Population Ecology and Conservation of the Snail Kite: an Update

Wiley Kitchens

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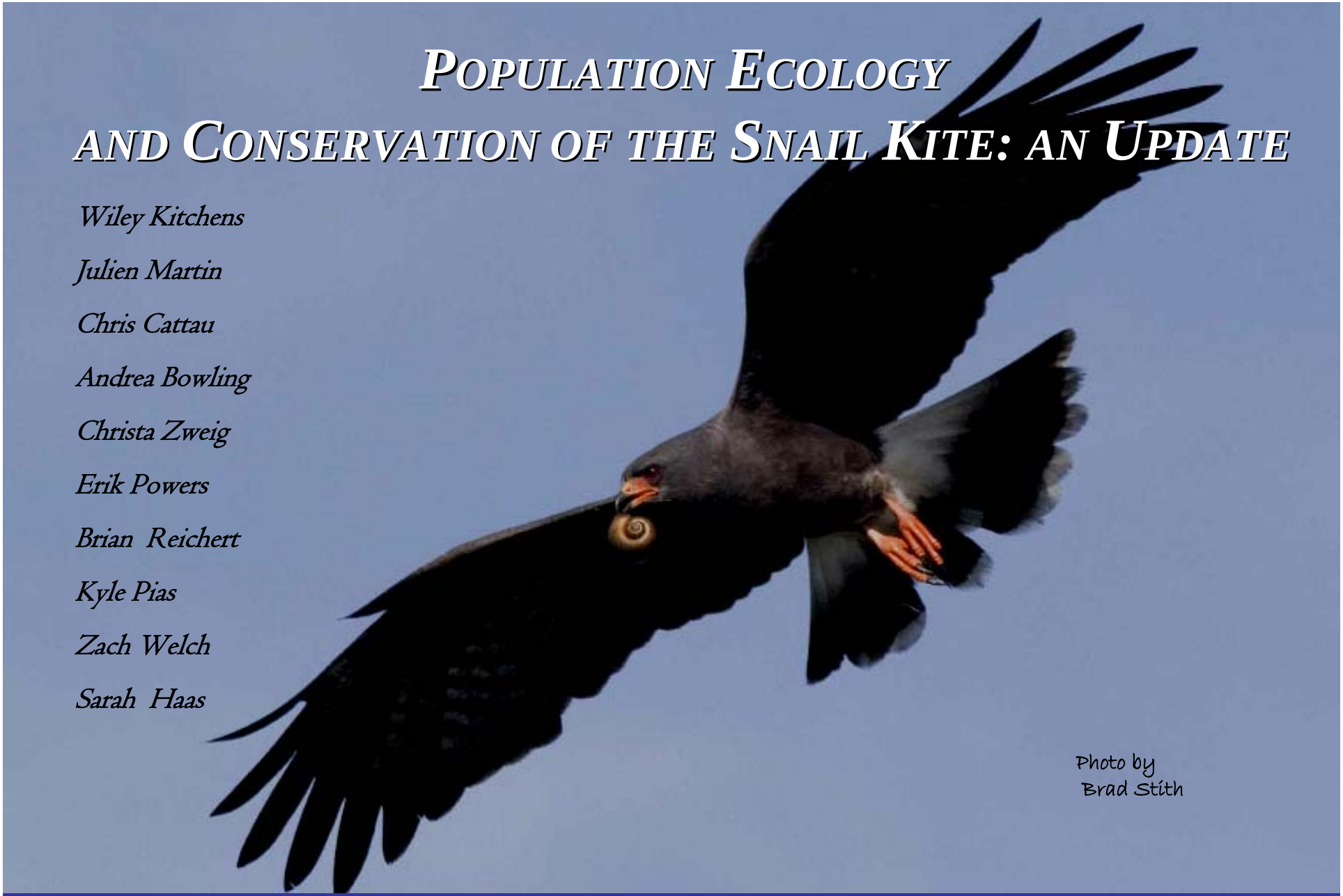


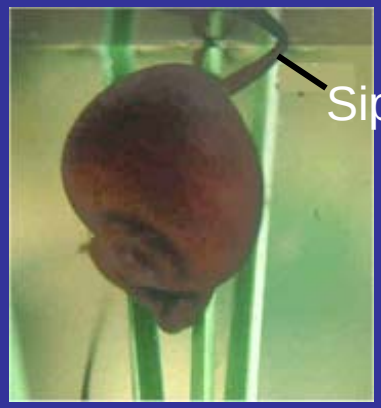
Photo by
Brad Stith

Funded by: U. S. Army Corps of Engineers, Jacksonville District
U. S. Fish and Wildlife Service, Vero Beach
St Johns River Water Management District
Florida Fish and Wildlife Conservation Commission

Outline

- Mandatory natural history /background info
- Demography and movement
- Kites are in trouble (big trouble): demographic evidence
- PVA indicates short timeline for restoration (even DCOMP)
- Triage, not restoration is the operative word of the day
- Water levels during the Fall (Sept-Jan) too high for too long
  ->Habitat conversion->degradation->Demo
- Water levels during Spring-Summer too low for too long
  -> Period 1998 to 2006
  -> Reduction in Survival, Reproduction, Recruitment
- Importance of WCA3A and L. Tohopekaliga

Snail kite in Florida
Sentinel/Indicator ?



Food specialist

Wetland dependent

Closed population

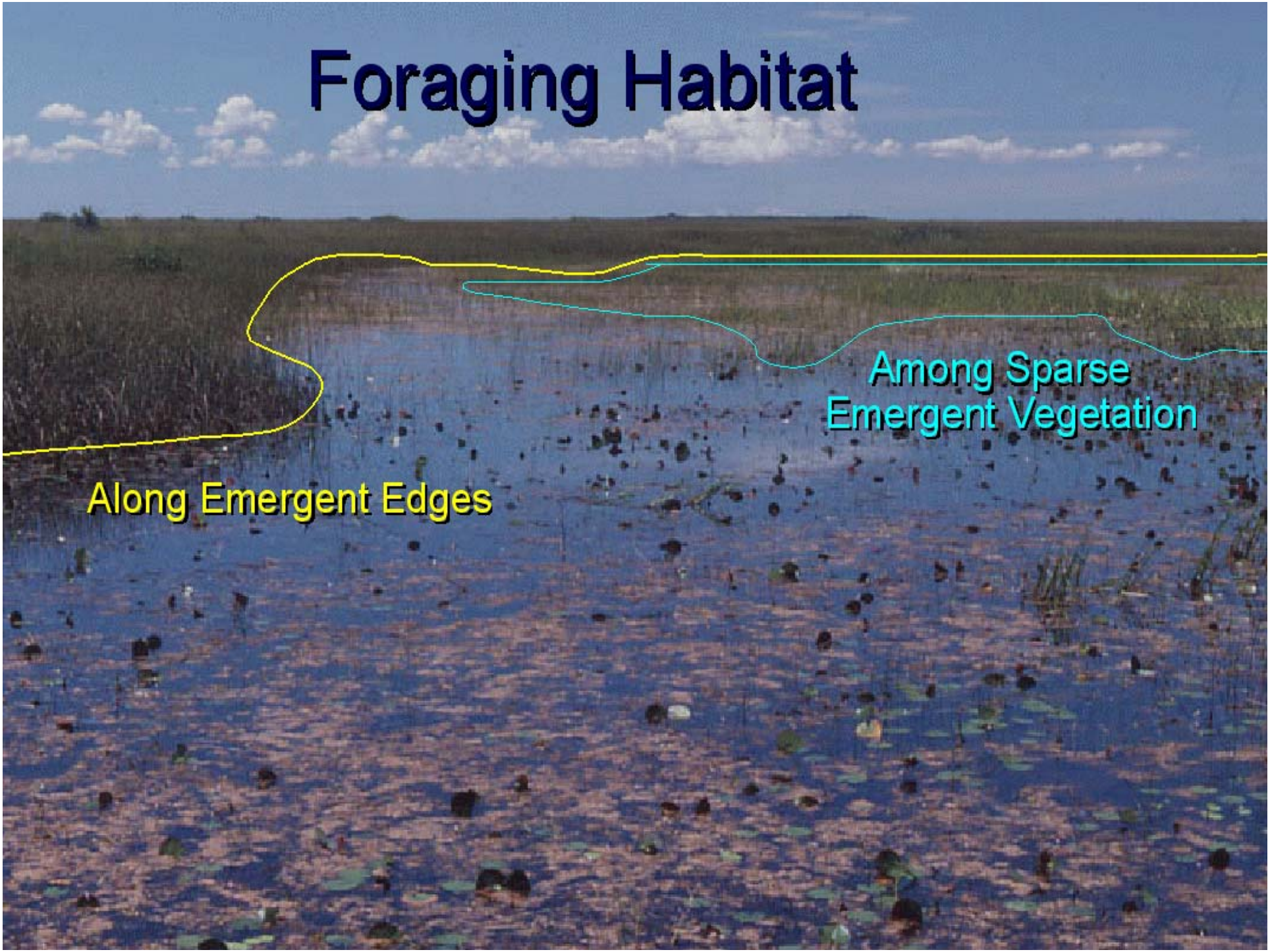
Endangered species

Confined to C. and S. FL

An Adaptive Management Poster Child

Foraging

Foraging Habitat

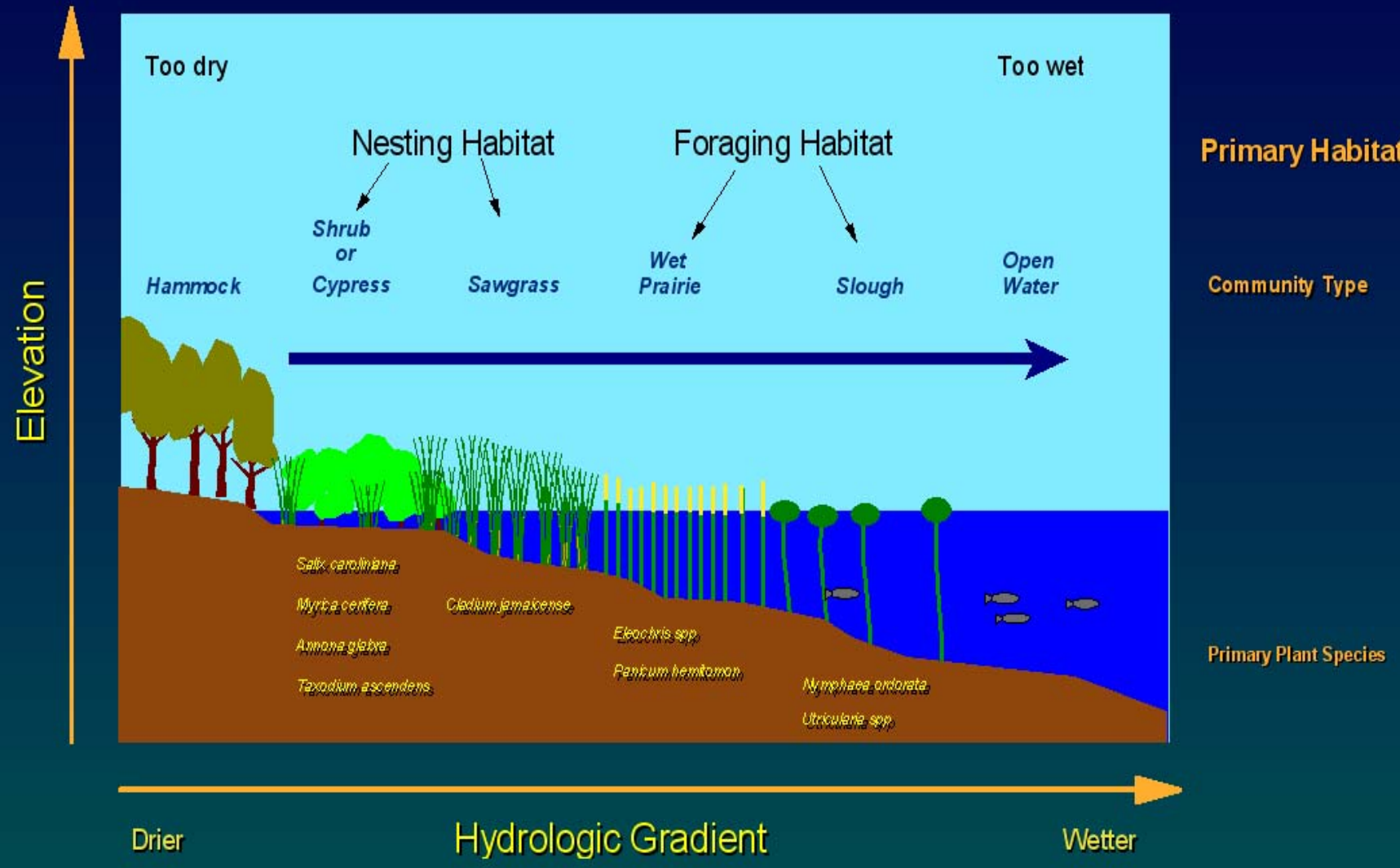


Primary Nesting Habitats

Willow or
Cypress Stands

Isolated
Shrubs or Trees

Thick
Herbaceous
Vegetation


Too dry
Too wet
Nesting Habitat
Foraging Habitat
Primary Habitat Use
Shrub or Cypress
Hammock
Sawgrass
Wet Prairie
Slough
Open Water
Community Type
Elevation
Salix caroliniana
Myrica cerifera
Annona glabra
Taxodium ascendens
Cladium jamaicense
Eleocharis spp
Panicum hemitomon
Nymphaea ordorata
Utricularia spp
Primary Plant Species
Drier
Hydrologic Gradient
Wetter

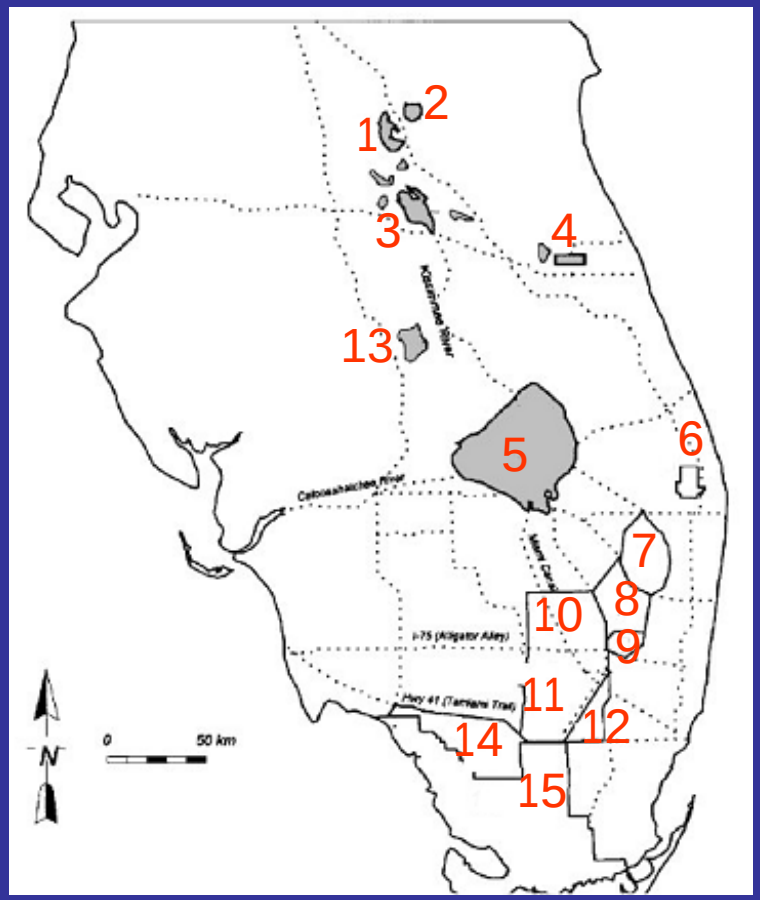
STUDY DESIGN

It's Survival Stupid!
Or is It?

Airboat surveys during breeding season

Nest Monitoring → Reproduction

Mark-Resight →
- Survival
- Recruitment/λ
- Movement



STUDY DESIGN cont.

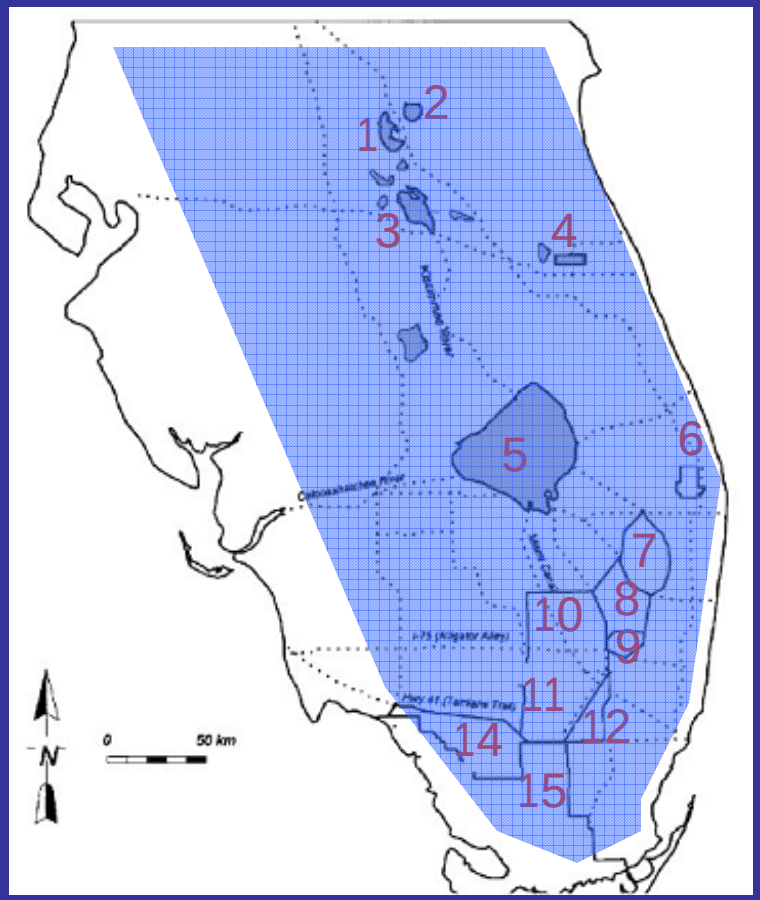
Radio telemetry (all year long)

1992-1995 Monthly sampling (Aircraft/Airboat)

2003-2008 Monthly sampling

Juvenile

- Movement
- Survival
- Recruitment



Banding
Capture-Resighting

Between-Year Survival

Natal Philopatry

Breeding Dispersal

Population size
Movements

Radio
Telemetry

Within-Year Survival

Movements

Reproductive Parameters

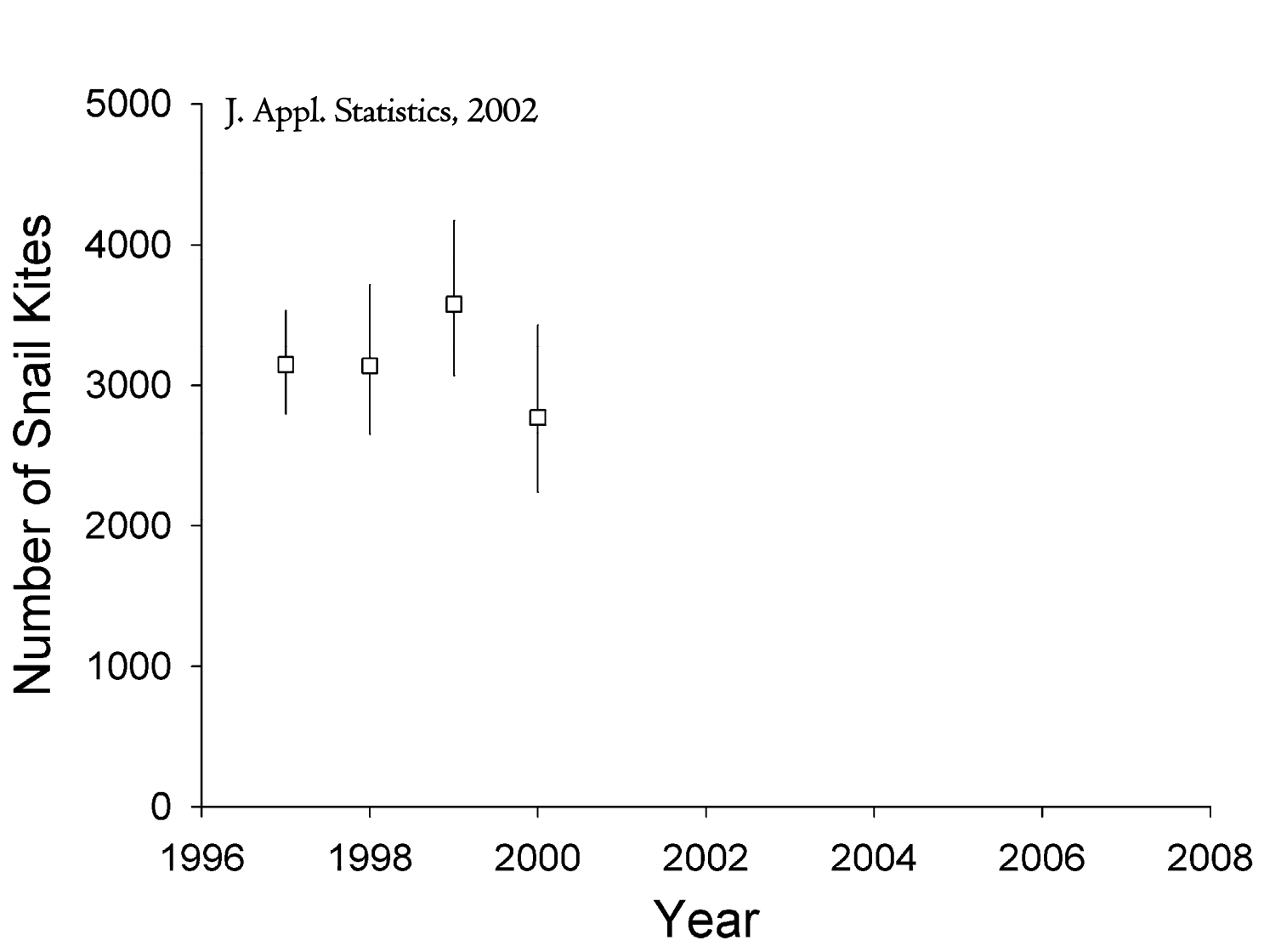
Recruitment

Nest
Monitoring

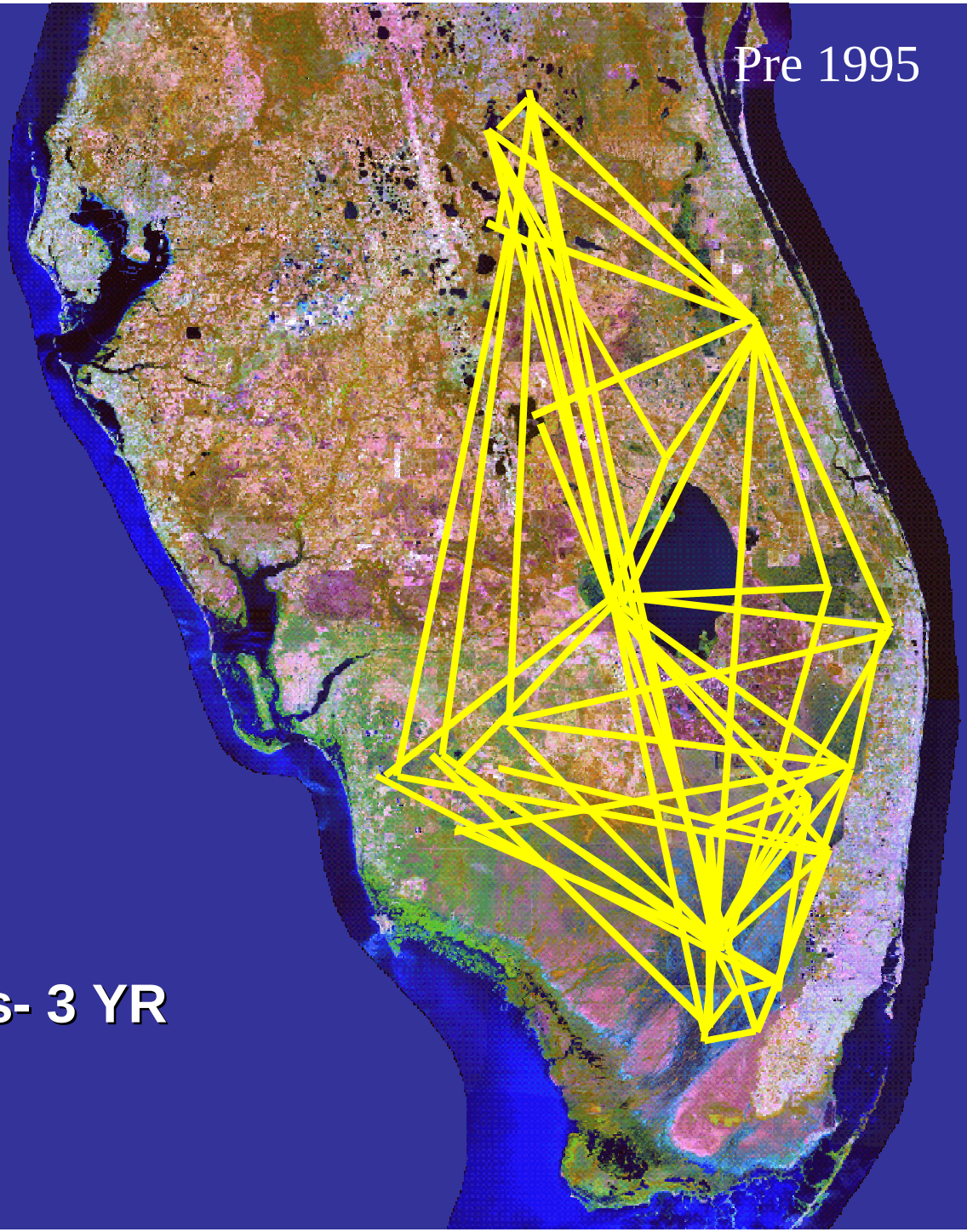
Nest Success

Number of Young

Superpopulation approach

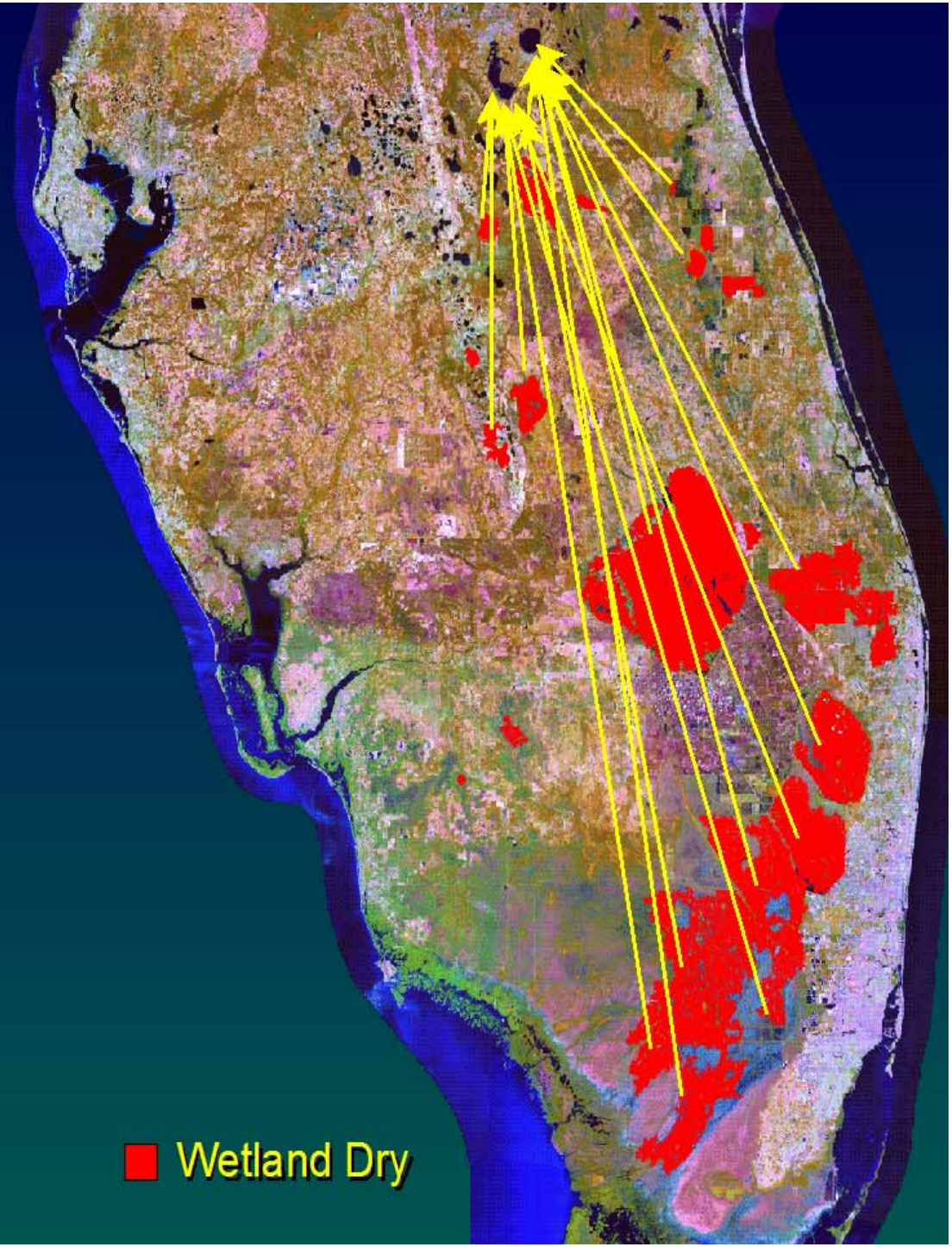


Oikos,1999

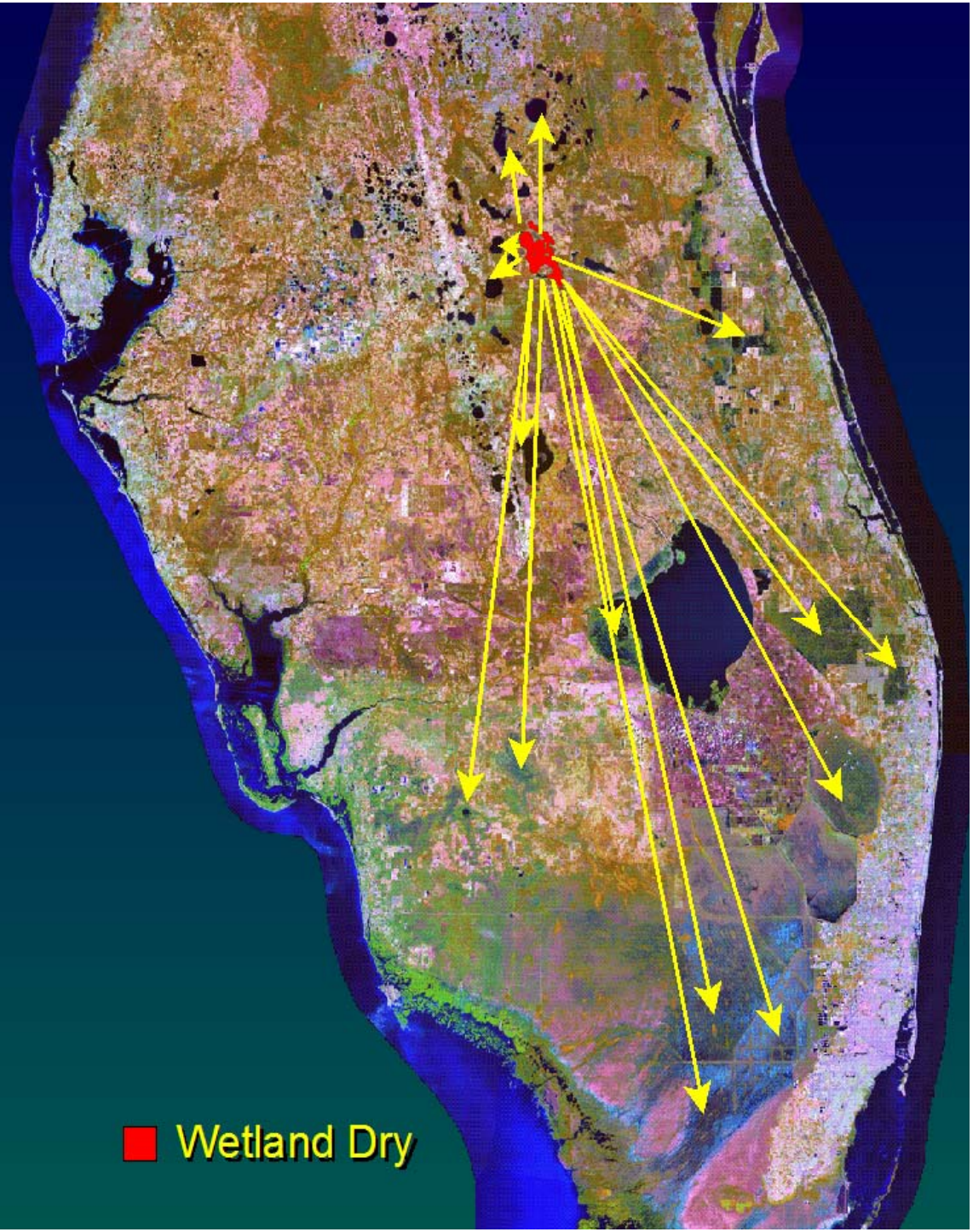


Kite Movements- 3 YR Summary

Widespread Drying Event

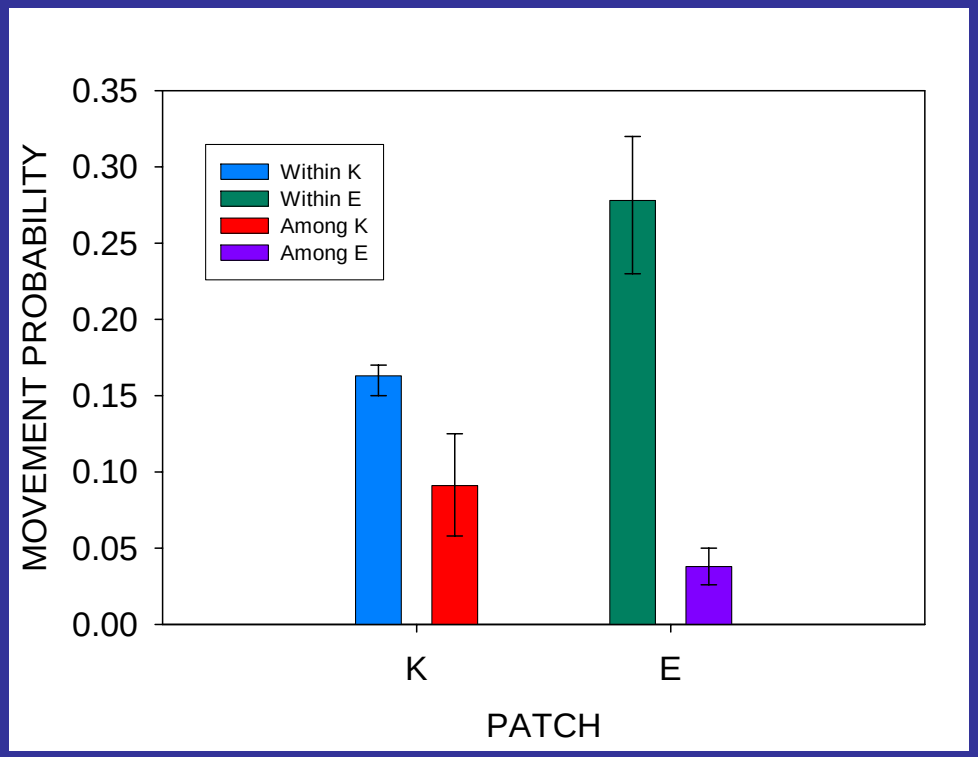


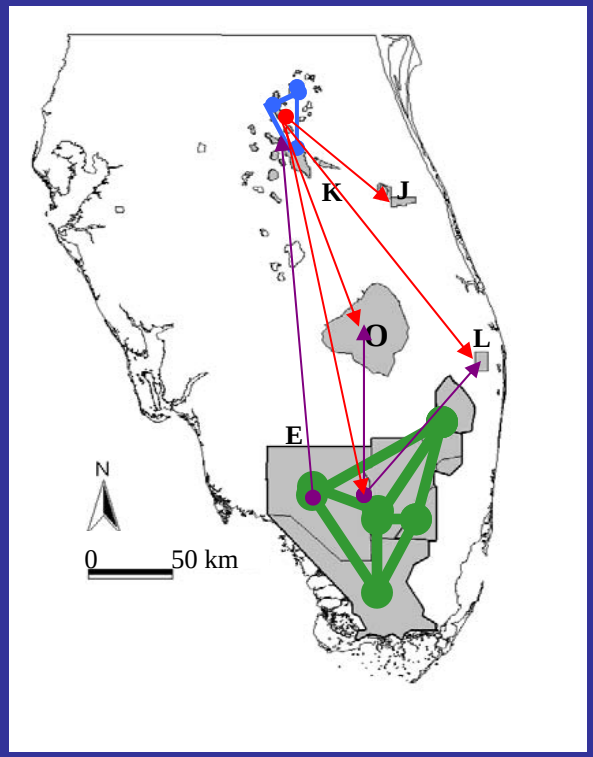
Local Drying Event



Journal Animal Ecol, 2006

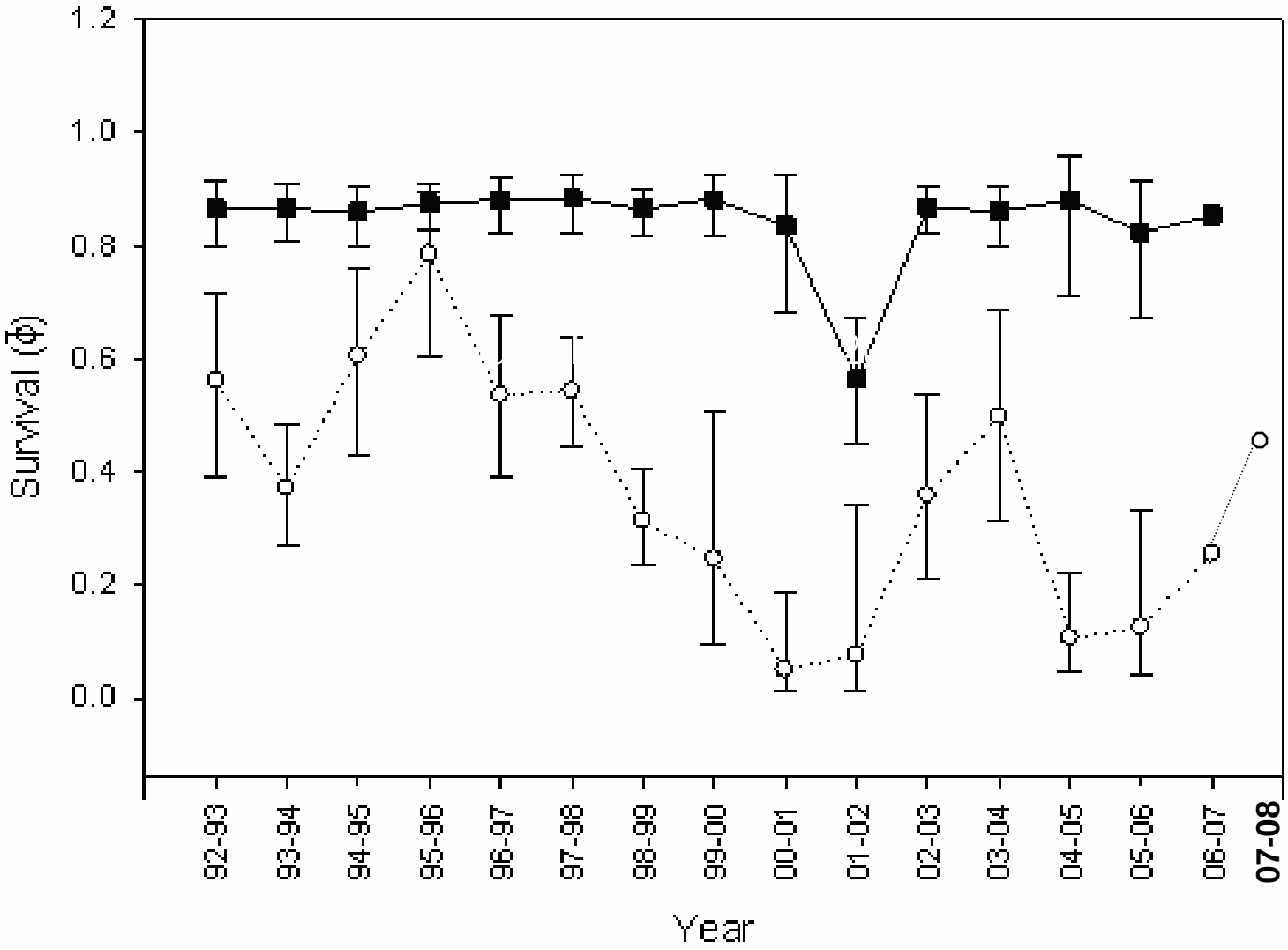
Monthly movements





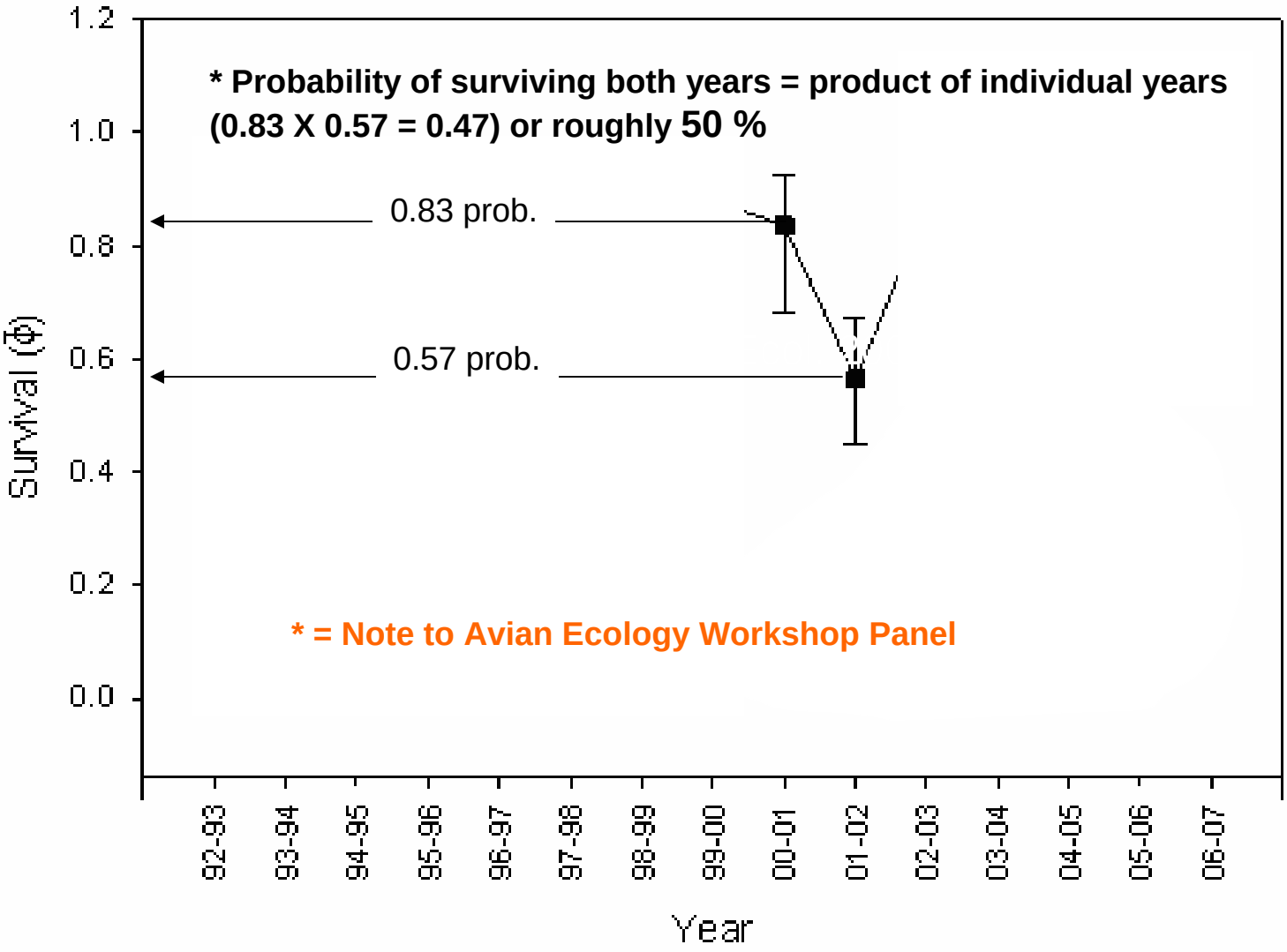
Journal Animal Ecol, 2006

Survival

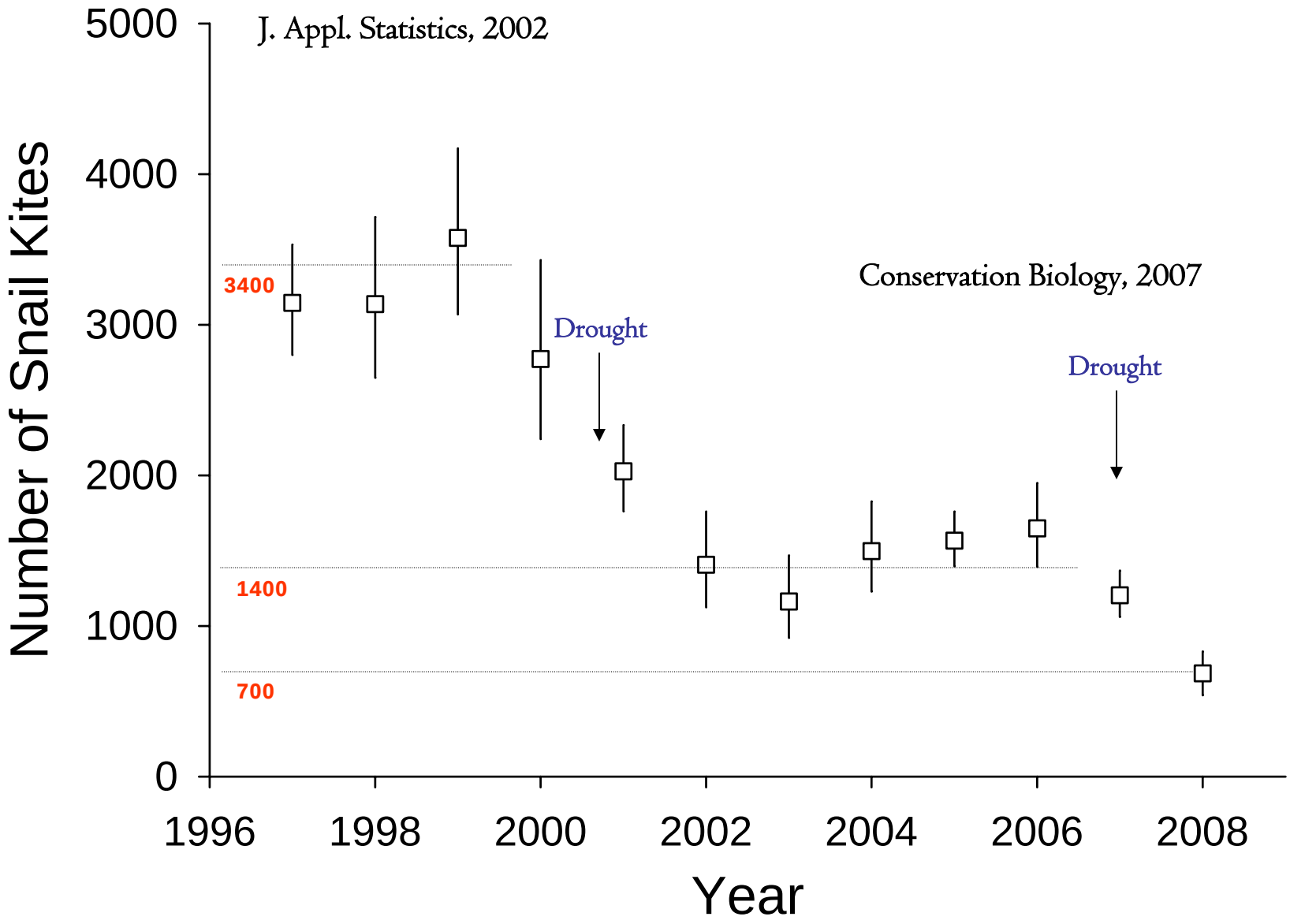


Survival

"Do the Math!"

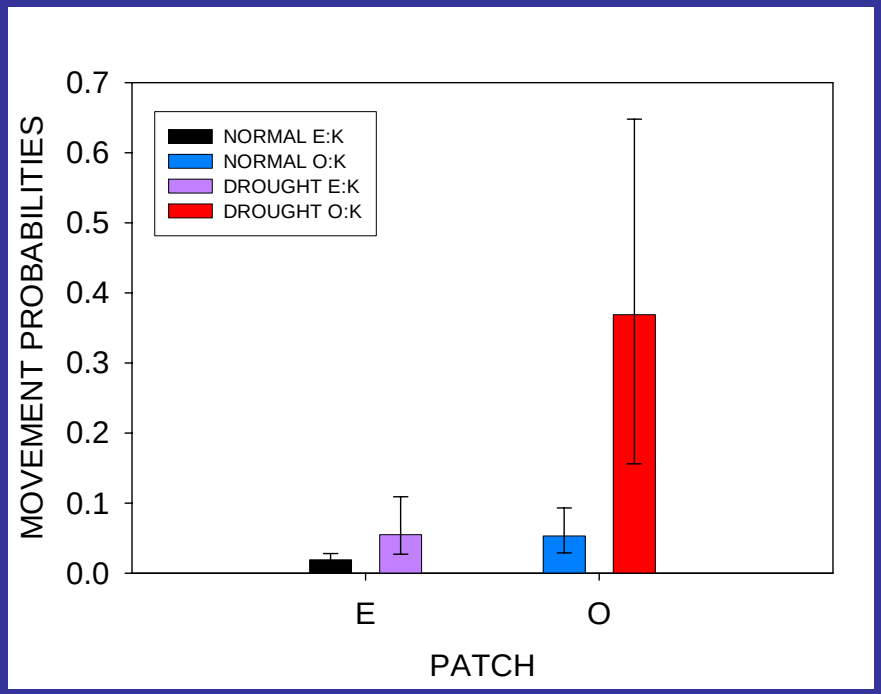


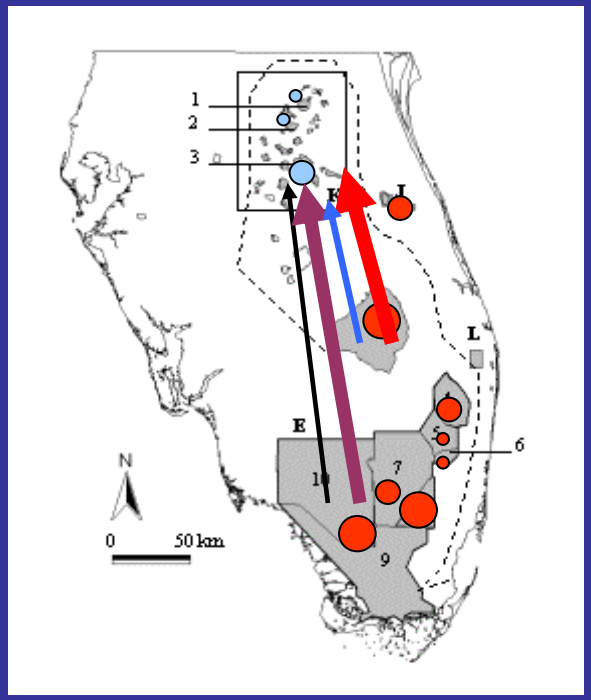
Population size



Movement toward refugia

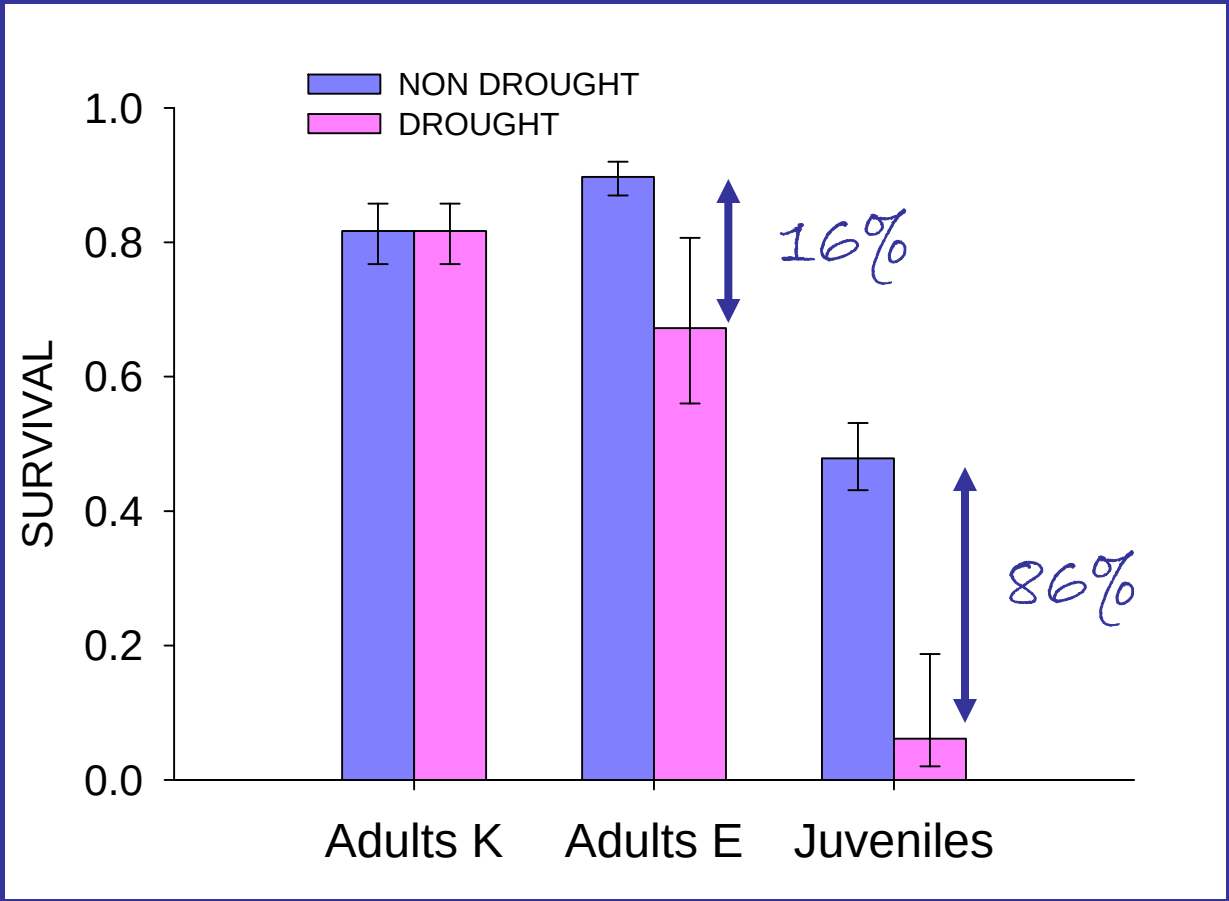
Oecologia 2007



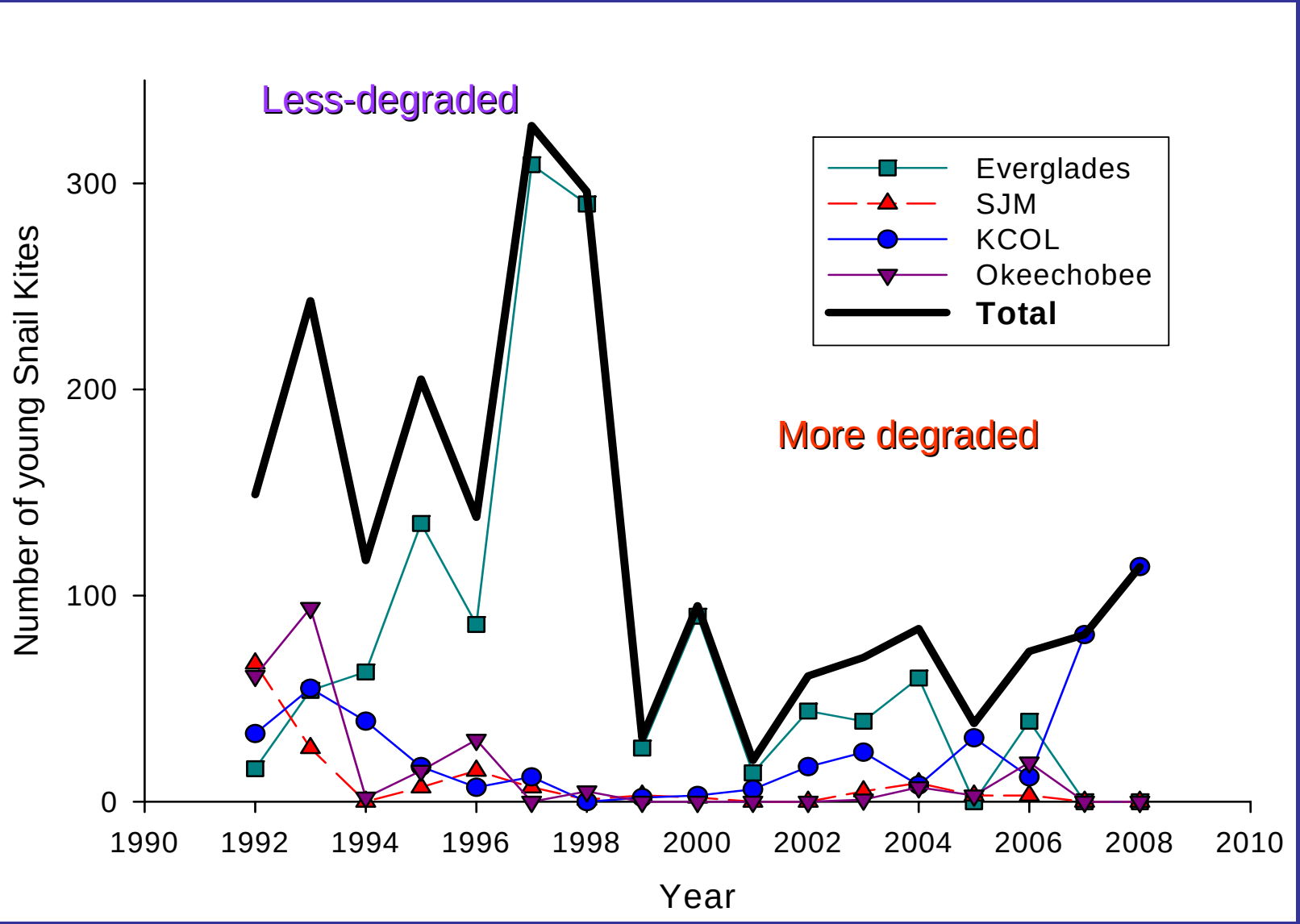


Drought (01-02) effect on survival

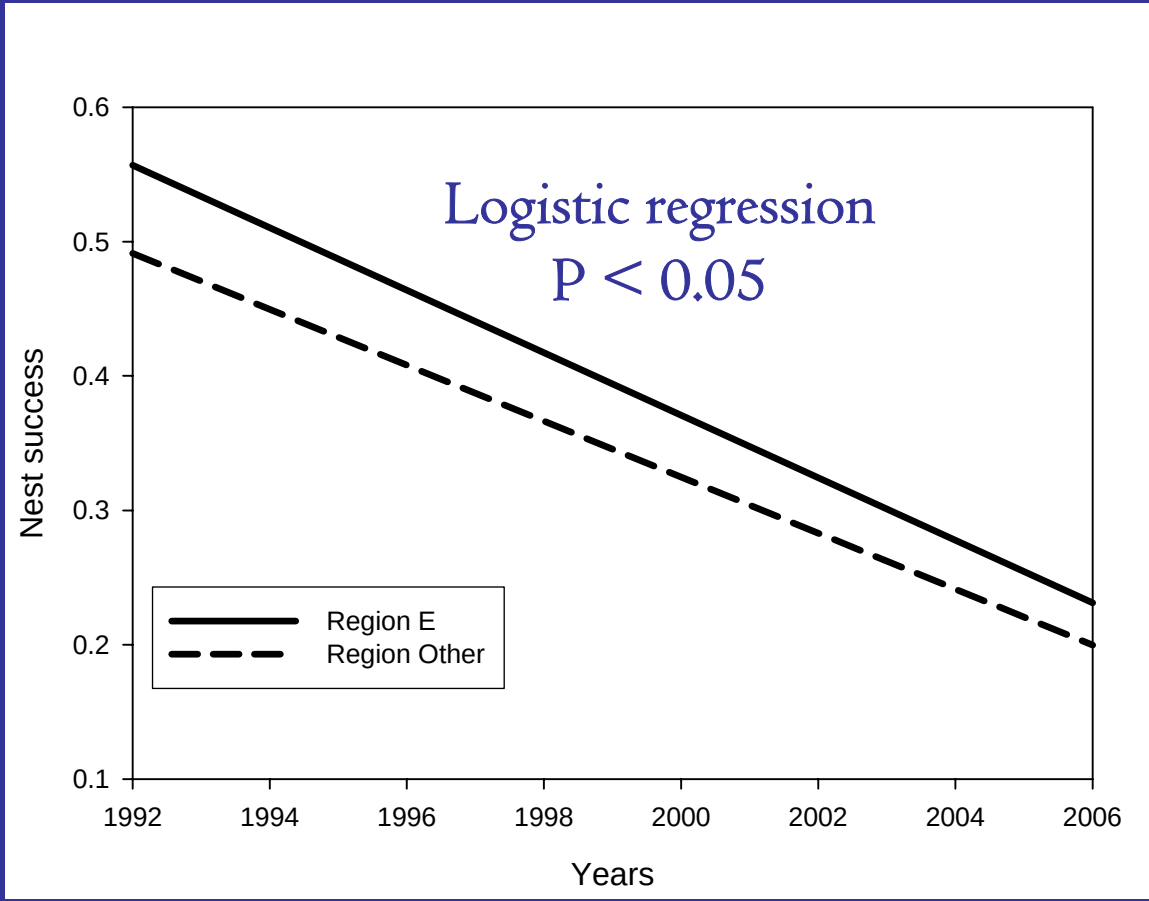
Oecologia 2007



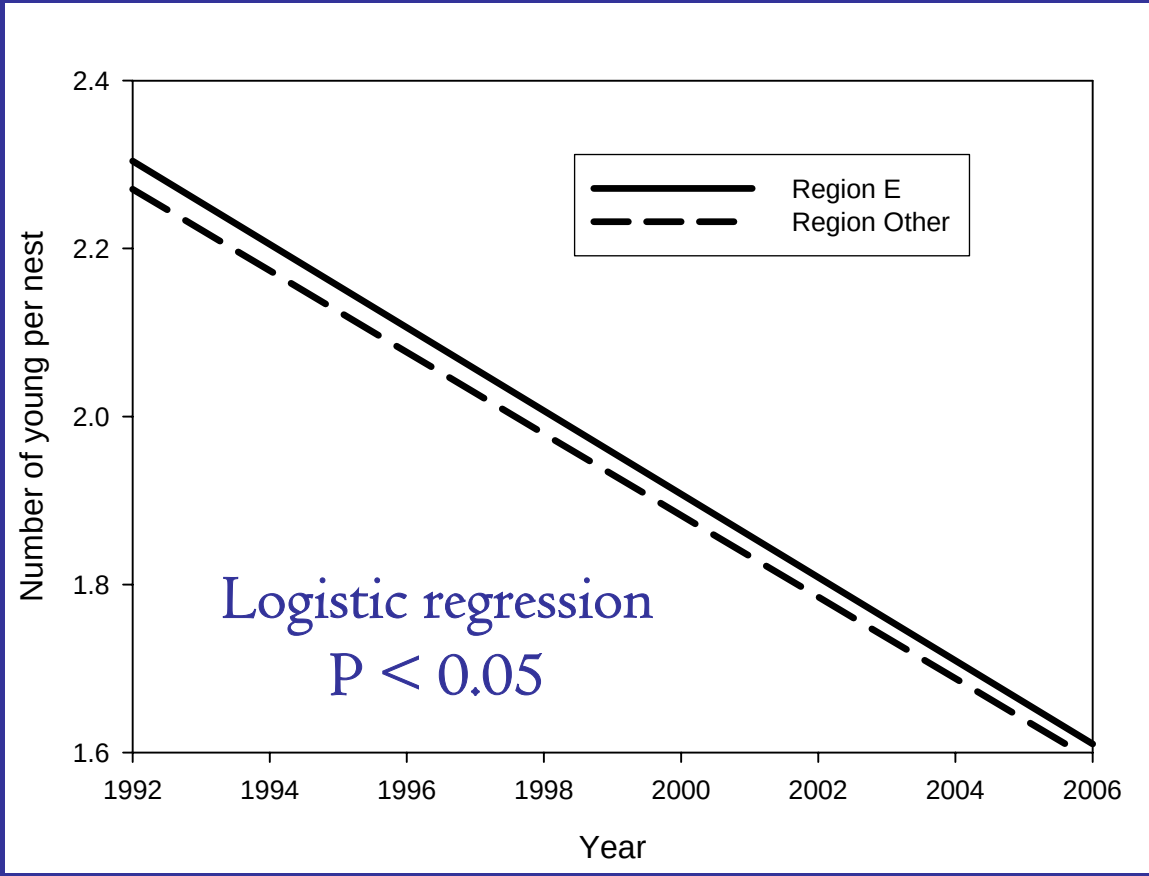
Young Fledged



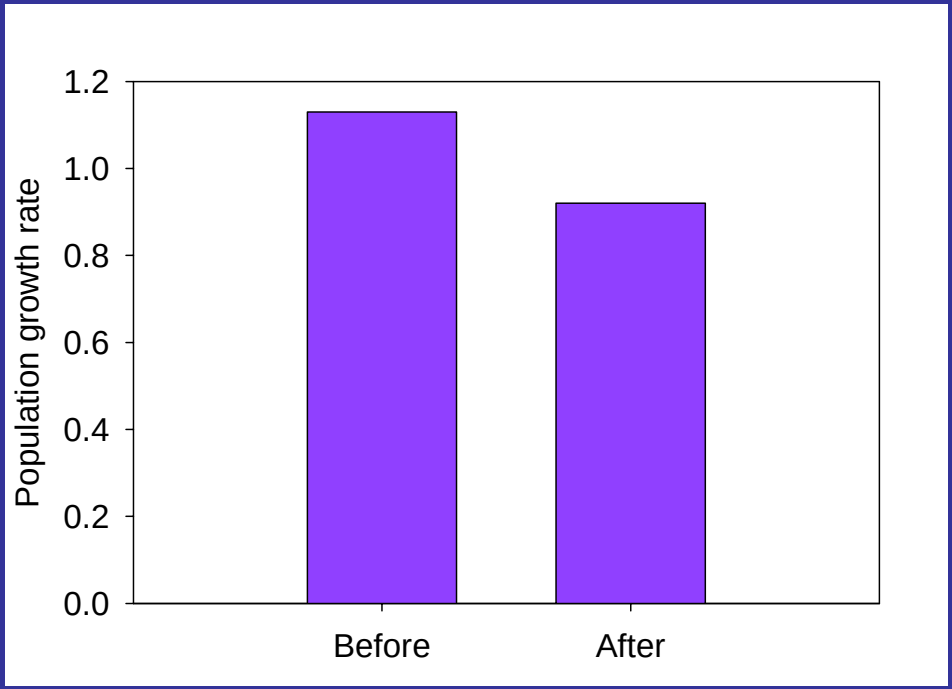
Nest Success



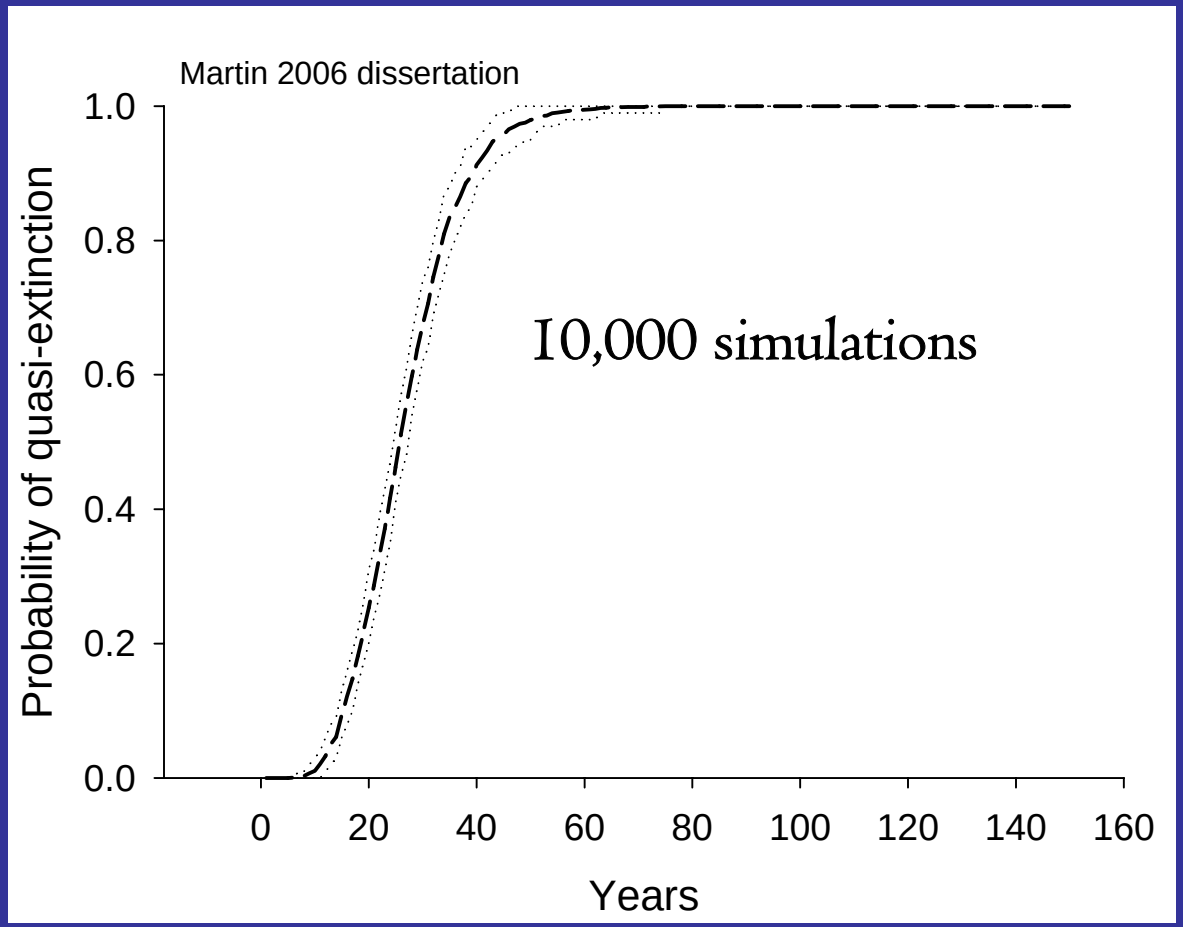
Number of young per nest



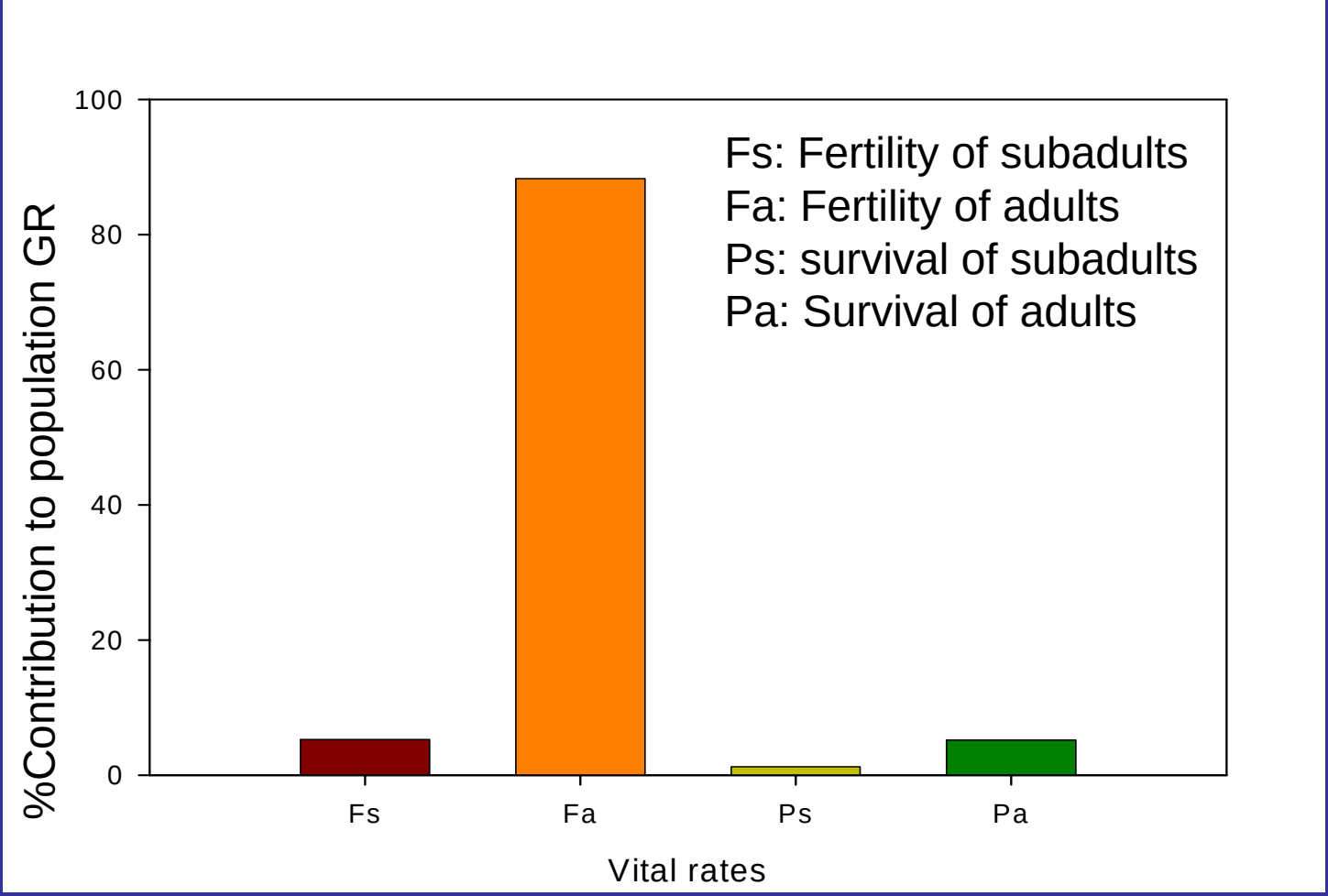
Population Growth
Before vs After 1998



Probability of quasi-extinction



Matrix Population Model / LT Response Experiment Evaluation of Population Growth Rates Before vs After 1998



WCA3A is one key!

1- Highest production

2- Greater Nest success and Number of young per nests

3- High natal philopatry (~95% for WCAs)

4- largest extent of connected suitable habitat

Hypotheses explaining Kite decline

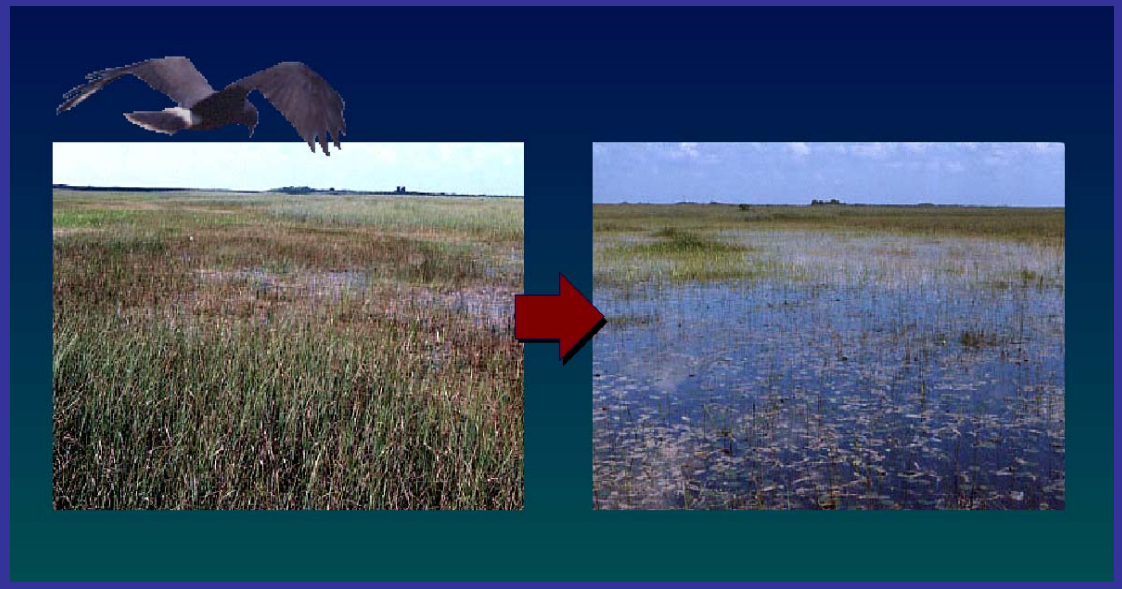
1- Hypothesis 1: Long term habitat degradation

2- Hypothesis 2: Increase in freq of drying events, high stages prior to breeding season, and high recession rates

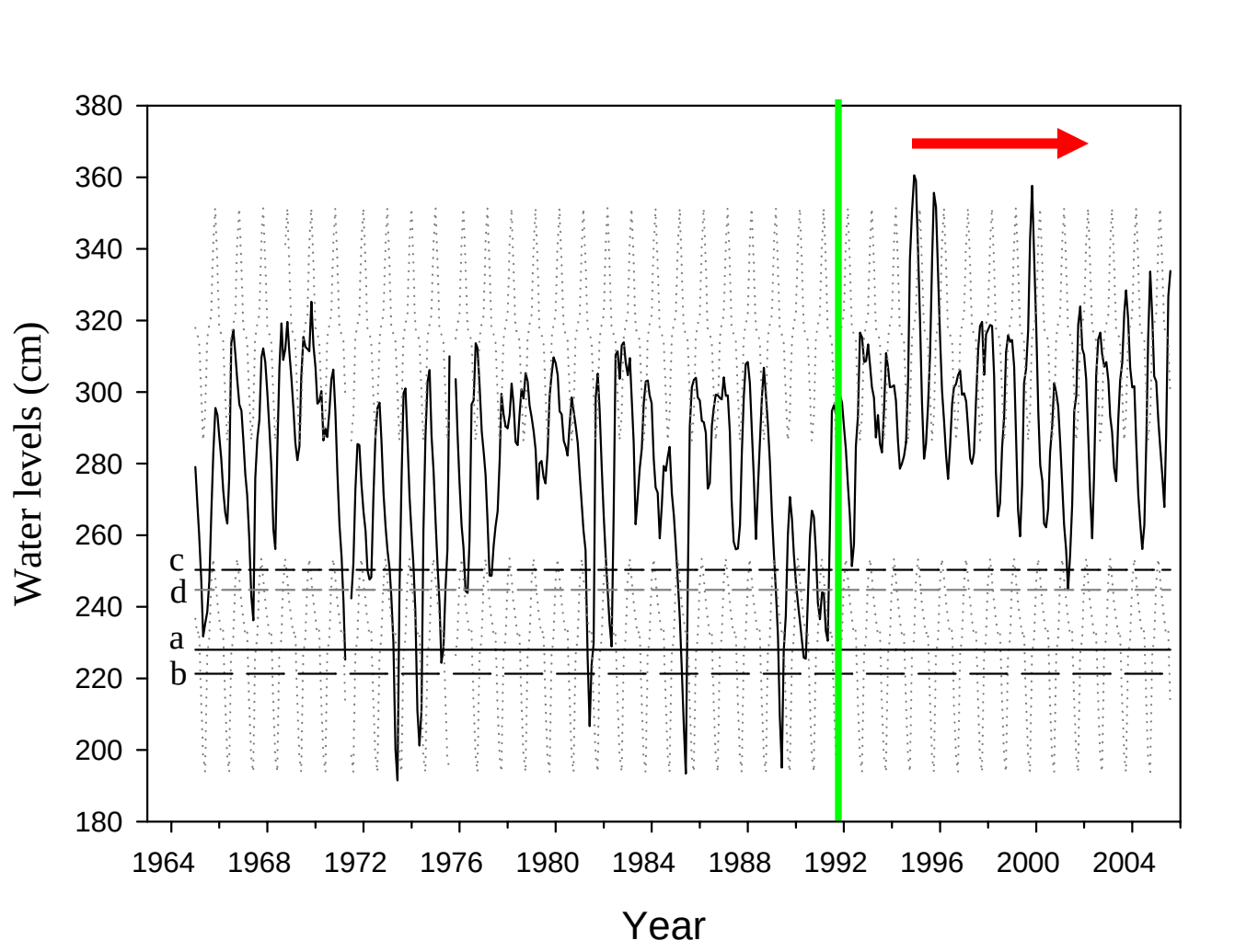
3- Hypothesis 3: Both effects are at play

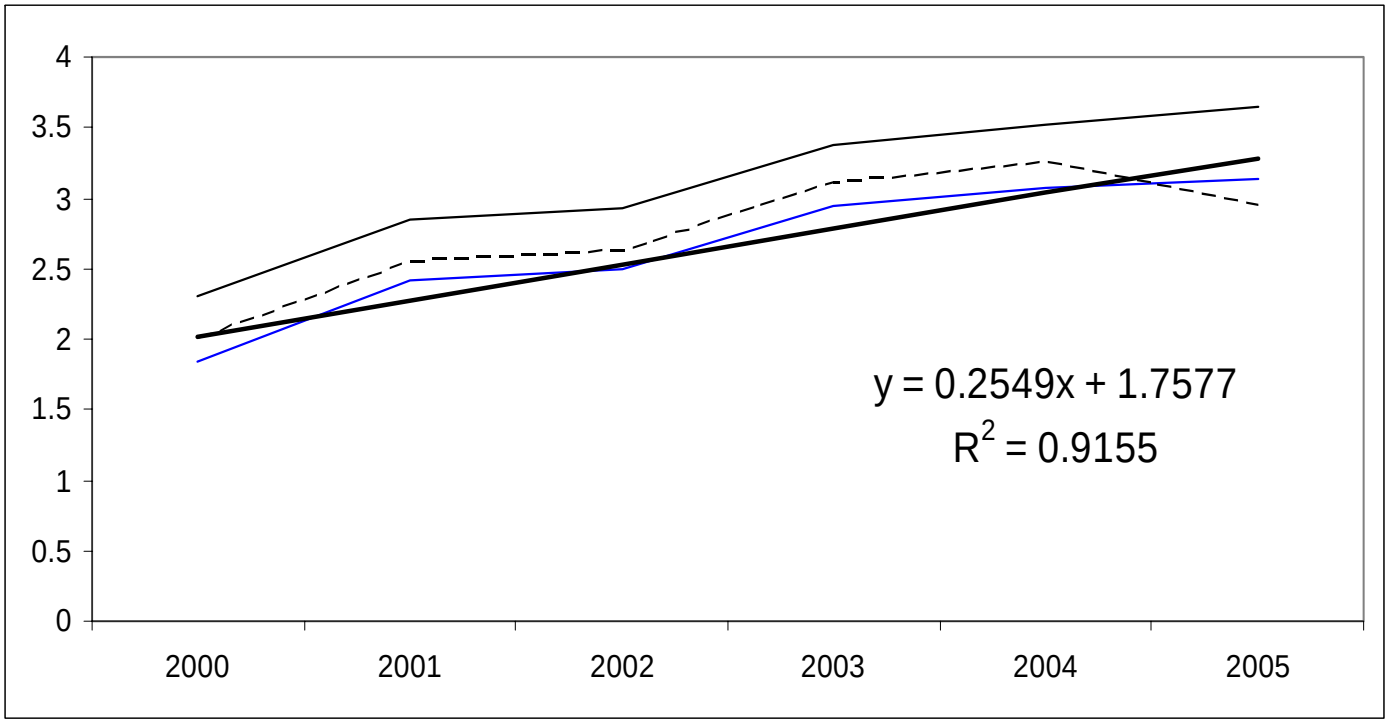
Hypothesis 1:Habitat alteration/degradation

- Prolonged hydroperiod, drought suppression:
  - *Shift in vegetation communities (Kitchens 2002; Zweig and Kitchens 2008)
  - *Degradation of foraging and nesting habitats
  - *Ecological trapping (high to rapid lows)
- Reduced snail abundances (Darby et al.)

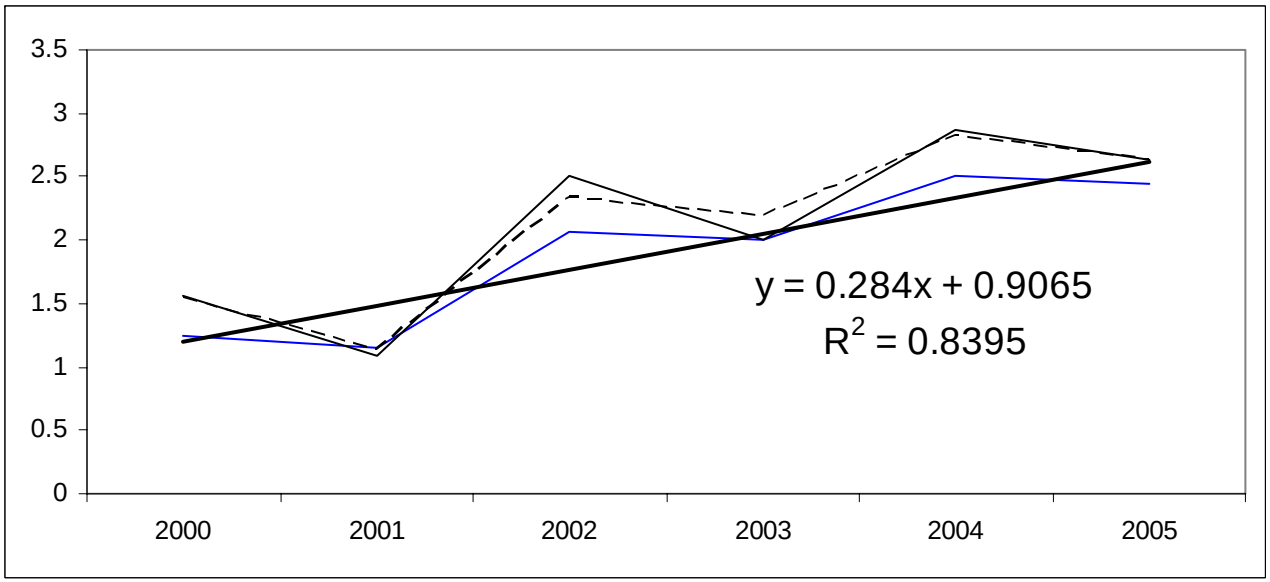


Hydrograph of WCA3A



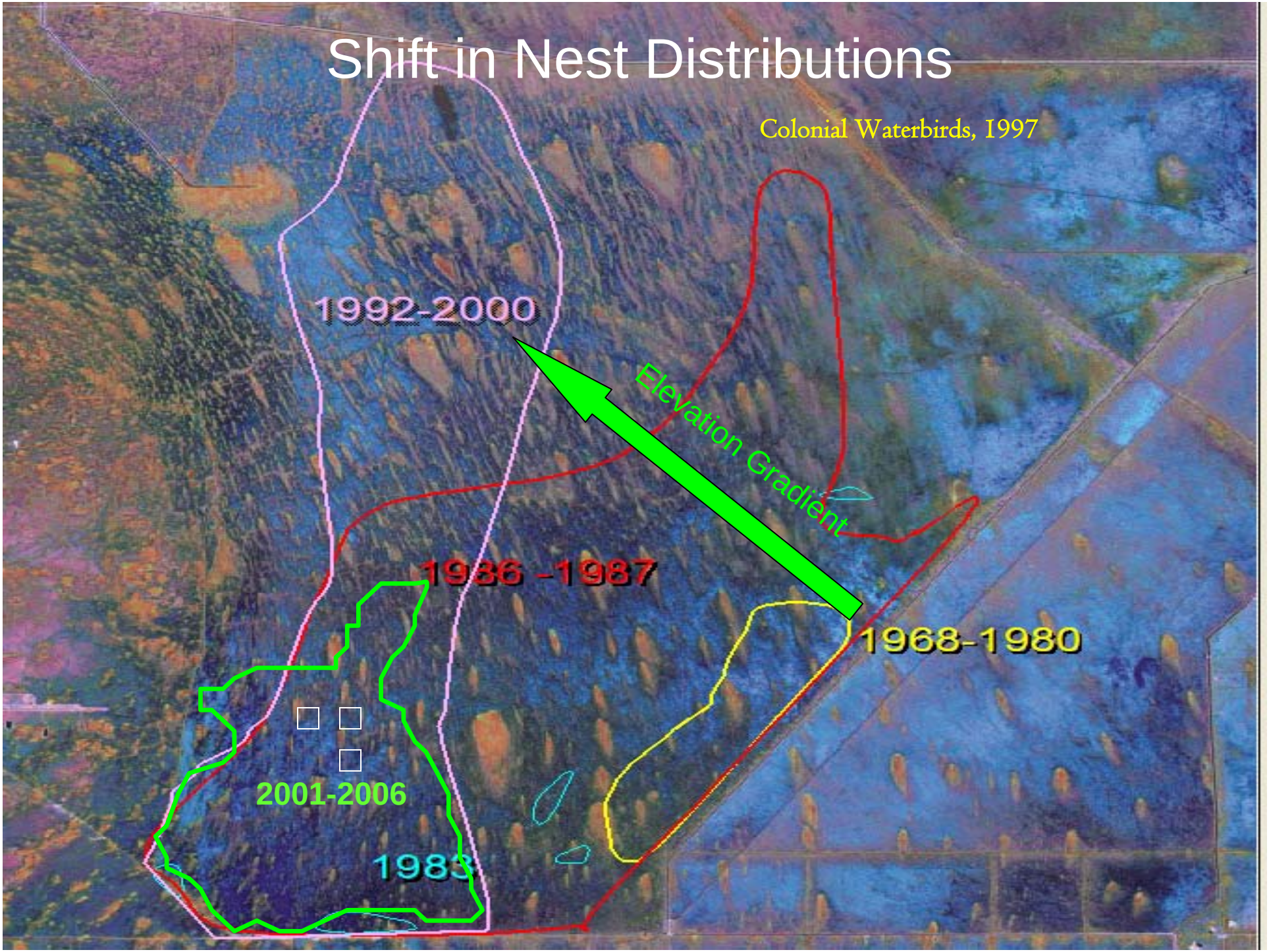

4
3.5
3
2.5
2
1.5
1
0.5
0
2000
2001
2002
2003
2004
2005
y = 0.2549x + 1.7577
R2 = 0.9155

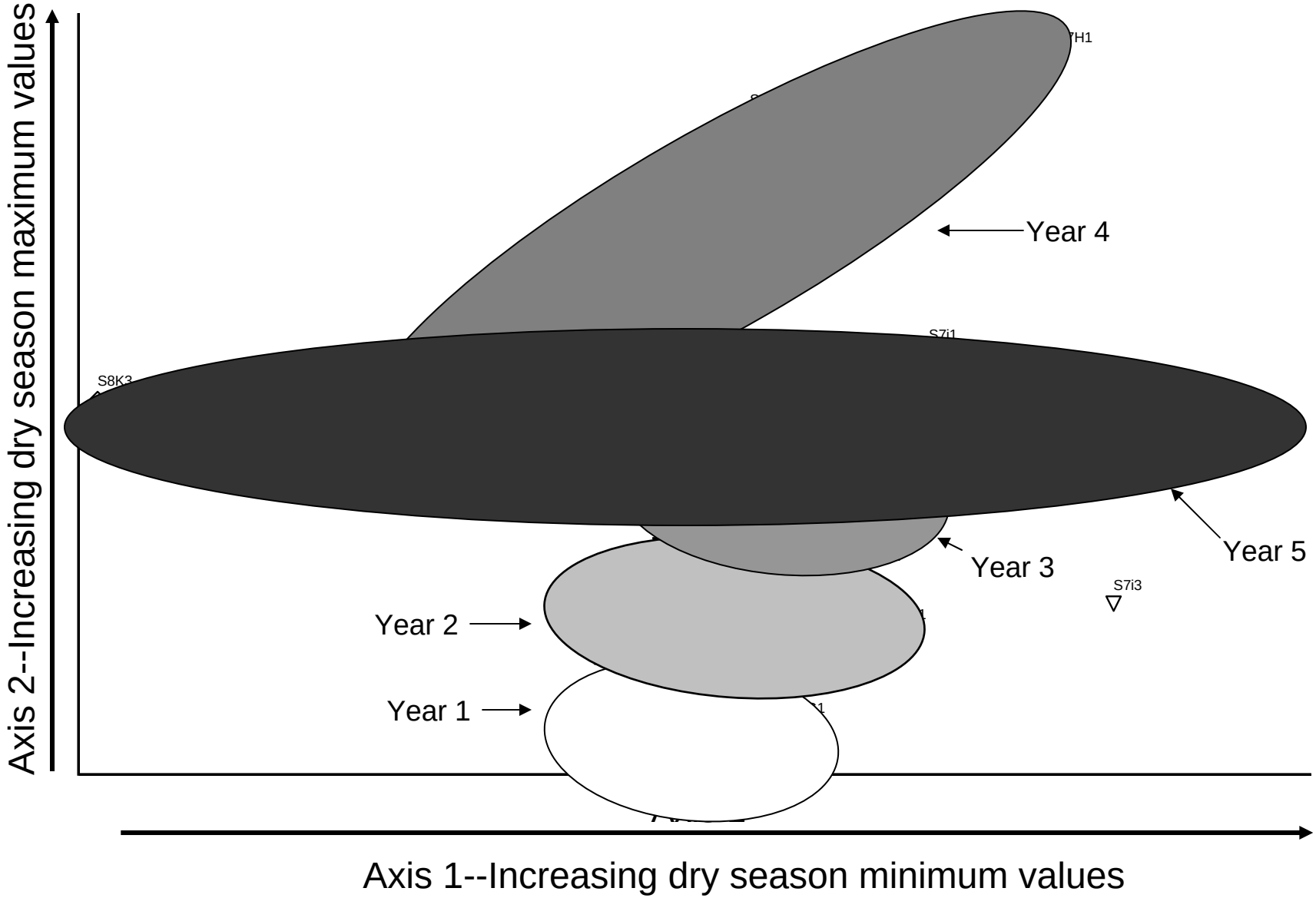
Maxes


3.5
3
2.5
2
1.5
1
0.5
0
2000
2001
2002
2003
2004
2005
y = 0.284x + 0.9065
R2 = 0.8395

Range

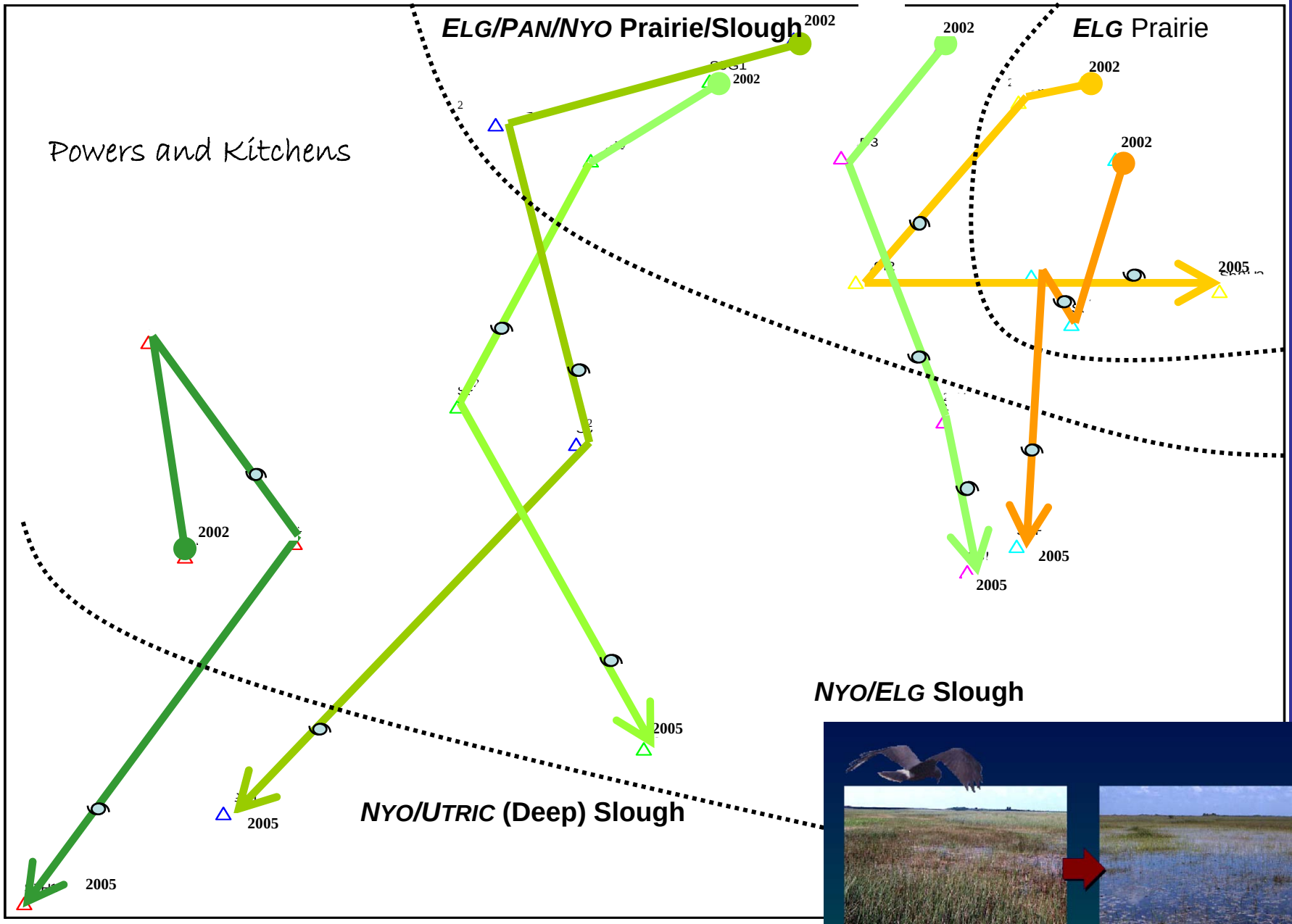
Shift in Nest Distributions





Zweig and Kitchens (Wetlands 2008)

Wet season NMS with frequency on Plots 7, 8, and 9



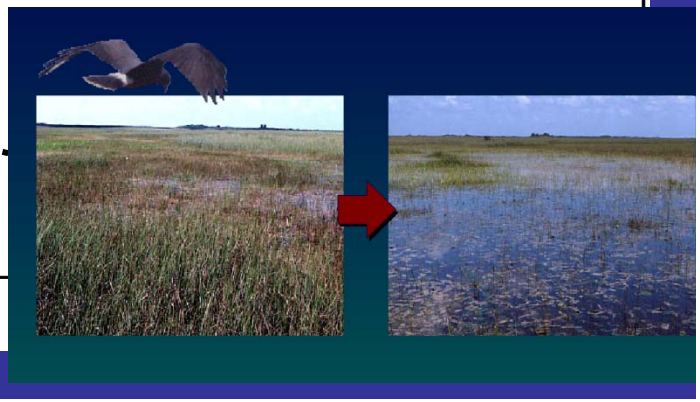
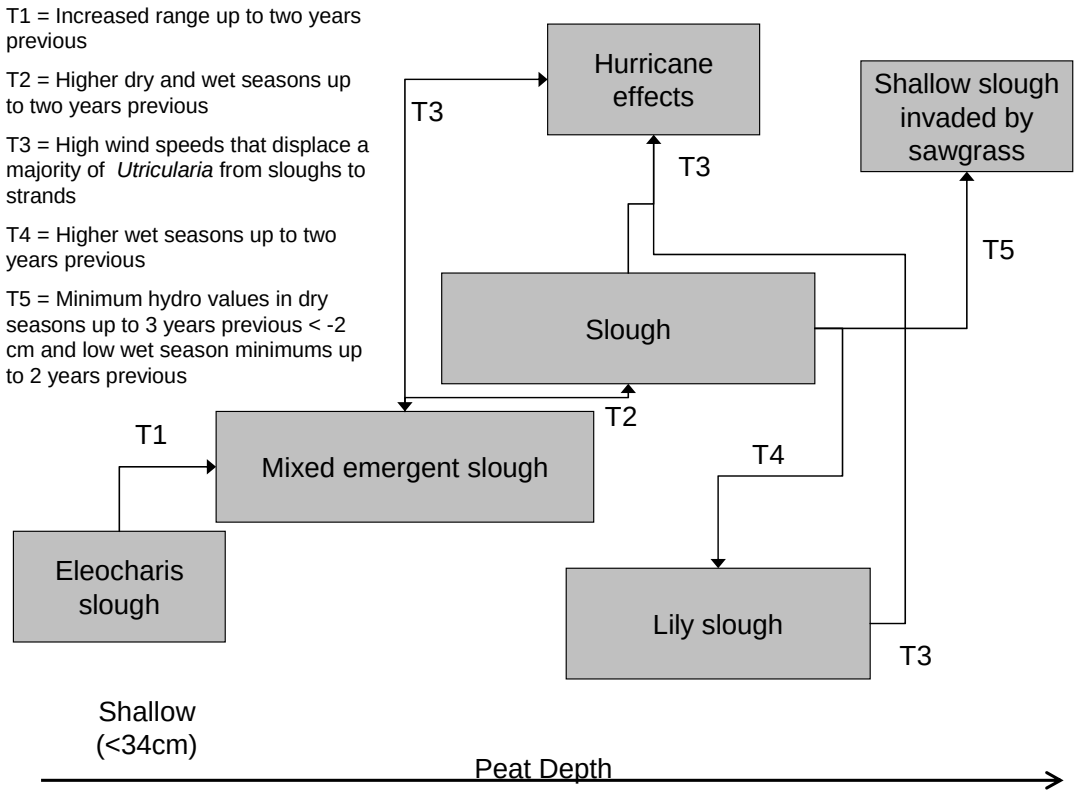
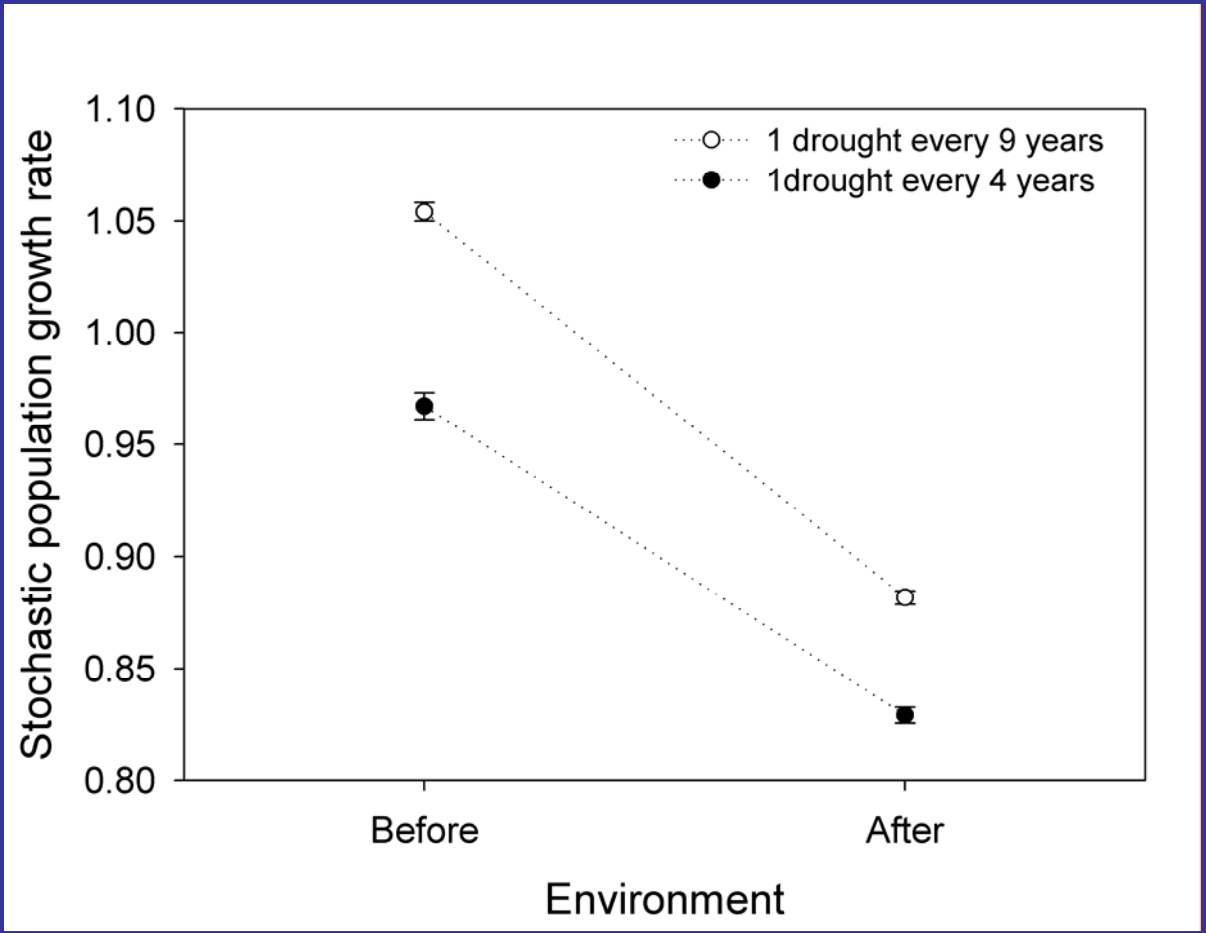


Figure 4 continued
C



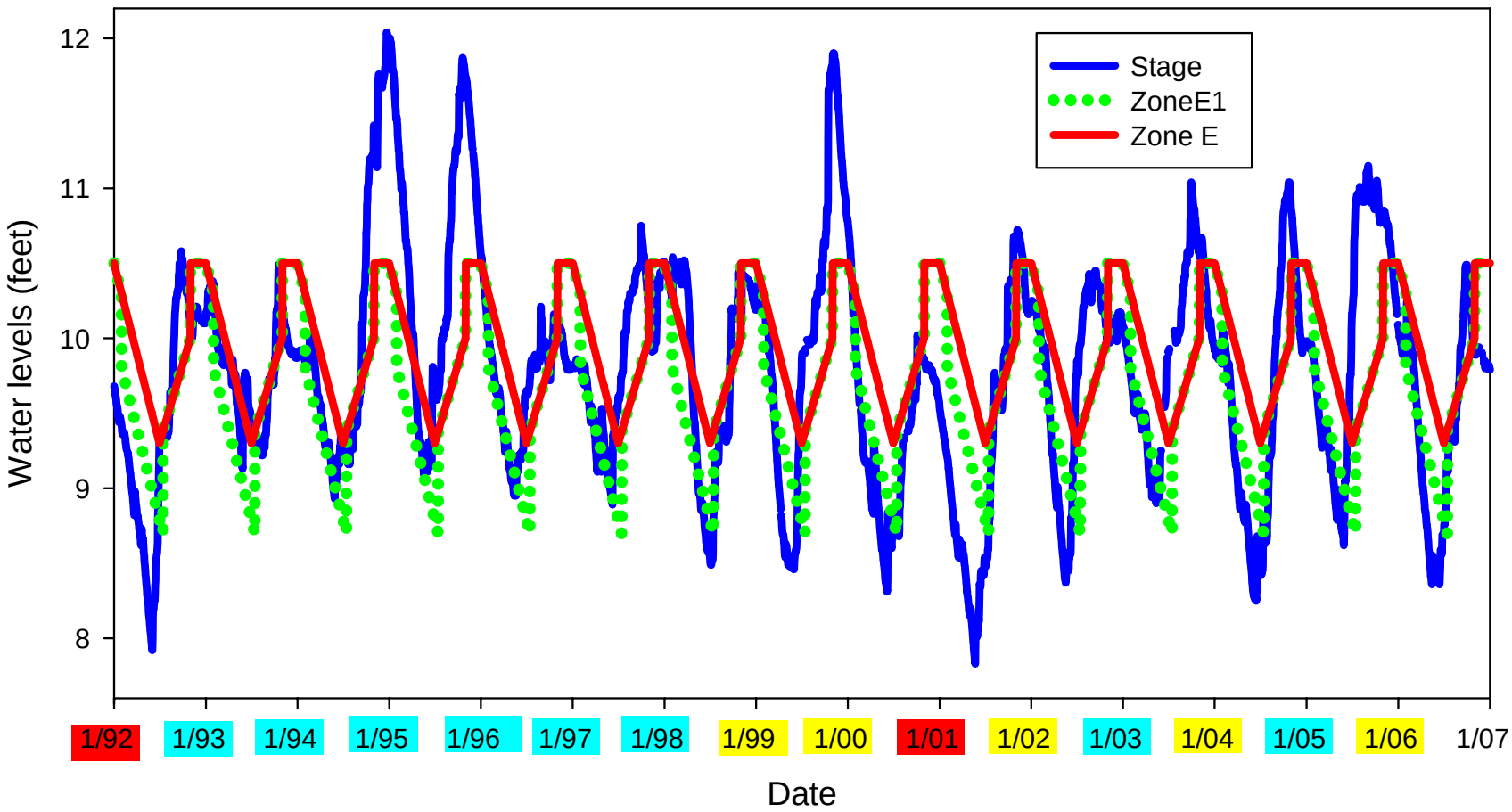
Hypothesis 1: Hab. deg. Effect on Growth Rate



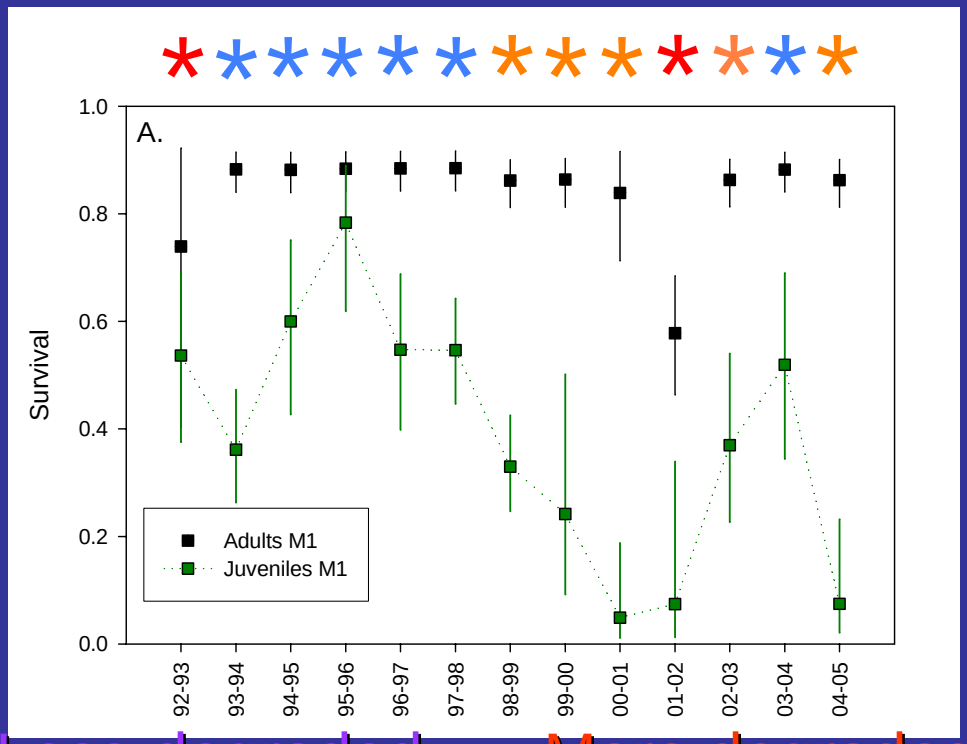
Hypothesis 2:

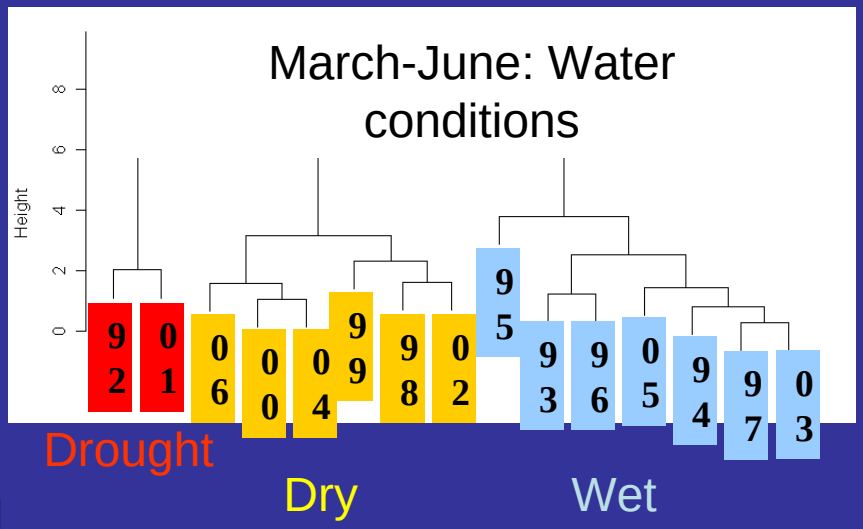
- Increase in drying event frequency,
- High stages prior to nesting, and
- Large stage excursions/high recession rates

Water Management of WCA3A



Hypothesis 2: Increase in drying event frequency

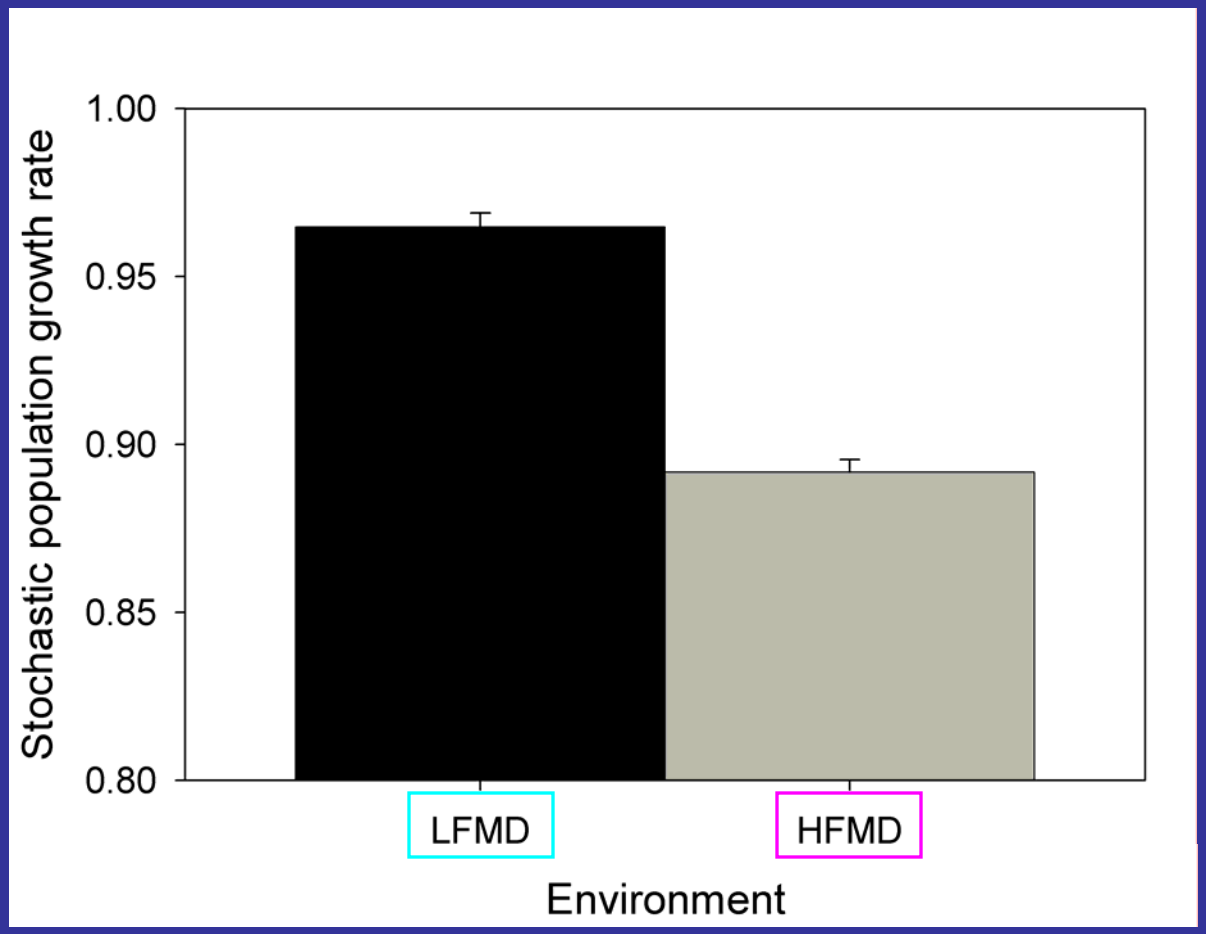




Less-degraded

More degraded

Hypothesis 2: Drying event freq
Population growth rate

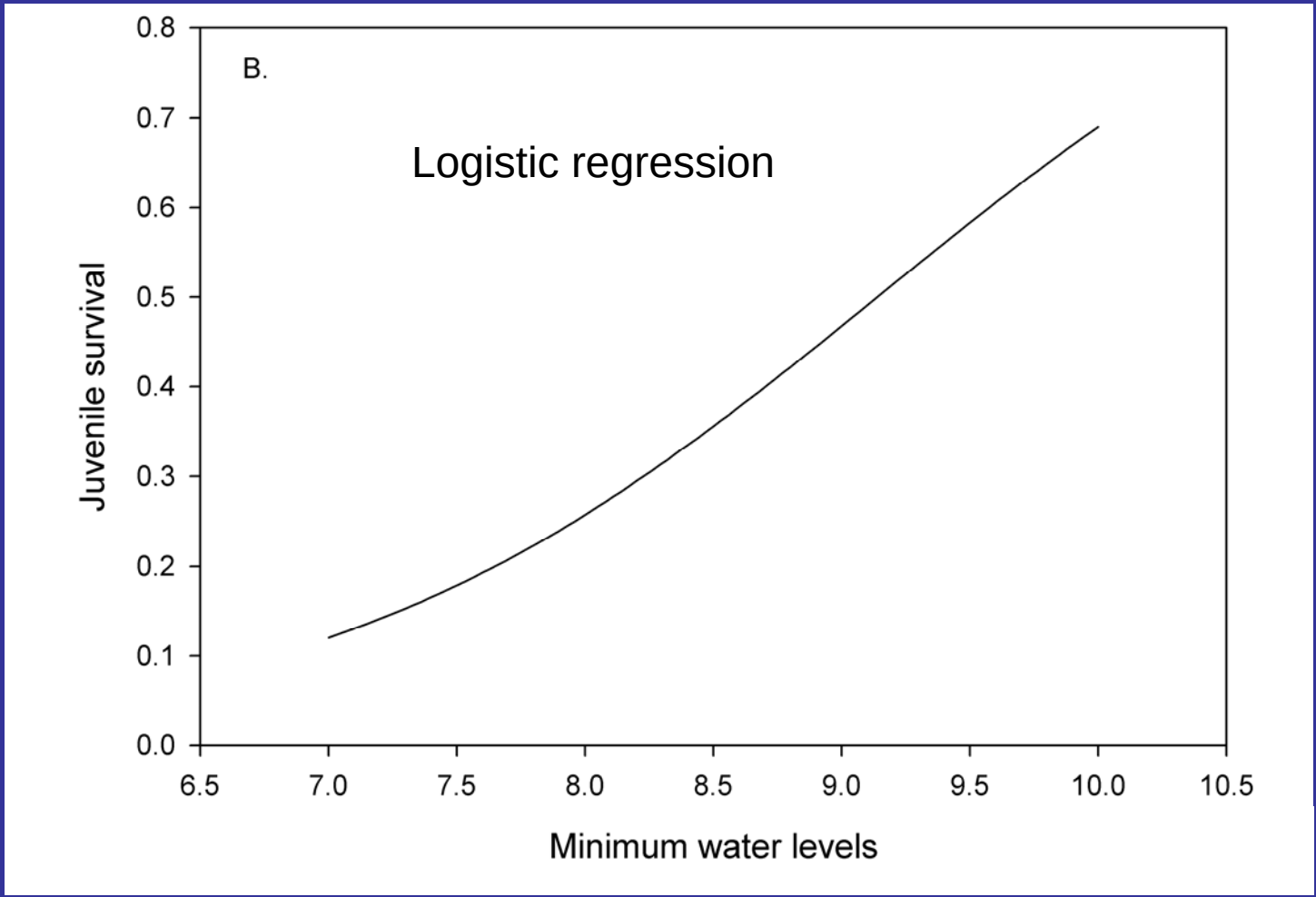


1992	R	1	1
1993	B	2	2
1994	B	3	3
1995	B	4	4
1996	B	5	5
1997	B	6	6
1998	O	7	7
1999	O	8	1
2000	O	9	2
2001	R	10	3
2002	O	11	4
2003	B	12	5
2004	O	13	6
2005	B	12	5

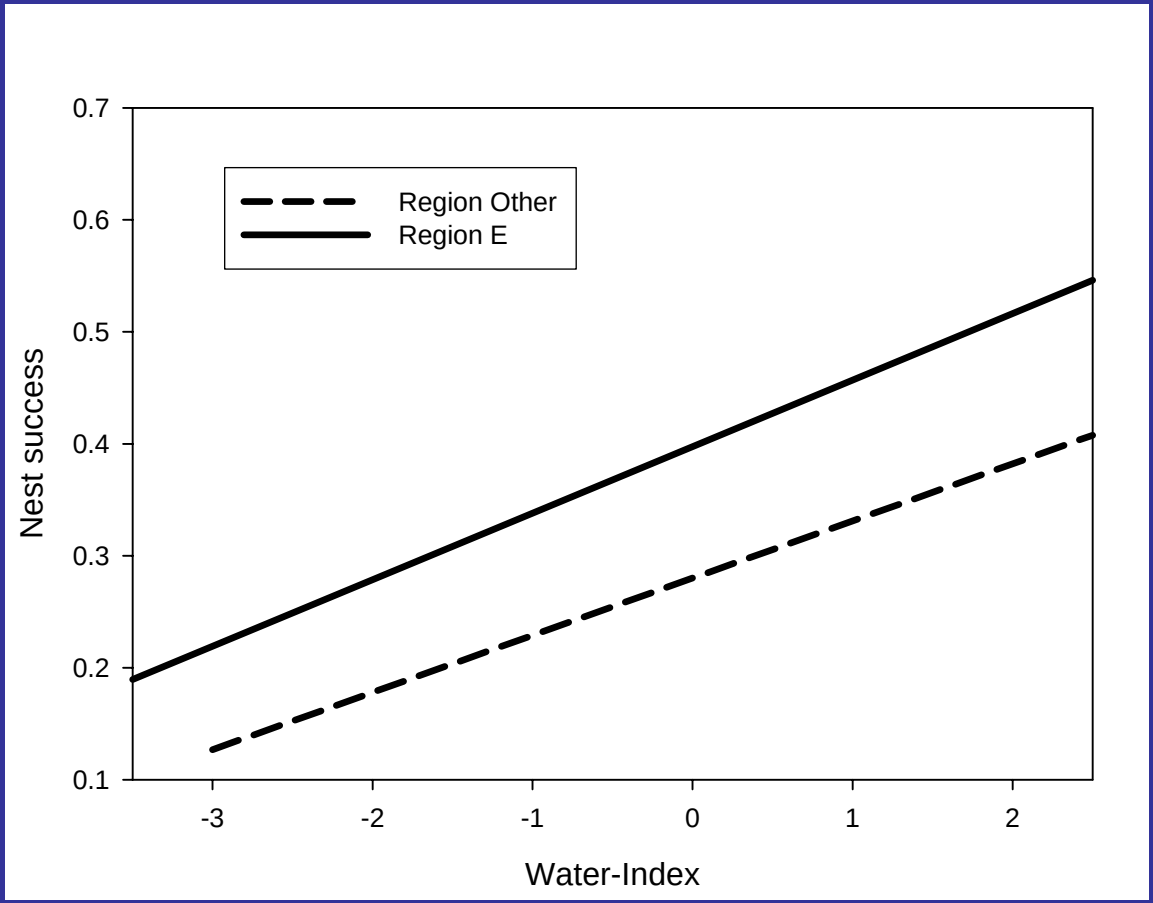
LFMD

HFMD

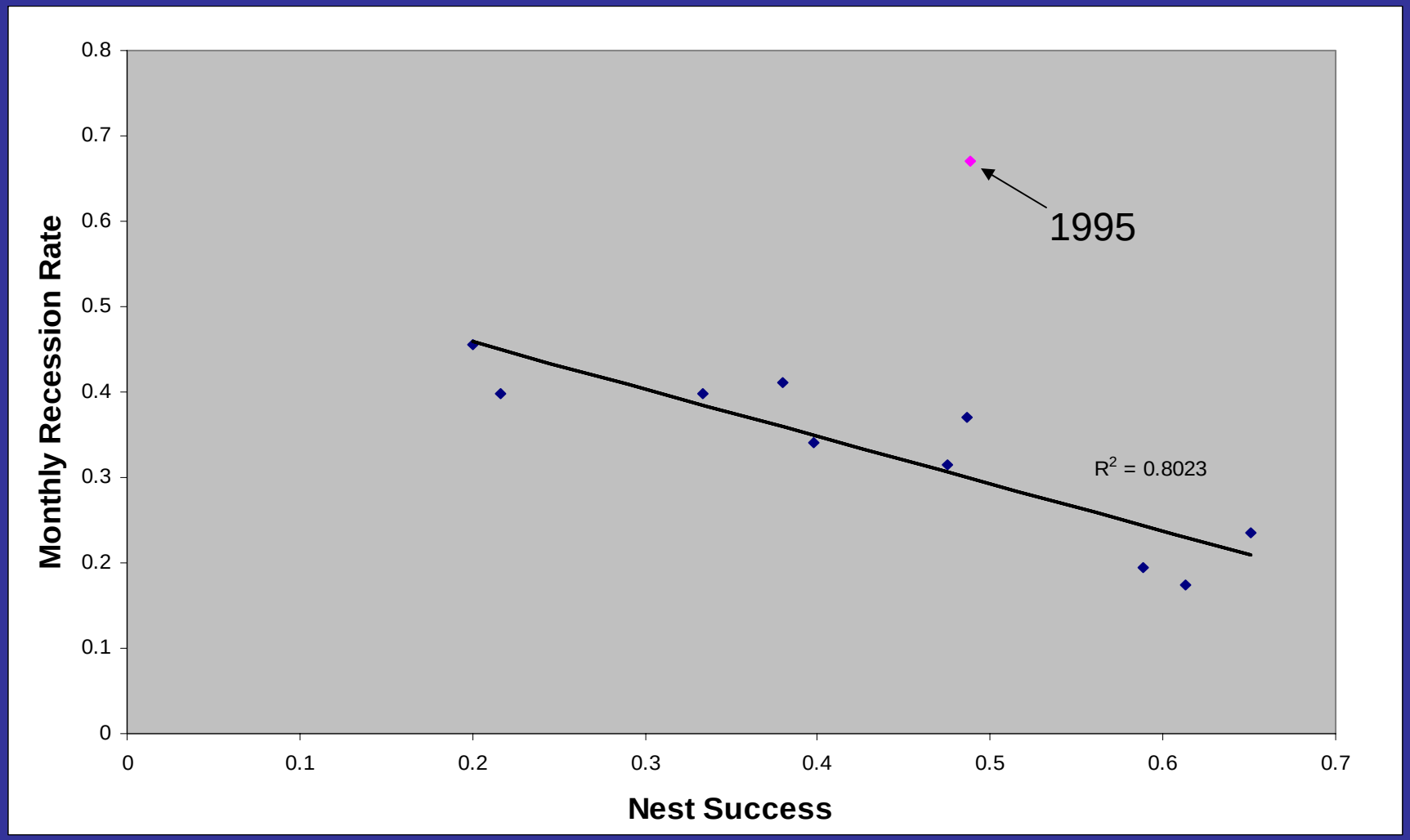
Hypothesis 2: Drying event freq. Survival

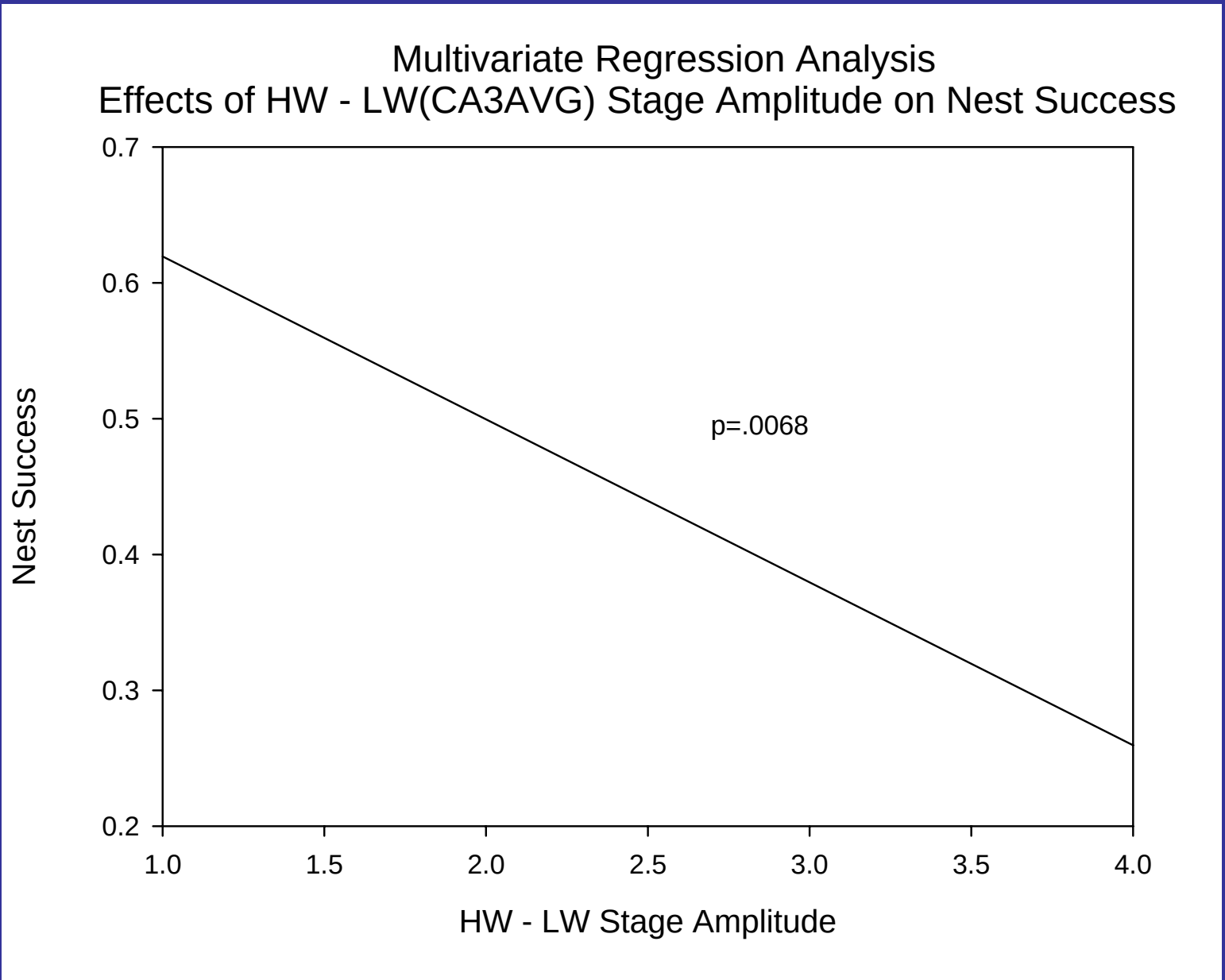


Hypothesis 2: Drying event freq. Nest success

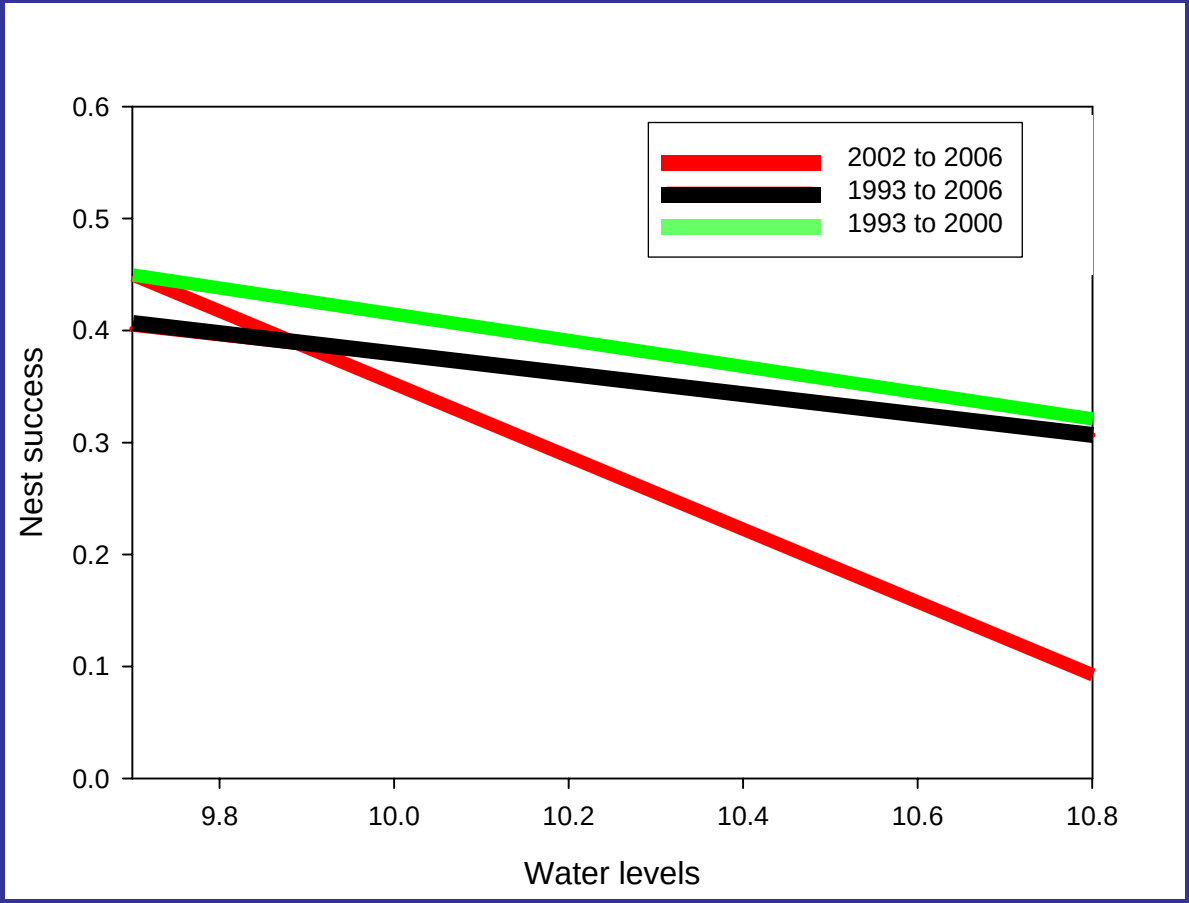


Effects of Recession Rate (Jan 1 – LW Event) on SNKI Nest Success

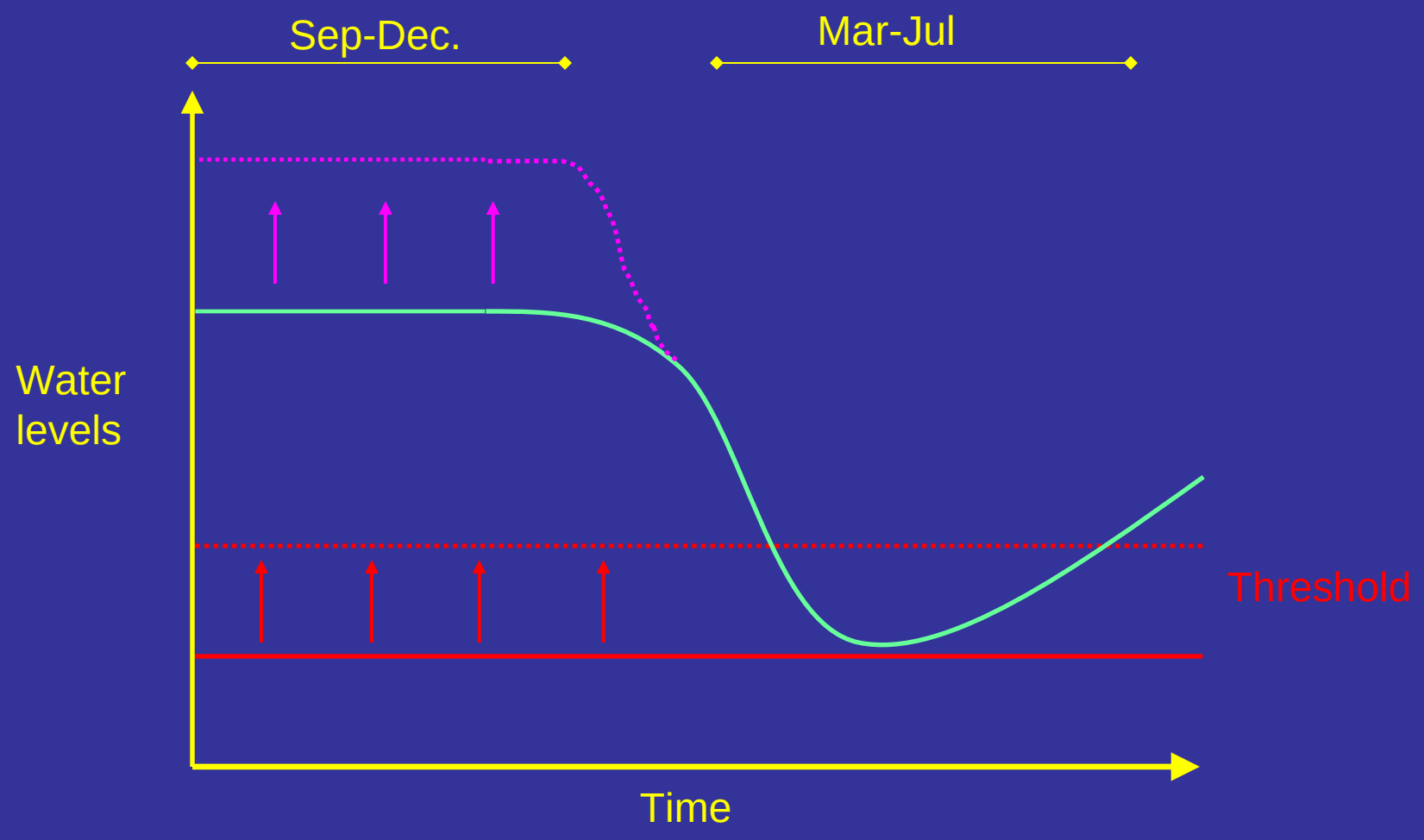



Multivariate Regression Analysis
Effects of HW - LW(CA3AVG) Stage Amplitude on Nest Success
Nest Success
0.7
0.6
0.5
0.4
0.3
0.2
p=.0068
1.0
1.5
2.0
2.5
3.0
3.5
4.0
HW - LW Stage Amplitude

Sensitivity of nest success to HW prior to breeding

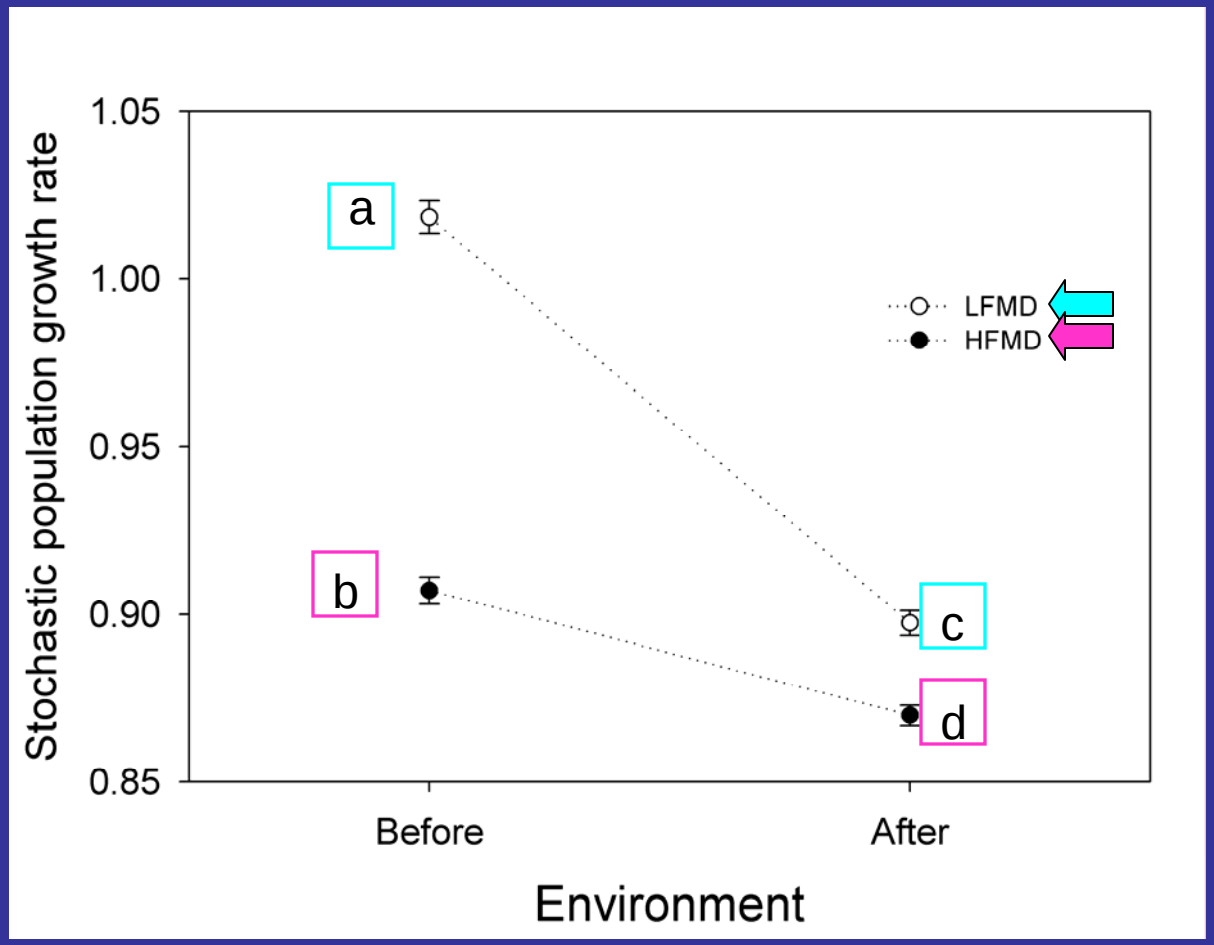


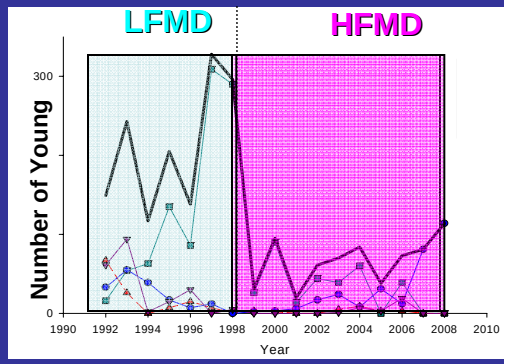
Hypothesis 3: Increase in drying events frequency & habitat conversion (extent and qual.)

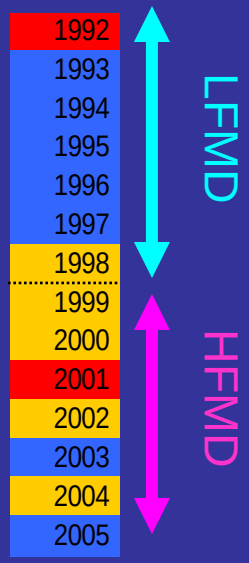


Effects of habitat conversion & an increase in drying events on population growth rates

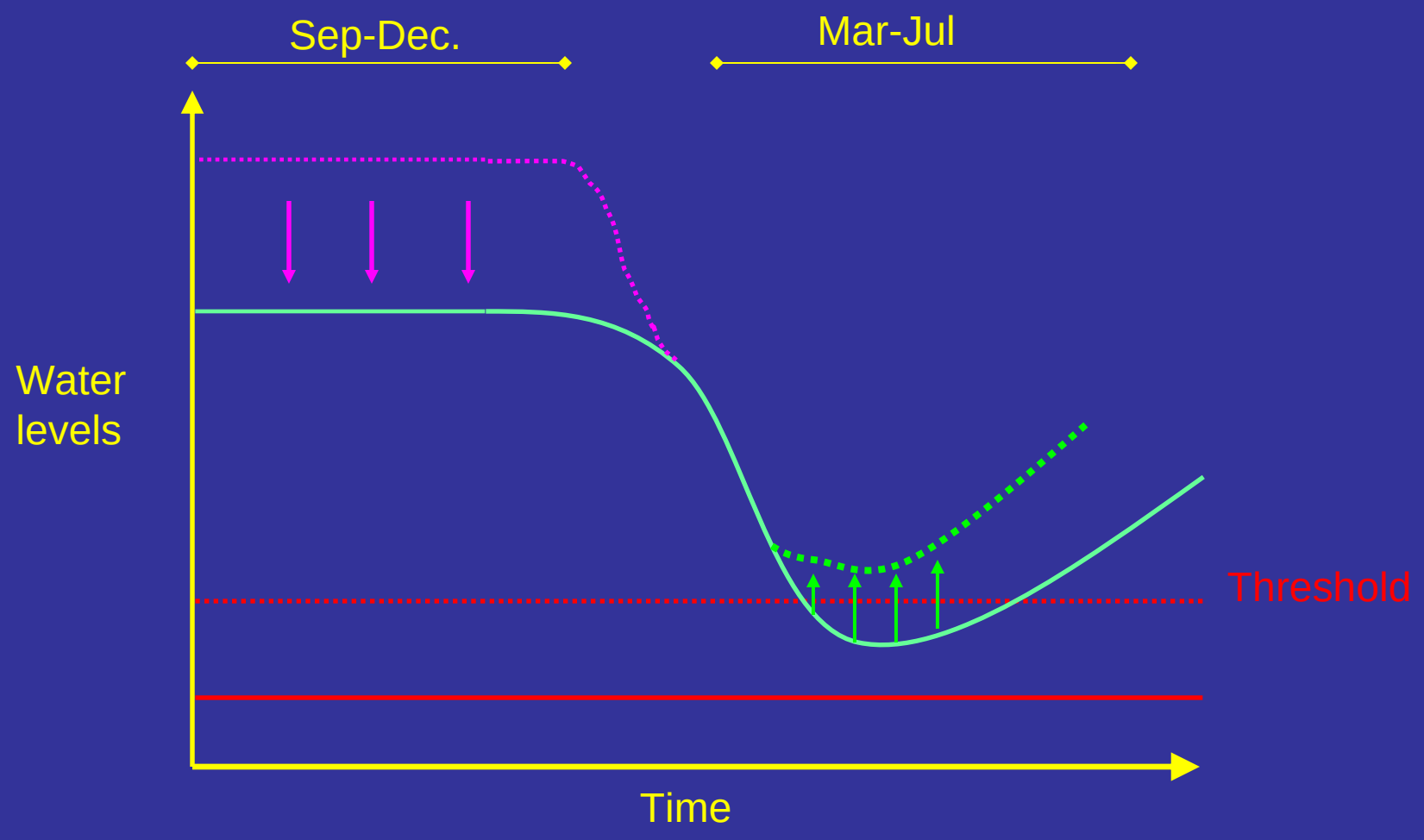
Endangered Species Research 2008



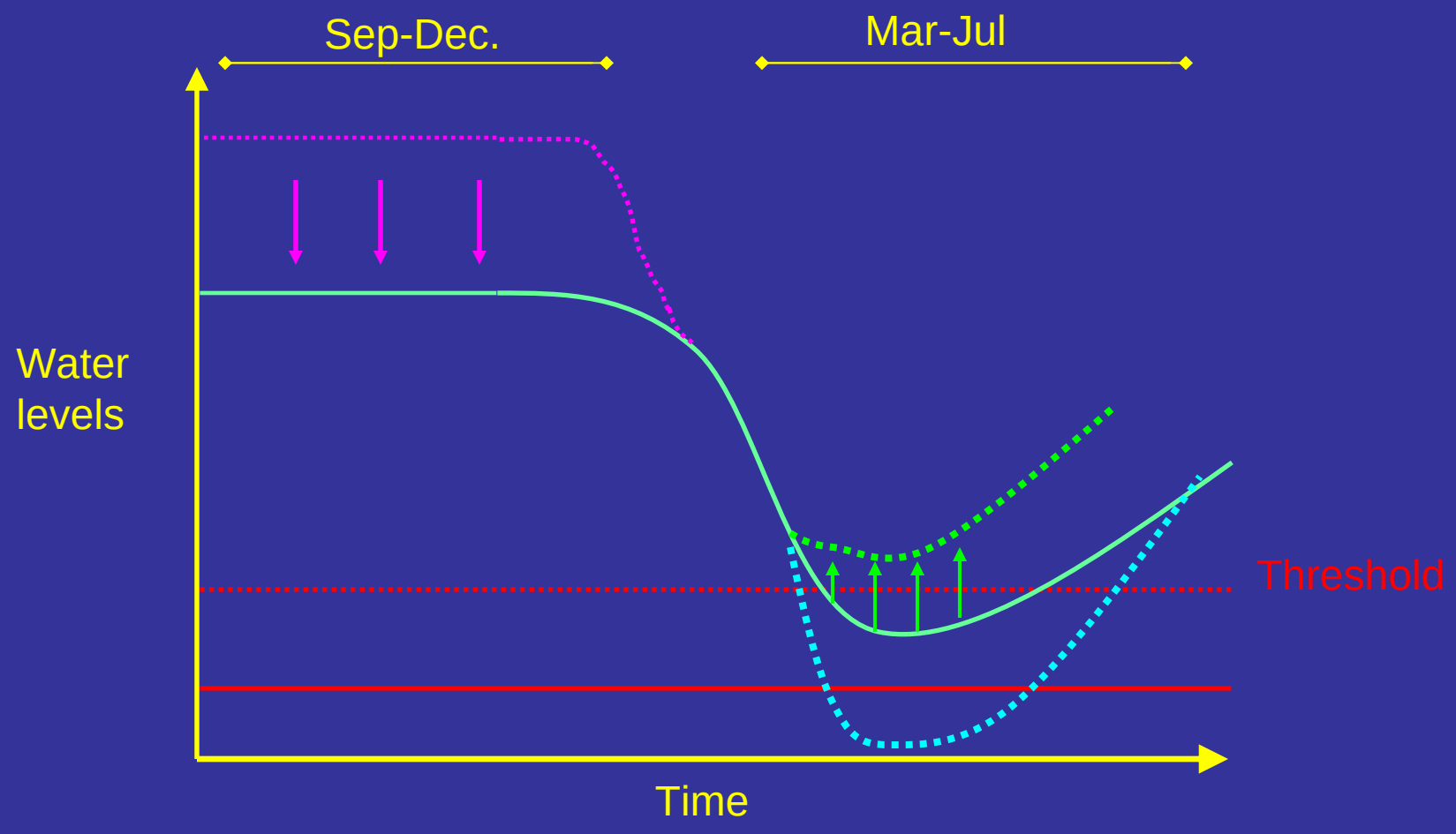




Management recommendation (1)



Management implications (2)



Lake Tohopekaliga is a another key!

1- 2nd only to WCA3A for kite production

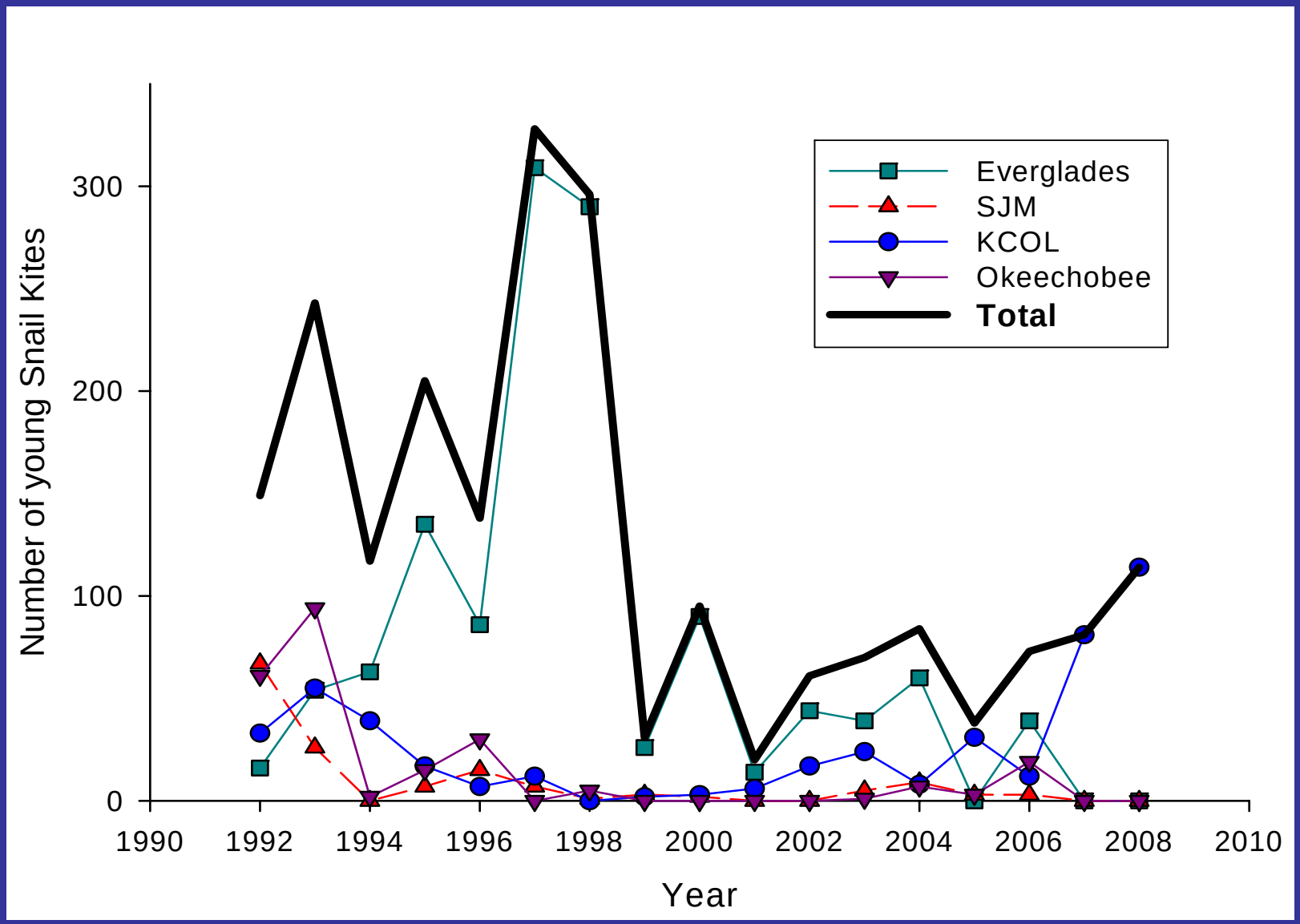
2- Presently the most critical nesting habitat for the kites

3- ~95% of production in past 4 years

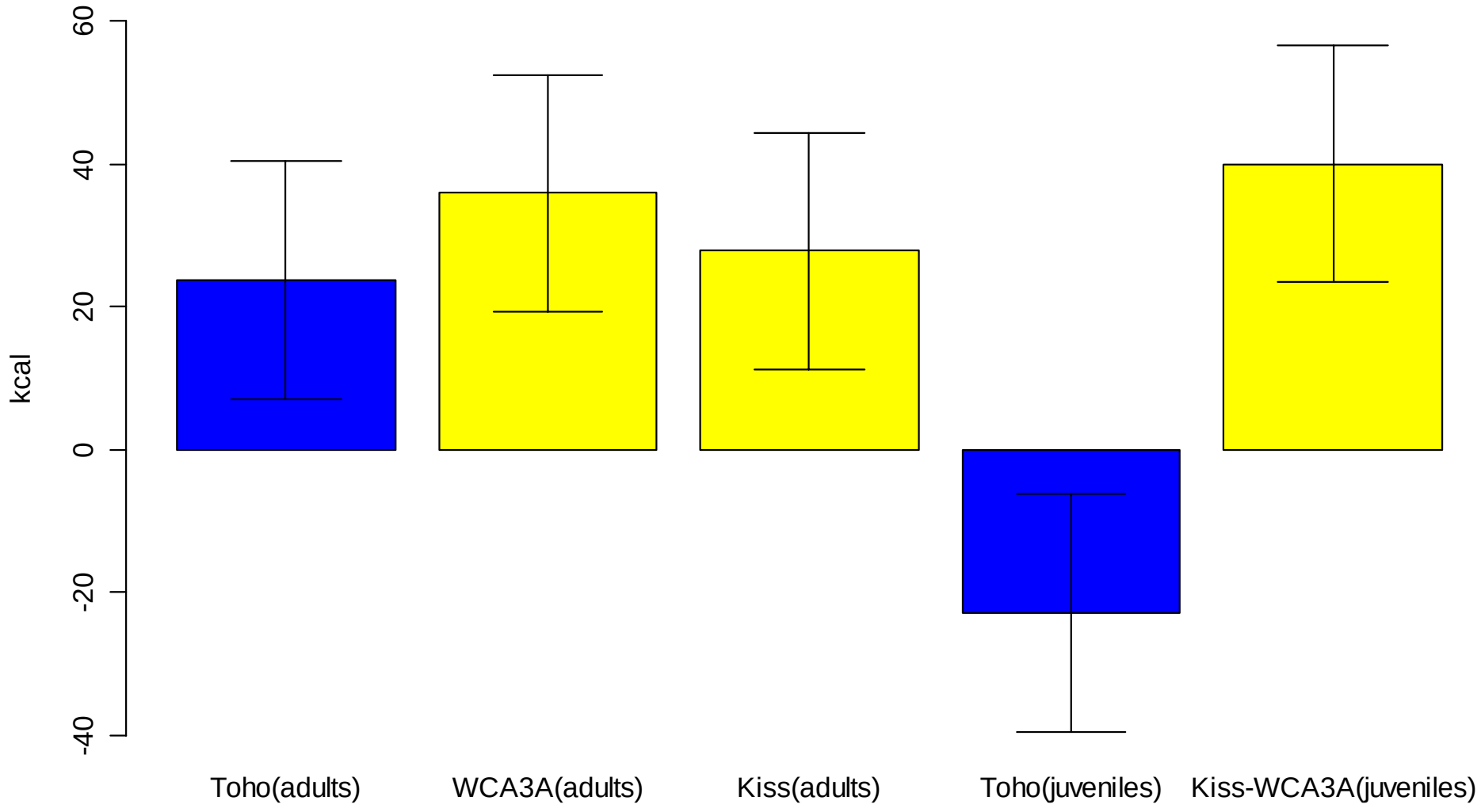
4- Highest snail abundance range-wide

5- Extended nesting season

6- Not sustainable in long-term
- -exotic snail stock
- -aquatic weed control issues, Hydrilla
- -incredible local development activities

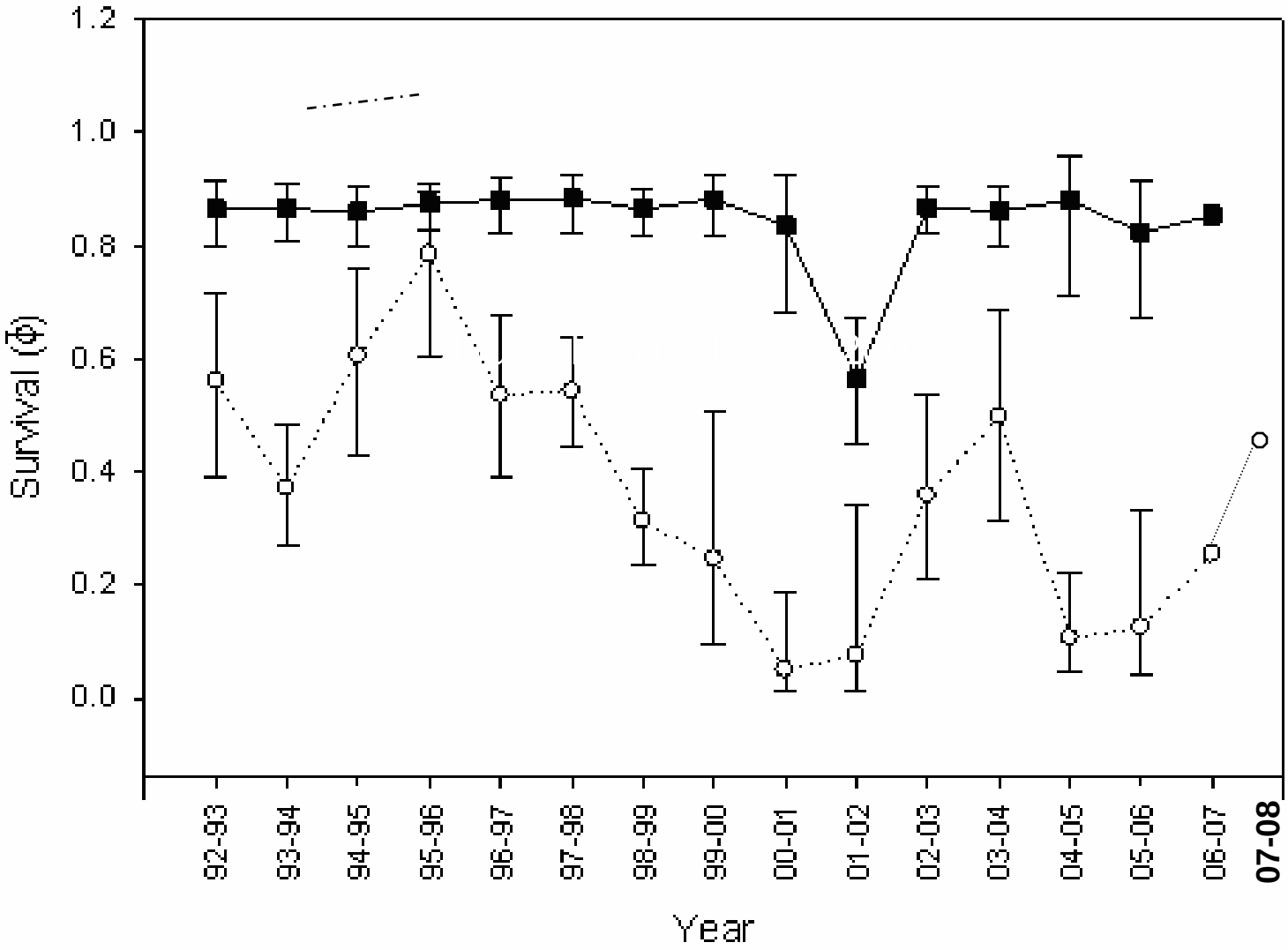

Number of young Snail Kites
300
200
100
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Year
Everglades
SJM
KCOL
Okeechobee
Total

Average Daily Energy Balances

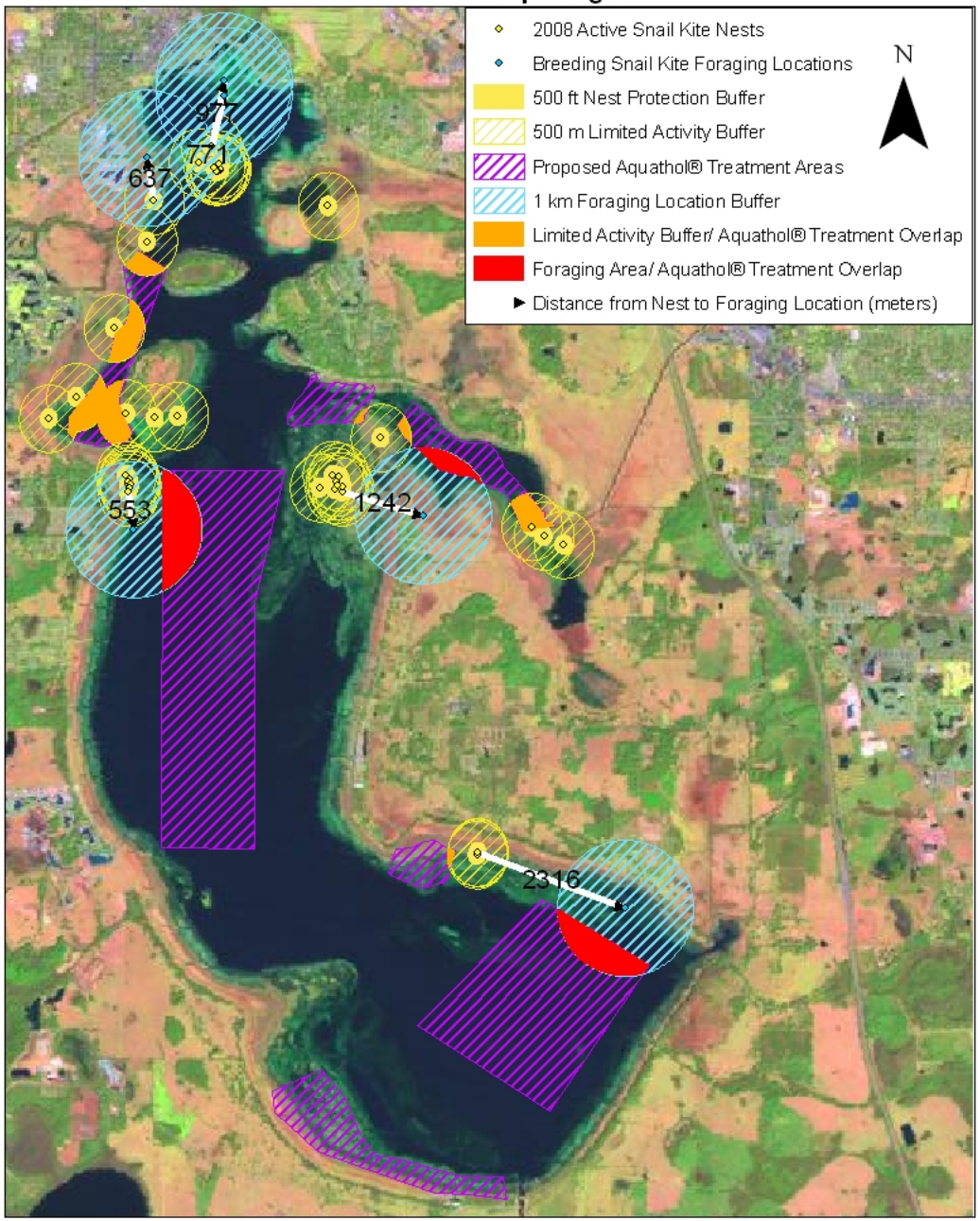


Journal Animal Ecol, 2006

Survival

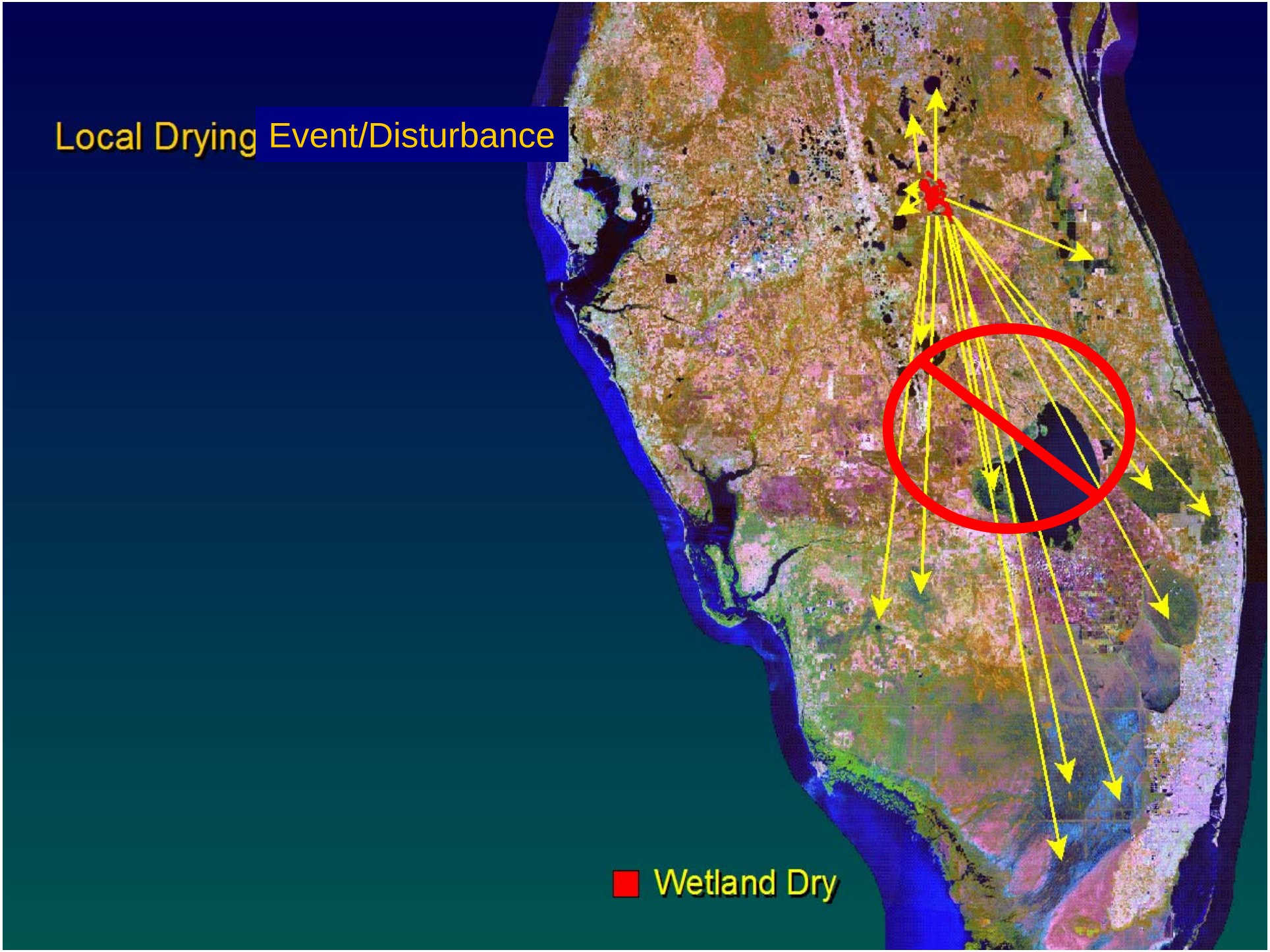
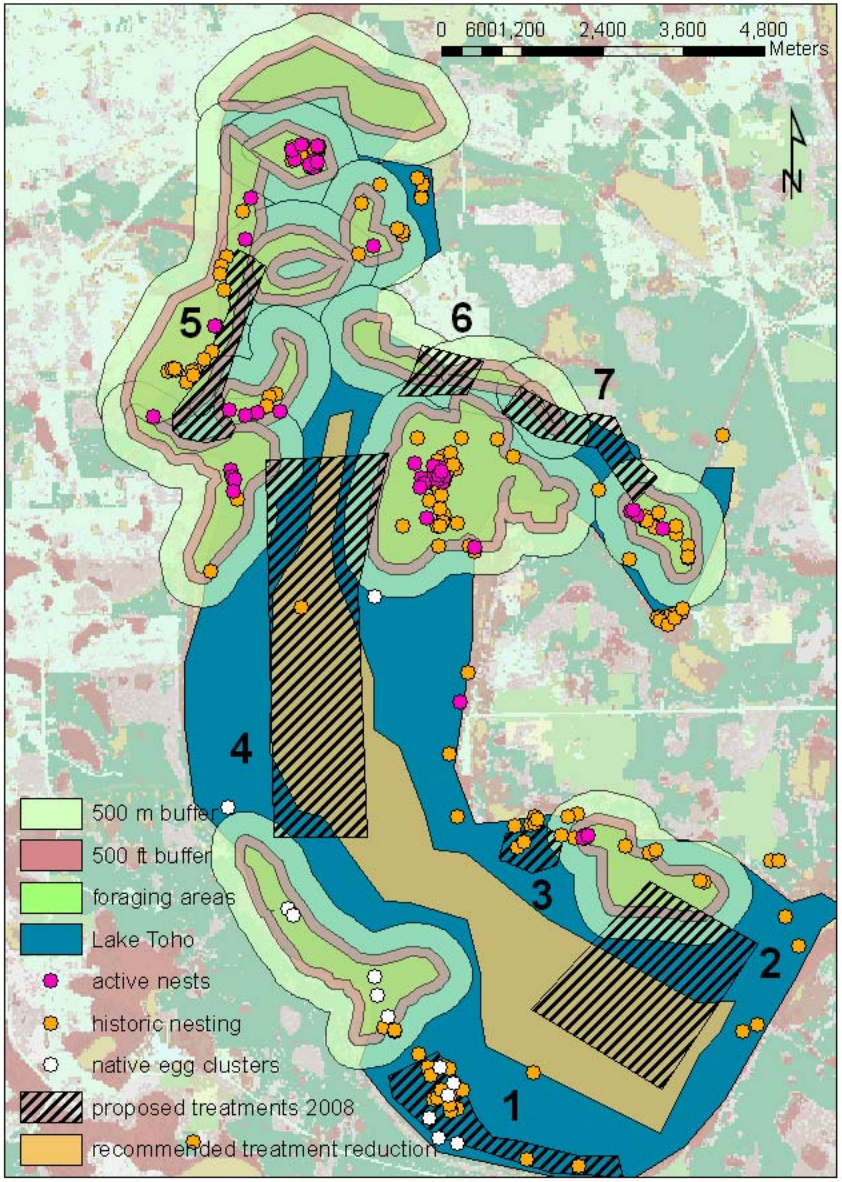


Proximity of Proposed Aquathol® Treatments to Important Snail Kite Areas on Lake Tohopekaliga



Map prepared by Kyle Pias
*2004 LandSat 7 ETM 3-4-5 Statewide Mosaic

0 0.5 1 2 3 4 Kilometers


Local Drying Event/Disturbance
Wetland Dry

Hence the anxiety attack !