WELCOME TO THE CONSERVATION LECTURE SERIES

CALIFORNIA
DEPARTMENT OF
FISH &
WILDLIFE

WWW.DFG.CA.GOV/HABCON/LECTURES

- *See the schedule of upcoming lectures*
- *Register for lectures*
- *Watch videos of past lectures*

Questions? Contact margaret.mantor@wildlife.ca.gov

LECTURES IN APRIL

- ***Alameda Striped Racer, Karen Swaim***

  April 24, 1:00-3:00, Sacramento
- ***California Tiger Salamander, Dr. Chris Searcy***

  April 28, 1:00-3:00, Sacramento
- ***Shasta Crayfish, Dr. Maria Ellis***

  April 29, 10:00-11:30, Redding

It Takes a Region to Save the Coastal Cactus Wren: Monitoring and Management to Ensure Persistence in Southern California

Kristine Preston

USGS science for a changing world

San Diego Management & Monitoring Program

NATURE RESERVE of ORANGE COUNTY

Cactus Wren (*Campylorhynchus brunneicapillus*)

- Non-migratory resident - SW US to central Mexico
- Southern CA - coastal & desert populations
- Nest in cactus
- Populations differ ecologically
  - Desert scrub vs coastal sage scrub
  - Different climates

Coastal Cactus Wren

- Historically, coastal populations abundant but patchily distributed by cactus availability
- Dramatic decline in coastal populations in last few decades
- Decline - loss of habitat to development & wildfires

Santiago Fire – 10-07, CBS News Photo

Natural Community Conservation Plans

California's Natural Community Conservation Planning (NCCP) Act of 1991

"Primary objective of the NCCP program is to conserve natural communities at the ecosystem level while accommodating compatible land use"

https://www.dfg.ca.gov/habcon/nccp/

California Dept. of Fish & Wildlife & US Fish & Wildlife Service

- Work with landowners, environmental organizations & local jurisdictions
- Develop plan that conserves multiple species & habitats and meets requirements of California & Federal Endangered Species Acts
- Permits development while focusing on long term sustainability of wildlife & plant communities

Conserving Coastal Cactus Wren

Starting in mid-1990s – wren conserved in conservation plans:

- *Nature Reserve of Orange County – coastal/central Orange Co (OC)*
- *Multiple Habitat Conservation Program – coastal/central San Diego Co (SDC)*
- *Palos Verdes Peninsula Land Conservancy*
- *Rancho Mission Viejo Conservancy (southern OC)*
- *San Diego Multiple Species Conservation Program (south SDC)*
- *Western Riverside Multiple Species Habitat Conservation Plan*

Coastal Cactus Wren Working Group Started in 2008

Chair: Trish Smith, The Nature Conservancy

Goal: *To Identify, based on best available science, conservation actions to ensure persistence of coastal cactus wren throughout its range (Ventura, Los Angeles, San Bernardino, Orange, Riverside & San Diego Cos.)*

Includes representatives from:

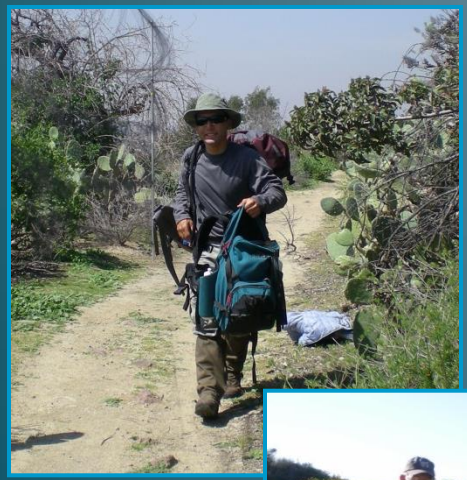
- NCCPs
- Wildlife agencies
- Land owners/managers
- Military bases
- Local governments
- US Geological Survey
- Academic institutions
- Non-profit organizations
- Biological consulting firms

Photo by Alex Houston

“Team Coastal Cactus Wren”

Team Coastal Cactus Wren =
Coastal Cactus Wren Working Group + many others

Regional collaboration to address questions essential to coastal cactus wren management that no single entity can answer



“Team Coastal Cactus Wren”

Coastal Cactus Wren Working Group

Wildlife Agencies

- CA Dept. of Fish & Wildlife
- US Fish & Wildlife Service

NCCPs & Coordinating/Implementing Entities

- Nature Reserve of Orange County
- Multiple Habitat Conservation Program
- Palos Verdes Peninsula Land Conservancy
- Rancho Mission Viejo Conservancy
- San Diego Association of Governments
- San Diego Management & Monitoring Program
- San Diego Multiple Species Conservation Program
- Western Riverside Multiple Species Habitat Conservation Plan
- Western Riverside County Regional Conservation Authority

"Team Coastal Cactus Wren"

Land Owners & Managers

- Audubon California Starr Ranch Sanctuary
- Bureau of Land Management
- California Dept. of Parks & Recreation
- California Dept. of Transportation
- California State Polytechnic University, Pomona
- California State University, Channel Islands
- Center for Natural Lands Management
- Chino Hills State Park
- City of Carlsbad
- City of Chula Vista
- City of Escondido
- City of Diamond Bar
- City of Fullerton
- City of Glendora
- City of Irvine
- City of Lake Forest
- City of Los Angeles Dept. of Recreation & Parks
- City of Moorpark
- City of Newport Beach
- City of San Diego Parks & Recreation / Public Utility Depts.
- City of San Dimas
- City of Thousand Oaks
- City of Whittier
- Puente Hills Habitat Preservation Authority
- Conejo Open Space Conservation Authority
- Conejo Recreation & Parks District
- Crystal Cove State Park
- Fallbrook Naval Weapons Station
- Helix Water District
- Irvine Ranch Conservancy
- Irvine Ranch Water District
- Los Angeles County Dept. of Recreation & Parks
- Marine Corps Base Camp Pendleton
- North Etiwanda Preserve
- Orange County Parks
- Orange County Transportation Authority
- Orange County Water District
- Outdoor Resorts Rancho California, Inc
- Pala Band of Mission Indians
- Palos Verdes Peninsula Land Conservancy
- Private Property Owners
- Riverside County Parks
- Riverside County Habitat Conservation Authority
- Riverside County Economic Development Agency
- San Bernardino Flood Control District
- San Bernardino County Water Conservation District
- San Bernardino County Depart. of Public Works
- San Bernardino Valley Municipal Water District
- San Diego County Dept. Parks & Recreation
- San Diego Gas & Electric
- San Diego National Wildlife Refuge
- San Diego Zoo Institute for Conservation Research
- San Dieguito River Park
- San Dieguito River Valley Conservancy
- Southern California Edison
- Sweetwater Authority
- Transportation Corridor Authority
- UC Irvine Ecological Preserve
- Vulcan Materials Company

"Team Coastal Cactus Wren"

More Conservation Partners

- AECOM
- Conservation Biology Institute
- Cooper Ecological
- D. Kamada
- Hamilton Biological, Inc.
- K. Moore
- Leatherman BioConsulting, Inc.
- Nakae Associates
- NewFields LCC
- RECON
- San Diego Audubon & Volunteers
- San Diego Natural History Museum
- Santa Ana Watershed Association
- Sea & Sage Audubon & Volunteers
- S. Thomas
- Sweetwater Authority

- The Nature Conservancy
- UC Irvine
- US Geological Survey
- Western Foundation for Vertebrate Zoology

Progress Made Since 2008 - What We Need to Know to Manage Cactus Wrens

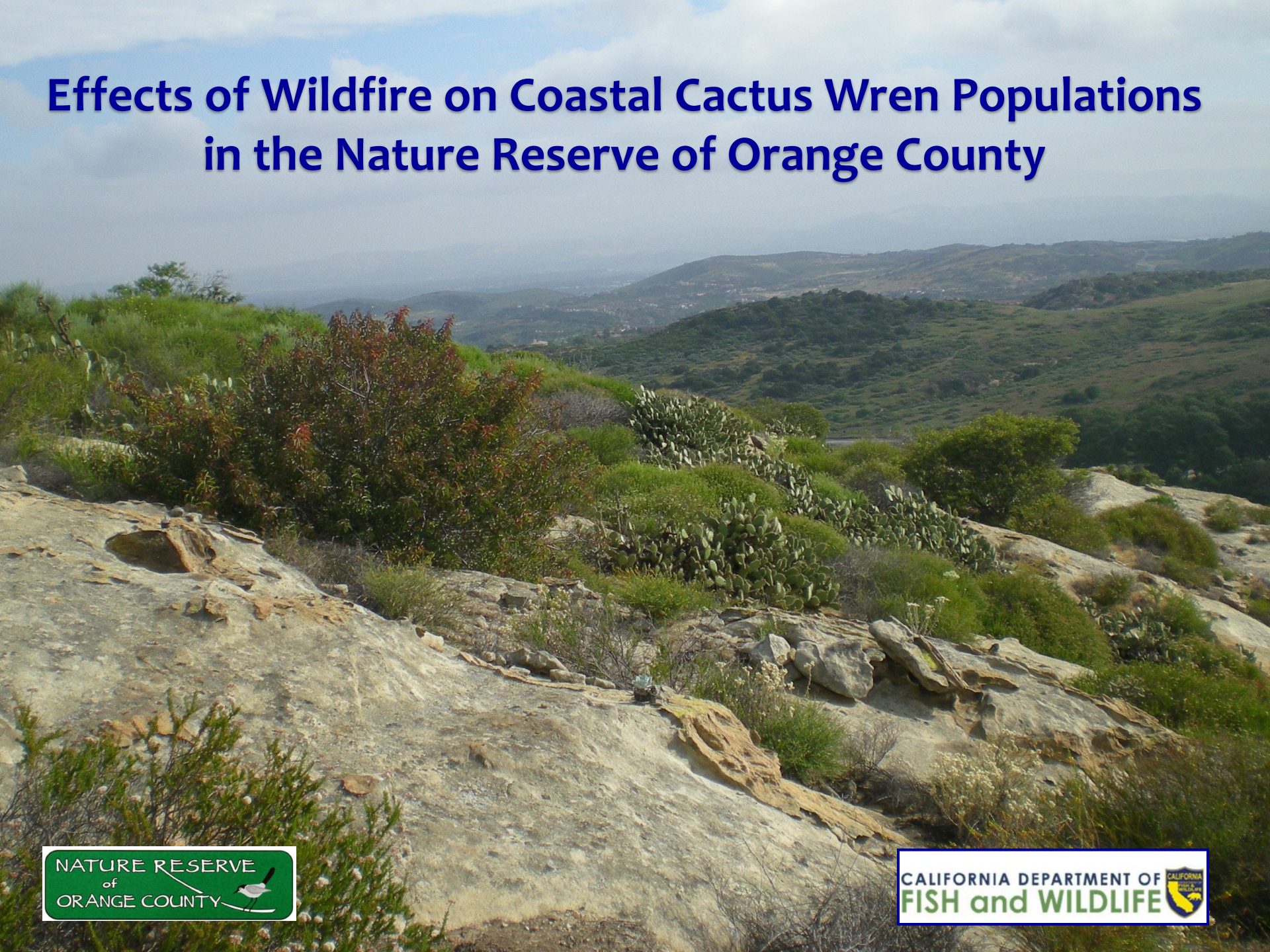
Team Coastal Cactus Wren has:

- Determined distribution & abundance in southern CA
- Documented effects of catastrophic wildfire
- Assessed threats to reproduction, dispersal, survival & population persistence
- Evaluated population genetic structure & connectivity
- Developed & tested management techniques to enhance populations

Today's Presentation

- Effects of catastrophic wildfires on Nature Reserve of Orange County (NROC) populations
- Threats to reproduction, dispersal, survival & population persistence
- *Selected* results from USGS genetics study
- Management actions to enhance populations
- Current distribution & status in SDC & using what we have learned to move forward

Effects of Wildfire on Coastal Cactus Wren Populations in the Nature Reserve of Orange County



NATURE RESERVE of ORANGE COUNTY

CALIFORNIA DEPARTMENT OF FISH and WILDLIFE

Nature Reserve Of Orange County (NROC)

- Orange County's Central & Coastal NCCP/HCP
- Established 1996
- >37,000 acres conserved

NATURE RESERVE of ORANGE COUNTY

NROC conserves 4,100 acres of cactus scrub
1992 surveys identified 671 coastal cactus wren “sites”

Santiago Fire – 10-07, CBS News Photo

1993 Laguna Fire burned 75% of Coastal Reserve

2007 Santiago Fire burned 75% of Central Reserve

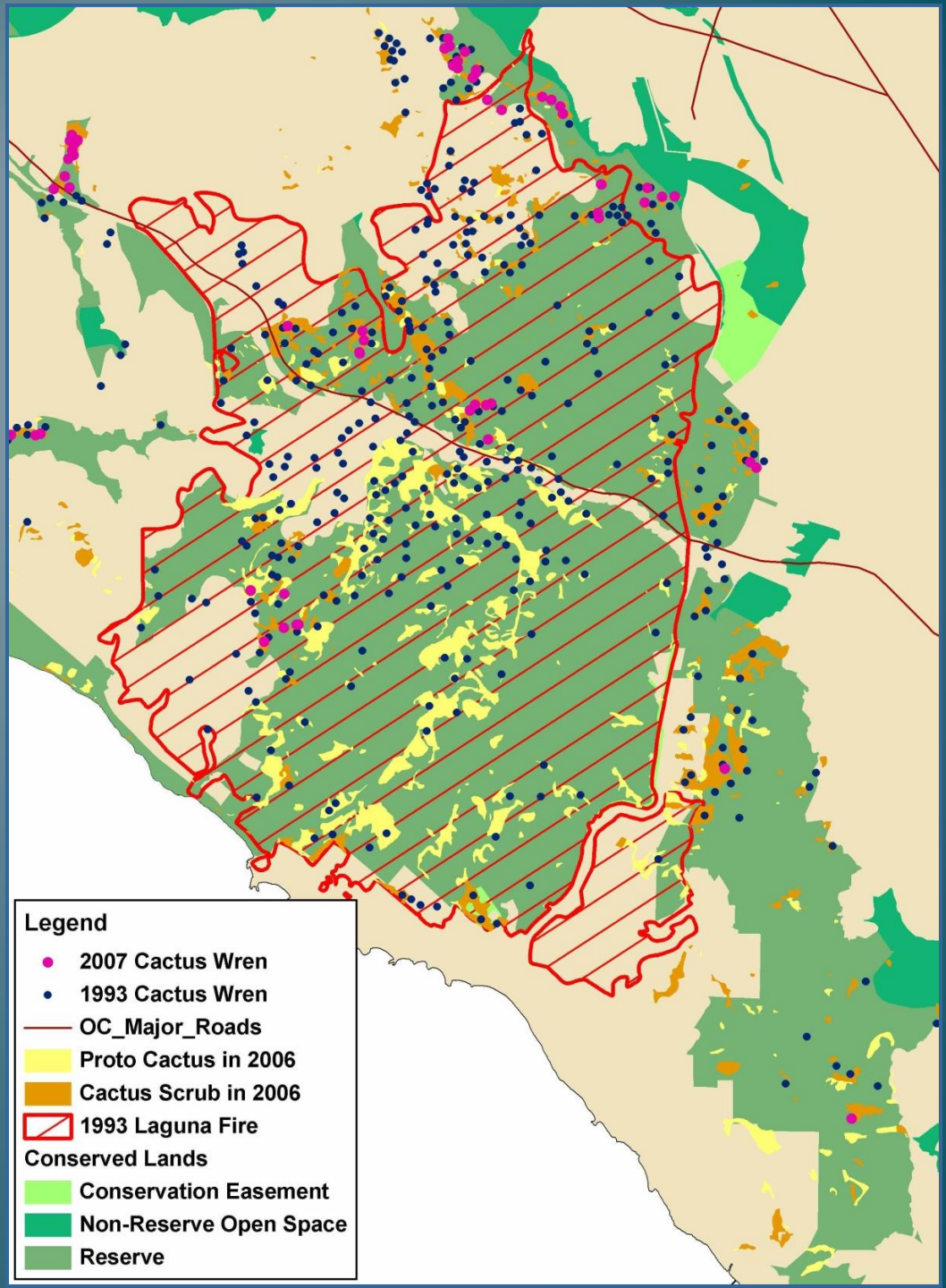
Santiago Fire – 10-07, CBS News Photo

Coastal Reserve

NROC mapped cactus & wrens 13 years after the 1993 Laguna Fire (2006-2007)

- 2,323 acres cactus scrub, 58% unsuitable for wrens
- 187 acres occupied in 2006 vs. ~1,470 in 1992 (87% ↓)

(Mitrovich & Hamilton 2007)

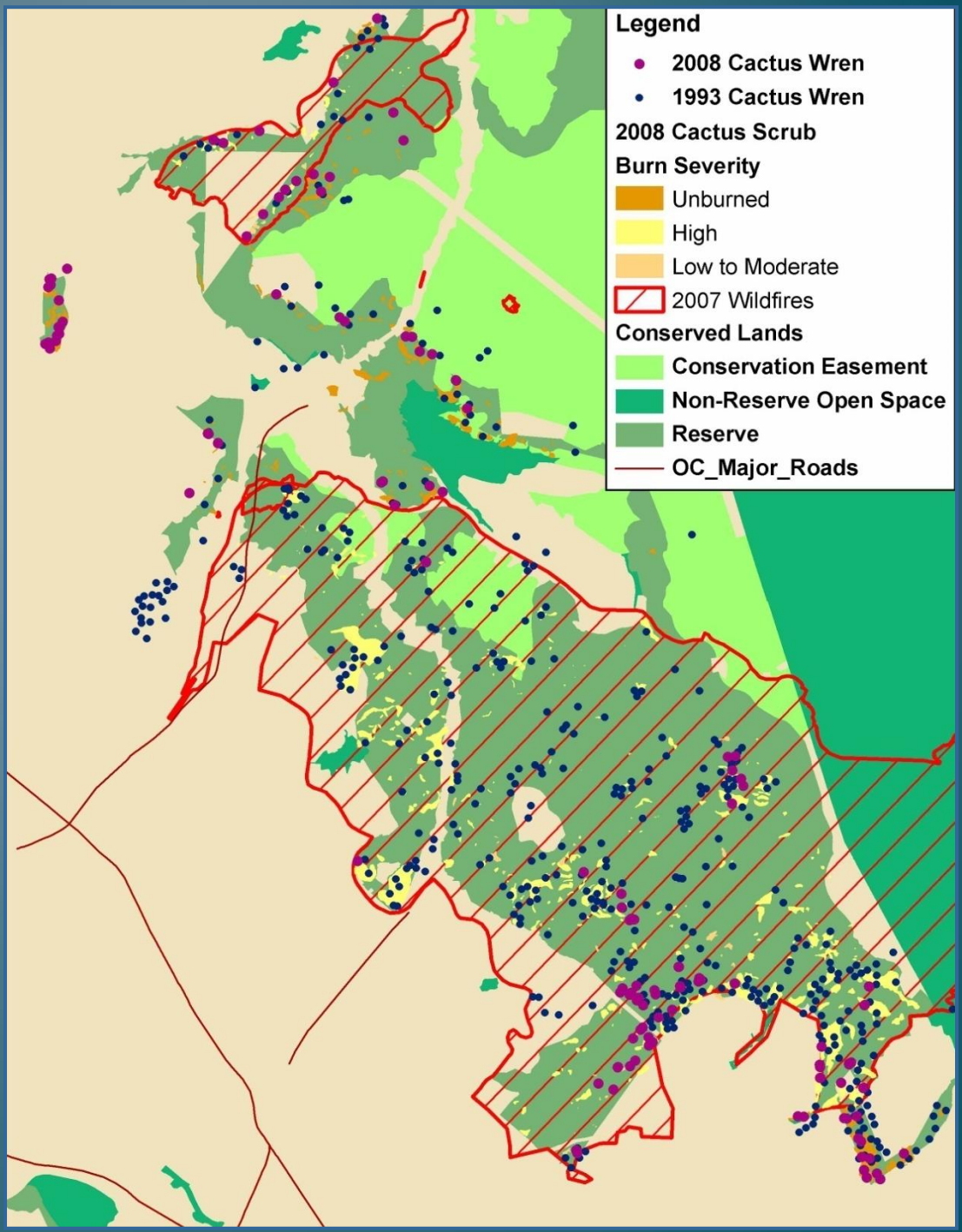


Central Reserve

NROC mapped cactus & wrens 1st year after 2007 Santiago Fire (2008)

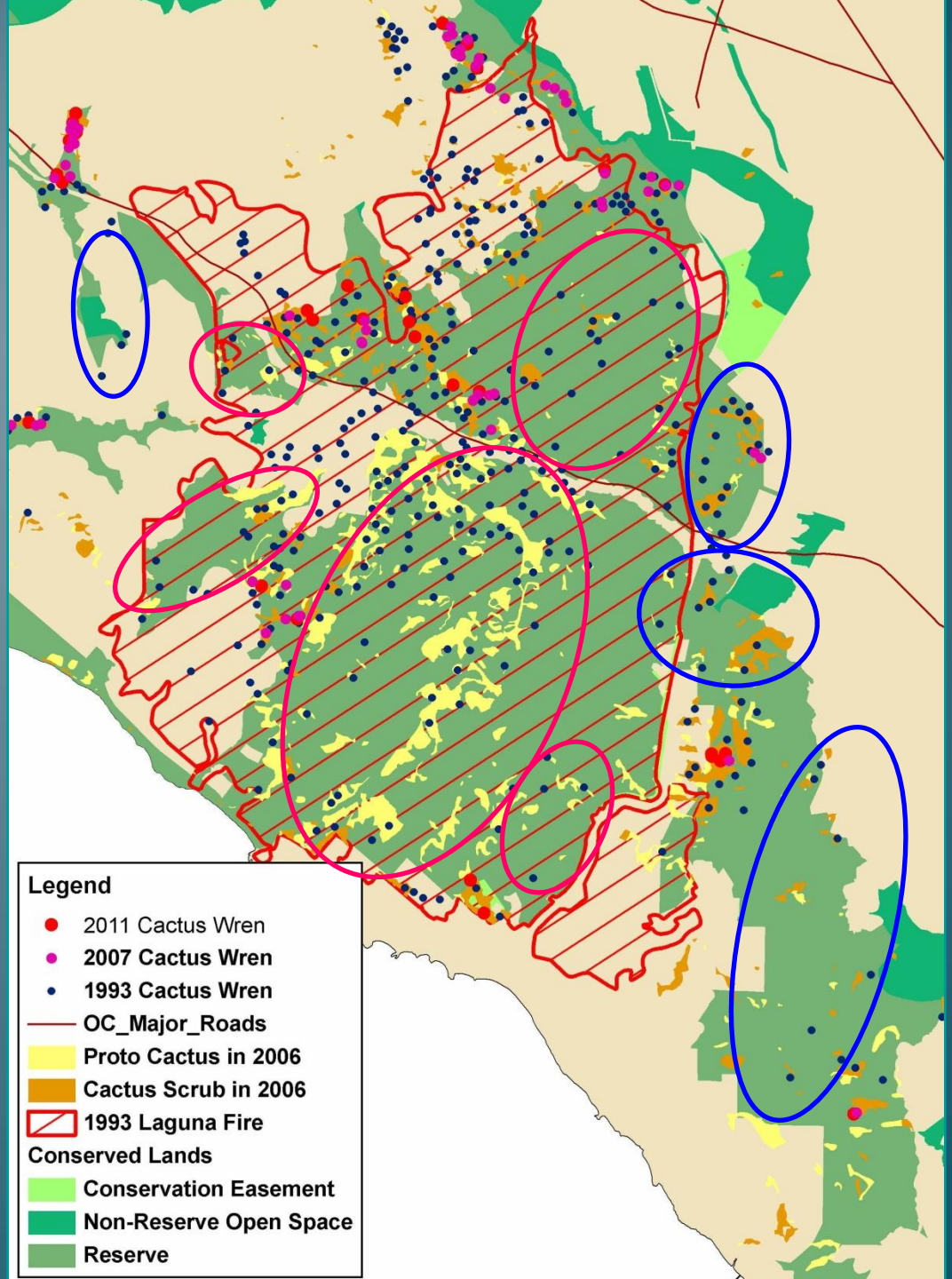
- 1,855 acres cactus scrub, 77% burned
- 683 acres suitable for wrens
- ~67 territories (est. 82%↓)

(Leatherman BioConsulting 2009)



Cactus Wren – have disappeared from burned & *unburned* areas of the Coastal Reserve

- *Missing from burned areas*
- *Missing from unburned areas (not shown is Newport Back Bay)*



Why are Coastal Cactus Wren Populations Declining in Unburned Areas of NROC?

Potential Factors Contributing to the Cactus Wren's Decline

- Low productivity
  food limitation, nest predation
- Low survivorship
  predation, disease
- Isolated small populations
  local extinction with limited dispersal & recolonization
- Insufficient suitable habitat
  habitat has not recovered to pre-fire composition & structure

NROC Monitoring Study 2009-13

Objectives:

- *Monitor individual productivity & annual survival*
- *Monitor dispersal & recruitment of individuals into local populations*
- *Identify threats to the persistence of Cactus Wren*
- *Collect genetic material for connectivity & taxonomic analyses*

Photo Maria Carillo

Photo Karly Moore

Monitoring Effort

Reproductive Monitoring:

- *2009 – 34 territories, 5 sites*
- *2010 – 50 territories, 9 sites*
- *2011 – 60 territories, 9 sites*
- *2012 – 16 territories, 5 sites*
- *2013 - 17 territories, 8 sites*

2009-13 Dispersal Surveys:

Periodically surveyed 9 monitoring + 7 nearby sites

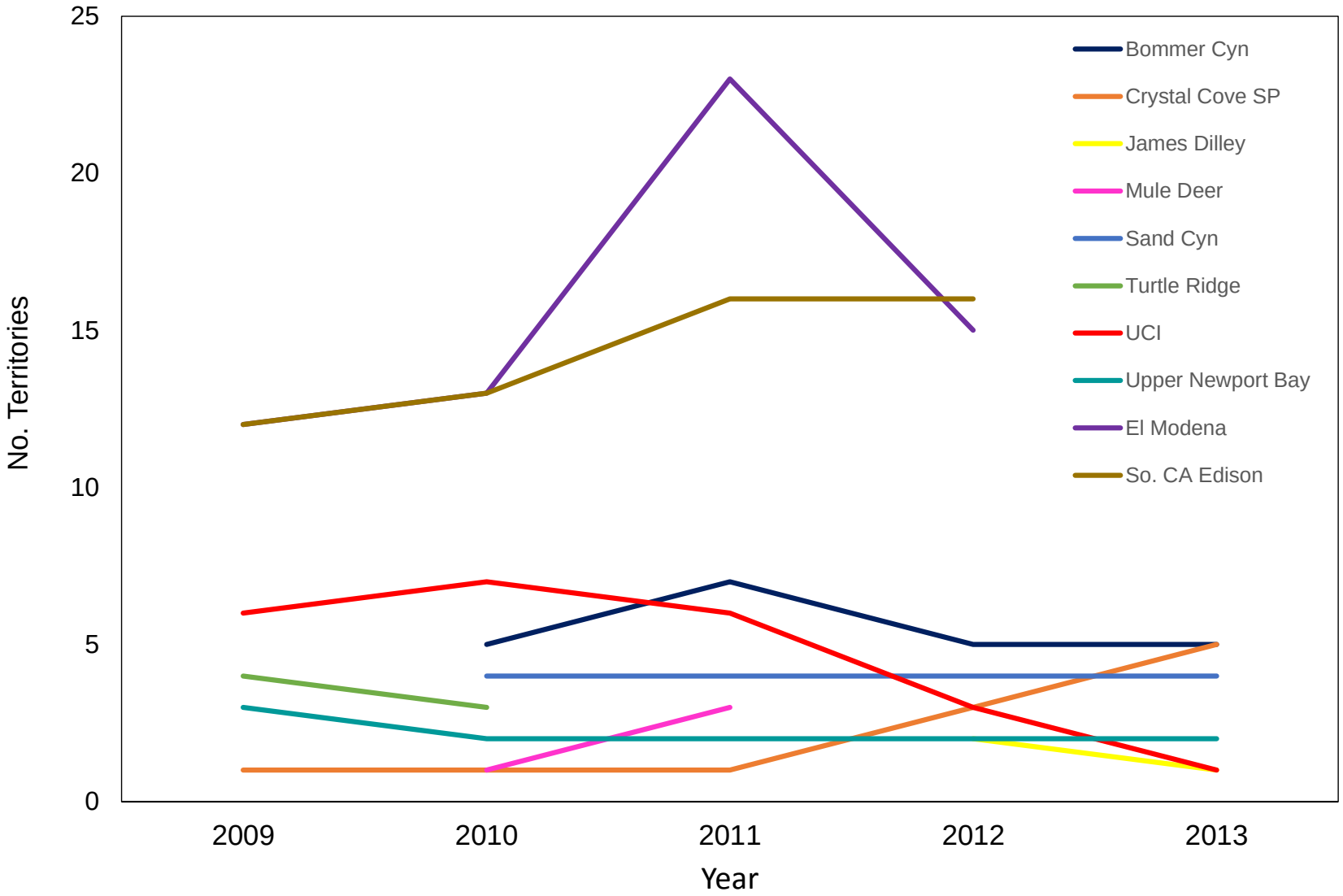
Banded 697 birds:

94 adults banded & monitored

494 HYs banded & monitored

109 adults & HYs banded but not monitored (genetics study)

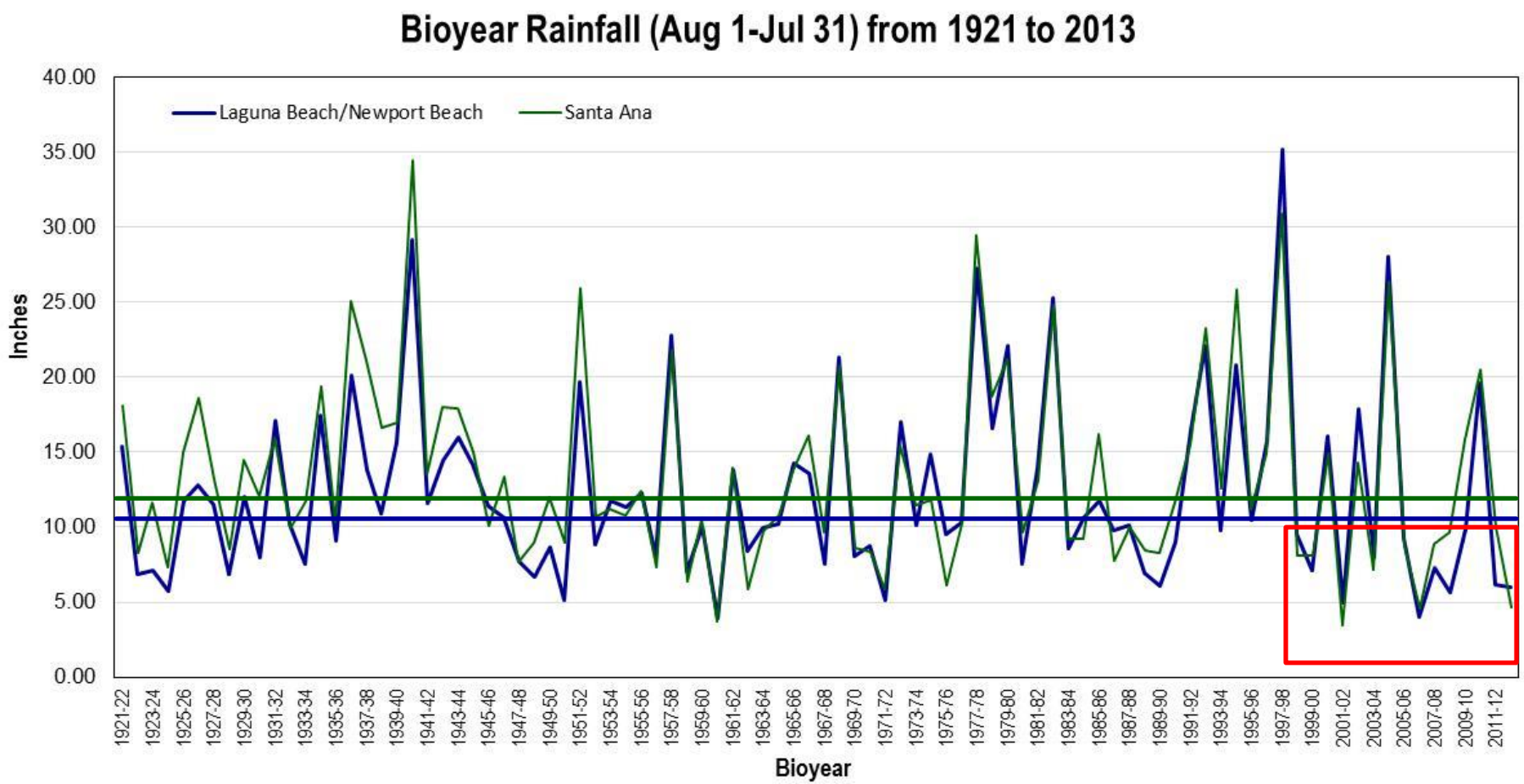
Number Of Territories By Site – 2009-2013



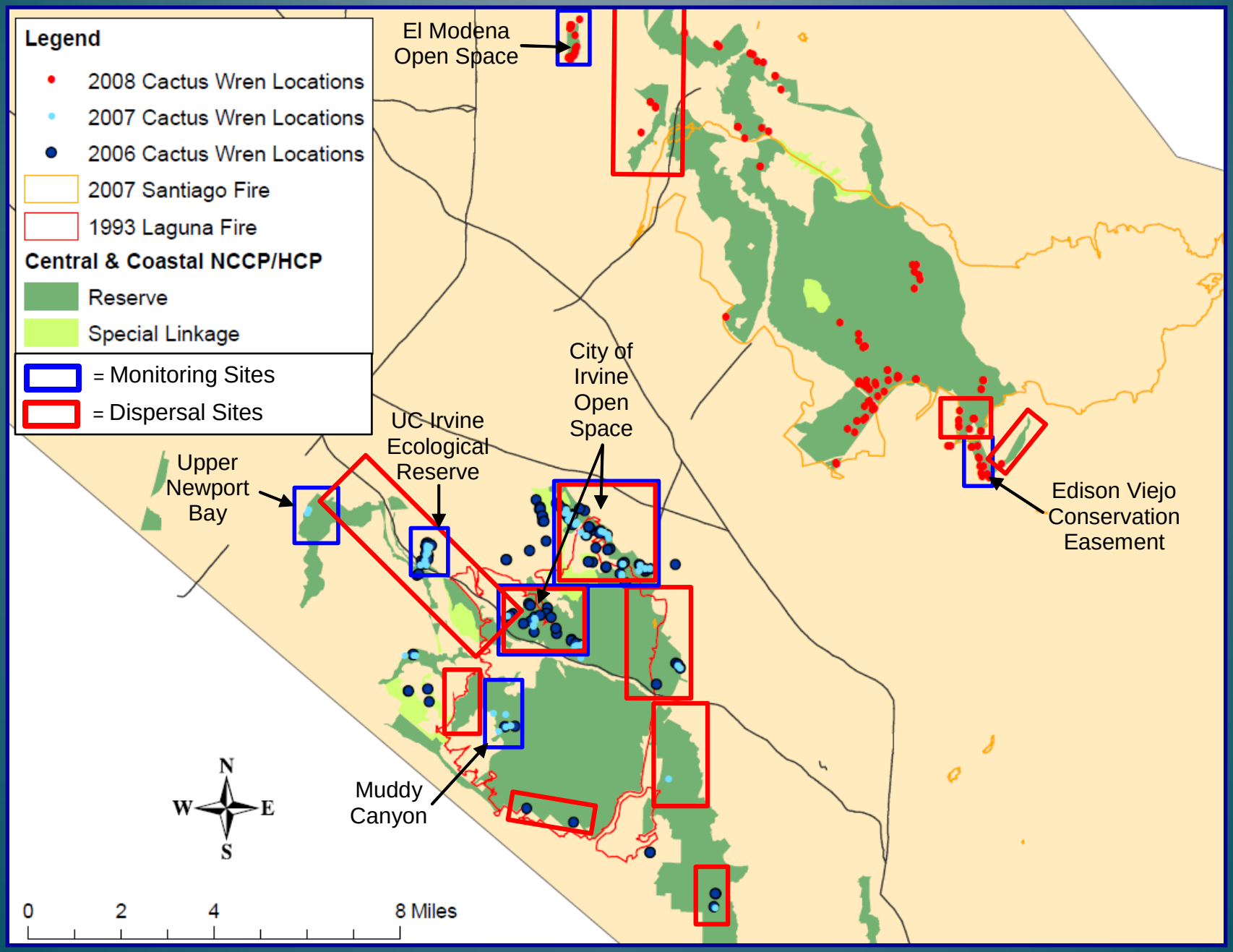
Measuring Cactus Wren Productivity

How Important Are Nest Predation & Food Limitation In Cactus Wren Productivity?

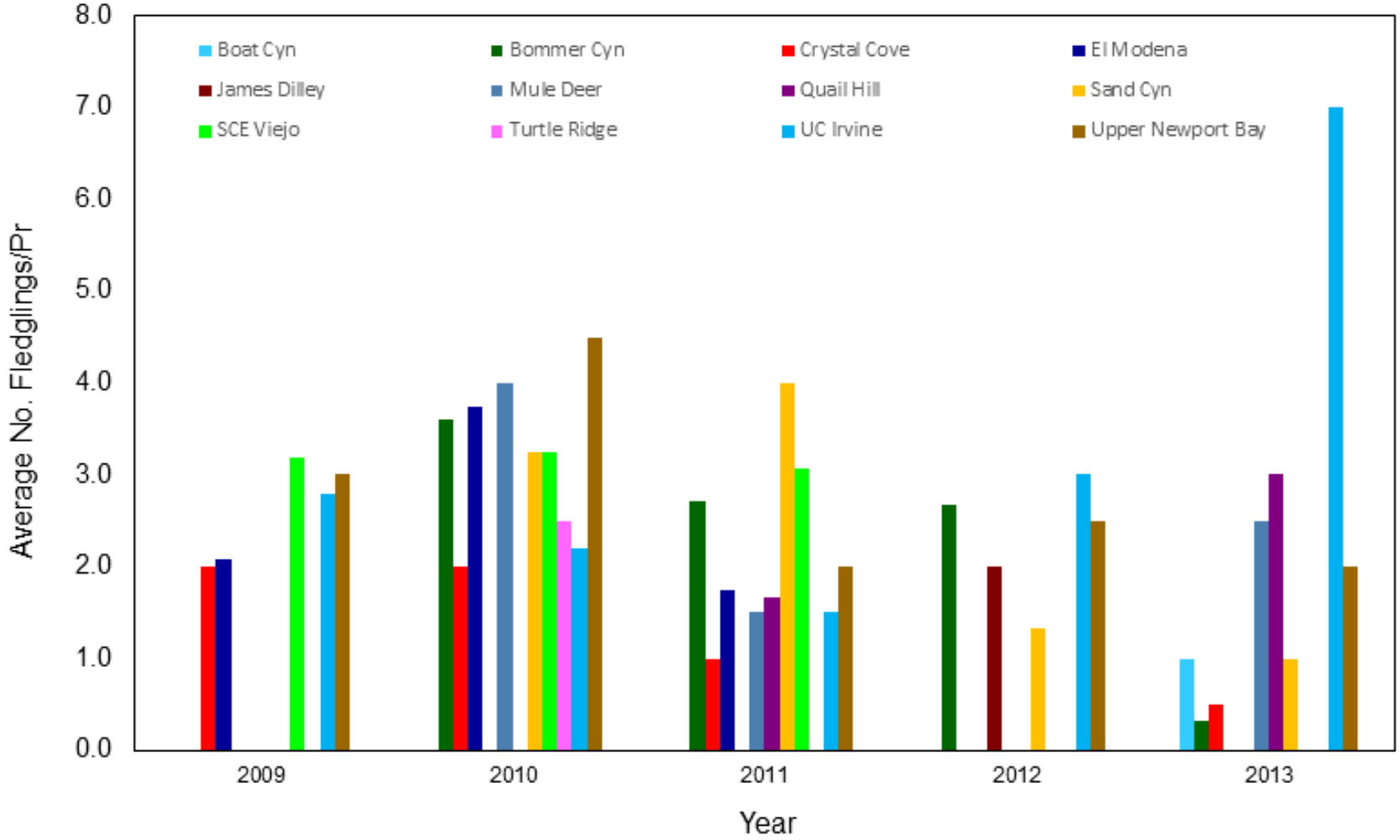
- *Population decline during droughts (since 1999, 11 of 15 years < ave. rainfall)*
- *Role of predation unknown*



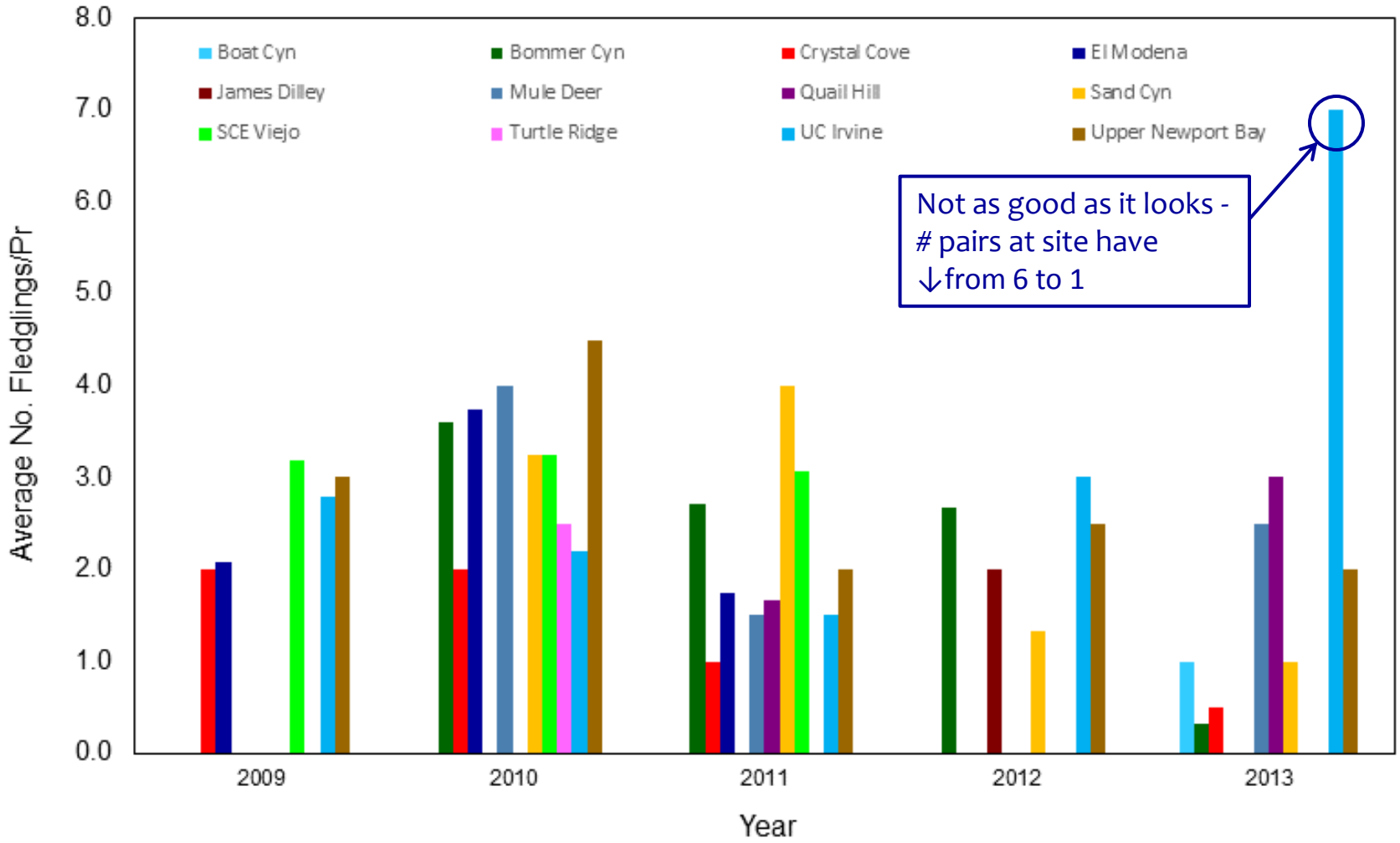
NROC Monitoring Study



Average Annual Productivity By Site



Average Annual Productivity By Site



What Factors are Associated with Wren Productivity?
(Minimum # Fledglings/Pair/Year)

- Cactus Wren Density– *occupied, all cactus, # territories/site*
- Date of 1st Egg Lay – *julian date*
- Predators – *all predators, corvids, greater roadrunners, Cooper's hawks*
- Landscape Matrix – *% urban (1km), % coastal sage scrub (1km), % cactus (200m)*
- Nest Area Cactus– *% cactus (25m)*
- Precipitation– *bioyear, nesting season (Jan-Apr)*
- Average Minimum Temperature– *pre-nest/egg lay (Jan-Feb), nestling (Apr) periods*
- Average Maximum Temperature – *incubation (Mar-Apr), nestlings (Apr) periods*
- Topography – *elevation, topographic heterogeneity, northness, % slope*
- Normalized Difference in Vegetation Index *(NDVI)*

Modeling Methods

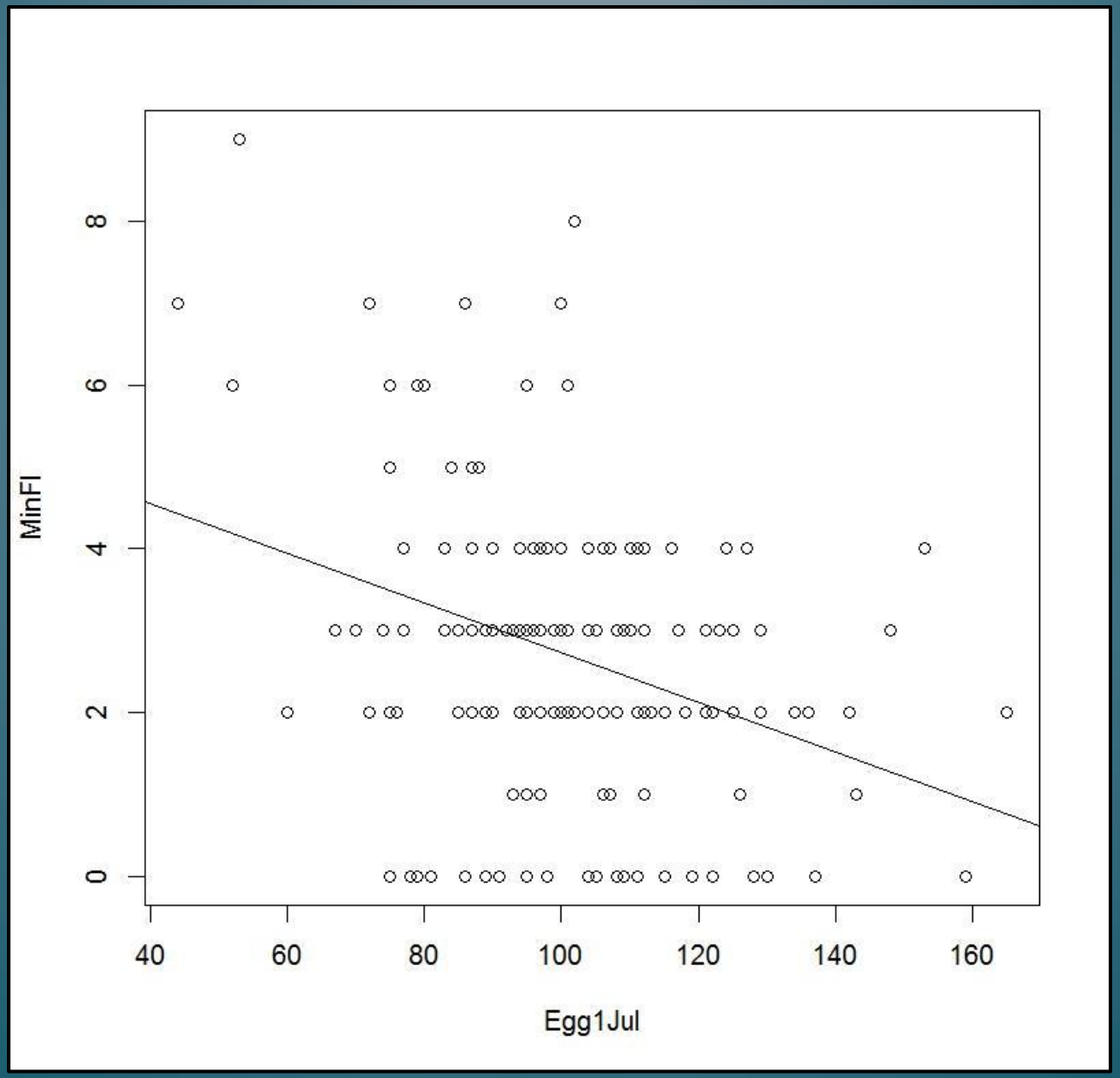
- ArcGIS - Moran's I test with residuals from multiple linear regression to assess spatial-temporal clustering
- General Least Squares (GLS) Regression – handles covariance between spatial & temporal variables
- Gaussian, exponential & spherical spatial correlation structures
- Compared models - AIC_c, model weights & evidence ratios

GLS Models Predicting Minimum # Fledglings/Pair/Year

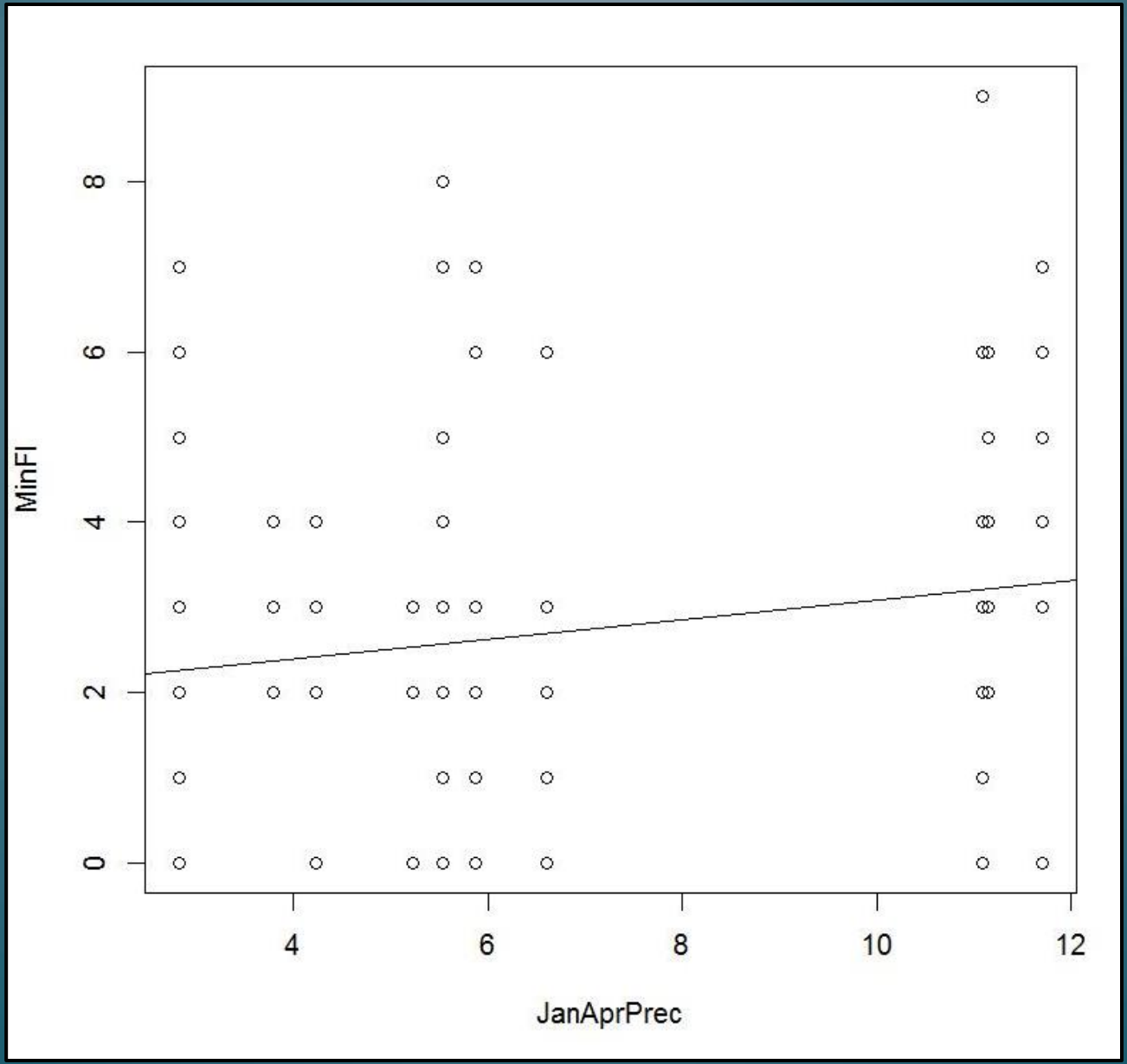
Models include Exponential Spatial-Temporal Correlation Structure

Model Parameters	K	Δ_i	ω_i	Evidence Ratio ω_i/ω_1
Year, Pair Density Occupied Cactus, PCorvids, Julian 1st Egg, Jan to Apr Precip, Min Jan & Feb Temp, Elevation, Topographical Heterogeneity, % Cactus 200m	**11**	**0.0000**	**0.9980**	
Year, Pair Density Occupied Cactus, Pcorvids, Julian 1st Egg, Jan to Apr Precip, Min Feb Temp, Max Mar & Apr Temp, Topographical Heterogeneity, Northness, % Urban 1km, % Cactus 200m	13	8.9990	0.0020	499.00
Year, # Territories, PCOHA, Julian 1st Egg, Jan to Apr Precip, Min Jan & Feb Temp, Max Mar & Apr Temp, Topographical Heterogeneity, Northness, % Slope, % Cactus 200m	13	13.1796	0.0004	2,495.25
Year, Pair Density Occupied Cactus, PCorvids, Julian 1st Egg, Jan to Apr Precip, Min Apr Temp, Max Apr Temp, Elevation, Topographic Heterogeneity, Northness, % CSS 1km, % Urban 1km, % Cactus 200m	15	21.4090	0.0000	24,952.50
Year, Pair Density All Cactus, PAll Predators, Julian 1st Egg, Biological Rainfall Yr, Min Jan & Feb Temp, Max Mar & Apr Temp, Elevation, Topographic Heterogeneity, Northness, % Slope, NDVI, % Cactus 25m	15	26.0594	0.0000	332,700.00

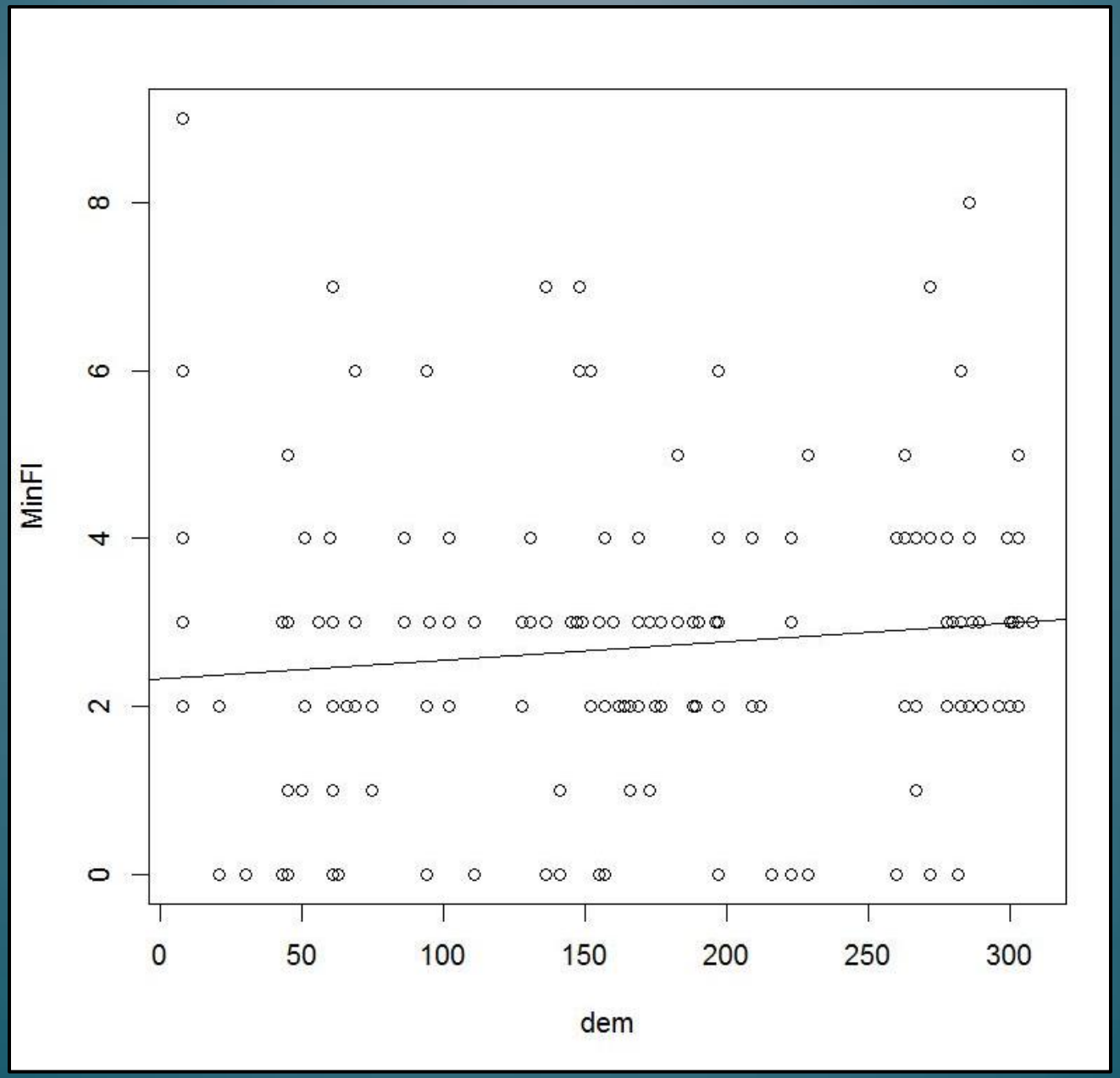
Minimum # Fledglings vs 1st Egg Lay Date



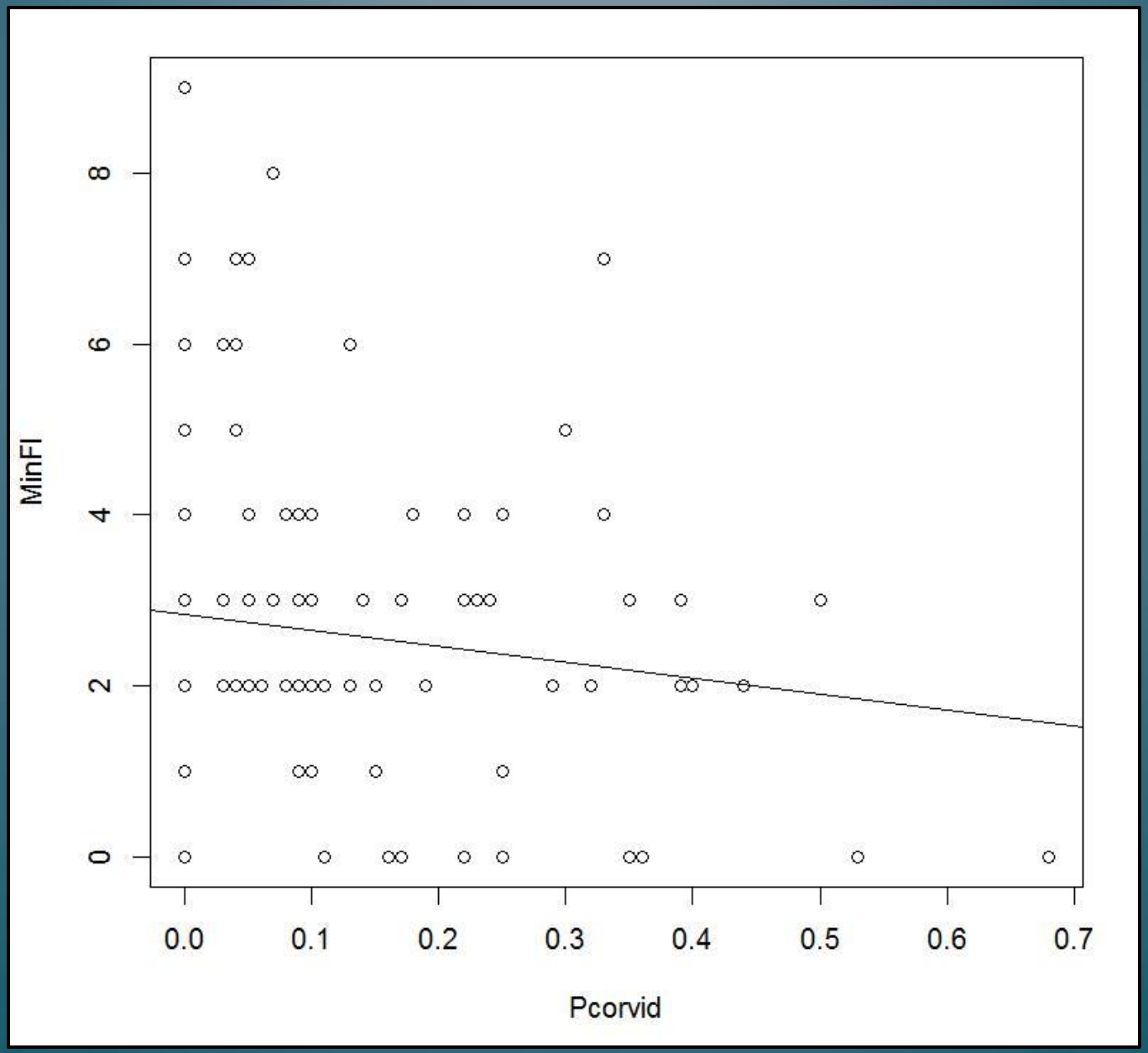
Minimum # Fledglings vs Jan to Apr Precip



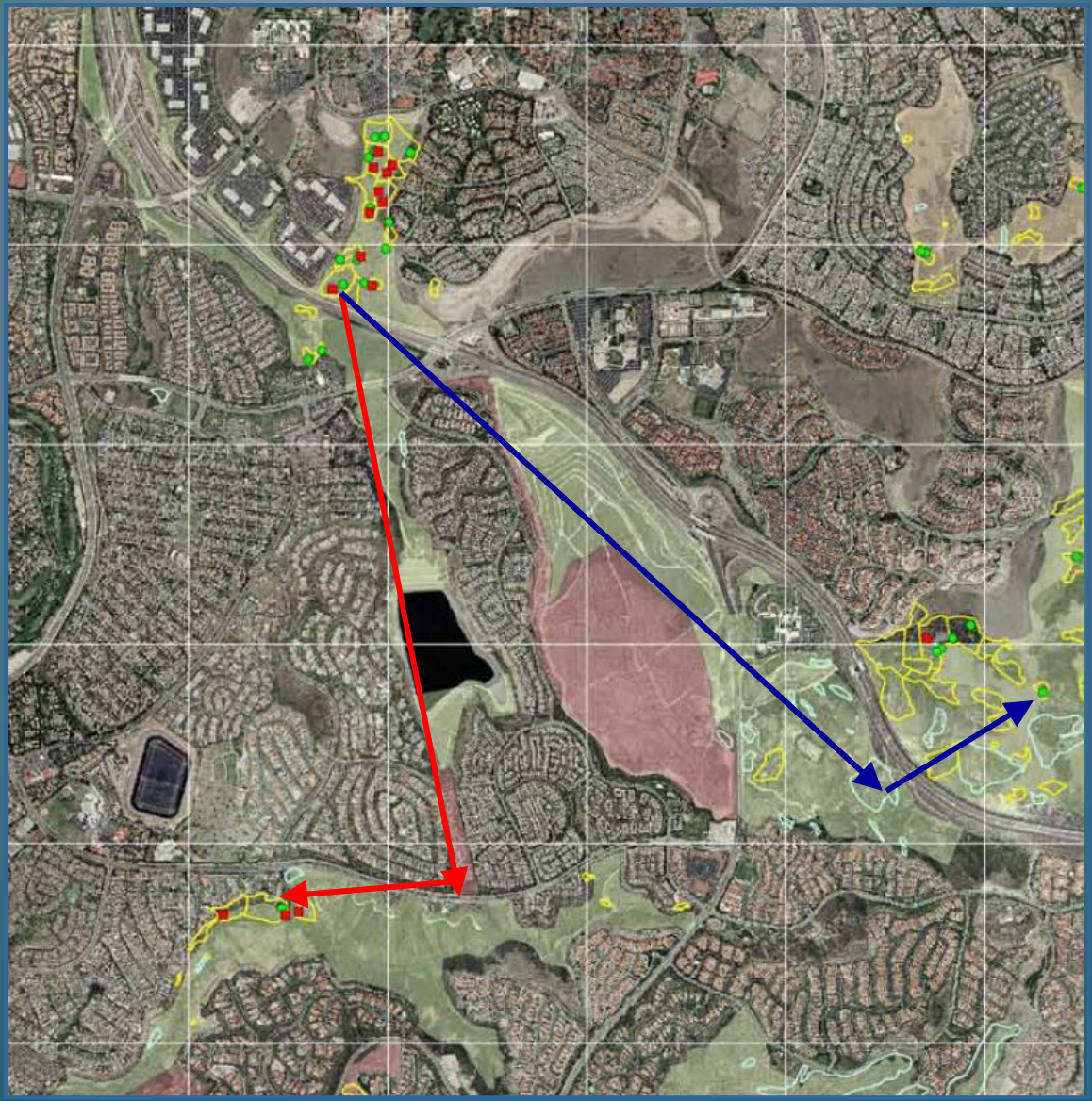
Minimum # Fledglings vs Elevation



Minimum # Fledglings vs Proportion of Visits Corvids Detected

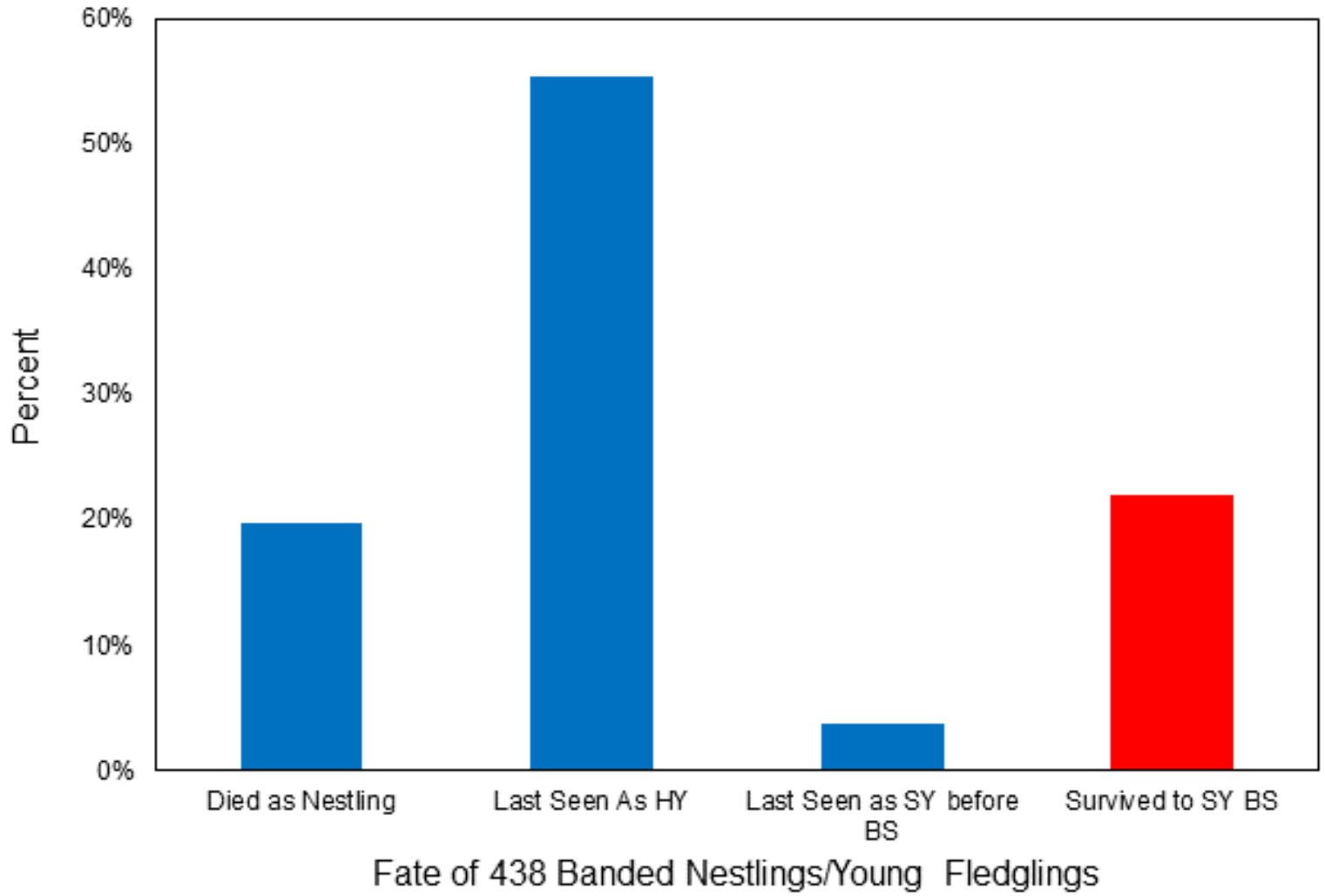


How Well are Wrens Surviving, Dispersing & Recruiting as Breeders?



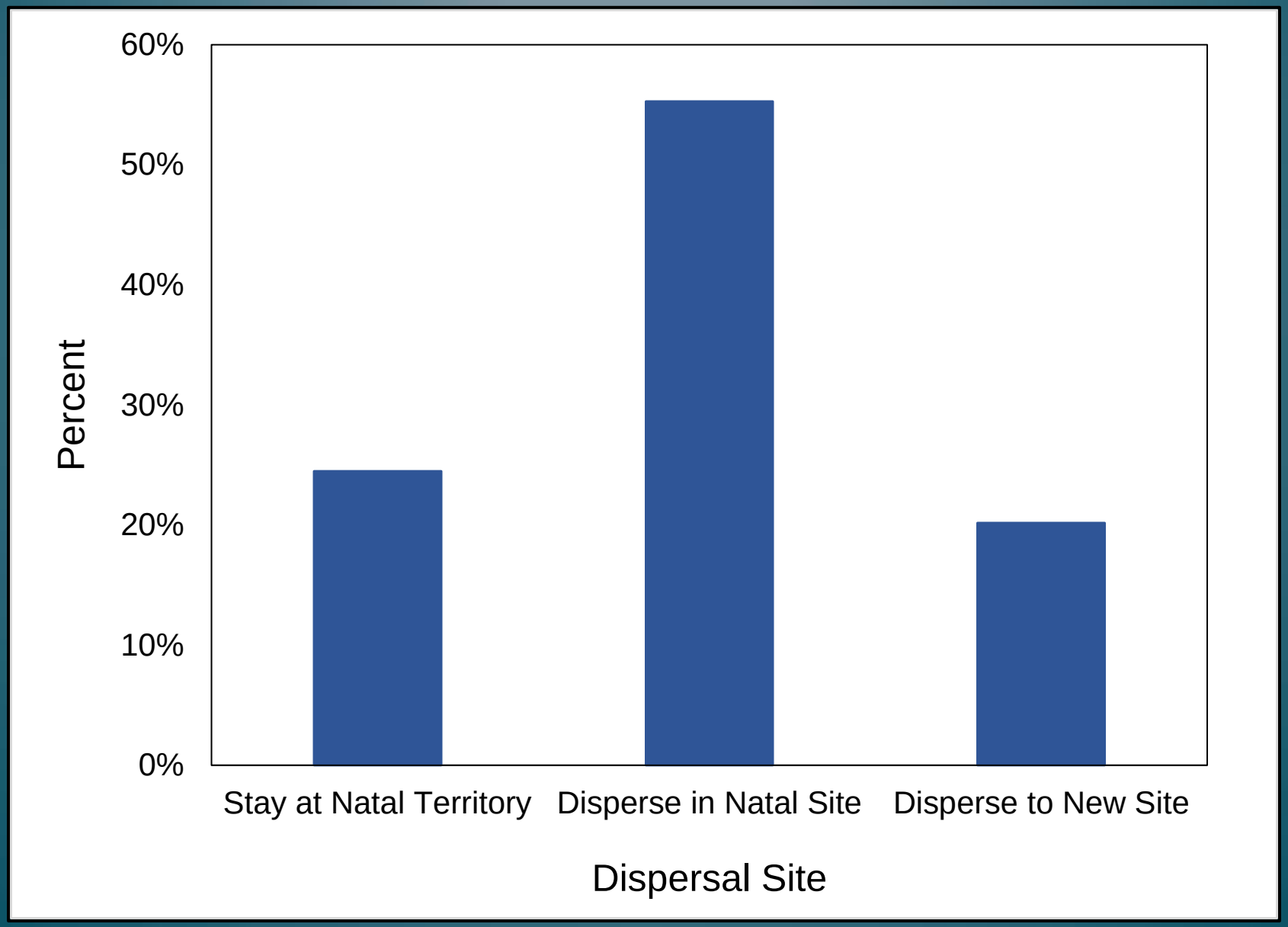
Fate of 438 Wrens Banded as Hatch Years (HY)

Only 22% survive to breeding season (BS) in Second Year (SY)



Where Do SY Wrens Disperse To?

~80% of surviving young remain at natal site



Juvenile Recruitment into Breeding Population

- 90% of banded HYs surviving to next BS obtained territories
- 32% were "floaters" prior to getting territory
- 85% obtained mate
- 80% of 60 banded HYs known to attempt breeding during SY or later were successful

Adult Dispersal, Divorce & Death

- 68% of banded adults "died" during study
- 12 (13%) cases of "divorce" among banded adults
- 20 (21%) adults moved to new territory at same site as 1st
- 7 (7%) adults moved to new territory at new site

Photo Joshua Sudock,OC Register

Adult Dispersal Distances

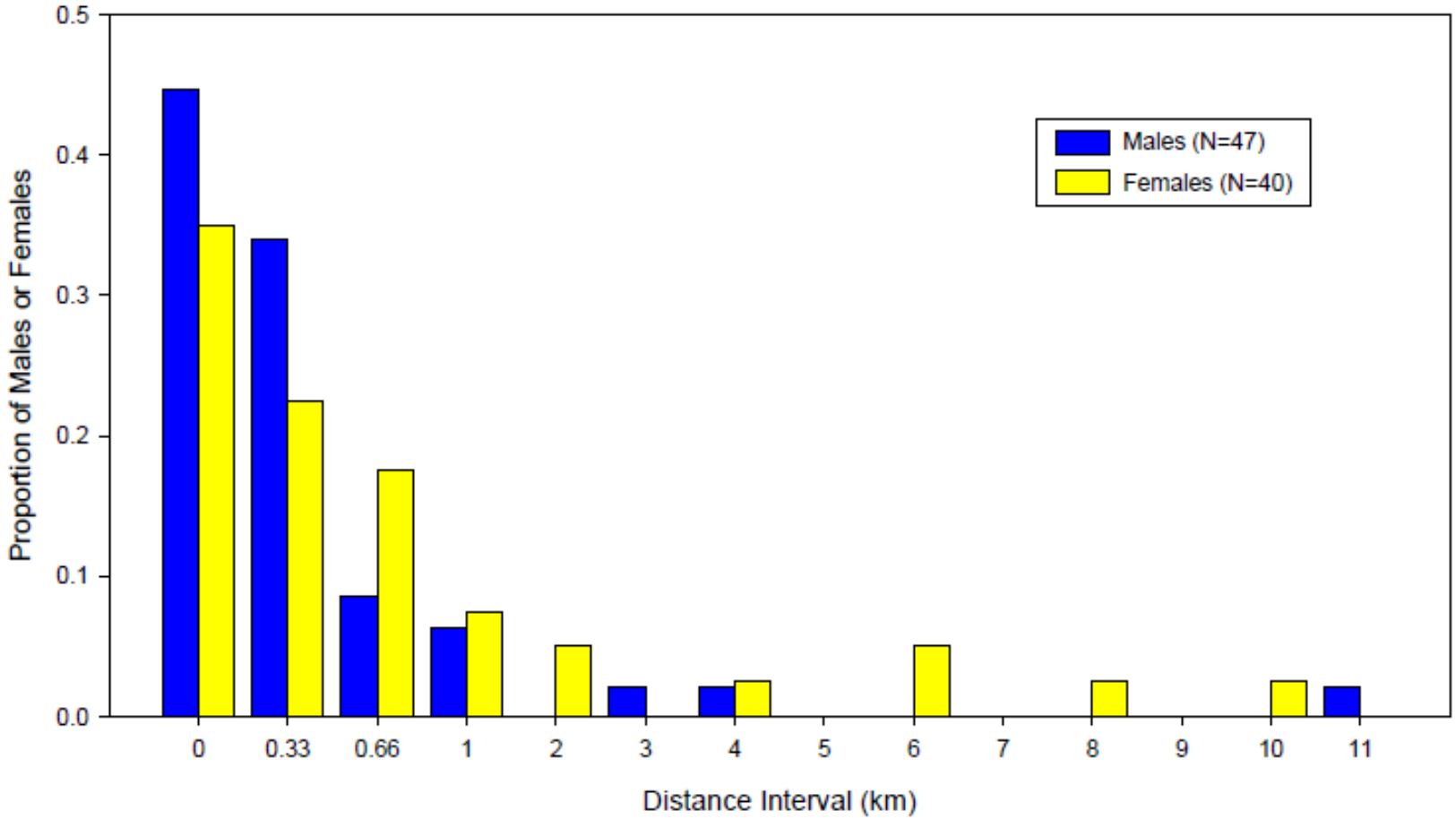
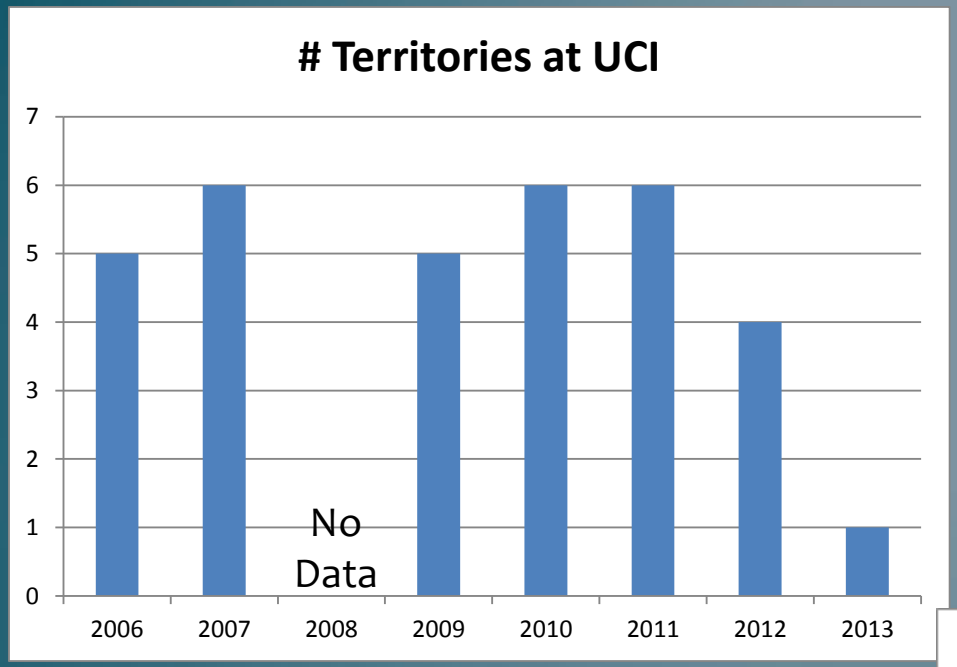
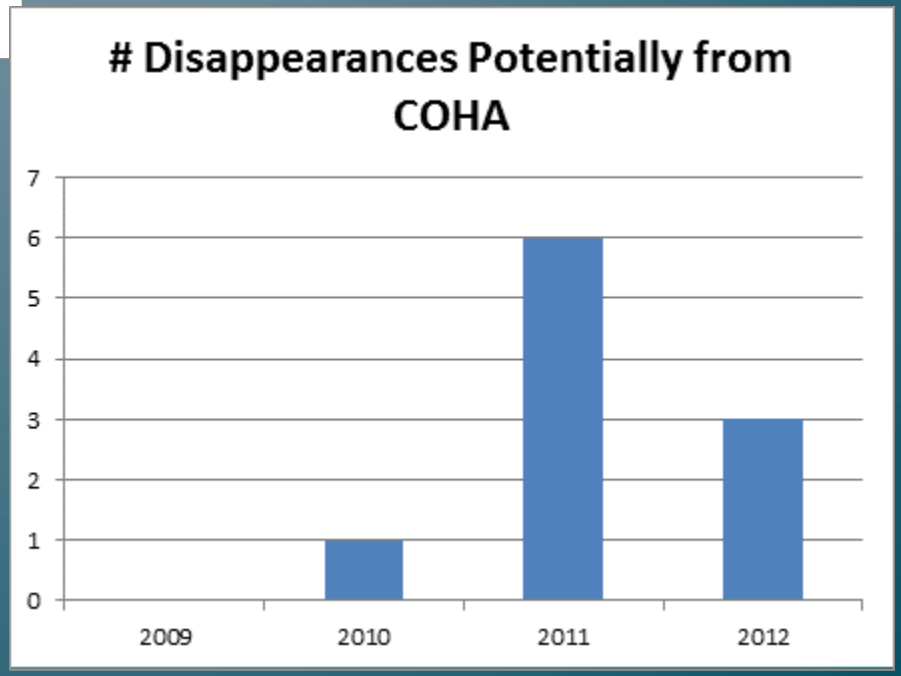


Figure 5. Dispersal distances of resighted male and female banded Cactus Wrens on the coastal and central NCCP/HCP lands in the Nature Reserve of Orange County's 2012 wren studies. The data includes only known males and females banded prior to 2012. Indicated distances represent the upper value of each distance interval. Note 78.7% of the males were resighted within 0.33 km from the original territory where they were banded and 57.5% of the females were resighted within 0.33 km.

EXAMPLE OF SMALL POPULATION VULNERABILITY





Habitat Quality & Food Limitation?

Habitat Quality & Food Limitation?

Conclusion – Factors Affecting Productivity

- Productivity low & associated with time of egg laying, Jan-Apr rainfall, elevation & corvids
- Corvid impacts vary by territory
- Nest predation moderate, nestling survival to fledging = 80%
- Floater strategy to recruit into breeding population (could result in polygyny & helpers at nest)
- Food appears important
- Habitat quality could affect productivity (exotic annual grasses & shrub/vine overgrowth)

Conclusion - Threats to Population Persistence

- Low productivity especially with droughts
- Fledgling/juvenile survival low, only 22% survive to next breeding season
- Predation of adults & young can be high, especially by Cooper's hawk
- High predation combined with low productivity can rapidly ↓ small populations
- Poor dispersal can limit population recovery & has implication for genetics

Genetic Structure in the Cactus Wren in Southern California: Subspecies Delineations and Implications for Population Management

Amy Vandergast
Barbara Kus
Kelly Barr
Kristine Preston

Western Ecological Research Center
San Diego Field Station

U.S. Department of the Interior
U.S. Geological Survey

Cactus Wren Genetics Study

- This presentation highlights only a few results from the USGS coastal cactus wren genetic study, the lead authors have many more detailed results

- The study was initiated as a result of a Connectivity Workshop & Strategic Plan developed by SDMMP for SDC & funded by San Diego Association of Governments

- The genetic work was extended to entire region with support from CDFW, NROC

Connectivity Monitoring Strategic Plan
For the San Diego Preserve System

Prepared for the San Diego Environmental Mitigation Program Working Group

January 11, 2011

The study can be downloaded from:

http://www.sdmmp.com/reports_and_products/Reports_Products_MainPage.aspx

USGS

Project Objectives

Goal:

To evaluate the degree of connectivity among coastal Cactus Wren populations in southern California

Objectives:

- Use microsatellite markers to evaluate within- and among-population genetic variability of coastal Cactus Wrens
- Color banding/resighting of Cactus Wren nestlings/fledglings to investigate juvenile dispersal patterns and behavior

USGS

Genetic Analyses

- Developed 26 microsatellite loci, genotyped 349 individuals

1. Identify gene pool/population boundaries.

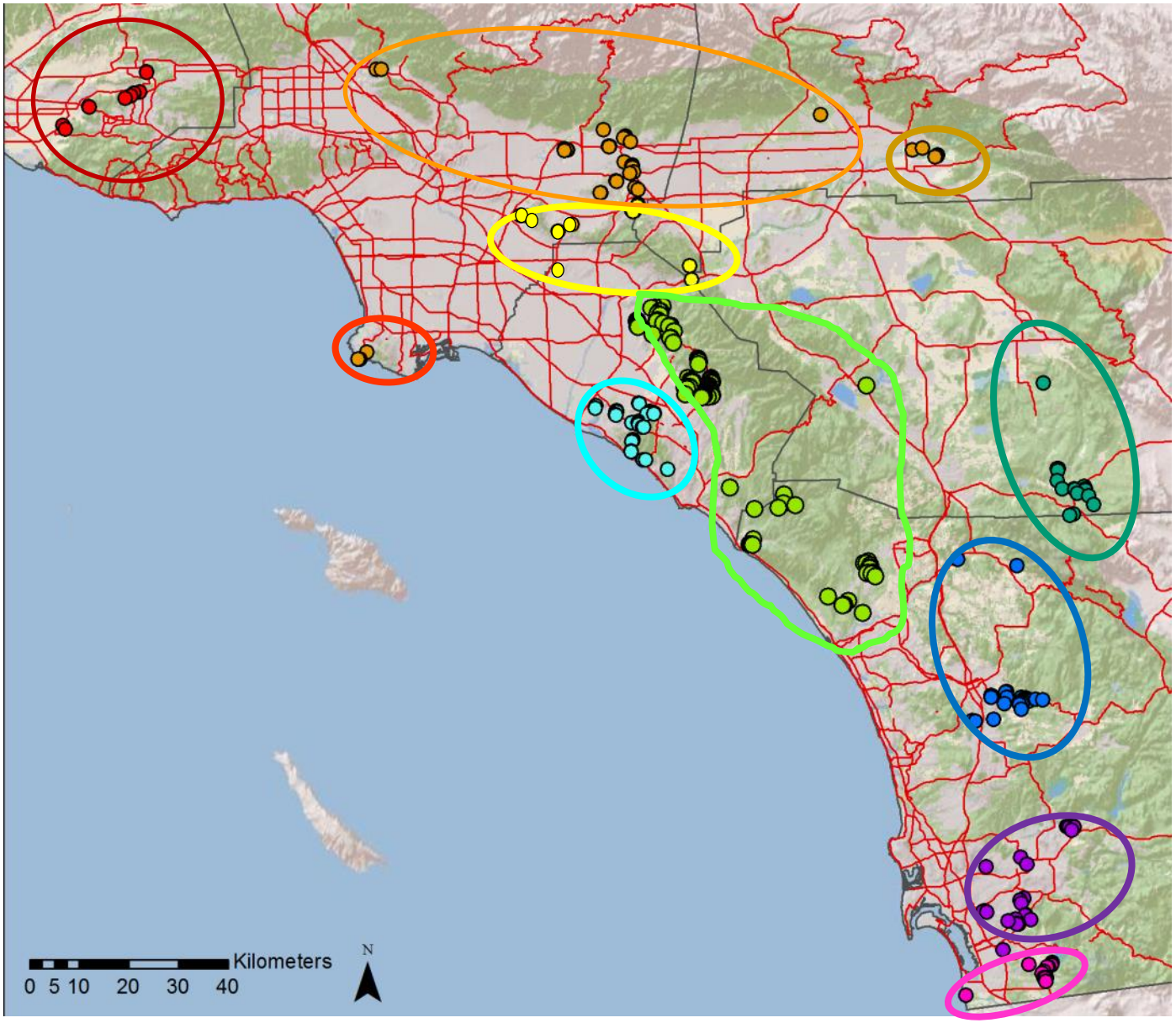
2. Are there limitations to movement and gene flow?

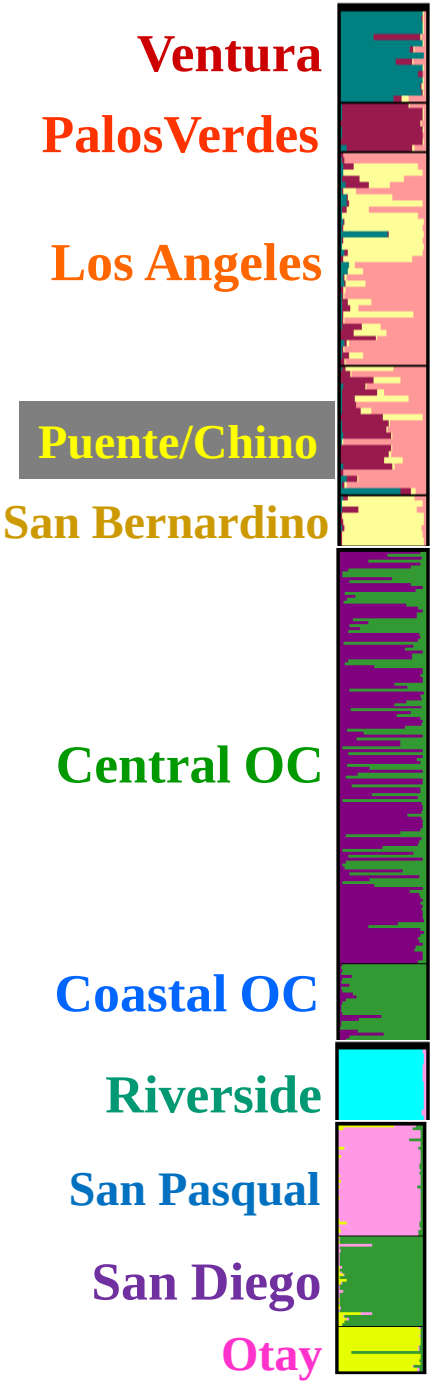
3. Measure the genetic diversity within aggregations, test for recent reductions in population size, environmental correlates.

4. Assess whether there is a genetic break concordant with *sandiegensis* subspecies boundary.

USGS

11 Genetic Clusters





NROC & SDC Populations

NROC

- Central Reserve is connected to northern SDC
- Coastal Reserve is isolated

SDC

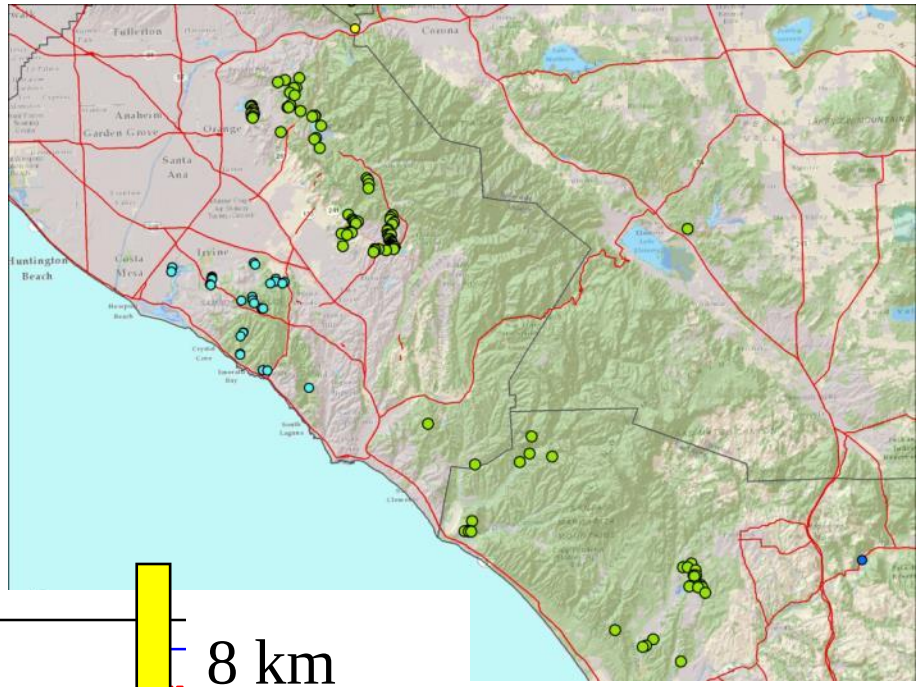
- Northern population is connected to OC
- Central San Pasqual population is isolated
- Two southern populations (Otay & Sweetwater-El Cajon) while close together are showing little recent gene flow

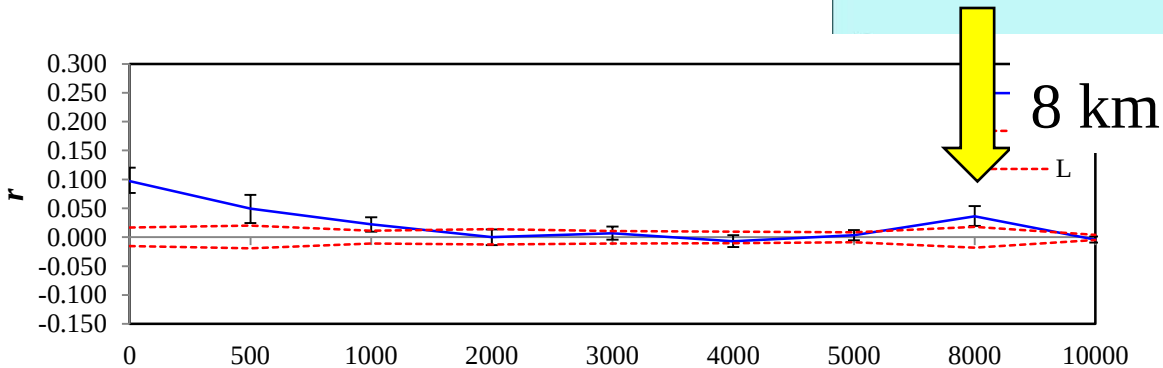
USGS

Spatial Autocorrelation Analysis:

- Plot the genetic relatedness among individuals grouped at different distance classes
- Positive observed values (blue) indicate that individuals are more similar genetically than by chance alone (red dashed lines)

Central OC





NROC Dispersal Data & Genetic Results

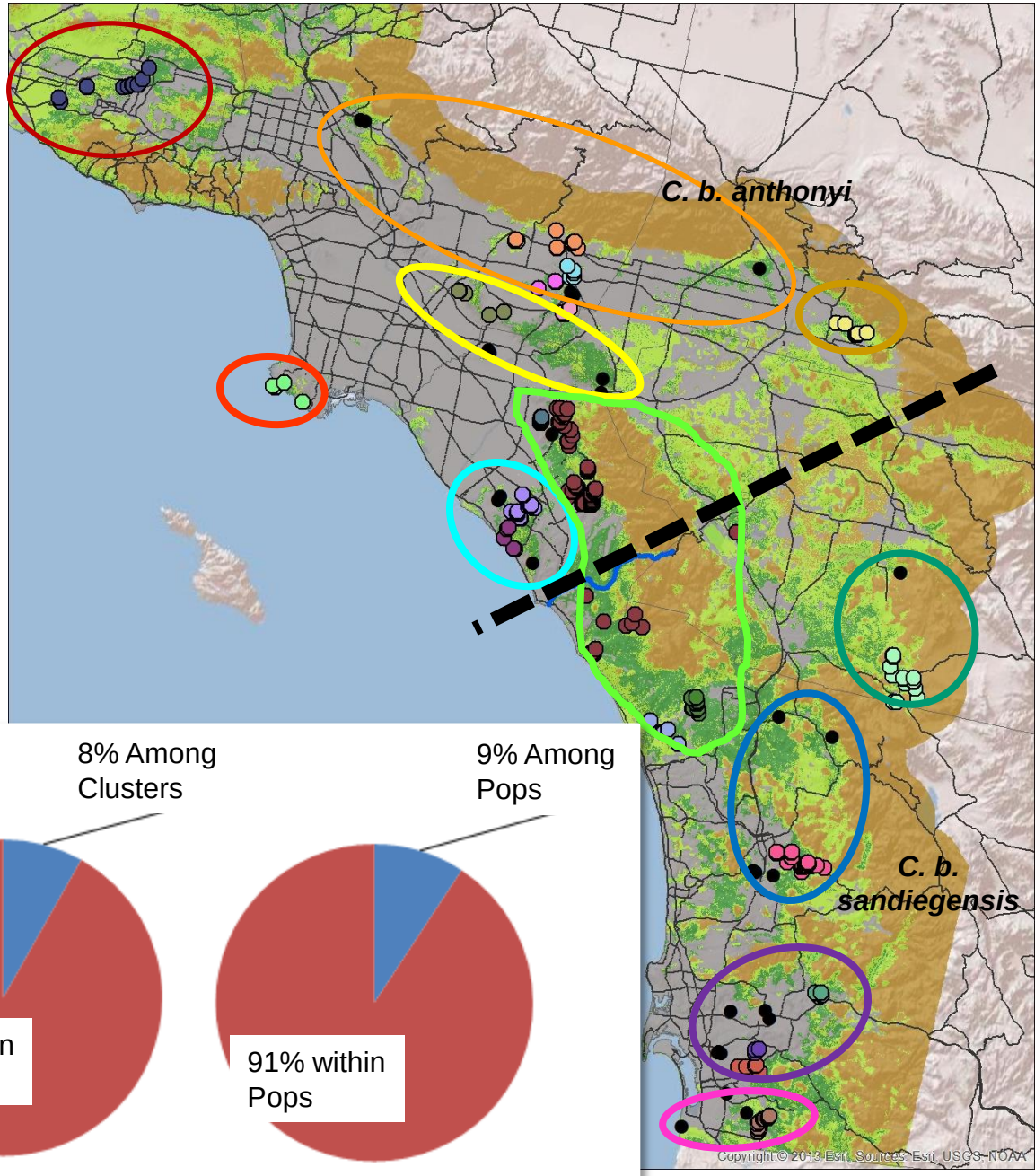
- NROC monitoring - only 20% young dispersed beyond natal site
- 7% Post-breeding adults move to new site
- Maximum dispersal ~8-10km
- Genetic study - two peaks of gene flow:

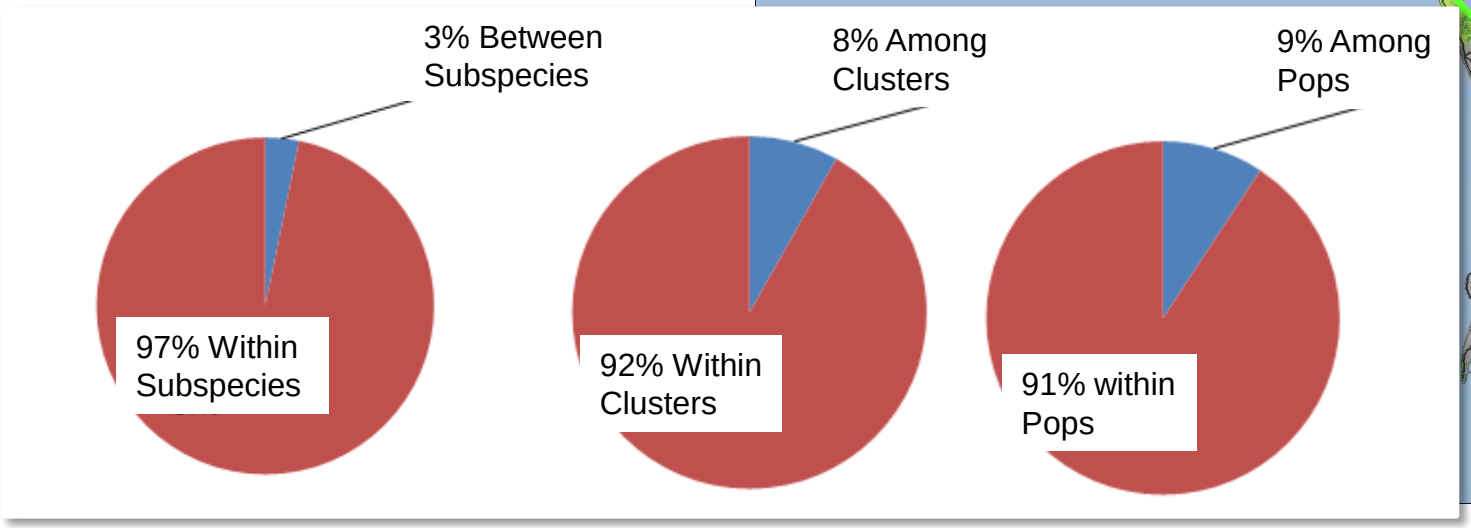
  <1000m & 8-9km

USGS

Microsatellites and *C. b. sandiegensis*

- No desert populations sampled.
- Putative boundary at San Juan Creek (Rea and Weaver 1990)





Summary & Implications

1. Coastal cactus wrens - genetically structured into 11 genetic clusters (& further subdivided into 20 populations)
2. Genetics agree with NROC monitoring results that dispersal is limited
3. Current subspecies designation is not supported by the genetic population structure
4. Currently, only b. c. sandiegensis is considered a CDFW Species of Special Concern
5. Implications for conservation of LA, Ventura & San Bernardino populations in the southern CA “metapopulation”
6. Results indicate until relatively recently cactus wren clusters were more connected & management is important to restore connectivity

USGS

Unresolved

- 3 previous range-wide genetic studies using mtDNA sequence divergence (deeper phylogenetic history) found:
  - no genetic differences in US/Mexico except for a Baja subspecies
  - some signals of isolation by distance among coastal aggregations
- How do the California desert populations fit into this scheme?

USGS

ACKNOWLEDGMENTS

San Diego Monitoring and Management Program
US Fish & Wildlife Service
California State Parks & Recreation
California Department of Fish & Wildlife
CalTrans
CACW Working Group
Conservation Biology Institute
The Nature Conservancy
Center for Natural Lands Management
Bureau of Land Management
AECOM
City of San Diego
County of San Diego
City of Chula Vista
San Diego Gas & Electric
San Dieguito River Park
San Dieguito River Valley Conservancy
Pala Band of Mission Indians
Helix Water District
San Diego National Wildlife Refuge
San Diego Zoo Institute for Conservation Research
Fallbrook Naval Weapons Station
Marine Corps Base Camp Pendleton
San Diego Audubon Society
Sweetwater Authority
City of Carlsbad
City of Escondido
Santa Ana Watershed Association
Many Private Landowners

Riverside County Parks
W. Riverside Co. Regional Conservation Authority
Riverside Co. Habitat Conservation Authority
Riverside Co. Economic Development Agency
W. Riverside Co. MSHCP
Outdoor Resorts Rancho California, Inc.
Audubon California Starr Ranch Sanctuary
City of Irvine
Irvine Ranch Conservancy
Crystal Cove State Park
Orange County Parks
Southern California Edison Viejo Conservation Easement
UC-Irvine Ecological Preserve
City of Fullerton
Orange Co. Water District
San Bernardino Co. Flood Control District
San Bernardino Co. Water Conservation District
San Bernardino Co. Dept. of Public Works
San Bernardino Valley Municipal Water District
Vulcan Materials Company
North Etiwanda Preserve
City of Los Angeles, Dept. of Recreation and Parks
County of Los Angeles, Dept. of Parks and Recreation

Palos Verdes Peninsula Land Conservancy
Puente Hills Habitat Preservation Authority
City of Glendora
City of Diamond Bar
City of San Dimas
City of Whittier
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California State University, Channel Islands
City of Moorpark
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City of Thousand Oaks
Conejo Recreation and Parks District

Field Crew

NROC: K. Moore & D. Kamada

USGS: K. Allen, L. Allen, K. Ferree, A. Houston, S. Howell, S. Lynn, M. Madden, R. Pottinger, T. Dixon, P.J. Falatek , A. Gallagher, M. Lipshutz, S. Nichols, J. Pietrzak, A. Shipley, A. Winters

USGS SANDAG NATURE RESERVE of ORANGE COUNTY Protecting our natural resources for future generations U.S. FISH & WILDLIFE SERVICE CALIFORNIA STATE PARKS SINCE 1864 CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

What actions are being taken to halt the decline of coastal cactus wrens?

Photo Joshua Sudock, OC Register

Cactus Scrub Restoration

- Takes many years for cactus to grow & become suitable for wrens
- Cactus scrub restoration benefits both wrens & federally-threatened California Gnatcatcher

Photo Kris Preston

NROC Cactus Restoration Projects			
	Year	Type of Restoration	Acres Restored
Laguna Canyon Linkage	2009	Cactus Pads	4
Laguna Canyon Linkage	2011	Large Cactus & Pads	1
Bonita Creek Corridor	2010	Cactus Pads	3
UCI Ecological Preserve	2010 & 2011	Large Cactus & Pads	12.5
Whiting Ranch Wilderness Park	2011	Large Cactus & Pads	4
Crystal Cove State Park	2011	Large Cactus & Pads	2
Total Restored			26.5

NROC Restoration Team

NewFields LCC – restoration ecologists

Nakae & Associates – restoration contractors

Funding & Support

CDFW, CALTRANS (EEMP), Orange County Transportation Authority, City of Lake Forest & NROC

Example of a site to be restored
Photo Kris Preston 2010

Before

After

Donor Site

Clearing site for planting

Photos Donna Eto, NewFields LCC

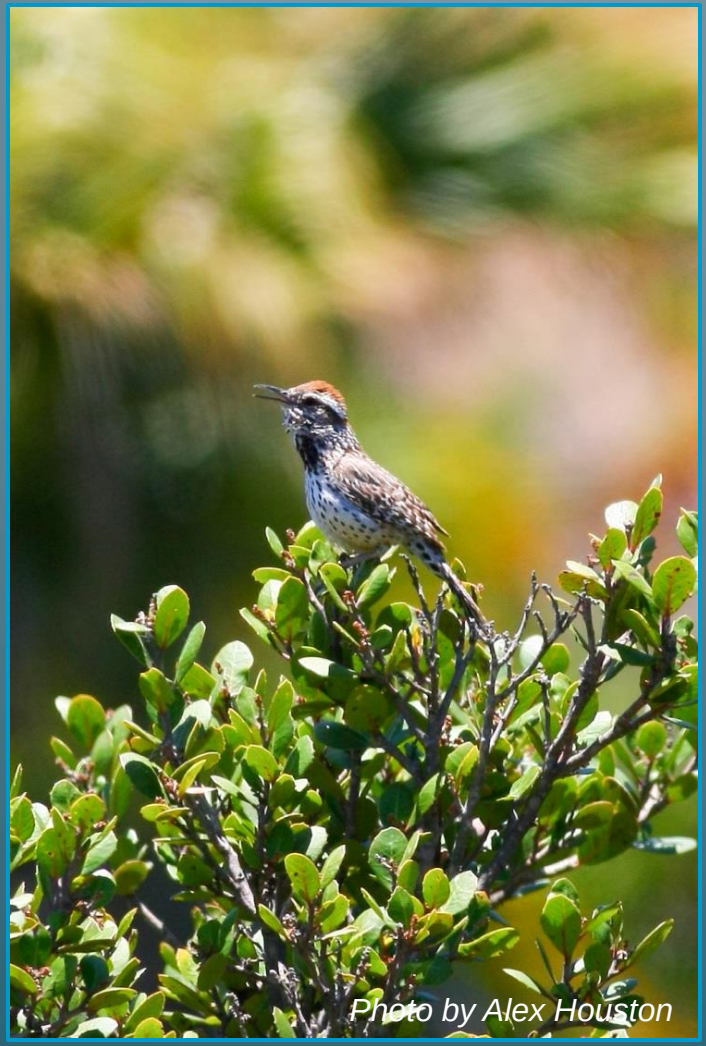
Planting cactus

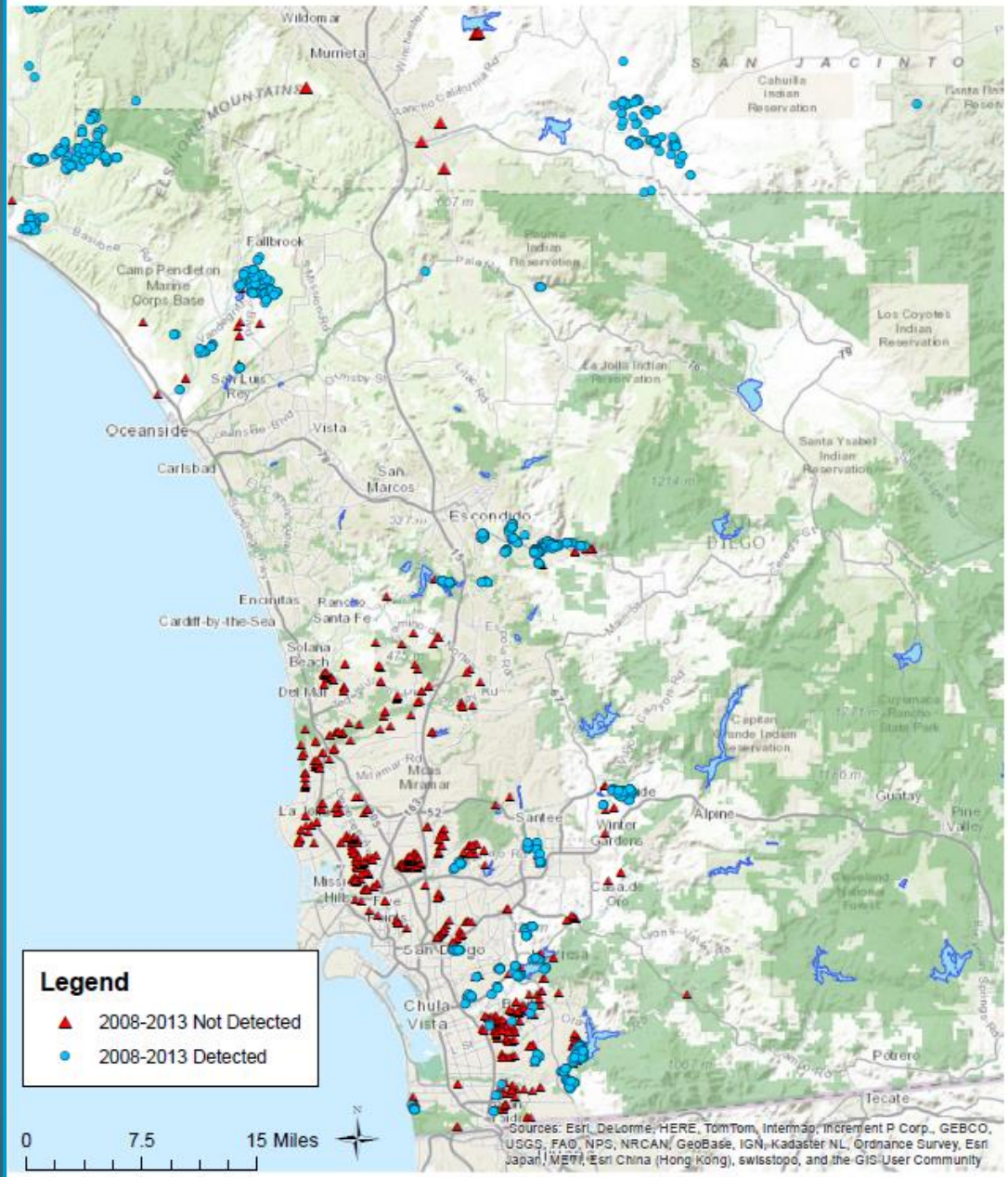
Photos Donna Eto, NewFields LCC

Photos NewFields

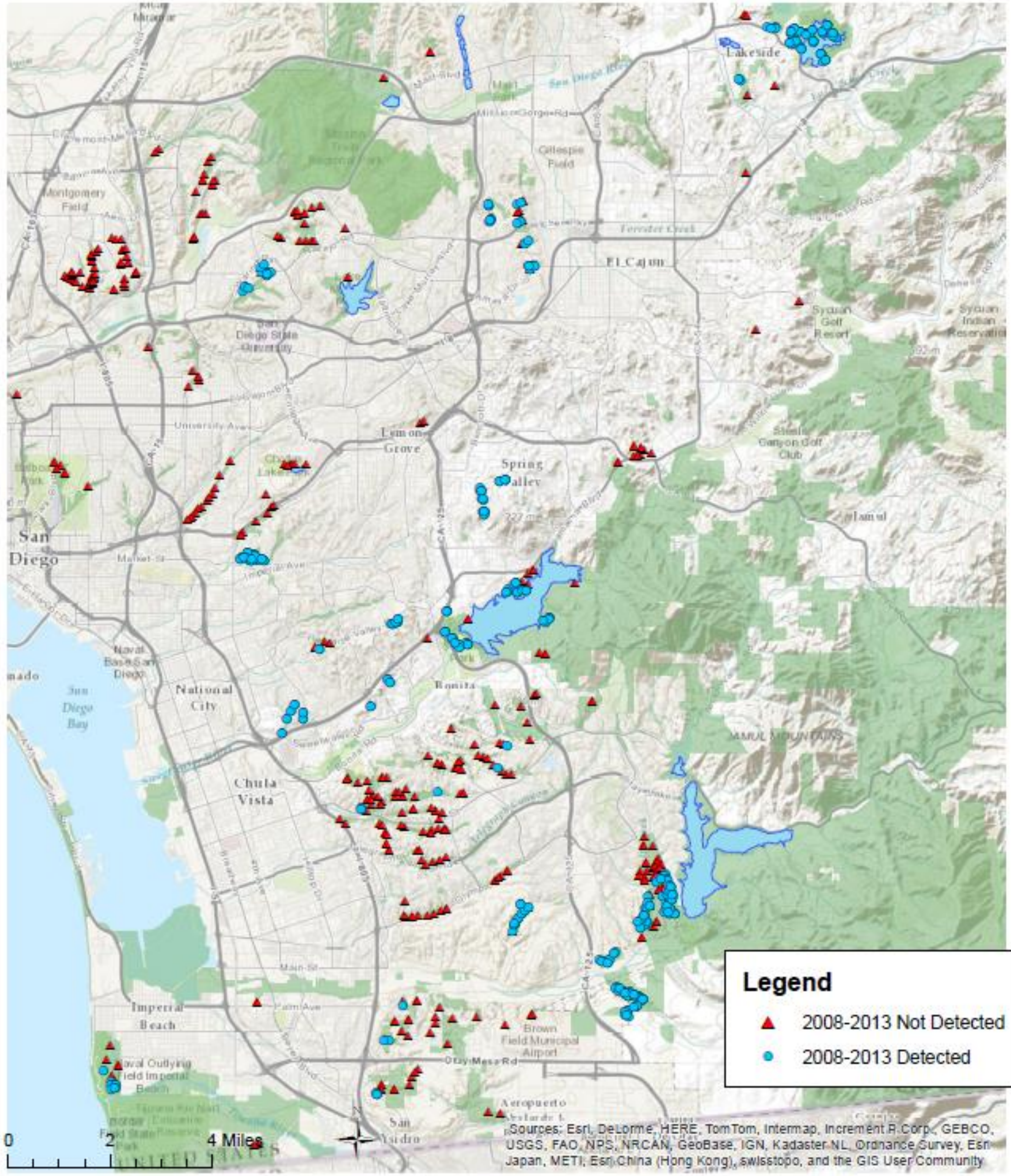
Cactus Wren can nest in large cactus not long after transplant
Photo NewFields

Current Status of Coastal Cactus Wren in SDC and Using What We Have Learned to Move Forward with Management





San Diego County Locations Where Coastal Cactus Wren were Detected and Not Detected 2008-13

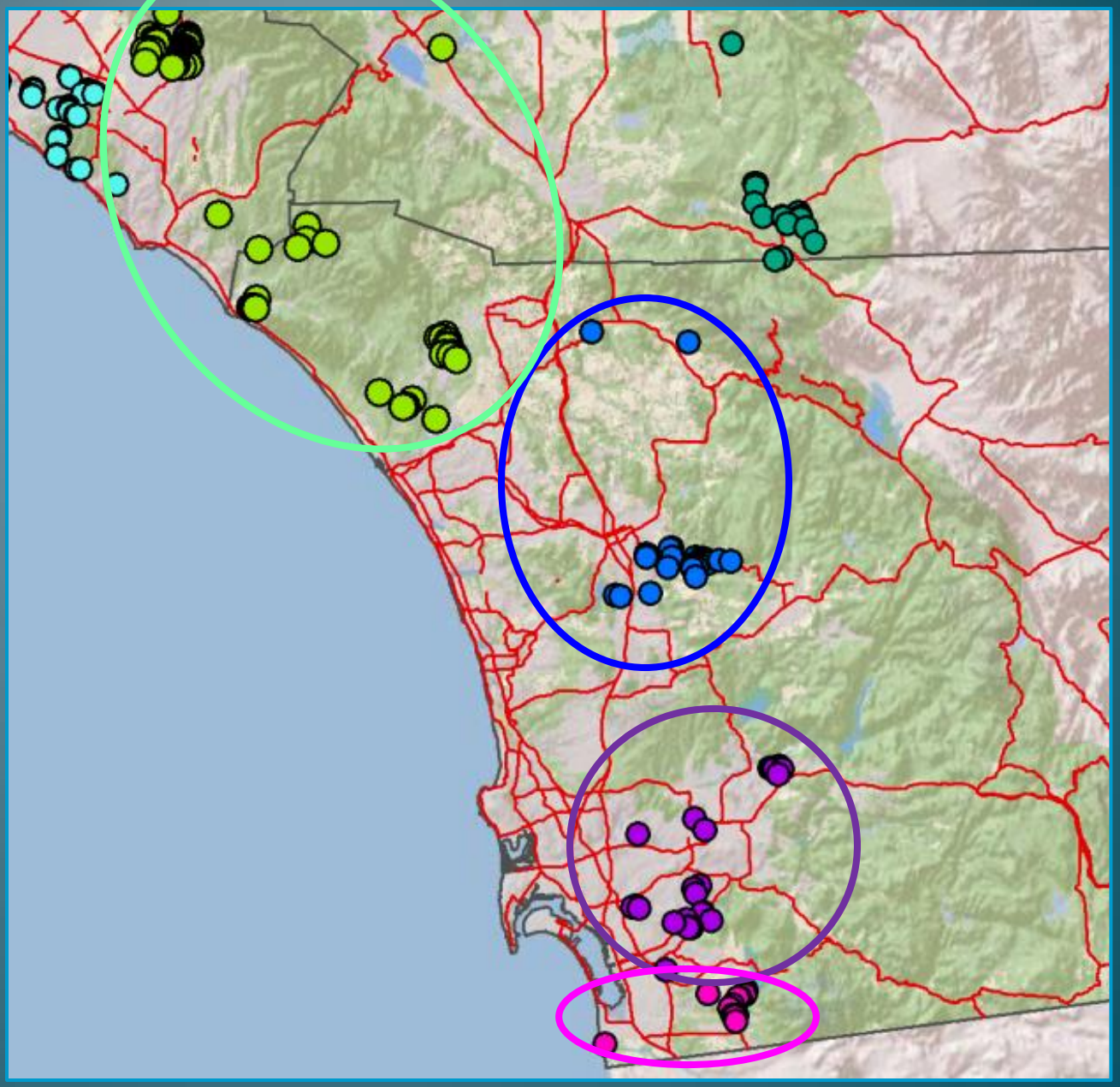


San Diego County Locations Where Coastal Cactus Wren were Detected and Not Detected 2008-13

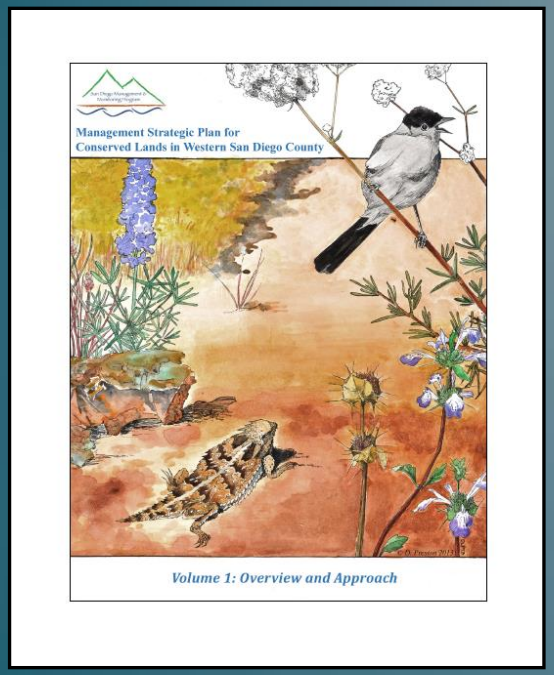
SDC Genetic Clusters

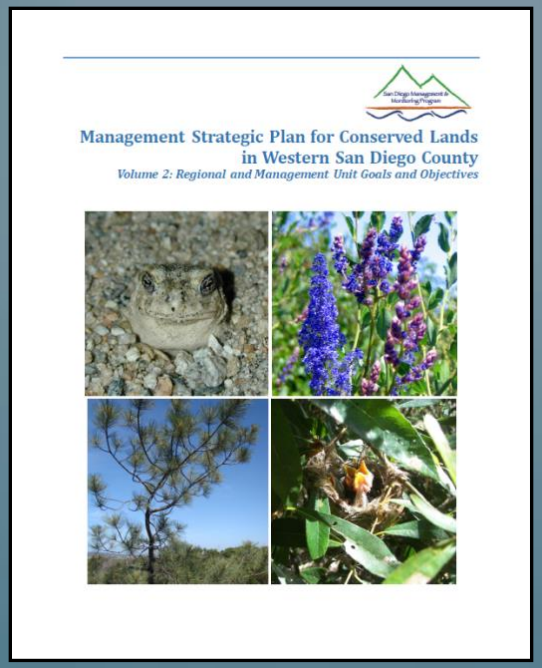
Concerned about two southern most Clusters

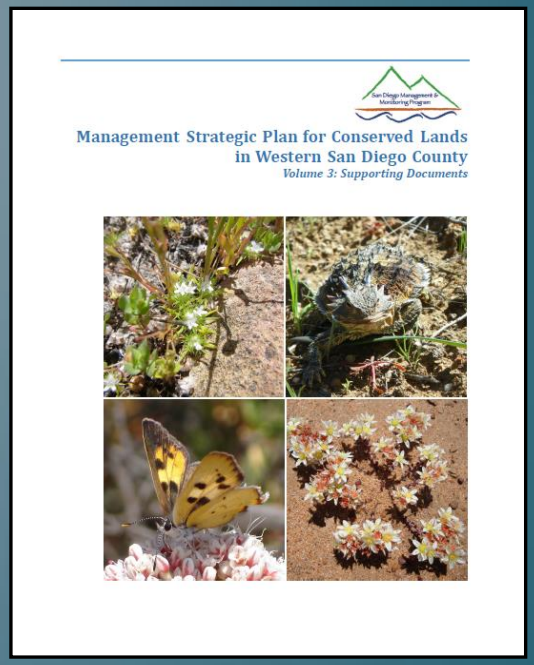
Should we try To restore Connectivity?



Management Strategic Plan







http://www.sdmmp.com/Management_Strategic_Plan.aspx/

San Diego Management &
Monitoring Program

PURPOSE OF THE STRATEGIC PLANS

Identify Actions that are needed to: ensure the persistence of identified species; maintain ecosystem process; and maintain healthy natural communities in an efficient and integrated manner across the western San Diego County preserve system

VOL 2., SEC. 2.2- SPECIES MGMT. FOCUS GOALS & OBJECTIVES –COASTAL CACTUS WREN

TNC & SDMMP are currently developing a cactus scrub restoration plan for south SDC

Table 2-2.9. Management goals and objectives for coastal cactus wren.

Regional Management Goal: Protect and enhance suitable cactus scrub and coastal sage scrub habitat within and between the recently identified coastal cactus wren genetic clusters to increase the effective occurrence size to a sustainable level (e.g. 50/500; see Vol. 3, Section 5), provide habitat connections to allow for movement within genetic clusters and potentially between the San Diego/El Cajon and Otay genetic clusters, and prioritize management in areas with low predation pressures to provide for coastal cactus wren persistence in the strategic plan area over the long-term (>100 years).

MU3 Management Goal: Protect and enhance suitable cactus scrub and coastal sage scrub habitat within the Otay River and San Diego/El Cajon genetic clusters to expand the occurrences to a sustainable effective size to avoid inbreeding (see Vol. 3, Section 5), enhance habitat connectivity throughout the Otay River Valley, and potentially connect this occurrence to the San Diego/El Cajon genetic cluster (depending on results of the in-progress study on historic genetic structure) to provide for coastal cactus wren persistence in the strategic plan area over the long-term (>100 years).

MU4 Management Goal: Protect and enhance suitable cactus scrub and coastal sage scrub habitat within the San Diego/El Cajon genetic cluster to expand the occurrence to a sustainable effective size to avoid inbreeding (see Vol. 3, Section 5) and enhance habitat connectivity within the genetic cluster to provide for coastal cactus wren persistence in the strategic plan area over the long-term (>100 years).

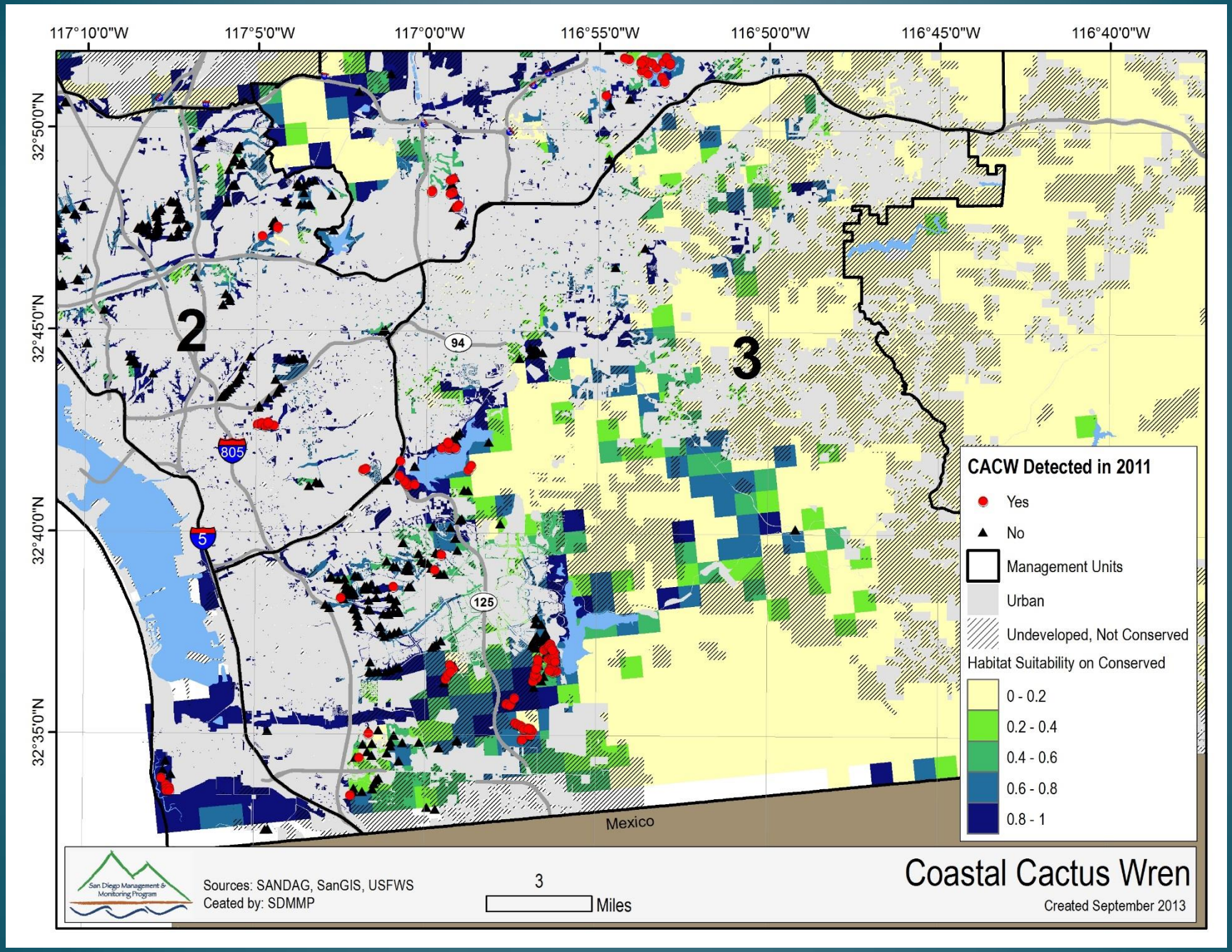
MUs 5 and 6 Management Goals: Protect and enhance suitable cactus scrub and coastal sage scrub habitat within the San Pasqual genetic cluster to expand the occurrence to a sustainable effective size to avoid inbreeding (see Vol. 3, Section 5) and enhance habitat connectivity within the genetic cluster to provide for coastal cactus wren persistence in the strategic plan area over the long-term (>100 years).

Type	Objectives	MUs	Actions
PIP; Regional	In 2014, prepare an implementation plan for enhancing and restoring cactus scrub habitats on Conserved Lands in MUs 3 and 4 in order to expand the Otay and San Diego/El Cajon cactus wren genetic clusters and enhance connectivity.	3,4	• Use the historic genetic analysis to determine if connectivity should be restored between the San Diego/El Cajon and Otay genetic clusters to enhance genetic diversity and reduce the potential for inbreeding, and to increase resilience to demographic stochasticity. • Construct dynamic occurrence viability models incorporating the landscape matrix of urban development and natural lands, habitat suitability and existing cactus scrub, fire risk, and wren occurrences, demography and dispersal capabilities. Use this model to compare alternative restoration scenarios connecting and enhancing cactus scrub habitat for the San Diego/El Cajon and Otay River genetic clusters in MUs 3 and 4. • Conduct site visits to potential cactus scrub enhancement and restoration sites and collect information on current wren occupancy, condition of cactus scrub, cover of invasive plant species, potential threats, and identify management needs. Map suitable areas for cactus scrub enhancement and restoration that avoid impacting sensitive plant and animal species. • Prioritize suitable habitat for enhancing and restoring cactus scrub to expand the occurrence and to increase connectivity within genetic clusters. • If it is determined by the historic genetics study that connectivity should be improved between the San Diego/El Cajon clusters, evaluate and prioritize sites for restoration between these genetic clusters that would enhance connectivity.

VOL 2., SEC. 2.0- SPECIES MGMT. FOCUS GOALS & OBJECTIVES – SO SPECIES EX. COASTAL CACTUS WREN

Photos Alex Houston

Type	Objectives	MUs	Actions
	(continued from previous page)		• Identify cactus sources that can be salvaged for transplanting of pads and entire plants into restoration and enhancement. Identify sites for harvesting vegetative cuttings that can be grown at the cactus nursery and later planted as entire plants or segments at the restoration and/or enhancement sites. • Specify BMPs for cactus harvest and salvage, cactus scrub restoration, restoration site selection, restoration and maintenance. • Develop ASMDs to reduce the exotic/invasive plant cover and to provide bare ground for foraging cactus wrens. • Develop ASMDs to reduce predation pressure and other threats to cactus wrens. • Prepare an implementation plan that takes into account the above factors and specifies total acreage and prioritized locations for restoration and enhancement of cactus, source material including availability of large cactuses, reduction of predation pressures, elimination of riparian and urban runoff from habitat historically xeric areas to reduce predation pressures and argentine ant occupation of cactus wren habitat, protection from wildfire, and decrease in invasive/exotic plant cover and creation open areas/bare ground.
NU; Regional	Starting in 2014, develop and maintain two cactus nurseries at approved facilities in MU3/4 and in MU6 and grow cactus pads, segments, and entire plants sufficient for restoration projects in the South County and the San Pasqual Valley as identified in cactus restoration implementation plans.	3,4,6	• Prepare a plan with specifications of BMPs for harvesting and growing cactus at a nursery in preparation for transplant into natural lands. • Develop and maintain a nursery for growing cactus harvested/salvaged from the MUs 2, 3, and 4 for use in restoration projects in the South County. The nursery should be set up to grow and supply cactus pads, segments and entire plants from locally harvested native cactus and the composition of species should reflect those found in that geographic area. • Develop and maintain a nursery for growing cactus harvested/salvaged from MUs 5, 6, and 8 for use in restoration projects in the North County. The nursery should be set up to grow and supply cactus pads, segments and entire plants from locally harvested native cactus and the composition of species should reflect those found in that geographic area. The amount and type of cactus will be determined by the South County implementation plan and by the ongoing restoration projects in the San Pasqual Valley. • Submit to the SC-MTX website portal the cactus nursery plans and annual reports documenting number, size class (pad, segment, entire plant), and type of cactus that were harvested by source site, planted at restoration sites, and that are at the nursery and available for planting.
FWP; Regional and/or Local	In 2014 and 2015, implement pre-fire management actions identified in the Strategic Fire Plan in order to reduce the effects of an altered fire regime on coastal cactus wrens and cactus scrub habitats on Conserved Lands in MUs 3, 4, 5, and 6.	3,4,5,6	• Perform pre-fire actions applicable to coastal cactus wrens and cactus scrub in the Strategic Fire Plan, including specific actions to protect cactus scrub from high intensity fires and recurrent fires. • Submit management data to the SC-MTX website portal.
IEX, RS; Local	In 2014 continue the ongoing cactus scrub restoration projects for the San Pasqual/Lake Hodges genetic cluster in MU6.	5,6	• Support cactus scrub restoration in the San Pasqual/Lake Hodges genetic cluster. • Support ongoing research into cactus wren abundance, habitat relationships, demographics, and response to restoration.
IIP, IEX; Regional and/or Local	In 2015, begin implementing high priority management actions identified in the implementation plan for the Otay and San Diego/El Cajon genetic clusters in MUs3/4 and continue to manage existing and restored cactus scrub habitat occupied by cactus wrens to allow for the continued growth and expansion of cactus by reducing invasive plant cover to ≤25% absolute cover, increasing the amount of bare ground to 50% cover, and removing predator opportunities and/or prioritizing management in areas with reduced predation pressure.	3,4,5,6	• Implement high priority management actions, including enhancing and restoring cactus scrub habitats as detailed in the implementation plan. • Implement ASMDs at existing occurrences to reduce the exotic/invasive plant cover and to provide bare ground for foraging cactus wrens. • Implement ASMDs at existing occurrences with high risk of predation to reduce predation pressure on cactus wrens.



Cactus Wren Habitat Suitability Maps to Inform Restoration Opportunities

Drought Concerns

- Concerned about impacts from prolonged drought, especially on southern most populations
- Low productivity combined with normal or ↑ mortality & lack of connectivity is great threat to southernmost Otay population
- Monitoring situation & developing contingency plans to try to maintain populations through the drought

Supplemental Feeding?

Irrigation & habitat enhancement?

In Closing

It truly takes the entire region to effectively conserve, monitor & manage coastal cactus wren

Partnerships & collaboration will be increasingly important as Team Cactus Wren moves forward with more regional monitoring & management

THANK YOU!