

# Report on Predator Monitoring Efforts in California

Presented by California Department of Fish and Wildlife Staff to the California Fish and Game Commission Wildlife Resources Committee

September 21, 2016



**Striped Skunk**



**Gray Fox**



**Raccoon**



**Short-tailed Weasel**



**Wolverine**



**Bobcat**



**Badger**



**Long-tailed Weasel**



**Spotted Skunk**



**American Mink**



**Sierra Nevada Red Fox**

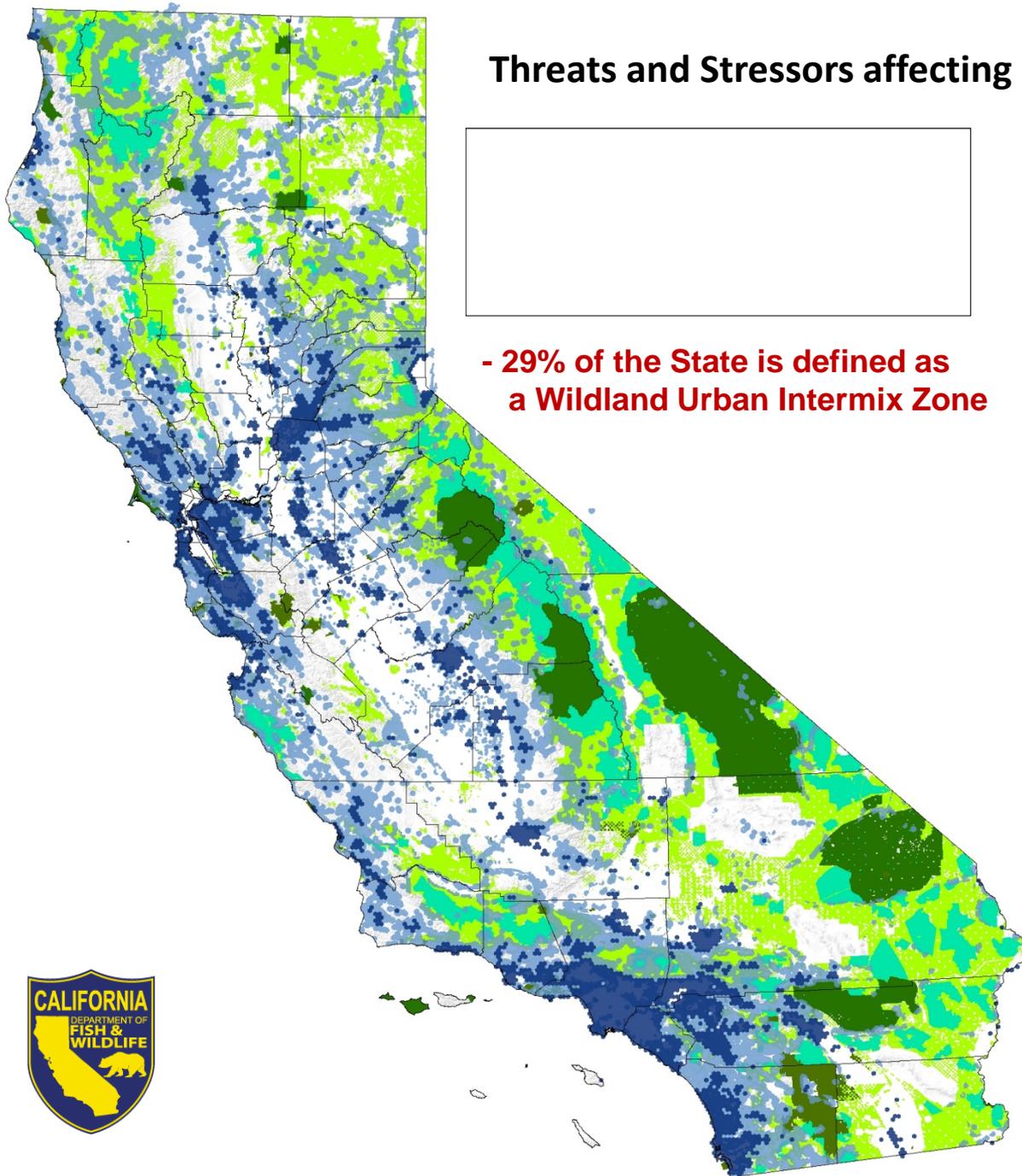


**Black Bear**



**Coyote**

# Threats and Stressors affecting Predators differ Statewide



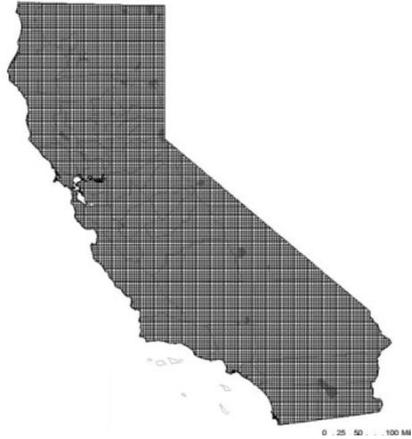
- 29% of the State is defined as a Wildland Urban Intermix Zone

## Public Lands

- National Park Service**
  - No Hunting or Trapping
  - **Wildland Urban Intermix = 4.6%**
- State Parks**
  - No Hunting or Trapping
  - **Wildland Urban Intermix = 23.1%**
- Wilderness Areas**
  - Hunting and Trapping
  - Access is Restricted
  - **Wildland Urban Intermix = 3.9%**
- USFS, BLM, USFWS, CDFW, and CDF**
  - Hunting and Trapping
  - **Wildland Urban Intermix = 35.2%**



# California Wildlife Habitat Relationship (CWHR) Range Maps



Coyote



Gray Fox



Bobcat



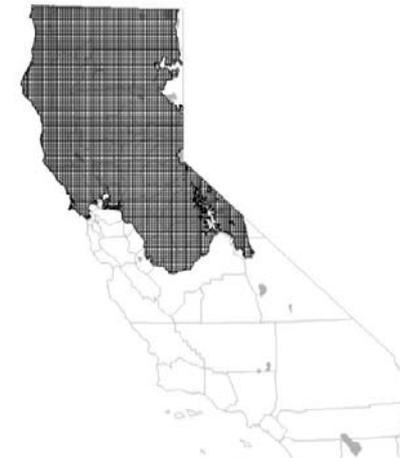
American Badger



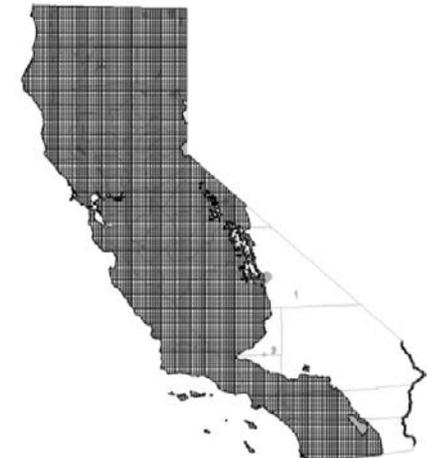
Long-tailed Weasel



Short-tailed Weasel

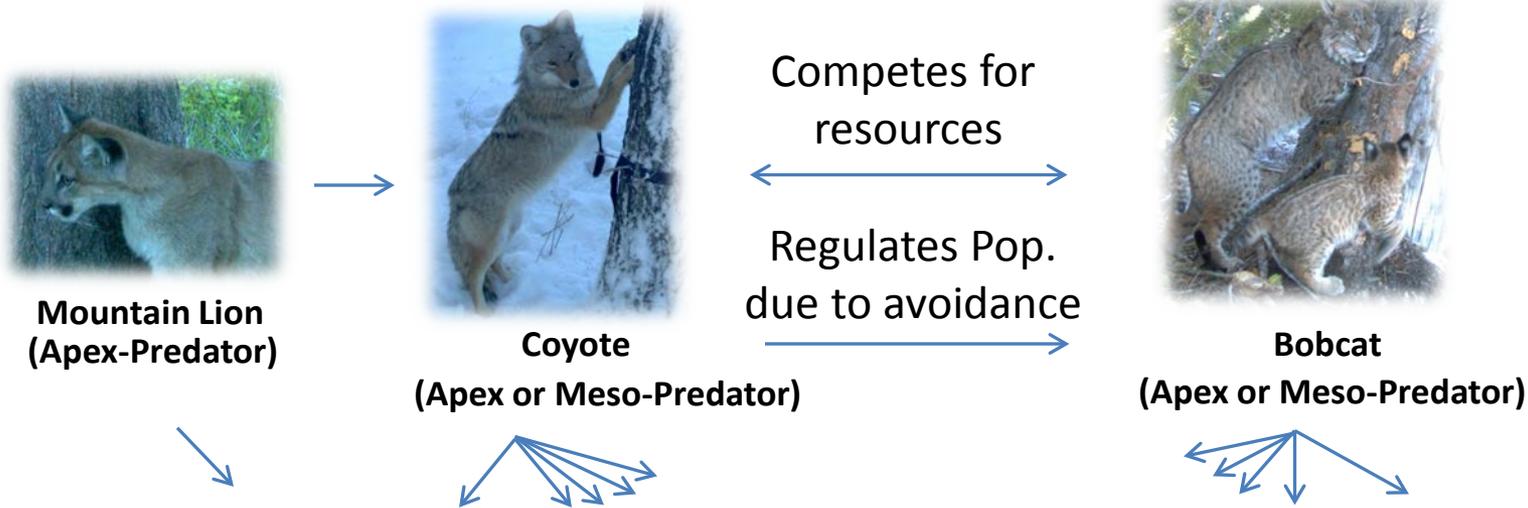


American Mink



Raccoon

# Ecological Interactions among the 8 Predator Species



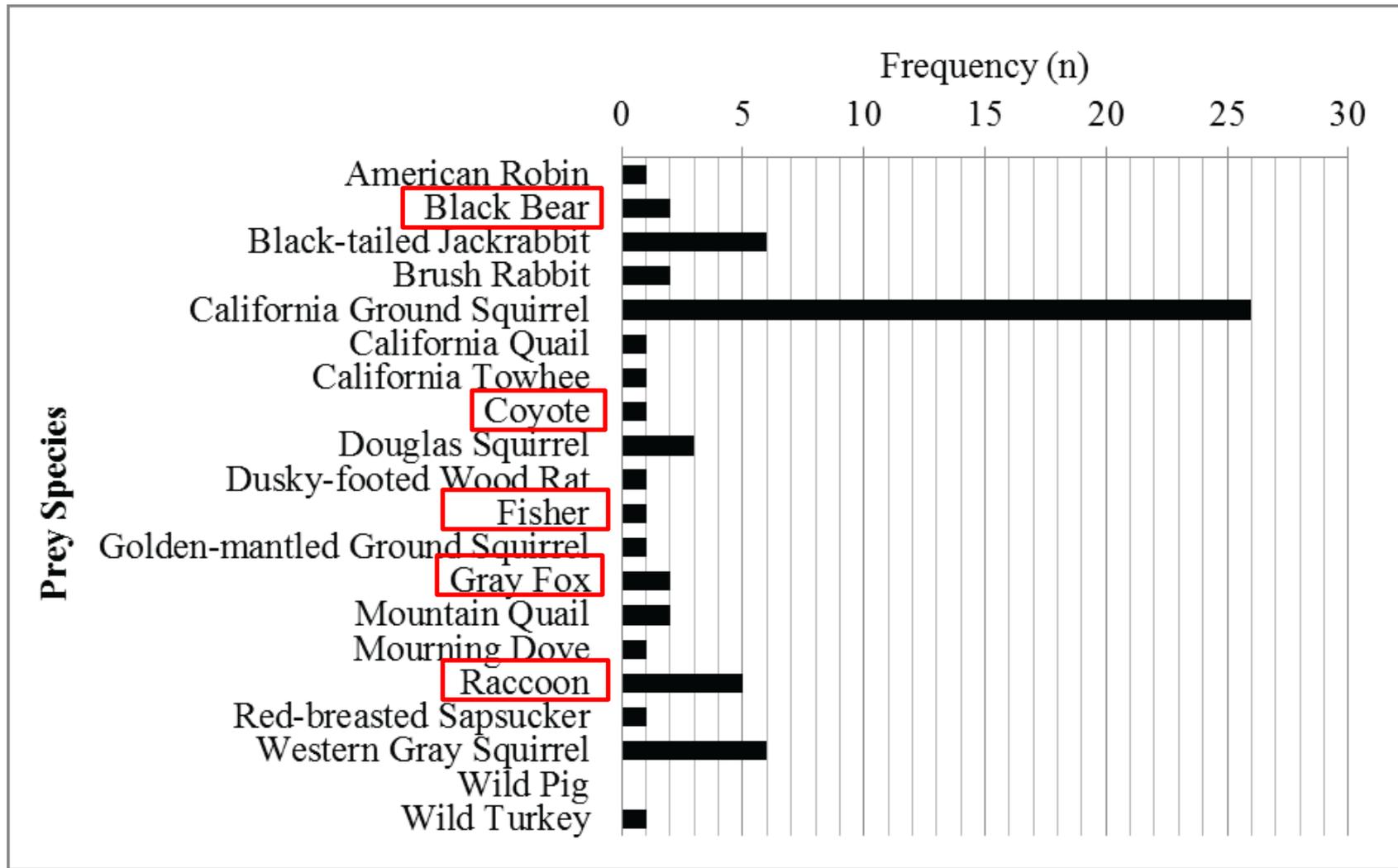
The Coyote and Bobcat have the potential to regulate the populations of these mesopredators through direct predation and/or avoidance.



Badger

The Badger can benefit other mesopredators through den creation, though predation of Badgers by Coyote and/or Bobcat is rare.

**Figure 2.**—The frequency of occurrence for each non-ungulate prey species we documented mountain lions eating during the study in the Mendocino National Forest, California, 2010-2012.



Allen, M. L., L. M. Elbroch, D.S. Casady, and H. U. Wittmer. Feeding and spatial ecology of mountain lions in the Mendocino National Forest, California. California Fish and Game 101(1):51-65; 2015.

# Steps toward Long-term Predator Monitoring

## Step 1. Methods Assessment

- Statewide consistency in monitoring
- Determining detection probabilities

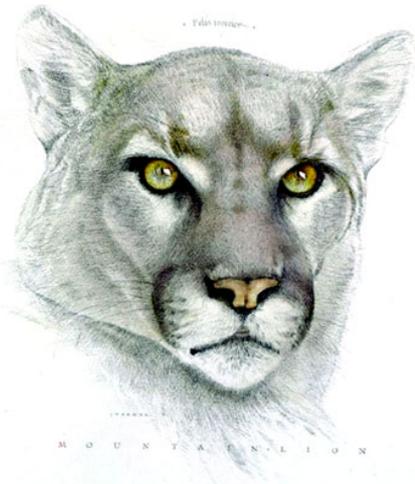


## Step 2. Population Assessment

- Estimate of Occupancy
- Estimate of Abundance

## Step 3. Habitat Assessment

- MaxEnt Habitat Suitability Models
- Habitat Covariates identified in Occupancy Estimate



## Step 4. Threat Assessment

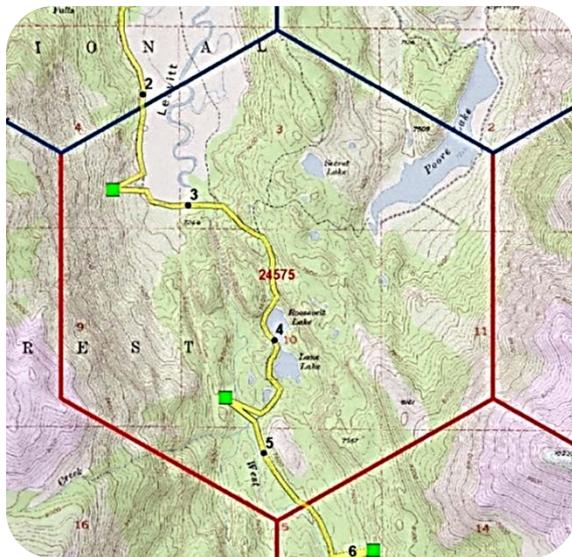
- Using Miradi software for a conceptual model/database of threats and stressors

# Step 1. Methods Assessment

## STATEWIDE CAMERA TRAP SURVEY PROTOCOL

### Methods derived from Zielinski and Kucera (1995) PSW-GTR-157.

- 4 square mile sampling cell (hexagon)
- 2 baited/scented camera stations per sampling cell. A minimum of 1 mi apart.
- 20-30 day revisit intervals.
- Hair snares and scat collection used to collect genetic samples for focal studies



CDFW SURVEY PROTOCOL FOR MESO-PREDATORS IN CALIFORNIA (DRAFT 6/8/2016)

(For information on this protocol contact: [chris.stermer@wildlife.ca.gov](mailto:chris.stermer@wildlife.ca.gov))

#### Introduction

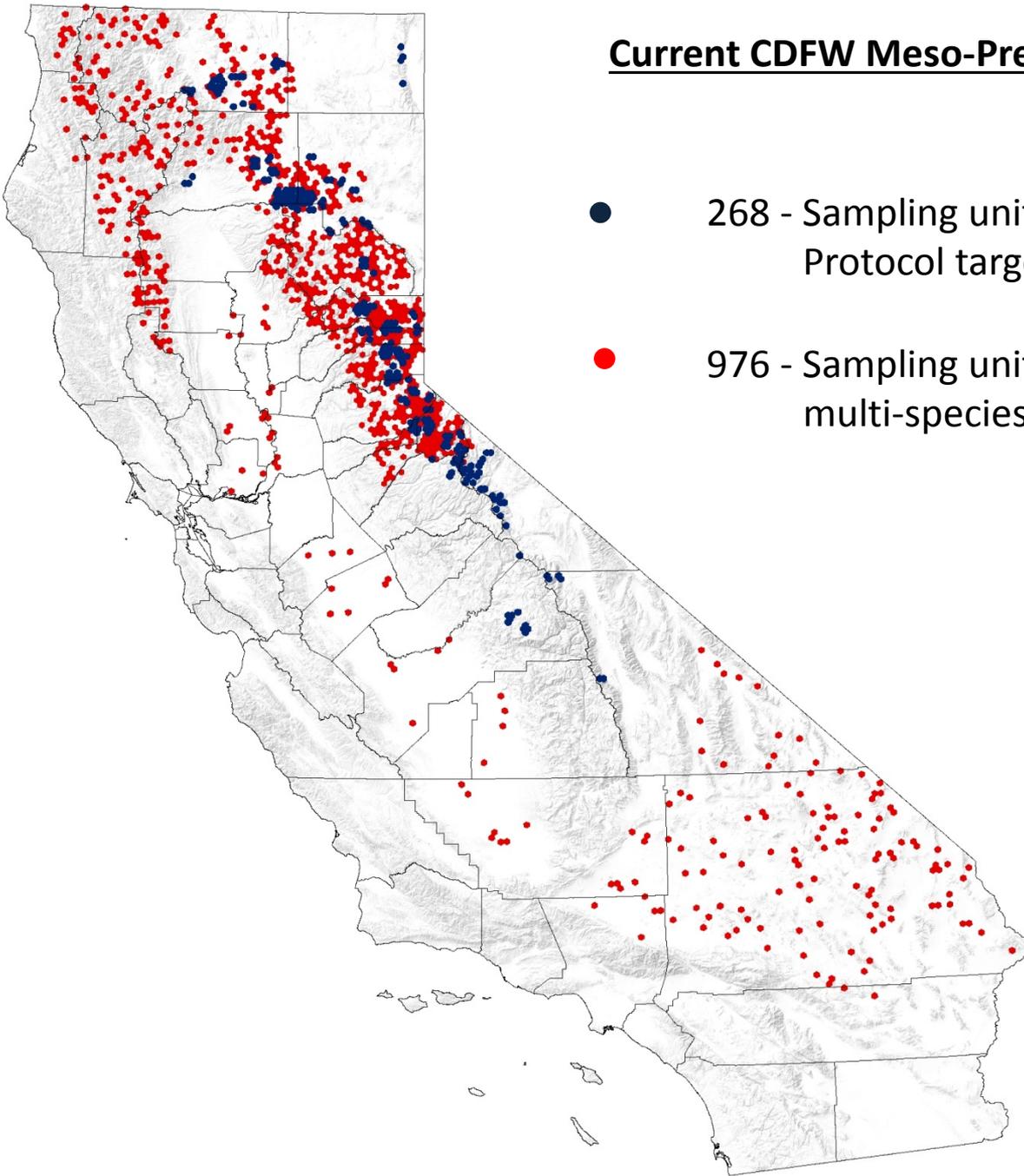
The methodology described here applies to the detection, monitoring, and assessment of Meso-Predator populations in California. The general framework of the camera trap survey protocol is derived from methods described by Zielinski and Kucera, in the 1995 GTR-157 report "American Marten, Fisher, Lynx, and Wolverine: Survey Methods for Their Detection". CDFW has been using modified versions of this protocol, beginning with a multi-region project to conduct broad surveys of mesopredator populations in the southern Cascade and Sierra Nevada Ecoregions between 2005 and 2010, funded by a State Wildlife Grant (SWG-T11-1). The protocol was further refined, and its effectiveness evaluated, for its use in conducting over winter surveys for the Sierra Nevada red fox (*Vulpes vulpes necator*) in the Sonora Pass region. Beginning in August 2010, the CDFW along with its UC Davis and USFS partners, applied these methods in a systematic effort to initially determine the extent and distribution of the SNRF population in this region. While the results of the research are still being prepared for publication, our initial findings are that the camera trap survey protocol had a greater than 80% detection probability when surveying for the SNRF, which has been one of our most difficult species to detect. In addition, when combined with an intensive search for additional genetic (scat) samples, provided valuable data determining the distribution, range extent, size, habitat associations, and genetic health for this population.

#### Sampling frame

A systematic grid of 4 mi<sup>2</sup> (10.4 km<sup>2</sup>) hexagons is used as the sampling frame for this survey protocol. The sampling frame GIS layer is available by contacting Chris Stermer at CDFW (916-445-2626 or [chris.stermer@wildlife.ca.gov](mailto:chris.stermer@wildlife.ca.gov)). A unique identifier (Unique ID) included in the

## Current CDFW Meso-Predator Survey Effort

- 268 - Sampling units surveyed using a Protocol targeting Predators
- 976 - Sampling units surveyed using the multi-species EBM protocol.



# Detection Probabilities – Are surveys effective?

Coyote  
(*Canis latrans*)



<u>Period</u>	<u>Detection Probability</u>
Dec-Jan	0.6685
Jan-Feb	0.9276
Feb-Mar	0.8658
Mar-Apr	0.9311
Apr-May	<b>0.9689</b>

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Bobcat  
(*Lynx rufus*)



Dec-Jan	0.7831
Jan-Feb	0.8907
Feb-Mar	<b>0.9215</b>
Mar-Apr	0.9084
Apr-May	0.4814

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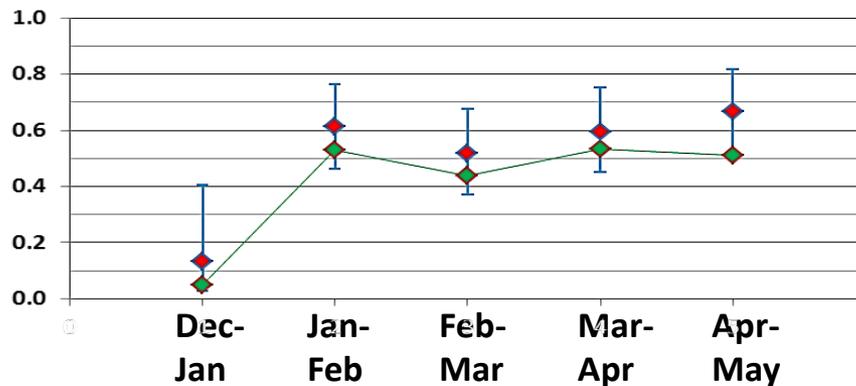
Gray fox  
(*Urocyon cinereoargenteus*)



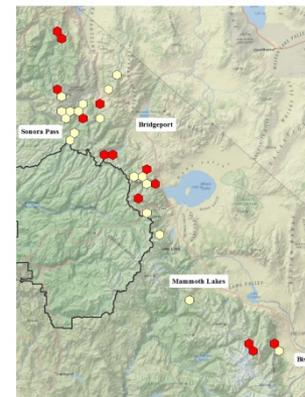
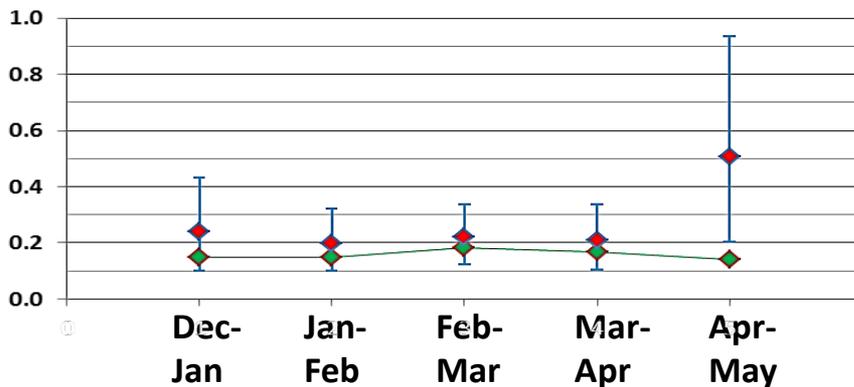
Dec-Jan	<b>0.9944</b>
Jan-Feb	0.9872
Feb-Mar	0.9794
Mar-Apr	0.9377
Apr-May	0.9618

# ◆ Modelled Occupancy Estimates - A Surrogate to Pop. Abundance.

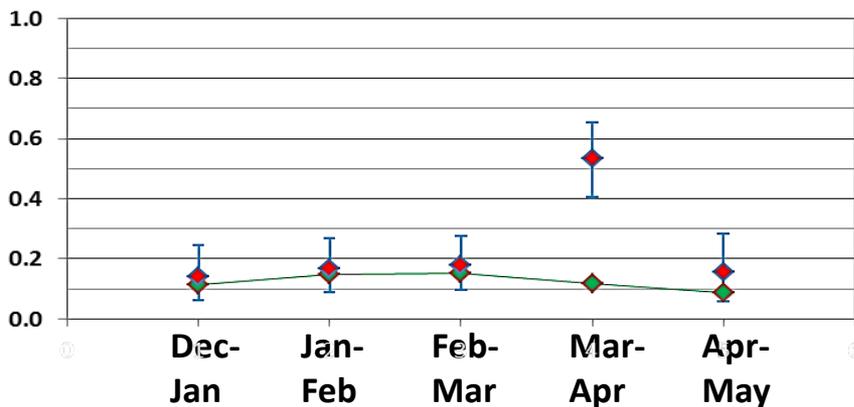
Coyote  
(*Canis latrans*)



Bobcat  
(*Lynx rufus*)



Gray fox  
(*Urocyon cinereoargenteus*)



# Probabilistic species co-occurrence model

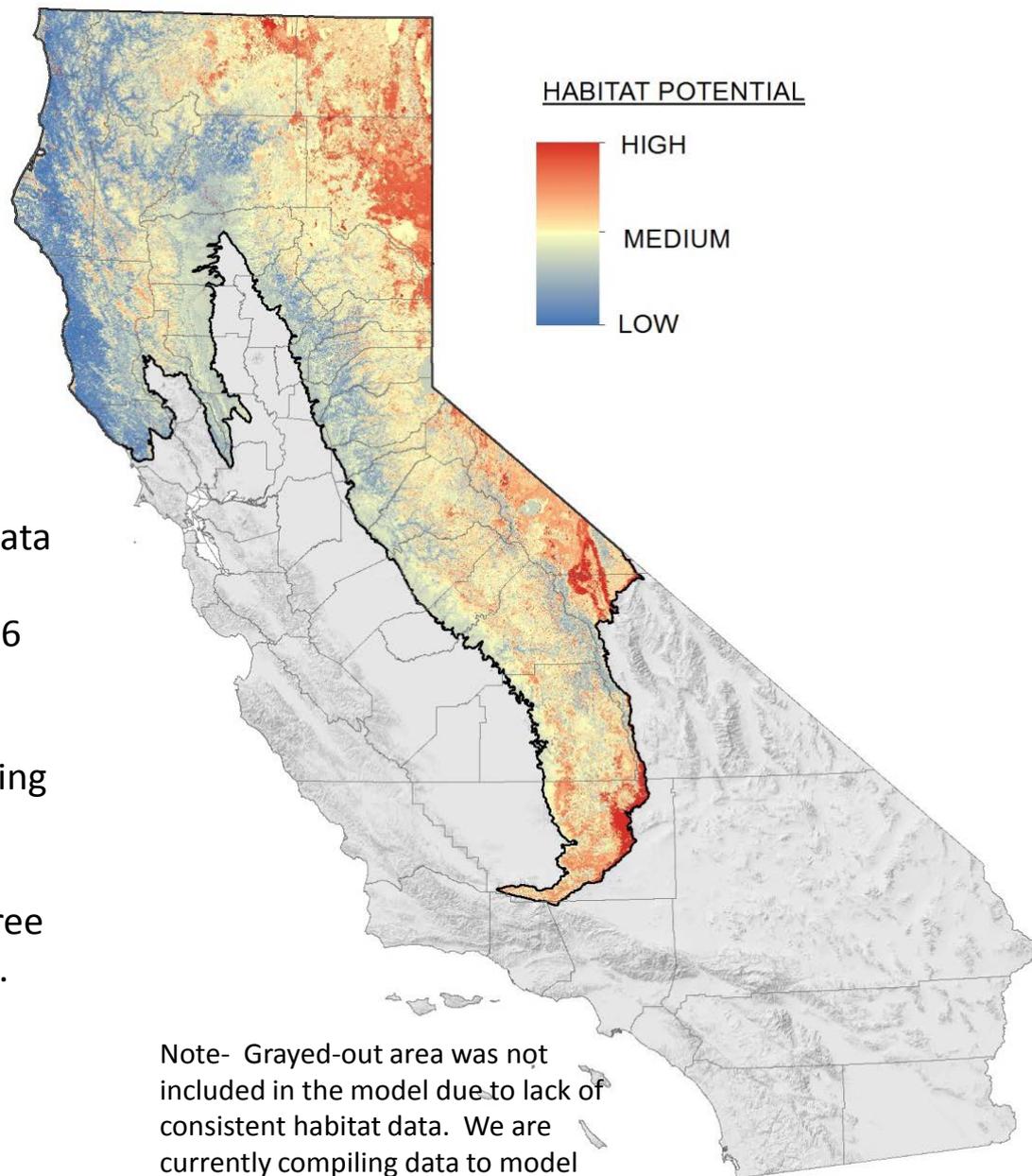
<u>Probability</u>	<u>Species1</u>	<u>Species2</u>
0.144	<b>SNRF</b>	<b>Coyote</b>
0.033	SNRF	Bobcat
0.02	SNRF	Gray Fox
0.085	SNRF	Marten
0.02	SNRF	Puma
0.09	Coyote	Bobcat
0.054	Coyote	Gray Fox
0.233	<b>Coyote</b>	<b>Marten</b>
0.054	Coyote	Puma
0.012	Bobcat	Gray Fox
0.053	Bobcat	Marten
0.012	Bobcat	Puma
0.032	Gray Fox	Marten
0.007	Gray Fox	Puma
0.032	Marten	Puma

Veech (2013), A probabilistic model for analyzing species co-occurrence, Global Ecology and Biogeography, DOI: 10.1111/j.1466-8238.2012.00789.x

### Step 3. Habitat Assessment: Spatial Habitat Model Example: Coyote



- Compiling addition coyote presence data to improve the models predictive performance. Current model uses 166 coyote locations.
- Model identifies habitat variables having predictive influence (e.g. elevation).
- Habitat variables include: elevation, tree canopy cover, and CWHR habitat type.
- Maximum Entropy Habitat Model.



Note- Grayed-out area was not included in the model due to lack of consistent habitat data. We are currently compiling data to model coyote habitat for the entire State.