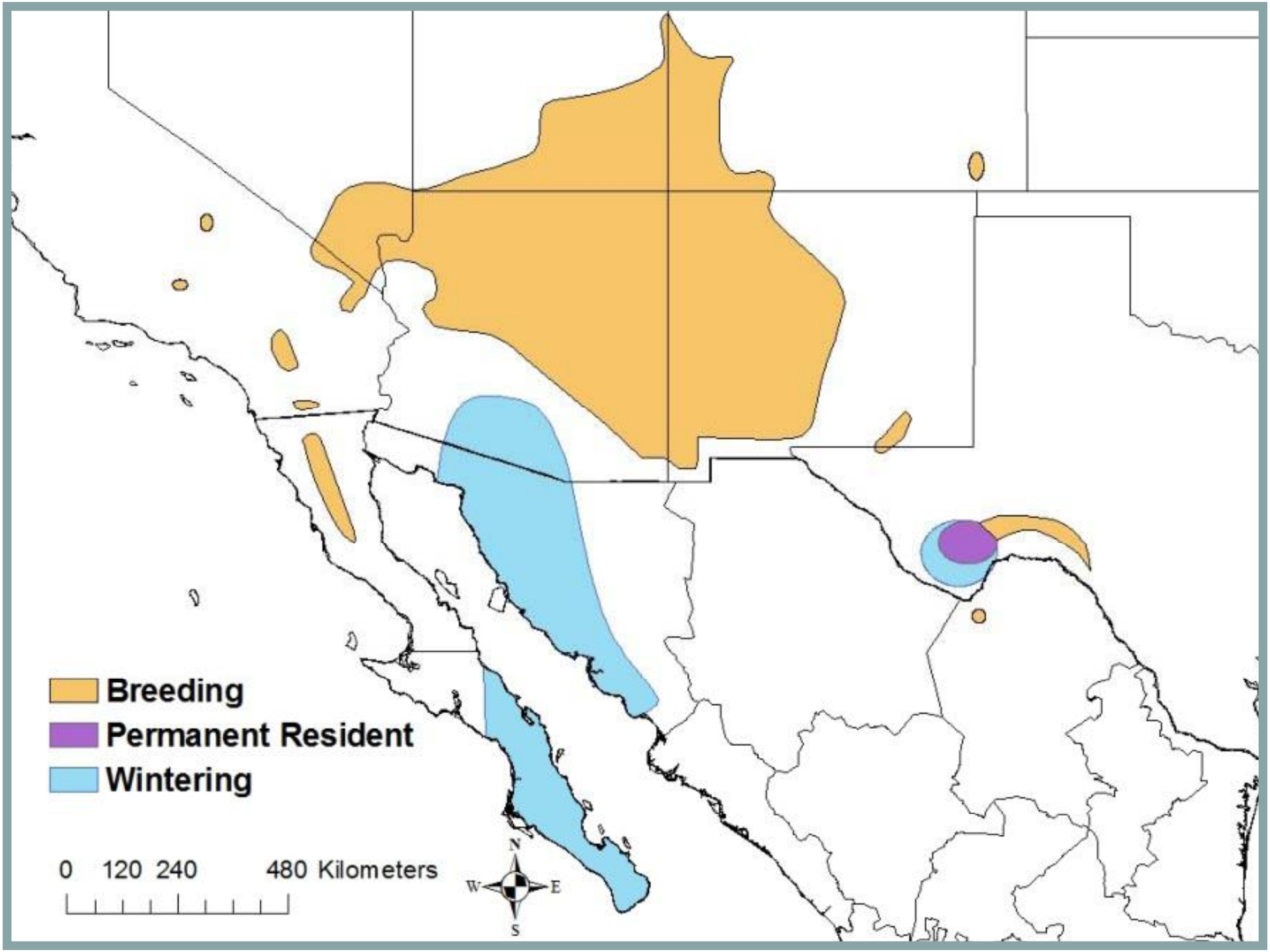
Breeding biology and causes of decline of the Gray Vireo (*Vireo vicinior*) in California

SDMMP

23 Oct 2013

Lori Hargrove & Philip Unitt

San Diego Natural History Museum


Breeding
Permanent Resident
Wintering
0 120 240 480 Kilometers
N
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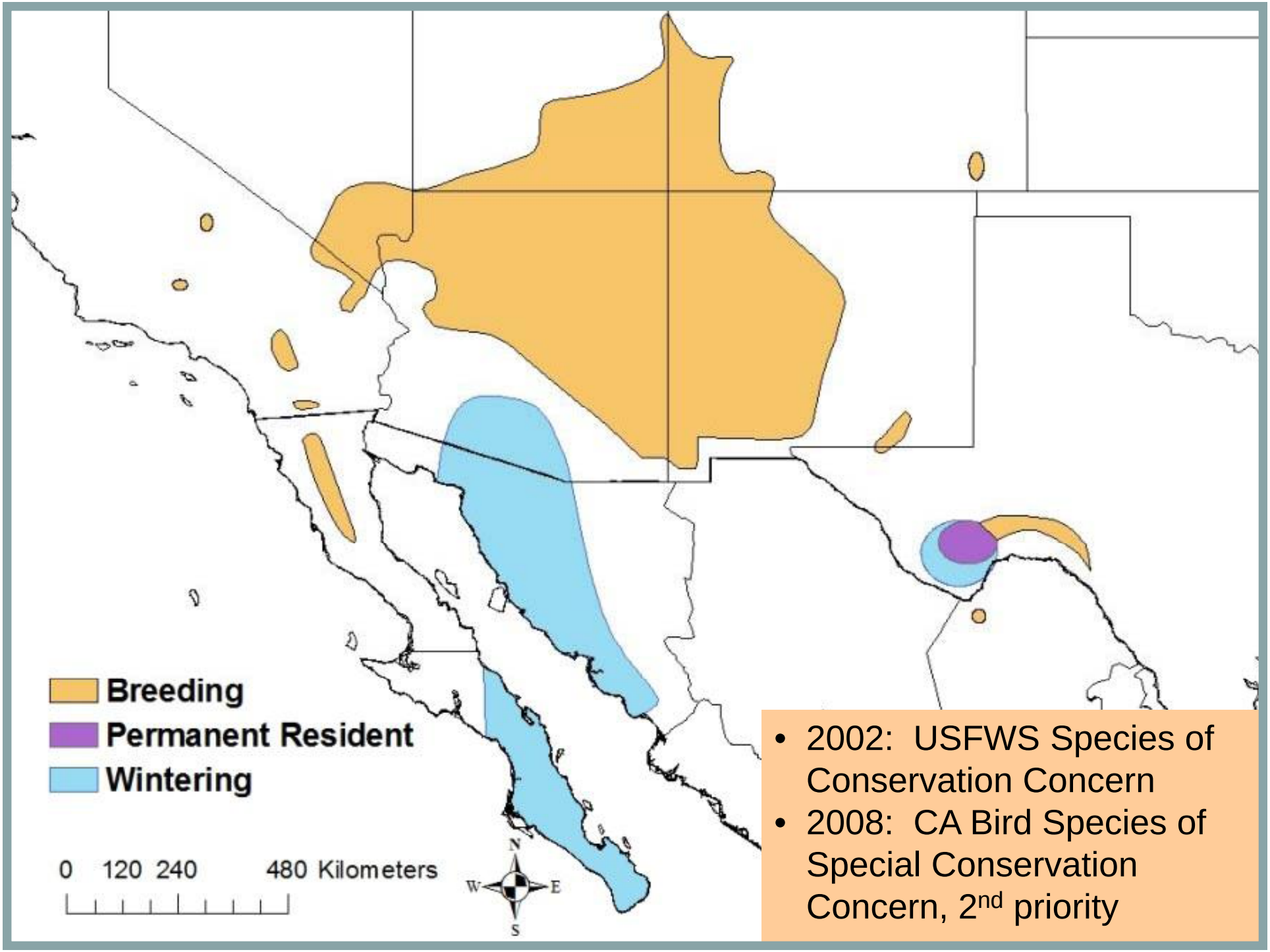
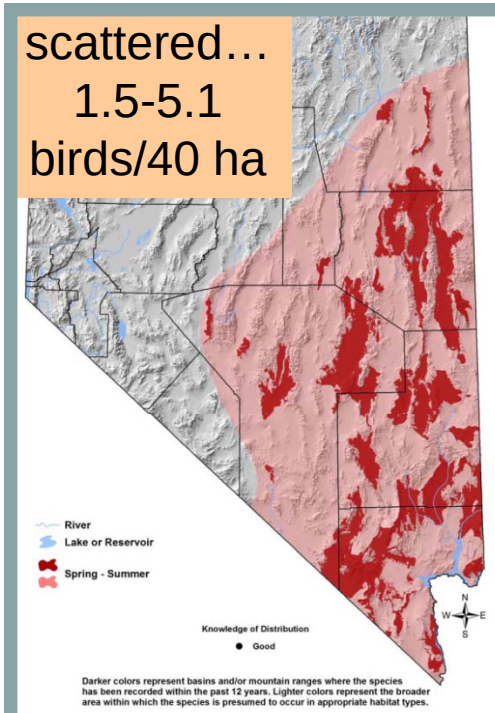


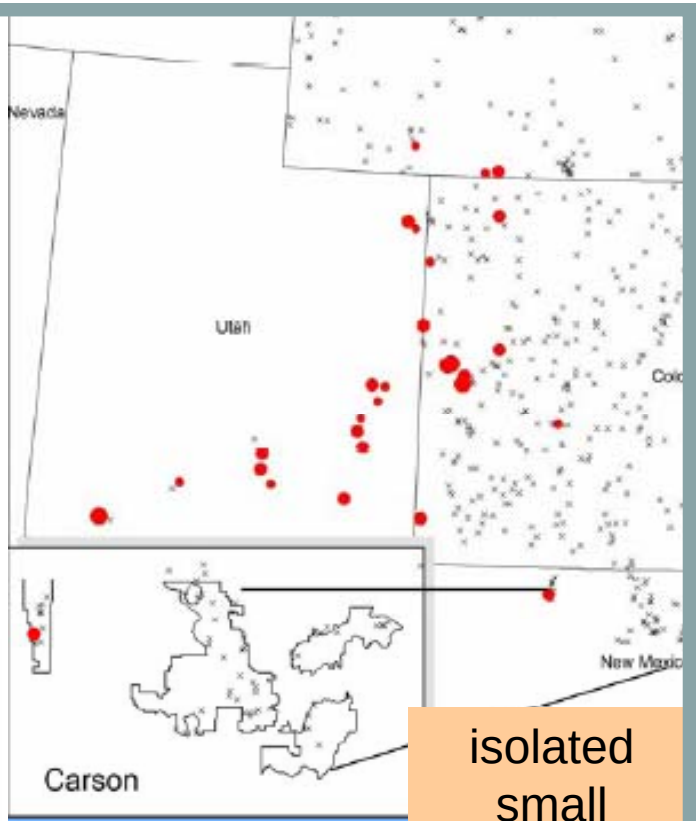
- 2002: USFWS Species of Conservation Concern
- 2008: CA Bird Species of Special Conservation Concern, 2nd priority

scattered… 1.5-5.1 birds/40 ha

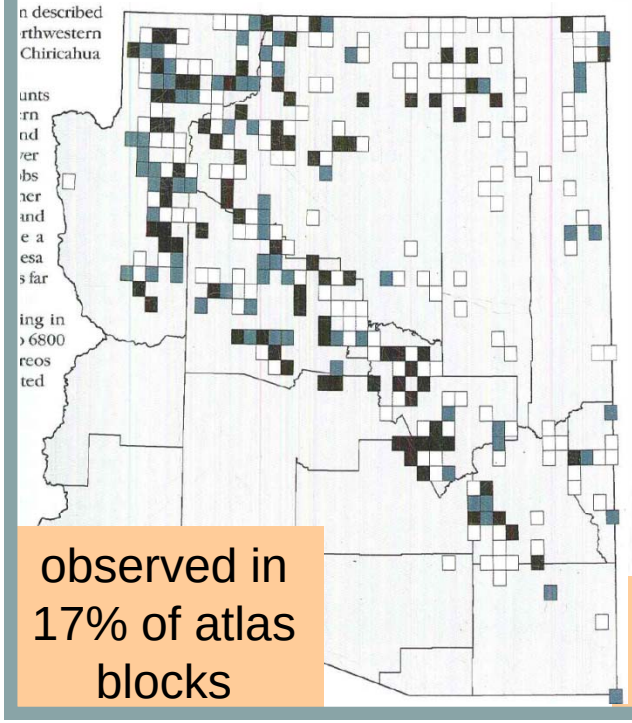


Gray Vireo Range Outside of CA

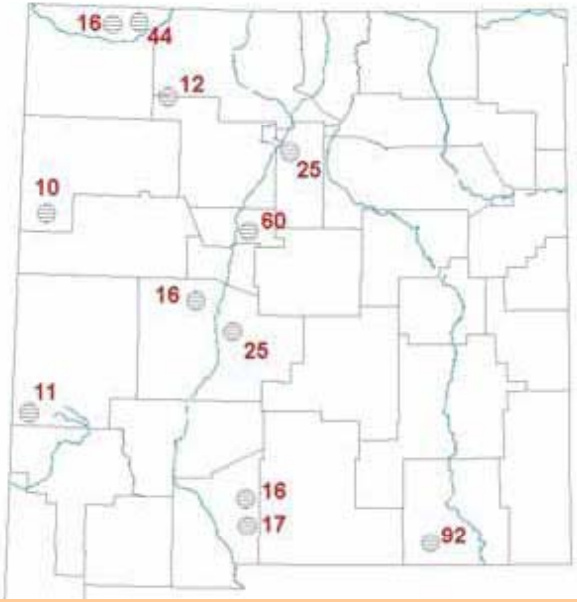
- Patchy distribution
- Scattered, small, isolated populations
- Very low density where it occurs



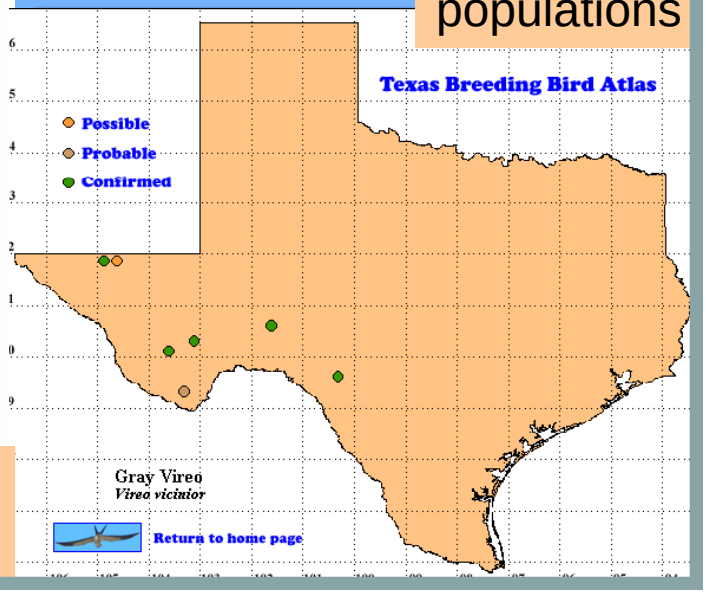
isolated small populations



observed in 17% of atlas blocks

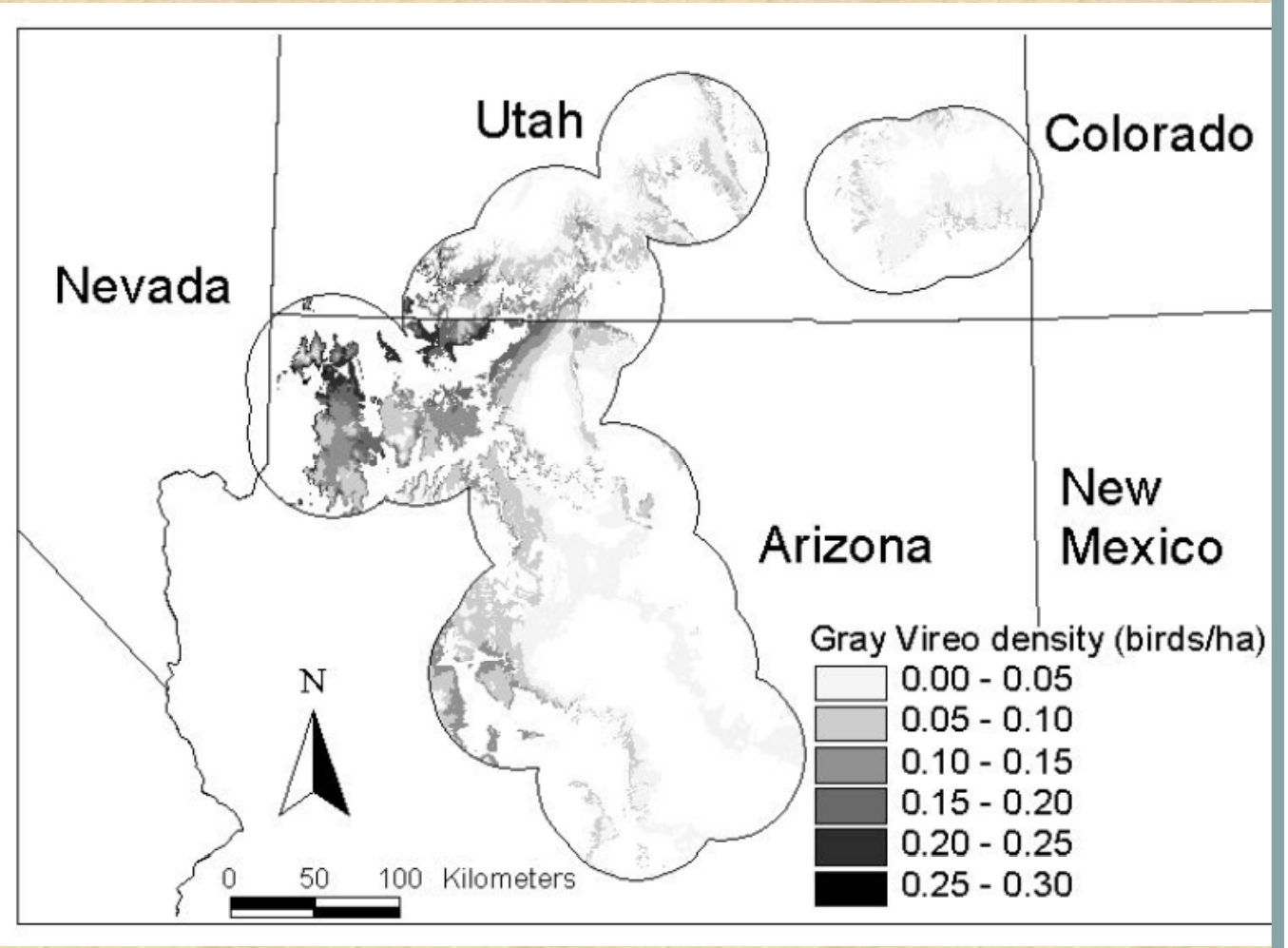


estimate 549 to 827 birds (DeLong & Williams 2006)



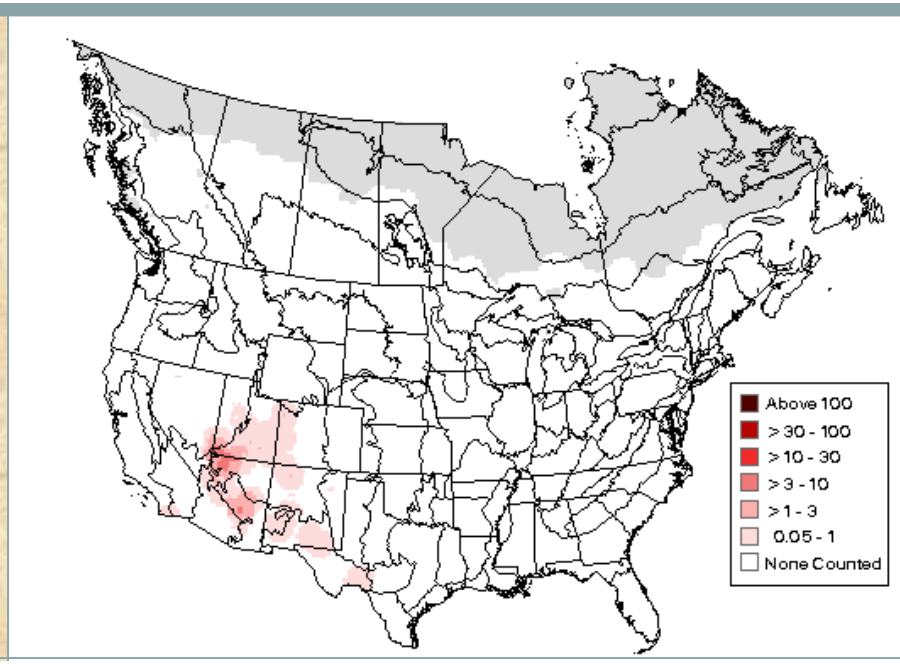
Abundance and habitat preferences of Gray Vireos (*Vireo vicinior*) on the Colorado Plateau (Schlossberg 2006)

- study in “core” of range
- present at 69 of 282 points (24%)
- 94 total observations
- Density estimate: 0.06 birds/ha



Breeding Bird Surveys

- Deficient to detect trends in any region
- Greater awareness may have increased detections recently



			1966-2011		2001-2011		
	Region	N	Trend	(95% CI)	Trend	(95% CI)	R.A.
🟡	Southern Rockies/colorado Plateau	64	1.5	(-1.4, 4.5)	2.8	(-1.1, 7.3)	0.6
🔴	Sierra Madre Occidental	12	4.5	(-0.4, 10.5)	4.5	(-1.2, 11.2)	0.5
🔴	Chihuahuan Desert	8	-3	(-10.7, 5.2)	-3.1	(-14.1, 8.8)	0.2
🟡	Arizona	20	3.7	(0.1, 7.4)	4	(-0.3, 8.6)	0.9
🟡	Colorado	14	1.1	(-3.4, 6.2)	1.3	(-5.2, 9.7)	0.2
🔴	New Mexico	14	4	(-1.3, 9.5)	3.5	(-4.6, 10.3)	0.1
🔴	Texas	8	-3	(-10.7, 5.2)	-3.1	(-14.1, 8.8)	0.2
🟡	Utah	35	0.1	(-3.8, 4.3)	1.4	(-4.8, 9.3)	0.9
🟡	Western BBS Region	92	1.4	(-1.3, 4.2)	3.1	(-0.3, 6.9)	0.5
🟡	United States	95	1.4	(-1.3, 4.2)	3.1	(-0.3, 6.9)	0.5
🟡	Survey-wide	95	1.4	(-1.3, 4.2)	3.1	(-0.3, 6.9)	0.5

R.A. = mean count of birds on a typical route in the region for a year

Studies on Gray Vireo Nesting Behavior or Ecology

Study	Sample Size	Years
Big Bend National Park, Texas (Barlow, in BNA 1999)	9 nests	1966-1985
Nesting ecology and behavior of the Gray Vireo in Western Colorado (Hutchings & Leukering unpubl)	27 nests	1995-1996
Socorro Resource Area, New Mexico (DeLong and Cox 2004, 2005)	30 nests	2004-2005
Kirtland Airforce Base, New Mexico (Moore et al. 2005)	16 nests	2005
Guadalupe Mountains, New Mexico (Hawks Aloft 2008)	32 nests	2005-2007
Lincoln National Forest, New Mexico (Hawks Aloft 2008)	11 nests	2007
Santa Ana Pueblo, New Mexico (Nishida pers. comm.)	?	2011-2012
Current studies?	?	?

Number of Birds Banded (1960 to 2013)

Red-eyed Vireo	277068
White-eyed Vireo	79500
Warbling Vireo	72137
Blue-headed Vireo	36136
Philadelphia Vireo	27821
Black-capped Vireo	16821
Bell's Vireo	10504
Least Bell's Vireo	6608
Yellow-throated Vireo	6130
Solitary Vireo	4414
Cassin's Vireo	4433
Plumbeous Vireo	563
Hutton's Vireo	4105
Black-whiskered Vireo	2566
Yellow-green Vireo	1107
Thick-billed Vireo	658

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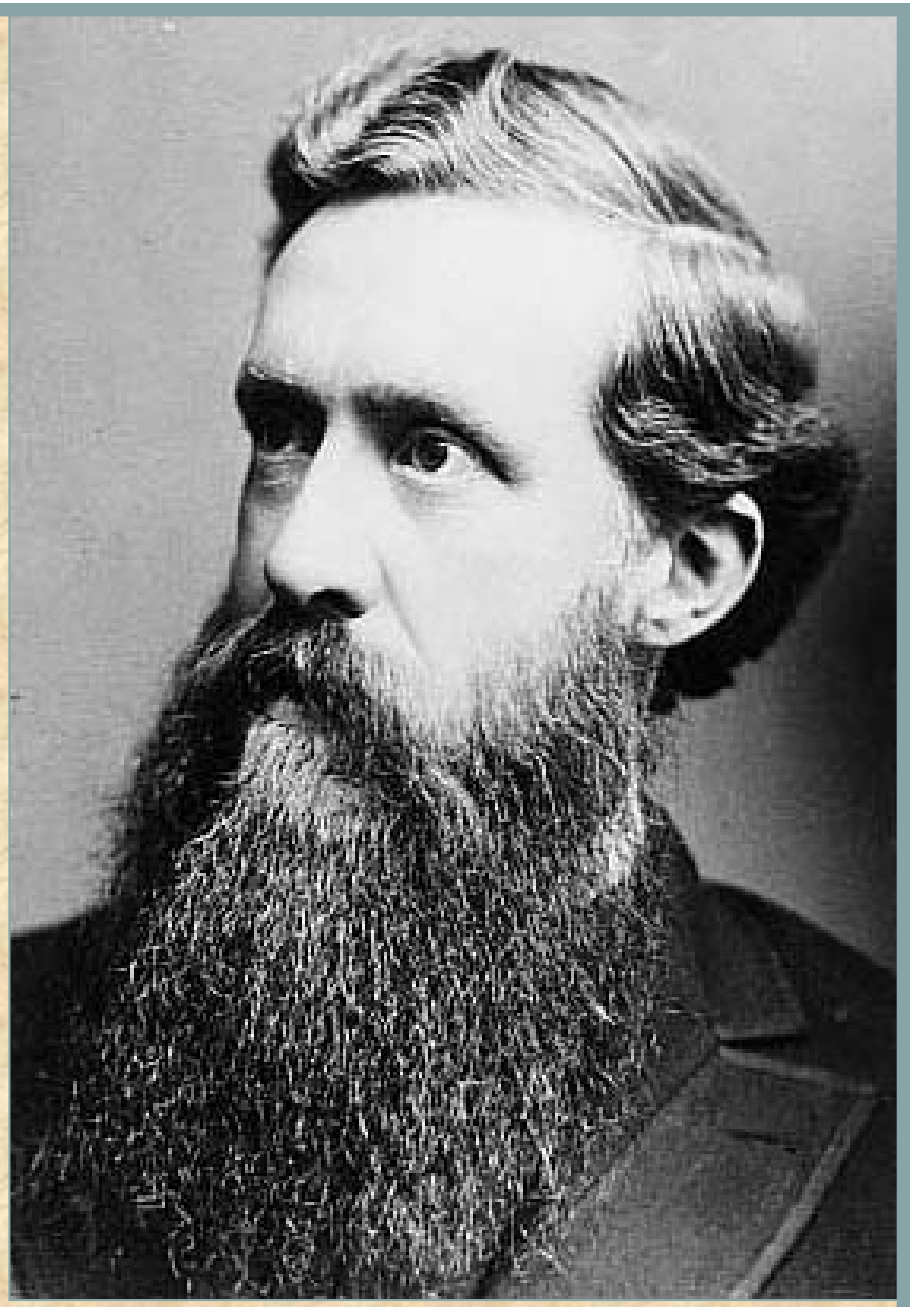
Texas (Barlow in BNA):

- 20/22 banded birds returned to same site the following year
- 1 banded male returned to same territory 4 years
- 2 banded nestlings seen the following year 5-6 km from natal site

Vireo vicinior

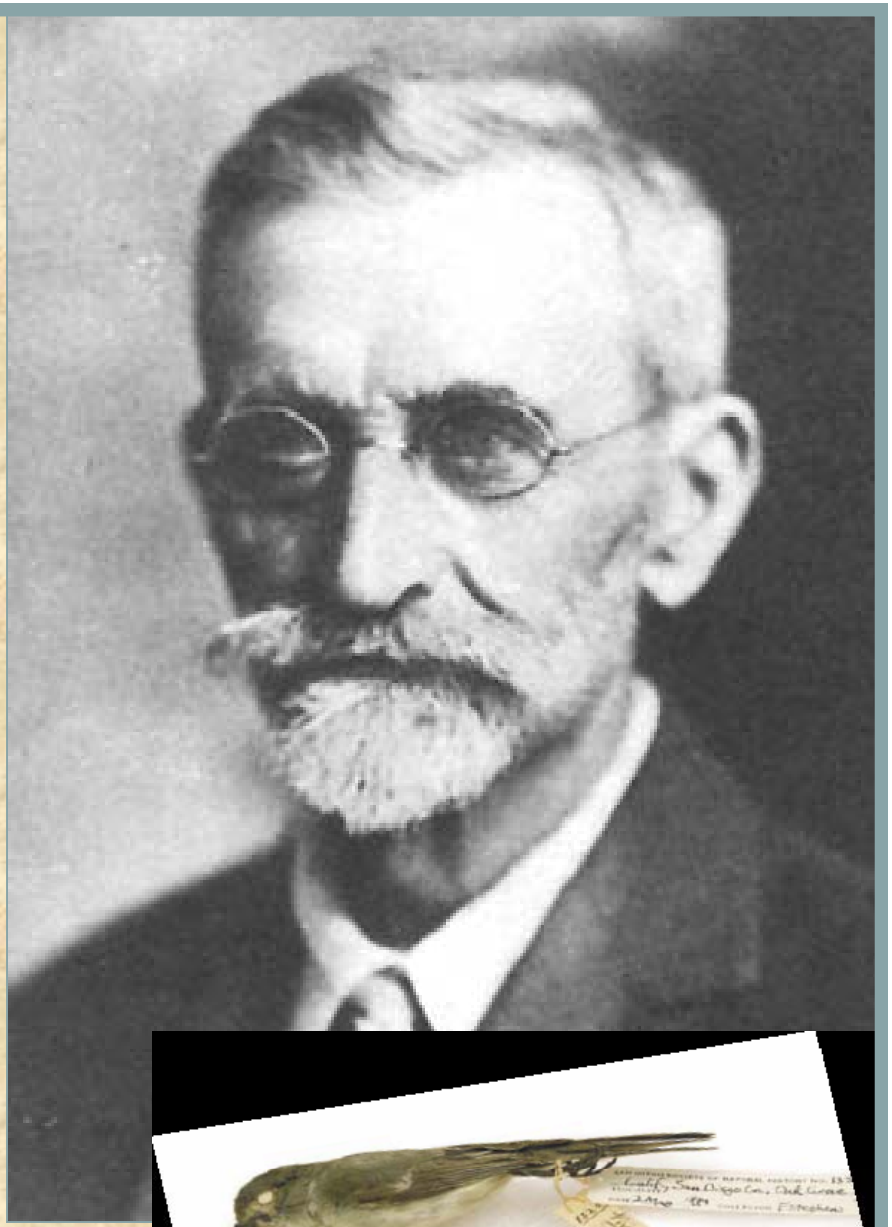
First collected 24 May 1865 by Elliott Coues (assistant surgeon, U.S. Army) at Fort Whipple (now Prescott), Arizona

Original description:
Coues, E. 1866.
A list of the birds of Fort Whipple, Arizona: with which are incorporated all other species ascertained to inhabit the Territory; with brief and critical field Notes, descriptions of new species, etc. Proceedings of the Academy of Natural Sciences of Philadelphia 18:39–100.

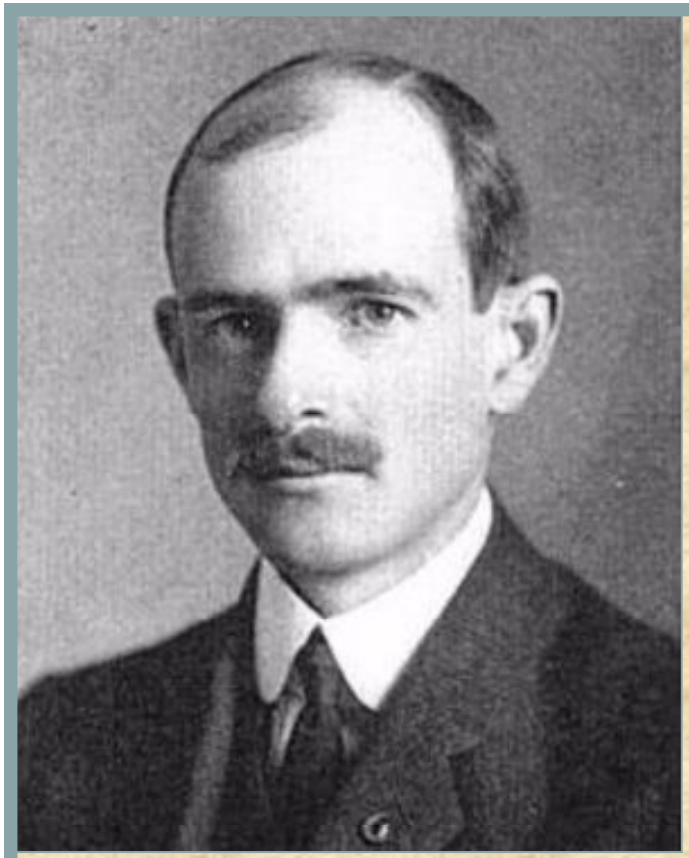


First record for California:
Stephens, F. 1878.
Vireo vicinior in California.
Bulletin of the Nuttall
Ornithological Club 3:42.

"I have found this vireo to be not uncommon in the vicinity of Campo, San Diego Co. … They first appeared about March 24, and as their number seen have varied but little since the beginning of April till the present time (middle of June), they probably do not go much farther north, which may account for their not having been found in California before."



The Gray Vireo: a “lost species” in San Diego County from the days of Frank Stephens (d. 1937) until rediscovery 4 June 1977 by Mike Evans



San Jacinto Mountains 1908

The Gray Vireo “was probably the most important single species of bird discovered in the San Jacinto region, because previously little known as a bird of California.”

—Joseph Grinnell and Harry S. Swarth

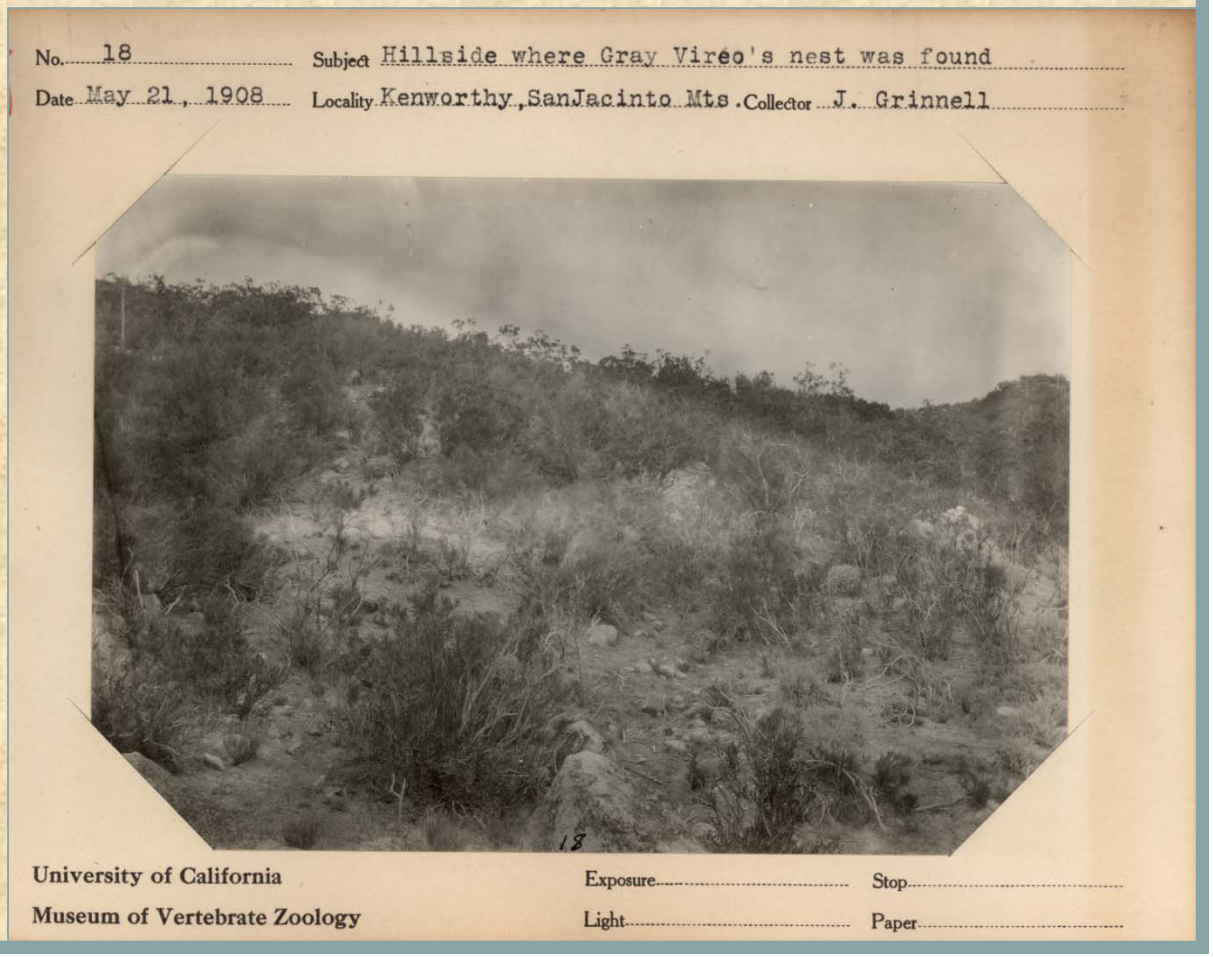
No. 17 Subject Gray Vireo on nest in Adenostoma

Date May 21, 1908 Locality Kenworthy, San Jacinto Mts Photographer J. Grinnell

NB Bird

“We estimated that there was a pair of gray vireos for every forty acres of suitable ground, thus giving an unusually large forage area for individuals of this species. The impression was sometimes given that the population was much more dense, but we decided the far-carrying song tended to mislead in this regard. Taking the above estimate as conservative, there would be about 16 pairs to the square mile. We are of the opinion that there are about thirty square miles of the appropriate association in the San Jacinto region, so that the total number of individuals of this rare bird in the region under treatment was, in 1908, before the advent of the new broods, close to 960.”

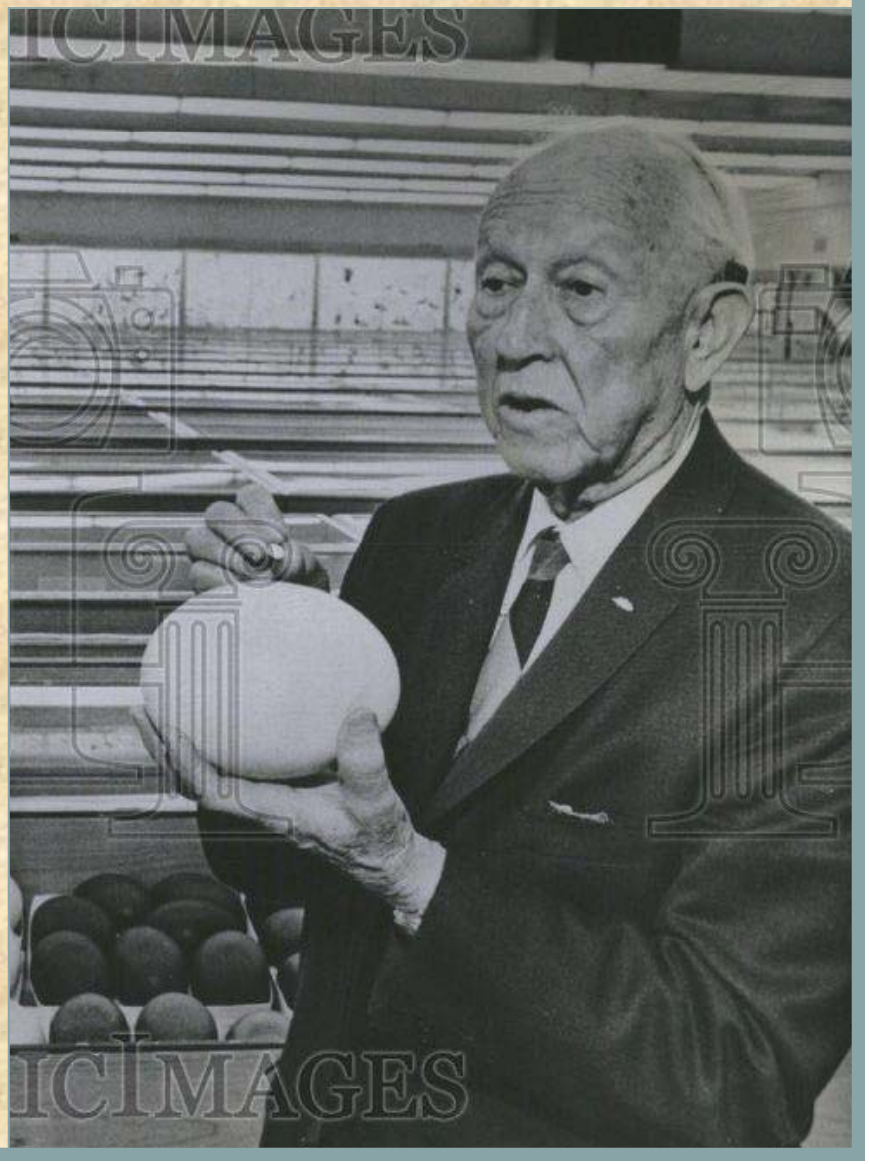
-—*Grinnell & Swarth,* 1913



The Gray Vireo as a victim of the cowbird. *Condor* 46:244.

"During the past 15 years it has seemed to me that most of the nests started by this vireo come to some unhappy end, often before the eggs are placed in them; at other time the eggs are destroyed…. This damage has been blamed on rats, chipmunks, California Jays, or reptiles, but it now seems probable that the Cowbird should receive at least part of the blame. Since the Gray Vireo often perches on the top of brush or yuccas it is conspicuous, except for its somber color. With loud, repeated calls it flies to its nesting site. We may thus expect that Cowbirds would have no trouble finding nests of this species."

—*Wilson C. Hanna*, 1944.



GRAY VIREO (*Vireo vicinior*)

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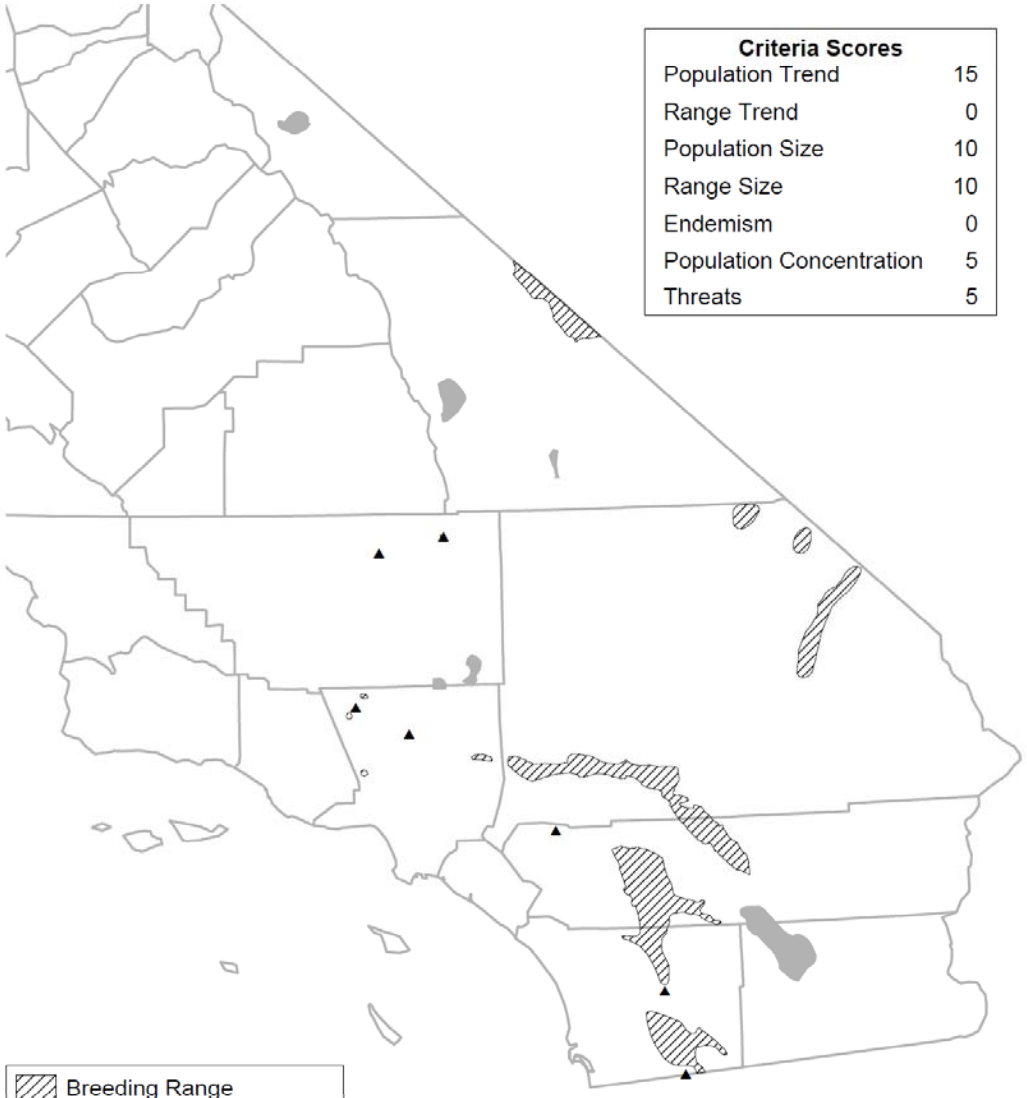

Grinnell & Miller 1944 vs. 2008 (Unitt 2008)

Status in CA

- Patchy distribution
- Rugged, arid scrub
- Elevation: 600-2400 m (2000-7870 ft)
- Pinyon-Juniper or Chamise-Redshank
- Population collapses since 1940

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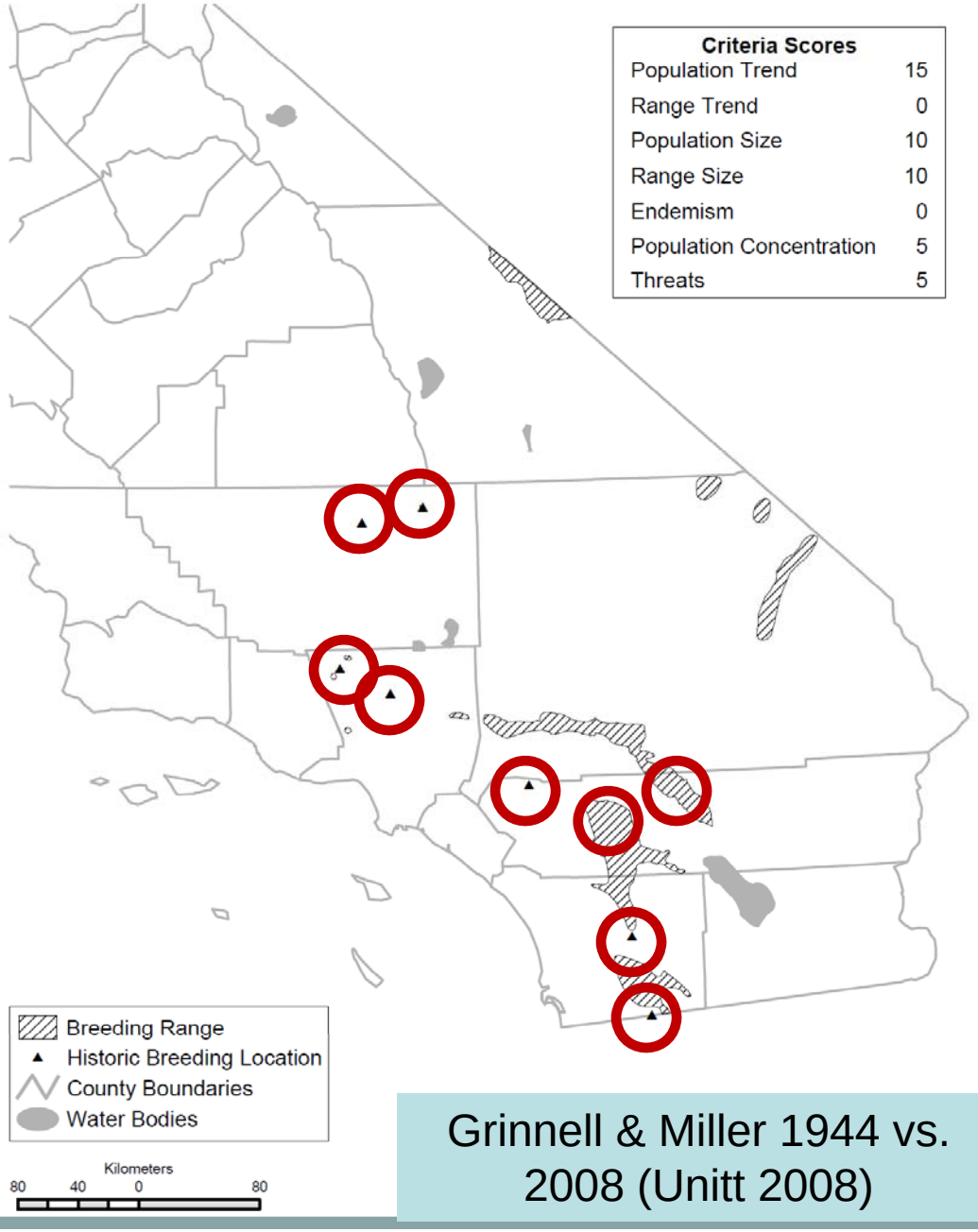

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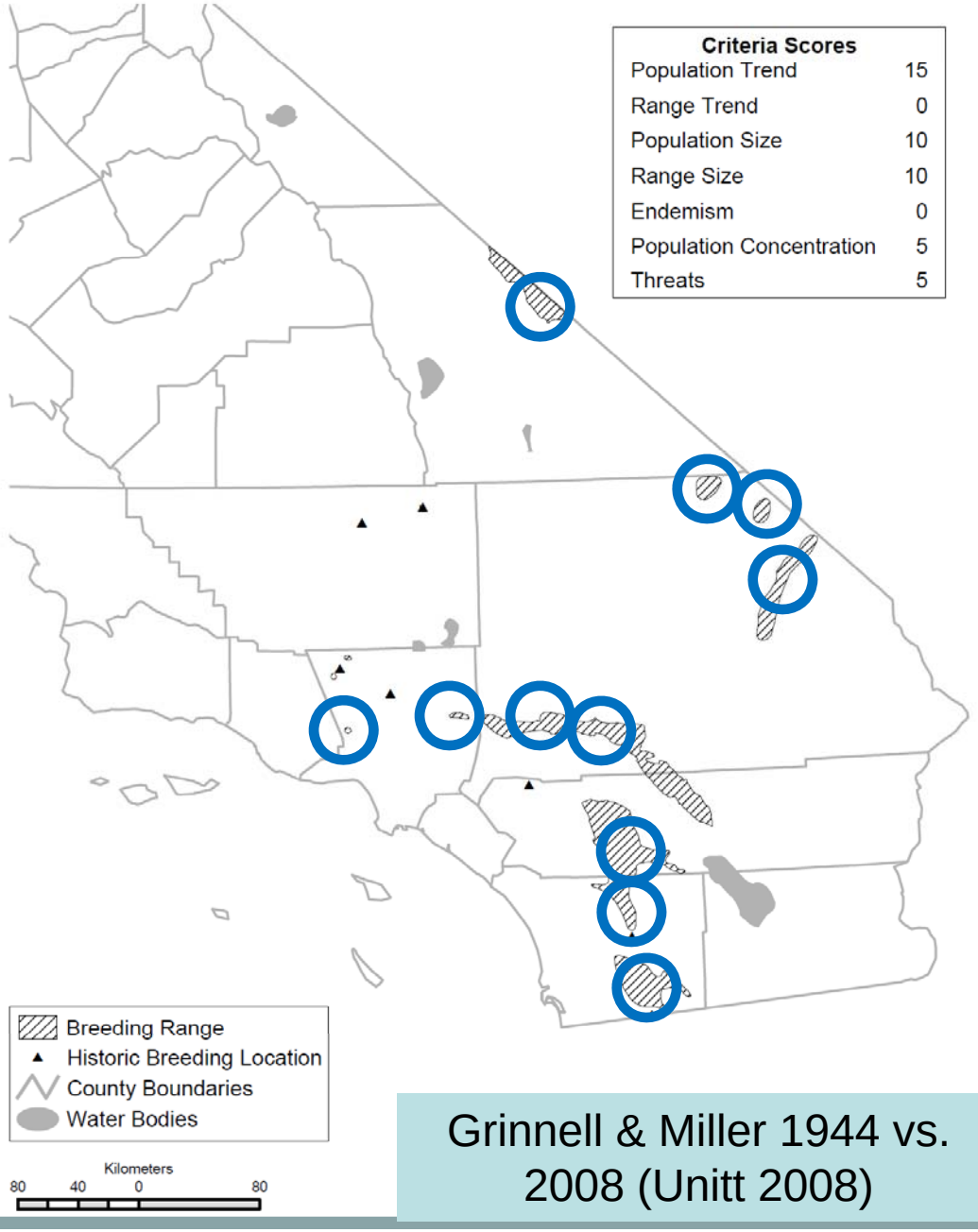

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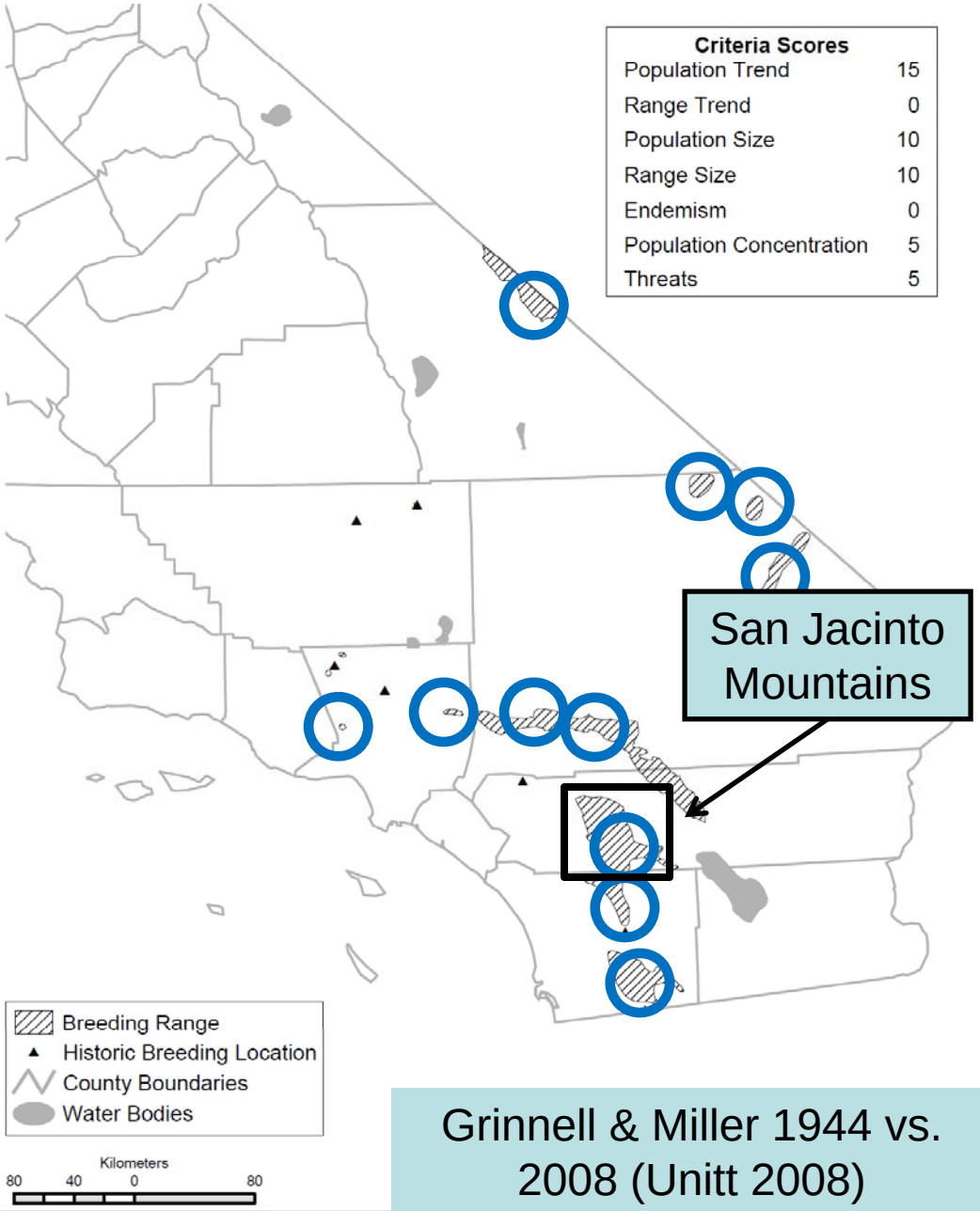
GRAY VIREO (*Vireo vicinior*)

PHILIP UNITT

Criteria Scores	
Population Trend	15
Range Trend	0
Population Size	10
Range Size	10
Endemism	0
Population Concentration	5
Threats	5



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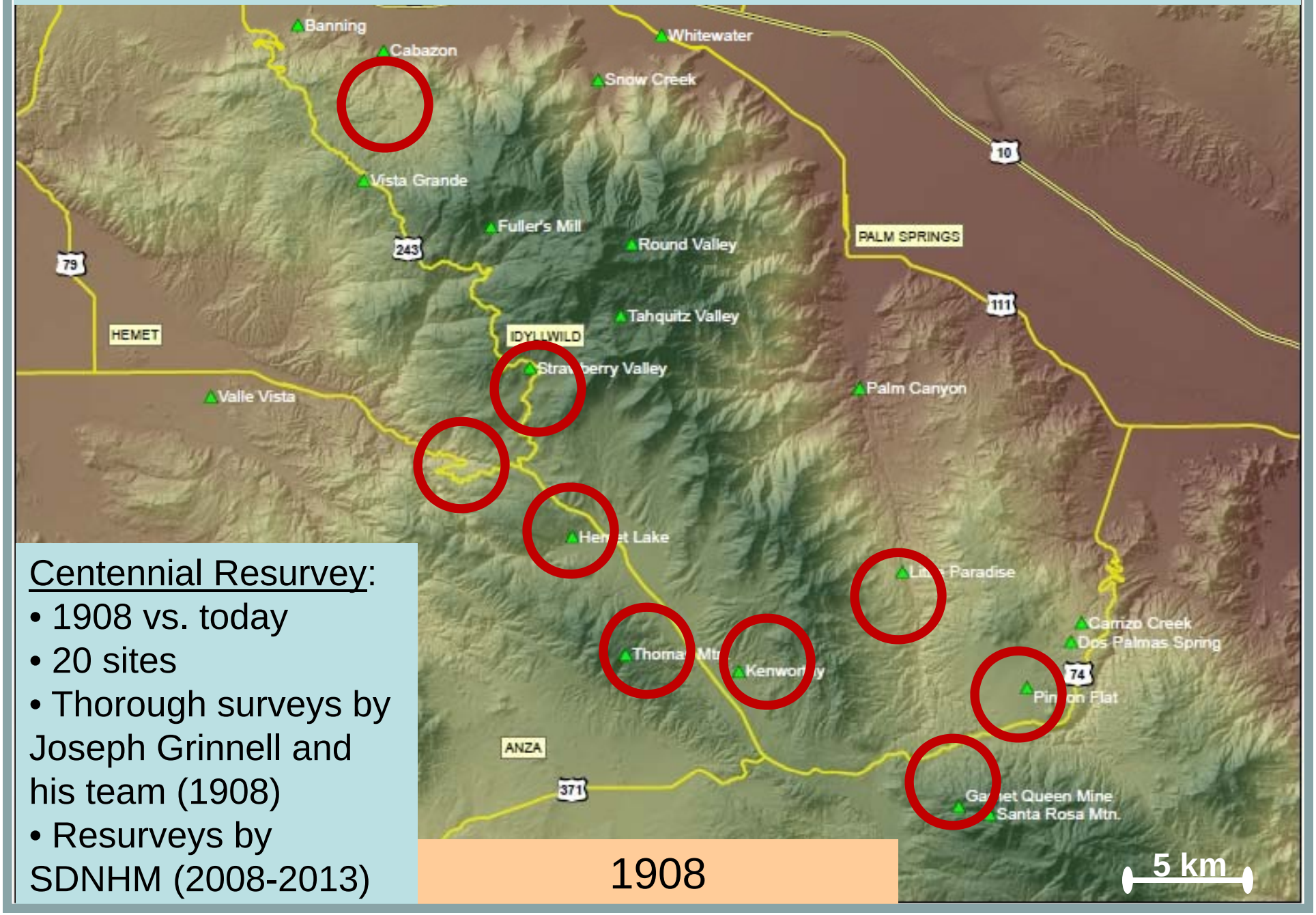
Centennial Resurvey of the San Jacinto Mountains



<u>Centennial Resurvey</u>:

- 1908 vs. today
- 20 sites
- Thorough surveys by Joseph Grinnell and his team (1908)
- Resurveys by SDNHM (2008-2013)

1908

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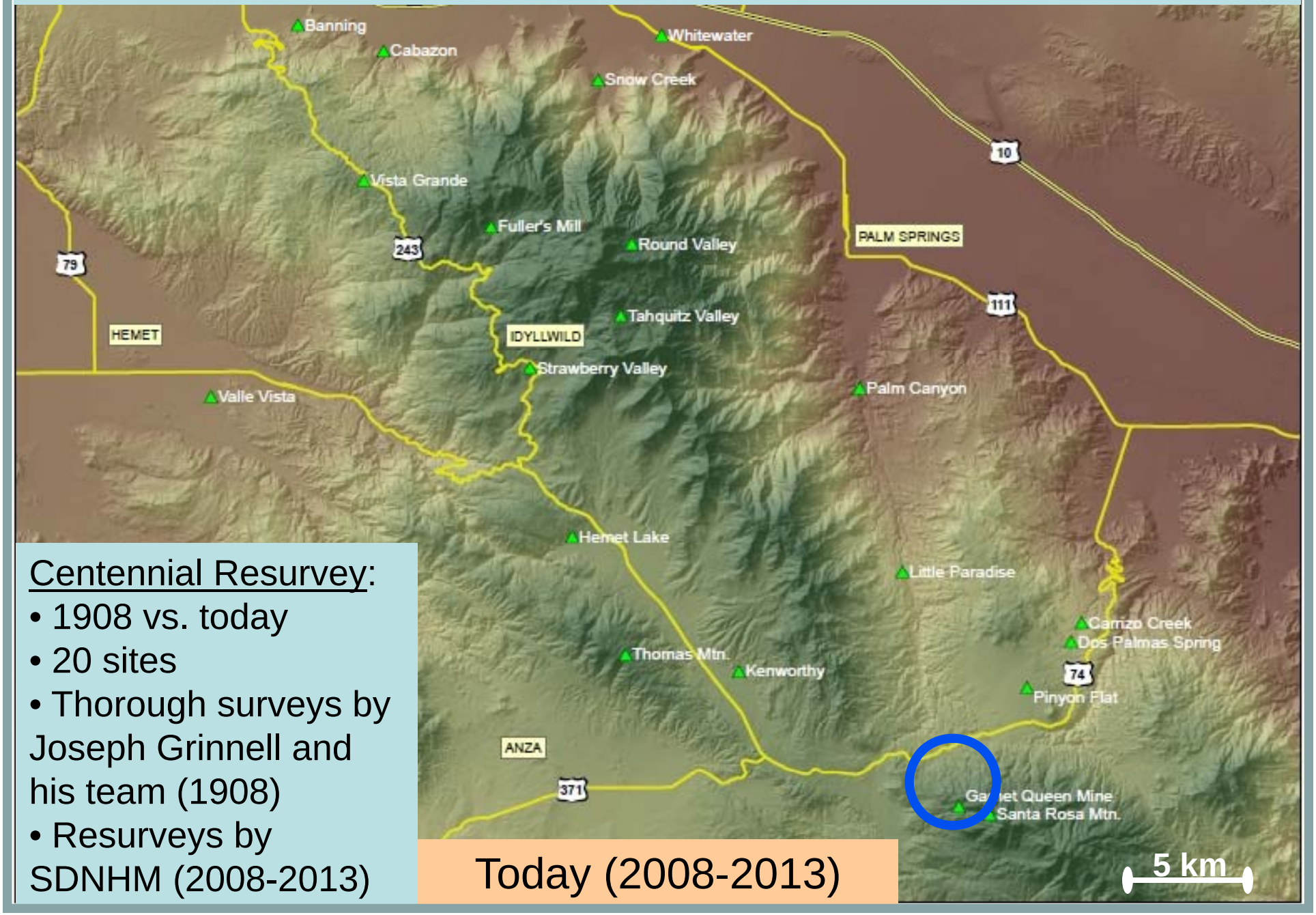

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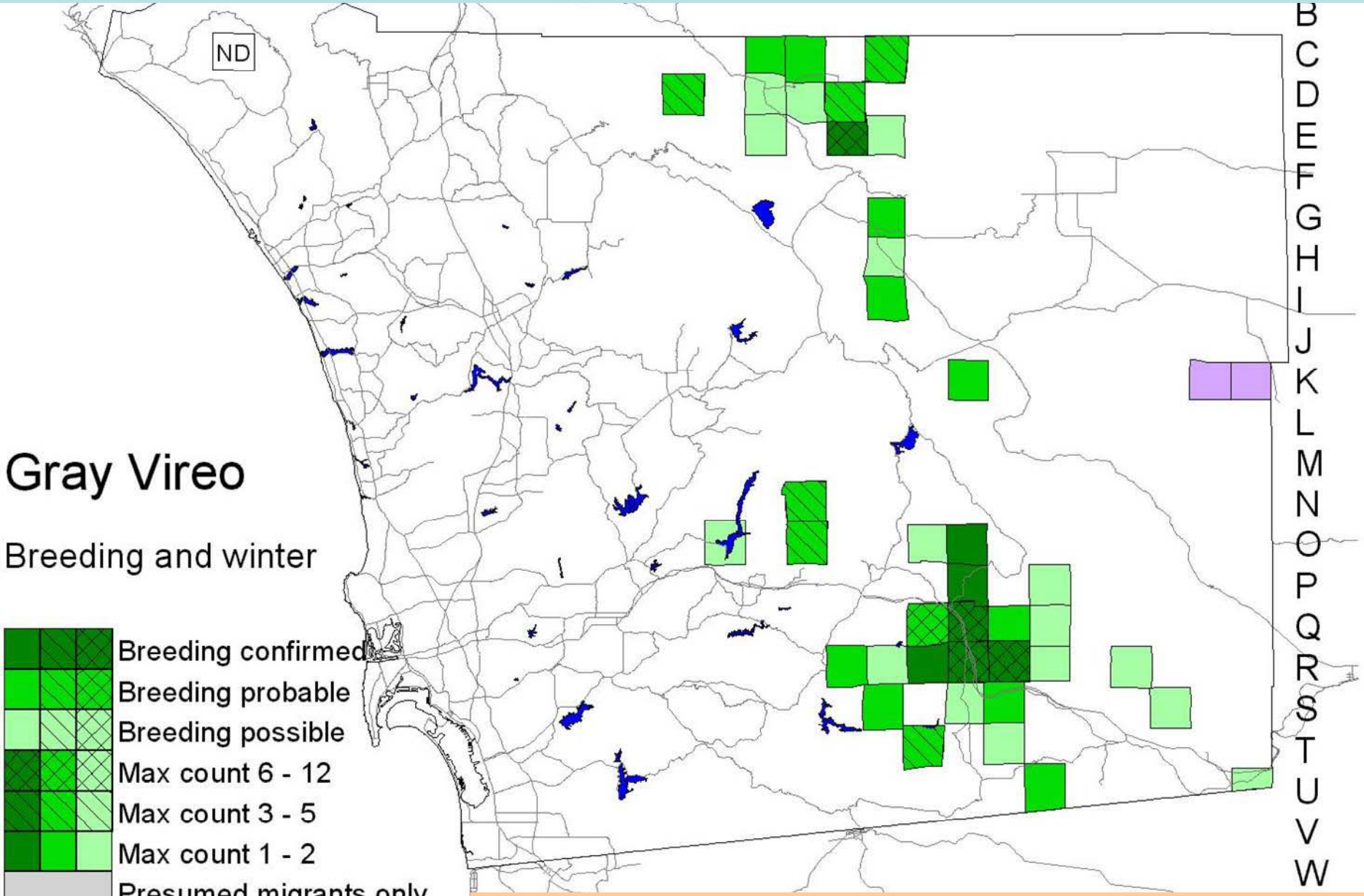
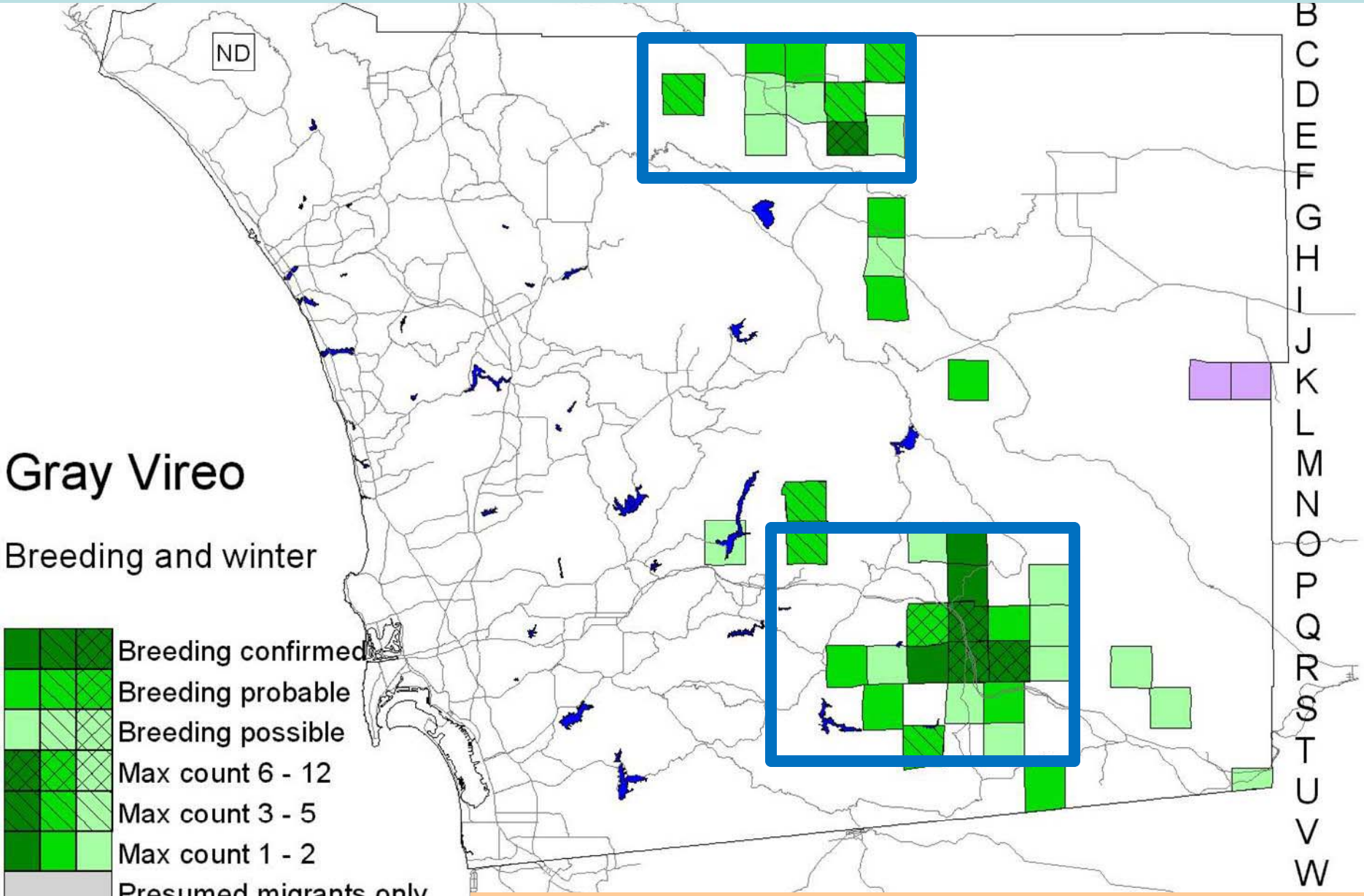
Today (2008-2013)

San Diego County Bird Atlas (1997–2001)



Population in “low hundreds” (Unitt 2004)

San Diego County Bird Atlas (1997–2001)



Population in “low hundreds” (Unitt 2004)

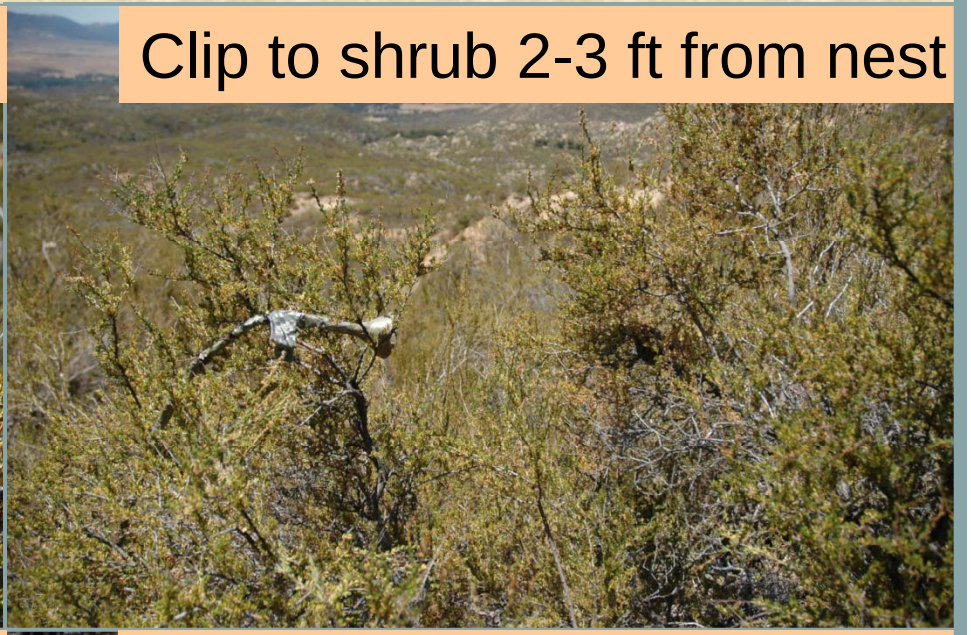
Methods (2012–13)

- Monitored ~30 territories per year at ~10 sites
- Visits every 2–5 days (March–July)
- Non-obtrusive observation of behavior to locate nests
- Minimal nest checking
- Deployed video cameras on 1/4 to 1/3 of nests
- Habitat & nests measured (July–October)

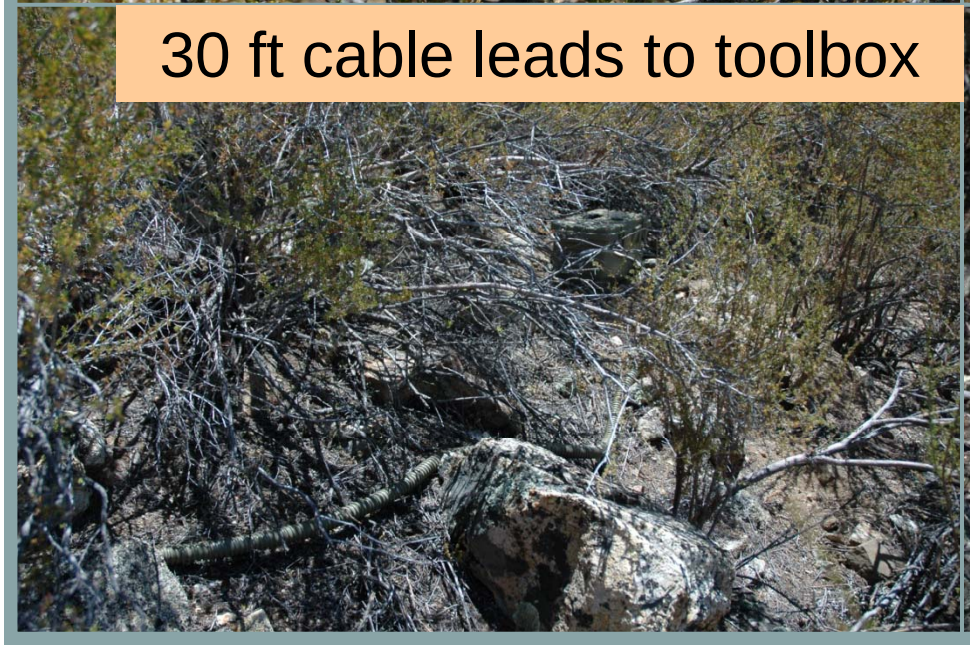
Video Camera System

Mini camera inside 2” funnel

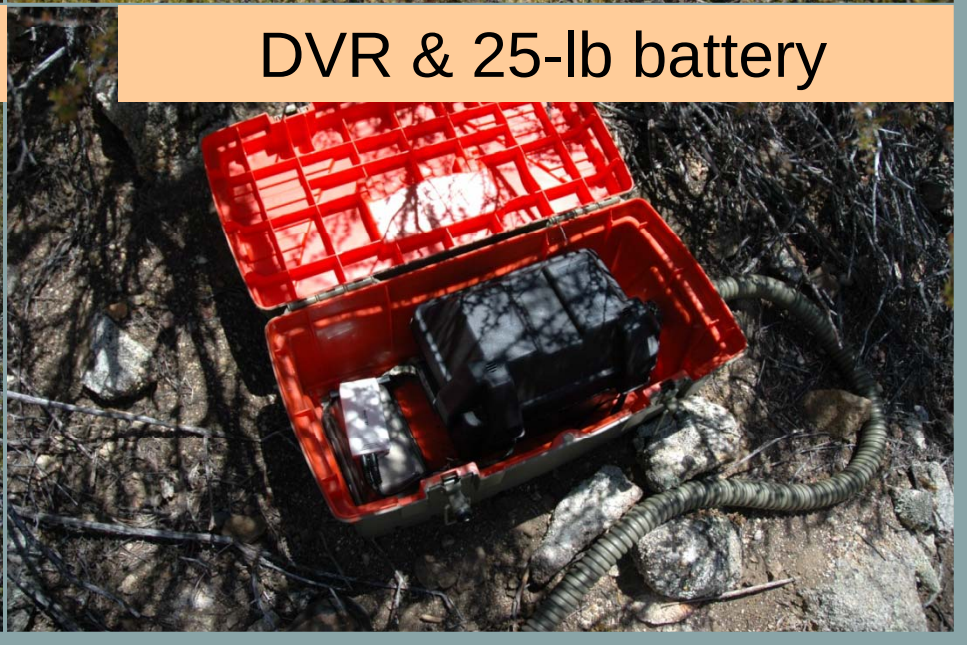
Clip to shrub 2-3 ft from nest



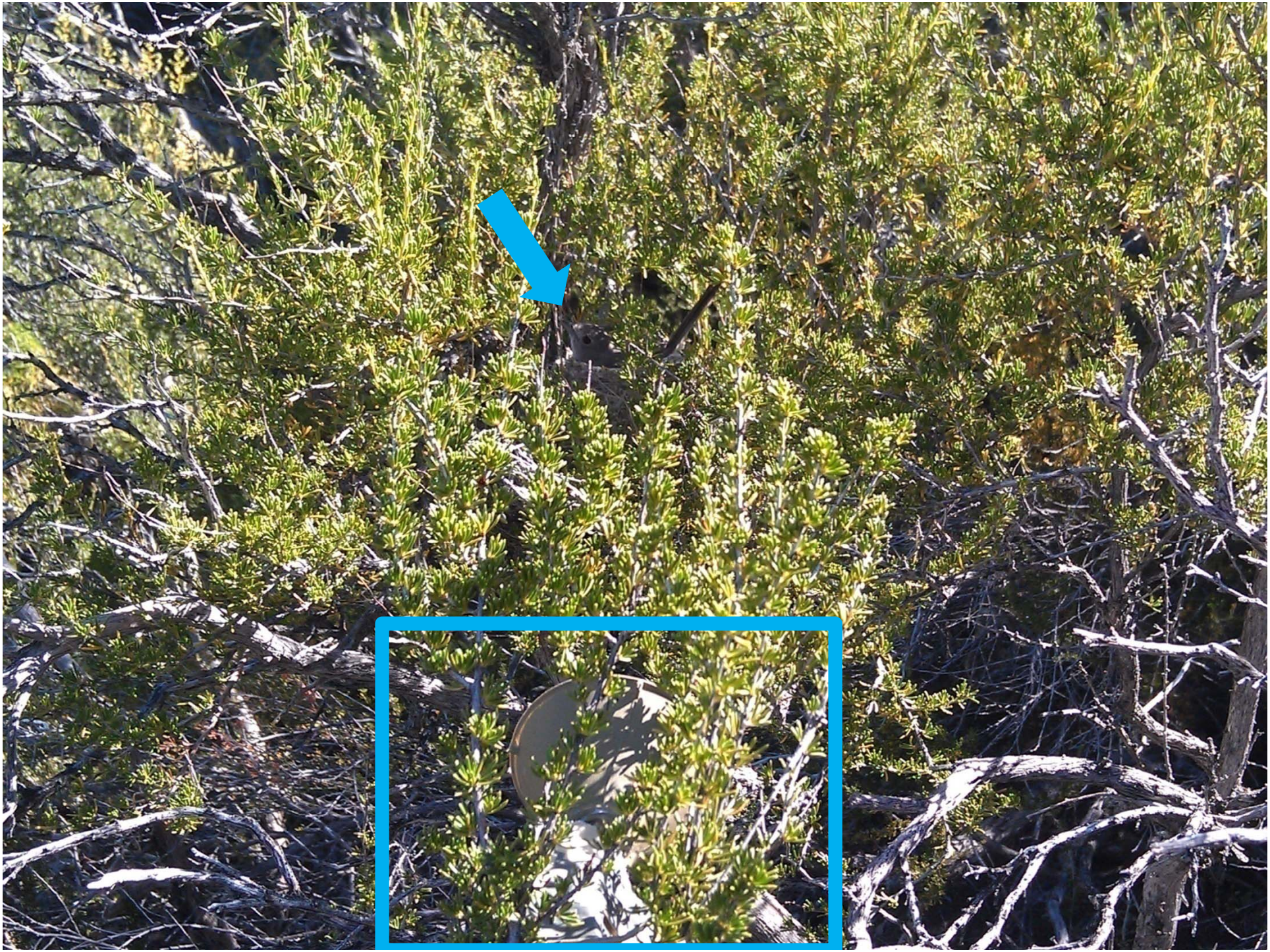
30 ft cable leads to toolbox



DVR & 25-lb battery




MOULTRIE
25.68 inHg
82°F
04/15/2012 02:08PM VIREO4

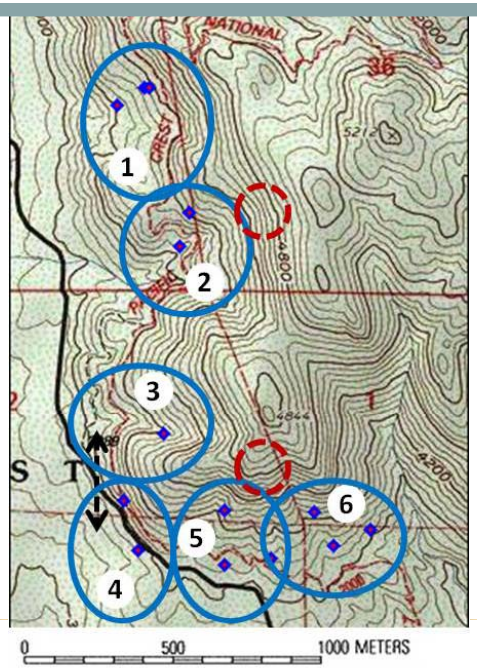


Gray Vireo Nests

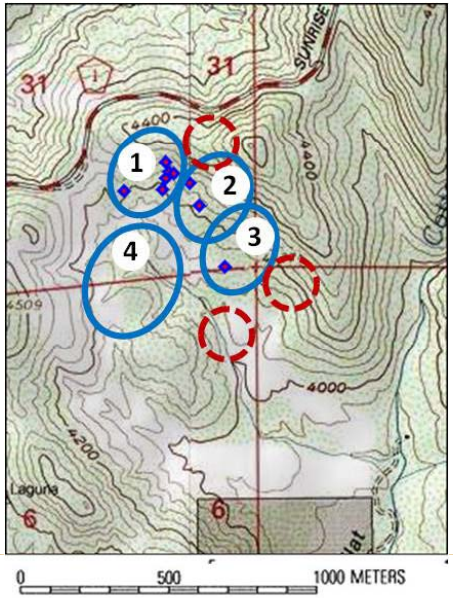
- 95 nests located (55 in 2012, 40 in 2013)
- 30 nests monitored by video camera (20 in 2012, 10 in 2013)
- 91% of nests located during construction or early egg stage
- Additional 15 nests found that were incomplete (not included in analysis), but depredation suspected (total nests = 110)

Territories

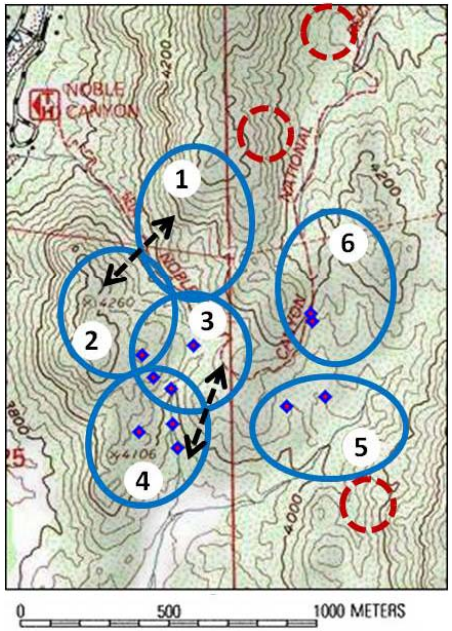
- ~30 territories regularly monitored in 2012, 28 in 2013
- Territory size: 3-40 ha
- Consistency between visits and years
- Territories in clusters
- Possible surplus of males, females possibly floating?



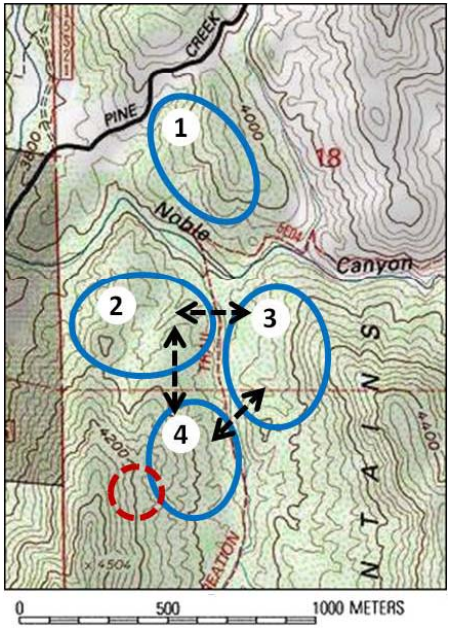
A. Pacific Crest Trail at Indian Flats



B. Sunrise Highway



C. Noble Canyon South



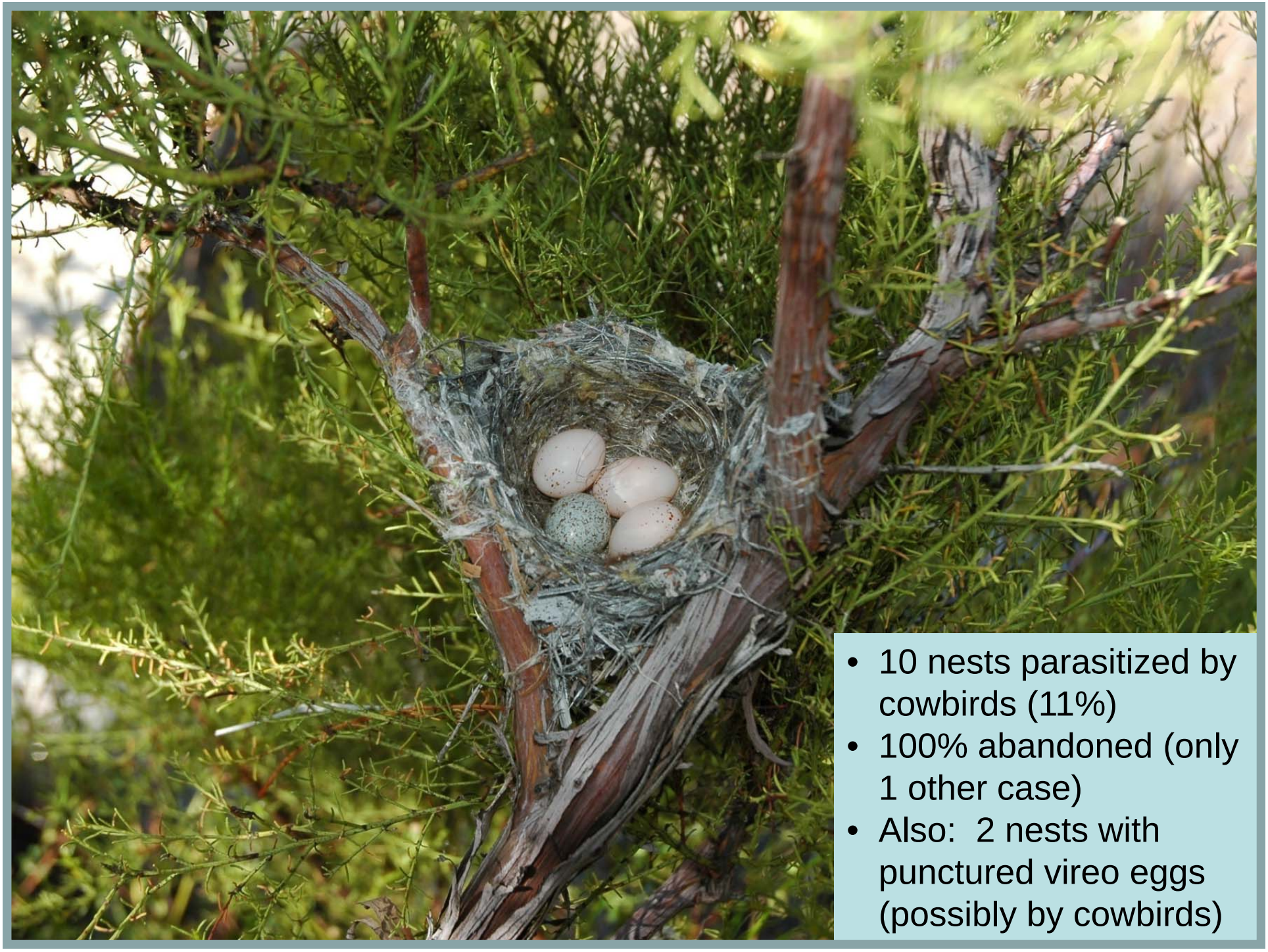
D. Noble Canyon North

Major Results (2012–13)

- Of 95 nests, only 17 successfully fledged (18%)
- 10 parasitized by Brown-headed Cowbirds (11%)
- 65 failed due to suspected or confirmed depredation (68%)
- 2 failed due to other cause, wind or abandoned (2%), and 1 had unknown outcome (1%)
- #1 nest predator: Western Scrub-Jay

Re-nesting

- Re-nesting was universal
- One pair attempted at least 6 nests in 2012 (none getting past the egg stage)
- Confirmation of successful double-brooding by one pair
  - 1st fledge: 6 June
  - 2nd fledge: 12 July

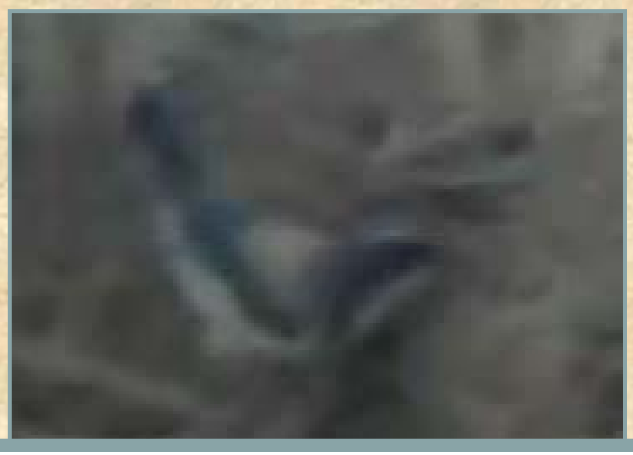

• 10 nests parasitized by cowbirds (11%)
• 100% abandoned (only 1 other case)
• Also: 2 nests with punctured vireo eggs (possibly by cowbirds)

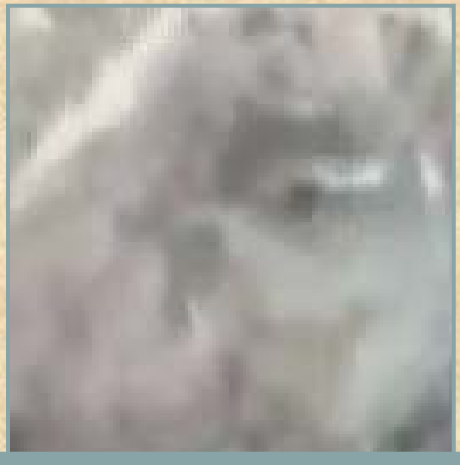
Results from Video Cameras

(Over 4000 hours of video yet to review!)

Fledged	Cowbird	Unk/Suspect depredation?	Depredated	**Total**
7	3	5	15	**30**
23%	10%	17%	50%	

Western Scrub-Jay	Gray Fox (nestlings)	Bobcat (took adult)	Unidentified/ Other?	Bewick's Wren?
10	1	1	2	1





Probability of Nest Success

"Apparent" nest survival = 18% (2012–2013) vs. Mayfield Method:

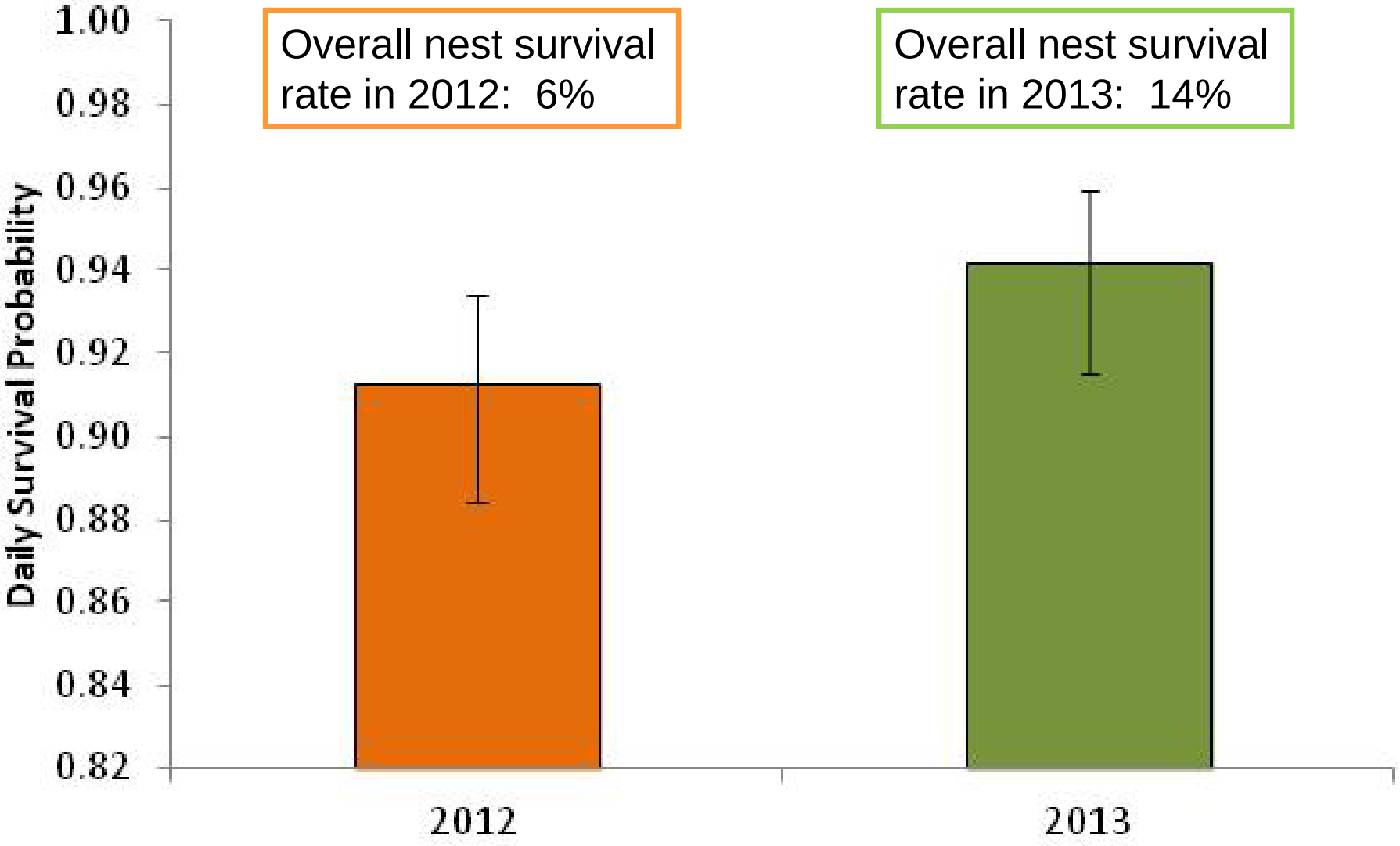
	2012	2013	2012-13
Total Nests	55	40	95
# Successful	9	9	18
# Failed	46	31	77
Exposure Days	502	486	988
Daily Survival Probability	0.91	0.94	0.92
Probability of Success	6%	14%	9%

Exposure days = number of days a nest was monitored from date of discovery to date of either success or failure, summed across all nests.

Probability of success = daily survival probability raised to the # of days in the nest cycle (30 days for Gray Vireo).

Probability of Nest Success

Not significant



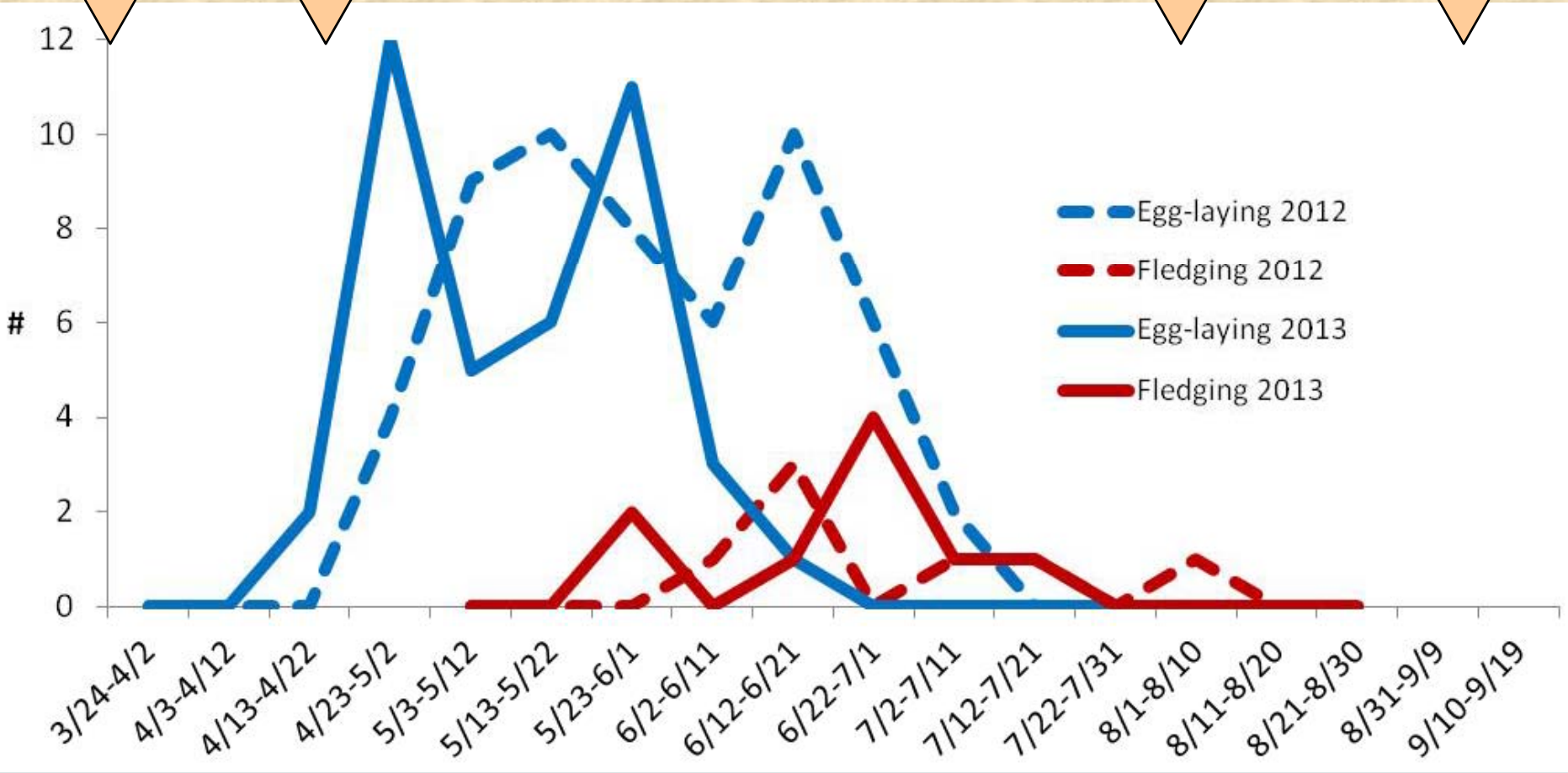
Nesting Chronology

Earliest Singing 24 March

Earliest Egg-laying 19 April

Latest Fledging 1 August

Latest Singing 12 Sept



Nesting Chronology

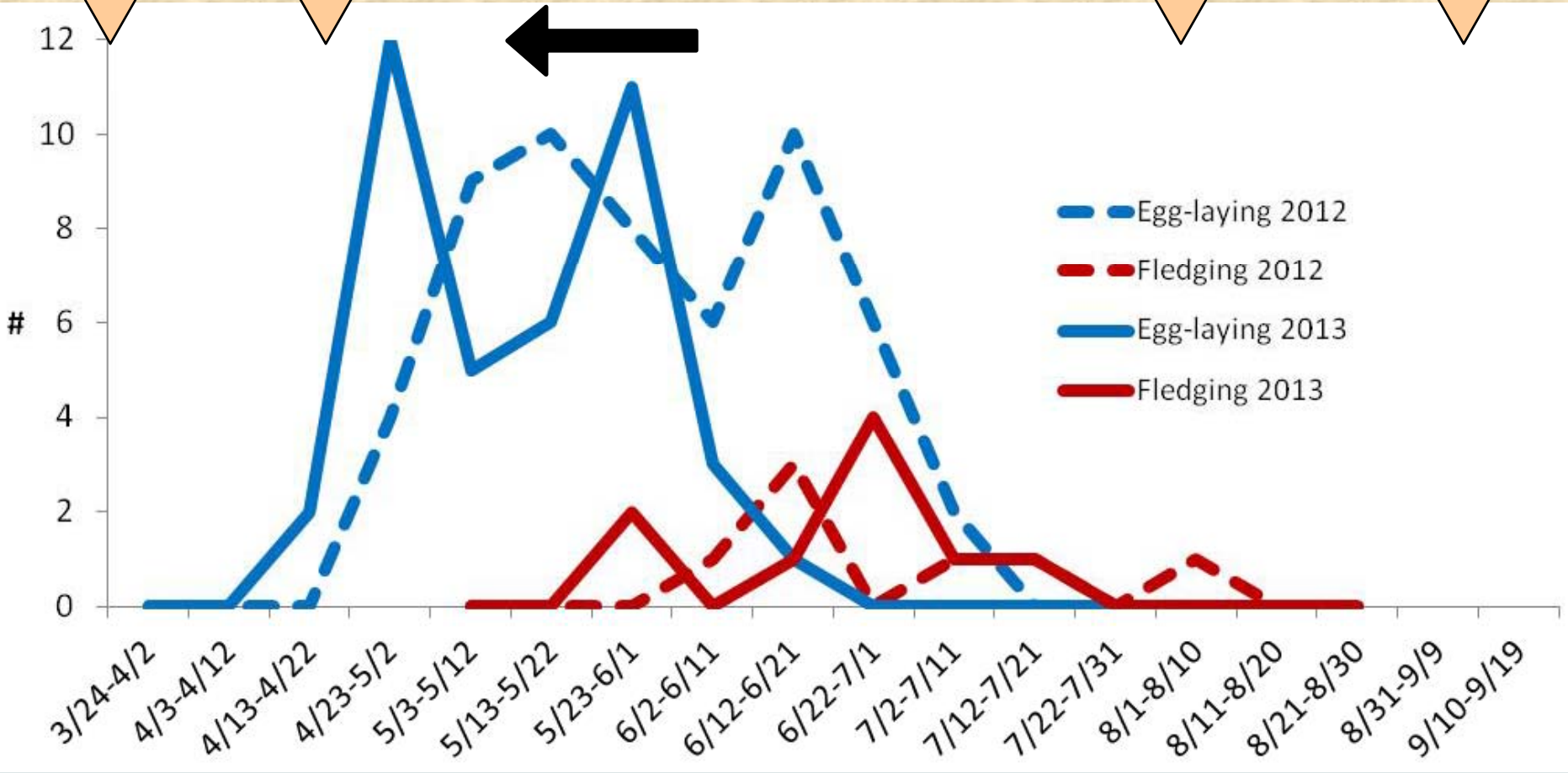
Earliest Singing 24 March

Earliest Egg-laying 19 April

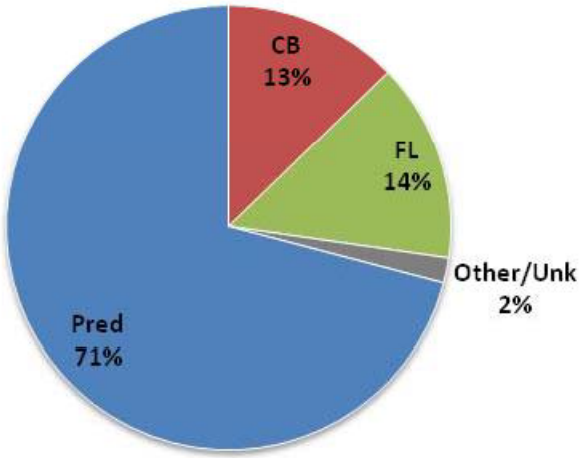
Latest Fledging 1 August

Latest Singing 12 Sept

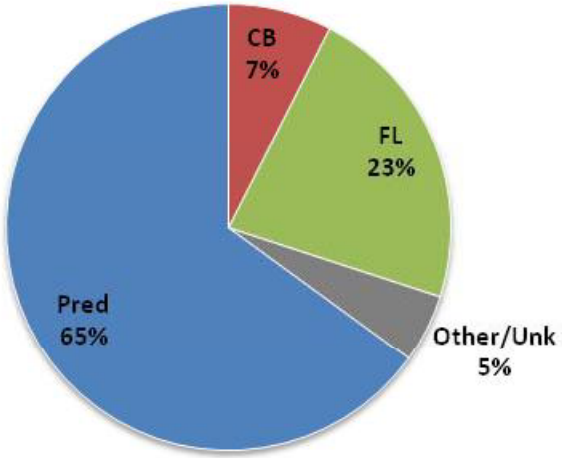
Average egg-laying date 16 days earlier in 2013



2012:
22%
below
average
precip



2013:
60%
below
average
precip



PRISM: 50-yr average precipitation (cumulative July to June) = 22.5”

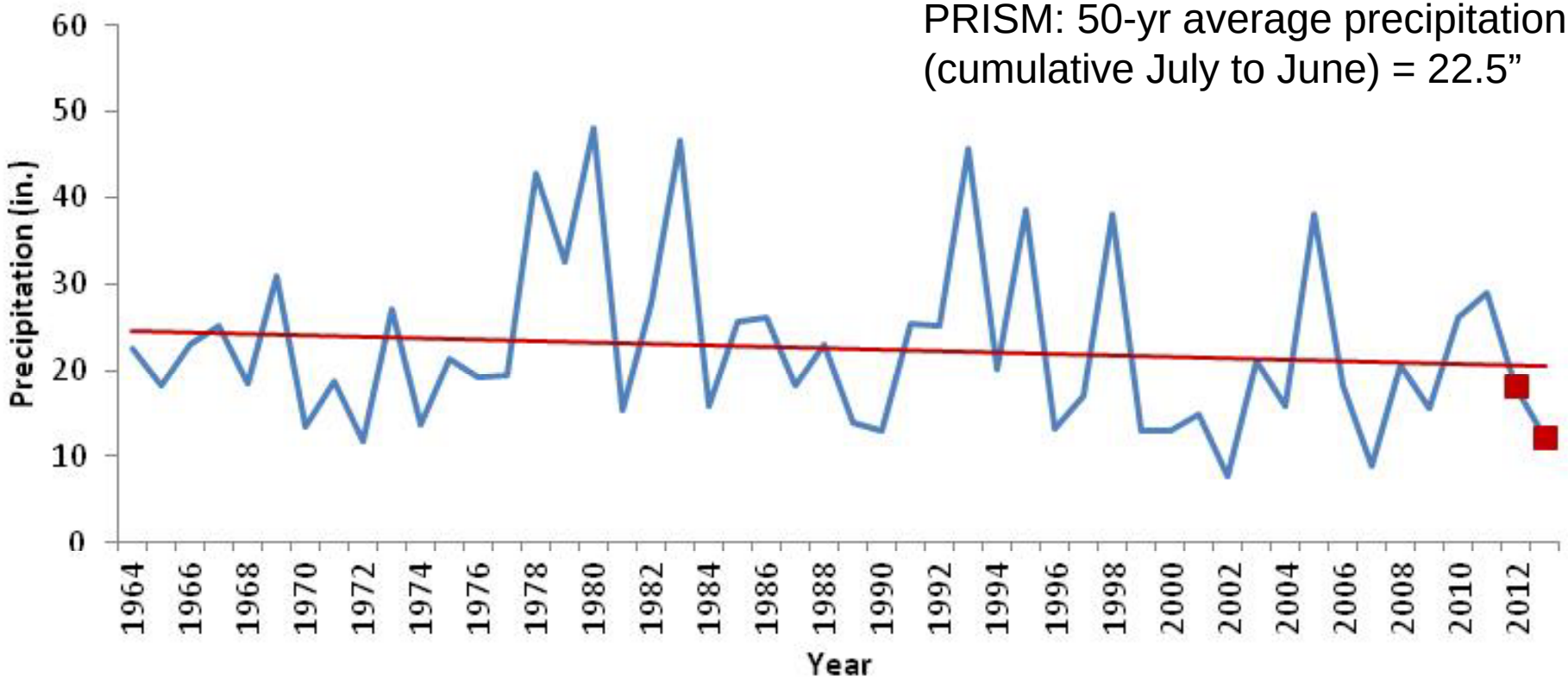



Photo: Lea Squires

Photo: Kevin Clark


Photo: Tom Myers

Photo: Kevin Clark

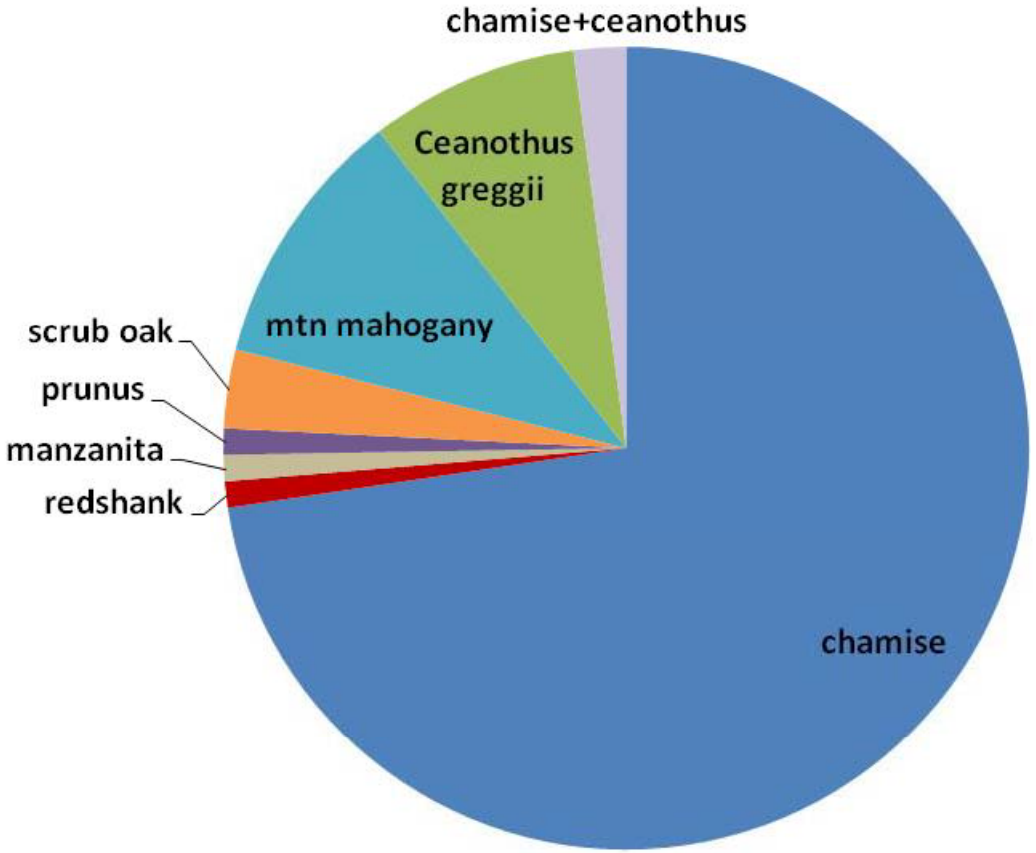

Photo: Kevin Clark


Photo: Matt Sadowski


Photo: Lori Hargrove

Nest Shrubs

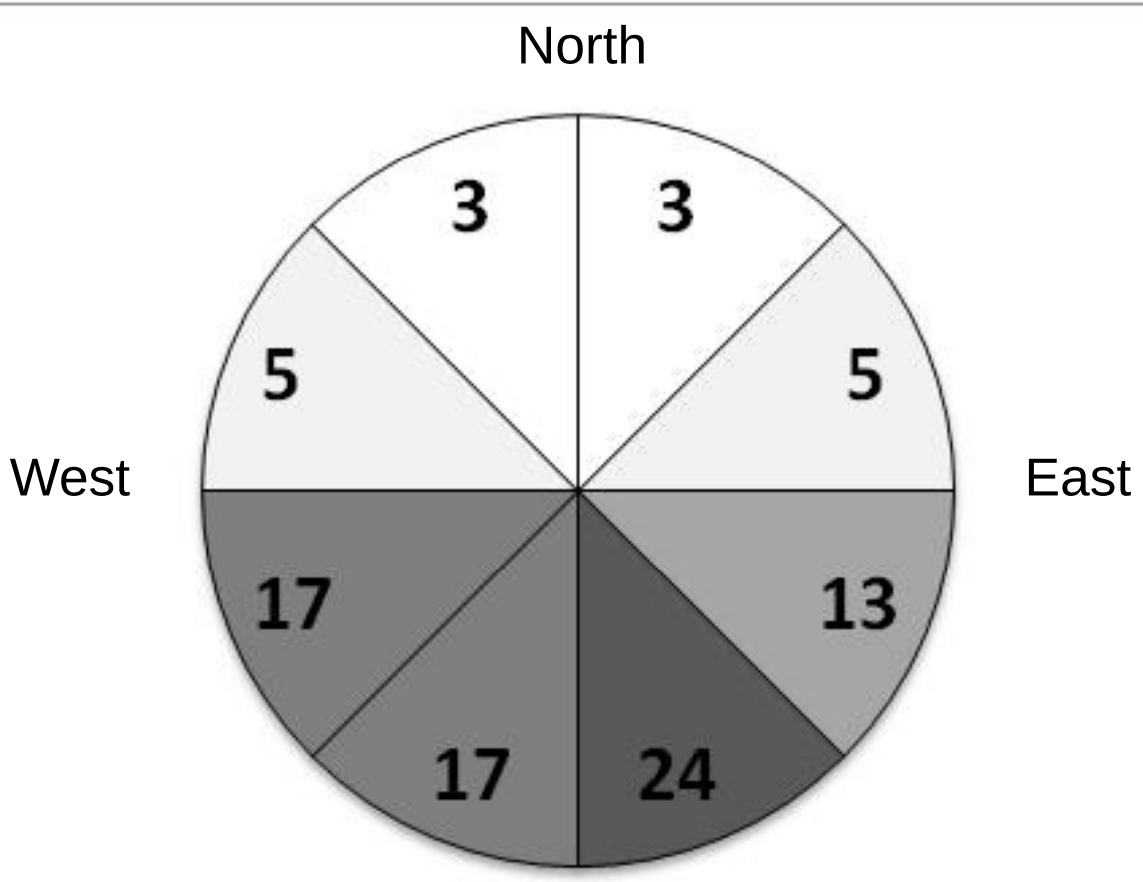
- Shrub height: 1.8 m (1.1 – 2.9 m)
- Most common: chamise (73%)



N = 95

Nest Shrubs

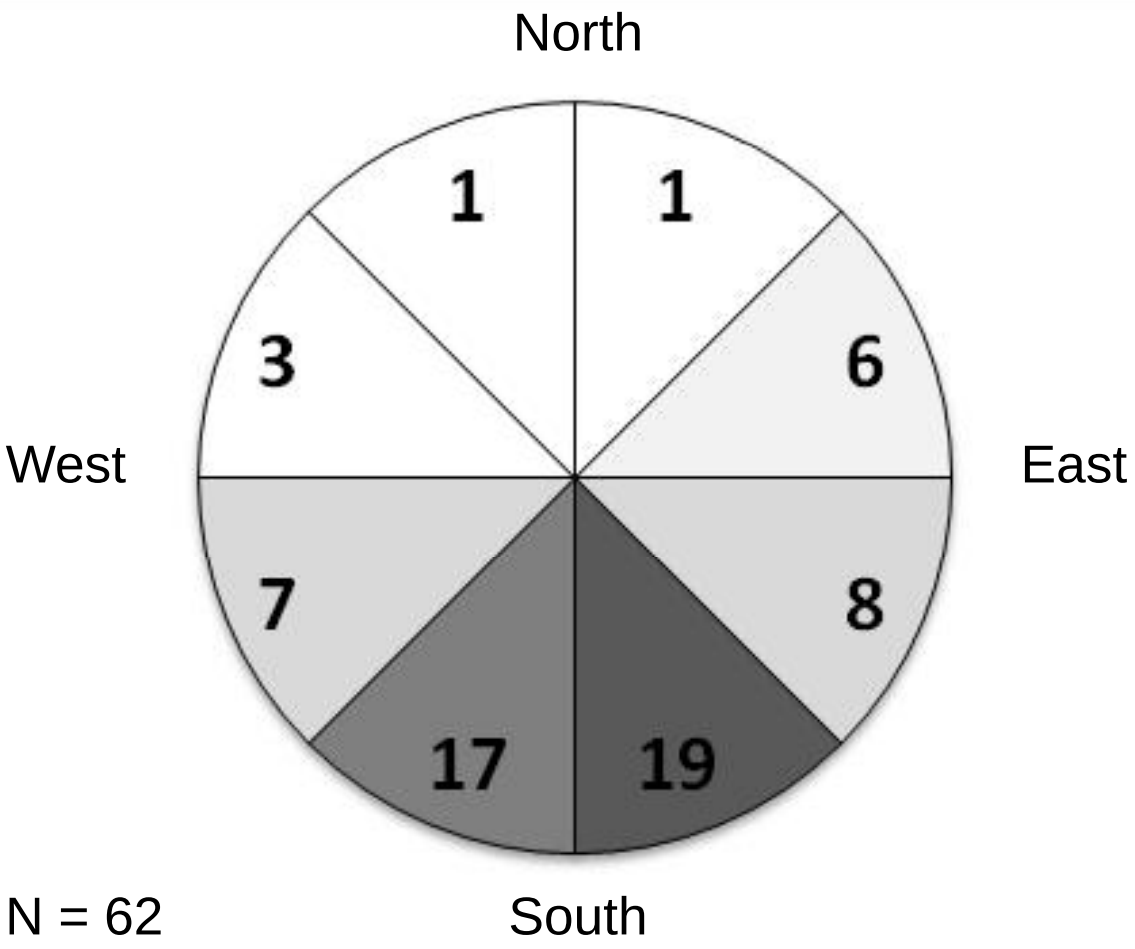
- Predominantly south-facing aspect



N = 87

Nest Placement

- Nest height: 1.2 m (0.6 – 2.3 m)
- 81% non-central (mostly south)

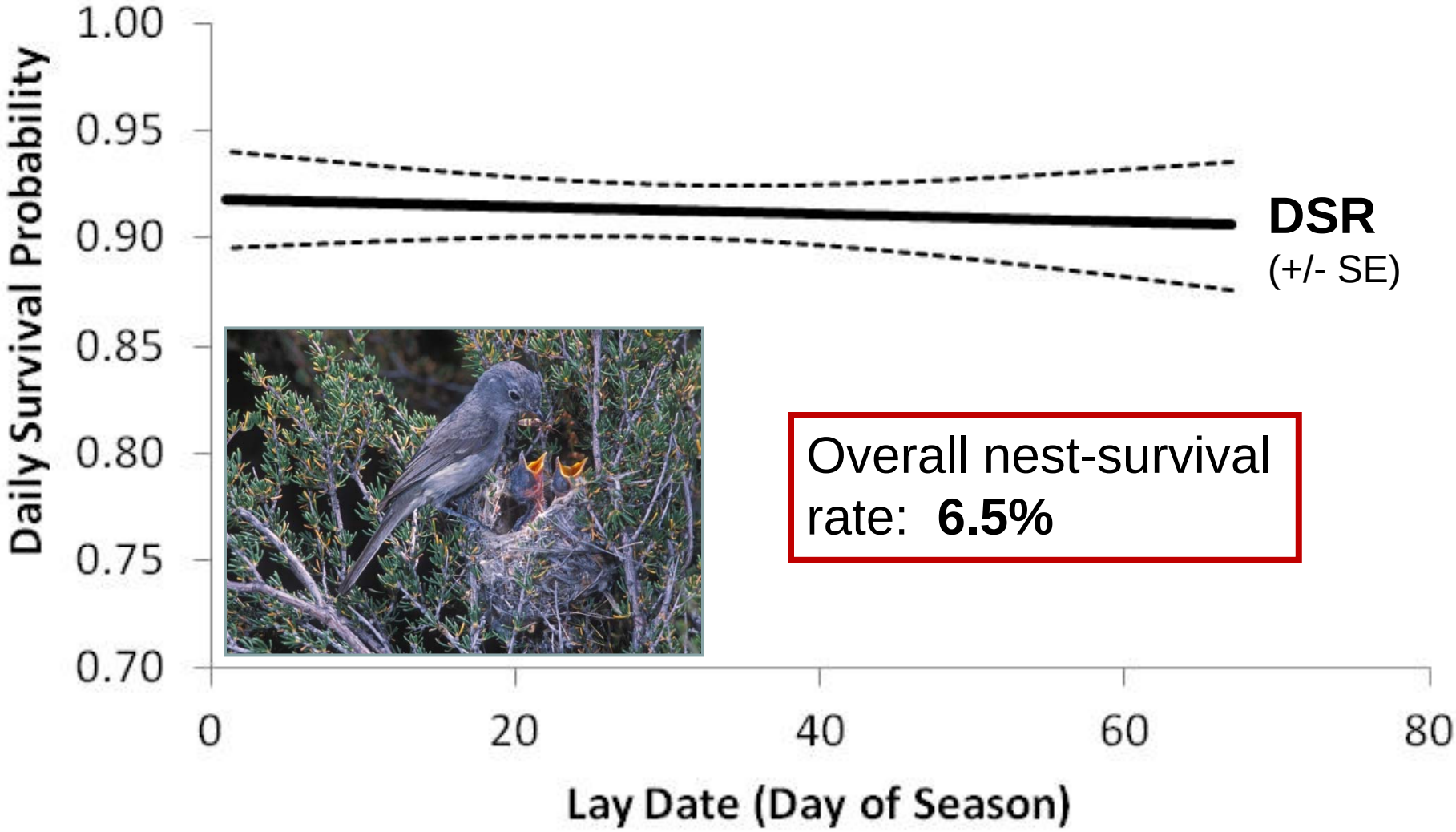


Other Nesting Observations

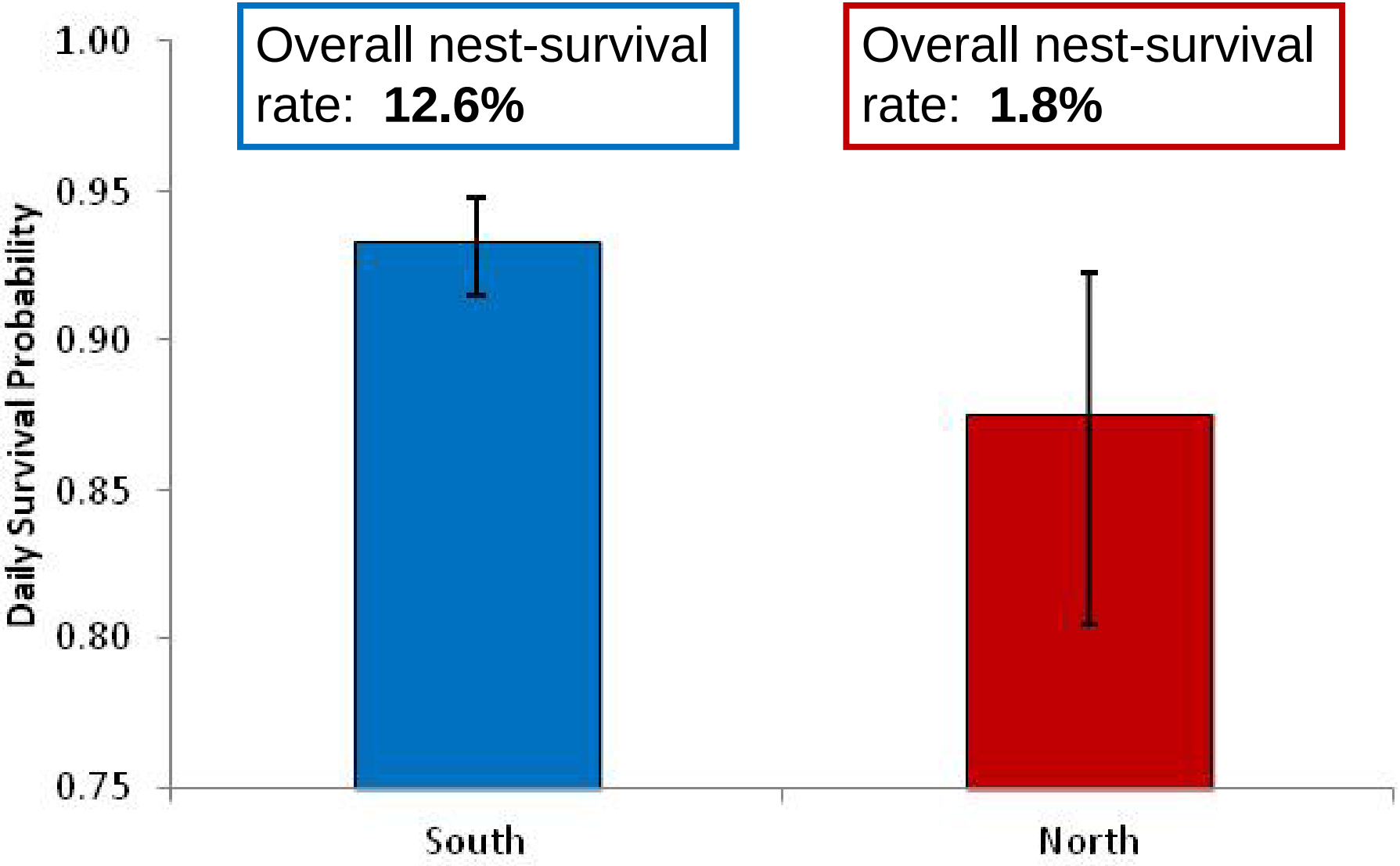
- Average clutch size: 3.4 (1–4, *n* = 45)
- Egg-laying: 1 egg/day (incubation starts with 1st egg)
- Incubation: 16–18 days
- Nestlings: 12–14 days
- Fledglings stay in territory
- Males assist with construction, incubation, brooding, feeding young, and scolding jays

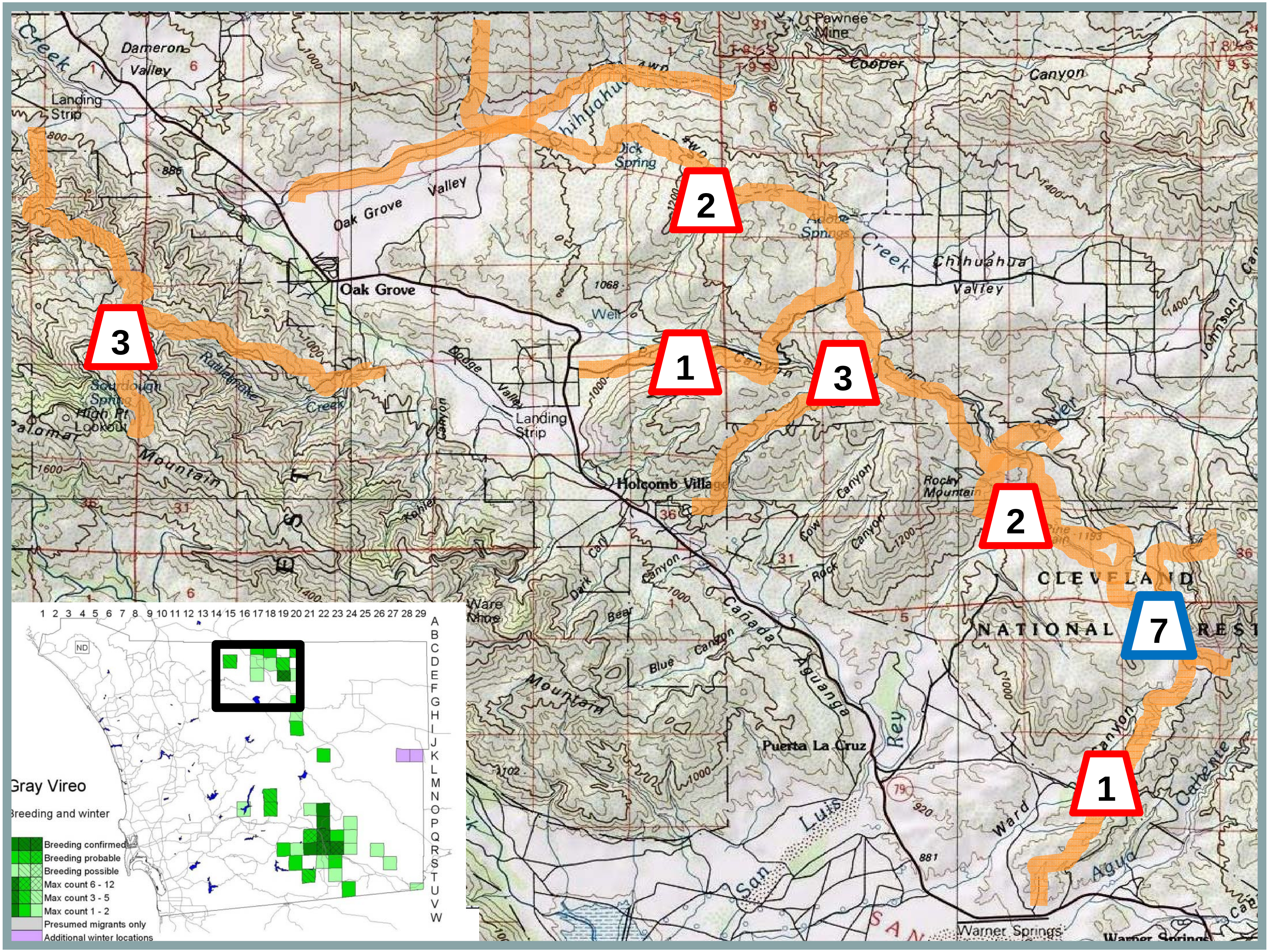
Daily Survival Rate by Day of Season

Year 2012 Only (Program Mark)

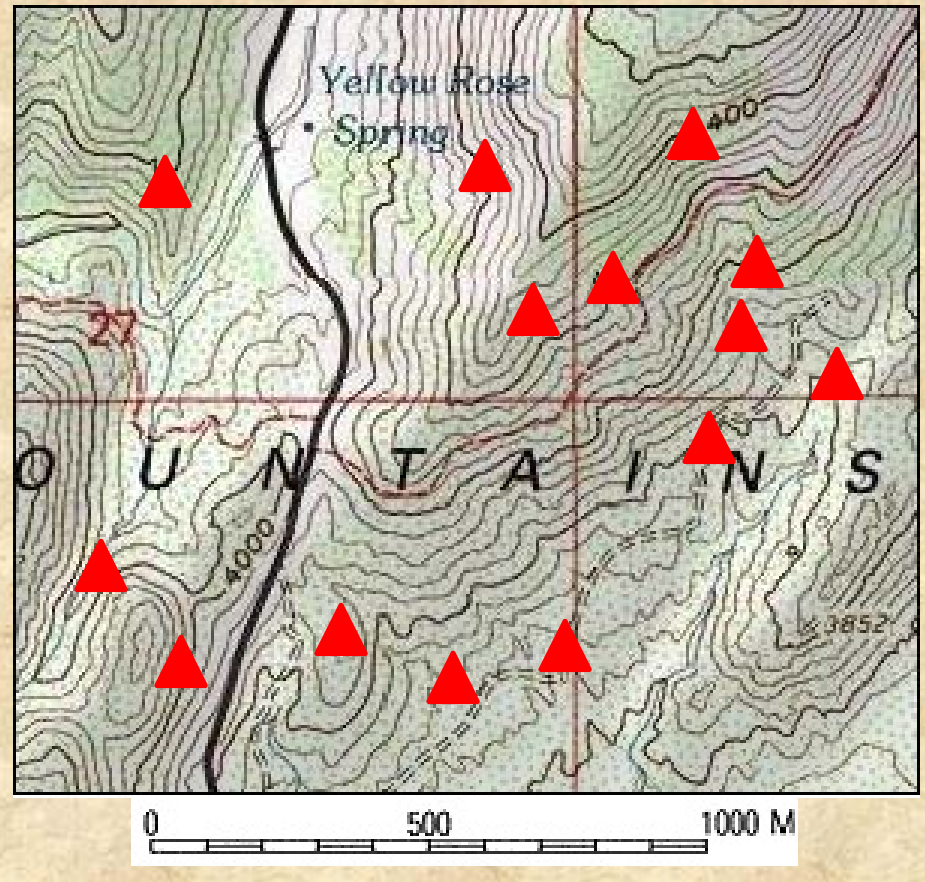


Survival Probability by Study Area



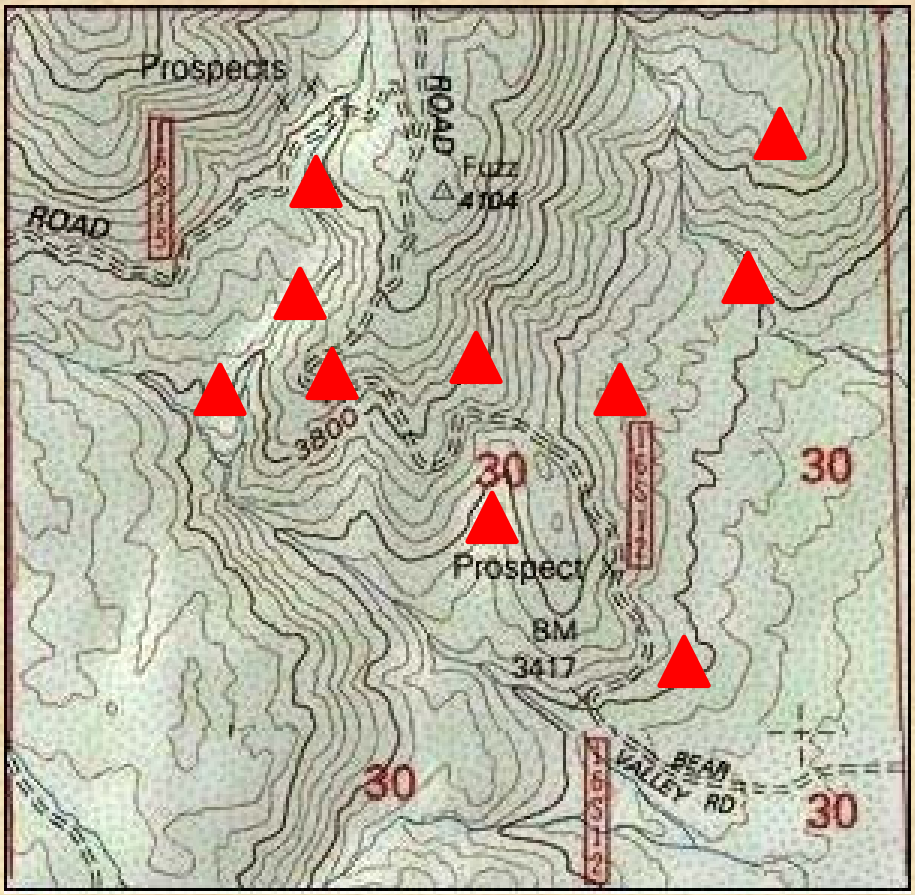

Dameron
Valley
Landing
Strip
Oak Grove Valley
Oak Grove
Chihuahua
Dick
Spring
Pawnee
Mine
Cooper
Canyon
Creek
Chihuahua
Valley
Johnson
Rattlesnake
Creek
Dodge
Valley
Landing
Strip
Sourdough
Spring
High Pt
Lookout
Palomar
Mountain
Holcomb Village
Rocky
Mountain
CLEVELAND
NATIONAL FOREST
Puerta La Cruz
Aguanga
Rey
San Luis
Warner Springs
Ward
Caliente
Blue
Bear
Canyon
Mountain
Cañada
Ware
Mine
3
2
1
3
2
7
1
Gray Vireo
Breeding and winter
Breeding confirmed
Breeding probable
Breeding possible
Max count 6 - 12
Max count 3 - 5
Max count 1 - 2
Presumed migrants only
Additional winter locations

Gray Vireo Territory Density (Hargrove 2002)



Kitchen Creek Road:

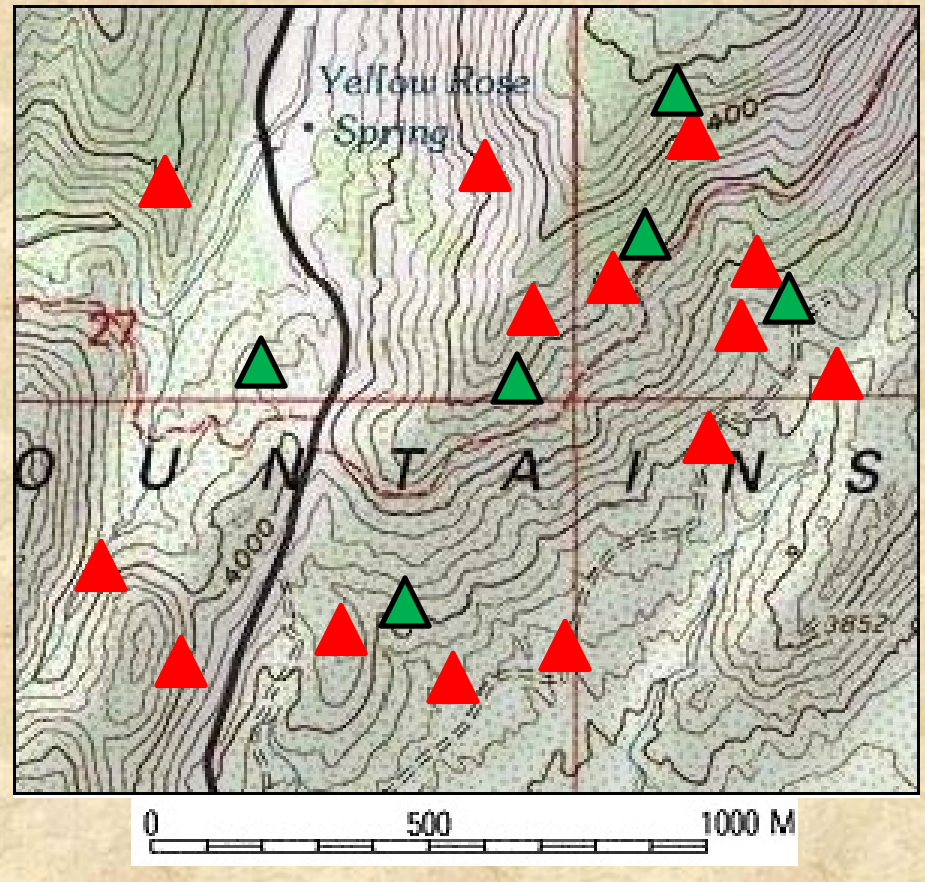
14 males per 250 ha (per 1 sq-mi)



Bear Valley Road:

10 males per 250 ha (per 1 sq-mi)

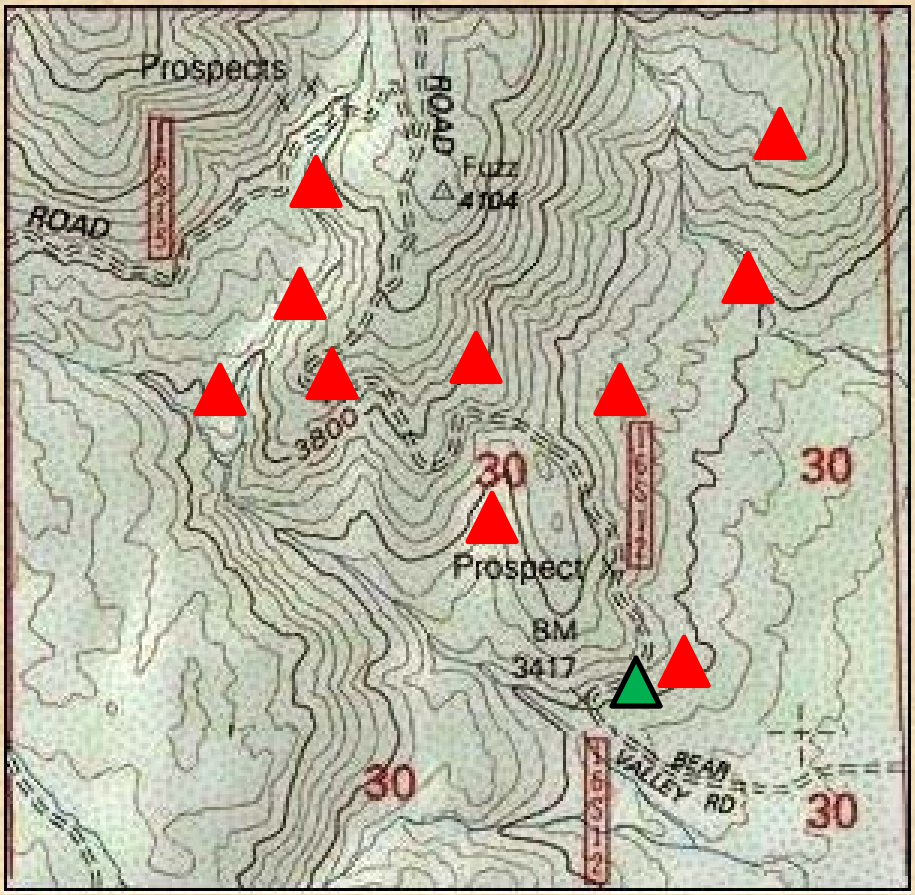
Gray Vireo Territory Density
(Hargrove 2002 vs. 2012)



Kitchen Creek Road:

14 males per 250 ha (per 1 sq-mi)

vs. 6 males per 250 ha



Bear Valley Road:

10 males per 250 ha (per 1 sq-mi)

vs. 1 male per 250 ha

Western Scrub-Jay

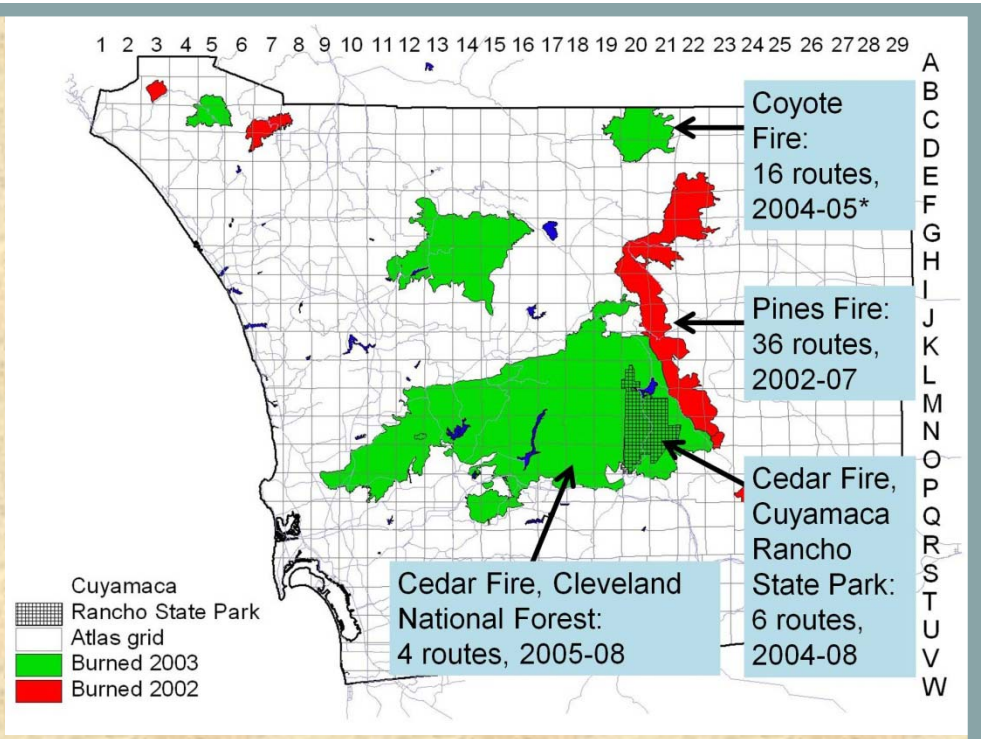
- The most frequent nest predator
- Egg stage or earlier
- Actively search for nests
- Protracted depredation
- Recent increases?
- Annual variation?

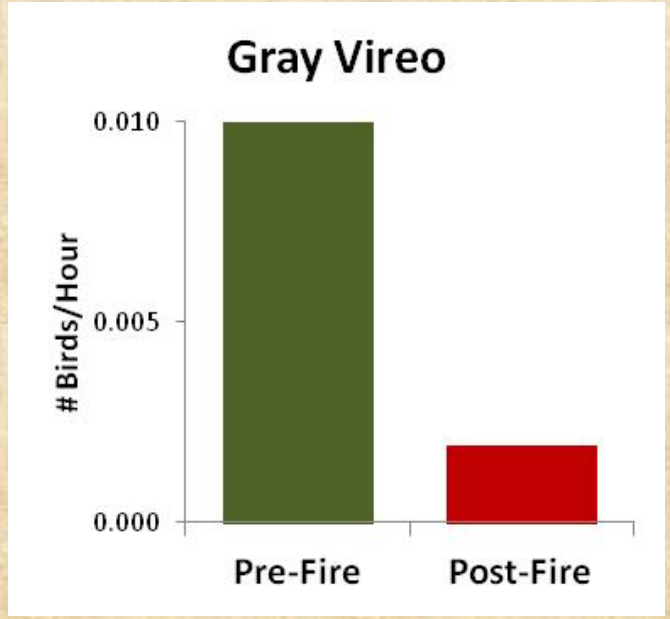
Other Possible Threats

- Habitat destruction
- Disease/parasites
- Other Predators
- Droughts/warmer climate
- Changing fire regimes

Response to Fire

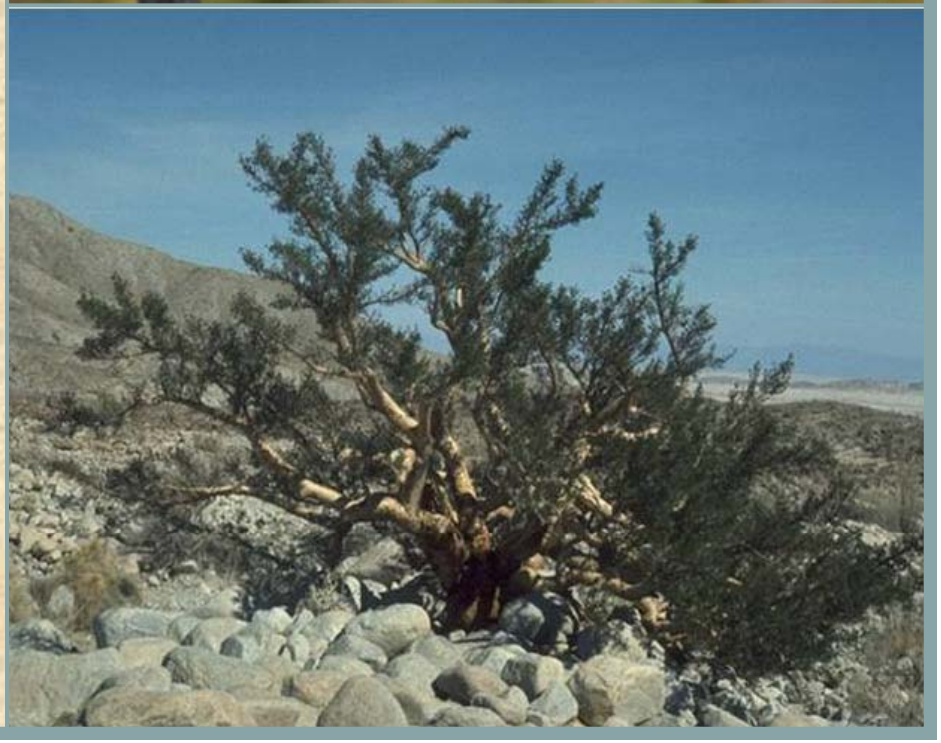
- Compared to pre-fire Atlas records, post-fire routes in the same squares showed a reduction by 80%.
- There were only 3 records of single Gray Vireos in burned areas within 5 years post-fire (2003, 2005, 2007), none persisting across multiple visits.
- Current Study (2012-13): All territories are in older-age chaparral with minimum age of 10 years.





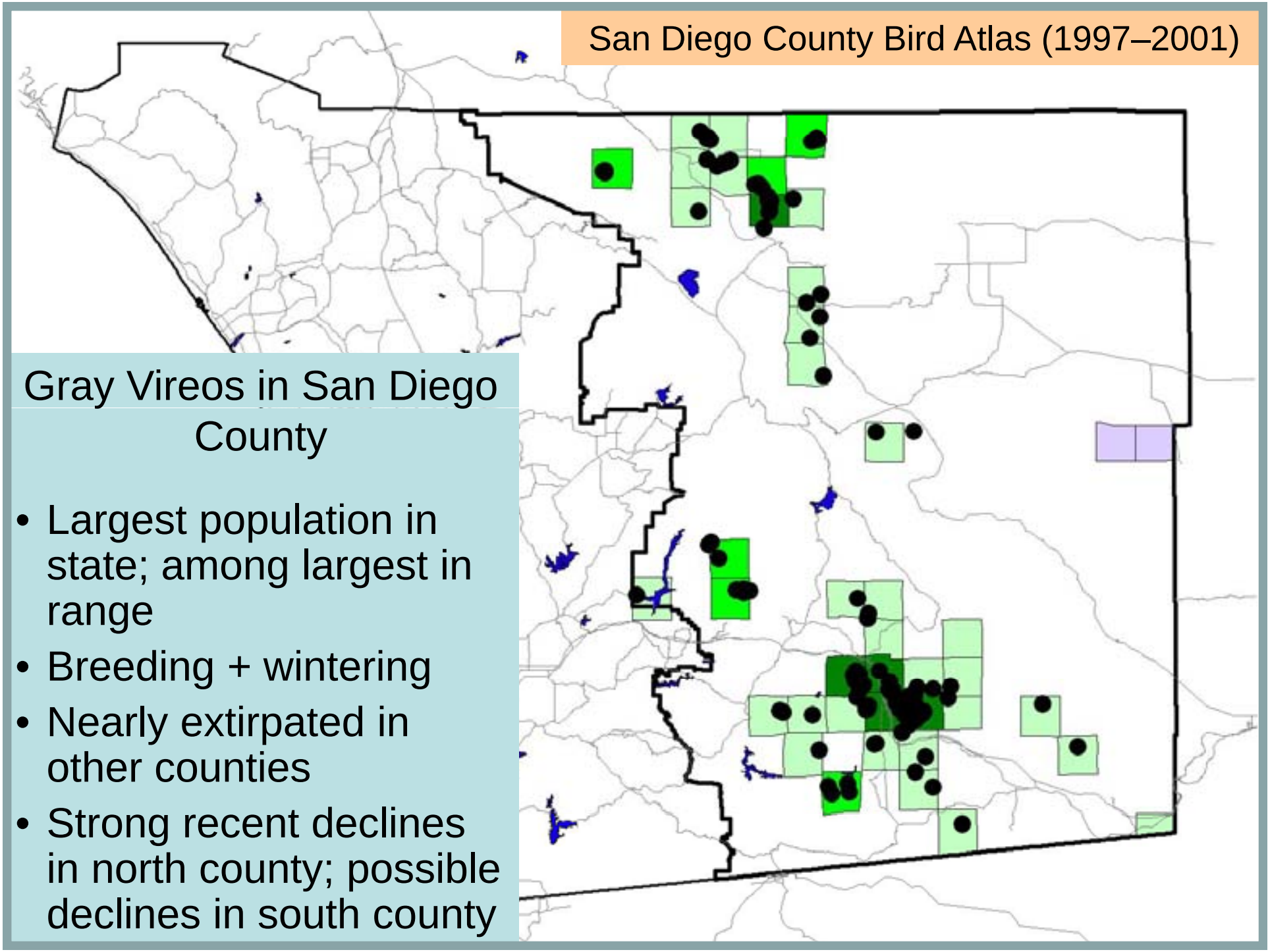
Future Directions

- Annual variation in factors affecting nest success?
- Genetic studies?
- Current breeding status in the Sierra Juarez and Sierra San Pedro Mártir in northern Baja: could there be a source population refilling a sink in the U.S.?
- Winter ecology: how does the Gray Vireo's close association with the elephant tree affect its survival over the winter?



What is effective management: Can the decline of the Gray Vireo be reversed?

- Monitoring: low-cost presence/absence
- Trapping of the Brown-headed Cowbird has been critical to the recovery of the Least Bell's Vireo. Would such trapping be enough to tip the scales in favor of the Gray Vireo even if the cowbird is not the biggest source of nest failure?
- Is there a practical means of managing habitat to reduce numbers of the Scrub Jay, if direct control (e.g. trapping), is unlikely to be effective?



Gray Vireos in San Diego County

- Largest population in state; among largest in range
- Breeding + wintering
- Nearly extirpated in other counties
- Strong recent declines in north county; possible declines in south county

Acknowledgements:

- California Department of Fish and Wildlife
- Cleveland Natl. Forest

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Lori Hargrove

Philip Unitt

Kevin Clark

Matt Sadowski

Christine Harvey

Photo by Tony Mercieca