



MEMORANDUM

Date: October 12, 2000

To: The Honorable Chair and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator 

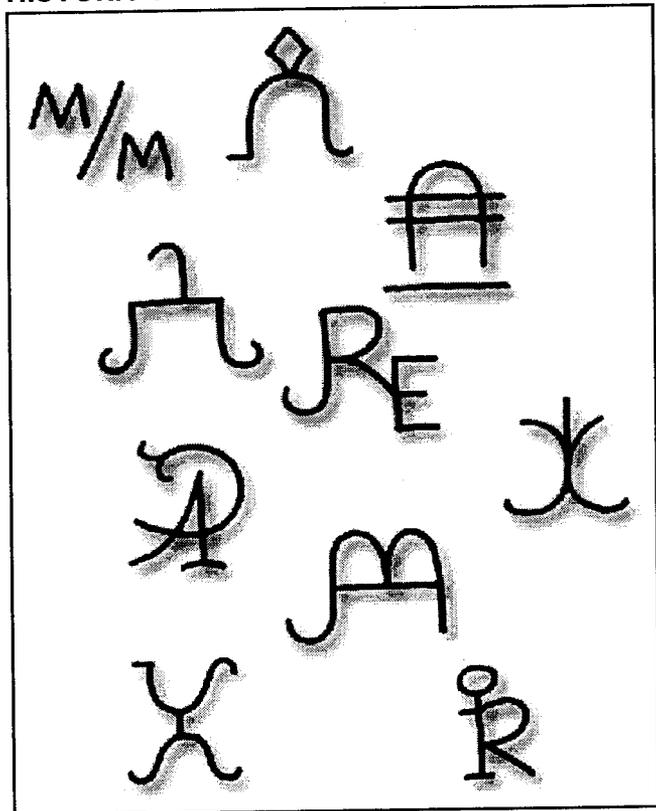
Re: Preserving Ranch Lands in Pima County

I. Overview

The attached report entitled *Preserving Ranch Lands in Pima County* is a companion to the *Preliminary Ranch Conservation Element*. Written by the members of the Pima County Ranch Conservation Team, this document brings together leaders in the area of Ranch Conservation and compiles their expert writings on ecological and economic sustainability in ranching. Dr. Nathan Sayre is the primary author. Sections of the report have also been drafted by other team members.

- Dr. George Ruyle has contributed a chapter entitled "Considering the Ecological Sustainability of Ranching."
- Dr. Dan Robinett wrote several chapters and subchapters of the report, including "Stewardship and Long-term Environmental Change," "Compatibility with Wildlife Habitat Needs" (with Dr. Sayre), and a section on the Anvil Ranch.
- Dr. Harold Barnett and Walter Lane drafted sections of the Economic Sustainability discussion.
- Mette Brogden of the Udall Center co-authored a chapter on the topic of purchase of development rights, with Rich Yarde.
- And Mac Donaldson, the great steward of the Empire Ranch, has contributed to the report through the discussion of his ranch as an example of ecological sustainability.

HISTORIC PIMA COUNTY RANCH BRANDS



II. Summary of Findings -- The executive summary makes these points in an effort to bring together the discussions by the authors:

- "Ranchlands in Pima County were severely impacted by uncontrolled grazing during periods of drought between 1880 and 1934, but they have generally improved in condition since that time. In many areas, improvements in management have significantly enhanced the stability, productivity and wildlife habitat conditions of ranchlands.
- Open space conservation is a function of land use and ownership. Unlike other land uses, ranching amalgamates private, state, and federal lands into single, large management units. In many respects, this is prerequisite to effective wildlife conservation.
- Wildlife conservation is a function of management. Ranching can be good, bad, or indifferent to wildlife depending on the wildlife species in question, the past history of the land, and how grazing is managed.
- The ecological sustainability of ranching is demonstrated by well-managed ranches and by scientific research. Long-term environmental changes, brought about in part by past overgrazing, pose important challenges and opportunities for stewardship of rangelands and the wildlife they support.
- The economic sustainability of ranching is threatened by the growing disparity in land values for agricultural versus suburban/commercial purposes. Livestock production typically yields a return of less than two percent per annum, measured against the value of the ranch. While land values have increased over the past fifty years, the real rate of return to ranching has steadily declined.
- For historical reasons, the areas of highest ecological value (due to the presence of water) tend to be private lands. These typically represent only a minority of the land base needed for a viable ranching operation. If deeded lands are severed from their state and federal grazing leases, they are no longer useable for ranching and will likely be subdivided.
- For most plant and animal species, more scientific research is needed to understand the complex relations between climate, habitat, grazing and other human pressures. Emphasis should be placed on adaptive management, with monitoring for wildlife and vegetation incorporated into ranch management.
- Measures to preserve open space by conserving ranching must: address the economic processes that drive land-use conversion; recognize the rights of ranch owners; be voluntarily accepted by individual ranch owners; address the complex issues surrounding tenure on state and federal grazing lands.
- Efforts must be made to involve ranchers in the formulation of open space conservation measures. This is necessary to arrive at measures that ranch owners will support. A suite of measures will be necessary to accommodate the diverse circumstances and to allow for flexibility in implementation and management, including purchase of development rights, conservation easements, and stewardship leases on State Trust lands."

III. Conclusion

For two years the Ranch Team has met to discuss and develop the Ranch Conservation Element. Members include:

- Dr. Thomas Sheridan, Chair
- Walter Alexander
- Mette Brogden
- Tom Chilton (past member)
- Mac Donaldson
- Carl Jones
- Kitty Knepper
- Micaela King McGibbon
- Bart McGuire
- Dr. Dan Robinett
- Jon Rowley
- Dr. George Ruyle
- Dr. Nathan Sayre

Working with minimal funding, this team and Ms. Linda Mayro from my office have developed a sophisticated set of reports. It is a privilege to forward the original work of the Ranch Team members in the attached document. *Preserving Ranch Lands in Pima County* is a major contribution to the Conservation Plan study series. We are looking forward to continued leadership from the Ranch Team in developing the final Sonoran Desert Conservation Plan during the next two years.

Attachment

**PRESERVING RANCH LANDS IN PIMA COUNTY
PIMA COUNTY SONORAN DESERT CONSERVATION PLAN**

By Nathan F. Sayre, Ph.D.

With Contributions By

Dan Robinett, George Ruyle, Ph.D, Harold Barnett, Ph.D.,
Mette Brogden, Rick Yarde, and Walter Lane

September 2000

Ranch Conservation Technical Advisory Team Members
Pima County Sonoran Desert Conservation Plan
September 2000

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Preserving Ranch Lands in Pima County

Pima County Sonoran Desert Conservation Plan

I. Executive Summary:

Ranch lands in Pima County were severely impacted by uncontrolled grazing during periods of drought between 1880 and 1934, but they have generally improved in condition since that time. In many areas, improvements in management have significantly enhanced the stability, productivity and wildlife habitat conditions of ranch lands.

Open space conservation is a function of land use and ownership. Unlike other land uses, ranching amalgamates private, state, and federal lands into single, large management units. In many respects, this is prerequisite to effective wildlife conservation.

Wildlife conservation is a function of management. Ranching can be good, bad, or indifferent to wildlife depending on the wildlife species in question, the past history of the land, and how grazing is managed.

The ecological sustainability of ranching is demonstrated by well-managed ranches and by scientific research. Long-term environmental changes, brought about in part by past overgrazing, pose important challenges and opportunities for stewardship of rangelands and the wildlife they support.

The economic sustainability of ranching is threatened by the growing disparity in land values for agricultural versus suburban/commercial purposes. Livestock production typically yields a return of less than two percent per annum, measured against the value of the ranch. While land values have increased over the past fifty years, the real rate of return to ranching has steadily declined.

For historical reasons, the areas of highest ecological value (due to the presence of water) tend to be private lands. These typically represent only a minority of the land base needed for a viable ranching operation. If deeded lands are severed from their state and federal grazing leases, they are no longer useable for ranching and will likely be subdivided.

For most plant and animal species, more scientific research is needed to understand the complex relations between climate, habitat, grazing and other human pressures. Emphasis should be placed on adaptive management, with monitoring for wildlife and vegetation incorporated into ranch management.

Measures to preserve open space by conserving ranching must:

- address the economic processes that drive land-use conversion;
- recognize the rights of ranch owners;
- be voluntarily accepted by individual ranch owners;
- address the complex issues surrounding tenure on state and federal grazing lands.

Efforts must be made to involve ranch owners in the formulation of open space conservation measures. This is necessary to arrive at measures that ranch owners will support and agree to. Very likely, a suite of measures will be necessary to accommodate the diverse circumstances of different ranches and to allow for flexibility in implementation and management. Some measures to be considered include purchase of development rights, conservation easements, and stewardship leases on State Trust lands.

II. The Goals of the Sonoran Desert Conservation Plan:

The goals of the Sonoran Desert Conservation Plan (SDCP) fall into two broad categories. *Wildlife goals* seek to preserve, restore, and enhance habitat, especially for threatened and endangered species. *Open space goals* aim to preserve large areas of relatively unfragmented, undeveloped land for aesthetic and recreational, as well as environmental reasons.

In many cases, wildlife and open space goals overlap or reinforce each other; generally speaking, habitat fragmentation is detrimental to wildlife and to biodiversity. Yet the two types of goals are distinct for legal, economic and practical reasons. Wildlife goals depend primarily on *management* while open space goals depend on *land use* and *ownership*. Once land has been divided into small parcels and developed, managing it for wildlife goals becomes difficult or impossible. In this respect, preserving open space is prerequisite to realizing wildlife goals.

Ranch Conservation can help in realizing both types of goals. Ranching preserves open space by virtue of its extensiveness as a land use. Range livestock production requires large, generally unfragmented areas to be economical. Land ownership in Pima County (as in much of the West) is a patchwork of private, federal, state and tribal lands. Almost all ranches in eastern Pima County combine private, state trust, Forest Service, and/or Bureau of Land Management (BLM) lands into single, large management units. In consequence, land ownership boundaries often remain nothing more than lines on a map. No other land use accomplishes this large-scale amalgamation of private, state and federal lands.

The effects of ranching on wildlife are more complex. It is well known that heavy, uncontrolled grazing severely damaged the soil, vegetation and habitat qualities of Arizona rangelands prior to 1934, particularly during periods of drought. Since that time, range conditions have generally improved, although wide variation can be found and indirect effects of the earlier damage persist (e.g., arroyo formation, vegetation change, relative absence of fires). The scientific literature and the experience of many ranchers suggest that grazing can be good, bad, or indifferent to wildlife, depending on the species in question, the past history of the land, and how the grazing is managed.

In sum, ranching *is* compatible with open space goals and it *can be* compatible with wildlife goals.

II-1. The Principle of Shared, Sustainable Landscapes

The principle of shared, sustainable landscapes has been put forward by the Arizona Common Ground Roundtable, a coalition of ranchers, environmentalists and scientists convened by the University of Arizona's Udall Center for Public Policy. Theirs is a vision of diversity—both

cultural and biological—and of sustainability—both economic and ecological. It rests on several premises: that the goal of healthy, diverse and productive lands is shared by all; that ranches can be managed to meet conservation and ranching goals together; that subdivision for real estate development poses a greater and more irreparable threat to conservation values than does cattle grazing.

How can shared, sustainable landscapes be achieved as part of Pima County's SDCP? What are the obstacles that must be overcome? With respect to wildlife goals, the answers lie in management. Ranches in Pima County and elsewhere in the Southwest demonstrate that management can simultaneously accommodate cattle and wildlife. Open space goals require that economic incentives to subdivide ranches for real estate development be mitigated without compromising private landowners' property rights.

III. Ecological Sustainability:

III-1. Considering the Ecological Sustainability of Ranching

George B. Ruyle, Rangeland and Forest Resources, The University of Arizona

Livestock have grazed rangelands of the Southwest since Europeans first entered into what is now Arizona. Livestock probably arrived first by way of the San Pedro River (Flint and Flint 1997); in the late 17th century, Father Kino brought cattle, sheep and horses down the Santa Cruz when he explored southern Arizona and distributed livestock among the native people of the region (Allen 1989, Sheridan 1995, Wildeman and Brock 2000). By the early 1800's ranching as an industry had begun, and cattle numbers in the region, while probably not at the anecdotal levels often cited, were no doubt large enough to impact plant communities, especially near water (Cox et al. 1983, Sheridan 1995). As the Apaches were subdued and ranching began in earnest at the end of the 19th century, cattle numbers skyrocketed, resulting in the well-known scenario of overgrazing, drought and range deterioration (Bahre and Shelton 1996).

There is little argument that drastic changes have occurred on many Arizona rangelands due, in part, to livestock grazing. However, the position that current livestock grazing practices are uniformly negative in their impacts on ecosystems is a narrow and unsubstantiated view. Discussions of this nature, such as Fleischner (1994), are a "dangerously one-sided presentation of data and opinions" (Brown and McDonald 1995). Many of the negative reports on effects of livestock grazing on uplands and riparian areas are unreplicated and confounded experiments, failing to separate effects of livestock grazing from other factors impacting these ecosystems. For example, Bock et al. (1984) found that Cassin's and Grasshopper Sparrows were more abundant in ungrazed areas, whereas Gordon (2000) reported that these two sparrow species were more abundant on grazed areas than an ungrazed study area during one year of a three year study. Further, Cooke and Reeves (1976), in the classic analysis of arroyo formation in the Southwest, could not conclude that heavy grazing by itself caused the formation of arroyos, although they felt it may have had

a role in the process. More significantly, direct human interventions such as dams, roads and railways appeared to be primary causes of the large stream channelization. Many analyses also fail to distinguish the effects of former grazing practices from the effects of present grazing management. Although historical overgrazing may have set the stage for current conditions by initiating shrub increases to thresholds of cover above which accelerated soil erosion occurs (Martin and Morton 1993), in such conditions even complete livestock removal will not reverse these processes (Roundy and Jordan 1988). Currently, heavily grazed sites may display similar system disruptions with little chance of rapid recovery, while the effects of light grazing pressure are little understood and largely undetectable (Friedel 1997).

Currently, much of the debate over livestock grazing focuses on obvious degradation of riparian areas and potentially negative impacts on threatened and endangered species. But even here, these influences are confounding and data inadequate and inconsistent, in part due to the costs and complexities of conducting appropriate experimental research. On some riparian areas, geomorphologic influences may be instrumental to the regeneration of cottonwood forests (Asplund and Gooch 1988), while in others, fluvial geomorphic changes may be tied to overgrazing (Cartron et al. 2000). Cartron et al. (2000) go on to say that where riparian areas are not already completely degraded, livestock grazing can be properly implemented. The relationship of livestock grazing to species extinction is even more anecdotal than most overgrazing issues. Although the ecological impacts of livestock grazing may be significant, there is little direct evidence of cause and effect between livestock grazing and the extirpation of any species. The masked bobwhite quail may be an exception (Loftin et al. 2000), but the only known remaining wild populations of masked bobwhites occupy a working cattle ranch in Sonora, Mexico. Species extirpation has been more directly linked with direct control efforts or large scale habitat conversion treatments by humans rather than grazing *per se*. In fact, the only occurrences of many endangered species are often in association with rangelands ecosystems that have been grazed for well over a century. Grazing as a land use may have preserved these habitats.

In Arizona, rangeland managers are challenged with complex and interrelated issues such as: 1) managing diverse vegetation types, with vastly different natural productive potentials, 2) mixed and complex ownership patterns including private, state and federal jurisdiction, and 3) a variety of often competing uses. The central goal of these managers has been to manage rangeland resources in such a way as to produce commodities and satisfy values without degrading the basic potential of the resource. Range livestock production, ranching, is based on the related premise of sustained yield. Proper grazing of livestock is sustainable on the great majority of rangeland (Pieper 1994), yet in spite of this, ranchers today find themselves at the center of acrimonious conflicts among a variety of stakeholder groups seeking to influence political processes and gain control of land use decisions.

The common ground for all of these stakeholder groups is an interest in preserving open space. Preserving open space also is a primary tool for conservation planning and the future of open space preservation can benefit from the continuation of ranching as a land use. A balanced perspective is needed concerning land use issues, in general and specifically for

ranching as a land use and for grazing management policy. The following are some considerations for the discussion of the role ranching can play in preserving open space.

- Grazing is a natural ecological process on rangelands, including deserts, desert scrub, semidesert grasslands and shrub savannahs. Large ungulate grazers are viewed by many scientists as a functional component in the formative evolution of grasslands and shrublands (Martin 1970 and 1990, McNaughton 1986 and 1993), although Fleischner (1994) and others (Loftin et al. 2000) dispute this. That the Southwest experienced a dissimilar natural herbivore evolution than other arid landscapes, ranging from deserts to grasslands to shrub/woodlands, is open to scientific curiosity and discussion (Burkhardt 1996).
- Controlling the kind and number of grazers as well as manipulating season of use may mitigate grazing effects. The dire consequences of overgrazing have long been recognized (Smith 1898) and these influences may still be seen on today's landscapes (Bahre 1991). However, it has also long been known that adjusting stocking rates, improving grazing distribution and changing season of use can mitigate negative impacts of livestock grazing and may even help achieve management goals for particular units of land (Griffiths 1910, Wootton 1916, Sampson 1919). While rangeland livestock grazing may influence plant community structure and function, as well as soil attributes and water cycles, the magnitude of these effects are highly variable (Caldwell et al. 1981, Gifford and Hawkins 1978, Holland 1992, Weltz et al. 1998). As Loftin et al. (2000) report, "studies have shown that heavy grazing (overgrazing) often produces significant detrimental treatment effects, and low and moderate grazing practices often do not." The consequences of these effects may be permanent or reversible on highly variable time scales. Light to moderate levels of livestock grazing have proven to be sustainable over time and the fact that previously grazed landscapes have been given park and preserve status indicates that such future uses are viable on grazed landscapes. Sustainable livestock grazing maintains options for future land use when the productive potential of the site is not impaired. Based on soil surveys and ecological site analysis some level of livestock grazing, under proper management prescriptions, is sustainable on most areas of Pima County (USDA - NRCS, in press).
- New theories describe alternative stable vegetation states that may result due to various influences, and these theories recognize that taking cows off the land may have little influence on these processes. Previously the interpretation of range condition in the United States was largely based on the writings and concepts of Clements (1916). These models of range condition assumed the following (Westoby et al. 1989):
 - ▶ There is only one stable state, i.e. the climax plant community.
 - ▶ Retrogressive changes caused by improper grazing result in unstable states, which can be reversed by curtailment or elimination of grazing.
 - ▶ The pathway of vegetation change as rangelands improve (secondary succession) is identical to and the reverse of that in retrogression.

However, each of these assumptions has been proven invalid for most arid and semiarid rangelands including those of Arizona (National Research Council 1994). Rangeland vegetation communities in southeastern Arizona commonly have more than one lower successional state that may be quite stable (Task Group on Unity in Concepts and Terminology 1995). This new state may be as stable as "climax", but different. The composition or range condition of vegetation in a stable state does not depend significantly on the reduction or elimination of grazing (CAST 1996).

- Livestock grazing management prescriptions can be used as a tool to maintain open space while meeting site-specific resource objectives for landscape-level processes. Those concerned about the condition of rangeland must define clear objectives regarding the desired plant community necessary to meet management goals. For a given ecological site, selection of the desired plant community should consider ecological and management feasibility and how these conditions will optimize the value of rangeland resources. For example, habitat conditions favorable for an endangered species may dictate the desired plant community, and may require grazing (McClaran and Sundt 1992). The application and practicality of specific grazing and other management strategies must be considered during selection and planning of the desired plant community and other resource goals.

III-2. Stewardship and Long-term Environmental Change

Dan Robinett, Natural Resource Conservation Service

Sustainable ranching must be examined in the context of long-term environmental changes in the region's rangelands. Foremost among these changes are the dramatic decrease in the incidence of fires, the spread of mesquites into areas previously dominated by grasses, and the entrenchment of washes (arroyo formation). While human activities (grazing, timber cutting, water diversion, agriculture, mining) contributed significantly to these changes, natural factors (climatic and vegetative) also played a role. Precise causes and consequences remain active areas of scientific research.

Fire

Naturally occurring wildfire played a role in shaping the Sonoran desert grasslands, plains grasslands, oak savannas and pine-oak woodlands of Pima County (Pase 1977, Leopold 1924, Humphrey 1958). Fires started by lightning in early summer storms or by Native Americans were common prior to the turn of the century (Bahre 1985, Leopold 1924).

Natural fire frequencies for grasslands and savannas in Pima County have been estimated at between 3 and 20 years (Kaib et.al.1999, Wright 1980, McPherson 1995, Swetnam 1988). Periodic fire in these ecosystems would certainly favor perennial grass species over shrubs and cacti and helped to maintain a grassland aspect in the past throughout much of the county (Wright & Bailey 1982, Wright 1988).

Anglo settlement of the region caused a variety of impacts that reduced the frequency of or eliminated fires as an environmental factor (Bahre 1991, Hastings and Turner 1965). Cultural impacts like grazing, farming, woodcutting and fire suppression interacted with natural phenomena like drought and changing precipitation patterns to cause a shift from grasslands to the shrub dominated landscapes of today. Photographic evidence from the turn of the century compared to today illustrates the magnitude of this change (Humphrey 1987, Hastings and Turner 1965).

In recent times prescribed burning has been used on Pima County rangelands as an effective tool to reduce stands of shrubby plants and restore grassland. Since 1978 thousands of acres on the Buenos Aires National Wildlife Refuge has been burned to kill snakeweed, burroweed and top-kill mesquite. Since 1985 about 10,500 acres of rangeland on the Anvil Ranch has been prescribe burned treating five large pastures totaling over 20,000 acres. These burns resulted in a mosaic of burned-unburned areas beneficial to both wildlife and livestock. Typical response of these communities is shown in a range trend monitoring transect installed in 1981. The pasture was burned in 1985 (Robinett 1995).

Table III-2.1. Percent Frequency

Factors or Species:	1981	1984	1989	1993	1999
Burroweed	60	75	1	5	2
Mesquite	4	3	6	5	7
Cacti	4	7	5	5	11
Santa Rita threeawn	5	17	38	67	56
Arizona cottontop	0	1	1	4	1
Perennial grass cover	1	2	5	8	4
Herbaceous production	20	100	200	400	300

The maximum effect of this fire was achieved 10 years after the burn. The anticipated life span is twenty years, at which time the area should be burned again to maximize the health and vitality of these ecosystems.

Large wildfires in Pima county rangelands can be managed to have beneficial results. Good examples include the 1991 "Montosa Fire" on the Empirita and Empire ranches where grazing was deferred for several years after the fire to allow grass species to recover. This fire controlled shrubby invasions of creosote bush, whitethorn acacia and sandpaper bush on several thousand acres of semi-desert grassland. Several large wildfires have occurred in the Baboquivari Mountain range in the last 25 years. In a recent range analysis of the Altar Valley a comparison of burned versus unburned hillsides was made on several of these areas (Meyer 2000). These areas are on Granitic Hills Ecological Sites in the 12 to 16 inch precipitation zone of the semi-desert grassland. The following table illustrates the effect of fire in maintaining a balance of perennial grasses and shrubs.

Table III-2.2. Comparison of Effects of Fire

Factors	Burned	Unburned
Bare ground	39%	70%
Litter	40%	23%
Live basal cover	21%	7%
Perennial grasses	70%	35%
Perennial forbs	2%	3%
Trees & shrubs	6%	36%
Half shrubs*	23%	20%
Production	1350 lbs./acre	775 lbs./acre

*False mesquite (*calliandra*) and ratany (*krameria*)

A study done on plains grassland and oak savannas at Fort Huachuca show that optimum fire return intervals for the higher elevation grassland-savanna areas in Pima County would be about 10 years (Robinett 1994).

Several trends in Pima County are acting to limit the use of prescribed burning and the ability to manage large wildfires to benefit grassland and savanna ecosystems. As subdivisions creep into rural areas the risk of doing prescribed burning or allowing wildfires to burn adjacent to these subdivisions is too great. The Arizona State Land Department has a total suppression fire policy within 5 miles of any subdivision. A quick glance at a land ownership map would show that if the remaining private ranch land in Pima County was subdivided there would be very few areas where fires could be used or managed to benefit grassland ecosystems.

Recent listings of both plant and animal species as Endangered also act to limit the use of fire as a factor in ecosystem health and management. Pima Pineapple Cactus (PPC) occurs throughout the Altar Valley in nearly a half million acres of what was and could be semi-desert grassland. The last prescribed burn on the Anvil Ranch in 1995 was on a pasture containing a high density of this species. In formal consultation with the US Fish and Wildlife Service a study was conducted to look at fire effects on this cactus. Preliminary results of the study showed 70% survival of burned PPC, and 74% survival of unburned PPC, no significant difference. However this fire was followed by severe drought for the next three years and rodents and rabbits consumed many of the burned PPC resulting in a high mortality due to the fire-drought combination (Roller, Halvorson 1997). Because of this it is unlikely that prescribed fires will be allowed in PPC habitat in the near future.

The Cactus Ferruginous Pygmy Owl was listed as Endangered in 1997. Subsequently over 700,000 acres of rangeland in Pima, Pinal and Maricopa Counties was listed as critical habitat for this species (July 1999). The entire western half of the Altar Valley was listed as critical habitat, and over half of the known occurrences of this owl species (in the U.S.) have been

documented in this area. This species nests in saguaro or tree cavities and forages in adjacent mesquite-paloverde, shrubby valley areas, many of which are dis-climax desert grasslands (Cartron, Finch et.al. 2000). The use of prescribed fire or managed wildfires may be limited in this area to avoid impacts on this species.

Single species management such as mandated by the Endangered Species Act may further restrain ecosystem management by not allowing the return of fire to a more natural role in these grasslands and savannas.

In the absence of fire most areas of semi-desert grassland, plains grassland and oak savanna in Pima County have experienced tremendous invasions and increases of shrubby species like mesquite, mimosa, snakeweed, burroweed and cacti at the expense of native perennial grasses. The return of fire to these ecosystems is perhaps the only way to realize their potentials in the future.

Mesquite

Velvet mesquite has invaded and or increased on nearly all of the semi-desert grassland and Sonoran savanna grassland in Pima County in the last 100 years. Photographs from the turn of the century show open grasslands, where now the same scenes are dominated by mesquite (Hastings & Turner 1965, Humphrey 1987). In the very recent past (30 years) mesquite has invaded plains grasslands in the Sonoita area of southeastern Pima County.

Although velvet mesquite is native to this region and occurred naturally throughout these rangelands, it was limited in extent to bottomlands and drainageways and along the mountain pediment. It has aggressively invaded and altered grasslands in the last century. The mechanisms for this invasion are many and are widely documented. The following factors undoubtedly contributed: grazing by domestic animals, reduction of naturally occurring fires, changes in native fauna and changes in climate (Archer 1994, Bahre & Shelton 1993, Glendening and Paulsen 1955, Martin 1975). In at least one case an area fully protected from humans and livestock disturbance has been invaded by mesquite (Turner 1990). In addition increasing atmospheric levels of CO₂ since the industrial revolution may favor establishment of cool season species like mesquite at the expense of warm season perennial grasses (McPherson & Weltzin 2000, Archer 1994).

The invasion of grassland by a large shrub like mesquite affects the ecosystem in many ways. Nutrient and carbon distribution is severely altered by mesquite invasion. In open grassland there is a fairly uniform level and distribution of Nitrogen (N), phosphorous (P) and organic matter-carbon (C) in the surface soil. Once mesquites have invaded the available N, P and C is redistributed across the landscape leaving rich pools of these nutrients under tree canopies and depauperate areas of these nutrients in the interspaces between canopies (Biggs, Webb and Quade 1999). Mesquite has a deep taproot and an extensive lateral root system near the soil surface (Cable 1977). Trees are able to exploit soil areas 30 to 40 feet outside of the drip line of the canopy and import N, P and water from these areas to the tree.

Soils under the tree canopy are enriched in N, P and C due to litterfall from the plant. Intercanopy areas are deprived of essential plant nutrients and soil moisture, reducing perennial grass root and shoot production. This in turn results in less organic matter return to the soil. As the system unravels other plants better adapted to the interspace environment can invade or increase. These may include cacti like prickly pear and cholla and cool-season half shrubs like snakeweed and burroweed. The changing environment attracts new animal species like packrats and kangaroo rats that can perpetuate this flora by caching viable seeds of mesquite and cacti throughout the area (Parmenter and Van Devender 1995).

Mesquite continues to increase on most deep upland ecological sites until deterioration begins to occur (Robinett and Carrillo 1999). On Deep Sandyloam, Sandyloam Upland and Loamy Upland sites in the 12-16 inch rainfall zone of the desert grassland, soil erosion accelerated to high levels as mesquite canopy approached 20%. Studies on 4 paired small watersheds on the Santa Rita Experimental Range showed that soil erosion rates range from 0.02 to 0.60 tons/acre/year on the grassland watersheds and 1.48 to 1.70 tons/acre/year on mesquite invaded watersheds (Martin and Morton 1993). The density of mesquite on these same paired watersheds increased between 20 and 377 percent from 1975 to 1994. The canopy cover of mesquite on these watersheds increased between 1 and 113% in the same time period (Robinett and Carrillo 1999).

Efforts to control mesquite on Pima County rangelands began in the late 1950's. Aerial sprays of 2,4,5-T were used with poor results. Mechanical methods like bulldozing and chaining were used with good results but the effective life span of these treatments was limited as grazing was not managed and no follow-up treatments were applied. In the Altar Valley about 110,000 acres of upland range was treated mechanically to control mesquite between 1965 and 1995. Mesquite reinvasion of these treatments is usually heavy enough in 15 years to justify follow-up treatment. Since 1978 about 100,000 acres of upland range in the Altar Valley has been prescribe burned to control mesquite and other shrubs. Most of this work was and is being done on the Buenos Aires Ranch and now National Wildlife Refuge. Costs and environmental regulations restrict the amount of control work done on ranches in the area.

A recent range inventory of the Altar Valley showed the following situation on about 300,000 acres of deep upland ecological sites (Meyer 2000).

Table III-2.3. Mesquite Canopy Cover

Site	Slight(0-5%)	Light(6-10%)	Moderate(11-15%)	Heavy(16-25%)
Deep Sandyloam	20*	33	14	33
Sandyloam Upland	4	20	22	54
Loamy Upland	26	22	17	35

*figures show % of area of the site in the four canopy classes

This table illustrates the situation of these former grasslands in Pima County. Areas of these three upland sites with moderate to heavy mesquite canopies are at risk of and experience accelerated rates of soil erosion which may ultimately, if left unchecked, destroy the potential of these areas to be grassland.

Arroyo Formation

One factor in the dramatic changes in range condition in Pima County in the last century is the downcutting and erosion of all the major river systems. Streams like the Rillito, Cienega, the Santa Cruz and Brawley Wash all started eroding at about the turn of the century.

In 1849 the Santa Cruz River at Tucson consisted of a few small brooks running through a grassy meadow. It harbored native trout (Gila chub), beaver and wild turkey. By 1890 the watershed of this river was devastated by years of heavy grazing and severe drought. From August 5 to 15, 1890, a flood cut the Santa Cruz floodplain starting an arroyo in the irrigation ditch owned by Sam Hughes. By the end of this flood it was 20 feet deep, 150 feet wide and a mile long. In 1912 this gully had proceeded upstream 18 miles. The Rillito and Cienega creek began channel cutting at the same time (Hastings and Turner 1965). When George Roskrige first surveyed the Altar Valley in 1886 he found no evidence of gullies in the valley floor (Cooke and Reeves 1976). The gully started shortly after the turn of the century probably cutting along the alignment of the wagon road from Robles Junction to Altar, Sonora. By 1923 it was over 6 feet deep and extended from Anvil Ranch to Puertocito Wash. Presently the arroyo is 20 feet deep, and in places it has eroded to widths up to 1400 feet.

The entrenchment of these major streams has had a drying effect on their watersheds. As the axial streams eroded, their tributaries eroded and downcut to seek the lower base level. The vast network of gullies on these watersheds act as a drain, rapidly removing runoff from the area to cause flooding downstream in the Marana - Eloy area.

Filling with sediment and subsequent cutting of large streams in this region is a natural geomorphic process. An excellent anthropological-geomorphic study of Cienega Creek showed that it is on its third cycle of cutting and filling in the last 3000 years (Eddy and Cooley 1983).

A photo taken at the Pantano shipping corrals of the Southern Pacific Railroad along Cienega Creek in 1895 showed no sign of erosion in the floodplain (Myrick 1981). Presently at this location the creek is in a channel 20 feet deep and 50 to 60 feet wide. In the bottom of the present day channel, in an outcrop of shale, are several mortar holes made by Native Americans in the past 1000 years. At that time Cienega Creek was deep entrenched only to fill again with sediment by 1900. In the last 100 years it has entrenched again.

Several of these large streams in southern Arizona appear to be in a deposition sequence at present. Cienega Creek has accrued 3 to 4 feet of sediment in the headwaters area on Empire Ranch in the last 15 years. The Brawley Wash has filled the channel from the Avra Valley-Altar Valley junction on Tortuga Ranch nearly to the bridge on Ajo Highway.

Unfortunately, in Pima County, commercial development in the Tucson area will preclude any significant channel aggradation for a variety of reasons. The channels of the Rillito, Santa Cruz and the Pantano-Cienega Creek through the Tucson area (as far east as Vail and south as Green Valley) have been turned into urban floodways. Floodplains along these streams are built up and continue to be developed. These stream segments will never be allowed to aggrade and will be dredged to maintain floodwater capacity and protect urban and commercial development on the floodplains.

Even the Brawley Wash is affected. The highway bridge on Ajo Road is a multimillion-dollar structure which could be rendered unsafe by the sedimentation that is currently proceeding upstream. After each major flood the bridge area and channel is cleared of sediment to maintain floodwater capacity. This will preclude aggradation of the stream channel above this point.

Attempts at controlling erosion in and around these large entrenched streams and their tributaries have occurred sporadically on most of the ranches in Pima County. Dams and spreader dikes have been constructed at small head cuts throughout the area. Gullies have been shaped, filled with mesquite brush and seeded. On the Tortuga Ranch north of Three Points in 1953 an earthen dam and three waterways were constructed in the Brawley Arroyo to divert floodwaters back onto the floodplain areas. This has, over the last 45 years, converted a 3000 to 4000 acre wasteland into a very productive grass-tree floodplain and caused the Brawley Arroyo to fill with sediment. This occurred only with consistent maintenance of these structures, additions of downstream water spreading dikes and mesquite control and grass seeding. This floodplain is fenced into two large and two small pastures that are only grazed in the fall, winter, spring period and have been deferred from grazing each year during the summer growing season.

On the Anvil Ranch the entire stream terrace of the Brawley Arroyo has been diked and dammed to prevent valley-side drainageways from downcutting and to allow development of floodplain vegetation on a narrow strip flanking either side of the arroyo. In addition the entire arroyo-floodplain area is fenced and managed as a separate pasture grazed only in the fall, winter and/or spring seasons.

At Arivaca private ranchers have maintained grade control structures in Arivaca Creek but a large headcut threatens the entire Arivaca cienega and needs to be treated with a permanent structure.

In upper Cienega Creek the riparian area on the Empirita and Empire Ranches is being fenced and alternative water supplies for cattle being developed on the outside of the riparian corridor

to manage grazing to achieve maximum riparian values. This work will complete protection for the entire area of perennial flow in upper Cienega Creek. In addition the Bureau of Land Management has built grade control structures and rerouted the creek into its historic channel at the Cienega ranch site. Pima County has protected the lower portion of Cienega creek with perennial flow near Pantano.

Conservation Opportunities

Fire. The Habitat Conservation Plan (HCP) for Pima County (as part of the Sonoran Desert Conservation Plan) should address the return of fire to grassland ecosystems. Two large valleys remain in the county where fires could be used and/or managed to help restore and maintain this resource. They are the Altar Valley and the Cienega Valley. The HCP needs to address the return of fire to grasslands in the Altar Valley and to accommodate the needs of endangered species like the Pima Pineapple Cactus, Cactus Ferruginous Pygmy Owl and Masked Bobwhite Quail. Carl Jones of the Arizona State Land Department, working in cooperation with the Altar Valley Conservation Alliance, has developed an area-wide fire management plan to manage wildfires in the area. This plan needs careful review and consultation with all affected agencies to be compatible with T&E species, air quality concerns and ecosystem management, and the HCP is an opportunity to accomplish this task.

Managed fire is the only tool left to land managers and ranchers to maintain grassland resources on an effective scale. Its use cannot be curtailed forever because as fuels accumulate fires will burn and the longer the interval between them the more destructive they will be. It is common knowledge among the scientific community that a natural fire regime is beneficial to these ecosystems and perhaps necessary for them, while an unnatural fire regime (one where fires are either too frequent or infrequent) is not beneficial (McPherson 1995, Wright and Bailey 1982).

The HCP also needs to address the return of fire to the desert and plains grasslands in the Cienega creek watershed. T&E species of concern include Gila topminnow and the Lesser Long Nosed Bat (and Agave Palmeri forage areas). The Bureau of Land Management is in the final stages of a plan for the Empire-Empirita area and a fire management plan needs to be incorporated. Most desert grassland areas on this large watershed are invaded by shrubby species. Mesquite is presently invading plains grassland areas on the southern part of the Empire Ranch. Fires, managed or prescribed could be used as a tool to restore and maintain these valuable resources.

The risk of using prescribed fire and managing wildfires is great. Private ranchers should not have to assume it by themselves. The risk needs to be shared by local, state and federal governments. Maximizing effectiveness and lifespan of managed fires can be achieved by grass banking and deferred grazing to allow more rancher participation.

Mesquite. Velvet mesquite continues to thicken on and invade new areas of grassland in Pima County. Effective control of these large areas is beyond the means of private ranchers. Mesquite invasion is especially negative on Loamy upland and Sandyloam upland Ecological Sites in the desert grassland resource area (USDA 1991). Soil erosion accelerates on these sites when mesquite canopies exceed 15%. These soils have thin (2-8 inch) sandyloam surfaces over clayey subsoils. As the coarse textured surface is lost to erosion and clayey subsoils left exposed or nearly so, these sites lose their ability to absorb intense summer precipitation. Warm season perennial grasses can no longer persist and runoff increases destabilizing the stream systems below. These soils are identified in the Soil Survey of Eastern Pima County (USDA 1993). Recent range inventories in both the Cienega Valley and Altar Valley further refine the location of areas of these sites where mesquite has reached undesirable levels.

Efforts to control mesquite should allow for the use of mechanical means (bulldozing, grubbing) prescribed fire and managed wildfire and hand control – wood cutting with stump treatments to control sprouting. It is estimated that the extent of mesquite at problematic densities in the Cienega, Santa Cruz and Altar Valleys is in excess of 400,000 acres. Most of this area is Loamy upland and Sandyloam upland Ecological Sites.

Arroyos. Tremendous opportunity exists in the Altar Valley to stabilize the arroyo of Brawley Wash, regrade the channel and activate the floodplain south of Ajo Highway. Detailed plans, surveys and investigations have been done in this area to develop a series of grade control structures on the Brawley Wash and turn the valley system into a functioning floodplain. An initial structure, just south of the Ajo Highway bridge, on land owned by the city of Tucson, would allow for stream aggradation to continue in the channel and at the same time protect the highway bridge and maintain its capacity to safely pass floodwaters downstream (NRCS 1992).

This effort would be an excellent component of the Sonoran Desert Conservation Plan to help Pima County mitigate continued development of floodplain areas along the Santa Cruz, Rillito and Pantano wash. It would also bring to fruition an effort on the part of the Pima Natural Resource Conservation District (NRCD) and the Natural Resources Conservation Service (NRCS) and now the Altar Valley Conservation Alliance (AVCA) that has been going on for the last 15 years.

The opportunities for Pima County to work with groups (NRCD, AVCA), agencies and private ranchers are tremendous. Mitigation of continued loss of habitat and open space to development in the Tucson area could occur in the large open spaces of the Altar and Cienega valleys. Grassland restoration and maintenance and rehabilitation of streams and gullies should be natural resource priorities combined with open space preservation and management for T&E species.

III-3. Compatibility with Wildlife Habitat Needs *Dan Robinett & Nathan F. Sayre*

Riparian areas

Riparian areas are widely recognized as critical to wildlife and other environmental values in the Southwest. Wildlife, habitat, watershed and esthetic values are all at their highest in riparian areas. On ranches in Pima county, these areas can also be important forage and water resources for the ranching operation. For historical reasons, riparian areas and valley bottoms are almost all privately owned, except where public entities have purchased them for conservation purposes (e.g., Arivaca cienega, Cienega Creek, and the Empire Ranch). They have always been the most intensively developed lands in desert regions, whether for agriculture, grazing or urban uses.

Because riparian areas have a long season of green forage, water and shade, they have been subject to intense livestock grazing in the past. Unmanaged grazing of these areas has had many negative consequences including erosion, lack of reproduction of trees species, reduced stream flow, channel cutting, increased flooding and changes in stream morphology. On the other hand, riparian areas are the easiest to maintain and improve if grazing is well managed. While many environmentalists call for complete exclusion of livestock from riparian areas, there is substantial evidence that well managed grazing is compatible with riparian restoration (Briggs 1996, Cartron et al. 2000). The solution lies in controlling the timing, frequency and intensity of grazing pressure. The growing season for riparian areas is limited only by temperature. Because soil moisture is available all the time, plants in riparian areas begin growth when soils warm up in the early spring (usually by mid March in Pima county) and end growth in the fall with killing frosts or when soil temperatures fall below biological zero (42 degrees F). Continuous grazing during the growing season can damage vegetation, resulting in erosion and other problems. If grazing is brief or excluded during the growing season, however, vegetation quickly recovers and stream conditions improve. Dormant season grazing does very little damage, provided that recovery is allowed to occur in the following growing season. This has been demonstrated on the Date Creek Ranch near Wickenburg, the Empire Ranch near Sonoita, the Pocahonnas Ranch in Arivaca, and the U Bar, Carrizo Valley, and Beck Ranches in New Mexico (Sayre, forthcoming a). Riparian areas recover much more quickly than the drier upland sites in a watershed, where the growing season can be quite short and extremely variable from year to year.

From a purely hydrological perspective the objective of grazing management in riparian areas is to always leave enough vegetative cover prior to the times of the year when large floods can occur. This ensures that there is sufficient vegetation to protect the soil from erosion and to trap sediment being delivered by flood events. In southern Arizona the summer months of July and August have the highest likelihood of large floods occurring. This region can also experience large floods in October and in December-January. Considering this information

can help set management guidelines. If a riparian area is grazed in the early spring it should be rested from grazing for at least 35 days prior to July 1st to allow adequate regrowth of vegetation before the first summer flood happens. If a riparian area is grazed in the fall or winter, utilization of herbaceous vegetation should not exceed 50% to leave adequate cover in case of fall or winter flooding. If a riparian area is grazed in the summer months not more than a third of the area should be grazed at any one time and rest periods should be at least 30 days (Kinch 1989, Ehrhart and Hansen 1997).

The mechanics of grazing management in riparian areas to meet the hydrologic needs of the stream system must be blended with the needs of vegetation, structure, diversity and wildlife species. Both herbaceous and woody plant species must be able to survive, reproduce and grow. Riparian areas must be fenced in order to manage grazing. Stream areas should be fenced from cienegas or sacaton floodplains to take adequate care of streamside vegetation. Grazing managed this way will result in streams reaching "Proper Functioning Condition". Management must also meet the needs of wildlife species. Critical habitat elements like water temperature, water quality and vegetative structure must not be impaired. Grazing in (and on sites adjacent to) riparian areas can also be effective in reducing fuel loads and aid in managing wildfires and human caused fires that threaten riparian areas.

Depending on the wildlife species in question, grazing can have positive impacts on riparian habitat. In the Verde Valley, researchers are finding that native fish species may benefit from grazing, and that exclusion of livestock indirectly harms natives by favoring non-native fish (Al Medina, pers. comm.). When cattle were excluded from springs around Deep Springs Lake in eastern California, the population of *Bufo exul*, a rare toad, dropped dramatically. Grazing there helps to keep areas of open water from being choked by vegetation. In southern Arizona, earthen stocktanks built to water livestock have come to provide habitat to several species of rare native toads and frogs, driven from their original habitats by non-native predators like the bullfrog (Cecil Schwalbe, pers. comm.). More generally, stocktanks provide water to wildlife as well as livestock, and may help certain species (DeStefano et al. 2000, Rosenstock et al. 1999).

Protection and Recovery from Grazing

The protection of rangeland from grazing leads to the question of what will happen (or what will change) to the resources like soils, vegetation, water and wildlife. Some observations can be made about the effect on soil and vegetation (on Pima county rangelands) as a result of protection from grazing.

Rangelands in Pima County fall into three broad categories where vegetative zones have an associated soil-moisture and temperature regime. The first zone is the Arizona Upland Division of the Sonoran Desert. This area corresponds to the Natural Resources Conservation Services (NRCS) Major Land Resource Area (MLRA) D-40-1 with a 10-12 inch precipitation zone (PZ). This area has a Typic-Aridic, Thermic soil-moisture and temperature regime. The

second zone is the Semi-desert Grassland. This area corresponds to the NRCSs MLRA D41-3 with a 12-16 inch precipitation zone. This area has an Ustic-Aridic, Thermic soil-moisture and temperature regime. The third area is Plains Grassland and Oak-Savanna. It corresponds to the NRCSs MLRA D41-1 with a 16-20 inch precipitation zone. It has a Udic-Aridic Thermic soil-moisture and temperature regime.

Experience across these zones in southern Arizona can be used to predict what will happen to areas excluded from grazing. The NRCS has conducted soil and range inventories on several protected areas in the last 20 years. Most recently NRCS completed a soil survey on the Mineral Strip of the San Carlos Apache Nation. This large area was returned to the tribe in 1976 and was fenced by 1978. It has not been grazed since that time. In May of this year the NRCS conducted a range inventory of 60,000 acres on the far east end of the Mineral Strip. Ecological sites in the 10-12 inch PZ and in the typic-aridic thermic soil regime had no recovery in the 22 year period without grazing. These sites have experienced heavy past erosion and have heavy cover of shrubs like mesquite, whitethorn and creosotebush and cannot return to grassland vegetation. Ecological sites in the higher PZ (12-16 inch) with an ustic-aridic thermic soil regime had good recovery of range condition in the 22 year period. It should be pointed out however that this zone is not appreciably different than adjacent National Forest and BLM lands where grazing is well managed.

NRCS found the same situation while doing a soil and range inventory on Fort Huachuca in the mid 1980's. On the East range of this Army base where most of the area is in a 10-12 inch PZ there has been almost no recovery of range condition since grazing was terminated in 1954. On the main post there has been good recovery of semi-desert grassland areas and most areas classify in good to excellent condition with 46 years of no grazing. In the plains grassland and oak-savanna areas on Fort Huachuca most areas are in excellent condition, however most areas in this zone on adjacent grazed ranges are in nearly the same condition (good condition).

In Pima County most rangelands below 3200 feet in elevation fall into a 10-12 inch PZ in a typic-aridic thermic regime. The only sites in this zone that may improve in condition with no grazing are the sandy sites. The area above 3200 feet in an ustic-aridic thermic regime would see poor and fair condition areas of most ecological sites improve in condition with no grazing. An exception would be Loamy upland sites with a cover of mature mesquite which would not change with protection. Several areas like this on the Buenos Aires National Wildlife Refuge have not changed in range condition with no grazing for the last 16 years.

Does livestock exclusion work to save wildlife?

Removing livestock is widely seen as an effective way to restore threatened and endangered wildlife species, especially on public lands. Responding to public pressure and lawsuits, the Forest Service has fenced livestock out of riparian areas at many locations in Arizona and New Mexico. Livestock have also been removed from numerous National Wildlife Refuges

in recent decades. With a few notable exceptions, exclusion has generally had the desired effects on vegetation. Yet there is surprisingly little scientific evidence that exclusion has worked to restore the target wildlife species.

--Livestock have been excluded from the Buenos Aires National Wildlife Refuge since its creation in 1985. Yet the intended beneficiary, the masked bobwhite, has not increased significantly in numbers in fifteen years. The best years for the masked bobwhite were 1977-79, when the Buenos Aires was still a working cattle ranch (Sayre forthcoming b).

--In the Gila National Forest in southwestern New Mexico, several miles of the Gila River have been fenced to exclude livestock for the endangered southwest willow flycatcher. Yet the bird has not been found on the Forest. Meanwhile, the largest known population of the southwest willow flycatcher occupies adjacent private lands that are grazed and farmed. Careful monitoring has documented an increasing population on these lands (see Appendix 1).

--Research on the endangered spike dace and loach minnow is finding the same pattern, on the Gila and also in the Verde Valley: the fish appear to prefer the grazed habitat to neighboring ungrazed areas.

This is not to say that exclusion cannot benefit wildlife, or that grazing is always good for wildlife. Rather, the notion that removing grazing will "save" species whose habitat has been grazed for many years is an assumption, rather than a proven fact. In many cases, the relationship between livestock grazing and target wildlife species remains obscure because proper scientific monitoring has not been done, before and/or after exclusion occurs.

III-4. Examples

The Empire Ranch

The Bureau of Land Management purchased the Empire Ranch in 1988. It comprises 36,498 acres of patented land and 37,462 acres of State Trust Lands. Located at the head of the Cienega Creek watershed, the Empire holds high conservation values for wildlife, water quality, flood control, and recreation/open space. The perennial reach of Cienega Creek on the ranch supports large populations of endangered Gila topminnow, Gila chubb, and longfin dace. Lowland leopard frogs, Mexican garter snakes, Southwestern willow flycatchers, Lesser long-nosed bats, Huachuca water umbels, Bairds sparrows, and Chihuahuan pronghorn are also found on the Empire.

John Donaldson and his son, Mac, have managed cattle grazing on the Empire since 1975. They call their management "flexible grazing," because it is based on the principle that management must constantly adapt to changing conditions in order to preserve and enhance the resource. The ranch is divided into 31 pastures, with many fences located to fit

ecological divisions on the land (between uplands and bottomlands, for instance, or different soil types). The cattle are managed as a single herd. The herd rotates to a new pasture every two to four weeks during the growing season, to ensure that plants have sufficient recovery time. Winter pastures are grazed for longer periods, but they rest all summer. The overall size of the herd varies from 600 to 1400 head, depending on forage availability (which varies tremendously with rainfall). The official carrying capacity of the ranch is 1500 head.

In 1994, the Donaldsons and the BLM launched a Biological Planning Team to guide management decisions on the Empire. The Team includes representatives from federal, state, and environmental entities, as well as local stakeholders. They meet twice a year to discuss management issues and evaluate conditions. This approach has helped resolve issues related to endangered species, riparian areas, recreation and other topics. A majority of the perennial creek (but not all of it) has been excluded from livestock; grazing in the remaining riparian pastures is limited to the dormant season. Exclosures have also been established elsewhere on the ranch (1500 acres to date) to provide control areas for monitoring grazing impacts.

The Empire Ranch demonstrates that the ecological impacts of grazing depend on management, and that management can be tailored to meet the needs of wildlife and cattle alike (not to mention the growing numbers of recreationists using the ranch for hiking, horseback riding, hunting, birding, biking and other pursuits). Selections from the Interim Livestock Management Plan for the Empire are included as Appendix 2.

The Malpai Borderlands Group

The Malpai Borderlands Group is a non-profit organization formed by a coalition of ranchers, scientists, agency personnel and environmentalists in 1993. Their goal is "to restore and maintain the natural processes that create and protect a healthy, unfragmented landscape to support a diverse, flourishing community of human, plant and animal life" in the borderlands region of extreme southeastern Arizona and southwestern New Mexico. The area of concern to the MBG comprises some 800,000 acres of private, state and federal lands in a region of extremely high biological diversity.

Three features of the MBG's activities warrant discussion here. First, the MBG encourages and fosters state-of-the-art scientific research on a wide variety of ecological topics, including fire, grazing, mesquite and shrub encroachment, and numerous endangered species (Gottfried et al. 1999). The MBG's integrated research program overcomes disciplinary divisions between range science and ecology, treating livestock grazing as one of a suite of management tools available for ecological restoration and maintenance. The relationships among these tools, climate, soils, vegetation and fauna are far from completely understood, and the MBG recognizes that more and better research will contribute significantly to the long-term well-being of ranching and ranch lands alike.

Second, the MBG stands out as a collaborative effort focused on stewardship. Tremendous

bureaucratic obstacles have been overcome in order to coordinate among two state land departments, two state game and fish departments, two state BLM offices, two National Forests, the Fish and Wildlife Service, the NRCS, and numerous private landowners. Such collaboration, united by the land itself, is necessary if complex resource and management issues are to be resolved.

Third, the MBG has developed a conservation easement program to assist area ranchers in protecting their deeded lands from subdivision and development. The MBG is qualified to hold and enforce the easements, and works with landowners to arrive at terms agreeable to both parties. (Example easements for Arizona and New Mexico are included as Appendix 3). MBG easements typically permit construction of buildings and other improvements in designated areas, and explicitly recognize the right of landowners to continue existing agricultural practices. The MBG raises funds to pay full market value for the easements, or other compensation is arranged in the form of credits to access a grassbank or obtain services (such as bulldozing of mesquites) (John Cook, pers. comm.). One recent easement transaction afforded the landowner funds to acquire additional land, connecting two previously discrete parcels and improving manageability of the whole ranch.

MBG conservation easements can only cover ranchers' deeded lands. To address the problem of uncertain tenure on adjacent public lands, the easements contain a clause that extinguishes the easements in the event that grazing leases are lost through no fault of the rancher. In such an event, the rancher would not have to buy the easement back from MBG; it would simply cease to exist, and the rancher would regain all the property rights s/he held prior to the easement (Wendy Glenn, pers. comm.). A similar clause may be necessary if easements are to become useful tools for the SDCP, since leasehold tenure on state and federal lands probably cannot be resolved or guaranteed without action by the relevant land management agencies.

The Anvil Ranch

Dan Robinett, Natural Resource Conservation Service

The Anvil Ranch consists of 54,000 acres of state and private land in the Altar Valley seven miles south of Three Points. It runs from the valley bottom along the Brawley Wash and west to the top of the Baboquivari and Coyote Mountains. There is a small BLM permit in the Baboquivari Mountains. The ranch has been in the King family control since 1908. The ranch boundary was fenced in the mid 1930's. From 1930 to 1980 the Kings constructed 49 earthen tanks (stockponds) and five wells to water the range. From 1979 to the present they have installed nine pipelines to provide more reliable water. Prior to 1975 the ranch ran about 650 head of cattle in four pastures that were grazed year-round.

Range condition reached a low point in the mid 1970's, an era of severe summer drought. The Kings developed 100 acres of irrigated pasture during this period. A conservation plan was developed with the Soil Conservation Service (now the NRCS) and the Pima Conservation

District in 1975. The herd was reduced to 500 head. Cattle were brought onto irrigated land for the summer growing season to rest and rebuild the range. The Baboquivari Mountains were fenced at the base to develop a large winter pasture in the mountains.

The University of Arizona Range Planning class under the direction of Dr. Phil Ogden conducted a range survey in 1975. Thirty-five Parker pace transects were measured to record range condition. In the early 1980's nine permanent range transects were installed by the Natural Resources Conservation Service to measure range trend and help make management decisions.

By 1985 the range had recovered enough to carry the herd in a rest-rotation throughout the year. Seven new cross fences have been built since 1975 dividing the ranch into 19 large pastures. Cattle graze the mountains only in winter when dry (non-lactating) cows can traverse the rough terrain in cooler weather. In the spring the cows are moved from the mountains as they have their calves. They begin a spring-summer-fall rotation through the flat country. This also avoids mountain lion predation on calves in the rough country of the Baboquivari. Pastures in the flat country are usually grazed for 1 or 2 months and then rested for a year before being grazed again. The mountain country is rested from grazing every summer growing season.

In the 1970's about 10,000 acres on the ranch was chained to control mesquite. Beginning in 1985 until 1995 10,500 acres of range was prescribe burned to control mesquite, snakeweed and burroweed. These treatments together with excellent grazing management resulted in tremendous range recovery.

Three range trend plots established in 1980 by NRCS illustrate this improvement:

Table III-4.1. Anvil Ranch Range Trend Plots

Species/Factor	<u>Deep Well Pasture</u>		<u>Mercy Pasture</u>		<u>²East San Pedro Pasture</u>	
	1980	1998	1980	1998	1980	1999
Mesquite	¹ 12	12	10	11	4	7
Burroweed-Snakeweed	60	54	63	30	67	13
Perennial Grasses	7	77	18	100	6	86
Bare Ground	71	45	70	32	50	17
Basal Plant Cover	0	15	0	11	0	4

¹ Figures are % frequency in 200 quadrat pace-frequency transects

² This pasture was burned in June 1985

These transects and six others, established in subsequent years, document increasing perennial plant cover and perennial grass abundance. They all however show mesquite

continuing to increase.

About half of the flat country on the Anvil ranch (below 3200 ft. elevation) is Upper Sonoran desert and Sonoran Savanna grassland. The remainder of the flat country (3200-3600 ft. elevation) and the lower slopes of the Coyote and Baboquivari Mountains are semi-desert grassland. The higher slopes of both mountain ranges are Mexican oak-savanna.

A recent range survey (Meyer-Robinett 2000) of the ranch reevaluated the 1975 Parker transects done by the University of Arizona. The comparison of the 35 transects is presented in the following table. Basal cover of perennial plants, soil stability ratings and range trend is summarized for transects in the three vegetation zones on Anvil Ranch.

Table III-4.1. Comparison of Range Transects

Vegetation Zone	1975			2000		
	Basal Cover	Soil Stability	Range Trend	Basal Cover	Soil Stability	Range Trend
Upper Sonoran and Sonoran Savanna Grassland	0	36 (poor)	down	7%	55 (fair)	slightly up
Semi-desert Grassland	3%	49 (fair)	static	9%	64 (good)	slightly up
Mexican – oak Savanna	2%	69 (good)	up	20%	86 (excellent)	slightly up

The Anvil Ranch is a success story. It shows the benefits of long tenure, stewardship and profitability. It is a good example of sustainable ranching in Pima County, Arizona. Rancher John King summed up the Anvil Ranch story by stating that there is more grass on the ranch now than at any time in his lifetime.

IV. Economic Sustainability

IV-1. Economic components of a ranch operation

Viewed economically, ranches are comprised of deeded land, leases for grazing on state or federal land, improvements, operating expenses, and cattle.

Deeded land is typically a minority of a ranch, though it may amount to tens of thousands of acres. Most deeded parcels were originally claimed under the various homesteading laws in

effect between 1862 and 1934. As a result, they tend to be scattered across the landscape, wherever water could be found at that time. Hence, deeded acres tend to correspond with the areas of greatest ecological value or potential: riparian areas, springs and seeps, and floodplains. Larger ranches usually contain many old homesteads, consolidated over the years and managed as a unit with the state and federal lands that connect them.

Leases for grazing on state or federal land usually transfer when the deeded lands are sold. Their value at sale is determined by the productive capacity that the leases contribute to the ranch, calculated in animal units. In this way, leases form part of the equity value of the ranch even though the land remains publicly owned. When the number of animal units permitted under a lease decreases, this equity value diminishes proportionately.

Improvements are fixed investments—fences, wells, waterlines, stocktanks and other infrastructure—that facilitate the operation of the ranch. Improvements made on federal land are the property of the federal government, while those on state land are property of the ranch that uses them. The value of improvements often constitutes a large portion of the agricultural value of ranch lands.

Operating costs and cattle represent the two sides of the ranch as a business: costs and returns. The sale of cattle usually represents the sole source of returns for the ranch, meaning that the number of cattle the ranch produces and the market price at time of sale determine income (or loss) for the year.

IV-2. The predicament: "cows vs. condos"

Ranches are unusual economic enterprises. On the one hand, they are like any commercial business, comprised of capital investments, costs and returns, taxes, etc. On the other hand, they are also like homes: ranch families live on them, buy them with mortgages, and are keenly aware of their property values. The interactions of these different economic dimensions define the limits of economic sustainability for any given ranch.

Over the last four decades, ranches in southern Arizona have performed rather poorly when viewed as businesses. Cattle prices have steadily declined in real terms, meaning that returns have stagnated. Costs for labor, equipment, insurance, taxes, fuel and other inputs have increased. Meanwhile, the market value of ranches has increased, sometimes dramatically, in response to the area's growing population and demand for housing. The value of deeded acres for actual or potential development has come to define the market price of most ranches, especially near urban areas and along highway corridors. The combined result of these trends is that the rate of return-on-investment for ranching has dwindled to well below market norms. Rates of return of less than three percent are common; in years of low rainfall and/or low market prices, many ranches lose money.

Viewed as investments (the way homeowners view their homes), ranches have been good

long-term investments over the past forty years. As cities have grown and expanded, land values have increased. Ranchers have become "land rich and money poor," and many have sold out at high prices, willingly or otherwise. These gains have been due entirely to the land's real estate potential, however. The majority of ranchers' equity now derives from the possibility of subdivision and development—in other words, terminating the ranch operation and converting to another land use.

"Cows vs. condos" is a phrase used to characterize the economics of land use conversion in Arizona and other western states. Some environmentalists have argued that there is no such trade-off between ranching and real estate development (Donahue 1999). The preponderance of evidence refutes this claim. Virtually all of the land developed around Tucson in the past half-century was previously used for ranching. The economic incentives driving land use conversion are well understood by economists, planners, developers and landowners. The process can be seen on the ground, in the development of individual ranches, and at the macro-scale, in statistics for the region as a whole ("Ranching in Pima County," p.11).

Indeed, if there is any question about cows vs. condos, it is why so many ranches remain in operation despite the financial advantages of subdivision. Each ranch's circumstances are different, but several factors that contribute to this persistence can be identified:

--Debt loads. A ranch that is paid off can be kept in ranching much more easily than one encumbered by mortgage.

--Lifestyle. Many ranchers, especially those with many generations in ranching, feel a strong commitment to their way of life and desire to pass it on to their children. Within limits, they place a higher value on this cultural commitment than on financial considerations alone.

--Non-ranching income and/or wealth. Most ranch families supplement ranch income with off-ranch jobs and/or private wealth. Many large ranches are owned by individuals, companies or families that can afford losses (again, within limits).

--Tax incentives. Property tax rates for agricultural producers are substantially lower than for commercial or residential land uses. Prior to the federal tax changes of 1986, many ranches were purchased by wealthy individuals or corporations as tax shelters.

--Speculation. Some ranches are owned by speculators, who await an opportune time to subdivide and sell. They continue grazing for the tax advantages but have little or no long-term commitment to ranching.

IV-3. Costs and returns of a Pima County ranch in 1999

By Walter Lane, Headquarters West

In order for ranchers to keep ranching, it is important for them to make a living. There is a perception that ranchers make a lot of money and can afford to pay higher grazing fees to public agencies. There is also a perception that ranchers run too many cattle on public lands and could reduce their herds without dramatically affecting their economic livelihood. Neither of these ideas is true and many people would be shocked to learn the real economics of cattle ranching.

As in all business, cattle ranchers try to maximize their revenue and minimize their expenses. However, ranchers are limited in their revenue generation by the land. The land will only carry so many cattle in a sustainable manner year after year. Therefore, the number of cattle on a ranch is fixed and the only opportunity for profit is price. Unfortunately, commodity prices are at all-time lows worldwide and do not even keep up with inflation. Cattle ranchers sold 450 Lb. calves in 1979 for \$1.05 per lb.; in 1999 the same weight calves sold for \$.85 per lb. Meanwhile, costs of production are growing steadily every year (wages, feed, utilities, etc.).

The economics of the range cattle industry are probably at the lowest level they have been in decades and are not forecasted to improve for some time. Why would anyone want to be a cattle rancher? The answer is not money but a love of the land. Many ranchers are third and fourth generation families that have been on the same land for years and have a deep attachment to the land. They are not motivated by money but still must support themselves and their families. Below is an example of the income of an actual ranch in southeastern Arizona for 1999. The economics of this 300 head operation are fairly typical for ranches of 300-500 head in southern Arizona.

Table IV-3.1 Ranch Annual Income & Expense Balance Sheet

<u>Income</u>		<u>Expenses</u>	
Calf Sales	\$106,621	Accounting	\$ 750
Other Cattle Sales	<u>6,476</u>	Depreciation	15,000
TOTAL	\$113,097	Feed	13,407
		Fees & Licenses	503
		Fence Work	2,284
		Fuel	3,066
		Insurance	10,541
		Miscellaneous	6,905
		Grazing Fees	1,985
		Payroll Expense	28,132
		Property Taxes	1,070
		Repairs	4,408
		Supplies	2,538
		Utilities	5,370
		Vet & Medicine	<u>528</u>
		TOTAL	\$96,487
		Net Profit	<u>\$16,610</u>

So the typical ranching family will earn about \$16,610 from their cattle ranching business. This is not a great deal of profit for the risk and hard work of a cattle ranch. This also does not look like a good return on a piece of property which is probably worth in excess of \$1,000,000. Most people would not be happy with a 1.6 % return on their investment.

As stated previously, most cattle ranchers are not in it for the money. They do, however, have to eat and take care of their families. They cannot make a living if their profit is squeezed to nothing by increased grazing fees, cuts in cattle numbers or too much regulation. Many people have now recognized that ranchers maintain open space that may otherwise be developed. If we want ranchers to remain on the land and preserve open space, then we must not deny them of a living.

IV-4. The Question of Subsidies

Dr. Harold Barnett, Department of Economics, University of Rhode Island

Ranching subsidies reflect the economic benefits that ranchers provide to the community and the economic benefits that the community provides to ranchers. Three types of subsidies are considered: First, the benefit ranchers provide to the community through stewardship. Second, the benefit the community provides to ranchers through subsidized grazing lease rates. Third, the subsidy that ranchers provide to the community by foregoing the sale of ranch land to developers and preserving unfragmented, natural open space.

Stewardship

Ranch stewardship involves management of public and state grazing lands to sustain and enhance ecological values and long term productivity. Stewardship also provides a "pair of eyes" to monitor human activity on the land and to deter inappropriate public use and trespass.

The net benefit that stewardship provides to the community depends on whether carefully managed cattle grazing has a negative, neutral or beneficial impact in terms of ecosystem stress. This is a most controversial issue.

Grazing Subsidies

The community provides a subsidy to ranchers when public and state trust (ASLD) grazing land is leased at a below market rate. The private lease rate in Pima County is currently around \$9 per AUM. The public and ASLD lease rates are less than \$2 per AUM.¹ The average difference is about \$7.25 per AUM. However, the per AUM subsidy is in all probability substantially lower than \$7.25. First, private grazing land is more productive than public and ASLD land. Second, while the rancher pays for expensive improvements on public and ASLD land, the landowner pays for these improvements on private land. Walter Lane of

¹ Federal and ASLD grazing rates are from the Arizona Agricultural Statistics Service, 1998. The private lease rate is from Walter Lane, Headquarters West, Ltd.

Headquarters West, Ltd. (Tucson) believes that the difference between private and public lease rates is fully accounted for by the cost of capital improvements to the land.

A fuller economic analysis of ranching in Pima County is required to determine the net value of a public grazing subsidy and whether ranches that derive their income primarily through cattle operations will be viable if faced with higher grazing lease rates. Ranches in Pima County lease as much as 85 percent of their grazing land. Whether or not ranches can pay a higher grazing lease rate, it is apparent that they will not be economically viable if subject to substantially reduced access to public and ASLD grazing lands.

Open Space Subsidies

Ranchers provide a subsidy to the community when they choose to not sell their deeded land for development. The cost to the rancher is the income forgone; the benefit to the community is the preservation of unfragmented, natural open space.

To illustrate the significance of this subsidy, consider two hypothetical ranches that represent the spectrum of large ranches in the Altar Valley. The first ranch has 1000 deeded acres, leases 25,000 acres of Federal or ASLD land, and owns 400 head of cattle. The second ranch has 5000 deeded acres, leases 50,000 acres of Federal or ASLD land, and owns 850 head. Table IV-4.1 presents the value of an open space subsidy under several scenarios.²

Table IV-4.1. Market Value and Open Space Subsidy for Representative Ranches

<u>Deeded acres</u>	<u>1,000</u>	<u>5,000</u>
<u>High development pressure</u>		
Value of ranch operation	\$100,000	\$250,000
Development premium	<u>\$400,000</u>	<u>\$1,000,000</u>
Value of property	\$500,000	\$1,250,000
<u>Medium development pressure</u>		
Value of ranch operation	\$100,000	\$250,000
Development premium	<u>\$100,000</u>	<u>\$250,000</u>
Value of property	\$200,000	\$500,000
<u>Income forgone (1)</u>		
High development premium	\$28,000	\$70,000
Medium development premium	\$7,000	\$17,500

(1) At 7 percent interest rate.

² Ranch acreage and market values used in this example are based on discussion with Walter Lane. Head of cattle figures use grazing capacity data from SDCP, *Ranching in the Altar Valley: Descriptive Summary*, March 2000, page 7. Development premiums derive from the observation that the value of development rights depend on local development pressure and vary from 30 to 80 percent of a property's fair market value (The Rincon Institute, *Conservation Options for Landowners*, 1998, page 24).

Both representative properties have a market value as a ranch. A developer will pay a premium above this price with the expectation that residential development provides a higher return than does ranching. The more attractive is the deeded land for development, the higher is the premium. Ranch land with easier access to transportation and water will demand a greater premium as will ranch land lying closer to the path of development.

If there is a market in conservation easements, the rancher can sell the development rights to his deeded land at a price equal to the premium offered by a developer. He can then invest the proceeds of the sale at interest and continue a ranch operation. The supplemental interest income the rancher can earn is reported in the bottom panel of Table 1 for varying degrees of development pressure. The income that the rancher gives up if he chooses to continue ranching but cannot sell development rights is a rough approximation of the open space subsidy. The income forgone is the annual cost to the rancher of providing open space to the community; it is a subsidy by the rancher to the community. The rancher does not necessarily absorb this subsidy by choice.

If there is not a market in development rights, the rancher's options are limited. He can hold on to all deeded land, absorb the subsidy, and continue to ranch; he can subdivide or lot split a portion of his deeded land, capitalize some of the subsidy, and continue to ranch; or he can sell all his deeded land to a developer and cease ranching. Subdividing or lot splitting a portion of deeded land may be the most viable option for the rancher who desires to increase his income.

The average ranch in Pima County received an estimated \$30,000 in net annual profits in 1997.³ Since large ranches account for a disproportionate share of gross cattle sales, their net profits are above this average. Further, ranchers pay wages to themselves and to other working family members. For the sake of illustration, say that the 1000 deeded acre ranch generates in the range of \$44,000 to \$60,000 in family wages and net profits. Were the rancher to sell all of this land to a developer for \$500,000, the resulting investment income of \$28,000 would replace at most about a third of ranch income. Even if the proceeds were invested at a 10 percent rate of interest (thereby earning \$50,000 per year), the rancher might not be able to replace his cattle operation income. With less development pressure, the sale price and associated income would be lower.

In contrast, sale of a portion of the deeded acres for subdivision or lot splitting may present an attractive and viable option for capitalizing some of the open space subsidy. For example, if the rancher could sell half his deeded acres for \$250,000, he could earn a supplemental income of \$17,500 at a 7 percent interest rate. If he can still earn close to \$50,000 in ranching, he will have increased his total income by some 35 percent.

³ Ranching in Pima County: A Conservation Objective of the Sonoran Desert Conservation Plan, November 1999, page 12.

Final Observations

In the absence of a market in conservation easements, deterioration in ranch income and the offer of higher development premiums will reinforce incentives to sell all or a portion of deeded ranch land for development. These may be the only options for converting an open space subsidy into income. If the rancher succumbs to this incentive, his income increases and the community loses open space. If there is a market in conservation easements, the rancher taking this option can continue to ranch and receive an investment income supplement.

It is important to recognize that landowners who acquire ranches as a speculative investment do not provide an open space subsidy to the community when viewed over the long term horizon of the Sonoran Desert Conservation Plan. They hold their land in anticipation of higher development premiums. When the premium is sufficiently large, they sell the land and are compensated for the income they have lost in the interim.

V. Conclusion: Mitigate the Incentives to Subdivide

There is no appropriate way for the SDCP to address the year-to-year profitability of cattle operations. The larger context of economic sustainability, however, is fundamentally determined by the growing disparity between cattle production and real estate development as competing land uses. Here the SDCP can play a crucial role in preserving open space and wildlife habitat through ranch conservation.

Both economic and ecological sustainability in ranching can be advanced through conservation easements and purchase of development rights. These tools remove development potential from a ranch's private lands in exchange for money and/or other consideration. Economically, this allows ranch owners to liquidate the speculative portion of their property value while retaining the agricultural value and the right to continue ranching.

The value of an easement is generally understood as the difference between the present market value and the value of the land encumbered by the easement. In Pima County, this is often between 50 and 90 percent of the present market value of a ranch. Once the potential for subdivision has been transferred, the ranch's value rests on its productivity for livestock (and, potentially, other values not yet marketable, such as functioning watersheds, wildlife, etc.). Because this is a function of the health of the land, the ranch owner has strong incentive to preserve and improve range conditions. (This incentive is not felt by the speculative ranch owner, because range condition is irrelevant to development potential.)

A voluntary purchase of development rights program, which offered ranchers fair market value for easements and/or development rights, would allow ranchers who wish to see their lands remain in ranching to be compensated for preserving open space.

Aside from funding, the biggest obstacle to a PDR or easement program is the fact that it can only cover ranchers' deeded acres. The state and federal lands that constitute the majority of most ranches cannot be so encumbered. This problem warrants careful analysis.

V-1. Sustainability and Certainty of Tenure on Public and State Trust Lands

Almost all ranches of any size in southeast Arizona depend on state and/or federal grazing leases for their viability. The deeded lands are too small (and in many cases too fragmented) to sustain enough livestock to support a household. If the leases are lost or severely cut, the ranch's deeded acres are rendered valueless for ranching purposes. In most cases, this leaves ranch owners no choice but to subdivide their private lands to secure their equity.

State Trust Lands constitute 51 percent of all grazed ranch lands in Pima County (817,541 acres out of a total of 1,605,210), exclusive of tribal lands. In the Altar Valley, Upper Santa Cruz, Empire-Cienega and San Pedro subareas, State Trust Lands are the majority of most ranches. The administration and legal status of State Trust Lands differ in important way from federal lands, and they raise difficult issues for the SDCP.

Under the terms of the federal Enabling Act of June 20, 1910, which established the framework for the Arizona Constitution, the Arizona State Land Department (ASLD) was created on May 20, 1912 to manage and administer lands from the public domain that were to be used by Arizona for revenue generation. First, the Territory of Arizona was given two sections of land per township, and at the time of Statehood, the State of Arizona was given two more sections for a total of four sections of land per township. By 1912, many of these designated sections were unavailable, having been reserved as National Forests, irrigation districts and Indian Reservations. The ASLD was thus authorized to select *in lieu* sections from the remaining public domain. At the time, prime grazing lands were the highest value lands available, so the ASLD selected them disproportionately. This is why the desert grasslands of southeastern Arizona are largely State Trust Lands.

Section 28 of the Enabling Act mandated that State Trust Lands be "held in trust, to be disposed of in whole or in part only in manner as herein provided..." The legal interpretation of trust law today holds that this requires the ASLD to *maximize* the revenues generated from its lands. Other provisions of the Act reinforced this mandate. No lease of more than five years' duration could be made without a public auction duly advertised for ten weeks in advance. A 1936 amendment extended this limit from five to ten years. A 1951 amendment authorized the state to protect lessees' rights to their improvements on State Trust Lands. Under this provision, when a lease changes hands or is terminated by the sale of the lands to another party, the new lessee or owner must pay the old lessee for the improvements such as fences, tanks, wells, windmills, etc. However, because the water rights on all State grazing leases belong to the State, the right to use this water transfers to the new lessee.

These restrictions cannot be changed by the State Legislature without corresponding changes in the Enabling Act. In other words, an Act of Congress is required to change the basic framework of ASLD administration of its lands.

In FY 1997-98, the ASLD leased 8,454,893 acres for grazing, out of total of some 9.4 million acres of State Trust Lands. These leases generated \$2,200,176. (By contrast, the investment earnings from the permanent fund were more than \$50 million.) The budget for the Range Section, which administers the leases, was \$350,000. Grazing thus generated 26 cents per acre of revenue against 4 cents per acre in costs. Costs are kept down by relying on ranchers to provide general oversight and stewardship of the lands they lease (e.g., removing trash, monitoring recreation and trespass, etc.).

Recent lawsuits have created controversy around the ASLD's grazing lease practices and cast a shadow of uncertainty over ranchers' leasehold. Most of these suits allege a violation of the ASLD's trust obligation to maximize revenues, on the grounds that lease rates on State Trust Lands classified for grazing could (and therefore should) be higher. These suits have not been entirely resolved at this time. The following points are general in nature, and are intended only to provide background and context for examining State Trust Lands issues.

The Enabling Act and state Constitution do not stipulate any timeframe for maximizing revenue. This fact relativizes most claims regarding whether the ASLD is meeting its trust obligation under the status quo. Maximizing revenue in the very short-term, for example, would require that the ASLD simply sell its lands to the highest bidder. Conversely, a purely long-term perspective would have the ASLD hold all its lands.

For the majority of State Trust Lands, there is no administrative classification for conservation. If lands under lease are not grazed (unless designated for "non-use" for grazing in a given year due to drought, etc.), the ASLD can consider the lands to be in commercial use and impose much higher lease fees. The Arizona Preserve Initiative and Growing Smarter Plus (if approved) establish limited exceptions to this.

The impacts of competitive bidding for State Trust Land grazing leases would be asymmetrical. Some conservation groups have offered to pay higher fees to hold grazing leases, invoking "competition" as the only way to determine highest and best use. The problem is that no "level playing field" could be established between these two types of entities. A ranch depends on its leases for annual returns. If it loses the leases just once, it will go out of business. A conservation group has no such constraint, and would likely find itself without competition for subsequent lease renewals. Revenues to the State Trust might well increase for the period of the initial lease, but decrease after that.

Key Issues:

- 1) The key issue is certainty of leasehold tenure. For the most part, the ASLD has thus far succeeded in defending its administrative practices against these lawsuits. But several banks have made it known that they will not treat State leases as equity for purposes of lending to ranchers (as has been standard practice in the past), pending resolution of these issues. To the extent that most ranches depend on credit, this is tantamount to losing the suits in court.

- 2) Conservation of deeded ranch lands cannot succeed in the long-term unless State Trust Lands issues are also resolved. Ranchers cannot be expected to sell or donate conservation easements on their deeded property if there is a reasonable chance of losing access to adjacent State Trust Lands. In that event, the deeded land would lose most or all of its value for livestock production, and its value for other purposes would be reduced or eliminated by the easement. Meanwhile, the State land would remain subject to commercial or residential development. In effect, the rancher would have donated his/her equity for the creation of someone else's future park. At present, the only solution to this dilemma is to include an escape clause in the conservation easement, under which the easement terminates automatically upon loss of associated grazing leases. This is what the Malpai Borderlands Group has done (see Appendix 3).

V-2. Purchase of Development Rights (PDR)

Mette Brogden and Rick Yarde, Udall Center for Studies in Public Policy. Abridged from a background paper prepared for the Arizona Common Ground Round Table.

During the past two decades, people have moved to Western states in record numbers, attracted to stunning vistas, wide open spaces, and rural lifestyles. It is one of the most frustrating ironies of these times that this attraction is leading to the destruction of the very qualities they seek. Suburbs become urbanized as growth expands. And a never-ending game of leapfrog ensues as large segments of the population jump outward and settle on the fringe of developed areas or near rural communities and resort towns. Soon they are surrounded by houses instead of views as sprawl consumes the unique character of Western landscapes and rural communities.

Westerners are finding that they must be innovative in conserving working landscapes and private lands while the opportunity still exists. And recently, landowners and communities have been discovering that purchase-of-development rights (PDR) and PDR programs are proving useful for the many ways in which people value open space: for agriculture and ranching, and for scenic beauty, wildlife habitat, and recreational opportunities.

PDR programs seek to provide funding to compensate landowners for restricting future uses of their land that are not compatible with its continued use for agriculture/ranching and for open space. These programs provide landowners with an opportunity to cash in a fair percentage of the equity in their land, thus creating a financially competitive alternative to development. PDR programs are completely voluntary, and their purpose is to protect land from inappropriate development while retaining private ownership.

PDR programs are established to purchase development rights on properties with significant cultural, agricultural, and/or ecological values, through "conservation easements." There are over 150 publicly funded PDR programs in the U.S. Most operate at the state or county level. PDR programs were created in the northeastern states, but they have nationwide applications. Although western states have characteristics that require conservation tools different from

those used in eastern states, PDR programs can be created that speak to those unique needs. California has had a PDR program in place for several years that has preserved over 45,000 acres of land in Marin and Sonoma Counties. Colorado's Routt County has a PDR program aimed at preserving ranch lands. Montana and Utah both passed state-wide PDR programs in 1999.

Purchase-of-Development Rights Explained

PDR transactions are a financially competitive alternative to development for ranchers and farmers. PDR provides landowners with liquid capital that can enhance the economic viability of individual operations and keep families on the land. It addresses the land-rich, cash-poor dilemmas that many of those in agribusiness know well. Proceeds from the sale of conservation easements can be used to reduce debt, expand or modernize operations, invest for retirement, or settle estates.

A fact sheet from the American Farmland Trust's Web site states, "when the development potential is removed from ranch production lands, it usually reduces the future market value of the land. This may facilitate ranch transfer to children, make the land more affordable to beginning ranchers and others who want the land for agricultural uses. It may also reduce property taxes and prevent them from rising."

The Relationship Between PDR and Conservation Easements. The relationship between PDR and conservation easements has been the source of some confusion. Briefly, in a PDR transaction, sale of a conservation easement is the legal instrument used to convey the development rights to a qualified conservation buyer. Conservation easements are legal agreements concerning a specific parcel of land that restrict or prohibit land uses such as mining, timber harvesting, or subdivision.

Owning property might be conceptualized as owning a bundle of sticks. Each stick represents a particular right that the deed-holder has, such as the right to exclude trespassers, construct buildings, subdivide, or harvest timber. "Fee simple ownership" of a parcel of land means that the deed-holder has the largest bundle of sticks possible. Any particular stick, or ownership right, may be sold individually. If one stick in the bundle is sold to allow someone else a particular use of the property, that sale is usually called an easement. A general term for an easement that results in the conservation of some natural resource is a conservation easement.

The specific rights that the landowner foregoes in granting a conservation easement are negotiated between the landowner and the prospective easement holder. They negotiate rights and restrictions on use necessary to protect the property, i.e., what can and cannot be done to it. The owner then conveys the right to enforce the restrictions—either through sale or donation—to a qualified conservation recipient, such as a public agency, a land trust, or a historical preservation organization.

One stick in the bundle of property rights associated with a parcel of land is the right to subdivide and the right to build additional buildings for residential, commercial, or industrial uses. When development rights are purchased or donated to another party, the vehicle for doing so is a conservation easement that extinguishes the right to subdivide and develop.

Once rights are sold, they are extinguished and cannot be resold or transferred to another party. These are actually negative rights—extinguishment of rights—rather than ownership rights that allow owners to do something with or on their land. The holder of the conservation easement who purchased the development rights cannot turn around and sell these rights to someone who wants to develop on the property, because the right to develop has been extinguished. The easement, however, can be conveyed to another party who then assumes the responsibility for the conditions of the easement.

Conservation easements are customized for each situation. The restrictions and conditions are negotiated by the buyers and sellers of the easements, but once finalized, they have the force of law. These restrictions and conditions may include the attachment of affirmative rights to the easement. Since development rights are often purchased to preserve open space values, the purchaser may require conditions for keeping the land in fair condition, which s/he then has the right to monitor. Similarly, the landowner may want to list a set of activities that s/he feels must be allowed to continue in order to make the land worth owning—usually these include farming or ranching.

How is the Value of a Conservation Easement Determined? Value is determined by subtracting the estimated sale price of the property with the easement in place from the current market value of the property with development rights intact. In Arizona, development rights typically represent 50% to 90% of the land's value, depending on a number of factors related to the desirability of the property for residential or commercial development.

How Long Does an Easement Last? An easement can be written so that it lasts forever in a "perpetual easement." If allowed by state law, an easement can also be written for a specified period of years in a "term easement." In Arizona, conservation easements are automatically considered by statute to be perpetual unless otherwise agreed upon and specifically included as a component of the easement. However, only gifts of perpetual easements qualify the donor for income- and estate-tax benefits, and most recipient conservation organizations accept only perpetual easements.

Easements go with the land, not the landowner. The current and all subsequent owners are bound by the restrictions in the easement. Easements are recorded in county or town records offices, so that all future owners and lenders will learn about the easement and its restrictions when a title report is obtained.

What are the Grantee's Responsibilities? The conservation organization to which the easement is conveyed is responsible for enforcing the restrictions spelled out in the easement document. Regular monitoring is typically done on an annual basis to determine that the property remains in the condition prescribed by the easement. Records of monitoring are maintained by the grantee.

If monitoring reveals a violation of the easement, the grantee has the legal right to require correction of the violation, including restoration of the property to the previous condition.

PDR Programs Described

As noted previously, PDR programs are set up to purchase development rights on properties with significant cultural, ecological, and/or agricultural values. These are over 150 publicly-funded PDR programs in the United States.

Purpose of PDR Programs. PDR programs give communities a way to share the costs of protecting agricultural and ranch lands with landowners. The urban public has a stake in the continuation of agricultural and ranch production for a variety of reasons, including: maintaining scenic and historic landscapes; preserving open space; keeping locally grown food available; and sustaining watersheds and wildlife habitat.

Existing PDR Programs and their Structure. PDR programs began in the northeastern United States and are now found in 13 eastern states, Colorado, Montana, Utah, Washington, and California. The total amount of land preserved by state PDR programs through June 1997 was over 400,000 acres. Locally-administered programs are widespread as well; counties have bought development rights on several-hundred-thousand acres across the country. These numbers represent publicly-funded PDR programs and do not include private land trusts, which hold millions of acres in conservation easements.

The structure of the programs varies. As indicated above, either the state or county levels of government may be involved. In some cases, counties may have independent programs where the state also purchases development rights, and in other cases state and local agencies may work together. Not every state allows private land trusts to hold conservation easements. However, Arizona is included in the majority of states that have adopted the Uniform Conservation Easement Act, allowing public and private entities to buy development rights (A.R.S. 33-271 to 33-276).

Essential considerations in designing PDR programs.

1. **Funding.** A reliable, steady source of income is necessary to support PDR. Not only must acquisition be regularly completed to maintain public faith in the program, but a constant supply of adequate funding is necessary to administer easements and monitor the properties.

A variety of different devices are used to secure funding for PDR programs in other states. Popular methods include general appropriations, bonds, taxes, and private funding. Of these, taxing is probably the most frequently used source of funding.

These taxes are frequently on real estate transfers or levied as development-impact fees, but taxes on sales, cigarettes, gasoline, cell phones, and recreation have also been used with success. In fact, across the country, voters are proving willing to tax themselves in order to preserve open space.

Funding sources tend to vary by administrative structure. State programs commonly use bonds, general appropriations, and real estate transfer taxes. Some states also request matching county and municipal funds. County programs use general obligation bonds, local real estate transfer taxes, and other dedicated taxes.

CORE ISSUES / DESIGN ELEMENTS

- ▶ A steady and reliable funding source
- ▶ Prioritization and eligibility
 - what kinds of land to protect
 - which areas to target
 - how to set priorities
- ▶ Restrictions to be placed on the land
 - duration of easement
 - allowable uses and restrictions
 - public access
 - monitoring and enforcement of the easement
- ▶ How much to pay for easements
- ▶ Who will administer the program

2. *Prioritization of lands and eligibility criteria.* Because every program that exists has more applicants than its funding can accept, programs need to decide what kinds of ranch and/or farmland should be protected, which areas should be targeted, and how priorities will be set. This system is developed in two steps. First, land types must be prioritized (e.g., big game habitat and wildlife migration corridors, historic rural landscapes, critical ranch lands or agricultural lands), and then parcels of land within those types must also be prioritized. Most existing programs create a standardized form that acts as a scorecard for prioritizing purchases. The scorecards usually index the costs of the easement, development pressures on the land, condition of the land, environmental benefits of preservation, and proximity to other preserved lands (programs favor creation of habitat corridors rather than islands of conserved properties).

3. *Restrictions to be placed on use of land.* As noted previously, the particulars of each easement used to purchase development rights should be tailored to the landowner and the property. The administrative agency should have the ability to choose from among different options depending on the situation, but there are some elements that are commonly addressed:

Duration of the easement. In most cases, it is in the best interests of both the landowner selling the easement (for tax advantages) and the state to have preservation in perpetuity. This can be written into the easement, and if no duration is stated, current Arizona statute calls for an assumption of perpetuity. Some states have enabling statutes that allow the landowner to purchase the easement for fair market value after a certain period of time. The states in which this option is allowed rarely see it used, due to the expense.

Allowable uses and restrictions on use. This refers to the affirmative rights that can be attached to easements.

Enumeration of the number of dwellings and other structures on the property.

Public access.

Monitoring. Who monitors, how often, and who pays for monitoring are all questions that can to be addressed by policy.

4. How much will the program pay for easements? Some programs place ceiling amounts on what will be paid per acre. If the development value exceeds that amount, some landowners have opted to donate the portion that exceeds the ceiling and reap the tax benefits associated with donations.

5. Who will administer the program, and how will it be administered? Examples include creation of new entities at the state, county, or local levels, or a new private entity. Or, existing agencies are given the administration of the program. Another possibility is to develop a hybrid of these options.

6. Payment options. This factor has a great deal to do with the tax burden imposed on the transaction. Payments can be made in cash or in land acquisition. With cash, programs may build in some flexibility by having two options—lump-sum payments or, as Harford County in Maryland does, through secured installment payments. In this program, the County pays for development rights through tax-free installment payments over a period of 20 years, ending with payment of the principle. This technique is most beneficial to those who have made substantial payments toward their mortgage, have been offered a large sum (over \$200,000), and would otherwise lose up to one-third of the payment to capital gains and other taxes.

Purchase of Development Rights—Additional Resources

The following three resources are recommended as starting points for additional research.

American Farmland Trust has an excellent Web site (www.farmland.org) as well as a number of publications of interest. Nationally prominent in the field of farmland protection, they may be contacted through their Web site, or at:

American Farmland Trust
1200 – 18th Street NW., Suite 800
Washington, D.C. 20036
Phone (202) 331-7300
Fax (202) 659-8339

The book, *Holding Our Ground: Protecting America's Farms and Farmland*, by Tom Daniels and Deborah Bowers (Covelo, CA: Island Press, 1997) provides a thorough discussion of the relationship between farm protection and controlling sprawl, land trusts, PDRs and farmland protection packages, with an excellent set of appendices of sample forms and agreements (334 pp).

A 1997 booklet published by **The Sonoran Institute**, *Preserving Working Ranches in the West*, (Liz Rosan, editor), offers a number of case study vignettes of ranchers who have sold development rights and provides a highly readable introduction to PDRs and estate planning tools for ranchers. The Institute is involved in ranchland protection, community-based conservation efforts, and growth management issues across the western United States and northwestern Mexico, working primarily with communities adjacent to protected areas or public lands with significant natural values. Contact:

The Sonoran Institute
7650 E. Broadway, Suite 203
Tucson, AZ 85710
Phone (520) 290-0828
Fax (520) 290-0969

VI. Final Conclusions

Conserving ranch lands can and should be a major strategy for habitat conservation under the SDCP. The plant and animals species found in Pima County today have coexisted with livestock grazing for more than a century, including periods when livestock were much more numerous and less carefully managed than now. The greatest threat to these species is not continuation of the status quo land use but rather land use change, from grazing to urban and suburban purposes. Even ranch lands where historic overgrazing or poor management has resulted in range deterioration retain the potential to be quality habitat for a wide variety of wildlife. This is generally not the case for lands that have been covered with homes, roads, drainage ditches and parking lots.

The driving forces of land use change are economic, translating the demands of a growing population into individual landowners' decisions. Unless these economic forces are understood and addressed, the present trends will continue.

To be effective, proposed solutions must address the following issues:

- (1) The high market value of deeded lands for potential real estate development. Even in rather remote locations of the county, market values exceed what livestock production alone can economically support.
- (2) The property rights of landowners. Two things are certain: the market value of ranches is a capitalized asset, and landowners have the right to subdivide, develop and/or sell their lands. Without the support and active cooperation of landowners, the SDCP is not likely to succeed, and landowners cannot be expected to support measures that diminish their assets without fair compensation.
- (3) The dependence of ranches on federal and state grazing lands for economic viability. This is a complex issue, particularly on state trust lands. Without security in their leases, ranch owners are unlikely to restrict future development options on their deeded lands.
- (4) Grazing management. The quality of wildlife habitat on rangelands is largely a function of management, but no simple prescription for "the best" management has yet been discovered. The extraordinary diversity and variability of rangeland resources in Pima County necessitates a large measure of flexibility in management. Means of ensuring and rewarding good management must incorporate wildlife needs without imposing inflexible rules or procedures.
- (5) Rangeland management. The use of tools for improving the long-term health and productivity of rangelands must be incorporated into the SDCP. These include prescribed and natural fire, the chaining or bulldozing of mesquite, seeding of native grasses, and the development and maintenance of water sources and erosion control structures.

- (6) Limitations in present biological knowledge. For a large number of plant and animal species, there is too little solid scientific knowledge to prescribe effective management strategies. Efforts should be made to cooperate with ranchers to address these scientific gaps, through collaborative monitoring, adaptive management, and further research.

The purchase of development rights or conservation easements is one of the best tools presently available that effectively addresses the first two issues, while providing the flexibility to address the other issues on a case-by-case basis. Purchasing development rights and/or conservation easements on ranch lands in Pima County will require substantial funding roughly 50 to 90 percent of the market value of the deeded lands in question. However, this is significantly less than the cost of purchasing ranch lands in fee simple, and it has two additional fiscal advantages: it keeps these lands on the tax rolls, and it does not shift the costs of management to public, tax-funded agencies.

Preserving ranch lands in Pima County unavoidably depends on decisions made by the individuals who own and manage ranches. Research in other Western states, where agricultural preservation programs have a longer history, has found that voluntary, incentives-based measures can substantially reduce the rate and extent of urbanization (Huntsinger and Hopkinson 1996). But success depends on the attitudes and expectations of ranch owners, and specifically on their commitment to continue ranching where they are, rather than selling out at high prices and relocating to areas where urbanization is not occurring:

As landscapes become more urban, increasing difficulties with ranching combine with growing expectations of lucrative land sales, and the ranching community becomes more hostile to land use control. Escalating land prices make the costs of incentive-based land conservation programs rise, and attrition of the ranching community threatens the economic and social viability of ranching. There comes a point when the landscape begins to be widely recognized as urban in character, rather than rural. At this threshold, ranchers shift from thinking about ranching as a long term part of the landscape to a phenomenon moribund in their locale. Committed to ranching as a lifeway, they look elsewhere to continue it, less concerned with the future of the functionally compromised land they now occupy, and more concerned for the short haul with maintaining their opportunity to liquidate (Liffmann et al. 2000: 369)

Organizations of landowners in rural Pima County have expressed the desire and commitment to preserve large, unfragmented ranching landscapes into the future. The SDCP should engage and support these groups. Further development pressures *or* inflexible regulatory impositions could nudge them towards an attitude inimical to habitat conservation.

Scientific knowledge of arid and semiarid range ecosystems is neither complete nor unequivocal. To reduce the future of these landscapes to a single issue - the presence or absence of domestic livestock - is as naïve as it is dogmatic. The diversity of the land itself defies such simplistic solutions: The effects of grazing vary widely, depending on how it is

managed, the landscape in question, and the prior history of that landscape. Grazing is a natural ecological process. It is a disturbance which, when well-managed, has far less impact on these ecosystems than other disturbances such as drought, flood, or fire (let alone intensive human development).

The challenge is as much social and economic as it is ecological: How to bring together the expertise and commitment of scientists, ranchers, environmentalists, and agency personnel to define clear goals for specific landscapes; how to implement creative solutions guided by those goals; how to evaluate management efforts with the rigor and care necessary to learn and adapt. Diverse and varied landscapes require diverse solutions and flexible tools. There is a tremendous need for all parties to desist from broad generalizations and inflammatory rhetoric, get out on the ground, look around and start talking about what we know, what we don't know, and what we want to see in the future.

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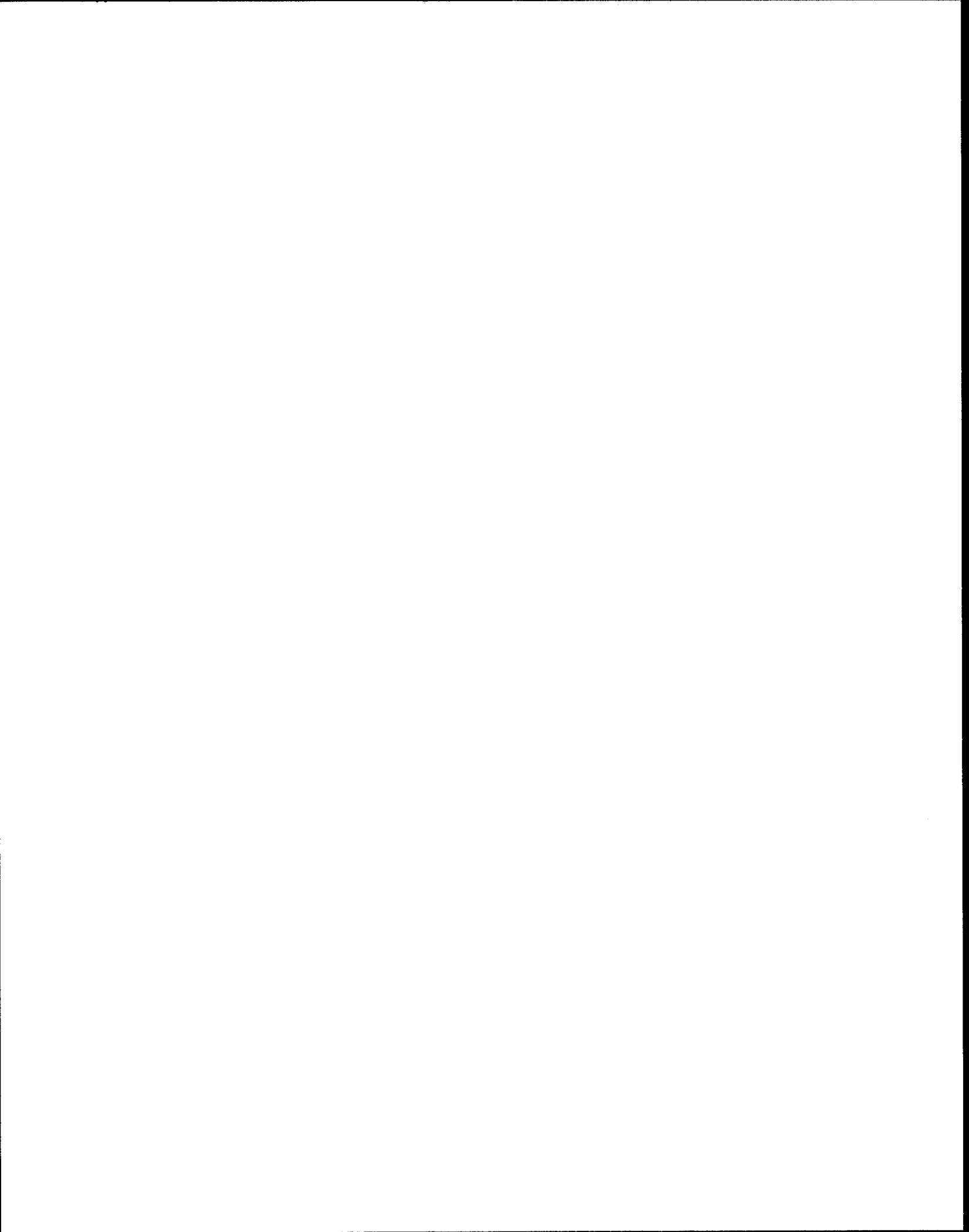
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Appendix 1: "The Southwest Willow Flycatcher and Me," by David Ogilvie,
Manager of the U Bar Ranch. From Quivira Coalition Newsletter.

The Quivira Coalition

September 1998 Vol. 2, No. 1

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Handling Endangered Species	Examples of Good Stewardship:
An Outdoor Classroom	Phil Knight and the Date Creek
The Wildlands Project and Cattle	Ranch
Grazing	Upcoming Events

An Environmental Paradox **The Southwestern Willow Flycatcher and Me** by David Ogilvie, Rancher



U Bar Ranch is a commercial ranching and farming operation in southwestern New Mexico along the Gila River. The ranch can be considered an environmental paradox because the largest known and most successful population of Southwestern Willow Flycatchers is found on the private land that we graze and farm.

Seldom a day goes by that one does not read in some publication or hear over some broadcast media of the endangerment of this species. Most environmental groups, with few exceptions, are calling for the removal of all livestock along riparian or riverine systems as the solution. The accusation is that livestock grazing (cattle in particular) have led the Flycatcher to the brink of extinction.

Federal Register Targets Livestock

One would only have to go to the listing of the Proposed Rules in the Federal Register of July 23, 1993 to find extensive references to the so-called negative influence caused by agriculture or livestock grazing. The many factors listed by the publication include destruction and overuse by livestock, cowbird parasitism, modification to the habitat resulting in invasions of exotic tamarisk or other non-native species, water diversion and impoundment, channelization of rivers and so on. In reading the listing, one finds that agriculture (specifically, cattle grazing) is identified as the cause of the demise of this song bird. If one was to believe all the information regarding this species' endangered status, you would immediately assume that the factors cited in the Register would have been scientifically studied, based, and supported. But, are they?

U Bar Ranch's involvement with the Flycatcher began with the Federal Register's listing because it referenced the Gila River. A total of 643 miles of stream and river were proposed as habitat, including the entire Gila River system.

"Although the habitat found on U Bar Ranch is not typically touted as Southwestern Willow Flycatcher habitat, it appears to optimal for the species. Nesting success is higher than in any other known population with the lowest parasitism by cowbirds found anywhere."

Population Survey

U Bar Ranch's concern was that we knew very little about the Southwestern Willow Flycatcher

and wanted information regarding its status on the private land we lease. In response to our concerns, a population survey of the birds inhabiting the U Bar was undertaken in May 1994 by qualified biologists using an established U.S. Fish & Wildlife Service protocol. The population survey continued through June and ended in July 1994, showing a high population of 64 pairs. It should be noted that, in 1997, the second largest population known was located on the Kern River in California, with 38 pairs. U Bar Ranch's population in 1994 was almost twice that.

Another interesting observation during the initial 1994 survey year was that the nesting habitats of preference on U Bar were not young dense stands of Willow and Cottonwood as identified, but flood plain forest patches comprised mostly of Box Elder, older mature Cottonwood and Willow, and introduced Russian Olive trees. These trees are more commonly found protected from the river in secondary stringers located along old earthen irrigation ditches. Even more interesting was that cowbird parasitism was not commonly observed.

Population surveys have been conducted every year since 1994. The 1995 survey ended with 107 pairs, the 1996 survey with 138 pairs, the 1997 survey with 174 pairs, and the current 1998 survey with 186 pairs. Keep in mind that the next highest population is 38 pairs where there is no livestock. Coincidentally, with the increase of Flycatchers came a corresponding increase in farm ground U Bar Ranch put under irrigation. In 1995, U Bar Ranch returned approximately 300 acres of fallow farm ground to irrigation production, with an additional 280 acres being returned to production in 1996.

Research Expanded

With these interesting departures from the best available scientific information, it was felt that there was a need to expand the scope of the research. In April 1997, the Rocky Mountain Research Station of the U.S. Forest Service, headed by Dr. Scott Stoleson, was asked to be involved along with Dr. Dale Zimmerman, Professor Emeritus, Western New Mexico University, a respected ornithologist, and Dr. Roland Shook, also of Western New Mexico University. Credibility of the research was of prime consideration, and the issue of credibility could be addressed with the cooperation of these other parties.

Specific objectives in the expanded research included evaluating the population densities of all breeding bird species in habitat patches occupied by Willow Flycatchers, evaluating reproductive success of Willow Flycatchers, quantifying nest site characteristics of Willow Flycatchers, and quantifying the floristic and landscape-level characteristics of occupied habitat.

With this expansion of the research, many interesting and significant observations have been made. Although the habitat found on U Bar Ranch is not typically touted as Southwestern Willow Flycatcher habitat, it appears to optimal for the species. Nesting success is higher than in any other known population with the lowest parasitism by cowbirds found anywhere. The nest placement with regard to nest height and vegetation of preference are significantly different from what the established science has been suggesting. Some nests heights exceed 70 feet above ground. All of these situations have occurred with high densities of livestock. It is important to note that, while the regulating agencies are steadfast in adhering to regulations that call for the removal of all livestock from riparian areas, the science that supports those claims is not being substantiated.

No Flycatchers Without Livestock

The only long-term scientific study of Southwestern Willow Flycatchers in conjunction with livestock has been on the U Bar Ranch. The identification of entire river systems in the Southwest as potential habitat (643 miles), including the Gila River system, was probably unwarranted. Extensive survey work has been done on the Gila River in the Gila National Forest and no Flycatchers have been found to exist in the narrow canyon bottoms in the absence of livestock, even with excellent vegetative characteristics. Present areas with wide flood plains and older more diverse stands of flood plain forests seem to be preferred. These situations are most commonly found on private land

(not public lands) used for farming or ranching.

Livestock management in riparian areas warrants special considerations. The study on U Bar Ranch demonstrates that livestock grazing can be compatible and even complimentary to sustaining some habitats. One reason that the older more diverse flood plain forest patches exist in the Gila/Cliff Valley is due in part to grazing. Historically, grazing has reduced fire fuels and has provided protection from fire. Earthen farming ditches have promoted the establishment of a variety of tree species and are critical to sustaining the Flycatcher habitat. Earthen levees have allowed the flood plain forest patches to attain maturity.

“The study on U Bar Ranch demonstrates that livestock grazing can be compatible and even complimentary to sustaining some habitats.”

Flexible Management

U Bar Ranch's livestock management, in association with the occupied habitat, has always been flexible, with some of the pastures being grazed strictly in the dormant season, while others are used in a rest/rotation system in direct association with nesting bird activity. Most farming activities in close proximity to nesting bird habitats are minimized during the active nesting season. On U Bar Ranch, the Flycatcher population is stable and increasing even with this variety of management.

Of great concern to U Bar Ranch is the flooding activity that has occurred along the Gila River. The flooding damage is endangering occupied Flycatcher habitat. We are interested in participating in projects that protect older known habitats and encourage new habitat growth. An example of this involves a completed restoration project on the Gila National Forest with which U Bar Ranch is involved as a permittee. The techniques used to restore a flood damaged section of the river were not commonly accepted. They involved redirecting the river away from exposed vertical soil banks with gravel berms and exposing the water table below the berms to enable planting of native riparian vegetation in backwater marshes to create a vegetative barrier. The berms protected and allowed the vegetative plantings time to establish. After two or three growing seasons, they have been very successful in stabilizing the river banks. Cattle are also managed to foster the recovery of the vegetative plantings.

This project was started in June 1995, with additional work in 1996. Population survey work was completed in 1998 in the Gila Bird Area (the location of the project) and 8 pairs of Willow Flycatchers were found nesting where none had ever been recorded. This same area had also been extensively surveyed in previous years, starting in the 1950s, with no recorded Flycatcher sightings.

We are discouraged about the lack of support from the agencies in charge of administering such restoration activities. There are other sites in need of restoration in the Cliff/Gila Valley, but it has been very difficult to obtain cooperation and approval from the agencies. It is hard to understand why such agencies ignore their mandate to protect and foster populations of an endangered species with proven practices, while forcing the elimination of a valid compatible use, livestock grazing.

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The Quivira Coalition Newsletter is published by The Quivira Coalition 4 times a year.

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Subscriptions are available for \$15 a year. Please send a check or money order to The Quivira Coalition, 551 Cordova Road, Suite 423, Santa Fe, NM 87501. Send address changes to the same address. Please allow 4-6 weeks for processing.

Printed on Recycled Electrons Worldwide

This page last updated April 6, 2000.

Appendix 2: Empire-Cienega Ranch Interim Livestock Management Plan

January 11, 1995

ALLOTMENT MANAGEMENT PLAN

DRAFT
Empire-Cienega Ranch
Interim Livestock Management Plan

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I. General Information

A. Introduction

This interim livestock grazing management plan has been prepared to guide the management and administration of the ongoing livestock grazing operation on the Empire-Cienega Resource Conservation Area pending the development of the comprehensive land use plan scheduled for 1995.

The plan identifies the resource objectives, prescribes the manner in which the livestock grazing operation will be conducted to sustain the resources, identifies needed range improvements, provides the monitoring plan to measure the effectiveness of management actions, and details the procedures for the evaluation and modification of the livestock grazing use. The resource data used to develop this plan is included in a prologue called the Allotment Analysis which is incorporated into this plan by reference. The analysis is on file at the Tucson Resource Area office.

Interim management guidelines for this area were developed to preserve, protect, and enhance the multiple-use values of the Empire-Cienega Ranch properties. These interim guidelines were promulgated under the authority of the Phoenix District Manager under 43 CFR 8364.1 and published in the Federal Register June 16, 1988. This interim management was also incorporated into the Phoenix Resource Management Plan and Final Environmental Impact Statement Dated December 1988. The guidelines provide for protecting the sensitive resources while allowing continuation of valid uses of the area.

B. Location

The Empire and Cienega ranches are located just north of the town of Sonoita, between the Whetstone and Santa Rita Mountains, 52 miles southeast of Tucson. The planning area is located in Pima and Santa Cruz Counties, Arizona. Elevations at the project sites average 4,600 feet. It contains 36,498 acres of recently acquired public land and 37,462 acres of state owned land.

The Empire-Cienega Ranch is within the Santa Cruz River drainage. The broad alluvial Cienega Valley is dissected by Cienega Creek which drains portions of the Santa Rita Mountains to the west, the Canelo Hills to the south, and the Whetstone Mountains to the east. Cienega Creek flows north 20 miles to its confluence with Pantano Wash, which flows through the city of Tucson. The watershed is important to Pima County and the City of Tucson for flood control protection and aquifer recharge for domestic water wells in the area.

II Objectives

A. Upland Vegetation

The project area is located within the Southeast Arizona Basin and Range Major Land Resource Area in the upper end of the 12 to 16 inch precipitation zone. The vegetation is predominately within the Chihuahuan Semidesert Grassland biotic community. These semidesert grasslands are perennial grass-shrub dominated rangelands positioned between the Chihuahuan Desertscrub type below and the Madrean Evergreen Woodlands above.

1. Limit the average utilization to 40 - 60% of current years growth on "key" perennial grass species, and assure the physiological requirements of plant growth, rest, and reproduction are met for the following "key" species:

Perennial Grasses

- plains lovegrass (ERIN)
- sideaots grama (BOCU)
- cane beardgrass (BOBA3)
- vine mesquite (PAOB)
- black grama (BOER4)
- hairy grama (BOHI2)
- sprucetop grama (BOCH)
- plains bristlegrass (SELE2)
- wooly bunchgrass (ELBA)
- green sprangletop (LEDU)
- Arizona cottontop (DICA8)
- crinkleawn (TRMO)
- bush muhly (MUPO2)
- Prairie junegrass (KOCR)

Shrubs and Succulents

- false mesquite (Caer)
- range ratany (KRPA)
- shrubby buckwheat (ERWR)
- Palmer's agave (AGPA)

2. Monitor Range Condition, Trend, and Utilization at the following sites:

Proposed Upland Monitoring Sites
Range Trend - Pace Frequency

PASTURE - UNIT	Town-ship	Range	Section	Study No.
Davis	20 S	17 E	14 NW	1
Hilton			2 NW	2
Hilton			3 NE	3
Johnson	19 S	17 E	33 NE	4
Hilton			25 SE	5
Lower Spring Water			11 SE	6
Upper Spring Water	19 S	18 E	7 SE	7
Upper Mattie			5 NE	8
Upper Apache	18 S	18 E	28 NE	9
Lower Apache			20 NW	10
Fresno	18 S	17 E	25 NE	11
Rockhouse			14 NW	12
Lower 49			22 SE	13
Upper 49			20 SE	14
N - North Pasture			32 NW	15
E - North Pasture	18 S	17 E	9 SW	16
W - North Pasture			7 NW	17
Empire	18 S	16 E	13 NE	18
Maternity			24 NW	19
Enzenburg			19 SW	20
Alamo Solo	18 S	17 E	16 SE	21

B. Riparian Vegetation

The riparian vegetation along Cienega Creek is within the Cottonwood-Willow Series of the Southwestern Riparian Deciduous Woodland biotic community. The dominant species include Freemont cottonwood and Goodding willow. Velvet ash and Arizona walnut occur along some reaches of Cienega Creek, primarily toward the northern end in the deeper canyon bottoms. Major understory species include big sacaton, deer grass, seep-willow, sedges, horse tail, and rushes.

Interior Marshland communities are also present along Cienega Creek, Mattie Canyon, and Empire Gulch. Better watered sites support complex communities of cattail, rushes, and reeds. Drier shorelines are covered by water grasses and sedges. Herbaceous plants include lizard tail, water cress, and pondweeds.

Mesquite bosques occur on the loamy bottom sites along the stream terraces, and at major drainage ways.

Almost pure stands of big sacaton occur on the level subirrigated floodplains, low stream terraces, and first and second order tributaries of Cienega Creek. These sacaton flats generally benefit from overbank flooding as well as subirrigation from the water table.

A summary of the perennial stream reaches in the RCA is:

Cienega Creek
10.4 Miles in the allotment
Lower Mattie Canyon
1.25 Miles Perennial Stream of Mattie Canyon in allotment
Empire Gulch
1.50 Miles Perennial Stream and Wetlands of Empire Gulch
in allotment

1. Maintain or restore an advanced ecological status and proper functioning condition on riparian areas, thus providing the widest variety of vegetation and habitat diversity for wildlife, fish, and watershed protection. This will include constructing fencing and upland water developments necessary to create riparian pastures along the perennial portions of Cienega Creek to provide adequate rest from livestock grazing.

2. Monitor riparian condition and function at the following sites:

Riparian Monitoring Sites
Cienega Creek
Riparian Area Condition Rating (RACE)

Segment	Location
CC-59A	Apache Cyn to Narrows
CC-59B	Fresno Cyn to Apache Cyn
CC-59C	Bedrock Falls to Fresno Cyn
CC-59D	Pump Cyn to Bedrock Falls
CC-59E	Cienega falls to Pump Cyn
CC-59F	Mattie to Cienega Falls
CC-59G	Cold Springs to Mattie Cyn
CC-59H	N Ag Fields to Cold Springs
CC-59I	Panama Canal to N Ag Fields
CC-59J	Oak Tree Cyn to Panama Canal
CC-59K	Spg Water Cyn to Oak Tree Cyn
CC-59L	Gardner Cyn to Spg Water Cyn
CC-59M	Headwaters to Gardner Cyn

C. Wildlife

The diversity of vegetation types present on the Empire-Cienega Ranch contribute to its value as wildlife habitat. The foothills of the Whetstone and Empire Mountains provide good big game habitat. The riparian areas along Cienega Creek provide breeding, foraging, watering, resting, and escape cover as well as travel corridors for a variety of wildlife. Extensive open grasslands provide habitat for a viable herd of pronghorn antelope, and wintering habitat for a variety of songbirds and migrating raptors.

1. Improve habitat for antelope, mule deer, white tail deer, and other wildlife species by providing adequate food resources, water cover, and space, with the primary emphasis on antelope habitat. These efforts will include but not be limited to maintaining forage reserves, cooperatively developing wildlife waters, and providing periodic rest to portions of the range.
2. Specific objectives for individual species are pending development of the Land Use Plan Amendment.
3. Provide for the protection and recovery of habitats necessary to support healthy viable populations of the following special status species:

Gila Topminnow, Gila chub, longfin dace

Lowland Leopard Frog

Mexican Garter Snake

Southwestern Willow Flycatcher

Lesser Long-nosed Bat

4. Through analysis of the Upland and Riparian vegetation monitoring programs, and the Fisheries, Wildlife, and Aquatic monitoring programs; evaluate the effects of the livestock grazing on wildlife populations.

D. Watershed

1. Reduce erosion and stabilize the watershed by increasing the overall vegetative ground cover.
2. Measure groundcover at all the proposed upland vegetative monitoring sites.

III. Proposed Livestock Management

A. Current Authorizations

The Bureau of Land Management currently leases the federal lands in the Empire-Cienega RCA to John and Mac Donaldson for livestock grazing. This lease expires December, 31 1997, and provides for renewal for a term of up to five years. The BLM also subleases the State of Arizona livestock grazing leases (05-1597 and 05-1623) to the Donaldsons. The summary of acreage and grazing capacity by ownership is as follows:

GRAZING LEASE	ACREAGE	ANIMAL UNITS
BLM No. 6090	36,538.31.00	704
STATE No. 1597	15,314.40	382
STATE No. 1623	22,147.29	414
TOTAL	74,000	1500

The initial authorized use on the Empire-Cienega Ranch allotment will be 1500 cattle yearlong. Continued data gathering and analysis will be necessary to determine whether this projection is accurate. Utilization figures, along with an analysis of actual use, climate, and range trend data will be used to determine if a change in livestock numbers is needed.

Due to the annual variability in forage production and plant growth resulting from fluctuations in moisture and temperature regimes, it may become necessary to disperse livestock or change from the planned rotation. Under extreme circumstances reduction of livestock numbers or removal of cattle from the allotment may be appropriate.

B. Rangeland Management and Herd Management Concepts

The Donaldson's management philosophy for livestock grazing on the Empire-Cienega is based on one herd of mother cows, moving through a series of flexible pasture rotations as the seasons progress. The ranch is divided into "Units of Useability", which are variable size units of rangeland that will support the base herd for a certain period of time during a certain time of the year. The units are tied to the "primary" water sources.

1. One Herd Concept

The one herd concept is where all mature female cattle are run together, and all replacement females are bought at breeding age to enable them to enter into this herd as soon as possible. Bulls are put with the cows in mid-summer and pulled off in the fall. One herd is used to maximize rest in all other non-grazed units, and to better utilize the different species of grasses.

2. Units of Useability

The rangeland on the RCA is divided into fairly distinct units of variable size capable of supporting the base herd of cattle for a specified period of time during the grazing rotation.

A summary of acreages by type of livestock use is as follows:

SUMMER RANGE	37,800 Acres
WINTER RANGE	31,160 Acres
SACATON PASTURES	2,930 Acres
SHIPPING PASTURES	1,170 Acres
HORSE PASTURES	620 Acres
EXCLOSURES	320 Acres
RANCH TOTAL	74,000 Acres = 116 Sections

Units are classified as either:

1). Spring & Summer Ranges (May through September)

A. Sacaton (May-Mid July)

Units	<u>Acres</u>
Mac's	450
500 Acre	260
5 Wire	590
Hilton	300
Hummel	180
Gardner	300
Rick's	350
Cottonwood	130
North Cieneguita	350
Jerry's	<u>20</u>
	2930

B. Upland Plains (Mid July-October)

Units	<u>Acres</u>
Hilton	7300
Davis	3900
Johnson	3000
Oil Well	820
Enzengburg/Bellota	2500
Alamo Solo	1300
North - South End	7240
Spring Water - West End	<u>6900</u>
TOTAL	32,960

2). Winter Range (November through April)

Empire Mountain Units	<u>Acres</u>
Upper 49	2700
Lower 49	1800
Rockhouse	4000
North Pasture (North end)	<u>2600</u>
TOTAL	11,100

Whetstone Units	<u>Acres</u>
Triangle	300
Apache	10000
Upper Mattie	3200
Lower Mattie	660
Fresno	2700
Spring Water - East End	<u>3200</u>
TOTAL	20,060

3). Combination (Growing and/or Non-Growing Season Use)

Units	<u>Acres</u>
Maternity	700
West	1750
Empire	1940
Bull Trap	450

4). Supplemental Use Units
A. Horse Pastures

Units	<u>Acres</u>
Headquarters (Primary)	300
Cienega HQ Horse Pasture	320

B. Shipping Pastures

Units	<u>Acres</u>
No. 1	360
No. 2	230
Orchard	560
Jerry's Sacaton	20
TOTAL	1170

C. Riparian Pastures

A1 - The Sam Enclosure which includes Cienega Creek west and south of the Ag fields. 100 acres

A2 - The Mattie Enclosure which includes those portions of Lower Mattie Canyon and Cienega Creek north of the Coldwater Sacaton Enclosure to the Fresno water gap. 120 acres

A3 - The Falls Enclosure which includes that part of Cienega Creek north of the Fresno water gap to the Falls. 20 acres

A4 - The Coldwater Enclosure which includes the Coldwater Sacaton Pasture east of Cienega Creek. 60 acres

Two other units were also fenced along Cienega Creek between A1 and A2. These units (B1 and B2) were to be used by livestock in alternate years to provide water for the cattle and to access Ag fields from the pastures on the west side of Cienega Creek. These are now referred to as the North and South 49 water gaps.

One other riparian pasture unit exists which is referred to as Bahti's Bog (20 acres). This unit is located south of the Ag field road crossing on Cienega Creek. It has not been used by livestock for about four years. It was constructed by the Donaldson's and nonuse has been voluntary.

C. Biological Planning - Livestock Rotation Through the Units

The key to this management approach is to have a variety of options available for any planned grazing rotations, and to be able to quickly change from the plan when range conditions or livestock needs are different than anticipated.

A "Biological Planning" process is being used to determine planned livestock management actions. This planning is conducted in February (prior to the spring growing season) and September (following the monsoon rains).

The Units of Useability are evaluated for their suitability for livestock use during the upcoming pasture rotations. A proposed rotation strategy is developed based on the animals physiological needs and the condition of the vegetative resource. The proposed rotation is charted on graphs.

Once the biological planning has been completed and the upcoming grazing rotations tentatively scheduled, the livestock graze the particular unit of useability selected until monitoring of forage utilization levels and animal performance indicate the need to proceed to the next unit in the rotation. Desired levels of utilization may vary based on the "key" forage species selected, plant phenology, time of the year, current condition of the unit, and intensity of past grazing use of the unit.

Biological planning in September or October based on forage produced in the summer units following the summer monsoon season is critical. Decisions to adjust the herd size must be made prior to shipping in October and November when the cattle are in the shipping pasture complex of the ranch.

D. Current Grazing Use and Scheduled Pasture Rotation

The Donaldsons have leased the ranch for livestock grazing since December 1975. Under their management the ranch will be operated under a flexible grazing rotation using the one herd concept as detailed above.

The stocking level is a maximum of 1500 Animal Units Yearlong. The following guidelines will provide the for the rotation of livestock to achieve the above objectives.

The basic grazing rotation on the ranch is as follows:

USE AREA	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
WINTER	XX	XX	XX	XX	XX	XX						
SPRING							XX	XX	X			
SUMMER									X	XX	XX	
SHIPPING												XX

1. Winter Use Areas

A winter use area (31480 acres) is established, where livestock grazing would occur from November through April. There are 11 separate pastures that are used in different combinations to provides options for necessary rotation of rest periods. Cattle will generally use 7 or 8 of the pastures during the winter period. We will try to rest 25 to 35% of the winter range each year, and will try and rest pastures for one or two years following use. The early spring months of March and April are the most critical times in these units. As the weather warms up and riparian vegetation begins growth, the cattle begin to spend more time in these areas and the impacts steadily increase until the cattle leave these units for the Sacaton Units.

Cattle will continue to water on Cienega Creek at the Fresno, Dominguez, and Narrows Gaps until the Northern Riparian Pasture realignments and water developments are completed.

2. Spring and/or Fall Use - Sacaton Units

The spring use period of May through mid July will primarily be associated with the sacaton pastures (2930 acres). There are 9 sacaton pastures adjacent to Cienega Creek, Empire Gulch, and Gardner Cañon used in the spring rotation. These pastures can also be used in various combinations during the fall (September to October) to provide additional rest for the summer units. Cattle generally will use 5 or 6 of the pastures. We will try to rest 15 to 25% of the sacaton range each year.

The grazing rotation using the sacaton in the fall is as follows:

USE AREA	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
WINTER	XX	XX	XX	XX	XX	XX						
SACATON							XX	XX	X		XX	
PLAINS									X	XX		
SHIPPING												XX

The decision on how to best utilize the sacaton bottoms cannot be made until early spring when the forage production and condition of the sacaton can be assessed, so stocking rate decisions and herd size adjustments must be made based on the growth of the upland plains units. The sacaton however is the key to providing additional rest and flexibility while maintaining the health of the cattle during this critical period in the spring and summer.

3. Summer Use - Upland Plains Units

The summer use period of mid July through September is associated with the upland grasslands at the southern end of the ranch. This area encompasses about 37350 acres in 11 different pastures. Units which are used will be rested until they have recovered from past use and made sufficient new growth. The cattle will generally rotate through 8 or 9 pastures during this portion of the year. We will try to rest 20 to 30% of the summer range each year.

The management strategy for this unit is to maximize rest of the units, so that plant vigor of the perennial grasses remains high. High range condition is also important to keep the greatest diversity of desirable native grasses present in the plant community. Healthy diverse range produces higher volumes of palatable forage if the summer rains do come.

Several management actions can be utilized to provide rest. The use of the Sacaton Units in the Spring enables use of the summer units to be deferred longer into the growing season, providing additional growth and rest for the more sensitive perennial grasses in the uplands.

If winter and early spring rains have been favorable the cattle can be isolated in the sacaton bottoms exclusively until the summer rains come and the mud and insect problems begin to stress the livestock.

If spring growth of the sacaton has been only fair, the Sacaton Units can be open to the uplands and forage in the bottoms can be used to supplement the forage available in the Summer units. This will reduce the grazing pressure on the warm season perennial grasses in the uplands.

Additional rest can also be obtained by using the Sacaton Units in the fall (September and October) to defer use of the upland plains units late in the growing season to allow regrowth of the perennial grasses following use by cattle. This increases the vigor of the plants and provides better ground cover to protect the soil and conserve moisture.

4. Fall Roundup

The yearly roundup occurs in October. The cattle are moved through the various shipping pastures. There are 4 or 5 of these pastures (1900 acres).

5. Riparian Pasture Units

These units are primarily important as watering points for cattle and as lanes to allow cattle to cross from east pasture units to west pasture units. They would provide only limited grazing for a short period of time by the main herd. They could be grazed by a portion of the herd for specified periods to achieve specific resource objectives such as a reduction of fuel loads for fire prevention or to open up marsh areas to provide open water habitat for waterfowl.

Once the Southern and Northern Riparian Pasture improvements have been completed livestock use of the riparian pastures along Cienega creek will be restricted to use of the northern 1.5 miles of the Creek near the narrows. Use of the designated crossing lanes will be used as necessary to rotate cattle to pastures unless specific resource objectives are to be achieved and have been consulted and agreed upon .

B. Northern Riparian Pasture Realignment

The second priority is to complete the riparian pasture development, and realignment of existing fences north of the Mac's sacaton pasture to the Narrows along Cienega Creek. This would eliminate the need for the Fresno and Dominguez watering points and allow the exclusion of livestock from Cienega Creek, except at the very north end at the Narrows where development of alternate water sources is difficult. The development of two new wells will be necessary prior to enclosing the creek.

PROJECT NAME	Town-ship	Range	Section	Units
Fresno/Narrows Fence Realignment	18 S 18 S	17 E 18 E	12,14 7	1 mi. 1 mi.
Lower Wood Canyon Well Drill, Equip, Tanks, Pipe	18 S	17 E	13 SW	1 well 2 tanks .5 mi pipe
Lower 49 Well Drill Equip & Tank and Fence	18 S	17 E	27 23,26,27	1 well & tank 1.5 mi fence

D. Lower Priority Upland Wells - Joint Wildlife Developments

These proposed projects are not essential to the operation on the livestock management on the Empire, but would enhance the availability of water for livestock on the ranch. It is expected that they could be jointly developed and funded on a priority basis determined by BLM and the Arizona Game and Fish Department.

PROJECT NAME	Town-ship	Range	Section	Units
Mattie Well	18 S	18 E	31 SW	1
Upper Wood Cyn Well	18 S	18 E	30 SE	1
Edwards Well	18 S	18 E	29 NE	1
Ferguson Well	18 S	18 E	20 SE	1
Upper Fresno Well	18 S	18 E	19 NE	1
Enzenburg North Well	18 S	17 E	34 NW	1
Diamond A Well	18 S	17 E	33 NE	1

D. Grazing Use Patterns

1. Past Grazing Use

Virtually all of the Empire-Cienega Ranch is accessible to livestock grazing. Prior to the Donaldson's operation, past livestock management was to stock each pasture unit at moderate levels, and leave the cattle there until the fall roundup. This included stocking the riparian pastures along Cienega Creek where free water was available yearlong.

This continuous yearlong grazing use had many disadvantages. Even with proper stocking, areas of livestock concentration around waters are excessively used, forage is not used in the more remote portions of the units, and the most desirable forage plants and most accessible parts of the range receive no rest.

Livestock tend to prefer the riparian corridors during the growing season, where movement is easy and food, shade, and water are available. The cattle would trail out of the riparian areas up the primary and secondary drainages to the windmills located in the uplands where they would spread out over the range in the cooler months. This repeated grazing of the riparian areas and drainages resulted in reduction of desirable perennial grass cover and often contributed to an acceleration of soil erosion and downcutting. Regrazing of the riparian zones hindered the recruitment of replacement woody riparian species such as cottonwood and willow. Lack of adequate rest in heavily used portions of the upland range sites caused a shift in species composition from desirable perennial bunch grasses, like plains lovegrass, towards the shorter less desirable sod grasses such as curly mesquite and blue grama. Woody shrub species such as burroweed and mesquite also increased under this continuous yearlong use.

2. Current Grazing Use

The Donaldsons have leased the ranch for livestock grazing since December 1975. Under their management the ranch is being operated under a flexible grazing rotation using the one herd concept as detailed above. The effect of their management on the resource is as follows:

Non Growing Season Use Units

Upland Sites

These sites are grazed from November through April. The first four months are during the dormant period for the perennial grasses, and thus have very little impact on their health and vigor. The critical period is in March and April when certain grasses may begin early season growth as a result of warm weather and sufficient moisture.

The current management provides for use of nine pastures. Units of useability are planned that will try and rest pastures for one or two years following use; and to rotate use of the units so that units grazed in the critical early spring are rested the following spring.

Riparian Sites

There are approximately five miles of perennial stream reaches in the non growing season use area that are currently grazed. During the winter months the weather is cool and cold air tends to settle in the creek bottom. During this time cattle prefer the adjacent upland range sites (generally the south and western exposures). The livestock are generally not going to water daily and may only water every second or third day. When they do, they trail down to the creek, drink, and return to the uplands. Thus livestock are not congregating in the riparian areas for any length of time, and spend little time grazing there. Utilization of riparian forage is light, trampling of stream bank soils and vegetation is minimal. Also at this time woody riparian trees have lost their leaves and are not very palatable to the livestock.

The early spring months of March and April are the most critical times in these units. As the weather warms up and riparian vegetation begins growth, the cattle begin to spend more time in these areas and the impacts steadily increase until the cattle leave these units for the Sacaton Units.

Generally the northern most portions of Cienega Creek are not used during this early spring period as cattle have already begun moving south towards the sacaton. The Dominguez and Fresno watering points on the creek do receive use during this period every year.

Growing Season Use Units

Sacaton Units

There are nine of these pastures that can be used in various combinations during either the spring or the fall (May to October). This is during the season of active growth for the sacaton. Cattle are closed into these units which are separated from the adjacent uplands. Three of these pastures (Mac's Sacaton, Five Hundred Acre, and the Five Wire) contain perennial stream reaches of Cienega Creek which are unfenced from the sacaton.

The sacaton is well adapted to sustain the high intensity short duration grazing pressure that it is subjected to under current management. The units are inspected prior to use and the past years livestock use is considered in selecting unit combinations and rotations. Units which are used are rested until they have recovered from past use and made sufficient new growth.

The major concern in use of these units is the grazing of the unfenced riparian areas during the spring and summer growing seasons. The pasture units are small and the high stock densities even for the short periods of use have resulted in repeated heavy grazing of the woody riparian species and high degrees of streambank trampling. There is little recruitment of riparian trees occurring, and very poor age class distribution.

Upland Plains Units

These late spring and summer use areas (Mid July through October) are probably the limiting factor to the livestock carrying capacity on the Empire-Cienega Ranch, and the slowest to recover from past livestock overuse. There are only four or five primary units of useability in this complex, so the flexibility of use is limited. If the summer rains are poor, or fire has consumed portions of these units, flexibility is further restricted to the use of those pastures that do receive sufficient precipitation to produce growth. Temporary electric fencing could be used to isolate areas of the units where immediate rest would be desirable and still allow use of the unit.

Biological planning in September or October based on forage produced in the summer units following the summer monsoon season is critical. Decisions to adjust the herd size due to forage production must be made prior to shipping in October and November when the cattle are in the shipping pasture complex of the ranch.

These units are grazed during the growing season of the warm season perennial grasses and use is primarily keyed to these species. The nutritional requirements of the cattle are at their highest, and travel from the primary waters during these hot summer months is limited. If cattle are stressed too much during this period, the pregnancy rate will be low next year and calves light this year.

The management strategy for this unit is to maximize rest of the units, so that plant vigor of the perennial grasses remains high. High range condition is also important to keep the greatest diversity of desirable native grasses present in the plant community. Healthy diverse range produces higher volumes of palatable forage if the summer rains do come.

Several management actions can be utilized to provide rest. The use of the Sacaton Units in the Spring enables use of the summer units to be deferred longer into the growing season, providing additional growth and rest for the more sensitive perennial grasses in the uplands.

If winter and early spring rains have been favorable the cattle can be isolated in these sacaton bottoms exclusively until the summer rains come and the mud and insect problems begin to stress the livestock.

If spring growth of the sacaton has been only fair, the Sacaton Units can be open to the uplands and forage in the bottoms can be used to supplement the forage available in the Summer units. This will reduce the grazing pressure on the warm season perennial grasses in the uplands.

Additional rest can also be obtained by using the Sacaton Units in the fall (September and October) to defer use of the upland plains units late in the growing season to allow regrowth of the perennial grasses following use by cattle. This increases the vigor of the plants and provides better ground cover to protect the soil and conserve moisture.

The decision on how to best utilize the sacaton bottoms cannot be made until early spring when the forage production and condition of the sacaton can be assessed, so stocking rate decisions and herd size adjustments must be made based on the growth of the upland plains units. The sacaton however is the key to providing additional rest and flexibility while maintaining the health of the cattle during this critical period in the spring and summer.

Riparian Pasture Units

These units are primarily important as watering points for cattle and as lanes to allow cattle to cross from east pasture units to west pasture units. They would provide only limited grazing for a short period of time by the main herd. They could be grazed by a portion of the herd for specified periods to achieve specific resource objectives such as a reduction of fuel loads for fire prevention or to open up marsh areas to provide open water habitat for fish and waterfowl. The primary concern is to provide for the continued use of the adjacent sacaton grass by livestock. This could easily be accomplished by fencing of the creek and development of some additional upland waters.

There is a need to re-examine the existing riparian enclosures and watering points to improve cattle distribution and reduce impacts of trampling and grazing. Some areas which are currently not being grazed might benefit by allowing some prescribed grazing (eg the south end of the Ag fields and the Coldwater Sacaton) while others may benefit from exclusion of livestock (eg the south end of Cienega Creek).

E. Water Analysis

There are a total of about 55 wells on the Empire-Cienega RCA. 38 are currently listed as Primary Waters for the livestock operation, and 4 are listed as Supplemental Waters.

Four are currently developed especially for yearlong wildlife use (Upper Spring Water, Wood Canyon, Ferguson, and Mattie).

The wells used as Primary Waters for the livestock operation are equipped with submersible electric pumps. The Donaldsons take portable generators to the wells being pumped. Some are hooked up to commercial electric power. Water is primarily pumped into earthen reservoirs about 50 feet in diameter by 3 feet deep. These "repressos" are allowed to dry up when livestock are not watering. Generally a Primary Water is used for about a month at a time.

Three wells are equipped with windmills that the Donaldsons still use and maintain for their operation. These are the Road Canyon, South Davis, and West Wells.

Cooperative agreements need to be developed detailing maintenance responsibilities, and investments of labor and capital on all water developments. All water rights are held by the BLM, although use is allowed for domestic livestock.

There are many of these waters that are (and could continue to be) used jointly by cattle and wildlife. These need to be identified and provisions made to ensure their joint use.

All water facilities need to be inventoried for any necessary modifications that need to be made to ensure the safety and access by wildlife. If yearlong water is needed for wildlife these need to be identified and provisions made to provide this water without risking the introduction of exotic fish into Cienega Creek.

Cienega Creek currently provides water for livestock in several key locations. If provisions are made to fence the Creek off from livestock use, additional upland waters would need to first be developed to provide continued water necessary for the livestock operation.

F. Fencing

There are approximately 37 pastures on the Empire-Cienega Ranch. The fencing consists of about 125 miles of interior pasture fencing and 75 miles of exterior boundary fence. The types and quality of the fencing varies from 5 or 6 strands of barbed wire down to only one or two wires. The older portions of the fence is primarily old mesquite posts and stays. The newer portions are primarily steel posts. A more complete inventory of these fences needs to be completed and modifications need to be completed to bring these fences up to BLM standards for safe passage by wildlife.

The maintenance of the exterior fences is a shared responsibility with the neighboring ranches (Beck, Parsons, Clyne, Barchas, Frasier, Wystrach, Rosetree Ranch, and the Rosemont Ranch). The interior fence are the maintenance responsibility of the Donaldsons, except for the riparian enclosures built by BLM. These enclosures are supposed to be maintained by BLM, but due to lack of BLM personnel, the Donaldsons have also been maintaining the enclosures to keep the cattle out of Cienega Creek. This maintenance issue needs to be resolved. Formal maintenance agreements should be obtained for the exterior fences as well as the interior fences.

Currently all the fences on the BLM and State Trust lands are the property of the United States. Provisions need to be made to document improvement dollars expended by the Donaldsons in the construction and maintenance of these fences.

V. Conclusions

The Donaldsons have been operating a livestock operation on the Empire-Cienega Ranch since 1975. The upland and riparian resources have been steadily improving under their livestock and range management practices.

The primary wildlife concerns at this time involve the protection and enhancement of the three Endangered Species and the candidate present on the ranch. Two of these (Gila Topminnow and Southwestern Willow Flycatcher) are closely tied to riparian improvement and stabilization of the habitats along Cienega Creek. Therefore, the highest priority for projects and actions should be those which facilitate improvement of this habitat.

Riparian and Wildlife values can be enhanced through continuation of cooperative management efforts with concerned parties.

Proposed improvements need to be developed and implemented to continue the upward trend of the resources.

Specific resource objectives need to be developed and monitoring implemented to measure progress towards achieving them.

Appendix 3: Malpai Borderlands Group Conservation Easements.

LAND USE EASEMENT
Malpai-

Arizona

This Land Use Easement is entered into by and between _____
_____, as Trustees of _____
Trust, dated June 6, 1997, (_____), whose address is _____
_____. And the Malpai Borderlands Group, a non-profit corporation organized
under the laws of the State of Delaware ("MBG"), whose address is P.O. Drawer 3536, Douglas,
Arizona 85608.

IT IS HEREBY AGREED:

1. Recitals:

A. MBG and _____ have entered into an Agreement whereby MBG has
acquired this Easement from _____ through a purchase and
exchange.

B. _____ the owner of the following described real estate (Fee Land)
located in _____, Arizona ("*Fee Land*"):

See legal description, which is attached hereto and incorporated by this reference
herein as Exhibit A entitled "Fee Land" *

* The Beneficiary of said Trust is:

C. Under the terms and provisions of the above referenced Agreement, _____
_____ has granted and conveyed to MBG this Land Use Easement on the terms and
conditions hereinafter set forth.

2. Grant. For and in consideration of valuable consideration stated herein, and other
valuable consideration, _____ for _____ and the assignees, heirs, personal
representatives, transferees, grantees, and successors in interest of _____ and any
future owner who may own the fee title to all or any portion of the Fee Land from time to time
grants, on the terms as provided herein, to MBG and the assignees, transferees, grantees, and
successors in interest of MBG, a Land Use Easement ("*Easement*") upon the Fee Land for the
purposes set forth herein. This grant and conveyance of the Easement to MBG from _____
is made pursuant to, and in accordance with, Title 33, Chapter 2, Article 4 of the Arizona
Revised Statutes (the "*Arizona Statutes*") and pursuant to the Arizona Statutes, _____

hereby specifically consents to the imposition of the Easement upon the Fee Land.

3. Purpose. Pursuant to the Arizona Statutes and the common law, the purpose of this Easement is to preserve and protect in perpetuity the natural, ecological, archeological and scenic features and values of the Fee Land and to prevent any use of the Fee Land that will significantly impair or interfere with the conservation values of the Fee Land. In so doing, it is the purpose of this Easement to foster the responsible ranching and agricultural uses of the Fee Land and with due regard for the natural, ecological, archeological and scenic values of the Fee Land. _____ intends that this Easement will limit use of the Fee Land to such activities as are consistent with the purposes hereof.

As the owner of the Fee Land, we direct that this Easement ensure sustainable, traditional commercial uses of our land, such as beef production, agricultural activities and hunting, which are dependent on and have in turn conserved the naturally occurring plants, animals, soils, and waters of our ranch. The Fee Land, together with its neighboring ranches in Arizona and New Mexico, is part of an unfragmented landscape with a relatively undisturbed, unplowed soil (except as set forth herein) and plant cover. This landscape supports a small human population now engaged in a rural and pastoral way of life compatible with the land. This Easement is created for the continuation of the human and ecological balance we have enjoyed on our ranch for future generations.

We support the goals of MBG and wish my lands to be managed according to its intent:

Our goal is to restore and maintain the natural processes that create and protect a healthy, unfragmented landscape to support a diverse, flourishing community of human, plant, and animal life in our Borderlands Region. Together we will accomplish this by working to encourage profitable ranching and other traditional livelihoods which will sustain the open space nature of our land for generations to come.

4. Consistent Uses. The following uses and practices on the Fee Land, though not an exhaustive recital of consistent uses and practices, are consistent with this Easement, and these practices shall not be precluded, prevented or limited by this Easement, except where provided for herein.

A. To raise, graze, range, and pasture cattle, horses, mules, hounds, donkeys, poultry, other domestic livestock and the future genetic crosses of any of them for commercial purposes.

These activities are to be carried out according to best standards of ranching historically practiced within the region of MBG at the time of its incorporation, and to the conservation practices encouraged by MBG.

B. To hunt and to guide hunters according to the ethical and professional standards established as follows:

Hunting, using "fair chase" standards which include:

- The use of mules and horses for transportation and/or on foot (walking)
- Glassing with binocular, telescope, or spotting scope
- All game hunted and/or killed in accordance with Arizona [Game and Fish Department Regulations and Seasons]
- The use of bird dogs or hounds, using legal methods
- Wildlife is not to be pursued by any form of motorized transportation
- No trapping of any form, except when or where needed to control the predator population, again in compliance with Arizona [Game and Fish Department Regulations]
- The ranch management retains the right to permit, limit, or exclude any hunting on the deeded land belonging to the landowner.
- All hunting is to be done in a serious, quiet, and safe manner with respect for wildlife and other hunters.

C. To maintain, remodel, and repair existing fences, corrals, utilities, and other improvements, and in the event of their destruction, to re-construct any of such existing improvements with another of similar size, function, capacity, location, and material. This shall also include the right to construct additional fencing and corrals and/or modify existing fencing and corrals consistent with good ranching and agricultural practices. All fencing shall be designed and constructed in a manner that minimizes adverse effect on the wildlife.

D. To maintain and repair existing roads at currently existing levels of improvement, and to construct and maintain such new roads as shall be reasonably desired for ranching and agricultural purposes and other consistent uses, as shall be consistent with the conservation purposes of this Easement.

E. To use and maintain existing waters and to develop new waters for ranching, agricultural and domestic purposes consistent with this Easement and the conservation purposes it is designed to protect.

F. To remove soil, sands, gravel, rock or other similar materials in support of the consistent uses above so long as such use does not damage the conservation intent protected by this Easement.

G. Maintain, remodel, restore, or replace the existing and allowed residential units and associated outbuildings with the understanding that these shall remain as single family residential units including mobile homes, of modest size.

H. To build up to three new residential buildings, including mobile homes, for domestic, non-commercial use only which buildings shall be solely for the use of the owners of the Fee Land or their heirs.

I. The raising and harvesting of agricultural crops, including plowing, planting, irrigating and harvesting (provided that no more than 40 acres of the Fee Land may ever be cultivated for this purpose, and once 40 acres of the Fee Land have been cultivated, no further cultivation of the remaining Fee Land shall be allowed for the purposes of this paragraph).

J. The use of natural or prescribed fire, grubbing, reseeding, and other land-management action when implemented as part of a sound land-conservation or ranch-management plan.

K. To use the existing or allowed buildings on the Fee Land as a commercial lodge, bed-and-breakfast or guest-ranch facility for housing overnight guests. The guests of this facility shall be allowed to engage in light recreational activities on the Fee Land, including hiking, horseback-riding, birdwatching, and other similar recreational uses, in a fashion that does not negatively impact the purposes of the Easement. _____ shall limit the total number of overnight guests and invitees on the Fee Land at any one time to six (6).

5. Prohibited Uses. The following uses and practices are inconsistent with the purpose of this Conservation Easement and shall be prohibited upon or within the property:

A. The division and subdivision of the Fee Land with the following exception:

The out-sale of pasture or rangelands to contiguous ranches so long as those ranches agree to uphold and respect this Easement held by MBG on the Fee Land.

B. The construction or placement of any permanent buildings or mobile homes, except as set forth in paragraphs 4.G. and 4.H.

C. The filling, dumping, and removal of soils except as provided in the Consistent Activities above.

D. The manipulation, degradation, pollution or alteration through human activities of the natural water courses of the Fee Land except as provided in the Consistent Activities above.

E. The conversion of the vegetation at the time of the signing of this Easement to new exotic cover species, or the introduction of exotic or non-native plant or animal species except for reasonable, traditional domestic, agricultural and ranching requirements already established at the Fee Land at the time of the signing of this Easement or specifically allowed in this Easement. This Easement shall not limit the use of any plant materials which are compatible with the stabilization of soils or other management activities such as prescribed fire consistent with this Easement to ultimately create favorable conditions for the re-establishment of native species. Other use of exotic plants and animals shall be at the mutual consent of the owners of the Fee Land and MBG, such consent not being unreasonably withheld.

F. The degradation through human action of the range condition, or naturally occurring animal life and wildlife of the Fee Land from their condition at the time of the signing of this Easement as established in the baseline described below. It is mutually recognized by the parties that climate and other conditions which are not a result of any acts or omissions of the owners of the Fee Land may have an effect on the range condition of the Fee Land. The owners shall not be responsible for any climatic conditions and other conditions beyond their control and will not be required to take any affirmative actions to cure, alleviate or mitigate any such climatic conditions and other such conditions and matters.

G. The sale of water and/or water rights from the Fee Land for uses other than described in this Easement.

6. **BASELINE.** At MBG's expense, a baseline detailing the condition of the property at the time of the Easement shall be created within six months for the purpose of future monitoring and interpretation of the Easement. The content and methodology of establishing the baseline shall be mutually agreeable to both parties and shall address existing roads, buildings, range condition, and general overview of the property, including a general description of the natural habitats and wildlife on the Fee Land.

7. MBG RIGHTS AND OBLIGATIONS. As holder of this conservation Easement, MBG representatives have the right to enter the Fee Land to monitor the Easement. MBG representatives shall not number more than three individuals.

MBG retains the right to monitor the Easement annually upon thirty days written notice to the Fee Land owners, prior to the visit. This visit should occur when the property owners are able to accompany the group and at a time that will not interfere with the ranch operation.

Should the Fee Land landowners have reasonable objection to the individuals selected by MBG to conduct said monitoring, and after reasonable attempts have been made to resolve the objection and the objection still remains, final and binding selection of said representatives shall be made by _____ and MBG mutually selecting a third party to monitor the terms of this Easement. Failure to make such selection will result in arbitration in accordance with ¶ 8 below.

All reports, information, and other data collected as part of the monitoring process shall be held confidential by the parties hereto.

8. MBG'S REMEDIES. In the vent that MBG representatives find a discrepancy in the actual land use and the terms and conditions in this Easement, MBG's representatives will talk over the discrepancies with the owners of the property and help find a satisfactory solution to the problem.

If a satisfactory solution can be reached between the two parties, then both parties agree that a third party mutually agreeable to both sides will be called in to remedy the situation through the arbitration process as more fully described under Exhibit B, attached hereto and incorporated by this reference herein.

9. AMENDMENT. This Easement may be amended at any time with the mutual consent of MBG and the owners of the Fee Land.

10. PUBLIC LAND ALLOTMENTS. Should, at any time in the future, the laws and policies of the State of Arizona, independent of any action taken by the parties, change the status of the state and federal land allotments of the Fee Land in such a manner as to prevent the purposes and objectives of this Easement as detailed above, this Easement may be released from the Fee Land. This determination will be made at the mutual consent of MBG and the owners of the Fee Land.

11. DISSOLUTION. In the event of the liquidation, dissolution, or winding-up of the affairs of MBG whether voluntary, involuntary, or by operation of law; this Easement shall be

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transferred to another private non-profit with goals and objectives similar to MBG, subject to the approval of _____ which approval shall not be unreasonably withheld. If _____ does not approve said transfer this Easement will be released from the Fee Land.

12. NOTICE. Any notices which may be required under this Easement shall be in writing, shall be effective when received, and shall be given by personal service, or by certified or registered mail, return receipt requested, to the address set forth below, or to such other addresses which may be specified in writing to all parties hereto.

LAND USE EASEMENT

New Mexico
Malpai-

This Land Use Easement is entered into by and between _____
_____, a married man dealing with his sole and separate property and
_____ OF NEW MEXICO, an Arizona
General Partnership, (collectively, _____), whose address is _____
_____ and the Malpai Borderlands Group, a non-profit
corporation organized under the laws of the State of Delaware ("MBG"), whose address
is P.O. Drawer 3536, Douglas, Arizona 85608.

IT IS HEREBY AGREED:

1. Recitals:

A. MBG and _____ have entered into a Memorandum of Agreement pursuant to which MBG has purchased this Easement from _____.

B. _____ is the owner of the following described real estate (Fee Land) located in Hidalgo County, New Mexico ("*Fee Land*"):

See legal description, which is attached hereto and incorporated by this reference herein as Exhibit A entitled "*Fee Land*"

C. The Fee Land currently remains in a substantially undisturbed, natural state and has significant ecological and open-space values as defined in New Mexico statutes, Sections 47-12-1 to 47-12-5, and provides significant relatively natural habitat for native plants and wildlife.

D. Under the terms and provisions of the above referenced Agreement, _____ has granted and conveyed to MBG this Land Use Easement on the terms and conditions hereinafter set forth.

E. MBG is a private organization that is a "holder" under the terms of Section 47-12-2 of the New Mexico Code.

2. Grant. For and in consideration of valuable consideration stated herein, and other valuable consideration, _____, for _____, and the assignees, transferees, grantees, and successors in interest of _____, and any future owner who may own the fee title to all or any portion of the Fee Land from time to time grants, on the terms as provided

herein, to MBG and the assignees, transferees, grantees, and successors in interest of MBG, a Land Use Easement ("*Easement*") upon the Fee Land for the purposes set forth herein. Pursuant to §47-12-3E NMSA (1978), _____, hereby specifically consents to the imposition of the Easement upon the Fee Land.

3. Purpose. Pursuant to §47-12-3E NMSA (1978), New Mexico law and the common law, the purpose of this Easement is to preserve and protect in perpetuity the natural, ecological, archeological and scenic features and values of the Fee Land and to prevent any use of the Fee Land that will significantly impair or interfere with the conservation values of the Fee Land. In doing so, it is the purpose of this Easement to foster the responsible ranching use of the Fee Land and with the due regard for the natural, ecological, archeological and scenic values of the Fee Land. _____ intends that this Easement will limit use of the Fee Land to such activities as are consistent with the purposes hereof.

As the owner of the Fee Land, we direct that this Easement ensure sustainable, traditional commercial uses of my land, such as beef production, hunting and passive recreational uses, which are dependent on and have in turn conserved the naturally occurring plant, animals, soils, and waters of our ranch. The Fee Land, together with its neighboring ranches in Arizona and New Mexico, is part of an unfragmented landscape with a relatively undisturbed, unplowed soil and plant cover. This landscape supports a small human population now engaged in a rural and pastoral way of life compatible with the land. This Easement is created for the continuation of the human and ecological balance I have enjoyed on our ranch for future generations.

We support the goals of MBG and wish my lands to be managed according to its intent:

Our goal is to restore and maintain the natural processes that create and protect a healthy, unfragmented landscape to support a diverse, flourishing community of human, plant, and animal life in our Borderlands Region. Together we will accomplish this by working to encourage profitable ranching and other traditional livelihoods which will sustain the open space nature of our land for generations to come.

4. Consistent Uses. The following uses and practices on the Fee Land, though not an exhaustive recital of consistent uses and practices, are consistent with this Easement, and these practices shall not be precluded, prevented or limited by this Easement, except where provided for herein.

A. To raise, graze, range, and pasture cattle, horses, mules, hounds, donkeys, poultry, other domestic livestock and the future genetic crosses of any of them for commercial purposes. These activities are to be carried out according to best standards of ranching historically practiced within the region of MBG at the time of its incorporation, and to the conservation practices encouraged by MBG.

B. To hunt and to guide hunters according to the ethical and professional standards established as follows:

Hunting, using "fair chase" standards which include:

- The use of mules and horses for transportation and/or on foot (walking)
- Glassing with binocular, telescope, or spotting scope
- All game hunted and/or killed in accordance with New Mexico Game and Fish Department Regulations and Seasons
- The use of bird dogs or hounds, using legal methods
- Wildlife is not to be pursued by any form of motorized transportation
- No trapping of any form, except when or where needed to control the predator population, again in compliance with New Mexico Game and Fish Department Regulations
- The ranch management retains the right to permit, limit, or exclude any hunting on the deeded land belonging to the landowner
- All hunting is to be done in a serious, quiet, and safe manner with respect for wildlife and other hunters.

C. To maintain, remodel, and repair existing fences, corrals, utilities, and other improvements, and in the event of their destruction, to re-construct any of such existing improvements with another of similar size, function, capacity, location, and material. This shall also include the right to construct additional fencing and corrals and/or modify existing fencing and corrals consistent with good ranching practices. All fencing shall be designed and constructed in a manner that minimizes adverse effect on the wildlife.

D. To maintain and repair existing roads at currently existing levels of improvement, and to construct and maintain such new roads as shall be reasonably desired for ranching purposes and other consistent uses, as shall be consistent with the conservation purposes of this Easement.

E. To use and maintain existing waters and to develop new waters for ranching, domestic and other allowed purposes consistent with this Easement and the conservation purposes it is designed to protect.

F. To remove soil, sands, gravel, rock or other similar materials in support of the consistent uses above so long as such does not damage the conservation intent protected by this Easement.

G. Maintain, remodel, restore, or replace the existing and allowed residential units and associated outbuildings with the understanding that these shall remain as single family residential units including mobile homes, of modest size.

H. To build up to two (2) new buildings, which could be mobile homes, and associated outbuildings within a one (1) acre building envelope, with each one (1) acre building envelope to be within a half mile of the existing residential building on the Fee Land. The two (2) new buildings shall be used for domestic, residential noncommercial purposes only and shall be solely for the use of _____ and their heirs (collectively, the "_____ Family"). In the event that the _____ Family does not elect to construct either or both of the two new buildings, and the Fee Land is conveyed to a third party, then this right shall terminate, and the subsequent owner may not construct these new buildings.

I. To use the existing or allowed buildings on the Fee Land as a commercial lodge, bed-and-breakfast or guest-ranch facility for housing overnight guests. The guests of this facility shall be allowed to engage in light recreational activities on the Fee Land, including hiking, horseback-riding, birdwatching, and other similar recreational uses, in a fashion that does not negatively impact the purposes of the Easement. _____ shall limit the total number of overnight guests and invitees on the Fee Land at any one time to 20 (___).

J. The use of natural or prescribed fire, grubbing, reseeding, and other land-management action when implemented as part of a sound land-conservation or ranch-management plan.

5. Prohibited Uses. The following uses and practices are inconsistent with the purpose of this Conservation Easement and shall be prohibited upon or within the property:

A. The division and subdivision of the Fee land with the following exception:

The out-sale of pasture or rangelands to contiguous ranches so long as those ranches agree to uphold and respect the Easement Agreement held by MBG on the Fee Land.

B. The construction or placement of any permanent buildings or mobile homes other than as provided for in articles G and H of the Consistent Activities above.

C. The filling, dumping, and removal of soils except as provided in the Consistent Activities above.

D. The manipulation, degradation, pollution or alteration through human activities of the natural water courses of the Fee Land except as provided in the Consistent Activities above.

E. The conversion of the vegetation at the time of the signing of this Easement to new exotic cover species, or the introduction of exotic or non-native plant or animal species except for reasonable, traditional domestic and ranching requirements already established at the Fee Land at the time of the signing of this Easement. This Easement shall not limit the use of any plant materials which are compatible with the stabilization of soils or other management activities such as prescribed fire consistent with this Easement to ultimately create favorable conditions for the re-establishment of native species. Other use of exotic plants and animals shall be at the mutual consent of the owners of the Fee Land and MBG, such consent not being unreasonably withheld.

F. The degradation through human action of the range condition, or naturally occurring animal life and wildlife of the Fee Land from their condition at the time of the signing of this Easement as established in the baseline described below. It is mutually recognized by the parties that climate and other conditions which are not a result of any acts or omissions of the owners of the Fee Land may have an effect on the range condition of the Fee Land. The owners shall not be responsible for any climatic conditions and other conditions beyond their control and will not be required to take any affirmative actions to cure, alleviate, or mitigate any such climatic conditions and other such conditions and matters.

G. The sale of water and/or water rights from the Fee Land for uses other than described in this agreement.

6. BASELINE. At MBG's expense, a baseline detailing the condition of the property at the time of the Easement shall be created within six months for the purpose of future monitoring and interpretation of the Easement. The content and methodology of establishing the baseline shall be mutually agreeable to both parties and shall address existing roads, buildings, range condition, and general overview of the Fee Land.

7. MBG RIGHTS AND OBLIGATIONS. As holder of this conservation Easement, MBG representatives have the right to enter the Fee Land to monitor the Easement. MBG representatives shall not number more than three individuals.

MBG retains the right to monitor the Easement annually upon thirty days written notice to the Fee Land owners, prior to the visit. This visit should occur when the property owners are able to accompany the group and at a time that will not interfere with the ranch operation.

Should the Fee Land landowners have reasonable objection to the individuals selected by MBG to conduct said monitoring, and after reasonable attempts have been made to resolve the objection and the objection still remains, final and binding selection of said representatives shall be made by _____ and MBG mutually selecting a third party to monitor the terms of this Easement. Failure to make such selection will result in arbitration in accordance with ¶ 8 below.

All reports, information, and other data collected as part of the monitoring process shall be held confidential by the parties hereto.

8. MBG'S REMEDIES. In the event that MBG representatives find a discrepancy in the actual land use and the provisions of the Easement, MBG's representatives will talk over the discrepancies with the owners of the property and help find a satisfactory solution to the problem.

If a satisfactory solution cannot be reached between the two parties, then both parties agree that a third party mutually agreeable to both sides will be called in to remedy the situation through the arbitration process as more fully described under Exhibit B, attached hereto and incorporated by this reference herein.

9. AMENDMENT. This Easement may be amended at anytime with the mutual consent of MBG and the owners of the Fee Land.

10. TERMINATION OF THE EASEMENT. Should, at any time in the future, a court determine that either conditions on the Fee Land have changed or the laws and policies of the State of New Mexico and the United States Forest Service, independent of any action taken by the parties, change the status of the state and federal land allotments of the Fee Land, in such a manner as to render the purposes and objectives of this Easement as detailed above impossible to accomplish, then this Easement may be released from the Fee Land.

11. DISSOLUTION. In the event of the liquidation, dissolution, or winding-up of the affairs of MBG, whether voluntary, involuntary, or by operation of law, this Easement shall be transferred to another private non-profit organization with goals and objectives similar to MBG.

12. NOTICE. Any notices which may be required under this Easement shall be in writing, shall be effective when received, and shall be given by personal service, or by certified or registered mail, return receipt requested, to the address set forth below, or to such other addresses which may be specified in writing to all parties hereto.

Appendix 4: Purchase of Development Rights
By Walter Lane, Manager, Santa Margarita Ranch

The concept of purchasing development rights via conservation easements or restrictive covenants to maintain open space has been around for a long time. There are even appraisal standards and practices for valuing these restrictions. As the demand for open space increases, more and more of these restrictions will occur. It is important, however, to pay fair value for these restrictions to the owner of the land and not to punish that landowner by taking his development rights via governmental regulation.

The Sonoran Desert Conservation Plan provides a unique opportunity to protect open space and endangered species in the Altar Valley. As increased urbanization in the Tucson area creates pressure on endangered species, there is a greater need to find suitable habitat for protection of these species. This is where ranchers in the Altar Valley can help. The ranchers would like to keep the open spaces while continuing to raise cattle. Cattle ranching and a number of the proposed endangered species have been found to co-exist together very easily. The local governments cannot, however, arbitrarily decree that this valley be perpetual open space. Somehow, the ranchers need to be compensated for their loss in property value due to forever relinquishing their development rights. Below is the most favorable outcome to this compensation issue.

Let us suppose that a developer in the Tucson urban area would like to develop 1,000 acres into a housing subdivision. In the course of his development review he becomes aware that all 1,000 acres contains an endangered species. Coincidentally, this same endangered species has habitat on an Altar Valley ranch. This ranch has an approved Habitat Conservation Plan and practices responsible renewable resource management. The developer approaches the proper governmental authorities and is told that he may develop his 1,000 acres if he will protect 1,000 acres of endangered species habitat in the Altar Valley. The developer approaches the rancher and negotiates a price for the development rights to the rancher's 1,000 acres of ranch land. The outcome is that the developer gets to develop his land, the rancher is paid a fair price for his development rights at no cost to the taxpayer and the endangered species is protected. This is a win-win situation for all involved.

I believe the foregoing is a sensible solution to solving open space and endangered species issues. It is important that a marketplace develop for these easements that is negotiable and arms-length as all other private markets are.