

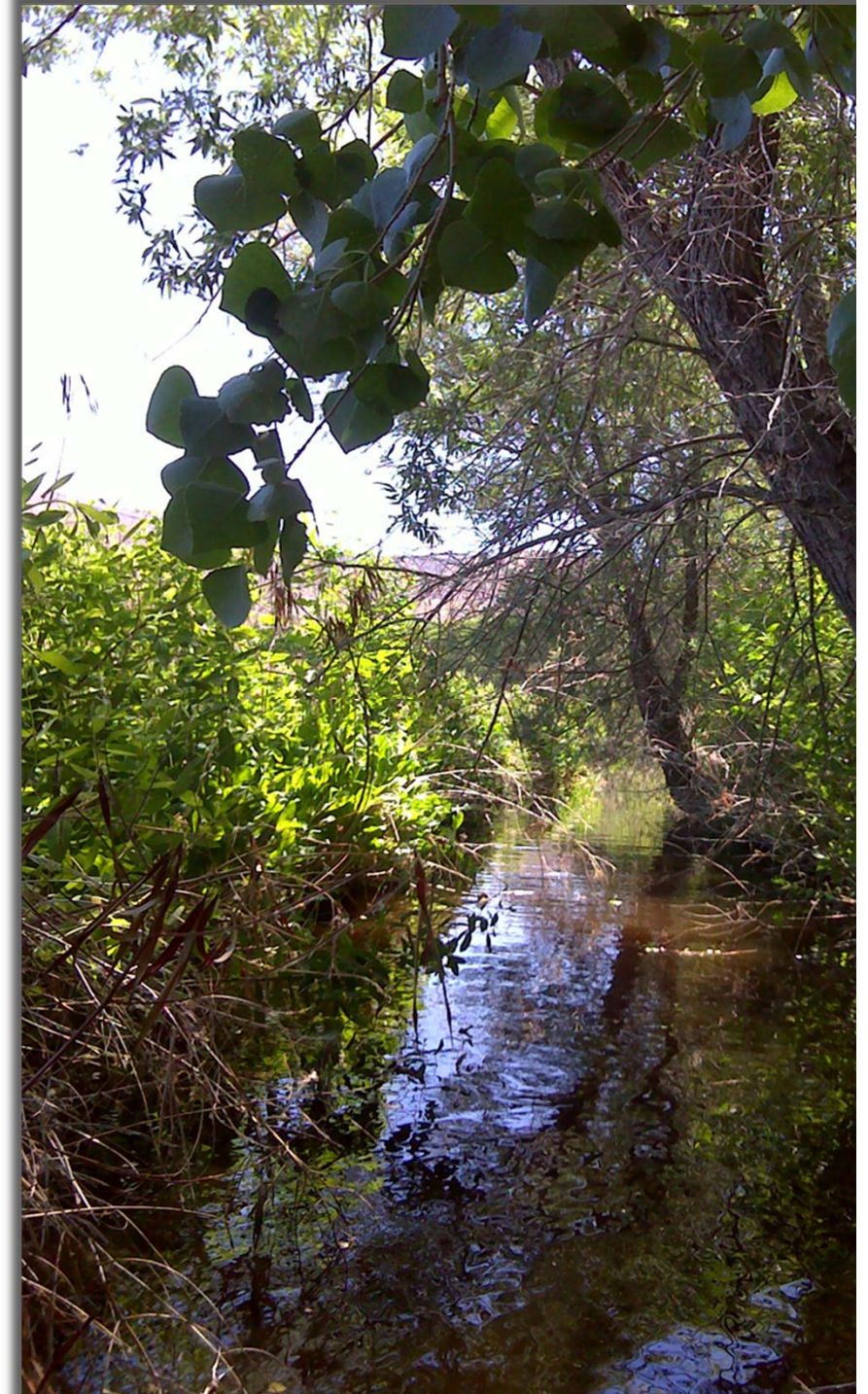
# Presence of Standing Water as an Indicator of Habitat Quality Among Southwestern Willow Flycatchers



Damon Peterson, Chris Yunker, Anne Pellegrini,  
Mary Anne McLeod, Tad Theimer

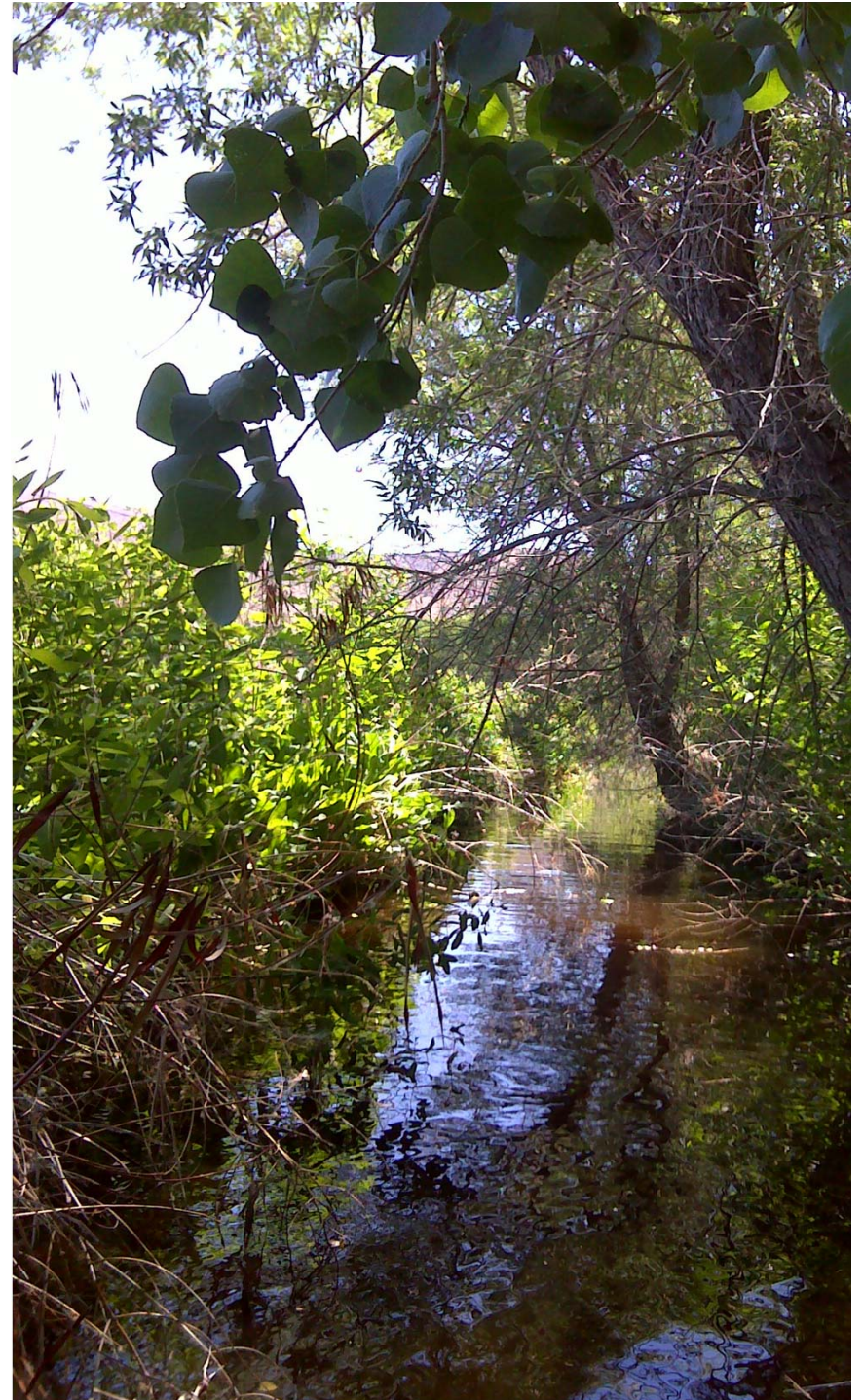
# Problem

- Willow Flycatchers are considered riparian obligates
- Other researchers have mentioned importance of standing water
  - Sogge et al 1997
  - Hatten et al 2010



# Questions

- Do nest locations change with changes in hydrology
- Is invertebrate prey density
- Soil moisture interaction



# Assessing spatial relationships

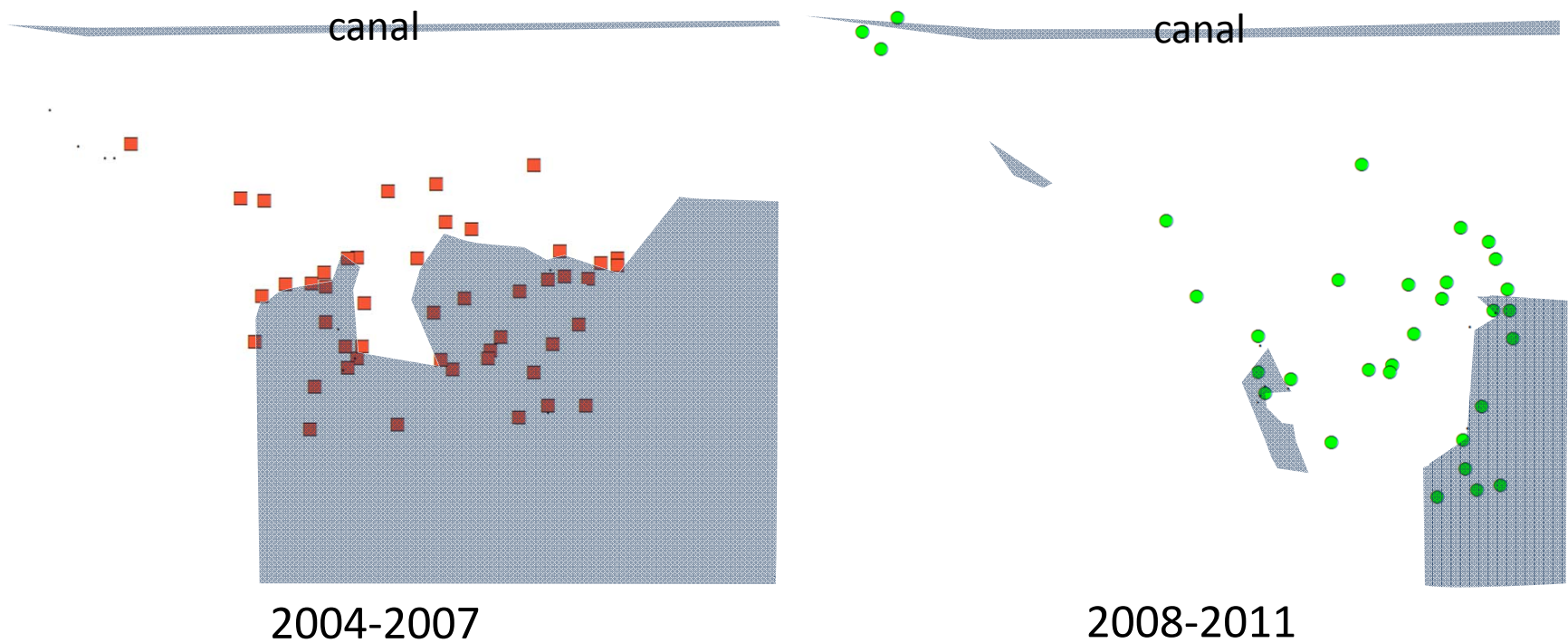
- Pahrnagat Dike failure in 2007
  - Water not present in 2008
  - Water returned in 2009, but lower levels
- GIS hotspot analysis



# Distribution of Willow Flycatcher nests

BEFORE DIKE FAILURE

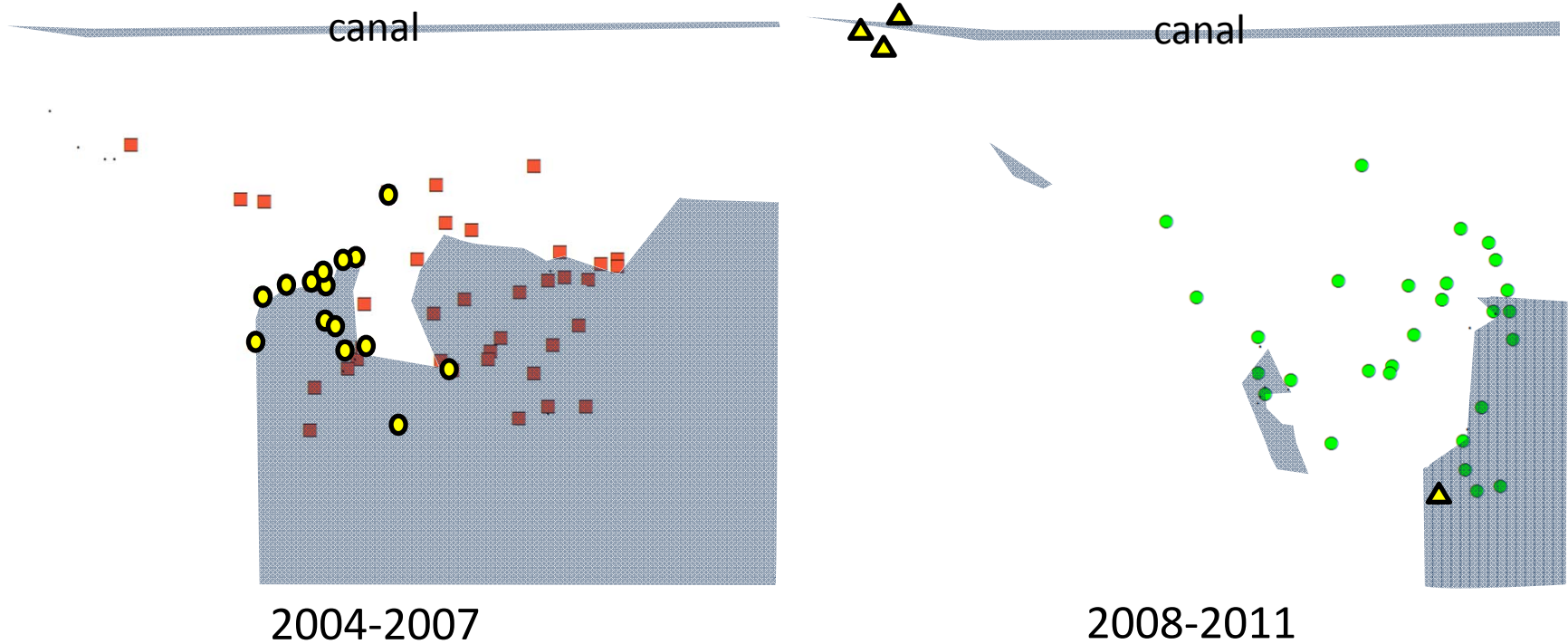
AFTER DIKE FAILURE



# Distribution of Willow Flycatcher nests

BEFORE DIKE FAILURE

AFTER DIKE FAILURE





## Nest initiation

Robertson & Hutto 2006



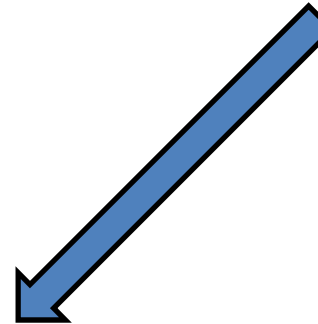
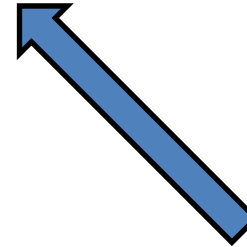
## Clutch size

Lack 1947, Daan et. al.,1990



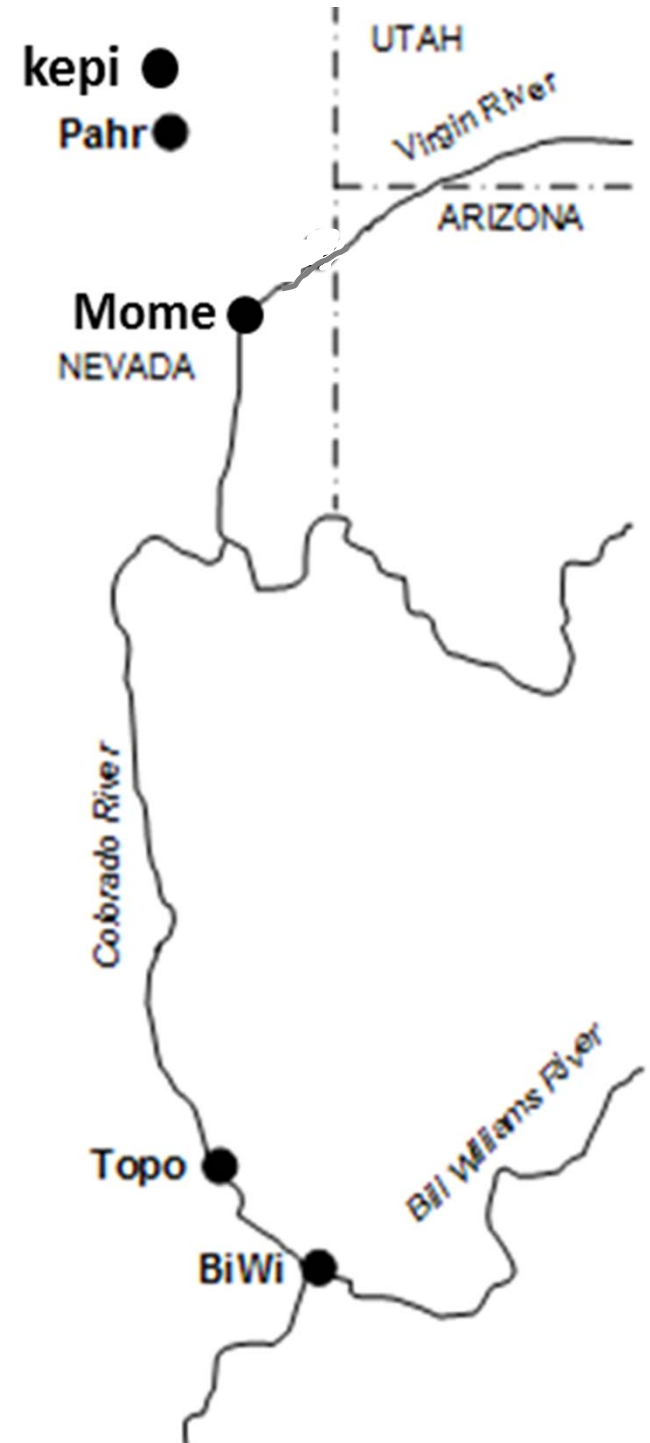
## Productivity

**Habitat quality**



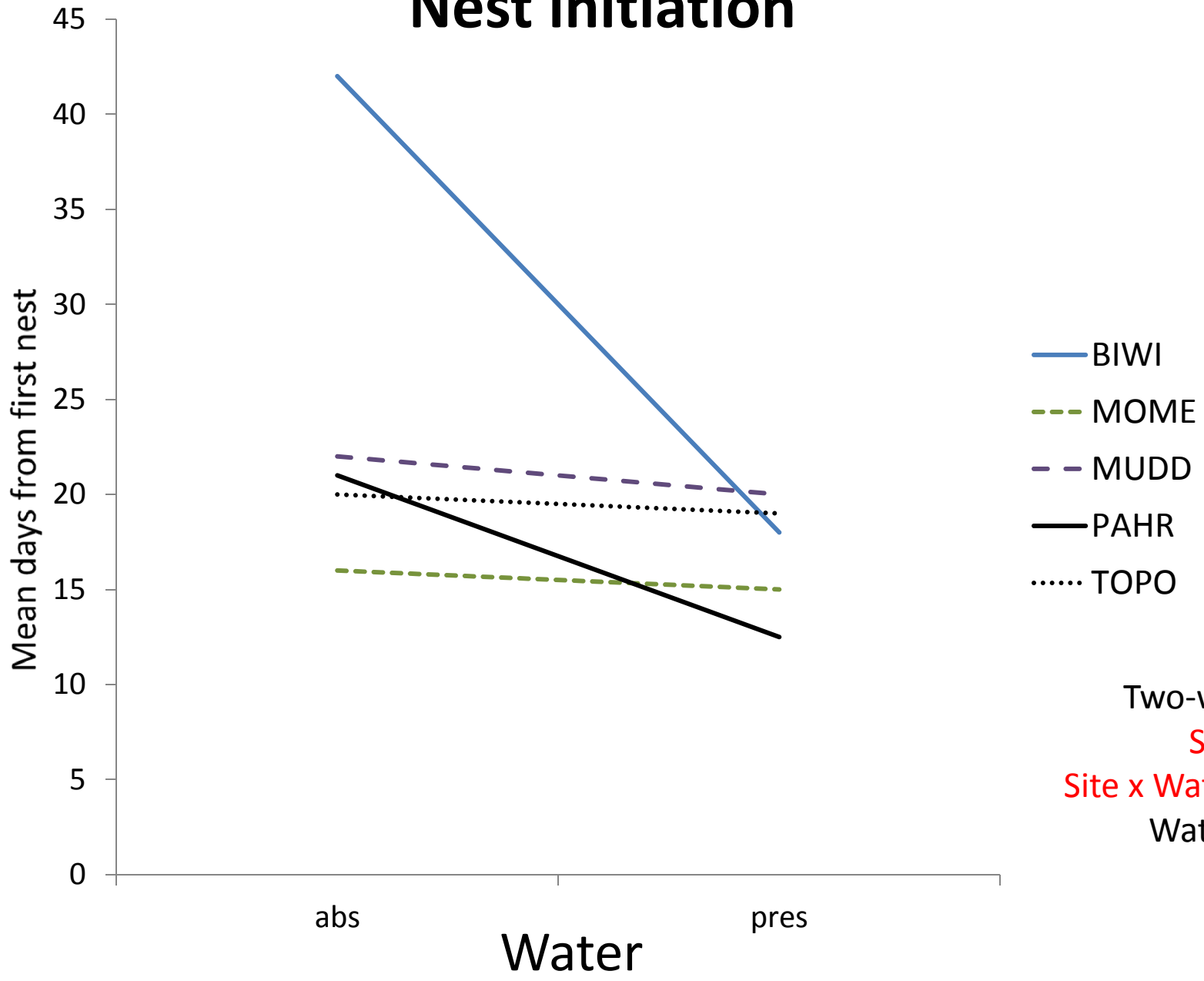
# Nest monitoring data

- Large sample size
- 8 year period (2004-2011)
- 5 sites
- Classified water as present when water was less than 10 meters away



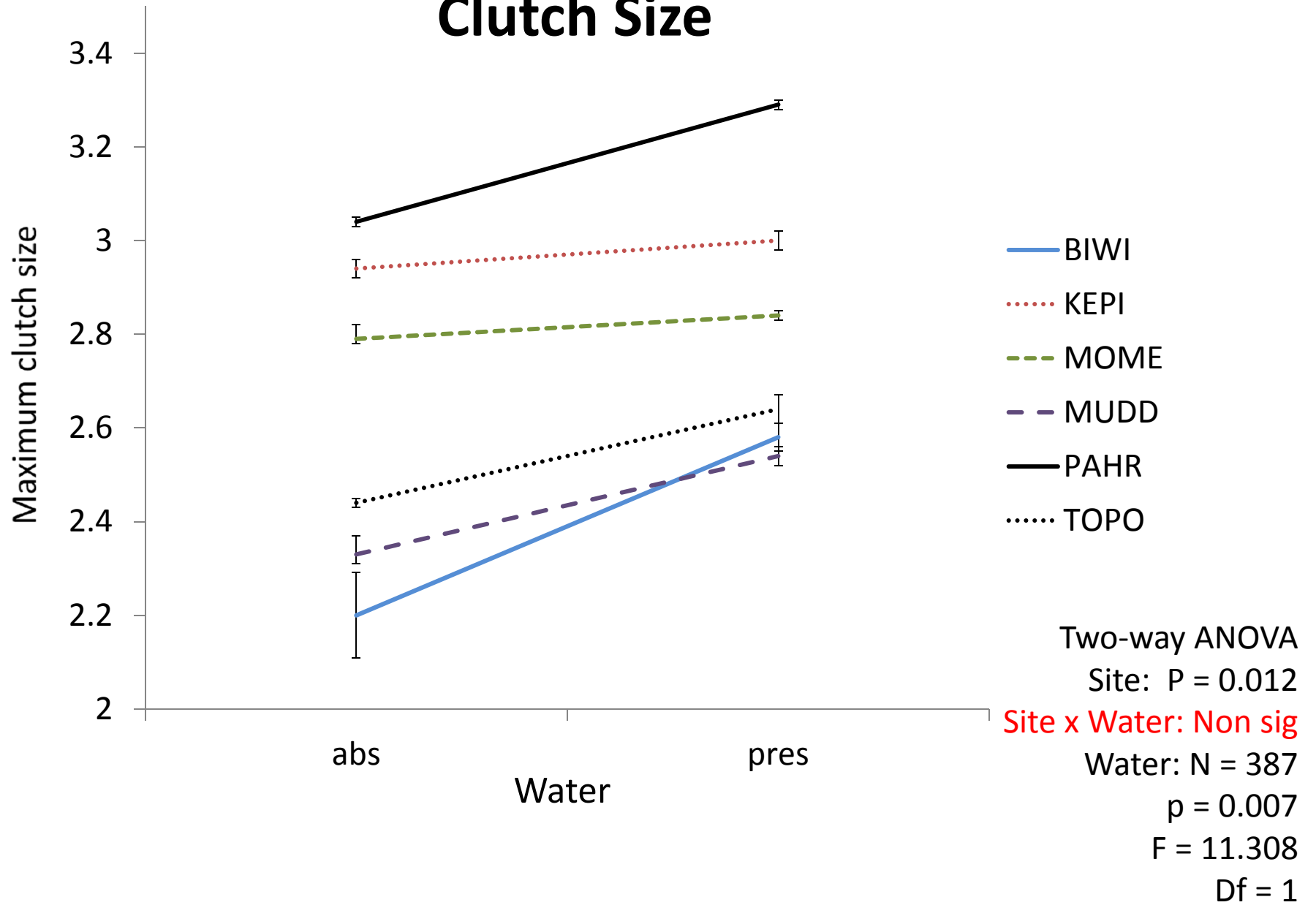


# Nest initiation

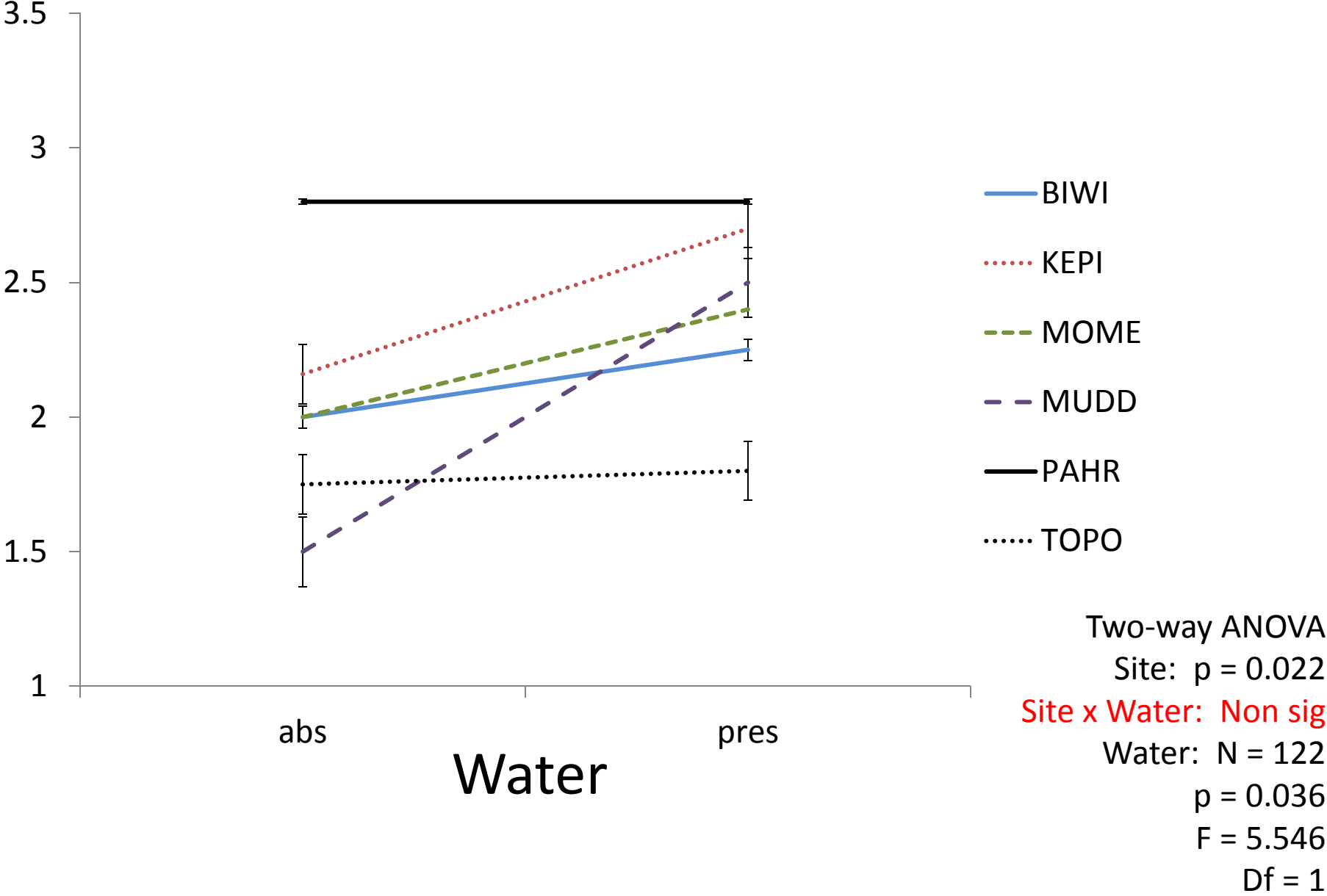


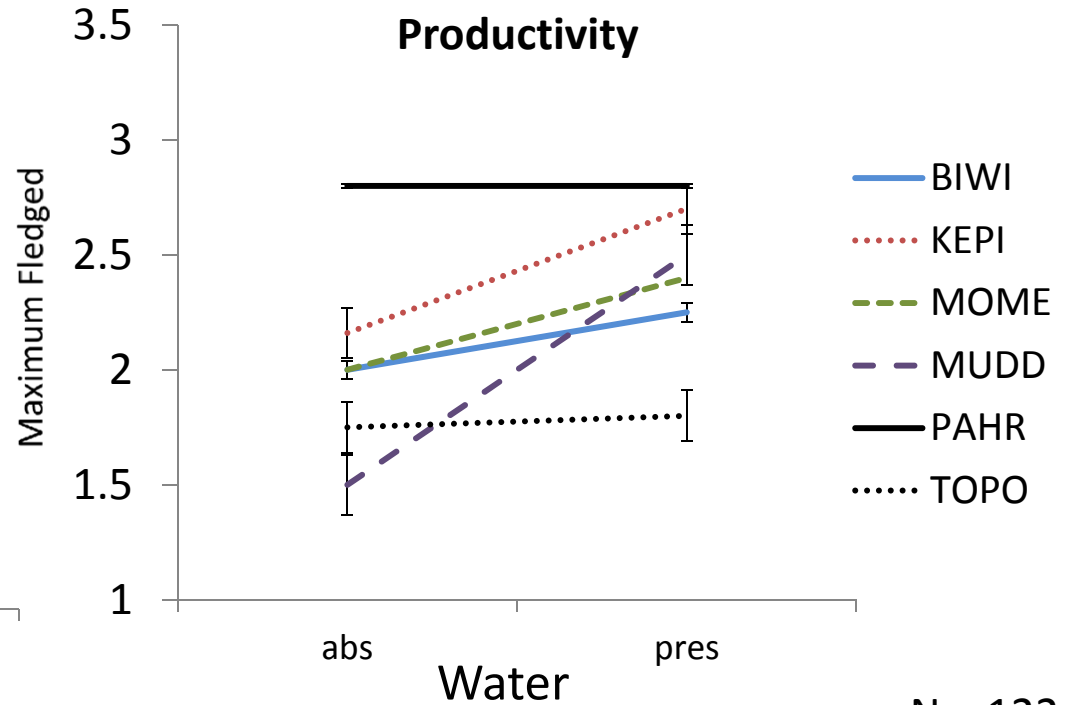
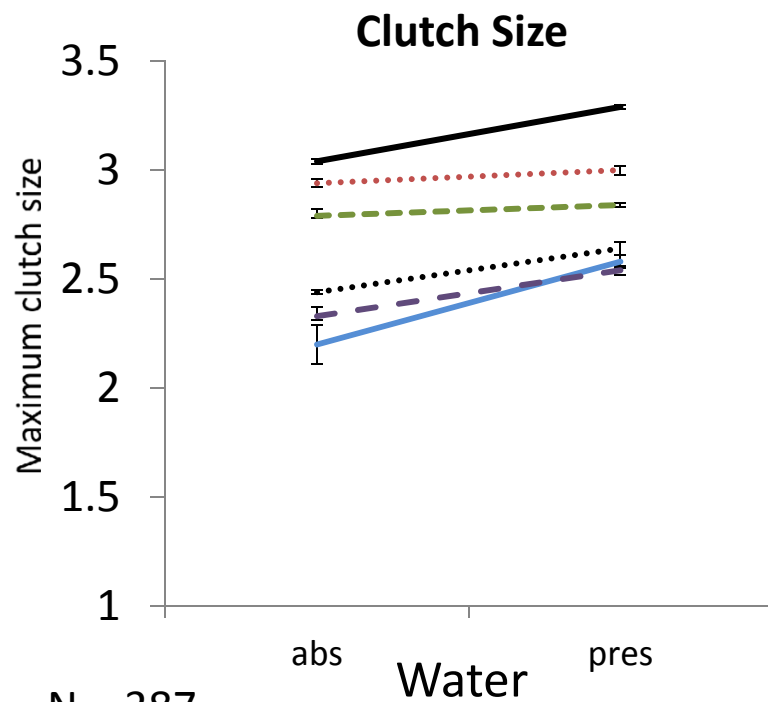
Two-way ANOVA  
Site: Non sig  
Site x Water: Non sig  
Water: N = 152  
p = 0.016  
F = 8.264  
Df = 1

# Clutch Size



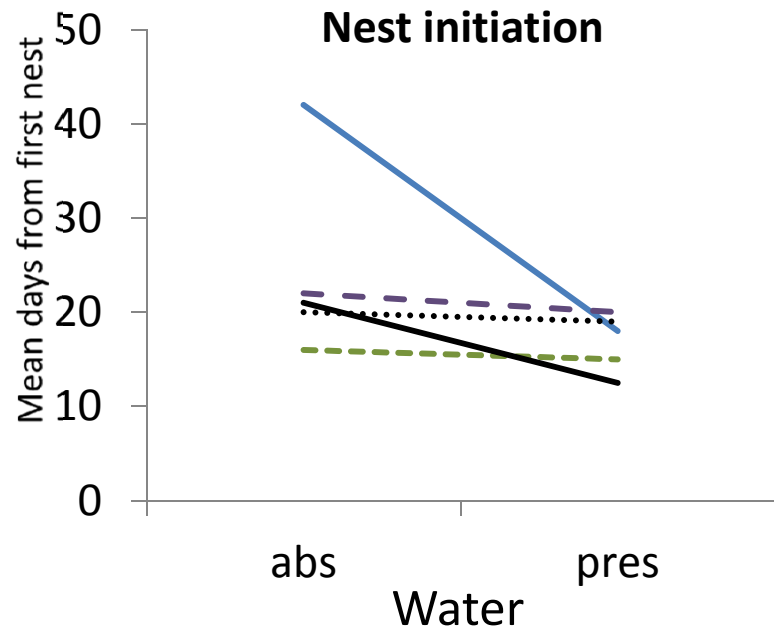
# Productivity





N = 387  
 $p = 0.007$   
 $F = 11.308$   
 $Df = 1$

N = 122  
 $p = 0.036$   
 $F = 5.546$   
 $Df = 1$



N = 152  
 $p = 0.016$   
 $F = 8.264$   
 $Df = 1$

# Mechanisms

- Water
  - Predation
    - Terrestrial predators excluded
  - Microclimate
  - Food availability
    - Higher densities near water

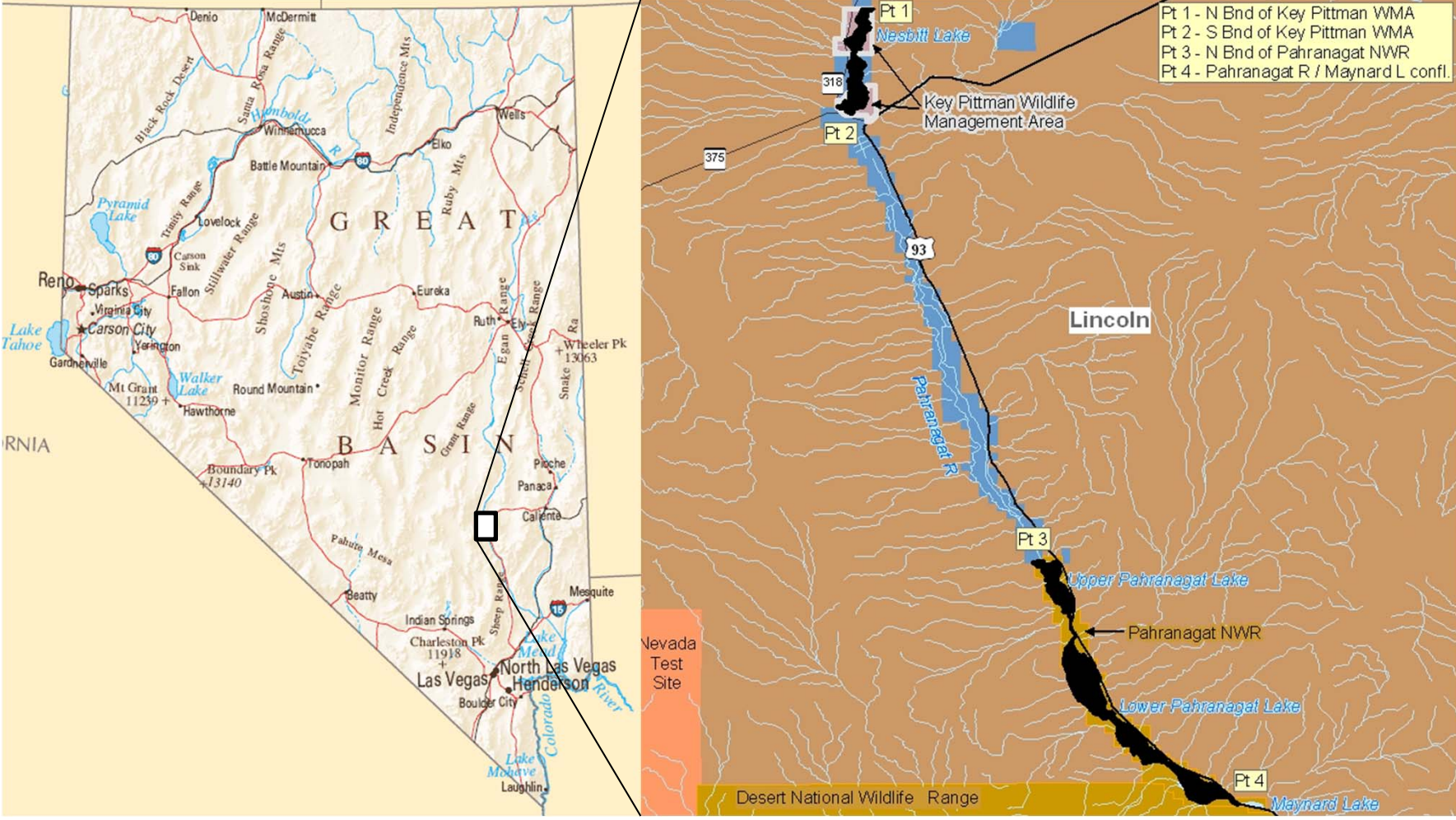


# Food availability

- Previous research showing increasing density invertebrates at decreasing distances from water
  - Iwata et al 2003, Hagen 2011
- Nestling provisioning rates
  - Hutto 1990
- Soil moisture



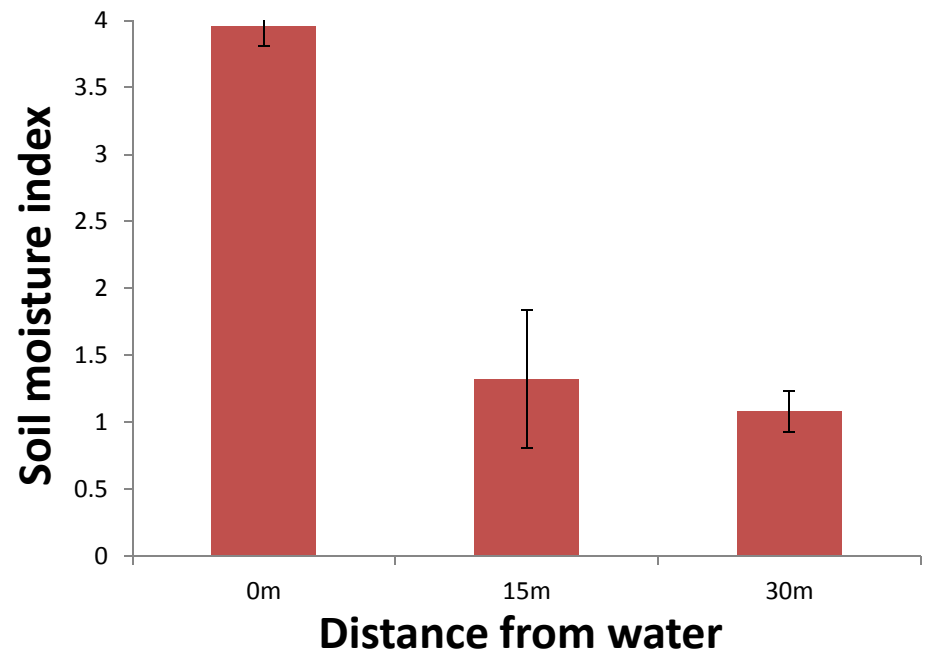
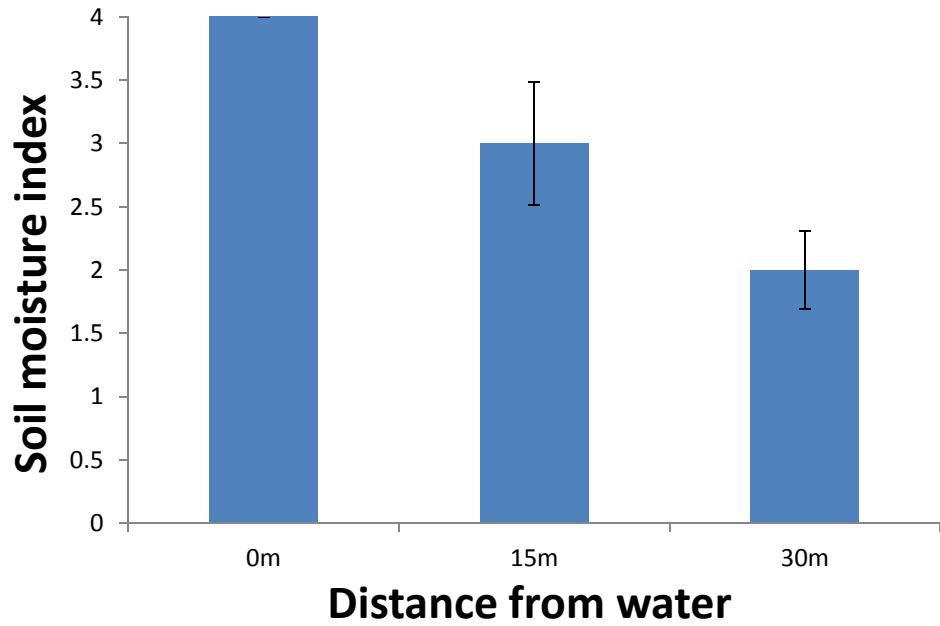
# Study Sites



Pt 1 - N Bnd of Key Pittman WMA  
 Pt 2 - S Bnd of Key Pittman WMA  
 Pt 3 - N Bnd of Pahranaagat NWR  
 Pt 4 - Pahranaagat R / Maynard L confl.

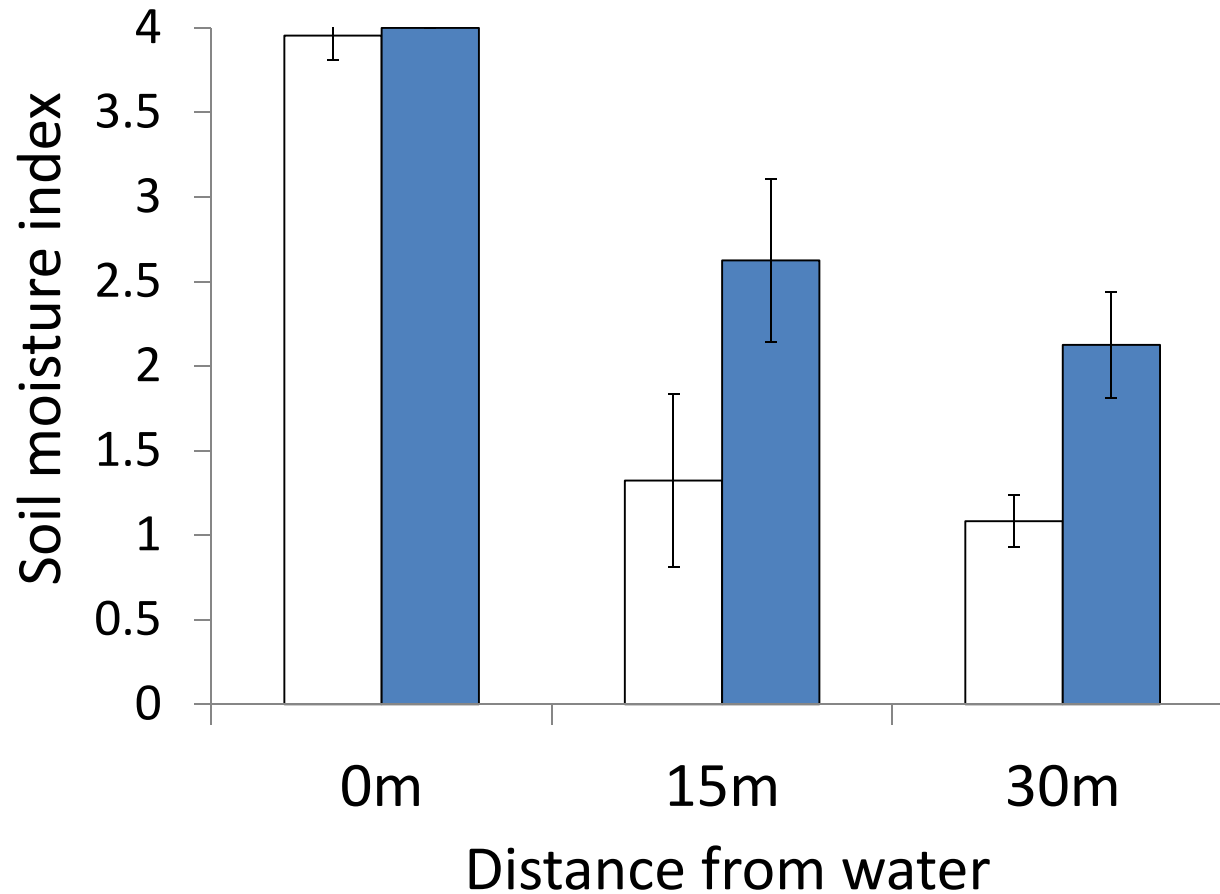
Nevada  
 Test Site

Desert National Wildlife Range





# Soil moisture gradient is different between sites



□ KEPI  
■ PAHR

Two way ANOVA  
Site x treatment  $p > 0.001$   
 $F=22.269$   
Df = 2  
N = 99

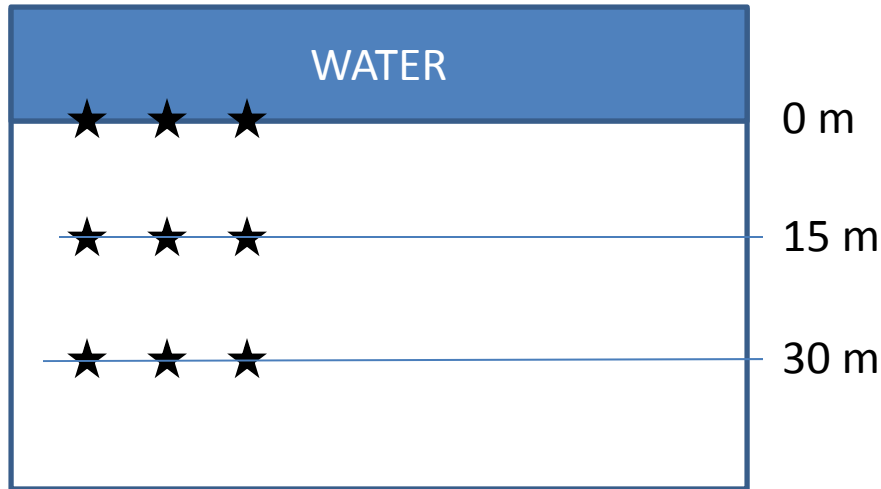
# Invertebrate Trapping

- Malaise traps
  - Flying invertebrates
- Southwestern Willow Flycatchers are generalist insectivores (Durst 2004; Drost 2003)

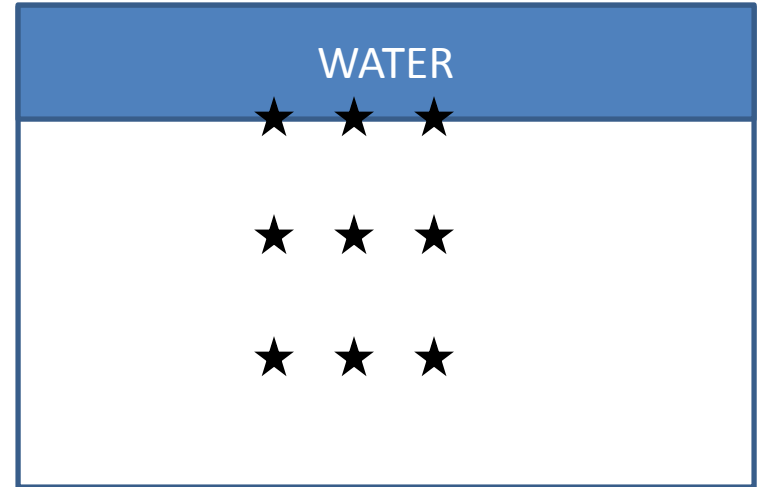


# Sampling Method

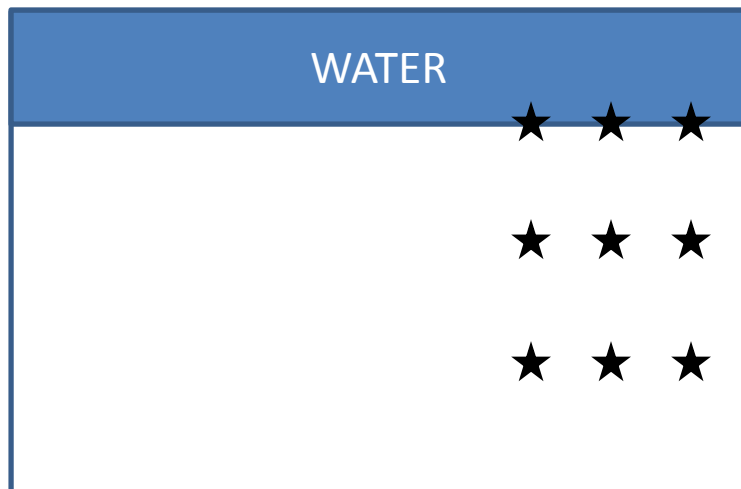
DAY 1



DAY 2

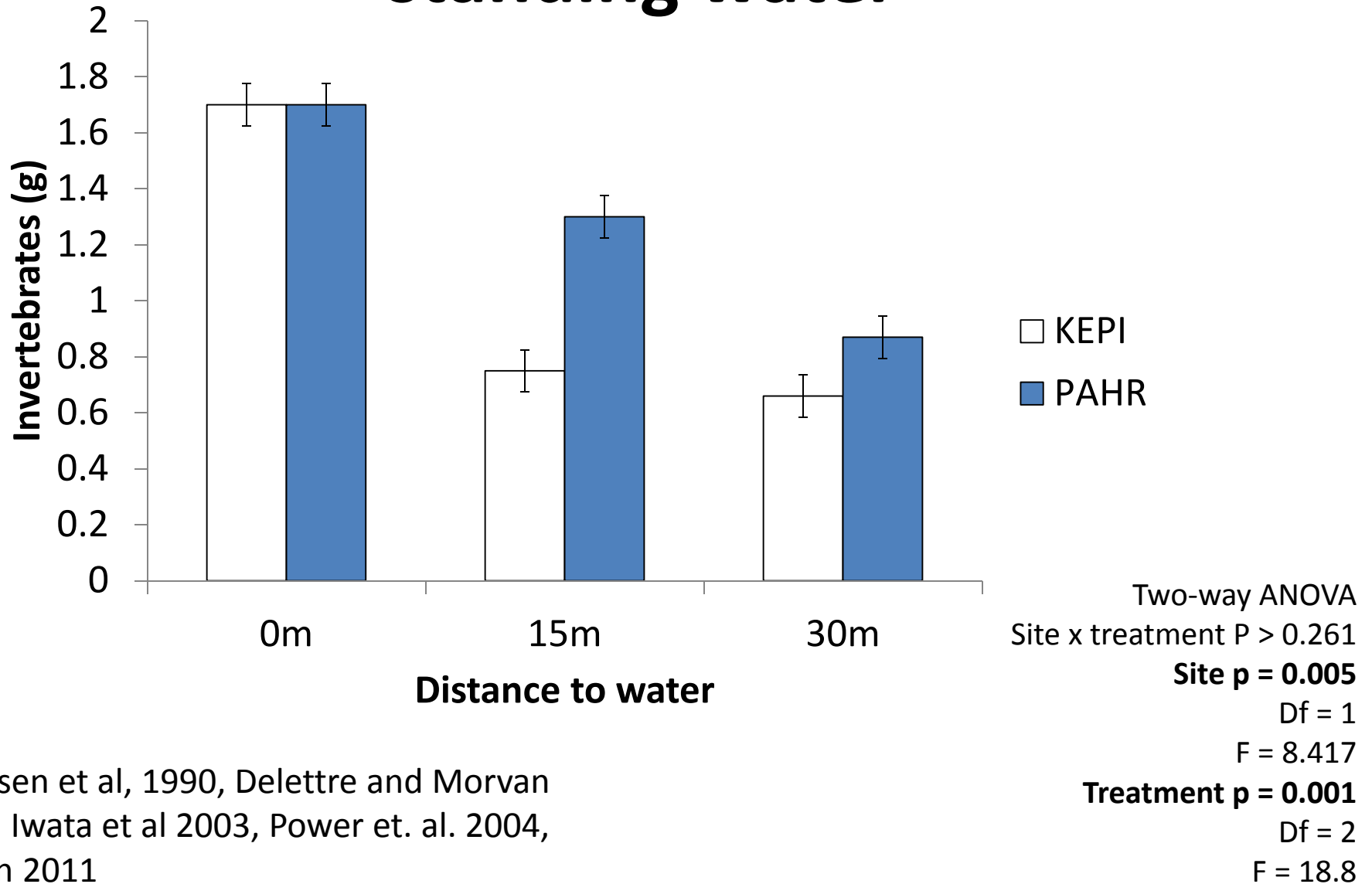


DAY 3



3 day sampling period  
Changed sampling location each time  
3 sampling periods  
2 sites  
27 triplets per site

# Density of invertebrates depends on standing water



Petersen et al, 1990, Delettre and Morvan  
2000, Iwata et al 2003, Power et. al. 2004,  
Hagen 2011

# Monitoring Willow Flycatchers

- Placed remote cameras on Willow Flycatcher nests
  - Nests monitored continuously over nesting period



# Reviewed camera footage

Four nestling ages

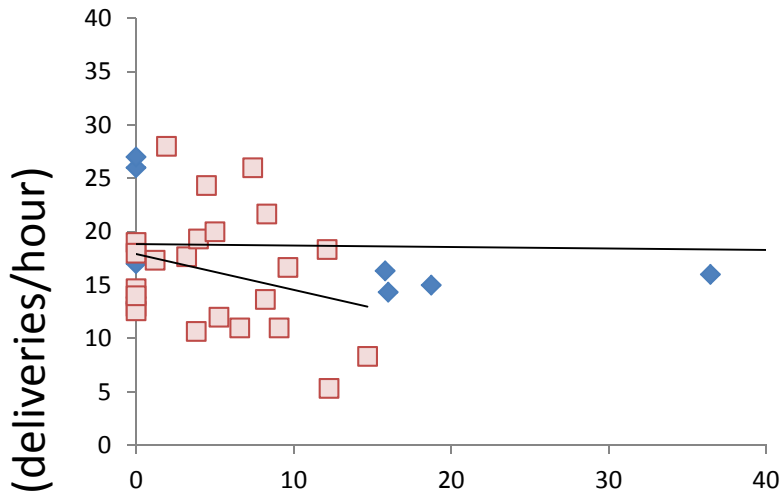
- 5-7 days old
- 7-9 days old
- 9-11 days old
- 11-Fledge

Three times a day

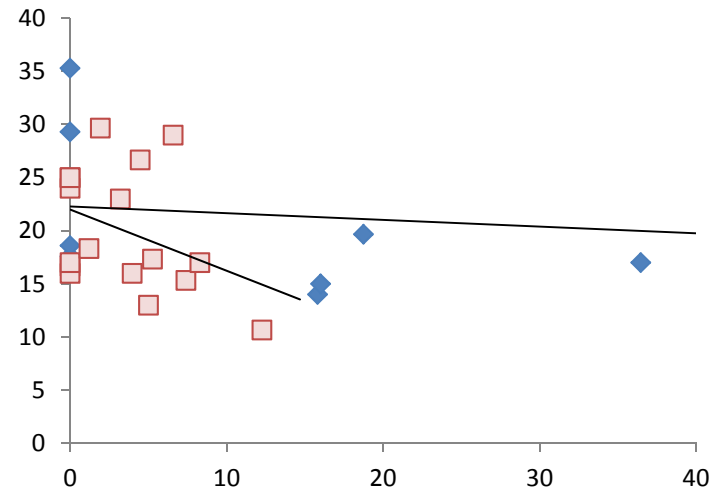
- AM
  - 5:30-6:30
- NOON
  - 11:30-12:30
- PM
  - 5:00-6:00



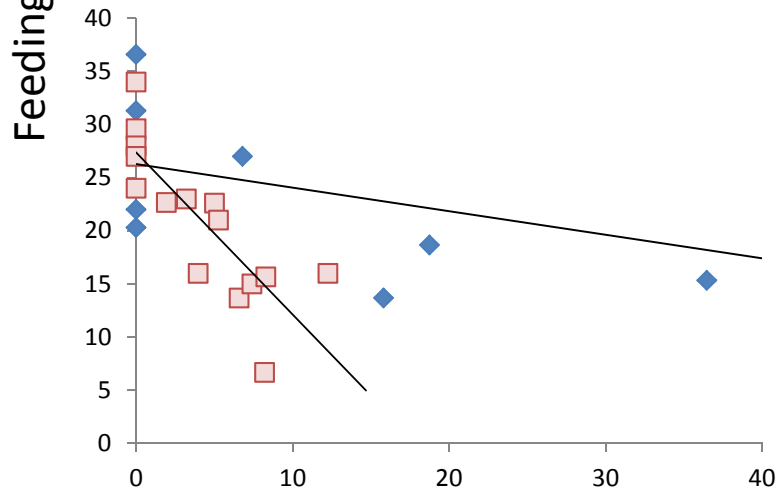
**5-7 Day old nestlings**



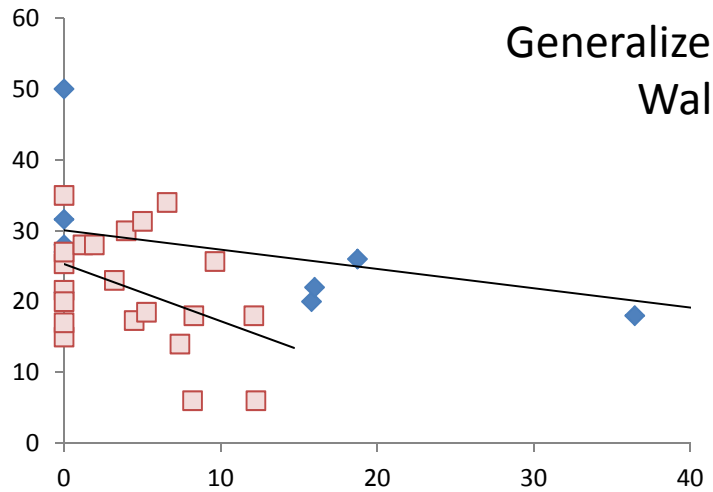
**7-9 Day old nestlings**



**9-11 Day old nestlings**



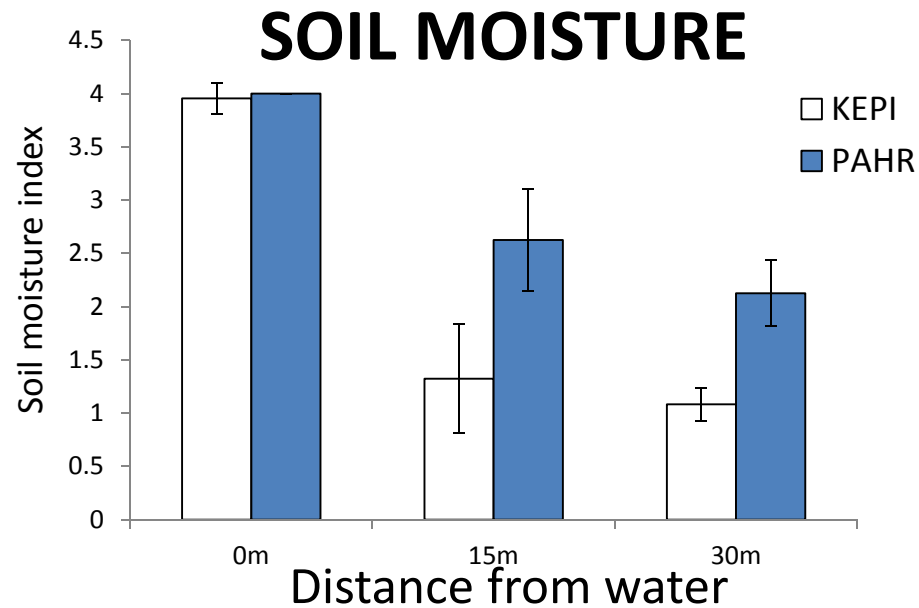
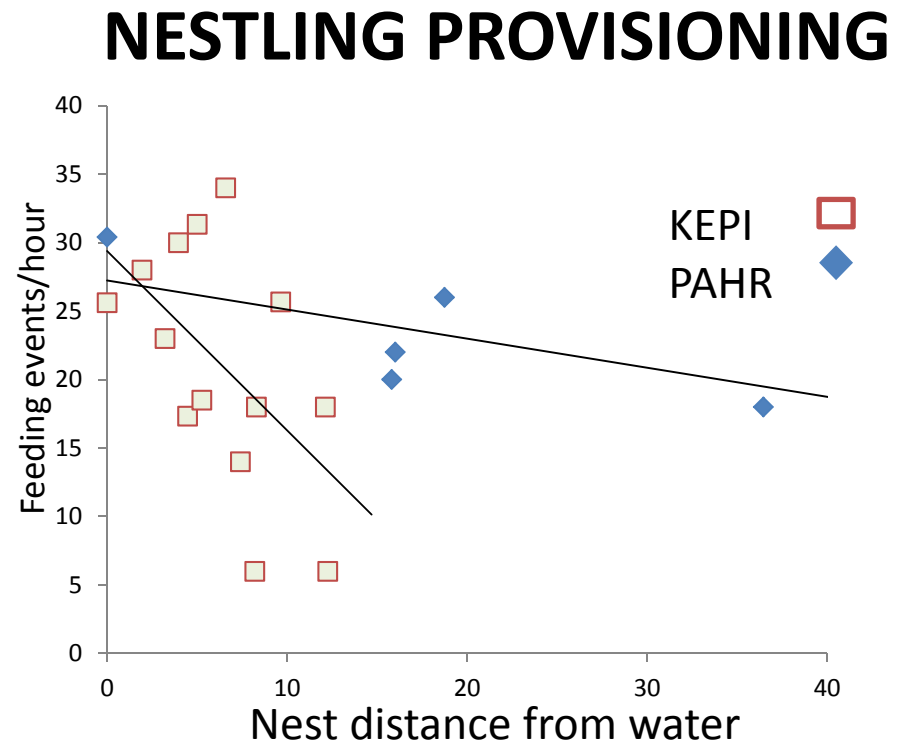
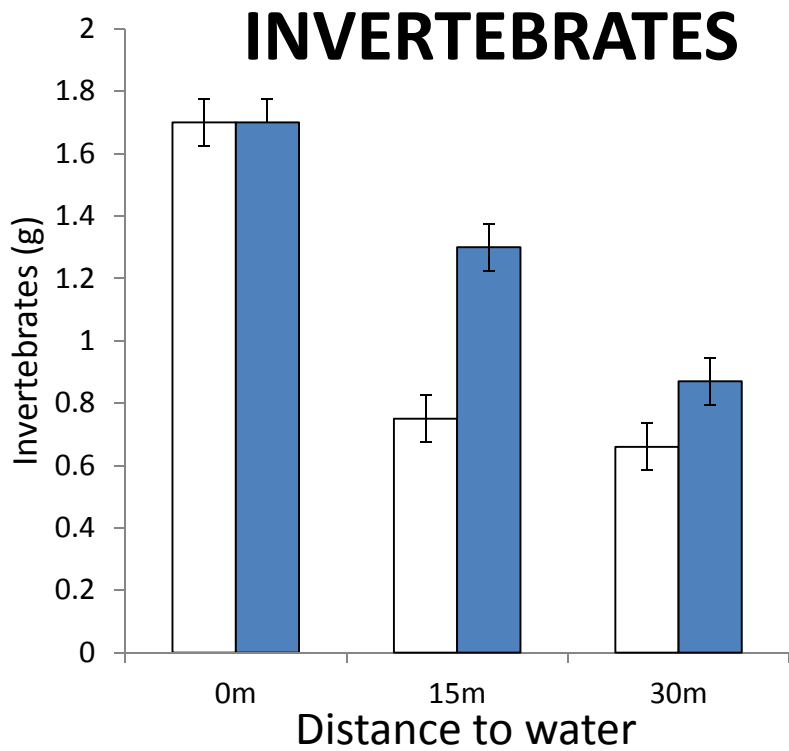
**11- Fledge**



□ KEPI  
◆ PAHR

Generalized linear model  
Wald  $X^2 = 262.025$   
df = 2  
P < 0.001

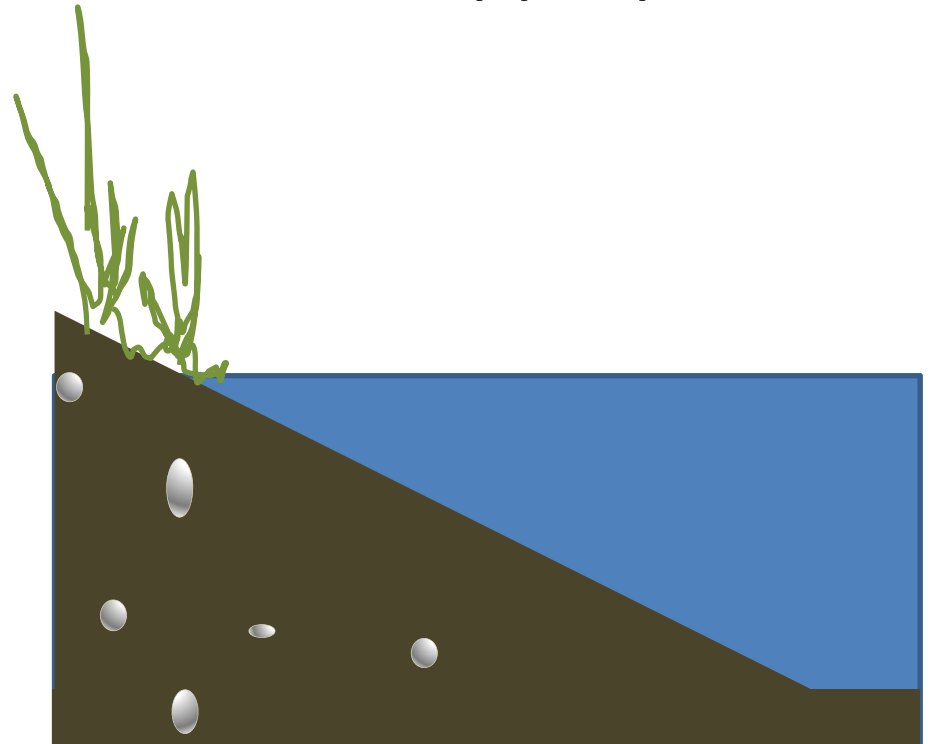
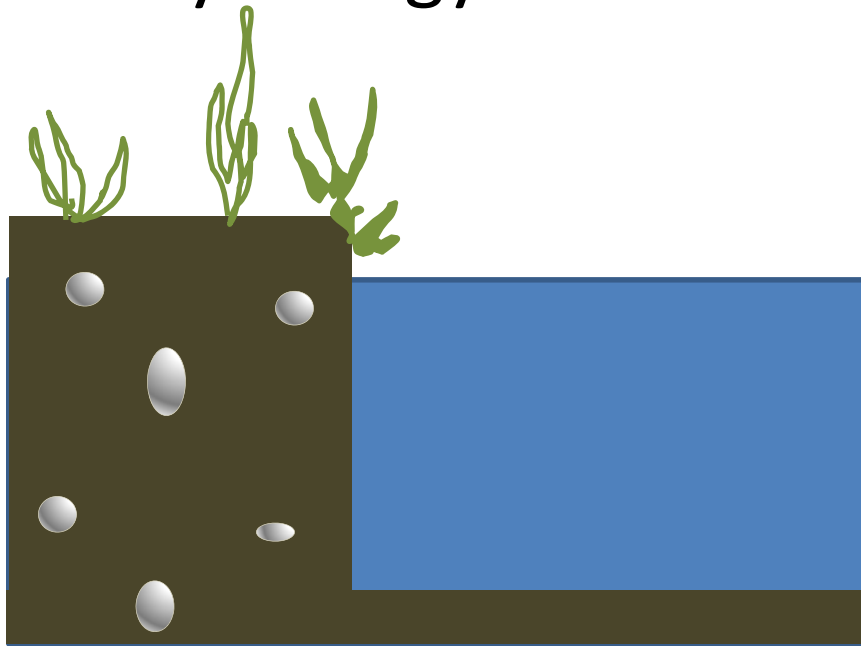
Distance to Water (m)





# Management implications

- Create water management structures with obtuse water/terrestrial boundaries
- Focus restoration on habitats with appropriate hydrology



# Take home message

- Standing water matters
  - Restoration of vegetation without restoring hydrology may be insufficient
- Focus on increasing invertebrate density
- Close means less than 15m



# Questions?



Photo courtesy of SWCA

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ARIZONA  
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# Clutch size, Productivity and Nest initiation

- Nest initiation is earliest among high quality habitat
- Lack (1947) hypothesized that clutch size reflects parents ability to raise young
  - Parental condition (Pettifor 1988; Drent and Daan, 1980; Daan et al., 1990)
  - Habitat quality (Hogstedt 1980)





# Objectives

- Consider importance of standing water
  - Riparian obligate (Unitt 1987)
- Look at management suggestions for willow flycatchers