

Effects of Vegetation Structure and Microclimate on Southwestern Willow Flycatcher Nest Predation



Why study predation?

- Leading cause of nest failure for open-cup nesting passerines (Martin 1992, Driscoll 2005)
- Strong selective pressure on choice of nest site (Martin and Roper 1988, Li and Martin 1991)
 - Nest-site choice may lead to enhanced reproductive success, which is one factor that determines population size
 - Maintaining viable population size critical for conservation of endangered species



Vegetation structure

- Higher canopy height (Murphy 1983)
- Greater canopy cover (Budnik et al 2002, Farnsworth and Simons 1990, Robinson et al 1995)
- Higher nest placement (Wilson and Cooper 1998, Budnik et al 2002, Best and Stauffer 1980)
- Greater concealment (Filliater et al 1994, Budnik et al 2002)

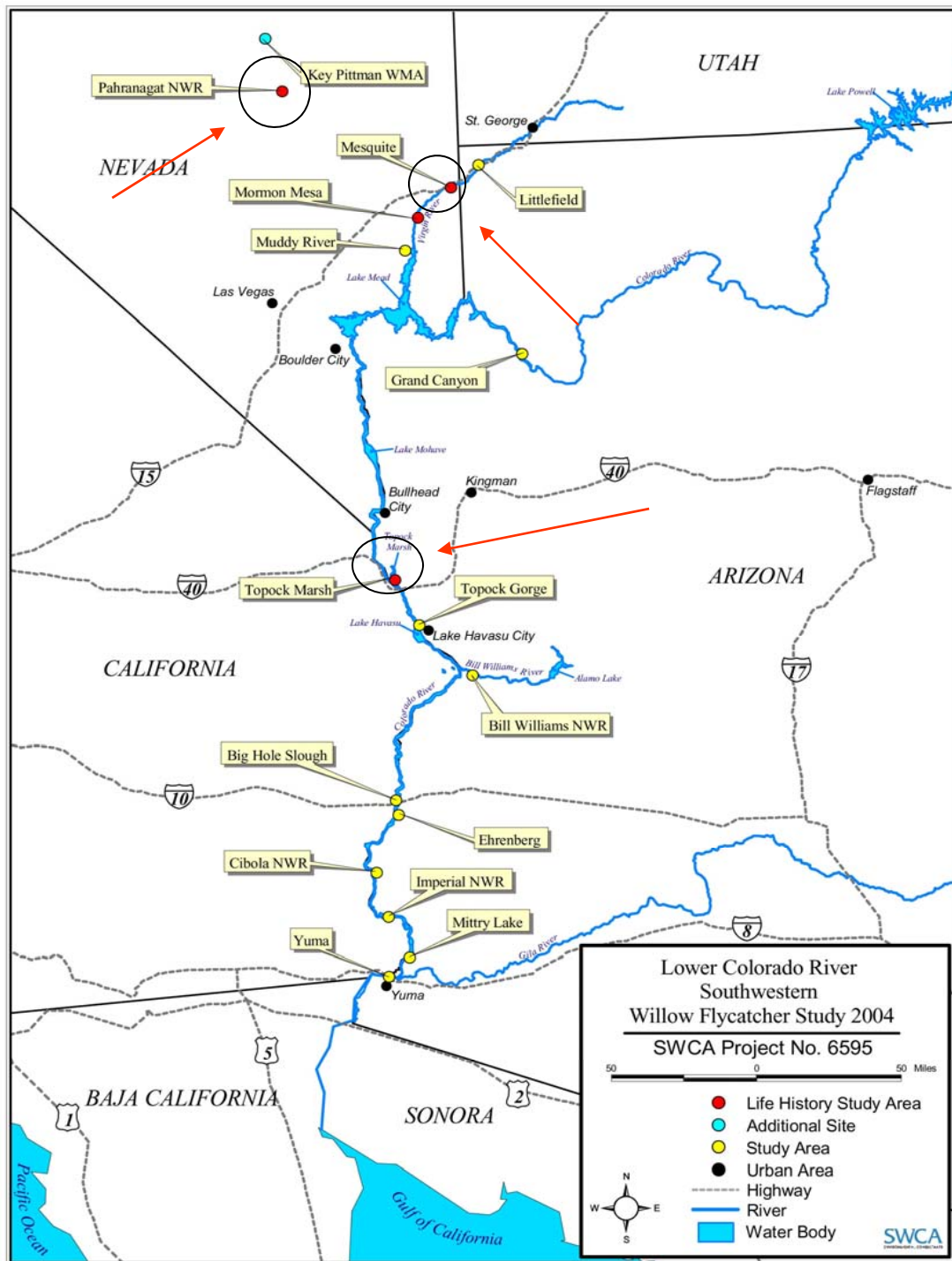
* In studies that find no effect of structure on success, microclimate of nest site is often cited as a potential factor (e.g. Bisson and Stutchbury 2000, Martin 1998, Prather et al. 2002)



Microclimate

- Temperature extremes impact reproductive output (Rauter et al. 2002)
- Higher mid-day temperatures correlated with nest placement (Lloyd and Martin 2004, Walsberg 1981)
- **However, very few studies have attempted to link microclimate and predation**
 - Predation reduced by roost selection based on microclimate (Hiller and Guthery 2005)





Studies with SWCA

- Study sites along Virgin, Muddy and Colorado Rivers and Pahrnagat Valley
- Data collected 2003-2006

Methods

- Vegetation measurements (5)
 - Nest height, canopy height, canopy cover, ground cover, concealment
- Microclimate (4)
 - Diurnal maximum and minimum temperature and humidity



Patterns of depredation

	FLEDGE	DEPREDATED	# NESTS
MESQ	61.2 (30)	38.8 (19)	49
PAHR	76.8 (43)	23.2 (13)	56
TOPO	51.3 (38)	48.7 (40)	78
TOTAL	61.7 (111)	38.3 (72)	183

* Table shows percent fledged/depredated (# nests)

** Nest fate differs by site

(Pearson Chi-square = 10.8; p=0.004)

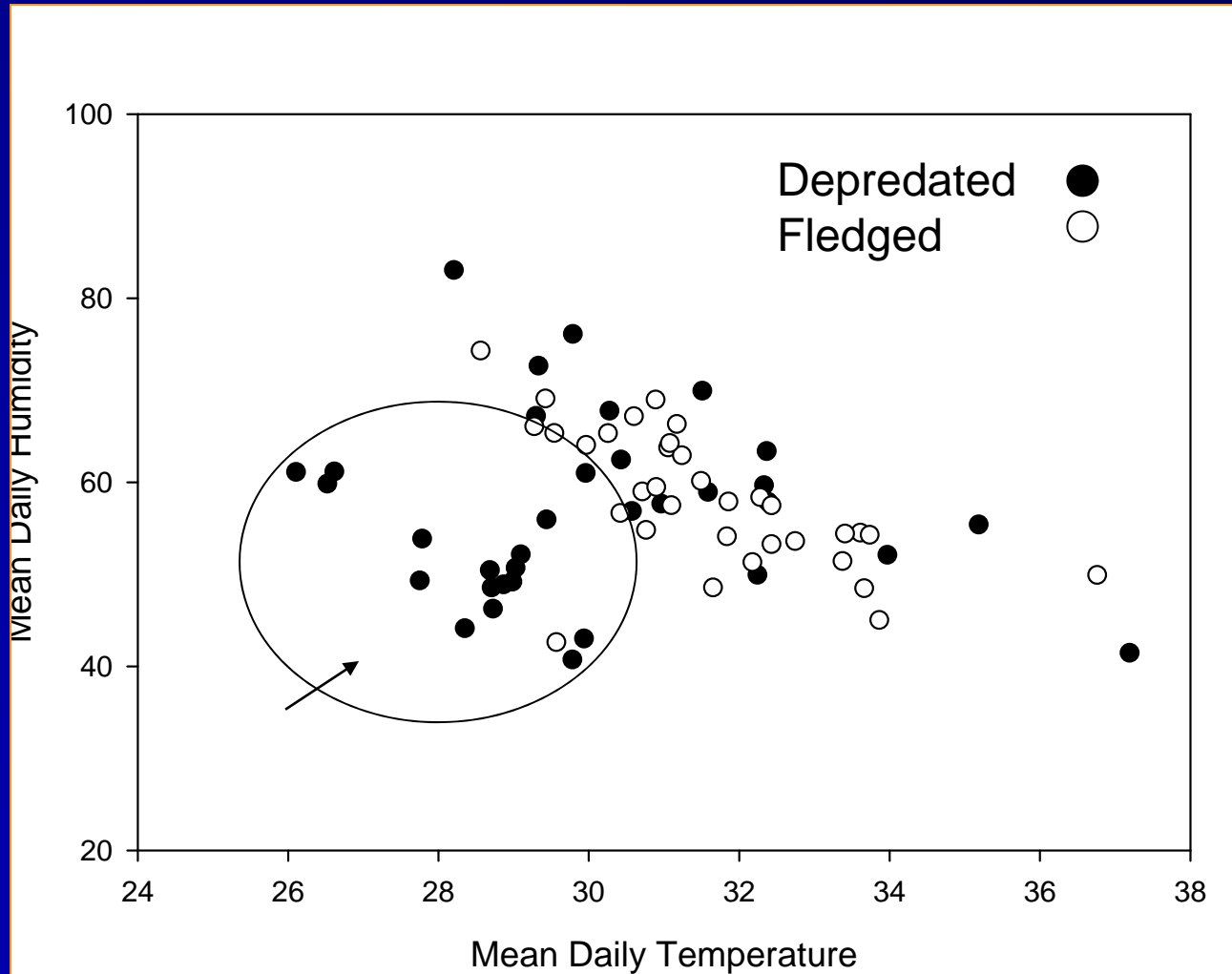


	MESQ		PAHR		TOPO	
	Fledged	Depredated	Fledged	Depredated	Fledged	Depredated
	(n=30)	(n=19)	(n=41)	(n=12)	(n=38)	(n=40)
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Nest height	2.1 (0.1)	2.0 (0.1)	3.4 (0.2)	3.1 (0.5)	3.6 (0.2)	3.7 (0.2)
Canopy height	4.9 (0.1)	5.1 (0.2)	17.1 (0.9)	15.1 (2.3)	92.5 (1.4)	6.8 (0.3)
Ground cover	18.0 (3.4)	11.0 (2.9)	31.3 (4.3)	27.8 (7.3)	15.8 (2.5)	20.0 (3.6)
Canopy closure	92.4 (1.1)	94.8 (1.2)	93.0 (1.6)	92.4 (2.4)	1.4 (0.2)	92.3 (1.2)
Concealment	1.4 (0.2)	1.7 (0.1)	2.0 (0.2)	2.3 (0.3)	1.4 (0.2)	1.2 (0.2)
Maximum temp	41.4 (1.0)	42.1 (1.2)	37.1 (0.5)	38.2 (1.2)	41.7 (0.6)	40.6 (0.6)
Minimum temp	15.5 (0.4)	14.4 (0.9)	13.3 (0.3)	10.2 (0.6)	17.9 (0.5)	14.2 (0.5)
Maximum humidity	97.0 (0.7)	93.3 (2.0)	88.6 (1.7)	78.7 (4.2)	95.3 (0.8)	94.8 (0.8)
Minimum humidity	17.5 (1.8)	14.0 (1.9)	14.5 (1.0)	10.0 (0.7)	22.0 (1.3)	18.6 (1.6)

Results of univariate logistic regression (numbers in bold are significant; $p < 0.05$)

- **Microclimate around the nest is the most important factor driving predation**
- Vegetation structure does not affect predation





- Higher temperature = higher chance success
- Higher humidity = higher chance success

- Results from one site; others exhibit same pattern



Why is microclimate so important?



- First study to demonstrate this link
 - But, we are still missing data on female behavior at the nest!
- Behavior can be documented with nest cameras, iButtons, etc.



Implications of this study for habitat restoration

GOAL: Create and conserve habitat, work toward recovery of T&E species, and reduce likelihood of additional species being listed.

Accomplish this by **restoration of sites** along LCR where:

1. **Microclimate is optimized**
2. **Reproductive rate (productivity and fecundity) is maximized**
3. **Predation rate is minimized**

* Results may apply to all cup nesting passerines



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