Tracking Wildlife Use of Interior Wetlands in Southern California

Drew Stokes
Scott Tremor
Lori Hargrove
Philip Unitt

Dept. of Birds & Mammals

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Grinnell Resurveys in Southern California:
100 Years of Changes to Vertebrate Species' Distributions and Habitats

San Diego Natural History Museum
in collaboration with Museum of Vertebrate Zoology

The impetus for this research had its origins in the Grinnell Resurvey Project, begun in 2008, where we revisited sites first surveyed some 100 years ago by Joseph Grinnell and his colleagues, to document faunal change over the past century. (We have completed the San Jacinto Mtns, and are now wrapping up the Mojave Desert.)

One of the most important and obvious drivers of faunal compositional change has been…

…Water. (Either importation, modification, or drying up of natural springs.)

These are examples of sites that had flowing water historically, but are now dry. We have found that sites with a change in the availability of water have had the most faunal change. (Remove water, and numbers of animals collapse.) We also noted concentrations of wildlife around isolated remaining springs, which were often modified but not maintained (such as at Thomas Mountain, lower right).

And surprisingly, we frequently encounter wildlife managers, and even biologists, who denigrate the importance of water, even at sites where it was historically flowing year-round. So this led us to propose more focus on “interior wetlands”: defined as any seasonal or perennial springs, streams, or ponds.

Importance of Interior Wetlands to Wildlife in Southern California

Questions/Goals:

1. Better understanding of wildlife-wetland relationships
2. Which species are most dependent on wetlands?
3. Which wetland features support the most biodiversity?
4. Monitor wetlands & wildlife

Obviously, water is critical to people and to wildlife, and controversial, especially in southern California. And while its importance to wildlife is definitely appreciated, we feel that it is still UNDER-appreciated.

So we started this new project with a few major goals:

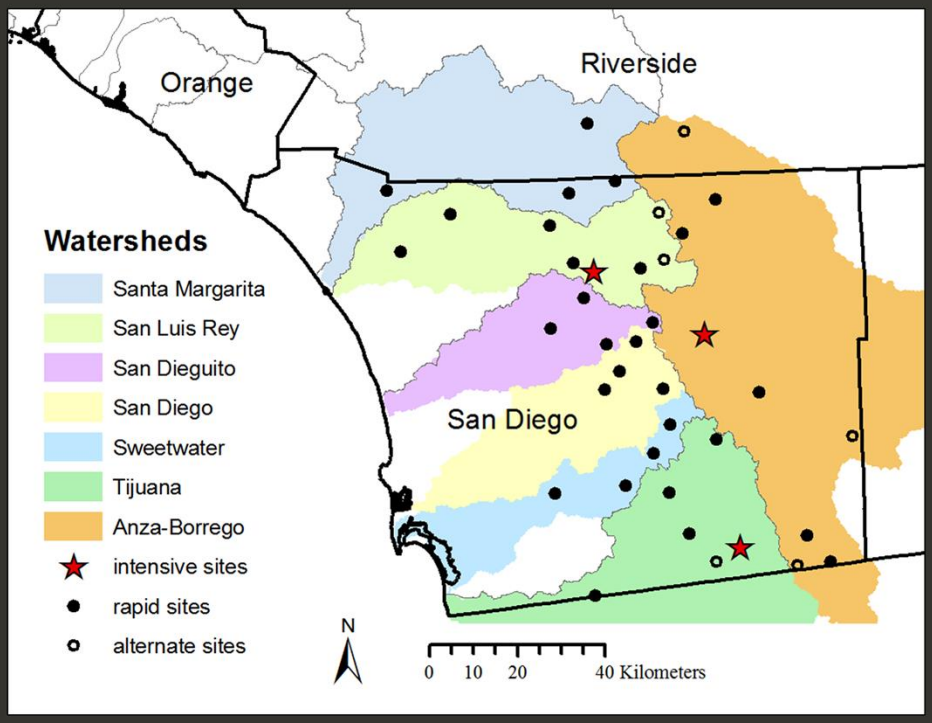
1. We need a better understanding of wildlife-wetland relationships. (I'll talk briefly about modeling this.)
2. Within this first general goal, which species are most dependent on wetlands? (Wetland or riparian-obligate species are already fairly well known, but how important are wetlands to other species?)
3. Which wetland features are most important to wildlife? (What are the quality indicators?)
4. We would like to recommend a long-term monitoring strategy that is complementary to existing surveys and wetland monitoring. (Since coastal wetlands already get some well-deserved attention, we are focusing on interior rather than coastal wetlands)

Methods

- Identify interior wetlands
- Stratify by watershed and elevation
- Surveys at two scales:

➢ <u>"Rapid" survey</u>
  - 30-50 sites
  - 3-day visit by 2 biols
  - Pt-transect & habitat
  - Cameras & recorders

➢ <u>"Intensive" survey</u>
  - 3-5 sites
  - 3 x 5-day visits by team
  - Rapid methods + trapping, netting



We are faced with a strategy problem: do we spend more time surveying fewer sites, or do we skimp on time to visit more sites? One solution, is to do both! So we proposed a two-scale strategy.

First we identified all potential interior wetland sites by GIS. Then we stratified by major watershed and elevation, and selected a random site within each stratum. (But we substituted sites that were too inaccessible or urbanized.)

We conducted rapid surveys at each site, including a 1-km walking transect, point counts, and deployment of cameras, bat detectors, and acoustic recorders. These were mostly in spring.

And we conducted intensive surveys at a small subset of sites: which was a more thorough inventory, including plants, and trapping & netting for birds, mammals, amphibians, reptiles, and insects. These included the rapid survey methods, and were repeated in spring, summer, and fall.

Cameras

- Moultrie MCG-13181
- High sensitivity, 10 second delay, single shot
- Baited with tuna (1.3 oz)
- 2 cameras per site, paired as:
  - Wetland: at/near water
  - Upland: 300-500m
- 3 days and nights
- Measured habitat, water
- Photo review:
  - Presence/absence by species
  - # "Hits" at least 1 hour apart
  - Review by volunteers, biologist ID all species

Camera surveys were a component of the rapid surveys, with 2 cameras per site paired as wetland (at/near the water source), and adjacent upland (300-500 m away from the water source). From pre-defined points, cameras were always placed at the nearest trail, draw, or clearing, easily accessible but out of the public eye as much as possible.

They were left for 3 days and nights at high sensitivity setting, and each camera was baited with a very small amount of tuna.

At each camera site we measured habitat features including water extent and quality.

Photo review was by volunteers to record presence/absence by species for each camera, but also # hourly hits for activity, which I'll define in the next slide.

Results (2017-2018)

- 9 “Intensive” surveys (3 sites x 3)
- 46 “Rapid” surveys (35 sites)
- Total “Rapid” photos: 108,575
- Total # species ID’d: 72
- Total # “hits”: 1284

Camera Summary

Category	Total # Hits	# Species
Wildlife:		
Amphibians	66	0
Reptiles	10	2
Birds	551	49
Mammals	350	21
Other:		
Cattle	204	
Humans	103	
Total	**1284**	**72**

We are 2 years into this study and hope to collect more data this spring, and have more photos to review and more species IDs to confirm. So these are very preliminary results that I am sharing with you today.

For a general summary, we completed 9 intensive surveys, and 46 rapid surveys. (But of these, only 41 surveys had good wetland/upland comparison with both cameras working properly.)

So far, we have identified 72 species by motion-detection camera, and in controlled comparison of wetland/upland had a total of 1284 “hits” (cattle and humans too, not counting photos of us biologists). “Hits” are a measure of activity constrained by hour for a more controlled comparison. For example, this photo would count as 2 hits (2 individual deer), but if we see deer in additional later photos, would not count those as new hits until at least one hour has passed (unless we see a new individual in the next photo that is obviously different, like a buck).

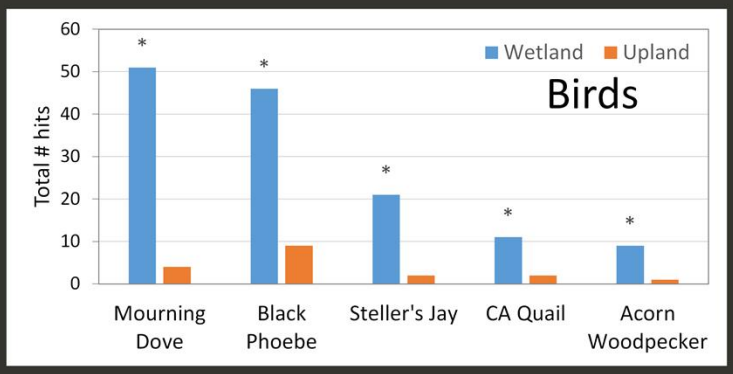
Mammals	Sites	Hits
Virginia opossum	1	1
Sciuridae		
Western gray squirrel	1	1
White-tailed antelope squirrel	4	4
Calif. ground squirrel	14	29
Merriam's chipmunk	3	4
Other rodents		
Kangaroo rat sp.	5	11
Mouse sp.	5	9
Woodrat sp.	3	4
Rabbits		
Black-tailed jackrabbit	10	26
Desert cottontail	9	21
Brush rabbit	3	5
Sylvilagus sp., unidentified	4	5

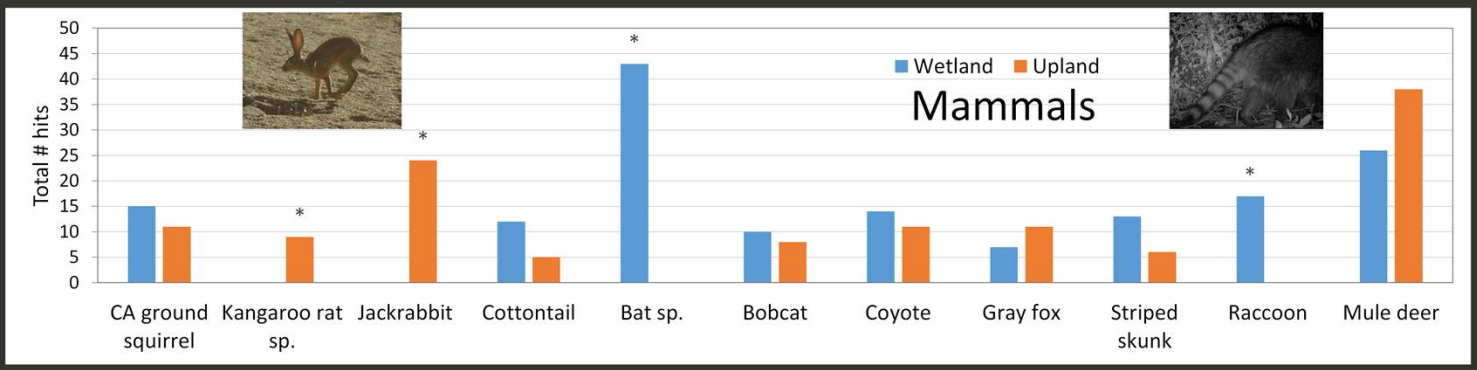
Mammals	Sites	Hits
Bats		
Calif. leaf-nosed bat	1	5
Townsend's big-eared bat	1	1
Unidentified bat	4	46
Carnivores		
Bobcat	17	28
Mountain lion	4	4
Coyote	17	29
Gray fox	13	19
Long-tailed weasel	1	1
American badger	1	1
Striped skunk	10	25
Raccoon	7	17
Mule deer	25	71
Unidentified mammal	4	7

Here is a breakdown of all 21 mammal species identified, showing # sites present by camera, and # "hits". Of large mammals, the most frequently photographed were deer, followed by coyote and bobcat, then gray fox.

Total Hits by Paired Habitat

Category	Wetland	Upland
Amphibians	**62**	**0**
Reptiles	5	5
Birds	**443**	**32**
Mammals	181	142
Cattle	**87**	**13**
Humans	**82**	**14**
Total	**860**	**206**





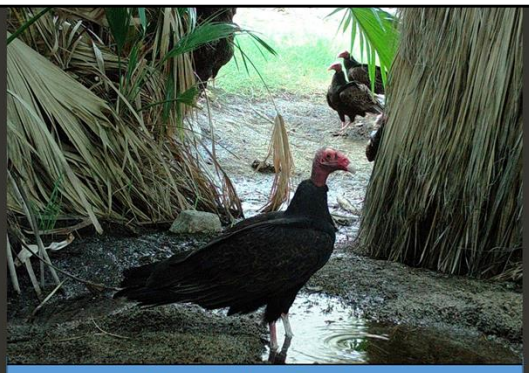
In controlled comparison of wetland vs. upland, we had over 4x the number of hits on wetland cameras compared to adjacent upland.

These are the top 5 most common bird species photographed, out of 49 species identified so far (but many “bird sp” are still pending review for ID). All 49 bird species with more than 1 or 2 records were more often photographed on wetland cameras.

These are the top 11 most common mammals photographed, with more of a mixed pattern, from raccoon only photographed by wetland cameras vs. jackrabbit only photographed in upland.

Site Quality

- Avg # hits per site: 26 (range 2 – 152)
- Avg # species per site: 7.3 (range (1 – 21)
- Identify high priority sites and quality indicators
  - Example Mtn Palm Springs (Turkey Vulture roost, most bat photos, 10 bat species and 1939 hits by anabat)
- Identify invasive species, disturbance, issues of immediate management concern
  - Example Mtn Palm Springs lack of trail signs (hiking in streambed)



Mtn Palm Springs

No Feral Pigs!

Of course, there was huge variation between wetland sites, which we have yet to analyze and model.

But we are identifying important sites and quality indicators, such as isolated desert springs like at Mountain Palm Springs where we had most of our bat photos (corresponding to high diversity by anabat detector) and photographed ~15-16 Turkey Vultures line up to take turns drinking the water.

And we are identifying issues such as invasive species (no feral pigs! Good to have lots of eyes out there…) and other disturbance, such as cattle and off-trail hiking. At this same Mtn Palm Springs site, lack of trail signs are leading to people just walking straight up the streambed, badly trampling it.

Conclusions/Future

- Cameras are a valuable and low-cost component of wetland monitoring
- Document diversity of species, identify key sites, invasive species
- Future:
  - Additional “rapid” surveys this spring
  - Compare rapid vs. intensive methods
  - Model wildlife use of wetlands
  - Recommend long-term monitoring strategy

By definition, our “rapid” survey methods will not detect all species. But given a relatively minimal effort (estimated 2 hours per camera), the cameras are producing a large amount of valuable data. If we collect more data in the future, I would like to double the number of cameras.

I definitely don’t want to suggest that the cameras could replace bird surveys, or bat detectors, etc, but they are a very nice complementary survey element to document wildlife-wetland relationships, especially for large mammals.

In the future we will be testing our rapid surveys against the more intensive surveys, and will model wildlife-wetland relationships, identify habitat quality indicators, and recommend a long-term monitoring strategy that is focused on interior wetlands.

A few favorite photos: Mountain lion at Warner Valley “wetland” (upper San Luis Rey River just below hwy 79).

Badger at “upland” habitat adjacent to Wilson Creek, just below Barrett Lake.

And one of our unidentified mammals (Drew Stokes who set up most of these rapid survey cameras).

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