# Of Owls and Alfalfa:
## Why are burrowing owls associated with irrigated agriculture in the Southwest?

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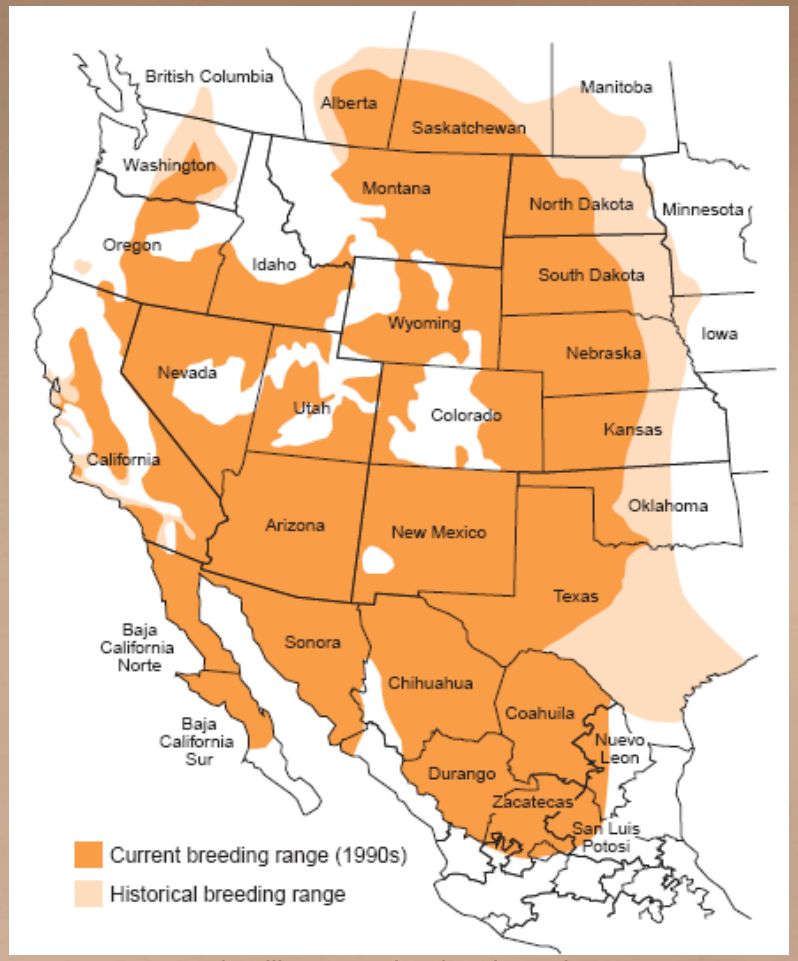
# Western Burrowing Owl

*Athene cunicularia hypugaea*




(Wellicome and Holroyd 2001)

# Western Burrowing Owl

?

# Why agriculture?

**Three hypotheses:**

**Prey abundance** – burrowing owls are associated with agricultural areas because of greater prey abundance

**Nest burrow availability** – burrowing owls are associated with agricultural areas because of greater burrow availability

**Predation risk** – burrowing owls are associated with agriculture because nest predation is lower

# Study Sites

Salton Sea, CA
Blythe, CA

Casa Grande, AZ
Thatcher, AZ

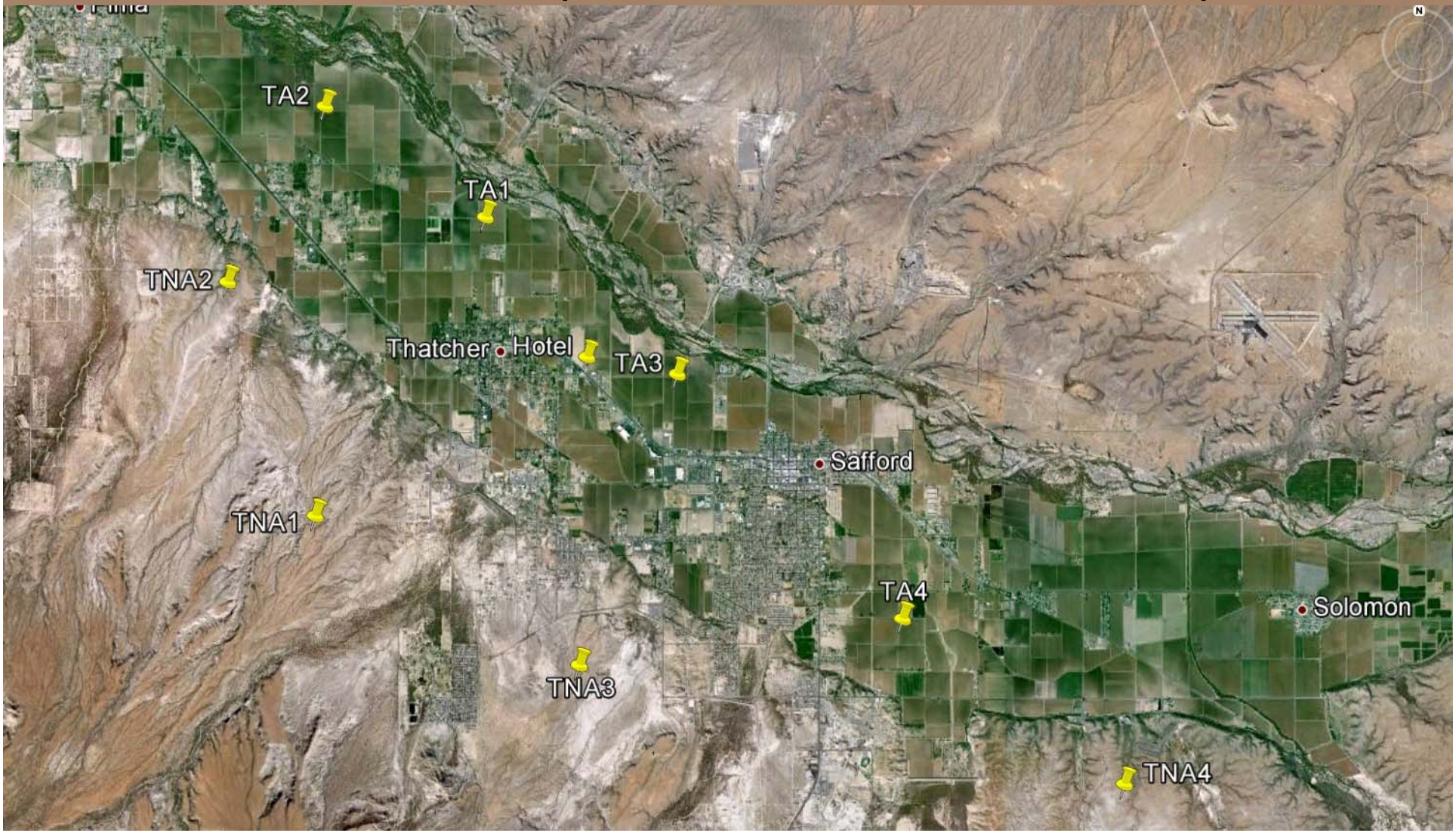
Wellton, AZ
Buckeye, AZ

Yuma, AZ

# Study Sites – Nested Design

Summer – 7 sites, 64 points

Winter – 1 site, 8 points



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# Prey Abundance

**Small mammals**

Capture/recapture with Sherman live traps

-15,616 trap nights

# Prey Abundance

**Invertebrates**

Pitfall traps

-768 trap nights

# Prey Abundance

**Birds**

Walking 400 m transects for distance sampling

-41 transects

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# Burrow Availability

**Number of natural burrows**

Walking census of 2500 $m^2$

-48 surveys

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# Predation Risk

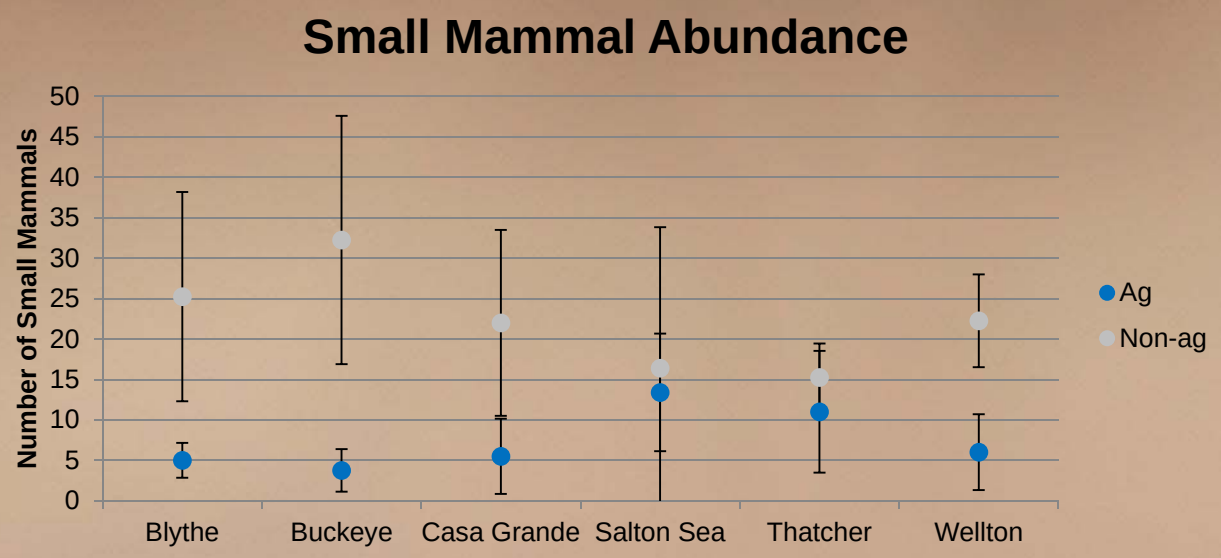
**Predation rates on nest burrows**

Depredation of replica burrowing owl nests

-96 burrows, 576 burrow days

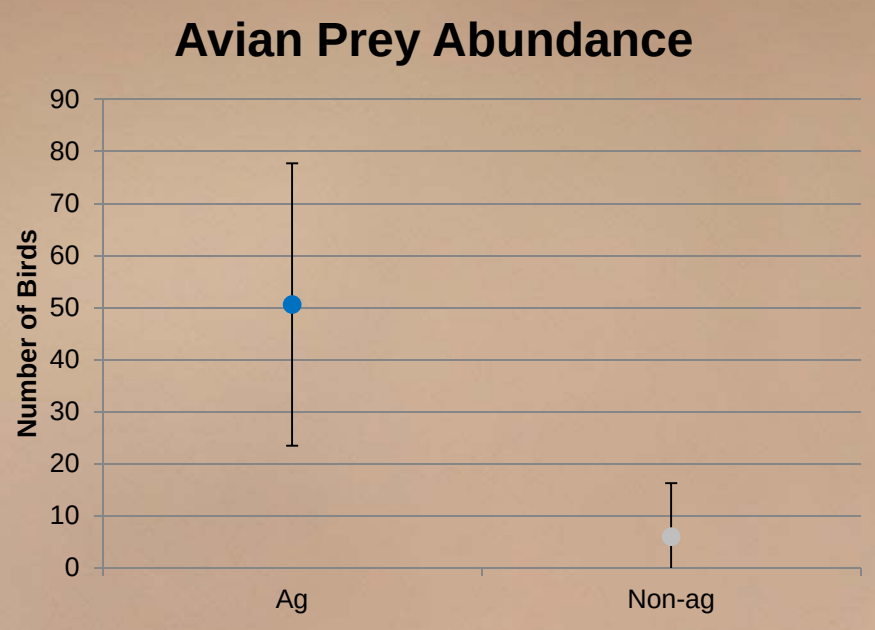
# Prey Abundance: Mixed Results

Lower small mammal abundance in ag areas



# Prey Abundance: Mixed Results

Higher avian prey abundance in ag areas



# Prey Abundance: Mixed Results

Higher invertebrate abundance in ag areas

-Biomass is what matters

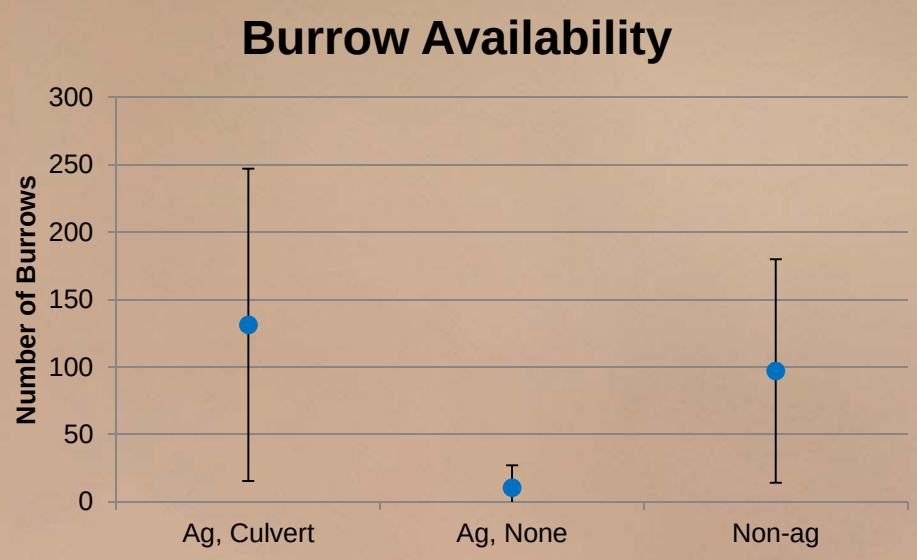
| Major Ag Orders | Major Non-ag Orders |
|---|---|
| Dermaptera | Coleoptera |
| Orthoptera | Hymenoptera |
| Hymenoptera | |

# Burrow Availability: No Difference

Failed to detect difference in burrow availability between ag and non-ag

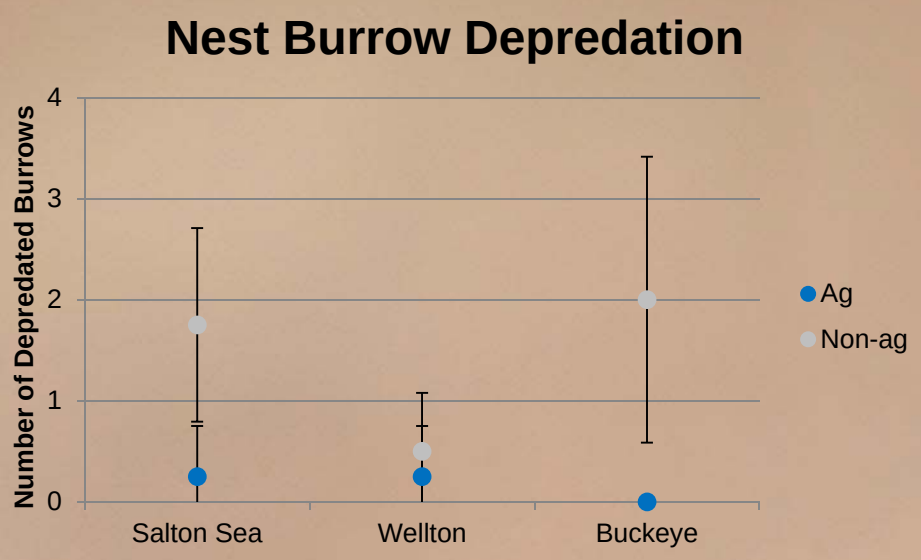
Effect of concrete culvert: more burrows in ag with culvert than in ag without culvert

BUOWs shown to associate with culverts at Salton Sea, CA



# Lower Predation in Ag Areas

More artificial nest burrows depredated in non-ag areas than in ag areas



# Management Implications

Decline: endangered (Canada), species of concern (U.S.)

-Denied T/E listing in CA because of densities in Imperial Valley

BUOW densities in ag MUCH higher than in native areas

-BUOW absent from some ag areas; why?

Management based upon a few high-density ag areas

Declines in native areas buffered by increases in ag, but what happens if densities in ag areas decline?

# Management Implications

Ag areas not publicly owned, not managed for BUOW

-Some farmers dislike BUOW, destroy burrows

-Ag areas constantly in flux (diff. crops, methods)

Conversion of agriculture (housing, energy production, etc.)

-Effect on BUOW? Don’t even understand why they are associated with some ag areas

Need to understand BUOW-ag association so we can take actions to ensure BUOW persistence in Southwest

# Acknowledgements

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# Site Selection

Site: large agricultural matrix with nearby native vegetation

-Randomly choose 8 survey points on roads ~10 m wide

Ag point: >500 m from non-ag,
flood-irrigated alfalfa or grass

Non-ag points: >500 m from ag,
<10 km of ag, native vegetation with
limited recent disturbance

# Fewer Small Mammals in Ag

| Ag Species | Non-ag Species |
|---|---|
| *Chaetodipus penicillatus* | *Chaetodipus penicillatus* |
| *Mus musculus* | *Chaetodipus baileyi* |
| *Peromyscus maniculatus* | *Dipodomys merriami* |
| *Sigmodon hispidus* | *Ammospermophilus harrisii* |
| *Thomomys bottae* | *Xerospermophilus tereticaudus* |
| *Reithrodontomys sp.* | *Perognathus amplus* |
| | *Neotoma albigula* |
| | *Dipodomys deserti* |
| | *Chaetodipus intermedius* |
| | *Peromyscus eremicus* |

| Site | Ag | Non-ag |
|---|---|---|
| Thatcher | 44 | 60 |
| Casa Grande | 22 | 88 |
| Blythe | 20 | 101 |
| Salton Sea (S11) | 22 (3) | 37 (2) |
| Salton Sea (W) | 29 | 24 |
| Salton Sea (S12) | 15 | 21 |
| Wellton | 23 | 89 |
| Buckeye | 15 | 129 |

| | # Individuals | # Points |
|---|---|---|
| **Non-ag** | 549 | 30 |
| **Ag** | 190 | 31 |
| **Total** | 739 | 60 |

15,616 trap nights

# More Invertebrates in Ag

| Major Ag Orders | Major Non-ag Orders |
|---|---|
| Dermaptera | Coleoptera |
| Orthoptera | Hymenoptera |
| Hymenoptera | |

Invertebrate abundance in ag far higher than in non-ag

Higher variance in ag

Record soil type/structure

Questions?

Suggestions?