Western Burrowing Owl Workshop

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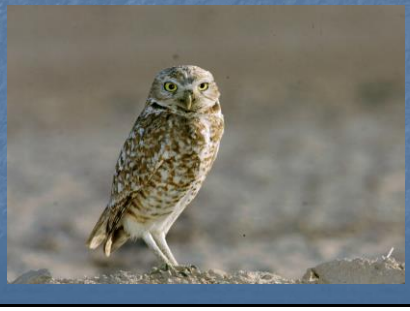
Workshop Topics

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

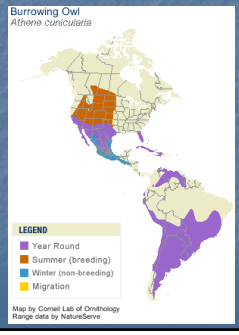
Athene cunicularia Burrowing Owl or "Little Miner"



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!

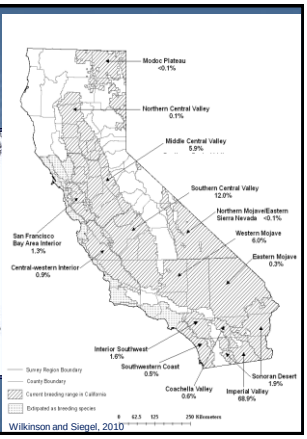
Entire Species Range - ~20 subspecies



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

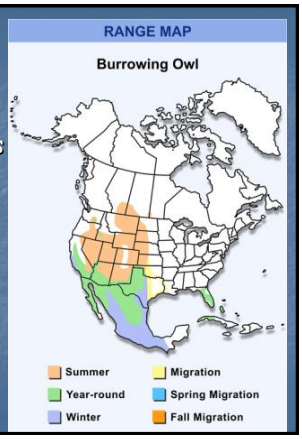
Range of the Western Burrowing Owl



Wilkinson and Siegel, 2010

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



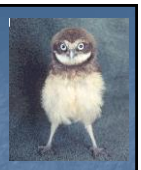
Identification - Adults

- 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

Identification - Adults

Male and female are 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

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
- A raptor – although a small one
- Many predators
- Migratory in much of range, but in No. CA 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:

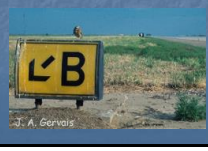
Prairies, Ag Lands, Bases, Golf Courses, Open Fields – Natural Grasslands and Urban Sites

Habitat Types~Statewide

(Wilkerson & Siegel, 2010)

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

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



Nesting Habitat Requirements

Flexible requirements…within limits

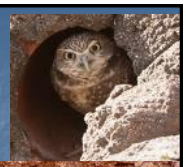
Nesting owls are found…

- 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

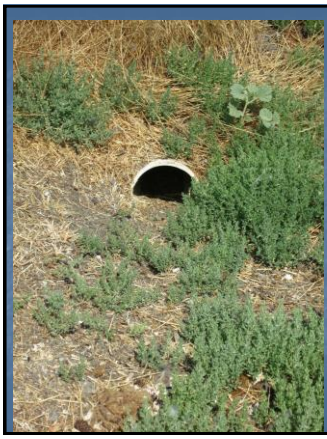
Predators? Just about everything!

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

Burrows are key, natural and artificial



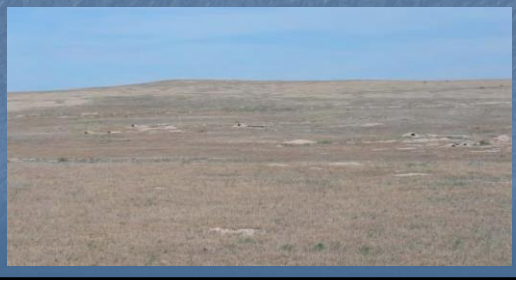
California Ground Squirrels



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, depending on prey availability and quality

Wintering Season in CA:

Many resident birds but…

- 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

Birds pair up starting in February

Aggressive/Defensive

Typically seen when defending burrow

Females lay up to 12 eggs

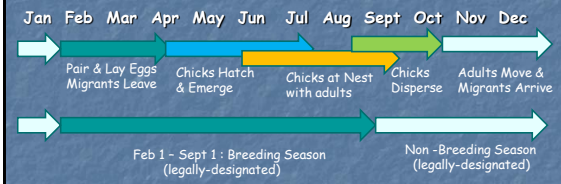
Chicks stay below ground for several weeks

Chicks emerge in May – stay with parents all summer

By September:

* juveniles molt and disperse to seek their own burrows
* adults 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

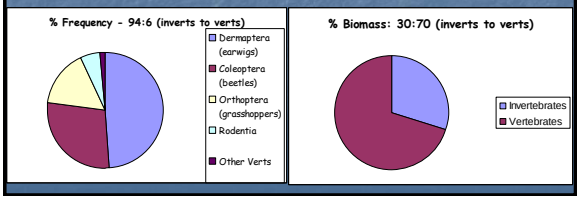
Diet in Santa Clara County, CA

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)

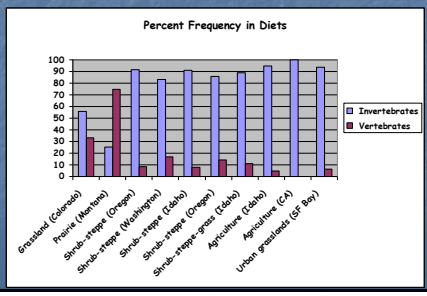
Results—As a Whole

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



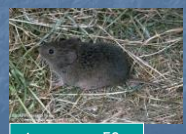
Compared to other habitats?

Similar to other ag and more natural habitats



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

Key Findings

Gophers are a large, valuable prey item for a BUOW, so…

…let's have more of them!

Or, more BUOWs to eat gophers in urban settings!

Landscape as a Factor in Habitat Quality

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

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)
- PVAs show adult survivorship is the key parameter in population change (Barclay et al. 2011)

Population Genetics

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

(Results from Korfanta, et al. 2005)

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?

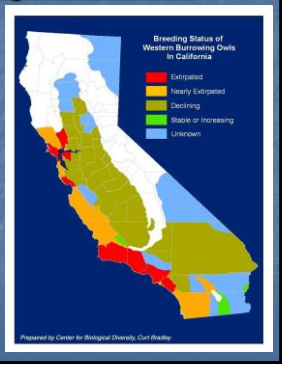
Looking at these, what would you want to know about the site in order to say that owls might be there? What aspects of the site do you think would constrain or promote the presence of owls?

Status

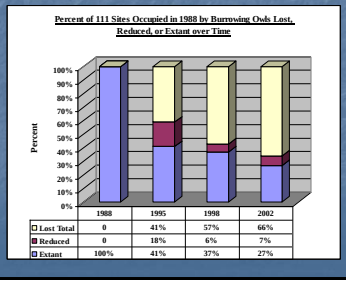
- Endangered in Canada
- Threatened in Mexico
- Bird of Conservation Concern in US
- Endangered in Minnesota
- Threatened in Colorado
- Species of Special Concern in California, Montana, Oklahoma, Oregon, Utah, Washington, and Wyoming

Owls are declining in California

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



Between 1988 and 2002, 66% of owl locations were lost in Santa Clara County



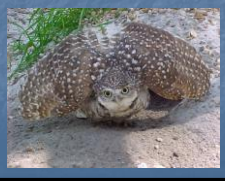
Only ~50 pairs of birds remain in all of Santa Clara County

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

- **#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 raptor that does well in agricultural areas



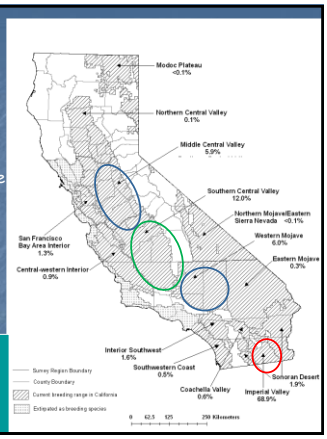
Threats

- **#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

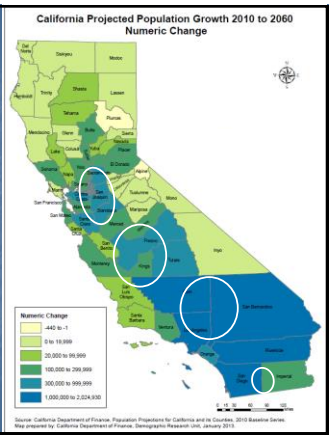
Very similar to statewide estimate of ~10 years before



* 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.

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: Bird of Conservation Concern
- 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

Regulatory Framework

- State: California Species of Special Concern
- 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; impacts must be avoided or mitigated
- State: Staff Report on Burrowing Owl Mitigation (2012) – guide for determining owl presence and avoiding impacts to owls and their habitat

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

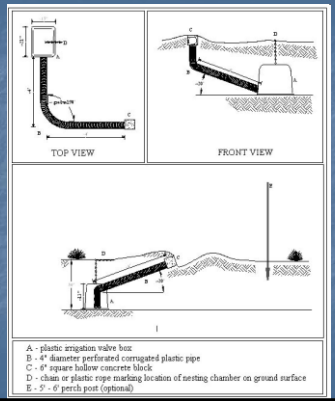
How to Manage Habitat to Preserve Burrowing Owls

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

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.

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 disturbance
- And there is enough foraging habitat

They don't need pristine habitat

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!

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

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

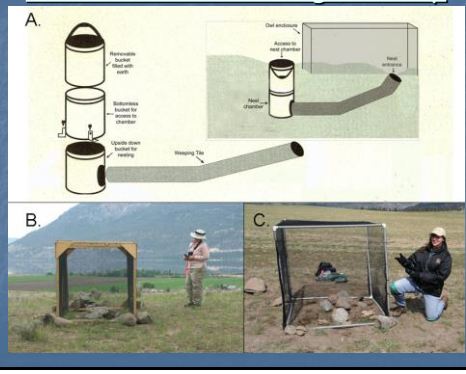
Small Group Exercise

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

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

The Long View for Burrowing Owls: Climate Change

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

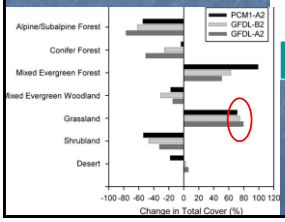
Consider vegetation change*

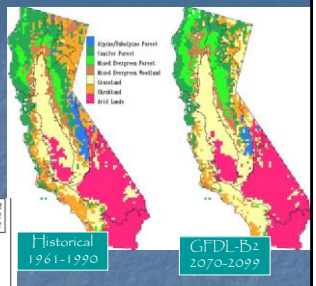
* Lenihan, J.M., D. Bachelet, R.P. Neilson and R. Drapek. 2008. Response of vegetation distribution, ecosystem productivity, and fire to climate change scenarios for California. Climate Change 87 (Suppl. 1):S215-S230.

By 2100, under 3 climate change scenarios:

>70% increase in grasslands

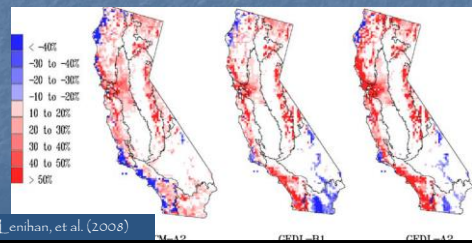
Replacing shrub & Mixed evergreen woodland





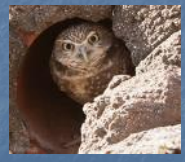
Climate Change – Fire!

- 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.)



Can Burrowing Owls Adapt?

- Live in range of habitats
- Increased grassland & fire could be exploited by burrowing owls
- Disturbed habitats
- Generalist diet
- Migration flexible

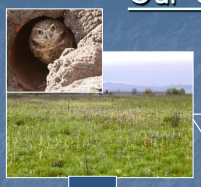


But, Some Big Questions…

- **Fire + Habitat Change**
  - Too much, too often?
  - Create heterogeneity habitat?
  - Support ground squirrels?
  - Squeeze owls into less suitable conditions?
- **And what about the intersection of human activities, population growth + climate change?**


Dave Taylor, WildCare

Our Challenge



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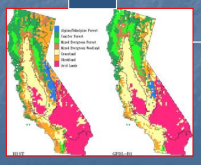

Develop Local Plans

Protect & Enhance Current Habitat

Identify Future Owl Habitat

Predict Protect Enhance

Provide conditions for owls to persist

Thanks to my research colleagues & supporters over the years

- Dr. Dan Rosenberg, Oregon State Un.
- Debra Chromczak, Phil Higgins, 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!