Gathering animal density data

Nikki Dictson and Kevin Wagner, PhD

Texas Water Resources Institute

General Steps To Develop Livestock & Wildlife Population Estimates

1. Determine number of animals in each county
2. Multiply that number by the percentage of each county that lies in the watershed
3. Validate/confirm with local experts

EXCEPTION: Regions with known CAFOs (Confined Animal Feeding Operations)

General guidelines/considerations

- Animal numbers fluctuate

- 1 year of data generally insufficient
  - Unless that's what's available (generally the case)

- Using 5-7 yr average is better approach
  - Generally available for cattle, goats & sheep

Sources of animal density data

- Livestock
  - Texas Agricultural Statistics
  - USDA Census of Agriculture
- Deer
  - TPWD White-tailed deer survey & reports
  - TPWD County Biologists
- Feral hogs
  - TPWD County Biologists
  - Stakeholders
  - Various studies

Livestock density data

12.3 million cattle and calves

Texas Agricultural Statistics

- USDA's NASS Texas Field Office & TDA
  - http://www.nass.usda.gov/Statistics_by_State/Texas/
  - Data compiled annually (Google Texas Ag Stats & Year)
- Best source of county data for:
  - Cattle
  - Goats
  - Sheep
- Not all livestock categories reported at county level:
  - Hogs
  - Poultry
- Some livestock categories not reported:
  - Horses

Census of Agriculture

- Conducted every 5 years
- 2012 Census of Agriculture (Next one end of 2017)
  - Issued May 2014
    - http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/
- Primary source of county data for:
  - Hogs
  - Poultry
  - Horses
  - Sheep (in counties not reported in Texas Ag Stats)
  - Goats (in counties not reported in Texas Ag Stats)

Texas Ag Statistics – Cattle Inventory

- Texas Cattle Inventory Categories
  - All Cattle & Calves
  - Beef Cows
  - Milk Cows
- Beef Cows = most appropriate for assessing cattle numbers for cow/calf operations
- All Cattle & Calves = if feedlots & many stocker operations

Texas Ag Statistics – Cattle Inventory

Texas Cattle Inventory and Milk Production by County

District Code	County FIPS Code	District and County	All Cattle & Calves [1] January 1 Inventory (head)		Beef Cows January 1 Inventory (head)		Milk Cows January 1 Inventory (head)	
			2011	2012	2011	2012	2011	2012
11	011	Armstrong	32,000	31,000	11,000	10,000	*	*
	045	Briscoe	19,000	18,000	11,000	10,000	*	*
	065	Carson	35,000	33,000	*	*	*	*
	069	Castro	515,000	500,000	11,000	10,000	36,000	36,500
	111	Dallam	205,000	200,000	*	*	*	*
	117	Deaf Smith	595,000	600,000	20,000	18,500	41,000	42,000
	153	Floyd	75,000	74,000	12,000	11,000	*	*
	179	Gray	100,000	100,000	*	*	*	*
	189	Hale	125,000	120,000	7,000	6,400	18,400	18,800
	195	Hansford	265,000	280,000	*	*	*	*
	205	Hartley	295,000	300,000	18,000	16,500	25,000	25,000
	211	Hemphill	72,000	73,000	13,000	11,900	*	*

2012 Census Agriculture Data

Table 11. Cattle and Calves -- Inventory and Sales: 2012 and 2007

Table 12. Hogs and Pigs -- Inventory and Sales: 2012 and 2007

Table 13. Sheep and Lambs -- Inventory, Wool Production & Sales: 2012 & 2007

Table 14. All Goats -- Inventory and Sales: 2012 and 2007

Table 18. Equine -- Inventory and Sales: 2012 and 2007

Table 19. Poultry -- Inventory and Sales: 2012 and 2007

Census of Agriculture

Table 13. **Sheep and Lambs – Inventory, Wool Production, and Sales: 2012 and 2007**
[For meaning of abbreviations and symbols, see introductory text.]

Item	Texas	Anderson	Andrews	Angelina	Aransas	Archer	Armstrong
Sheep and lambs inventory ...... farms, 2012	10,674	34	3	19	1	6	3
2007	8,750	21	15	27	4	9	3
number, 2012	623,000	431	146	230	(D)	520	275
2007	945,164	500	1,270	317	20	454	(D)
2012 farms by inventory:							
1 to 24 .... farms	7,009	31	2	17	1	3	-
number	65,836	254	(D)	(D)	(D)	24	-
25 to 99 .... farms	2,591	3	-	2	-	1	1
number	117,289	177	-	(D)	-	(D)	(D)
100 to 299 .... farms	696	-	1	-	-	2	2
number	111,624	-	(D)	-	-	(D)	(D)
300 to 999 .... farms	288	-	-	-	-	-	-
number	145,478	-	-	-	-	-	-
1,000 or more .... farms	90	-	-	-	-	-	-
number	182,773	-	-	-	-	-	-
Ewes 1 year old or older .... farms, 2012	7,148	20	3	6	1	6	3
2007	6,814	12	11	13	3	9	1
number, 2012	357,434	188	90	76	(D)	285	270
2007	580,861	354	1,117	124	6	218	(D)
Wool production .... farms, 2012	2,379	-	1	4	-	-	-
2007	2,540	1	3	-	-	-	-
pounds, 2012	2,610,764	-	(D)	160	-	-	-
2007	4,604,047	(D)	12,396	-	-	-	-
$1,000, 2012	2,268	-	-	-	-	-	-
2007	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)
Sheep and lambs sold .... farms, 2012	6,264	8	3	3	1	3	3
2007	5,252	6	7	16	2	6	3
number, 2012	450,497	218	80	54	(D)	346	80
2007	530,646	(D)	1,262	112	(D)	140	(D)
$1,000, 2012	64,420	33	(D)	5	(D)	45	8
2007	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)

Item	Atascosa	Austin	Bailey	Bandera	Bastrop	Baylor	Bee	Bell
Sheep and lambs inventory .... farms, 2012	54	25	2	98	62	1	16	183
2007	65	31	8	113	48	-	29	108
number, 2012	1,308	427	(D)	2,366	744	(D)	193	4,269
2007	1,049	432	665	4,165	816	-	371	3,430
2012 farms by inventory:								
1 to 24 .... farms	36	16	-	69	56	1	13	137
number	(D)	135	-	(D)	486	(D)	82	1,471
25 to 99 .... farms	16	9	1	28	6	-	3	42
number	768	292	(D)	1,234	258	-	111	1,816
100 to 299 .... farms	2	-	1	-	-	-	-	2
number	(D)	-	(D)	-	-	-	-	(D)
300 to 999 .... farms	-	-	-	1	-	-	-	2
number	-	-	-	(D)	-	-	-	(D)
1,000 or more .... farms	-	-	-	-	-	-	-	-

Validating Livestock Estimates & **Distributing** Across Watershed

- Best Approach = Consult With:
  - Ag Workgroup
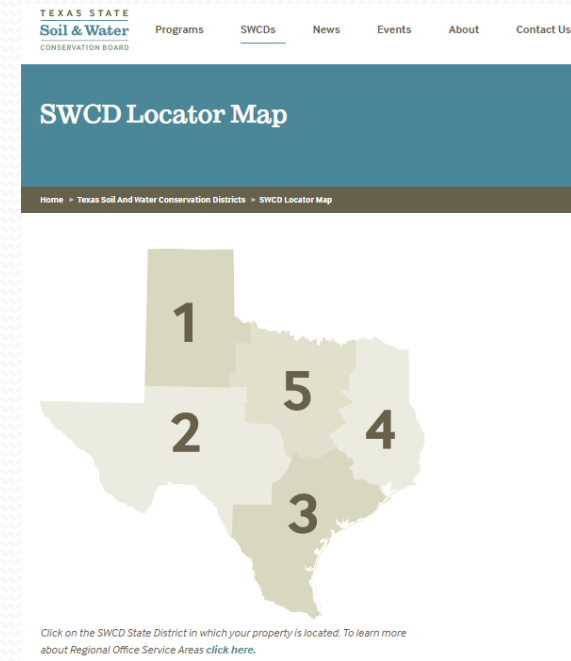 - NRCS District Conservationists / Local SWCDs
    - http://www.tsswcb.state.tx.us/swcds/locatormap
  - County Extension Agents
    - https://counties.agrilife.org/

Deer density data

3.6 million deer in Texas

Deer Density Sources

- TPWD County Biologists
  - http://www.tpwd.state.tx.us/landwater/land/habitats/county/

- TPWD Publications
  - Lockwood, M. (2005). *White-tailed Deer Population Trends.*
  - Pineywoods Deer Herd Status Report
    - http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_0088a.pdf
  - The Post Oak Savannah Deer Herd Past, Present, Future
    - http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_rp_w7000_0237b.pdf
  - Frio County White-tailed Deer Population Data
    - http://www.tpwd.state.tx.us/landwater/land/habitats/southtx_plain/regulatory/pop_trends/frio_pop.phtml
  - White-tailed Deer Management In The Texas Hill Country
    - http://www.texasconservation.org/resources/pwd_rp_w7000_0828.pdf
  - Guidelines For White-tailed Deer Management In The Cross-timbers And Prairies Region Of North Texas
    - http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_rp_w7000_1133.pdf

Resource Management Units in Texas

Figure 1. Monitored deer range within the Resource Management Units (RMU) of Texas.
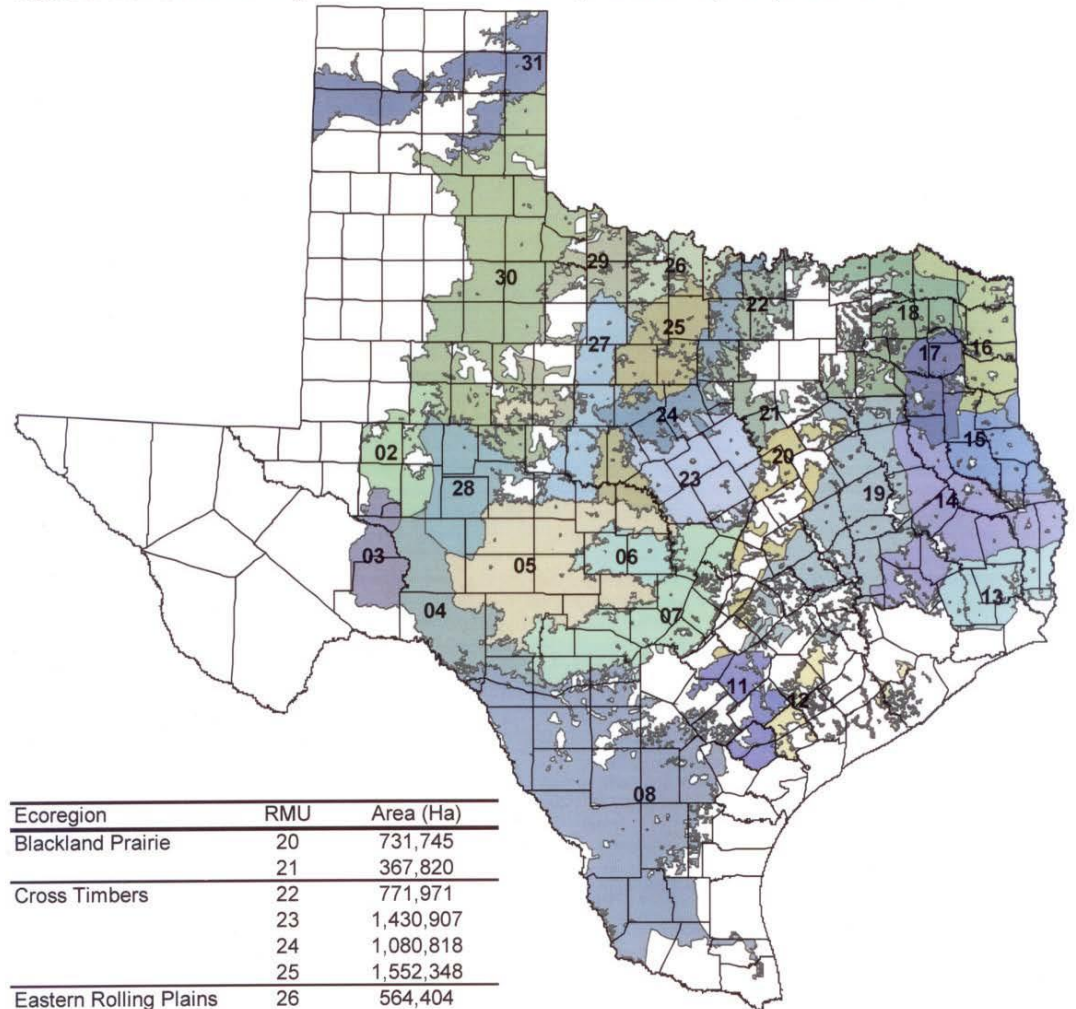
Ecoregion	RMU	Area (Ha)
Blackland Prairie	20	731,745
	21	367,820
Cross Timbers	22	771,971
	23	1,430,907
	24	1,080,818
	25	1,552,348
Eastern Rolling Plains	26	564,404
	27	1,162,939
	29	1,091,385
Edwards Plateau	4	1,308,326
	5	2,807,841
	6	583,685
	7	1,909,010
	28	1,246,008
Pineywoods	13	949,342
	14	1,755,050
	15	862,622
	16	1,056,147
	17	735,592

Ecoregion	RMU	Area (Ha)
Post Oak Savannah	11	690,618
	12	475,323
	18	1,290,491
	19	2,528,747
South Texas Plains	8	5,255,676
Southern High Plains	2	810,505
TransPecos	3	693,080
Western Rolling Plains	30	4,223,231
	31	1,622,158
Total		39,557,788

Deer densities in other WPPs

- Upper Llano – 10.1 ac/deer
- Copano Bay – 13.5 ac/deer
- Leon River – 27.5 ac/deer
  - RMU23 – 56.6/1000 ac
  - RMU24 – 8.4/1000 ac
- Buck Creek – 36 ac/deer
- Plum Creek – 127 ac/deer

Feral Hog/ Wild Pig density data

2012: 2.6 million feral hogs in Texas

2017 estimates 3-5 million feral hogs in Texas

2012 Feral Hog Density Study
Texas A&M Institute of Renewable Natural Resources

- Average hog density in Texas from reported studies
  - ranged from 1.3-2.5 hogs/mi^2
  - this range represents a 95% confidence interval.
- By multiplying hog density estimate & total potential suitable feral hog habitat
  - estimated 1.8-3.4 million hogs (mean 2.6 million hogs) statewide

Suitable habitat for feral hogs
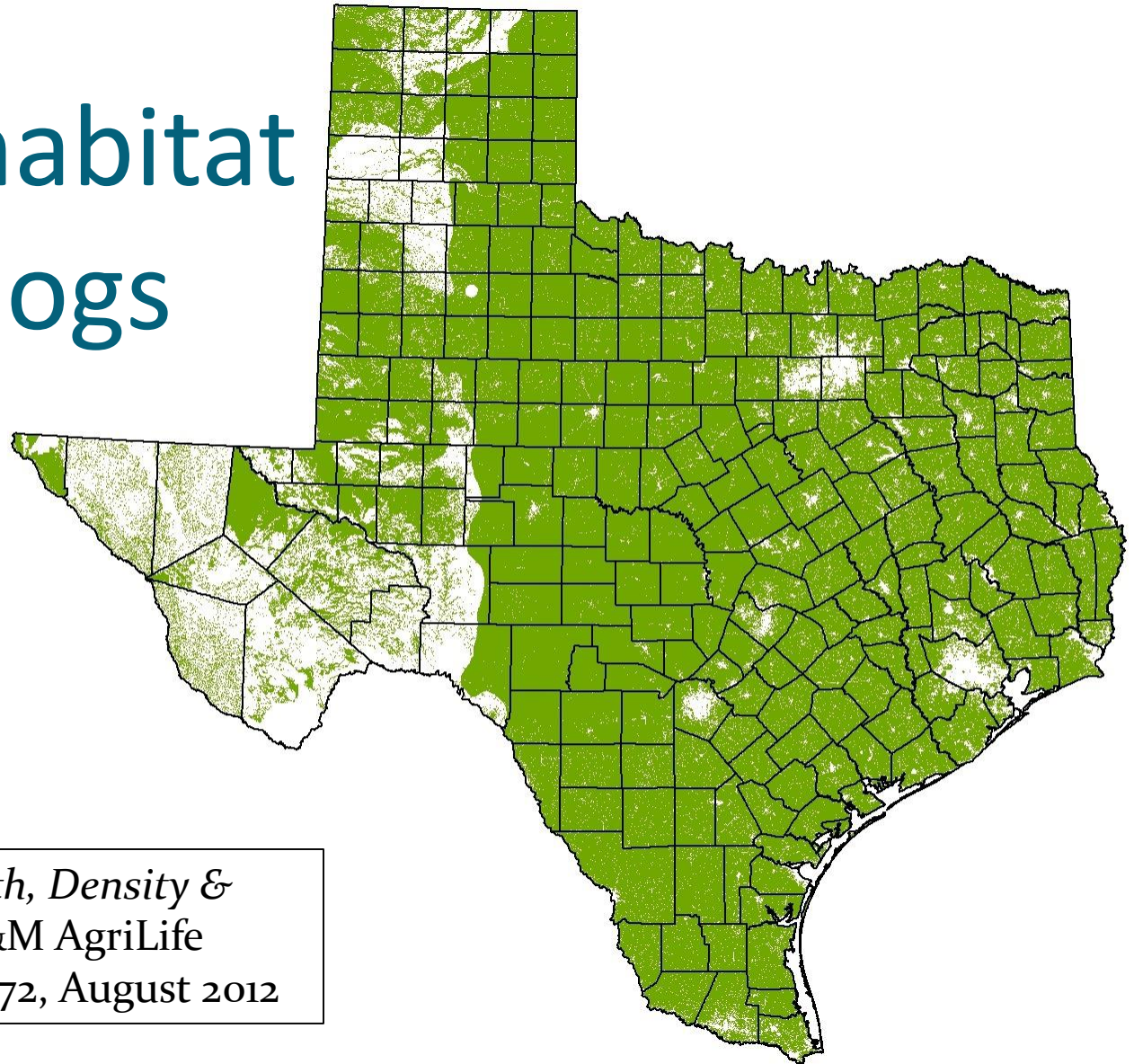
Feral Hog Population Growth, Density & Harvest in Texas – Texas A&M AgriLife Extension Publication SP-472, August 2012
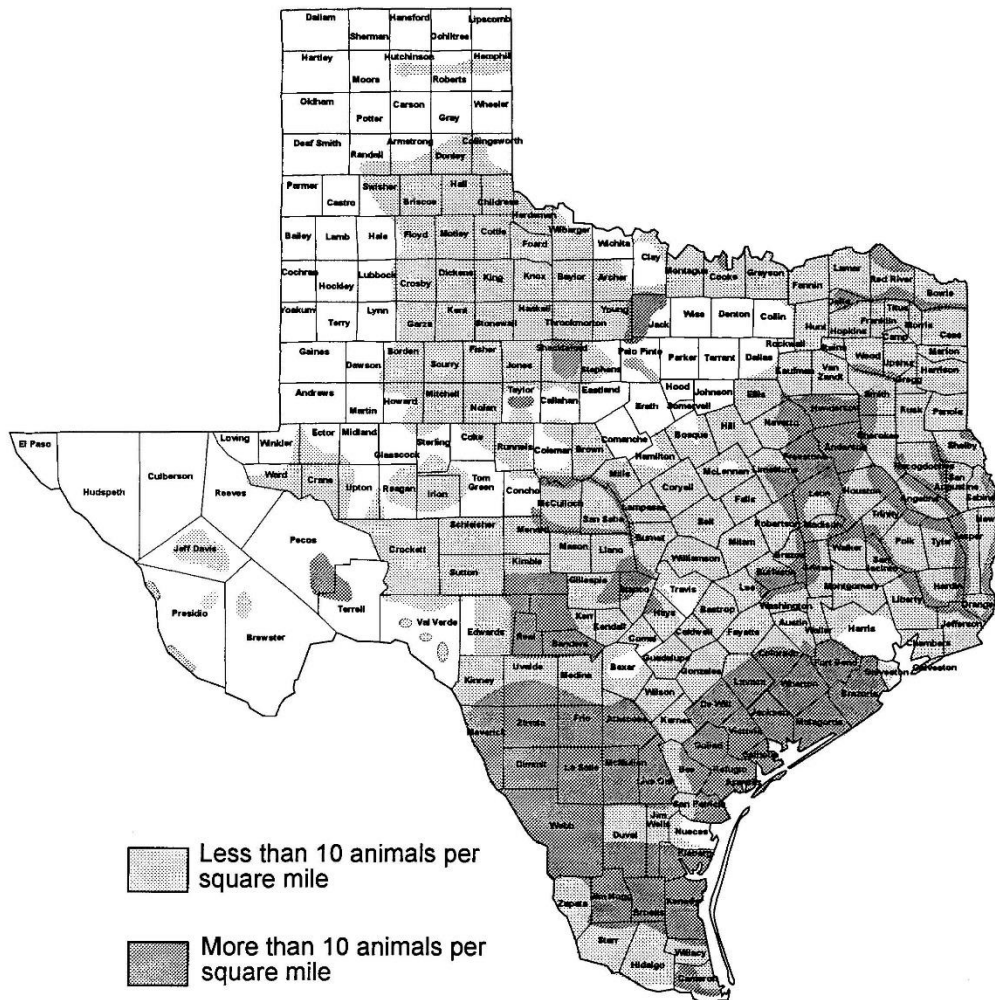
Feral Hog Density Data Sources

- TPWD County Biologists
  - http://www.tpwd.state.tx.us/landwater/land/habitats/county/

- Stakeholder group

- Published studies in Texas
  - Adkins & Haveson. 2007. Demographic and spatial characteristics of feral hogs in the Chihuahuan Desert, Texas. *Human–Wildlife Conflicts* 1(2):152–160, Fall 2007
  - Harveson, L. A., M. E. Tewes, N. J. Silvy, J. D. Hillje, and J. Rutledge. 2000. Prey use by mountain lions in southern Texas. *Southwestern Naturalist* 45:472–476.
  - Ilse, L. M., and E. C. Hellgren. 1995. Resource partitioning in sympatric populations of collared peccaries and feral hogs in southern Texas. *Journal of Mammalogy* 76:784–789.

Other Published Studies on Feral Hogs

- Mapston, M. E. 2004, May. Feral hogs in Texas. Publication B-6149. College Station: Texas Cooperative Extension, Wildlife Services.

- Reidy, M. M. 2007. Efficacy of electric fencing to inhibit feral pig movements and evaluation of population estimation techniques. Thesis. Kingsville, Texas: Texas A&M University-Kingsville.

- Rollo, S., L. D. Highfield, and M. P. Ward. 2007. A novel estimation method for predicting spatial density of feral swine using ecological data. GISVET '07 – Pre Conference Draft. College Station, Texas: Texas A&M University, Department of Veterinary Integrative Biosciences.

- Taylor, R. 1991. The feral hog in Texas. Texas Parks and Wildlife Department. Federal Aid Report Series No. 28. Project W-125-R. 20 pp.

- University of Georgia. 1993. Southeastern Cooperative Wildlife Disease Study.

WILD SWINE DISTRIBUTION
IN TEXAS
1993

Less than 10 animals per square mile

More than 10 animals per square mile

Feral Hog Densities In Other WPPs

- Feral hog densities range from 12-26 hogs/sq. mi.
  - Plum Creek – 12 hogs/sq. mi.
  - Leon River – 18.9 hogs/sq. mi.
  - Copano Bay watershed – 19.2 hogs/sq. mi.
  - Upper Llano – 21.3 hogs/sq. mi.
  - Geronimo Creek – 25 hogs/sq. mi.
  - Buck Creek – 25.6 hogs/sq. mi.

Estimated Beef Cow Numbers By County (Texas Agricultural Statistics)

County	2004	2005	2006	2007	2008
Aransas	2,000	1,000	1,000	1,000	1,000
Bee	32,000	29,000	30,000	32,000	45,000
Goliad	39,000	37,000	39,000	45,000	44,000
Karnes	45,000	42,000	41,000	43,000	39,000
Refugio	24,000	23,000	23,000	24,000	23,000
San Patricio	7,000	7,000	7,000	7,000	7,000
Total	149,000	139,000	141,000	152,000	159,000

Est. Beef Cows in Copano Watershed (From 2004 - 2008 County Averages)

County	County Average	Percent in Watershed	Beef Cows
Aransas	1,200	34.7%	417
Bee	33,600	88.6%	29,766
Goliad	40,800	37.8%	15,418
Karnes	42,000	3.7%	1,571
Refugio	23,400	62.7%	14,674
San Patricio	7,000	64.3%	4,502
Total	148,000	-	66,348

Estimated Cattle Distribution In Copano Bay Watershed

Land Use Classification	Area (ac)	SR (ac/ AU)	Cattle (AU)
Open Water	6,794		
Developed Open Space	53,312		
Developed Low Intensity	16,473		
Developed Medium Intensity	4,888		
Developed High Intensity	1,067		
Bare Rock/Sand/Clay	4,082		
Deciduous Forest	67,256	20.0	3,363
Evergreen Forest	4,930	20.0	246
Mixed Forest	423	20.0	21
Shrub, Scrub	438,417	30.0	14,614
Grasslands/Herbaceous	62,791	15.4	4,066
Pasture/Hay	340,081	7.7	44,038
Cultivated Crops	315,781		
Woody Wetlands	26,344		
Emergent Herbaceous	46,092		
TOTAL	1,388,731		66,348

Est. Deer in Copano Watershed Based on TPWD County Biologist Estimates

County	Density (ac/deer)	Acres of County in Watershed (ac)	Total Deer
Aransas	100	52,307	523
Bee	14.11	499,755	35,419
Goliad	12.4	208,049	16,778
Karnes	20	18,126	906
Refugio	20	316,345	15,817
San Patricio	15	291,106	19,407
Total			88,850

Feral Hog Estimates

- Reidy (2007) study at Welder Wildlife Refuge estimated feral hog density at 33.3 ac/hog
  - When applied to all ag lands in watershed, it's estimated that there's **37,718** feral hogs in watershed
- Rollo et al. (2007) estimated 460,262 hogs in 33-county area (i.e. 13,947 hogs/county), including most counties in watershed
  - When applied to % of county in watershed, it's estimated there's **40,708** feral hogs in the watershed
- 1993 Southeastern Cooperative Wildlife Disease Study estimated feral hog density >10/mi^2
  - Taylor (1991) estimated TX feral hog pop. at 1 million
  - Mapston (2004) found TX feral hog numbers had doubled to 2 million
  - Based doubling of 10 hogs/mi^2 to 20 hogs/square mi. & applied to 1,388,731 land acres in watershed, it's estimated there's **43,398** feral hogs in watershed

Est. Feral Hogs in Copano Watershed Based on TAMU-K Estimates

Land Use Category	Acres	Density (ac/hog)	Feral Hog Pop.
Open Water	6,794		
Developed Open Space	53,312		
Developed Low Intensity	16,473		
Developed Medium Intensity	4,888		
Developed High Intensity	1,067		
Bare Rock/Sand/Clay	4,082		
Deciduous Forest	67,256	33.3	2,020
Evergreen Forest	4,930	33.3	148
Mixed Forest	423	33.3	13
Shrub, Scrub	438,417	33.3	13,166
Grasslands/Herbaceous	62,791	33.3	1,885
Pasture/Hay	340,081	33.3	10,212
Cultivated Crops	315,781	33.3	9,483
Woody Wetlands	26,344	33.3	791
Emergent Herbaceous	46,092		
TOTAL	1,388,731		37,718

Estimated numbers of livestock & wildlife in the Copano Bay watershed

	Aransas	Bee	Goliad	Karnes	Refugio	San Patricio	Total
Beef Cattle	417	29,766	15,418	1,571	14,674	4,502	**66,348**
Horses	16	1,232	335	36	434	426	**2,479**
Goats	139	2,458	425	81	251	257	**3,611**
Sheep	0	594	61	12	45	215	**927**
Hogs	5	100	26	1	14	477	**623**
Layers	12	703	325	0	40	298	**1,377**
Pullets	0	120	28	10	0	383	**542**
Broilers	0	170	95	0	0	408	**673**
Turkey	5	0	13	4	0	6	**28**
Deer	523	35,419	16,778	906	15,817	19,407	**88,850**
Feral Hogs	N/A	N/A	N/A	N/A	N/A	N/A	**37,718**

Questions/Discussion