

Water Use by Livestock and Game Animals in the Plateau Regional Water Planning Area

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Introduction

Hunting is a large part of the economy in the Plateau Region. In some cases hunting has replaced traditional livestock as the primary source of income for ranches. In addition to native species, some ranches have imported exotic game animals for their hunting clients. These exotic species are usually confined by high fencing. The high fencing limits access by both the native and non-native animals to natural sources of water, creating greater reliance on pumped groundwater to support these species. In addition, some of these exotic game animals, most notably axis deer, have escaped and established large free-roaming populations throughout the area. Feral hogs, which have originated either as escaped domestic hogs or European wild hogs imported for hunting, have large populations in the region as well.

The Plateau Regional Water Planning group is concerned that the water use for game species is not included in the regional plan. These species are similar to livestock in that they provide considerable economic benefit to the region. Ranchers develop groundwater supplies to provide water for confined exotic species as well as to attract native species. Preliminary estimates of water use by exotic animals show that these animals use about the same amount of water as more conventional livestock species.

This memorandum describes:

- Methods used by the Texas Water Development Board (TWDB) to determine water use and projected demands for traditional livestock
- Trends in water use for traditional livestock
- Available data on the population and water use by game species in the Plateau Region

Changes to the livestock demand projections for the region are not recommended at this time. However, the Plateau Regional Water Planning Group may wish to consider revisions in the next round of regional water planning. More complete data on animal populations in each county will be needed to develop these projections.

Historical and Projected Livestock Water Use in the Plateau Region

Table 1 shows the historical and projected use for livestock in the Plateau Region from the Texas Water Development Board (TWDB). The projected water demands are equal to the year 2000 historical use and remain the same throughout the planning period. Livestock water use was about 6 percent of the total historical water use in the Plateau Region in 2007. (At this time, 2007 is the last year of complete historical water use available for the Plateau Region.)

Table 1
Historical and Projected Livestock Use in the Plateau Region
from the Texas Water Development Board
 (Values in Acre-Feet per Year)

Historical							
Year	Bandera County	Edwards County	Kerr County	Kinney County	Real County	Val Verde County	Region Total
1974	427	1,311	1,012	780	329	1,223	5,082
1980	376	1,011	535	618	267	1,053	3,860
1984	319	510	442	482	227	471	2,451
1985	284	513	407	468	210	495	2,377
1986	265	443	306	567	226	545	2,352
1987	283	486	337	632	225	596	2,559
1988	331	552	390	680	235	687	2,875
1989	327	549	384	620	234	678	2,792
1990	325	552	382	624	232	691	2,806
1991	333	600	399	648	244	749	2,973
1992	333	615	526	675	174	663	2,986
1993	312	595	488	592	139	676	2,802
1994	361	603	492	553	182	592	2,783
1995	362	596	473	536	180	565	2,712
1996	294	426	432	465	128	534	2,279
1997	275	424	448	391	144	465	2,147
1998	288	473	428	346	143	599	2,277
1999	346	568	501	404	156	733	2,708
2000	315	562	487	445	176	767	2,752
2001	314	520	450	419	158	773	2,634
2002	278	460	415	387	160	687	2,387
2003	241	446	415	285	141	590	2,118
2004	253	439	414	309	136	533	2,084
2005	263	463	369	331	160	516	2,102
2006	263	391	385	298	127	497	1,961
2007	279	312	385	272	143	437	1,828

Projected							
Year	Bandera County	Edwards County	Kerr County	Kinney County	Real County	Val Verde County	Region Total
2000	315	562	487	445	176	767	2,752
2010	315	562	487	445	176	767	2,752
2020	315	562	487	445	176	767	2,752
2030	315	562	487	445	176	767	2,752
2040	315	562	487	445	176	767	2,752
2050	315	562	487	445	176	767	2,752
2060	315	562	487	445	176	767	2,752

TWDB calculates historical livestock water use by multiplying the number of livestock animal units by the estimated water needs for each type of animal. The Natural Resources Conservation Service *National Range and Pasture Handbook* defines an animal unit as “one mature cow of approximately 1,000 pounds and a calf up to weaning, usually 6 months of age, or their equivalent.” Animal units can be used to estimate the amount of water or feed needed in livestock operations. One animal unit can represent many individual animals. For example, 1,000 hens is one animal unit.

Table 2 shows the historical animal units from 2003 to 2007, as provided by TWDB. TWDB obtains the number of animal units from the United States Department of Agriculture (USDA). Cattle, sheep, goats and horses are the dominant types of livestock in the Plateau Region. Table 3 shows the water use factors used by TWDB to develop historical water use data.

Trends in Livestock Water Use

Figure 1 compares the historical to projected livestock water use for the region. There is a significant decline in water use between 1974 and 1984, and a slight downward trend since 1984. The estimated year 2007 livestock water use is about 37 percent of the 1974 water use and about 66 percent of the projected livestock water used for planning. This trend is probably the result of the reduction of traditional ranching as a source of income in the region.

Exotic Game Animal Water Use

Numerous exotic game species have been introduced into the Plateau Region. These species were primarily introduced for hunting, which has become a significant source of income in the region. Many of these species are confined in high fenced areas. These animals are essentially equivalent to other types of livestock kept on ranches for commercial purposes. Some of these species have escaped confined operations and have become established throughout the region. Species such as axis deer can out-compete native deer for food. As a result there are now large free-roaming populations of axis deer in addition to the confined populations.

Because many of these species are kept in confined areas, access to natural sources of water may be limited. As a result, groundwater is used as a water source for the commercial herds. Other ranches that are not confined may supplement natural water sources with groundwater to attract game species and improve hunting. The Plateau Regional Water Planning Group believes that, because hunting is a major commercial activity in the area, water use by game species should be considered in regional water planning.

Although not considered a game species, feral hogs have also established significant populations in the region. These hogs originated as domestic hogs or imported European wild hogs. Because there are so many of these animals, water use by feral hogs is significant as well.

Table 2
Historical Livestock Animal Units in the Plateau Region Years 2003 to 2007

Year	County	Cattle	Hogs	Sheep	Goats	Broilers	Horses	County Total
2003	Bandera	11,000	0	8,100	11,000	0	2,465	32,565
	Edwards	16,000	438	37,000	67,000	0	3,797	124,235
	Kerr	20,000	0	13,000	21,000	0	2,828	56,828
	Kinney	11,000	0	23,000	22,000	249	2,491	58,740
	Real	7,000	0	4,200	10,000	0	534	21,734
	Val Verde	15,000	0	108,000	42,000	0	5,396	170,396
	<i>Category Total</i>	<i>80,000</i>	<i>438</i>	<i>193,300</i>	<i>173,000</i>	<i>249</i>	<i>17,511</i>	<i>464,498</i>
2004	Bandera	12,000	0	5,500	11,000	0	2,465	30,965
	Edwards	16,000	0	35,000	73,000	0	3,797	127,797
	Kerr	20,000	0	12,000	21,000	0	2,828	55,828
	Kinney	13,000	0	18,000	21,000	257	2,491	54,748
	Real	7,000	0	2,100	9,000	0	534	18,634
	Val Verde	14,000	0	90,000	41,000	0	5,396	150,396
	<i>Category Total</i>	<i>82,000</i>	<i>0</i>	<i>162,600</i>	<i>176,000</i>	<i>257</i>	<i>17,511</i>	<i>438,368</i>
2005	Bandera	12,000	0	5,000	11,000	0	3,252	31,252
	Edwards	17,000	0	36,000	77,000	0	4,022	134,022
	Kerr	18,000	0	12,000	22,000	0	2,054	54,054
	Kinney	15,000	0	17,000	24,000	0	2,054	58,054
	Real	7,000	0	2,300	8,000	3	2,396	19,699
	Val Verde	11,000	0	91,000	43,000	0	7,702	152,702
	<i>Category Total</i>	<i>80,000</i>	<i>0</i>	<i>163,300</i>	<i>185,000</i>	<i>3</i>	<i>21,480</i>	<i>449,783</i>
2006	Bandera	12,000	0	4,900	12,000	0	3,252	32,152
	Edwards	13,000	0	34,000	75,000	0	4,022	126,022
	Kerr	19,000	0	12,000	21,000	0	2,054	54,054
	Kinney	13,000	0	17,000	24,000	0	2,054	56,054
	Real	5,000	0	2,500	8,500	3	2,396	18,399
	Val Verde	10,000	0	89,000	46,000	0	7,702	152,702
	<i>Category Total</i>	<i>72,000</i>	<i>0</i>	<i>159,400</i>	<i>186,500</i>	<i>3</i>	<i>21,480</i>	<i>439,383</i>
2007	Bandera	13,000	0	4,600	11,000	0	3,252	31,852
	Edwards	9,000	0	30,000	70,000	0	4,022	113,022
	Kerr	19,000	0	12,000	20,000	0	2,054	53,054
	Kinney	12,000	0	13,000	24,000	0	2,054	51,054
	Real	6,000	0	2,200	8,500	14	2,396	19,110
	Val Verde	7,000	0	85,000	45,000	0	7,702	144,702
	<i>Category Total</i>	<i>66,000</i>	<i>0</i>	<i>146,800</i>	<i>178,500</i>	<i>14</i>	<i>21,480</i>	<i>412,794</i>

* Data are from the Texas Water Development Board

Table 3
TWDB Livestock Water Use Factors

Livestock Type	Water Needs (gallons per animal unit)
Dairy Cattle	75
Fed Cattle	15
Other Cattle	15
Hogs & Pigs	11
Sheep	2
Goats	0.5
Hens (thousand)*	90
Broilers (thousand)*	15
Horses	12

* For poultry 1 animal unit equals 1,000 birds

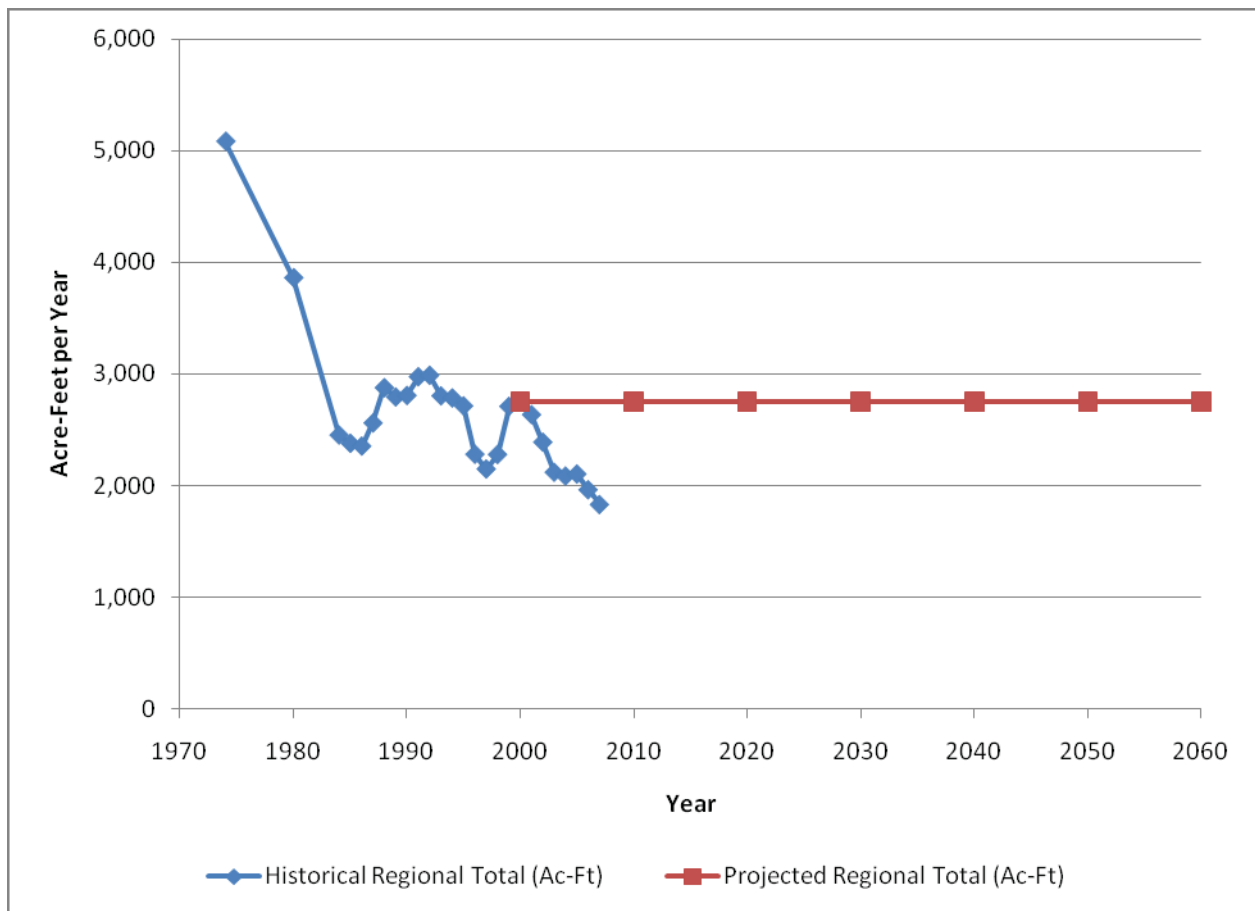


Figure 1
Historical and Projected Livestock Water Use for the Plateau Region

A four-step methodology was developed to determine the water used by game species and feral hogs:

1. Select dominant species
2. Determine water use per animal
3. Estimate population
4. Multiply population by water use per animal.

In the mid 1990s two surveys were conducted on the populations of exotic game animals in Texas. In 1995 the Texas Parks and Wildlife Department (TPWD) conducted a statewide census of exotic big game animals. TPWD reported these data for each county. The second survey was conducted in 1996 by the Texas Agricultural Statistics Service and the Exotic Wildlife Association. In this survey the state was divided into four regions. Figure 2 shows that the Plateau Regional Planning Area falls in Region 3 in this survey. Since Region 3 is a large area it is difficult to apply the results to the Plateau Region. FNI was unable to locate more recent surveys of exotic game species.

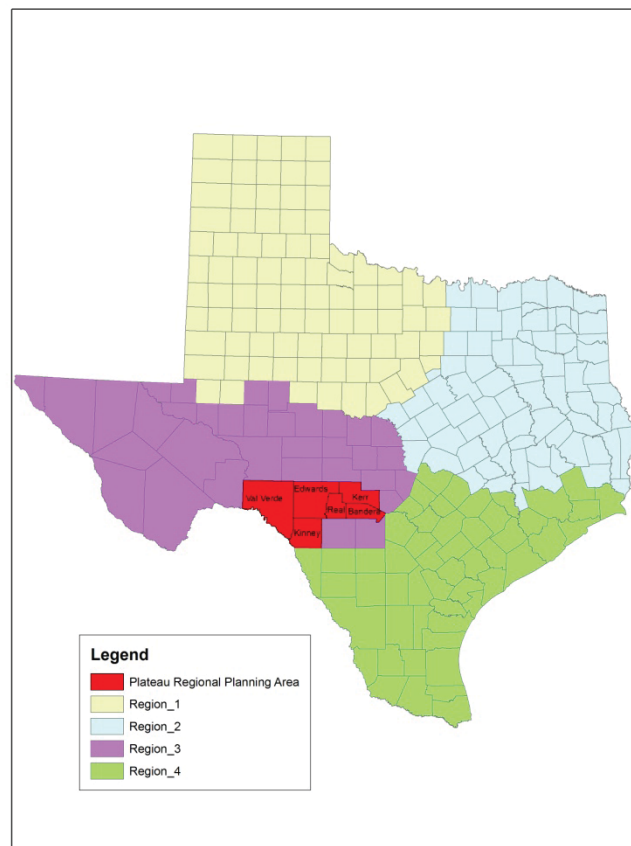
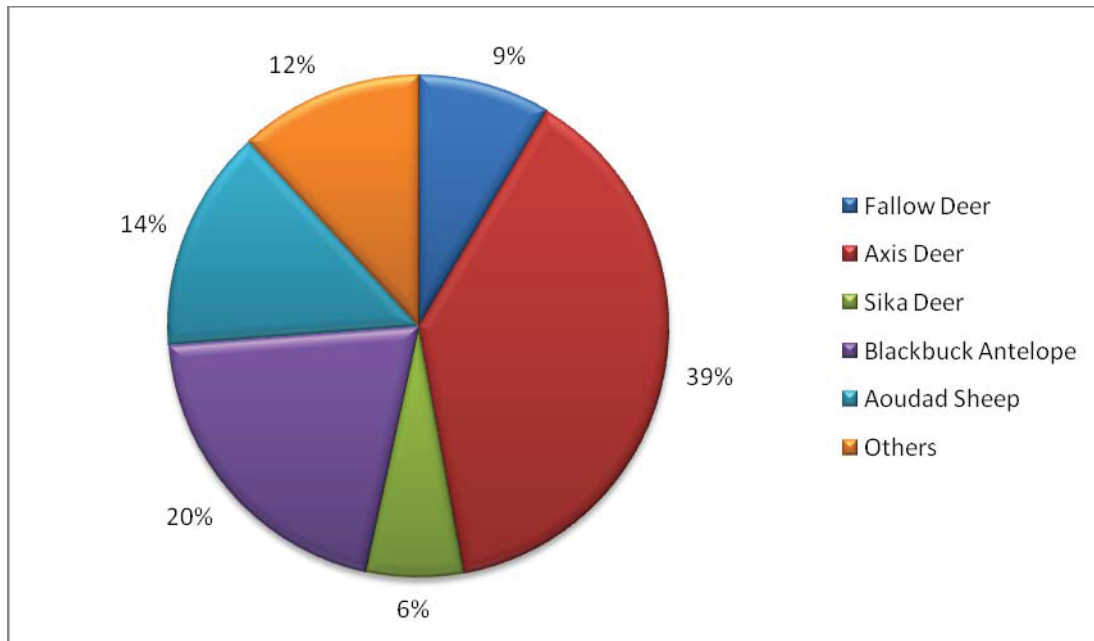


Figure 2
Texas Agricultural Statistics Service and the Exotic Wildlife Associations Survey Regions

According to the 1995 TPWD survey, the dominant species in the Plateau Region were axis deer, aoudad sheep, blackbuck antelope, fallow deer, and sika deer. Figure 3 shows the percentage of these animals compared to the overall population of exotic game species in the Plateau Region.



Data are from the 1995 TPWD Statewide Census of Exotic Big Game Animals.

Figure 3
Percentage of Exotic Game Species in the Plateau Region from 1995 TPWD Survey

Data on water use by these exotic game animals are not readily available. According to Dr. Fred Bryant of Texas A&M – Kingsville and Dr. Urs Kreuter of Texas A&M - College Station, water use by exotic game is proportional to the weight of the animal. Dr. Bryant recommends using 0.005 gal/day/lb and Dr. Kreuter recommends using 0.008 gal/day/lb. These water use factors can be multiplied by the average weight of exotic species to estimate gallons per animal per day. Average weights for exotic species were determined from the *Mammals of Texas Online Edition*. Table 4 shows the estimated average weight and water needs for exotic game using both factors.

Table 4
Exotic Game Average Adult Weight and Range of Estimated Water Needs

Species	Average Adult Weight (lbs)	Estimated Water Needs (gallons per animal per day)	
		@ 0.005 gal/day/animal	@ 0.008 gal/day/animal
Fallow Deer	132	0.7	1.1
Axis Deer	173	0.9	1.4
Sika Deer	175	0.9	1.4
Blackbuck Antelope	72	0.4	0.6
Aoudad Sheep	231	1.2	1.8

The only comprehensive sources of exotic species population data are the two surveys conducted in the mid 1990s. TPWD and other agencies no longer collect data on exotic game species, so more recent data are not readily available. Mr. Ray Aguirre, a TPWD biologist in Kerr County, estimates that there are 8,000-10,000 axis deer in Kerr County and 6,000 axis deer in Bandera and Real Counties. Ryan Schmidt, a TPWD biologist in Edwards County, estimates that in Edwards County there is one white tail deer for every 11 to 15 acres, one axis deer for every 20 acres, and 1 feral hog for every 10 acres. Lee Sweeten of the Real Edwards Conservation and Reclamation District (RECRD) provided both population and water use estimates for game species and feral hogs in Edwards and Real Counties (Tables 5 and 6). Mr. Sweeten estimates 602 acre-feet of water use by exotics in Edwards County and 233 acre-feet in Real County. The projected demands for traditional livestock in these counties are 562 and 176 acre-feet per year, respectively. These estimates show that including exotic species could more than double livestock water use projections in these counties.

Table 5
RECRD Exotic Species Estimates for Edwards County

Edwards County	Estimated Number	Gallons per Day	Gallons per Year	Acre Feet per Year
White Tail	106,899	106,899	39,045,004	120
Axis	67,840	138,723	50,668,559	156
Feral Hog	135,680	281,282	102,738,093	315
Black Buck	4,500	3,681	1,344,390	4
Elk	500	4,499	1,643,143	5
Other	1,500	1,840	672,195	2
Totals	316,919	536,924	196,111,384	602

Table 6
RECRD Exotic Species Estimates for Real County

Real County	Estimated Number	Gallons per Day	Gallons per Year	Acre Feet per Year
White Tail	44,800	44,800	16,363,200	50
Axis	29,867	61,073	22,306,913	68
Feral Hog	44,800	92,876	33,922,955	104
Black Buck	2,500	2,045	746,883	2
Elk	500	4,499	1,643,143	5
Other	2,000	2,454	896,260	3
<i>Totals</i>	<i>124,467</i>	<i>207,746</i>	<i>75,879,354</i>	<i>233</i>

Conclusions

- The water use projections for traditional livestock may be higher than the actual livestock needs in the region. The Plateau Region may wish to monitor livestock population data to see if the downward trend in livestock populations continues.
- Water use by game species can be estimated using techniques similar to those employed by TWDB in estimating traditional livestock water use. However, at this time there are insufficient data on the number of animals in the region to make these estimates. Additional information on exotic game populations will be required if the Plateau Region wishes to include this water use in regional planning.

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