Bat Surveys at
Army Corps of Engineers
Libby Dam, Libby, Montana
2011

Prepared for:

US Army Corps of Engineers
Libby Dam
17877 Hwy 37
Libby, MT 59923

Sponsor Reference # W912DW-11-P-0068

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March 2012

This document should be cited as:
Lenard, S. and P. Hendricks. 2012. Bat Surveys at Army Corps of Engineers Libby Dam, Libby, Montana: 2011. A report to the US Army Corps of Engineers, Libby Dam. Montana Natural Heritage Program, Helena, MT. 21 pp.

EXECUTIVE SUMMARY

Survey work was conducted during the summer of 2011 at the US Army Corps of Engineers' (ACOE) Libby Dam near Libby, Montana, to document bat activity and diversity at this location. The project was initiated as a result of concern about bat species currently roosting at the Visitor Center in openings in the underside of the outdoor ceiling. Their presence and the associated guano on the Visitor Center deck are an annoyance and public relations concern. Measures to mitigate these issues, such as exclusion of the bats from the ceiling, are being proposed. Five sites were selected for survey to determine relative bat activity and diversity within the ACOE property. These sites were also selected to determine their potential for placement of alternative roost structures if bats were excluded from the Visitor Center. Site selection was made in the field in May 2011 by ACOE and Montana Natural Heritage Program personnel.

Acoustic surveys were conducted from late May through mid-September on a rotating weekly basis at each of the five sites. Nine species of bats were documented during the survey work: Little Brown Myotis (*Myotis lucifugus*), Long-eared Myotis (*M. evotis*), California Myotis (*M. californicus*), Western Small-footed Myotis (*M. ciliolabrum*), Yuma Myotis (*M. yumanensis*), Silver-haired Bat (*Lasionycteris noctivagans*), Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), and Townsend's Big-eared Bat - *Corynorhinus townsendii*). Two additional species, Long-legged Myotis (*M. volans*) and Fringed Myotis (*M. thysanodes*), were possibly detected at two separate sites each, but these species identities were not confirmed definitively with call analysis. Based upon known distributions, all species would be anticipated to inhabit the area. However, one species, Yuma Myotis, is not well documented in the state. Acoustic data suggests the visitor center could be a maternity colony for Yuma Myotis and this warrants further study.

Two bat species documented on the project are state listed as Species of Concern: Hoary Bat - (G5 S3) and Townsend's Big-eared Bat (G4 S2). (See http://mtnhp.org/animal/2004_SOC_Criteria.pdf for a list of Species of Concern in Montana and definitions of Global and State alpha-numeric ranks). Another Species of Concern, Fringed Myotis - (G4G5 S3), was potentially detected, but calls suspected to be this species did not meet all of the characteristics required for definitive identification. Two other species recorded during the project work are also of conservation interest in Montana and are recognized as state Potential Species of Concern: Silver-haired Bat (G5 S4) and Yuma Myotis (G5 S3S4). The US Forest Service Northern Region lists Townsend's Big-eared Bat as Sensitive. All species recorded during this project, including those of state conservation concern, have been documented on USFS lands in the Libby area.

We recommend coordinating the exclusion of bats at the Libby Dam Visitor Center with the installation of additional bat boxes and a mini-bat condo. Bats currently roost in the bat boxes on the sides of the Visitor Center deck. There is little reason to think bats will not use new boxes should they be of similar design and placed at nearby locations. Installation of a bat condo will provide an important additional roost site and a great educational opportunity for the visiting public. We also recommend installation of bat boxes at the Downstream Trail site.

ACKNOWLEDGEMENTS

We thank Rhonda Lucas and Alana Mesenbrink for initiating and promoting this project through the Army Corps of Engineers. We are grateful for the opportunity to be involved. We also commend Alana Mesenbrink for conducting the field portion of this project and for dealing with the thousands of acoustic files that were ultimately downloaded, converted, attributed, scrubbed, and sent to us for analysis. It was a tremendous amount of work.

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INTRODUCTION

Bats roost in trees and under tree bark, in rock crevices, under bridges, and in buildings. Unfortunately, as one of the most maligned and misunderstood groups of mammals, their presence in human-made structures often causes more concern than interest. Understandably, because of the accumulation of guano from roosting bats, most human occupants prefer to have bats excluded from buildings. While there is great concern about the potential transmission of diseases from bats to humans, especially rabies, the majority of bats do not have rabies, nor can the disease be passed by skin contact with guano, urine or blood (Constantine 2009, BCI 2012). The presence of bats in a building visited by the public, including children, does, however, warrant consideration of providing alternative roost sites for the bats. It is important to move bats away from prying fingers and to ease health concerns of the general public. Creating an alternative roost site also presents an opportunity to educate the public about bat biology and the beneficial effects of bats.

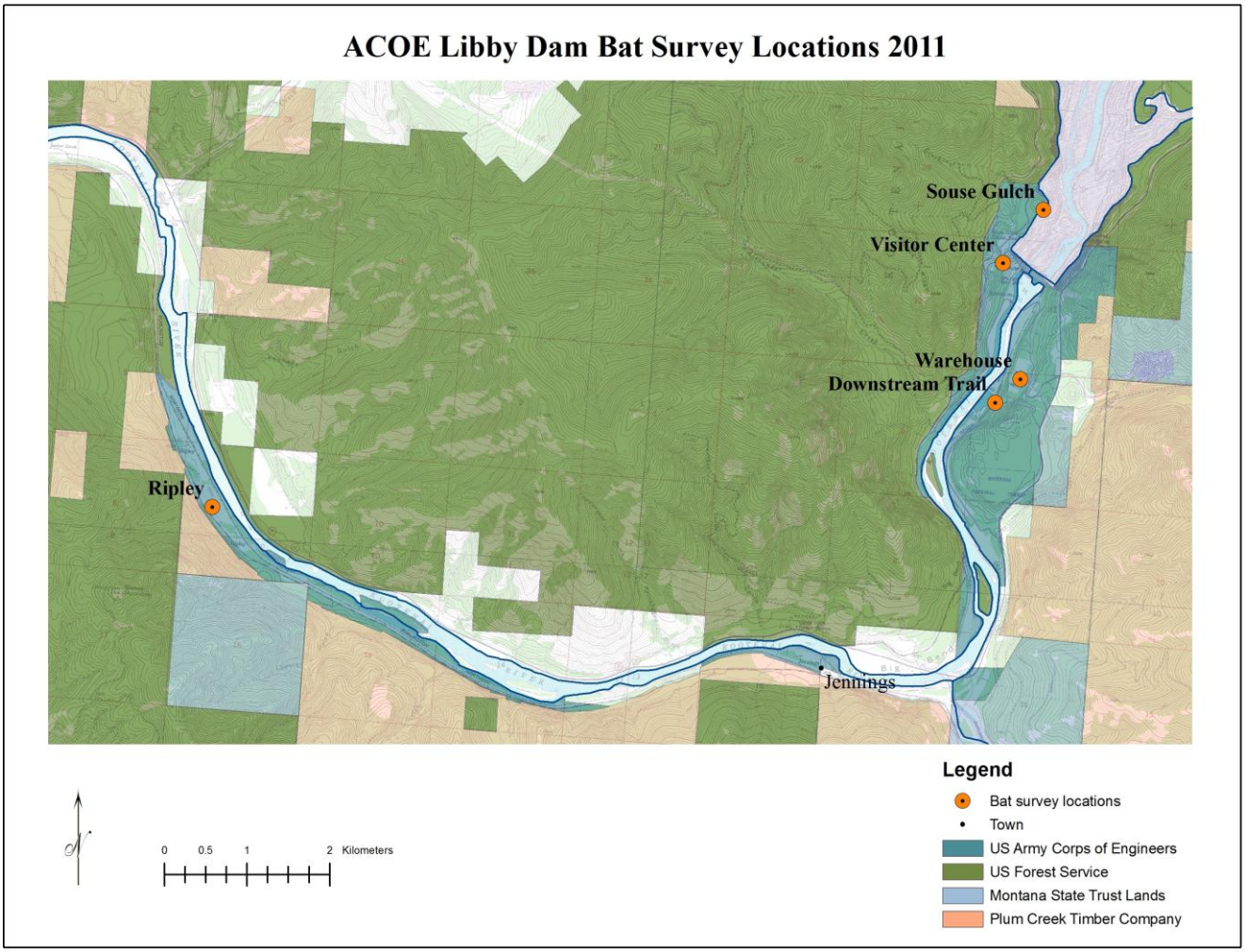
The purpose of this project was to determine bat species presence and diversity and whether any special status species occur at the Libby Dam Visitor Center and other locations within the U.S. Army Corps of Engineers (ACOE) Libby Dam property boundaries. The primary objective was to find a suitable alternative roost site for bats currently roosting in the ceiling and along some of the walls of the Visitor Center deck. Plans are currently underway to build an alternate roost structure, exclude the bats from the Visitor Center, and educate the public about bats at Libby Dam.

PROJECT SUMMARY AND METHODS

Survey Locations and Field Methods

Acoustic bat surveys were conducted by ACOE personnel at five sites within the ACOE Libby Dam property: Downstream Trail (a site along the river-side trail system with mixed-conifer habitat), Ripley (an area farther downstream with ponded open water, meadow, and mixed-conifer/deciduous forest habitat), Souse Gulch (on a rock cliff 800 meters north of and at a slightly higher elevation to the Visitor Center), Visitor Center (close to the building to survey specifically for bats roosting in the building and bat boxes), and Warehouse (a location with several storage buildings and attached bat boxes) (Map 1) (For specific locations and survey dates, see Appendix A).

Map 1: Bat Survey Locations Libby Dam



A minimum of two nights of survey was conducted at each of the sites per week with sites rotated each week so that no particular site would be surveyed repeatedly during a full moon (a time when bat activity is reduced).

Acoustic surveys were conducted by placing an SM2 detector/recorder unit (Wildlife Acoustics, Inc., Concord, MA) at a designated GPSd location, with the microphone set at a height of approximately 1.5 meters, and programmed to run from dusk to dawn (calibrated to the location). Calls were collected, downloaded, labeled, and scrubbed by ACOE personnel and were sent to the Montana Natural Heritage Program (MTNHP) for analysis using Sonobat 3.0 software (Sonobat, Arcata, CA).

MTNHP currently employs a Beta-version of Sonobat 3.0 which automatically identifies call sequences to bat species. Automated species identifications made by this software are not always reliable because of interference created by extraneous noise (echoes, rain noise, 2nd species calls present, etc.) and other factors. Therefore, we confirm the identification of at least one call sequence for each species during each recording session at a site using an Echolocation Call Characteristics key (Szewczak and Weller 2006). We use this key as the basis for all bat call identifications. Calls definitively identified to species using this key must meet all of the most-discriminating characteristics for each species, as well as most or all of the features classified as "special characteristics." However, using Sonobat 3.0 to sort the calls and make tentative identifications greatly speeds up the analysis when dealing with a high volume of call sequences.

RESULTS

Survey work was initiated on 18 May 2011 at the Downstream Trail site and was completed on 23 Sept 2011 at Souse Gulch. The Downstream Trail and Visitor Center sites were surveyed five times each throughout the survey period, the other sites, four times. Fifty-nine nights of sampling were conducted, with data collected on 50 nights (nine nights produced no data due to excessive extraneous noise or wind, and/or an apparent equipment malfunction).

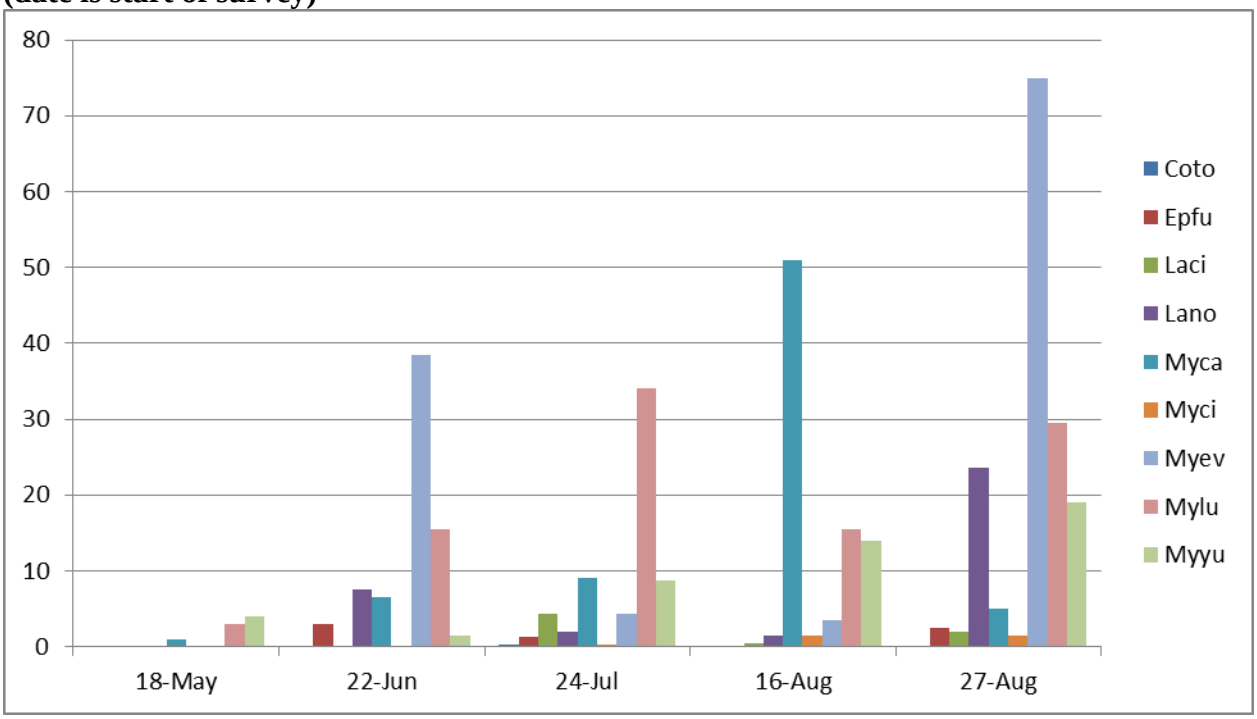
Nine bat species were identified as definitive through call analysis across all survey sites: Little Brown Myotis (*Myotis lucifugus*), Long-eared Myotis (*M. evotis*), California Myotis *(M. californicus*), Western Small-footed Myotis (*M. ciliolabrum*), Yuma Myotis (*M. yumanensis*), Silver-haired Bat (*Lasionycteris noctivagans*), Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), and Townsend's Big-eared Bat *Corynorhinus townsendii*). Two species, Long-legged Myotis (*M. volans*) and Fringed Myotis (*M. thysanodes*), were not identified definitively at any of the locations. However, call sequences consistent with some characteristics of calls of both of these species were recorded so they are potentially present in the area. The Hoary Bat, Townsend's Big-eared Bat, and Finged Myotis are state Species of Concern (SOC); the Silver-haired Bat and Yuma Myotis are state Potential Species of Concern (PSOC) (MASC 2012). All species documented on this project, definitive and potential, are within their known distributions in Montana (Lenard, Hendricks, and Maxell 2007).

The following information for survey locations is presented as a per-night average as the number of nights sampled was not equal across all sites or time periods.

Downstream Trail

The Downstream Trail site had the highest number of species (nine), and was the only site where Townsend's Big-eared Bat was detected (Figures 1a, 1b and 2). The greatest number of species occurred during the July survey, while the greatest number of call sequences detected per night of survey occurred during late August (Figure 1c). Long-eared Myotis was the species with the greatest number of call sequences identified at this site, while Townsend's Big-eared Bat had the fewest. A tenth species, Fringed Myotis, was potentially detected at this site in July, but the call sequence could not be identified definitively.

Figure 1a. Average number of call sequences per species per night at Downstream Trail (date is start of survey)



Species codes: **Coto** (*Corynorhinus townsendii* - Townsend's Big-eared Bat*), **Epfu** (*Eptesicus fuscus* - Big Brown Bat), **Laci** (*Lasiurus cinereus* - Hoary Bat*), **Lano** (*Lasionycteris noctivagans* - Silver-haired Bat+), **Myca** (*Myotis californicus* - California Myotis), **Myci** (*Myotis ciliolabrum* - Western Small-footed Myotis), **Myev** (*Myotis evotis* - Long-eared Myotis), **Mylu** (*Myotis lucifugus* - Little Brown Myotis), **Myyu** (*Myotis yumanensis* - Yuma Myotis+). * Species of Concern (SOC); + Potential SOC

Figure 1b. Total number of species detected at Downstream Trail

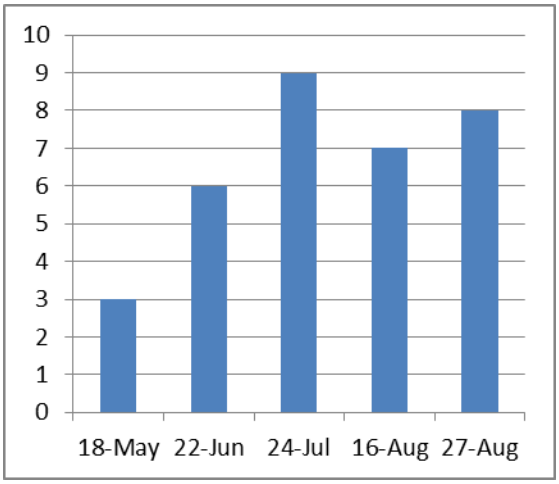


Figure 1c. Average number of call sequences detected per night across all species at Downstream Trail

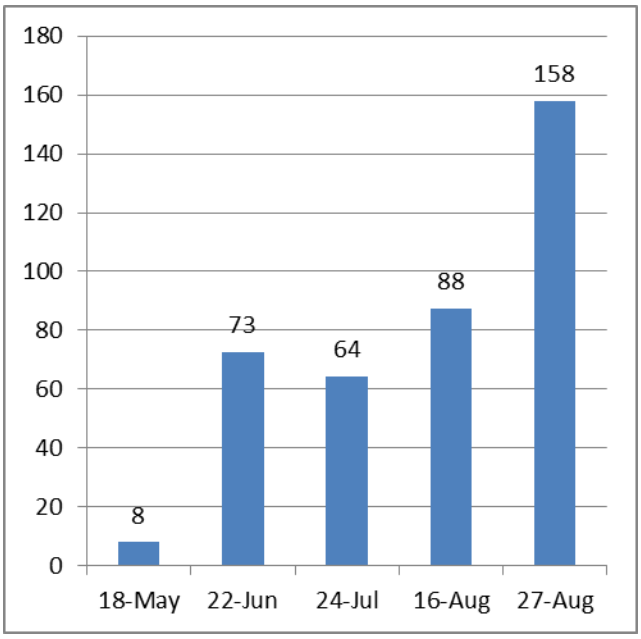
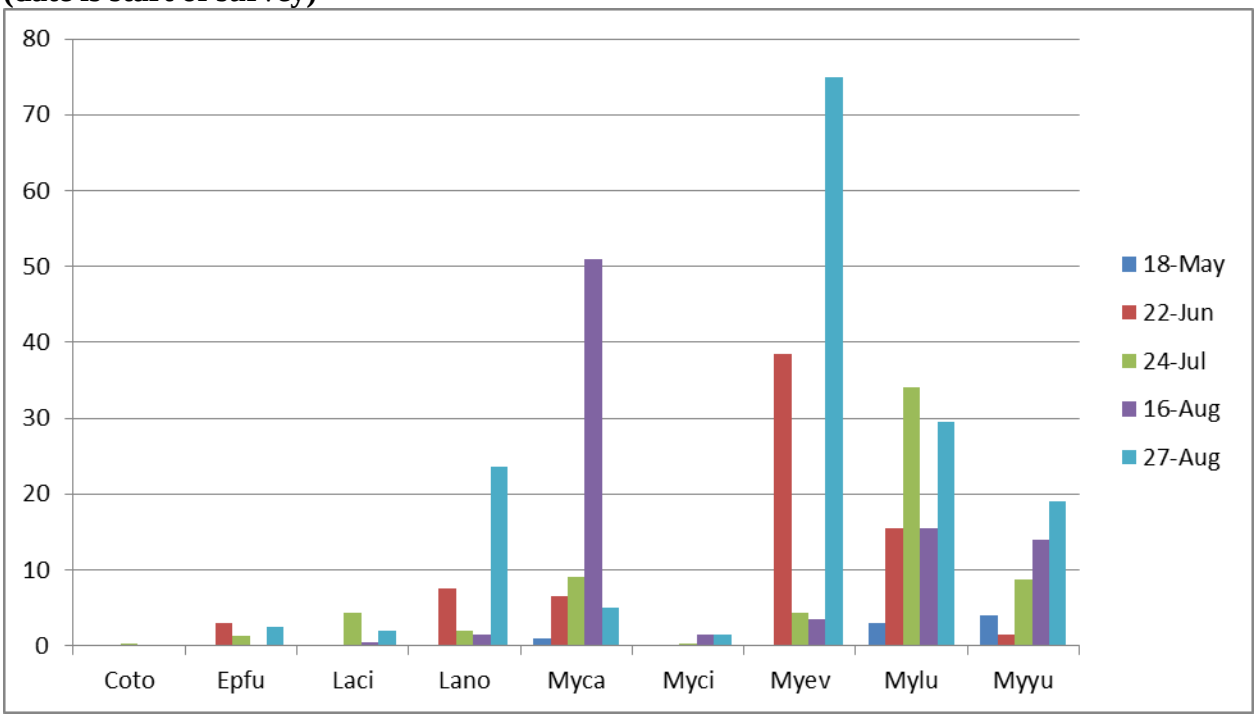


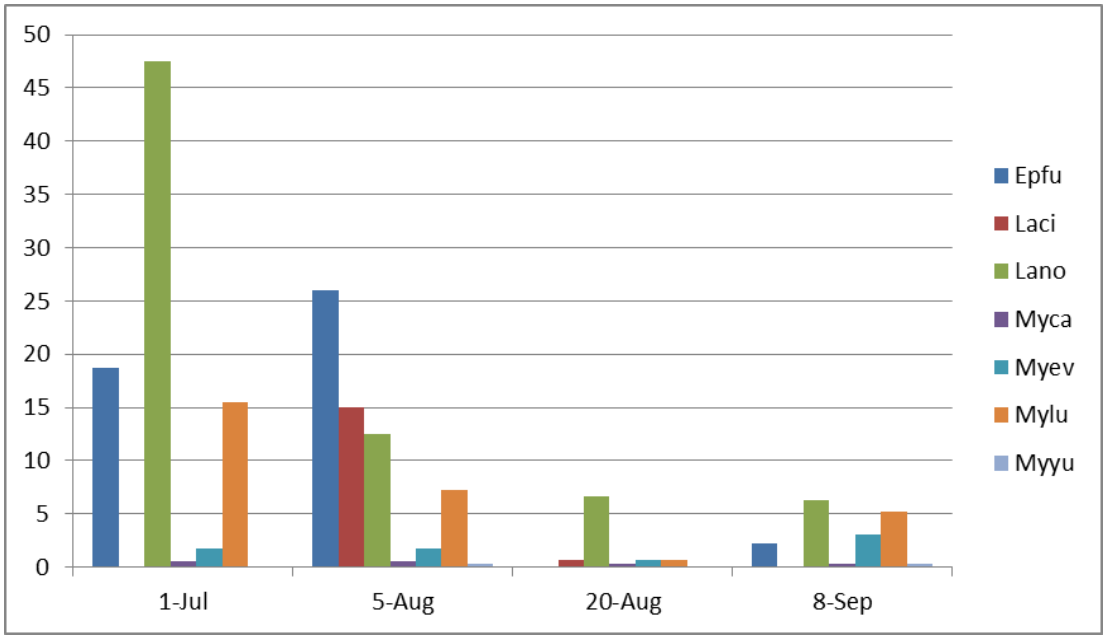
Figure 2. Average number of call sequences per species per night at Downstream Trail (date is start of survey)



Ripley

Seven bat species were detected at the Ripley site (Figures 3a, 3b and 4). The greatest number of species occurred during the early August survey, while the greatest number of call sequences detected per night of survey occurred in early July (Figure 3c). More call sequences were identified at this site for the Silver-haired Bat; the fewest for Yuma Myotis. One call sequence at this site in September was potentially from a Western Small-footed Myotis, but the call sequence could not be identified definitively.

Figure 3a. Average number of call sequences per species per night at Ripley (date is start of survey)



Species codes: **Epfu** (*Eptesicus fuscus* - Big Brown Bat), **Laci** (*Lasiurus cinereus* - Hoary Bat*), **Lano** (*Lasionycteris noctivagans* - Silver-haired Bat+), **Myca** (*Myotis californicus* - California Myotis), **Myev** (*Myotis evotis* - Western Long-eared Myotis), **Mylu** (*Myotis lucifugus* - Little Brown Myotis), **Myyu** (*Myotis yumanensis* - Yuma Myotis+). *SOC; +PSOC.

Figure 3b. Total number of species detected at Ripley

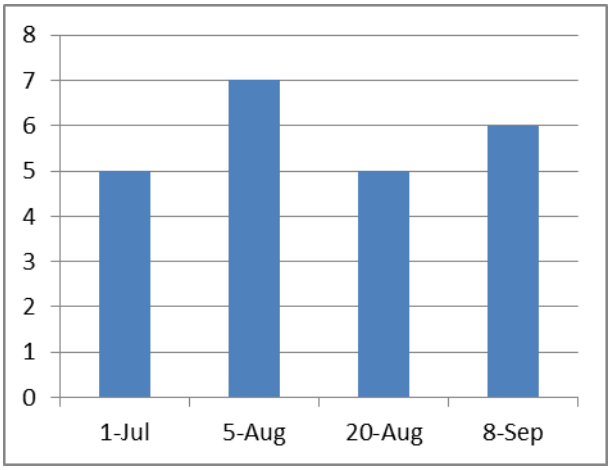


Figure 3c. Average number of call sequences detected per night across all species at Ripley

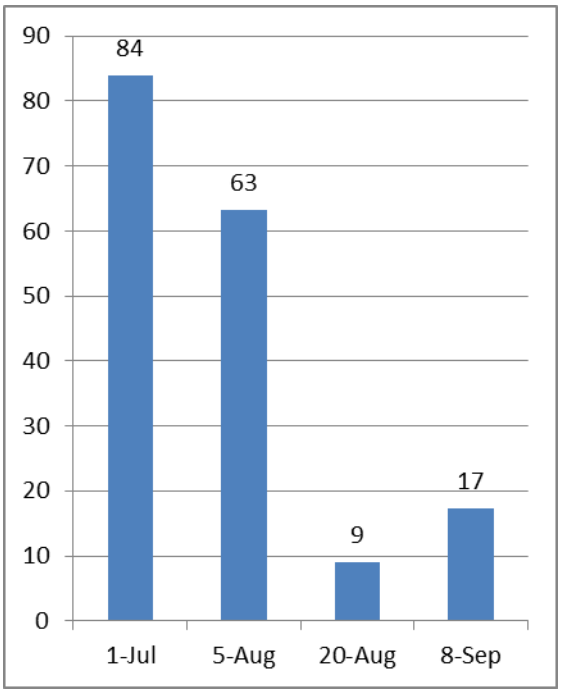
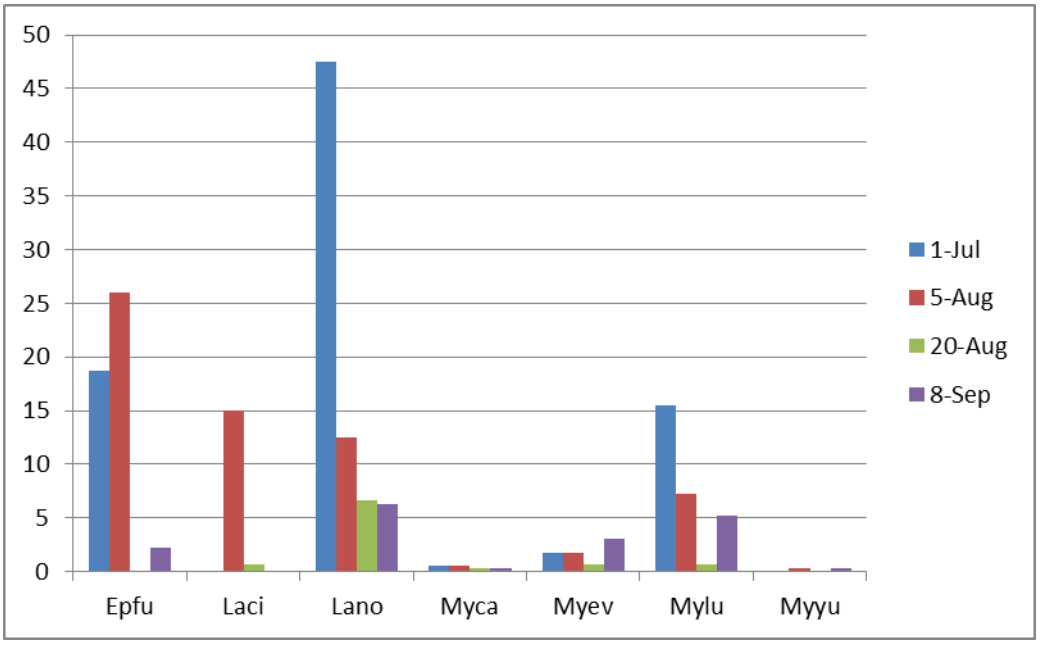


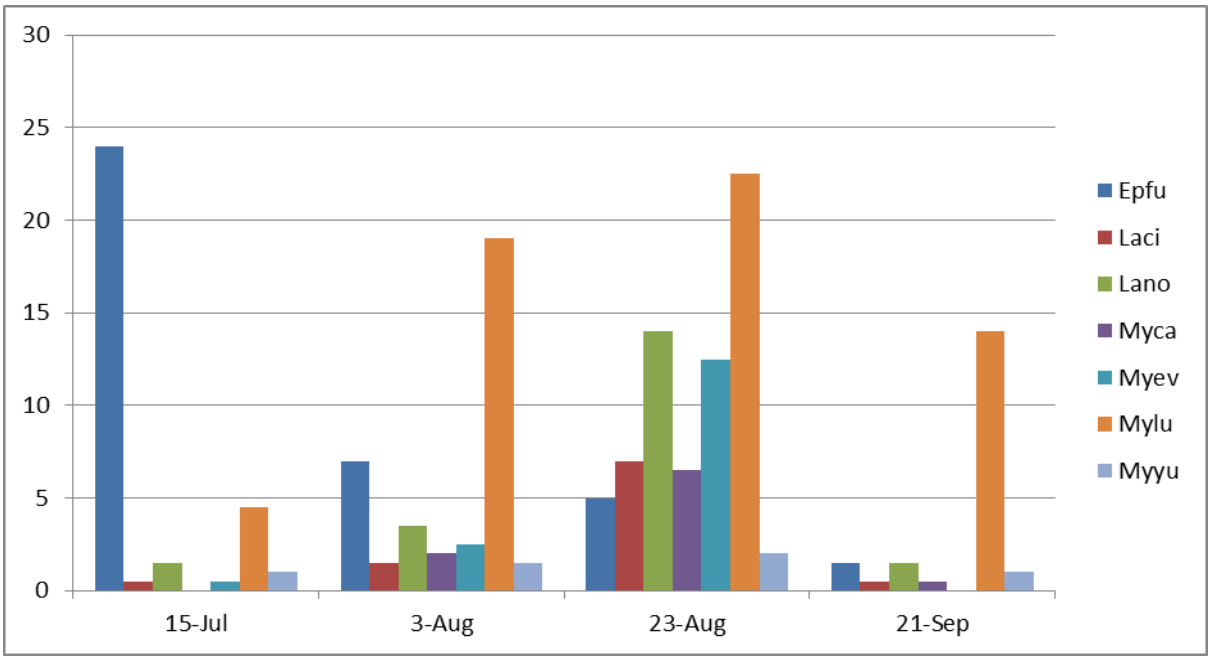
Figure 4. Average number of call sequences per species per night at Ripley (date is start of survey)



Souse Gulch

Seven species of bats were documented acoustically at Souse Gulch (Figures 5a, 5b, and 6). The greatest number of species occurred during the two August surveys, while the greatest number of call sequences per night of survey occurred during late August (Figure 5c). The greatest number of call sequences identified at this site was for Little Brown Myotis, the fewest for Yuma Myotis. Three call sequences in August were potentially from Western Small-footed Myotis, but the call sequences could not be identified definitively.

Figure 5a. Average number of call sequences per species per night at Souse Gulch (date is start of survey)



Species codes: **Epfu** (*Eptesicus fuscus* - Big Brown Bat), **Laci** (*Lasiurus cinereus* - Hoary Bat*), **Lano** (*Lasionycteris noctivagans* - Silver-haired Bat+), **Myca** (*Myotis californicus* - California Myotis), **Myev** (*Myotis evotis* - Western Long-eared Myotis), **Mylu** (*Myotis lucifugus* - Little Brown Myotis), **Myyu** (*Myotis yumanensis* - Yuma Myotis+). * SOC; + PSOC.

Figure 5b. Total number of species detected at Souse Gulch

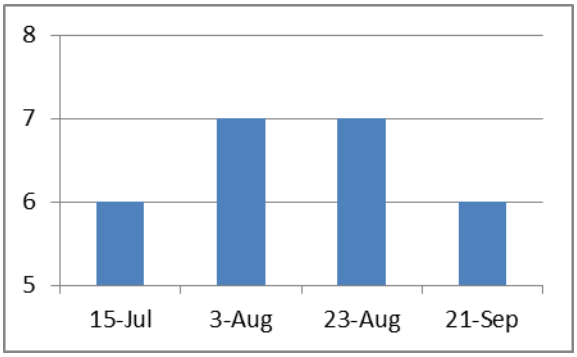


Figure 5c. Average number of call sequences detected per night across all species at Souse Gulch

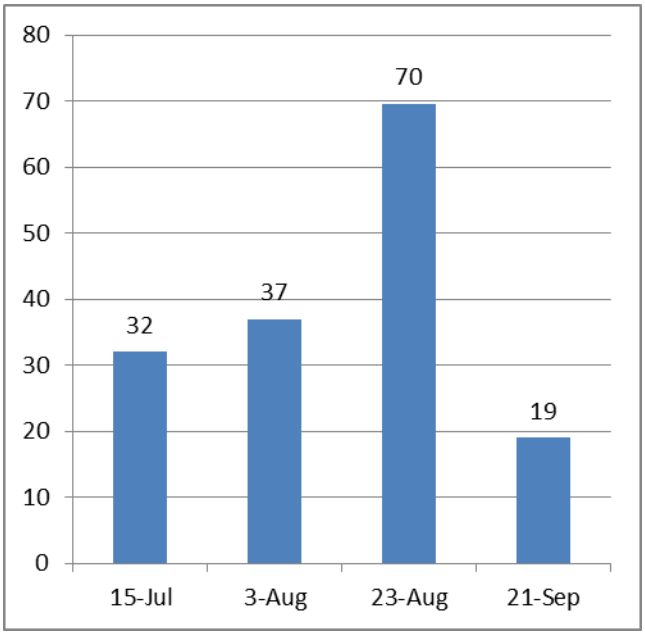
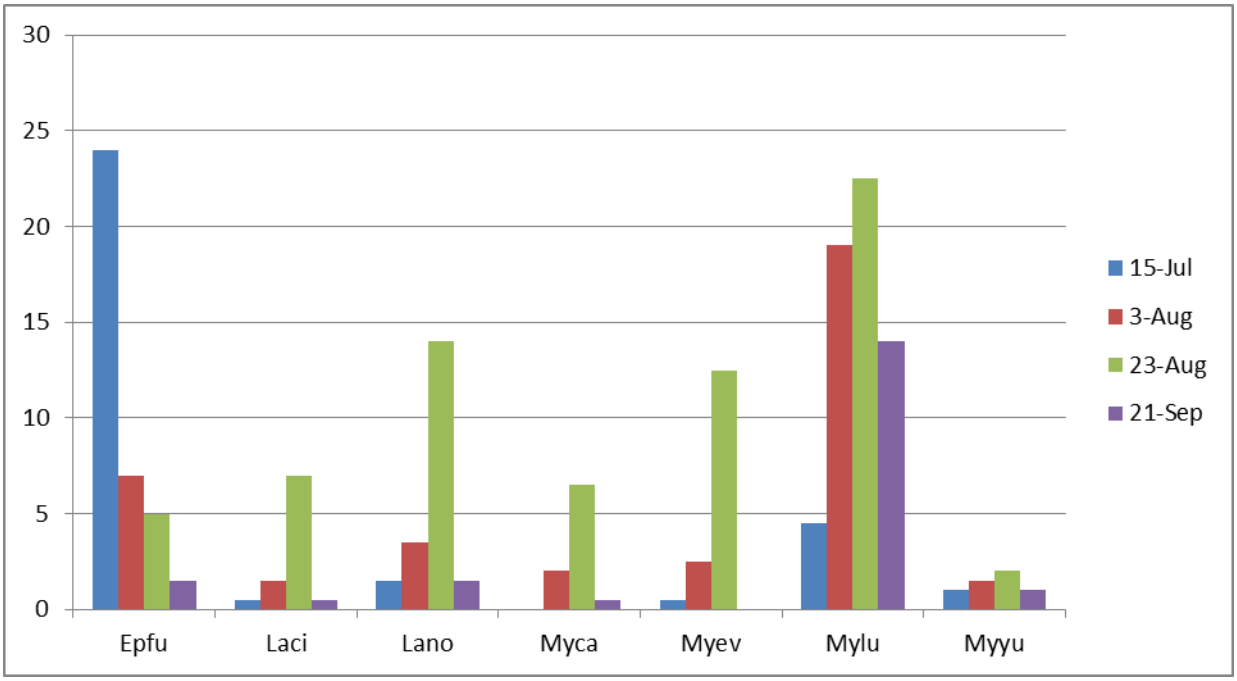


Figure 6. Average number of call sequences per species per night at Souse Gulch (date is start of survey)

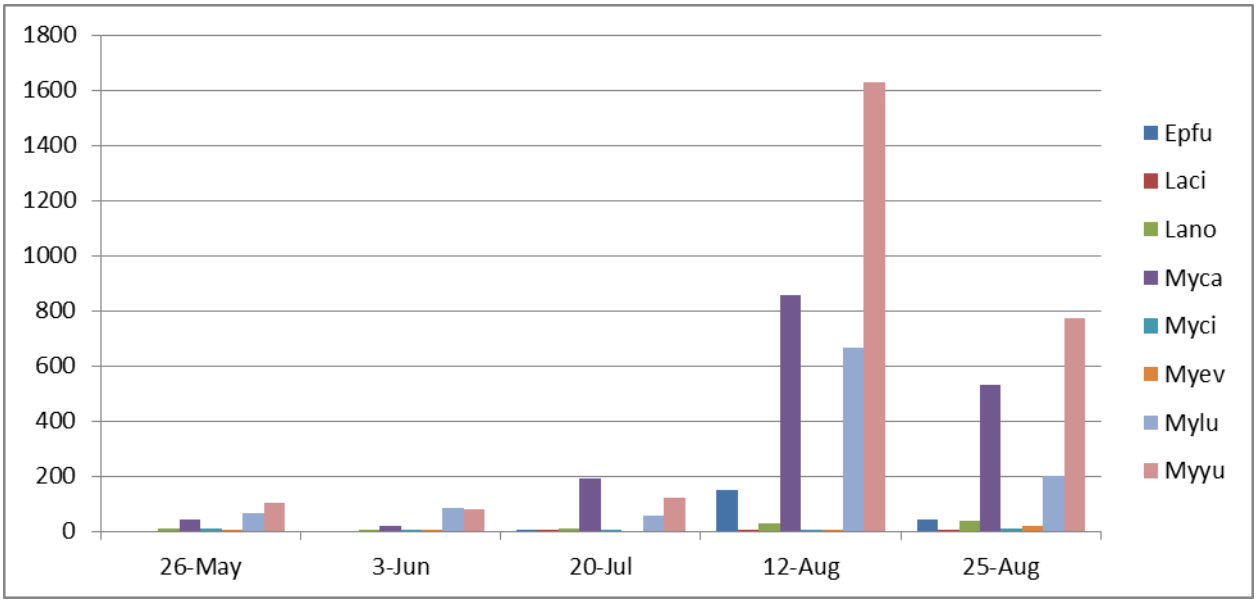


Visitor Center

Eight bat species were recorded definitively at the Visitor Center (Figures 7a and 7b). All were present at this site during both August surveys, with the greatest number per night detected during the earlier of the two surveys (Figure 7c). Most of the call sequences at this location were identified as Yuma Myotis, while Hoary Bat had the fewest (Figure 8). Interestingly, a few call sequences were recorded for Western Small-footed Myotis at this location adding credence to the potential detection of this species at Souse Gulch, approximately 800 meters to the north. A ninth species, Long-legged Myotis, was potentially present at this site during the surveys in July and earlier in August, but call sequences could not be definitively identified.

The Visitor Center results are particularly interesting for a few reasons. The increase in call numbers in August suggests newly flighted young and that the Visitor Center deck ceiling and/or bat houses are a likely maternity colony for at least one of the species recorded. Additionally, the presence of Yuma Myotis is intriguing as the species is not well documented in the state, in part because of morphologic and genetic similarities to Little Brown Myotis (Weller et al. 2007, Rodhouse et al. 2008). Although historical records of Yuma Myotis exist for Montana, solid genetic evidence for current populations is lacking. The likely presence of a maternity colony at the Visitor Center for this PSOC warrants further investigation. A study of this population could clarify genetic differences between these two species and could result in the first documented maternity colony for Yuma Myotis in Montana.

Figure 7a. Average number of call sequences per species per night at the Visitor Center (date is start of survey)



Species codes: **Epfu** (*Eptesicus fuscus* - Big Brown Bat), **Laci** (*Lasiurus cinereus* - Hoary Bat*), **Lano** (*Lasionycteris noctivagans* - Silver-haired Bat+), **Myca** (*Myotis californicus* - California Myotis), **Myci** (*Myotis ciliolabrum* - Western Small-footed Myotis), **Myev** (*Myotis evotis* - Western Long-eared Myotis), **Mylu** (*Myotis lucifugus* - Little Brown Myotis), **Myyu** (*Myotis yumanensis* - Yuma Myotis+). * SOC; + PSOC.

Figure 7b. Total number of species detected at Visitor Center

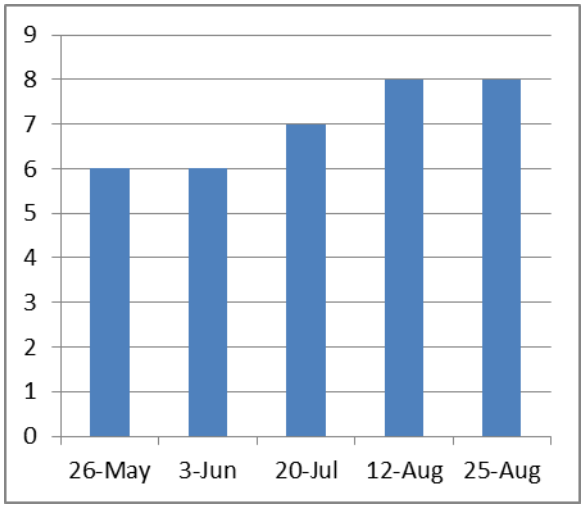


Figure 7c. Average number of call sequences detected per night across all species at Visitor Center

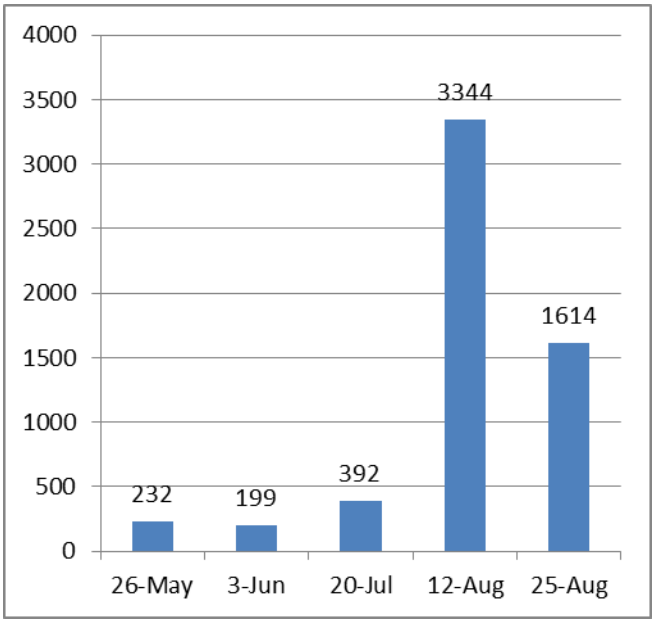
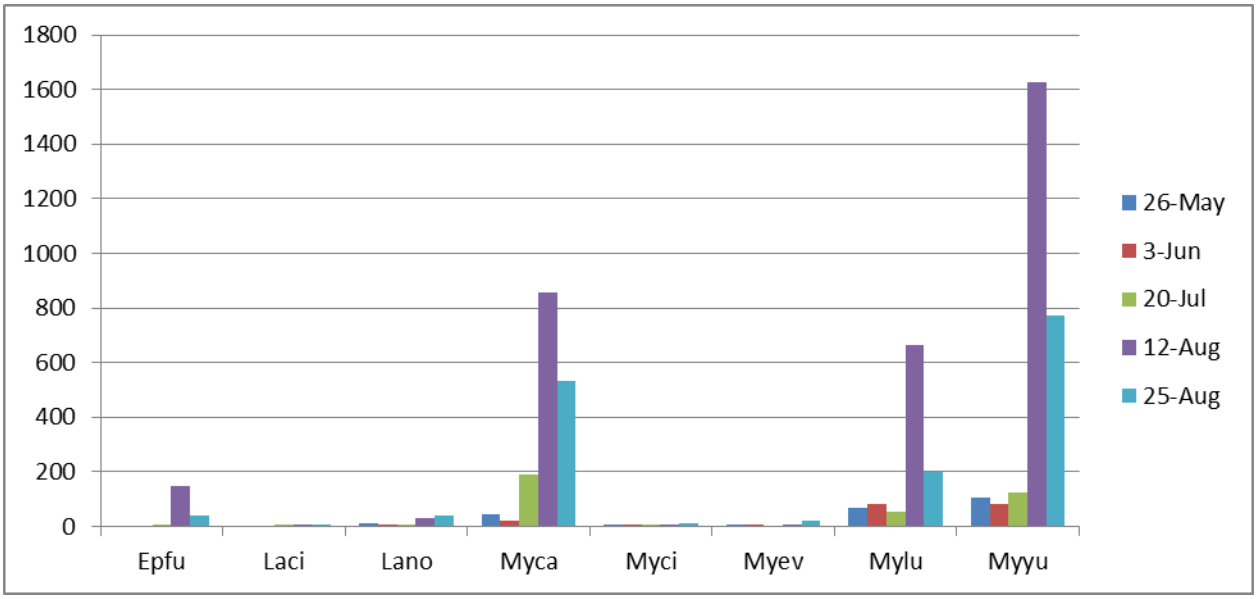


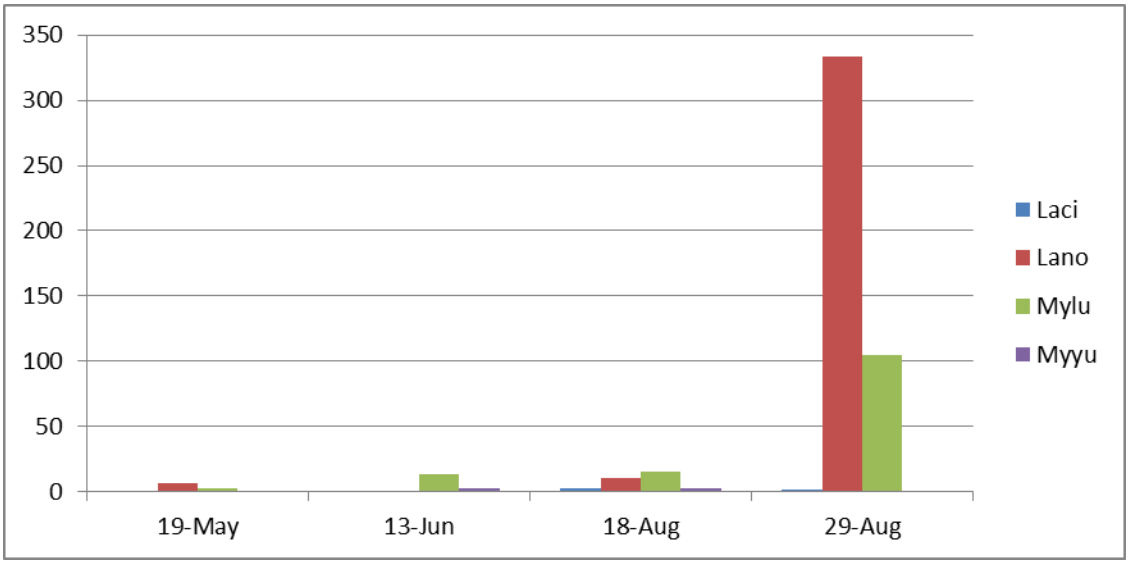
Figure 8. Average number of call sequences per species per night at the Visitor Center (date is start of survey)



Warehouse

Four species were identified acoustically at this site (Figures 9a and 9b). All species were present during both August surveys, with the overwhelmingly greatest number of call sequences recorded during the survey period beginning on 29 August (Figure 9c). The greatest number of call sequences during that survey period was for Silver-haired Bat (Figure 10). Three additional species were potentially present at this site, but call sequences could not be definitively identified: Big Brown Bat (11 call sequences in late August), California Myotis (six call sequences in August), and Western Small-footed Myotis (one call sequence in May and one in June).

Figure 9a. Average number of call sequences per species per night at Warehouse (date is start of survey)



Species codes: **Laci** (*Lasiurus cinereus* - Hoary Bat*), **Lano** (*Lasionycteris noctivagans* - Silver-haired Bat+), **Mylu** (*Myotis lucifugus* - Little Brown Myotis), **Myyu** (*Myotis yumanensis* - Yuma Myotis+). * SOC; + PSOC.

Figure 9b. Total number of species detected at Warehouse

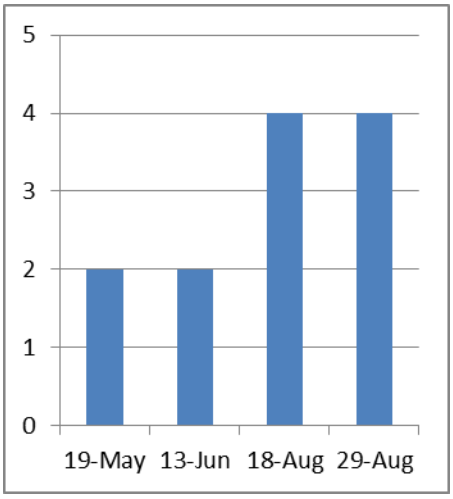


Figure 9c. Average number of call sequences detected per night across all species at Warehouse

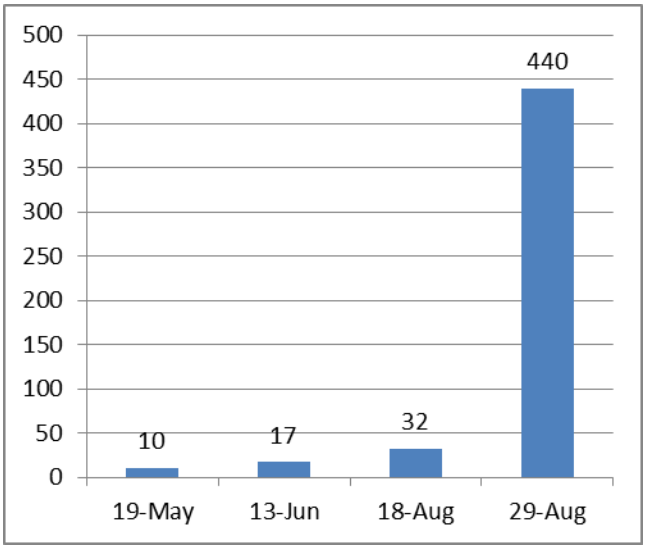
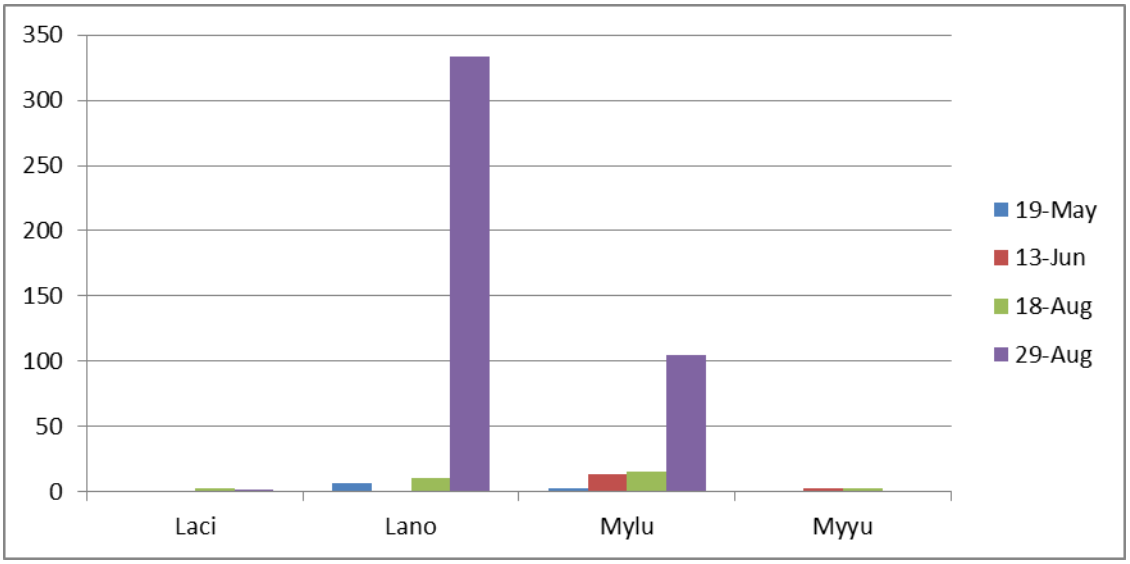


Figure 10. Average number of call sequences per species per night at Warehouse (date is start of survey)



RECOMMENDATIONS

We offer the following recommendations on excluding bats from the ACOE Libby Dam Visitor Center, providing alternative roost structures, and suggested timing of these activities.

Exclusion:
One of our first and primary concerns was that the Visitor Center might be currently used as a hibernaculum. ACOE personnel investigated the attic area of the Visitor Center during early February 2012 and found no evidence of bat use. An acoustic detector was placed in the area to see if there was any acoustic evidence to challenge that assessment. Should no bats be present in the attic, then we recommend exclusion efforts be made at the Visitor Center after the bats leave in the fall, or before they return in the spring Exclusion methods are outlined at the following web addresses: http://www.batmanagement.com/havebats/nuisance.html. We recommend the ACOE select whatever material is most likely to have the greatest longevity and not shrink or crack upon freezing.

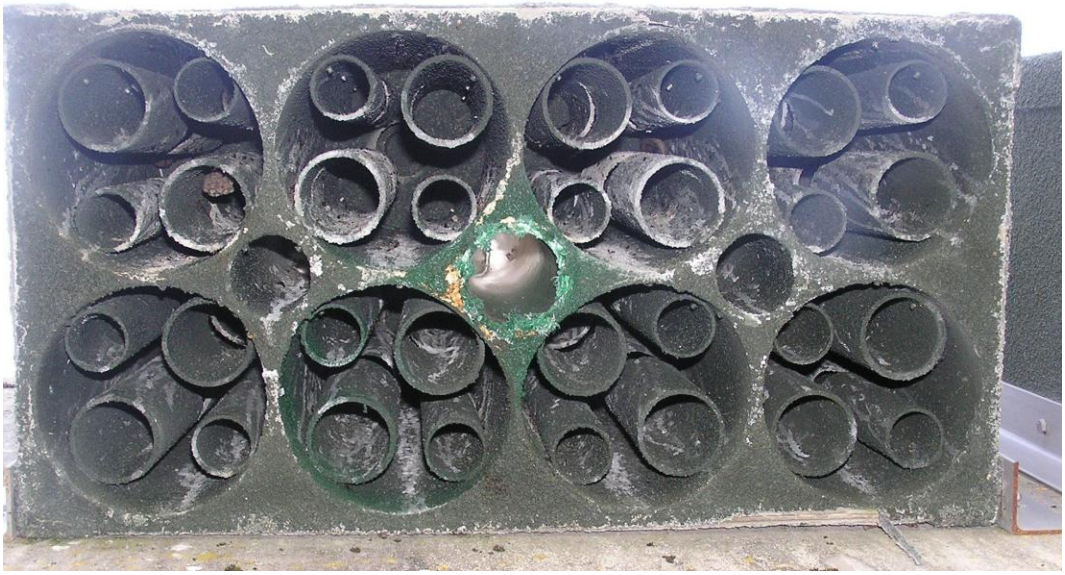
Bat condo:
Plans currently available on the web for bat condos are generally designed for a structure 8x8x8 feet in dimension. We, and other bat biologists who live at similar latitudes to Montana, recommend construction of a "mini bat condo" (4x4x6 feet in dimension or smaller) for placement at the visitor center site rather than the large one. The mini-condo (see example at: http://www.batmanagement.com/Ordering/motels/batmotel.html) would be a more appropriate size for the likely number of bats (2500 bat capacity versus 7000) and would likely get warmer and retain that warmth longer throughout the night (Haskew 2012). While the plans for the mini-condo are currently not available, we do recommend the ACOE investigate the possibility of scaling down to the smaller dimensions, if possible. Whatever size condo is installed, it is more likely to be used if the following recommendations are considered:

1. Placement of the condo should be such that the structure will be in full sun for as long as possible (up to and beyond 10 hours per day).
2. One side of the condo should be oriented to the southeast direction.
3. Placement of the condo should occur within view of the site from which they will be excluded (Haskew 2012). We recommend placing the condo within 300 meters of the Visitor Center if possible and no more than 500 meters if the intent is to provide an alternative roost site for bats displaced by the exclusion.
4. Construction and placement of the condo should be performed before, or during, July or August while bats still inhabit the Visitor Center (Haskew 2012). This will allow the bats, generally curious creatures, to have the opportunity to investigate the structure before they leave the Visitor Center in the fall. It will improve the likelihood of bats roosting in the condo when they return to the Visitor Center the following spring and find they can no longer roost in the cracks in the ceiling.
5. An exclusion fence should be placed around the base of the condo to protect the public from any direct contact with bats or to the accumulating guano below the condo, as well as limiting the potential for harassment of the bats by humans (Sheffield et al. 1992, Haskew 2012).

Bat Houses:
Bat houses can be installed at any time of the year, but the sooner they are installed the more likely they are to be used as alternative roost sites when bats are excluded from the Visitor Center. However, to avoid disturbing bats in the existing boxes during the summer and increase the probability of use during the first summer after exclusion from the building, we recommend installing new boxes before the bats return in the spring or after they leave in the fall. We recommend installing at least two additional bat boxes on the east side of the Visitor Center wall adjacent to the existing boxes similar to the ones in place with the baffles parallel to the front and back of the house (Photo 1) and not the tubular baffles (Photo 2). In addition to adding new boxes, we recommend replacing the tubular baffle boxes with those of parallel baffle construction. Bats currently use the parallel baffle boxes, so it is likely conditions will be acceptable for roosting in new ones of similar design at this location. If similar boxes are not commercially available, we recommend the Four-chamber Nursery House (Bat Conservation International: http://www.batcon.org/pdfs/bathouses/FourChamberNurseryHousePlans.pdf) or the Bat Can (Bat Conservation and Management, Inc.: http://www.batmanagement.com/Ordering/batboxes/batcan/batcan.html). Placement of new boxes must be in full sun for as long in the day as possible. Should there be no room on the east wall, then we recommend placing the additional boxes on the north side, although this side of the building was not the preferred location for the bats during the May 2011 visit.

Photo 1. Bats occupying a Libby Dam Visitor Center bat box (May 2011).

Photo 2. Libby Dam Visitor Center tubular baffle bat box occupied by a single bat (May 2011).



The bat boxes with parallel baffle construction (currently affixed to the outside of the Visitor Center) are clearly attractive to bats, as they were in use by large numbers of bats during the initial field visit in May. Acoustic data at this site indicates high activity throughout the summer months, with Little Brown Myotis and Yuma Myotis, and to a lesser degree California Myotis, the likely inhabitants. In addition to the recommendations made regarding structure design and placement, we suggest that follow-up surveys be conducted to check the use and effectiveness of any new structures put in place. This will aid in documenting the success of mitigation efforts at this site in particular, and could contribute greatly to development of effective and non-lethal bat exclusion protocols elsewhere in the region where human-made structures are offered as alternative roosts.

Rocket Boxes

We recommend that bat houses in the Rocket Box design [http://www.batsnorthwest.org/rocketbox_plans.pdf or http://native-wildlife-gardening.com/rocket-box-bat-house-plans/] be installed at the Downstream Trail location. This site is along a walking trail and had the highest diversity of bat species. In addition to providing additional roosting sites for bats, boxes placed at this location would provide a wonderful educational opportunity for the public. Bat boxes are more likely to be used if more than one roosting structure is available and they are grouped (Kiser and Kiser 2004), so we suggest that at least three boxes be put in place at this site. The boxes should be placed on poles 12-20 feet in height, at least 10, preferably 20-30, feet from the nearest tree, and in full sun for as long in the day as possible (Kiser and Kiser 2004). Rocket boxes generally have the highest occupancy rate for bats when compared to traditional bat box designs (Tigner 2012). For other locations without an existing building to which bat houses can be affixed, or locations without bat house designs currently occupied, we recommend Rocket Boxes be installed.

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APPENDIX A.

SURVEY SITE LOCATIONS AND SURVEY DATES

Appendix A. Survey site locations and survey dates at the ACOE Libby Dam project area in 2011.

Survey Location	Latitude	Longitude	Survey Dates
Downstream Trail	48.39583 N	-115.31944 W	5/22
			6/22 - 6/24
			7/24 - 7/27
			8/16 - 8/18
			8/27 - 8/29
Ripley	48.37806 N	-115.44611 W	7/1-7/5
			8/20 - 8/23
			8/5 - 8/9
			9/8 - 9/13
Souse Gulch	48.41722 N	-115.31389 W	7/15 - 7/19
			8/3 - 8/5
			8/23 - 8/25
			9/21 - 9/23
Visitor Center	48.41111 N	-115.3198 W	5/26 - 5/27
			6/1 - 6/4
			7/20 - 7/22
			8/12 - 8/16
			8/25 - 8/27
Warehouse	48.39861 N	-115.31556 W	5/19 - 5/22
			6/13 - 6/16
			8/18 - 8/20
			8/29 - 8/31