Threats to Avian Resources of the Great Salt Lake

John Cavitt
Department of Zoology
Weber State University
Ogden, UT

Avian Resources

- American Avocets
- American White Pelicans
- Black-necked Stilts
- California Gull
- Cinnamon Teal
- Eared Grebe
- Marbled Godwits
- Northern Pintail
- Tundra Swan
- White-faced Ibis
- Wilson’s Phalarope

Current Threats to Avian Populations

- Invasive/Exotic Species
- Landscape Change/Management
- Water Quantity
- Water Quality

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Survival

Productivity

Productivity

Nesting Period

- Clutch size
- Hatchability
- # Young
- Nesting success

Brood Period

- Young survival during parental care – up to fledging

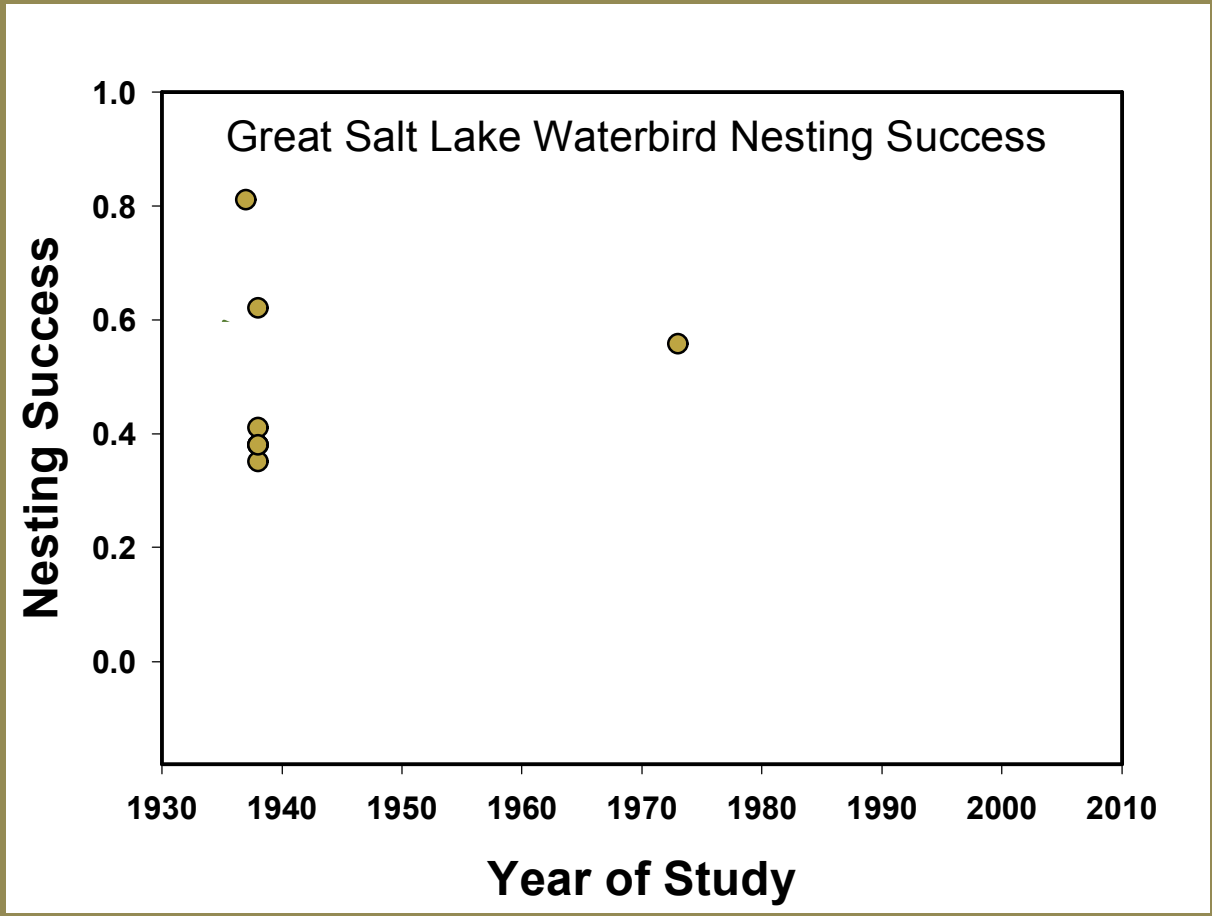


Figure 1. Historical trends in nesting success at Great Salt Lake ($F = 28.49$, $df = 1,15$, $P = 0.0001$, $r^2 = 0.67$)

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Invasive/Exotic Species

Change in Predator Community

Increased human activity, introduced species (carp), and landscape change affected predator community

Virtually absent from GSL prior to 1980's

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

2003 - 2008
BEAR
OGBAY
SHORE
ANTELOPE
ISLAND
FARM
SL
SEWER
ISSR
SALT

Table 1. Effects of reduced predator densities on AMAV and BNST daily survival rate. Mayfield nesting success estimates are included below each DSR.

	AMAV			BNST		
	Reduced DSR (Mayfield)	Control DSR (Mayfield)	Statistic	Reduced DSR (Mayfield)	Control DSR (Mayfield)	Statistic
2003	0.95 (0.25)	0.74 (< 0.01)	$\chi^2 = 10.2$, $df = 1$, $P = 0.001$	0.93 (0.14)	0.95 (0.25)	$\chi^2 = 0.24$, $df = 1$, $P = 0.62$
2004	-	-		-	-	
2005	0.98 (0.58)	0.90 (0.06)	$\chi^2 = 5.52$, $df = 1$, $P = 0.02$	0.99 (0.76)	0.99 (0.76)	$\chi^2 = 0.16$, $df = 1$, $P = 0.69$
2006	0.99 (0.76)	0.92 (0.10)	$\chi^2 = 28.7$, $df = 1$, $P < 0.0001$	0.99 (0.76)	0.95 (0.25)	$\chi^2 = 9.7$, $df = 1$, $P = 0.002$
2007	0.97 (0.44)	0.93 (0.14)	$\chi^2 = 35.9$, $df = 1$, $P < 0.0001$	0.95 (0.25)	0.93 (0.14)	$\chi^2 = 5.8$, $df = 1$, $P = 0.01$

Identification of nest predators

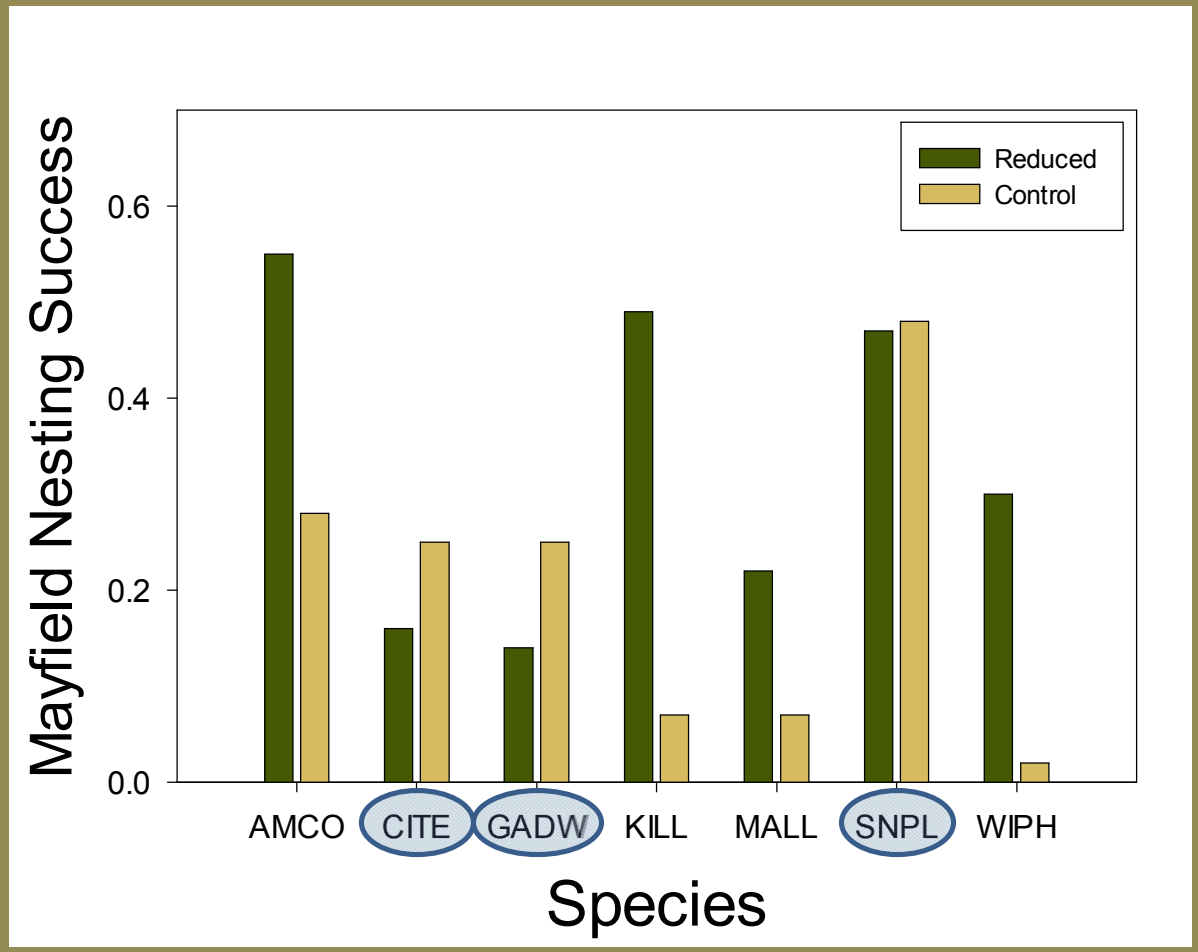
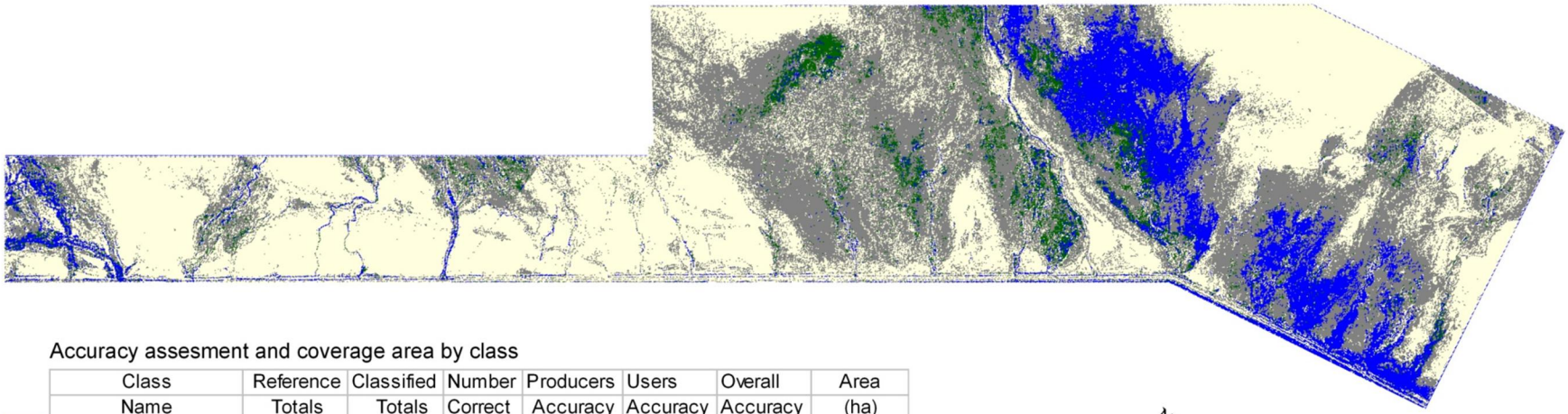


Figure 4. Mayfield nesting success estimates for birds at sites with reduced predator densities and control sites.

2003

2003 Thematic Classification



Accuracy assesment and coverage area by class

Class Name	Reference Totals	Classified Totals	Number Correct	Producers Accuracy	Users Accuracy	Overall Accuracy	Area (ha)
Marsh/water	74	72	63	85.14%	87.50%	86.03%	42
Emergent vegetation	44	37	31	70.45%	83.78%		25
Mudflat	67	74	58	86.57%	78.38%		221
Alkali flat	87	89	82	94.25%	92.13%		283

N

0 0.25 0.5 1

Kilometers

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Emergent vegetation (*Phragmites)* increased from

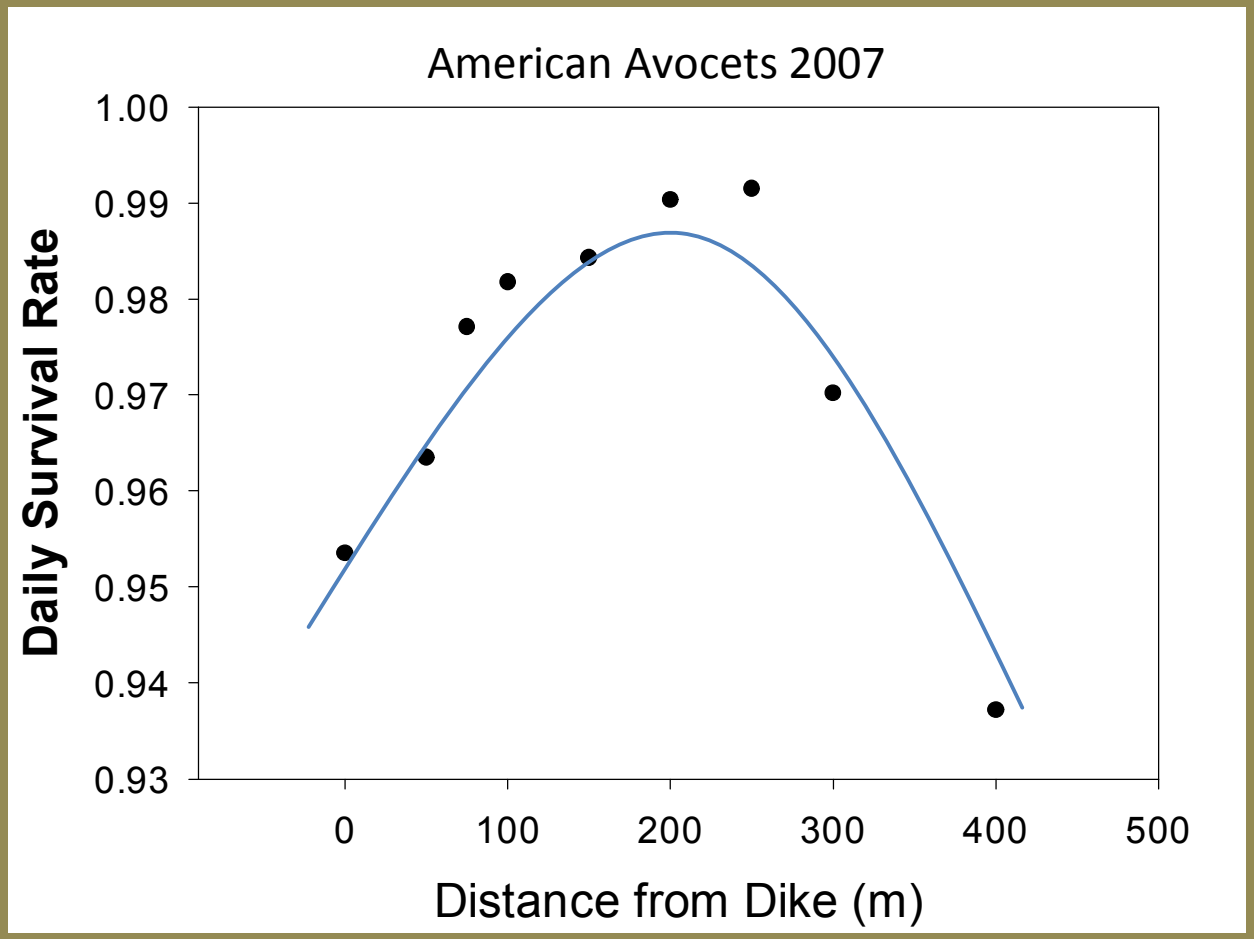
25 ha to 130 ha

= 420% increase

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Landscape Change/Management

Farmington Bay Waterfowl Management Area



2nd Order Polynomial Regression

$F = 109.1$; $P < 0.001$; $R^2 = 0.973$

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Water Quantity

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Great Salt Lake Avian Productivity Study

Utah Wetlands Foundation

National Science Foundation
WHERE DISCOVERIES BEGIN

Utah Division of Wildlife Resources

Division of Water Quality

FRIENDS of Great Salt Lake

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

TIDES

North Davis County Sewer District

Primary Goal - maintain healthy, self-sustaining populations

HOW?

Healthy population = productivity sufficient to balance adult & juvenile mortality

Central problem exists when counts are used to assess population health –

populations may experience productivity problems and yet go undetected because of immigration from healthy sources.

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

What level of nesting success is needed to sustain a “healthy population”?

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

CALCULATION OF LAMBDA

(finite population growth rate)

SNPL

$$\lambda = P_A + P_J \beta$$

where,

P_A = annual adult survival (set to 74% or 50% based on Paton 1994 and Nur et al. 1999);

P_J = juvenile survival from fledging to the following breeding season (set to 50% based on Nur et al. 1999)

β = mean annual production (calculated from this study, Paton 1995, Nur et al. 1999)

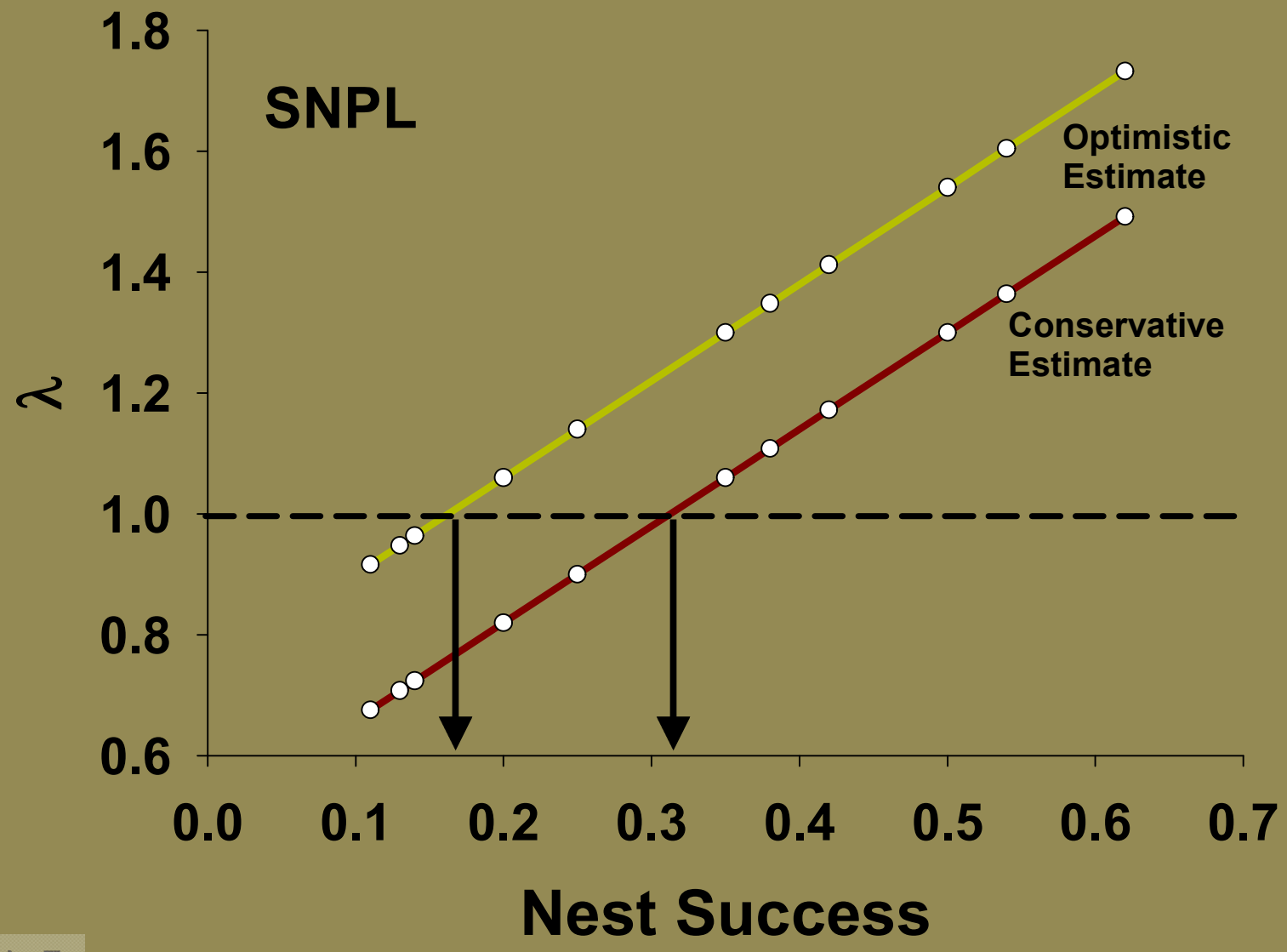
AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

$$\lambda = P_A + P_J \beta$$

$\lambda > 1$ Population Source

$\lambda < 1$ Population Sink

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY



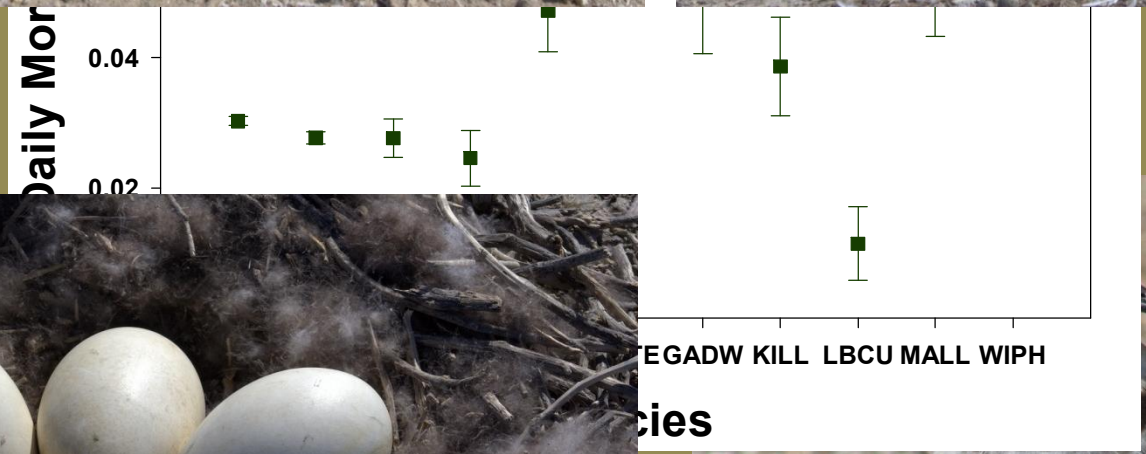
AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

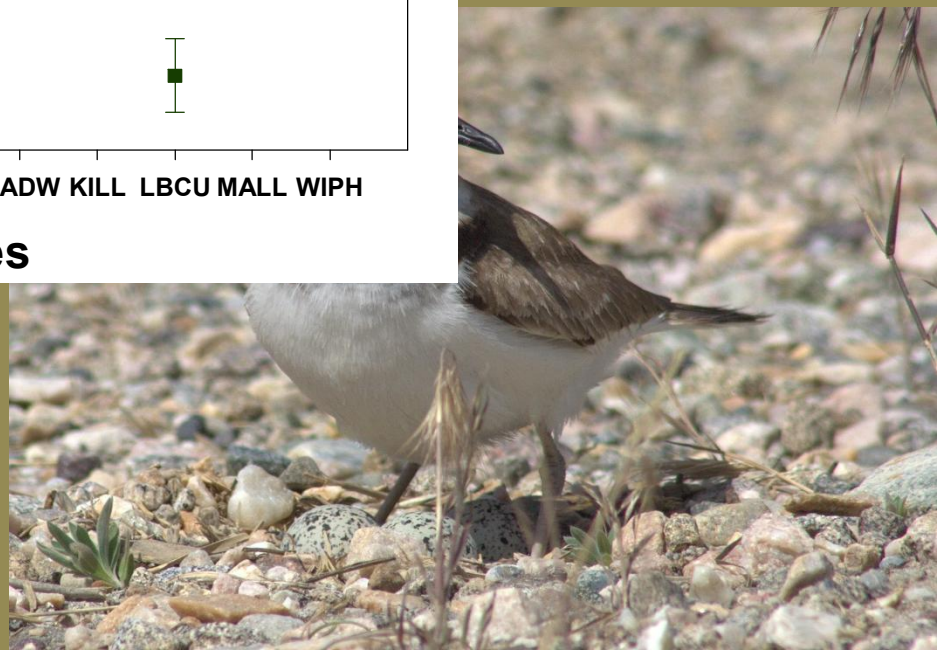
SNPL

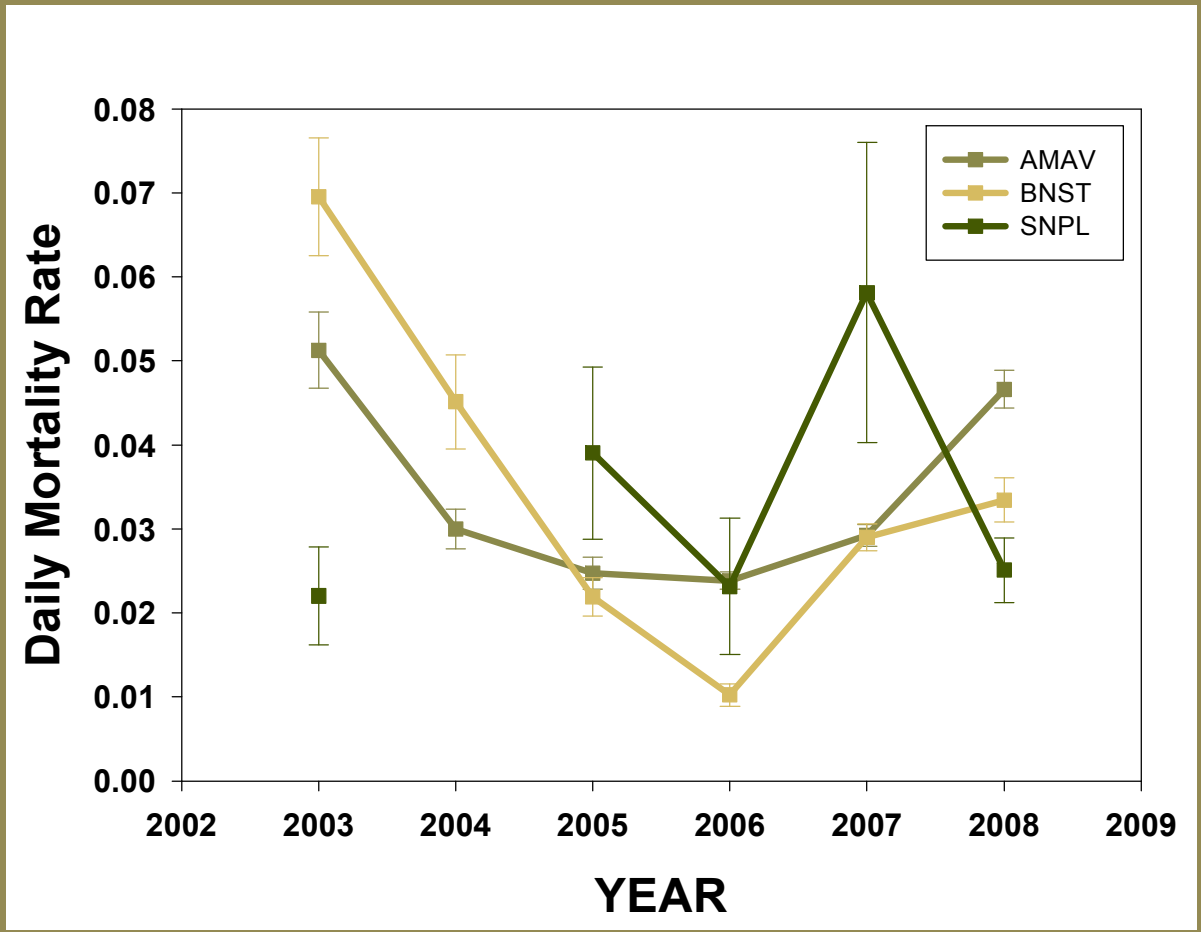
	Mayfield Nesting Success (%)						
Study Site	2005	2004	2003	1993	1992	1991	1990
BEAR	24.5	50.4	53.8	-	-	-	-
FARM	42.1	61.8	54.3	-	-	-	-
SHORE	-	13.9	24.7	34.5	12.9	11.3	38.1

(Paton 1995)

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY


Daily Mor
0.04
0.02
TEGADW KILL LBCU MALL WIPH
cies





AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

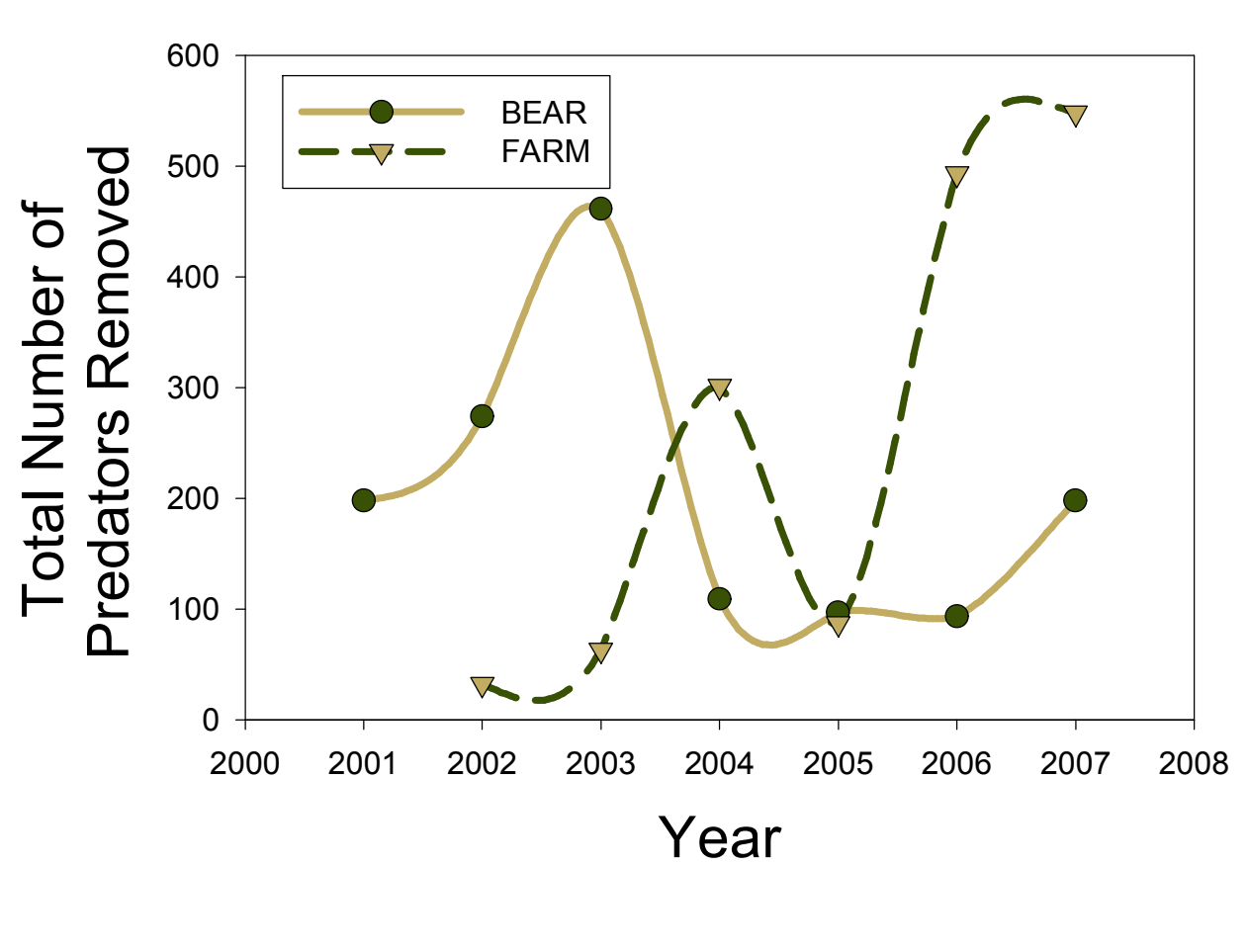


Figure 1. Number of mammalian predators removed each year

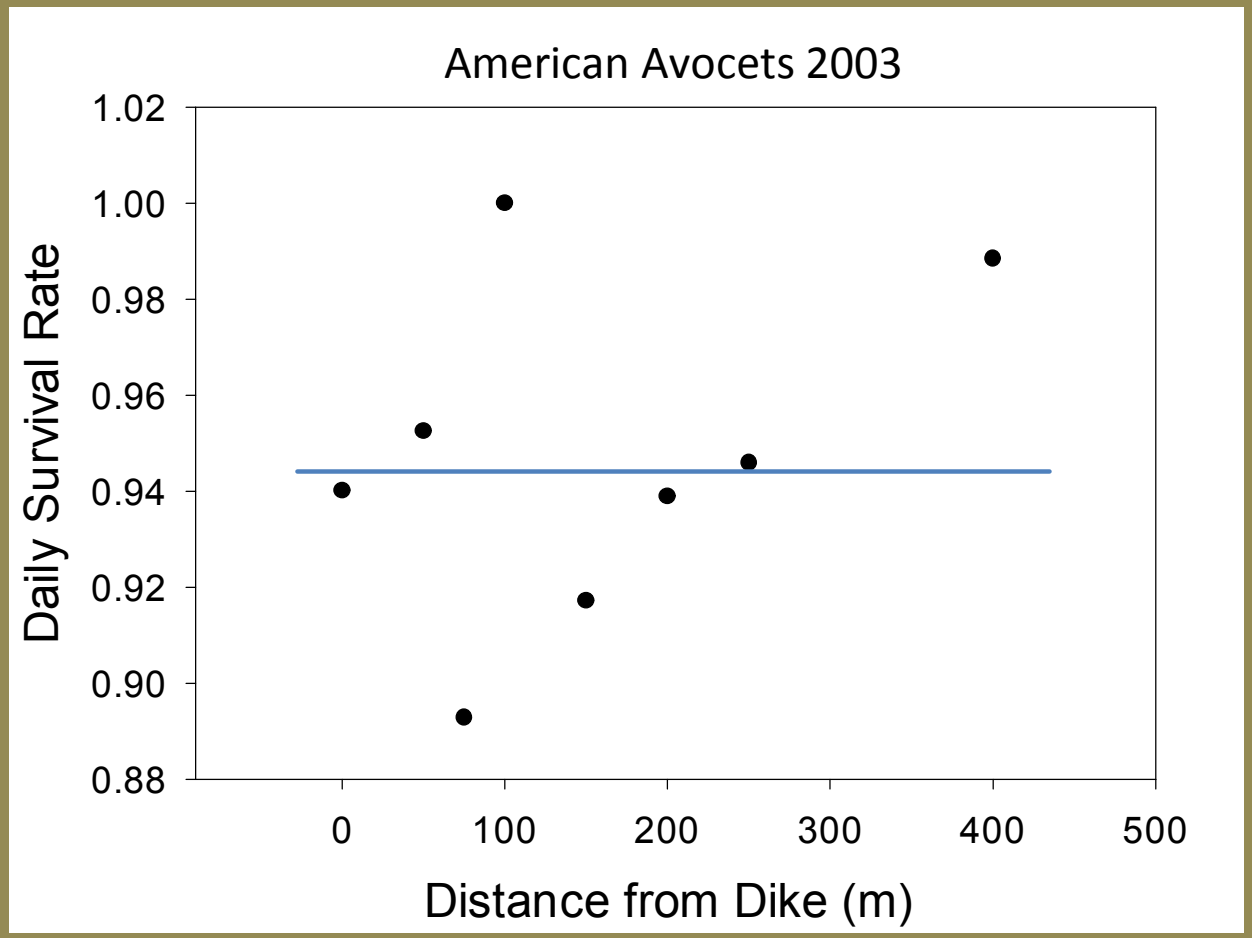
AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY

Bear River Migratory Bird Refuge
O – Line Dike
June 9, 2007
3:19 am

Farmington Bay Waterfowl Management Area

Blaze

Cardinals



Linear Regression

$F = 0.98$; $P = 0.360$; $R^2 = 0.141$

AVIAN ECOLOGY LABORATORY
WEBER STATE UNIVERSITY