Forage or Fuel: That is the question.

Texas A&M Sheep and Goat Field Day

San Angelo, TX

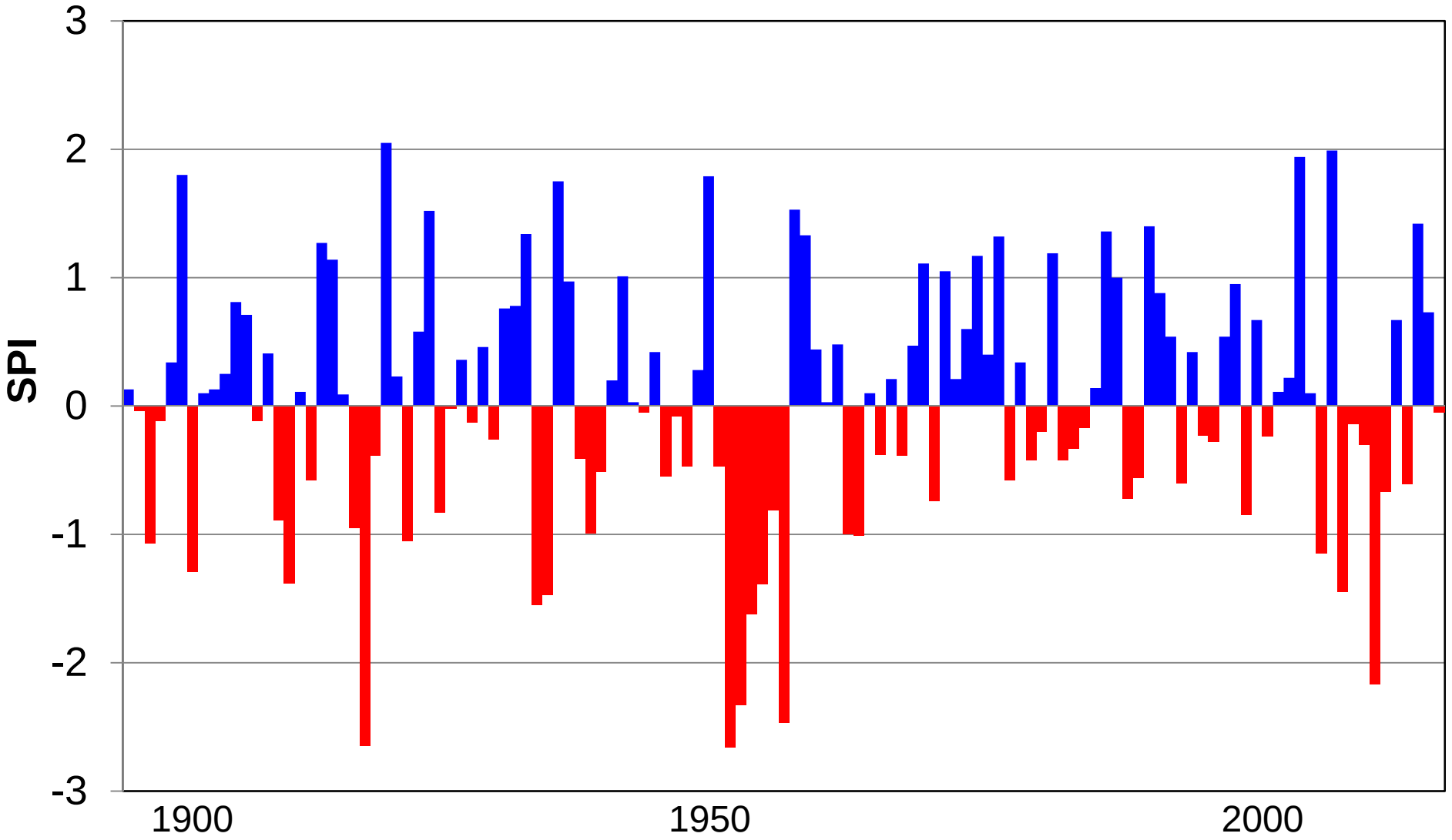
August 17, 2018

Texas A&M AgriLife Research

Objectives

1. Stimulate thought on the value of range plants
2. Present some recent research results
3. Propose some practical applications

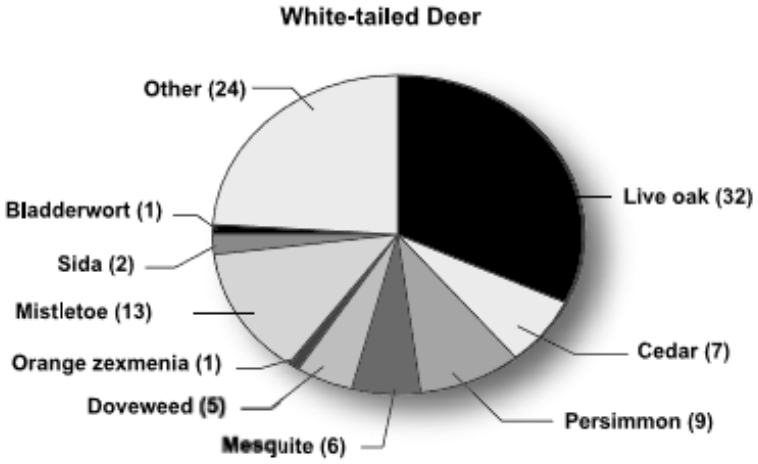
100-year annual Standardized Precipitation Index for the Sonora TX Research Station.



Juniper Expansion
central Arizona, 1995 to 2012

What is the value of this plant?

Forage or Fuel?

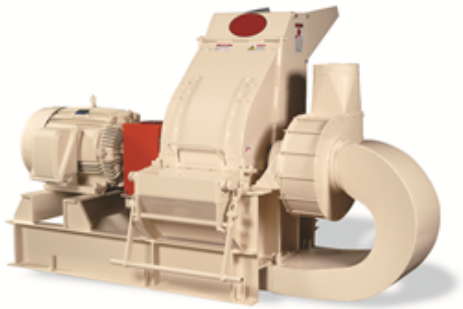


Harvesting Juniper Trees for Livestock Feed

Wood to Feed Program

Texas A&M AgriLife Research

FROM FIELD → **PROCESSED** → **INTO FEED**



$80/ton FOB

Courtesy of Travis Whitney

What is the value of this plant?

Forage or Fuel?

South Texas Grasses

Below are the different species of grasses that can become components of a custom blend. One of the benefits of planting Texas Natives is drought tolerance. These plants are specially adapted to handle the levels of rainfall in Texas.


Atascosa Texas Grama


Carrizo Little Bluestem


Catarina Bristlegrass


Chaparral Hairy Grama


Dilley Slender Grama


Duval Red Lovegrass


Falfurrias Big Sacaton


Hidalgo Multiflower False Rhodes grass (Four-Flower Trichloris)


Kennedy Big Bluestem


Kinney False Rhodesgrass (Two-Flower Trichloris)


La Salle Arizona Cottontop


Lavaca Canada Wildrye


Mariah Hooded Windmillgrass


Maverick Pink Pappusgrass


Nueces Sand Dropseed


Oso Halls Panicum


Ramadero Spike Lovegrass


South Texas Sideoats Grama


Webb Whiplash Pappusgrass


Welder Shortspike Windmillgrass


Wilson Indiangrass

Other Values?

Our Texas Natives are certified "Selected Texas Native Germplasm" by the Texas Department of Agriculture. Each variety is of a specific ecotype of its species that was locally sourced from counties in Texas.

Douglass King Seeds

Prescribed Burn
Thursday March 10, 2016

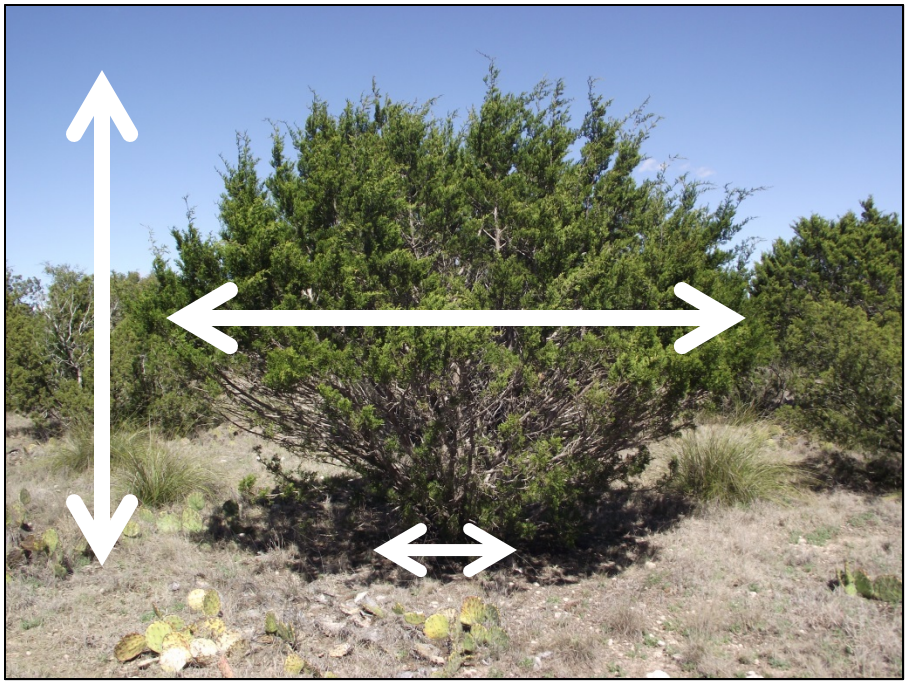
Saturday
March 12, 2016

Saturday
April 9, 2016

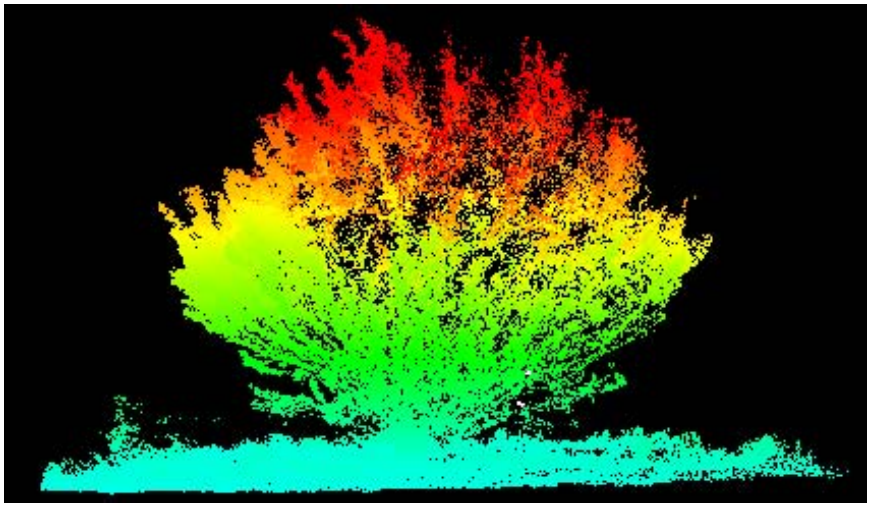
“Mod/Heavy” juniper, with grass understory

“Light” Juniper, with grass understory

Comparison of Methods to Determine Biomass in Juniper



Physical Measurements



LiDar

LiDar data collection set up including scanner and reference spheres.

Juniper Allometry Data

Tree ID	Basal Diameter cm	Height m	Basal Diameter ^{2} x Height cm^3	Canopy Area m^2	Canopy Volume m^3	Canopy Diameter, Widest Point m
Small 1	3.58	0.89	11.41	0.54	0.32	0.90
Small 2	2.42	0.63	3.69	0.15	0.06	0.47
Small 3	1.92	0.80	2.95	0.12	0.07	0.48
Medium 1	5.00	1.22	30.50	0.72	0.58	0.94
Medium 2	7.83	1.83	112.20	3.08	3.75	2.24
Medium 3	5.67	1.44	46.29	0.65	0.62	0.96
Large 1	26.10	3.31	2254.81	16.26	35.86	4.50
Large 2	18.14	2.76	908.20	10.95	20.14	3.83
Large 3	13.69	2.95	552.88	9.82	19.30	3.71

	Less than 1.83m						Greater than 1.83m						
Tree ID	Total Weight	1 hr Fuels	10 hr Fuels	100 hr Fuels	1,000 hr Fuels	10,000 hr Fuels	Total Weight	1 hr Fuels	10 hr Fuels	100 hr Fuels	1,000 hr Fuels	10,000 hr Fuels	Grand Total
Small 1	0.73	0.55	0.09	.	.	.	.	.	.	.	.	.	0.73
Small 2	0.22	0.16	0.05	.	.	.	.	.	.	.	.	.	0.22
Small 3	0.15	0.11	0.03	0.05	.	.	.	.	.	.	.	.	0.15
Medium 1	1.66	1.19	0.22	0.18	.	.	.	.	.	.	.	.	1.66
Medium 2	7.02	4.74	0.93	1.17	.	.	.	.	.	.	.	.	7.02
Medium 3	2.08	1.27	0.52	0.21	.	.	.	.	.	.	.	.	2.08
Large 1	66.22	19.27	20.54	14.12	7.64	4.52	23.68	21.65	0.34	0.34	.	.	89.90
Large 2	41.31	12.02	12.81	8.81	4.77	2.82	7.79	7.12	0.11	0.11	.	.	49.10
Large 3	26.71	7.77	8.28	5.69	3.08	1.82	7.63	6.97	0.11	0.11	.	.	34.33

Determine Juniper density by size class

Determine Lbs Juniper Forage /Acre

	Juniper Tree Count in 0.1 Ha					Kg Forage / 0.1 Ha				
Pasture	< 0.91 m	0.91 - 1.83 m	> 1.83 m	Trees/Ha	**Trees/Ac**	< 0.91 m	0.91 - 1.8 m	> 1.83 m	Kg Forage /Ha	**Lbs/Ac**
1	29	15	25	690	**276**	7.9	36.0	325.4	369.4	**329.5**
2	13	5	1	190	**76**	3.5	12.0	13.0	28.6	**25.5**
3	52	5	9	660	**264**	14.1	12.0	117.2	143.3	**127.8**
4	13	6	5	240	**96**	3.5	14.4	65.1	83.0	**74.1**
5	71	17	39	1270	**508**	19.3	40.8	507.7	567.8	**506.6**
6	83	23	40	1460	**584**	22.5	55.3	520.7	598.5	**534.0**
7	62	13	18	930	**372**	16.8	31.2	234.3	282.4	**251.9**
8	48	23	36	1070	**428**	13.0	55.3	468.6	536.9	**479.0**
Avg				813.8	**325.5**				326.2	**291.1**
SE				161.6	**64.6**				80.4	**71.7**

“Stocking Rate” Calculations

	0 to 3 ft	3 to 6 ft	6+ ft	Total
Trees per Acre	100	50	10	160
Lbs Forage per Tree	0.14	3.75	17.1	2.33
Lbs per Acre	14.0	187.5	171.0	372.5

Acres in Pasture	500
Lbs Juniper Forage/Acre	372.5
Total Lbs Juniper Forage	186250
% Utilization	0.25
Lbs Juniper Forage Utilized	46563
Dry Matter Intake Lbs Juniper	1.25
Grazing Period (d)	90
Dry Matter Intake/Period	113
Number of Goats	414

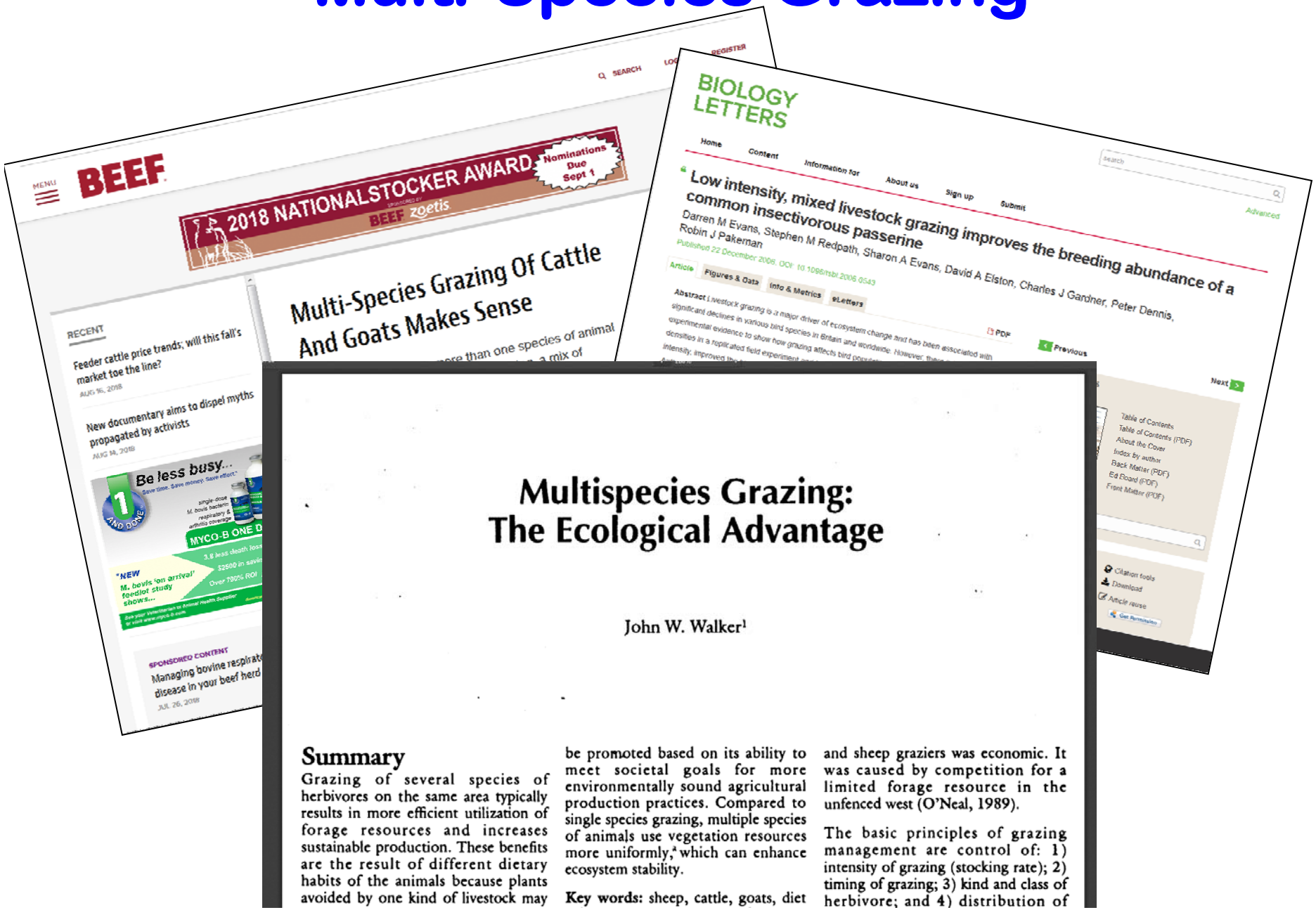
Courtesy of Dr Reid Redden

Merrill Grazing System

4 pastures: 3 herds

	Year 1			Year 2			Year 3			Year 4		
Pasture	ONDJ	FMAM	JJAS	ONDJ	FMAM	JJAS	ONDJ	FMAM	JJAS	ONDJ	FMAM	JJAS
1	Graze	Graze	Graze	Rest	Graze	Graze	Graze	Rest	Graze	Graze	Graze	Rest
2	Graze	Graze	Rest	Graze	Graze	Graze	Rest	Graze	Graze	Graze	Rest	Graze
3	Graze	Rest	Graze	Graze	Graze	Rest	Graze	Graze	Graze	Rest	Graze	Graze
4	Rest	Graze	Graze	Graze	Rest	Graze	Graze	Graze	Rest	Graze	Graze	Graze

Multi-Species Grazing



Put it all together…

	Year 1			Year 2		
Pasture	ONDJ	FMAM	JJAS	ONDJ	FMAM	JJAS
1	Sheep	Rest	Flex	Goats	Sheep	Rest
2	Rest	Flex	Goats	Sheep	Rest	Flex
3	Flex	Goats	Sheep	Rest	Flex	Goats
4	Goats	Sheep	Rest	Flex	Goats	Sheep

Summary

1. In a variable climate, with invasive plant species; consider the value of range plants as forage or fuel
2. With careful range management planning, we can integrate and capture the value of vegetation as both
3. Think long-term, there are no quick fixes in range and ranch management

Courtesy OK State