



# Population dynamics of mule deer; effects of timing and amount of precipitation

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## Deer Population Dynamics

## Condition and survival of sympatric deer, pronghorn, and cattle

A population's rate-of-increase ( $\lambda$ ) is driven by:

1. Adult female survival ( $S_F$ )
2. Production and survival of juveniles (productivity)

$$\lambda = S_F + \frac{1}{2} * J:F_{Apr}$$

Year	$S_F$	J/F	$\lambda$	Predicted	Observed
2005/6	0.48	0.14	0.62	Decline 38%	Declined 26%
2006/7	0.58	0.11	0.55	Decline 31%	Declined 20%
2007/8	0.61	0.05	0.66	Decline 34%	Declined 40%

Higher buck survival dampened overall population declines in 2006 and 2007



### Methods

1. Capture & radio-collaring
  1. Determine survival and causes of mortality
2. Determine nutritional condition
  1. Model effects on survival = logistic regression
3. Determine effects of habitat on condition
  1. Model effects of precipitation and home range attributes on doe condition = logistic regression
  2. Compare temporal and spatial co-use of cattle and deer and model effects on condition of deer
4. Estimate population size, productivity, & trends



## Health, condition, & causes of mortality

### Health & condition

### Causes of mortality

### Habitat : what is important???

#### Deer

#### Does

	2005	2006	2007
Fat (cm)	0.18	0.32	0.23
% BF (all)	6.9	7.2	6.3
% BF (lac)	5.6	6.2	5.0
rBCS	2.1	2.2	2.0
wBCS	3.3	3.6	3.6
Loin (cm)	3.7	3.7	3.9
Girth (cm)	87	88	88

Cause	2005/6	2006/7	2007/8
Malnutrition	5	2	4
Predation	1	1	0
Disease	0	0	0
Illegal kill	0	0	0
Accident	0	0	0
Unk/pending	0	0	5
<b>Survival</b>	<b>0.48</b>	<b>0.58</b>	<b>0.61</b>

### Precipitation, vegetation, & food

- Survival of deer is closely related to precipitation from conception through parturition
- Years of low precipitation result in little or no forb production
- CRLRC lacks an abundant deciduous shrub component so deer are dependent upon forbs for food on CRLRC
- Other areas of New Mexico that have an abundant shrub component do not show the high adult mortality seen in CRLRC in drought years
- Survival in these areas is more strongly related to habitat composition of home ranges than to precipitation

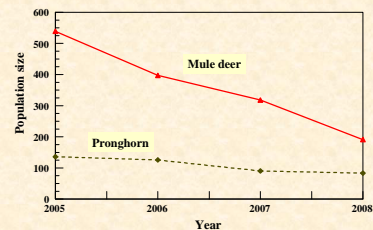


Low fat levels of does = very poor survival ----->

Strong impact of lactation = strong nutritional stress

### Population trends

#### Bucks

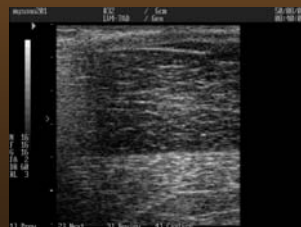
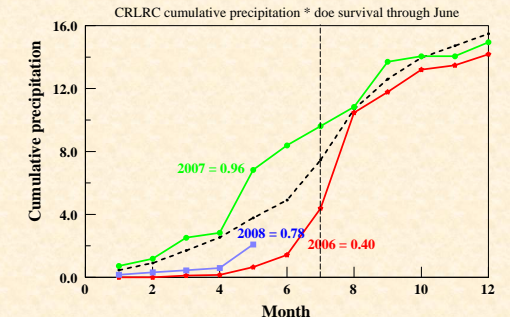


Cause	2005/6	2006/7	2007/8
Malnutrition	0	2	2
Predation	0	0	0
Disease	0	0	0
Illegal kill	0	0	0
Accident	0	0	0
Unk/pend	0	0	0
<b>Survival</b>	<b>1.00</b>	<b>0.60</b>	<b>0.60</b>

### Precipitation

#### Effects of precipitation

- Increases forage quantity & quality
- Increases maternal condition (doe body fat)
- Low cumulative precipitation from conception (January) through late gestation (June) greatly increases deer mortality
- Why?
  - Does need energy and protein to replenish body reserves AND grow their fetus
- Below normal precipitation = little herbaceous food (forbs)



Ultrasound view of fat