

Managing Natural Resources – Stocking Rate, Carrying Capacity & Animal Units
Gillespie County Beef & Range Field Day
May 12, 2011

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R.V. Machen



Goals

- Personal
- Resources
 - Soil
 - Plants
 - Animals
- How are they related?





“I love ground nesting birds, especially quail. How can I draw them into the yard?”



How are these
goals related?

What is “Job One”?







Yellow Indiangrass
Wright's Threeawn



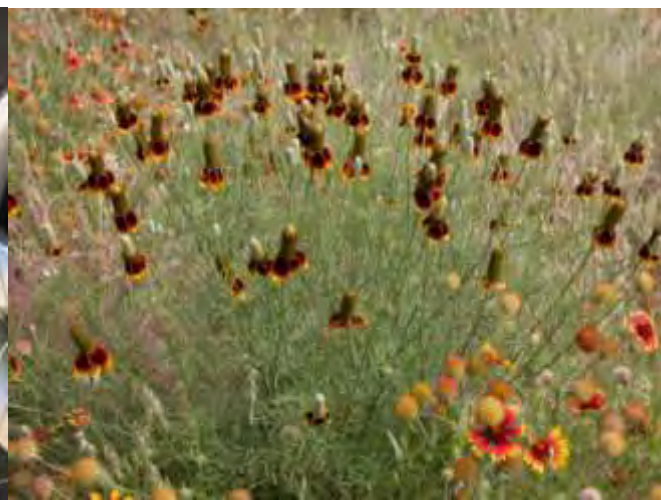
Little Bluestem
KR Bluestem



Big Bluestem



Switchgrass



Prairie Coneflower



Wildlife Management





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**How can I
monitor progress toward
achieving my goal(s)?**

Range Health



Why is Rangeland Health Important?

Robert K. Lyons, Ph.D.
Extension Range Specialist

Rangeland Health Definition



● Degree of sustained integrity of:

☞ Soils

☞ Ecological processes

★ Photosynthesis

★ Nutrient cycling

Rangeland Management Standard

● Minimum:

- ☞ prevent human induced loss of rangeland health

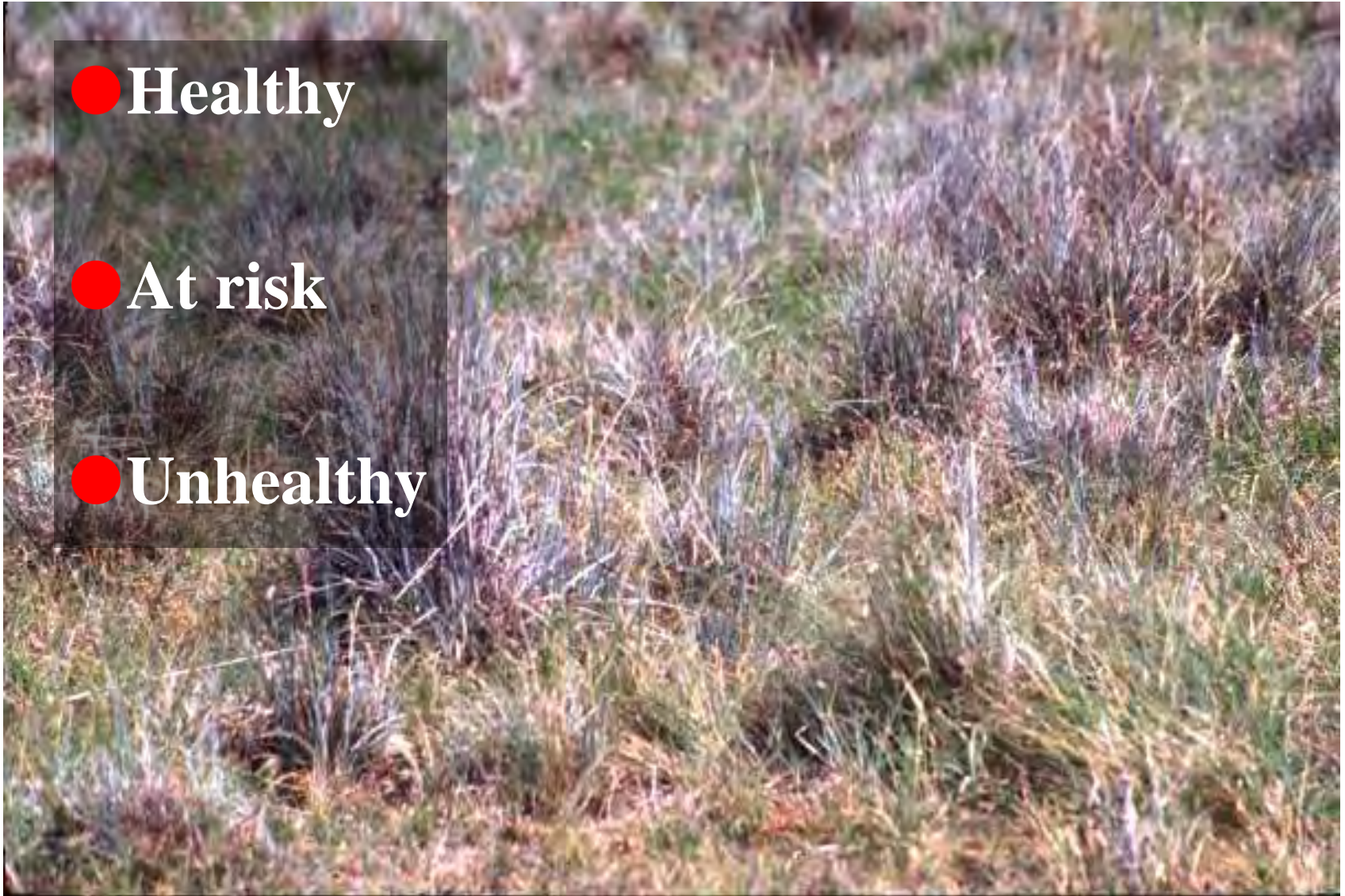


Rangeland Health Thresholds

● Healthy

● At risk

● Unhealthy



Health Criteria & Thresholds

Soil Stability

Healthy	At Risk	Unhealthy
No movement	Moving on site	Moving off site



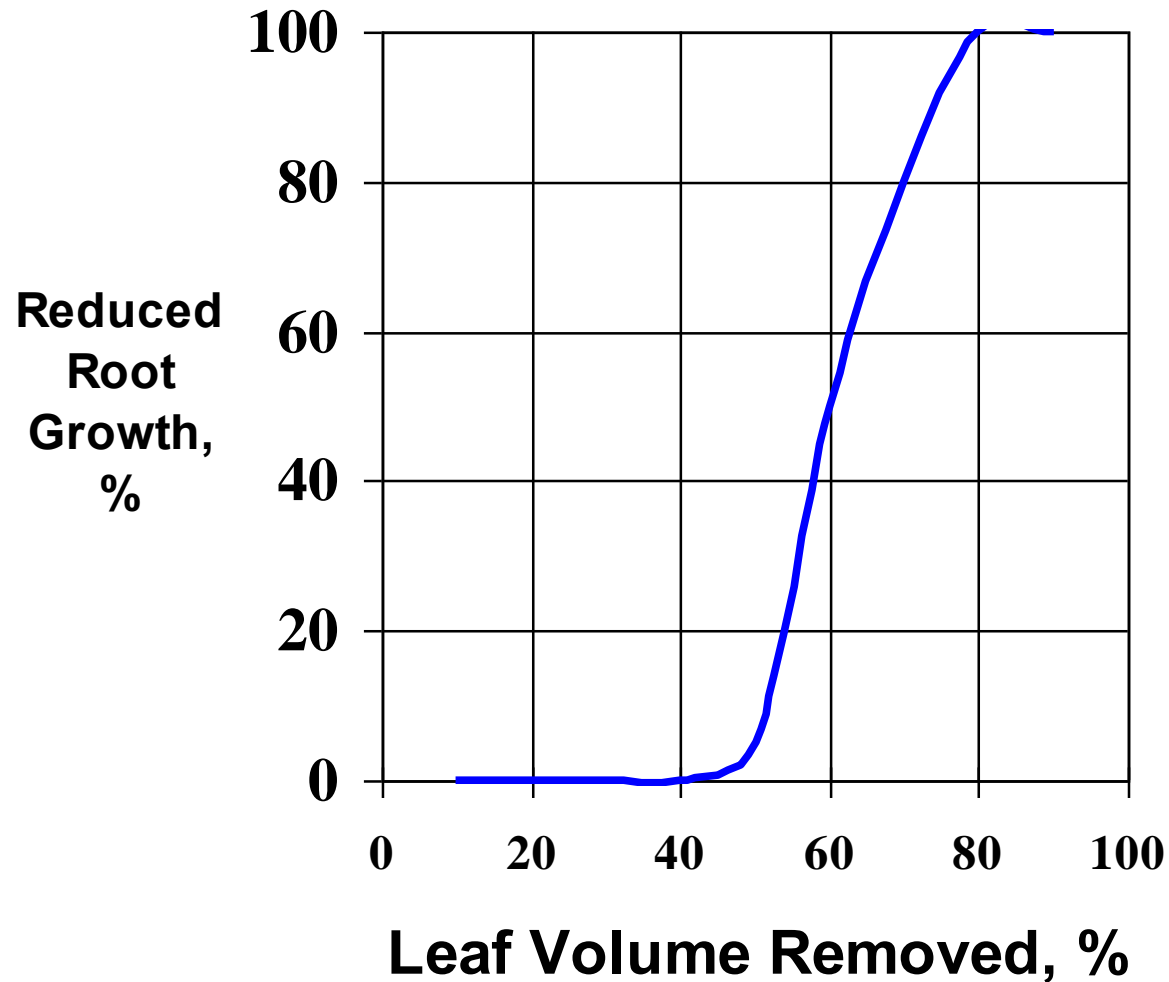
Nutrients/Energy & Thresholds

Plants & Litter

Healthy	At Risk	Unhealthy
Good distribution	Fragmented	Fragmented; large barren areas; pedestaled plants



Leaf Removal & Root Growth



Heavy, Frequent Defoliation

- Reduces
 - ☞ root growth & size
 - ☞ water infiltration
 - ☞ water absorption
 - ☞ nutrient absorption
- Loss of competitive advantage



Forage Residue Levels

Vegetation Type	Lb./ac	Minimum Stubble Height, in
Tallgrass	1200-1500	12-14
Midgrass	750-1100	6-8
Shortgrass	300-500	2-3

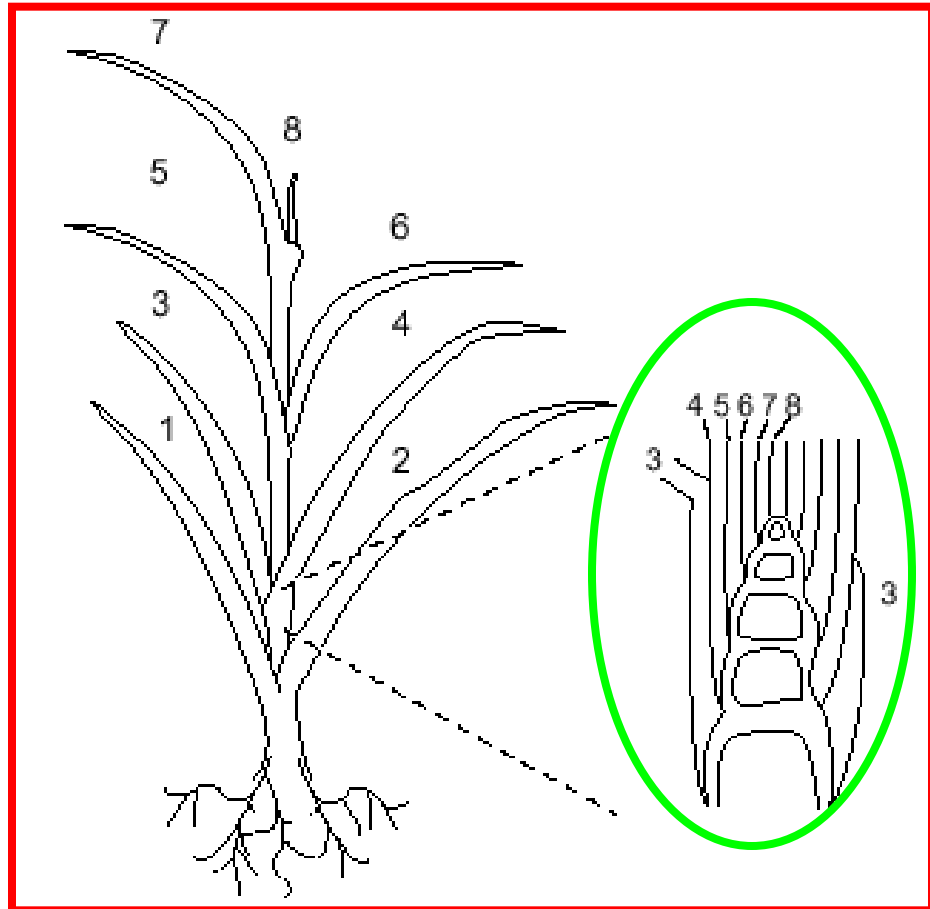
How grass grows



How Grasses Grow

● Growing point

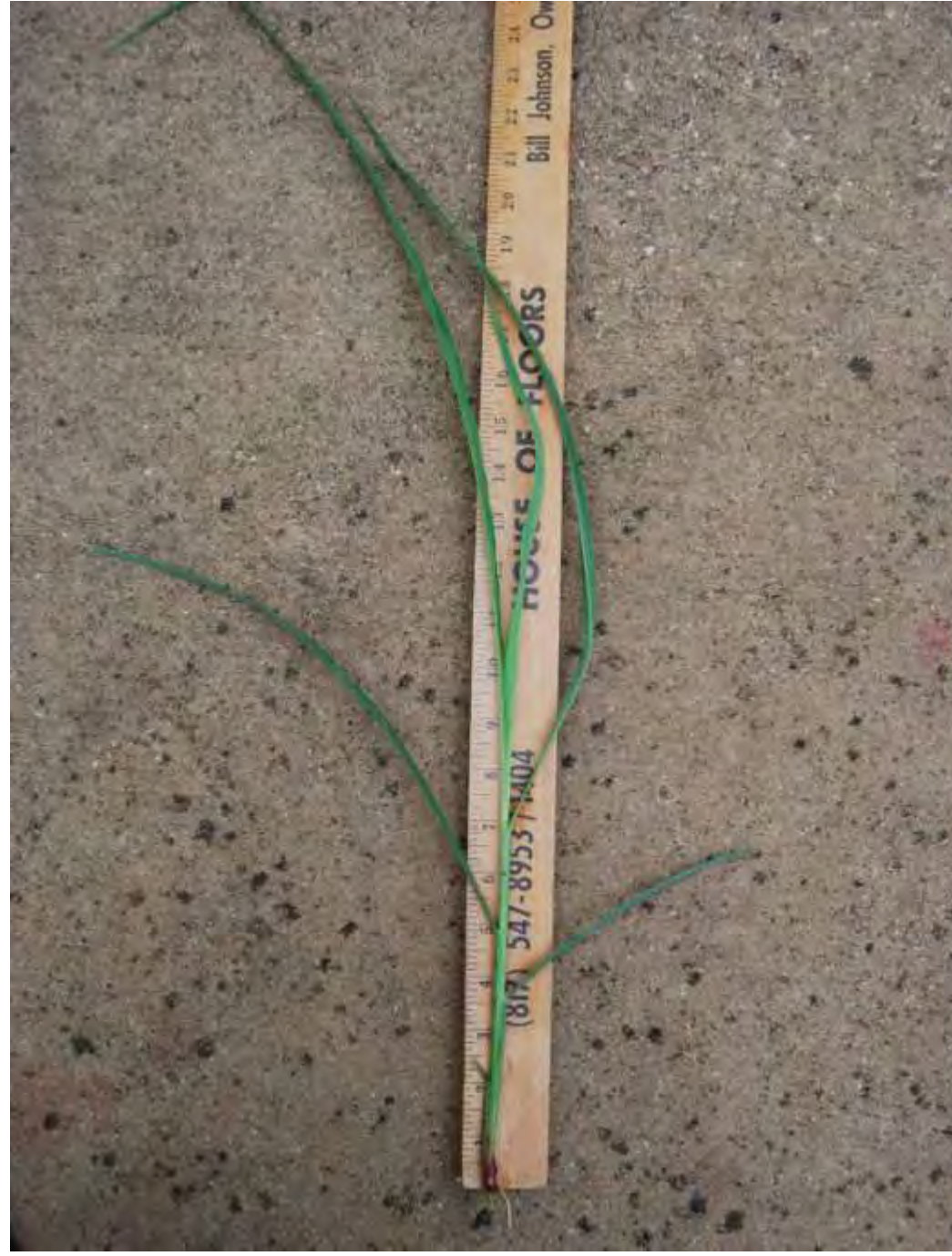
- 👉 close to ground
 - ★ protected
 - ★ produce leaves 1-2 yrs
- 👉 elevated
 - ★ unprotected
 - ★ eaten/makes seedhead: dies





Growing Point Elevation & Grazing Resistance

Grass species	Growing point elevation/ reproductive tiller ratio	Grazing resistance
Buffalograss	Remain close to ground	High
Little bluestem	Elevation late w/ large number reproductive tillers	Moderate
Sideoats grama	Elevation late w/ large number reproductive tillers	Moderate
Switchgrass	Early	Low
Yellow Indiangrass	Early	Low
Johnsongrass	High number reproductive tillers	Low





Rainfall Movement From Range Watersheds

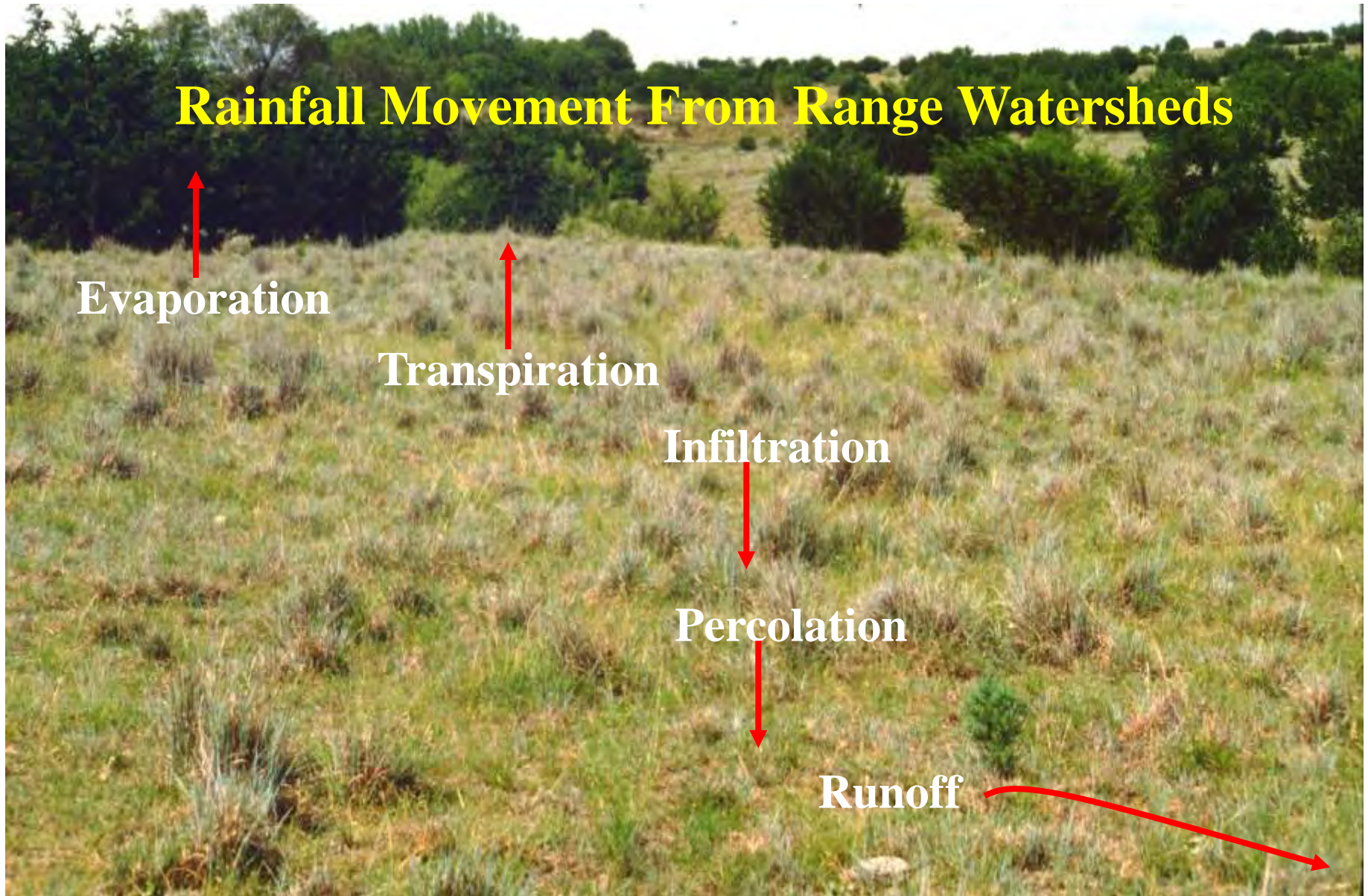
Evaporation

Transpiration

Infiltration

Percolation

Runoff

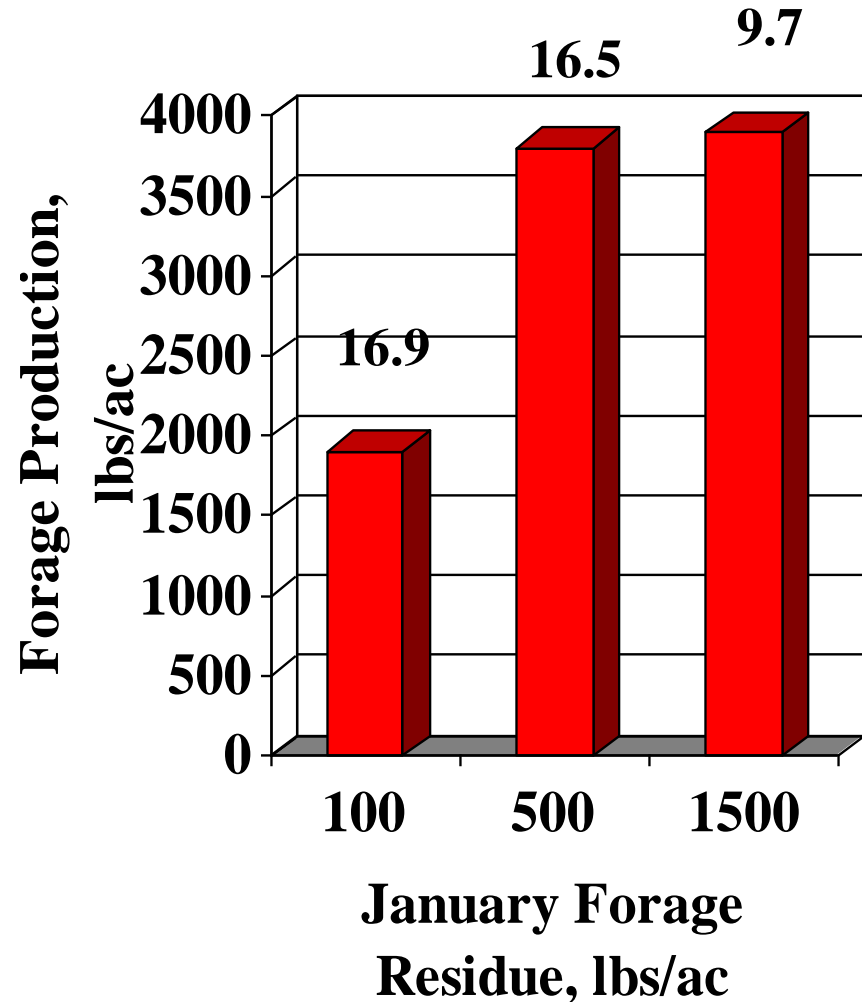


Grazing Management

Forage Residue & Rainfall Effectiveness

- Leaving a forage residue

- ☞ Protects soil
- ☞ Increases rainfall effectiveness
- ☞ Increases forage production



Animal Unit

- relates different animals to a common base – forage consumption.

An animal unit is the number of animal(s) which consume **26 pounds** of forage (DM) per day.



1,000 lb cow
5 sheep
6 goats
7 deer
17 jackrabbits
52 free-range hens

“Animal Unit”

	<u>wt.</u>
Aoudad	200
Axis	160
Blackbuck	75
Fallow	130
Mouflon	120
Red Deer	450
Sika	145
Whitetail	100
Cattle	1000
Sheep	90
Spanish goat	90
Boer X goat	135

from *Exotics on the Range*, Mungall & Sheffield, 1994

“Animal Unit”

	<u>wt.</u>	<u>intake</u>
Aoudad	200	0.035
Axis	160	0.035
Blackbuck	75	0.04
Fallow	130	0.035
Mouflon	120	0.035
Red Deer	450	0.03
Sika	145	0.035
Whitetail	100	0.035
Cattle	1000	0.026
Sheep	90	0.04
Spanish goat	90	0.04
Boer X goat	135	0.04

from *Exotics on the Range*, Mungall & Sheffield, 1994

“Animal Unit”

	<u>wt.</u>	<u>intake</u>	<u>lb/day</u>
Aoudad	200	0.035	7.00
Axis	160	0.035	5.60
Blackbuck	75	0.04	3.00
Fallow	130	0.035	4.55
Mouflon	120	0.035	4.20
Red Deer	450	0.03	13.50
Sika	145	0.035	5.08
Whitetail	100	0.035	3.50
Cattle	1000	0.026	26.00
Sheep	90	0.04	3.60
Spanish goat	90	0.04	3.60
Boer X goat	135	0.04	5.40

from *Exotics on the Range*, Mungall & Sheffield, 1994

“Animal Unit”

	<u>wt.</u>	<u>intake</u>	<u>lb/day</u>	<u>AUE</u>	<u>hd/AU</u>
Aoudad	200	0.035	7.00	0.27	3.7
Axis	160	0.035	5.60	0.22	4.6
Blackbuck	75	0.04	3.00	0.12	8.7
Fallow	130	0.035	4.55	0.18	5.7
Mouflon	120	0.035	4.20	0.16	6.2
Red Deer	450	0.03	13.50	0.52	1.9
Sika	145	0.035	5.08	0.20	5.1
Whitetail	100	0.035	3.50	0.13	7.4
Cattle	1000	0.026	26.00	1.00	1.0
Sheep	90	0.04	3.60	0.14	7.2
Spanish goat	90	0.04	3.60	0.14	7.2
Boer X goat	135	0.04	5.40	0.21	4.8

from *Exotics on the Range*, Mungall & Sheffield, 1994

How many 1,000 lb cow's are out there?





1200 lb



1200 lb

Production Stage Early Lactation

**Daily Feed Good Bermudagrass hay
11% CP, 54% TDN**

Daily DM intake	25.5 lb
Daily weight change	-0.98 lb

Days to Lose 1 BCS	94
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Daily DM intake	27.7 lb
Daily weight change	-2.88 lb

Days to Lose 1 BCS	29
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<http://www.ansi.okstate.edu/exten/cowculator/>



160 lb



100 lb

Daily DM intake 5.6 lb

Head/AU 4.6

Daily DM intake 3.5 lb

Head/AU 7.4

1 AU consumes = 26 lb DM/day



Daily DM intake 4.0 lb

Head/AU 6.4

Daily DM intake 7.2 lb

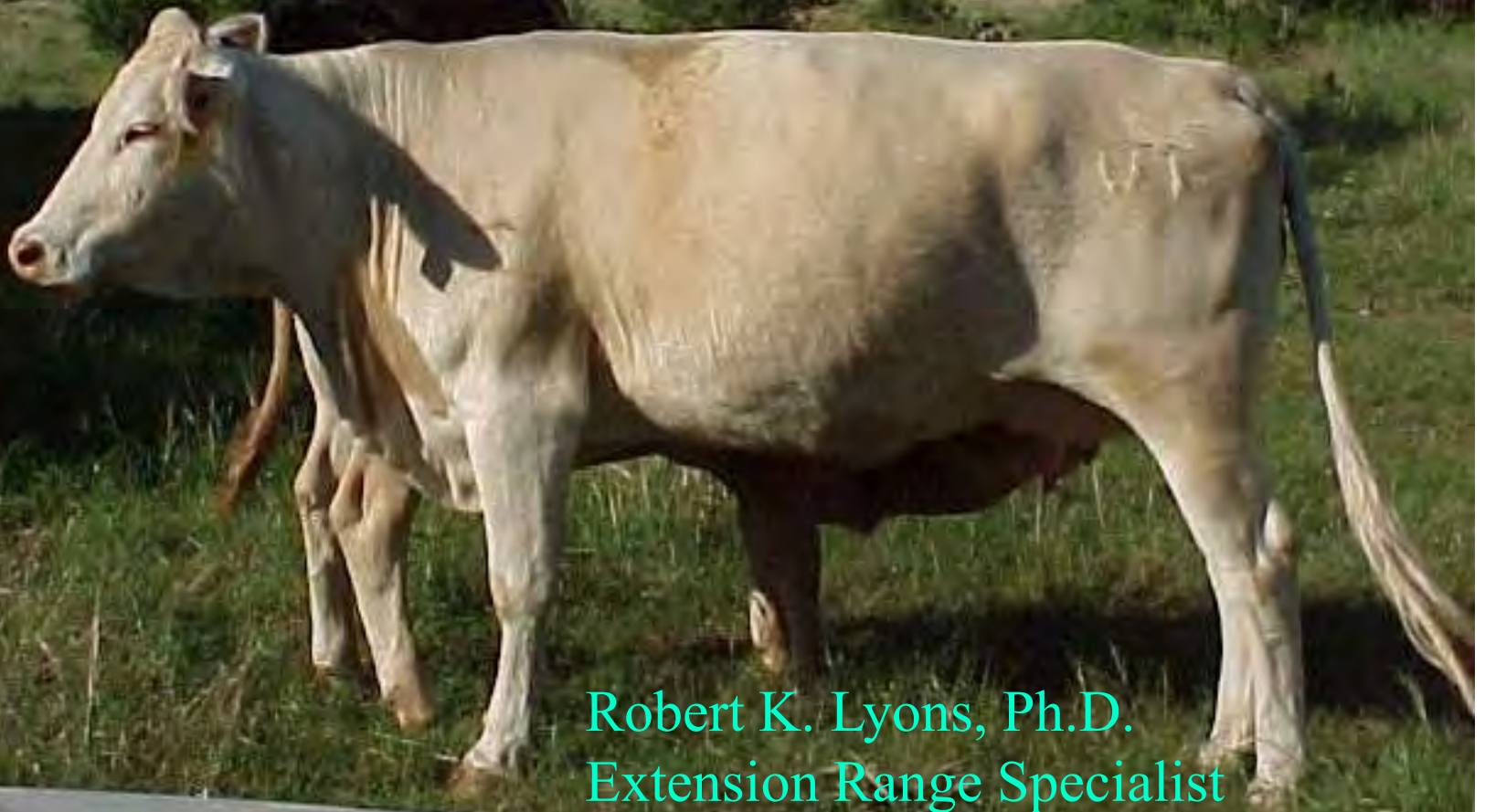
Head/AU 3.6

1 AU consumes = 26 lb DM/day



Stocking Rate
Carrying Capacity
Grazeable Acres

Carrying Capacity, Stocking Rate, & Grazeable Acres



Robert K. Lyons, Ph.D.
Extension Range Specialist

Stocking Rate vs. Carrying Capacity

- Stocking rate



Acres allotted to an animal



Acres/animal unit/year

- Carrying capacity







Stocking rate possible w/o resource damage



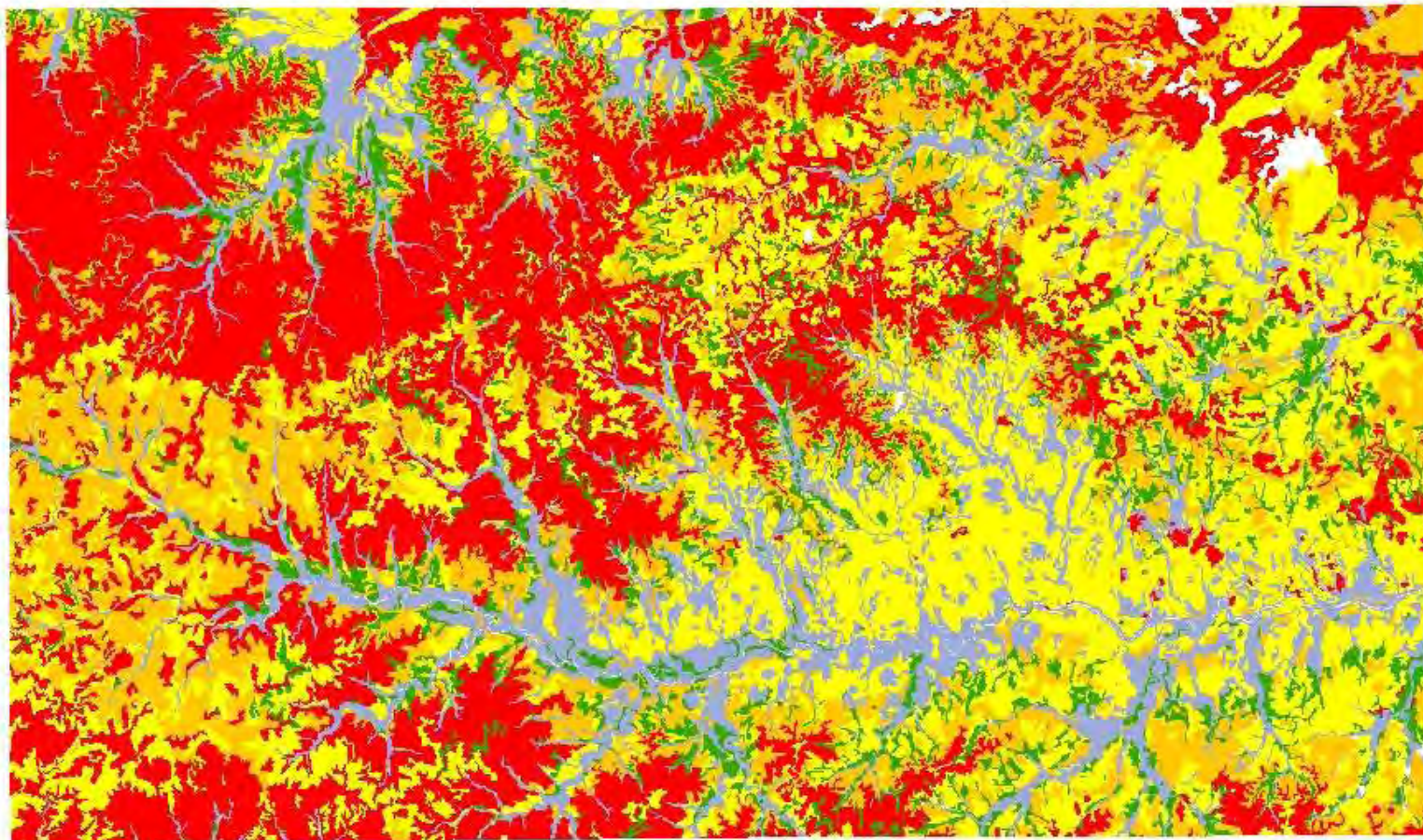
Numbers ***not set in stone***, only guidelines

Carrying Capacity/Stocking Rate Considerations

Take Half-Leave Half

- Take half
 -  25% to livestock
 -  25% to trampling, insects, decay
- Leave half
 -  Protect soil
 -  Plant vigor & protection

Average Range Production per Major Soil Components for Gillespie County, Texas



Range Production (lbs/ac)

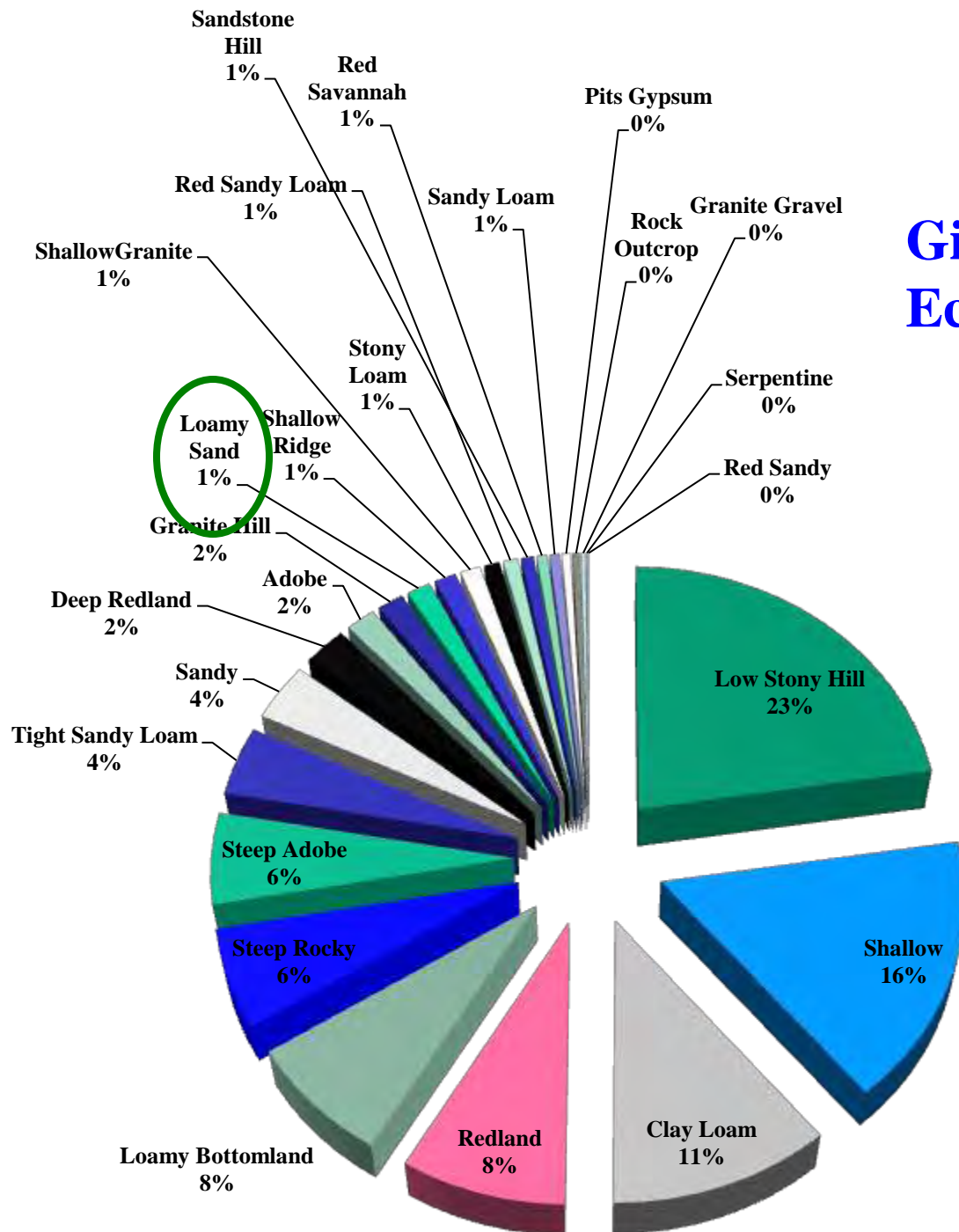


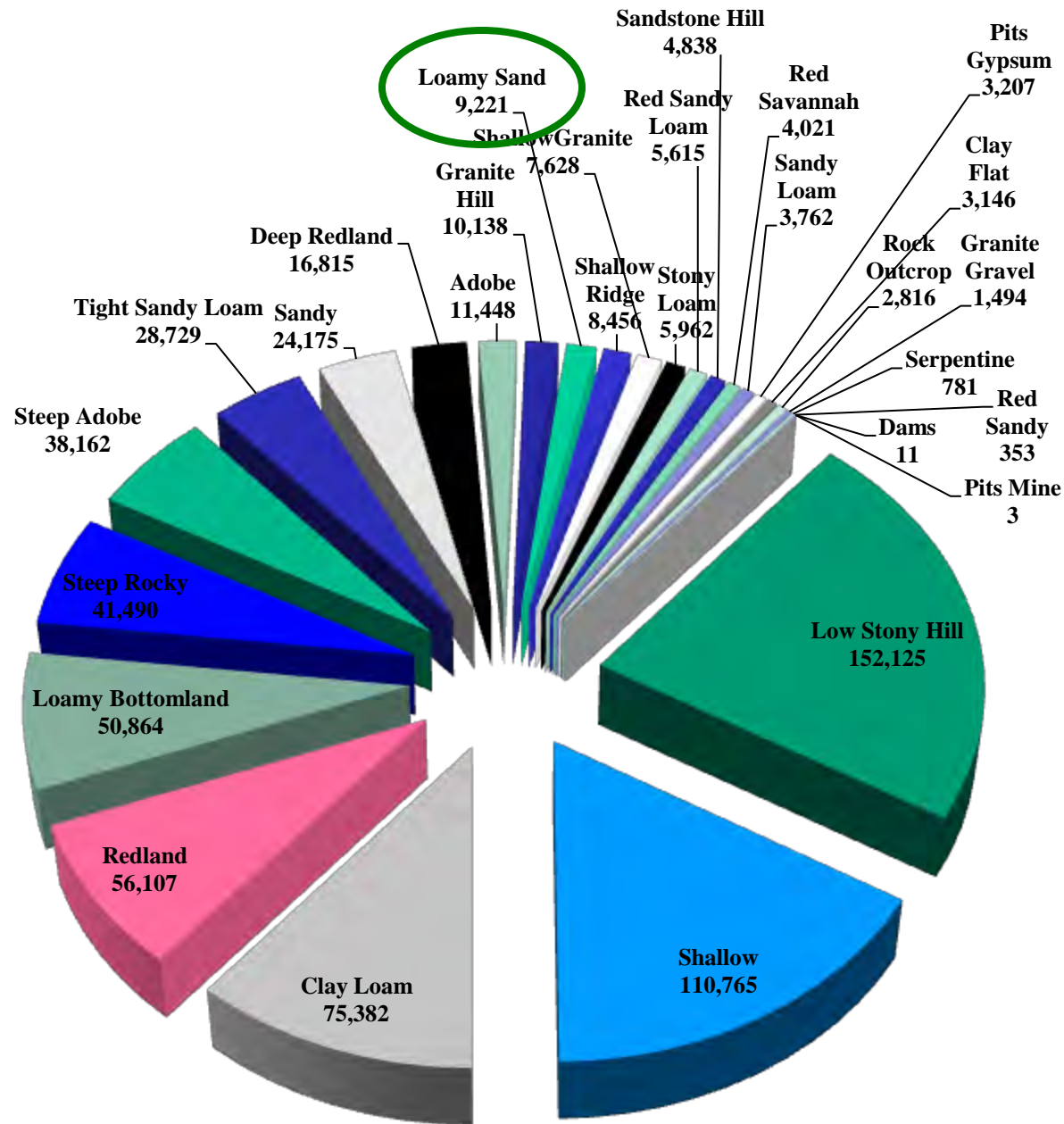
Gillespie County

Major Soil Component Carrying Capacity

Soil	Annual Production, lb/ac	25% Production to Livestock, lbs/ac	Carrying Capacity, Ac/AUY	
1	900-1800	225-450	42	21
2	1801-2800	450-700	21	14
3	2801-3500	700-875	14	11
4	3501-4500	875-1125	11	18
5	4501-6000	1125-1500	8	6

Gillespie County Ecological Sites, %

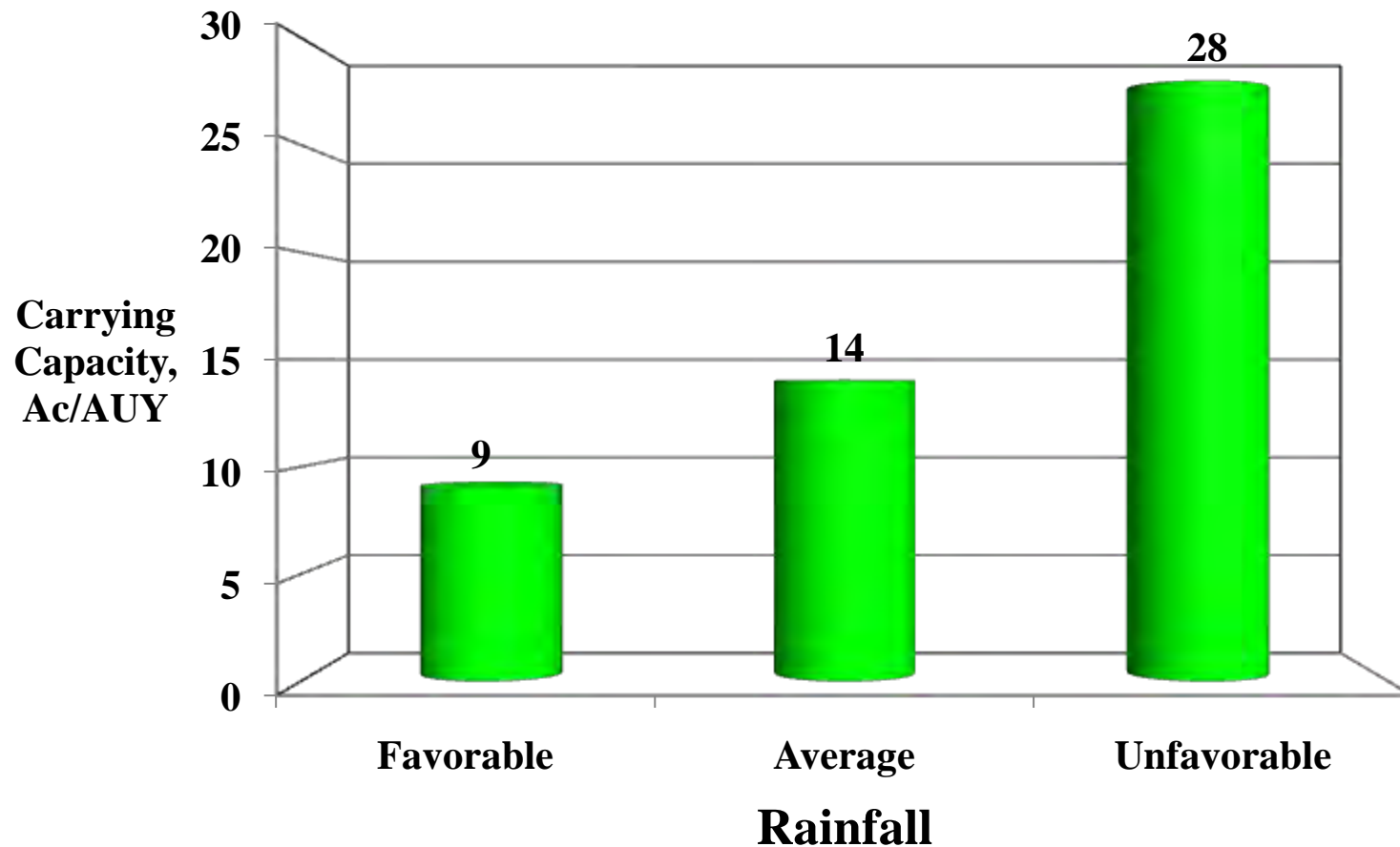




**Gillespie County
Ecological Site, Acres**

Low Stony Hill

Theoretical Carrying Capacities



Stocking Rate Perspectives

Range resource








Animal performance










Stocking Rate Considerations

Animal Size

- Proper stocking rate (carrying capacity) example:
 **30 ac** /animal unit/year
- Animal unit (1000-lb cow)
 Forage demand, **26 lbs/day**
- 1200-lb cow
 -  Forage demand, 1200 lbs x **0.026** = **31 lbs/day**
 -  Animal unit equivalent, 31 lbs ÷ 26 lbs = 1.2
 -  Stocking rate, 30 ac/AUY x 1.2 = **36 ac/cow**

Stocking Rate Considerations

Animal Productivity

- Proper stocking rate (carrying capacity) example:
 **30 ac**/animal unit/year
- 1200-lb cow, weaning **500-lb calf**
 -  Forage demand, 1200 lbs x **0.026** = 31 lbs/day
 -  Animal unit equivalent, 30 lbs ÷ 26 lbs = 1.2
 -  Stocking rate, 1.2 x 30 ac/AUY = **36 ac/cow**
- 1200-lb cow, weaning **600-lb calf**
 -  Forage demand, 1200 lbs x **0.03** = 36 lbs/day
 -  Animal unit equivalent, 36 lb ÷ 26 lb = 1.4
 -  Stocking rate, 1.4 x 30 ac/AUY = **42 ac/cow**

Stocking Rate Considerations

Grazeable Acres

- Ranch/pasture size
- Brush cover/density
- Topography
- Distance to water
- Forage preference

GPS Collars



Edwards Plateau Ranch 2



Low Stony Hill

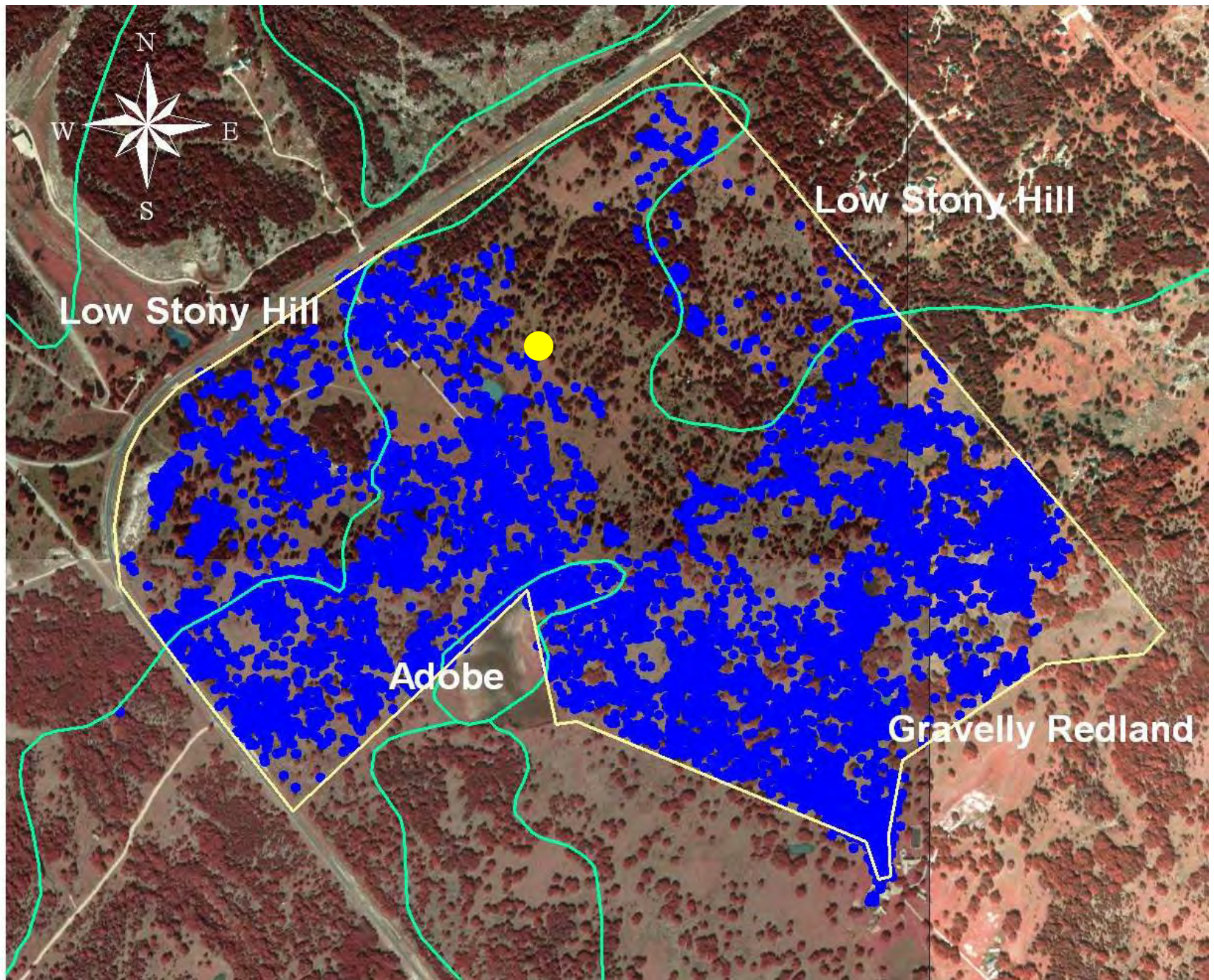
Low Stony Hill

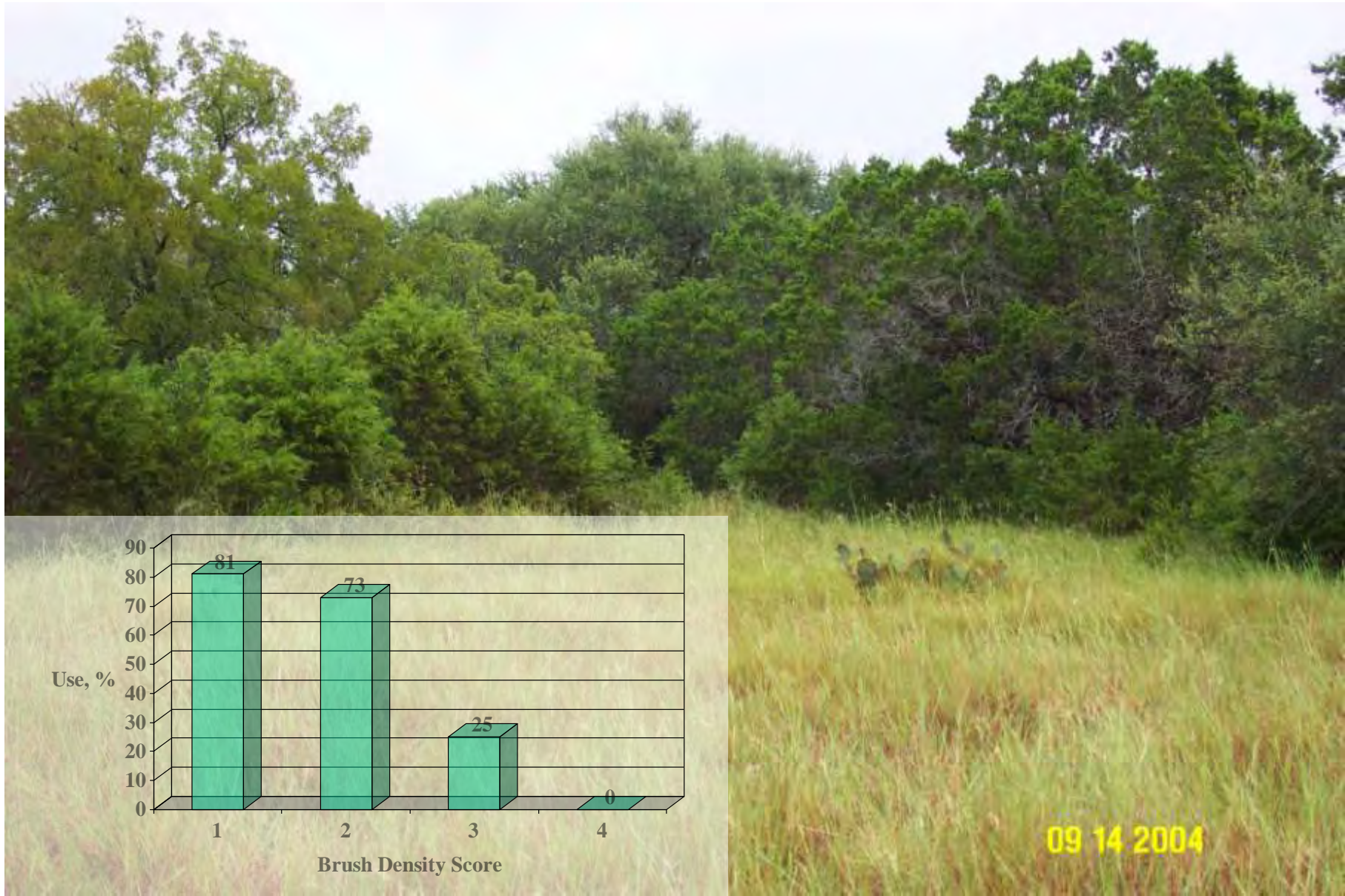
Adobe

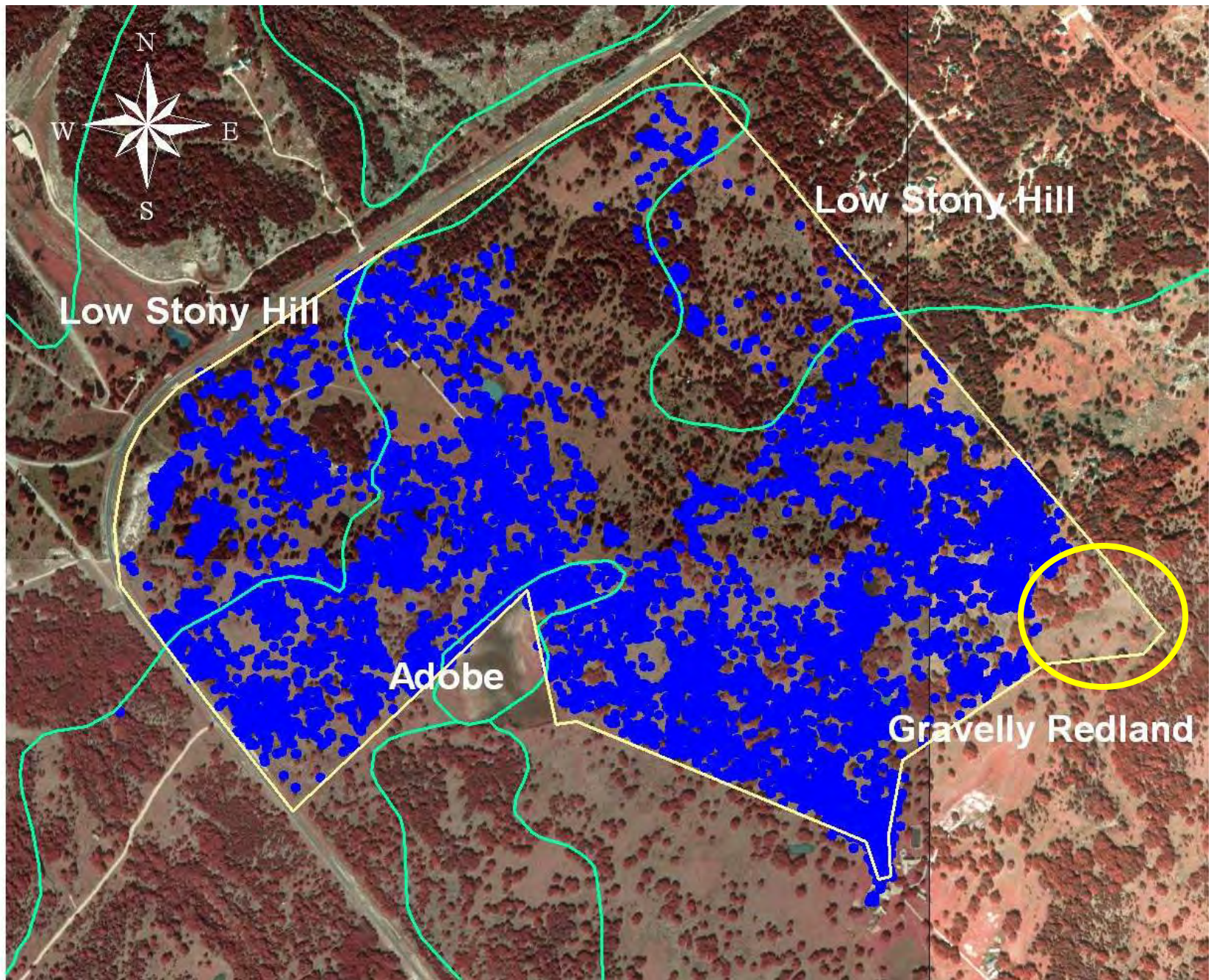
Gravelly Redland

**Gravelly Redland:Low Stony Hill
Preference**

2.5:1









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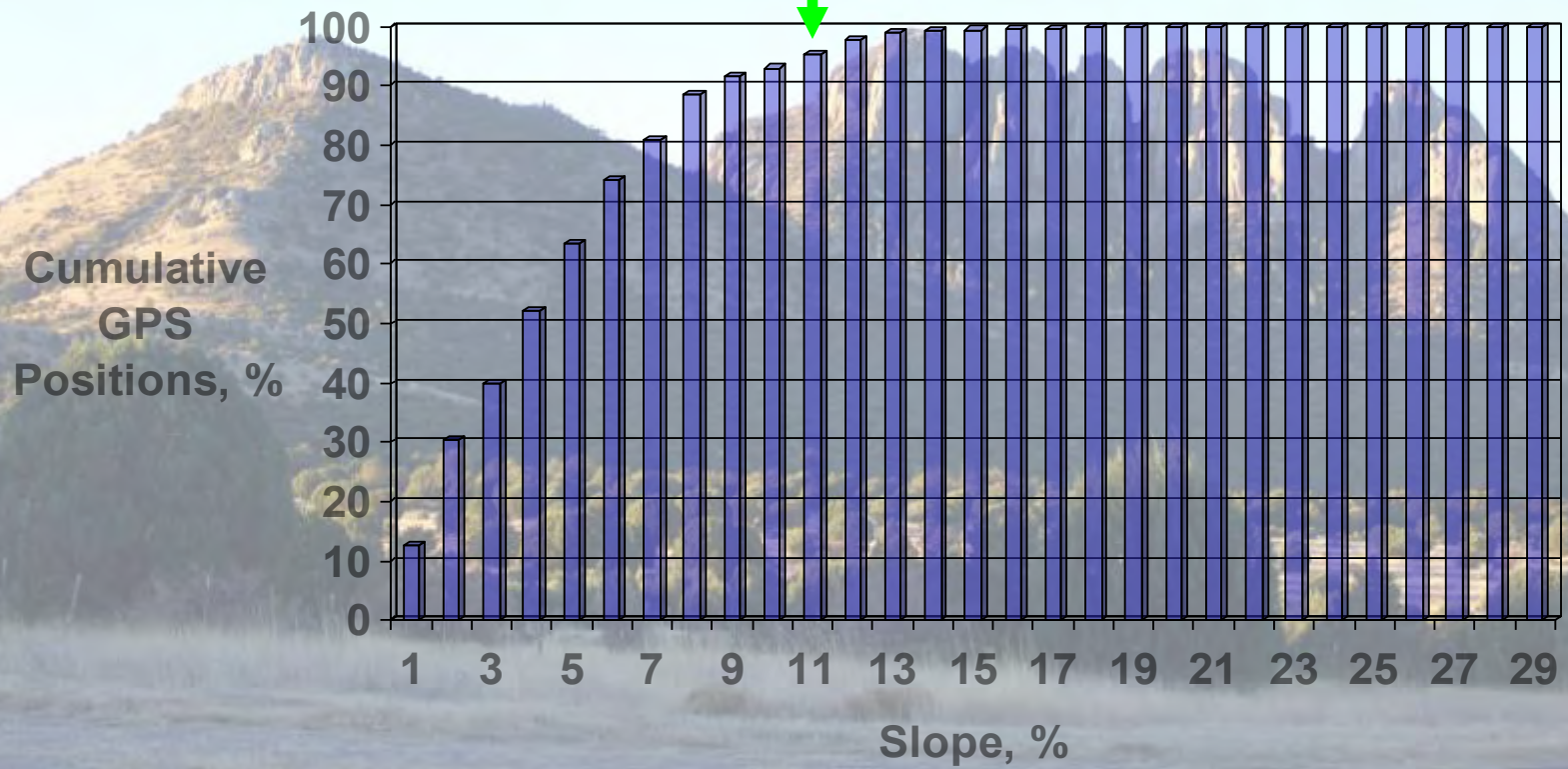
Rock Cover, %	Use, %	No Use
<28	68	32
>28	12	88

09 14 2004

Forage Preference



Slope



Grazeable Acres

Distance to Water	Percent Use
0.5	100
1.0	90
1.25	80
1.5	60
1.75	40
2.0	20
2.5	10

**Water
Access**

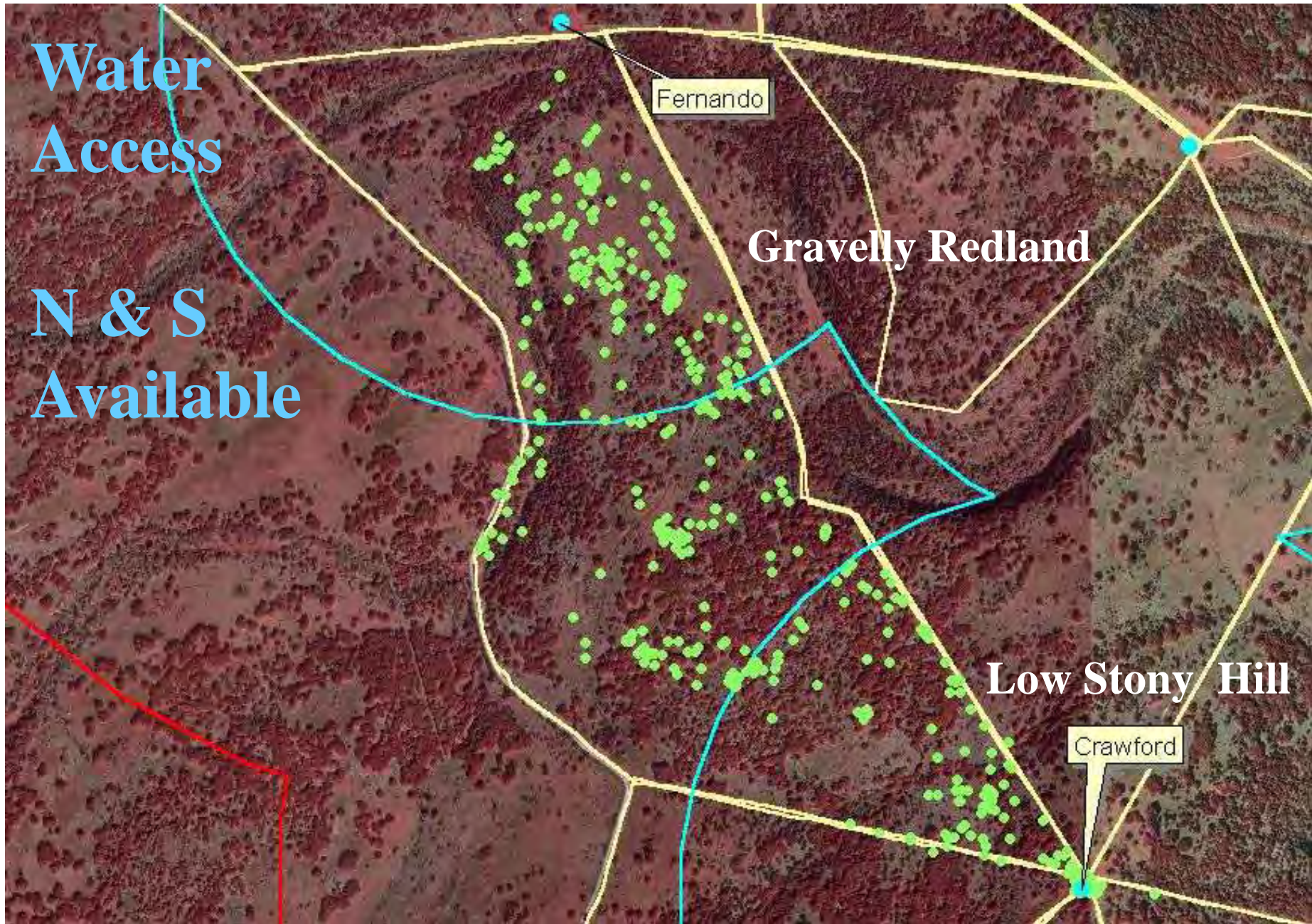
**N & S
Available**

Fernando

Gravelly Redland

Low Stony Hill

Crawford



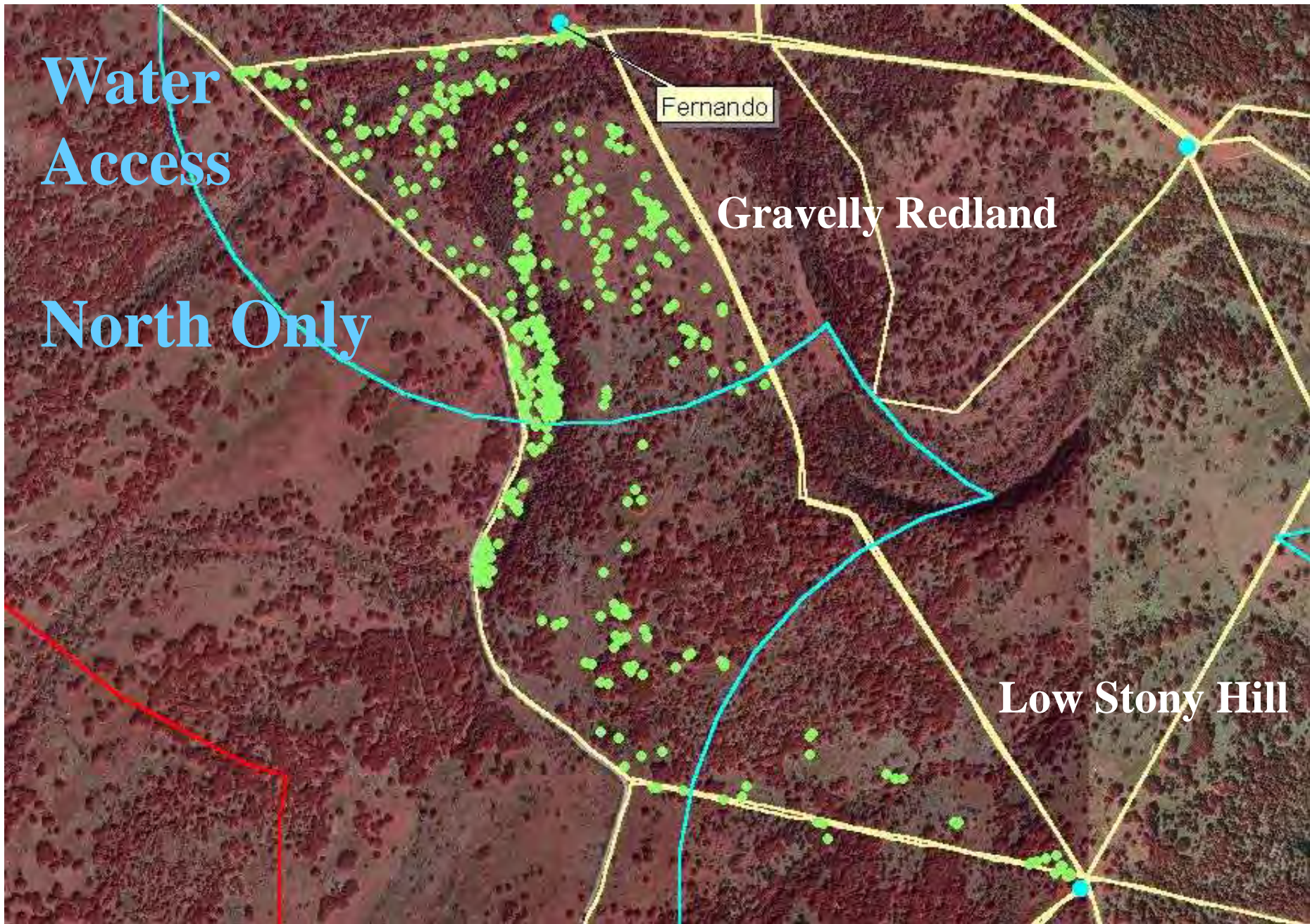
**Water
Access**

North Only

Fernando

Gravelly Redland

Low Stony Hill



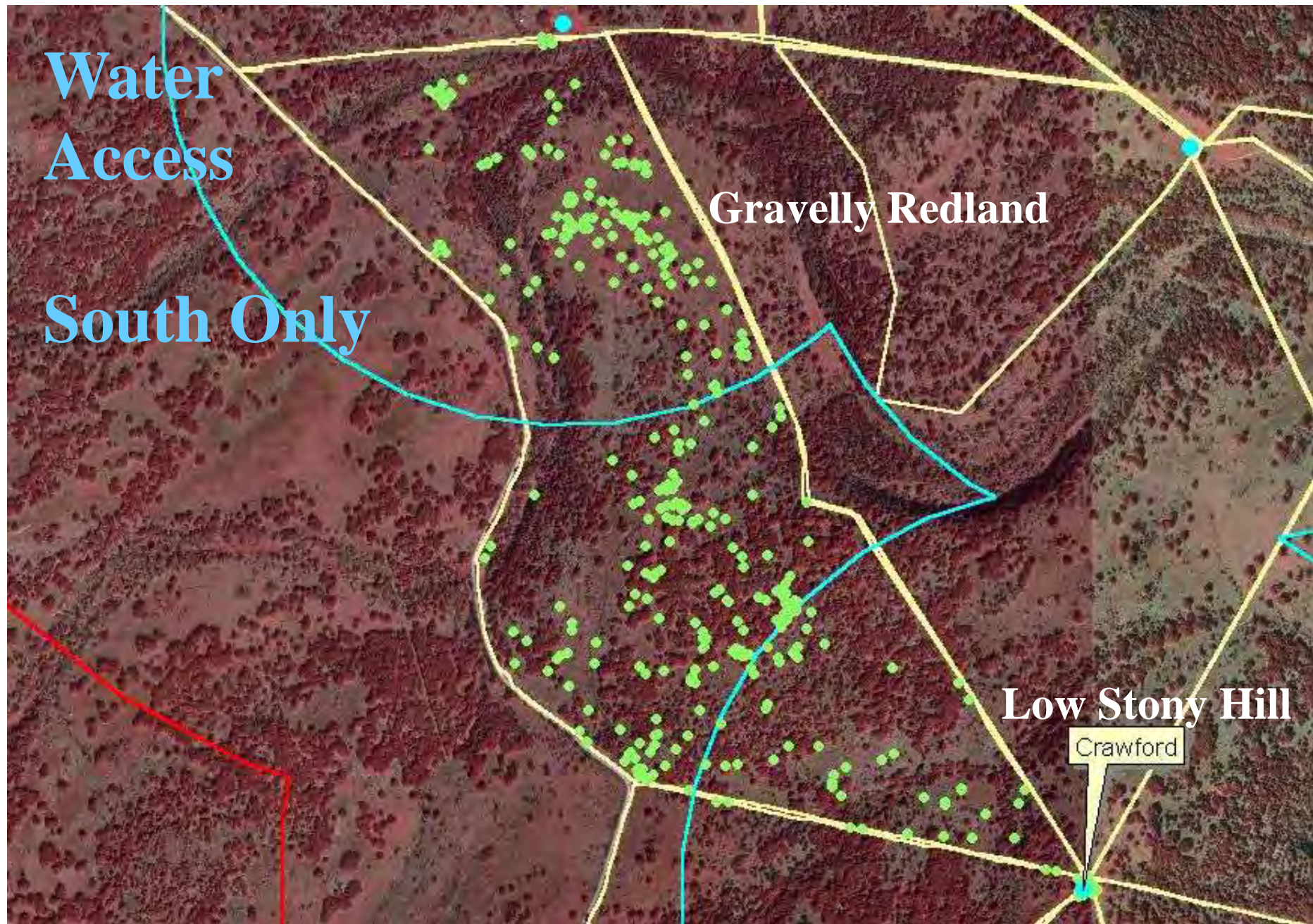
**Water
Access**

South Only

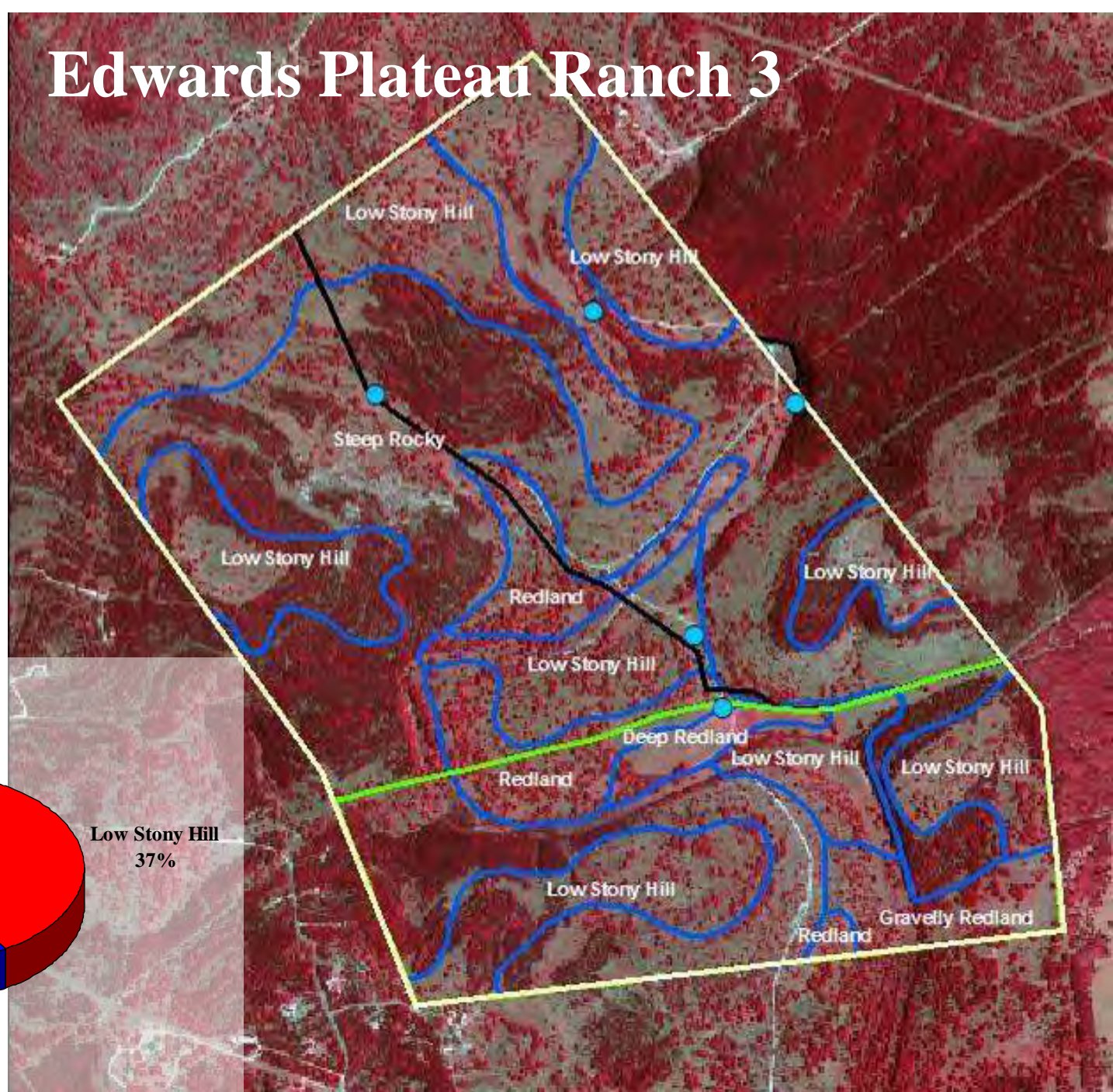
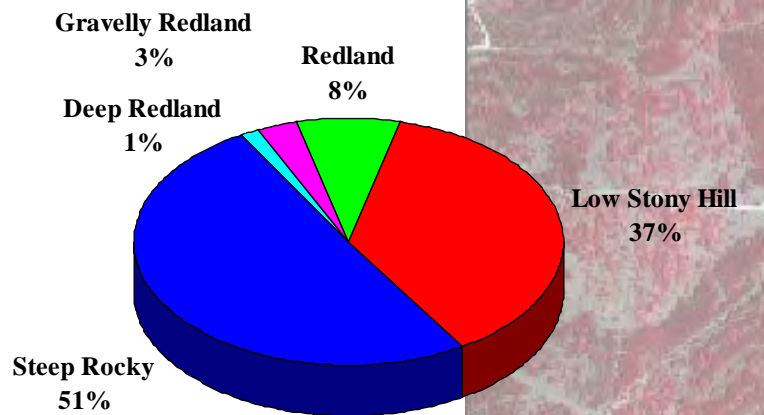
Gravelly Redland

Low Stony Hill

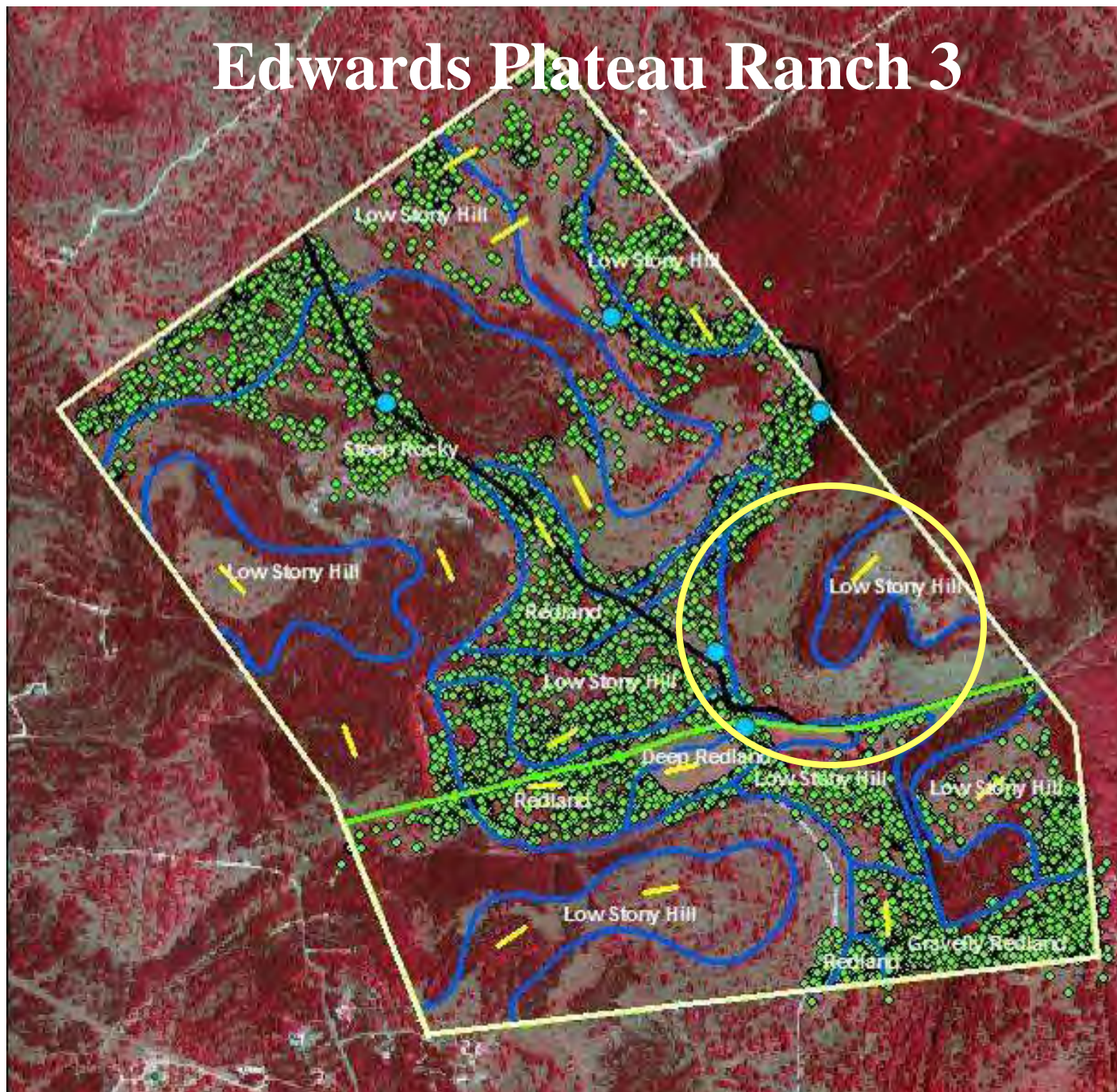
Crawford



Edwards Plateau Ranch 3

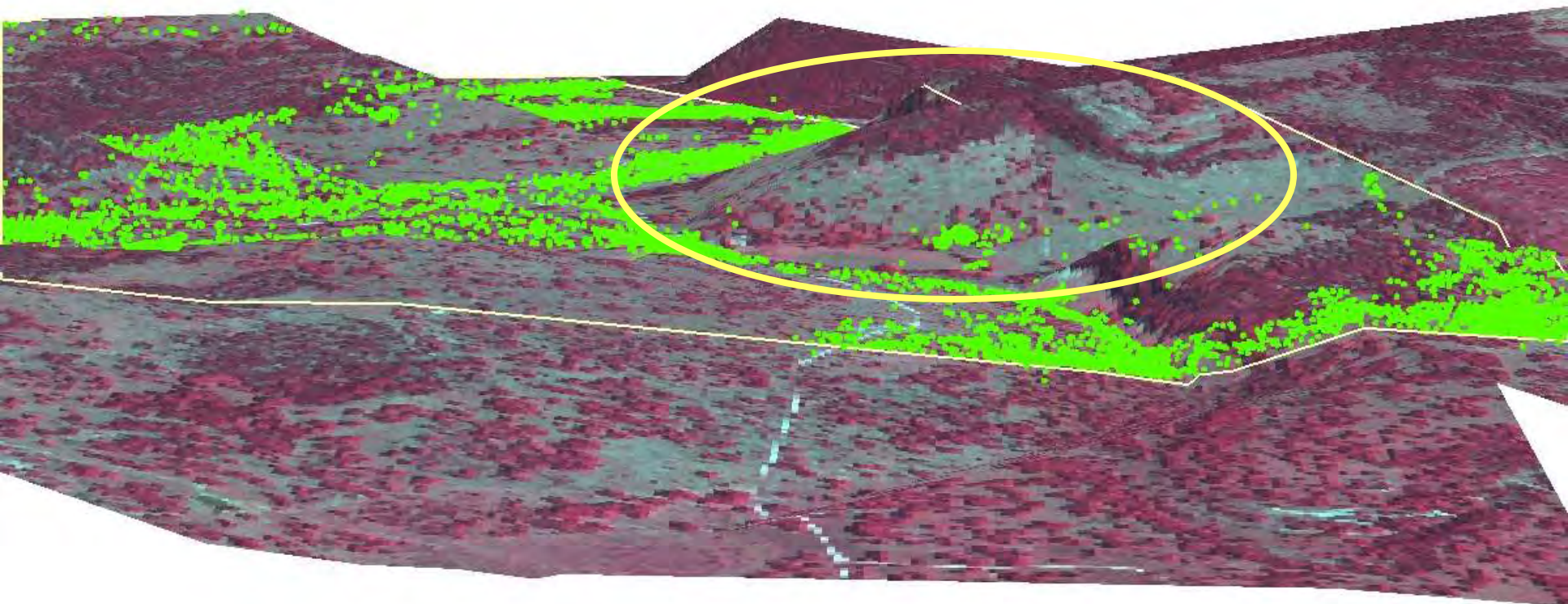


Edwards Plateau Ranch 3



Edwards Plateau Ranch 3-D View w/ GPS Locations

- 39% area used
- 41% GPS points on 9% area
- SR: 21 ac/cow
- Effective SR: 9 ac/cow



Carrying Capacity & Stocking Rate

How Do You Know Your're Getting it Right?

- Monitoring: can't set it & forget it



Range resource



Forage residue



Range health indicators



Animal performance



Body condition scores



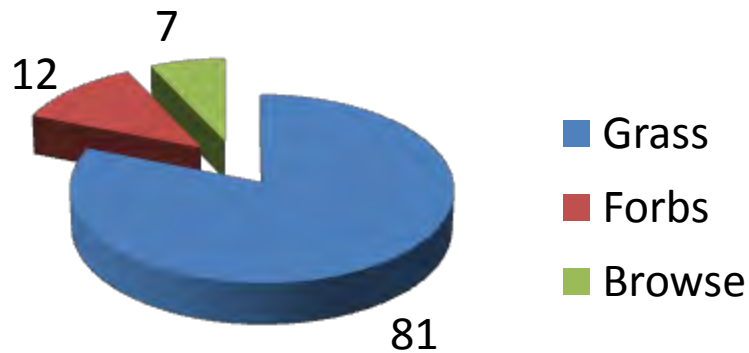
Gain records



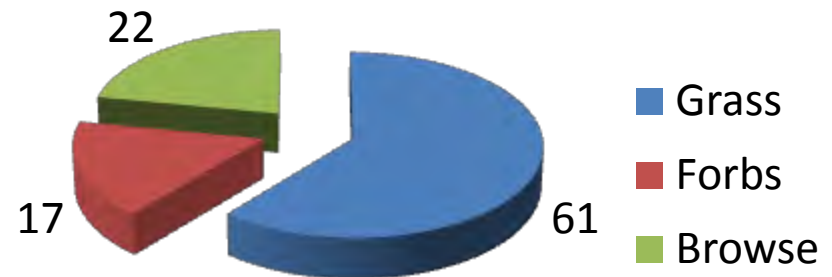
Herbivores – Dietary preferences?

Annual Diet Composition, %

Cattle

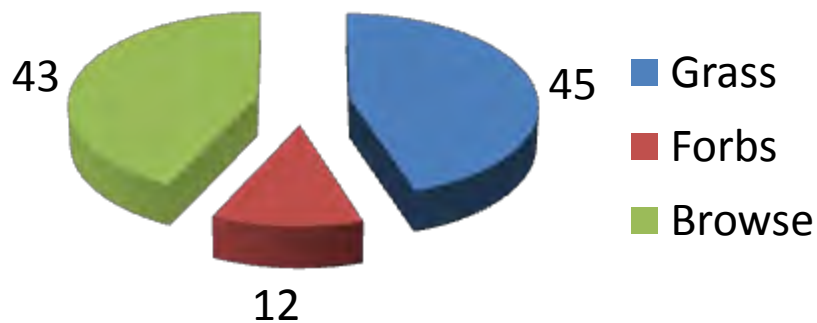


Sheep

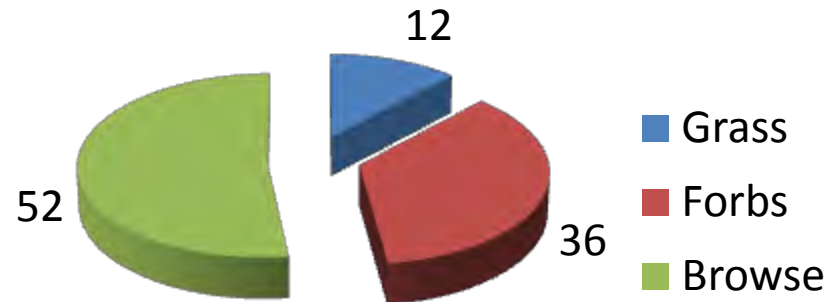


Annual Diet Composition, %

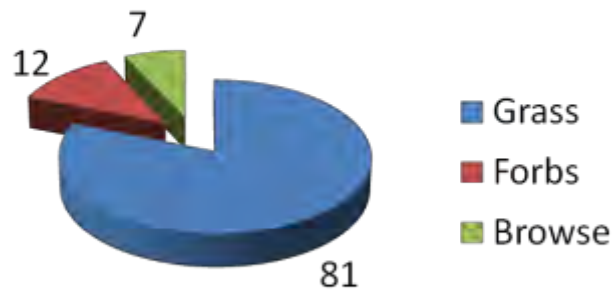
Goats



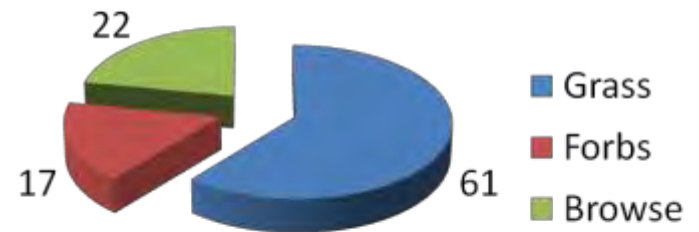
Deer



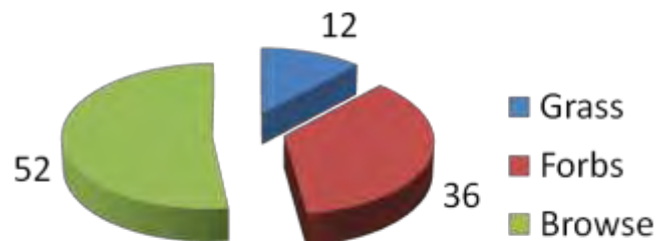
Cattle



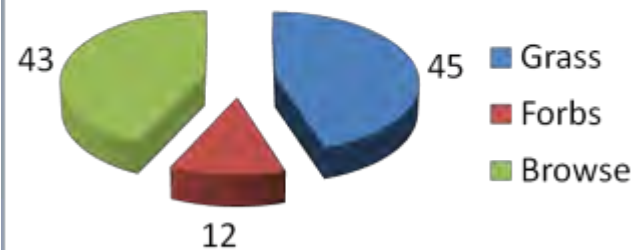
Sheep



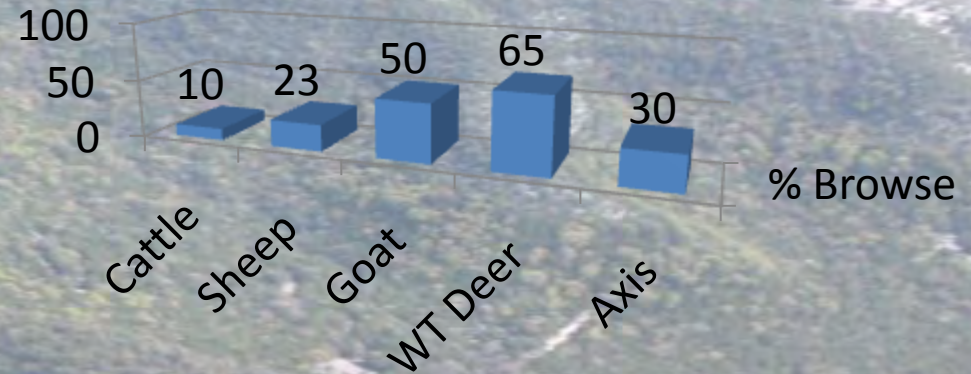
Deer



Goats



Approximate Annual Diet – % Browse



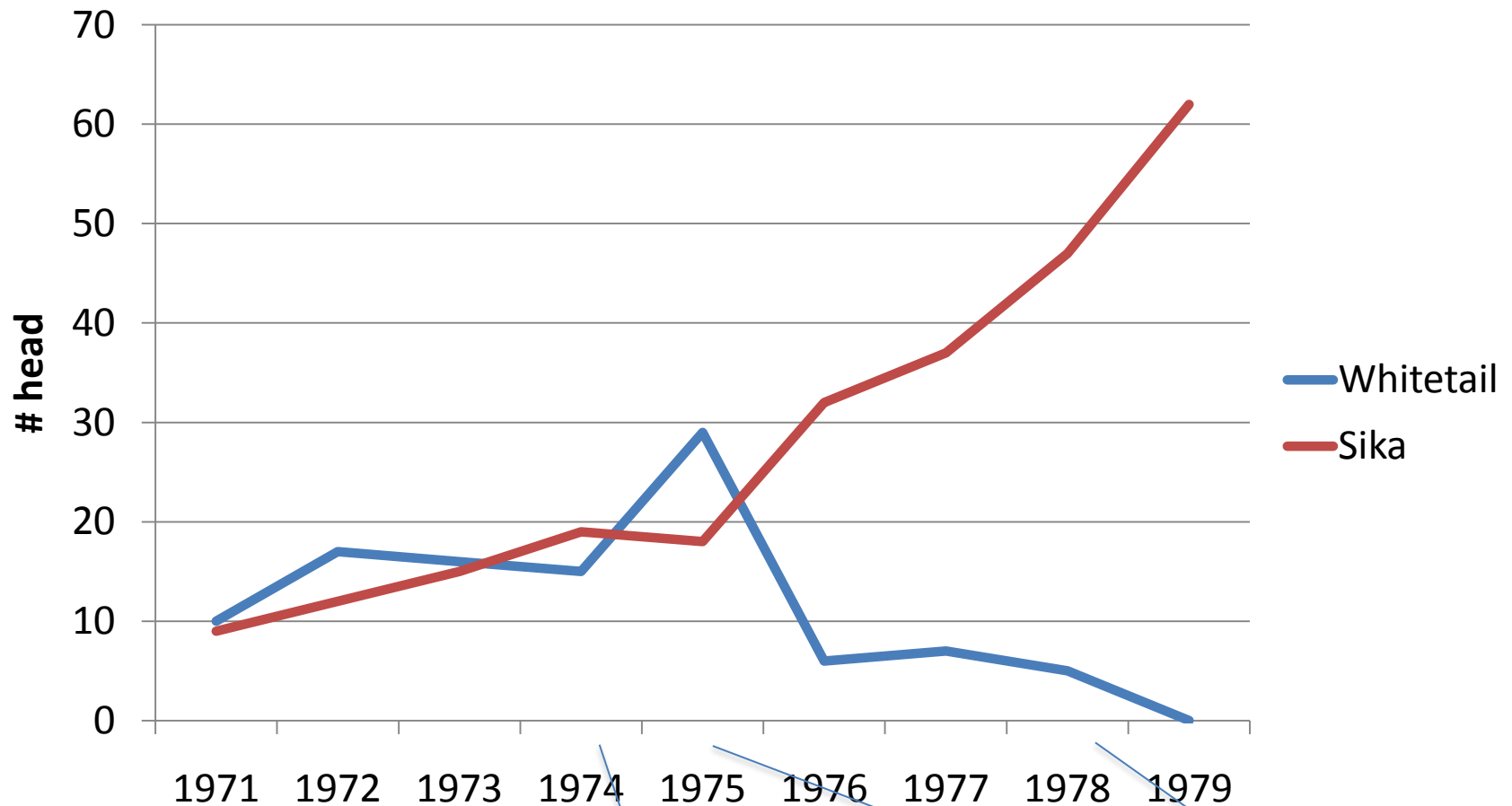
from *“The Use and Management of Browse in the Edwards Plateau of Texas”*, NRCS Pub., 1994

Competition Among Deer

Kerr Wildlife Area, 1971

- 96 acre enclosure
 - 6 whitetail deer
 - 6 sika deer
- No livestock
- Primary browse
 - Shinoak
 - Liveoak
- Mid 70's = record rainfall

Population Dynamics – Whitetail & Sika



Heavy browsing
of shinoak

No acorn crop

All browse
depleted







Diet Preference

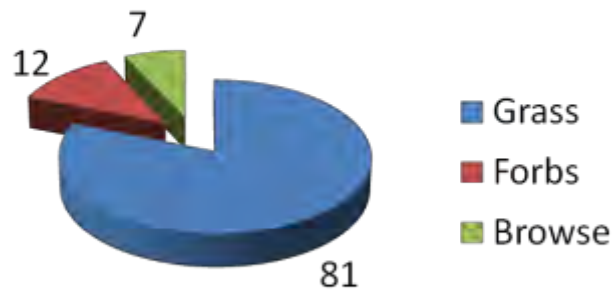




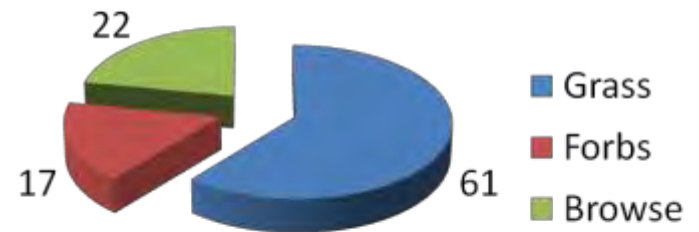




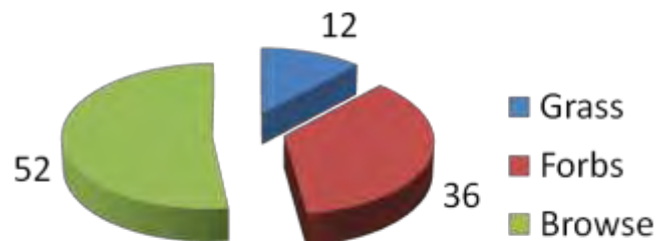
Cattle



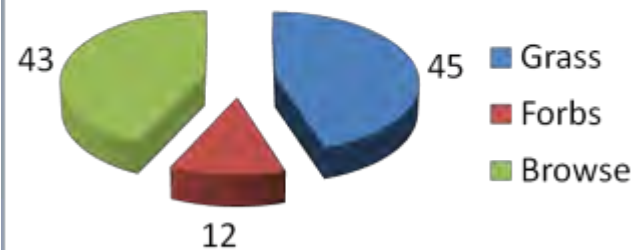
Sheep



Deer



Goats





Thank you

