 core habitat areas are separated south of Dugas Road by a series of small ridges and mesas broken by the prominent steep canyon drainages of Sycamore Creek and Indian Creek. Within these more rugged terrains juniper-shrub densities have increased; and livestock fence densities (miles/acre) are higher than the north and south core habitat areas. Other human caused barriers to movement and habitat use include urban expansion of Cordes Junction, expansion and redevelopment of the I-17-SR 69 interchange in 2013 and subsequent commercial development; and private ranch development-infrastructure in the vicinity of the Agua Fria River-Sycamore Creek confluence. There is a proposed new development just west of the town of Dugas along Sycamore Creek that could result in 80 or so new ranchettes. These factors combined may influence how pronghorn move between north and south habitat areas and influence their susceptibility to predation.

Despite these topographic and anthropogenic barriers, the Unit 21 pronghorn herd continues to move between the northern and southern portions of the unit.

Habitat quality	No. of sections	Km ²	% of Unit
High	9	22.9	0.7
Moderate	103	245.8	7.9
Low	144	353.1	11.4
Poor or unsuitable	102	209.2	6.8

Population Status:

The simultaneous double count method is used to derive a population estimate. In many years, a winter survey flight is also used to estimate the total population since pronghorn are aggregated at this time and easier to count in total. The winter survey flights are being continued in Unit 21 to compare to the simultaneous double count population estimates.

Six Year Comparison of Winter Survey Flight and Double Count Population Estimates.

Year	Winter Survey Total Observed	Double Count Population Estimate
2008	230	200
2009	218	207
2010	266	268
2011	249	282
2012	204	214
2013	Pending	278

Management Concerns:

The Unit 21 population is considered an isolated population due to the I-17 corridor and also by topography and the Verde River. I-17 separates pronghorn in Unit 21 from those in Unit 19A in the Orme Ranch area and in Unit 20A in the Cordes area. Further, a small area of suitable habitat occurs in the highway median just north of the Dugas-Orme Ranch interchange. It is unlikely that any modifications to highway fences can be accomplished to mitigate these impacts; increasing traffic volumes are a contributing factor to a significant interstate barrier

effect. No bridge along this route appears large and open enough for pronghorn to pass under. The bridge at the Agua Fria River has some chance as a passage between Units 19A and 21, if the mesquite and catclaw thickets on both sides are cleared and the slopes lessened by grading. Until movement corridors are established across I-17, the Unit 21 herd will remain an isolated population. Additionally, it is essential to maintain open rangeland along the 2 most traveled dirt roads bisecting Unit 21 pronghorn habitat, Dugas and Bloody Basin roads, so pronghorn will continue to move across them. Fencing along these roads should exceed game standards with a bottom smooth wire greater than 46 cm above ground. The first 4 miles of the Dugas Road are paved; future expansion of the paved roadway should be discussed and evaluated to determine if additional barriers will be created.

In 2011 the Department acquired the Horseshoe Ranch, a key property comprising nearly half the suitable pronghorn habitat in the southern portion of the unit, along with some management influence over the 70,000 acre grazing allotments (Horseshoe and Copper Creek) associated with the ranch. A number of the management issues and opportunities will be addressed as the Department is able to apply its management influence via the Horseshoe-Copper Creek Coordinated Resource Management Plan (CRMP) and adaptive management process. Three agencies (Tonto NF, BLM and the Department) originally signed a Memorandum of Understanding (MOU) and are collaborating with NRCS and other cooperating stakeholders for the 2 allotments. The planning process is public and collaborative; designed to engage all interested publics-stakeholders in the identification of local resource needs-opportunities, assist agencies in the collection of resource data, assist in the development of alternatives that address these needs-opportunities, and to encourage participation on long-term resource working groups.

Numerous livestock fences occur in Unit 21. Most are barbed-wire fences that do not meet wildlife standards. A GIS database and map of fences and natural barriers has been developed for Unit 21. Results from a fence quality inventory conducted in 2004–2005 were archived in that database along with updates since that time. Data indicates only 33% of fences within Unit 21 pronghorn habitat meet or come close to meeting wildlife standards (personal communication, D. Warnecke, AGFD). Some have been modified to meet game standards and some electric fences occur in the East Pasture area. Additional fences need to be modified and heightened by removing or replacing the bottom barbed wire strands with a smooth wire 41-46 cm above ground. All interior allotment fences should be modified as a minimum mitigation feature. Coordination with permittees and land managers should determine if any fences can be removed and still maintain adequate livestock control. Fences along the movement corridors between north and south core habitats should be priorities for removal. Fences continue to be improved through partnership efforts (most recently with funding from Central AZ Grassland Conservation Strategy (CAGS) for fiscal year 2014).

Water developments are adequate in Unit 21. If water sources remain functional yearlong and precipitation levels provide recharge. Recent drought has impacted water availability at stock tanks, which hit a critical low the summer of 2012. Several water developments (stock tanks and wells) have been identified for repair and maintenance on Perry Mesa. Fencing around all stock tanks, especially those on Perry Mesa, needs to be reduced-removed modified to exceed game standards, or wildlife friendly troughs at ground level need to be placed outside the corrals. Brush around the waters needs to be removed throughout the unit. A GIS layer of water sources

was developed for Unit 21. This cover should be updated with seasonal water availability, and it should be used as a tool for monitoring and maintaining water availability. Using buffers around waters with known availability, placement of new waters or identifying old waters to modify for yearlong availability can be easily accomplished.

Junipers, prickly pear, shrub form mesquite, and catclaw have invaded many grassland areas and shrub encroachment within movement corridors between the northern and southern portions of Unit 21 have reduced visibility and make them less suitable for pronghorn movement. This is of major concern and negatively affecting pronghorn habitat quality in Unit 21. Tree thinning and prescribed fire is a practical control for juniper but catclaw and mesquite are not effectively root-killed with these methods. Herbicides may be necessary to thin catclaw and mesquite dominated grasslands. Cabling, chaining, and pushing may thin numbers, particularly if prescribed fire follows the initial treatment. Efforts to apply experimental treatments outlined within the CAGS were discussed as part of the proposed PNF Agua Fria Grasslands Improvement Project. In 2002 a juniper thinning project was initiated with the BLM to reduce juniper densities along pronghorn movement corridors and restore grassland habitat on Sycamore Mesa and adjacent grasslands north of Sycamore Creek. The goal was to target juniper thinning within the more rugged terrain east of Cordes Junction, the area separating the north and south core habitats, where juniper densities were negatively impacting pronghorn movement, habitat use, and susceptibility to predation. In 2005 the Prescott National Forest (PNF) joined the effort to expand the project east to FR 677, the furthest most portions of suitable pronghorn habitat. A total of 5,788 acres are targeted for treatment, of which 2,789 acres (~48%) have been completed. The project was funded in FY2013 for \$177,000 to accomplish an estimated 600 acres. Treatments involve chainsaw cutting and piling, followed by pile burning to remove junipers. As part of the CAGS, the PNF Agua Fria Grasslands Improvement Project will create future opportunities to expand juniper treatments on the PNF. Pronghorn telemetry data collected in 2012 will inform ongoing work and could be used to help design treatment priorities for the future.

Mesa tops in Unit 21 are dominated by tobosa grasslands found on deep, cobbly, silty clay loam soils. These soils typically support low plant species diversity. However, there are intrusions of alternate soil types adjacent and within these mesas that support higher plant species diversity. Plant species diversity and canopy cover is affected by prolonged grazing disturbance, fire, drought, and timing of precipitation. These factors have contributed to increases of exotic annuals, snakeweed, and prickly pear across these semi-desert grasslands. Most notable in recent years is the expansion of *Avena fatua* (California oatgrass) as well as several other non-native invasive weed and grass species, from the I-17 corridor east across Black Mesa and the Agua Fria River canyon onto Perry Mesa. Application of prescribed fire concurrent with a few occurrences of lightning caused wildfire, combined with ongoing drought resulted in significant reductions of native grass and forb cover across several portions of Perry Mesa and set the stage for the non-native invasive species to take hold, despite no livestock grazing in the area between 2006-2011. Black Mesa has been highly impacted by these factors over past decade; current ecological conditions are highly departed from a semi-desert native grassland. Precipitation patterns in recent years have favored cool season annuals with higher winter precipitation levels, and lower than average monsoon precipitation which is critical for native warm season grasses.

Higher levels of summer precipitation in 2013 appear to have stimulated a favorable growth response by warm season native grasses and hopefully range conditions will improve.

Unit 21 is near the Phoenix metroplex, and considerable recreational traffic occurs during all but the summer months. Major access routes include Bloody Basin Road, Dugas Road, and Forest Road 677 (a segment of the Great Western Trail). Visitation and commercial tours are expected to increase on the Perry Mesa and Black Mesa pronghorn habitats as a result of future archaeological interpretative development within the Agua Fria National Monument (about 40% of the Unit 21 pronghorn habitat is within the monument). Vehicular access in the north on Dugas Road is expected to increase as private lands along Sycamore Creek are subdivided and developed. Dugas Road also provides access to the Pine Mountain Wilderness and realignment of the road away from the middle of the mesa tops east of the junction with Forest Road 677 may help reduce disturbance to pronghorn.

Controlling access to key fawning areas during fawning season (March-May) may be needed to improve fawn survival. Closure of non-system roads and numerous OHV trails may be required to protect and maintain pronghorn habitat. The Agua Fria National Monument Resource Management Plan (BLM 2010) addresses these issues through management actions including seasonal use restrictions, vehicle type and speed restrictions, rerouting and closure, and/or suitable road impact mitigation.

Cordes Junction development has resulted in the loss of habitat for pronghorn in Unit 21. Further, it has affected seasonal movements between East Pasture and Black Mesa. Increased development in this area would result in additional loss of grassland habitat, something the small herds in Unit 21 may not be able to recover from. Another area of concern that may impact pronghorn in Unit 21 may result from continued development near the Sunset Point Interchange. The best movement corridor to Black Mesa was lost to this development. Further, development on the east side of I-17 at Sunset Point or Badger Springs could result in permanent separation of Black Mesa from the rest of the unit. Continued clearing of the gas line easement just east of I-17 may mitigate some of the impact. Proposed I-17 expansion or realignment (possibly 3 parallel alignments with 2 or 3 lanes each to accommodate north-south vehicular traffic and freight transport) could further fragment suitable pronghorn habitat. The potential for development of private lands along Sycamore Creek and the Agua Fria River is increasing. Private land along Sycamore Creek was targeted for development in 2005; however, the water needed for the proposed housing development was not available. Developer plans are still pending for a housing project at a smaller scale. Development of private land inholdings within USFS and BLM lands have the potential to fragment core habitats in the north and south and negatively affect pronghorn movement corridors between them. The most critical issues for pronghorn in this unit are to maintain habitat connectivity between north and south ranges, protect or improve habitat quality and quantity, and minimize private land development. Conservation efforts should target these private lands to minimize development using land use planning, acquisition, or conservation easement tools.

Coyotes are a factor with respect to pronghorn management in Unit 21. The densities of coyotes in the area are typical of central Arizona landscapes. Coyotes can be detrimental to recruitment of fawns into a pronghorn population, especially if adequate hiding cover for fawns is not

available. Fawn hiding cover assessments conducted during 3 spring fawning seasons (2002–2004) indicated more hiding cover was available in the south versus the north pronghorn habitat. The Department surveyed a greater number of fawns per 100 does in the south during the spring fawning seasons from 2002–2005 and late-summer fawn survival indices (fawn:100 does) met or exceeded the Department’s species management guidelines of 30–40 fawns per 100 does 3 out of 4 years in the south. Investigators concluded that more optimum hiding cover in the south may have positively influenced fawn recruitment. During the early 2000’s the PNF implemented a minimum stubble height rangeland guideline in key areas for pronghorn fawning to address Department concern’s with the declining status of the Unit 21 pronghorn herd. Since that time pronghorn numbers have rebounded and implementation of that guideline may not be active. The Horseshoe-Copper Creek CRMP plan may incorporate a minimum stubble height objective for key pronghorn fawning areas associated with Horseshoe Ranch in the future.

The Department has coordinated with the land management agencies (BLM, Tonto NF, and Prescott NF), the Agua Fria Grasslands Coalition and the Arizona Antelope Foundation to improve habitat conditions through various projects within Unit 21. Most recently, the Central Arizona Grasslands Conservation Strategy was developed to guide strategic planning and interagency collaboration on grassland and wildlife conservation in the plan area. An interagency Implementation Team collaborates on project priorities and allocation of restoration-enhancement oriented project funding. Overtime, the intent is to expand beyond interagency collaboration and develop non-governmental partnerships towards achieving strategy goals and objectives. Projects have included fence modifications to wildlife standards, fence removals, water developments, development of broad scale grassland maintenance burns, and juniper cuts. Habitat assessments and various research efforts have continued to focus on identifying pronghorn needs and developing management recommendations.

Management Objectives: The population management objectives for the Unit 21 pronghorn herd is to continue to increase herd size and viability through habitat and other management actions, while providing hunter opportunity according to guidelines.

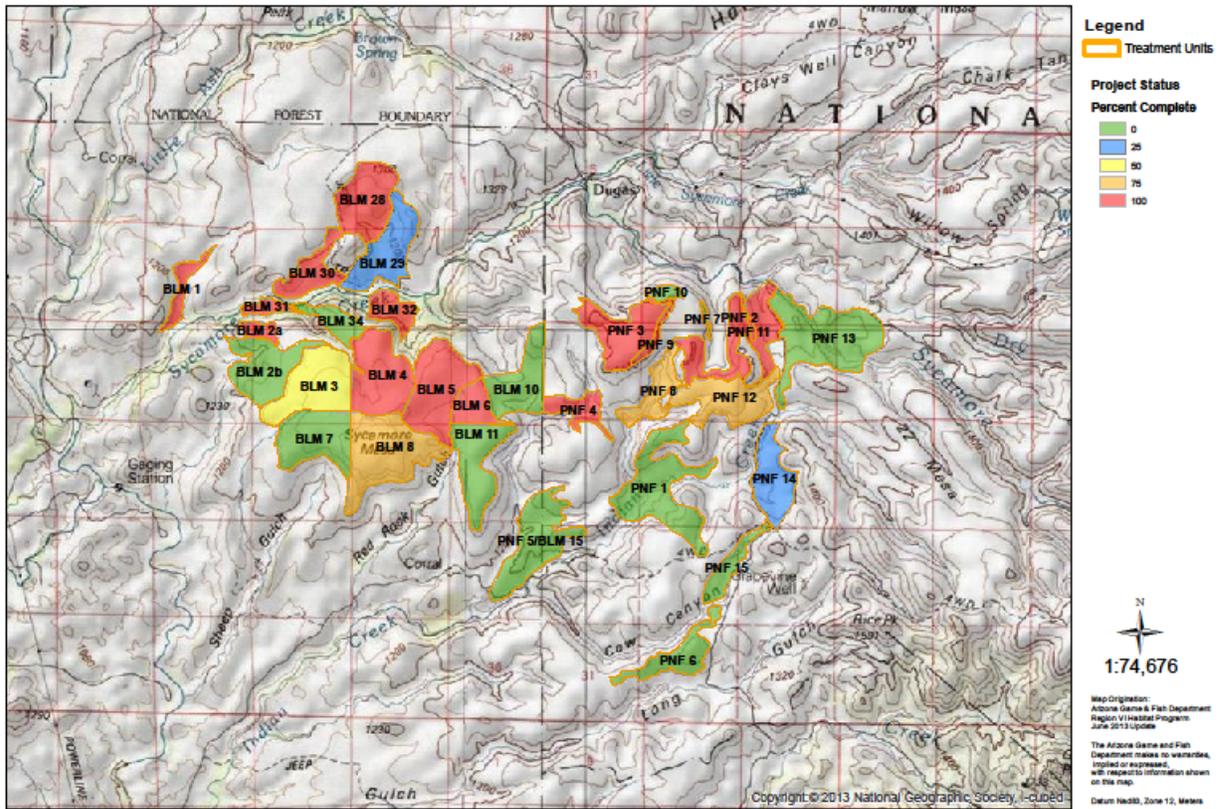
This objective will be achieved via the following considerations and management strategies:

- Obtain a pronghorn summer survey population estimate of 250+ animals using the double count survey method, comparable with observed pronghorn numbers during the period of 1985–1990 (mean = 268).
- Implement management strategies that improve and maintain fawn:doe recruitment to consistent levels between north and south herds that meet Department management guidelines.
- Collaborate with land management agencies and other stakeholders to develop landscape scale management plans that address management issues; maintain or improve grassland habitat quality; and influence pronghorn distribution patterns similar to historic records. A Central Arizona Grasslands Restoration Strategy, which is supposed to be a landscape level plan, is being implemented by land management agencies.
- Coordinate with land management agencies and stakeholders to improve the availability of forage and target a minimum of 8 inch residual stubble height cover to mitigate drought impacts on pronghorn fawn survival and habitat quality.

- Review environmental assessments developed for the renewal of grazing permits (NEPA process) and develop recommendations to mitigate impacts to pronghorn habitat quality. Document issues and concerns with allotment management and provide feedback to appropriate land managers for their consideration when developing annual operating instructions (adaptive management).
- Conduct periodic habitat assessments to evaluate fawn hiding cover, forage availability, canopy cover, grassland vegetative composition and diversity, and water availability.
- Develop a landscape scale plan to maintain and restore pronghorn habitat connectivity and quality across central Arizona and within Unit 21 grassland habitat. Participate in the implementation of the Central Arizona Grassland Conservation Strategy.
- Initiate Adopt-a-Ranch partnerships where needed to facilitate habitat improvement projects.
- Improve relations with permitted livestock operators. Collaborate on habitat improvement projects that benefit pronghorn and livestock rangelands.
- Fund and implement habitat improvement projects to reduce tree and shrub encroachment in Unit 21 pronghorn habitats.
 - Develop site specific treatment priorities and methods consistent with direction in the forthcoming Central Arizona Grassland Conservation Strategy.
 - Prioritize treatments for movement corridors and core habitat areas.
 - Collaborate with land management agencies to support completion of required environmental analyses (NEPA and ESA) for project implementation.
 - Collaborate with livestock operators to develop partnerships and commitment to project goals, objectives and strategies.
 - Pursue funding for ongoing project implementation through annual funding sources, project match from federal or state land management partners, and/or project match from livestock operators.
 - Complete ongoing juniper thinning targets for the Sycamore Mesa Project and Agua Fria Antelope Habitat Improvement Project areas currently funded at \$50,000 for FY 2013.
- Evaluate current monitoring of pronghorn recruitment, distribution and population trends.
 - Continue surveys to determine if pronghorn distribution expands or contracts with respect to historic range within Unit 21 as habitat improvement projects are completed or habitat quality changes in core habitat areas.
 - Develop a monitoring strategy, to include GIS radiotelemetry, to verify if pronghorn respond favorably to habitat improvements designed to enhance suitability of movement corridors and reduce tree and shrub densities in core habitat areas.
- Reduce fence densities and improve fence quality to wildlife standards conducive for pronghorn movement.
 - Use the Unit 21 GIS based fence quality inventory data (see map) to prioritize fence improvement projects in an efficient approach that maximizes collaboration between volunteer efforts and contracted work.
 - Prioritize annual work projects with volunteers in areas conducive to easy access.

- Develop proposal to fund fence modifications of all fence segments inventoried as moderate, low, poor or unsuitable in the Unit 21 fence quality inventory and pursue funding.
- Track fence improvement projects and update GIS based fence quality inventory map for ongoing planning.
- Develop recommendations to reduce fence densities and pursue removal of fences identified as unnecessary for livestock operations and/or in such a state of disrepair as to create an entrapment hazard for wildlife.
- Reduce habitat fragmentation between north and south Unit 21 core habitats and between Units 21, 19A, and 20A.
 - Use heritage funds or other funding and partnerships to acquire private lands targeted for development along the Sycamore Creek, Agua Fria River, or State lands identified for auction.
 - Pursue conservation easements where possible within core habitats and movement corridors.
 - Support and pursue the Horseshoe Ranch land acquisition proposal.
 - Pursue mitigation associated with future I-17 alignment and expansion projects to reconnect pronghorn habitat between Units 21, 19A, and 20A and prevent habitat fragmentation of Black Mesa.
- Conduct water distribution analysis and monitoring to facilitate the maintenance or improvement of water availability.
 - Locate and map all suitable waters for pronghorn use in Unit 21. Develop a GIS based map to facilitate annual monitoring efforts to identify locations that need management action.
 - Coordinate with land management agencies and livestock operations to maintain water availability.
 - Develop cost-share agreements to redevelop or enhance existing waters.
 - Implement management actions to improve population trends and protect long-term viability when needed.
 - Apply aerial gunning coyote control to key fawning areas the following year if the 3 year average observed fawn ratio for the unit drops below Department Guidelines.
 - Consider harvest objectives for mountain lions in Unit 21 West if the total observed pronghorn drops below 75 during the summer survey for 2 consecutive years.
 - Conduct pronghorn transplants when habitat quality and precipitation levels are optimum.

Gmu 21 Sycamore Mesa Juniper Thinning Project (BLM) and Agua Fria Antelope Habitat Improvement Project (PNF)



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