

Welcome to the Conservation Lecture Series



www.dfg.ca.gov/habcon/lectures

Questions? Contact margaret.mantor@wildlife.ca.gov

Lecture Schedule

- **Mohave Ground Squirrel, Dr. Phil Leitner**
November 6, 1:00-3:00, Sacramento
- **Spartina and California Clapper Rail, Dr. Donald Strong**
November 11, 1:00-3:00, Sacramento
- **Foothill Yellow-Legged Frog and Stream Ecology, Dr. Sarah Kupferberg**
December 3, 1:00-3:00, Sacramento
- **Rare Plants in Pine Hill, Dr. Debra Ayres**
January 22, 1:00-3:00, Sacramento
- **Bighorn Sheep, Dr. Jeff Villepique**
February 4, 1:00-3:00, Ontario
- **Invasive Watersnakes, Dr. Brian Todd**
March 12, 1:00-3:00, Sacramento

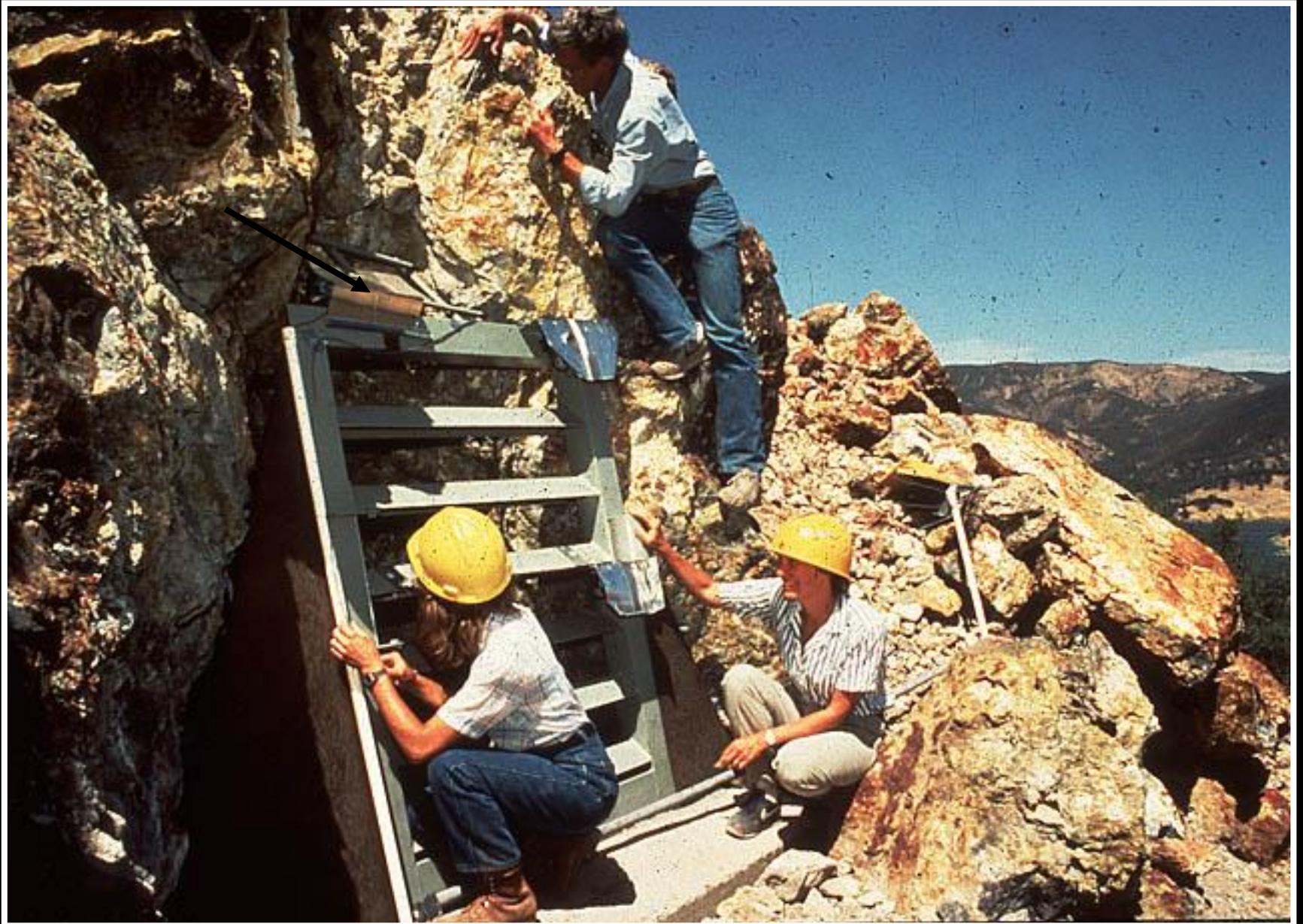
Townsend's big-eared bat *Corynorhinus townsendii*

The biology, conservation,
and mitigation
recommendations for
California

Dave Johnston, Ph.D.
Associate Ecologist and Bat Biologist



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Drs. Dixie Pierson and Bill Rainey 1994



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Drs. Pat Brown and Bob Berry

Nomenclature



Photo by Merlin Tuttle

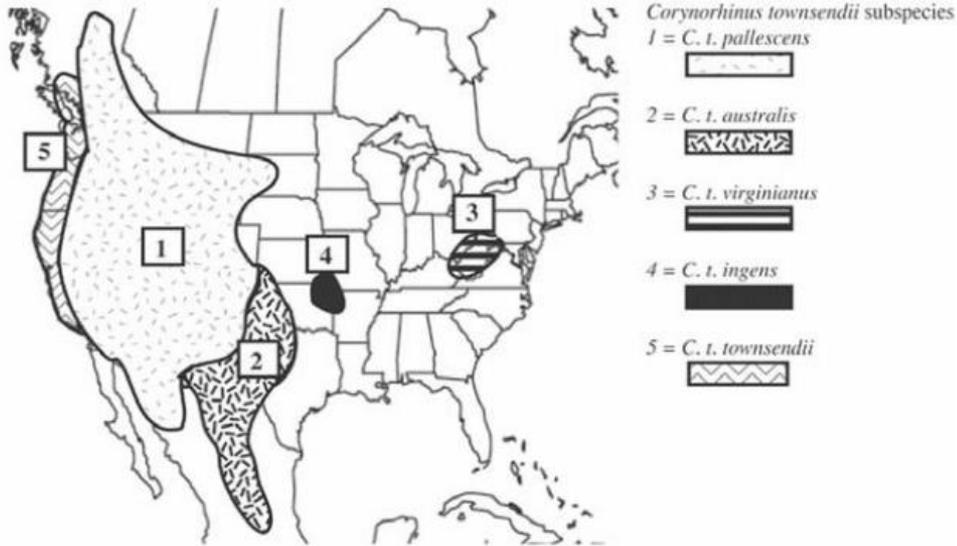
- For most of the time *Corynorhinus* Handley (1959) = *Plecotus*.
- 1992 separated from Palearctic and back to *Corynorhinus* (Frost and Timm 1992, Tumlison and Douglas 1992)



Five subspecies in North America

- *In the Western North America*
 - *C. t. townsendii*
 - *C. t. pallescens*
- *In the Eastern United States*
 - *C. t. ingens*
 - *C. t. virginianus*
- *In the Mexico and Western Texas*
 - *C. t. australis*

Handley (1959)



Piaggio and Perkins



Subspecies in North America





Very large ears = 33-38mm

**Prominent “lumps” on sides
of nose**

Forearm = 39-48mm

Weight = 7-12g

**“Whispering bat” often not
recorded**

**Fc ~ 20-30 kHz; 2nd
harmonic often
prominent**

Photo by Merlin Tuttle



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Status in California

- Global Rank - G4T4
- IUCN Red List of threatened species
- USFWS “category 2” candidate for listing under ESA 1989,1994
- CDFW - Species of Special Concern 1986, 1998
- Western Bat Working Group – High Priority
- US Forest Service – Sensitive Species
- Bureau of Land Management – Sensitive Species
- CDFW - Endangered Species Candidate 2013

Coastal Habitat Associations in California



Coast Redwoods



Riparian with California bay, coast live oak and sycamore



Coastal oak woodland



Interior – Sierra Nevada Habitat Associations

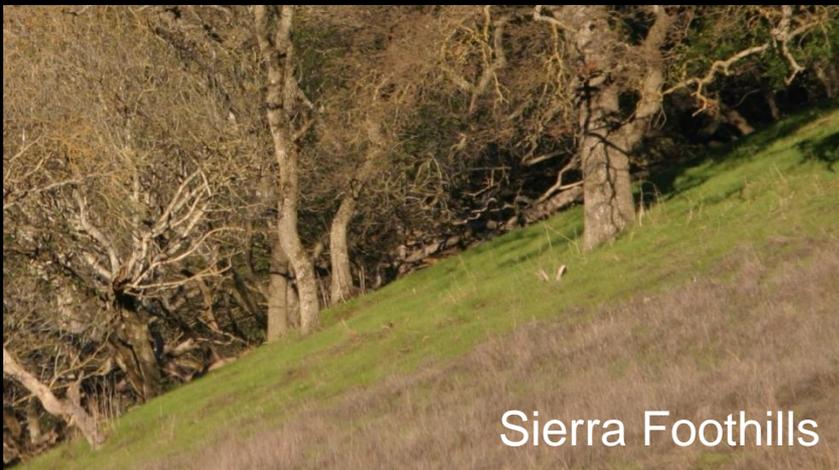


Mixed Coniferous Forests



Photo credit: Calaveras Big Trees State Park

Giant Sequoias



Sierra Foothills



Interior – California Deserts



Photo by Joe Szewczak

Great Basin Deserts – Inyo Basin



Photo by Andrea Wuenschel

Southern California– Mojave Desert

Foraging Associations cont.

- edge habitats
- along streams
- wooded and forested habitats (Fellers and Pierson 2001, Brown et al. 1994).
- avoided the lush introduced vegetation near their day roost, and traveled up to 5 km (3 miles) to feed in native oak and ironwood forest. (P. Brown, pers. comm.)
- Avoided open grazed pasture land. (Fellers unpubl. data)

A diet of mostly moths with a higher than expected % of noctuids



- *COTO* is a Lepidopteran specialist,
 - >90% of the diet) on medium sized (6-12 mm) moths
 - *C. t. virginianus* selects primarily noctuid moths, but their diet also included a large percentage of geometrids, notodontids and sphingids.
 - Arctiidae (e.g., tiger moths) comprised 37.5% of available moth prey items, but were not consumed (Shoemaker and Lacki 1993)
 - 15 of 28 species of moths identified (from moth wing fragments from under a maternity roost) were noctuids. (Sample and Whitmore 1993)
 - Other insects consumed including Coleoptera, Diptera, Neuroptera and other orders have been observed sporadically

Roosting habitat – Caves, Mines



Photo by Bob Strafford



Roosting habitat continued

Anthropogenic structures - Attics and Barns



Photo by Pat Brown

Reproduction

- Colonial species, maternity colonies forming March - June
- Colony size few dozen - several hundred
-
- Mating occurs Oct - Feb migratory sites and hibernacula
- Females are usually reproductive in their 1st year, but males not until their 2nd year. Gestation = 56 to 100 days
- Some maternity colonies have 3 sites
 - pregnancy, birthing, rearing



Photo by Pat Brown



Reproduction continued

- A single pup is born between May and July
- Pups ave 2.4 g at birth, ~ 25% of mother's postpartum wt.
- Juvs start flying 2.5-3 wks old, weaned at ~6 weeks = subadults
-
- Nursery colonies disperse in August when young are weaned, break up in Sept. – Oct.
- Estimated annual survivorship
~50% for young,
~ 80% for adults.
- Oldest record
16 years, 5 months



Photo by Pat Brown



Hibernation

Hibernation sites are typically in caves or mines although this species is occasionally found in buildings

Prefers roosts with stable, cold temperatures -2.0°C to 13.0°C and some air flow

Individuals roost on walls or ceilings, often near entrances

Winter roosting typically comprises males and females up to several hundred or thousand.



Photos by Pat Brown

Hibernation / Migration continued

- In areas with short winters, bats usually form small hibernating aggregations up to about 75 individuals
- Areas with long periods of sub freezing temperatures usually have larger aggregations (75-460).
- Not a migratory species although local seasonal movements of 32 km have been observed. Seasonal movements likely follow an altitudinal gradient.
- If undisturbed, individuals will frequently roost < 3 m off the ground, and have been found in air pockets under boulders on cave floors (E. Pierson pers. obs.).



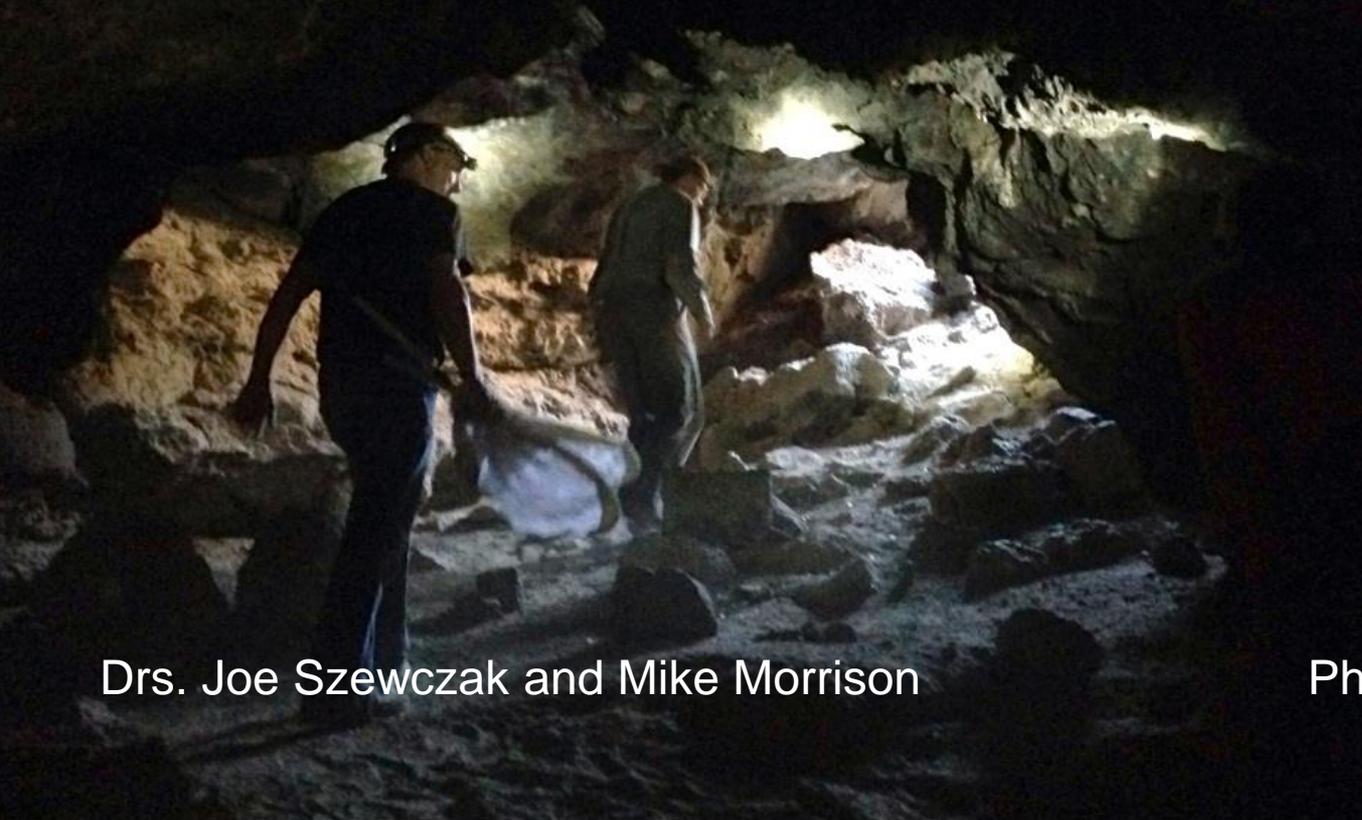
Population trends (Pierson and Rainey 1996)



- mid1950s - mid1990s
52% loss of maternity colonies
- 45% decline in #available
maternity roosts
- 54% decline in the total number
of animals
- 33% decrease in the average
size of remaining colonies

Drs. Dixie Pierson and Bill Rainey 1994

California State-wide Population Trend Update



Drs. Joe Szewczak and Mike Morrison

Photo by Leila Harris

- 1. Survey efforts of current CA population
- 2. develop a model of bat abundance and occupancy in California
- CDFW through a federal State Wildlife Grant administered by Dr. Scott Osborn, CDFW 

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Conservation Issues

- Mines and caves
- Timber harvesting
- Urbanization
- Anthropogenic roosts
- Educational and public health
- Rangeland management
- Water Management / quality
- Transportation
- Agriculture and pesticides



Disturbance at Mines

Colonies that abandoned young after human disturbance

- Wilson Canyon 100 adult females
 - removal of seismic equip during pupping
 - Mummified juveniles hanging on ceiling
- Tungsten Hills with 200 near Bishop contained a maternity colony of over COTO in July 2008
- Channel Islands – scientific collecting likely led to demise of colony



Lower Colorado

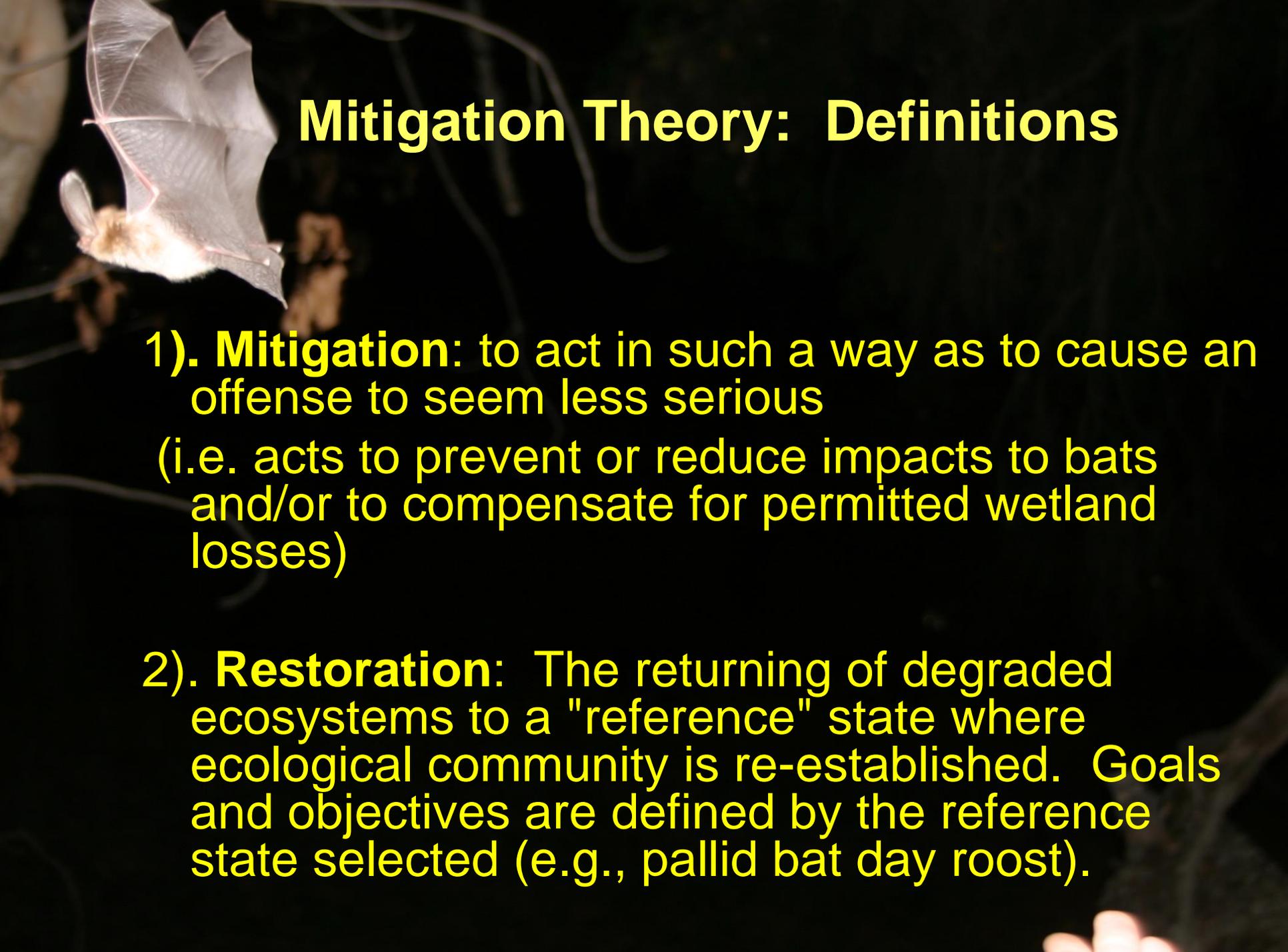
- Alice Mine 3,000 females (Stager 1939) based on cluster 3 x 12 feet and 1 sq ft = 100 COTO (Pierson and Rainey 1996)
 - None observed in 1968 on (Pat Brown, pers comm.)
- Homestake Mine near Davis Dam
 - Collected and banded in 1960s by Musgrove
 - None observed in 2000s by Pat Brown (pers comm.)

Water quality issues at mining sites



Photo by Bob Strafford





Mitigation Theory: Definitions

- 1). **Mitigation:** to act in such a way as to cause an offense to seem less serious
(i.e. acts to prevent or reduce impacts to bats and/or to compensate for permitted wetland losses)
- 2). **Restoration:** The returning of degraded ecosystems to a "reference" state where ecological community is re-established. Goals and objectives are defined by the reference state selected (e.g., pallid bat day roost).

3). Creation:



The construction of a habitat (e.g., roosting habitat) in an area that was not habitat in the recent past (within the last 100-200 years) and that is isolated from existing roosts (i.e., not directly adjacent).

Mayhews silo on National Wildlife Refuge



4). Compensatory mitigation: Statutory and regulatory context.

- a). Federal laws – NEPA, ESA, Waters of the U.S. (Clean Water Act, Rivers and Harbors Act)
- b). State laws – CEQA, CESA, CDFG code sections 1601 – 1603, other CDFG codes
- c). Policy decisions and documents written by counties, cities, and other regulatory agencies.



Definitions continued.....

5). Preservation: Land acquisition?

Off-site habitat conservation easements result in a net loss of habitat.

6). No net loss policies and compensatory

ratios

But is it the same (in-kind) habitat
e.g., can COTO breed there?



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**In order to determine mitigation strategy,
you need to predict the Impacts**

**In order to predict the impacts,
you need to assess the existing conditions
of bat habitat and bat populations**

6. 1. 1999 11:30



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Assessing the habitat and bat populations....

1. How many bat surveys are enough?
2. What kind of equipment should I use?
3. What is the functional habitat for each species of bat during each season?
4. What is the scale of the project?
5. For a construction project: What, When, and How?



Suburban golf course

vs.



Suburban orchard



The difficulties in surveying for COTO

- this species is rarely caught in nets or identified with an acoustic detector, it often escapes detection using standard bat survey techniques.
- Because roost surveys offer the only viable survey method, and roost disturbance is such a critical issue, guidelines need to be established for survey methods which do not require roost entry (e.g., electronic monitoring devices and night vision equipment) (e.g., Navo 1995, Rainey 1995),
- or which set standards for roost entry in those cases where access to the roost is necessary.



Some “rules” of the road for effective Mitigation Strategies

- 1). The best mitigation is always avoidance.
- 2). Mitigation should always be sequenced.
- 3). Restoration mitigation: Restored habitat should replace the lost habitat in-kind and on-site.
- 4). Monitor: Does it actually work or not?

Determining impacts - temporary



- **Disturbance:**

- Increase in noise levels (e.g., chains and/or heavy equipment)
- Increase in vibration (e.g., pile driving)
- Increase in lights at night

Temporary Impacts continued...

- . Short-term loss of the use of a roost
 1. What type of roost is it? Hibernaculum?
maternity roost
 2. What time of year is it?
 3. How long is “temporary”? When does temporary mean permanent?



Determining Permanent Impacts.....

- Modification of roosts
- Loss of maternity roosts
- Loss of hibernacula
- Loss of foraging habitat
- Fragmentation and isolation
- Increase in human activity

Are there cumulative effects?

- May result if in-kind restoration is not required
- May result if we permit the loss of habitats we are yet unable to restore
- May result if long-term considerations are not addressed
- May result if many small impacts are not considered

How do we mitigate for a candidate for listing under the California Endangered Species Act?

- Incidental Take Permit - ensure any take is fully mitigated and will not jeopardize the California population
- Habitat Conservation Plan – usually for a broad area/project. Long term agreement for take and mitigation measures
- CDFW research permit
- CESA is animal oriented; habitat is not covered but can be under CEQA



Pat Brown was an early pioneer in mitigation at mines



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SENSITIVE RESOURCE AREA
PRIOR TO ENTRY, CONTACT ONE
OF THE FOLLOWING FOR ACCESS:
• RESTORATION SUPERVISOR
• MAINTENANCE CHIEF
• RESOURCE ECOLOGIST

Photo by Joe Szewczak



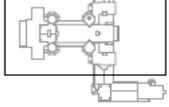
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Buffer zones – how far is far enough?



OVERVIEW

DETAIL



LEGEND

- BAT LOCATIONS
- T.C. TILE ROOF (UPPER LEVEL)
- T.C. TILE ROOF (LOWER LEVEL)
- MEMBRANE ROOF
- L-XX LADDER NUMBER
- XX ROOF NUMBER
- C-XX CATWALK NUMBER

0 8 16 32
Feet

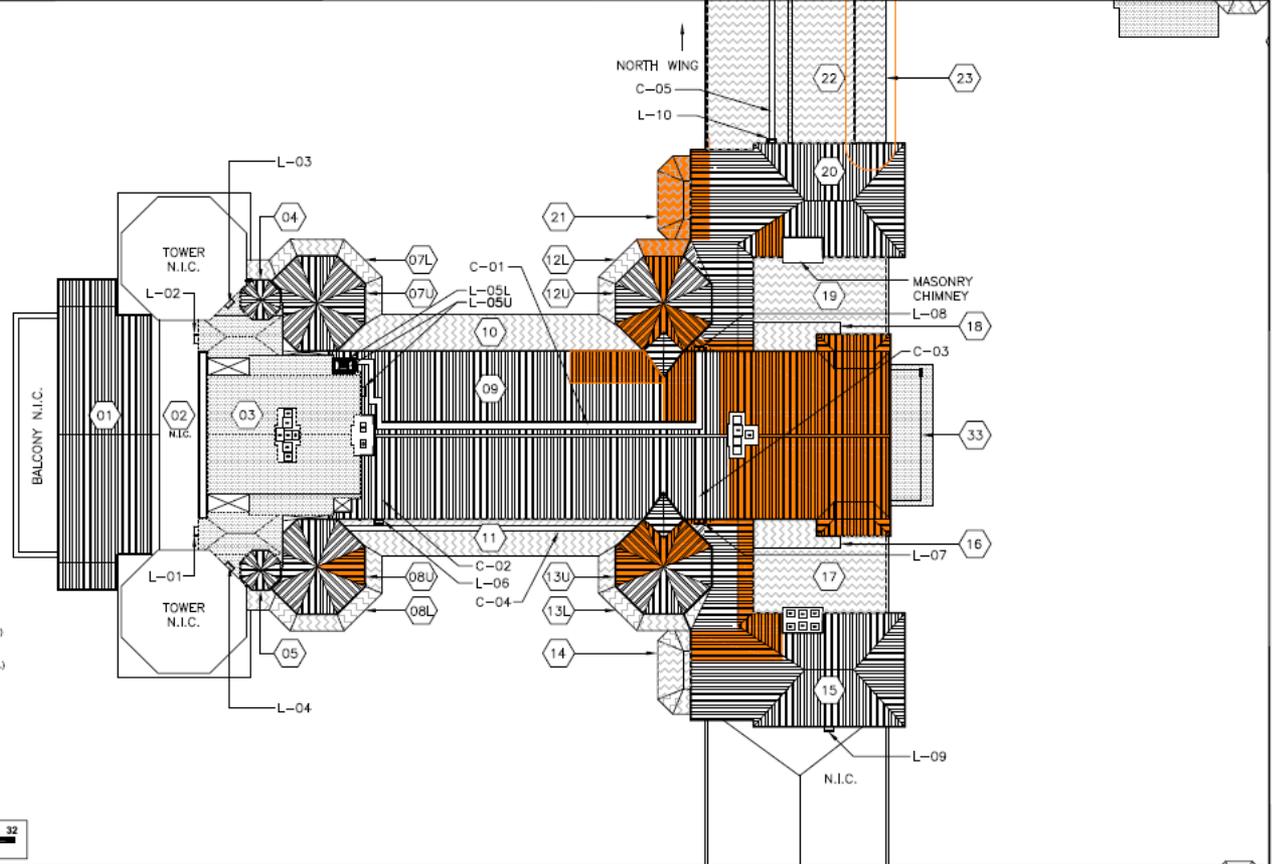


Figure 2: Bat Locations on Central Roof of Main House

Hearst Castle (3569-01)
Apr 11 2014



Bear Gulch Caves, Pinnacles



**Bear Gulch Cave is
PARTIALLY OPEN**

A protected colony of Townsend's long-eared bats is hibernating in the cave. They are extremely sensitive to human disturbance. Unnecessary noise and lights are harmful to the state of California as a number of local cultures, without our protection, they may become endangered or even extinct.



During open cave hours, please do not use flash photography, tripods, or any other equipment that may disturb the bats. Please do not touch the cave walls or ceiling. Please do not feed the bats. Please do not enter the cave. Please do not enter the cave. Please do not enter the cave.

Thank you for your cooperation.

ÁREA CERRADA

AREA CLOSED



TODA ESTA ÁREA DEL SERVICIO DE PARQUE NACIONAL ESTA CERRADA PARA EL USO DEL PÚBLICO POR CONDICIONES DE EMERGENCIA.

ALL NATIONAL PARK SERVICE AREA BEYOND THIS POINT CLOSED TO PUBLIC USE AND TRAVEL BECAUSE OF EMERGENCY CONDITIONS

DEPARTAMENTO DE INTERIOR DE LOS ESTADOS UNIDOS SERVICIO DE EL PARQUE NACIONAL UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE





Photo by Caltrans

Pieta Creek



Lemoore Naval Air Station

What about off-site cavernous bat habitat mitigation?



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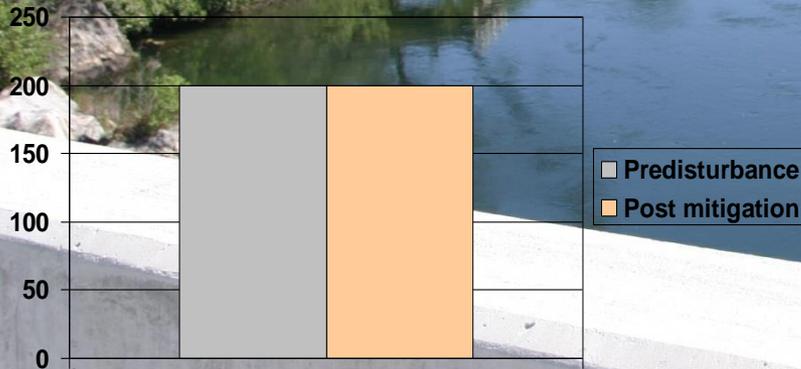
Mitigation for *Corynorhinus townsendii*
in California
“What Works and What Doesn’t”



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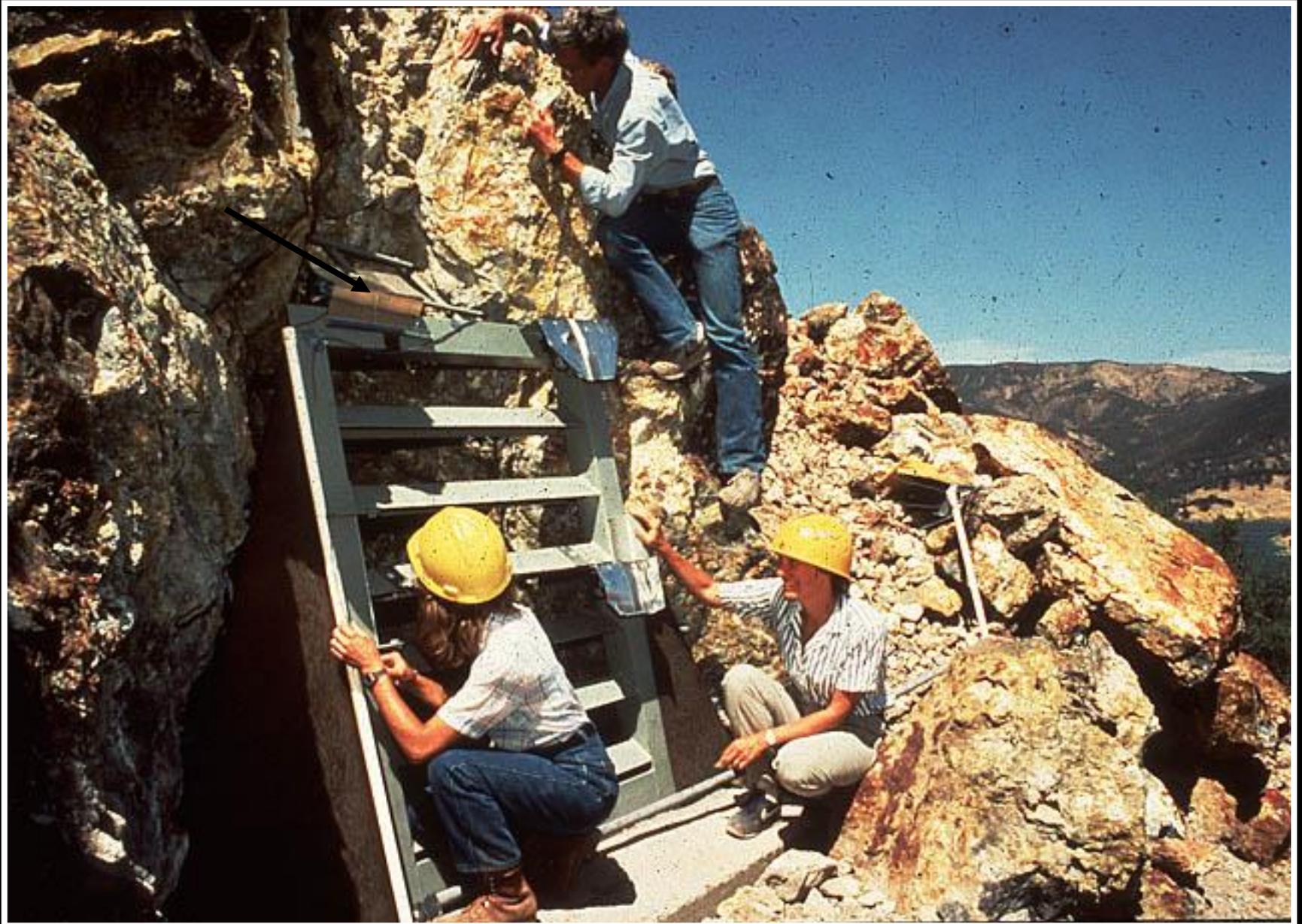
Original Bridge Roost Structure Left Intact

Consider Avoidance as a mitigation option



Mexican free-tailed bats





Dixie Pierson and Bill Rainey 1994



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Interim Roosts – off Site mitigation



Bat houses did attract bats, but were they
The right species?



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Photo by Caltrans

Pieta Creek



Lemoore Naval Air Station

What about off-site cavernous bat habitat mitigation?



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Bat Friendly



Not Bat Friendly

CUPOLAS



ES
TS

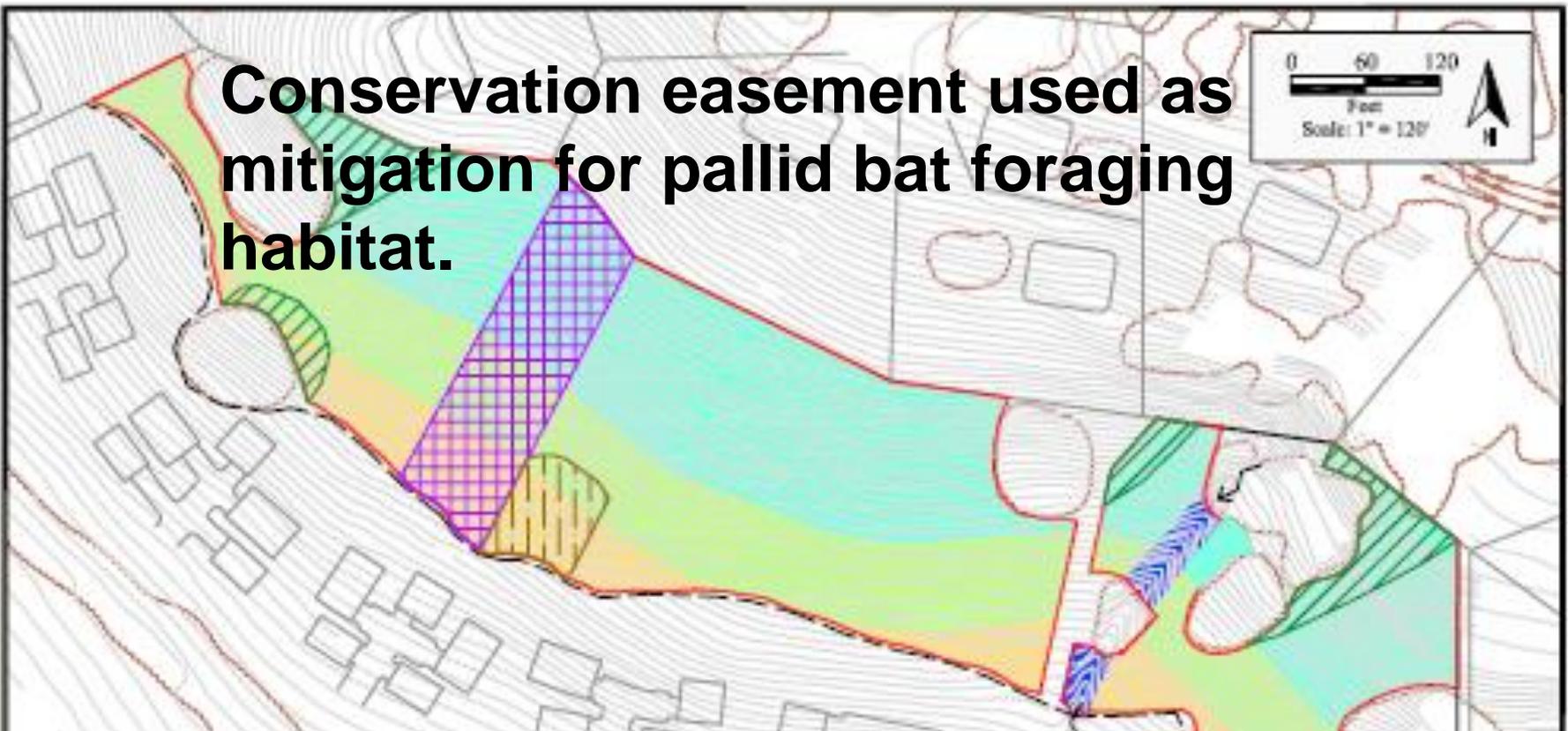
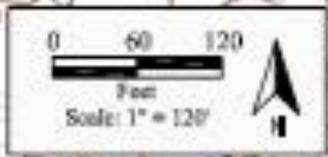


Mayhews Silo for bats and birds



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Conservation easement used as mitigation for pallid bat foraging habitat.



Legend

	Proposed Oak Woodland Mitigation Area (5.00 acres)
	Shaded Area
	Clay Soil
	Swale
	Direction of Flow
	Split Rail Fence
	Proposed Development

Proposed Mitigation Layouts

Planting Areas:

	Lower Slope (0.81 acres)
	Mid-Slope (1.83 acres)
	Upper Slope (2.46 acres)
	Drainage (0.10 acres)

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Country Estates Phase III: Restoration Area

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Summary of Mitigation Strategies

- Treat every situation differently!
- Mitigation can be complicated and a better understanding of bat species' natural history will improve the chances of successful mitigation.
- Assessing the existing conditions and determining potential impacts are critical for successful mitigation
- Enlist the help of a bat biologist!

If you have more information on land access you'd like to share with the COTO statewide reassessment project please contact:

Scott Osborn

Scott.osborn@wildlife.ca.gov

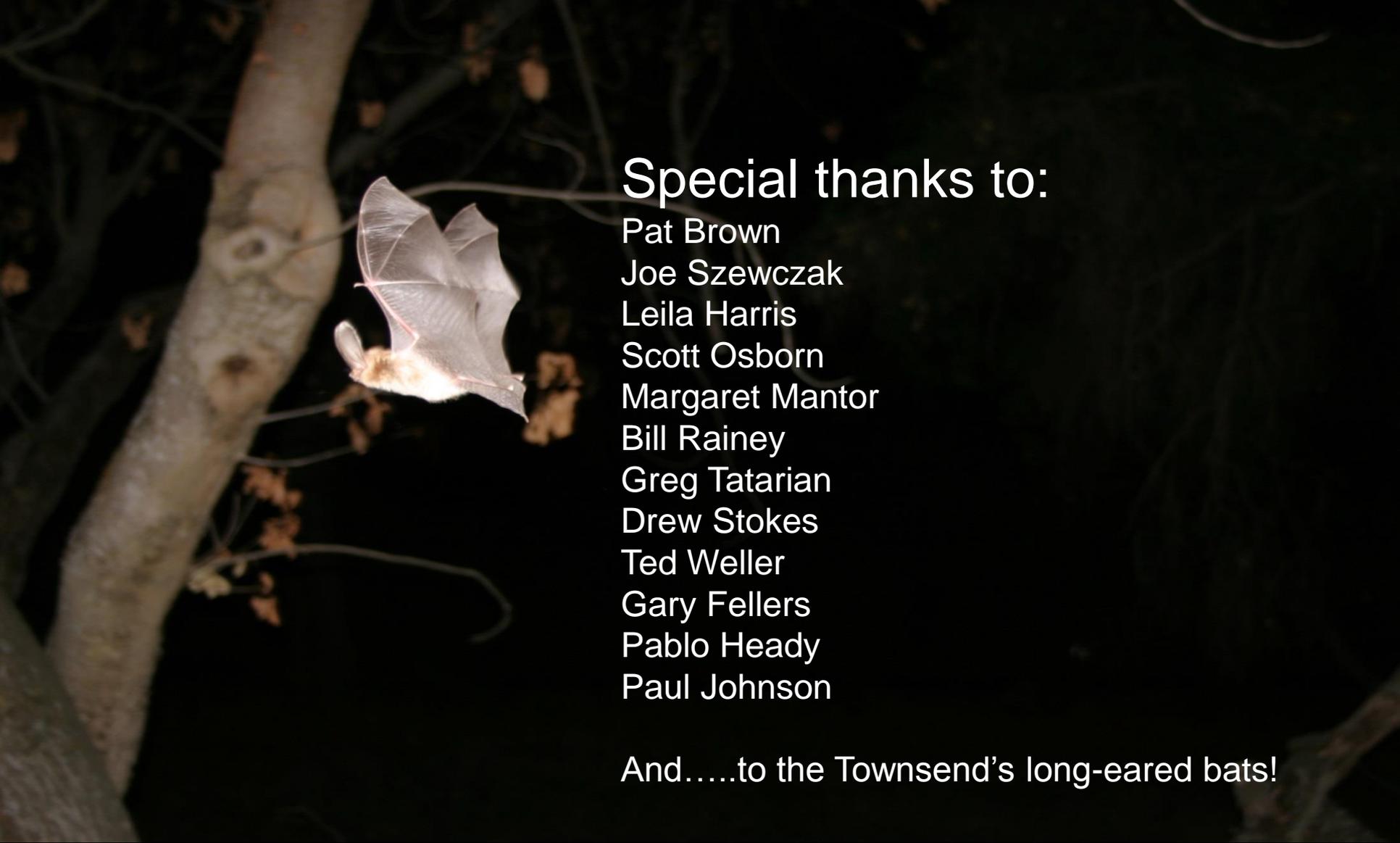
Or if he's not available:

Leila Harris (data and field coordination)

Leilharri@gmail.com



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Special thanks to:

Pat Brown

Joe Szewczak

Leila Harris

Scott Osborn

Margaret Mantor

Bill Rainey

Greg Tatarian

Drew Stokes

Ted Weller

Gary Fellers

Pablo Heady

Paul Johnson

And.....to the Townsend's long-eared bats!



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