



USE OF REMOTE CAMERAS FOR MONITORING BURROWING OWL NESTING ECOLOGY IN SAN DIEGO COUNTY

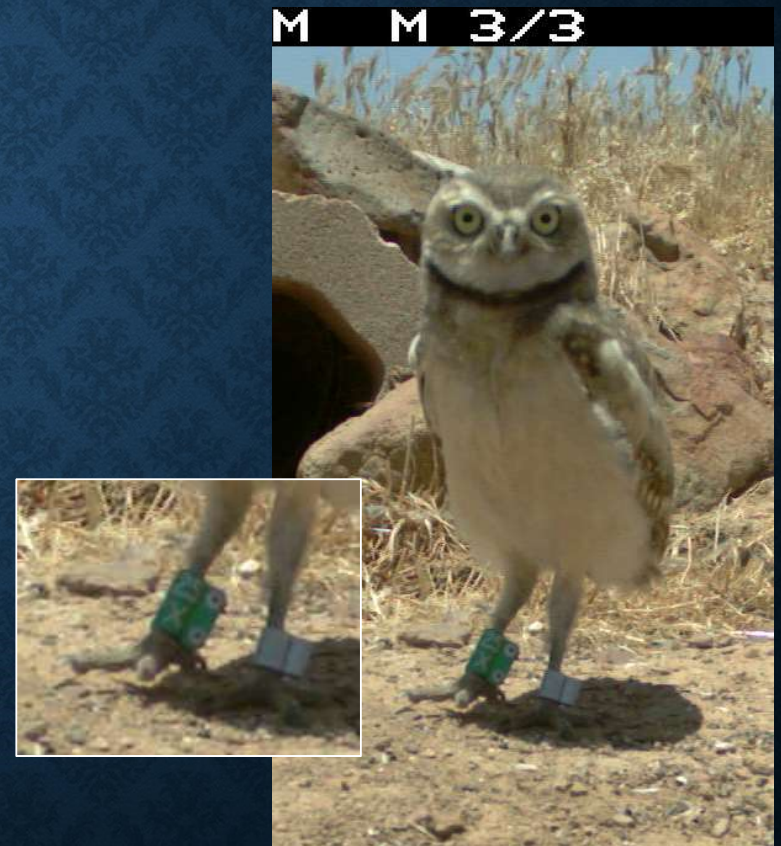
Presented by

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INSTITUTE FOR
CONSERVATION
RESEARCH**

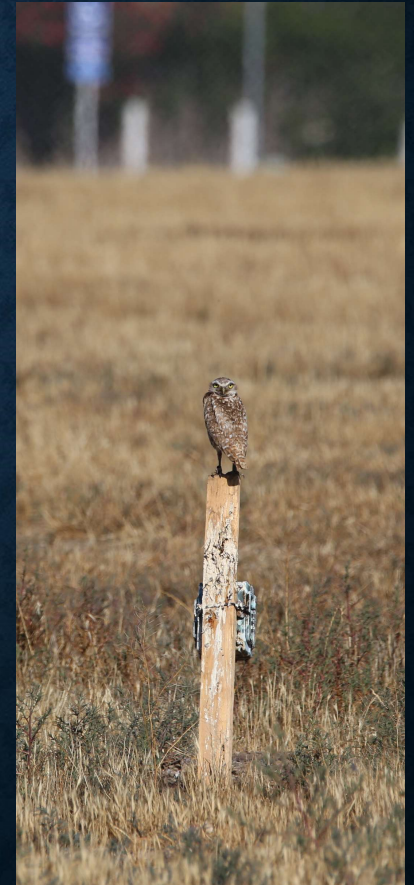
OBJECTIVES

- **Burrowing owl nesting ecology**
 - reproductive rates
 - nest success
 - survivorship
 - prey provisioning
 - predation
- **Monitoring active breeding burrows**
- **Southern San Diego County**
 - Otay Mesa, Rancho Jamul
- **Southern California Region**
 - productivity



METHODS

- 1-2 camera traps per nest burrow
- Cameras used:
 - Reconyx® Hyperfire PC900 (\$650)
 - Bushnell® TropyCam HD (\$170)
 - Bushnell® NatureView HD (\$250)
- 3 pictures/trigger (motion-activated), 30-second quiet period
- Cameras serviced ~1x/week
 - 2 SD cards, 2 sets of battery per camera
- SD cards downloaded to NAS server and back-up hard drives
- Catalogue of folders and files to organize photo processing



DATA RETRIEVAL/MANAGEMENT/PHOTO REVIEW

- Photo processing done manually using Adobe® Bridge to tag photo files
- QC done manually in Bridge
- EXIF data extracted to Excel using command line and macro
- Data cleaned and summarized in Excel
 - Further analyses with statistical software

File Structure

Year

Area

Site

Burrow

Burrow Entrance (Camera Name)

Dates (SD Card)

Subfolder [made by camera]

Images

DATA RETRIEVAL/MANAGEMENT/PHOTO REVIEW

- Independent Events
- Hierarchical Keyword List (Bridge)
 - Frequency of prey deliveries and types
 - Frequency of predation events and types
 - Human disturbances
 - Reproductive success
 - Other wildlife at/near burrows
- Maximum Count per day (paper)
 - Adults & Juveniles
 - Survivorship of Banded individuals
- Quality Control





RESULTS—PRODUCTIVITY & PREDATION

JUVENILE MORTALITY

PRODUCTIVITY

Year	Max # Chicks	# Fledglings	Proportion
2013	78	49	0.63
2014	68	30	0.44
2015	70	38	0.54
2016	107	83	0.78
2017	96	79	0.82

Cause of Mortality	2013	2014	2015	2016	2017
Infanticide	11	4	6-9	4*	—
Common Raven	2	11	3	2	2
Cooper's Hawk	2	—	1	—	—
Northern Harrier	—	—	—	2	—
Long-tailed weasel	1	—	—	—	—
California king snake	1	—	—	—	—
Coyote	—	1	—	1*	—
Skunk	—	—	2	1*	—
Opossum	—	—	1	—	—
Raccoon	—	—	—	—	1
Possible siblicide	1	—	—	—	—
Non-predation	1	2	3*	2	1
Non-predation (human caused)	—	—	—	—	1
Unknown (remains found)	—	1	—	1	2
Total	19	19	16	13	7

RESULTS--SURVIVORSHIP

Return Rates

Year banded	% resighted after:					
	1 yr	2 yrs	3 yrs	4 yrs	5 yrs	6 yrs
<i>Adults (n)</i>						
2011 (8)	0.38	0.5	0.13	0.13	0.13	0
2012 (0)						
2013 (15)	0.73	0.53	0.2	0.13		
2014 (20)	0.85	0.45	0.25			
2015 (16)	0.88	0.44				
2016 (9)	0.67					
<i>Juveniles (n)</i>						
2011 (14)	0.21	0.29	0.14	0.07	0.07	0.07
2012 (0)						
2013 (56)	0.14	0.07	0.04	0.04		
2014 (38)	0.18	0.11	0.05			
2015 (44)	0.34	0.09				
2016 (81)	0.27					

Apparent Survival

Year	Annual Survival	95% CI
<i>Adults</i>		
2011/12	not estimated	
2012/13	not estimated	
2013/14	0.63	0.44—0.79
2014/15	0.64	0.49—0.76
2015/16	0.63	0.50—0.75
2016/17	0.49	0.36—0.61
<i>Juveniles</i>		
2011/12	not estimated	
2012/13	not estimated	
2013/14	0.15	0.08—0.28
2014/15	0.22	0.11—0.37
2015/16	0.37	0.24—0.53
2016/17	0.28	0.18—0.38

RESULTS

- Management actions initiated due to camera work in 2018
 - Intervention for sticktight flea outbreak
 - Extent and severity from photos
 - Assessment of effects on productivity



ISSUES/RECOMMENDATIONS

2013-2018 Data

- ~14.2 million total photos collected
- 7+ TB worth of photo files
- Volunteers, ~10 hours training per volunteer
- Processing time: ~40 hrs/week for 4-6 months
- Quality Control: ~10 hours/burrow (prey)
- Entry & proofing of max count data

- Field Equipment
 - Camera performance
 - Batteries and SD cards
- Office Equipment
 - Data storage and back up
 - Computers/space for processing
- Sampling rate (pics/quiet period)
- Processing and QC time
- Organization is key!

2013-07-31 8:16:53 PM M 1/3 63°F



RECONYX

18-05-07 2:18:02 PM M 1/3 81°F



RECONYX

BUOW R2
2018-06-04 3:23:47 AM M 3/3

60°F



RECONYX

BUOW R25



● CAMERA9A 73°F22°C

05-16-2018 23:00:51



08-28-2018 06:13:50



Bushnell Camera2A 102°F38°C 06-02-2018 13:38:12



QUESTIONS?

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