

2015 Spotlight Deer Survey Report

Prepared for:
Lower Colorado River Authority (LCRA)



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Executive Summary

During September 2015, four LCRA properties were surveyed using traditional strip-transect spotlight techniques to determine estimated deer population sizes. Results for each property are as follows.

- Double Horn Resource Area estimated density is 5.91 acres per deer, with a sex ratio of 1.45 does per buck, and a fawn crop of 0.19 fawns per doe.
- Canyon of the Eagles Preserve deer density was estimated to be 12.12 acres per deer, with a sex ratio of 2.33 does per buck and a fawn crop of 0.43 fawns per doe.
- Canyon of the Eagles Park deer density was estimated at approximately 2.52 acres per deer, with and a fawn crop of 0.63 fawns per does. No Bucks were observed during the Canyon of the Eagles Park surveys, thus a sex ratio was not determined.
- The Wheless Preserve density was estimated to be 73.80 acres-per-deer. The sex ratio and fawn crop could not be determined due to lack of buck and fawn observations.

Traditional spotlight survey methodology clearly has drawbacks for properties with habitat characteristics similar to those found at each LCRA site, resulting in potentially skewed or inaccurate estimates. A review of each site to determine best survey methodologies and possible integration of remote camera surveys are strongly encouraged for future surveys efforts to improve the quality of data and reliability of population estimates and ensuing harvest recommendations. Feral hogs pose a significant management concern on the Double Horn and Canyon of the Eagles properties.

Introduction

This report presents results of a series of deer surveys conducted on four Lower Colorado River Authority (LCRA) properties in Burnet and Travis counties – Double Horn Resource Area, Canyon of the Eagles Preserve, Canyon of the Eagles Park, and the Wheless Preserve (Appendix A). Each of these surveys were conducted by staff members or approved subcontractors of Plateau Land and Wildlife Management (Plateau). Each property consisted of three survey nights conducted in September, following protocol in compliance with Texas Parks and Wildlife Department standards as described by Shult and Armstrong (1999).

Methodology

Three (3) spotlight census counts were conducted on each of the LCRA tracts between September 8 and 26, following newly established routes, or routes that were modified from past survey efforts. Counts began ½ to 1 hour after official sunset. A pickup truck was used for measuring visibility and conducting deer counts. Surveyors, consisting of highly experienced personnel, included two individuals in the truck bed operating spotlights, and a driver recording data and navigating the route. During each census count, weather parameters were recorded at the start and the end of the count, and the length of each route was measured by the vehicle's

odometer and utilizing Geographic Information System (GIS). Visibility measurements were recorded every 1/10th (0.1) mile perpendicular to the vehicle, indicating the survey line's visible acreage, resulting in a representative percentage of the entire property.

Each deer sighted during the spotlight surveys was identified as buck, doe, or fawn. If sex or age classification was not obtainable in a reasonable timeframe or before the animal was no longer visible, they were classified as unidentified, and the survey continued. Resulting estimated deer densities are expressed as the number of acres per deer. It is calculated by dividing the number of visible acres by the total number of deer seen on the spotlight route, including deer that were not identified to age or gender. Herd statistics are calculated using all deer that were reliably identifiable to age and gender, giving us estimated sex ratios (does per buck) and fawn crops (fawns per doe). Maps of each property and their survey routes have been provided (Appendices B, C, and D). We do not actively seek out other non-target species by shining spotlights into the sky or into treetops; however, we do tend to encounter a variety of animals other than deer during census counts, the results of which are provided for each tract (Tables 1- 4)

Double Horn Resource Area Results

The Double Horn census route covered approximately 197.1 visible acres, representing 24% of the entire property. The length of the survey line was 3.1 miles (Appendix B).

Overall Herd Composition: (Average from all trip counts)

Density: (acres:deer) **5.91:1**

Sex Ratio: (doe:buck) **1.45:1**

Fawn Crop: (fawn:doe) **0.19:1**

The estimated deer density on Double Horn for 2015 is **5.91 acres per deer**. This population density is higher than desired; the targeted density for the subject property given its existing habitats and current health is 10-12 acres per deer.

Herd composition is calculated using all deer that were reliably identifiable to age and gender (Figure 1). For the 2015 survey series, this included 33 bucks, 48 does, and 9 fawns. The sex ratio is balanced. Higher ratios, those skewed more towards female deer, provides for an undesirably high potential productivity rate, but also limits opportunities for harvesting mature bucks within a given carrying capacity for the property. Desirable sex ratios should be 2:1 or less.

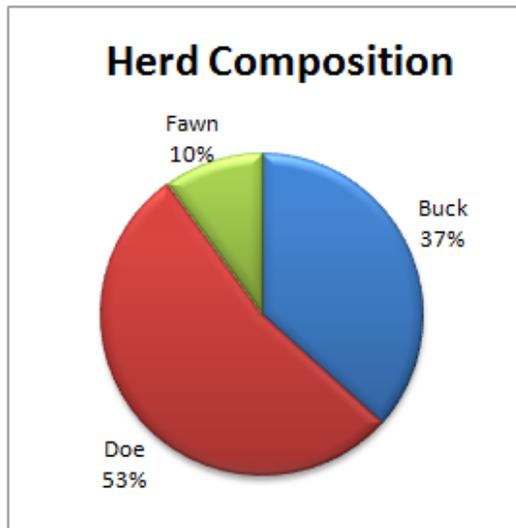


Figure 1: Herd Composition of Double Horn.

The observed fawn:doe ratio is considered low, possibly indicating that the overall population level is higher than the habitat can support, or that other biological factors (predators) or stochastic events (drought, heat) may have limited fawn recruitment. However, tall grasses and midstory vegetation may have limited fawn sightings, and regional fawn crops are presumed to be fairly high this year due to early year rain events and resulting quality range conditions. In a healthy herd, the fawn crop should be at least 0.50 fawns per doe or even higher. An assumed ratio of 0.50 was used in calculating harvest recommendations.

Following is a concise summary of notations made to the data sheets for each of the 3 counts:

Trip: 1 of 3		Date: 9-Sep	Start time: 8:38 PM	CDT		
		Official Sunset 7:47 PM	End Time: 9:53 PM	CDT		
		Moon Phase Waning crescent				
Start Wind Speed (MPH):	Calm	Start Cloud Cover: 0.8				
Start Wind Direction:	N/A	Start Temp. (F): 85				
End Wind Speed (MPH):	2	End Cloud Cover: 30				
End Wind Direction:	SW	End Temperature: 80				
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
1 of 3	13	16	1	2	32	6.16

Trip: 2 of 3		Date:	17-Sep	Start time:	8:45 PM	CDT
		Official Sunset	7:37 PM	End Time:	10:32 PM	CDT
		Moon Phase	Waxing crescent			
Start Wind Speed (MPH):	Calm	Start Cloud Cover:	Clear			
Start Wind Direction:	N/A	Start Temp. (F):	86			
End Wind Speed (MPH):	3	End Cloud Cover:	Clear			
End Wind Direction:	S	End Temperature:	84			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
2 of 3	9	22	5	5	41	4.81

Trip: 3 of 3		Date:	24-Sep	Start time:	8:29 PM	CDT
		Official Sunset	7:28 PM	End Time:	9:57 PM	CDT
		Moon Phase	Waxing gibbous			
Start Wind Speed (MPH):	Calm	Start Cloud Cover:	0.75			
Start Wind Direction:	N/A	Start Temp. (F):	84			
End Wind Speed (MPH):	Calm	End Cloud Cover:	0.25			
End Wind Direction:	N/A	End Temperature:	77			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
3 of 3	11	10	3	3	27	7.30

Based on Double Horn’s area of 809 acres, the current population of deer on Double Horn is estimated at 137 animals. This is distributed as follows: 31% bucks (43), 46% does (63), and 23% fawns (31). **To achieve a target density of 8 acres per deer and a target sex ratio of 1.0 does per buck , the harvest recommendation for the 2015-2016 hunting season is 7 bucks and 24 does.** Long-term density goals should be closer to 10-12 acres:deer, though would require a more aggressive harvest (13 bucks, 31 doe), and may not be readily achievable in one season. Traditional spotlight surveys are problematic on Double Horn, primarily due to a complete lack of vehicular access to the southern 2/3s of the property. A large percentage of excluded acreage, low visibility, and a somewhat constricted survey route greatly increases sampling issues, thus increasing the likelihood of poor estimates.

Table 1. Incidental observations on COE Preserve.

	9-Sep	17-Sep	24-Sep
Armadillo	1	1	1
Bat (Mexican free-tailed)		1	
Cottontail rabbit		2	15
Eastern Screech-Owl	2		
Feral hog	1	3	2
Field mouse sp.		1	
Great Blue Heron	1		
Great Horned Owl	2	1	
Leopard frog		1	
Opossum	1		
Raccoon		1	1
Striped skunk	1		3

Canyon of the Eagles Preserve Results

The Canyon of the Eagles Preserve (COE Preserve) census route covered approximately 109.1 visible acres, representing 14% of the entire property. The length of the survey line was 4.7 miles (Appendix C).

Overall Herd Composition: (Average from all trip counts)

Density: (acres:deer) **12.12:1**

Sex Ratio: (doe:buck) **2.33:1**

Fawn Crop: (fawn:doe) **0.43:1**

The estimated deer density of the COE Preserve for 2015 is **12.12 acres per deer**. This population density is at acceptable levels; the targeted density for the subject property given its existing habitats and current health is 10-12 acres per deer.

Herd composition is calculated using all deer that were reliably identifiable to age and gender (Figure 2). For the 2015 survey series, this included 6 bucks, 14 does, and 6 fawns. The sex ratio is mostly balanced. Higher ratios provides for an undesirably high potential productivity rate, and also limits opportunities for harvesting mature bucks within a given carrying capacity for the property. Desirable sex ratios should be 2:1 or less.

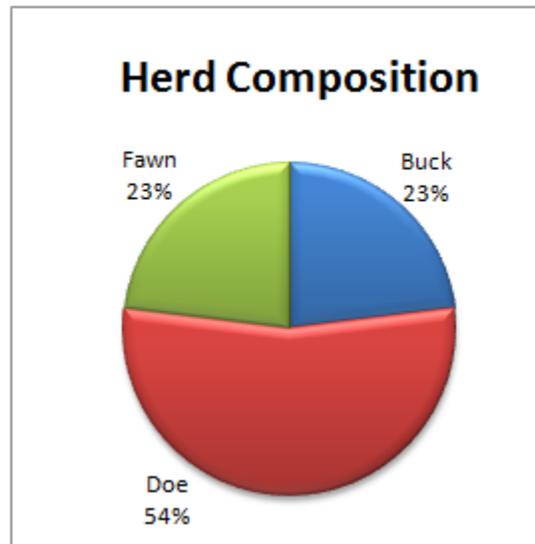


Figure 2: Herd Composition of COE Preserve.

The observed fawn:doe ratio is considered acceptable. In a healthy herd, the fawn crop should be at least 0.50 fawns per doe or even higher.

Following is a concise summary of notations made to the data sheets for each of the 3 counts:

Trip: 1 of 3		Date:	10-Sep	Start time:	9:04 PM	CDT
		Official Sunset	7:47 PM	End Time:	10:55 PM	CDT
		Moon Phase	Waning crescent			
Start Wind Speed (MPH):	5	Start Cloud Cover:	0.3			
Start Wind Direction:	S	Start Temp. (F):	78			
End Wind Speed (MPH):	1	End Cloud Cover:	Clear			
End Wind Direction:	S	End Temperature:	76			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
1 of 3	2	10	3	0	15	7.27

Trip: 2 of 3		Date:	16-Sep	Start time:	9:15 PM	CDT
		Official Sunset	7:39 PM	End Time:	11:24 PM	CDT
		Moon Phase	Waxing crescent			
Start Wind Speed (MPH):	7	Start Cloud Cover:	Clear			
Start Wind Direction:	S	Start Temp. (F):	84			
End Wind Speed (MPH):	4	End Cloud Cover:	Clear			
End Wind Direction:	SSE	End Temperature:	80			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
2 of 3	1	4	3	0	8	13.64

Trip: 3 of 3		Date:	22-Sep	Start time:	9:05 PM	CDT
		Official Sunset	7:32 PM	End Time:	10:26 PM	CDT
		Moon Phase	Waxing gibbous			
Start Wind Speed (MPH):	Calm	Start Cloud Cover:	Clear			
Start Wind Direction:	N/A	Start Temp. (F):	84			
End Wind Speed (MPH):	Calm	End Cloud Cover:	Clear			
End Wind Direction:	N/A	End Temperature:	78			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
3 of 3	3	0	0	1	4	27.28

Based on an area of 800 acres, the current population of deer on the COE Preserve is estimated at 66 animals. This is distributed as follows: 21% bucks (14), 48% does (32), and 21% fawns (14). **To maintain the density at its current level (approximately 12 acres per deer) and obtain a target sex ratio of 1.0 does per buck, the harvest recommendation for the 2015-2016 hunting season is 10 does.**

Survey route coverage was fair across the property, though significant acreage was not accessible. Furthermore, with the exception of the large field situated near the observatory in the

north-central portion of the property, visibility along the drive line was severely limited due to the density of mid-story woody plants (whitebrush, persimmon, juniper, mesquite, etc.).

Table 2. Incidental observations on COE Preserve.

	10-Sep	16-Sep	22-Sep
Armadillo	2	3	3
Bat (Mexican free-tailed)	2	5	1
Common Poorwill			1
Cottontail rabbit	2		13
Feral hog	9	1	
Gray fox			1
Great Horned Owl	1		
Northern Mockingbird	1		
Raccoon	6	1	2

Canyon of the Eagles Park Results

The Canyon of the Eagles Park (COE Park) census route covered approximately 33.6 visible acres, representing 22% of the entire property. The length of the survey line was 1.8 miles (Appendix C).

Overall Herd Composition: (Average from all trip counts)

Density: (acres:deer) **2.52:1**

Sex Ratio: (doe:buck) **N/A**

Fawn Crop: (fawn:doe) **0.63:1**

The estimated deer density of the COE Park for 2015 is **2.52 acres per deer**. This population density is much higher than desired; the targeted density for the subject property given its existing habitats and current health is 10-12 acres per deer.

Herd composition is calculated using all deer that were reliably identifiable to age and gender (Figure 3). For the 2015 survey series, this included 0 bucks, 24 does, and 15 fawns. The sex ratio could not be determined due to lack of observed bucks, but an assumed ratio of 2.0 was used in calculations for harvest recommendations.

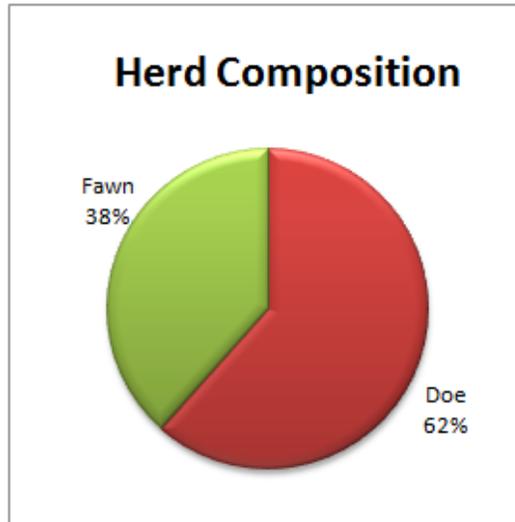


Figure 3: Herd Composition of COE Park.

The observed fawn:doe ratio is considered acceptable, given the favorable range conditions stemming from a wet start to the year. In a healthy herd, the fawn crop should be at least 0.50 fawns per doe or even higher.

Following is a concise summary of notations made to the data sheets for each of the 3 counts:

Trip: 1 of 3		Date:	10-Sep	Start time:	8:30 PM	CDT
		Official Sunset	7:47 PM	End Time:	9:04 PM	CDT
		Moon Phase	Waning crescent			
Start Wind Speed (MPH):	5	Start Cloud Cover:	Partly cloudy			
Start Wind Direction:	S	Start Temp. (F):	78			
End Wind Speed (MPH):	1	End Cloud Cover:	Clear			
End Wind Direction:	S	End Temperature:	76			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
1 of 3	0	5	3	1	9	3.73

Trip: 2 of 3		Date:	16-Sep	Start time:	8:30 PM	CDT
		Official Sunset	7:39 PM	End Time:	9:07 PM	CDT
		Moon Phase	Waxing crescent			
Start Wind Speed (MPH):	4	Start Cloud Cover:	Clear			
Start Wind Direction:	SSE	Start Temp. (F):	85			
End Wind Speed (MPH):	6	End Cloud Cover:	Clear			
End Wind Direction:	SSE	End Temperature:	84			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
2 of 3	0	15	8	0	23	1.46

Trip: 3 of 3	Date:	22-Sep	Start time:	8:35 PM	CDT	
	Official Sunset	7:32 PM	End Time:	9:02 PM	CDT	
	Moon Phase	Waxing gibbous				
Start Wind Speed (MPH):	Calm	Start Cloud Cover:	Clear			
Start Wind Direction:	N/A	Start Temp. (F):	82			
End Wind Speed (MPH):	Calm	End Cloud Cover:	Clear			
End Wind Direction:	N/A	End Temperature:	84			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
3 of 3	0	4	4	0	8	4.19

Based on property acreage of 150 acres, the current population of deer on the COE Park is estimated at 60 animals. This is distributed as follows: 23% bucks (14), 47% does (28), and 30% fawns (18). **Reducing current densities to a more manageable size (6 acres per deer) and obtaining a more desirable sex ratio of 1.0 does per buck, the harvest recommendation for the 2015-2016 hunting season is 4 bucks and 9 does.**

The relatively small property is likely seeing an influx of deer from the surrounding area, funneled in by the lake and the shared high-fence boundary with the Preserve. Though regional deer numbers are undoubtedly high, current estimates for the Park are likely overestimated. Reducing deer numbers may have short-term, localized impact, and is strongly recommended annually to ensure reduce browse pressure and to slow deer movement into the park from surrounding areas. As with the other properties, low visibility creates sampling issues with traditional spotlight surveys - remote camera surveys may improve accuracy of density estimates.

Table 3. Incidental observations on COE Park.

	10-Sep	16-Sep	22-Sep
Armadillo			
Bat (Mexican free-tailed)		1	
Cottontail rabbit	1	1	3
Domestic cat	1		
Eastern Screech-Owl	1	1	2
Feral hog	4	11	3
Gray fox	1		
Raccoon	1	6	
Striped skunk			1

Wheless Preserve Results

For the Wheless Preserve, the census route covered approximately 73.79 visible acres, representing only 3% of the entire property. The length of the survey line was 6.6 miles. As a result of dense vegetation and low visibility, deer sightings were almost completely lacking with a total of 3 doe observations over the three-night effort. Resulting density estimates for the property are 73.80 acres:deer. No bucks or fawns were observed, thus the sex ratio and fawn crop are unknown.

Following is a concise summary of notations made to the data sheets for each of the 3 counts:

Trip: 1 of 3		Date:	8-Sep	Start time:	8:46 PM	CDT
		Official Sunset	7:46 PM	End Time:	10:16 PM	CDT
		Moon Phase	Waning crescent			
Start Wind Speed (MPH):	8	Start Cloud Cover:	Partly Cloudy			
Start Wind Direction:	SSE	Start Temp. (F):	88			
End Wind Speed (MPH):	10	End Cloud Cover:	Partly Cloudy			
End Wind Direction:	SSE	End Temperature:	85			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
1 of 3	0	0	0	0	0	N/A

Trip: 2 of 3		Date:	19-Sep	Start time:	8:32 PM	CDT
		Official Sunset	7:32 PM	End Time:	10:20 PM	CDT
		Moon Phase	Waxing crescent			
Start Wind Speed (MPH):	3	Start Cloud Cover:	Clear			
Start Wind Direction:	SE	Start Temp. (F):	84			
End Wind Speed (MPH):	5	End Cloud Cover:	Clear			
End Wind Direction:	SE	End Temperature:	80			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
2 of 3	0	1	0	1	2	36.90

Trip: 3 of 3		Date:	26-Sep	Start time:	8:22 PM	CDT
		Official Sunset	7:22 PM	End Time:	10:18 PM	CDT
		Moon Phase	Waxing gibbous			
Start Wind Speed (MPH):	2	Start Cloud Cover:	Clear			
Start Wind Direction:	E	Start Temp. (F):	83			
End Wind Speed (MPH):	Calm	End Cloud Cover:	Partly Cloudy			
End Wind Direction:	N/A	End Temperature:	76			
Trip	Buck	Doe	Fawn	Unknown	Total	Density (acres:deer)
3 of 3	0	1	0	0	1	73.80

Table 4. Incidental observations on the Wheless Preserve.

	8-Sep	19-Sep	26-Sep
Cottontail rabbit		1	1
Coyote		1	
Gray fox			1
Jackrabbit			1
Porcupine		1	

Based on our experience with deer census and habitat evaluation, our best assessment of this property is that the deer population is quite low and well under the carrying capacity of the property. No immediate need exists to incur the expense and effort associated with a culling operation. Since the property is part of the Balcones Canyonlands Preserve, however, deer densities should be monitored on a regular basis to track population trends.

Conclusions

Though traditional spotlight surveys are widely used to determine deer population sizes and composition, each of the LCRA properties exhibits varying degrees of survey route problems, including excessive brush and other vegetative characteristics that impede visibility during surveys. Extrapolating deer observations collected during spotlight surveys across low representative visible acreage results in potentially distorted population estimates. Thus, data analysis and resulting harvest recommendations are less reliable for making informed management decisions.

Moving forward, it is strongly recommended that spotlighting methodology is replaced or supplemented with remote camera surveys. Infrared-triggered cameras are an accurate way to identify deer and estimate population size as they can sample constantly for a specified period of time and capture deer that may have been missed using traditional techniques that sample small areas for a short period of time. Initial research found that between 80-100% of bucks could be photographed on a property if cameras were placed at no less than 1 camera/160 acres. Results similar to helicopter surveys have been obtained in South Texas (Koerth 1997). Incidental observations collected during daylight hours are an important supplement to spotlight or camera surveys as they help more accurately determine sex ratios and fawn production, two parameters that greatly influence harvest recommendations.

While white-tailed deer are an important part of our ecosystem, they can be a detriment to habitat for all wildlife if not controlled, especially in an enclosed high-fenced population. One of the benefits of reducing deer numbers is that, when deer management reduces overall numbers and makes more natural food available for each animal, individual deer become healthier and less likely to suffer from malnutrition and disease. Habitats with excessive deer often have fewer and less diverse populations of forbs, important food sources for a variety of wildlife including songbirds. Properties actively managing deer populations are more likely to see a wider variety of birds and other wildlife. Also, because deer rely heavily on woody plant stems and leaves (browse), a loss of hardwood seedlings such as Texas oak, shin oak, and cedar elm is typically seen on properties with excessive deer numbers. Chronic, long-term consumption of seedlings by deer will result in a loss of lower and mid-level woody plants as no young plants are available to replace older or dying trees. This leads to an overall decrease in the diversity of plants which, in turn, decreases the diversity of wildlife able to utilize the habitat. Lack of hardwood recruitment is of major conservation concern to endangered species as well, including the Golden-cheeked Warbler (*Setophaga chrysoparia*) and the Black-capped Vireo (*Vireo atricapilla*). Warblers rely on mature juniper woodlands with a high hardwood component. Limited hardwood replacement in aging woodlands reduces the desirability and longevity of the critical habitat. Vireos similarly require a strong deciduous component (especially shin oak) in low-lying shrubby habitat which is widespread on the COE Preserve. Though vireos may be utilizing the habitat annually, a

strong diversity with an elevated percentage of shin oak is typically necessary for high usability and nesting success.

In addition to lowering deer numbers, the ecological health of each property could benefit from a number of management efforts including feral hog control, Brown-headed cowbird control, and a reduction in regrowth and adolescent juniper. Feral hog and cowbird traps were noted on the COE Preserve and hog trapping was noted on Double Horn. These practices should continue. Removal of juniper will result in an increase in desirable grasses, forbs, and woody plants that are much more likely to be utilized by deer and other wildlife. Brush management targeting juniper was observed on Double Horn during the course of the survey. It is also recommend that year-round feeding of corn not be conducted, as this practice can exacerbate current deer overpopulations.

Harvest records should be collected for all animals taken, including sex, age, weight, and antler measurements. With adequate efforts to cull excess animals, average body weights and antler dimensions will increase both overall and within each age class. Increasing age structure of bucks by allowing young bucks to mature can increase buck quality relatively quickly (over next several years).

Plateau is happy to offer deer management services. Plateau maintains a partnership with Orion Research and Management Services, which holds a State-issued Special Use-Scientific Collection Permit. Biological data are taken from all harvested deer as part of ongoing research with several Texas Universities. We utilize an experienced team of professional wildlife biologists and military trained sharpshooters to run a safe, effective, and efficient harvest program. Our services are quick and discreet, and we will work closely with landowners and/or managers to accommodate their needs. Harvested deer will be removed from the property and edible portions will be donated to charitable organizations for human consumption.

Literature Cited

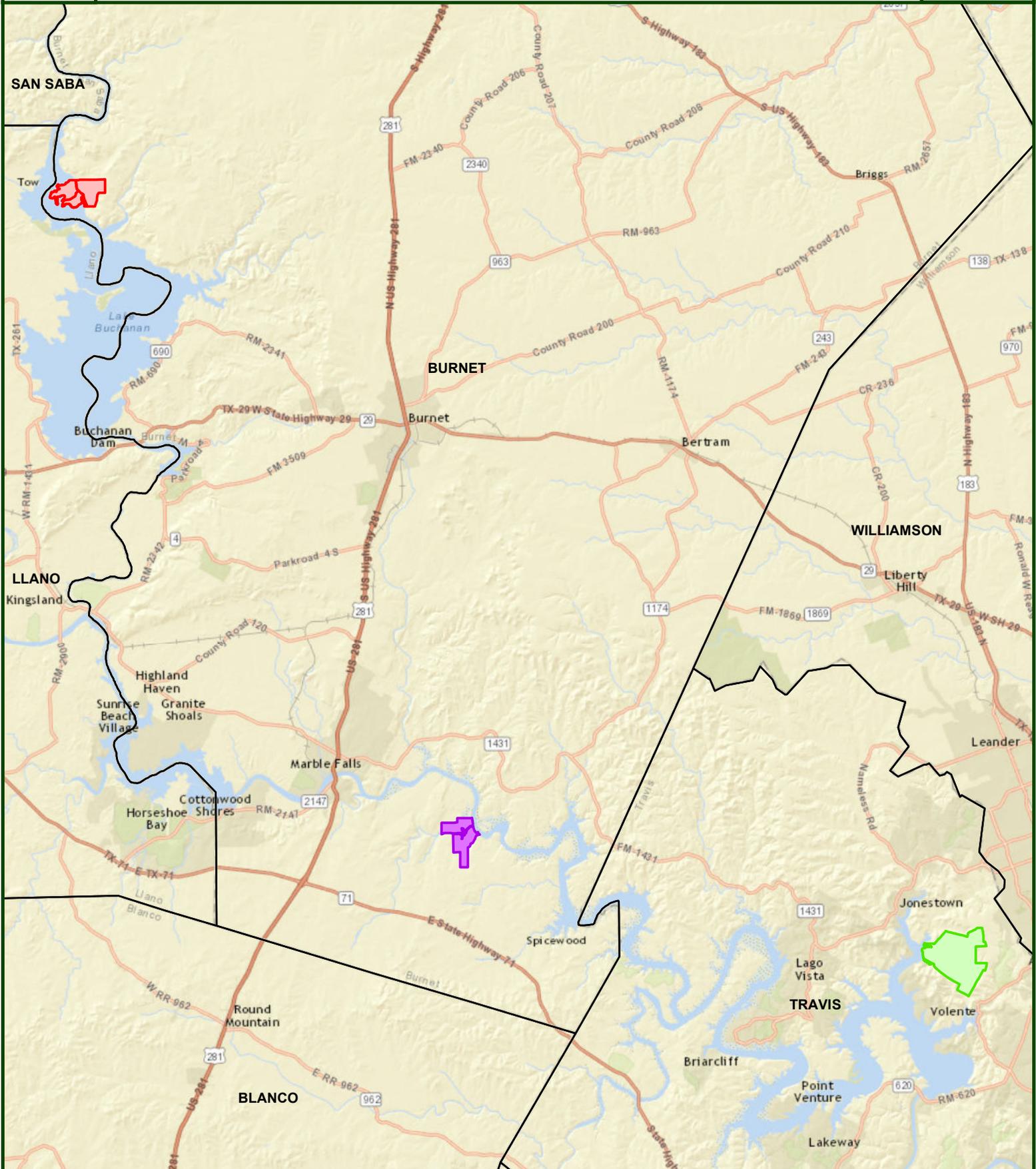
Koerth, B. H., C. D. McKown and J. C. Kroll. 1997. Infrared-triggered camera versus helicopter counts of white-tailed deer. *Wildlife Society Bulletin*, 25:557-562.

Shult, M. J. and B. Armstrong. 1999. Deer census techniques. Booklet 7000-83. Texas Parks and Wildlife. Austin.



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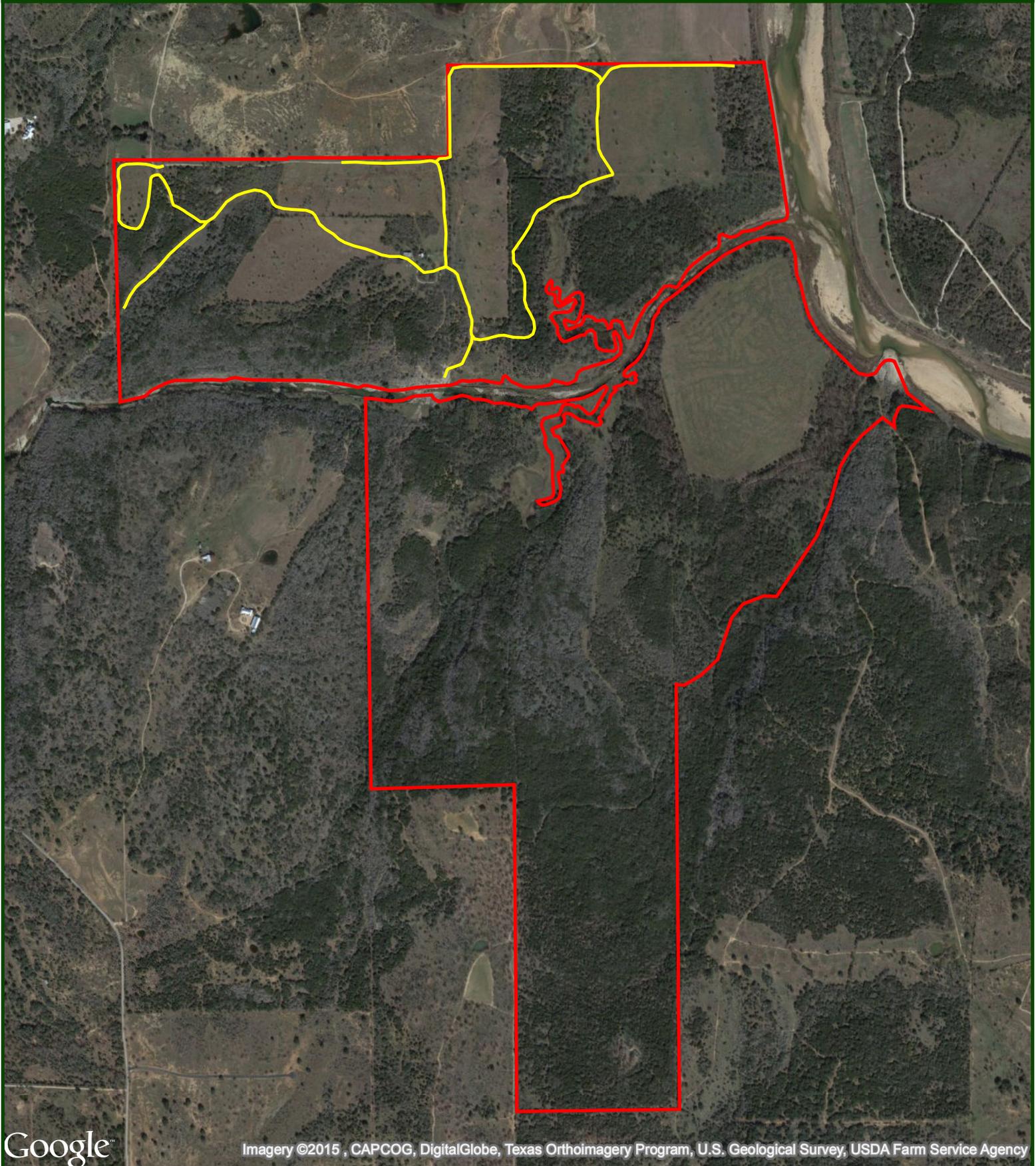
Appendix A - LCRA Property Locations





2015 Spotlight Survey Report

Appendix B - Double Horn Resource Area



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Imagery ©2015 , CAPCOG, DigitalGlobe, Texas Orthoimagery Program, U.S. Geological Survey, USDA Farm Service Agency



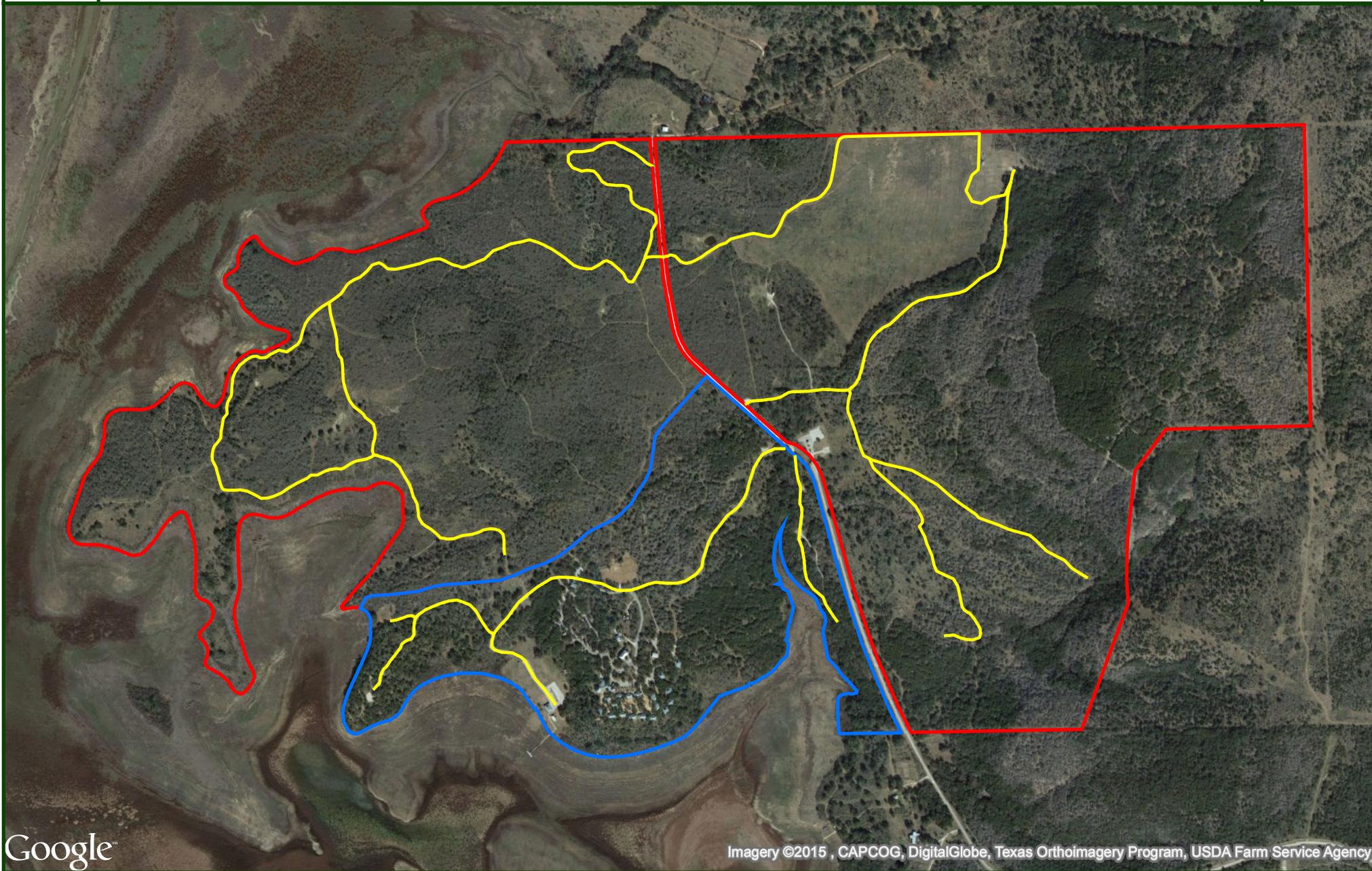
-  Property Boundary
-  Survey Drive Line





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Appendix C - Canyon of the Eagles Preserve and Park

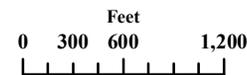


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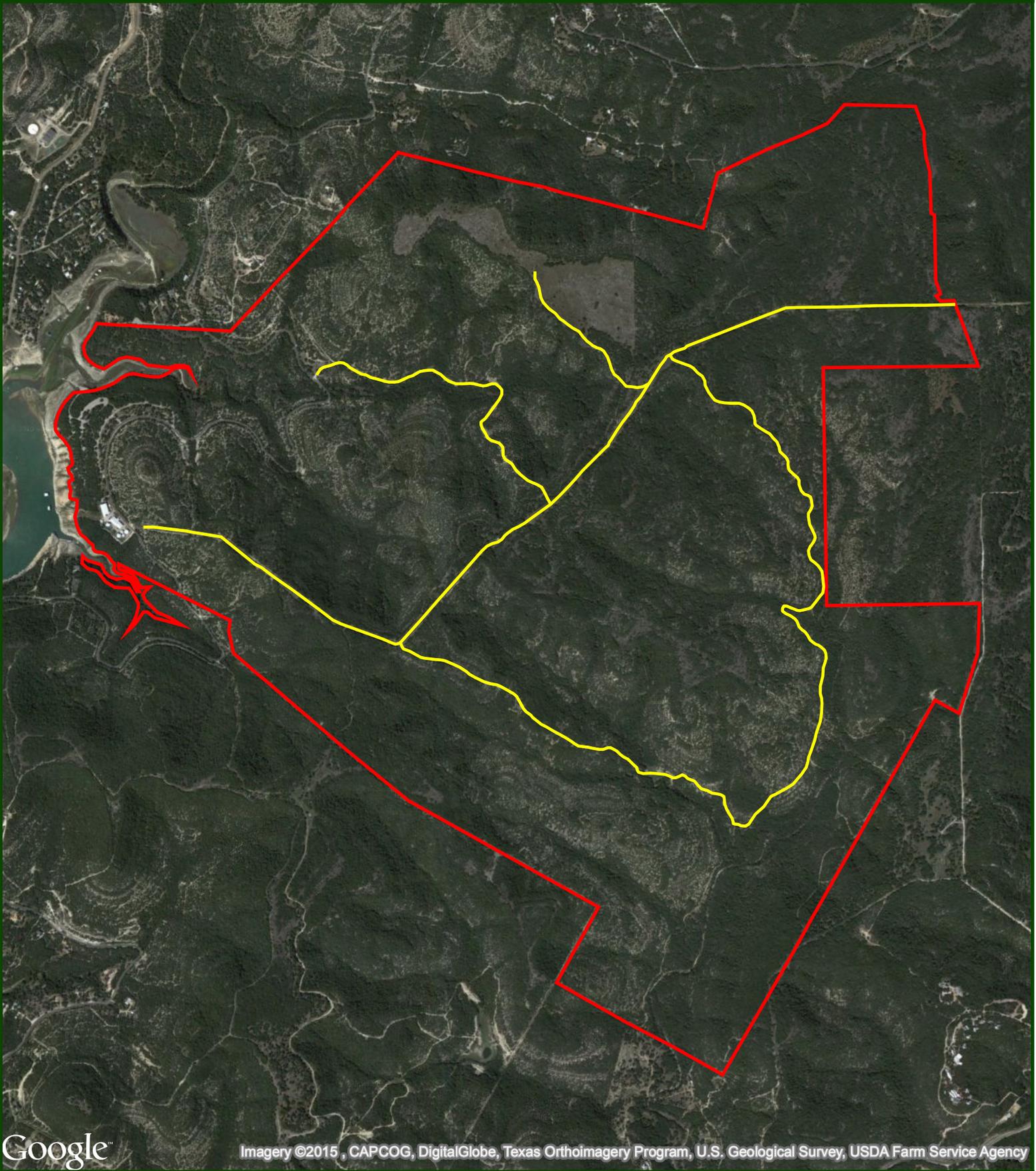


-  Preserve Boundary
-  Survey Drive Line
-  Park Boundary





2015 Spotlight Survey Report Appendix D - Wheless Preserve



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-  Property Boundary
-  Survey Drive Line

