



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

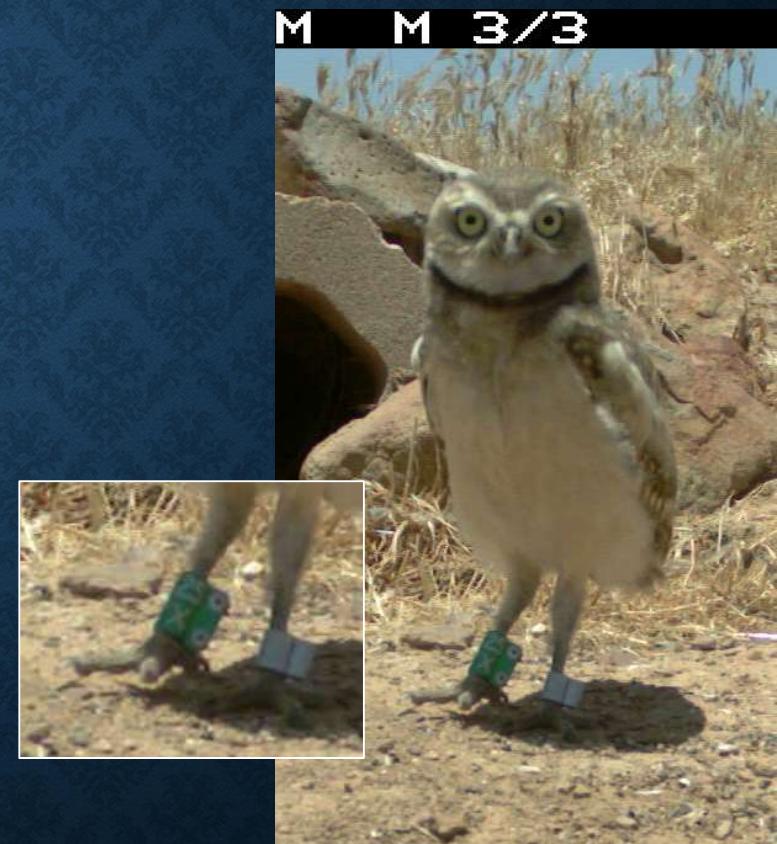
Presented by

Colleen L. Wisinski

SAN DIEGO ZOO
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



100RECNX

File Edit View Stacks Label Tools Window Help

Desktop > Computer > BUOW (lase storage) (S) > CamTrapOriginals > CamTraps-BUOW > 2018 > MAP > Olay > Brown Field > R19 north > 20180606-0613 (R19b) > 100RECNX

PREVIEW ESSENTIALS FILMSTRIP METADATA

Sort Manually

FAVORITES FOLDERS

- 2017
- 2018
 - Border Fence Translocation
 - CEC
 - MAP
 - Olay
 - Brown Field
 - 20K
 - Fire Station
 - Gales
 - Gales Culvert North
 - Gorilla
 - Gorilla 2
 - Mr. Sales
 - Napo Fence
 - North Moncave (LMS)
 - OTRH8s-v
 - Palm Pad
 - R19 north
 - 20180418-0424 (R19)
 - 20180424-0503 (R19)
 - 20180503-0510 (R19)
 - 20180510-0517 (R19)
 - 20180517-0523 (R19)
 - 20180522-0531 (R19b)
 - 20180531-0606 (R19)
 - 20180606-0613 (R19b)
 - 100RECNX
 - 20180418-0419 (R19)
 - 20180424-0520 (R19b)
 - 20180522-0705 (R19)
 - 20180703-0712 (R19b)
 - 20180714-0717 (R19)
 - 20180717-0725 (R19b)
 - 20180725-0903 (R19)
 - 20180803-0808 (R19b)
 - 20180803-0823 (R19)
 - 20180823-0906 (R19b)

PREVIEW

2018-06-11 4:38:28 PM M 1/3 94°F

BUOW R19

RECONYX

IMG_9343.JPG

CONTENT

9999 items, 1 selected - 459 KB (7551 preview extractions)

FILTER

- Keywords
 - No Keywords 9998
 - Reptile prey 1
- Date Created
 - 6/12/2018 114
 - 6/11/2018 1371
 - 6/10/2018 1872
 - 6/9/2018 1988
 - 6/8/2018 1993
 - 6/7/2018 2100
 - 6/6/2018 603

KEYWORDS EXPORT

Selected Keyword: Reptile prey

- Good/Bad Picture
 - Bad picture
 - Good picture
 - QC for Collen
- Human disturbance
 - Human
 - Misc. human disturbance
- Watering
 - Watering
- Interesting Events
 - Adult predation event
 - Copulation
 - First emergence
 - Interesting prey
 - Juvenile predation event
 - Other interesting events
 - Unknown
- Predator Species
 - Rabbit
 - Coyote
 - Domestic cat
 - Domestic dog
 - Opossum
 - Other
 - Raccoon
 - Raptor
 - Seven Crow
 - Shrike
 - Wiesel
- Prey
 - Amphibian prey
 - Bird prey
 - Running Owl prey
 - Invertebrate prey
 - Mammal prey
 - Possible feeding
 - They were unknown
 - Unknown
 - Probable feeding
 - Reptile prey
 - Snake
 - White mouse
- Visitor Species
 - Bird other
 - Surrounding owl
 - Cactus wren
 - OGG
 - Red
 - Starred
 - Mouse/vole
 - Other
 - Rabbit
 - Road runner
 - Woodrat
- Z_Rapid Assessments 6

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
Adults (n)						
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					
Juveniles (n)						
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
Adults		
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
Juveniles		
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



RECONYX BUOW R35



RECONYX

ISSUES/RECOMMENDATIONS

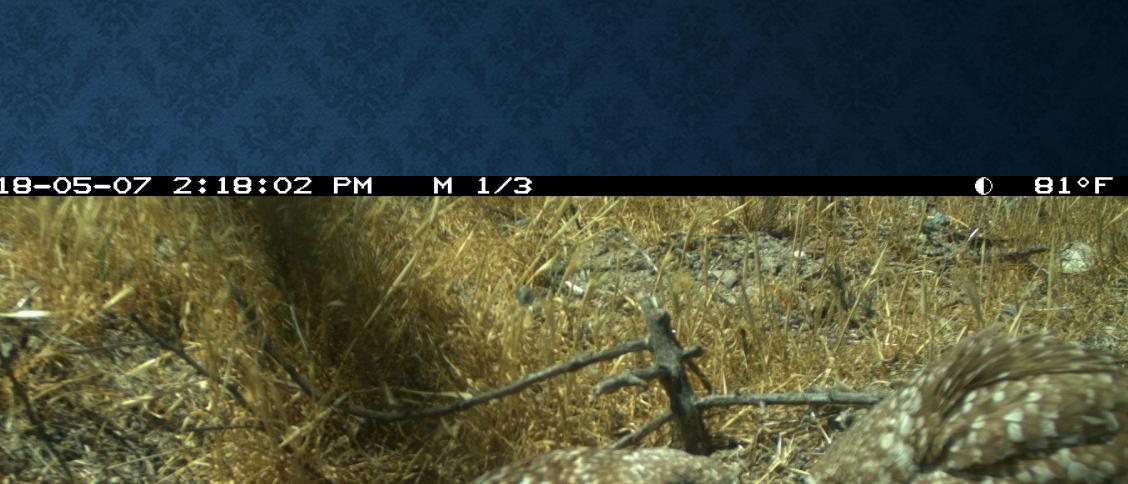
2013-2018 Data

- ~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



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

60°F



BUOW R25

RECONYX

RECONYX





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



QUESTIONS?

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2014-05-30 3:13:45 PM M 1/3

○ 93°F



PC900 PROFESSIONAL

RECONYX