

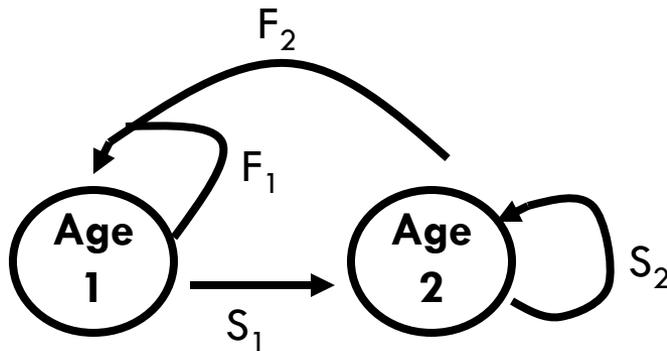
# SAGE-GROUSE POPULATION MODELING, PARKER MOUNTAIN, UT

USU, Logan, UT

David Dahlgren, Terry Messmer, David Koons

# Population Modeling

- 1998 – 2006
  - Joel Flory 1998-1999
  - Renee Chi 2000-2002
  - Dave Dahlgren 2003-2006



# Methods

- Telemetry based data (1998-2006)
  - Annual Hen survival (yearling and adult)
  - Nest Initiation
  - Nest Survival
  - Clutch Size (infertility)
  - Brood Survival
  - Fledgling Survival
  
- **Program MARK (nest fate, known fate)**



# Methods

## Life Table

vital rates for each parameter

...generate population matrices

pre-breeding census

1 = yearling

2 = adult

$F_1$	$F_2$
$S_1$	$S_2$

## Fertility equation

$$f_x = NI_x * (CS - INF) * 0.50 * NS_x * BS * PCSB * FS$$

# Methods

- Analyses
  - Sensitivity
  - Elasticity
  - LTRE



Photo by Les Flake

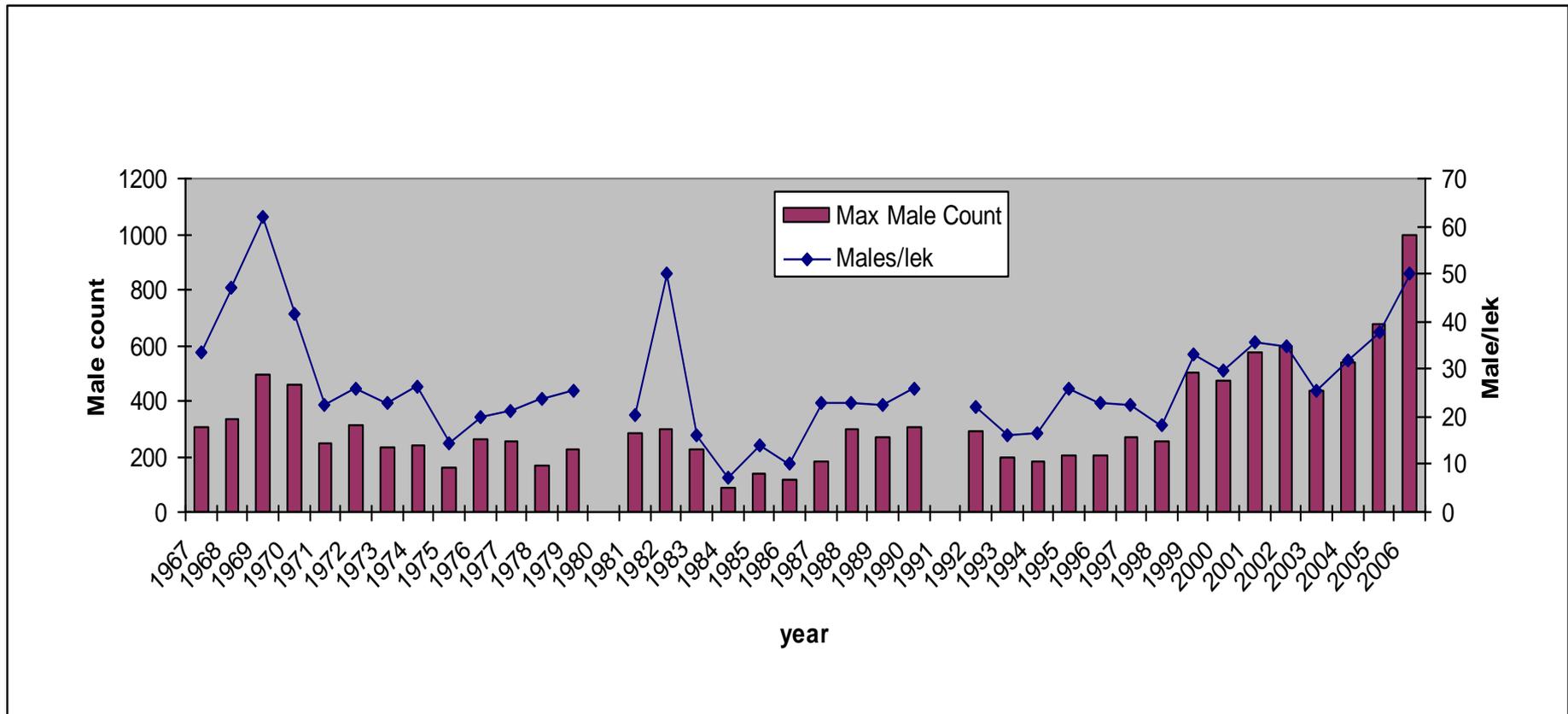
# Methods

- Stable Age Distribution and Harvest



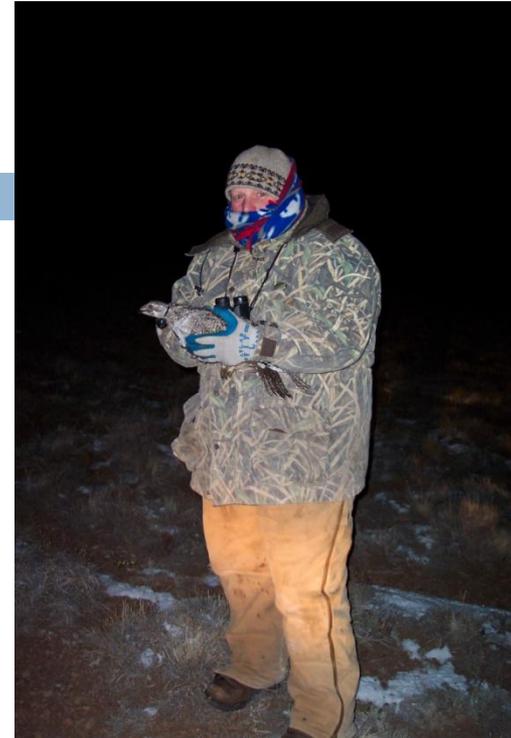
# Methods:

## Growth Rate - Modeling vs. Lek Count



# Results

- Sample sizes
  - ▣ 180 radio-marked hens
    - 276 annual survival histories
      - Adult n = 136
      - Yearling n = 140
  - ▣ 153 nests
  - ▣ 99 broods
  - ▣ 30 successful radio-marked broods (2005-2006)



# Results

## □ Life Table

## ■ Average matrix

□  $\lambda = 1.001$

Year	HS <sup>c</sup>		NI <sup>d</sup>		ECS <sup>e</sup>	NS <sup>f</sup>		BS <sup>g</sup>	Ch/SB <sup>h</sup>	FS <sup>i</sup>
	Y <sup>a</sup>	A <sup>b</sup>	Y	A		Y	A			
1998	0.56	0.56	0.56	0.81	5.85	0.67	0.78	0.81	0.55	0.68
1999	0.56	0.56	0.56	0.81	5.85	0.38	0.67	0.81	0.55	0.68
2000	0.56	0.56	0.70	0.89	5.85	0.67	0.78	0.59	0.55	0.68
2001	0.56	0.56	0.70	0.89	5.85	0.38	0.67	0.81	0.55	0.68
2002	0.56	0.56	0.70	0.89	5.85	0.38	0.67	0.59	0.55	0.68
2003	0.42	0.42	0.70	0.89	5.85	0.38	0.67	0.81	0.55	0.56
2004	0.78	0.78	0.56	0.81	5.85	0.67	0.78	0.59	0.55	0.85
2005	0.78	0.78	0.56	0.81	5.85	0.38	0.67	0.81	0.55	0.85
2006	0.56	0.56	0.56	0.89	5.85	0.38	0.67	0.95	0.55	0.68
mean	0.59	0.59	0.62	0.85	5.85	0.48	0.71	0.75	0.55	0.70

# Results



Year	HS <sup>c</sup>		NI <sup>d</sup>		ECS <sup>e</sup>	NS <sup>f</sup>		BS <sup>g</sup>	Ch/SB <sup>h</sup>	FS <sup>i</sup>
	Y <sup>a</sup>	A <sup>b</sup>	Y	A		Y	A			
mean	0.59	0.59	0.62	0.85	5.85	0.48	0.71	0.75	0.55	0.70



# Results

## □ Sensitivity, Elasticity, and LTRE Analyses Results

Vital Rate	$S_{ij}^a$	$S_{ij}$ rank	$e_{ij}^b$	$e_{ij}$ rank	LTRE <sup>c</sup>	LTRE rank
Yearling Survival	0.45	5	0.26	6	0.00199	5
<b>Adult Survival</b>	<b>0.65</b>	<b>1</b>	<b>0.38</b>	<b>1</b>	<b>0.00429</b>	<b>3</b>
Yearling Nest Initiation	0.14	9	0.09	9	-0.00045	7
Adult Nest Initiation	0.31	7	0.26	6	0.00026	8
Clutch Size	0.06	10	0.35	2	0.00000 <sup>d</sup>	9
Clutch Infertility	-0.060	10	-0.032	11	0.00000 <sup>d</sup>	9
Yearling Nest Survival	0.19	8	0.09	9	0.00676	2
Adult Nest Survival	0.37	6	0.26	6	0.00351	4
<b>Brood Survival</b>	<b>0.47</b>	<b>4</b>	<b>0.35</b>	<b>2</b>	<b>-0.00121</b>	<b>6</b>
<b>Chicks/Successful Brood</b>	<b>0.64</b>	<b>2</b>	<b>0.35</b>	<b>2</b>	<b>0.00000<sup>d</sup></b>	<b>9</b>
<b>Fledgling Survival</b>	<b>0.50</b>	<b>3</b>	<b>0.35</b>	<b>2</b>	<b>0.00714</b>	<b>1</b>

# Results

- **Adult Survival**

- **Production**

- Brood Success

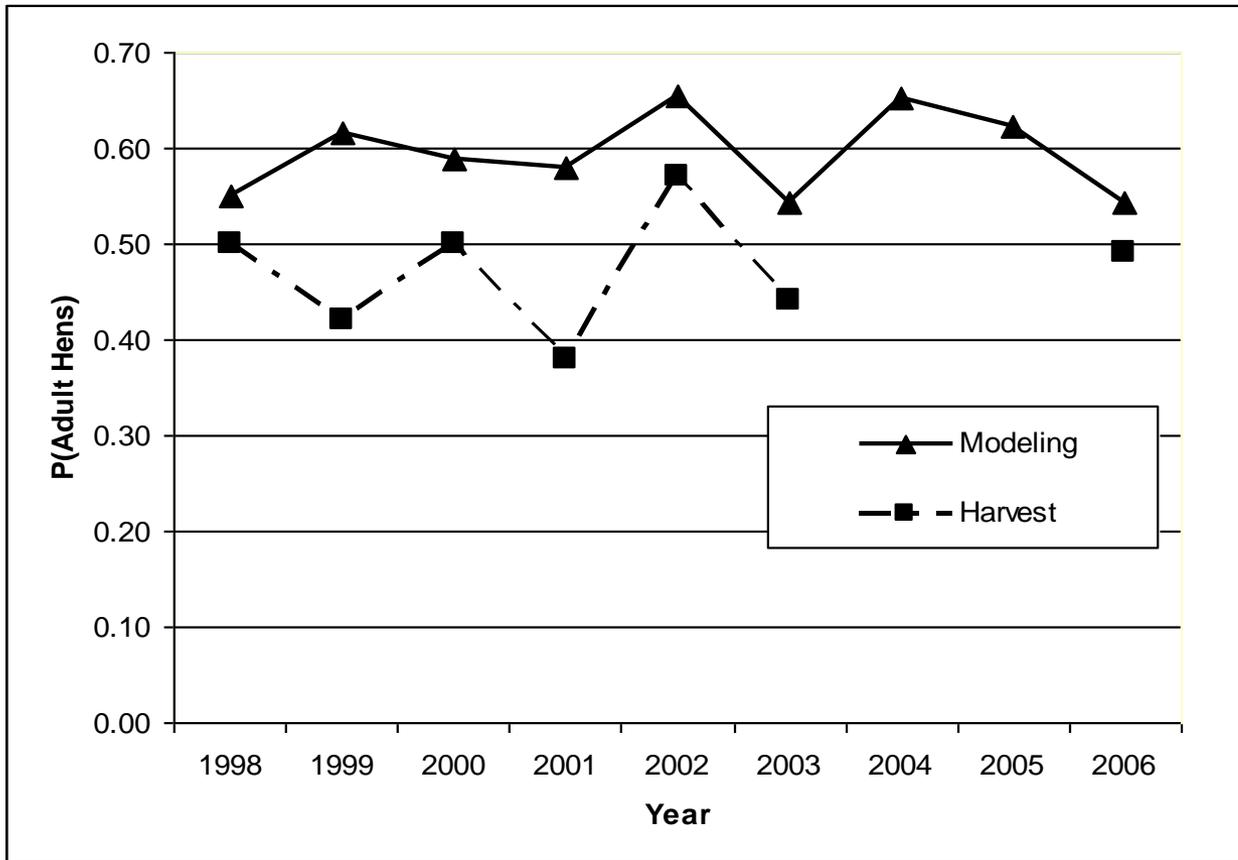
- Chicks Fledged per Successful Brood

- Fledgling Survival

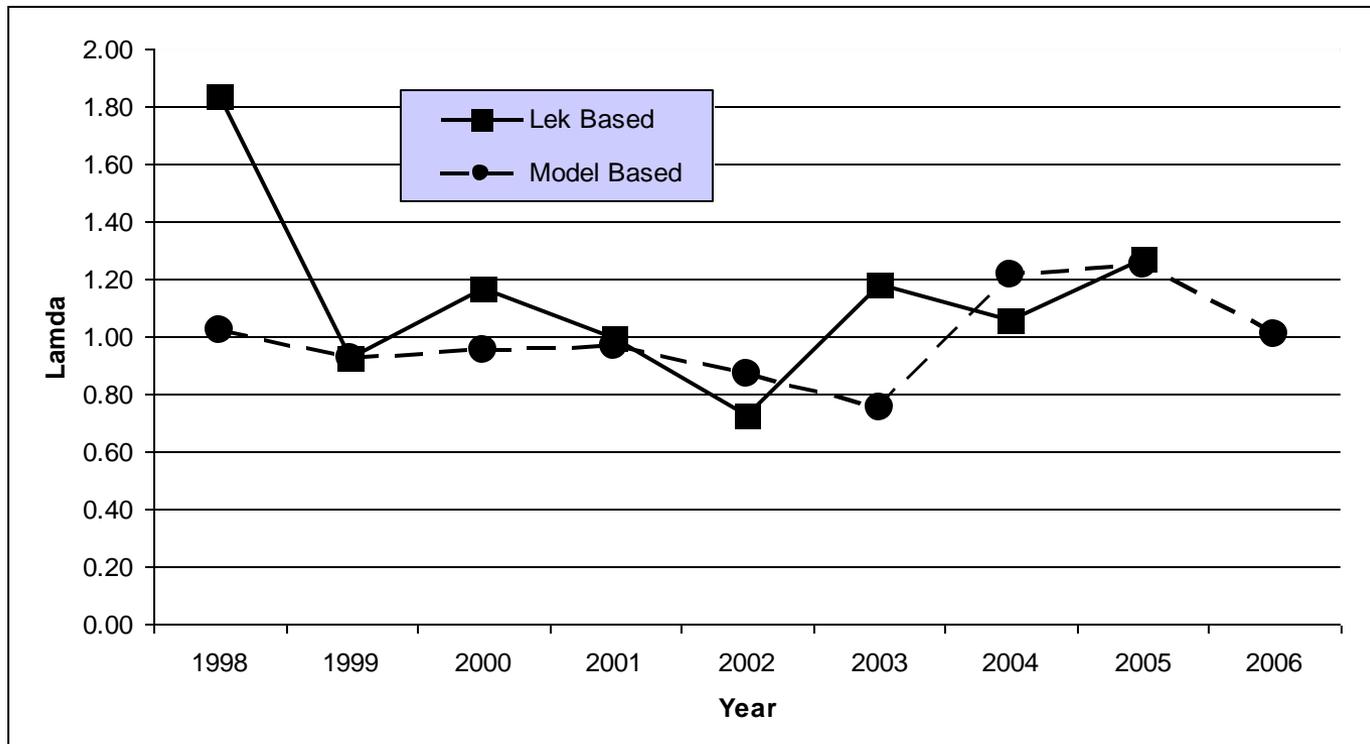


# Results

## Stable Age Distribution and Harvest



# Results



**Model:**

$$\lambda = 1.001$$

**Lek Count:**

$$\lambda = 1.14$$

**Minus 1998**

$$\lambda = 1.04$$

# Management Implications

- Adult Hens: what is affecting low years of adult survival?
- Need information on fledgling survival
- Keep managing for brood-rearing habitat
- Harvested wing sample biased (UDWR Regulations)
- Possible discrepancies b/w lek and telemetry based data

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