Results of Long-Term Bat Mitigation Monitoring

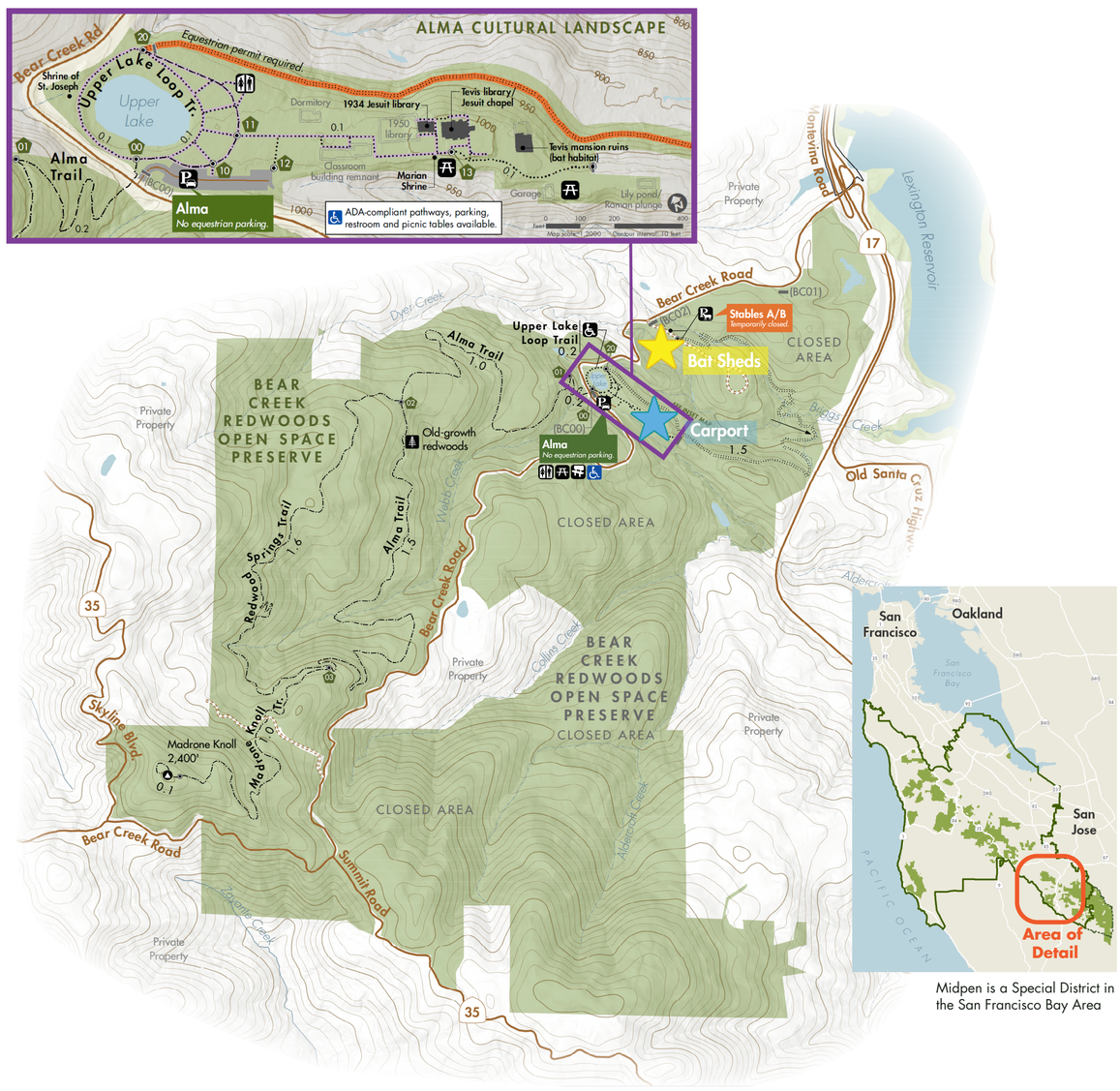
Artificial Replacement Habitat Supports Rare Townsend's Big-Eared Bat, as well as Maternity Roosts of Common Bat Species



ABSTRACT: Mitigation for the loss of bat habitat is often a requirement under the California Environmental Quality Act. However, artificial habitat does not always maintain the same habitat value as previously available, particularly for habitat specialist species like the Townsend's big-eared bat (Corynorhinus townsendii) or habitat that supports maternity roosting bat colonies. From 2015 to 2023 the Midpeninsula Regional Open Space District, with technical expertise from H.T. Harvey and Associates, worked to develop and implement a bat exclusion and habitat replacement plan to address a loss of habitat due to the demolition of buildings found within Bear Creek Redwoods Open Space Preserve, in Santa Clara County, California.

This work included the construction of two new freestanding structures, as well as the modification of an existing structure specifically to attract and support Townsend's big eared bats, a California State Species of Special Concern, as well as a variety of more common crevice roosting species. The new and modified structures were monitored for bat activity by conducting annual emergence surveys during the maternity roosting season, as well as opportunistic daytime surveys during non-sensitive seasons. In-situ temperature probes were also utilized to determine annual thermal characteristics of the interior of the structures to determine habitat suitability and inform management decisions. Surveys have documented an increase in bat use through time, as well as confirmed maternity roosts of common bat species, at each of the replacement habitat structures. Townsend's big-eared bats have been documented utilizing the interior of the modified existing structure as a presumed bachelor roost. Exterior bat boxes on all structures support the majority of individual bats on-site and are utilized by four common species of bats. The habitat use, number of individual bats, as well as species composition on-site is similar to what was documented by surveys prior to the demolition project.

Habitat value at these structures is dynamic as exterior boxes degrade and require replacement, vandalization of structures requires ongoing maintenance and modification, and new crevice roosting habitat becomes available as the structures shift and degrade through time. The findings from this project can inform bat mitigation and monitoring work, particularly for Townsend's big-eared bat, and offer strategies for improved outcomes.



Midpen is a Special District in the San Francisco Bay Area

Structures supporting roosting bats removed for habitat restoration and public access. The carport/Teval Mansion Ruins were retained and modified as bat habitat and two new freestanding bat habitat structures were constructed nearby to support multiple bat species.

Methods

Table 3. Number of Acoustic Call Files / Species One Hour after Sunset

Site	Species or Species Group	Fall	Winter	Summer	Total # Call Files/Building
Chapel	Yuma myotis/California myotis	52	27	158	
	Mexican free-tailed bat	29	16	91	
	Townsend's big-eared bat	33	4	35	
	Big brown bat/pallid bat	0	0	13	
	Pallid bat	0	0	5	463
1934 Library	Yuma myotis/California myotis	24	24	50	
	Mexican free-tailed bat	4	0	5	
	Townsend's big-eared bat	18	0	4	
	Big brown bat/pallid bat	0	0	2	131
1950s Library	Yuma myotis/California myotis	20	2	52	
	Mexican free-tailed bat	0	0	55	
	Townsend's big-eared bat	1	0	1	
	Big brown bat/pallid bat	0	0	0	131
Classroom Building	Yuma myotis/California myotis	197	17	116	
	Mexican free-tailed bat	0	8	3	
	Townsend's big-eared bat	0	1	4	
	Big brown bat/pallid bat	1	0	3	350
	Total # Call Files/Season	379	99	597	

Table 2. Number of Bats Counted during Fall and Summer Evening Emergence Surveys

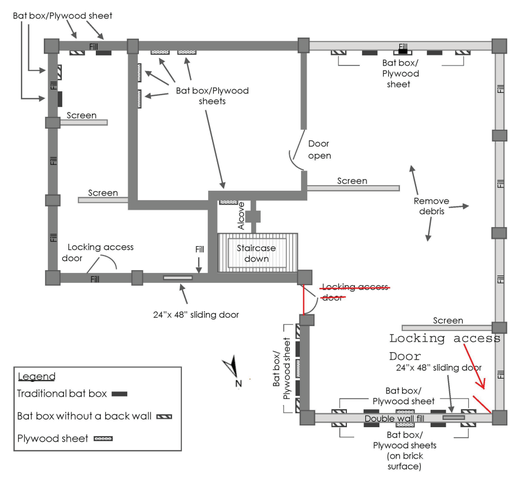
Building	Season		Notes
	Fall	Summer	
Chapel	77	273*	Observed bats exiting from the northeast and southeast doors of large main room floor, and the roof of the northeast Chapel walkway.
1934 Library	64	15	Observed exiting from east door, and dormer vents on roof.
1950s Library	1	0	Observed bats exiting from the walkway roof on northeast side of the building.
Classroom Building	27*	15*	Observed bats exiting from the peeling siding on northwest exterior wall, the southeastern room window, and the roof and siding above northeastern porch.

* Denotes an average count for sites surveyed on multiple nights.

Table 4. Bat Capture Data for Mist Net Surveys at Alma College.

Time Captured	Species	Weight (grams)	Forearm (millimeters)	Sex	Age	Reproductive Status
22:00	Townsend's big-eared bat	9.6	45.4	Male	Adult	Non-reproductive
22:00	*Myotis* sp.	NA	NA	NA	NA	NA
23:00	Yuma myotis	6.1	35.7	Female	Subadult	Non-reproductive
23:01	Yuma myotis	6.6	34.4	Male	Subadult	Non-reproductive

Presurveys completed by H.T. Harvey and Associates verified the presence of six species of bats and up to 267 individuals during summer surveys.



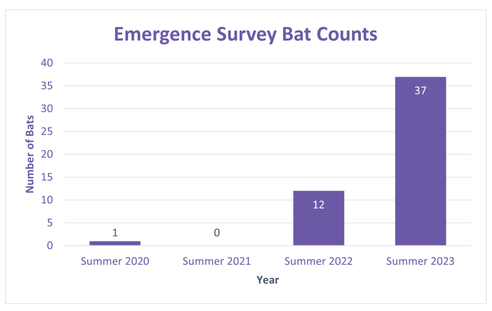


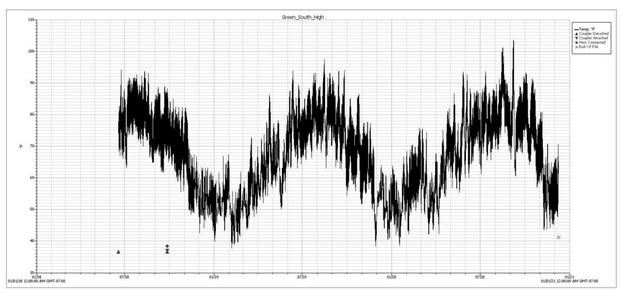


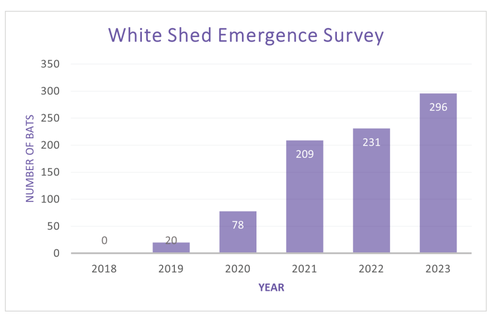
Midpen and H.T. Harvey developed a Mitigation and Monitoring Plan that included construction of new bat habitat structures designed to attract Townsend's as well as other more common crevice roosting species.

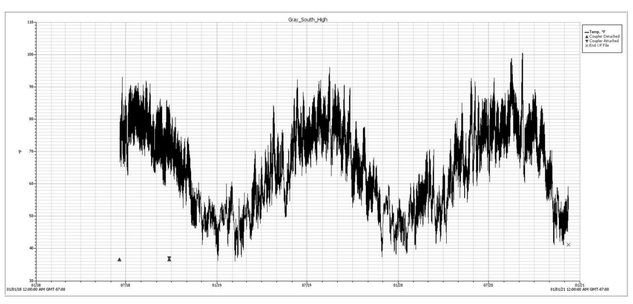
Results

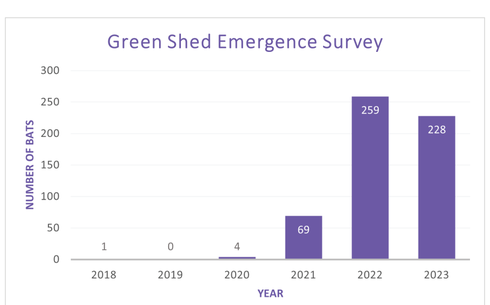
Post restoration monitoring included emergence surveys, acoustic surveys, winter surveys, and temperature monitoring within each of the mitigation structures.

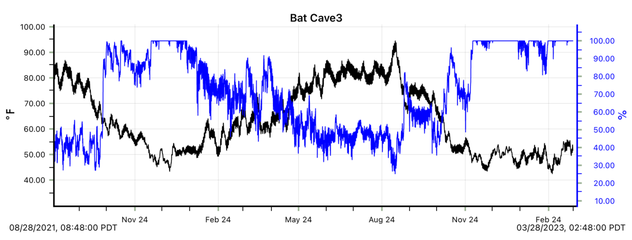












- Doubled the individual bat count
- 7 Townsend's big-eared bats observed inside of the modified carport
- First known documentation of Townsend's using a mitigation structure

Temperatures getting into the 85-115 degree F range in the summer but not consistently staying that hot. The Carport had better heat retention than the smaller bat structures and maintained ideal temperatures for maternity roosting Townsend's for around 2 weeks in August of 2024.

Total Number of Bats:
Pre-Restoration: 267
Post-Restoration: 561
Maternity roosts documented in all three structures (including TABR, MYYU, and EPFU)

Species:
Pre-Restoration: MYYU, MYCA, TABR, COTO, EPFU, ANPA
Post-Restoration: All except ANPA



Townsend's observed roosting inside of the carport with up to four individuals during the maternity roosting season representing the first known documentation of the species utilizing a mitigation structure.

Next Steps

- Continued maintenance and monitoring of bat structures to address vandalism, deterioration, parasite loads in crevice structures, and to improve heat retention during the summer maternity roosting season.
- Continued outreach and education for members of the public on the benefits of bats.
- Exploration of carving crevice habitat into tree snags to enhance natural habitat features that may better support bats than do artificial structures.

Scan to learn more

Acknowledgments

Coauthors: Dr. Dave Johnston & Kim Briones

H.T HARVEY & ASSOCIATES
Ecological Consultants

California Department of Fish and Wildlife

Midpen Crew: Cody Fickes, Stephanie Town, Holden Neal, Steve Neighbors, Trisha Marshall, Leigh Guggemos, Scott Reeves, Julie Andersen, Karine Tokatlian, Ariel Starr, Sophie Christel, John Holback, Bernard Fahey, Bryan Apple

Matt Sharp Chaney, Midpeninsula Regional Open Space District, 5050 El Camino Real, Los Altos, CA, USA 94022, Phone: 650-625-6573, Email: mchaney@openspace.org