Community Composition of Bat Species and Assessment of Bat Habitat on Fort Harrison and the Limestone Hills Training Area

Prepared for the Department of Military Affairs

Prepared by

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Montana Natural Heritage Program

Montana State Library

Submitted May 2022

Revised December 2022

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Community Composition of Bat Species and Assessment of Bat Habitat on Fort Harrison and the Limestone Hills Training Area

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This document should be cited as follows:

Bachen, D. A. and A. L. McEwan. 2022. Community Composition of Bat Species and Assessment of Bat Habitat on Fort Harrison and the Limestone Hills Training Area. Report to the Montana Department of Military Affairs. Montana Natural Heritage Program, Helena, Montana. 18pp. plus appendices.

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Background

Bats in Montana face a number of threats that may impact populations of many species present in the state. Although considerable work has been conducted to determine species presence across the state, describe seasonal activity patterns, and describe roost and other important landscape features used by bats, significant uncertainty remains within these areas of information for many species. The Missouri River Valley in central Montana has high diversity of bat species and some of these species appear quite abundant (Bachen et al. 2020a). However, surveys within portions of this region have been sparse. In particular, mist net surveys to detect some species that are not easily detected with acoustic methods have only been performed at several sites.

The habitat diversity within the greater Helena area is relatively high, as ecosystems more typical of eastern Montana can be found along the Missouri River, and uplands and forested areas more typical of western Montana are found along the Continental Divide. This diversity of habitat supports a diverse bat community and 13 of Montana's 15 bat species may occur here, although only 11 have been confirmed. Both the California Myotis (*Myotis californicus*) and Yuma Myotis (*M. yumanensis*) have been documented in the general area but further documentation is necessary to conclusively establish species presence in the area. Other species of conservation concern including Townsend's big-eared Bat (*Corynorhinus townsendii*), and various *Myotis* species roost in features such as caves, mines, buildings, and rock outcrops that may be impacted by anthropogenic activities and identifying roost preferences and locations are necessary for informing management and mitigating impacts.

To address these information needs we conducted surveys for bat species across Fort Harrison (FH) and the Limestone Hills Training Area (LHTA). We conducted roost surveys of suitable rock outcrops, structures and mine audit entrances to identify day roosts and quantify use. We also conducted surveys of drinking sites using mist nets to explore community composition, age, and sex ratios of captured species. To further explore habitat associations and landscape use, we deployed acoustic detectors on both the long- and short-term-time frames.

Study area

Surveys were conducted on two discrete areas managed by the Department of Military Affairs for training purposes. Fort Harrison (FH) is located west of Helena, Montana (Figure 1). The fort has both developed areas with buildings as well as more natural areas including grasslands and coniferous forests. The Limestone Hills Training Area (LHTA) is located to the southwest of Townsend, Montana along the Missouri River (Figure 2). Almost all of this area is undeveloped and characterized by grassland and shrubland near the river to dry shrublands and pine forests in the western areas. The LHTA's most striking feature and namesake are a series of north-south trending ridges capped with various types of sedimentary rock.

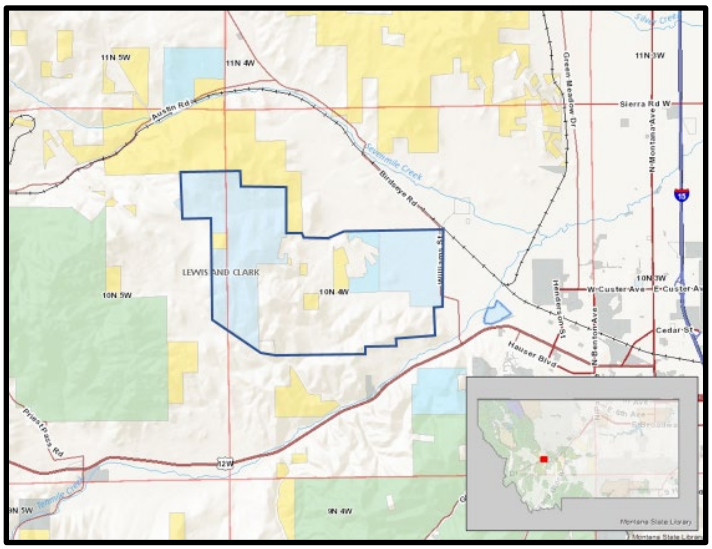


Figure 1. The location of Fort Harrison, west of Helena Montana. Approximate boundary of the study area is shown in blue.

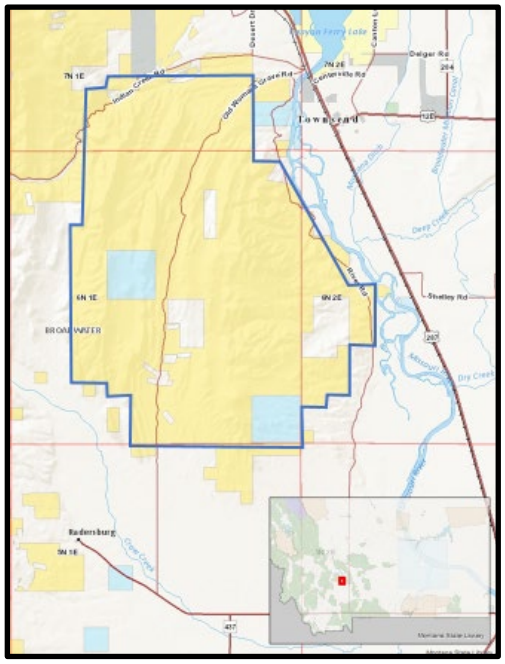


Figure 2. The location of the Limestone Hills Training Area southwest of Townsend, Montana. Approximate boundary of the study area is shown in blue.

Methods

We used a diversity of methods to determine species presence within Fort Harrison and the Limestone Hills training areas and identify habitat features used by these animals. We relied on acoustic methods to assess general species presence during the active season at discrete features as well as general species presence across the year. As these methods are not appropriate for all species that occur in this region (Bachen et al. 2018), we supplemented them with targeted direct capture methods using mist nets. We also performed assessments of potential roost features to document active season roosts and potential hibernaculum.

Acoustic Detector Site Selection and Deployment

To select sites to deploy detectors, we identified springs and other water features as well as mine adits and areas with potential roost sites in structures, rock outcrops, and trees. We deployed ultrasonic bat detector recorders (hereafter "detectors") at suitable features within each site. Short term detectors were powered with internal batteries and were deployed in July and August of 2021 and allowed to run until the batteries died (9-19 days). Long-term monitoring sites were established in June 2021 and run continuously through the end of April of 2022. We used both SM2Bat+ and SM3 Bat full spectrum detectors with SMU-1 microphones (Wildlife Acoustics). Units were deployed adjacent to features of interest at locations that minimized clutter and reflection of sound off water and landscape features. Microphones were elevated to at least 3m above ground level. Initially we planned to deploy short-term units for a single night at each site to maximize geographic coverage within the areas of interest. However, after reviewing the potential placements and general habitat available on both the FH and LHTA we decided to trade increased geographic coverage for increased nights at the detectors. As the geographic scope is limited and habitat is similar, the increased survey effort from fewer detectors deployed for longer time periods will increase chances of detecting rare species while maintaining a similar scope of inference across the study area. In July and August 2021, we deployed two long-term detectors and collected acoustic data at three sites across FH (one site) and the LHTA (two sites) between early June 2021 and late April 2022 (Figure 3,Figure 4, Figure 5). We established seven short-term sites, with three on FH and four within the LHTA.

Management of Acoustic Data and Call Analysis

Acoustic file recordings, in both original WAC and processed WAV formats, are stored in the Montana Bat Call Library which is housed on a series of 15-20 Terabyte Drobo 5D and 5N storage arrays at the Montana State Library as well as a secondary offsite location to protect against catastrophic loss. Acoustic analysis results were processed and combined within SQL database tables in accordance with the general workflow pattern for data management and analysis outlined in the text and in Appendices 8-10 of Maxell (2015). Bat call sequences were analyzed with the goal of definitively identifying individual species presence by site, in accordance with the Echolocation Call Characteristics of Montana Bats and Montana Bat Call Identification materials in Bachen et al. 2018. The location and date of all call sequences that could be attributed to a given bat species were uploaded to the Montana Natural Heritage Program's Point Observation Database and are available through the programs online data visualization and planning tools including the Map Viewer application.

Direct Capture

To detect species not readily identifiable using acoustic methods and assess use of water features, we deployed mist nets across water sources and flyways within FH and the LHTA in July and August 2021.

We conducted netting at six sites across both areas (Figure 3, Figure 4). We placed mist nets (Avinet, 38mm poly nets) within 3 meters of the ground or water, across features that concentrate bat activity such as water sources suitable for drinking, foraging areas, and flyways. At each site we deployed up to six nets of variable length (2.3 - 18 m). Nets were opened at dusk and closed no earlier than 12:00 am, unless inclement weather or other factors precluded netting for a full evening. All animals captured were briefly held in cloth bags prior to processing to allow bats to defecate so that guano could be collected and used for genetic identification. Time in the bag for each animal did not exceed 0.5 hrs. For each animal, we measured ear, tragus, forearm, foot, and thumb to the nearest millimeter. We identified captured individuals to species using morphology and pelage attributes (Bachen et al. 2018). All gear was decontaminated between sites following USFWS protocols (White-nose Syndrome Disease Management Working Group 2020) to reduce the risk of disease transmission between sites.

Roost Surveys

To assess bat use of potential roost features including buildings, mines, and rock outcrops we performed timed visual encounter searches of these features in June, July and August of 2021. Across both areas we surveyed 17 features including 4 buildings, 3 mines, and 10 rock outcrops (Figure 3, Figure 4). For buildings, surveyors examined the exterior for indirect evidence of occupancy including guano accumulation and urine staining. Cracks and crevices were illuminated with bright handheld flashlights (> 500 lumens) to assess presence of roosting individuals. If direct or indirect evidence of bat use was found, the time to detection was noted. If bats were visible the potential species and number were also recorded. If possible, guano samples were collected and submitted for genetic identification to verify the species using the roost.

For rock outcrops our methods were similar to those used to survey buildings. We carefully worked through areas of exposed rock examining cracks and crevices that could be used as roosts. Roost in use were identified by the presence of individuals. Occupied roosts were classified as Maternity Roosts (pregnant females or females and young observed), Day Roosts (individual present). If guano was observed but animals were not using the roost at the time of survey, we noted this and attempted to collect guano for analysis to determine which species had previously used the roost. The location of all roosts and a brief description of the roost were noted (e.g., crack orientation, width, depth, etc.) and appended to the Montana Natural Heritage Program's (MTNHP) Roost Monitoring Database.

Both FH and the LHTA have had extensive mining, and numerous adits are present across these areas. As entry into abandoned mines can be dangerous, we deployed acoustic detectors (see previous section) to assess activity at the mine site and infer use. We did conduct a survey of a single small mine on FH that appeared to be stable. We used a timed visual encounter protocol for this survey, similar to the rock outcrop survey methods.

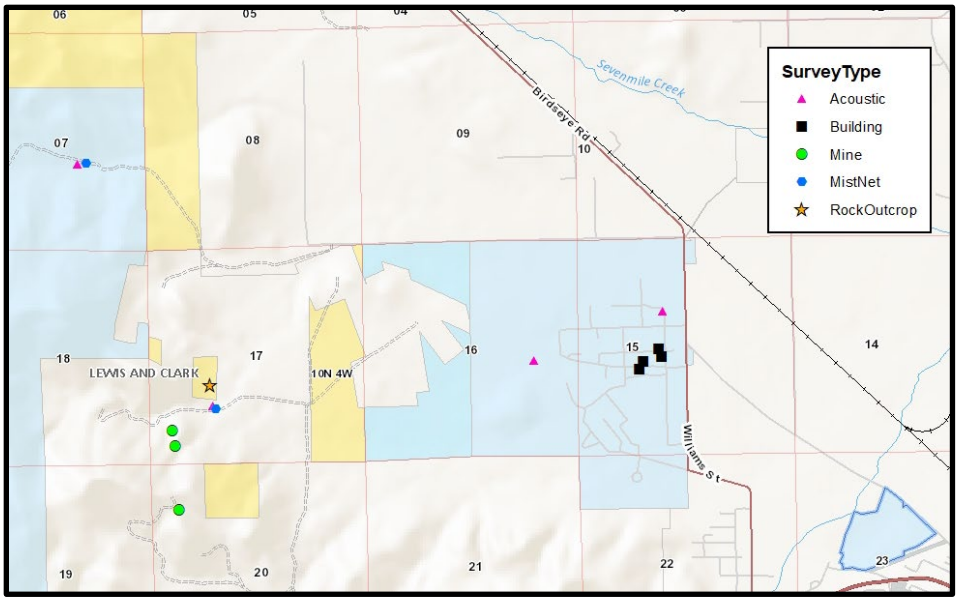


Figure 3. Survey locations within Fort Harrison.

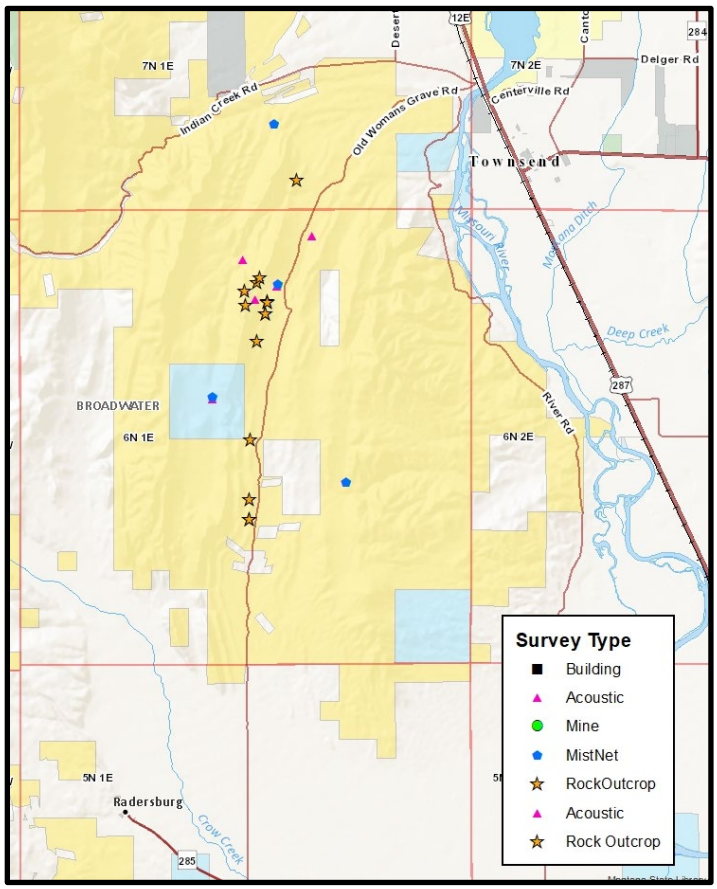


Figure 4. Survey location on the Limestone Hills Training Area

Results

Acoustic Surveys

Across the four acoustic deployments at Fort Harrison, we confirmed the presence of six species of bats (Table 1,Table 2). At the three short-term sites we recorded 9,093 calls over 47 detector/ nights. The "Dip Tank" detector which was deployed next to a large concrete basin accounted for most of the activity with 7,046 calls recorded and an average of 503 calls per night, the highest of any detector deployed in either area. Five species: Little Brown Bat (*Myotis lucifugus*), Western Small-footed Myotis (*M. ciliolabrum*), Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereous*), and Silver-haired Bat (*Lasionycteris noctivagans*) were confirmed at the detector. The detector deployed along Cherry Creek detected these same species and Long-eared Myotis (*M. evotis*), but recorded fewer calls. Across the 19 detector nights the unit was deployed, 1,741 calls were recorded with an average of 92 per night. We also deployed a detector at a wildlife tank within the urban area of the fort and in close proximity to a Big Brown Bat roost. This detector may have had some technological issues and recorded only 306 calls with an average of 21 per night. Three species were detected: Little Brown Bat, Hoary Bat, and Silver-haired Bat. The long-term detector deployed above a small spring recorded moderate activity levels during the active season, but relatively high diversity. During July the detector recorded 1997 calls and averaged 64 calls per night. The community of species recorded during this month was similar to the Cherry Creek site, except Western Small-footed Myotis was not recorded and Townsend's Big-eared Bat (*Corynorhinus townsendii*) was. Additionally, Fringed Myotis (*M. thysanodes*) was recorded at this site in the fall.

At the LHTA we deployed detectors at six sites, two long-term sites and four short-term sites (Table 1). The detector failed to record at one of the short-term sites due to unknown technical issues. At the three short-term sites we recorded 2,104 calls over 28 detector/nights. The Section 16 Spring site was the most active with 1,113 total calls recorded and an average of 124 per night. Four species were detected at the site: Little Brown Myotis, Long-eared Myotis, Hoary Bat, and Silver-haired Bat. The Wild Turkeys mine had approximately half of the activity of this site, but much higher diversity. Seven species were recorded at this site, including all species at the Section 16 Spring as well as Western Small-footed Myotis, California Myotis, and Big Brown Bat. The "Unnamed Mine" site had the lowest activity with 375 calls recorded over 9 nights and an average of 42 calls per night. Five species were recorded here including: Little Brown Myotis, Long-eared Myotis, Hoary Bat, Silver-haired Bat, and most notably Townsend's Big-eared Bat. The initial deployment location for the long-term detector (LH Long-term 1) was deployed adjacent to a natural pool and recorded high levels of activity until the site dried up. During its deployment period 4,915 calls were recorded over 21 detector/nights with an average of 234 calls per night. Seven species were recorded during this time period including all species detected with the short-term deployments except Townsend's Big-eared Bat. Additionally, Spotted Bat (*Euderma maculatum*) was recorded during this time period. The second location for this long-term detector recorded only 1,338 calls over 31 days in mid-July through mid-August and averaged 43 calls per night. Diversity was very similar to the previous long-term site except Townsend's Big-eared Bat was detected and Western Small-footed was not.

Table 1. Species detections during the active season at both short and long-term detectors with comparisons of total calls recorded and the average calls per night at each site. Long-term sites were restricted to recordings made in July and early August for comparison. Sites at Fort Harrison are noted with a FH in the site name and those at the Limestone Hills Training area with a LH. Species presence at a site is noted with an "X". Species are listed by 4-code representing the first two letters of genus and first two of species: MYLU = Myotis lucifugus, MYVO = M. volans, MYCI = M. ciliolabrum, MYCA = Myotis californicus, MYEV = M. evotis, MYTH = M. thysanodes, EPFU = Eptesicus fuscus, LACI = Lasiurus cinereus, LANO = Lasionycteris noctivagans, COTO = Corynorhinus townsendii, EUMA = Euderma maculatum.

Name	Latitude	Longitude	MY LU	MY VO	MY CI	MY CA	MY EV	MY TH	EP FU	LA CI	LA NO	CO TO	EU MA	Total Calls	Days Deployed	Calls/ Night
Sec. 16 Spring (LH)	46.2754	-111.6075	X				X			X	X			1113	9	123.6667
Wild Turkeys Mine (LH)	46.2947	-111.5956	X		X	X	X		X	X	X			616	10	61.6
Little Hog Back Mine (LH)	46.2964	-111.5985	Technical difficulties no bats recorded											0	11	0
Unnamed Mine 1 (LH)	46.3023	-111.5992	X				X			X	X	X		375	9	41.66667
Cherry Creek (FH)	46.6356	-112.154	X		X		X		X	X	X			1741	19	91.63158
Dip Tank (FH)	46.6223	-112.1095	X		X				X	X	X			7046	14	503.2857
Tank (FH)	46.6256	-112.0969	X							X	X			306	14	21.85714
FH Long-term	46.6192	-112.1411	X				X	X	X	X	X	X		1997	31	64.41935
LH Long-term 1	46.3069	-111.5799	X		X		X		X	X	X		X	4915	21	234.0476
LH Long-term 2	46.2972	-111.5896	X				X		X	X	X	X	X	1338	31	43.16129

Seasonal Activity and Species Presence

At the long-term detector site established at FH, robust but inconsistent activity was recorded throughout the summer. Consistent activity was not recorded at the detector until mid-August and continued through the end of September. Activity at the LHTA detectors peaked in July and declined to consistent low levels through mid-September. Between mid-October and March neither detector recorded bats. The first spring activity at the FH site was recorded on April 8th. The first activity recorded at the LHTA was on March 1st (Figure 5).

Species that were detected during the active season seemed to be consistently present within each area with the exception of Western Small-footed Myotis at Fort Harrison and California Myotis and Spotted Bat at the Limestone Hills (Table 2). Townsend's Big-eared Bat was not detected every month at either sites but given the difficulty detecting this species with acoustic methods this is not surprising. During the fall migration period, Big Brown Bat and Western Small-footed Myotis were not detected at either area despite consistent presence throughout the summer. Fringed Myotis was detected for the first time during this period at FH. Silver-haired bat was the only species consistently detected into October at each installation. No activity was recorded between November and March at the LHTA and November and April at FH. Western Small-footed Myotis was the only species detected in April at the LHTA.

Table 2. Species detections at Fort Harrison and the Limestone Hills Training Area by month. Acoustic detections of each species for the month are noted as "A", in hand detections as "D". Species are listed by 4-code representing the first two letters of genus and first two of species: MYLU = Myotis lucifugus, MYVO = M. volans, MYCI = M. ciliolabrum, MYCA = Myotis californicus, MYEV = M. evotis, MYTH = M. thysanodes, EPFU = Eptesicus fuscus, LACI = Lasiurus cinereus, LANO = Lasionycteris noctivagans, COTO = Corynorhinus townsendii, EUMA = Euderma maculatum.

	Species	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**
		Active Season			Migration/ Swarming		Hibernation				Spring Emergence	
	MYLU	A	A	A	A							
Fort Harrison	MYVO											
	MYCI			A								
	MYCA											
	MYEV	A	A	A D	A							
	MYTH				A							
	EPFU	A	A	A								
	LACI	A	A	A	A							
	LANO	A	A	A	A	A						
	COTO		A		A							
	EUMA											
Lime-stone Hills Training Area	MYLU	A	A	A D	A							
	MYVO											
	MYCI	A	A D	D	A						A	
	MYCA		A									
	MYEV	A	A	A D	A							
	MYTH											
	EPFU	A	A	A								
	LACI	A	A	A	A							
	LANO	A	A	A	A	A						
	COTO		A		A							
	EUMA		A		A							

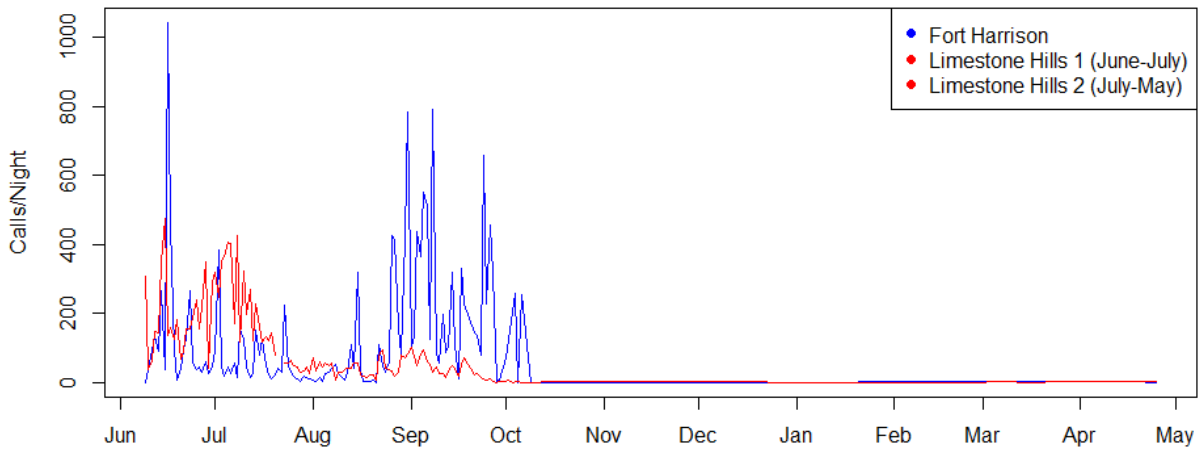


Figure 5. Nightly activity (calls per night) recorded at three detector locations on Fort Harrison and the Limestone Hills Training Area. In July the spring by the original Limestone Hills detector (Limestone Hills 1) dried out and the detector was moved 1.3 km SW to the nearest spring. No activity was recorded between November and March at either site, but both detectors began to record low levels of activity in the early spring (5 or fewer calls per night).

Direct Capture Surveys

We conducted six nights of mist netting across both areas, covering all available water features suitable for netting. On FH we netted at a spring within a stand of cottonwoods (Cottonwood Spring, same site as the long-term acoustic detector) but did not capture any bats. We also netted Cherry Creek and captured three adult male Long-eared Myotis. On the LHTA we netted four springs and captured three individuals representing two species. At the Site 16 spring we captured two Long-eared Myotis and at the Wheeler Spring we captured a single Western Small-footed Myotis. No bats were captured at RO Springs or Side Camp Spring (Table 3).

Table 3. Capture summary and locations for mist net sites on Fort Harrison (FH) and the Limestone Hills Training Area (LHTA)

Name	Latitude	Longitude	MYCI	MYEV
RO Springs (LHTA)	46.29754	-111.58932		
Side Camp Spring (LHTA)	46.25944	-111.57045		
Cottonwood Spring (FH)	46.61907	-112.14082		
Cherry Creek (FH)	46.63565	-112.15356		D
Site 16 (LHTA)	46.2759	-111.60758		D
Wheeler Spring (LHTA)	46.3284	-111.59054	D	

Mine surveys

Although common across both areas, we only surveyed three areas with mining activity in FH. We examined several mine sites in the LHTA, but all were pits that would require technical rope work to enter. At the FH sites, we examined the workings of a small mine and did not observe roosting bats or bat sign. The other two sites, a gated pit and area with significant surface mining did not appear to have features likely to be used by bats (see Appendix B for survey locations).

Building Surveys

We examined four groups of buildings at FH for evidence of bat presence. Three of the four had no evidence of bat use, but we located a roost in an alcove adjacent to the northern side of the Montana Military Museum Building. Genetic testing confirmed this to be a Big-brown Bat roost (see Appendix B for survey locations).

Rock Outcrop Surveys

Across both FH and the LHTA we surveyed 10 rock outcrops (Table 4). Only one of these surveys was performed in FH due to a lack of suitable rock features in the area, and we did not detect bats or bat sign. We focused the other nine surveys on the extensive rock outcrops within the LHTA. Across all areas we found 53 roosts with 21 occupied. We detected three species and 28 individuals, Long-eared Myotis (8), Western Small-footed Myotis (11), and Little Brown Myotis (2). Five roosts appeared to be maternity roosts as indicated by the presence of both adults and juveniles co-roosting. One was occupied by four long-eared Myotis, and four were occupied by pairs of western Small-footed Myotis. Time to detection for the seven occupied outcrops ranged from 1 minute to 45 minutes and averaged 20 minutes.

Table 4. Location, detection summary and survey effort for rock outcrop surveys performed on Fort Harrison (FH) and the Limestone Hills Training Area (LHTA). Species are listed as four-codes (MYLU = MYEV = M. evotis, MYCI = M. ciliolabrum, MYLU = Myotis lucifugus) detection of a day roost is noted with a "D", and a maternity roost an "M". For specific roost locations see Appendix A.

Site	Date	Latitude	Longitude	Person/ Hours	Roosts Occupied	Roosts not occupied	Minutes to first detection	MY EV	MY CI	MY LU
1 LH	7/21/21	46.2988	-111.5944	16	0	8	-			
2 LH	7/21/21	46.2988	-111.5944	12	3	5	21	M D		
3 LH	7/22/21	46.2960	-111.5930	16	5	3	15	D	M D	
4 LH	7/22/21	46.2963	-111.5985	3	1	1	1		D	D
5 LH	8/2/21	46.2950	-111.5984	6	2	2	27		D	D
6 LH	8/3/21	46.3209	-111.5809	6	2	3	45		D	
7 LH	8/4/21	46.2677	-111.5971	3.75	2	3	30		M D	
8 LH	8/5/21	46.2511	-111.597	4	5	4	10		M D	D
9 LH	8/5/21	46.2866	-111.5950	3	0	1	-			
1 FH	7/19/21	46.6206	-112.1413	4	0	0	-			

Discussion

Activity patterns

Activity patterns differed significantly between FH and the LHTA (Figure 5). That the most consistent activity observed at the FH long-term detector was in September is surprising. Typical activity peaks recorded in Montana are in mid-Summer, with a second peak in August and early September (Bachen et al. 2018). The observation that a peak in activity was observed during the migration period may indicate that FH is within a migration corridor, or that swarming sites exist within the vicinity. The increased number of auto-classified calls attributed to Silver-haired bats (Figure 6), which are thought to migrate (Bachen et al. 2020b), supports the migration corridor hypothesis. In contrast, the LHTA detectors recorded a more typical pattern of activity with relatively constant activity during parturition and when young are becoming volant with a slight increase in the late summer as animals begin to migrate to overwintering sites.

Habitat associations

Water and suitable roost habitat are perhaps the most important habitat features within any area occupied by bats, followed by areas that concentrate insect activity. Although Fort Harrison and associated lands are relatively close to the Limestone Hills training area, both areas differ in the resources that each provide, and as such their use by bats.

Water Sources

The dip tank at Fort Harrison provides a frequently used water source for animals roosting or foraging near Fort Harrison as shown by the relatively high nightly activity (Table 1). Although this tank was not designed for wildlife use, it is an ideal water source for bats. Bats drink on the wing and require calm water free from obstructions such that approach and departure are uncluttered (Jackrel and Matlack 2010). This feature provides these attributes and is located in an area without other areas of standing water and is likely important for local animals. Dewatering, changes to the structure, or increase in vegetation which impedes flight around the perimeter could impact use and suitability.

Cherry Creek is one of the few significant hydrological features present on Fort Harrison and likely provides opportunities for animals to drink as well as increasing insect abundance within the local area. Several areas of the creek were unobstructed and had relatively still water such that animals could drink, including the mist net site where we captured several Long-eared Myotis. However, most of the creek is incised and has dense vegetation surrounding it with little pooled water. Restoration of reaches to increase pooled water and decrease dense vegetation would increase drinking and foraging opportunities and support local bat populations.

The Limestone Hills Training Area has more springs and water sources than Fort Harrison, but these appear to be less important for bats. Most springs are fed into tanks, which can provide water sources for bats (Jackrel and Matlack 2010). However, in this area use of these features appears very low. Over four nights of mist netting, we captured three bats, which is much lower than typical capture rates in other areas of Montana (MTNHP Bat Capture and Morphometric Database 2022). If the abundance of bats on the training range was also low, this would not be surprising. However, the high rates of detection during rock outcrop surveys and robust acoustic activity indicate the area is well used by bats. The abundance of bats and low use of springs indicates that the animals are getting water elsewhere, likely the Missouri River given its proximity. Bats are known to travel from roost features to access other

resources like food and water, and even our smallest species, the Western Small-footed Myotis can travel 10's of kilometers each night (Rodhouse and Hyde 2014). Given the abundance of aquatic insects and water the river can provide it is not surprising that other smaller water sources are ignored. This pattern is typical across other regions of the state where large waterbodies have been observed receiving higher use by bats than smaller ones or dry areas (Bachen et al. 2018).

Roost Features

Fort Harrison has two types of features that may be used as roosts by bats, buildings and trees. We conducted exterior surveys across a portion of the buildings on the fort and observed a single Big Brown Bat roost. Given the variation of building types and ages, it is possible other roosts exist in buildings we did not survey or that were not detected during our surveys. Buildings can provide important maternity roosts for many of Montana's species (Bachen et al. 2019). Roosts can also be problematic due to guano accumulation and concerns about disease exposure to people working within buildings. If removal of a colony is desired, it is best to seal all entrances when the animals have migrated to their overwintering sites (late-October to early-April). Although tree roosts were not directly observed, 7 of the 8 species present on Fort Harrison roost within or on trees (Bachen et al. 2018) and the forests in the local area undoubtedly contain roost trees. Large diameter trees and prominent snags are often used as roosts in Montana (Bachen et al. 2018). When implementing timber harvest or other forest management practices potential impacts on bats should be considered, particularly when these projects are conducted during the late spring and summer as they may adversely impact maternity roosts. As bats are unlikely to overwinter in trees in our area project, conducted in the late summer, fall, and winter would not be expected to impact any tree roosting species.

The LHTA has buildings and forests and extensive areas of exposed rock. Rock roosts are used by all species detected in this area (as reviewed by Bachen et al. 2018). We found extensive use across almost all the outcrops we surveyed. Given this, any outcrop within the training area should be considered potential bat habitat and sensitive to disturbance during the spring and summer. The proximity of these roosts to the Missouri River, which produces abundant food resources and provides water, creates a relatively unique system where bats roost in the LHTA but commute to the river to forage and drink. We observed this nightly movement when conducting mist net surveys and in the acoustic data where most calls at the detectors are recorded within the first hour after sunset.

We did not record any bat calls during the winter at either FH or the LHTA. This may have been the result of technical issues due to the cold weather, but this might also indicate that animals are migrating to other areas to overwinter. Western Small-footed Myotis and Big Brown Bat are consistently recorded on detectors during the winter months (Bachen et al. 2018). At both long-term detector sites, these species were not recorded past September, which is surprising given the consistent detections of both species during the summer. This might indicate migratory behavior, but further study is needed to assess this.

We did observe several mines in the LHTA with what appeared to be extensive workings. Mines may be used by Townsend's Big-eared Bat to overwinter and as sites for maternity colonies (Bachen et al. 2019). Several maternity colonies within this region are known, and the detections of this species in proximity to mine sites may indicate use as roosts. With some significant exceptions, mine and cave use by other species appears to be opportunistic. Across the western United States, bats other than Townsend's Big-eared Bat rarely overwinter in caves and mines (Weller et al. 2018). In Montana, caves and mines are

used by most species, but large aggregations are rare (Bachen et al. 2019). However, potential impacts to roosting bats should be considered if closure of larger mines is proposed. If bat use cannot be ruled out through direct survey, bat friendly gates should be used to maintain access to the mine workings.

Species Detections

We detected several uncommon and notable species during these surveys. California Myotis was recorded at the Wild Turkeys Mine Site on the LHTA in July 2021. The LHTA is on the eastern edge of the species range in Montana, so its presence is not particularly surprising, but this observation is important for understanding the habitat associations of the species. Across most of its range in the state the species occupies relatively mesic habitats. That the species is present on the LHTA indicates that more xeric habitats may be used, and the species may be distributed farther east than its current range would suggest. Further surveys of similar habitats in the Big Belt Mountains and other areas of central Montana are needed to determine species presence and assess range.

Townsend's Big-eared Bat is widely distributed, but rarely common within any area of Montana. We detected the species in both areas using acoustic methods. This species is difficult to record as it echolocates quietly (Bachen et al. 2018). That it was recorded multiple times may indicate that the species is common within both areas. Currently this species is listed as a Species of Conservation Concern under the State's Wildlife Action Plan due to loss of habitat related to closures of old mines and general lack of information (Montana's State Wildlife Action Plan 2015).

Fringed Myotis was only detected in September at the FH long-term detector. The lack of consistent detections during the active season and detection during the fall migratory period may indicate that this was a migratory individual. Migration of North American bats is poorly understood (Pierson 1998) and the extent of migratory movements of all species in Montana are completely unknown.

Spotted Bat was the rarest species detected during this study. We recorded infrequent calls at both the LHTA long-term detector sites in July and September. This species is known from the Helena Valley and can travel over 40 km between foraging areas and roosting areas (Chambers et al. 2011). The species is thought to favor large cliffs as roost, but acoustic data from the Bull Mountains suggests use of relatively small sandstone outcrops (Bachen et al. 2020b). It is possible, but unlikely, that the species roosts on the LHTA and more consistent detections would be needed to support this. Fortunately, Spotted Bat is the only species in Montana that produces echolocation calls audible to the human ear. If regular "click" calls are heard, they should be reported to MTNHP.

Although we detected most species thought to be present in the area, we did not detect Long-legged Myotis (*M. volans*), or Yuma Myotis (*M. yumanensis*). Long-legged Myotis is difficult to detect using acoustic methods (Bachen et al. 2018). Although the species is common and relatively easy to record, the shape of its calls is similar to other *Myotis* bats in Montana, and most calls cannot be distinguished from other species with confidence (Bachen et al. 2018). Fort Harrison had relatively high numbers of calls that the Sonobat auto-classifier identified as this species (Figure 6). The LHTA also had calls that were attributed to this species (Figure 7). Although these calls were not definitively made by this species, the higher volumes suggest the presence of this species. As it is common in many regions of the state, particularly in forested areas (Bachen et al. 2019), it is likely present within both areas. If confirmation of species presence is necessary, targeted mist netting should be conducted.

That we did not detect Yuma Myotis is less surprising. The species range in Montana is poorly defined (Bachen et al. 2019) due to confusion in-hand with the similar Little Brown Myotis. Currently the closest confirmed observation is approximately 70 kilometers northwest of FH near Helmville in the Blackfoot River Valley (NHP Point Observation Data 2022). Given the habitat similarities and proximity, it is possible that the species may be found within the study area, but further effort is needed to confirm this.

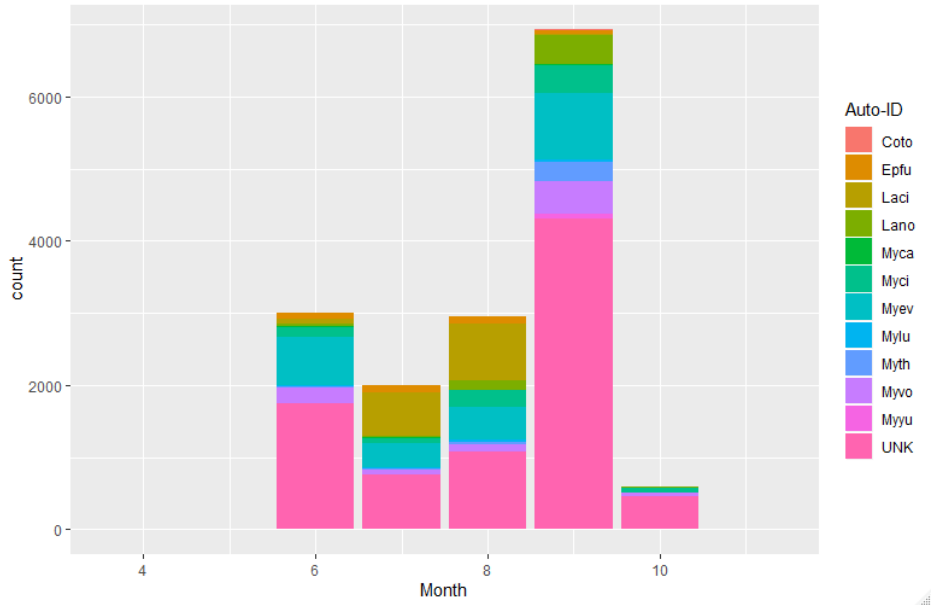


Figure 6. Auto-classification results from the Fort Harrison acoustic detector

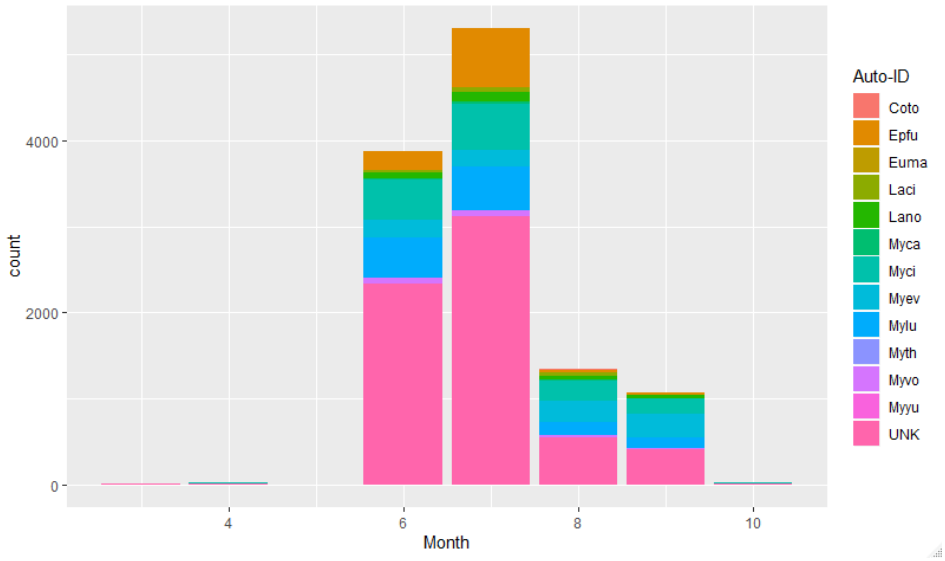


Figure 7. Auto-classification results for the Limestone Hills Training Area acoustic detectors

Survey Protocols

Use of multiple survey protocols allowed a rigorous assessment of the community of bat species present within the area of interest. The diversity of surveys was also crucial as the effectiveness of these surveys was not what we typically experience at other sites. Mist net captures were very low, and the survey method appears to be ineffective at all sites except for Cherry Creek on FH. In contrast, rock outcrop surveys were much more effective at locating bats than in other areas where we have implemented this protocol. As the use of this protocol is not widespread it is difficult to quantify differences in time to detection and the standardized number of roosts found, anecdotally the outcrops in the LHTA were among the most heavily used that we have surveyed in Montana and the Dakotas.

Conservation Status and Threats

Many of the bat species detected on both FH and the LHTA are listed as state Species of Concern (SOC) (Appendix C). Little Brown Myotis is also under review for listing under the Endangered Species Act (US Fish and Wildlife Service 2022). *Myotis* bats were added to the state's SOC list due to significant threats of population decline due to White-Nosed Syndrome (WNS), a disease caused by the pathogenic fungus *Pseudogymnoascus destructans* (Pd). This disease has caused significant population declines of *Myotis* bats in the eastern regions of North America (Blehert et al. 2008, Lorch et al. 2011) and has been found in eastern Montana (White-Nose Syndrome Occurrence Map 2022). As *Pd* spreads across Montana, declines of most or all of the *Myotis* species found within the study area as well as Big Brown Bat, may occur. Once the fungus establishes within the area, repeated monitoring of bats at known roost sites and observation of landscape activity with acoustics will allow assessment of local impacts.

Several other species found within the area face threats from wind energy facilities due to mortalities resulting from collision with turbine blades. Tree roosting bat species including Hoary Bat and Silver-haired Bat are particularly vulnerable to this threat (Arnett et al. 2008). Although the impact of increased wind energy development on these species is not well quantified, collision with turbines may cause catastrophic declines (Frick et al. 2017). Both species are easily monitored with acoustic detectors and regional efforts like the North American Bat Monitoring Project will allow assessment of status and quantification of declines in site occupancy and abundance if they occur. If wind energy development is considered within or adjacent to the study area, impacts on these species should be considered. Given the high likelihood that areas within and around FH are used by migratory Silver-haired bats, development in this area may result in greater impacts to this species.

Management and Monitoring Recommendations

Management of roost features used by bats within FH and the LHTA is likely to have the biggest impact on local populations. Roosts are made in a variety of natural and anthropogenic features including crevices and cracks in rock outcrops, both live and dead trees, and buildings, bridges, and mines. Based on literature documenting roost preferences (see Bachen et al. 2018 for a comprehensive review of known roost types by species) and life history of the species determined to be present within the study area, we recommend the following actions for species conservation within the study area.

1. Maintain potential roost trees, including large diameter trees, snags, and partially dead trees that provide cavities or loose bark for animals to roost in unless they pose a hazard to people in the immediate area. If removal is necessary, wait until the late fall or winter to remove trees suspected or known to support roosting bats.

2. Before modification of any buildings or bridges, conduct surveys to establish whether the structures are used as roosts. These surveys could include searching for guano deposits and urine staining on the exterior of the building and attic spaces. Also, examine external crevices and internal areas of structures for roosting bats. If feasible, conduct exit counts at dusk at potential exit points from the structure. If bats are found and exclusion is desired, follow best practices for exclusion (e.g. http://www.batcon.org/resources/for-specific-issues/bats-in-buildings/excluding-a-colony) and place alternative roost structures (bat boxes) in the local area to compensate for the loss of roosting habitat.
3. Surveys to determine bat use of rock outcrops, caves, and mines, and other potential roosts should be conducted prior to any modification of these features.
4. Avoid disturbance of known maternity roosts between May and July and known hibernaculum between October and April.

Monitoring of Species of Concern within Montana is generally performed on an annual, five, or ten-year interval to quantify short-term trend in population (Montana Natural Heritage Program 2021). Survey interval is generally dictated by threat or rate of decline and the life history of the species being monitored, as well as statistical considerations like probability of detection and survey logistics. Habitat changes, regional wind energy development, and disease (WNS) are most likely to drive changes to local bat populations and impact the community of species using FH and the LHTA. These threats may have significant impacts in the coming decades, but associated declines may be difficult to detect in the short-term using current monitoring methods. If monitoring of bat species and populations across FH and the LHTA is conducted the interval of monitoring should be long enough such that differences in the index assessed are measurable but frequent enough that management actions can be implemented. Given these considerations we recommend:

1. Redeployment of acoustic bat detector/ recorders between May and November at sites with previous long-term deployments. Data collected should be analyzed for monthly species presence and comparisons of the number of auto-classified calls by species and species groups and species presence should be made to previous years deployments. Monitoring should be conducted every five years.
2. Roost monitoring to supplement and support any trend derived from acoustic monitoring. Known roosts should be monitored in the following ways:
    a. Monitoring of roost in rocks can be problematic as animals may frequently move between cracks. Monitoring for use of occupied outcrops should be repeated every 5 - 10 years to assess whether the outcrop continues to be occupied. The community of species detected within each outcrop and the number of roosts should then be compared with previous assessments.
    b. Exit counts at building roosts of WNS sensitive species should be conducted in June and repeated annually to explore population trajectory as this disease progresses into this area.
3. Dead or sick bats encountered should be reported immediately to the Montana Natural Heritage Program or Montana Fish Wildlife and Parks upon detection.

Literature Cited

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Tankersley, Jr. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72(1):61-78.

Bachen, D.A., A.L. McEwan, B.O. Burkholder, S.L. Hilty, S.A. Blum, and B.A. Maxell. 2018. Bats of Montana: Identification and Natural History. Report to Montana Department of Environmental Quality. Montana Natural Heritage Program. Helena, MT. 111pp.

Bachen, D.A., A. McEwan, B. Burkholder, S. Blum, and B. Maxell. 2019 Features used as Roosts by Bats in Montana. Report to Montana Department of Environmental Quality. Montana Natural Heritage Program, Helena, Montana. 23 p. plus appendices.

Bachen, D. A., B. O. Burkholder, A. L. McEwan, S. L. Hilty, S. A. Blum, and B. A. Maxell. 2020a. Long-term acoustic assessment of bats at Gates of the Mountains, Montana for 2013-2015. Report to MTNHP. Montana Natural Heritage Program, Helena, Montana. 20 pp.

Bachen, D.A., A. McEwan, B. Burkholder, S. Blum, and B. Maxell. 2020b. Accounts of Bat Species Found in Montana. Report to Montana Department of Environmental Quality. Montana Natural Heritage Program, Helena, Montana. 58 p.

Blehert, D.S., A.C. Hicks, M. Behr, C.U. Meteyer, B.M. Berlowski-Zier, E.L. Buckles, J.T.H. Coleman, S.R. Darling, A. Gargas, R. Niver, J.C. Okoniewski, R.J. Rudd, and W.B. Stone. 2008. Bat white-nose syndrome: an emerging fungal pathogen? Science 323: 227. DOI:10.1126/science.1163874

Chambers, C.L., M.J. Herder, K. Yasuda, D.G. Mikesic, S.M. Dewhurst, W.M. Masters, and d. Vleck. 2011. Roosts and home ranges of spotted bats (Euderma maculatum) in northern Arizona. Canadian journal of zoology 89(12): 1256-1267.

Frick, W.F., E.F. Baerwald, J.F. Pollock, R.M.R. Barclay, J.A. Szymanski, T.J. Weller, A.L. Russell, S.C. Loeb, R.A. Medellin, and L.P. McGuire. 2017. Fatalities at wind turbines may threaten population viability of a migratory bat. Biological Conservation 209: 172-177.

Jackrel, S.L., and R.S. Matlack. 2010. Influence of surface area, water level and adjacent vegetation on bat use of artificial water sources. The American Midland Naturalist 164(1): 74-79.

Lorch J.M., C.U. Meteyer, M.J. Behr, J.G. Boyles, P.M. Cryan, A.C. Hicks, A.E. Ballmann, J.T.H. Coleman, D.N. Redell, D.M. Reeder, and D.S. Blehert. 2011. Experimental infection of bats with Geomyces destructans causes white-nose syndrome. Nature 480:376–378. DOI:10.1038/nature10590.

Maxell, B.A. Coordinator. 2015. Montana Bat and White-Nose Syndrome Surveillance Plan and Protocols 2011-2016. Montana Natural Heritage Program. Helena, MT 205 p.

Montana Natural Heritage Program. 2021. Conservation Status Assessment Definitions, Process, Rank Factors, and Calculation of State Ranks for Montana Species. 18 p.

Montana's State Wildlife Action Plan. 2015. Montana Fish, Wildlife & Parks, 1420 East Sixth Avenue, Helena, MT 59620. 441 pp

Pierson E. D. 1998. Tall trees, deep holes, and scarred landscapes. Pp. 309–325 in Bat biology and conservation (Kunz T. H. Racey P. A., eds.). Smithsonian Institution Press, Washington, D.C.

Rodhouse, T. J., and K.J. Hyde. 2014. Roost and forage site fidelity of western small-footed myotis (Myotis ciliolabrum) in an Oregon desert canyon. *Western North American Naturalist*, *74*(2), 241-248.

US Fish and Wildlife Service. 2022. Little brown bat species profile. https://ecos.fws.gov/ecp/species/9051. Accessed May 30, 2022.

White-nose Syndrome Disease Management Working Group. 2020. National White-Nose Syndrome Decontamination Protocol - October 2020. www. WhiteNoseSyndrome.org

White-Nose Syndrome Occurrence Map. 2022. https://www.whitenosesyndrome.org/where-is-wns. Accessed May 15, 2022.

Appendix A Roost Locations

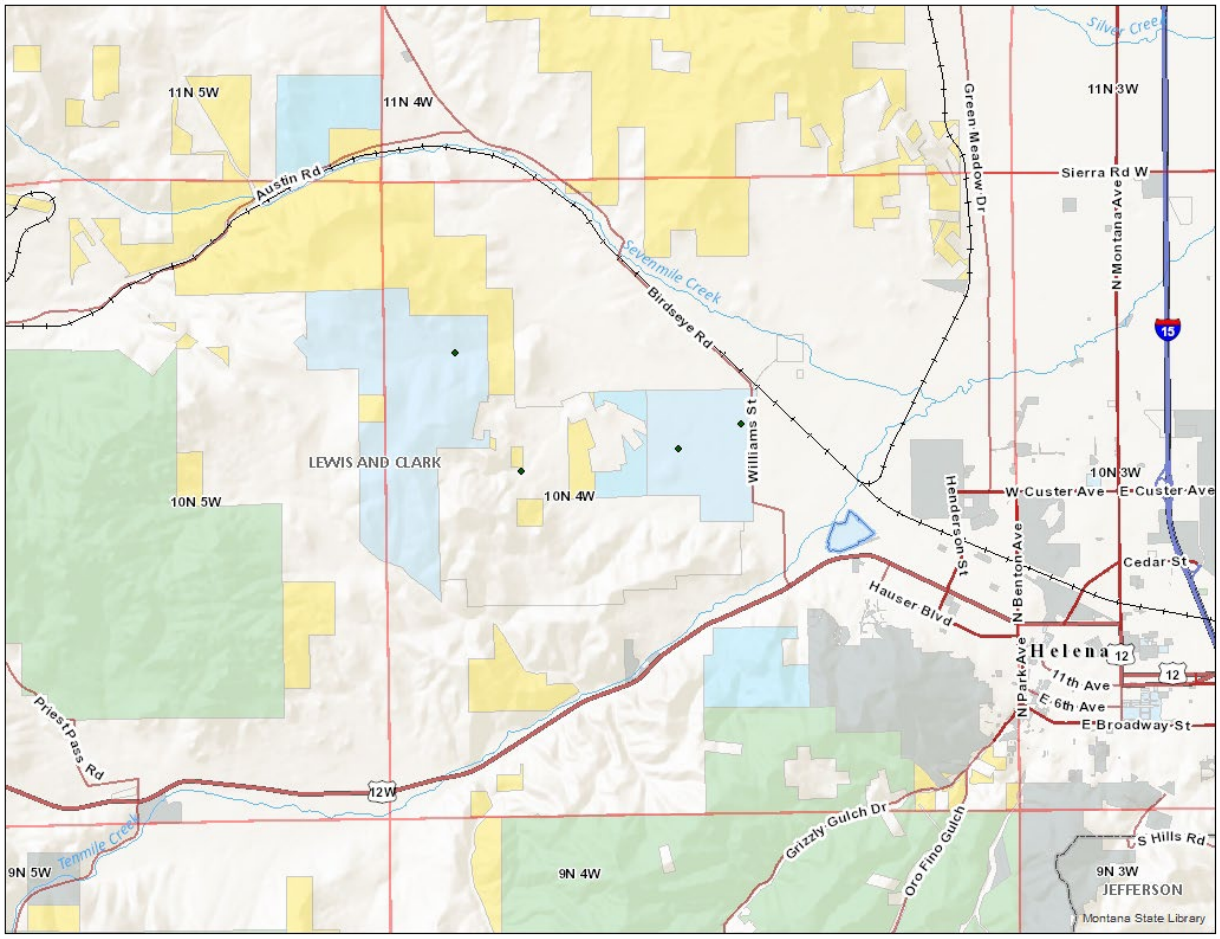
Roost Feature	Roost Type	Latitude	Longitude	Species
Rock Outcrop	Unoccupied	46.299	-111.594	
Rock Outcrop	Unoccupied	46.29948	-111.594	
Rock Outcrop	Unoccupied	46.29959	-111.594	
Rock Outcrop	Unoccupied	46.29976	-111.594	
Rock Outcrop	Unoccupied	46.30014	-111.593	
Rock Outcrop	Unoccupied	46.30016	-111.593	
Rock Outcrop	Unoccupied	46.30061	-111.593	
Rock Outcrop	Unoccupied	46.29867	-111.595	
Rock Outcrop	Unoccupied	46.29852	-111.595	
Rock Outcrop	Day	46.29802	-111.595	MYEV
Rock Outcrop	Day	46.29788	-111.595	MYEV
Rock Outcrop	Unoccupied	46.29518	-111.592	
Rock Outcrop	Day	46.29198	-111.593	MYEV
Rock Outcrop	Unoccupied	46.29544	-111.599	
Rock Outcrop	Day	46.29394	-111.599	MYCI
Rock Outcrop	Unoccupied	46.29388	-111.598	
Rock Outcrop	Unoccupied	46.00152	-111.582	
Rock Outcrop	Day	46.31742	-111.584	MYCI
Rock Outcrop	Unoccupied	46.26811	-111.597	
Rock Outcrop	Day	46.26833	-111.598	MYCI
Rock Outcrop	Maternity	46.26876	-111.597	MYCI
Rock Outcrop	Unoccupied	46.25174	-111.598	
Rock Outcrop	Unoccupied	46.25178	-111.598	
Rock Outcrop	Day	46.25234	-111.597	MYCI
Rock Outcrop	Day	46.29641	-111.599	MYLU
Rock Outcrop	Day	46.25284	-111.597	MYCI
Rock Outcrop	Maternity	46.29793	-111.595	MYEV
Rock Outcrop	Day	46.29428	-111.592	MYCI
Rock Outcrop	Day	46.29404	-111.592	MYCI
Rock Outcrop	Day	46.29196	-111.593	MYCI
Rock Outcrop	Day	46.29195	-111.593	MYEV
Rock Outcrop	Day	46.29636	-111.599	MYLU
Rock Outcrop	Day	46.29354	-111.598	MYLU
Rock Outcrop	Day	46.3177	-111.584	MYCI
Rock Outcrop	Maternity	46.25237	-111.597	MYCI
Rock Outcrop	Maternity	46.25239	-111.597	MYCI
Rock Outcrop	Day	46.2562	-111.597	MYCI
Rock Outcrop	Unoccupied	46.30049	-111.593	

Roost Feature	Roost Type	Latitude	Longitude	Species
Rock Outcrop	Unoccupied	46.29837	-111.595	
Rock Outcrop	Unoccupied	46.29834	-111.595	
Rock Outcrop	Unoccupied	46.29818	-111.595	
Rock Outcrop	Unoccupied	46.29516	-111.592	
Rock Outcrop	Unoccupied	46.29386	-111.592	
Rock Outcrop	Unoccupied	46.2947	-111.598	
Rock Outcrop	Unoccupied	46.29412	-111.598	
Rock Outcrop	Unoccupied	46.31961	-111.582	
Rock Outcrop	Unoccupied	46.31737	-111.584	
Rock Outcrop	Unoccupied	46.2686	-111.597	
Rock Outcrop	Unoccupied	46.26914	-111.597	
Rock Outcrop	Unoccupied	46.25146	-111.598	
Rock Outcrop	Unoccupied	46.2515	-111.598	
Rock Outcrop	Unoccupied	46.25155	-111.598	
Rock Outcrop	Unoccupied	46.2892	-111.594	
Building	Unknown	46.62264	-112.097	EPFU

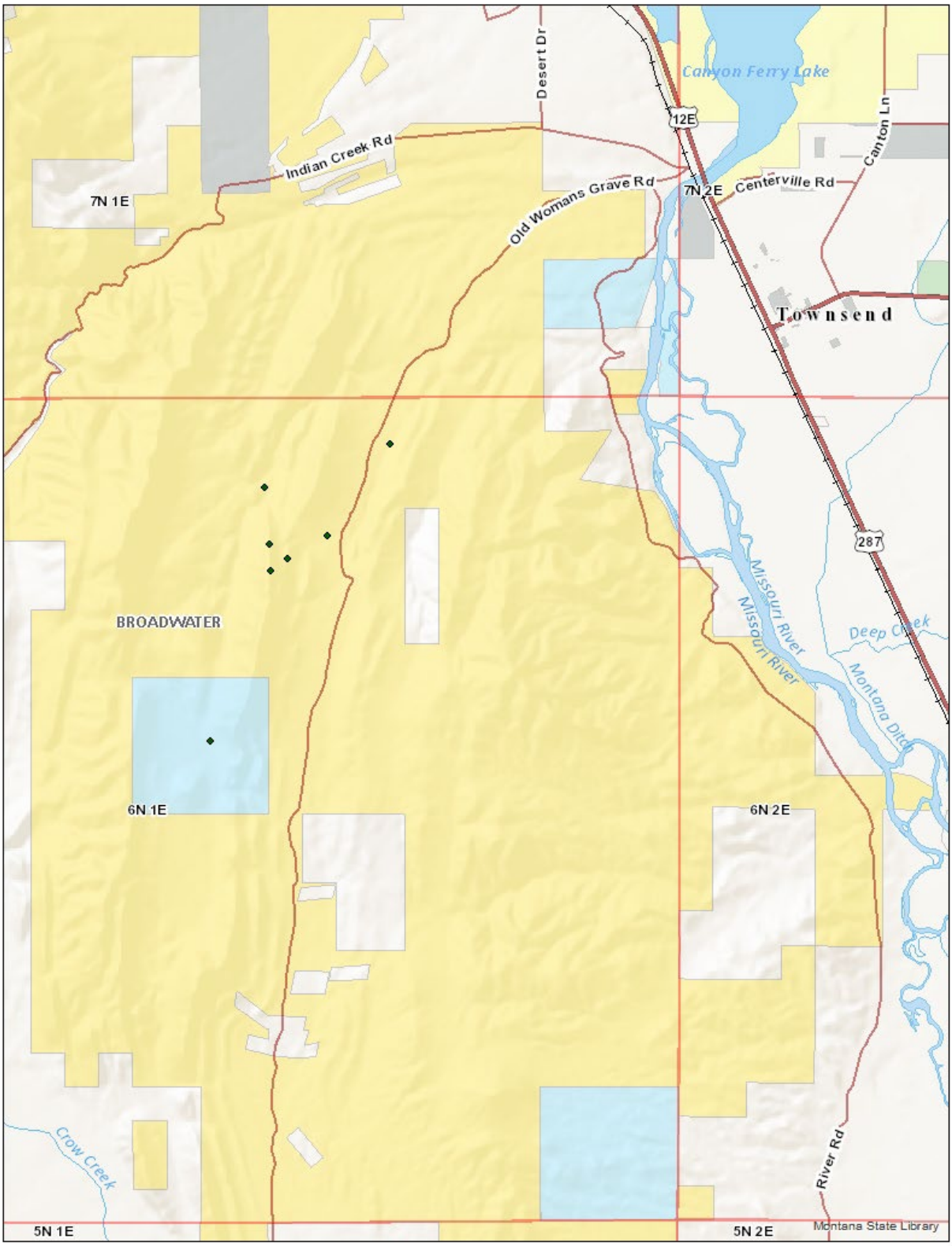
Appendix B

Species Detection Locations

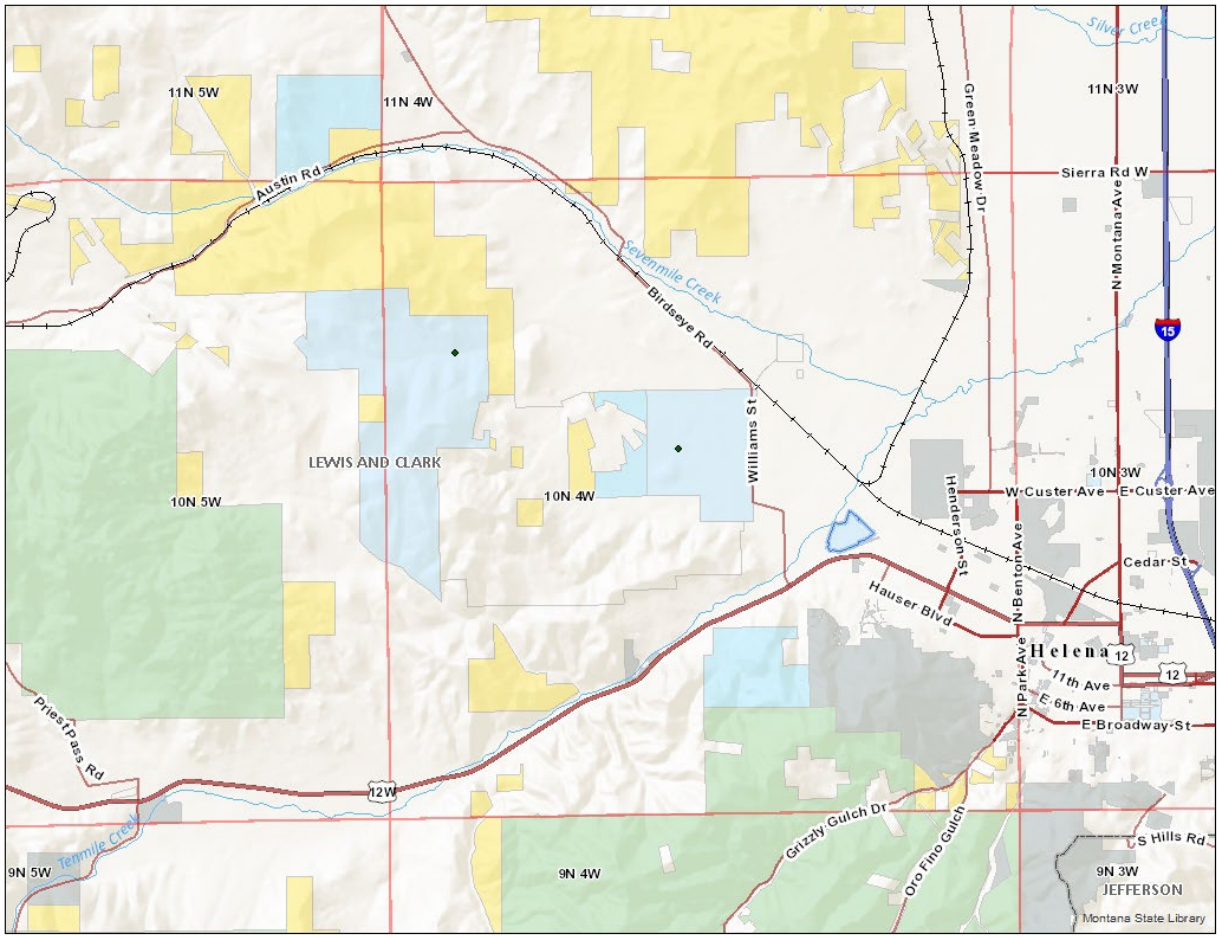
Fort Harrison - Little Brown Bat



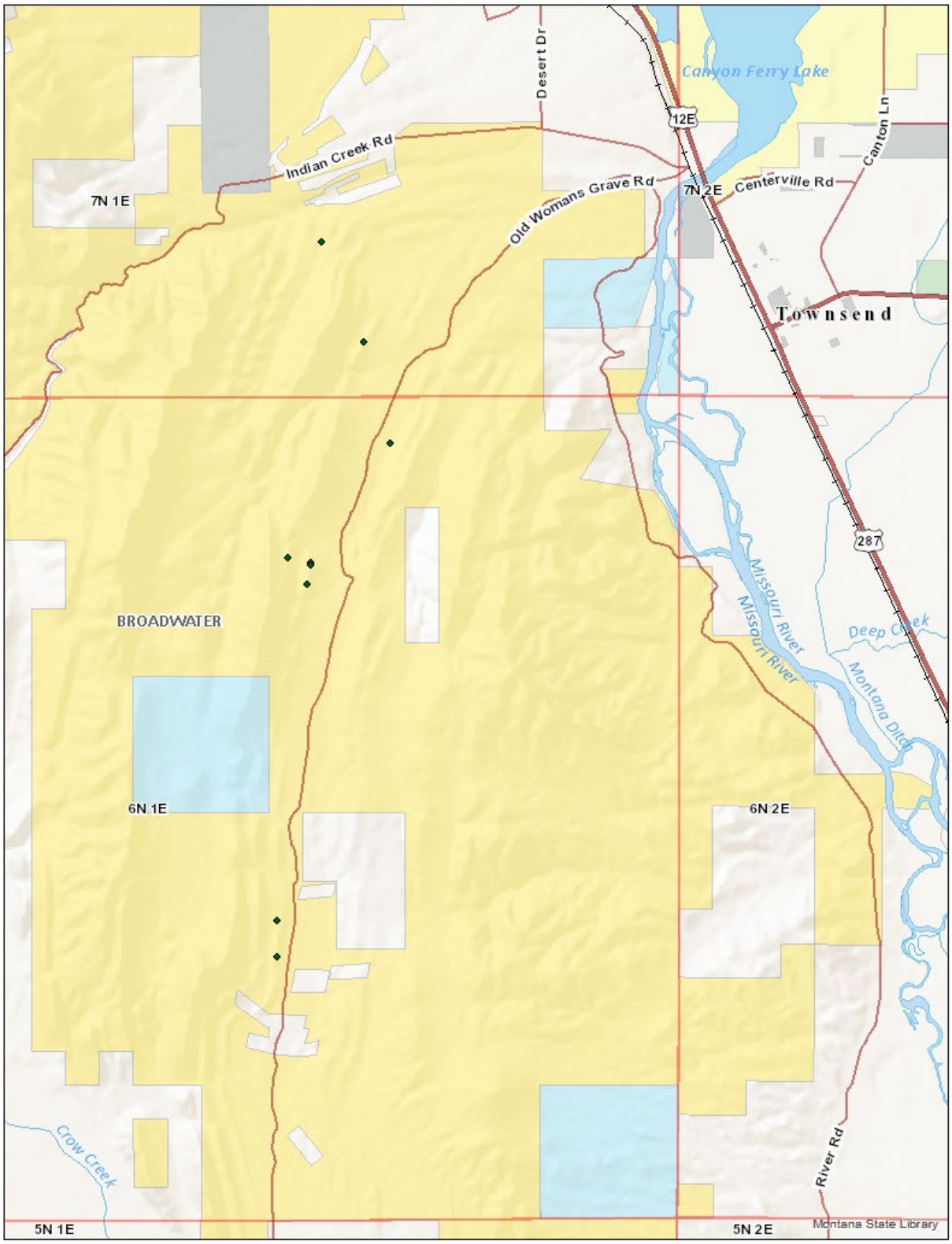
Limestone Hills Training Area - Little Brown Bat



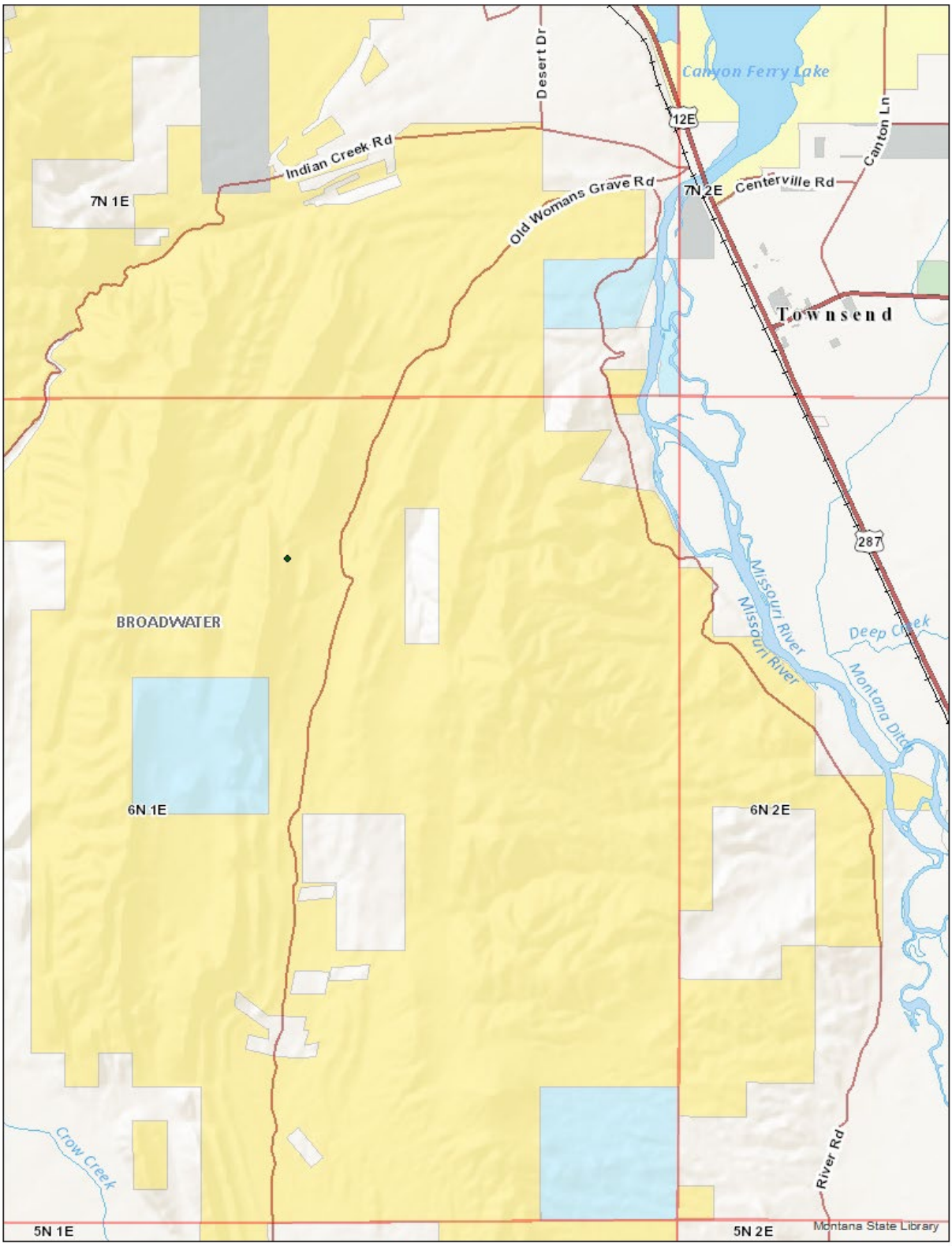
Fort Harrison – Western Small-footed Myotis



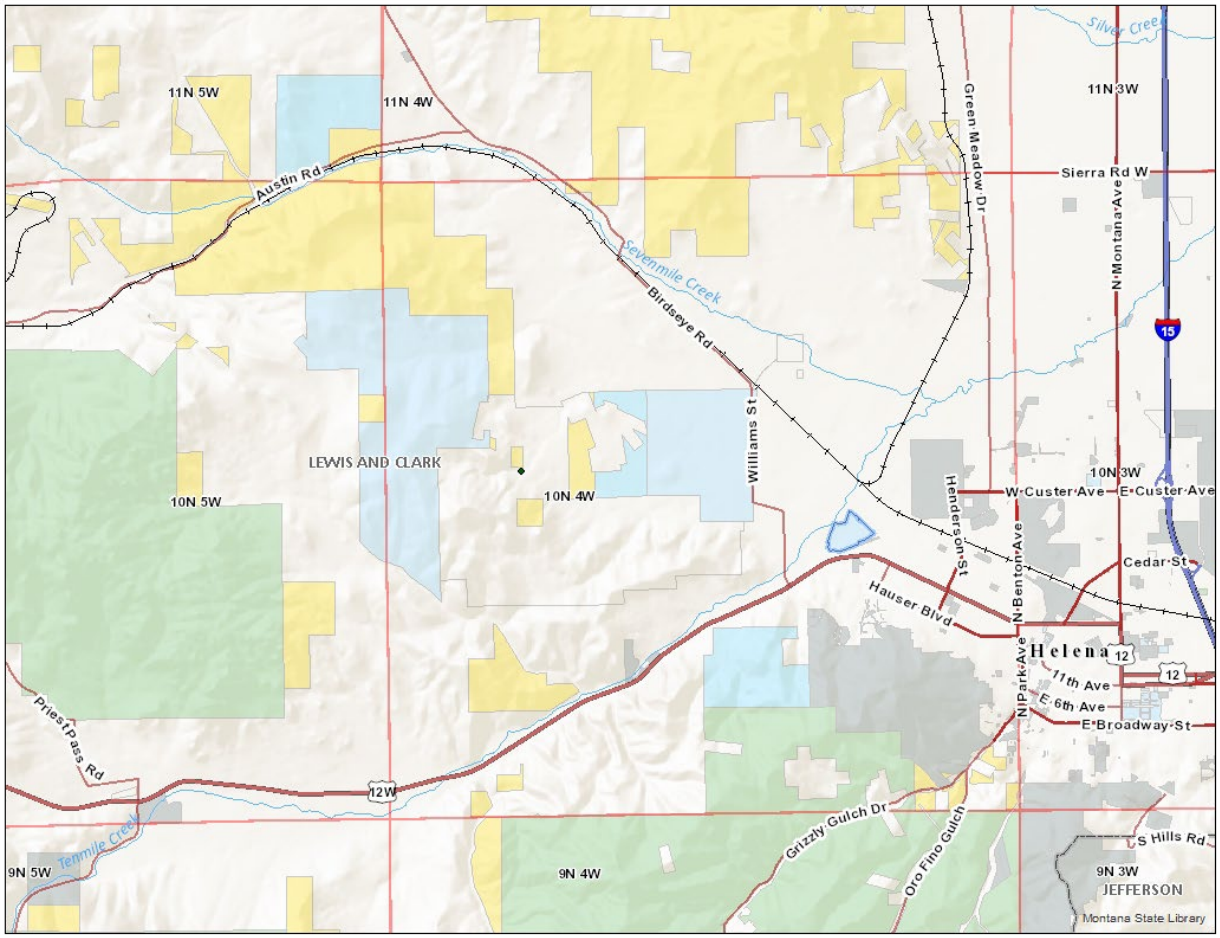
Limestone Hills Training Area – Western Small Footed Myotis



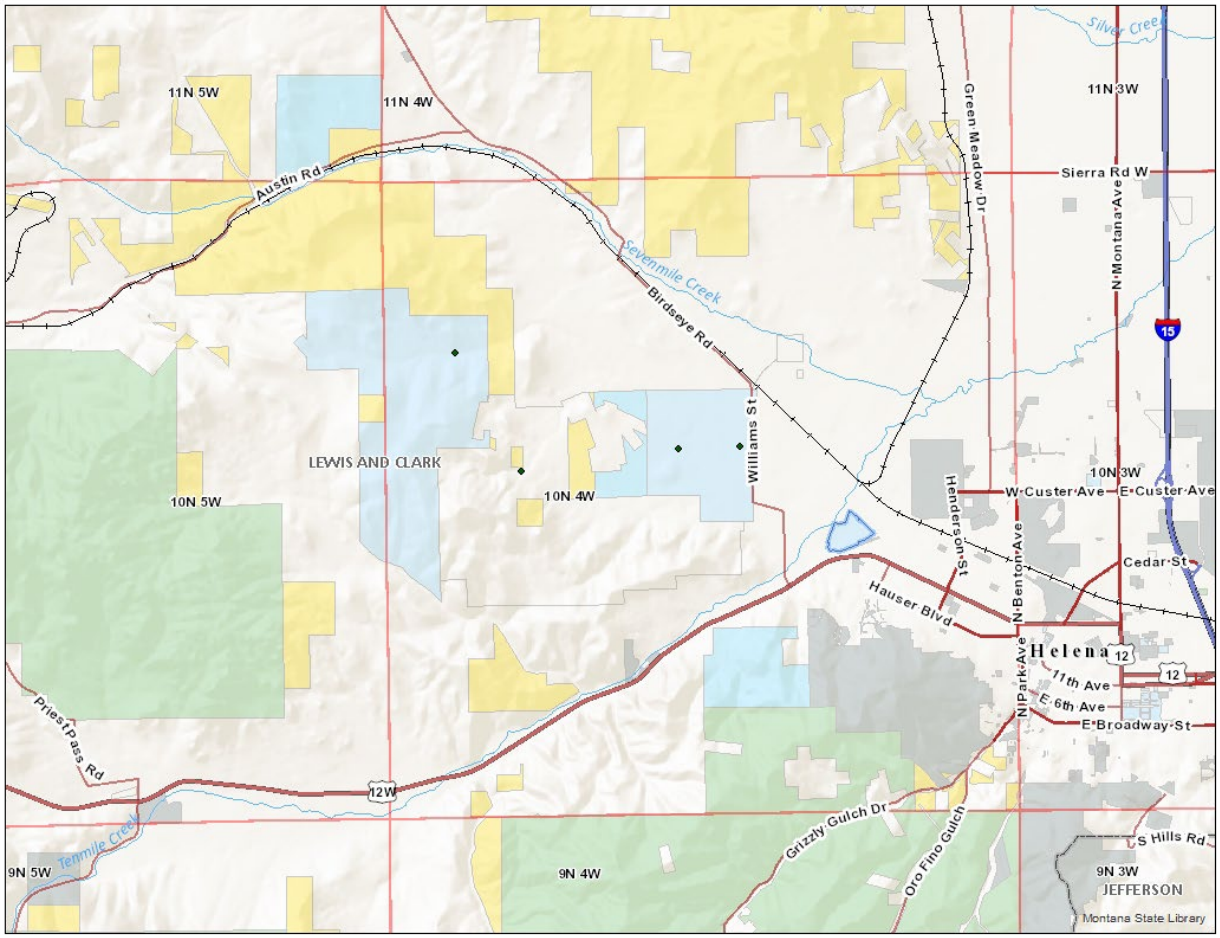
Limestone Hills Training Area – California Myotis



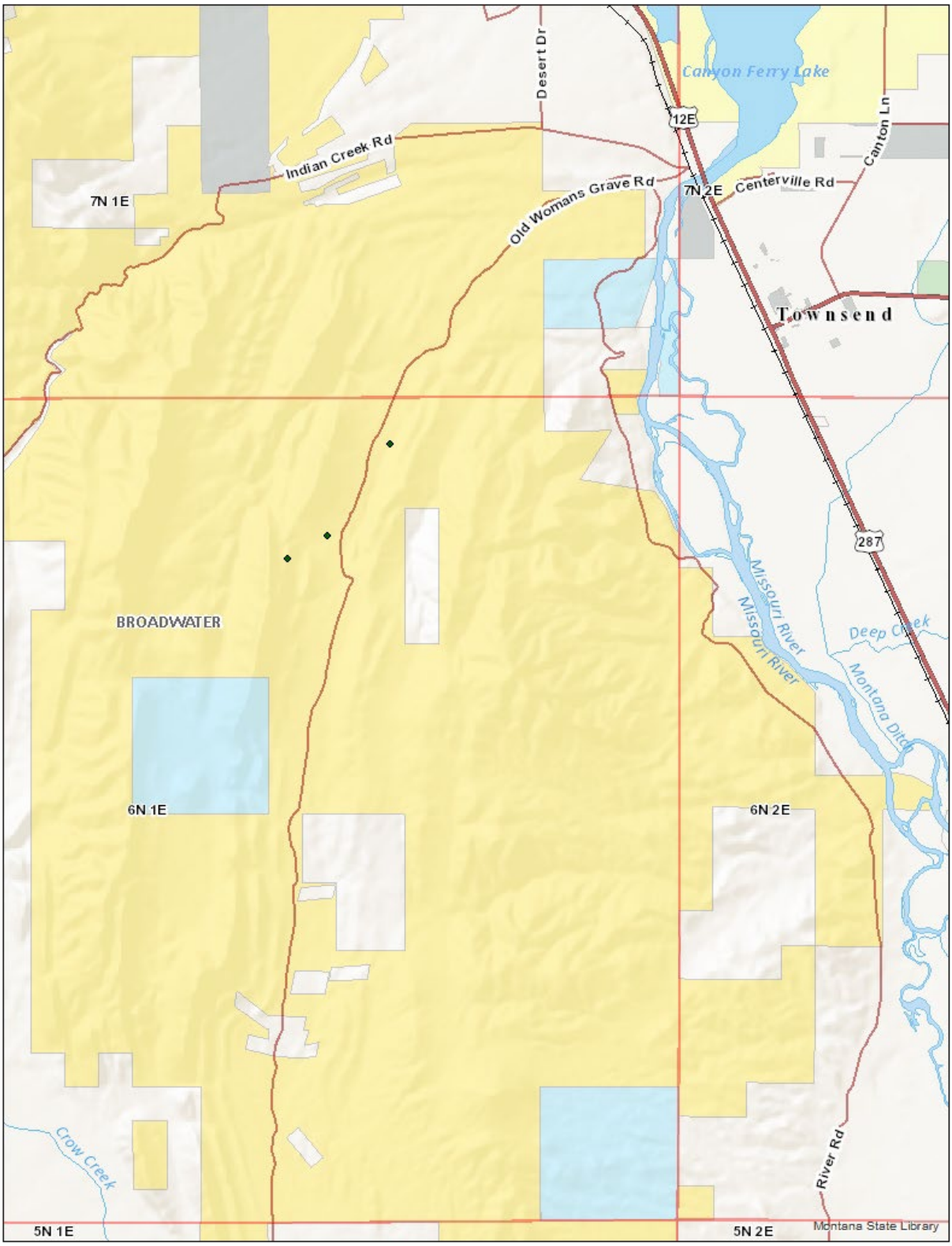
Fort Harrison – Fringed Myotis



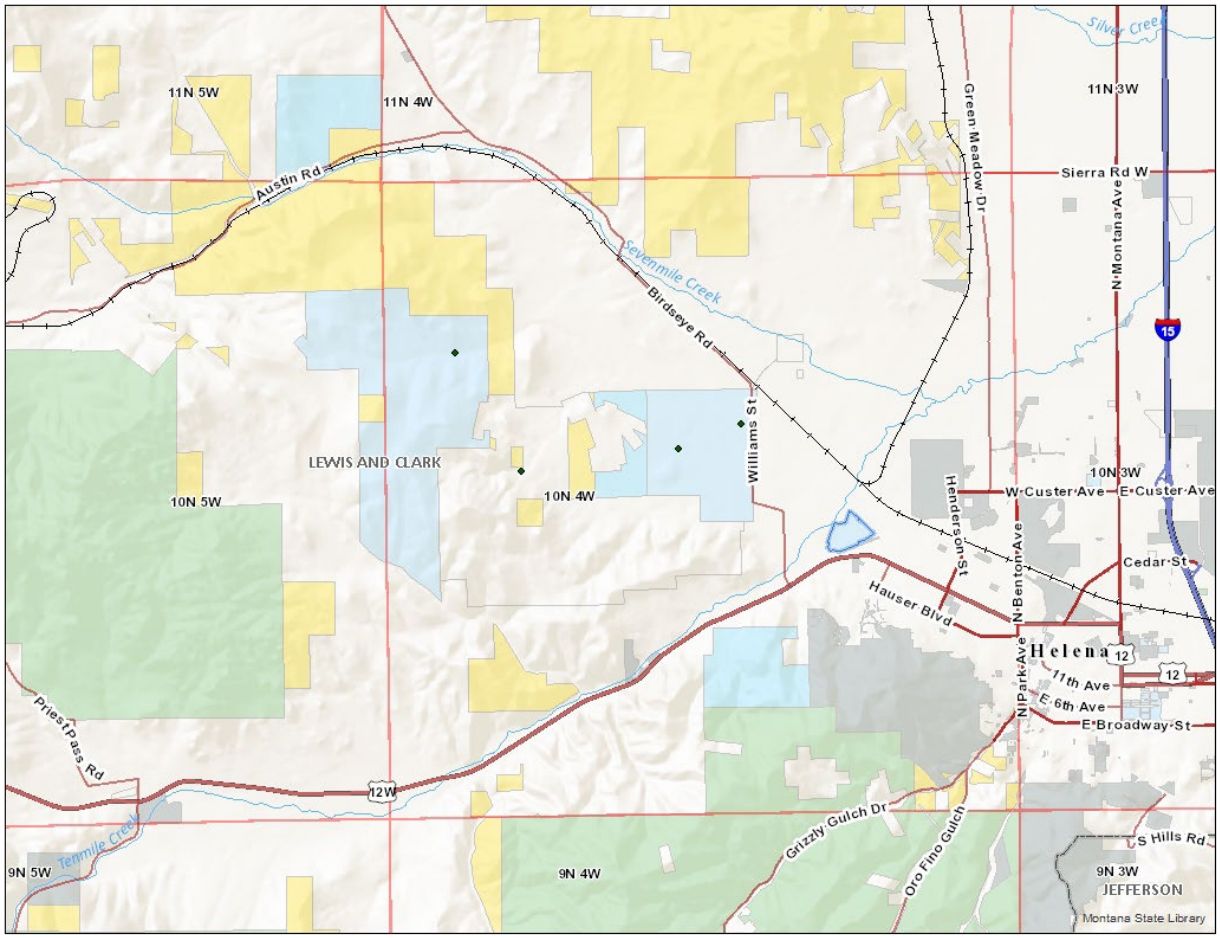
Fort Harrison – Big Brown Bat



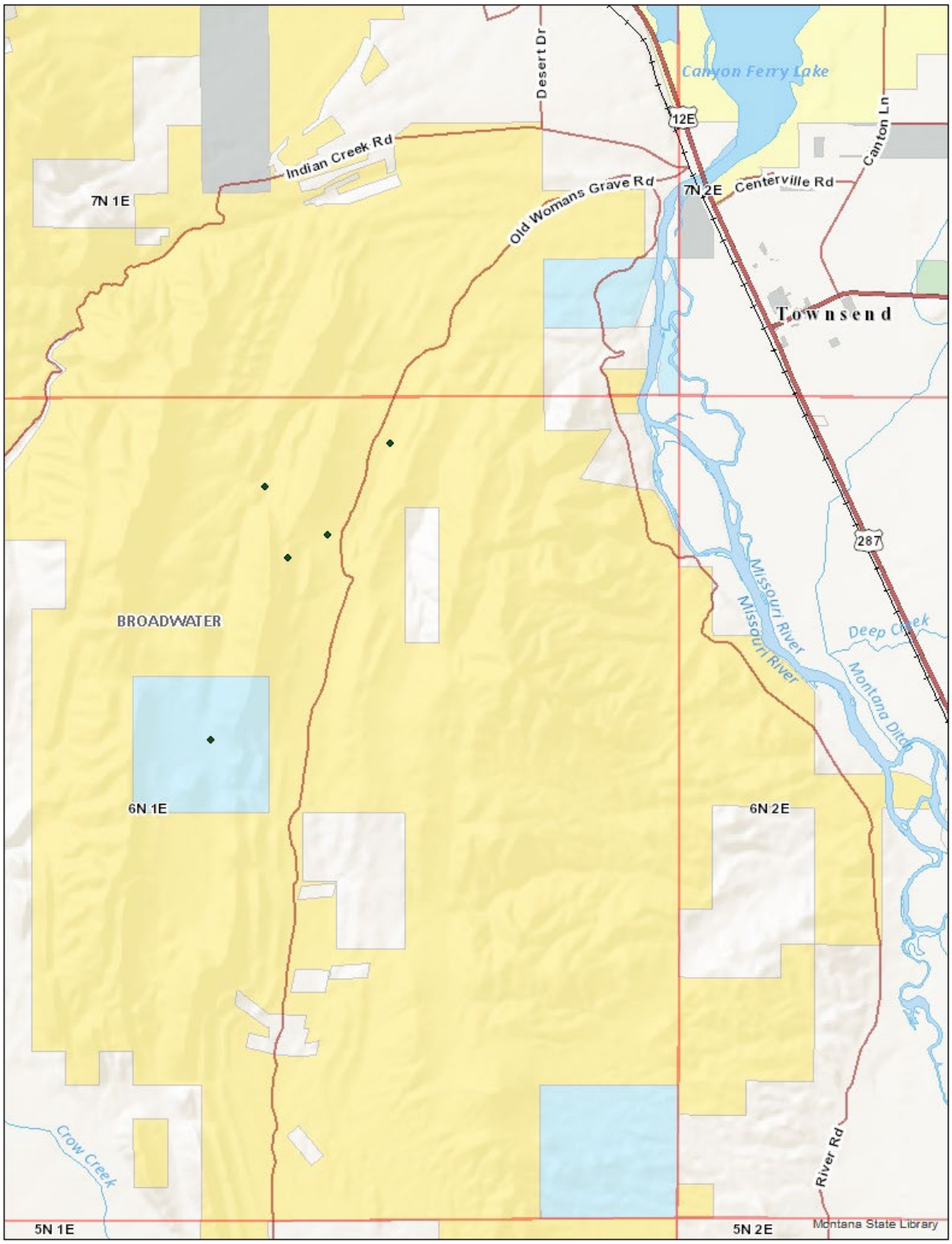
Limestone Hills Training Area – Big Brown Bat



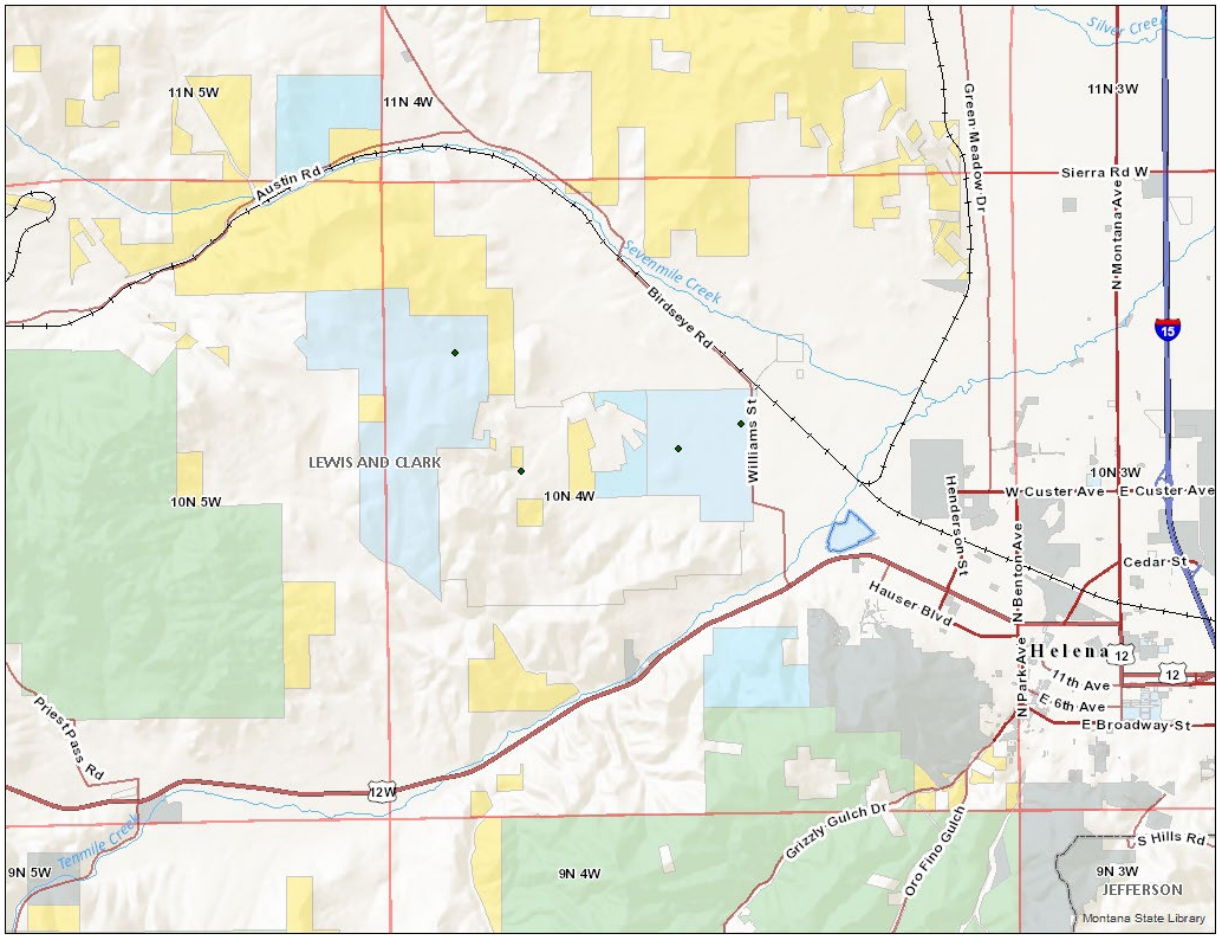
Fort Harrison – Hoary Bat



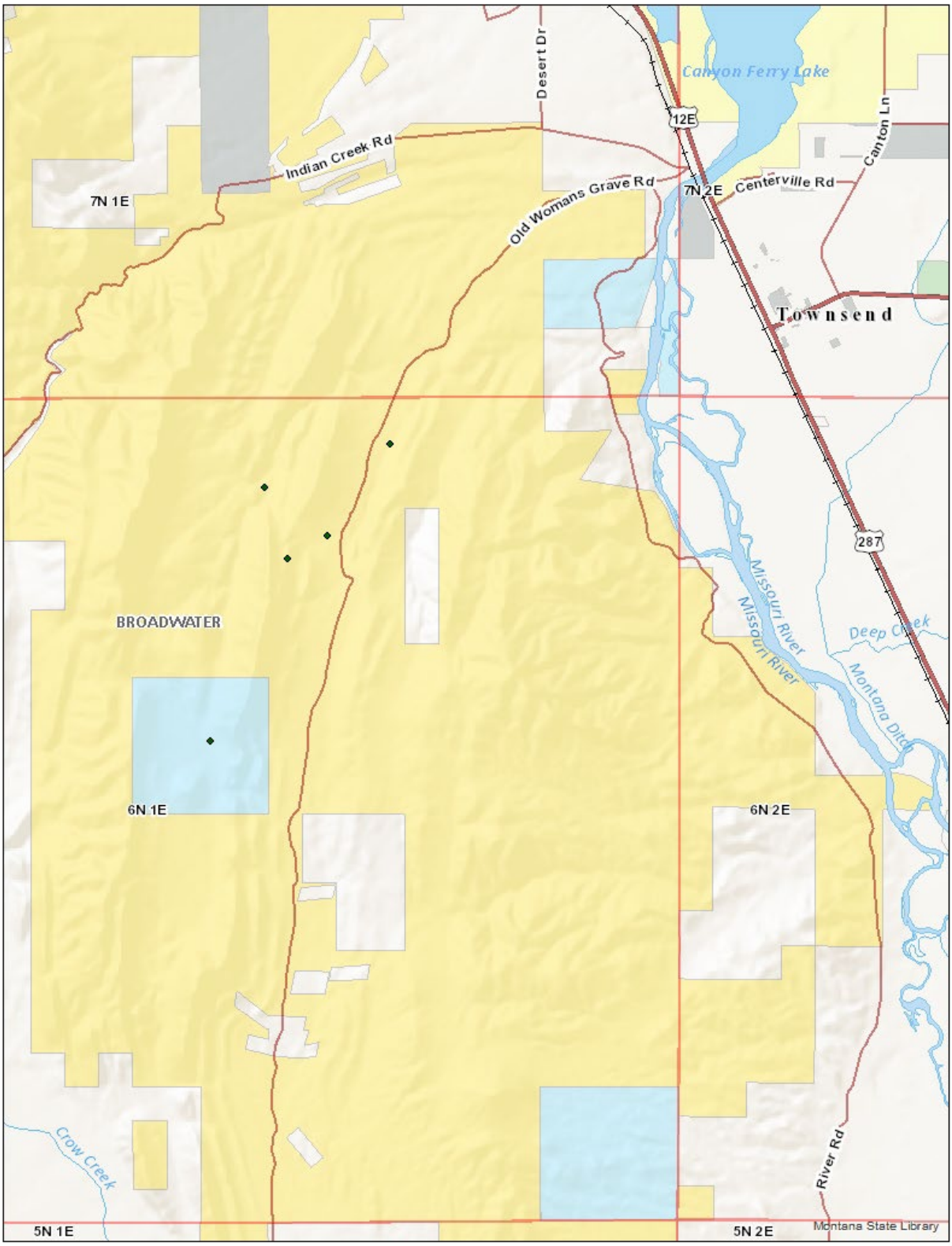
Limestone Hills Training Area – Hoary Bat



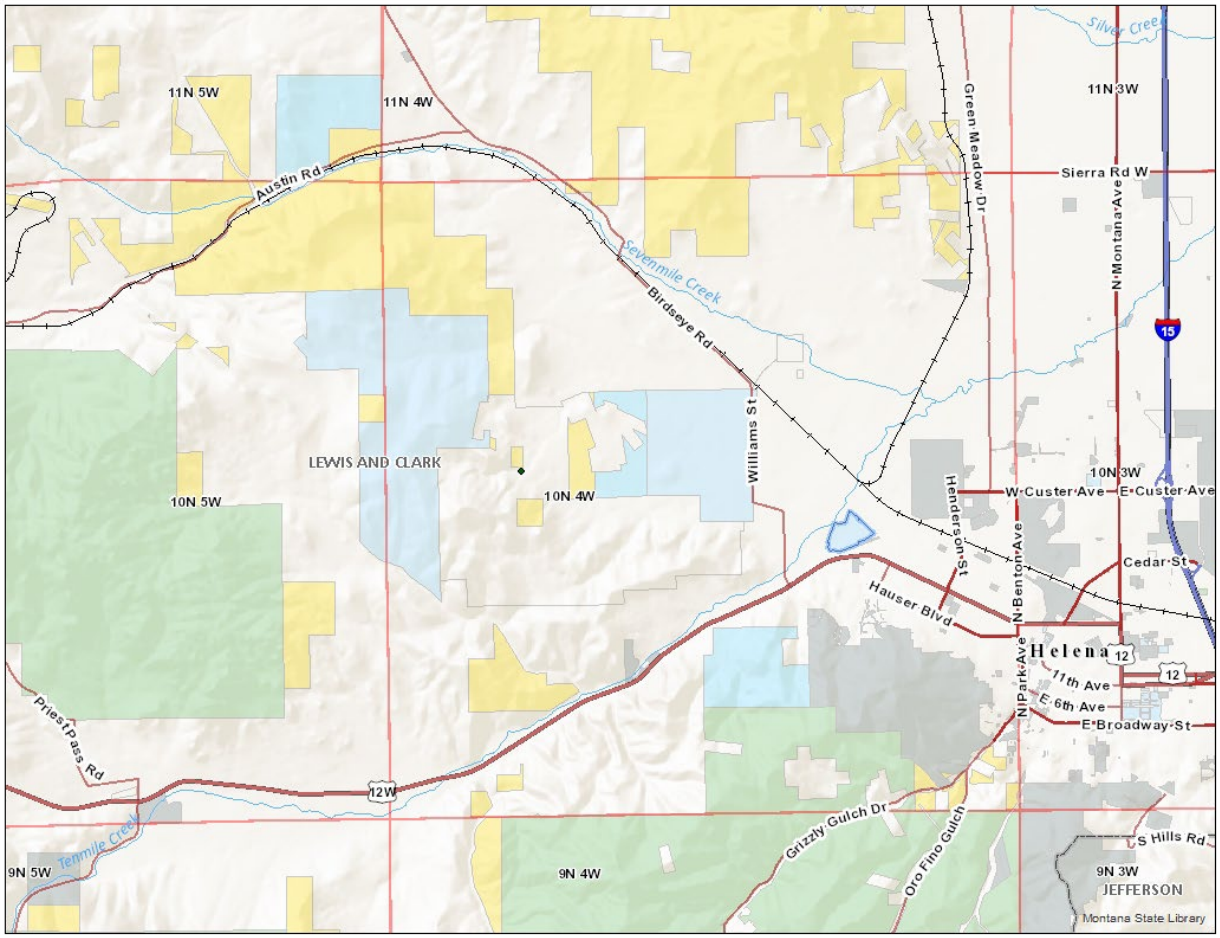
Fort Harrison – Silver-haired Bat



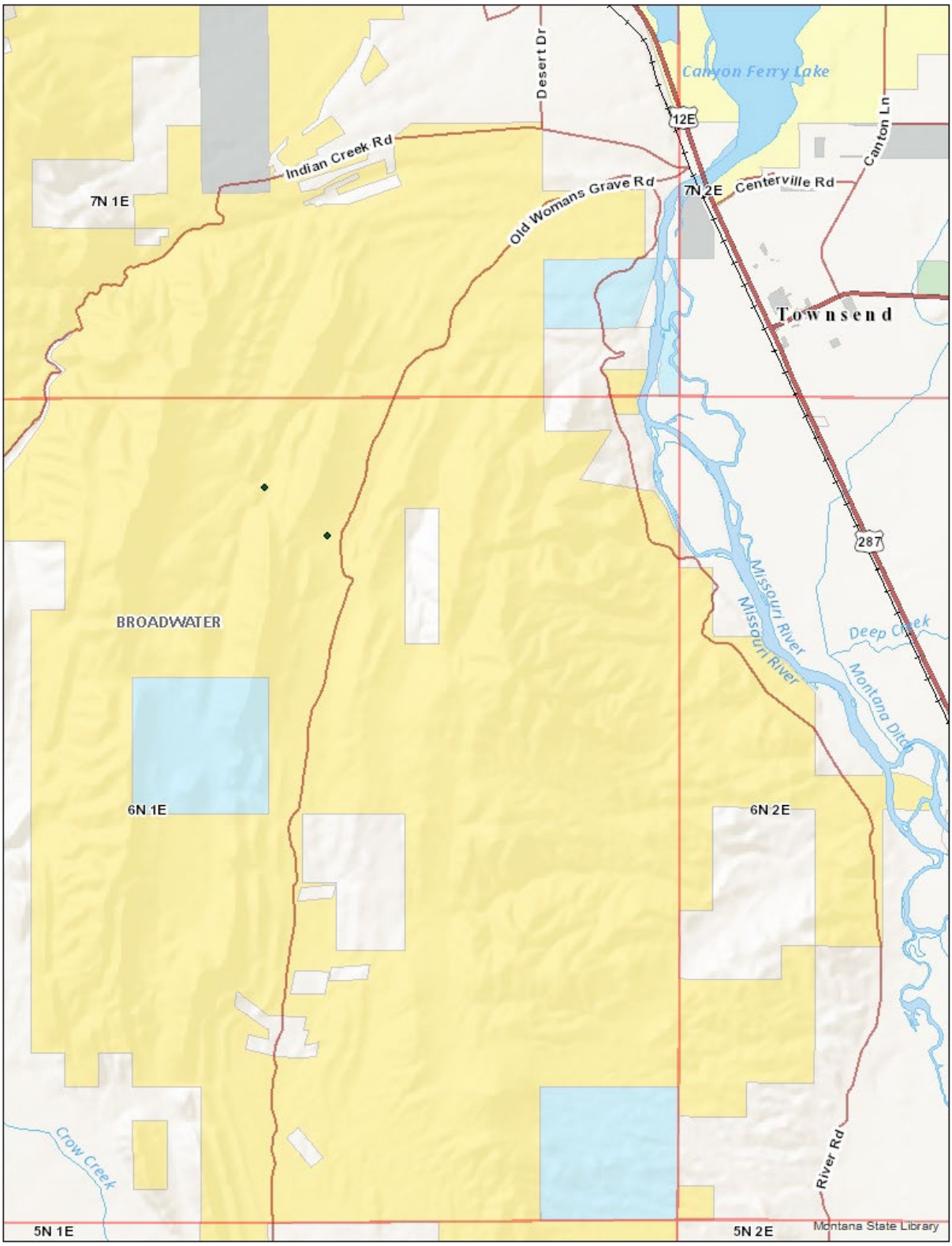
Limestone Hills Training Area – Silver-haired Bat



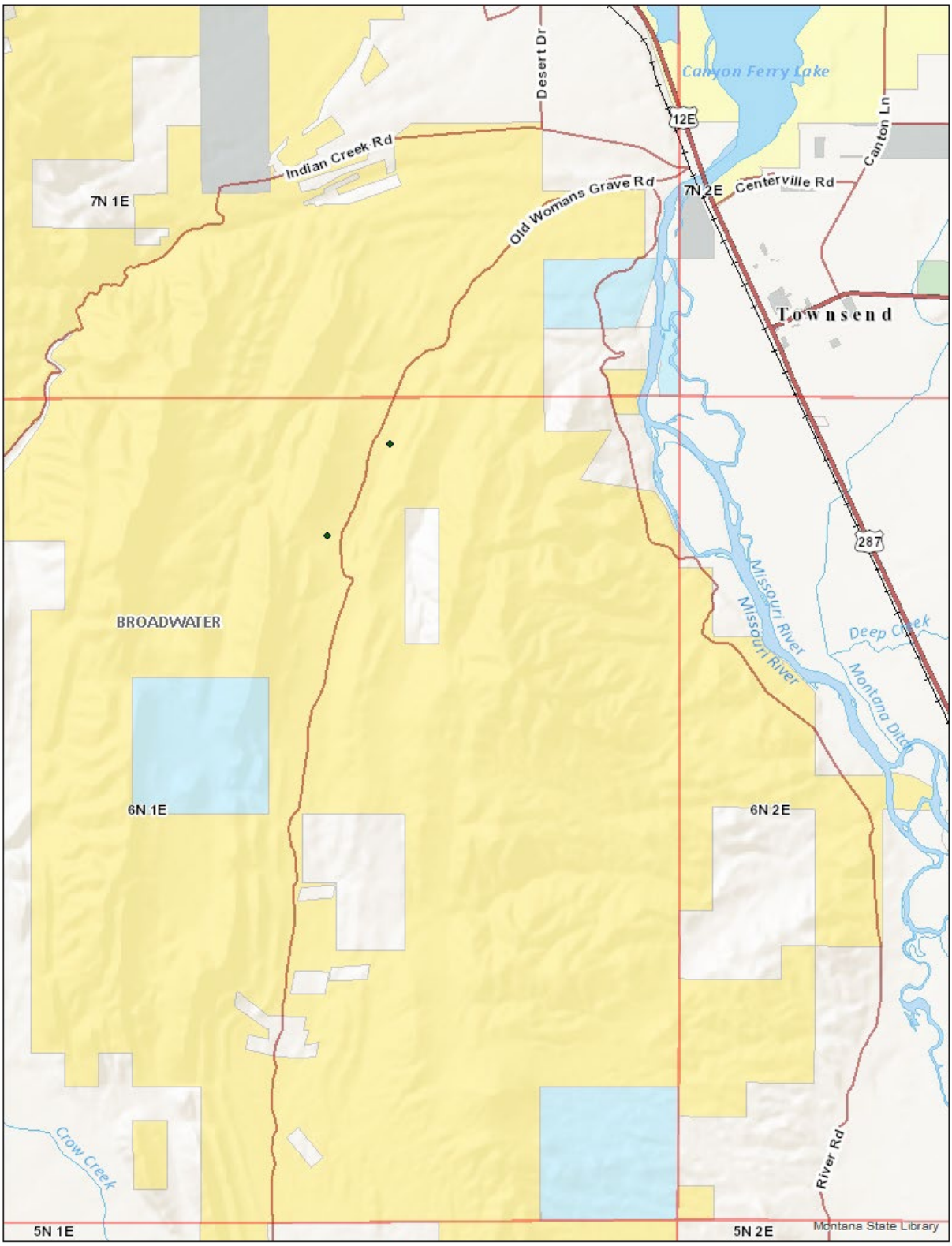
Fort Harrison – Townsend's Big-eared Bat



Limestone Hills Training Area – Townsend's Big-eared Bat



Limestone Hills Training Area – Spotted Bat



Appendix C

Status of Montana's Bat Species

Scientific Name	Common Name	Global Rank	State Rank	US Endangered Species Act	US Forest Service Sensitive Species	Bureau of Land Management Sensitive Species	Fish Wildlife and Parks State Wildlife Action Plan	Montana Status
Antrozous pallidus	Pallid Bat	G4	S3			SENSITIVE	SGCN3	SOC
Corynorhinus townsendii	Townsend's Big-eared Bat	G4	S3		Sensitive - Known on Forests (BD, BRT, KOOT, LOLO)	SENSITIVE	SGCN3	SOC
Euderma maculatum	Spotted Bat	G4	S3		Sensitive - Known on Forests (BD)	SENSITIVE	SGCN3, SGIN	SOC
Lasiurus borealis	Eastern Red Bat	G3G4	S3			SENSITIVE		SOC
Lasiurus cinereus	Hoary Bat	G3G4	S3			SENSITIVE	SGCN3	SOC
Myotis evotis	Long-eared Myotis	G5	S3					SOC
Myotis lucifugus	Little Brown Myotis	G3G4	S3	C			SGCN3	SOC
Myotis septentrionalis	Northern Myotis	G2G3	S2	LT		THREATENED		SOC
Myotis thysanodes	Fringed Myotis	G4	S3			SENSITIVE	SGCN3	SOC
Myotis volans	Long-legged Myotis	G4G5	S3					SOC
Myotis yumanensis	Yuma Myotis	G5	S3				SGIN	SOC
Lasionycteris noctivagans	Silver-haired Bat	G3G4	S4					PSOC
Eptesicus fuscus	Big-Brown Bat	G5	S4					
Myotis californicus	California Myotis	G5	S4					
Myotis ciliolabrum	Western Small-footed Myotis	G5	S4					

Status definitions

Montana Species Ranking Codes (GRank, SRank)

Montana employs a standardized ranking system to denote **global** (range-wide) and **state** status (NatureServe 2006). Species are assigned numeric ranks ranging from 1 (highest risk, greatest concern) to 5 (demonstrably secure), reflecting the relative degree of risk to the species' viability, based upon available information.

A number of factors are considered in assigning ranks — the number, size and quality of known occurrences or populations, distribution, trends (if known), intrinsic vulnerability, habitat specificity, and definable threats. The process of assigning state ranks for each taxon relies heavily on the number of occurrences and Species Occurrence (OE) ranks, which is a ranking system of the quality (usually A through D) of each known occurrence based on factors such as size (# of individuals) and habitat quality. The remaining factors noted above are also incorporated into the ranking process when they are known. The "State Rank Reason" field in the Montana Field Guide provides additional information on the reasons for a particular species' rank.

Rank		Definition
G1	**S1**	At high risk because of **extremely limited** and/or **rapidly declining** population numbers, range and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
G2	**S2**	At risk because of **very limited** and/or **potentially declining** population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.
G3	**S3**	Potentially at risk because of **limited** and/or **declining** numbers, range and/or habitat, even though it may be abundant in some areas.
G4	**S4**	Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining.
G5	**S5**	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
GX	**SX**	Presumed Extinct or Extirpated - Species is believed to be extinct throughout its range or extirpated in Montana. Not located despite intensive searches of historical sites and other appropriate habitat, and small likelihood that it will ever be rediscovered.
GH	**SH**	Historical, known only from records usually 40 or more years old; may be rediscovered.
GNR	**SNR**	Not Ranked as of yet.

GU	**SU**	Unrankable - Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNA	**SNA**	A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities as a result of being: 1) not confidently present in the state; 2) non-native or introduced; 3) a long distance migrant with accidental or irregular stopovers; or 4) a hybrid without conservation value.

Combination or Range Ranks

G#G# or **S#S#** Indicates a range of uncertainty about the status of the species *(e.g., G1G3 = Global Rank ranges between G1 and G3).*

S#, S# Indicates that populations in different geographic portions of the species' range in Montana have a different conservation status *(e.g., S1 west of the Continental Divide and S4 east of the Continental Divide).*

Sub-rank

T# Rank of a subspecies or variety. Appended to the global rank of the full species, *e.g. G4T3* where the G-rank reflects the global status of the entire species and the T-rank reflects the global status of just the subspecies.

Qualifiers

Q **Questionable** taxonomy that may reduce conservation priority-Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. Appended to the global rank, *e.g. G3Q*

? **Inexact Numeric Rank** - Denotes uncertainty; inexactness.

B **Breeding** - Rank refers to the breeding population of the species in Montana. Appended to the state rank, *e.g. S2**B**,S5N = At risk during breeding season, but common in the winter*

N **Nonbreeding** - Rank refers to the non-breeding population of the species in Montana. Appended to the state rank, *e.g. S5B,S2**N** = Common during breeding season, but at risk in the winter*

M **Migratory** - Species occurs in Montana only during migration.

U.S. Fish and Wildlife Service (Endangered Species Act) (USFWS)

Status of a taxon under the federal Endangered Species Act of 1973
(16 U.S.C.A. § 1531-1543 (Supp. 1996))

Designation Descriptions

LE	**Listed endangered:** Any species in danger of extinction throughout all or a significant portion of its range (16 U.S.C. 1532(6)).
LT	**Listed threatened:** Any species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (16 U.S.C. 1532(20)).
C	**Candidate:** Those taxa for which sufficient information on biological status and threats exists to propose to list them as threatened or endangered. We encourage their consideration in environmental planning and partnerships; however, none of the substantive or procedural provisions of the Act apply to candidate species.
P	**Proposed:** Any species that is proposed in the Federal Register to be listed under section 4 of the Act.
DM	**Recovered, delisted, and being monitored** - Any previously listed species that is now recovered, has been delisted, and is being monitored.
NL	**Not listed** - No designation.
XE	**Experimental - Essential population** - An experimental population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild.
XN	**Experimental - Nonessential population** - An experimental population of a listed species reintroduced into a specific area that receives more flexible management under the Act.
CH	**Critical Habitat** - The specific areas (i) within the geographic area occupied by a species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (II) that may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.

PS	**Partial status** - status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population, that has a record in the database has USESA status, but the entire species does not. For example, Yellow-billed Cuckoo (*Coccyzus americanus*) is ranked **PS:LT**. Partial Status - Listed Threatened. Designated as Threatened in the Western U.S. Distinct Population Segment (DPS) (subspecies *occidentalis*)
BGEPA	**The Bald and Golden Eagle Protection Act of 1940 (BGEPA)** - (16 U.S.C. 668-668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald or golden eagles, including their parts, nests, or eggs. The BGEPA provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The BGEPA defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.
MBTA	**The Migratory Bird Treaty Act (MBTA)** - (16 U.S.C. §§ 703-712, July 3, 1918, as amended 1936, 1960, 1968, 1969, 1974, 1978, 1986 and 1989) implements four treaties that provide for international protection of migratory birds. The statute's language is clear that actions resulting in a "taking" or possession (permanent or temporary) of a protected species, in the absence of a U.S. Fish and Wildlife Service (USFWS) permit or regulatory authorization, are a violation of the MBTA. The MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill ... possess, offer for sale, sell ... purchase ... ship, export, import ... transport or cause to be transported ... any migratory bird, any part, nest, or eggs of any such bird .... [The Act] prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior." The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." The USFWS maintains a list of species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. The USFWS also maintains a list of

	species not protected by the MBTA. MBTA does not protect species that are not native to the United States or species groups not explicitly covered under the MBTA; these include species such as the house (English) sparrow, European starling, rock dove (pigeon), Eurasian collared-dove, and non-migratory upland game birds.
BCC	The 1988 amendment to the Fish and Wildlife Conservation Act mandates the U.S. Fish and Wildlife Service to identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act. Birds of Conservation Concern 2008 (BCC 2008) is the most recent effort to carry out this mandate. The overall goal of this report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the Service's highest conservation priorities. BCC10, BCC11, and BCC17 designations represent inclusion on the Birds of Conservation Concern list for Bird Conservation Region 10, 11, and 17 in Montana, respectively.

Bureau of Land Management (BLM)

BLM Sensitive Species are defined by the BLM 6840 Manual as native species found on BLM-administered lands for which the BLM has the capability to significantly affect the conservation status of the species through management, and either: (1) there is information that a species has recently undergone, is undergoing, or is predicted to undergo a downward trend such that the viability of the species or a distinct population segment of the species is at risk across all or a significant portion of the species range, or; (2) the species depends on ecological refugia or specialized or unique habitats on BLM-administered lands, and there is evidence that such areas are threatened with alteration such that the continued viability of the species in that area would be at risk.

Designation Descriptions

Endangered Denotes species that are listed as Endangered under the Endangered Species Act

Threatened Denotes species that are listed as Threatened under the Endangered Species Act

Sensitive Denotes species listed as Sensitive on BLM lands

U.S. Forest Service (USFS)

Designation Descriptions

Sensitive	U.S. Forest Service Manual (2670.22) defines Sensitive Species on Forest Service lands as those for which population viability is a concern as evidenced by a significant downward trend in population or a significant downward trend in habitat capacity. These designations were last updated in 2011 and they apply only on USFS-administered lands with land management plans finalized prior to 2017. Sensitive Species designations are being replaced by Species of Conservation Concern designations on individual National Forest as revised land management plans are finalized under the 2012 planning rule.
Species of Conservation Concern	A species, other than federally recognized Threatened, Endangered, Proposed, or Candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area (36 CFR 219.9). Species of Conservation Concern replace regional forester Sensitive Species on individual National Forests as revised land management plans are finalized under the 2012 planning rule.

FWP State Wildlife Action Plan (FWP SWAP)

In recent years states have received federal funding to develop State Wildlife Action Plans. Montana's first SWAP, the Comprehensive Fish and Wildlife Conservation Strategy, was approved by the U.S. Fish and Wildlife Service in 2006. An updated SWAP was subsequently approved by the U.S. Fish and Wildlife Service in 2015 to assist with guiding conservation efforts throughout Montana by identifying species and habitats that are in greatest need of conservation. Montana vertebrates with a state conservation status rank of S1, S2, or S3 and the Western Pearlshell Mussell were included as Species of Greatest Conservation Need (SGCN). SGCN with state conservation status ranks of S1, S2, and S3 are listed on Montana Natural Heritage Program websites as SGCN1, SGCN2, and SGCN3, respectively. The SWAP also identifies Species of Greatest Inventory Need (SGIN) if they are a Species of Concern or Potential Species of Concern and they lack, or have outdated, statewide baseline surveys that can be used to assess their state conservation status.