

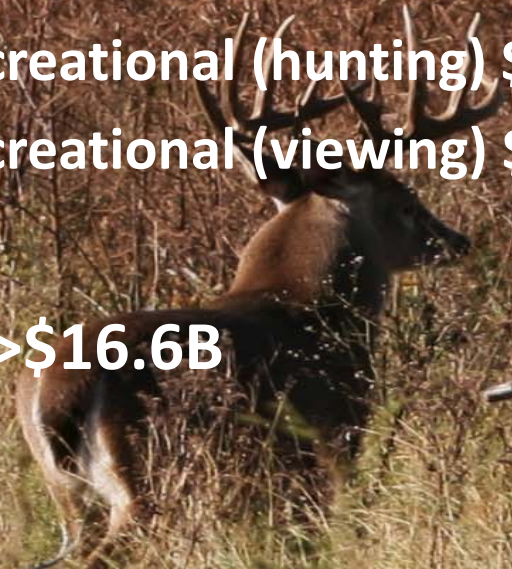
The Deer Genome: From Molecules to Management

Randy DeYoung
Deer Associates
March 4, 2016



Why Deer?

- Negative value
 - Ecological damage...?
 - Auto collisions \$1.7B
 - Attacks on humans <\$1M
 - Diseases...?
 - Ag loss \$0.6B
 - Loss of timber \$1.6B
 - Household damage \$0.5B
- Total \$>4.4B
- Net value \$12.2B
- Positive value
 - Ecological...?
 - Existence, aesthetic...?
 - Recreational (hunting) \$12B
 - Recreational (viewing) \$4.6B
- Net: >\$16.6B



Deer Genome Project

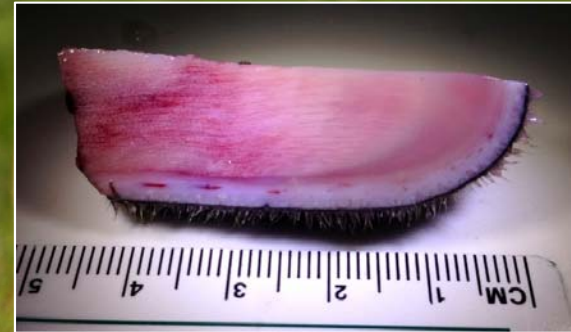


- Needs: understand antler development at cellular level
- Gene expression requires high-quality genome resource
- Sample growing antler at different stages in captive deer

Albert and Margaret Alkek Ungulate Research Facility

Results

- Genome resource completed...
- What's next?



Answer questions relative to
ecology and management...



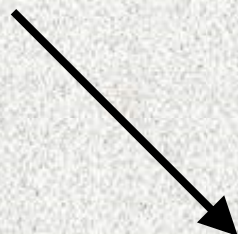
The Molecular “Toolbox”

- Genetic markers inherited in known manner from parents
 - ID individuals
 - Parentage, relatedness
 - Identify unique groups
 - subspecies, management units
 - Determine landscape factors influencing animal movements



ID	BovPI	BovP	Cervic	Cervic	ILSTS	ILSTS	INRA	INRA	N	N-B	Q	Q-B	BL25	BL25	BM64	BM64	K	K-B
KRC00005801	159	159	181	189	265	265	191	197	310	310	239	256	176	176	252	266	196	208
KRC00015111	157	159	185	187	263	269	191	191	314	330	256	277	174	178	270	270	196	196
KRC00015376	157	159	171	171	261	263	191	195	310	314	241	252	174	178	248	266	196	200
KRC00019782	157	159	173	189	265	265	191	191	300	310	237	256	178	178	266	274	196	196
KRC00022854	157	157	171	171	0	0	195	197	310	314	239	245	176	178	266	270	196	196
KRC00023011	157	157	187	189	263	263	195	195	300	330	256	277	178	178	274	274	196	196

Individual allele counts

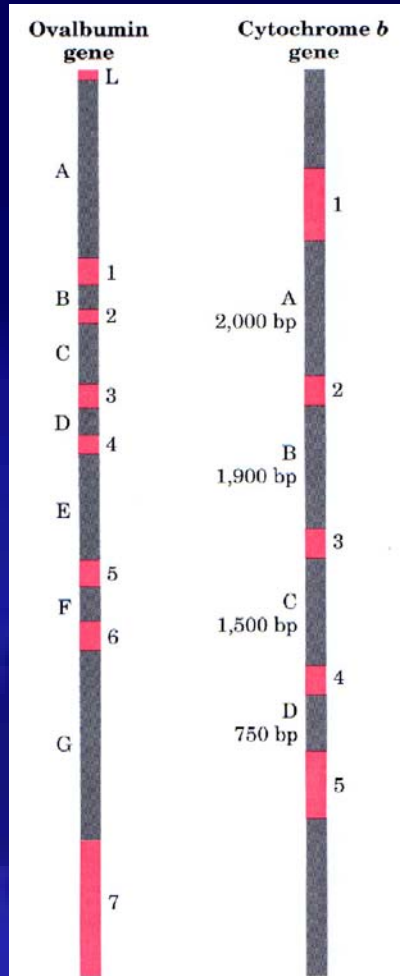


Frequency of each allele
In the population

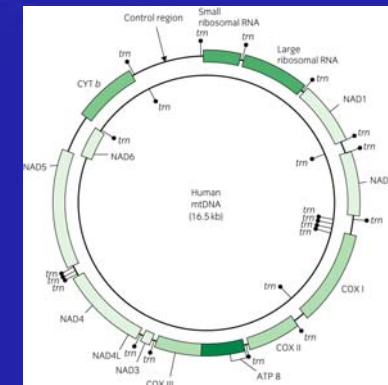
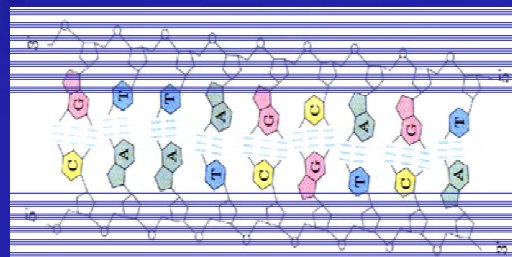
Individual genotypes to population
allele frequencies

****	Locus	Cerid1-	****	
Number of	alleles:	13		
Number of	individuals typed:	420		
	Heterozyg	365		
	Homozyg	55		
Observed	heterozyg	0.869		
Allele	Count	Heterozyg	Homozyg	Frequency
159	16	16	0	0.019
169	5	5	0	0.006
171	177	141	18	0.2107
173	49	47	1	0.0583
175	32	32	0	0.0381
177	4	4	0	0.0048
179	35	33	1	0.0417
181	126	110	8	0.15
183	9	5	2	0.0107
185	160	132	14	0.1905
187	128	110	9	0.1524
189	80	76	2	0.0952
191	19	19	0	0.0226

Genetic Markers

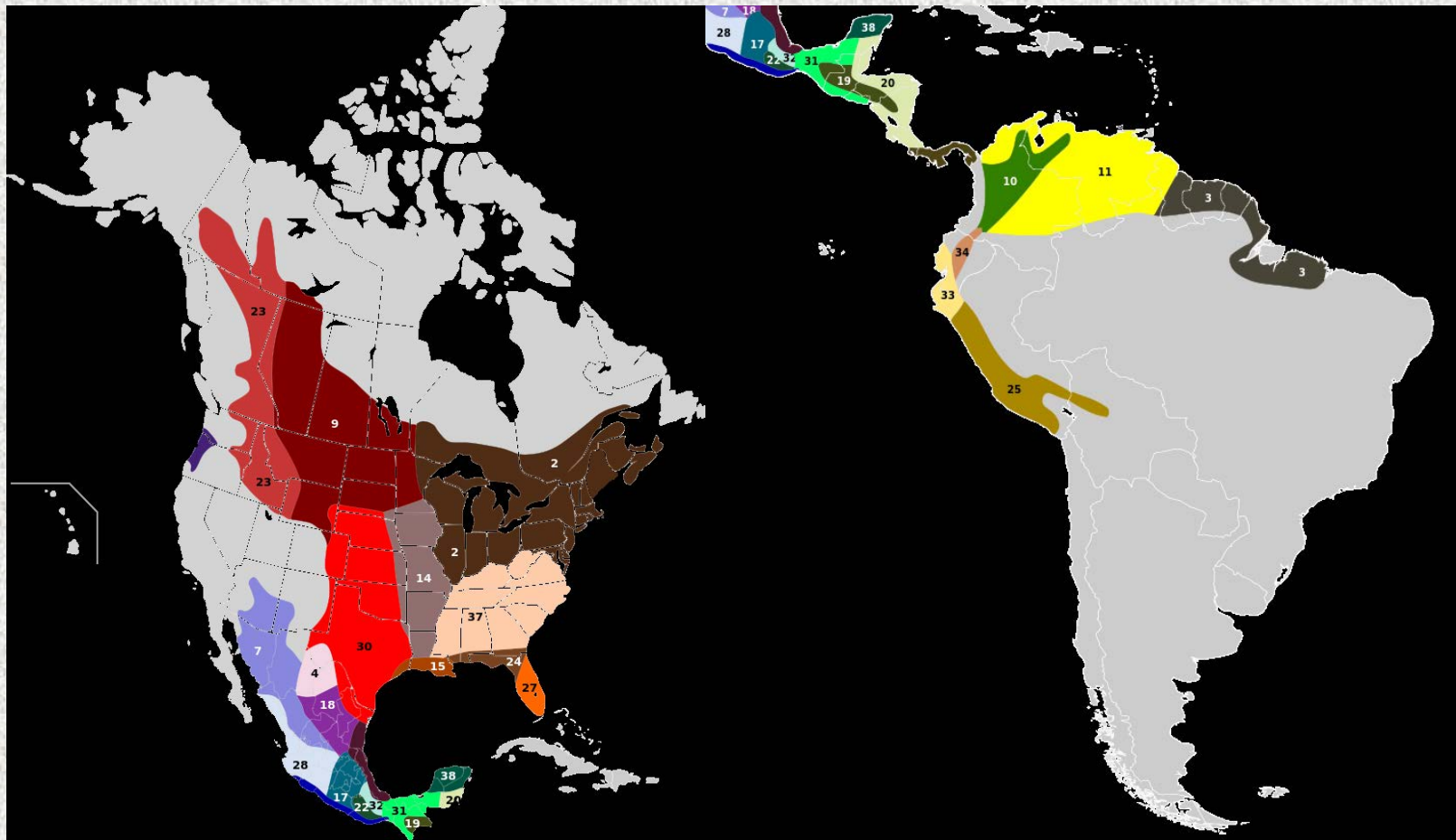


- Nuclear and mtDNA (proteins)
 - Coding, non-coding DNA
 - structural and regulatory genes
 - introns, repetitive sequences
 - Inherited from 1 or both parents
 - Different mutation rates



Extensive Geographic Range

- 4 million years
- Tropical forest
- Mountains
- Desert
- Plains
- Boreal



Understand how deer have adapted to different environments: tropical, mountains, desert, plains, boreal



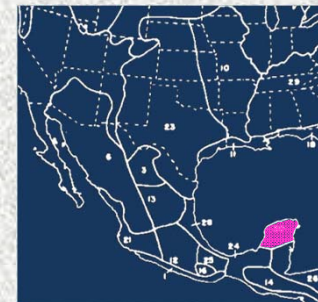
"Texas Deer"
175 lb or more



"Coues Deer"
85-100 lb

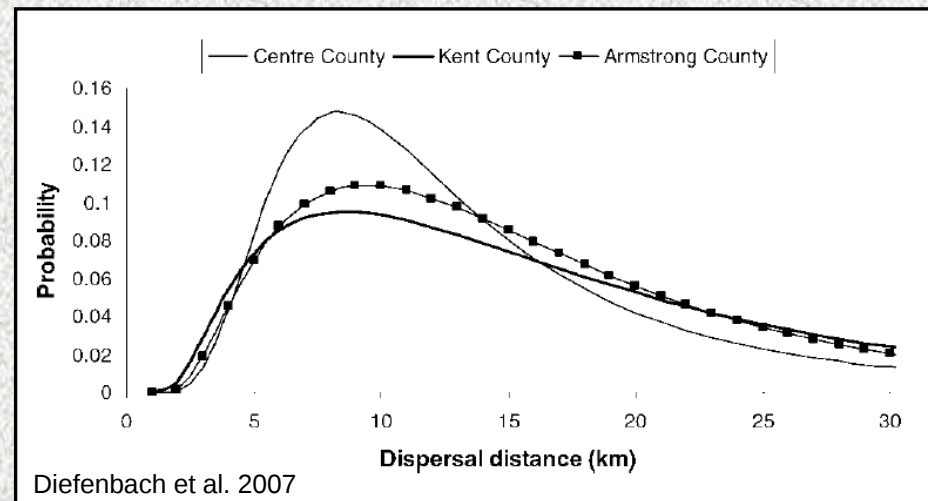
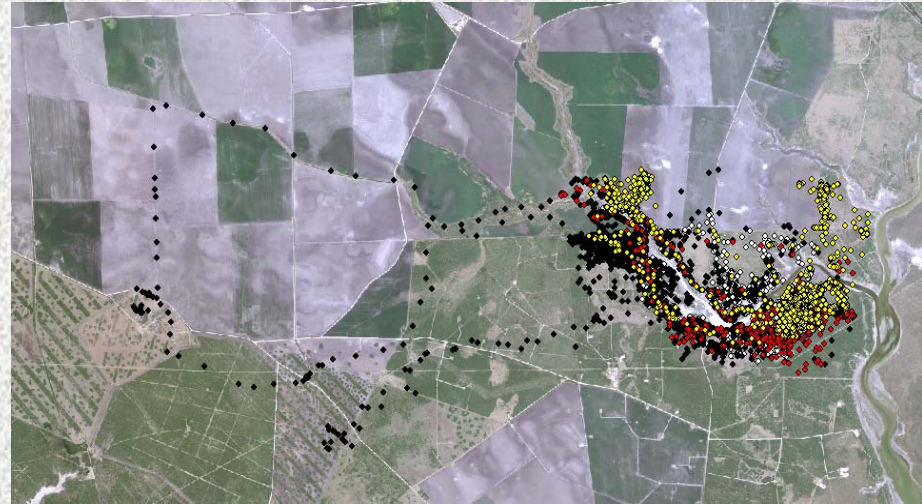


"Yucatan Deer"
80-90 lb

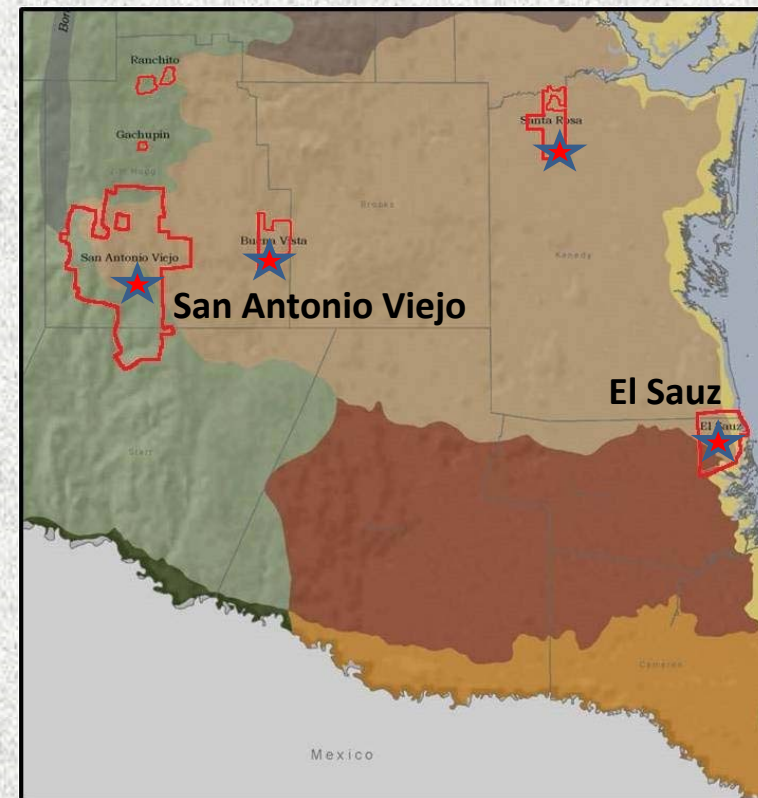
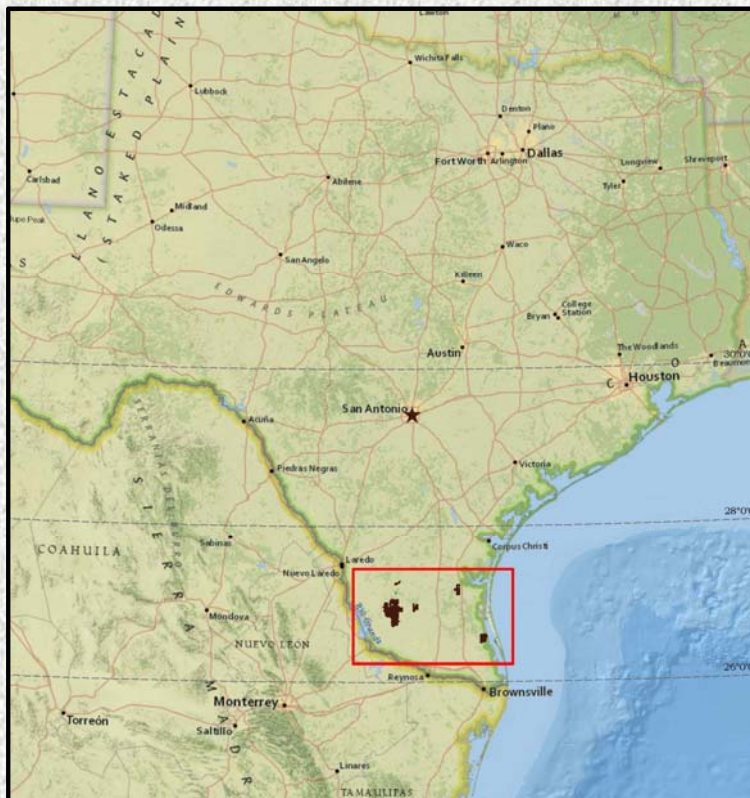


Management

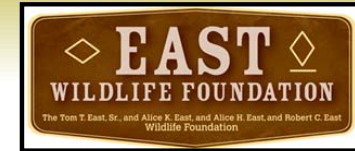
- Social dimension
- Biological dimension
- Scale: “Population?”
 - Landscape
 - Dispersal
 - Seasonal movements



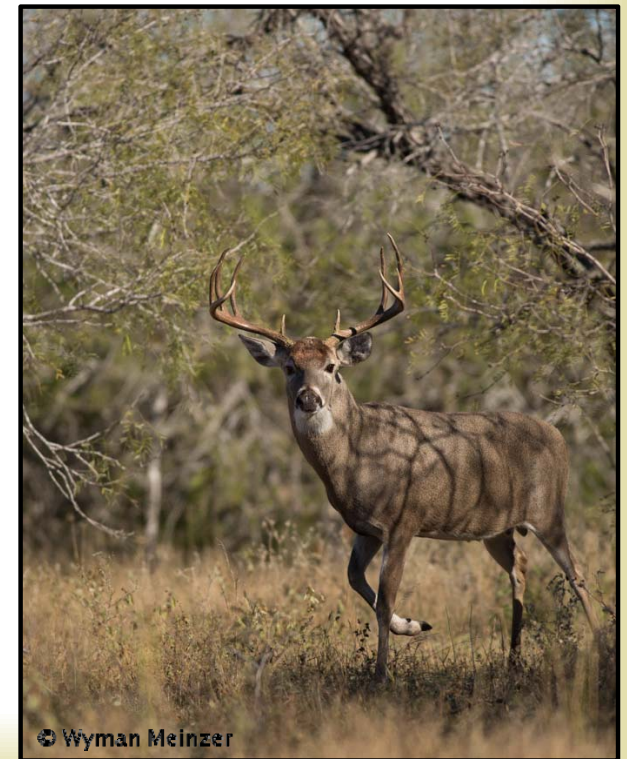
Why do some ranches have bigger deer than others?

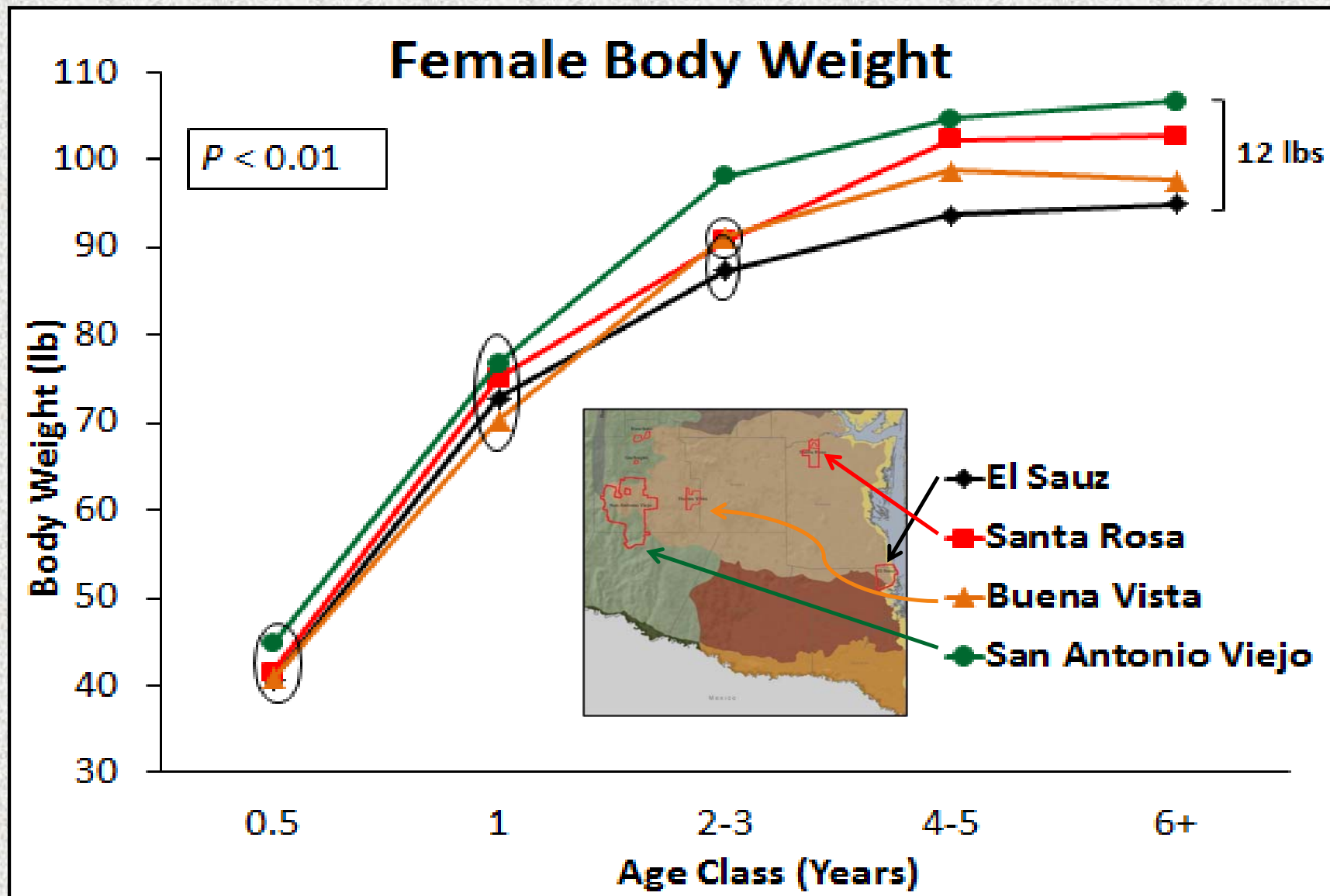


East Foundation

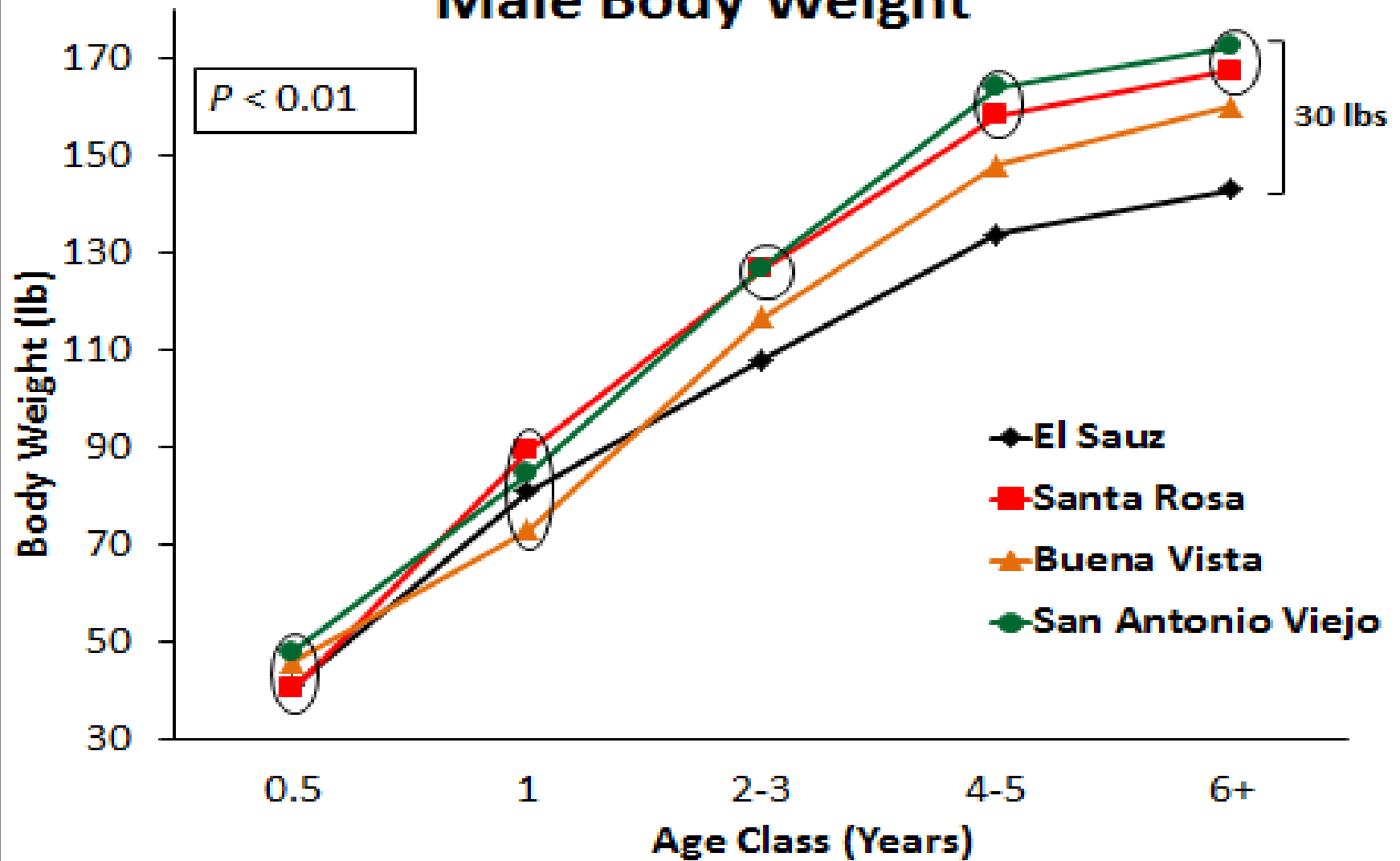


- Established from the estate of Robert C. East
- Private Operating Foundation
- Integrated program of research, education, and outreach
- Compatibility of wildlife conservation with cattle ranching

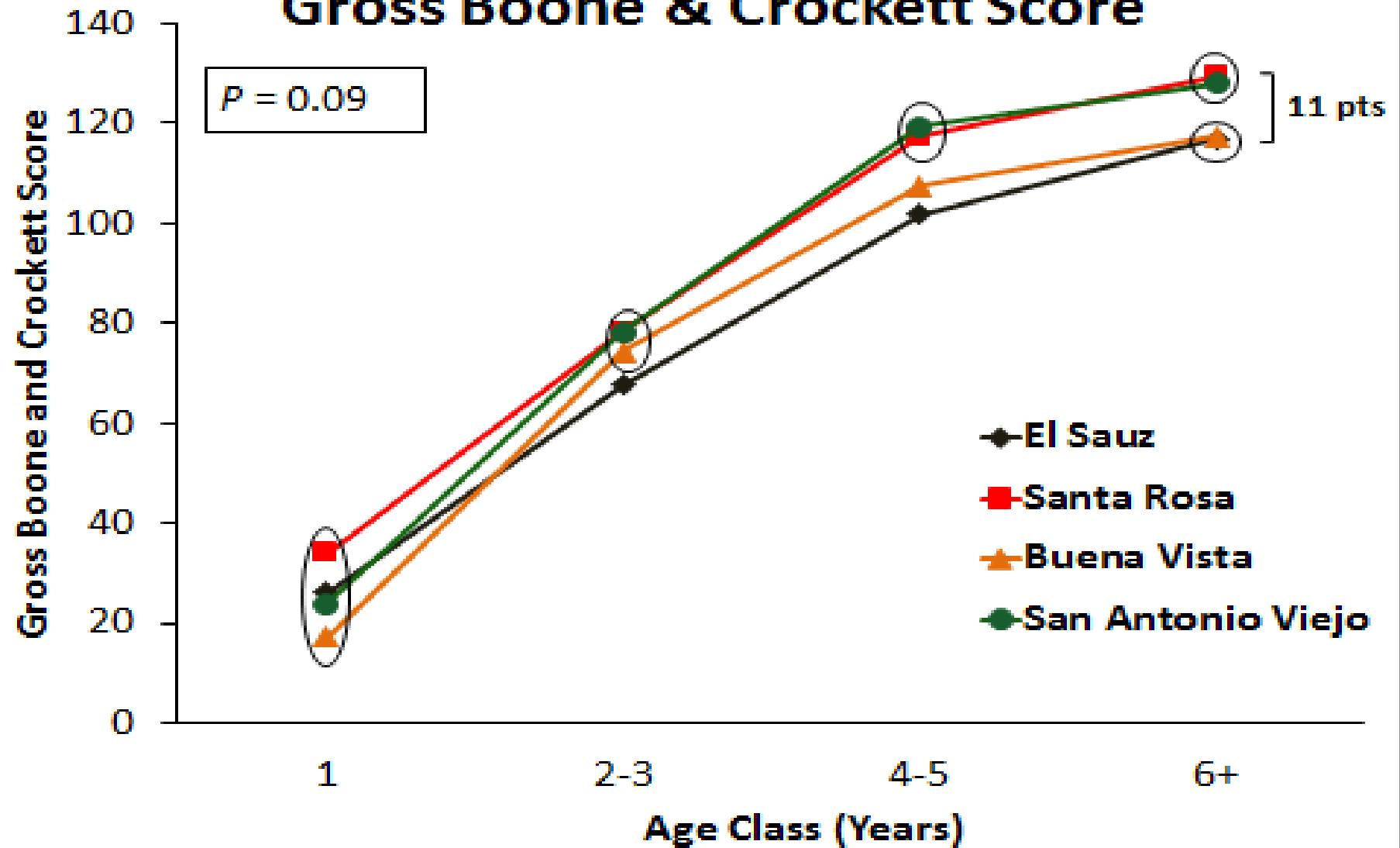




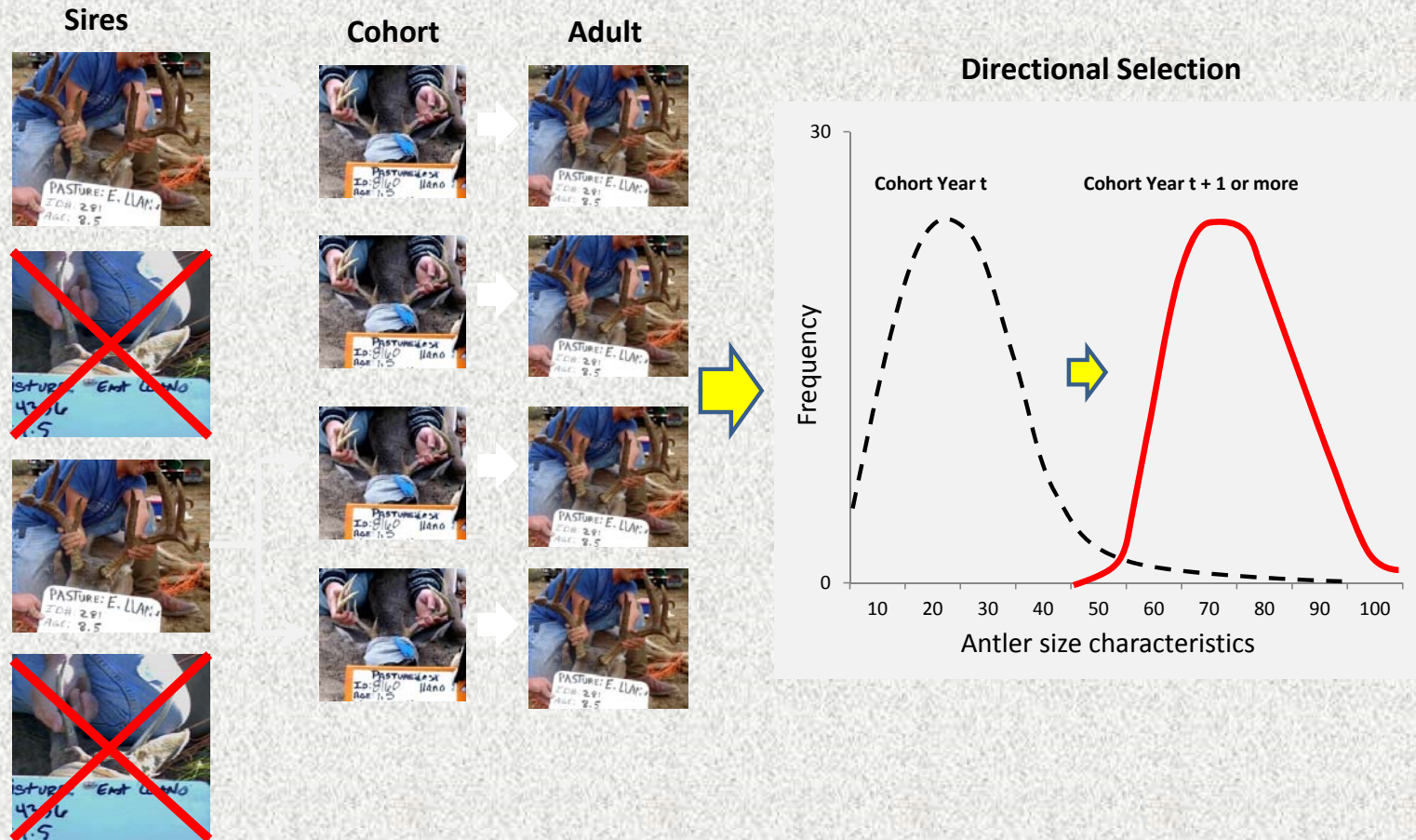
Male Body Weight



Gross Boone & Crockett Score

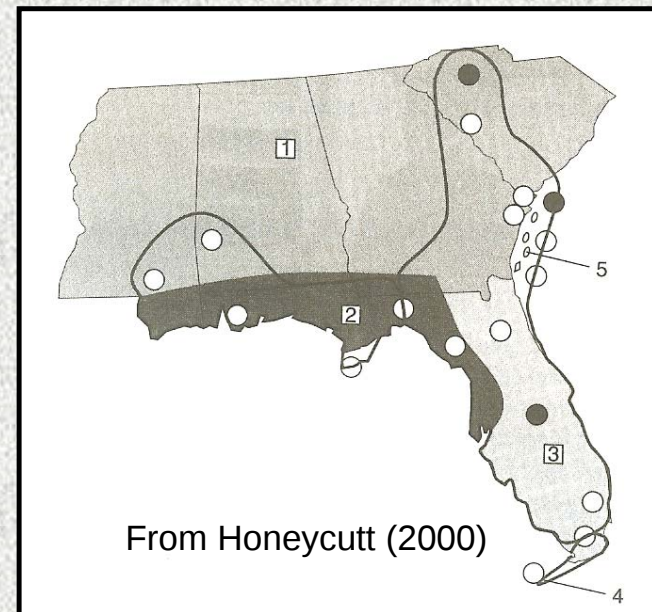
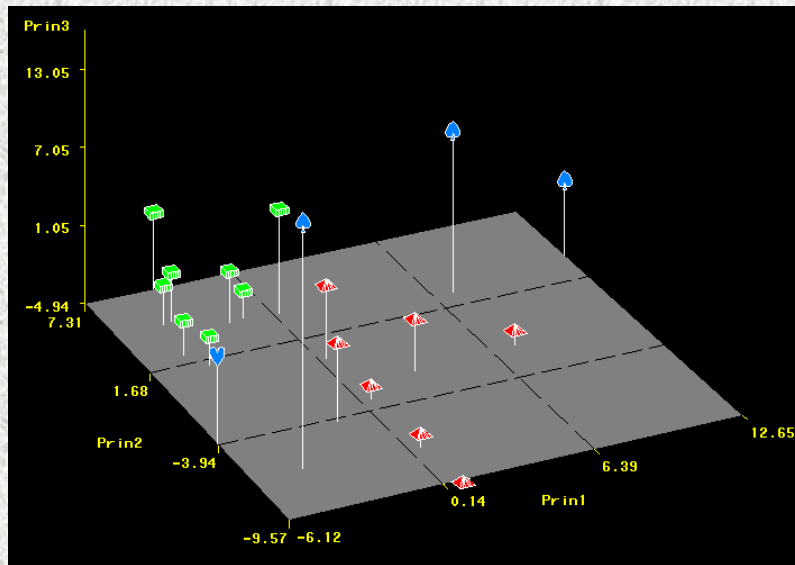


Understand Antlers, Effects of Culling and Selection

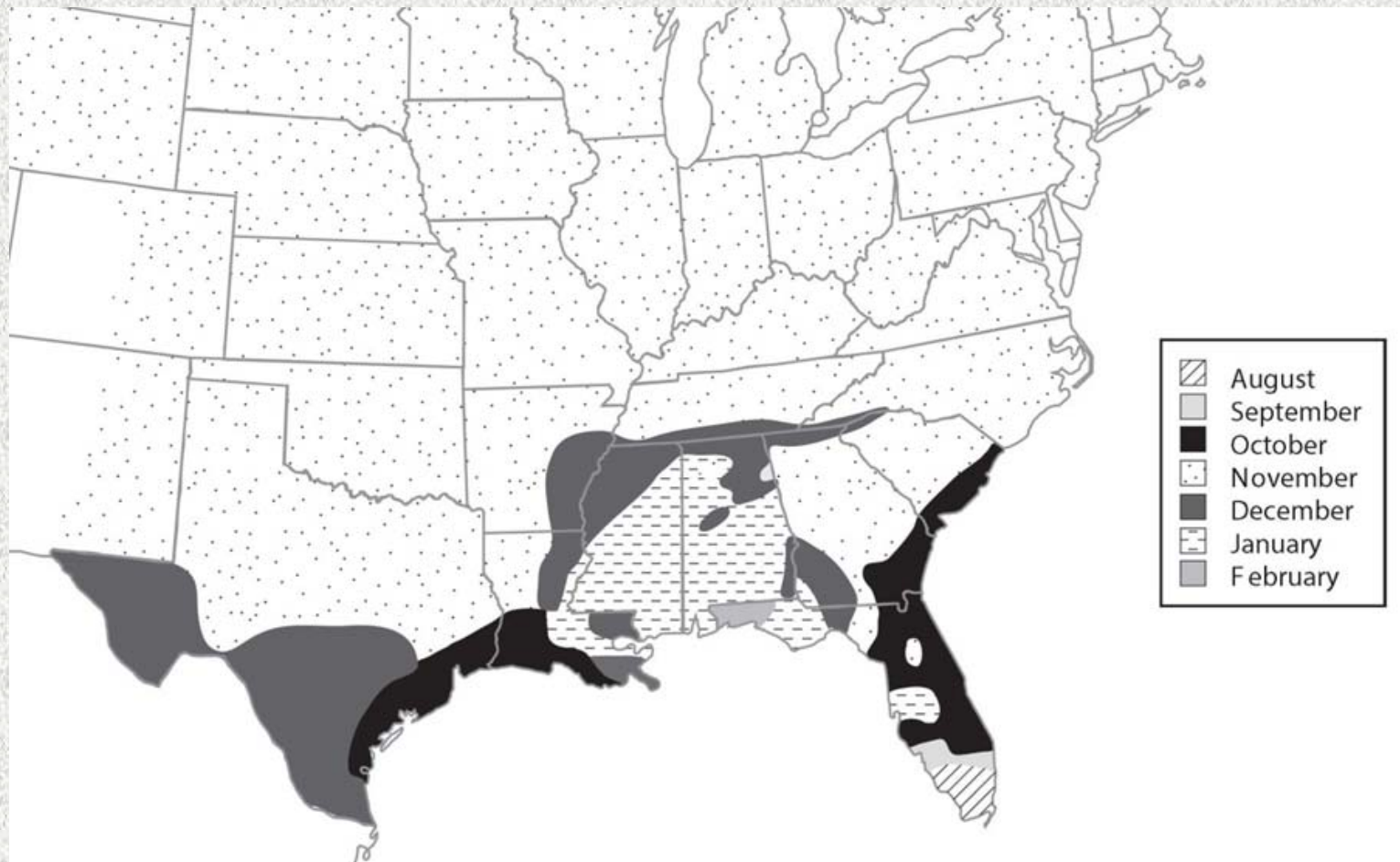


Effects of Past Management, Restoration

Mixing of Genetic Stocks: Adaptation to New Environments?

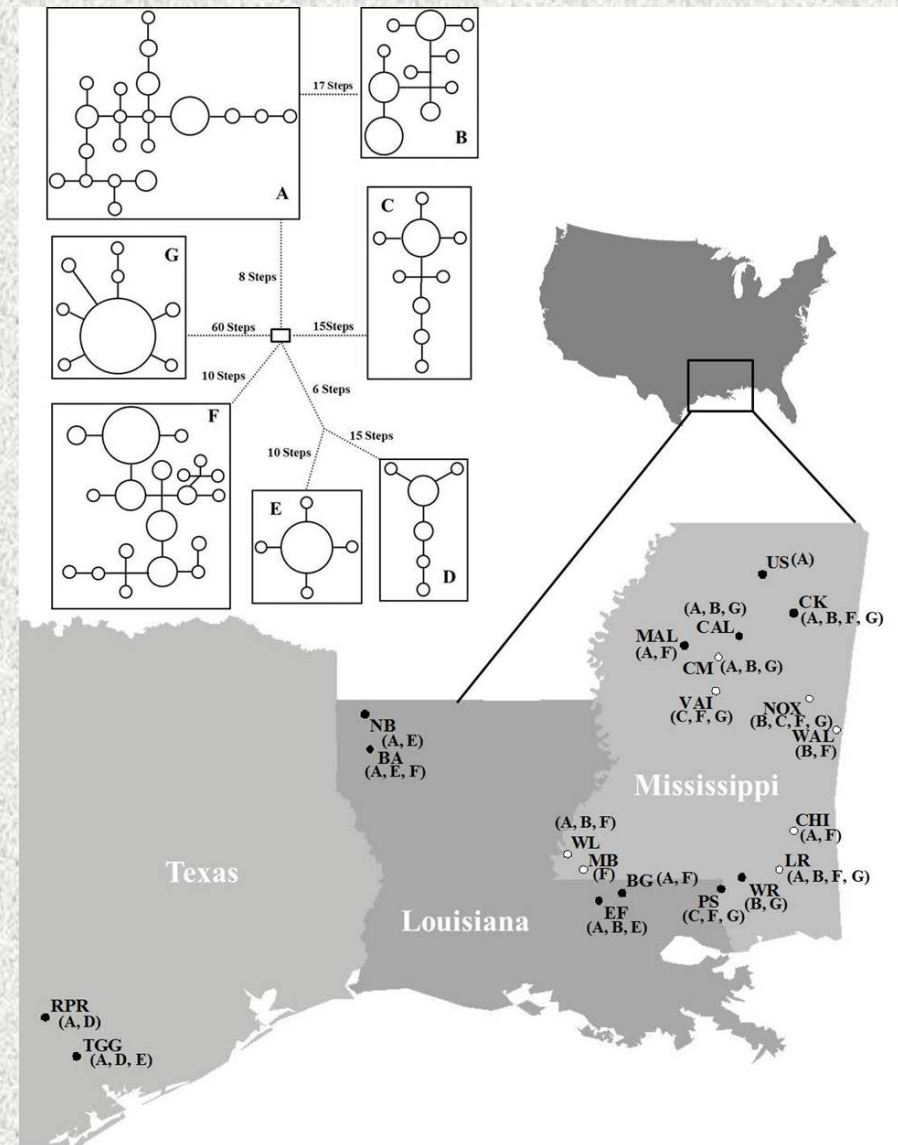


Breeding Dates



Breeding Dates

- Abnormal breeding associated with effects of restocking
- Difficult to demonstrate, indirect
- Not in every region
- Genetic influence in livestock, tropical vs. northern breeds of sheep, goats, etc.
- Who cares?
- Yearling bucks!

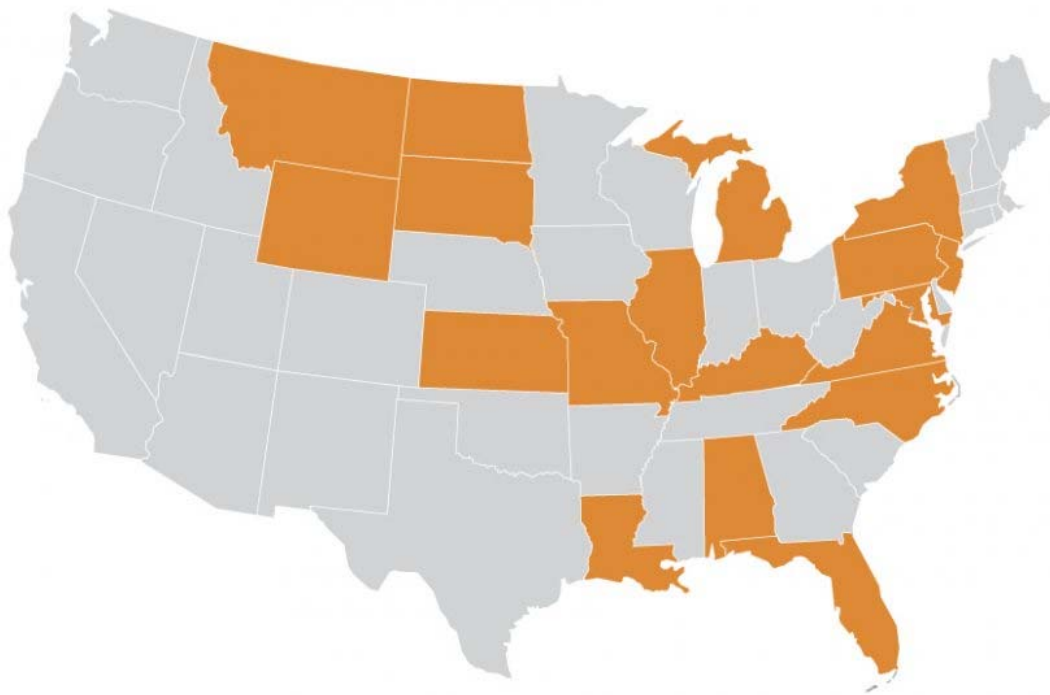


Brain Abscess in Southeastern Deer



Bluetongue-EHD

States with Hemorrhagic Disease (HD) in 2011



QDMA

HD Suspected/Confirmed in 2011



D Snyder, USDA ARS



© Photo by Joe Lacefield

Does intensive management threaten unique lineages?

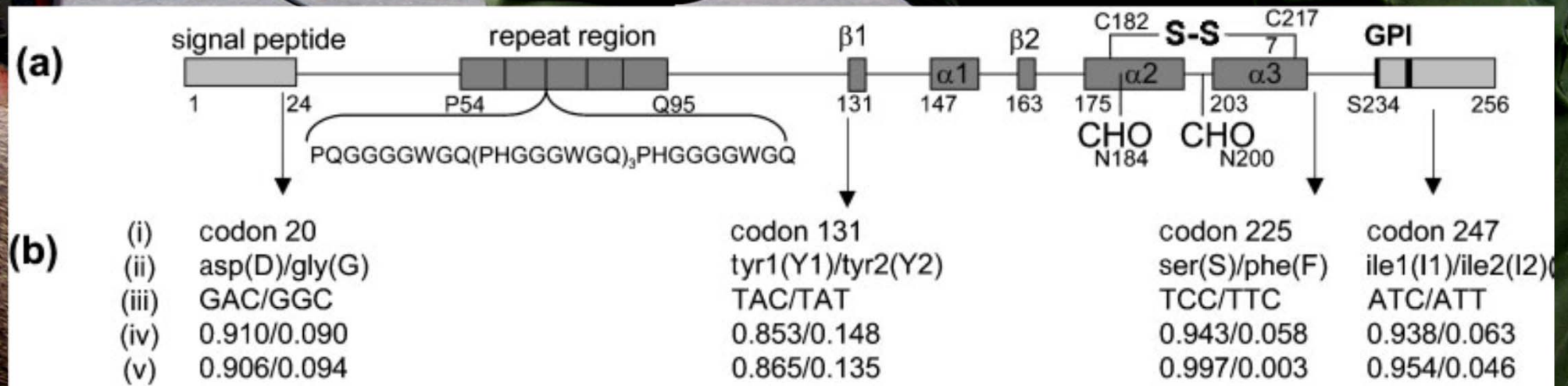


Chronic Wasting Disease



WVA DNR

Chronic Wasting Disease



Prion protein gene variants.... Others?