Nilgai Antelope and Santa Gertrudis Cattle
When properly managed, wildlife and cattle can successfully coexist (Photo by Tom Urban).

CATTLE, WILDLIFE, AND RANGE: MAKING IT WORK AT KING RANCH

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ABSTRACT

King Ranch cattle and wildlife enterprises cooperate together to insure that a sufficient return on investment occurs and that neither enterprise is inappropriately compromised. As a result, grazing plans are conservative, stocking rates are moderate, and the goal for range condition is between "fair" and "good." Where feasible, a modified Merrill System is used to allow for quick removal of stockers during times of drought and to insure range conditions are appropriately managed. In areas where native, warm-season bunch grasses remain, King Ranch does not plant introduced grasses but rather, manages to allow native grasses to increase. During 2002, a unique agreement involving a reduced stocking rate and an increase in lease payments was initiated between King Ranch and the San Tomas Lease to further improve range conditions on 1 portion of the ranch. As a result of increasing economic value of wildlife, King Ranch philosophies have shifted over the last century from initial efforts of total brush eradication, to a brief period of merely controlling brush, and finally, to its current approach of "sculpting" brush to manage it as an important resource. King Ranch was one of the first ranches to recognize the value of brush. A series of 14 brush management guiding principles were developed that included emphasis on the amount of brush to remain in each pasture, the width of treated and untreated strips, and the inclusion of 5% of the acreage in untreated scattered mottes within the treated strips. Cooperation between enterprises has also occurred in the development of burn plans, which are now conducted on a smaller scale and involve only a portion of each pasture. In addition, wildlife-sensitive time periods, such as the peak of quail nesting and deer parturition, are taken into consideration.

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INTRODUCTION

Although a positive economic return is gained from both the cattle and wildlife enterprises on King Ranch, neither entity alone generates sufficient income to yield an acceptable return on investment. Therefore, both cattle and wildlife managers must cooperate and compromise. Open and frequent communication is also essential. This paper deals with some of the ways in which the King Ranch cattle and wildlife enterprises work together, including a brief description of their history and highlights

CATTLE MANAGEMENT

King Ranch has a long and illustrious history in cattle ranching. In fact, the ranch was founded for the purpose of ranching cattle. King Ranch was originally stocked with approximately 50,000 Texas longhorns, which were descendants of cattle brought to the Americas by early Spanish colonists (Rhoad 1949). Although this breed was hardy and well adapted to the harsh environment, the carcass would not compare favorably to present-day American standards of beef cattle.

During 1880–1885, purebred Shorthorn and Hereford bulls were introduced as part of a "grading-up" period that would continue for the next 30–35 years. A herd of approximately 5,000 Shorthorns resulted, but despite improvements in breed characteristics and beef type, the developing herd lost hardiness, reproductive performance, and rustling ability (Rhoad 1949). In an effort to restore these qualities, the first exploratory crosses between Brahman and Shorthorns were conducted in 1910. Crosses between Brahman bulls and Shorthorn cows continued until a red-colored offspring of outstanding quality resulted. This bull calf, named Monkey, became the foundation sire for the development of a new breed of cattle—the Santa Gertrudis. A program of closebreeding and linebreeding to Monkey was initiated. A unique system of single-sire and multiple-sire herds also facilitated this program. The new and distinct breed was officially recognized in 1940.

In conjunction with the development of an entirely new breed of cattle, King Ranch also began a breeding program to develop a line of quarter horses. Old Sorrel, the foundation sire for this program, was said to be "the finest cow horse ever seen on King Ranch" (Rhoad and Kleberg 1946). Old Sorrel was bred to 50 of the best mares on the ranch, many of which were pure Thoroughbred.

Presently, King Ranch is moderately stocked with approximately 1 animal unit per 25–30 acres. This moderate stocking rate, established to balance the impacts of cattle and grazing on the range and wildlife, is one of many compromises between the 2 enterprises and would be substantially higher if wildlife were not a major concern. Approximately two-thirds of the animal units involve cows, while one-third involves stockers, even though stockers are less profitable in this environment than cows. This additional compromise allows the cattle enterprise to quickly remove stockers during times of drought to further minimize grazing impacts on the range and wildlife, while also allowing for the ability to keep the cowherd intact.

Cattle and wildlife managers work together on grazing plans with the recognition that stocking rate adjustments alone will not typically improve range conditions and that deferment is needed. No single system of grazing management can be prescribed ranch-wide because of varying soil types. Dominant grass species also vary across regions of the ranch, further precluding the use of 1 grazing system.

In areas where the predominant grasses are introduced species (i.e., Bermudagrass [*Cynodon dactylon*], buffelgrass [*Cenchrus ciliaris*], guineagrass [*Panicum maximum*], King Rauch bluestem [*Bothriochloa ischaemum*], or

Kleberg bluestem [*Dichanthium annulatum*]), a moderately stocked, continuous grazing system is used. A modified Merrill System (3 herds, 4 pastures) has been implemented on areas where grass stands are predominantly native warm-season bunch grasses. Pastures are stocked based on grass coverage and type versus total acreage, regardless of the grazing system in place.

The Merrill System, which was implemented to insure proper range conditions for both the cattle and wildlife enterprises, was chosen because it is uniquely suited to King Ranch. This system was specifically adapted for areas where rain may be received any time of the year and where forage growth also can occur year round. The Merrill System allows for a pasture to be grazed for about 12 months followed by a deferment period of approximately 4 months (Table 1). After 4 years, all 4 pastures are deferred 3 times, with each deferment period occurring at a different time resulting in an entire calendar year of deferment over the 4-year period. The 3 herds used in King Ranch's modified Merrill Systems include 1 fall-calving cow-calf herd, 1 spring-calving cow-calf herd, and a third herd of stockers. An advantage of having cow-calf herds with different calving dates is that only 1 of these herds is lactating (lactation is the highest nutritional stress period in a cow's production cycle) at any 1 time. Stockers are used to allow quick removal during times of drought, at which time the lactating herd can be spread over 3 of the 4 pastures. Early results 3 years after the implementation of the first Merrill System on King Ranch indicate that densities of native, climax bunchgrass species are increasing (Table 2). These range improvements occurred despite suffering through the most severe 12-month drought in history.

Table 1. Modified King Ranch Merrill System.

Pasture	Years	Herd	Months
A	1	Deferment	Jan 2003-Apr 2003
	1-2	Fall cow-calf	May 2003-Apr 2004
	2	Deferment	May 2004-Aug 2004
	2-3	Spring cow-calf	Sep 2004-Aug 2005
	3	Deferment	Sep 2005-Dec 2005
	4	Stockers	Jan 2006-Dec 2006
B	1	Fall cow-calf	May 2002-Apr 2003
	1	Deferment	May 2003-Aug 2003
	1-2	Spring cow-calf	Sep 2003-Aug 2004
	2	Deferment	Sep 2004-Dec 2004
	3	Stockers	Jan 2005-Dec 2005
	4	Deferment	Jan 2006-Apr 2006
	4	Fall cow-calf	May 2006-Apr 2007
C	1	Spring cow-calf	Sep 2002-Aug 2003
	1	Deferment	Sep 2003-Dec 2003
	2	Stockers	Jan 2004-Dec 2004
	3	Deferment	Jan 2005-Apr 2005
	3-4	Fall cow-calf	May 2005-Apr 2006
	4	Deferment	May 2006-Aug 2006
	4	Spring cow-calf	Sep 2006-Aug 2007
D	1	Stockers	Jan 2003-Dec 2003
	2	Deferment	Jan 2004-Apr 2004
	2-3	Fall cow-calf	May 2004-Apr 2005
	3	Deferment	May 2005-Aug 2005
	3-4	Spring cow-calf	Sep 2005-Aug 2006
	4	Deferment	Sep 2006-Dec 2006

RANGE CONDITIONS

A range condition of "good" to "excellent," with solid stands of climax grasses that are devoid of brush, is the goal for most cattle ranching operations. Further, cattle operations typically are not reluctant to introduce "improved" grasses such as buffelgrass or Bermudagrass. However, an "improved" pasture

Table 2. Percent of climax grasses prior to the initiation of a Merrill Grazing System on the Santa Gertrudis Division of King Ranch, compared to the percentage 3 years later.

Species	October 1999	October 2002
Bluestems (seacoast, little, silver)	1.5%	5.8%
Brownseed paspalum	0.6%	2.8%
Thin paspalum	5.4%	6.1%
Bristlegrasses (knotroot and plains)	2.4%	1.9%
Tanglehead	0.8%	1.9%
Crinkleawn	0.0%	0.2%
Total	10.7%	18.7%

void of brush and consisting of an even-aged stand of green, actively growing introduced grass would likely support few, if any, quail or deer. On the other hand, a native range condition of "fair" to "good" would likely be most productive for quail and deer. Native, warm-season bunch grasses, such as little bluestem (*Schizachyrium scoparium*), brownseed paspalum (*Paspalum plicatulum*), four-flower trichloris (*Trichloris pluriflora*), and switchgrass (*Panicum virgatum*), are especially critical for quail and turkeys because they provide nesting and security cover. These grasses can also be important sites for fawn security cover during the first few critical months of their lives. Native warm-season bunch grasses are also important during times of limited rainfall because these deep-rooted plants are more drought tolerant. As another example of compromise, a native range condition somewhere between "fair" and "good" is the goal on King Ranch. Also, introduced grasses are no longer planted in areas where native, warm-season bunch grasses remain even though they can be very productive for cattle.

Freeport-McMoRan's San Tomas Hunting Camp has existed on King Ranch primarily as a corporate quail hunting camp since 1979. Quail harvests during the first 6 years (1979–1984), averaged 1 bird per 5 acres; during the first 10 years, harvest averaged 1 bird per 13 acres; and during the last 10 years, the harvest averaged only 1 bird per 21 acres. Years of drought or below-average rainfall occur more frequently in South Texas than do years of above-average rainfall. Also, "average" annual rainfall in South Texas is biased upward because of the infrequent hurricane and tropical storm events that occur, resulting in sporadic annual rainfall totals exceeding 30 inches. Although rainfall has varied during the last 24 years and may account for much of the annual variation in numbers of harvested quail, the population trend as measured by harvest clearly indicates that quail populations are declining and that abundance is lower now than when the lease was initiated in 1979.

Notable habitat changes that have occurred include a dramatic decrease in range conditions. In other words, a noticeable decrease in native, warm-season bunch grasses has caused a corresponding decrease in livestock and wildlife carrying capacity. These native grass stands have been replaced by short-lived, early successional grasses (i.e., sandburs [*Cenchrus* spp.], goosegrass [*Eleusine indica*], threeawns [*Aristida* spp.]) and annual forbs (i.e., sunflowers [*Annulatus* spp.], crotons [*Croton* spp.], cardinalfeather [*Acalypha radians*]).

A trend toward more conservative harvests (from an average of 300 outings annually during the first 6 years to an average of only 180 outings during the last 10 years) has failed to reverse the trend toward lower quail abundance and has not helped the population to return to 1979–1988 levels. It is evident that the critical number of nesting quail required to replenish the population has not been carried into the spring nesting season during recent years. Late-season harvest certainly removes some quail that would have otherwise survived to nest and replenish the population. However, excessive grazing, especially during times of drought, that results in pastures without sufficient grass structure from late winter through summer further reduces quail

abundance and lowers nesting success to only a fraction of the density necessary to replenish the population. Therefore, the combination of drought, late-season harvest mortality, and grazing management acted to reduce long-term quail abundance on the San Tomas Lease.

This downward trend in the quail population, as well as a concern about losing grazing capacity, prompted the initiation of a Merrill System in 1999, altering stocking rates and duration of grazing to insure that adequate nesting cover and structure are present. Proper grazing management that allows for sufficient winter-to-spring carryover of quail should allow for increased quail abundance while also reducing year-to-year variability.

However, due to a lessee desire for more rapid progress, a grazing agreement was entered into between King Ranch and the San Tomas Lease during the summer of 2002. This unique agreement, involving a reduced stocking rate on behalf of King Ranch and an increase in lease payments by the San Tomas Lease to offset lost revenue, was initiated with the goal of improving range conditions. The agreement began with a 3-year plan that included either total deferment, or a 50% reduction in grazing intensity (i.e., animal unit months [AUM]) on 24,000 acres of the San Tomas Lease. Pastures in very low range condition received total deferment for 1 year, while other pastures were grazed at one-half of their recent stocking rate. Fortunately, above-average rainfall occurred during 2002, which has allowed a rapid recovery of the grass structure and an opportunity for the native, warm-season bunch grasses to reseed.

Additional grazing management changes included modifications to the pre-existing Merrill System, which had been in place since 1999. The number of cattle herds in this system was reduced from 3 to 2, while the number of animal units was reduced 50%. Two additional pastures previously on a switchback grazing system were completely deferred during 2002 and will be grazed at one-half of their traditional stocking rate during 2003–2004. Two additional pastures were grazed very lightly during 2002 with a stocker herd. These 2 pastures will be deferred during 2003–2004.

Benefits of reduced stocking rates and grazing deferments were seen in 2002 (5 months into the program). Ground cover was greatly improved the first season, which resulted in improvements in hunting quality because quail were less likely to flush "wild" when sufficient cover existed. As a result, quail held better in front of pointing dogs, allowing hunting guests the opportunity to witness increased covey rises reminiscent of the early 1980s. Nesting cover during the spring of 2003 was excellent and the number of nesting pairs of quail was higher than seen in recent years.

Prescribed fires will be incorporated into the grazing plan as range conditions improve and forage levels increase. These fires will be used to reduce brush invasion, remove dead and decaying debris, shorten vegetation height, and improve hunting access. Sufficient grass cover should remain to inhibit germination of additional mesquite plants. Individual plant treatment (IPT), using the chemicals *Vel-Par*™ and *Remedy*™, will be used to thin existing brush stands to further increase hunting access.

King Ranch cattle, range, and wildlife personnel will continue to confer and cooperate with San Tomas Lease personnel to modify this program over time to insure that range and wildlife habitat improvements are achieved. Ultimately, forage production for cattle should increase and more stable wildlife populations should result.

WILDLIFE MANAGEMENT

King Ranch also has a long and illustrious history in wildlife management. According to Aldo Leopold (Letter from Aldo Leopold to Val Lehmann, March 12, 1947), "The big thing is that the King Ranch is one of the best jobs of wildlife restoration on the continent, and has almost unparalleled opportunities for both management and research. Still more important: it is a gem

among natural areas, and must be kept intact." Val Lehmann (1957:761) added, "Wild game has perhaps received more attention on King Ranch than on any other private ownership in North America."

Habitat management practices on King Ranch for the benefit of wildlife date back to the early 1900s, when brush shelters were first constructed for bobwhite quail (*Colinus virginianus*). Additional pioneering habitat improvements included modifying windmills to provide overflow to fenced ponds allowing for a continuous and exclusive, ground-level water source for wildlife; half-cutting shrubs and the construction of "living fences" in open areas to increase security cover; and strip disking to create soil disturbance thereby promoting early successional plant species important for wildlife. In 1925, an organized predator control program was implemented with the hiring of a full-time trapper. By 1946, the predator control staff had increased to 4 and the annual removal of coyotes (*Canis latrans*) and bobcats (*Felis rufus*) had topped 2,000.

Hunting regulations on King Ranch date back to 1912 when Caesar Kleberg implemented a hunting code to increase sport and reduce crippling losses (Lehmann 1957). Populations of white-tailed deer and Rio Grande turkey (*Meleagris gallopavo intermedia*) were nearly nonexistent. Bob Kleberg once told of seeing only 2 deer on the ranch in an entire year. Thus, in 1925, over 400,000 acres of King Ranch were closed to hunting to allow deer and turkey populations to rebuild. By 1928, deer and turkey populations on the Norias Division were of densities sufficient to allow restocking to other divisions. During this year, 100 turkeys were released on the Laureles Division where turkeys did not previously exist. An additional 200 turkeys were released on the Santa Gertrudis Division, where turkeys had been extirpated. Subsequently, deer and turkey from King Ranch have been released in many other parts of Texas as well as other states around the nation.

As early as 1940, Bob Kleberg, Jr., and King Ranch recognized the potential economic value in managing for wildlife. One result of this philosophical change in wildlife attitudes was the hiring of Val Lehmann in 1945, making King Ranch 1 of the first privately owned ranches in the U.S. to add a professional wildlife biologist to its staff. Mr. Lehmann developed census techniques for monitoring wildlife populations and implemented a research program on the ranch that resulted in the completion of many noteworthy scientific studies on a variety of wildlife species. In addition, Mr. Lehmann, who is best known for his landmark book *Bobwhites in the Rio Grande Plains of Texas*, was hired to examine different avenues for developing an economic return from wildlife on King Ranch. King Ranch has continued to open its doors to various scientific wildlife research projects. One of the most visible recent projects, the South Texas Quail Project, was initiated in cooperation with the Caesar Kleberg Wildlife Research Institute during 1998. The goals of the project, which is being conducted on the San Tomas Lease, are to monitor quail population dynamics on several different habitat types in hopes of improving quail densities. The data collected in this long-term, large-scale project include nesting success, survival, habitat preference, hunting dynamics, and predation through the use of radio telemetry. Project results may be useful in guiding the decision-making process relating to future habitat management throughout South Texas.

Another highly visible project involving the King Ranch is the South Texas Buck Capture Project, which was also initiated in cooperation with the Caesar Kleberg Wildlife Research Institute. This intensive, long-term project is being conducted on 5 ranches throughout South Texas. The objectives are to (1) test for differences among spike-antlered and fork-antlered yearling bucks at older ages to determine if spikes are inferior to fork-antlered bucks in free-ranging situations; (2) acquire a large, known-age sample of mandibles and incisor teeth from deer of all age classes to modify and improve the accuracy

and precision of aging techniques based on tooth replacement, tooth wear, and cementum annuli; (3) test for relationships among antler growth and rainfall to determine periods when rainfall is most critical; and (4) determine when antler size peaks for bucks in South Texas and measure year-to-year changes in antler characteristics within individual bucks and age classes. Project results will be useful in guiding deer management in South Texas for decades to come.

Caesar Kleberg, the principal proponent of exotic releases, initiated a nilgai antelope (*Boselaphus tragocamelus*) release program in 1924 in hopes that exotics might occupy an ecological role intermediate between deer and cattle. Although the initial releases were unsuccessful, in 1941, 12 nilgai antelope, including 8 cows and 4 bulls, were successfully released onto the Norias Division (Sheffield et al. 1983). By 1948, this population had grown to over 100 animals (Lehmann 1957). By 1972, there were an estimated 3,300 nilgai on King Ranch (Mungall and Sheffield 1994:61). Nilgai density estimates peaked around 11,000 during the late 1990's (M. Hellickson, unpublished data). King Ranch has since discontinued any further releases of exotics.

BRUSH MANAGEMENT

The result of frequent and extended droughts, cessation of fire, and lack of grazing deferment led to a loss of the higher successional grasses and ultimately, encroachment of brush. These factors turned South Texas from what was once a sea of grass to a sea of brush. Obviously, from a cattle ranching standpoint, replacing grass with brush is detrimental because carrying capacity is reduced leading to lower stocking rates and smaller profits. For these reasons, King Ranch began actively fighting this invasion of brush in the early 1900s. In fact, many of the mechanical methods of brush removal used today were developed on King Ranch. However, from a wildlife standpoint, this brush encroachment increased habitat diversity and provided a tremendous baseline food source during times of drought for a wide array of wildlife species. White-tailed deer especially, benefited from the spread of brush.

Bob Kleberg recognized as early as the 1940s the economic value of wildlife and its reliance on brush. Thus, with the hiring of Val Lehmann a systems approach to managing the brush, wildlife, and cattle was initiated. By the late 1970s, the leasing of hunting rights on private ranch lands began and attitudes toward brush and its encroachment began to change. As a result of the trend toward leasing, and the increase in wildlife-generated income, ranchers began to realize the value of brush. This shift in attitudes resulted in a corresponding shift in management that allowed for a balance between grasslands and brush.

As a result of the above, the ranch's goals have also shifted over the years from an initial period of total brush eradication, to a period of brush control, and finally, to its current form of "sculpting" brush to manage it as an important resource. King Ranch management, recognizing the importance of having a comprehensive brush management plan in place, established a review team of noted experts in the fields of range and wildlife management in 1998. This team assisted the ranch with defining the appropriate landscape mixture of brush and grass and with methods of brush management. Based on information provided by this review team, Paul Genho, King Ranch Vice President of Livestock and Ranching Operations, formulated the following brush management guiding principles.

1. **Not all soils are created equal**. King Ranch soil types vary widely in potential forage yields and as a result, the number of acres required per cow also varies widely. Therefore, the highest returns on investment in brush management occur in areas where soils are most productive. Hence, these areas are prioritized in the brush management plan.

2. **Edge is important for wildlife**. Bobwhite quail and white-tailed deer, the wildlife species of highest importance, are not well adapted to either a complete brush canopy or a completely open grassland habitat. Instead, these species perform best in a mixed habitat with some brush to provide concealment and a baseline forage source during times of drought. Open areas are also required because the bulk of the forage consumed by both of these species is produced in these areas. The preferred habitat for both species is the "edge" between brush and open rangeland. For wildlife purposes, a pasture with a few, very large mottes of brush scattered within open areas is inferior to a pasture with the same amount of brush, but in a higher number of smaller mottes.
3. **No single method of brush management will accomplish the ranch's goals**. No single brush treatment method is indicated for all situations. What is appropriate for 1 situation may be the wrong treatment for another situation or location. In brief, some of the methods for brush management and the relative advantages and disadvantages are provided in Table 3.
4. **Brush management is a process, not an event**. The high cost of treating dense stands of brush usually cannot be justified economically unless the benefits of the initial treatment are extended by less costly maintenance methods. As a result, individual brush treatment plans are developed for each pasture that include multiyear plans for both the initial and follow-up treatments (see Fig. 1).
5. **Flow chart decision making**. A decision must be made in each situation regarding the most effective treatment methods because no single treatment is best for all situations and locations. EXSEL, a computer flow chart decision-making software program, is used to aid in planning treatments.
6. **Certain sensitive areas are left undisturbed**. Highly sensitive areas, such as riparian drainages, wetland borders, and mature mesquite corridors, are not treated.
7. **Brush–grass proportions**. The critical issue regarding the most appropriate mix of brush and grass likely relates to the distance wildlife must travel to reach security cover. Deer generally forage within 100 yards of concealment cover, requiring brushy areas large enough to allow freedom of movement while concealed. Quail generally forage no more than 50 yards from cover, with areas as small as a single brush plant providing sufficient cover for concealment. Therefore, brush treatment patterns are developed that result in a maximum treated strip width of 200 yards. Untreated strips of brush between treated strips are 100 yards wide to allow deer freedom of movement. Narrow openings are then cleared through the untreated strips at varying intervals to increase cattle gathering efficiency and to increase edge for wildlife. The resulting landscape will be approximately 65% grass and 35% brush; however, these ratios are the result of the above defined principles not the goal of the brush control program. This ratio should meet wildlife needs for concealment, browse, and edge, while also improving forage production for cattle. In addition to the above strip pattern, 5% of the pasture acreage is left in small, 0.25 to 0.5-acre mottes scattered throughout the treated strips.
8. **Follow-up treatments**. Research has indicated that brush reinvasion of grasslands can reach up to 30% canopy coverage before forage production is adversely affected. Canopy coverage less than 30% is also required to allow for sufficient grass growth to provide adequate fuel loads for follow-up prescribed fires. Therefore, treated areas are re-treated when canopy

Table 3. Brush management methods and relative advantages and disadvantages.

Method	Cost	Advantages	Disadvantages
1. Rootplowing	High	Provides high level of initial control	Mesquite- and huisache- dominated reinvasion
		Effects are long lasting	Desirable understory plants reduced or eliminated
		High level of soil disturbance promotes early successional plant species	Disturbs sod reducing native grass stands, allowing invasive species to establish and spread
		Effective in mesquite- and huisache-dominated areas	Increased risk of wind erosion and loss of organic matter if applied on sandy soils
			Slow treatment rate
2. Chaining	Low	Effective initial treatment	Limited to primarily large-stemmed brush plants
		Limited soil disturbance	Less promotion of early successional plants
		High treatment rate	Increases prickly pear cactus densities
			Requires follow-up prescribed fire treatment
			Promotes regrowth of brush plants not uprooted
3. Roller chopping	Moderate	Moderate level of soil disturbance	Regrowth is rapid and multi-stemmed
4. Shredding	Moderate	No soil disturbance	Regrowth is rapid and multi-stemmed
5. Aerial spraying	High	No soil disturbance	Reduces early successional plant densities
		High treatment rate	Not an option near agriculture due to drift
		Plant species specific	Limited time frame when most effective
			Inconsistent results
6. Individual plant treatment	High	Limited soil disturbance	Limited time frame for application
		Effective in areas of low stem density	Cost prohibitive in areas of high stem density
		Plant species specific	
7. Prescribed fire	Low	No soil disturbance	Most effective on younger brush plants
		Promotes early successional plant species	Requires coordination with grazing management
		Effective for follow-up maintenance	Limited time frame when applicable and effective
			Liability risks

SANTA GERTRUDIS DIVISION

PAISANO PASTURE

October 7th, 2002

Goals:

- 65 % grass 35% brush
- 200 yd wide grass strips w/ 100 yd wide permanent brush strips w/ openings spaced @ 1/8, 1/4, or 1/2 mile approx. 75 yds wide (2 openings per mile)
- Scattered mottes (5%) of various sizes will be left in cleared strips
- Strips will be in a north/south pattern throughout pasture
- 50-yd grass strip along fences unless major exception is noted
- Leave brush on west and south fenceline
- Clear 20-30 yds around outside of water traps (leave big mature trees, but clear understory)

Plan:

- 2002 Chain 65% of pasture with 200 yd wide grass strips leaving 100 yd wide brush strips
- 2005 Defer, burn, & rest to clean up debris and allow area to reestablish

Budget:

· 2002	Double Chain 5800 acres @ 12.00/ac	=	$	69,612.00
· 2002	Create openings 219 acres	=	$	12,500.00
· 2002	Rootplow fire lanes 218 acres @ 72.00/ac	=	$	15,700.00
· 2002	Stack fire lanes 218 acres @ $ 30.00/ac	=	$	6,500.00
· 2002	Disk fire lanes 218 acres	=	$	3,000.00
· 2002	King Ranch Cost	=	$	107,312.00

Paisano Pasture Rotation Schedule:

Jan 2000 - May 2000	Rest
May 2000- April 2001	Fall Calvers
May 2001 - Sept 2001	Rest
Sept 2001 - Aug 2002	Spring Calvers
Sept 2002 - Dec 2002	Rest
Jan 2003 - Dec 2003	Stockers
Jan 2004 - April 2004	Rest

Fig. 1. Example of an actual brush management plan written for the Paisano Pasture of King Ranch.

coverage reaches approximately 30%. Untreated brush areas remaining after treatment are considered permanent and no future brush treatment will occur in these areas.

9. **Grazing management is essential**. While there is no known way of completely preventing brush encroachment, good stands of grass slow the invasion rate by providing competition. Good grazing management results in better grass and stands of desirable forbs and thus improves both cattle and wildlife habitat. Proper grazing management is essential to maximize brush treatment effectiveness because grass stands of sufficient density slow the re-invasion rate of brush by providing competition. Proper grazing management also allows for sufficient fuel loads necessary for follow-up prescribed burns and maintenance. Where feasible, the Merrill System (3 herds, 4 pastures) is being implemented to improve range conditions and allow for more management flexibility.
10. **Stock based on grass, not on total acreage**. Two pastures of equal size may have different cattle carrying capacities because of varying brush coverage amounts. Therefore, stocking rates are based on grass acreage versus total acreage.
11. **Nilgai antelope densities must be controlled**. Nilgai densities have increased during recent years, which has accelerated the rate of brush re-encroachment and reduced the benefits of brush removal. As a result of this and a dietary overlap with both cattle and deer, their numbers are being reduced.
12. A **permanent brush–grass landscape plan will be developed for each pasture**. It is critical that the cattle and wildlife enterprises cooperate toward a unified brush management plan. Therefore, each entity participates in the development of the plans and each contributes suggestions for changes and amendments before fieldwork proceeds. An example of a King Ranch brush management plan is provided in Figure 1.
13. **GIS and GPS will be useful tools**. King Ranch is incorporating Geographic Information Systems (GIS) and Global Positioning Systems (GPS) technology into the long-range brush management planning. These "cutting-edge" mapping systems allow the planning of future brush treatments in greater detail and accuracy. GIS and GPS, combined with ground-proofing and soil mapping, enable various plant species to be accurately identified, allowing for more selective removal. These tools play a critical role in the continued enhancement of the natural resources that exist on King Ranch.
14. **Financial considerations and lessee participation**. The ranch is committed to spend a consistent and realistic amount on brush management annually. In addition, hunting lessees have been provided the option of participating in the brush management planning process, wherein they can gain a multiyear lease by contributing toward the costs of brushwork on their lease each year.

The formulation of brush management plans involves a tremendous amount of communication, cooperation, and compromise between the cattle and wildlife enterprises. The finalized brush pattern is the result of this process and the resulting brush–grass mix is felt to be the best balance for cattle, quail, and deer.

One issue is the amount of brush to remain in each pasture. If King Ranch were only managed for cattle, nearly 100% of brush would be removed. If quail management were the priority, around 80% of the brush canopy would be removed, with untreated brush left in small, scattered mottes. If deer management were the priority, only around 50% of the brush canopy would be removed, with untreated brush left in

strips and scattered, larger mottes. Another area of compromise is the width of treated and untreated strips within the pasture. Cattle require only an occasional shade tree, while a 10-yard-wide strip of untreated brush at 50-yard intervals would likely suffice for quail. Deer, on the other hand, require larger areas of untreated brush. Therefore, widths of treated and untreated strips were initially set at 200 and 125 yards, respectively. Ideally, mottes of untreated brush should be left within the cleared strips to allow quail the ability to reach concealment cover more easily. As a result of the concern for quail, untreated brush strip widths were reduced from 125 yards to 100 yards to allow for an additional 5% of the pasture to remain in untreated scattered mottes within the treated strips.

The burn plans that are developed in association with each brush management plan also involve enterprise compromise. If cattle were the only concern, burns would occur on a pasture-wide basis during times when the grass response to the burns would be expected to be greatest. However, because quail and deer are also a concern, burns are conducted on a smaller scale involving only a portion of each pasture. In addition, wildlife-sensitive time periods, such as the peak of quail nesting and deer parturition, are taken into consideration. The burn plans also include a scheduled period of deferment following the burn to allow grasses to sufficiently recover prior to being grazed.

CONCLUSION

Enterprise management of King Ranch cattle, wildlife, and range resources has evolved into an integrative systems approach. Managers of each enterprise are now more in harmony than ever before, communicating often to discuss current activities and the problems facing each of their areas of responsibility. Each enterprise Area Manager develops an annual plan for range management, consisting of a 1-year burn plan as well as mechanical and chemical brush treatment plans that outline the methods of control and timing of application for each targeted pasture. Cattle and wildlife managers rely on each other for advice and support, and the range manager completes the plans in a way that is conducive to the cohabitation of cattle and all species of wildlife. Field technicians also communicate often, and serve as the "eyes and ears" for lessee representatives, further strengthening relationships between King Ranch and its group of lessees.

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