Western Burrowing Owl Workshop

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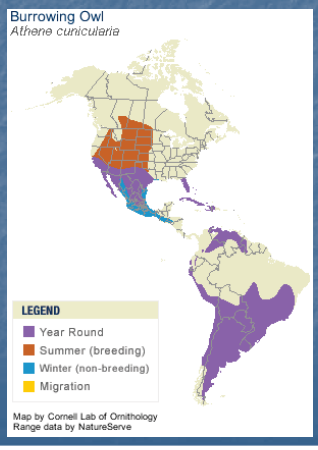
An Odd Bird

- 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!

Workshop Topics

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

Entire Species Range - ~17 subspecies

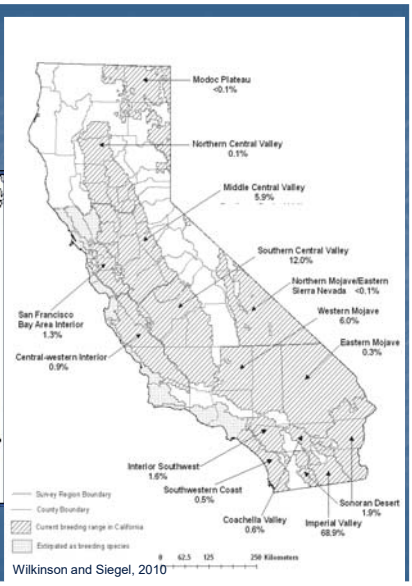


Athene cunicularia Burrowing Owl or "Little Miner"

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



Wilkinson and Siegel, 2010

Identification - Adults

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

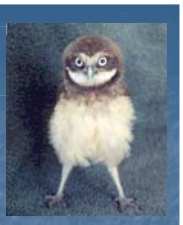
Steve Thurman

Steve Thurman

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 - Chicks



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

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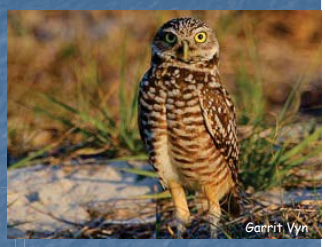
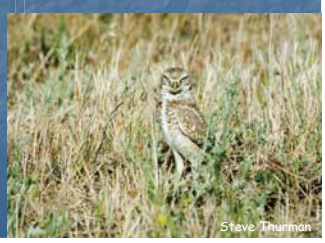
Identification - Adults

- 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

Chicks over the Season

Steve Thurman

Pete Bloom

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

Habitat Types - Statewide in CA

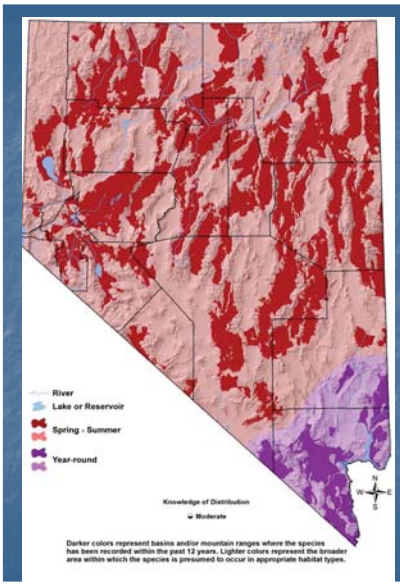
(Wilkerson & Siegel, 2010)

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

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

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



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)

Bird of Open Grasslands:

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

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
- With some level of disturbance, esp. from ground squirrels

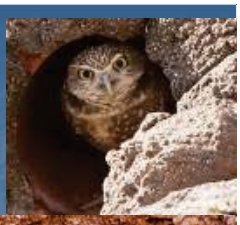
California Ground Squirrels

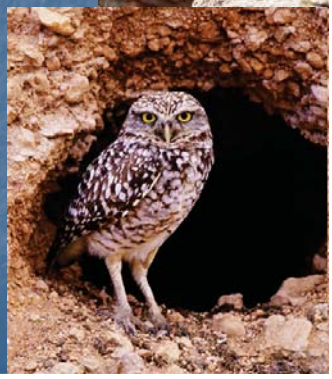
Predators? Just about everything!

- Primary: hawks, larger owls, skunks, foxes, coyotes, snakes
- Others: crows, dogs, cats, badgers

Artificial burrow with lots of debris out front

Burrows are key, natural and artificial





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, depending on prey availability and quality

…shows amazing migratory travels!

Bend, Oregon

to

Salinas, California

Wintering Season in CA:

Many resident birds but…

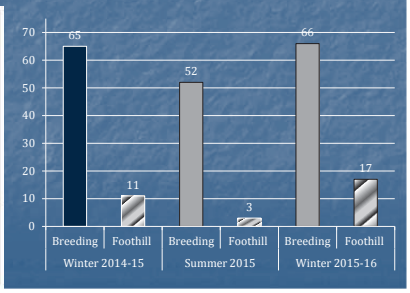
Burrowing owls are formally endangered in Canada and of special concern in the USA. This map shows wintering distribution sites for 25 adult burrowing owls, based on geolocator data.

- 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

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?



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

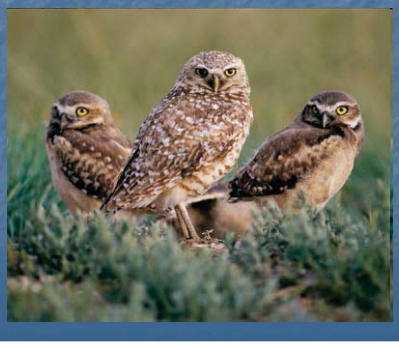
Birds pair up starting in February

Aggressive/Defensive

Typically seen when defending burrow

By September:

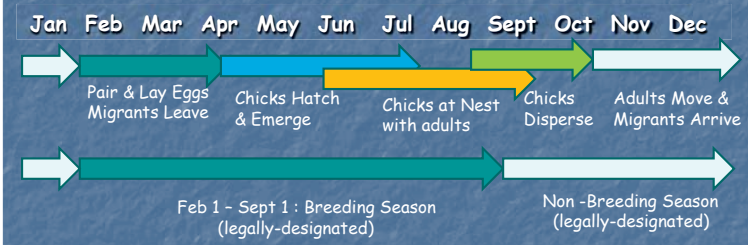
* juveniles molt and disperse to seek their own burrows
* adults typically migrate or move to other local burrows for the winter



Females lay up to 12 eggs

Chicks stay below ground for several weeks

Year-round Timeline



Chicks emerge in May – stay with parents all summer

Burrowing Owls In Action!

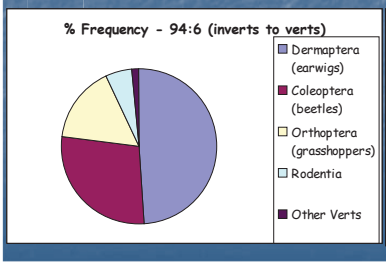
- Adults at nest burrow:
- http://www.arkive.org/burrowing-owl/athene-cunicularia/video-00.html
- Parents and Chicks: http://www.arkive.org/burrowing-owl/athene-cunicularia/video-03a.html
- http://www.arkive.org/burrowing-owl/athene-cunicularia/video-09.html

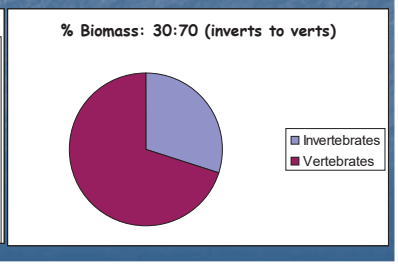
Opportunistic predators

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

Results—As a Whole

- 3092 pellets from 92 burrows
- 54 burrows associated w/specific owls



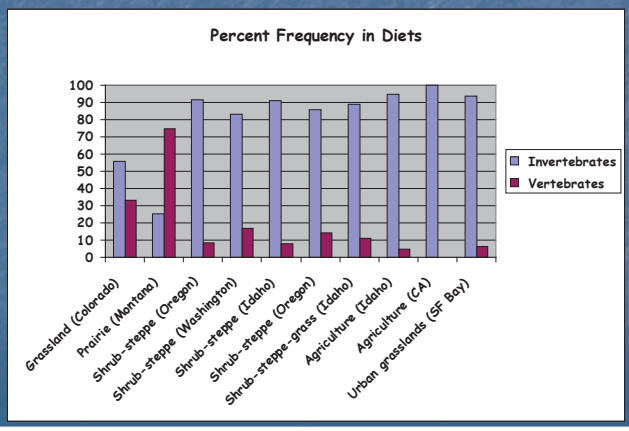


Diet in Santa Clara County, CA

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

Compared to other habitats?

Similar to other ag and more natural habitats



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

Landscape as a Factor in Habitat Quality

Patches – yes - but enough foraging habitat in the landscape is needed to support long-term populations

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?

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)

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

Population Genetics

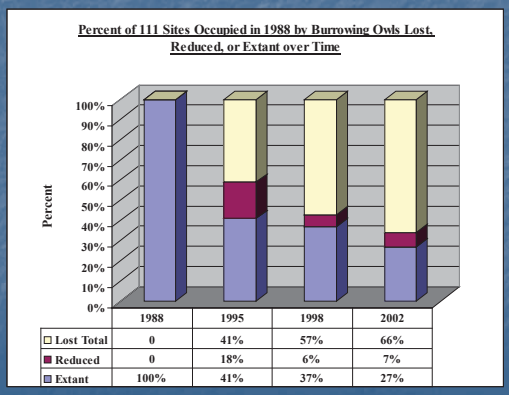
- No genetic difference between migratory and resident birds
- Inbreeding due to isolated populations not evident
- Panmictic in the west!
  - Migratory
  - Dispersal distances both short (1 mile or less) and long (50-150 miles or more)

(Results from Korfanta, et al. 2005)

Owls are declining in California

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

Example: Santa Clara County



Between 1988 and 2002, 66% of locations lost

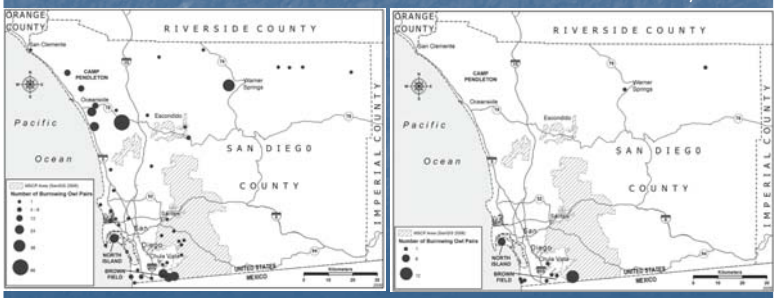
Only ~50 pairs of birds remain in all of Santa Clara County

Santa Clara Valley Habitat Plan

Example: San Diego County Status

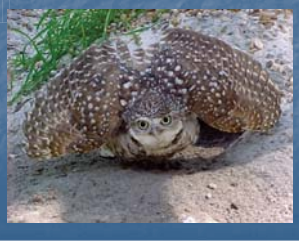
- Population Status – 1970s/1980s, ~250-300 pr; 2003, 25-30 pr
- Protection Efforts & Recovery Efforts

Lincer and Bloom, 2007



Threats

- **#1 – Urbanization of agricultural land. Loss of agricultural lands will impact burrowing owl populations.**
  - ~90% of pairs found in agricultural landscapes
  - One of the only California raptors that does well in agricultural areas



Threats

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

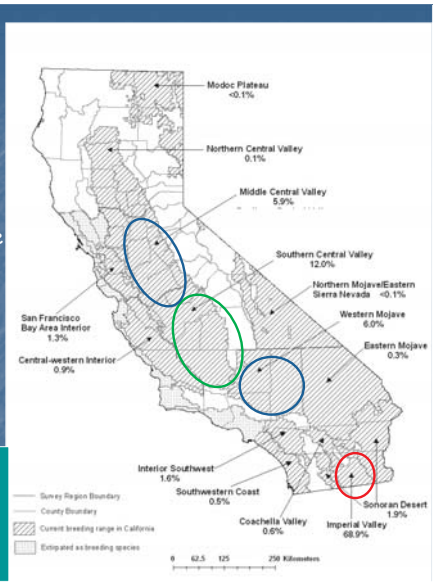
Threats

- **#2 – Agricultural Practices**
  - Conversion to vineyards
  - Lining irrigation ditches
  - Discing to eliminate weeds
  - Exterminating rodents
  - Secondary poisoning
- **#3 – Solar/wind Farms**
  - Loss of ag lands
  - Direct mortality

CA Burrowing Owl Distribution*

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

Very similar to statewide estimate of ~10 years before



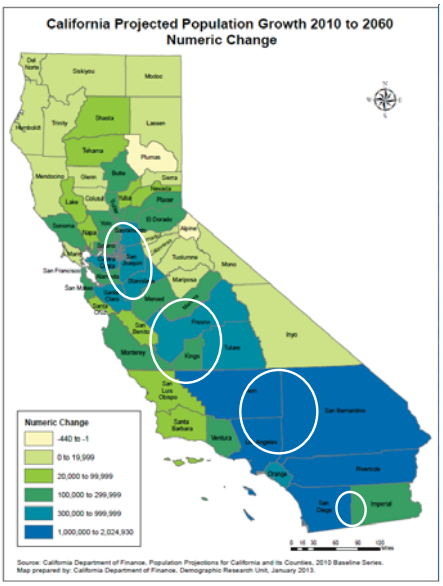
* Wilkerson, R.L. and R. B. Siegel. 2010. Assessing changes in the distribution and abundance of burrowing owls in California, 1993-2007. *Bird Populations* 10:1-36.

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: Staff Report on Burrowing Owl Mitigation (2012) – guide for determining owl presence and avoiding impacts to owls and their habitat

Human Population Growth Expected:

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



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

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 CDFG

Line Transect Surveys – Very effective for smaller areas

How to Manage Habitat to Preserve Burrowing Owls

- Habitat Features (owls present)
- Principles for Establishing Sites (owls not present)
- BUOW Relocation Review
- The Long View for California BUOWs

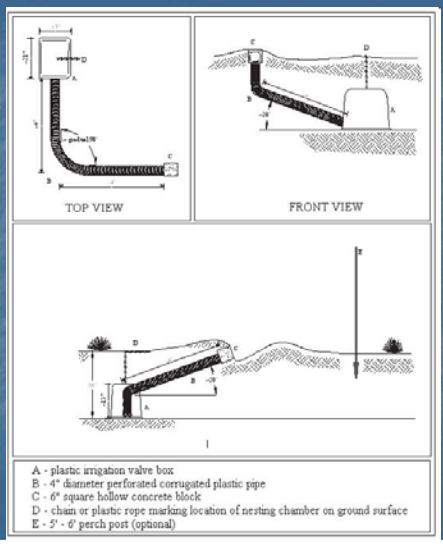
Principle 3: Enhance the site for ground squirrels by bringing in mounds of dirt (don't use good soil!) and encourage healthy ground squirrel populations.

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



Principle 2: Enhance sites for nesting with artificial burrows.

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

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

Management & Protection

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

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

They don't need "pristine habitat"

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

Principles for Establishing Habitat - owls not present

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

Small Group Exercise

What are your recommendations for habitat enhancing habitat for burrowing owls?

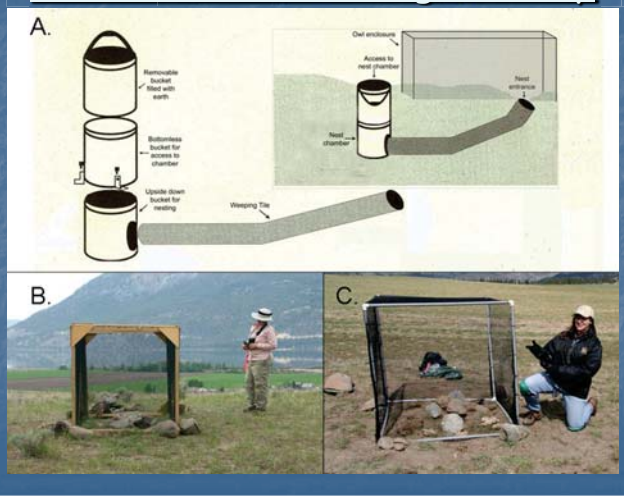
What about relocating owls?

GOAL is to attract owls
Relocate birds only when absolutely necessary

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

Soft-release ("hacking") Set up



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 with birds in enclosures 14–17 days
- Supplemental feeding over the breeding season to maximize reproductive output.

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

The Long View for Burrowing Owls: Climate Change

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

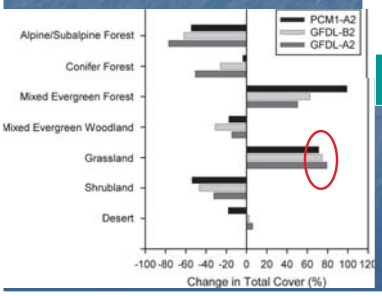
Consider vegetation change*

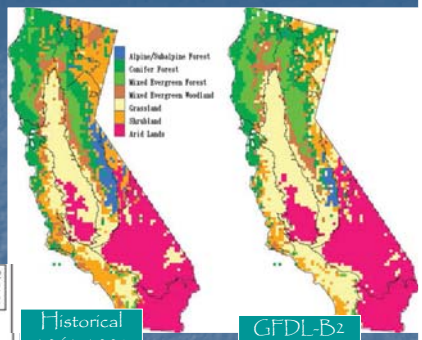
* Lenihan, J.M., D. Bacheltet, R.P. Neilson and R. Drapek. 2008. Response of vegetation distribution, ecosystem productivity, and fire to climate change scenarios for California. *Climate Change* 87 (Suppl. 1):S215-S230.

By 2100, under 3 climate change scenarios:

>70% increase in grasslands

Replacing shrub & Mixed evergreen woodland





Big Questions…


Dave Taylor, WildCare

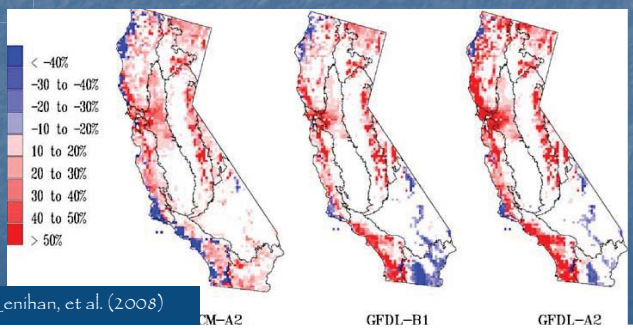
- Fire + Habitat Change
  - Too much, too often?
  - Squeeze owls into less suitable conditions?
- And what about the intersection of human activities, population growth + climate change?
- National Audubon Climate Report states:

"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…"

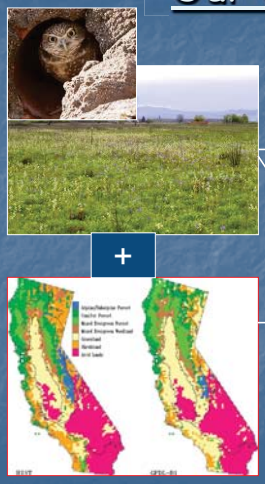
(http://climate.audubon.org/birds/burowl/burrowing-owl)

Climate Change – Fire!

- 9-16% increase in area burned (Lenihan, et al., 2008)
- Fire frequency twice the current rate (Fried, J.S., M. Torn & E. Mills. 2004. *Climate Change* 64:169-191.)



Our Challenge



Develop Local Plans

Protect & Enhance Current Habitat

Identify Future Owl Habitat

Predict Protect Enhance

Provide conditions for owls to persist

Can Burrowing Owls Adapt?

- Live in range of habitats
- Increased grassland & fire could be exploited by burrowing owls
- But, climate change modeling suggests major losses to breeding habitat in the US.

Thanks to my research colleagues & supporters over the years

- Dr. Dan Rosenberg, Oregon State Un.
- Phil Higgins, Debra Chromczak, Jack Barclay
- City of Mountain View, Shoreline at Mountain View
- City of Sunnyvale, Baylands Park & WPCP
- City of San Jose, WPCP
- City of Santa Clara, Golf & Tennis Club
- Mission College
- Moffett/NASA Ames, esp. Chris Alderete

…and many tireless, enthusiastic field and laboratory assistants!

And thank you…

- Grey Hayes and Virginia Guhin, Elkhorn Slough Coastal Training Program
- All the biologists, USFWS and CDFW experts working to protect burrowing owls
- And, you for your attending this workshop to learn about this wonderful animal!