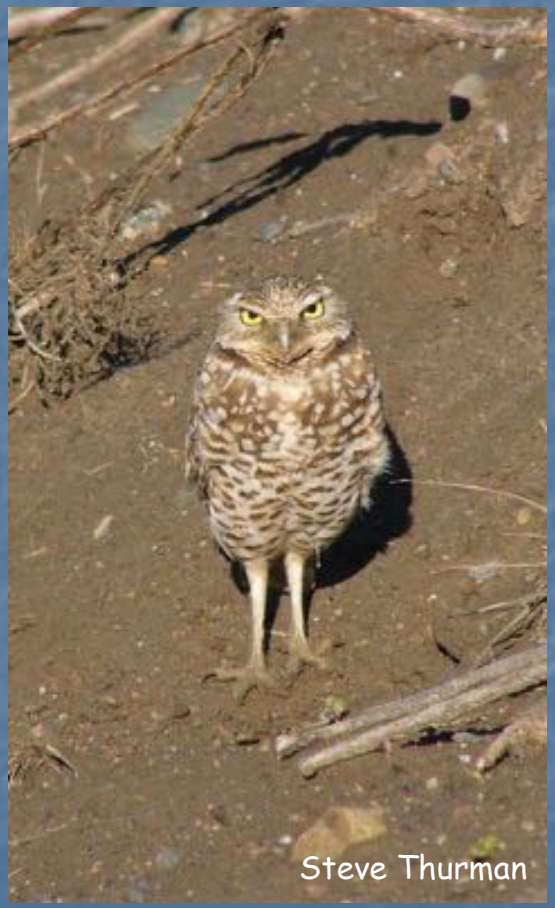
Western Burrowing Owl Workshop



Dr. Lynne Trulio
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July 18-19, 2019

Workshop Topics

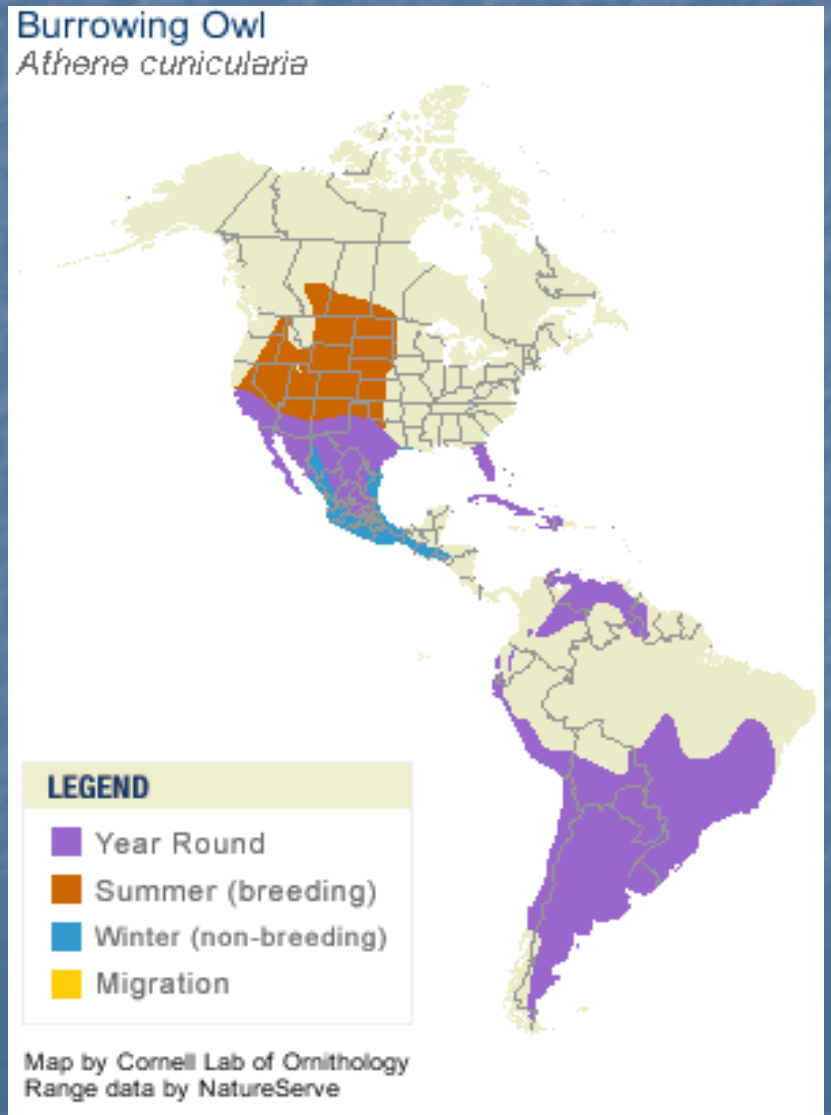
- Distribution
- Identification
- Life History
- Habitat Requirements
- Status & Threats & Regulations
- Habitat Enhancement Methods
- Reestablishing Owls on Sites
- Management for Population Persistence

Athene cunicularia
Burrowing Owl or "Little Miner"

An Odd Bird

- Does not hoot
- Active day and night
- Only owl that lives and nests underground
- Life revolves around the burrow
- Lines burrows with dung, collects burrow decorations
- Juveniles do a great rattlesnake mimic!

Entire Species Range –
18 recognized subspecies

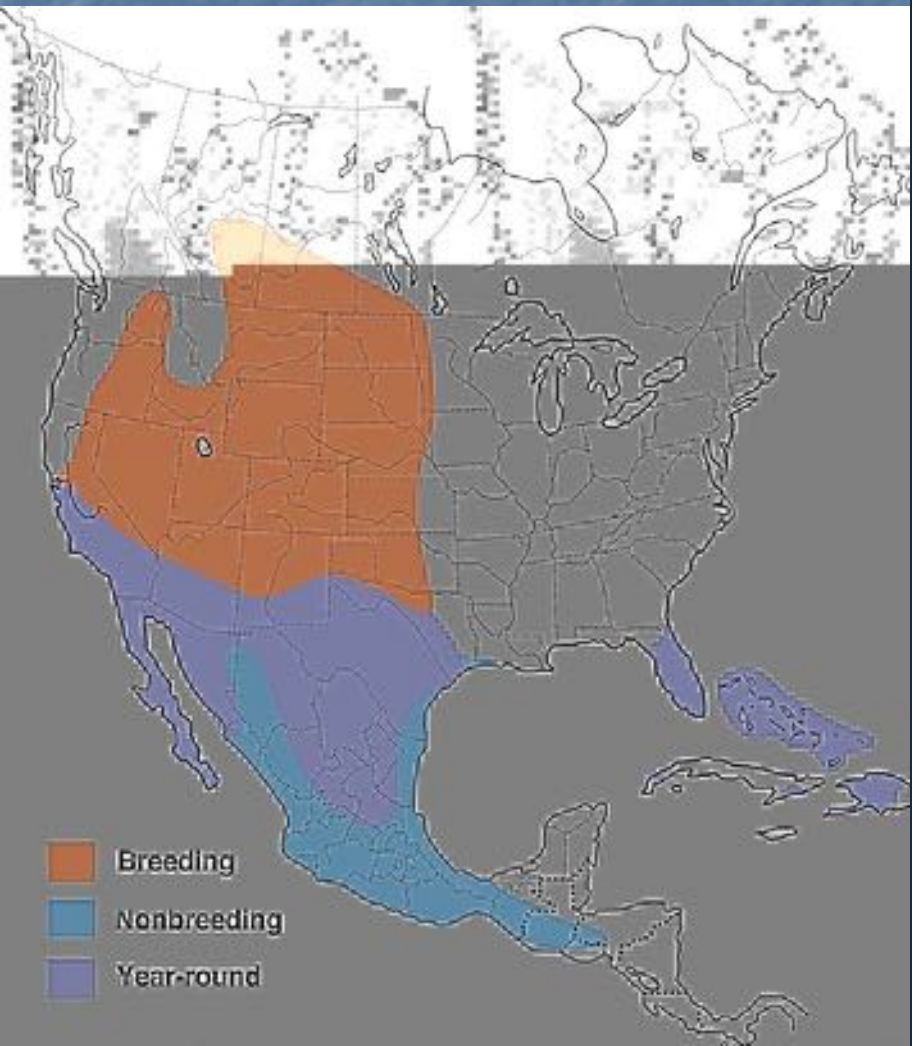


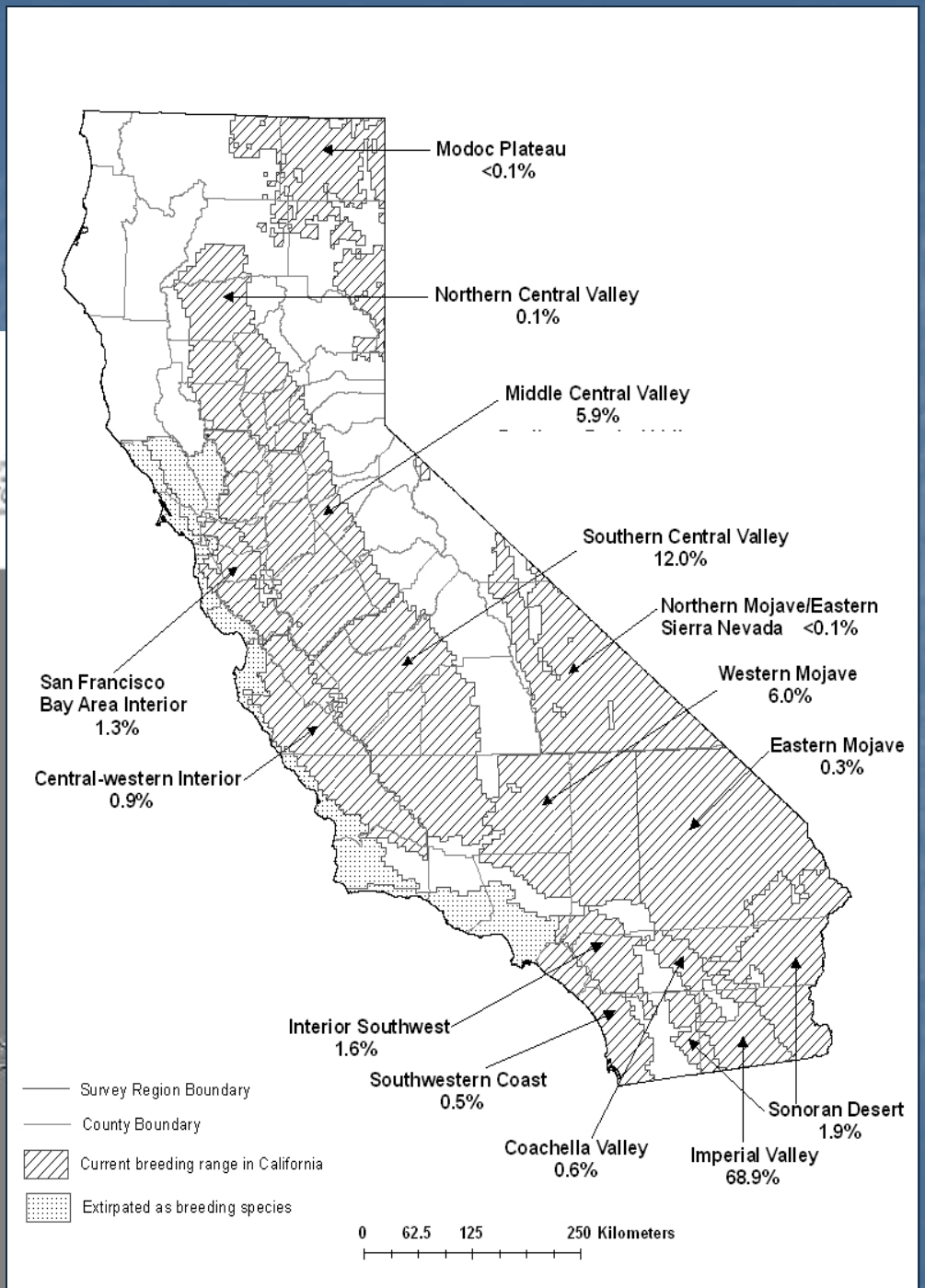
See Macias-Duarte, et al. (2019) for genetics of wide-spread vs insular Burrowing Owl subspecies

US Subspecies of Burrowing Owls

- Two subspecies in the US:
  - Western burrowing owl (*A. cunicularia hypugaea*)
  - Florida burrowing owl (*A. cunicularia floridana*)
- Very similar in appearance/behavior

Range of the Western Burrowing Owl





Migration

- Year-round residents
- Migrants – coastal, bay edges, hill sides
- Breed in more interior, flat areas
- Focus is on the breeding season…
- …but the winter season is also vital

Identification - Adults

- Ht ~7.5-9.5 inches
- Wt ~5-6 ounces
- Wing span ~22 inches
- Long legs, few feathers
- Mottled brown and cream
- Designed for camouflage!
- Bright lemon yellow eyes
- No ear tufts
- Active day and night
- On ground or low perch


Garrit Vyn


Steve Thurman

Identification - Adults

Male and female not sexually dimorphic, but male is slightly larger & paler in summer; behavioral differences.

Identification - Chicks

- May – September in CA
- Smaller than adults until about July
- Buffy breast, whiter eye-brow, darker collar

Steve Thurman

Chicks over the Season

Calls

- No typical owl "hoots"
- Males: "coo – coo" territorial/mating call
- All birds: "chatter" alarm call
- Females & Juveniles: "rasp" food call
- Nestlings & Juveniles: defensive call
- Listen to the calls: http://www.allaboutbirds.org/guide/burrowing_owl/sounds

Life History Characteristics

- Inhabits open grasslands; short scrub habitat
- A raptor – although a small one
- Many predators
- Migratory in much of range, but in temperate areas some resident and some migrant
- Semi-colonial, esp. with sciurids
- Semi-fossorial – inhabits burrows year round
- Monogamous during the breeding season
- Sexually mature at 1 year
- Lays 2-12 eggs; one clutch per year
- Lives ~3-5 years, but up to ~8 years

Bird of Open Grasslands:

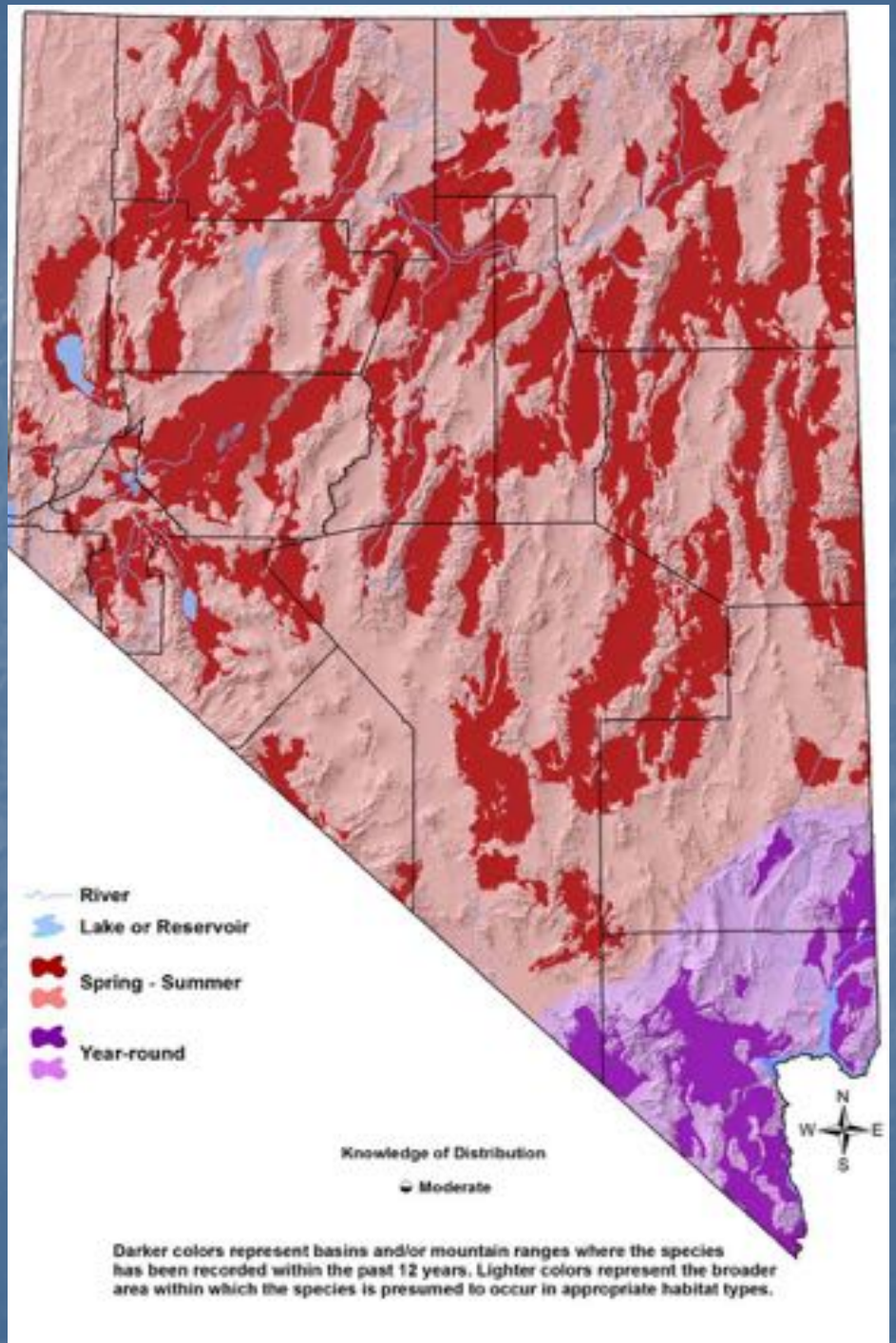
Prairies, Ag Lands, Bases, Golf Courses, Open Fields – Natural Grasslands and Urban Sites

Habitat Types - Statewide in CA

(Wilkerson & Siegel, 2010)

~30%=irrigation canals
~16%=natural grassland
~10%=idle/fallow field
~10%=field crop

~10%=urban
~ 8%=pasture
~ 6%=brushland
~ 3%=grain/row



But in Nevada, for example…

- 44% in sagebrush
- 22% in grasslands
- 21% in salt desert scrub
- 9% in agriculture

(Great Basin Bird Observatory. 2010. *Nevada Comprehensive Bird Conservation Plan* at http://www.gbbo.org/bird_conservation_plan.html)

Nesting Habitat Requirements

Flexible requirements…within limits

Nesting owls are found…

- At lower elevations in much of California (often <200 ft)
- In open areas, typically with few trees
- Short grass (<6") around burrows
- Structural heterogeneity elsewhere - long grass, shrubs, rock + brush piles
- Associated with ground squirrels
- Some level of soil disturbance, esp. from ground squirrels

Predators? Just about everything!

- Primary: hawks, larger owls, skunks, foxes, coyotes, snakes
- Others: crows & ravens (a growing concern), dogs, cats, badgers


Scott Thurman

Burrows are key, natural and artificial

California Ground Squirrels

Ground Squirrel Importance

- Colonial & semi-fossorial
- Provide burrows for burrowing owls
- Natural landscape maintenance
- Share many predators—
  Aerial & Terrestrial

Early Warning System!*

Owls responded at least 75% of the time squirrels called first

*Henderson & Trulio. 2019 Can California ground squirrels reduce predation risk to burrowing owls? *J. Raptor Research* 53:172-179.

Artificial burrow with lots of debris out front

Many burrows are needed:

* Per pair: primary + satellite
* Overall: prefer high-burrow density areas

Breeding Season Territory & Home Range

- Site tenacity – during season
- Some site fidelity – 32% - 57%
- 80% of foraging within 600m of burrow, but as far as 2 miles away
- Home range size varies widely, based on prey availability and quality

Wintering Season in CA:

Many resident birds but…

Burrowing owls are formally endangered in Canada and of special concern in the USA. This map shows wintering distribution sites for 25 adult burrowing owls, based on geolocator data.

- Saskatchewan Study using geolocators showed:
  - 9/10 females to CA
  - 10/15 males to OR/WA
- CA = important winter habitat for birds
- Males nearer breeding sites than females

http://usfwspacific.tumblr.com/post/54113535534/wintering-habits-of-burrowing-owls-come-as-a-surprise

Current research using satellite telemetry conducted by a number of researchers (Conroy, Johnston, Holroyd, Trefry) …

…shows amazing migratory travels!

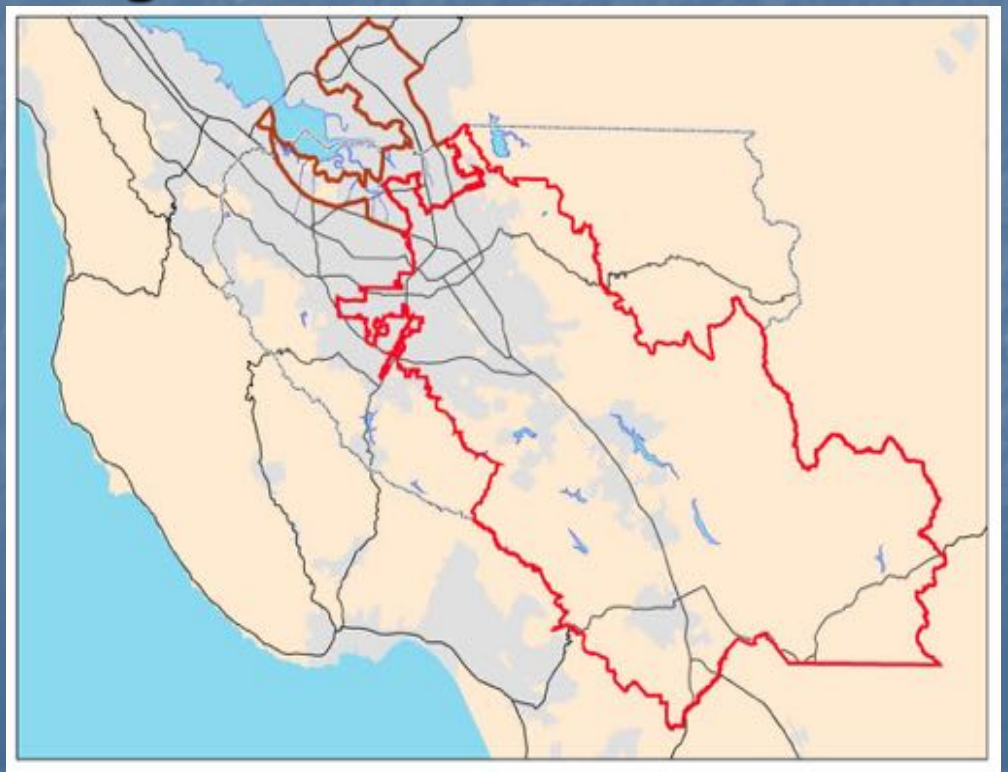
Bend, Oregon

to

Salinas, California

Wintering BUOWs in the Santa Clara Valley Habitat Plan Area

- Where do BUOWs winter & how many?
- What is the relationship between wintering and breeding owls?



Santa Clara Valley Habitat Plan
(HCP/NCCP)

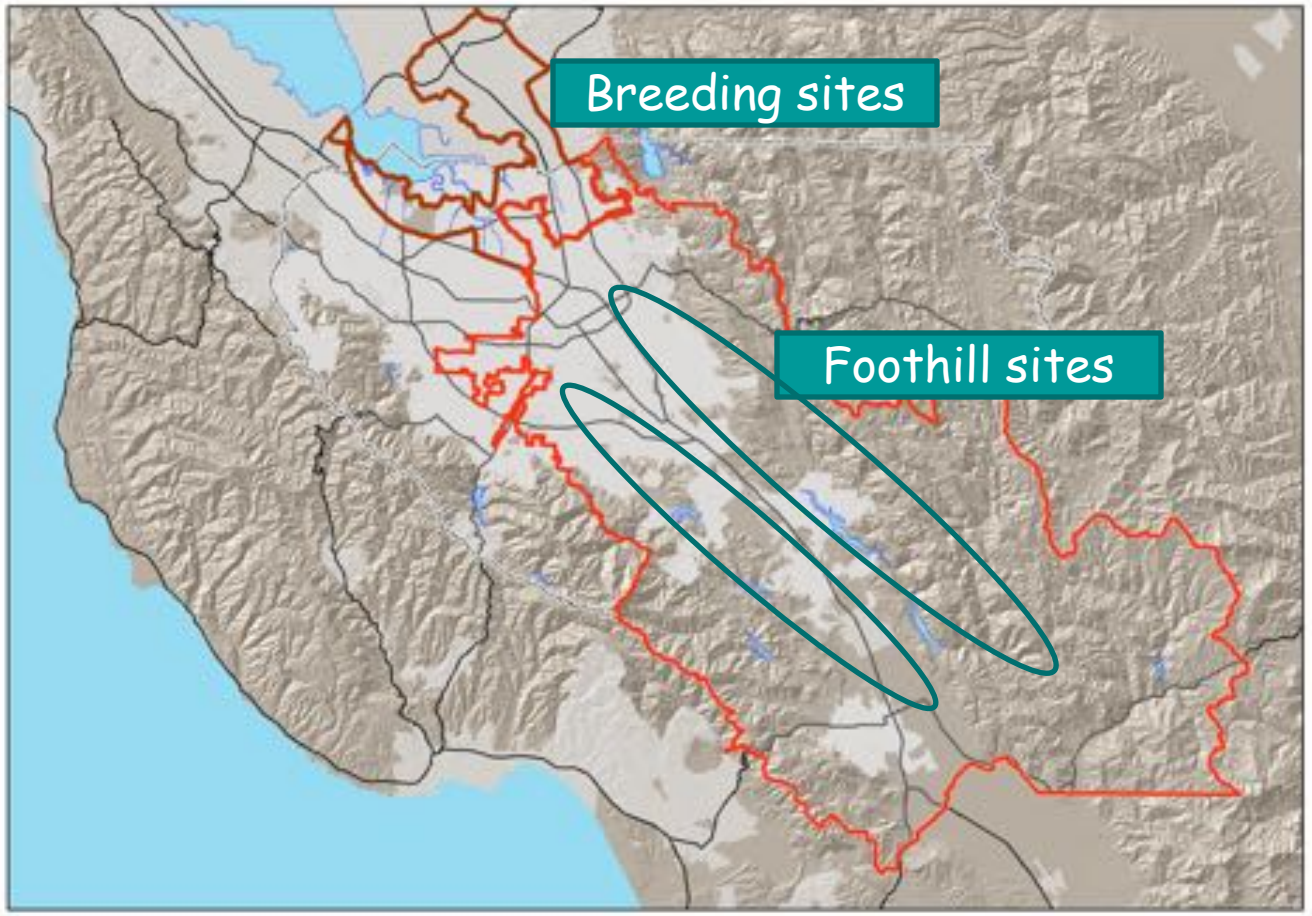
Burrowing owls - a covered species

Seeking ways to protect & recover

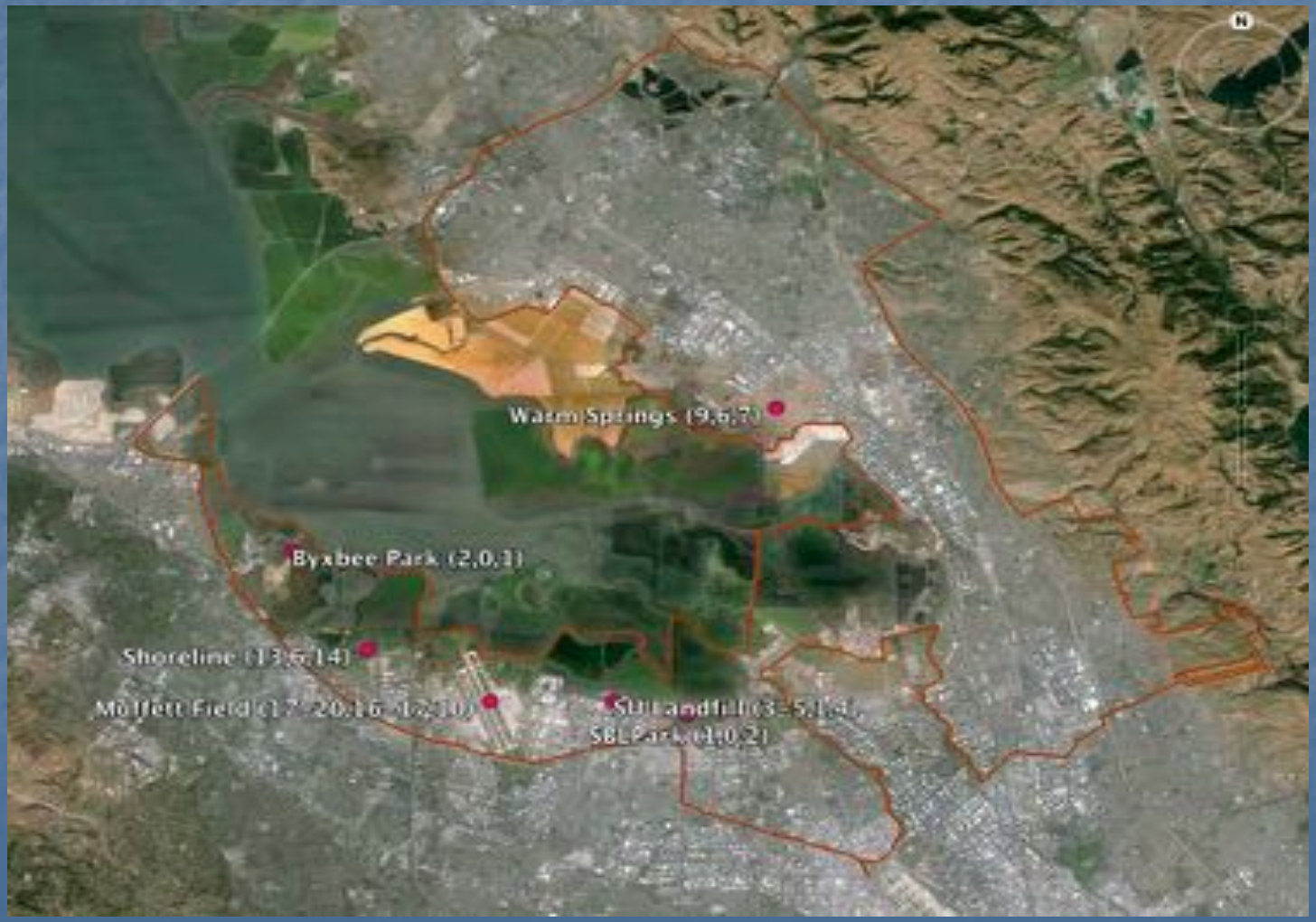
SANTA CLARA VALLEY
HABITAT AGENCY

Santa Clara Valley Habitat Plan Area

--focus on protected open space--



Long-term (typical) breeding sites



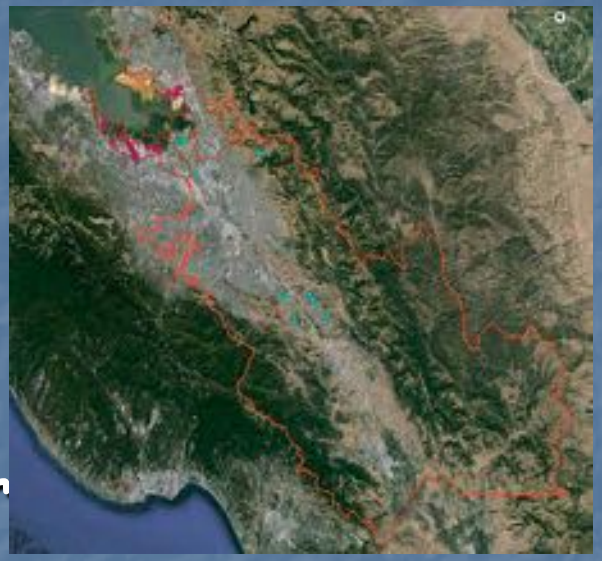
Winter Study Methods

- CBC locations, local experts, eBird
- Bow trap and MP3 player
- Capture and band

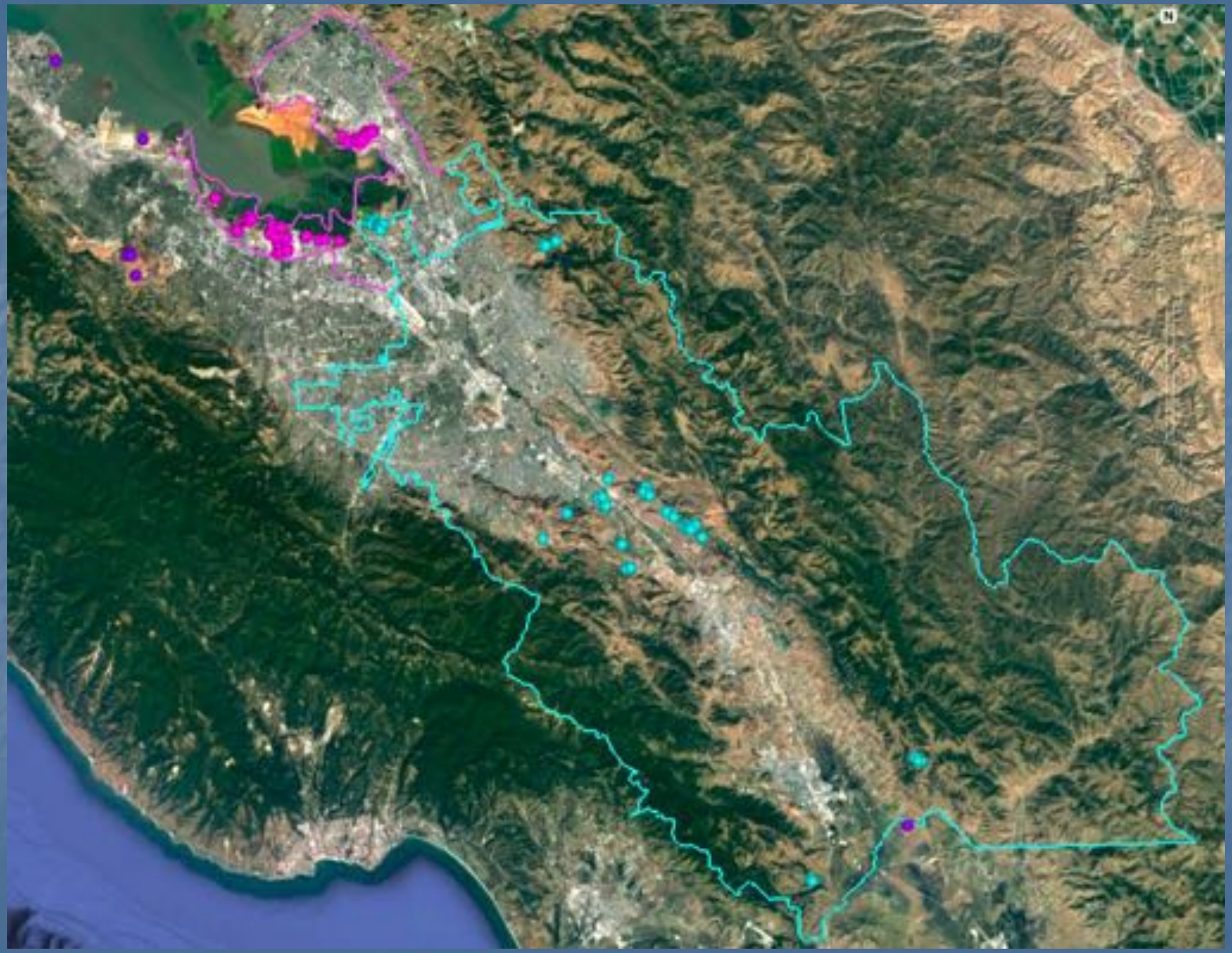
Summer Study Methods

- Surveys and banding at:
  a) Typical breeding sites and
  b) Foothill locations of wintering owls

4 Winter-Summer field seasons – 2014-15 to 2017-18



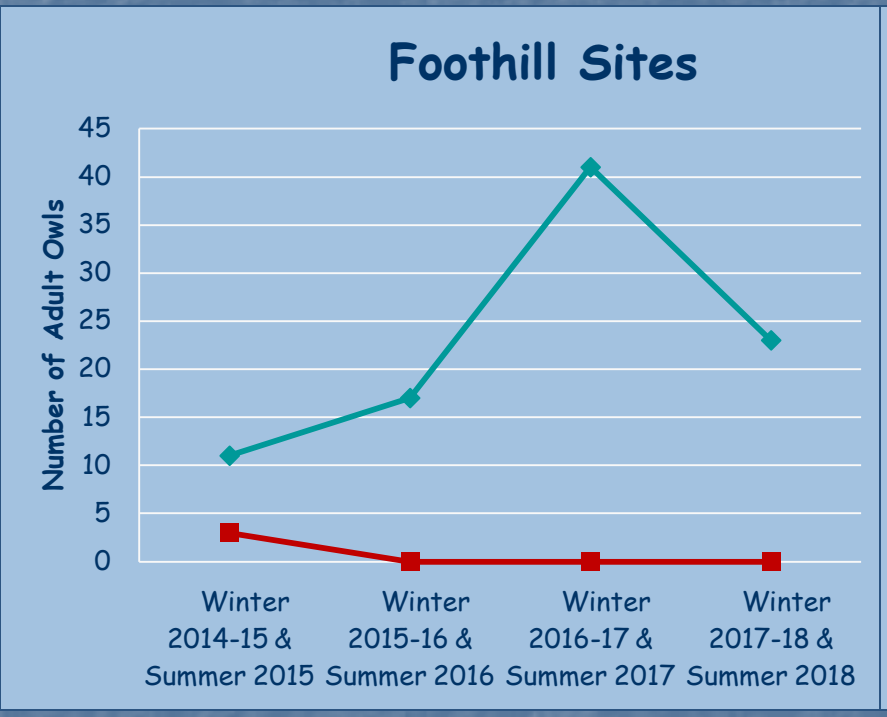
- Overall in winter:
  - 23-28 newly banded birds
  - Up to 700m in elevation
- Winter returns:
  - 2-3 birds from previous winter that were not seen in the summer
- Resident birds:
  - At typical breeding sites
  - No previously banded breeding owls in foothills

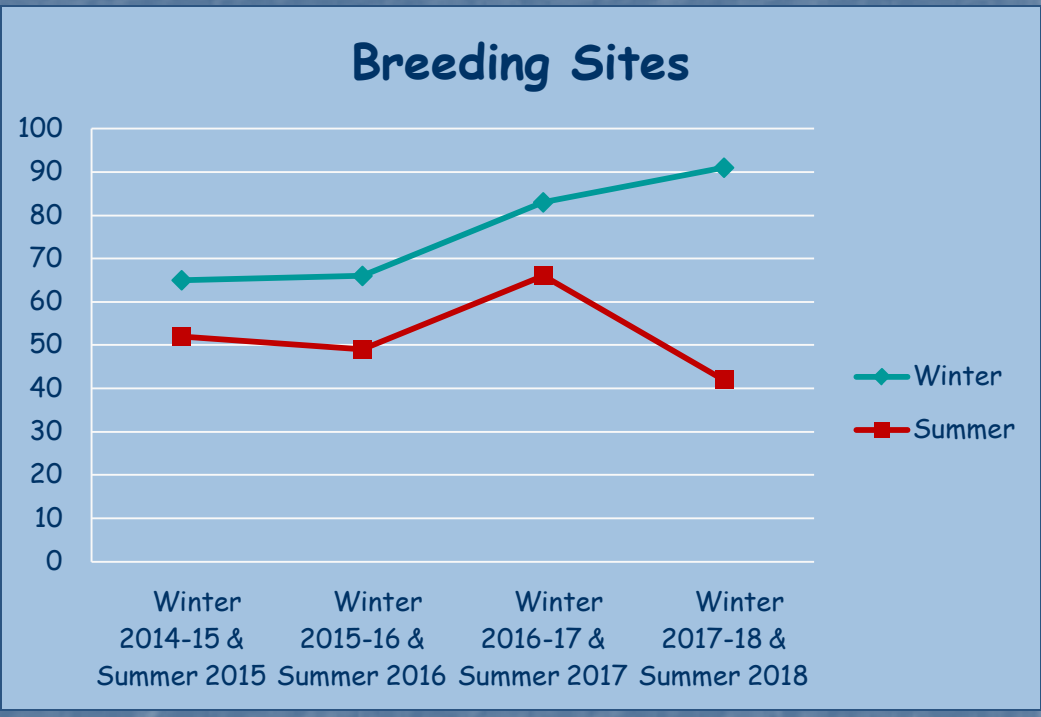


Summers 2015 - 2018

- Birds bred *only* in typical breeding areas—no birds bred (or found) at winter foothill sites
- No winter birds from foothill sites seen at typical breeding areas
- Saw 12-20 summer resights per year from previous summers
- Many birds seen in winter at breeding sites disappeared by summer

Results - 2014-2018





True Migrants! But, who are they?

What they seek in winter habitat

- Higher elevation
- Still need burrows, but simpler ones OK
- Fewer burrows, perhaps
- Single birds, perhaps
- Widely-distributed
- Low profile/cryptic

Valuing and Protecting all Habitat

Burrowing owls are formally endangered in Canada and of special concern in the USA. This map shows wintering distribution sites for 25 adult burrowing owls, based on geolocator data.

Birds pair up starting in February

Aggressive/Defensive

Typically seen when defending burrow

Females lay up to 12 eggs

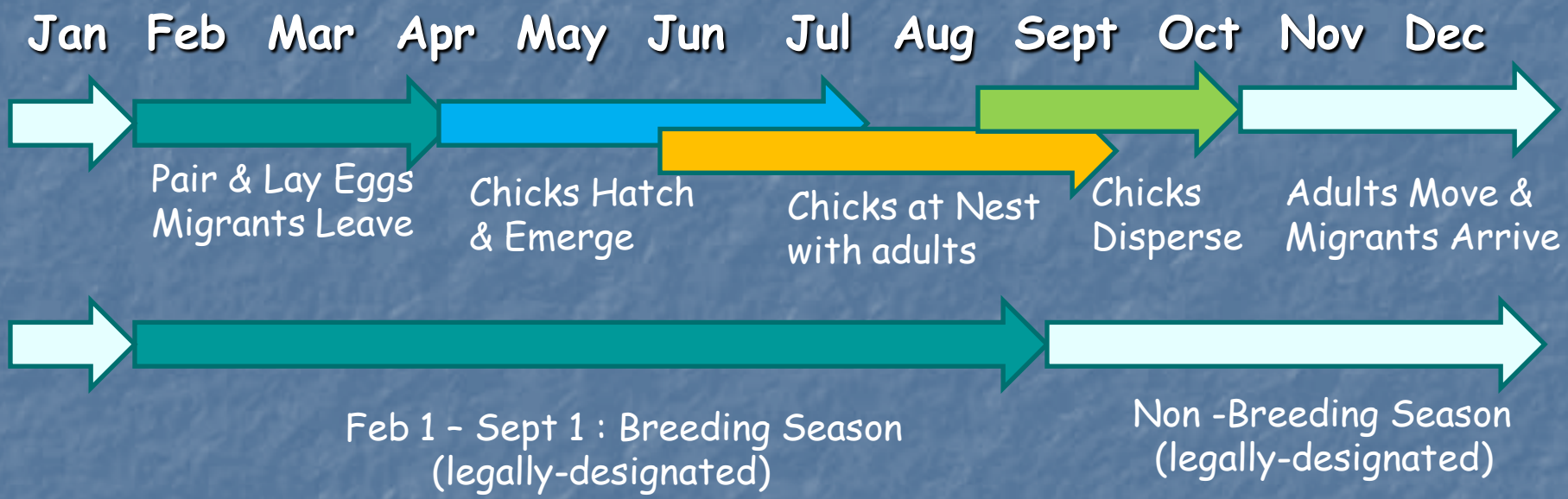
Chicks stay below ground for several weeks

Chicks emerge in May – stay with parents all summer

By September:

* juveniles molt and disperse to seek their own burrows
* adults typically migrate or move to other local burrows for the winter

Year-round Timeline



Burrowing Owls In Action!

- Adults at nest burrow:
- http://www.arkive.org/burrowing-owl/athene-cunicularia/video-00.html

- Parents and Chicks: http://www.arkive.org/burrowing-owl/athene-cunicularia/video-03a.html
- http://www.arkive.org/burrowing-owl/athene-cunicularia/video-09.html

Opportunistic predators

* insects and small rodents dominate the diet
* also eat amphibians, reptiles, crustaceans, birds

Diet in Santa Clara County, CA

Trulio, L. and P. Higgins. 2012. The diet of western burrowing owls in an urban landscape. *Western North American Naturalist* 72:348-356.

5 Study Sites: Total ~1450 ha (Site sizes: 62 to 722 ha)

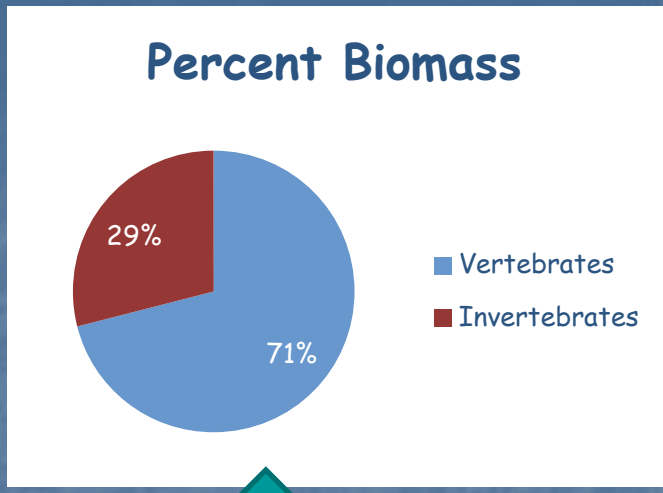
Key Findings

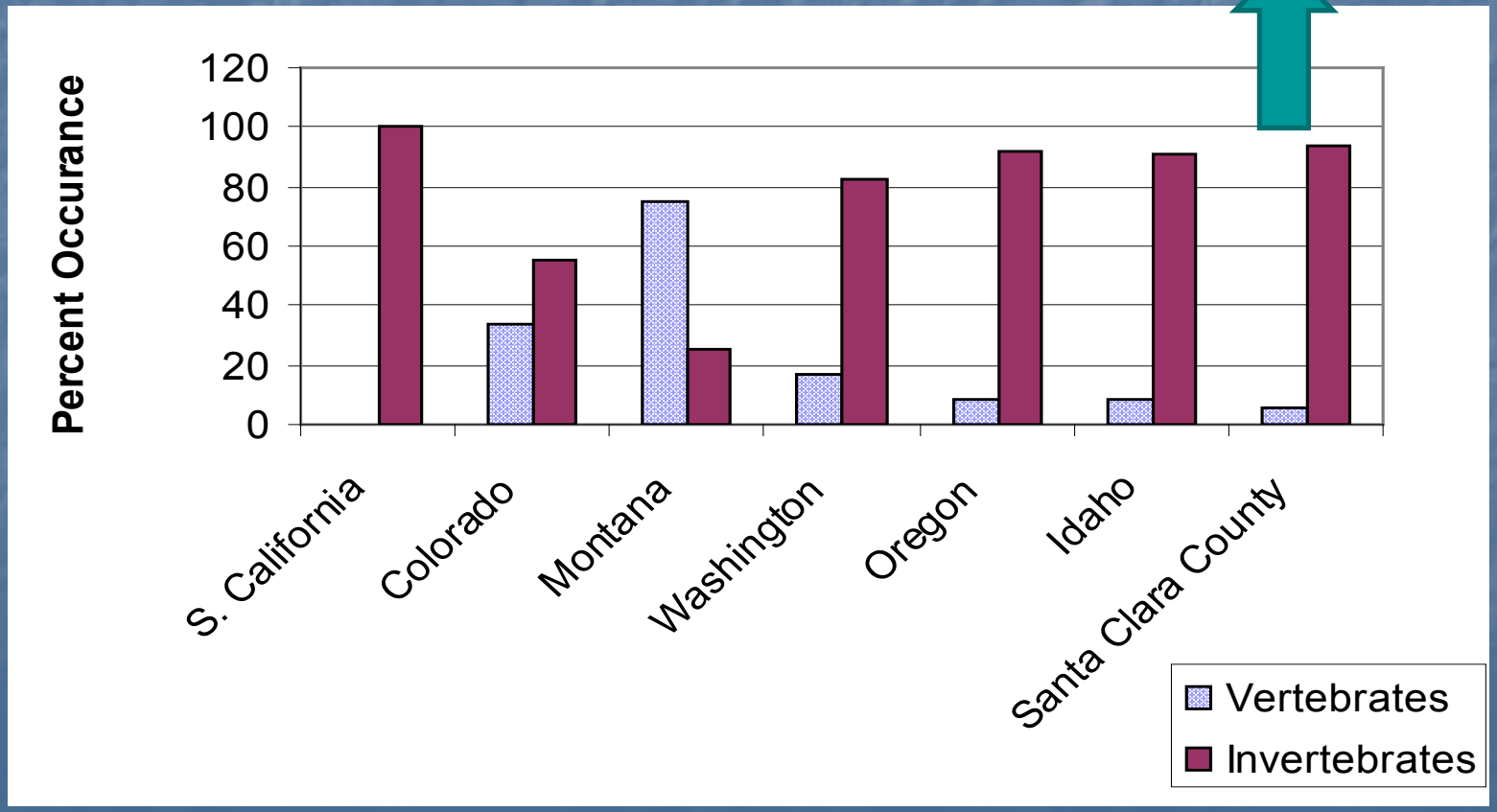
- Year-round prey - rodents and insects
- Composition and species, especially insect taxa, similar to other habitats
- CA vole and Botta's pocket gophers - do well in urban settings

Avg. mass = 53 g

Avg. mass = 155 g

Diet differs over the range based on prey availability





Population Dynamics

- Adult survivorship: ~30-60% or more
- Juvenile survivorship: ~12-30%
- Nest success rates: Extremely variable
- Fecundity: Quite variable (~3 chicks per successful pair)
- PVA shows adult survivorship is the key parameter in population change (Barclay et al. 2011)

Population Genetics

- *A. c. hypugaea* is Panmictic
  - Especially migratory populations
  - Dispersal distances both short (1 mile or less) and long (many hundreds of miles)
- New data from fine-grained DNA tests are changing our understanding
  - Isolated populations show lower genetic diversity
  - Can show inbreeding effects
  - Resident populations differ from migratory ones
- Many implications for species management

Landscape as a Factor in Population Persistence

Enough foraging habitat in the landscape? Dispersal between populations? Land use change?

Small Group Exercise
Could they be here?

As a burrowing owl biologist, you are given information on a site. The owner wants to know, just based on these features, do you think there might be burrowing owls here?

Looking at these, what would you want to know about the site in order to say that owls might be there? What aspects of the site do you think would constrain or promote the presence of owls?

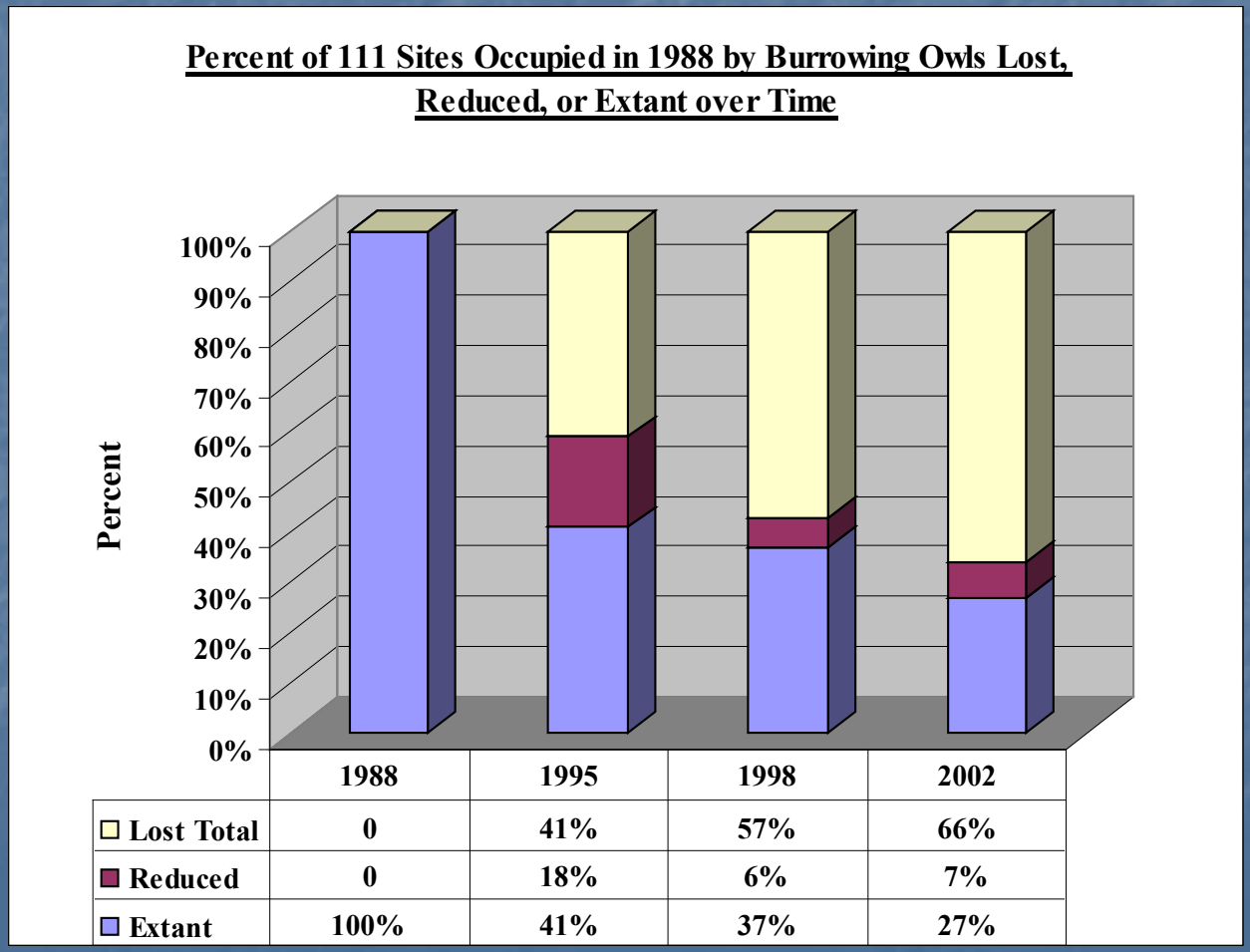
Status

- Endangered in Canada
- Threatened in Mexico
- Bird of Conservation Concern in US
- Endangered in Minnesota
- Threatened in Colorado
- Species of Special Concern in California, Montana, Oklahoma, Oregon, Utah, Washington, and Wyoming

Owls are declining in California

- 60% of breeding groups found in the 1980s disappeared by the 1990s
- A species of special concern in California

Example: Santa Clara County



	1988	1995	1998	2002
Lost Total	0	41%	57%	66%
Reduced	0	18%	6%	7%
Extant	100%	41%	37%	27%

Between 1988 and 2002, 66% of locations lost

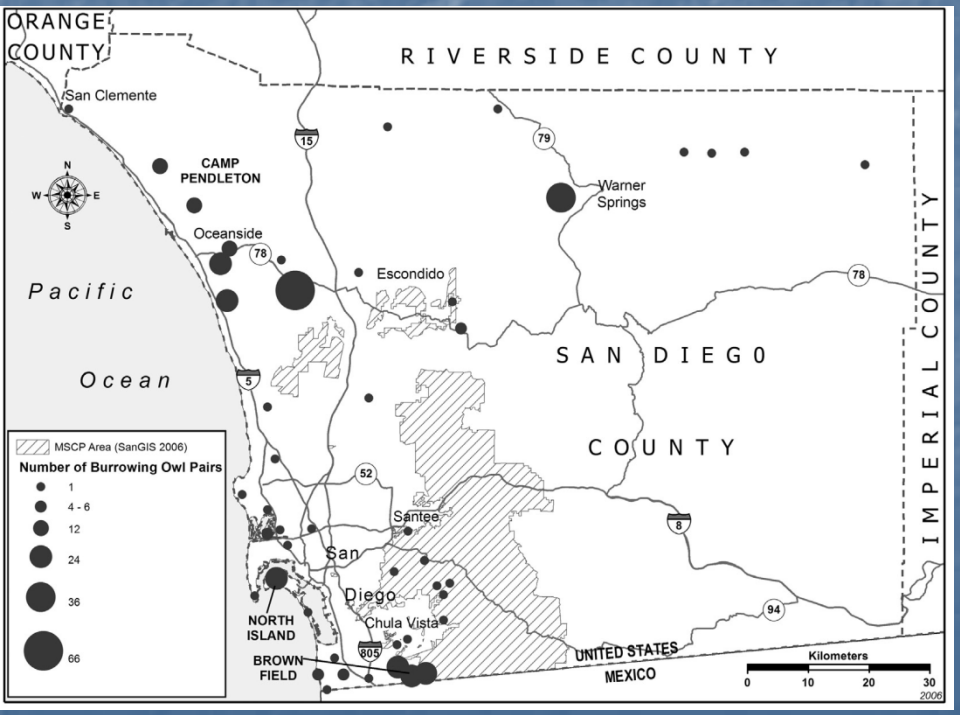
Fewer than 50 pairs of birds remain in all of Santa Clara County

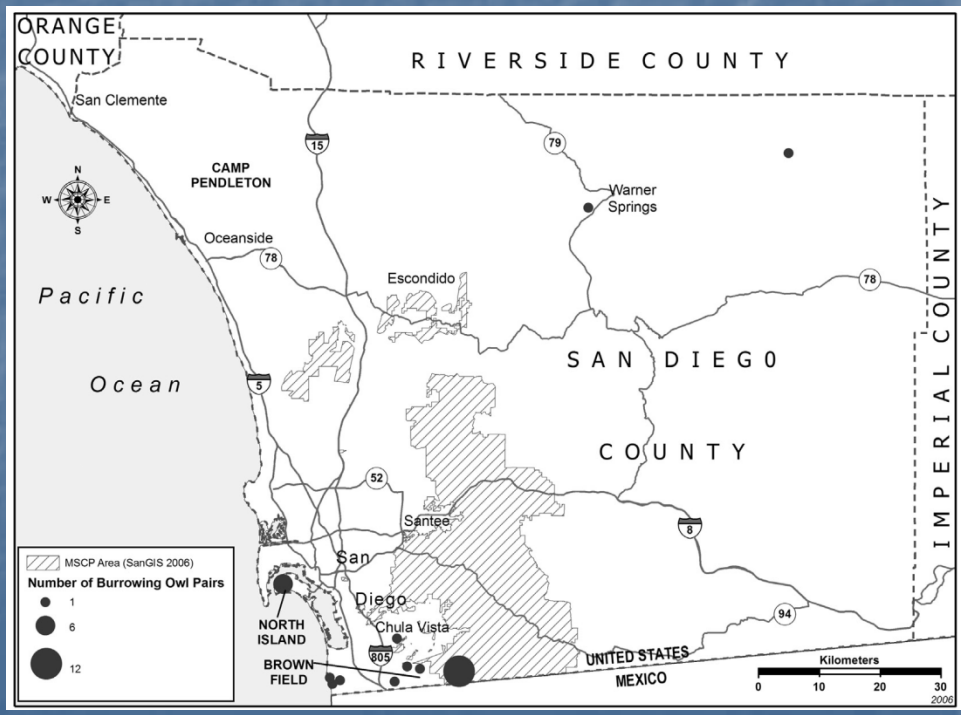
Santa Clara Valley Habitat Plan

Example: San Diego County Status

- Population Status – 1970s/1980s, ~250-300 pr; 2003, 25-30 pr
- Protection Efforts & Recovery Efforts

Lincer and Bloom, 2007





Threats

- **Urbanization of grasslands.** Urban sites are subject to disturbance, habitat loss, and poor habitat conditions.
  - Development
  - Auto strikes
  - Exterminating rodents
  - Secondary poisoning
  - More mesopredators & corvids
  - Weed abatement & Tall grass
  - Recreationists & Dogs
  - Surface/soil disturbance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Threats

- **Loss of agricultural land**
  - ~90% of pairs found in agricultural landscapes, especially with irrigation canals
  - One of the only California raptors that does well in such agricultural areas
  - Significant areas likely to be converted to developed uses

Threats

- **Agricultural Practices**
  - Conversion to vineyards
  - Lining irrigation ditches
  - Discing to eliminate weeds
  - Exterminating rodents
  - Secondary poisoning

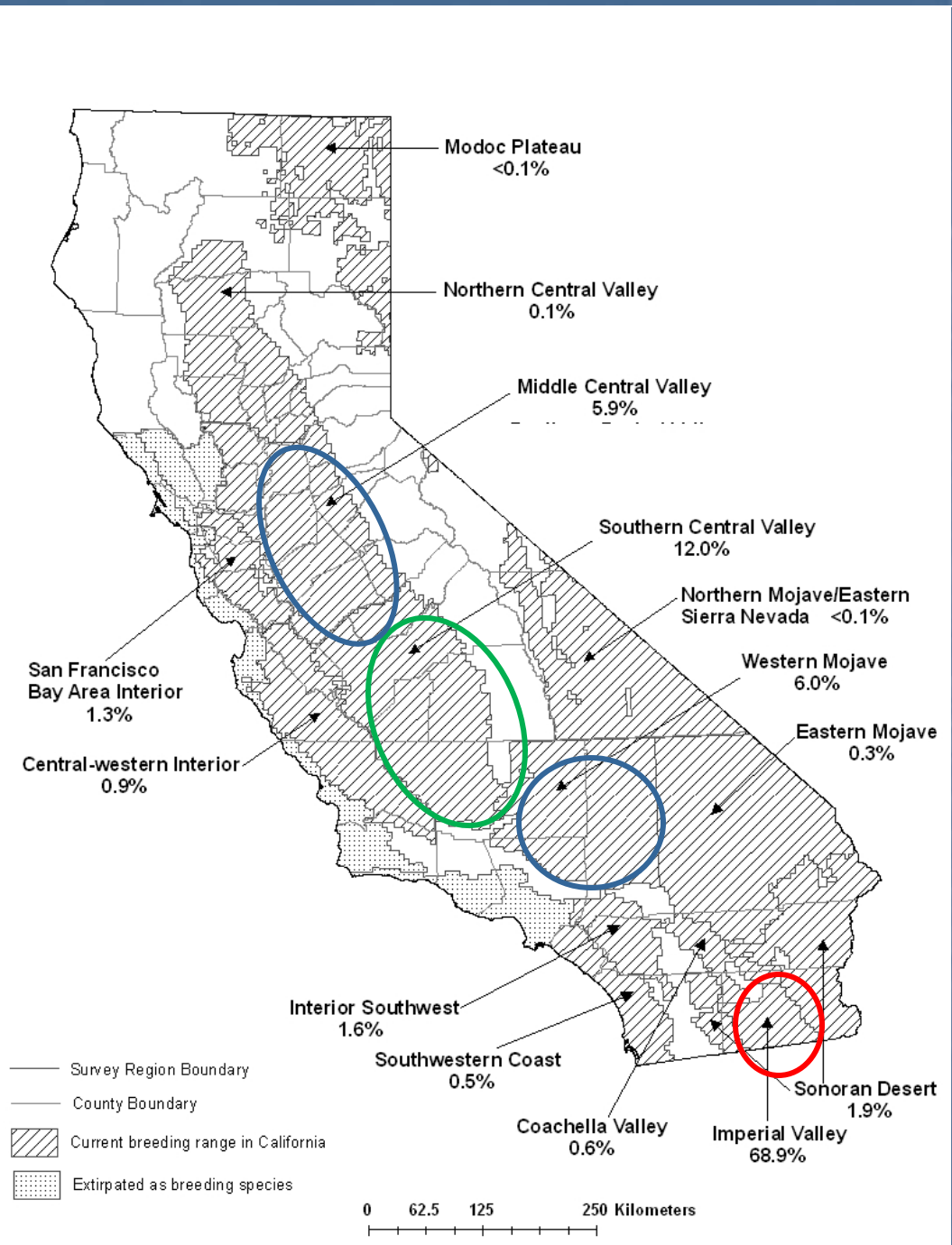
- **Solar/wind Farms**
  - Loss of ag lands
  - Direct mortality

- **Global Climate Change** – already harming BUOWs

CA Burrowing Owl Distribution*

2006-07 estimate=
9,187 (SE=2,346) pairs statewide

Very similar to statewide estimate of ~10 years before



* Wilkerson, R.L. and R. B. Siegel. 2010. Assessing changes in the distribution and abundance of burrowing owls in California, 1993-2007. *Bird Populations* 10:1-36.

Human Population Growth Expected:

* Middle Central Valley
* Southern Central Valley
* Western Mohave
* Imperial Valley

Regulatory Framework

- Federal: Migratory Bird Treaty Act - prohibits the "take" of any migratory bird or body parts, nests, eggs or products
- Federal: Fish and Wildlife Conservation Act - Bird of Conservation Concern
- Federal: Endangered Species Act, Section 10 - Habitat Conservation Plans
- State: California Fish and Wildlife Code Section 3503.5 - prohibits the taking, possession or destruction of birds of prey, their nests or eggs. For this reason, any impacts to burrowing owls during the breeding season (February 1 to August 31) are in violation of this code, unless approved by the CDFW

Regulatory Framework

- State: ESA – California Species of Special Concern
- State: Natural Community Conservation Planning Act (1991) - takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity
- State: California Environmental Quality Act (CEQA) - requires evaluation of project impacts to Species of Special Concern; requires a "mandatory finding of significance" if impacts to rare, threatened or endangered species are likely to occur
- State: CDFW Staff Report on Burrowing Owl Mitigation (2012) – guide for determining owl presence and avoiding impacts to owls and their habitat

Staff Report on Burrowing Owl Mitigation (CDFG, 2012)

- Seek landscape-based planning
- Steps in developing mitigation include:
  1. Habitat Assessment (Appendix C)
  2. Surveys (Appendix D)
  3. Impact Assessment (pg 6-8)
  4. Mitigation Approaches (pg 9-15)
- Get to know your CDFW contact & work with them on mitigation approaches

Determining Presence/Absence

- Employ only qualified biologists (species-specific experience, education, & field training)
- Survey all suitable habitat areas an adequate time before disturbance (breeding or wintering)
- Observe at sunrise or sunset for at least 3 hr
- Observe at least 3 days
- Survey entire site on foot for burrows/birds
- If burrowing owls are found, contact California Department of Fish and Wildlife

Line Transect Surveys – Very effective for smaller areas

Mitigation Methods

- Mitigation depends on impact assessment
- Avoid or Minimize to less than significant
- Burrow Exclusion (Passive relocation) - may be permitted, as appropriate
- Translocation (Active relocation) – only in the context of scientific research

NOTE: Consequences of relocation not studied – but research by Institute for Conservation Research (San Diego Zoo) is underway

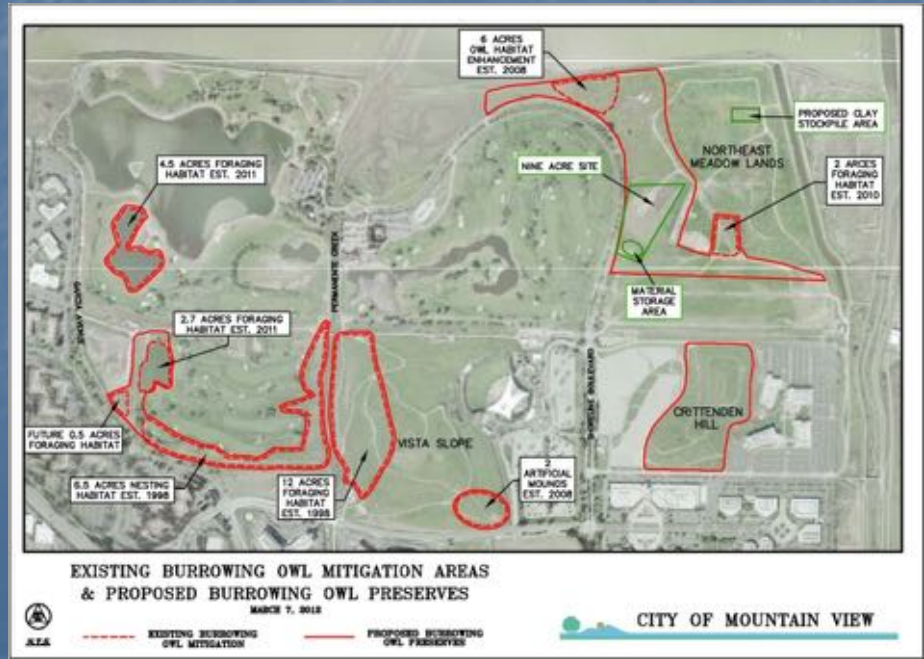
How to Manage Habitat to Preserve Burrowing Owls

- Habitat Features (owls present)
- Principles for Establishing Sites (owls not present)
- BUOW Relocation Review
- Project Assessment – Small Group

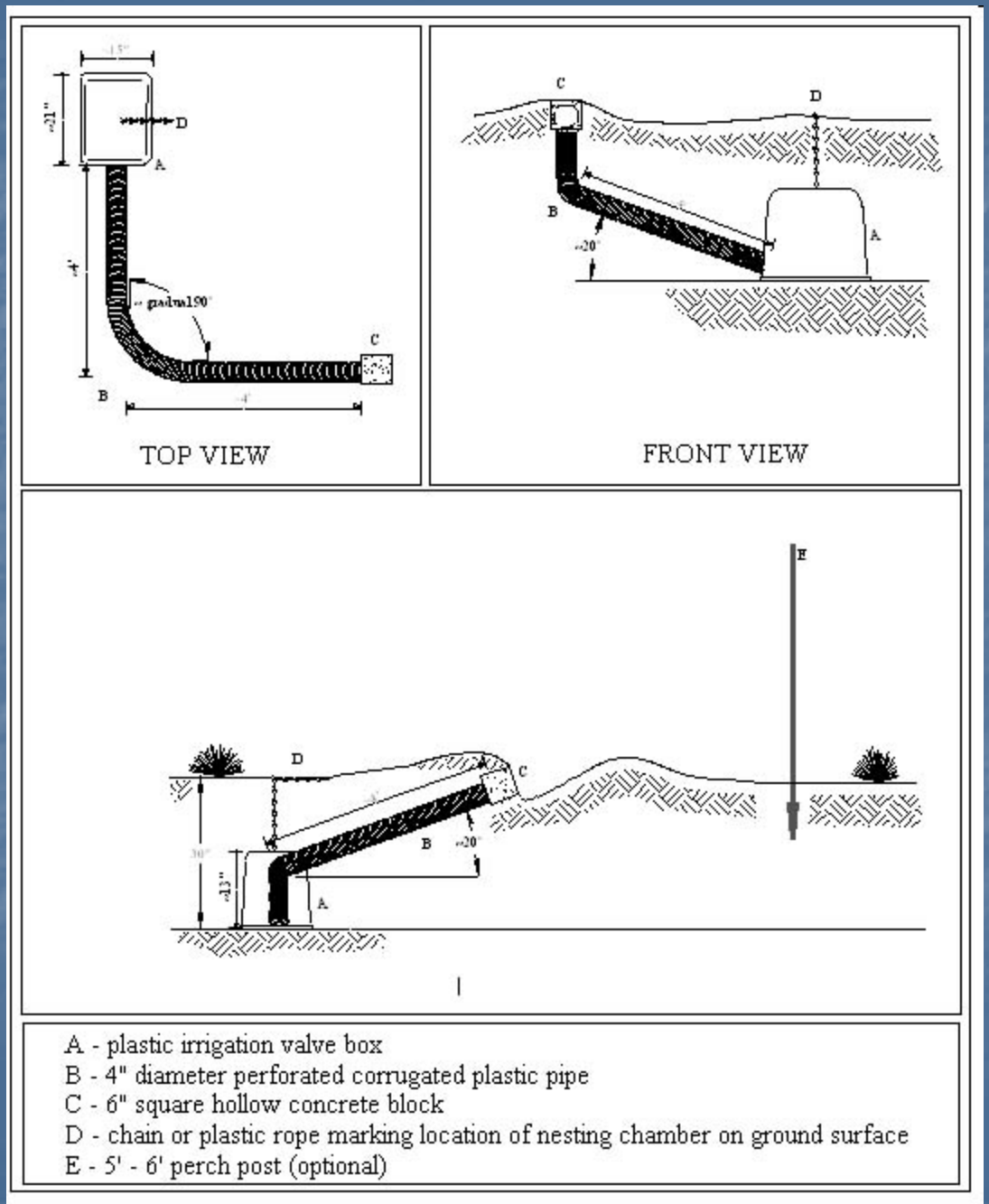
Habitat Features for Enhancing Areas for Owls (owls present)

- Shoreline Burrowing Owl Preservation Plan
- San Jose/Santa Clara Water Pollution Control Plant Interim Plan

Principle 1:
Develop a long-term plan that sets aside adequate areas for burrowing owl protection and management; exclude disturbance activities.



Principle 2: Enhance sites for nesting with artificial burrows.



Principle 3: Enhance the site for ground squirrels by bringing in mounds of dirt (don't use good soil!) and encourage healthy ground squirrel populations.

Principle 4: Keep grass short (<6 inches) around nesting burrows and remove trees.

Principle 5: Enhance foraging opportunities by creating a structurally heterogeneous prey habitat; no pesticides or poisons.

https://www.flickr.com/photos/123882326@N04/

Recap - Key Habitat Features

- Open grassland habitat, few to no trees or other obvious raptor-perching sites
- As large as possible – viable site size will vary depending habitat quality and qualities of the surrounding landscape
- Healthy, breeding ground squirrel population
- Lots of burrows
- Short grass (<6") around burrows
- Structurally heterogeneous habitat—longer grass, foraging areas--for strong prey base

Management & Protection

Owls can do well in developed, urban, & agricultural areas if…

- Nests are protected from excessive disturbance
- And there is enough foraging habitat

They don't need "pristine habitat"

Principles for Establishing Habitat - owls not present

- GOAL: Attract nesting owls to a site where they are not currently found
- NOTE: Once owls are extirpated from an area, reestablishing them is *very difficult*

Establishing Habitat

- Sites with the best chance of *attracting* nesting burrowing owls:
  - Add to adjacent, owl-occupied nesting habitat or within 300m of occupied habitat
  - Nesting owls recently on the site
  - Relatively large (~30-140 acres/owl pair??)
  - Not fragmented with roads or paths
  - Low elevation and flat
  - Habitat features as noted previously
  - Large, healthy colonial rodent population

Monitoring for Success

- Stable population over the years
- >50% of nests per year produce chicks
- Average of 3 chicks fledged per nest
- Some birds show site fidelity
- Acceptable levels of predation
- Successful habitat management for grass height and heterogeneity
- Strong prey base

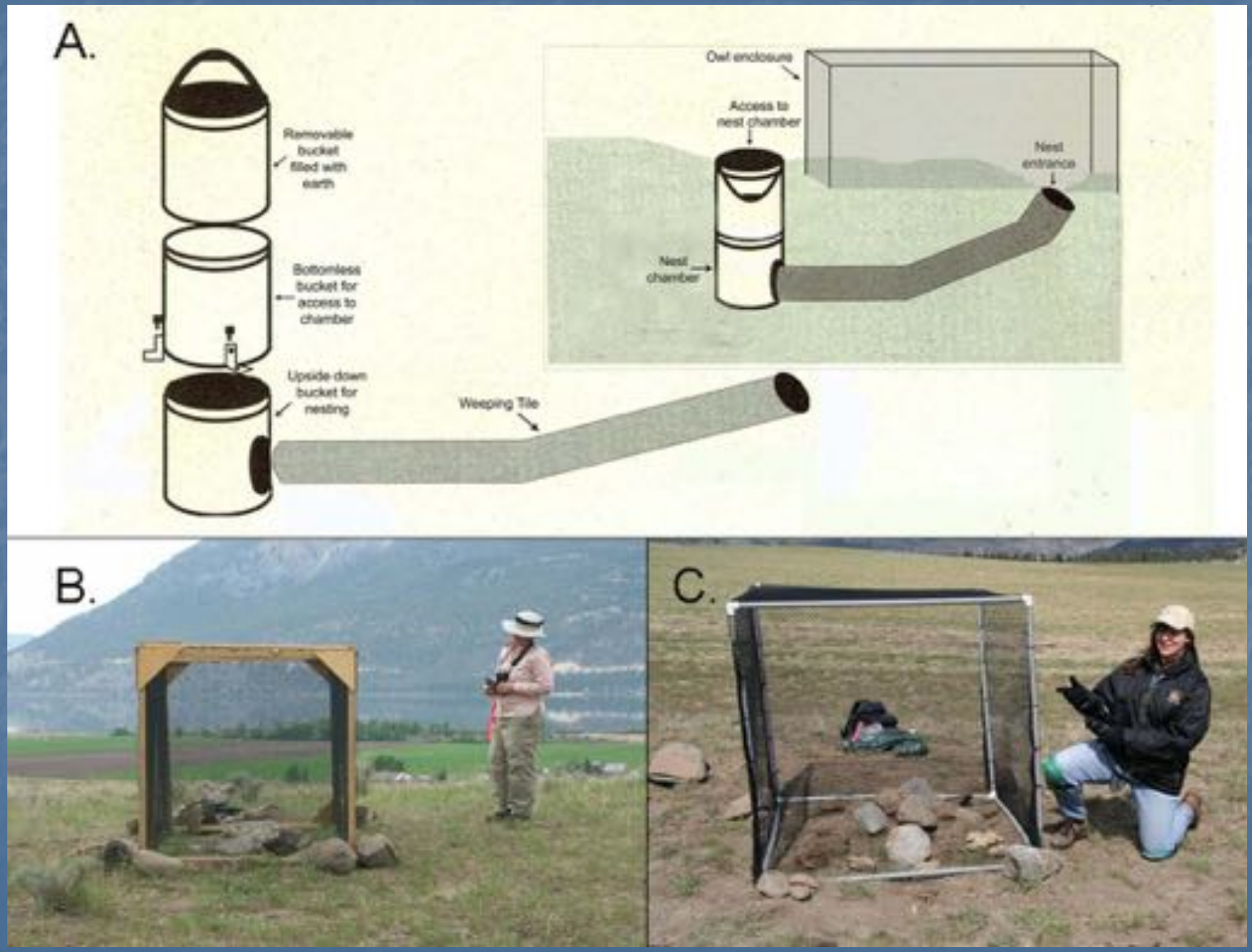
What about relocating owls?

GOAL is to *attract* owls

Relocate birds only when absolutely necessary

Steve Blackmon, WildCare

Soft-release ("hacking") Set up



Relocation Research Findings

- 105 wild, preflight juveniles soft-released at burrows in Minnesota 1986-1989 (Martell et al., 2001):
  - No birds ever found after release.
- 106 captive-raised, 10mo juveniles hard-released at burrows in British Columbia 1992-1997 (Leupin and Low, 2001):
  - 34% killed by predators
  - 2 overwintered for 3 years
  - 2 returned to release site after Spring migration
  - 7 successful nest attempts

Relocation Research Findings

- 27 adult birds moved from construction sites, soft-released at burrows in Santa Clara County in 1990s (Trulio, 1995):
  - 17 disappeared (63%) within a year of release
  - 7 birds (26%) flew back to their original site
  - 2 bred successfully on site (7%)
  - 1 victim of predation (4%)

- Researchers compare hard- vs. soft-release of captive-bred owls (2001-04) (Mitchell et al., 2011):
  - Soft-release results in greater survivorship and reproduction
  - 3% of adults returned the next year
  - 7% of chicks returned
  - 48% pairs fledged young; ~2.4 young/pair

Release conditions that seem to work best:

- Captive-reared, yearling adult owls
- One male and one female per burrow
- Birds reared in captivity near release sites
- Beginning of each breeding season
- Soft-release - birds in enclosures 14–17 days
- Supplemental feeding over the breeding season to maximize reproductive output
- Use social cues, especially calls
- Release at least 5 pairs in an area

Small Group Exercise

What are your thoughts/questions for evaluating this project?

Consider habitat, surveying, impact assessment, possible mitigations

Scenarios:

What would you want to know to evaluate the impacts?

- 1 Adding another water tank
- 2 Upgrading the power towers
- 3 Putting in a pipeline along the road
- 4 Placing a trail around the flat open space and putting in picnic tables
- 5 Townhouses on 8.97 acres
- 6 Commercial development on 200 acres

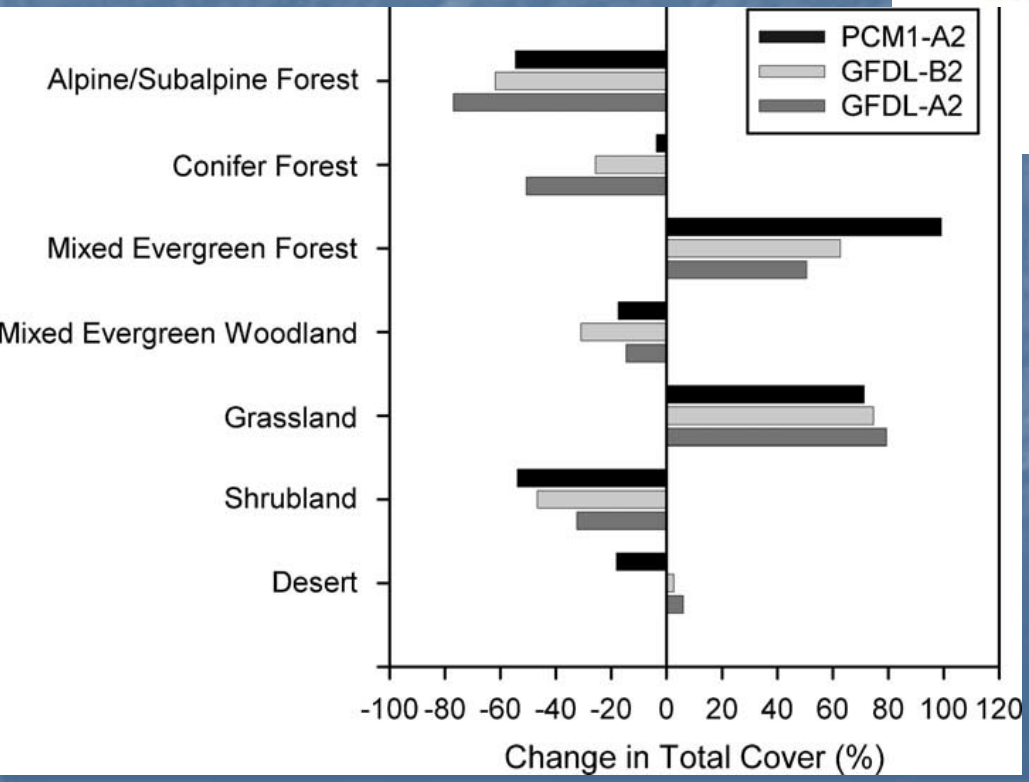
The Long View for Burrowing Owls: Climate Change

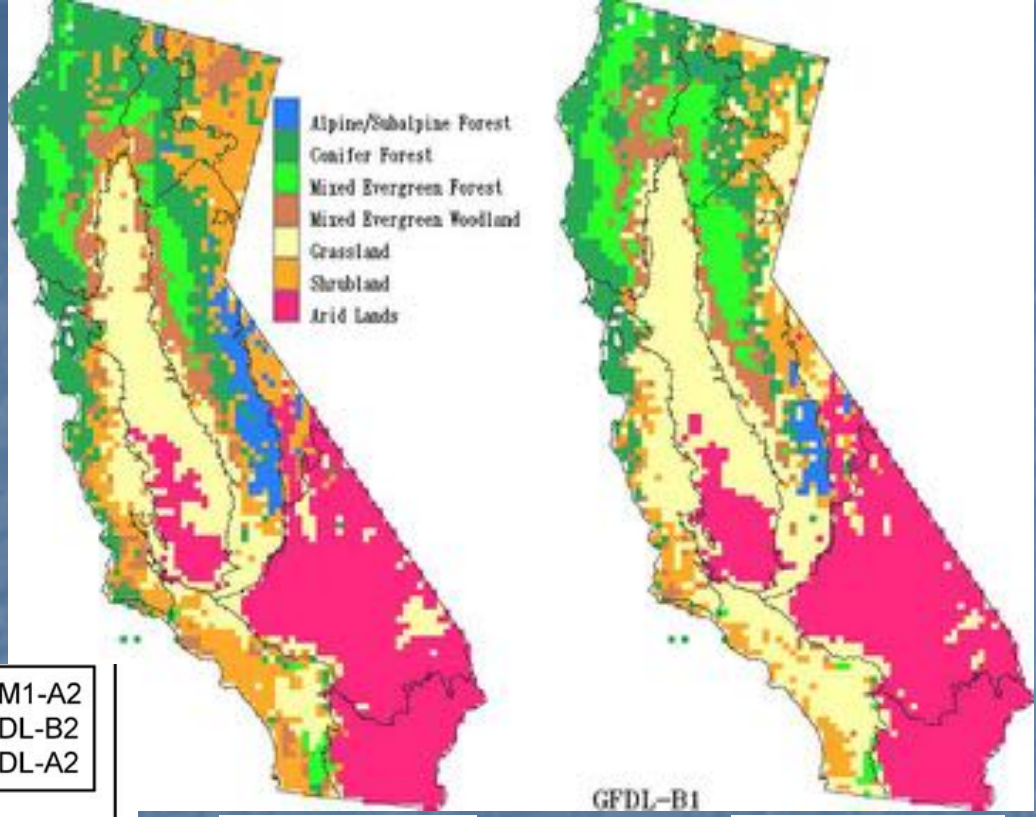
How will the burrowing owl fare in an era of climate change?

By 2100, under 3 climate change scenarios:

>70% increase in grasslands

Replacing shrub &
Mixed evergreen woodland



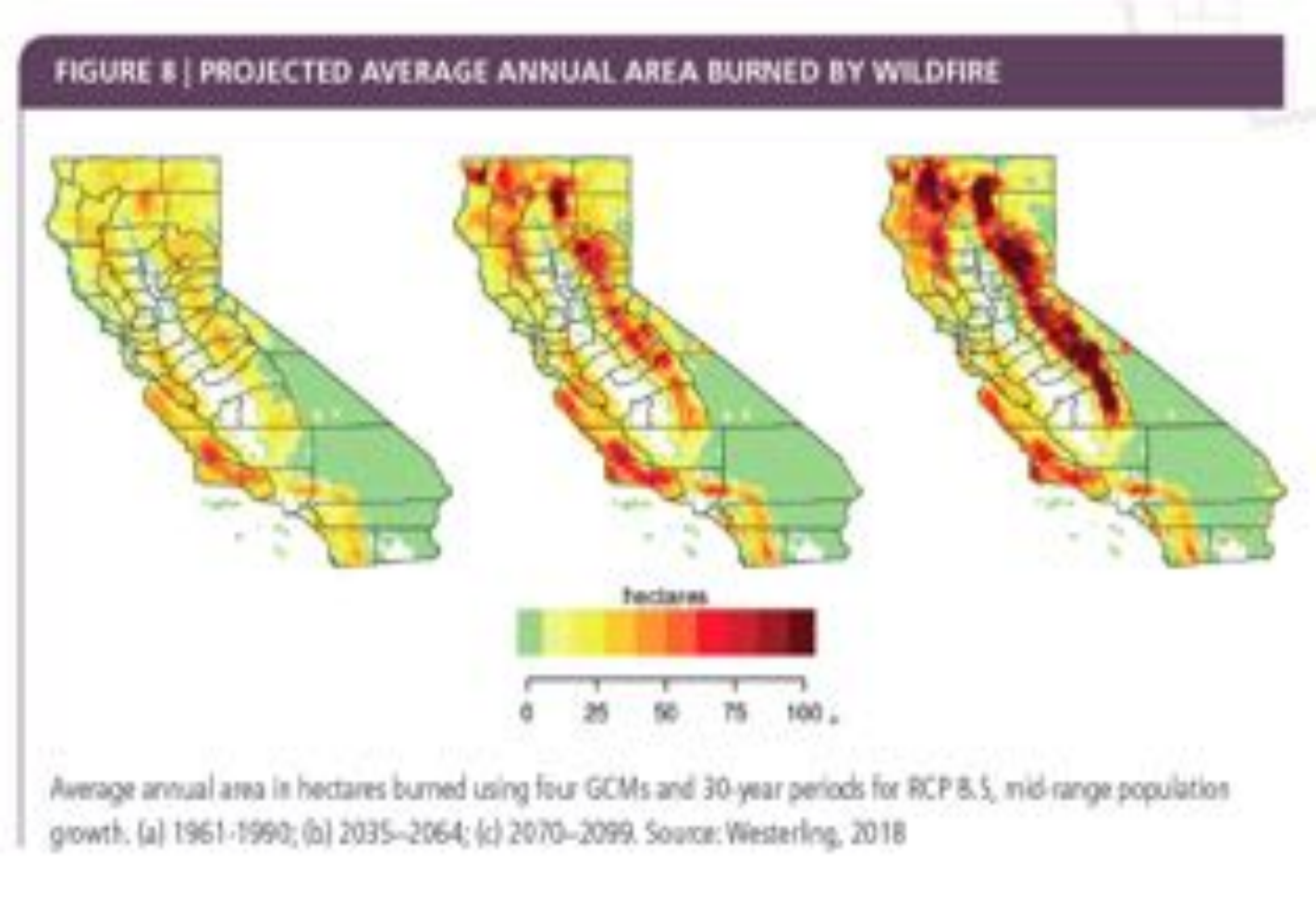


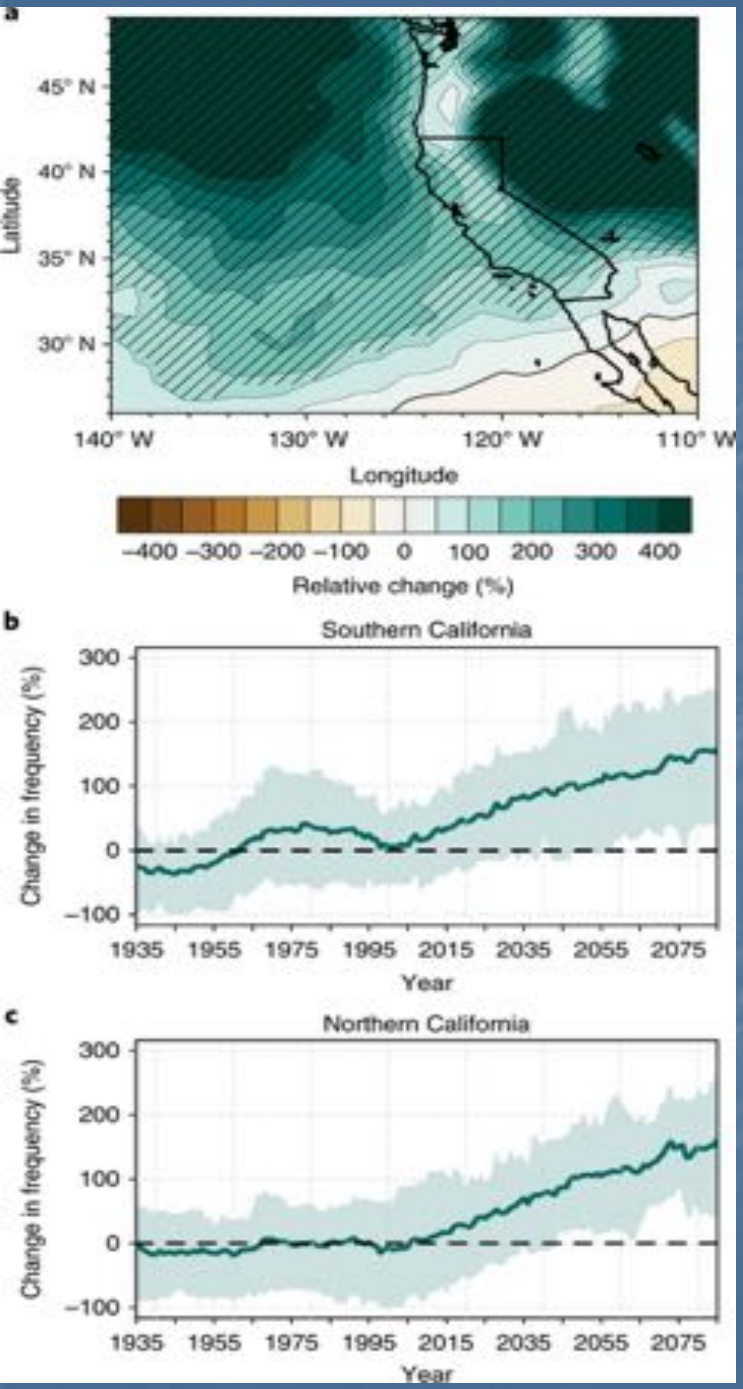
Historical
1961-1990

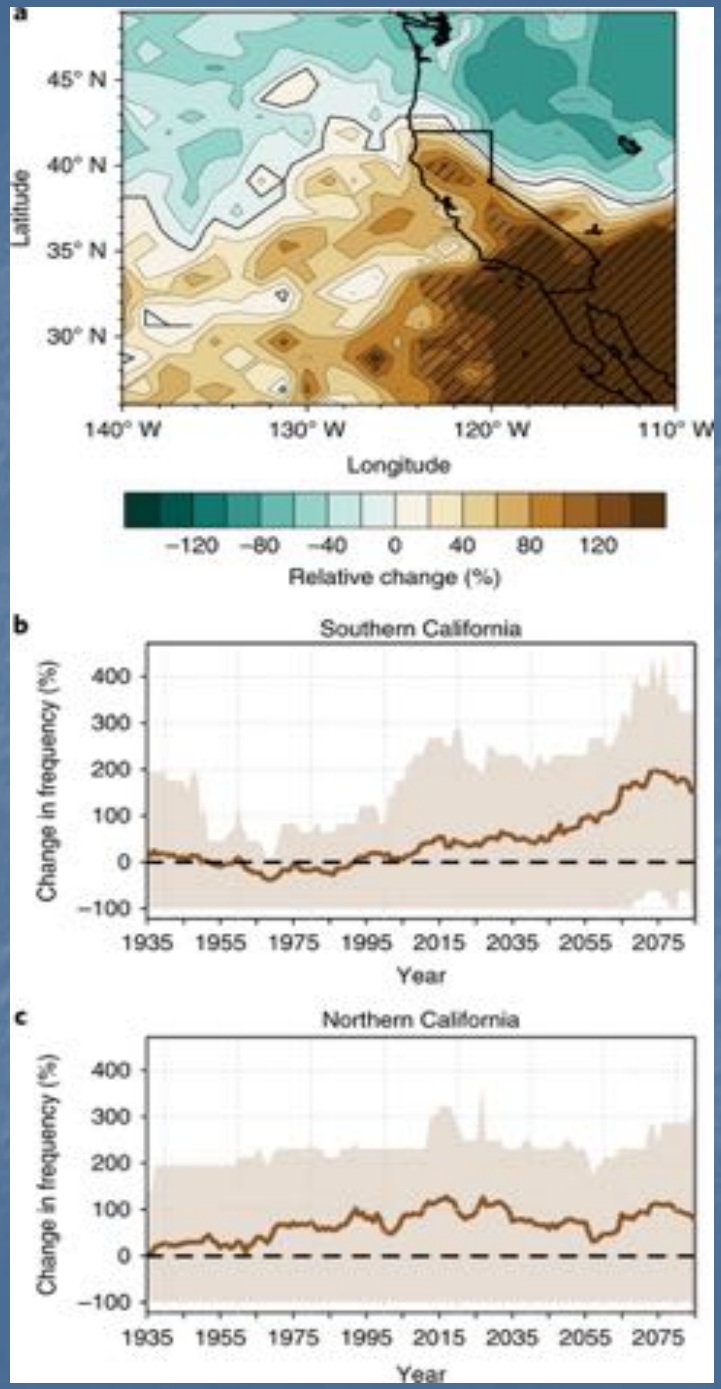
GFDL-B2
2070-2099

Climate Change – Fire!

- ~77% increase in mean area burned under current CO_2 conditions







Change in frequency of extremely wet (left) & extremely dry (right) seasons (Swain, et al. 2019)

Big Questions…

Dave Taylor, WildCare

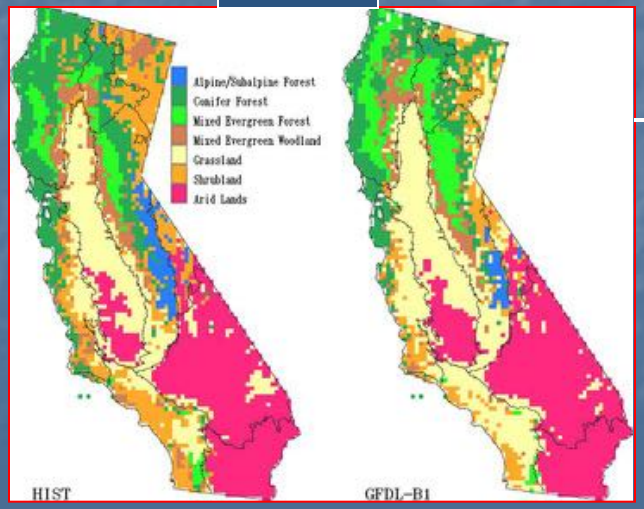
- Fire + Habitat Change
  - Too much, too often?
  - Squeeze owls into less suitable conditions?
- And what about the intersection of human activities, population growth + climate change?
- National Audubon Climate Report states:

"By 2080, this diurnal owl species could lose 77 percent of its current breeding range. Climate change will disrupt its winter range as well, leaving only 33 percent intact…"

(http://climate.audubon.org/birds/burowl/burrowing-owl)

Our Challenge

+



Develop Local Plans

Protect & Enhance Current Habitat

Identify Future Owl Habitat

Predict Protect Enhance

Provide conditions for owls to persist

Thanks to colleagues & supporters

Especially…

- Phil Higgins, Debra Chromczak, Sandra Menzel
- Edmund Sullivan, Santa Clara Valley Habitat Agency
- City of Mountain View, Shoreline at Mountain View
- City of San Jose, WPCP
- NASA Ames Research – Moffett Federal Airfield
- US Fish & Wildlife Service & Don Edwards SFBNWR
- California Department of Fish and Wildlife
- Santa Clara Valley Open Space Authority
- Santa Clara County Parks & Recreation, Santa Clara Valley Water District, and VTA

…and many tireless, enthusiastic field & lab assistants!

And thank you…

- Elkhorn Slough Coastal Training Program
- All the biologists, advocates, agency experts working to protect burrowing owls
- And, you for your attending this workshop to learn about this wonderful animal!

Directions to the Field Site

- Turn left onto Zanker Road. Zanker becomes Los Esteros Road.
- Bear left onto Grand Boulevard.
- Bear left onto Disk Drive.
- Turn left on Nortech Parkway and park at the end of the street.

PLEASE CARPOOL! Parking is limited