

# Bat research and management ideas for San Diego County reserve lands

By Drew Stokes



# Bat experience (1996-2014)

- Federal lands:
  - Cleveland NF
  - Los Padres NF
  - Angeles NF
  - San Bernardino NF
  - San Diego County BLM lands (Banner, Ranchita, Otay Mountain)
  - Miramar MCAS
  - Camp Pendleton MCB
  - Fallbrook NWS
  - 29 Palms MCAGCC
  - Gila Bend Bombing Range (AZ)
  - Cabrillo National Monument & Point Loma Navy Lands
  - Silver Strand Navy Lands
  - Tijuana River Valley Park NOLF site
  - Salton Sea EES USBR
  - San Diego National Wildlife Refuge
  - Campo Indian Reservation
  - Manzanita Indian Reservation
  - Viejas Indian Reservation
  - San Jacinto Centennial Resurvey (mostly USFS)

## State lands:

- Cuyamaca Rancho State Park
- Rancho Jamul Ecological Reserve
- Hollenbeck Canyon Ecological Reserve
- Boden Canyon Ecological Reserve
- Crestridge Ecological Reserve
- Sycuan Peak Ecological Reserve
- Torrey Pines State Preserve
- Anza Borrego Desert State Park
- Freeman State Park
- Camp Cady Wildlife Area

## County lands:

- Dos Picos County Park
- 4S Ranch
- Fairbanks Ranch
- Flinn Springs County Park
- San Pasqual Valley
- Sweetwater County Park
- Sycamore Canyon/Gooden Ranch
- Santa Ysabel County Preserve
- El Monte County Park
- Louis Stelzer County Park
- El Capitan Open Space Preserve
- Oak Oasis County Preserve
- Lusardi Creek Open Space Preserve
- Lakeside Linkage
- Ramona Grasslands
- Del Dios Highlands
- Hellhole Canyon
- Boulder Oaks County Preserve
- Public Health Department & Project Wildlife bats

## City:

- Los Penasquitos Canyon Preserve
- San Diego River Mission Valley Preserve
- Marron Valley
- Mission Trails Regional Park
- Torrey Pines Bridge retrofit

## Private:

- San Diego Zoo Safari Park
- SDGE Sunrise Powerlink
- SDGE ECO Jacumba substation
- Corte Madera Ranch
- Rancho El Chivato (Baja)

# Bats in the HCP landscape

- Bats are mobile, long-lived, have low fecundity – they are likely adaptable to changes and fluctuations in their environment to a degree.
- Bats are not evenly distributed throughout the landscape.
- Bats tend to be patchily distributed; distribution not easily predicted.
- There does not appear to be enough information for ‘take’ analyses.
- Coverage by HCPs may not be appropriate at this time.
- The presence/absence of bats needs to be determined on a project by project basis until accurate representation and/or models exist.

# Bat roosts

- Bat colonies are typically found in places away from human disturbance and in protected locations.
- Bat colonies are usually not found by people unless they are in a man-made structure or a cave/mine.
- Several species have specialized roost requirements (cave-obligates) resulting in limitations of roost sites. Vulnerable due to human accessibility.
- Several species utilize man-made structures as roost sites making them vulnerable.
- Bats show high roost site fidelity from year to year, generation to generation. Colony sites are likely to persist in the long term, but may move to nearby locations under circumstances of changing temperatures, staggered birthing, increased parasite load, disturbance, habitat loss, seasonal availability of prey, etc.
- Movement of individuals and dispersal between colony sites is not well understood and might be resolved using genetics. Males likely represent agents of gene flow. Copulation occurs at fall swarming sites and hibernation sites.
- Maintaining the privacy of colonial roost sites is an important conservation strategy to keep in mind.

# Foraging bats

- The foraging bat species community tends to be at its richest and most active in riparian habitats, oak woodlands, and open water sources in western San Diego County.
- Several species have specialized diets and foraging strategies.
  - Terrestrial foragers
  - Gleaners
  - Use of linear features
- Several local sensitive bat species forage up to 15 kms or more from roosts nightly. Bats often show strong foraging site fidelity, typically select native vegetation, and follow seasonal insect ‘blooms’.
- Local landscapes with a high diversity of topographic, vegetative, and aquatic features in a contiguous area appear to be particularly supportive of a rich and active foraging bat community including the diet and foraging specialists.



# Local bat species

- 22 bat species known from San Diego County: 8 California species of special concern (CSSC), 1 federally endangered.
- Sixteen species were found in the MSCP area including the 8 CSSC during 2002-2003 surveys.
- Five species were previously identified as needing local management and conservation attention:
  - **Pallid bat (*Antrozous pallidus*)**
  - **Townsend's big-eared bat (*Corynorhinus townsendi*)**
  - **California leaf-nosed bat (*Macrotus californicus*)**
  - Western mastiff bat (*Eumops perotis*) and western red bat (*Lasiurus blossevillii*).
- There are 3 species that are consistently found to be frequently detected in western San Diego County: Yuma myotis (*Myotis yumanensis*), Mexican free-tailed bat (*Tadarida brasiliensis*), and big brown bat (*Eptesicus fuscus*).
  - Although these appear to be common they likely make good indicator species for future monitoring since they are highly detectable and they provide large amounts of data. Therefore, they would most likely offer the strongest detectable signal of change in bat populations.

<b>MSCP bats (2002-2003)</b>	
Bat species	% of 45 sites
<i>Myotis yumanensis</i>	68%
<i>Nyctinomops femorsaccus</i>	61%
<i>Tadarida brasiliensis</i>	59%
<i>Eptesicus fuscus</i>	57%
<i>Eumops perotis</i>	55%
<i>Parastrellus hesperus</i>	52%
<i>Myotis ciliolabrum</i>	39%
<i>Myotis californicus</i>	25%
<i>Lasiurus blossevillii</i>	25%
<i>Lasiurus cinereus</i>	16%
<i>Myotis evotis</i>	9%
<i>Corynorhinus townsendii</i>	9%
<i>Nyctinomops macrotis</i>	7%
<i>Antrozous pallidus</i>	7%
<i>Choeronycteris mexicana</i>	2%
<i>Macrotus californicus</i>	2%

<b>Camp Pendleton MCB bats (2010)</b>	
Bat species	% of 42 sites
<i>Tadarida brasiliensis</i>	86%
<i>Myotis yumanensis</i>	83%
<i>Eptesicus fuscus</i>	71%
<i>Lasiurus blossevillii</i>	45%
<i>Parastrellus hesperus</i>	38%
<i>Nyctinomops femorsaccus</i>	33%
<i>Myotis californicus</i>	31%
<i>Lasiurus cinereus</i>	24%
<i>Myotis ciliolabrum</i>	21%
<i>Eumops perotis</i>	14%
<i>Antrozous pallidus</i>	14%
<i>Corynorhinus townsendii</i>	0%
<i>Macrotus californicus</i>	0%

<b>Fallbrook NWS bats (2013)</b>	
Bat species	% of 29 sites
<i>Myotis yumanensis</i>	86%
<i>Tadarida brasiliensis</i>	79%
<i>Eptesicus fuscus</i>	72%
<i>Nyctinomops femorsaccus</i>	59%
<i>Lasiurus blossevillii</i>	48%
<i>Myotis ciliolabrum</i>	48%
<i>Parastrellus hesperus</i>	45%
<i>Eumops perotis</i>	45%
<i>Lasiurus cinereus</i>	34%
<i>Myotis californicus</i>	17%
<i>Antrozous pallidus</i>	0%
<i>Corynorhinus townsendii</i>	0%
<i>Macrotus californicus</i>	0%

Bat rehab intake records (2001-2013)	
Bat species	Count
<i>Myotis yumanensis</i>	118
<i>Tadarida brasiliensis</i>	109
<i>Eptesicus fuscus</i>	105
<i>Lasiurus cinereus</i>	34
<i>Parastrellus hesperus</i>	24
<i>Myotis californicus</i>	24
<i>Lasiurus blossevillii</i>	14
<i>Myotis volans</i>	10
<i>Myotis sp.</i>	8
<i>Myotis ciliolabrum</i>	7
<i>Myotis evotis</i>	6
<i>Choeronycteris mexicana</i>	4
<i>Nyctinomops femorsaccus</i>	2
<i>Nyctinomops macrotis</i>	2
<i>Eumops perotis</i>	2
<i>Antrozous pallidus</i>	2
<i>Lasiurus xanthinus</i>	2
<i>Corynorhinus townsendii</i>	1
<i>Euderma maculatum</i>	1
<i>Macrotus californicus</i>	0
Grand Total	475

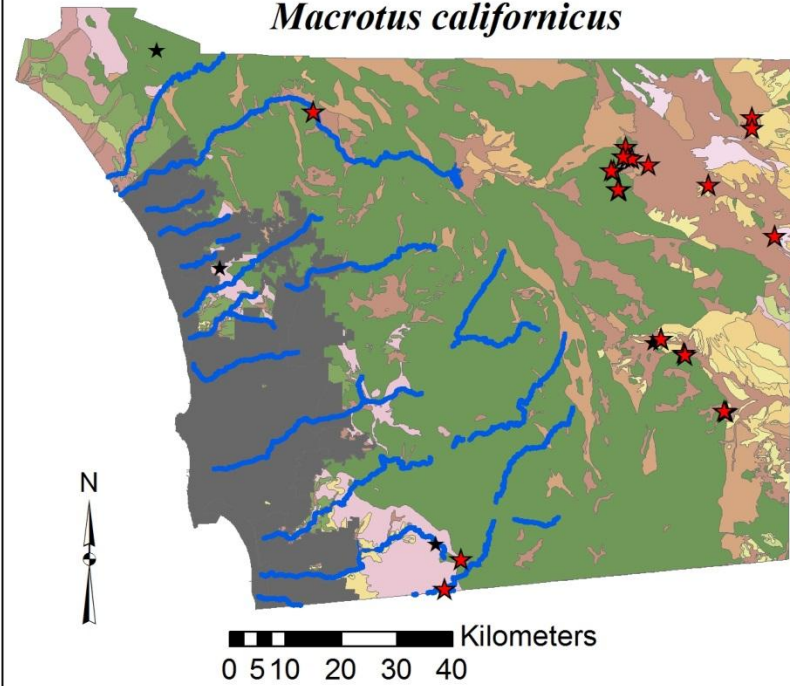
Public health dept bats (2006 - 2013)	
Bat species	Count
<i>Eptesicus fuscus</i>	19
<i>Lasiurus cinereus</i>	16
<i>Tadarida brasiliensis</i>	15
<i>Lasiurus blossevillii</i>	6
<i>Myotis yumanensis</i>	5
<i>Eumops perotis</i>	4
<i>Corynorhinus townsendii</i>	4
<i>Myotis californicus</i>	2
<i>Parastrellus hesperus</i>	1
<i>Nyctinomops macrotis</i>	1
<i>Myotis evotis</i>	1
<i>Antrozous pallidus</i>	0
<i>Macrotus californicus</i>	0
Grand Total	74



**California leaf-nosed bat (*Macrotus californicus*)**  
**Photo: Cheryl Brehme**

San Diego County Mammal Atlas (DRAFT)

*Macrotus californicus*



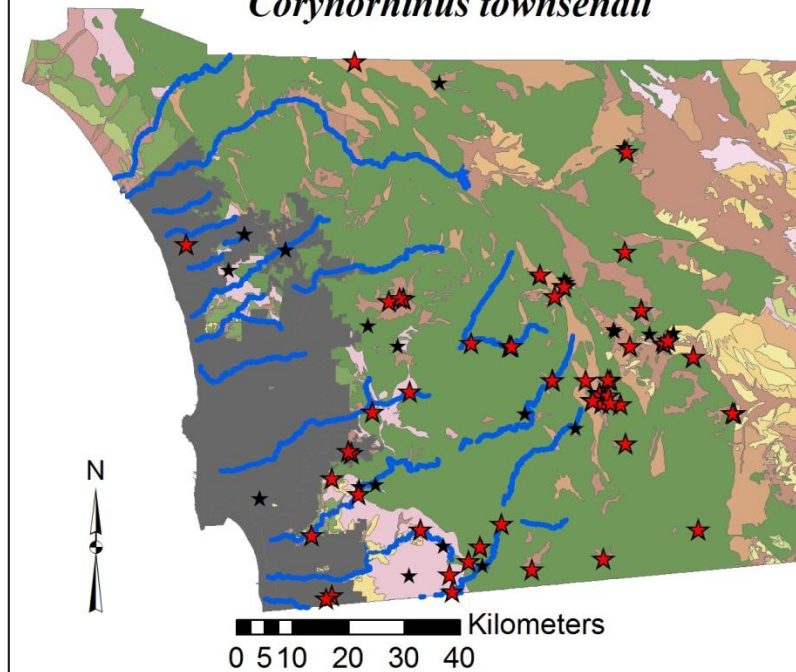


**Townsend's big-eared bat (*Corynorhinus townsendii*)**

Photo: Samantha Marcum

San Diego County Mammal Atlas (DRAFT)

*Corynorhinus townsendii*





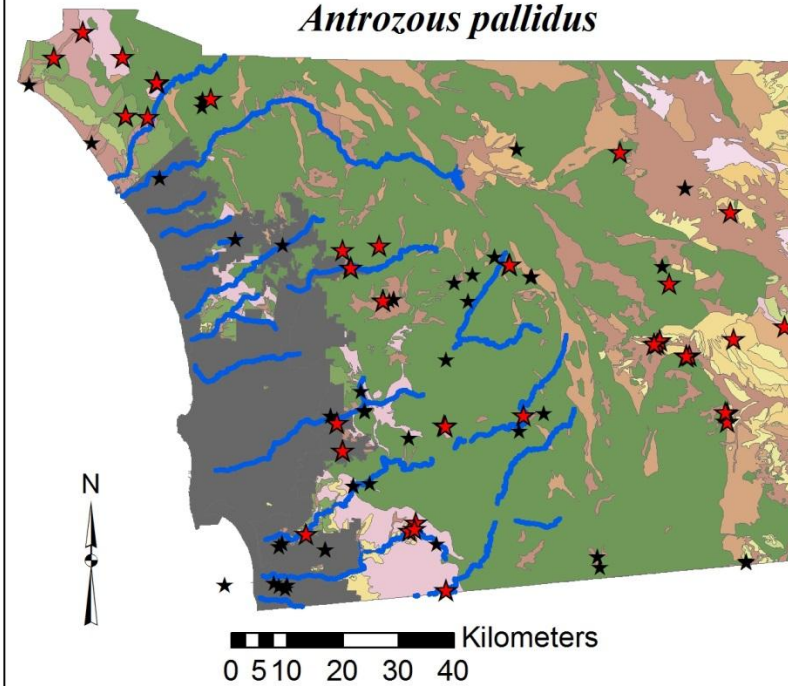
**Pallid bat (*Antrozous pallidus*)**

Photo: Cheryl Brehme



San Diego County Mammal Atlas (DRAFT)

*Antrozous pallidus*



# Implementation of research, management, and conservation strategies:

- Synthesize existing historical and recent bat data (collections, surveys, public health data) into maps for the San Diego County Mammal Atlas (a transparent database that can be accessed by all \*except for roost information\*)-
  - Allows for comparison between historical and recent data.
    - Species distribution trends (in multi-year blocks: pre-1960, 1960-1995, 1995-present) – range contractions, expansions, overall trends.
    - Data gaps.
  - Preliminary bat species habitat modeling.
    - Choose target species-
      - Based on sensitive species status and/or declining (contracting range).
      - Common species as indicators.
      - Compile list of habitat components common to sensitive species.

## Implementation of research, management, and conservation strategies:

- Survey HCP/NCCP areas for current bat populations using standard complimentary bat survey techniques (bat detectors, mist-netting, roost searches)-
  - Survey sites previously surveyed in 2002/2003 to assess status/change in status compared to 1. Historical and 2. The 2002/2003 results.
  - Survey areas identified as gaps via mapping/modeling exercise.
  - Survey potential roosts not previously searched for/documented.
  - Bolster bat species habitat maps and hone models.

## Implementation of research, management, and conservation strategies:

- Collect genetic material for target species if possible at multiple locations both near and far from each other.
  - Some samples already obtained by SDNHM and USGS.
    - Pallid bat (*Antrozous pallidus*).
    - Townsend's big-eared bat (*Corynorhinus townsendii*).
    - California leaf-nosed bat (*Macrotus californicus*).
  - Use individual genetic relatedness to determine functional colonies, or metacolonyes.
  - Compare to museum samples to determine persistence of colonies.
  - Include samples throughout range of target species, and use population genetics to determine subspecies boundaries, and population structuring in SD.

## Implementation of research, management, and conservation strategies:

- Based on existing data (historical, previous surveys, public health), the data collected during field surveys (and the population genetics data), protect existing habitats important to bats (Seasonal closures, seasonal maintenance activities, limit public access - signage, covered trails, fences, and gated mines, urban bat management, etc.); characterize and protect potential habitats in HCP/NCCP areas based on current survey data and knowledge of existing bat populations plus target bat species modeling results

Protect known significant roosts (\*sensitive information, please do not distribute\*) – multijurisdictional task, mechanisms of protection (CEQA, CSSC, HCP)

\*\*Roost locations removed from posted presentation. Please contact Drew Stokes ([dstokes@sdnhm.org](mailto:dstokes@sdnhm.org)) for information.

# Characterize/Model and protect bat habitat within reserve areas

- Using species maps/models and newly acquired data.
- Examine and characterize (quantify?) habitat components of properties in reserve areas where bat diversity (including sensitive species) currently exists (oak woodlands, riparian reaches, open water sources, grasslands, exposed geology including caves and mines, scrub, size of areas (core vs. fragments), gradient, max/min temp.s, ambient light levels, noise levels, prey community, etc.).
- Use characterization information to predict where bat diversity and sensitive species will occur (and test if possible).
- Protect key habitat components in reserve areas.
- Habitat/reserve enhancement.
- Ensure that bat surveys are conducted by qualified bat biologists on a project by project basis when potential bat-use habitats are going to be impacted.

# Key areas supporting rich and sensitive bat communities

- **Marron Valley/Tijuana River watershed**
  - Diverse topography/geology, vegetation, open water, habitat connectivity
  - Pallid bats, Townsend's big-eared bats, California leaf-nosed bats
- **Hollenbeck Canyon/Otay River watershed**
  - Diverse topography/geology, vegetation, open water, habitat connectivity
  - Pallid bats, Townsend's big-eared bats
- **El Monte Valley/San Diego River watershed**
  - Diverse topography/geology, vegetation, open water, habitat connectivity
  - Pallid bats, Townsend's big-eared bats
- **San Diego National Wildlife Refuge/Sweetwater River watershed**
  - Diverse topography/geology, vegetation, open water, habitat connectivity
  - Townsend's big-eared bats, Pallid bats?? (historical, Palo Verde, Sloan Canyon??)
- **Hellhole Canyon/San Luis Rey River watershed**
  - Diverse topography/geology, vegetation, open water, habitat connectivity
  - Townsend's big-eared bats, Pallid bats??, California leaf-nosed bats?? (historical records)



## Long term monitoring strategies

- Periodic roost counts at known roost sites of target (both common and rare) species.
- Install permanent acoustic recording devices in selected locations.
  - Establish baseline bat activity.
  - Understand night to night, seasonal variation patterns.
  - Once baseline and variation in bat activity levels are established, look for signals of change over time that could be attributed to changes in bat populations resulting from effects like wildfire, disease (e.g. White Nose Syndrome), drought, habitat loss, etc.
  - Target species of concern and interest.
  - Powerful and non-invasive research technique.

# Long term monitoring strategies

- Radio telemetry-
  - Test habitat characterization and modeling by obtaining empirical data.
  - Locate new roosts and alternate roost sites.
  - Locate other target bat species habitat use areas (drinking sources, foraging grounds, night roosts, etc.).
  - Determine home range and seasonal variation of individuals within target species.
  - Limitations-
    - Tracking access may be difficult in a multijurisdictional landscape (including private lands) and is logistically complex and labor intensive.
    - Triangulating bat movements accurately is challenging.
    - Only able to collect bat movement and roost data during life of transmitters and only before or after maternity season – limited data.
    - Invasive technique and depends on capture of species that are potentially difficult to catch.

# Habitat enhancement

- Enhance artificial water sources using Bat Conservation International's 'Water for Wildlife' research and document as a guide.
  - Hollenbeck Canyon.
  - Marron Valley.
  - SDNWR.
  - El Monte County Park.
  - Oak Oasis County Park.
  - North County Parks.
- Create artificial roosts specifically designed to accommodate target species, if specific criteria can be met.
  - Areas lacking appropriate roosting substrate.
  - Areas where existing roosts are vulnerable.
  - Built on reserves where long-term stability is assured.
  - Built where not vulnerable to disturbance, vandalism, and predation.

# Bat conservation begins with people

- Jim Asmus
- Christy Wolf
- Robert Lovich
- Jennifer Price
- Maeve Hanley
- Tom Oberbauer
- Jackie Hopkins
- Joyce Schlachter
- Shannon Smith
- Paul Kilburg
- Betsy Miller
- Karen Miner
- Patricia Brown
- Terri Stewart
- John Stephenson
- Kirsten Winter
- Tammy Sherman
- Yvonne Moore
- Kris Preston
- Cindy Myers
- Dick Wilkins