Long-term Acoustic Assessment of Bats at Coal Mines across Southcentral Montana and Management Recommendations for Bats

Prepared for:
Montana Department of Environmental Quality
Air, Energy, & Mining Division, Coal Section

Prepared by:
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Montana Natural Heritage Program
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Executive Summary

Montana's bat populations face a wide array of conservation challenges, including loss of roosting sites, elimination of prey species, collision or drowning hazards at sites where they forage, drink, and mate, and a lack of baseline information on distribution and habitat use that is available to resource managers. In recent years, concerns have focused on fatalities at wind turbine facilities and those resulting from White-nose Syndrome (WNS). WNS has killed an estimated 5.7 to 6.7 million bats in eastern North America and 600,000 to 888,000 bats are estimated to have been killed at wind energy facilities across the United States in 2012 alone. These and other sources of mortality may be having significant impacts on bat populations because bats are long-lived and have only one or two young per year. Given these concerns, detectors were installed at nine sites in proximity to active, inactive, or remediated coal mines or proposed project areas across Southcentral Montana. These detectors are part of a regional network deployed over multiple years to document activity patterns of bats across Montana, and portions of northern Idaho, and the western Dakotas.

The overarching objectives of this project were to gather multiple years of year-round baseline information on: (1) bat species composition and activity levels; (2) timing of species immergence to and emergence from hibernacula for nonmigratory bat species; (3) timing of migrations by tree roosting migratory species that have been documented as having the highest levels of mortality from collisions with wind turbines; and (4) correlates of bat activity such as wind speed, temperature, precipitation, barometric pressure, and moon illumination.

We recorded bat echolocation calls from sunset to sunrise nightly using a SM2Bat+ detector/recorder at each site. At the West Decker, Spring Creek, and Big Sky mines we placed a single detector/recorder unit in proximity to a waterbody. At the Absaloka, and Rosebud Mines we placed detectors away from water in habitat representative of the surrounding area. We placed and additional detector at the Rosebud Mine in proximity to a waterbody. Two detectors were deployed at waterbodies at the Signal Peak Mine. Additionally, we placed a single detector at the Otter Creek Coal Tract next to a water source. Six detectors were deployed in 2012 and three more in 2013. Six detectors were deployed for between three years and five years. Three detectors at the Signal Peak or Big Sky mines are still in operation. Across all sites, 1,539,851 call sequences were recorded through spring of 2017, with 24.5% auto-identified to species by Sonobat 4.2.1 or Kaleidoscope Pro 4.1 software.

Across all detectors and mine sites, 12 species (range of seven to ten species per site) were definitively confirmed by hand review using the bat call characteristic identification guidelines in Montana's Bat and White-Nose Syndrome Surveillance Plan and Protocols (Maxell 2015): Pallid Bat (*Antrozous pallidus*), Townsend's Big-eared Bat (*Corynorhinus townsendii*), Big Brown Bat (*Eptesicus fuscus*), Spotted Bat (*Euderma maculatum*), Hoary Bat (*Lasiurus cinereus*), Silver-haired Bat (*Lasionycteris noctivagans*), Eastern Red Bat (*Lasiurus borealis*), Western Small-footed Myotis (*Myotis ciliolabrum*), Long-eared Myotis (*Myotis evotis*), Little Brown Myotis (*Myotis lucifugus*), Long-legged Myotis (*Myotis volans*). The West Decker and Absaloka mines had the least diversity (six species), while ten species were detected at the Signal Peak Mine, Big Sky Mine, and Otter Creek Coal Tract. Signal Peak detectors also consistently recorded Spotted Bats. Surprisingly, Eastern Red Bats were confirmed at all mine sites which indicates that they are more common across this region during fall migration than previously thought.

Activity of all species was greatest between April and late September at all sites. While all detectors recorded some level of activity during the inactive or hibernation season (November through March), Signal Peak and Big Sky mines had consistently high levels of activity throughout the winter. This likely indicates proximity to hibernacula in cracks or crevices in the surrounding rock outcrops, or similar habitat. At both mines, Big Brown Bat and Western Small-footed Myotis were confirmed to be active through the fall, winter, and spring. Additionally, at the Big Sky Mine Silver-haired Bats were also detected during the inactive season.

While we did not increase the number of species known to be in the region, use of acoustic detectors was an effective method for gaining a more complete understanding of species presence throughout the year. Across all sites, we documented 170 detections of species within months (species/months), which represented an average increase per mine of 24.3 species/months. The largest increase in information was at the Big Sky Mine, with an increase of 38 species/ months. At the Big Sky, Rosebud, and Signal Peak mines, the Eastern Red Bat presence was documented for the first time. Patterns of recorded bat activity were consistent with the regional network of acoustic detectors. Apart from the Signal Peak and Big Sky mines, activity was very limited between November and February. However, at least some bat activity was documented every month in at least one of the study years across all detectors. Average nightly bat passes began to increase each year in mid to late April, reached a maximum between June and September after young became flighted and during migration and swarming, and were greatly reduced again by mid-October.

During the active season (April to October), bats were active near the detectors throughout the night. However, in the early and late season we detected a major pulse of activity in the first hour after sunset and most activity occurred during the first two to three hours after sunset. In the middle of the summer, an additional peak in activity between midnight and dawn was observed. This increased activity may be the result of an additional foraging bout in response to warmer temperatures and increased availability of prey.

Across the entire acoustic network, patterns between bat activity and landscape variables, such as ruggedness, the presence or absence of trees, and type of water body, were evident. In rugged landscapes, or areas with high densities of rock outcrops and cliffs available to roosting bats, activity was significantly higher than in non-rugged landscapes, such as prairie or grassland cover types. The presence of trees in rugged landscapes did not appear to influence bat activity across the network. However, detectors in non-rugged landscapes recorded more activity when trees were present. Detectors near large and small lentic waterbodies recorded greater activity than detectors near lotic waterbodies or detectors placed away from water. These results suggest that rock outcrop or tree roosts as well as reservoirs are important landscape features to bats.

Nightly average bat pass temperatures recorded across all detectors ranged from -1.3 to 31.8°C during the active season and -2.3 to 14.0°C during the inactive season. Throughout the study, maximum background and bat pass temperatures recorded at the detectors closely approximated one another. However, average and minimum bat pass temperatures recorded at the detector were consistently much higher than average and minimum background temperatures recorded at the nearest weather station. Monthly average pat bass temperatures ranged from -1.3 to 13.3°C higher and monthly minimums pass temperatures ranged from -1 to 26.4°C higher. Similarly, the distribution of temperatures recorded at the closest available weather stations associated with bat passes were significantly higher than the distribution of background temperatures. Thus, bats consistently restricted their activity to warmer periods from the range of background temperatures that were available to them. This same pattern held across these sites and the entire detector network with more than 99% of bat activity restricted to temperatures above freezing and 97% of bat activity restricted to temperatures above 5°C.

Across our study area and the entire network bats were more active at lower wind speeds. Detectors places at the mine sites generally recorded more activity at wind speeds of between one to four meters per second than would be expected if activity was randomly distributed across all available wind speeds. Almost all activity was recorded at or below five meters per second. Across the entire detector network, bat activity was greater than expected at random for wind speeds at one to three meters per second. Wind speeds less than three meters per second accounted for 72% of bat passes and wind speeds less than seven meters per second accounted for 97% of bat passes.

Except for West Decker Mine, increased bat activity was associated with stable or falling barometric pressure. This is similar to the pattern observed across the regional network. Approximately 73% of bat activity was associated with little to no change (negative one to one millibars) in hourly barometric pressure. However, bat activity was greater than expected during negative hourly changes (negative one to negative three millibars) and is less than expected with neutral or positive hourly changes (one to two millibars) than if it were randomly distributed across background pressure change classes.

Within the study area precipitation did not appear to affect recorded bat activity. Decreased activity during precipitation events is frequently observed during mist netting efforts. As we would expect the same behavior by animals in the vicinity of the acoustic detectors, this difference may be driven by the nature of precipitation events in the area and the distance between weather stations and detectors. During the active season, thunderstorms are common and precipitation can be local. The distance between detectors and weather stations ranges from 7.9 km for the Busse Water Reservoir detector at the Signal Peak Mine, to 41.2 km for the Absaloka Mine, and averages 26.9 km across all sites and stations. Given that bats are capable of flight within minutes after the passage of a storm front and precipitation was aggregated by hour, our analysis of these data may not be adequate to detect a relationship between activity and precipitation.

Based on activity recorded at project sites, bats appeared to become more active during periods of low lunar illumination (Figure 22). During periods of low light when the moon was below the horizon or was new o close to new, bats were more active than would be expected if activity were random. This pattern was similar across the regional network of bat detectors, with a few minor exceptions (Figure 23). Activity decreased as moon phase became brighter and above the horizon. This pattern was documented across the network, except at sites in canyons or in proximity to terrain that blocked moonlight. At these sites activity often increased during periods of high lunar illumination. This may indicate that animals are selecting areas that provide refuge from illumination during bright periods.

Identification of individual species activity patterns was hindered by relatively low, and potentially inconsistent, rates of auto-identification of call sequences to species (Table 4, Maxell 2015). Big Brown Bat, Spotted Bat, Hoary Bat, Silver-haired Bat, Western Small-footed Myotis, Long-eared Myotis, and Little Brown Myotis had relatively high rates of confirmation of monthly presence and enough calls auto-identified, to examine trends (Table 5). However, activity patterns for all species from auto-identified call sequences should still be regarded as speculative due to a variety of issues that might cause auto-identifications to be inaccurate and/or inconsistent (Maxell 2015).

Measures of overall bat activity near the detector, hand confirmed presence of individual species by month, and hand confirmed minimum temperatures associated with bat passes of individual species are all stable metrics upon which management recommendations can be made. However, patterns of activity of individual species resulting from automated analyses should be used with a great deal of caution due to low rates of species assignment and low or uncertain rates of accuracy of those assignments. Furthermore, it should be noted that bat activity measured during this study was made by a microphone on a nine to ten-foot mast and may not have adequately sampled the activity of high flying bats such as the Hoary Bat and Silver-haired Bat, which together with the Eastern Red Bat are the three species that have suffered approximately 75% of the documented mortalities associated with wind turbines across North America (Kunz et al. 2007). Thus, the following management recommendations avoid use of activity patterns of individual species as determined by automated analyses and instead rely on results of hand confirmed analyses, general patterns of bat activity that were recorded at the study site, and results of published studies of wind turbine impacts on bat species.

General management recommendations for species observed at project sites include:

(1) protect potential natural roost sites by conserving large diameter trees (especially snags with loose bark), rock outcrops, cliff crevices, and caves (Appendix C).

(2) maintain accessibility for underground mine entrances that bats may be using as summer or winter roosts. Install bat friendly gates if closure is required.

(3) When removing bat colonies from buildings or other structures follow current best practices, including waiting until the late fall and winter to seal entry points and placing bat houses to compensate for elimination of the roost.

(4) Reduce structural complexity of vegetation (e.g., short stature grasslands) and availability of standing waters in proximity to wind turbines or other human structures that might represent a threat to bats or where bats are undesired.

(5) In safe environments, maintain lotic or lentic waterbodies to provide habitat for foraging and drinking.

(6) If wind turbines are installed in the region, set turbine cut-in speeds to > 6.0 m/sec between April and October – especially important in July during peak bat activity when young are newly flighted, and August, September, and October when migratory species are passing through and local bats are swarming and breeding. Feather wind turbine blades, making them parallel to wind direction, when wind speeds are <6 m/sec to reduce risk of barotrauma during times of relatively high bat activity.

(7) Report dead bats of any species found in the winter or spring to Montana Fish Wildlife and Parks or Montana Natural Heritage Program personnel. Animals found dead during these seasons may have contracted WNS and should be tested as part of Montana's Passive WNS surveillance protocol.

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INTRODUCTION

Populations of bats within Montana face a wide array of threats to their persistence, including loss of roosting sites, elimination of prey species, collision or drowning hazards at sites where they forage, drink, and mate, and a lack of baseline information on distribution and habitat use that is available to resource managers. In recent years, concerns have focused on fatalities at wind turbine facilities and those resulting from White-nose Syndrome (WNS) (Table 1). The large increases in mortality posed by these threats are especially significant to bat populations because bats are long-lived and have only one or two young per year (Barclay and Harder 2003).

WIND TURBINE IMPACTS

Bat fatalities are prevalent at wind energy facilities across the United States with 600,000 to 888,000 fatalities estimated in 2012 alone (Hayes 2013, Smallwood 2013). The widespread nature of these fatalities coupled with low fecundities of bats raises concerns that wind turbines may be having significant impacts on bat populations (Barclay and Harder 2003, Kunz et al. 2007, Arnett et al. 2008). Of North America's 45 bat species, 11 have had documented mortalities from wind turbines. Five of these species occur in the project area for at least a portion of the year (Tables 1 & 2; Kunz et al. 2007, Arnett et al. 2008). Across all species, mortality rates have been highest (≥ 75% of mortalities) in tree roosting migratory species such as the Eastern Red Bat (*Lasiurus borealis*), Hoary Bat (*Lasiurus cinereus*) and Silver-haired Bat (*Lasionycteris noctivagans*) (Kunz et al. 2007, Arnett et al. 2008, Arnett et al. 2011). Thus, if wind turbines were to be installed in the region, most mortalities would be expected to be associated with Hoary Bats and Silver-haired Bats during migratory or mating events (Cryan 2008). However, resident bats may also be impacted (Poulton and Erickson 2010) and impacts may occur even during the winter (Lausen and Barclay 2006).

WHITE-NOSE SYNDROME IMPACTS

Since 2006, White-Nose Syndrome (WNS), resulting from the cold adapted fungus *Pseudogymnoascus destructans* (PD), has killed an estimated 5.7 to 6.7 million bats in eastern North America (Blehert et al. 2008, Lorch et al. 2011, USFWS News Release January 17, 2012, Minnis and Lindner 2013). As a result, the extinction of Little Brown Myotis (*Myotis lucifugus*) is predicted in eastern North America by 2026 (Frick et al. 2010), Little Brown Myotis, Northern Myotis (*M. septentrionalis*), and Tricolored Bat (*Perimyotis subflavus*) were emergency listed as Endangered under Canada's Species at Risk Act (COSEWIC 2012), Little Brown Myotis has been petitioned for emergency listing under the United States Endangered Species Act (Kunz and Reichard 2010), and Northern Myotis has been listed as Threatened under the United States Endangered Species Act across its range, including nine eastern Montana counties (USFWS 2015). *P. destructans* has progressed westward to states along the Mississippi River corridor as well as the Province of Ontario, Canada and, recently was detected in Washington State (WDFW, USFWS, and USGS 2016). It has caused WNS in at least four species documented in Montana, has been detected in other species that may serve as local or regional vectors. Many western species have not yet been exposed to Pd, but as they are closely related to susceptible impacts of the disease are possible (Table 1, Blehert et al. 2011).

ACOUSTIC MONITORING NETWORK

Starting in the fall of 2011, various federal, state, and tribal partners began deploying SM2Bat, SM2Bat+, and SM3Bat ultrasonic detector/recorders to gather year-round baseline information on bat activity in various localities across Montana. During 2012, individual efforts began to coalesce into a regional network of detectors to address most bat species known to occur in Montana (Table 1, Figure 1, Maxell 2015). Most recordings from this array are being processed, analyzed, and archived at the Montana Natural Heritage Program.

Project Need

Although previous projects to determine what species of bat are present in the region have been conducted, data on presence throughout the year are lacking. Previous surveys using acoustic detectors and mist nets in southcentral Montana were limited to single night sampling between late June and early September. Roost searches were conducted between March and October in some areas, and contributed additional active season detections for some species. However, the scope of previous projects was limited both in geographic scope and project duration. Therefore, our understanding of distribution, occupancy, and phenology for many of the species is limited. One notable exception is the intensive surveys of caves and water sources in the Pryor Mountains conducted in the late 1980's and early 1990's as part of a University of Montana Masters project and subsequent surveys by Montana Natural Heritage Program personnel (Worthington and Ross 1990; Worthington 1991). Through these surveys and other efforts, this mountain range has some of the most extensive data on bats in the state, but due to the unique ecosystems and geographic features of this area, it is unlikely that inferences about the natural history of the region's bats species can be applied to the larger geographic area including the mine sites to the north and east. Thus, southcentral and southeast Montana lack baseline data on year-round patterns of bat activity that could be used to inform resource management plans or individual projects.

Species Potentially Present

Of the 15 species of bat known to occur within Montana, 13 have been confirmed to be present within southcentral and southeastern Montana: Townsend's Big-eared Bat (*Corynorhinus townsendii*), Big Brown Bat (*Eptesicus fuscus*), Spotted Bat (*Euderma maculatum*), Hoary Bat, Eastern Red Bat, Silver-haired Bat, Pallid Bat (*Antrozous pallidus*), California Myotis (*Myotis californicus*), Western Small-footed Myotis (*Myotis ciliolabrum*), Long-eared Myotis (*Myotis evotis*), Little Brown Myotis, Fringed Myotis (*Myotis thysanodes*), and Long-legged Myotis (*Myotis volans*) (Table 2, MTNHP 2017). Within 50 km of the mine sites, all species except for the California Myotis have been documented on at least one occasion during the active season. It is possible that the California Myotis may be present within the area of focus, but a detection would represent a significant eastward expansion of this species known range (MTNHP 2017). Within 50km of each individual mine the number of observed species is lower. The number of previously documented species at the West Decker Mine was 11, ten at the Spring Creek Mine, 12 at the Otter Creek Coal Tract, eight at the Big Sky and Absaloka mines, seven at the Rosebud Mine, and ten at the Signal Peak Mine.

Objectives

The major goals of this project were to: (1) gather baseline information on bat species composition and activity levels at coal mines year-round for two-three years; (2) identify timing of species immergence to and emergence from hibernacula for non-migratory bat species; (3) identify timing of migrations by tree roosting migratory species; and (4) identify relationships between bat activity and wind speed, temperature, precipitation, barometric pressure, and moon illumination. Furthermore, placement at active, proposed, and remediated coal mines may allow us to explore trends in activity that may be influenced by management of these sites.

METHODS

BAT DETECTOR DEPLOYMENT

Across Southcentral Montana nine detectors were deployed at seven areas with past, current, or proposed mining activity: West Decker (one), Spring Creek (one), Big Sky (one), Absaloka (one), Rosebud (two), and Signal Peak Mines (two), and one proposed mine site, the Otter Creek Coal Tract (Figures 1, 2, 3). Of these, six detectors were deployed in the late summer or early fall of 2012. The remaining three were deployed in 2013 (Table 3). The detector deployed at the Rosebud mine was deployed in 2012 but moved to a different site within the mine in 2013, while the Signal Peak Mine has had two detectors deployed at different sites for the duration of the project. At six of the sites, acoustic surveys were conducted for three to four years and detectors were decommissioned in 2015 or 2016. Both detectors at the Signal Peak, and the detector at the Big Sky mine are still in operation.

To determine the best placement, each area was assessed for a location with: (1) open water for as much of the year as possible; (2) rock outcrops and trees that might be used as roosts by bats; (3) southern solar exposure that would allow a solar panel to charge a battery even during the winter; (4) year-round accessibility; and (5) a low likelihood of vandalism (Figure 4). At all sites, a Song Meter SM2Bat+ detector/recorder with an SMX-US microphone (Wildlife Acoustics Inc., Maynard, MA) was deployed. The microphones at all operational sites in 2015 were upgraded to SMX-U1 microphones (Wildlife Acoustics Inc., Maynard, MA). The SM2Bat+ detector/recorder was deployed, monitored, and maintained with the equipment, supplies, settings, and protocols listed in Montana's Bat and White-Nose Syndrome Surveillance Plan and Protocols 2012-2016 (Maxell 2015).

Many aspects of the equipment and site selections influence the detection of a bat echolocation call and the quality of the resulting recording. These include sensitivity of the individual microphone, temperature, humidity, wind speed, and frequency, amplitude, distance, and directionality of echolocation calls emitted by bats (Parsons and Szewczak 2009, Agranat 2014). The energy of sounds spreading in all directions diminishes by one fourth for every doubling of distance because the surface area of a sphere is related to the square of its radius. Furthermore, higher frequency sounds are diminished over shorter distances because of atmospheric absorption (Parsons and Szewczak 2009, Agranat 2014). Testing of the SMX-US microphone used through June 2015 in this study indicates that bats emitting frequencies in the range of 20 kHz should be detected at distances of 24 to 33 meters from the microphone while those emitting frequencies in the range of 40 kHz should be detected at distances of 18 to 22 meters (Agranat 2014). These distances are the radii of the relevant spheres of detection around microphones when they are at full sensitivity. However, we know that sensitivity varied over time by an unknown magnitude because some precipitation and freezing events permanently reduced the sensitivity (Table 3). In 2015 the microphones at eight detectors were upgraded to the SMX-U1 microphone, which increased the quality of recorded calls and reduced the effect of adverse weather on microphone sensitivity over time. Due to this change in hardware, comparisons between data collected before and after June 2015 should be made with caution as the different models of microphone may affect the number of calls and species detected.

DATA MANAGEMENT & CALL ANALYSES

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, temperature files, weather station data, and solar and lunar data were all processed and combined within SQL database tables in accordance with the general work flow 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 month and individual species' minimum temperatures of activity in accordance with the Echolocation Call Characteristics of Montana Bats and Montana Bat Call Identification materials in Appendices 6 and 7 of Montana's Bat and White-Nose Syndrome Surveillance Plan and Protocols 2012-2016 (Maxell 2015).

Weather Station Data

Weather station data were downloaded using the Mesowest application programming interface as outlined in Appendix 9 of Maxell (2015). Temperature, wind speed, solar, and precipitation data were downloaded from weather stations across the regions. Distance from the detector to the station varied by site and data type (Table 4). All data from weather stations were averaged by hour and associated with all call sequences recorded within this hour bin for use in our analyses.

Solar and Lunar Data

Solar and lunar data were calculated for all hours of detector deployment using the Python package ephem (3.7.6.0), which uses well established numeric routines to produce high precision astronomy computations (see Appendix 10 of Maxell 2015). The underlying code produces results nearly identical to data available from the U.S. Naval Observatory (Astronomical Applications Department). Precise times for sunrise, sunset, moonrise, moonset, and percent illumination at the detector were calculated based on latitude, longitude, and date. It should be noted that local topography is not incorporated into any of these calculations. Therefore, the exact timing of these events on the ground may differ slightly from those produced by this model, but should typically be within a few minutes unless local terrain differs greatly from the modeled horizon (e.g. if the site is at the bottom of a canyon).

RESULTS

TOTAL VOLUME OF BAT PASSES AND AUTO-IDENTIFICATION RATES

Between August 2012 and March 2017, a total of 1,539,851 bat call sequences were recorded across all detectors, with 24.5% (average range 16.1% to 32.4% across detector sites) auto-identified to species by Sonobat 4.2.1 or Kaleidoscope Pro 4.1 software. Individual detectors varied in both call sequences and auto identification rates (Table 5). Overall rates of auto-identification were very similar to the regional network average of 25.5% for many months of the study (Table 6, Figure 5).

SPECIES PRESENT & ACTIVITY PERIODS

Across all sites and detector deployments we confirmed the presence of presence of 12 species of bat. The diversity of species across mines averaged 8.5 species/detector site (Table7). The Absaloka Mine and West Decker mines had the fewest confirmed species (seven) while the detector placed at Reservoir 1 at the Signal Peak Mine, Big Sky Mine, and Otter Creek Coal Tract had the highest diversity with ten species confirmed at each. Six species were confirmed across every mine site and detector placement: Big Brown Bat, Hoary Bat, Silver-haired Bat, Western Small-footed Myotis, Long-eared Myotis, and Little Brown Bat. Pallid Bat was confirmed at the Big Sky Mine and Otter Creek Coal Tract. Spotted Bat was detected at the Big Sky Mine, and both detectors at the Signal Peak Mine. Townsend's Big Eared Bat was detected at Otter Creek and both Signal Peak Mine detectors. The Long-legged Myotis was confirmed at the Big Sky Mine, Otter Creek Coal Tract, both Rosebud Mine Detectors, Signal Peak Mine, and Spring Creek Mine. Fringed Myotis was confirmed only at the Spring Creek Mine.

During the active season, six species were detected across all sites: Big Brown Bat, Hoary Bat, Silver-haired Bat, Western Small-footed Myotis, Long-eared Myotis, and Little Brown Myotis. During the fall migration period (July – October), Eastern Red Bats were detected at all detectors except Rosebud Mine Area F Pond 7. Additionally, Eastern Red Bats were detected during spring migration at the Spring Creek Mine.

Five additional species were detected during the active season. Townsend's Big-eared Bat was detected across the active season at both the Otter Creek and Signal Peak Mine detectors. This species was also detected in September at the Signal Peak Mine Busse Water Reservoir detector. Spotted bats were detected in June at the Big Sky Mine detector, and between April and September and October at both Signal Peak detectors. Pallid Bats were detected in April and May at the Big Sky Mine, and in June at the Otter Creek Site. Long-Legged Myotis was confirmed in single months during the active season at the Big Sky Mine, Otter Creek, and both Rosebud and Signal Peak Mine detectors. Fringed Myotis was detected in July at the Spring Creek Mine.

Three species were recorded over the winter. Big Brown Bats were active throughout the hibernation season at Big Sky Mine detector, and both Signal Peak Mine detectors. At the Big Sky Mine, Silver-haired Bats were active across the winter. Additionally, Western Small-footed Myotis was detected throughout the winter at the Signal Peak Busse Water Reservoir detector.

GENERAL PATTERNS OF BAT ACTIVITY

Patterns of activity recorded across all mines were generally consistent with the overall activity patterns across the regional network of acoustic detectors (Table 8). Between November and February, activity was limited at most sites. Detectors at Big Sky and Signal Peak mines recorded relatively high and consistent activity throughout the winter (Table 9, Figures 6,7), which differs significantly from other project detectors and the network as a whole (Figures 8, 9). It is likely that these detectors were in proximity to hibernacula used by several species. Across all detectors, average nightly passes began to increase in mid to late April, peaking in late May through early June. After the summer, activity began to decline in September, reaching typical winter levels in October. No detectors or mine sites had higher than expected activity in the fall typical of a swarming site.

Timing of Bat Activity

Across all detectors some level of bat activity was evident throughout the night during the active season (April through October). In the spring activity was generally highest early in the evening, then decreased through dawn (Figure 10). As the season progressed, activity began to peak within a few hours after sunset and again within a few hours of sunrise, which is likely the result of multiple bouts of foraging by some species. In the late summer and early fall, activity returned a single peak in activity similar to spring.

Landscape Factors & Bat Activity

Across the entire acoustic network, patterns were evident between bat activity and landscape variables, such as ruggedness, the presence or absence of trees, and water body type (Figures 11 & 12). Bat activity was significantly higher during both the active and inactive seasons in rugged landscapes, areas with high densities of rock outcrops and cliffs available to roosting bats, as compared with non-rugged landscapes such as prairie or grassland habitats (Figure 11). The presence or absence of trees in rugged landscapes did not appear to influence bat activity across the network (Figure 11). However, non-rugged landscapes had much higher bat activity levels when trees were present and non-rugged landscapes without trees lacked any bat activity from November through March (Figure 11). Trees provide both roosting and foraging habitat, and this pattern indicates that they are an important feature to bats in non-rugged landscapes.

During the active season, there was greater activity at detectors near large and small lentic waterbodies than at detectors near lotic waterbodies or those placed away from water (Figure 12a). This suggests that standing water bodies, especially large ones, provide bats with important drinking and foraging habitat. However, small and large rivers are also important for providing drinking opportunities for bats during the colder months of November through March (Figure 12b).

Ruggedness, tree cover, and water vary across mine sites and detector placements. Absaloka and Rosebud mines had the only detector placements in upland sites, all others were placed in proximity to lentic or lotic waterbodies. Except for the Rosebud and Signal Peak mines, all detector placements had either deciduous or conifer trees nearby. Apart from the Otter Creek Coal Track, and West Decker and Absaloka mines, all sites were considered rugged.

Temperature & Bat Activity

Nightly average bat pass temperatures recorded across all detectors ranged from -1.3 to 31.8°C during the active season and -2.3 to 14.0°C during the inactive season (Table 9). Throughout the study, maximum background and bat pass temperatures recorded at the detectors closely approximated one another (Table 10). However, average and minimum bat pass temperatures recorded at the detector were consistently much higher than average and minimum background temperatures recorded at the nearest weather station. Monthly average pat bass temperatures ranged from -1.3 to 13.3°C higher than average temperatures and monthly minimums pass temperatures ranged from -1 to 26.4°C higher than recorded minimums (Table 11, Figure 13). Similarly, the distribution of temperatures recorded at the closest available weather stations associated with bat passes were significantly higher than the distribution of background temperatures (Figure 14). Thus, bats consistently restricted their activity to warmer periods from the range of background temperatures that were available to them. This same pattern held across these sites and the entire detector network with more than 99% of bat activity restricted to temperatures above freezing and 97% of bat activity restricted to temperatures above 5°C (Figure 15).

Monthly minimum bat pass temperatures confirmed for individual species ranged from 0.8 to 15°C for the Pallid Bat, 6.7 to 25.7°C for Townsend's Big-eared Bat, -1.3 to 28.4°C for Big Brown Bat, 8.9 to 23.9°C for Spotted Bat, 1.6 to 29.3°C for the Eastern Red Bat, -0.1 to 25.9°C for Hoary Bat, -1.8 to 27.9°C for Silver-haired Bat, -1 to 26.7°C for Western Small-footed Bat, -0.3 to 26.5°C for Long-eared Myotis, -0.5 to 26.2°C for Little Brown Myotis, 19.4 for Fringed Myotis (one detection), and 0.6 to 22.4°C for Long-legged Myotis (Tables 11 & 12, Appendix B). Across the mine sites minimum temperatures for many were up to 11.8°C greater than the minimums across the network (Table 11, Appendix B). At the Absaloka mine the coldest minimum temperature was recorded for the Eastern Red Bat across the network.

WIND SPEED & BAT ACTIVITY

Across all sites, bats were generally more active at wind speeds of between one and four meters per second than would be expected if bat activity was randomly distributed across all available wind speeds. Furthermore, almost all activity occurred at or below five meters per second (Figure 16). Across the entire detector network, bat activity was greater than expected at random for wind speeds at one to three meters per second (Figure 17). Wind speeds less than three meters per second accounted for 72% of bat passes and wind speeds less than seven meters per second accounted for 97% of bat passes (Figure 17). Given the possible difference between wind speeds at bat detectors and weather stations, it seems likely that bats restrict their flight to even lower wind speeds than the associations in Figures 16 & 17 indicate.

BAROMETRIC PRESSURE & ACTIVITY

For all sites except the West Decker Mine, increased bat activity was associated negative pressure change classes down to negative three millibars of change per hour. Less activity than expected was recorded during neutral or positive changes up to one to two millibars per hour. This same pattern is evident across the detector network (Figure 18). Approximately 73% of bat activity across the network was associated with little to no change (negative one to one millibars) in hourly barometric pressure. However, bat activity was greater than expected during negative hourly changes (-negative one to negative three millibars) and is less than expected with neutral or positive hourly changes (one to two millibars) than if activity were randomly distributed across background pressure change classes (Figure 19). At West Decker, increased bat activity was associated with stable or slightly increasing pressure. The closest weather station to this detector that can provide pressure data is in Sheridan, Wyoming, 32 km to the south. Although it is possible that bats at the West Decker site behave differently, it is more likely that the pressure measured at the weather station may not accurately reflect conditions at the detector.

PRECIPITATION & BAT ACTIVITY

Across all sites and detectors, we found little correlation with bat activity and precipitation measured at proximal weather stations (Figure 20). Decreases in activity in response to precipitation events are frequently observed during mist netting efforts. The discrepancy between the data and observed behavior may be driven by the nature of precipitation events in the area and the distance between weather stations and detectors. During the active season, thunderstorms are common and precipitation can be local. The distance between detectors and weather stations ranges from 7.9 km for the Busse Water Reservoir detector at the Signal Peak Mine, to 41.2 km for the Absaloka Mine, and averages 26.9 km across all sites and stations. Given that bats are capable of flight within minutes after the passage of a storm front and precipitation was coded in hourly bins, timing of recorded precipitation may not accurately reflect conditions at detector sites.

Across the acoustic detector network, bat activity was slightly higher (less than 1%) during hours without precipitation and slightly lower (less than 1%) during hours with precipitation than would be expected if bat activity was randomly distributed across available time (Figure 21). This lack of correlation between precipitation and activity is probably due to similar issues in quantifying precipitation at the detector. Given these issues patterns of bat activity relative to recorded precipitation events at weather stations may not be all that meaningful across the network.

Moonlight & Bat Activity

Based on activity recorded at project sites, bats appeared to become more active during periods of low lunar illumination (Figure 22). During periods of low light when the moon was below the horizon or was new o close to new, bats were more active than would be expected if activity were random. This pattern was similar across the regional network of bat detectors, with a few minor exceptions (Figure 23). Activity decreased as moon phase became brighter and above the horizon. This pattern was documented across the network, except at sites in canyons or in proximity to terrain that blocked moonlight. At these sites activity often increased during periods of high lunar illumination. This may indicate that animals are selecting areas that provide refuge from illumination during bright periods.

Species Activity Patterns

Identification of individual species activity patterns was hindered by relatively low, and potentially inconsistent, rates of auto-identification of call sequences to species (Table 5, Maxell 2015). Big Brown Bat, Spotted Bat, Hoary Bat, Silver-haired Bat, Western Small-footed Myotis, Long-eared Myotis, and Little Brown Myotis had relatively high rates of confirmed monthly presence and enough calls auto-identified to examine trends (Table 6). Call sequences of known species identity in the Montana Bat Call Library have also had relatively high accuracy rates (>50% correct auto-identification rates) for these species. However, activity patterns for these species from auto-identified call sequences should still be regarded as speculative due to a variety of issues that might cause auto-identifications to be inaccurate and/or inconsistent (Maxell 2015).

Upgrading the microphones in June of 2015 had a significant effect on the ability of the software to identify calls to species. At detectors deployed with both the SMX-US and SMX-U1 microphones, an increase in the number of call sequences identified to species is clearly visible in the months following installation (Figure 24). Across all detectors, the use of the SMX-U1 microphone was correlated with a 10-20% increase in auto identification rates. Given these differences, comparisons of activity patterns for species from auto-identified call sequences through time should be further regarded with caution.

Availability of Data Summaries

Current tabular and chart data summaries for bat activity patterns in association with time, weather, and other correlates for detectors across the regional network of ultrasonic acoustic monitoring stations are available by request from the Montana Natural Heritage

Program through an Excel workbook. Pivot tables and charts in topical worksheets in this workbook can be filtered to produce the latest data summaries for one or more sites, time periods, and species. As confirmations of individual species monthly presence and minimum temperatures of activity are made, this information is added to the animal point observation database at the Montana Natural Heritage Program and is available to agency biologists and resource managers for regional and project-level planning online in the context of a variety of map information through the MapViewer web application http://mtnhp.org/mapviewer

DISCUSSION

Across mine sites, we confirmed several uncommon and noteworthy species. At both Signal Peak detectors, Spotted Bats were frequently recorded from April to September and October. This species was once considered one of the rarest mammals in North America (Foresman 2012), and consistent detections of this species are rare across the state-wide detector network. The species is currently thought to roost primarily in large cliff habitat (e.g. Big Horn Canyon, Chambers et al. 2011), however the closest large cliffs to the detectors are on the Yellowstone River. While Spotted Bats have been documented traveling greater distances from roosts to foraging areas (e.g. Rabe et al. 1998), calls were recorded early in the evening which indicates that at least some individuals must be roosting in the local area. Small sandstone outcrops are abundant across the Bull Mountains and use of these features as roosts are likely, but the use of other features cannot be ruled out. If future work identifies what local features are used, it will improve our understanding of the life history of this species within the northern extent of its range.

Eastern Red Bats were consistently detected during their migration period at every mine site and all but one detector. Prior long-term acoustic monitoring across the state, this species was considered rare and only nine individuals had been observed (MTNHP Point Observation Database 2018). The data generated from this and other projects has shown that Eastern Red Bats are common in late summer and fall as they presumably migrate south through Montana. Given that all captured individuals were female, mortality of individuals migrating through the state may negatively impact this species across its range.

Although Silver-haired Bats are a common species, their consistent detection throughout the winter at the Big Sky Mine site is noteworthy. This species is predominately a tree roosting bat, although it has been recorded using structures, caves and mines outside of Montana (reviewed in Maxell 2015). To date we have not detected this species during cave or mine surveys across the state in either the active season or over winter. The most likely hibernacula in proximity to this detector are a butte 300 m to the east that has sandstone outcrops and cliffs, or other smaller sandstone outcrops in the forested area to the west of the reservoir. This site is unique among network sites with winter detections of this species as the potential hibernacula in proximity are limited. Although we cannot be certain what features the animals are roosting in, rock outcrops are likely and could be confirmed with roost surveys.

Southcentral and southeastern Montana have a relatively diverse community of bat species. Of the 15 species found across the state, 13 are found within this geographic area, and 12 of these were detected across all sites. Although sites averaged 8.5 species, not all species present are consistently detected using acoustic methods, even across years of recording. Quiet species like Townsend's Big-eared Bat may not trigger the detector and species like the Long-legged Myotis have calls similar to other *Myotis* and confirmation of species is impossible for most sequences. Species like Spotted Bat and Pallid Bat are on the northern edge of their range and may be locally common but rare across the landscape. Fringed Myotis has been not been consistently detected across its rage within eastern Montana and since it can be identified using acoustic methods, its absence from all but one site is probably due to its rarity.

Across all years, bat activity appeared stable at all sites regardless of previous history of mining or other anthropogenic uses. The most noticeable difference in activity between years is caused by the transition from the older SMX-UX and newer SMX-U1 microphones in 2014 (Figures 6 & 7). Aside from this, the increase or decrease in subsequent years at any site does not appear to exceed the variation found across years. If previous, current, or proposed mining activities at a given site or area were having a detectable impact on abundance of detected species, we would expect to see declines in the amount of activity recorded across all species over time or within auto identified species groups. This trend was not apparent at any site or within any of the auto identified species trends.

Species presence and activity metrics recorded at these sites will serve as robust baseline that can be used to assess the status of populations at sites into the future. This is particularly important due to the imminent threats to bat species posed by White-Nose Syndrome and wind energy development.

To-date, the presence of Pd and associated WNS have not been detected in Montana. However, detections of Pd and WNS in Washington in 2015 (Lorch et al. 2016), and the continued spread westward into the Great Plains have increased the urgency for establishing baseline metrics to assess future impacts on resident bats. Of the 12 species detected within the project area, two have been shown to develop WNS when exposed to Pd. These species are the Big Brown Bat, and Little Brown Myotis. Additionally, the Silver-haired Bat, Eastern Red Bat, and Townsend's Big-eared Bat have been shown to carry Pd, but not exhibit symptoms of WNS (Table 1). The remaining *Myotis* species have not been shown to carry Pd or develop WNS. Rather than indicating immunity, the lack of detections of Pd positive individuals or WNS is likely a result of their western distribution that does not overlap affected areas. As many other *Myotis* species are impacted by WNS, it is probably best to consider these species as susceptible until proven otherwise.

Tree roosting species such as the Hoary Bat, Eastern Red Bat, and Silver-haired Bat are not known to be susceptible to WNS, but suffer mortality at wind farms. These species often fly near turbines, and suffer barotrauma when in close proximity to the turbine blades. Due to these species low reproductive rate and long life, unmitigated wind energy development may cause precipitous declines of these species over the next 50 years (Frick et al. 2017). Wind energy has not been developed on any of the sites, but this threat may have indirect impacts on bats using this site due to mortality during migration or decreased regional populations. If development of wind energy is considered within the local area, mitigation measures should be implemented to reduce potential impacts on resident and migratory species.

High levels of winter activity at the Signal Peak and Big Sky mines indicates proximity to hibernacula. Species identified as active during these times include: Big Brown, Western Small-footed Myotis, Little Brown Myotis, Long-eared Myotis, and Silver-haired Bat. All have been known to use cracks and crevices in rock outcrops and badlands as winter hibernacula (see Appendix C for information on hibernacula preference). Because no known caves are in proximity to these sites, it is likely that rock outcrops or other features including abandoned mines are providing overwintering habitat. If mining activities alter rock outcrops or badlands, roost searches in both the active and hibernation seasons should be conducted to determine the potential impact of these activities to bats and acoustic monitoring should continue to assess impacts on activity over the duration of the project.

Bats also may use both active, inactive, and abandoned mines as roost and hibernacula. If an adit is being considered for closure, first determine its workings are being used by bats. Bats may move between roosts over a season, so multiple surveys are often necessary to determine if the mine is used as an active season roost. If conditions allow safe entry into the mine, a winter survey should be conducted between late December and April to determine if it is used as a hibernaculum. If possible, mines with bat use should be decommissioned with a bat friendly gate. See Sherwin et al. 2009 for a guidance on determining bat use and implementation of bat friendly closures.

Across the acoustic network and within the study area, detectors placed near water recorded high levels of activity. As open water is essential for bats, ensure that waterbodies remain accessible, free from clutter, and regularly contain water throughout the active season. As many of the mine sites are in relatively xeric environments, each individual waterbody is valuable to supporting local populations. Bats drink on the wing, and while smaller species (e.g. *Myotis* bats) may be able to exploit small areas of standing water, larger less maneuverable species such as Hoary and Spotted Bats need clear flight paths and large areas of open water to drink.

While we did not include the Northern Myotis (*Myotis septentrionalis*) as a potential species, the US FWS has designated Powder River County along with eight other counties in eastern Montana as within the range of this species. Therefore, the Northern Myotis could possibly be present at Otter Creek Coal Tract. Within Wyoming, and the Dakotas, this species has been found in both coniferous uplands and riparian hardwood forests (Miller and Allen 1928, Tigner and Aney 1993, Tigner and Aney 1994, Worthington and Bogan 1993, Tigner and Stukel 2003, Griscom and Keinath 2011, Peurach 2017). In Montana the species has been found at five sites along the Missouri River at or downstream from Culbertson (MT NHP point observation data, 2018). Bat surveys of hardwood and conifer forest habitats across the nine counties including Powder River have been conducted either to document species diversity or specifically to detect Northern Myotis. Within Powder River County 21 sites have been surveyed with mist nets, and 156 sites have had been surveyed with acoustic detectors for at least one night. Across these surveys no Northern Myotis have been captured or recorded. Targeted surveys within the island buttes of Carter County have produced similar results as have the surveys of riparian forest along the Little Missouri, Tongue, and Powder Rivers within Montana. Although it is difficult to definitively determine true absence of a species, given the number of surveys conducted in Powder River County that have failed to detect this species, its presence appears unlikely.

MANAGEMENT RECOMMENDATIONS

Measures of overall bat activity near the detector, hand confirmed presence of individual species by month, and hand confirmed minimum temperatures associated with bat passes of individual species are all stable metrics upon which management recommendations can be made. However, patterns of activity of individual species resulting from automated analyses should be used with a great deal of caution due to low rates of species assignment and low or uncertain rates of accuracy of those assignments. Furthermore, it should be noted that bat activity measured during this study was made by a microphone on a nine to ten-foot mast and may not have adequately sampled the activity of high flying bats such as the Hoary Bat and Silver-haired Bat, which together with the Eastern Red Bat are the three species that have suffered approximately 75% of the documented mortalities associated with wind turbines across North America (Kunz et al. 2007). Thus, the following management recommendations avoid use of activity patterns of individual species as determined by automated analyses and instead rely on results of hand confirmed analyses, general patterns of bat activity that were recorded at the study site, and results of published studies of wind turbine impacts on bat species.

General management recommendations for species observed at project sites include:

(1) protect potential natural roost sites by conserving large diameter trees (especially snags with loose bark), rock outcrops, cliff crevices, and caves (Appendix C).

(2) maintain accessibility for underground mine entrances that bats may be using as summer or winter roosts. Install bat friendly gates if closure is required.

(3) When removing bat colonies from buildings or other structures follow current best practices, including waiting until the late fall and winter to seal entry points and placing bat houses to compensate for elimination of the roost.

(4) Reduce structural complexity of vegetation (e.g., short stature grasslands) and availability of standing waters in proximity to wind turbines or other human structures that might represent a threat to bats or where bats are undesired.

(5) In safe environments, maintain lotic or lentic waterbodies to provide habitat for foraging and drinking.

(6) If wind turbines are installed in the region, set turbine cut-in speeds to > 6.0 m/sec between April and October – especially important in July during peak bat activity when young are newly flighted, and August, September, and October when migratory species are passing through and local bats are swarming and breeding. Feather wind turbine blades, making them parallel to wind direction, when wind speeds are <6 m/sec to reduce risk of barotrauma during times of relatively high bat activity.

(7) Report dead bats of any species found in the winter or spring to Montana Fish Wildlife and Parks or Montana Natural Heritage Program personnel. Animals found dead during these seasons may have contracted WNS and should be tested as part of Montana's Passive WNS surveillance protocol.

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Table 1. Montana bat species, conservation status, and known or potential concerns from WNS and wind turbine facilities.

Species	Conservation Status	Species known to be affected by White-Nose Syndrome / *P. destructans*	Species known to be subject to mortality at wind turbines*
Pallid Bat (*Antrozous pallidus*) = ANPA	G4 S3, MT SOC, BLM Sensitive, USFS Sensitive	No connection known at this time.	No mortalities documented in literature.
Townsend's Big-eared Bat (*Corynorhinus townsendii*) = COTO	G4 S3, MT SOC, BLM Sensitive, USFS Sensitive	Detected, but no diagnostic sign of WNS (USFWS 2014). Potential winter roost vector.	No mortalities documented in literature.
Big Brown Bat (*Eptesicus fuscus*) = EPFU	G5 S4	Blehert et al. 2008, Langwig et al. 2012, 2014, Frank et al. 2014.	Johnson et al. 2004; Kunz et al. 2007; Arnett et al. 2008, 2011.
Spotted Bat (*Euderma maculatum*) = EUMA	G4 S3, MT SOC, BLM Sensitive, USFS Sensitive	No connection known at this time.	No mortalities documented in literature.
Silver-haired Bat (*Lasionycteris noctivagans*) = LANO	G3G4, Potential MT SOC	Detected, but no diagnostic sign of WNS (Bernard et al. 2015, USFWS 2014). Potential regional migratory vector.	Johnson et al. 2004; Kunz et al. 2007; Arnett et al. 2008, 2011; Baerwald et al. 2009; Poulton and Erickson 2010.
Eastern Red Bat (*Lasiurus borealis*) = LABO	G3G4 SU, Potential MT SOC	Detected, but no diagnostic sign of WNS (Bernard et al. 2015, USFWS 2014). Potential regional migratory vector.	Kunz et al. 2007; Arnett et al. 2008, 2011.
Hoary Bat (*Lasiurus cinereus*) = LACI	G3G4 S3, MT SOC	No connection known at this time.	Johnson et al. 2004; Kunz et al. 2007; Arnett et al. 2008, 2011; Baerwald et al. 2009; Poulton and Erickson 2010.
California Myotis (*Myotis californicus*) = MYCA	G5 S4	Close relatedness to *M. leibii* indicates possible susceptibility (Agnarsson et al. 2011, Langwig et al. 2012)	No mortalities documented in literature.
Western Small-footed Myotis (*Myotis ciliolabrum*) = MYCI	G5 S4	Relatively close relatedness to *M. lucifugus* indicates possible susceptibility (Frick et al. 2010, Agnarsson et al. 2011)	No mortalities documented in literature.
Long-eared Myotis (*Myotis evotis*) = MYEV	G5 S4	Close relatedness to *M. sodalis* indicates possible susceptibility (Agnarsson et al. 2011, Langwig et al. 2012)	Kunz et al. 2007
Little Brown Myotis (*Myotis lucifugus*) = MYLU	G3 S3, MT SOC	Blehert et al. 2008, Frick et al. 2010, Lorch et al. 2011, Warnecke et al. 2012, Johnson et al. 2014, Langwig et al. 2012, 2014.	Johnson et al. 2004; Kunz et al. 2007; Arnett et al. 2008, 2011.
Northern Myotis (*Myotis septentrionalis*) = MYSE	G1G2 SU, BLM Special Status, USFS Threatened, USFWS Listed Threatened	Blehert et al. 2008, Langwig et al. 2012, 2014, USFWS 2015.	Kunz et al. 2007; Arnett et al. 2008
Fringed Myotis (*Myotis thysanodes*) = MYTH	G4 S3, MT SOC, BLM Sensitive	Relatively close relatedness to *M. lucifugus* indicates possible susceptibility (Frick et al. 2010, Agnarsson et al. 2011)	No mortalities documented in literature.
Long-legged Myotis (*Myotis volans*) = MYVO	G4G5 S4	Close relatedness to *M. sodalis* indicates possible susceptibility (Agnarsson et al. 2011, Langwig et al. 2012)	No mortalities documented in literature.
Yuma Myotis (Myotis yumanensis) = MYYU	G5 S3S4, Potential MT SOC	Susceptible (USFWS 2017)	No mortalities documented in literature.

*Unidentified Myotis species mortalities have also been reported at the Judith Gap Wind Farm (Poulton and Erickson 2010).

Table 2a. Bat species documented and potentially present at or within 50 km of the West Decker Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)					C (1)			C (1)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)								C (3)				
Big Brown Bat (*Eptesicus fuscus*)							C (3)	C (3)				
Spotted Bat (*Euderma maculatum*)							A (3)	A (2)				
Hoary Bat (*Lasiurus cinereus*)						A (1)		A (1) C (1)				
Silver-haired Bat (*Lasionycteris noctivagans*)						A (1)		C (3)				
Eastern Red Bat (*Lasiurus borealis*)								A (1) C (1)				
Western Small-footed Myotis (*Myotis ciliolabrum*)						C (7) A (2)	C (10)	A (1)	C (2)			
Long-eared Myotis (*Myotis evotis*)					C (1)	C (3)	C (9)	C (3)	C (1)			
Little Brown Myotis (*Myotis lucifugus*)						C (1)	C (1)	C(2)	C (1)			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)							C (5)	C (1)				

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2b. Bat species documented and potentially present at or within 50 km of the Spring Creek Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)					C (1)			C (4)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)								C (3)	C (1)			
Big Brown Bat (*Eptesicus fuscus*)							C (7)	C (2)				
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)						A (1)		C (1) A (1)				
Silver-haired Bat (*Lasionycteris noctivagans*)						A(1)		C (2)				
Eastern Red Bat (*Lasiurus borealis*)								C (1) A (1)				
Western Small-footed Myotis (*Myotis ciliolabrum*)						C (5) A (2)	C (10)	A (1)	C (1)			
Long-eared Myotis (*Myotis evotis*)					C (1)	C (3)	C (7)	C (4)	C (1)			
Little Brown Myotis (*Myotis lucifugus*)						C (1)	C (1)	C (2)	C (1)			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)								C (4)	C (1)			

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2c. Bat species documented and potentially present at or within 50 km the Otter Creek Coal Tract [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)					C (2)		C (1)	C (1)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)					C(1)	A (2)		C (1) A (1)	A (1)	A (1)		
Big Brown Bat (*Eptesicus fuscus*)					A (4)	C (1)	C (4) A (1)	C (5) A (3)	A (3)			
Spotted Bat (*Euderma maculatum*)					A (1) * Detected between May and September							
Hoary Bat (*Lasiurus cinereus*)					A (4)	A (2)	C (3) A (2)	C (3) A (7)	A (1)			
Silver-haired Bat (*Lasionycteris noctivagans*)					A (3)	A (1)	A (3)	C (5) A (11)	A (2)			
Eastern Red Bat (*Lasiurus borealis*)								C (1) A (2)				
Western Small-footed Myotis (*Myotis ciliolabrum*)					A (3)	C (5) A (3)	C (7) A (3)	A (10)	A(1)			
Long-eared Myotis (*Myotis evotis*)				A (1)	C (1) A (6)	C (8) A (1)	C (7)	C (4) A (4)	A (1)			
Little Brown Myotis (*Myotis lucifugus*)					A (2)	C (1)	C (1)	A (6)				
Fringed Myotis (*Myotis thysanodes*)				A (1)	A (1)		C (2)					
Long-legged Myotis (*Myotis volans*)							C (1)	C (4)				

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2d. Bat species documented and potentially present at or within 50 km the Big Sky Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)					C (1)			C (1)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)												
Big Brown Bat (*Eptesicus fuscus*)								C (2)				
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)						A (2)						
Silver-haired Bat (*Lasionycteris noctivagans*)								C (1) A (4)				
Eastern Red Bat (*Lasiurus borealis*)												
Western Small-footed Myotis (*Myotis ciliolabrum*)								C (1) A (3)				
Long-eared Myotis (*Myotis evotis*)								C (2) A (3)				
Little Brown Myotis (*Myotis lucifugus*)								A (2)				
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)								C (1)				

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2e. Bat species documented and potentially present at or within 50 km the Absaloka Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)								C (1)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)												
Big Brown Bat (*Eptesicus fuscus*)							C (1)	C (3)				
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)						A (2)						
Silver-haired Bat (*Lasionycteris noctivagans*)								C (1)				
Eastern Red Bat (*Lasiurus borealis*)												
Western Small-footed Myotis (*Myotis ciliolabrum*)								C (1)				
Long-eared Myotis (*Myotis evotis*)								C (2)				
Little Brown Myotis (*Myotis lucifugus*)							C (1)					
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)								C (1)				

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2f. Bat species documented and potentially present at or within 50 km the Rosebud Coal Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)								C (1)				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)												
Big Brown Bat (*Eptesicus fuscus*)						C (1)		C (2)				
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)						A (2)		C (1)				
Silver-haired Bat (*Lasionycteris noctivagans*)								C (1) A (3)				
Eastern Red Bat (*Lasiurus borealis*)												
Western Small-footed Myotis (*Myotis ciliolabrum*)								C (1) A (1)				
Long-eared Myotis (*Myotis evotis*)								C (3) A (2)				
Little Brown Myotis (*Myotis lucifugus*)									C (1)			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)												

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 2g. Bat species documented and potentially present at or within 50 km the Signal Peak Mine [1].

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (*Antrozous pallidus*)							C (1)					
Townsend's Big-eared Bat (*Corynorhinus townsendii*)			C (1)				C (2) A (2)		C (1)			
Big Brown Bat (*Eptesicus fuscus*)						C (2)	C (15) A (6)	C (7) A (3)	C (6)			
Spotted Bat (*Euderma maculatum*)							A (6)	A (1)	A (2)			
Hoary Bat (*Lasiurus cinereus*)							C (5) A (11)	C (1) A (11)				
Silver-haired Bat (*Lasionycteris noctivagans*)						C (1)	C (6) A (9)	C (2) A (8)	C (2)			
Eastern Red Bat (*Lasiurus borealis*)												
Western Small-footed Myotis (*Myotis ciliolabrum*)			C (1)				C (2) A (5)	C (2) A (3)	C(3)			
Long-eared Myotis (*Myotis evotis*)							C (6) A (7)	C (3) A (2)	C (4)			
Little Brown Myotis (*Myotis lucifugus*)						C (1)	C (10) A (8)	C (3) A (5)	C (2) A (2)	C (1)		
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*)							C (4)	C (1)	C (1)			

[1] Number of records in the point observation database at the Montana Natural Heritage Program prior to this study (MTNHP 2017). A = acoustic record. C = capture record. Records may include multiple individuals.

Table 3. Deployment history for SM2 Bat+ detector/ recorders deployed at coal mines.

Mine	Site	Installation Date	Decommission Date
West Decker Coal Mine		August 2012	July 2016
Spring Creek Mine		August 2012	December 2016
Otter Creek Coal Track		October 2013	June 2016
Big Sky Mine		October 2013	In operation
Absaloka Mine		August 2012	June 2016
Rosebud Coal Mine	Area C Pond	October 2013	June 2016
Rosebud Coal Mine	Area F Pond 7	August 2012	October 2013
Signal Peak Mine	Reservoir 1	August 2012	In operation
Signal Peak Mine	Busse Water Reservoir	August 2012	In operation

Table 4. Proximity of weather stations to detector locations for all sites and data types. Distance in kilometers between the station and detector is given in brackets after the station name. Note that some detectors used multiple stations over their deployment.

Detector Site	Wind	Temperature	Pressure	Precipitation
West Decker Mine	CW7283 Sheridan (32.0)	CW7283 Sheridan (32.0) / Tongue River Dam (8.0)	CW7283 Sheridan (32.0)	Wolf Mountain (38.0)
Spring Creek Mine	Wolf Mountain (27.9)	Tongue River Dam (14.6) / Wolf Mountain (27.9)	CW7283 Sheridan (33.6)	Wolf Mountain (27.9)
Otter Creek Mine	Fort Howes (20.8)	Fort Howes (20.8)	Weston (94.5)/ Forsyth (94.5)	Fort Howes (20.8)
Big Sky Mine	Badger Peak (22.4)	Badger Peak (22.4)	Forsyth (51.6)	Badger Peak (22.4)
Absaloka Mine	Little Bighorn (41.2)	Little Bighorn (41.2)	Forsyth (59.6)	Little Bighorn (41.2)
Rosebud Mine Area C Pond	Badger Peak (33.08)	Badger Peak (33.08)	Forsyth (45.4)	Badger Peak (33.08)
Rosebud Mine Area F Pond 7	Badger Peak (42.6)	Badger Peak (42.6)	Forsyth (49.7)	Badger Peak (42.6)
Signal Peak Mine Reservoir 1	Bull Mountain US-87 MP 33.3 (7.9)	Bull Mountain US-87 MP 33.3 (7.9)	Roundup (29.7)	Bull Mountain US-87 MP 33.3 (7.9)
Signal Peak Mine Busse Water Reservoir	Bull Mountain US-87 MP 33.3 (8.2)	Bull Mountain US-87 MP 33.3 (8.2)	Roundup (25.7)	Bull Mountain US-87 MP 33.3 (8.2)

Table 5a. Detector status as measured by percent of calls auto-identified to species for West Decker Coal Mine

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	8968	1947	21.7%
2012	September	10927	2035	18.6%
2012	October	33	14	42.4%
2012	November	0	0	-
2012	December	0	0	-
2013	January	0	0	-
2013	February	0	0	-
2013	March	0	0	-
2013	April	1065	3	0.3%
2013	May	1492	7	0.5%
2013	June	2538	3	0.1%
2013	July	1422	1	0.1%
2013	August	-	-	-
2013	September	-	-	-
2013	October	4	0	0.0%
2013	November	0	0	-
2013	December	0	0	-
2014	January	0	0	-
2014	February	0	0	-
2014	March	0	0	-
2014	April	1475	3	0.2%
2014	May	5567	272	4.9%
2014	June	2497	159	6.4%
2014	July	1055	7	0.7%
2014	August	8140	1087	13.4%
2014	September	25643	2230	8.7%
2014	October	74	15	20.3%
2014	November	2	2	100.0%
2014	December	0	0	-
2015	January	20	0	0.0%
2015	February	34	0	0.0%
2015	March	208	29	13.9%
2015	April	7665	620	8.1%
2015	May	21295	656	3.1%
2015	June	33221	12935	38.9%
2015	July	22230	10267	46.2%
2015	August	60491	20312	33.6%
2015	September	7376	3255	44.1%
2015	October	75	35	46.7%
2012	November	0	0	-
2015	December	63.6%	14	22

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2016	January	100.0%	1	1

Table 5b. Detector status as measured by percent of calls auto-identified to species for Spring Creek Mine

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	11910	1587	13.3%
2012	September	2082	183	8.8%
2012	October	0	0	-
2012	November	0	0	-
2012	December	0	0	-
2013	January	0	0	-
2013	February	0	0	-
2013	March	0	0	-
2013	April	602	251	41.7%
2013	May	22668	2738	12.1%
2013	June	22665	2372	10.5%
2013	July	0	0	-
2013	August	0	0	-
2013	September	0	0	-
2013	October	49	9	18.4%
2013	November	17	1	5.9%
2013	December	6	0	0.0%
2014	January	0	0	-
2014	February	0	0	-
2014	March	1	0	0.0%
2014	April	238	2	0.8%
2014	May	3380	82	2.4%
2014	June	24774	537	2.2%
2014	July	26885	488	1.8%
2014	August	15343	327	2.1%
2014	September	364	11	3.0%
2014	October	0	0	-
2014	November	23	7	30.4%
2014	December	15	5	33.3%
2015	January	1	0	0.0%
2015	February	0	0	-
2015	March	5	0	0.0%
2015	April	92	9	9.8%
2015	May	677	94	13.9%
2015	June	5812	3561	61.3%
2015	July	7785	4442	57.1%

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2015	August	8690	4391	50.5%
2015	September	3990	1669	41.8%
2015	October	168	47	28.0%
2012	November	49	25	51.0%
2015	December	49	29	59.2%
2016	January	40	28	70.0%
2016	February	46	21	45.7%
2016	March	18	11	61.1%
2016	April	19	12	63.2%

Table 5c. Detector status as measured by percent of calls auto-identified to species for Otter Creek Coal Tract

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2013	October	14	2	14.3%
2013	November	0	0	-
2013	December	0	0	-
2014	January	0	0	-
2014	February	0	0	-
2014	March	3	0	0.0%
2014	April	0	0	-
2014	May	17936	648	3.6%
2014	June	20205	1988	9.8%
2014	July	13931	2613	18.8%
2014	August	6988	629	9.0%
2014	September	2678	175	6.5%
2014	October	0	0	-
2014	November	2	0	0.0%
2014	December	3	0	0.0%
2015	January	0	0	-
2015	February	2	1	50.0%
2015	March	115	16	13.9%
2015	April	5288	233	4.4%
2015	May	19601	2735	14.0%
2015	June	19435	7456	38.4%
2015	July	17220	6305	36.6%
2015	August	31738	8943	28.2%
2015	September	15397	3271	21.2%

Table 5d. Detector status as measured by percent of calls auto-identified to species for Big Sky Mine

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2013	October	1171	335	28.6%
2013	November	1970	585	29.7%
2013	December	411	176	42.8%
2014	January	596	240	40.3%
2014	February	199	88	44.2%
2014	March	748	262	35.0%
2014	April	5918	2667	45.1%
2014	May	732	161	22.0%
2014	June	0	0	-
2014	July	598	63	10.5%
2014	August	3985	763	19.2%
2014	September	351	63	18.0%
2014	October	0	0	-
2014	November	0	0	-
2014	December	0	0	-
2015	January	0	0	-
2015	February	0	0	-
2015	March	11508	4868	42.3%
2015	April	6384	3006	47.1%
2015	May	9267	2546	27.5%
2015	June	26664	16867	63.3%
2015	July	42725	24425	57.2%
2015	August	25093	13814	55.1%
2015	September	17829	10387	58.3%
2015	October	8034	4616	57.5%
2012	November	5764	3597	62.4%
2015	December	3211	2039	63.5%
2016	January	2356	1520	64.5%
2016	February	9810	6015	61.3%
2016	March	13322	8553	64.2%
2016	April	6286	4101	65.2%

Table 5e. Detector status as measured by percent of calls auto-identified to species for Absaloka Mine

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	4035	663	16.43%
2012	September	5528	845	15.3%
2012	October	30	7	23.3%
2012	November	0	-	-
2012	December	0	-	-

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2013	January	0	-	-
2013	February	0	-	-
2013	March	0	-	-
2013	April	36	13	36.1%
2013	May	956	262	27.4%
2013	June	791	129	16.3%
2013	July	269	35	13.0%
2013	August	0	-	-
2013	September	0	-	-
2013	October	24	5	20.8%
2013	November	1	0	0.0%
2013	December	0	-	-
2014	January	0	-	-
2014	February	0	-	-
2014	March	0	-	-
2014	April	98	7	7.1%
2014	May	1476	553	37.5%
2014	June	1121	410	36.6%
2014	July	20	0	0.0%
2014	August	1337	541	40.5%
2014	September	1415	347	24.5%
2014	October	20	2	10.0%
2014	November	1	1	100.0%
2014	December	4	1	25.0%
2015	January	1	0	0.0%
2015	February	2	0	0.0%
2015	March	32	20	62.5%
2015	April	352	145	41.2%
2015	May	1962	728	37.1%
2015	June	9980	5797	58.1%
2015	July	8365	5248	62.7%
2015	August	674	51	7.6%
2015	September	23	2	8.7%

Table 5f. Detector status as measured by percent of calls auto-identified to species for Rosebud Mine F Pond 7

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	1133	274	24.2%
2012	September	1401	318	22.7%
2012	October	30	4	13.3%
2012	November	2	0	0.0%

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	December	0	0	-
2013	January	0	0	-
2013	February	0	0	-
2013	March	0	0	-
2013	April	0	0	-
2013	May	39	0	0.0%
2013	June	218	0	0.0%
2013	July	295	1	0.3%
2013	August	317	6	1.9%
2013	September	60	1	1.7%
2013	October	3	0	0.0%

Table 5g. Detector status as measured by percent of calls auto-identified to species for Rosebud Mine Area C pond

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2013	October	8	4	50.0%
2013	November	2	1	50.0%
2013	December	0		
2014	January	0		
2014	February	3	2	66.7%
2014	March	0		
2014	April	326	105	32.2%
2014	May	2491	935	37.5%
2014	June	7223	1573	21.8%
2014	July	14728	3339	22.7%
2014	August	9654	2244	23.2%
2014	September	3146	450	14.3%
2014	October	96	37	38.5%
2014	November	4	1	25.0%
2014	December	4	1	25.0%
2015	January	0	0	-
2015	February	0	0	-
2015	March	70	24	34.3%
2015	April	117	50	42.7%
2015	May	2410	1117	46.4%
2015	June	24939	12034	48.3%
2015	July	32479	19038	58.6%
2015	August	16920	8244	48.7%
2015	September	4141	2151	51.9%
2015	October	65	34	52.3%
2012	November	9	1	11.1%

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2015	December	12	6	50.0%
2016	January	13	11	84.6%
2016	February	-	-	-
2016	March	-	-	-
2016	April	605	310	51.2%
2016	May	3732	2065	55.3%
2016	June	-	-	-
2016	July	-	-	-

Table 5h. Detector status as measured by percent of calls auto-identified to species for Signal Peak Mine Reservoir 1

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	3553	380	10.7%
2012	September	7884	929	11.8%
2012	October	790	46	5.8%
2012	November	901	54	6.0%
2012	December	421	19	4.5%
2013	January	290	40	13.8%
2013	February	183	5	2.7%
2013	March	727	101	13.9%
2013	April	3266	693	21.2%
2013	May	5628	625	11.1%
2013	June	5998	719	12.0%
2013	July	5076	663	13.1%
2013	August	7609	1138	15.0%
2013	September	1527	262	17.2%
2013	October	406	64	15.8%
2013	November	447	41	9.2%
2013	December	67	7	10.5%
2014	January	31	5	16.1%
2014	February	5	0	0.0%
2014	March	0	0	-
2014	April	164	28	17.1%
2014	May	4004	476	11.9%
2014	June	5792	1204	20.8%
2014	July	14738	3886	26.4%
2014	August	8517	2176	25.6%
2014	September	1519	243	16.0%
2014	October	286	88	30.8%
2014	November	297	52	17.5%
2014	December	163	7	4.3%

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2015	January	30	0	0.0%
2015	February	60	0	0.0%
2015	March	1682	160	9.5%
2015	April	1621	121	7.5%
2015	May	1449	187	12.9%
2015	June	12390	7906	63.8%
2015	July	24210	15560	64.3%
2015	August	14255	8582	60.2%
2015	September	9275	5193	56.0%
2015	October	1436	614	42.8%
2012	November	1355	507	37.4%
2015	December	1013	403	39.8%
2016	January	560	257	45.9%
2016	February	1082	394	36.4%
2016	March	-	-	-
2016	April	-	-	-
2016	May	-	-	-
2016	June	-	-	-
2016	July	-	-	-

Table 5i. Detector status as measured by percent of calls auto-identified to species for Signal Peak Mine Busse Water Reservoir

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2012	August	13768	3542	25.7%
2012	September	23576	7578	32.1%
2012	October	257	71	27.6%
2012	November	57	6	10.5%
2012	December	74	19	25.7%
2013	January	7	0	0.0%
2013	February	0	0	-
2013	March	0	0	-
2013	April	1366	241	17.6%
2013	May	7956	874	11.0%
2013	June	30880	6313	20.4%
2013	July	41451	10202	24.6%
2013	August	12566	2019	16.1%
2013	September	3728	329	8.8%
2013	October	343	127	37.0%
2013	November	91	39	42.9%
2013	December	22	9	40.9%
2014	January	20	8	40.0%

Year	Month	Total No. of Calls	No. Calls Classified to Species	% Auto-identified to Species
2014	February	9	5	55.6%
2014	March	12	6	50.0%
2014	April	2204	817	37.1%
2014	May	15852	4774	30.1%
2014	June	30687	7836	25.5%
2014	July	43747	13386	30.6%
2014	August	22965	5784	25.2%
2014	September	4284	832	19.4%
2014	October	99	19	19.2%
2014	November	25	5	20.0%
2014	December	104	21	20.2%
2015	January	17	7	41.2%
2015	February	31	4	12.9%
2015	March	1054	332	31.5%
2015	April	2400	1102	45.9%
2015	May	10230	3206	31.3%
2015	June	24655	12617	51.2%
2015	July	68847	30916	44.9%
2015	August	27061	13803	51.0%
2015	September	28898	11953	41.4%
2015	October	394	256	65.0%
2012	November	255	138	54.1%
2015	December	413	244	59.1%
2016	January	372	231	62.1%
2016	February	218	111	50.9%
2016	March	-	-	-
2016	April	-	-	-
2016	May	-	-	-
2016	June	-	-	-
2016	July	-	-	-

Table 6. Monthly rates of hand confirmation from automated analysis results across all mine sites and detectors

Species	No. months with automated identification of species	No. months with hand confirmed identification of species	Percent of months automated identification was hand confirmed
Pallid Bat (Antrozous pallidus)	86	0	0.0%
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]	77	3	5.3%
Big Brown Bat (*Eptesicus fuscus*)	124	59	68.6%
Spotted Bat (*Euderma maculatum*)	19	17	100.0%
Hoary Bat (*Lasiurus cinereus*)	96	56	71.8%
Silver-haired Bat (*Lasionycterus noctivagans*)	128	70	71.2%
Eastern Red Bat (*Lasiurus borealis*)	135	10	10.5%
Western Small-footed Myotis (*Myotis ciliolabrum*)	142	66	64.7%
Long-eared Myotis (*Myotis evotis*)	76	60	87.0%
Little Brown Myotis (*Myotis lucifugus*)	105	56	73.7%
Fringed Myotis (*Myotis thysanodes*)	41	0	0.0%
Long-legged Myotis (*Myotis volans*)[2]	71	3	6.0%
	∑ = 1100	∑ = 400	X = 54.95%

1 Species is relatively quiet and often does not create fully definitive echolocation call recordings on bat detectors.

2 Long-legged Myotis calls can overlap with Western Small-footed Myotis, Long-eared Myotis, Little Brown Myotis, and Fringed Myotis calls and rarely have call characteristics recorded that allow them to be definitively identified as Long-legged Myotis (Maxell 2015). Several call sequences were auto-identified as Long-legged Myotis. However, these call sequences lacked the definitive characteristics necessary to confirm the species' presence.

Table 7a. Species definitively detected by month each year of the study at the West Decker Coal Mine [1]

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)												
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]												
Big Brown Bat (*Eptesicus fuscus*)				2013 2016	2013 2014	2013 2014	2013	2012 2014	2012 2014			
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)					2014 2016	2013 2015 2016	2014 2015 2016	2012 2014 2015	2012 2014 2015			
Silver-haired Bat (*Lasionycterus noctivagans*)				2013 2016	2013 2014 2016	2014 2015 2016	2015 2016	2012 2014 2015	2012 2014 2015	2012 2014		
Eastern Red Bat (*Lasiurus borealis*)								2012 2015	2014 2015	2015		
Western Small-footed Myotis (*Myotis ciliolabrum*)				2013 2014	2013 2014	2013 2014 2015	2013 2014 2015	2012 2014	2012 2014	2015		
Long-eared Myotis (*Myotis evotis*)				2013	2013 2014	2013 2014 2015	2015 2016	2012 2014 2015	2012 2014 2015			
Little Brown Myotis (*Myotis lucifugus*)				2015	2013 2014 2015	2013 2014 2015	2013 2014 2015	2012 2014 2015	2012 2014 2015	2012		
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]												

[1] Blue cells of table indicate documentation of the species in the region during this month prior to this study.

Table 7b. Species definitively detected by month each year of the study at the Spring Creek Mine

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)												
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]												
Big Brown Bat (*Eptesicus fuscus*)					2013 2014	2013 2014	2014 2015	2012 2014 2015				
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)					2013 2014	2013 2014 2015 2016	2014 2015 2016	2012 2014 2015 2016	2012 2014 2015 2016			
Silver-haired Bat (*Lasionycterus noctivagans*)				2013 2014	2013 2014	2013 2014 2015	2014 2015 2016	2012 2014 2015	2012 2014 2016		2013 2014	
Eastern Red Bat (*Lasiurus borealis*)				2016				2012 2014				
Western Small-footed Myotis (*Myotis ciliolabrum*)				2013 2014	2013 2014	2013 2014	2014 2015	2012 2014	2012 2014			
Long-eared Myotis (*Myotis evotis*)				2014	2013 2014 2015	2013 2014 2015	2014 2015	2012 2014 2015	2012 2014 2015			
Little Brown Myotis (*Myotis lucifugus*)				2013	2013 2014	2013 2014 2015	2014 2015	2012 2014	2012 2014			
Fringed Myotis (*Myotis thysanodes*)							2016					
Long-legged Myotis (*Myotis volans*) [3]								2014				

Table 7c. Species definitively detected by month each year of the study at the Otter Creek Coal Tract

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)						2015						
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]						2016			2015			
Big Brown Bat (*Eptesicus fuscus*)					2016		2015					
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)					2014 2015 2016	2014 2015 2016	2014 2015	2014 2015	2014 2015			
Silver-haired Bat (*Lasionycterus noctivagans*)				2016	2014 2015 2016	2015 2016	2015	2014 2015	2014 2015			
Eastern Red Bat (*Lasiurus borealis*)							2015	2014 2015	2015			
Western Small-footed Myotis (*Myotis ciliolabrum*)				2015 2016	2014 2016	2015 2016	2014 2016	2014 2016	2015	2013		
Long-eared Myotis (*Myotis evotis*)					2014 2015	2015 2016	2014 2015	2014 2015	2014			
Little Brown Myotis (*Myotis lucifugus*)				2015 2016	2014 2015 2016	2014 2015 2016	2014 2015	2015	2014 2015			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]					2015							

Table 7d. Species definitively detected by month each year of the study at the Big Sky Mine

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)				2014	2016							
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]												
Big Brown Bat (*Eptesicus fuscus*)	2014	2014	2014	2014	2014	2015	2014	2014	2014	2013	2013	
Spotted Bat (*Euderma maculatum*)						2015						
Hoary Bat (*Lasiurus cinereus*)			2015	2015	2015 2016	2015 2016	2015 2016	2015 2016	2015 2016	2015	2015	
Silver-haired Bat (*Lasionycterus noctivagans*)	2014	2014	2014 2015 2016	2014 2015 2016	2014 2015 2016	2015	2015 2016	2014 2015 2016	2015 2016	2013 2015 2016	2013 2015	2013 2015
Eastern Red Bat (*Lasiurus borealis*)						2015		2014				
Western Small-footed Myotis (*Myotis ciliolabrum*)	2014 2016	2014 2016	2014 2016	2014 2016	2014 2016	2015 2016	2015 2016	2014 2015	2015 2016	2013 2015	2013 2015	2015
Long-eared Myotis (*Myotis evotis*)					2015 2016	2015	2014 2015	2014 2015	2015 2016			
Little Brown Myotis (*Myotis lucifugus*)				2014 2016	2014 2016	2015 2016	2015 2016	2014 2015 2016	2014 2015 2016			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]										2015		

Table 7e. Species definitively detected by month each year of the study at the Absaloka Mine

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)												
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]												
Big Brown Bat (*Eptesicus fuscus*)					2013 2014	2013	2013		2012			
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)				2015	2013 2014 2015	2013 2014 2015	2014 2015	2012 2014 2015	2012 2014			
Silver-haired Bat (*Lasionycterus noctivagans*)				2014	2013 2014	2013 2015		2012 2014	2012 2014	2012		
Eastern Red Bat (*Lasiurus borealis*)								2012	2014			
Western Small-footed Myotis (*Myotis ciliolabrum*)						2013 2015	2015	2012				
Long-eared Myotis (*Myotis evotis*)					2013 2014	2013 2014 2015	2015	2012 2014	2012 2014			
Little Brown Myotis (*Myotis lucifugus*)						2015	2015	2012	2012			
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]												

Table 7f. Species definitively detected by month each year of the study at the Rosebud Mine Area C and F pond sites

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)												
Townsend's Big-eared Bat (*Corynorhinus townsendii*)[1]												
Big Brown Bat (*Eptesicus fuscus*)				2014	2013 2014 2016	2013 2014	2013 2014	2012 2013 2014	2012 2014	2014	2012	
Spotted Bat (*Euderma maculatum*)												
Hoary Bat (*Lasiurus cinereus*)					2014 2016	2013 2014 2015	2013 2014 2015	2013 2014 2015	2014 2015			
Silver-haired Bat (*Lasionycterus noctivagans*)				2014 2016	2013 2014 2015 2016	2013 2014 2015	2013 2014 2015	2012 2013 2014 2015	2012 2013 2014 2015	2014		
Eastern Red Bat (*Lasiurus borealis*)								2014 2015	2015			
Western Small-footed Myotis (*Myotis ciliolabrum*)				2014	2013 2014 2016	2013 2014 2015 2016	2013 2014 2015	2012 2013 2014 2015	2012 2013 2014 2015	2013 2014		
Long-eared Myotis (*Myotis evotis*)					2014 2016	2013 2014 215	2013 2014 215	2012 2013 2014 2015	2012 2013 2014 2015	2013		
Little Brown Myotis (*Myotis lucifugus*)					2014 2015 2016	2013 2014 0215	2014 2015	2012 2013 2014 2015	2012 2014 2015	2014		

Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]							2014		2012			

Table 7g. Species definitively detected by month each year of the study at the Signal Peak Mine Reservoir 1 and Busse Water Reservoir sites

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)												
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]						2014 2015	2013 2014 2015	2014 2015	2012 2015			
Big Brown Bat (*Eptesicus fuscus*)	2015	2014	2015	2013 2014	2013 2014	2013 2014 2015	2013 2014	2012 2013 2014	2012 2013 2014	2012 2013	2012 2013	2012 2013
Spotted Bat (*Euderma maculatum*)				2013 2015 2016	2014 2016	2013 2014 2015 2016	2013 2014 2015 2016	2013 2014 2015	2012 2013 2015	2014 2016		
Hoary Bat (*Lasiurus cinereus*)					2013 2014 2015	2013 2014 2015	2013 2014	2012 2013 2014	2012 2013 2014			
Silver-haired Bat (*Lasionycterus noctivagans*)			2013	2013 2014	2013 2014	2013 2014	2013 2014	2012 2013 2014	2012 2013 2014	2013		
Eastern Red Bat (*Lasiurus borealis*)							2013	2014 2015 2016	2015			
Western Small-footed Myotis (*Myotis ciliolabrum*)	2014 2016	2016	2013 2016	2013 2014	2013 2014	2013 2014 2015 2016	2013 2014 2015	2012 2013 2014	2012 2013 2014	2012 2013	2012 2013 2015 2016	2013 2015

Long-eared Myotis (*Myotis evotis*)			2016	2013 2015 2016	2013 2014 2015	2013 2014	2013 2014	2012 2013 2014	2012 2013 2014	2012 2013		
Little Brown Myotis (*Myotis lucifugus*)				2013 2014 2016	2013 2014	2013 2014	2013 2014	2012 2013 2014	2012 2013 2014 2015	2015 2016		
Fringed Myotis (*Myotis thysanodes*)												
Long-legged Myotis (*Myotis volans*) [3]									2014			

Table 8. Species definitively detected by month across the acoustic detector network (blue cells) and at project detectors (X)

Species	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Pallid Bat (Antrozous pallidus)[1]				X	X	X						
Townsend's Big-eared Bat (*Corynorhinus townsendii*) [1]						X	X	X	X			
Big Brown Bat (*Eptesicus fuscus*)	X	X	X	X	X	X	X	X	X	X	X	X
Spotted Bat (*Euderma maculatum*)				X	X	X	X	X	X	X		
Hoary Bat (*Lasiurus cinereus*)			X	X	X	X	X	X	X	X	X	
Silver-haired Bat (*Lasionycteris noctivagans*)	X	X	X	X	X	X	X	X	X	X	X	X
Western Small-footed Myotis (*Myotis ciliolabrum*)	X	X	X	X	X	X	X	X	X	X	X	X
Eastern Red Bat (*Lasiurus borealis*)				X		X	X	X	X	X		
Long-eared Myotis (*Myotis evotis*)				X	X	X	X	X	X	X		
Little Brown Myotis (*Myotis lucifugus*)				X	X	X	X	X	X	X		
Fringed Myotis (*Myotis thysanodes*)							X					
Long-legged Myotis (*Myotis volans*) [2]					X		X	X	X	X		

[1] Species is relatively quiet and often does not create fully definitive echolocation call recordings on bat detectors.

[2] Long-legged Myotis calls can overlap with Western Small-footed Myotis, Long-eared Myotis, Little Brown Myotis, and Fringed Myotis calls and rarely have call characteristics recorded that allow them to be definitively identified as Long-legged Myotis (Maxell 2015). Several call sequences were auto-identified as Long-legged Myotis. However, these call sequences lacked the definitive characteristics necessary to confirm the species' presence.

Table 9a. Bat Passes summarized by month across all species at the West Decker Mine

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	11951	11	1086.5	476.1	454	1850
2012	9	14460	30	482	521.3	10	2108
2012	10	32	31	1	2.3	0	12
2012	11	0	30	0	0	0	0
2012	12	0	31	0	0	0	0
2013	1	0	31	0	0	0	0
2013	2	0	28	0	0	0	0
2013	3	0	31	0	0	0	0
2013	4	1568	30	52.3	140.4	0	680
2013	5	2117	31	68.3	160.8	0	897
2013	6	3033	30	101.1	87.4	2	273
2013	7	1676	31	54.1	134.5	0	572
2013	8	0	31	0	0	0	0
2013	9	1	28	0	0.2	0	1
2013	10	36	31	1.2	4.3	0	21
2013	11	0	29	0	0	0	0
2013	12	0	29	0	0	0	0
2014	1	0	31	0	0	0	0
2014	2	0	28	0	0	0	0
2014	3	0	31	0	0	0	0
2014	4	2037	30	67.9	149.5	0	773
2014	5	7296	31	235.4	195.2	0	856
2014	6	2818	30	93.9	171.2	0	761
2014	7	1283	31	41.4	100.1	0	386
2014	8	11492	31	370.7	1023.6	0	4010
2014	9	31909	30	1063.6	1352.1	1	5324
2014	10	78	31	2.5	5.2	0	20
2014	11	3	30	0.1	0.4	0	2

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2014	12	3	31	0.1	0.4	0	2
2015	1	38	31	1.2	6.8	0	38
2015	2	54	28	1.9	8.5	0	45
2015	3	293	31	9.5	25.7	0	110
2015	4	11075	30	369.2	396.7	0	1246
2015	5	30240	31	975.5	1215.8	0	4413
2015	6	19841	8	2480.1	1890.8	7	4225
2015	6	32426	22	1473.9	559	517	2447
2015	7	21401	28	764.3	547.3	50	1920
2015	8	58297	31	1880.5	1529.6	14	5088
2015	9	6647	30	221.6	312.6	3	1422
2015	10	71	31	2.3	5.1	0	23
2015	11	0	30	0	0	0	0
2015	12	19	31	0.6	3.4	0	19
2016	1	2	31	0.1	0.2	0	1
2016	2	0	29	0	0	0	0
2016	3	2	31	0.1	0.2	0	1
2016	4	6166	30	205.5	370	0	1618
2016	5	47534	31	1533.4	962.1	0	3338
2016	6	72849	30	2428.3	872.1	1142	3965
2016	7	46684	23	2029.7	1185.1	243	4079

Table 9b. Bat Passes summarized by month across all species at the Spring Creek Mine

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	13932	11	1266.5	653.2	595	2744
2012	9	2454	30	81.8	215.6	0	708
2012	10	0	22	0	0	0	0

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	1	0	1	0		0	0
2013	4	952	28	34	47	0	180
2013	5	28360	31	914.8	654.3	0	2105
2013	6	27402	30	913.4	486	25	1976
2013	7	0	31	0	0	0	0
2013	8	0	31	0	0	0	0
2013	9	0	30	0	0	0	0
2013	10	65	31	2.1	4.2	0	18
2013	11	20	30	0.7	1.7	0	8
2013	12	6	31	0.2	0.7	0	4
2014	1	0	31	0	0	0	0
2014	2	0	28	0	0	0	0
2014	3	2	31	0.1	0.4	0	2
2014	4	307	30	10.2	29.3	0	127
2014	5	4755	31	153.4	203.3	0	892
2014	6	36944	30	1231.5	583	475	2489
2014	7	46231	31	1491.3	876.8	289	3018
2014	8	24803	31	800.1	798.7	0	2620
2014	9	381	30	12.7	21.8	0	109
2014	10	2	31	0.1	0.4	0	2
2014	11	29	30	1	2.4	0	11
2014	12	21	31	0.7	1.4	0	5
2015	1	1	31	0	0.2	0	1
2015	2	1	28	0	0.2	0	1
2015	3	6	31	0.2	0.6	0	3
2015	4	99	30	3.3	8.1	0	43
2015	5	744	31	24	30.4	0	131
2015	6	469	9	52.1	36.9	0	108
2015	6	5735	21	273.1	97	47	458
2015	7	7561	31	243.9	172.6	26	889

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2015	8	8418	31	271.5	194	29	872
2015	9	3858	30	128.6	115.9	3	427
2015	10	155	31	5	10.4	0	57
2015	11	46	30	1.5	2.7	0	9
2015	12	45	31	1.5	3.9	0	16
2016	1	39	31	1.3	2.4	0	11
2016	2	44	29	1.5	4.1	0	21
2016	3	18	31	0.6	1.4	0	7
2016	4	316	30	10.5	16.4	0	71
2016	5	1796	31	57.9	45.4	0	151
2016	6	5173	30	172.4	91.2	28	460
2016	7	6727	31	217	150.9	26	686
2016	8	7291	31	235.2	262.9	10	1100
2016	9	1135	30	37.8	46.6	0	181
2016	10	16	31	0.5	0.9	0	3
2016	11	8	30	0.3	0.6	0	2
2016	12	1	12	0.1	0.3	0	1

Table 9c. Bat Passes summarized by month across all species at the Otter Creek Coal Tract

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	10	20	16	1.3	3.2	0	12
2013	11	1	30	0	0.2	0	1
2013	12	0	31	0	0	0	0
2014	1	0	31	0	0	0	0
2014	2	1	28	0	0.2	0	1
2014	3	4	31	0.1	0.7	0	4
2014	4	0	1	0		0	0

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2014	5	32695	17	1923.2	802.4	915	3545
2014	6	36315	30	1210.5	690	225	3031
2014	7	19609	31	632.5	379.9	13	1348
2014	8	8025	31	258.9	220.4	0	847
2014	9	3261	6	543.5	163.5	310	813
2014	10	0	4	0	0	0	0
2014	11	2	30	0.1	0.3	0	1
2014	12	2	31	0.1	0.4	0	2
2015	1	0	31	0	0	0	0
2015	2	2	28	0.1	0.3	0	1
2015	3	125	31	4	8.5	0	39
2015	4	6613	30	220.4	451.7	0	2025
2015	5	28503	31	919.5	711	0	2264
2015	6	11242	10	1124.2	366.4	459	1656
2015	6	18985	20	949.3	543.3	295	2083
2015	7	17014	31	548.8	415.1	46	1628
2015	8	29612	31	955.2	551.6	26	2079
2015	9	13501	30	450	293.7	7	1062
2015	10	253	31	8.2	18	0	62
2015	11	17	30	0.6	3.1	0	17
2015	12	92	31	3	7	0	31
2016	1	50	31	1.6	4.6	0	19
2016	2	16	29	0.6	1.3	0	4
2016	3	87	31	2.8	6.7	0	28
2016	4	5855	30	195.2	302.4	0	1405
2016	5	38930	31	1255.8	859.1	0	3350
2016	6	24716	21	1177	376.1	632	2156

Table 9d. Bat Passes summarized by month across all species at the Big Sky Mine

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	10	1699	16	106.2	128.3	2	369
2013	11	3007	30	100.2	94	0	342
2013	12	621	31	20	33.4	0	119
2014	1	886	31	28.6	43.4	0	203
2014	2	323	28	11.5	23.2	0	105
2014	3	1313	31	42.4	84	0	422
2014	4	12294	30	409.8	612.3	0	2451
2014	5	922	9	102.4	130.2	0	408
2014	7	756	2	378	274.4	184	572
2014	8	5108	31	164.8	166.4	0	607
2014	9	585	30	19.5	38	0	168
2014	10	0	31	0	0	0	0
2014	11	0	30	0	0	0	0
2014	12	0	31	0	0	0	0
2015	1	0	31	0	0	0	0
2015	2	0	28	0	0	0	0
2015	3	23169	31	747.4	951.5	0	2984
2015	4	12140	30	404.7	460.4	14	2049
2015	5	13263	31	427.8	339.9	3	1082
2015	6	7468	10	746.8	280.3	263	1176
2015	6	26656	20	1332.8	676.4	219	2587
2015	7	42178	31	1360.6	721.8	128	3186
2015	8	24190	31	780.3	471.1	0	2210
2015	9	17334	30	577.8	390.1	42	1362
2015	10	7901	31	254.9	214.7	0	1086
2015	11	5672	30	189.1	192.8	0	656
2015	12	3137	31	101.2	139.4	0	451
2016	1	2309	31	74.5	90.9	0	276

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2016	2	9637	29	332.3	319.4	0	1580
2016	3	13073	31	421.7	347.6	0	1321
2016	4	14092	30	469.7	517.3	2	1797
2016	5	25963	31	837.5	548.5	1	1831
2016	6	45155	30	1505.2	494.5	544	2427
2016	7	37735	31	1217.3	656.8	81	2450
2016	8	17140	31	552.9	230.3	205	1226
2016	9	7966	30	265.5	220.6	0	727
2016	10	3861	31	124.5	107.7	0	344
2016	11	5184	30	172.8	113.7	0	420
2016	12	478	31	15.4	34.3	0	129
2017	1	476	31	15.4	30.4	0	93
2017	2	1543	28	55.1	60.4	0	162
2017	3	4999	31	161.3	298	0	1620
2017	4	7534	30	251.1	308.5	0	1204
2017	5	15131	31	488.1	369.3	5	1430
2017	6	24334	30	811.1	367.2	67	1592
2017	7	37131	31	1197.8	373	451	2100
2017	8	8609	14	614.9	207.8	226	1032

Table 9e. Bat Passes summarized by month across all species at the Absaloka Mine

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	4403	10	440.3	316.7	111	1228
2012	9	6608	30	220.3	398.8	8	2046
2012	10	35	31	1.1	2.9	0	15
2012	11	0	30	0	0	0	0
2012	12	0	31	0	0	0	0
2013	1	0	31	0	0	0	0
2013	2	0	28	0	0	0	0
2013	3	0	31	0	0	0	0
2013	4	34	30	1.1	2.5	0	9
2013	5	890	31	28.7	43.4	0	181
2013	6	668	30	22.3	39	0	189
2013	7	193	31	6.2	7.5	0	26
2013	8	0	31	0	0	0	0
2013	9	0	30	0	0	0	0
2013	10	30	31	1	4.2	0	23
2013	11	1	30	0	0.2	0	1
2013	12	5	31	0.2	0.9	0	5
2014	1	0	31	0	0	0	0
2014	2	0	28	0	0	0	0
2014	3	0	31	0	0	0	0
2014	4	153	30	5.1	11.7	0	55
2014	5	1616	31	52.1	89.9	0	338
2014	6	1068	30	35.6	65.5	0	275
2014	7	12	31	0.4	0.7	0	2
2014	8	2001	31	64.5	155.5	0	572
2014	9	1532	30	51.1	94.2	0	432
2014	10	21	31	0.7	1.8	0	7
2014	11	1	30	0	0.2	0	1

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2014	12	4	31	0.1	0.5	0	2
2015	1	1	31	0	0.2	0	1
2015	2	2	28	0.1	0.3	0	1
2015	3	48	31	1.5	5.8	0	30
2015	4	466	30	15.5	25.8	0	102
2015	5	2199	31	70.9	103.3	0	430
2015	6	1250	10	125	162.5	0	469
2015	6	9863	20	493.1	305.1	134	1107
2015	7	8131	23	353.5	443.6	0	1352
2015	8	522	14	37.3	32.5	5	118
2015	9	16	10	1.6	2	0	6
2015	10	0	10	0	0	0	0
2015	11	0	4	0	0	0	0

Table 9f. Bat Passes summarized by month across all species at the Rosebud Mine Area F Pond 7

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	1188	10	118.8	76.6	26	274
2012	9	1845	30	61.5	85.6	5	384
2012	10	40	31	1.3	5.5	0	30
2012	11	2	30	0.1	0.3	0	1
2012	12	0	31	0	0	0	0
2013	1	1	31	0	0.2	0	1
2013	2	1	28	0	0.2	0	1
2013	3	0	31	0	0	0	0
2013	4	9	30	0.3	1.1	0	5
2013	5	131	31	4.2	6.9	0	28
2013	6	260	30	8.7	6.4	0	25
2013	7	373	31	12	7.3	3	37

2013	8	326	31	10.5	9	1	34
2013	9	72	30	2.4	2.5	0	11
2013	10	4	15	0.3	0.6	0	2

Table 9g. Bat Passes summarized by month across all species at the Rosebud Mine Area C Pond

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	10	11	16	0.7	1.9	0	7
2013	11	3	30	0.1	0.5	0	3
2013	12	3	31	0.1	0.4	0	2
2014	1	0	31	0	0	0	0
2014	2	4	28	0.1	0.8	0	4
2014	3	4	31	0.1	0.6	0	3
2014	4	477	30	15.9	29.4	0	110
2014	5	3796	31	122.5	151.3	0	485
2014	6	10728	30	357.6	246.7	6	917
2014	7	18955	31	611.5	376.4	72	1633
2014	8	11093	31	357.8	318.6	0	1126
2014	9	3590	30	119.7	206.2	0	965
2014	10	125	31	4	6.6	0	24
2014	11	6	30	0.2	0.9	0	5
2014	12	4	31	0.1	0.6	0	3
2015	1	1	31	0	0.2	0	1
2015	2	0	28	0	0	0	0
2015	3	122	31	3.9	15.3	0	78
2015	4	178	24	7.4	34.9	0	171
2015	5	3722	31	120.1	173.1	0	773
2015	6	3525	10	352.5	285.8	54	1065
2015	6	24894	20	1244.7	618.9	385	2543
2015	7	41127	30	1370.9	642.6	16	2204
2015	8	16179	31	521.9	538.3	12	2318

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2015	9	3939	30	131.3	161.8	0	821
2015	10	53	31	1.7	3.7	0	18
2015	11	4	30	0.1	0.6	0	3
2015	12	14	31	0.5	1.5	0	8
2016	1	14	31	0.5	1.5	0	8
2016	2	1	29	0	0.2	0	1
2016	3	55	31	1.8	8.3	0	46
2016	4	783	30	26.1	68.7	0	341
2016	5	5659	31	182.5	216.5	0	742
2016	6	8947	12	745.6	424.3	57	1482

Table 9h. Bat Passes summarized by month across all species at the Signal Peak Mine Reservoir 1

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	4851	9	539	101.7	383	666
2012	9	12423	30	414.1	443.5	25	2309
2012	10	1172	31	37.8	65.2	0	314
2012	11	1108	30	36.9	35.4	0	119
2012	12	572	31	18.5	41.3	0	166
2013	1	466	31	15	37.4	0	157
2013	2	276	28	9.9	17.8	0	66
2013	3	1312	31	42.3	75.1	0	255
2013	4	7493	30	249.8	417.8	0	1275
2013	5	8163	31	263.3	386.5	0	1576
2013	6	9084	30	302.8	238.7	0	898
2013	7	7246	31	233.7	124.6	30	487
2013	8	10952	31	353.3	291.1	5	1635
2013	9	2154	30	71.8	81.7	0	262
2013	10	550	31	17.7	29.5	0	115

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	11	541	30	18	24.8	0	107
2013	12	94	31	3	6.5	0	21
2014	1	43	31	1.4	4.2	0	21
2014	2	4	28	0.1	0.4	0	2
2014	4	231	1	231		231	231
2014	5	4746	31	153.1	200.5	0	740
2014	6	6790	30	226.3	195.4	1	738
2014	7	17224	31	555.6	210.5	141	1057
2014	8	10306	31	332.5	270.3	0	1163
2014	9	2021	30	67.4	130.3	0	690
2014	10	285	31	9.2	13.8	0	60
2014	11	406	30	13.5	32.9	0	146
2014	12	410	31	13.2	20.1	0	82
2015	1	97	31	3.1	7.3	0	28
2015	2	59	28	2.1	4.6	0	19
2015	3	3874	31	125	277.7	0	1120
2015	4	2649	30	88.3	159.8	0	707
2015	5	1484	31	47.9	106	0	490
2015	6	392	11	35.6	39.4	0	122
2015	6	12112	19	637.5	478.4	146	1674
2015	7	23690	31	764.2	426.4	147	1843
2015	8	13740	31	443.2	447	21	2413
2015	9	9316	30	310.5	268.9	3	1071
2015	10	1388	31	44.8	41.3	0	151
2015	11	1313	30	43.8	76.1	0	314
2015	12	970	31	31.3	46.3	0	147
2016	1	550	31	17.7	29.3	0	122
2016	2	1073	29	37	72.3	0	311
2016	3	8	21	0.4	1.1	0	5
2016	4	2231	21	106.2	180.8	0	648

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2016	5	3099	31	100	103	0	370
2016	6	26577	30	885.9	572.9	90	2485
2016	7	13255	31	427.6	390	18	1893
2016	8	6879	31	221.9	130.1	22	523
2016	9	2698	30	89.9	137.8	0	534
2016	10	661	31	21.3	18	0	68
2016	11	1298	30	43.3	44.2	0	141
2016	12	137	31	4.4	14.3	0	71
2017	1	327	31	10.5	22.7	0	77
2017	2	558	28	19.9	39.7	0	186
2017	3	779	31	25.1	42.6	0	188
2017	4	1537	30	51.2	69	0	295
2017	5	5865	31	189.2	216.7	0	736
2017	6	22021	30	734	488.2	78	1957
2017	7	26120	31	842.6	499.7	231	2013
2017	8	6345	13	488.1	265.6	21	1008

Table 9i. Bat Passes summarized by month across all species at the Signal Peak Mine Busse Water Reservoir

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2012	8	24895	9	2766.1	697	1735	3873
2012	9	39185	30	1306.2	904.8	90	3153
2012	10	360	31	11.6	28	0	118
2012	11	81	30	2.7	4.7	0	23
2012	12	98	31	3.2	7.2	0	35
2013	1	11	9	1.2	2.6	0	8
2013	4	2704	29	93.2	168.7	0	595
2013	5	13831	31	446.2	388.3	0	1630
2013	6	59236	30	1974.5	1493.9	28	4533

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2013	7	69941	26	2690	474.7	1664	3614
2013	8	21481	27	795.6	344.4	284	1500
2013	9	4693	30	156.4	199	0	823
2013	10	518	31	16.7	36.7	0	165
2013	11	138	30	4.6	8.1	0	27
2013	12	36	31	1.2	2.8	0	11
2014	1	26	31	0.8	1.8	0	7
2014	2	21	28	0.8	1.7	0	5
2014	3	20	31	0.6	1.6	0	7
2014	4	4480	30	149.3	231.3	0	828
2014	5	28045	31	904.7	998.3	0	3855
2014	6	47713	30	1590.4	727.7	240	2934
2014	7	66688	31	2151.2	467.3	1206	3290
2014	8	34026	31	1097.6	671.8	0	2673
2014	9	5678	30	189.3	288.5	0	1352
2014	10	126	31	4.1	7.2	0	27
2014	11	28	30	0.9	1.8	0	6
2014	12	150	31	4.8	8.5	0	30
2015	1	20	31	0.6	1.3	0	5
2015	2	77	28	2.8	11.1	0	59
2015	3	2191	31	70.7	170.4	0	682
2015	4	5288	30	176.3	255.8	0	930
2015	5	16851	31	543.6	380.7	0	1172
2015	6	60207	30	2006.9	508.2	855	2851
2015	7	65667	31	2118.3	665.9	429	3141
2015	8	37383	17	2199	967.3	494	3901
2015	9	21991	30	733	1012.2	6	3555
2015	10	104	18	5.8	8	0	25
2015	6	24315	10	2431.5	386.7	1875	2938
2015	8	26506	11	2409.6	1082.4	543	4060

Year	Month	Bat Passes	Sample Nights	Avg Number of Bat Passes	StDev of Bat Passes	Min Count of Bat Passes	Max Count of Bat Passes
2015	9	28220	30	940.7	994.4	25	3702
2015	10	386	31	12.5	20	0	93
2015	11	247	30	8.2	16.5	0	64
2015	12	409	31	13.2	25.1	0	106
2016	1	369	31	11.9	17.2	0	66
2016	2	259	29	8.9	13.3	0	52
2016	3	629	31	20.3	40.4	0	154
2016	4	14756	30	491.9	715.7	0	3383
2016	5	23256	30	775.2	502	0	1819
2016	9	1242	3	414	137.9	286	560
2016	10	538	31	17.4	34.7	0	158
2016	11	413	30	13.8	21.4	0	94
2016	12	119	31	3.8	11.4	0	56
2017	1	122	31	3.9	8.3	0	33
2017	2	311	28	11.1	20.3	0	73
2017	3	455	31	14.7	26.3	0	103
2017	4	2818	30	93.9	134.9	0	496
2017	5	31531	31	1017.1	526.5	39	1976
2017	6	67669	30	2255.6	818.3	607	3622
2017	7	99795	31	3219.2	432	2224	4149
2017	8	38330	13	2948.5	867	1714	4482

Table 10a. Nightly background and bat pass temperatures summarized by month at the West Decker Mine[1]

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	15.7 (4.4) 1311	17.3 (3.4) 8968	5.5	5.7	25.7	24.7
2012	9	10.5 (4.9) 5355	13.6 (3.3) 10927	-0.8	0.3	24.4	22.9
2012	10	4.4 (4.3) 10931	9.7 (4.1) 33	-6.7	1.3	20.1	17.3
2012	11	-0.4 (4.9) 16328	-	-16.2	-	15.8	-
2012	12	-5.5 (6.8) 9830	-	-20.5	-	6.7	-
2013	1	-8.2 (5.4) 8826	-	-20.5	-	5.9	-
2013	2	-2.8 (3.5) 4560	-	-11.2	-	5.4	-
2013	3	-1 (5) 4499	-	-14.8	-	12.5	-
2013	4	2 (5.1) 3785	10.8 (3.5) 1065	-9.6	-1.5	15	15
2013	5	10.5 (5.2) 3400	12.1 (3.5) 1492	-3.9	-1.3	26.5	22.1
2013	6	14.6 (4.4) 3034	16.3 (2.6) 2538	2.2	7	25.1	24.4
2013	7	18.6 (3.2) 3294	18.2 (1.6) 1422	11.7	12.7	27.7	24.9
2013	8	18.4 (3.4) 3731	-	10.3	-	27.4	-
2013	9	14.3 (5.8) 3781	-	0.6	-	30.3	-
2013	10	5.2 (3.8) 4894	6.1 (0.1) 4	-4.6	6	16.6	6.2
2013	11	-1.2 (5) 5002	-	-16	-	10.3	-
2013	12	-9.1 (7.5) 5219	-	-20.5	-	6	-
2014	1	-3.5 (7) 5513	-	-20.5	-	11	-
2014	2	-8.7 (8.1) 4577	-	-20.5	-	4.9	-
2014	3	-1.1 (5.9) 4503	-	-20.5	-	9.7	-

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2014	4	4.1 (4.6) 3789	11.9 (4.2) 1475	-5.9	-0.3	18.6	18.6
2014	5	10 (5.1) 3429	13.2 (3.6) 5567	-2.6	1.1	25.2	24.9
2014	6	13 (3.3) 3085	12.8 (2.6) 2497	3.7	5.2	22.6	18.6
2014	7	16.9 (3.8) 3291	17.6 (2.3) 1055	7.2	12.7	26.5	25.2
2014	8	16.6 (3.8) 3766	14.6 (1.8) 8140	6.5	11.3	29.7	20.3
2014	9	11 (4.9) 4162	10.8 (4) 25643	-2	0.1	27.7	23.1
2014	10	6.2 (5) 4878	12.6 (3.8) 74	-4.6	0.6	22.7	19.6
2014	11	-3.5 (8.3) 5241	9.8 (3.4) 2	-20.5	7.4	12.7	12.2
2014	12	-4.9 (6.4) 5694	-	-20.5	-	8	-
2015	1	-6.1 (6.9) 5547	5 (0.1) 20	-20.5	4.9	9.8	5.1
2015	2	-1.8 (5.7) 4598	4.9 (2) 34	-17.3	4.2	13.5	12.7
2015	3	2 (7.2) 4533	10 (3) 208	-18	3.7	17.6	15.1
2015	4	4.9 (4.9) 3817	9.6 (2.8) 7665	-8.6	0.3	22.1	20.8
2015	5	9.7 (4.1) 3426	11.2 (3.4) 21295	-2.1	-0.8	20.9	20.1
2015	6	19.1 (3.2) 2182	18.8 (2.8) 33219	11.8	12.2	27.7	27.5
2015	6	15.4 (2.4) 884	15.2 (1.7) 11014	9.8	10.8	24.7	20.9
2015	7	19.4 (3.3) 2887	18 (2.8) 22230	10.3	10.8	28.7	27.9
2015	8	18.7 (5) 3731	14.9 (3.4) 60490	3.4	3.6	30.3	28.5
2015	9	15.4 (4.5) 4174	17.9 (3.2) 7376	6	8.2	28.7	27
2015	10	10.1 (4.7) 4895	17.7 (3.1) 75	-2.1	8.5	25.1	22.6
2015	11	0.4 (6) 5232	-	-16.5	-	12.8	0

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2015	12	-4.2 (6.5) 5732	3.1 (0) 22	-20.3	3.1	16.5	3.1
2016	1	-3.6 (5.9) 5578	0.9 () 1	-17.3	0.9	10.2	0.9
2016	2	2.2 (4.9) 4843	-	-11.5	-	19.3	-
2016	3	2.9 (1.6) 236	-	0.6	-	8	-

[1] Temperatures should only be regarded as being indicative of the general temperature at the time of detection. Temperatures were recorded at the detector approximately 1-meter above ground level while the microphone was mounted at approximately 3-meters above ground level and bats were in flight at an unknown altitude, but probably typically within 30-meters of ground level. Temperatures of the bat's roost environment at the time flights were initiated are also obviously unknown.

Table 10b. Nightly background and bat pass temperatures summarized by month at the Spring Creek Mine

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	20.3 (4.5) 1314	21 (4.3) 11910	8.4	8.7	31.7	30.7
2012	9	15 (4.4) 4164	19.2 (3.4) 2082	5.2	12	29	26.4
2012	10	9 (4.7) 3495	-	-3.6	-	24.4	-
2013	1	-12.8 (2.3) 114	-	-15.7	-	-8.9	-
2013	4	4.7 (5.8) 3441	11.7 (3.2) 602	-9.2	3.2	18.1	17.8
2013	5	12.9 (5.1) 3399	14.5 (4.4) 22668	-0.1	2.1	26.2	26.2
2013	6	16.8 (4.6) 3005	18.4 (3.5) 22665	4.7	4.7	28.2	28
2013	7	21 (3.6) 3276	-	13.5	-	32	-
2013	8	21.7 (3.7) 3723	-	14.3	-	31.8	-

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	9	16.5 (6) 4142	-	3.2	-	33.6	-
2013	10	8.1 (3.8) 4967	11.8 (2.4) 49	-1	6	18.4	15
2013	11	2.4 (4.9) 5240	6.2 (2.4) 17	-12.7	1.3	13.8	9
2013	12	-3.1 (9.5) 5667	6.1 (2.9) 6	-20.5	4.1	12.7	10
2014	1	0.7 (7.2) 5519	-	-20.5	0	13.6	0
2014	2	-5 (8.7) 4597	-	-20.5	0	10.2	0
2014	3	2.2 (6.5) 4528	6 () 1	-20.5	6	13.3	6
2014	4	7.1 (4.5) 3810	16.1 (3.2) 238	-3.9	4.9	19.9	19.6
2014	5	12.2 (4.9) 3445	16.9 (3.8) 3380	2.9	4.6	27.5	27.5
2014	6	15.3 (3.3) 3082	15.4 (3) 24774	6.9	6.9	25.5	25.5
2014	7	19.9 (4.1) 3308	18.9 (3.7) 26885	10.5	10.5	29.8	29.8
2014	8	19.1 (3.7) 3636	19.2 (2.5) 15343	8.9	14.3	29.3	26.9
2014	9	14.2 (5) 4175	18.5 (4.2) 364	0	6.7	28.5	25.9
2014	10	9.9 (4.6) 4914	-	-1.6	-	22.9	-
2014	11	0.3 (9.4) 5181	8.5 (5.1) 23	-20.5	3.2	17.9	15.1
2014	12	-0.2 (6.7) 5693	6.3 (1.7) 15	-20.5	2.9	13.5	8.9

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2015	1	0.1 (7) 5544	4.2 () 1	-18.3	4.2	16.1	4.2
2015	2	1.6 (7.2) 4601	-	-17.5	-	17.4	-
2015	3	6.2 (7.3) 4533	13.1 (4.9) 5	-15.3	7.5	20.9	17.3
2015	4	7.1 (4.3) 3817	17.2 (6.2) 92	-3.9	5.1	24.6	24.6
2015	5	11.6 (4.3) 3437	16.7 (3.6) 677	2.4	3.1	22.6	22.4
2015	6	18.2 (2.5) 985	19.4 (2.3) 461	12	14.5	24.9	24.7
2015	6	20.9 (3.2) 2096	21.9 (2.9) 5812	14.1	14.5	29.5	29.2
2015	7	21.3 (3.4) 3327	23.2 (3.3) 7785	13.5	14.8	31	31
2015	8	21.4 (5.4) 3763	25.6 (4.6) 8690	5.5	8	33	33
2015	9	18 (4.6) 4192	21.4 (3.8) 3990	8.9	10.8	30	30
2015	10	13.1 (4.8) 4909	19.2 (5) 168	0.4	5.7	26	24.4
2015	11	3.7 (6.2) 5241	6.4 (2.9) 49	-13.4	0.6	15.8	11.8
2015	12	0.8 (6) 5704	5.4 (3.1) 49	-13.4	0	19.8	12.8
2016	1	1.8 (4.8) 5527	5.2 (3.6) 40	-8.7	0.9	14.1	10.2
2016	2	5.8 (4.4) 4802	6.9 (2.3) 46	-5.9	3.1	21.7	11.3
2016	3	7.2 (5) 4537	13.2 (4.3) 18	-7.2	7.7	19.8	17.9

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2016	4	11.9 (4.5) 560	16.9 (4.7) 19	2.4	10	21.4	21.4

Table 10c. Nightly background and bat pass temperatures summarized by month at the Otter Creek Coal Tract

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	10	4.5 (4.1) 2533	5.3 (5.1) 14	-3.6	1.9	14	13.5
2013	11	-3 (5.2) 5260	-	-17.7	-	9.5	-
2013	12	-7.7 (8.5) 5706	-	-20.5	-	8.9	-
2014	1	-3.9 (7.3) 5556	-	-20.5	-	11.5	-
2014	2	-9.1 (9.1) 4602	-	-20.5	-	8.9	-
2014	3	-2 (6.4) 4509	0.8 (0) 3	-20.5	0.8	12.8	0.8
2014	4	-4.4 (5.5) 201	-	-12.9	-	1.7	-
2014	5	12.2 (3.6) 1774	11.9 (2.9) 17936	3.6	4.4	25.9	25.9
2014	6	12.2 (3.7) 3091	13 (2.6) 20205	2.1	6	21.9	19.8
2014	7	15.8 (4.6) 3291	14.5 (2.7) 13931	6.4	6.5	30.7	25.4
2014	8	16 (4.1) 3720	12.6 (2) 6988	8.5	8.2	29.2	26
2014	9	8.1 (4) 778	9.6 (2) 2678	0.6	3.9	21.2	21.2
2014	10	2.4 (6.9) 702	-	-6.4	-	21.4	-
2014	11	-4.7 (8.8) 5238	-0.7 (3) 2	-20.5	-2.8	14.6	1.4

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2014	12	-4.5 (6.3) 5681	1.6 (0.9) 3	-20.5	0.9	7.5	2.7
2015	1	-6.2 (7.6) 5526	-	-20.5	-	12.5	-
2015	2	-3.6 (7.2) 4582	1 (0.6) 2	-20.5	0.6	12.8	1.4
2015	3	1.2 (7.1) 4503	10.3 (3.6) 115	-18.1	3.7	20.3	18.3
2015	4	3.2 (5.5) 3781	7.3 (3.6) 5288	-9.4	-1.8	18.9	17.9
2015	5	8.8 (4.5) 3406	11.1 (3.4) 19601	-4.3	-1.6	20.4	19.3
2015	6	15.5 (2.6) 1084	15.6 (2.2) 7988	10.7	10.7	24.7	22.7
2015	6	17.7 (2.9) 2003	17.4 (2.3) 19418	10.7	11.7	25.2	24.4
2015	7	18 (3.9) 3334	15.9 (2.4) 17220	7.7	8.9	30.5	27.9
2015	8	17.1 (5) 3309	15.3 (3) 28484	1.6	3.2	29	27.9
2015	9	13.6 (4.7) 2634	14.8 (3.1) 12554	4.2	6	27.9	27.4

Table 10d. Nightly background and bat pass temperatures summarized by month at the Big Sky Mine

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	10	7.2 (4) 2538	9.3 (3.5) 1171	-2.1	0	15.5	15
2013	11	0.8 (5.1) 5271	3.3 (3.4) 1970	-14.7	-4.1	12.3	12

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	12	-3.4 (10) 5707	5.7 (2.8) 411	-20.5	-0.5	12.7	12.3
2014	1	0.1 (8) 5534	5.3 (2.8) 596	-20.5	-3.3	13.8	12.8
2014	2	-6.1 (9.5) 4589	4.6 (2) 199	-20.5	0.8	11	10.5
2014	3	1.2 (7.2) 4498	8.9 (4.5) 748	-20.5	-1.1	15.3	15.1
2014	4	5.9 (5.4) 3771	11.2 (4.6) 5918	-11.7	0.6	22.1	22.1
2014	5	8.8 (3.3) 1039	11.1 (2.2) 732	0.4	3.1	14.8	14.5
2014	7	18.3 (4.2) 165	19.9 (2.8) 598	13	13.2	25.7	23.4
2014	8	18.9 (4.1) 3708	20 (3.9) 3985	10	10.7	31.2	30.7
2014	9	12.3 (5.1) 4155	15.3 (2.9) 351	0.6	7.9	26.7	21.4
2014	10	8.5 (4.5) 4902	-	-3.3	-	22.1	-
2014	11	-1.1 (9.5) 5250	-	-20.5	-	18.9	-
2014	12	-1 (6.2) 5687	-	-20.5	-	11	-
2015	1	-1.8 (8.4) 5536	-	-20.5	-	16.1	-
2015	2	-0.3 (7.5) 4588	-	-20.5	-	16.6	-
2015	3	4.8 (7.2) 4506	11.4 (4.6) 11507	-16.3	-0.1	22.1	22.1
2015	4	5.9 (4.9) 3773	10.9 (4.2) 6384	-5.6	-1.3	20.8	20.4

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2015	5	11.2 (4.3) 3384	14.3 (3.7) 9267	-2.1	0.6	22.9	21.9
2015	6	18 (2.8) 1068	18.4 (2.3) 5457	11.5	12.3	26.9	26.4
2015	6	20.3 (3.6) 1971	21.1 (3.4) 26664	11	11.3	30.8	30.5
2015	7	20.6 (3.9) 3252	20.8 (3) 42725	12	12.5	33.8	33.8
2015	8	20 (5.2) 3703	20.4 (3) 25093	4.6	5.5	33.6	30.7
2015	9	17 (4.8) 4161	20.7 (3.9) 17829	7	8.4	30.5	29.3
2015	10	11.7 (5.2) 4885	15.3 (5) 8034	-3.6	0.1	25.4	23.4
2015	11	2.4 (7.3) 5247	6.8 (4) 5764	-16.2	-1.5	20.9	17.4
2015	12	-0.2 (7) 5694	6.2 (4.4) 3211	-15.3	-7.1	19.8	17.3
2016	1	0.4 (6.2) 5543	6.3 (3.4) 2356	-12.7	-4.9	14.8	14.3
2016	2	4.4 (4.5) 4769	6.3 (3.1) 9810	-6.6	-2.1	16.1	15.8
2016	3	5.7 (4.8) 4469	8.7 (3.5) 13183	-8.4	-1.6	18.1	17.3
2016	4	9.3 (4.5) 1468	11.4 (2.7) 6140	-0.8	0.3	19.6	18.9

Table 10e. Nightly background and bat pass temperatures summarized by month at the Absaloka Mine

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	14.9 (5.6) 1191	17.2 (4.4) 4035	1.4	2.4	26.2	26.2
2012	9	9 (5.7) 4160	15.6 (5.3) 5528	-3.3	-1.8	24.7	24.7
2012	10	4.1 (5) 5104	12.2 (5.5) 30	-8.1	-1.3	19.4	18.8
2012	11	-1.7 (4.7) 12673	-	-19	-	18.3	-
2012	12	-4.9 (7.1) 10435	-	-20.5	-	13.3	-
2013	1	-6.8 (6.3) 7080	-	-20.5	-	8.5	-
2013	2	-4.2 (4.8) 5321	-	-19.1	-	7.5	-
2013	3	-3.1 (5.9) 5328	-	-20.5	-	15.1	-
2013	4	0.3 (5.6) 4535	9.1 (3.3) 36	-13.2	2.7	14.6	13.8
2013	5	10.1 (5.3) 6634	14.3 (3.6) 956	-8.1	3.6	19.6	19.4
2013	6	12.9 (5) 4030	16.8 (3.6) 533	-1	6.7	25.2	25.2
2013	7	16.4 (3.5) 682	-	7.2	-	22.4	-
2013	8	15.8 (4.3) 4311	-	7	-	27	-
2013	9	11.8 (6.1) 4810	-	-0.1	-	31.7	-

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	10	3.5 (4.6) 5433	11.7 (1.5) 24	-7.1	8.2	16.3	13.3
2013	11	-2.5 (5.8) 5285	1.7 () 1	-18.1	1.7	9.5	1.7
2013	12	-7.2 (8.4) 5717	-	-20.5	-	8.9	-
2014	1	-4.5 (7.5) 5572	-	-20.5	-	10.2	-
2014	2	-8.6 (8.8) 4685	-	-20.5	-	7.9	-
2014	3	-3.4 (7) 5304	-	-20.5	-	11	-
2014	4	3.1 (5.7) 3782	12.6 (5.5) 98	-12.7	0.4	18.6	18.6
2014	5	8.8 (5.5) 3412	15.7 (5) 1476	-4.3	3.1	27.2	27.2
2014	6	11.5 (4.4) 3047	13.5 (2.4) 1121	-0.3	4.4	19.9	19.1
2014	7	14.5 (4.4) 3284	17.7 (6.1) 20	4.9	8	26.9	26
2014	8	15.4 (3.6) 3747	13.7 (2.8) 1337	8.5	7.5	31.5	23.9
2014	9	8.8 (5.1) 4176	13.5 (4.4) 1415	-4.1	-0.8	22.7	22.2
2014	10	5.2 (5) 4912	14.6 (2.9) 20	-6.4	10.5	19.8	18.8
2014	11	-4.5 (9.1) 5246	10.8 () 1	-20.5	10.8	14.8	10.8
2014	12	-4 (6.4) 5695	2 (1.6) 4	-20.5	0.3	7.4	3.4

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2015	1	-6.4 (6.7) 5548	1.1 () 1	-20.5	1.1	7.9	1.1
2015	2	-2.8 (6.7) 4589	3.3 (1.6) 2	-20.3	2.1	14.8	4.4
2015	3	0.9 (6.9) 4506	10.3 (5) 32	-16.5	0.9	18.3	16.1
2015	4	2.6 (5.5) 3783	9.6 (4.7) 352	-9.6	-1.6	17.4	17
2015	5	8.8 (4.6) 3389	13.2 (2.8) 1962	-5.6	2.1	19.3	19.3
2015	6	17.6 (3.8) 1987	19.2 (3.8) 9980	7.9	8.4	29	29
2015	6	15.3 (2.8) 1068	16.8 (2.7) 1135	10.2	10.3	23.1	22.6
2015	7	18.2 (3.8) 2149	19.7 (3.6) 8365	10.5	10.5	29.8	29.7
2015	8	19.6 (4) 1584	21.4 (4.6) 674	11.2	12.5	29.2	29.2
2015	9	12.9 (4.9) 1295	17.1 (5.6) 23	4.4	7.2	26	25.7
2015	10	8.2 (5.4) 1562	-	-3.4	-	17.3	-
2015	11	10.6 (2.7) 627	-	2.2	-	17.9	-

Table 10f. Nightly background and bat pass temperatures summarized by month at the Rosebud Mine Area F Pond 7

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	19 (6.3) 1196	22 (4.4) 1133	5.9	8.2	32.3	32
2012	9	14.9 (4.8) 4166	18.9 (4.3) 1401	4.1	4.1	27.2	26.7
2012	10	8.8 (6) 4894	17.5 (4.2) 30	-3.6	4.9	22.7	21.9
2012	11	5.8 (6.1) 5244	13.4 (7) 2	-12	8.5	20.3	18.4
2012	12	-0.4 (7.2) 5700	-	-18.1	-	18.6	-
2013	1	-0.2 (6.4) 5534	-	-18.3	-	13.6	-
2013	2	1.4 (4.5) 4572	-	-13	-	9.5	-
2013	3	1.9 (7) 4478	-	-15.8	-	17.9	-
2013	4	5.1 (6.4) 3747	-	-8.7	-	18.9	-
2013	5	12.3 (4.9) 3372	18.5 (2.9) 39	-3.9	9.5	27	20.9
2013	6	16.2 (4.3) 3036	18.1 (3.6) 218	6.9	9.5	27.5	27.5
2013	7	20.6 (3.8) 3269	21.2 (3.3) 295	12.8	13.2	29.8	29.3
2013	8	20.8 (4.4) 3696	20.7 (3.6) 317	11.3	11.5	31.8	31.5
2013	9	16.6 (5.5) 4146	19.8 (4.5) 60	6	9.7	31.2	28.9
2013	10	8.1 (3.9) 2366	16.1 (1) 3	0.3	15	18.1	17

Table 10g. Nightly background and bat pass temperatures summarized by month at the Rosebud Mine Area C

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	10	6.3 (4.3) 2527	10.7 (2.3) 8	-4.4	7	14.1	14
2013	11	0.4 (5.9) 5299	4.3 (0.8) 2	-16.8	3.7	17	4.9
2013	12	-3.3 (10) 5727	-	-20.5	-	12.3	-
2014	1	-0.3 (8.1) 5573	-	-20.5	-	12.5	-
2014	2	-7 (9.3) 4596	3 (0.1) 3	-20.5	2.9	9.5	3.1
2014	3	0.5 (7.5) 4633	-	-20.5	-	14.1	-
2014	4	4.8 (5.1) 3799	11 (4.4) 326	-11.7	1.4	19.3	18.9
2014	5	10 (5.3) 3418	14.8 (3.5) 2491	-1.5	1.4	25.7	25.7
2014	6	13.2 (3.8) 3066	14.7 (2.9) 7222	1.7	4.7	20.3	20.3
2014	7	17.1 (4.3) 3284	17.6 (3.4) 14728	8.5	9.4	28	27.5
2014	8	17.4 (3.6) 3728	16.1 (3) 9654	8.2	9.8	27.2	27.2
2014	9	11 (5) 4162	12.9 (2.7) 3146	0.4	1.4	24.2	21.2
2014	10	8.2 (4.3) 4882	11.3 (4.8) 96	-4.6	2.6	20.8	19.8
2014	11	-1.5 (9.9) 5251	9.4 (0) 4	-20.5	9.4	17.4	9.4

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2014	12	-0.8 (6.4) 5730	8.9 (0) 4	-19.3	8.9	12	8.9
2015	1	-1.4 (8.4) 5575	-	-20.5	-	16.3	-
2015	2	-0.6 (8) 4615	-	-20.5	-	16	-
2015	3	4.8 (7) 4519	15.9 (5.9) 70	-14.5	4.9	21.6	21.6
2015	4	4.9 (5.1) 3066	12.2 (2.2) 117	-6.6	-4.9	18.3	17.1
2015	5	10 (4.1) 3390	14.5 (3.6) 2409	-3.3	2.1	20.9	20.9
2015	6	18.2 (3.5) 3058	18.7 (3.7) 2904	9.2	12	28.2	25.2
2015	7	19.4 (3.4) 3150	-	10.8	-	29.2	-
2015	8	19 (5.5) 3699	-	2.7	-	29.5	-
2015	9	15.7 (5) 4147	-	4.9	-	28	-
2015	10	11.1 (5.6) 4899	-	-4.4	-	26.7	-
2015	11	1.9 (7.9) 5257	-	-17.5	-	20.8	-
2015	12	-2.1 (5.7) 4153	2.1 (1) 12	-17.3	0.4	18.3	2.7
2015	12	6.5 (5.1) 1555	-	-1.5	-	18.1	-
2016	1	-0.1 (5.8) 4948	4.7 (1.3) 13	-15.2	3.9	11.5	7
2016	4	8.4 (3.9) 2148	15.2 (2.6) 605	-0.6	2.9	18.6	18.6

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2016	5	10.7 (4.8) 2821	15.4 (3.2) 3732	-0.6	1.6	22.4	22.4

Table 10h. Nightly background and bat pass temperatures summarized by month at the Signal Peak Mine Reservoir 1

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	21.6 (4.9) 1067	23.3 (3.9) 3553	7.7	7.9	29.3	29.3
2012	9	16.1 (4.1) 4161	18.6 (3.4) 7884	4.4	5.1	26.5	26.5
2012	10	7.9 (5.6) 4922	13.3 (4.2) 790	-3.9	0.9	21.6	20.3
2012	11	5.7 (5.9) 5273	8.6 (3.6) 901	-11.9	-0.6	18.8	17
2012	12	-0.5 (6) 5714	4.8 (3.6) 421	-16.5	-2.1	15.6	12
2013	1	0.1 (6.1) 5552	6.5 (2.3) 290	-16.2	0	10.7	10.2
2013	2	1.2 (3.6) 4575	3.6 (1.8) 183	-10.4	-1.6	8.9	7.7
2013	3	2.5 (6) 4506	7.6 (3.7) 727	-10.7	-0.6	16.3	16.3
2013	4	4.3 (6.3) 3741	12.6 (3.7) 3266	-7.9	1.1	20.4	20.3
2013	5	12.3 (4.4) 3356	15.1 (3.2) 5628	-2.4	-0.3	27.2	27
2013	6	15.8 (4) 2986	17.6 (2.7) 5998	4.6	5.9	26	24.9

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	7	20.4 (2.9) 3244	20.9 (3) 5076	13.6	13.6	27.7	27.7
2013	8	21 (3.1) 3689	21.7 (3.1) 7609	13	13.3	27.9	27.7
2013	9	16.4 (5) 4153	21.6 (3.5) 1527	5.7	7.9	27.5	27.5
2013	10	7.3 (4.2) 4911	11.7 (2.9) 406	-5.1	3.7	17.8	17.6
2013	11	3.3 (5.3) 5285	6.9 (3.8) 447	-14.5	0.6	14.1	14
2013	12	-2.2 (9.6) 5715	7.4 (2.6) 67	-20.5	3.1	12.3	11.3
2014	1	1 (6.6) 5554	5.3 (2.1) 31	-20.5	1.9	12.5	8.5
2014	2	-4.8 (8.4) 4587	6.2 (2.8) 5	-20.5	3.9	9.5	9.2
2014	4	8.3 (1.8) 56	9.6 (1.5) 164	6.2	6.4	11.8	11.8
2014	5	11.5 (5) 3363	15.4 (3.5) 4004	0.1	4.1	25.5	25.5
2014	6	14.5 (3.1) 3003	16.4 (2.3) 5792	4.9	7.9	22.2	22.2
2014	7	20.6 (3.4) 3238	21.1 (3.4) 14738	11.2	11.2	30.7	28.2
2014	8	19.1 (4.2) 3696	21.6 (3.3) 8517	8.2	9.7	30.7	30.7
2014	9	14.3 (5.2) 4142	16.7 (3.5) 1519	2.1	4.2	25.4	24.2
2014	10	11.4 (4.3) 4890	14.5 (2.7) 286	-2.4	5.1	21.7	21.6

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2014	11	0.6 (9.9) 5253	8.4 (3.4) 297	-19.3	0.8	17.8	17.6
2014	12	1.6 (7) 5716	7 (3.6) 163	-20.5	-1.5	13.6	13.5
2015	1	1 (7.3) 5553	6.7 (3.7) 30	-19	-1.5	16	12.7
2015	2	1.8 (7.7) 4606	5.7 (3) 60	-16.5	2.7	17	11.7
2015	3	6.8 (7) 4533	13.2 (2.7) 1682	-14.8	5.2	20.6	20.6
2015	4	7.3 (4.5) 3802	11.8 (2.4) 1621	-3.8	1.6	21.2	21.1
2015	5	10.7 (3.4) 3374	11.9 (2.6) 1449	0.8	2.6	20.9	20.6
2015	6	20.3 (3.6) 1856	22.4 (3.4) 12390	12.7	14.1	29.5	29.5
2015	6	18 (3.4) 1163	20.4 (2.4) 481	11.8	13.5	26.4	26.4
2015	7	21 (3.3) 3291	22.5 (2.9) 24210	10.5	10.5	30.3	30.3
2015	8	21.8 (5.3) 3714	23.8 (3.9) 14255	7.9	7.9	33.5	33.5
2015	9	18.7 (4.6) 4181	21.5 (4) 9275	8.4	8.9	30	30
2015	10	13.9 (4.8) 4904	16.4 (6.4) 1436	3.6	3.9	28.5	28.2
2015	11	4.7 (6.4) 5281	10.1 (3.2) 1355	-11.5	2.9	17.9	16.8
2015	12	2.5 (5.8) 5764	8.3 (3.5) 1009	-10.7	-0.8	17	15.6

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2016	1	3.6 (4.4) 5575	6.9 (2.7) 558	-10.7	-1.3	13.6	12
2016	2	6.6 (4.4) 3598	9.3 (3.6) 1082	-4.1	2.2	15.6	14.8

Table 10i. Nightly background and bat pass temperatures summarized by month at the Signal Peak Mine Busse Water Reservoir

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C [2]	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2012	8	19.7 (5.5) 1056	20.9 (4.4) 13768	5.4	6.2	30.2	30.2
2012	9	14.3 (4.6) 4129	16.6 (3.8) 23576	3.6	3.6	26.9	26.9
2012	10	6.6 (5.2) 4868	14.3 (3.8) 257	-4.4	1.1	21.2	20.1
2012	11	4.1 (6) 5248	6.8 (3) 57	-15.8	1.3	17.9	13.6
2012	12	-2.5 (6.6) 5735	4.6 (4.5) 74	-20.3	-2.9	15.3	11.7
2013	1	0.1 (5.5) 1744	6.7 (1.9) 7	-13.9	4.6	9.2	8.7
2013	4	2.2 (6.4) 3560	10.4 (2.9) 1366	-10.7	0.8	17.9	17
2013	5	10.3 (4.3) 3363	13.3 (3) 7956	-3.9	0.6	24.7	24.4
2013	6	14 (4.3) 2939	15.9 (2.8) 30880	2.1	2.7	24.4	23.9
2013	7	18.9 (3.2) 2673	18.9 (3) 41451	10.5	10.7	26.7	26.7

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C [2]	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2013	8	19.2 (3.6) 3144	18.5 (3.5) 12566	11	11.7	28	28
2013	9	14.3 (5.1) 4146	17.6 (3.1) 3728	2.7	5.5	26	25.9
2013	10	4.9 (4.1) 4914	11.6 (3.3) 343	-6.6	-1.5	17.3	17
2013	11	0.7 (5.5) 5290	4.6 (3.7) 91	-20	-1.6	11.7	10.8
2013	12	-4.5 (9.2) 5732	4.5 (3.3) 22	-20.5	-2	9	9
2014	1	-1.7 (7) 5553	2.4 (3.7) 20	-20.5	-1.1	10	9.8
2014	2	-7.4 (8.2) 4597	4.6 (2.5) 9	-20.5	0.8	7	7
2014	3	-0.8 (7) 4510	4.2 (3.9) 12	-20.5	-1.6	10.8	10.7
2014	4	4.5 (4.8) 3798	11 (3.1) 2204	-8.6	-0.5	17.3	17.3
2014	5	9.7 (5.4) 3411	14.4 (3.7) 15852	-2.1	1.1	23.1	23.1
2014	6	12.3 (3.4) 3012	13.6 (2.9) 30686	1.9	2.1	20.4	20.4
2014	7	17.7 (3.7) 3250	17.8 (3.3) 43747	8.9	8.9	26.9	26.5
2014	8	16.6 (3.9) 3701	18 (3.2) 22965	6	6.4	28.5	28.5
2014	9	11.3 (5) 4141	13.7 (3.7) 4284	0.3	3.9	23.7	23.7
2014	10	8.4 (4.5) 4894	13.1 (4.6) 99	-5.3	0.6	20.8	20.6

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C [2]	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2014	11	-2.1 (9.9) 5272	5.1 (4.1) 25	-20.5	-4.4	15.3	13.2
2014	12	-1.3 (7.1) 5718	4.4 (4.4) 104	-20.5	-5.8	12.2	12
2015	1	-1.9 (7.3) 5557	4.4 (4.1) 17	-20.5	-1.6	12.8	12
2015	2	-0.7 (7.4) 4619	10.1 (5.2) 31	-19.1	0.3	15.6	14.1
2015	3	4 (7) 4535	11.6 (3.7) 1054	-17.3	-1.6	19.1	18.4
2015	4	5.3 (5) 3788	11.1 (3.5) 2400	-6.3	0	17.4	17.1
2015	5	8.8 (3.5) 3377	10.6 (3) 10230	-1	0.4	20.6	20.6
2015	6	16.5 (3.5) 3040	17 (3.4) 48546	9.4	9.4	27.4	27.4
2015	6	16.5 (2.8) 1000	16.7 (2.7) 24655	11.2	11.2	24.9	24.9
2015	7	17 (3.4) 3288	17.6 (2.8) 68847	8.2	8.4	27.9	27.9
2015	8	18.8 (5.8) 1961	19.9 (4.3) 29747	3.7	3.9	29.8	29.8
2015	8	20.3 (6.6) 1321	22.2 (4.7) 27061	5.2	5.4	30.7	30.7
2015	9	15.7 (5) 4141	18.9 (4.6) 28898	5.2	5.4	28	28
2015	9	14.2 (5) 4148	16.2 (4.4) 16150	3.7	3.9	26.7	26.7

Year	Month	Background Temp C Avg (SD) N	Bat Pass Temp C Avg (SD) N	Background Min Temp C [2]	Bat Pass Min Temp C	Background Max Temp C	Bat Pass Max Temp C
2015	10	11.1 (5.1) 2842	16.2 (4.4) 100	0	4.2	25.5	25.2
2015	10	11.1 (5) 4889	17.4 (4.5) 394	0	4.7	26.5	26.5
2015	11	1.6 (6.9) 5262	6.7 (3.4) 255	-16.8	0	16	14.8
2015	12	-0.6 (6.5) 5731	5.8 (4.3) 413	-16.3	-2.1	14.8	14.8
2016	1	0.5 (4.8) 5571	4.8 (2.7) 372	-13.4	-4.6	11	10.3
2016	2	3.6 (4.3) 3593	6.9 (3) 218	-7.9	0.3	12.7	11

Table 11a. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the West Decker Mine

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Epfu	2012								17.4	13.8			
Epfu	2013				13.6	14.1	18.6	21.1					
Epfu	2014					16.1	14.6		15.3	16.1			
Labo	2012								14.5				
Labo	2014									6.5			
Laci	2012								9	9.8			
Laci	2013						18.9						
Laci	2014					12.7		20.1	13	10.8			
Lano	2012								13.5	7.7	2.9		
Lano	2013				12.2	8.5							
Lano	2014					11.3	11.7		16.3	7.4	15.5		
Myci	2012								7.4	13.3			
Myci	2013				13.8	14.1	18.1	18.8					
Myci	2014				8.7	14	12.2	18.1	13.3	8.7			
Myev	2012								9.7	9.2			
Myev	2013				7.2	15	11						
Myev	2014					13.6	17.4		17	5.4			
Mylu	2012								11.3	0.4	9		
Mylu	2013					12.7	17.1	17.1					
Mylu	2014					11.2	17.4	17.1	12.8	16.1			
Mylu	2015				14.6	18.6	16.3						
Epfu	2016				15								
Labo	2015								19.1	16.6	22.6		
Laci	2015						16.1	13.8	17.1	13.3			
Laci	2016					14.5	15	20.4					
Lano	2015						15.6	13.8	16.1	13.2			
Lano	2016				13.5	10	15	20.9					
Myci	2015						14.6	11			17.6		
Myev	2015						17.6	16.1	17	11			
Myev	2016							21.7					

Table 11b. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Spring Creek Mine

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Epfu	2012								22.6				
Epfu	2013					12.5	21.4						
Epfu	2014					24.6	17	23.9	20.8				
Labo	2012								21.6				

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Labo	2014								19.8				
Laci	2012								20.6	17.9			
Laci	2013					11.7	17.6						
Laci	2014					13.5	21.2	25.9	20.9	8.9			
Lano	2012								23.7	16.5			
Lano	2013				12	12.2	11.3					8.2	
Lano	2014				12	12.7	16.5	12	21.4	15.8		13.5	
Myci	2012								20.6	17.1			
Myci	2013				7.5	16.5	17						
Myci	2014				18.4	19.4	16.8	16.8	20.8	24.2			
Myev	2012								24.9	16.6			
Myev	2013					6.5	14.5						
Myev	2014				11.7	12.2	8.9	18.8	22.4	8.7			
Myev	2015					16.6							
Mylu	2012								17.4	19.8			
Mylu	2013				15.1	6	12.3						
Mylu	2014					15.1	16	19.9	22.7	13.3			
Myvo	2014								22.4				
Epfu	2015							28.2	28.4				
Labo	2016				12.5								
Laci	2015						23.9	17.8	15.6	13.8			
Laci	2016						22.9	21.7	15.3	17.4			
Lano	2015						19.8	21.7	23.2				
Lano	2016							26.9		17.8			
Myci	2015							22.1					
Myev	2015						19.8	19.1	17.9	19.9			
Mylu	2015						23.6	19.3					
Myth	2016							19.4					

Table 11c. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Otter Creek Coal Tract

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Labo	2014								14				
Laci	2014					10.2	14.3	21.6	8.9	8.9			
Laci	2015					17.1							
Lano	2014					8.9			10.8	5.4			
Lano	2015					16.1							
Myci	2013										13		
Myci	2014					9.2		13.8	11.2				
Myci	2015				8.7								

Myev	2014					9.5		14.8	11	8.2			
Myev	2015					13.5							
Mylu	2014					16	14.6	15.3		8.2			
Mylu	2015				6	15.8							
Myvo	2015					0.6							
Anpa	2015						15						
Coto	2015									6.7			
Coto	2016						19.9						
Epfu	2015							16.8					
Epfu	2016					18.4							
Labo	2015							12	13.2	14.3			
Laci	2015						13.3	14.1	12.2	13.6			
Laci	2016					14.1	17.1						
Lano	2015						14.5	14.3	17.8	12.7			
Lano	2016				14.1	11.8	18.8						
Myci	2015						14.5	16	17.1	16.1			
Myci	2016				12.2	12.5	16.5						
Myev	2015						18.8	16.1	15				
Myev	2016						21.4						
Mylu	2015						15.8	20.3	17.9	13			
Mylu	2016				15.6	8.2	16.5						

Table 11d. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Big Sky Mine

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Anpa	2013											0.8	
Anpa	2014				5.2								
Epfu	2013										15	8	
Epfu	2014	5.1	3.7	6.5	13.3	12.7		21.9	17.8	19.3			
Labo	2014								13.6				
Laci	2015			14.5	6.7	7.7	17.8						
Lano	2013										14.1	-4.1	0.4
Lano	2014	-0.5	4.9	10.7	8.2	12.3			18.8				
Lano	2015			6.4	12.2	9.2	17						
Myci	2013										4.1	-0.6	
Myci	2014	-1	4.6	2.9	7	12.7			12.3				
Myev	2014							22.9	12.2				
Myev	2015					9.2	18.1						
Mylu	2014				18.3	3.9			19.6	18.3			
Anpa	2016					11.7							

Epfu	2015						18.4						
Euma	2015						23.6						
Labo	2015						29.3						
Laci	2015						20.9	14.5	15.6	12	8.5	2.2	
Laci	2016					11.5	14.6	14	15.3	17.1			
Lano	2015						20.1	18.6	17.4	21.2	15.1	1.7	2.1
Lano	2016			13.5	14.6	17.1		21.4	18.9	12.2	16		
Myci	2015						18.3	17.9	18.6	19.9	14.8	6.9	2.9
Myci	2016	3.7	10.8	11.7	10.3	11.7	10.7	22.4		22.4			
Myev	2015						12.3	14.1	16	18.3			
Myev	2016					11.7				21.1			
Mylu	2015						18.4	22.2	15.8	19.8			
Mylu	2016				18.6	18.3	21.9	26.2	17.4	18.1			
Myvo	2015										18.4		

Table 11e. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Absaloka Mine

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Epfu	2012									17.9			
Epfu	2013					12.3	18.8						
Epfu	2014					11.7							
Labo	2012								15.8				
Labo	2014									1.6			
Laci	2012								14.5	-0.1			
Laci	2013					17.9	16.6						
Laci	2014					20.3	4.6	19.6	10.3	0.8			
Laci	2015				2.7	12.3	17.6						
Lano	2012								20.6	-1.8	12.2		
Lano	2013					4.6	19.8						
Lano	2014				15.6	6.5			17.3	-0.8			
Lano	2015						17.4						
Myci	2012								16.8				
Myci	2013						16.3						
Myev	2012								13.3	3.4			
Myev	2013					10	17						
Myev	2014					10.2	13		16.1	0.3			
Mylu	2012								14	-0.5			
Laci	2015						15.1	14	14.1				
Lano	2015						13.8	15.5					
Myci	2015						13.8	18.9					
Myev	2015						13.5	15.3					

Mylu	2015						15.8	24.1					

Table 11f. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Rosebud Mine Area F Pond 7

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Epfu	2012								26.7	10.8		8.5	
Epfu	2013					20.9	19.8	24.7	18.4				
Laci	2013						16.5	18.6	13				
Lano	2012								11.5	14.1			
Lano	2013					16.3	16.1	16.5	12.3	27.9			
Myci	2012								23.7	15.5			
Myci	2013					20.9	16.8	22.6	17.4	21.9			
Myev	2012								13.8	6.2			
Myev	2013						19.1	17.1	12.7	26.5	15		
Mylu	2012								19.3	19.3			
Mylu	2013						14		17.3				
Myvo	2012									9.4			

Table 11g. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Rosebud Mine Area C Pond

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Epfu	2014				7	9.7	11	15.8	15	15.1	16		
Labo	2014								12.5				
Laci	2014					9.8	7.7	10.7	14	9.7			
Lano	2014				5.7	10.2	10.5	12.2	12.2	11	14.5		
Lano	2015					11.7	13.3						
Myci	2013										14		
Myci	2014				16.3	10.3	13.2	11.7	11	13.2	10		
Myev	2014					6	19.3	11	14.6	5.7			
Mylu	2014					8	11.5	12.3	9.8	5.4	8.2		
Mylu	2015					18.6							
Myvo	2014							22.2					
Bug	2015								15.6				
Epfu	2016					15.1							
Labo	2015								16.1	12.8			
Laci	2015						21.9	15	10.5	17			
Laci	2016					14.1							
Lano	2015						17.8	18.8	17	19.1			
Lano	2016				11.7	16.1							
Myci	2015						21.7	19.3	26.7	15.6			
Myci	2016					18.4	16						
Myev	2015						16.3	23.2	15.6	12.7			

Myev	2016					11.2							
Mylu	2015						18.1	20.3	18.8	12.2			
Mylu	2016					11.5							

Table 11h. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at Signal Peak Reservoir 1

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Coto	2013							22.9					
Coto	2014						16.5	19.3	25.7				
Epfu	2012								28.2	21.4	17.4	4.2	-1.6
Epfu	2013				13.5	14	19.9	17.6	21.2	19.8	13		
Epfu	2014					10.8	17.8	21.6	26	16.1			
Epfu	2015	5.7											
Euma	2012									20.4			
Euma	2013				12		15.8	23.6	23.9				
Euma	2014					21.2	13.6	13.2	15.3		15.5		
Euma	2015				11.5								
Labo	2013							17.4					
Labo	2014								15.8				
Laci	2012								24.9	18.9			
Laci	2013					14.6	12.5	16	16.5	18.3			
Laci	2014					10	12.2	16.6	10.8	11			
Lano	2012								19.6	21.7			
Lano	2013			0.3	13.6	8.9	14.3	18.6	18.8	18.8	8.2		
Lano	2014				10.7	16.8	13.6	15.6	10.7	14			
Myci	2012								17.6	17.6	10.5	10.2	
Myci	2013			-0.6		14	13.8	20.3		22.9	10.3		
Myci	2014					12.7	13		11.3	15.8			
Myev	2012								21.9	16.3			
Myev	2013				12.2	-0.3	13	22.4	14	14.8	11.3		
Myev	2014					11	11	18.3	18.8	14.1			
Myev	2015					13.6							
Mylu	2012								20.9	17.6			
Mylu	2013				12.2	13.2	14.1	17.6	17.6	21.2			
Mylu	2014					14	15.8	14.1	20.4	15.6			
Myvo	2014									17			
Bird	2016				5.9								
Coto	2015						16.3	20.6	23.7	22.9			
Euma	2015						15.3	14.8	19.3	14.8			
Euma	2016				15	12.5	16	23.6			16		
Labo	2016								18.4				

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Myci	2015							17.4				7.9	
Myci	2016						17.9					18.8	

Table 11i. Monthly minimum bat pass temperatures (°C) recorded for individual species hand confirmed as definitively present at the Signal Peak Busse Water Reservoir

Species	Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Coto	2012									11.7			
Epfu	2012								23.6		19.4		
Epfu	2013				7.9	10	15.1	16.8	22.6	18.6	12.7	-1.3	-2
Epfu	2014		0.8		5.5	5.9		23.2		9.7			
Epfu	2015			-1.3									
Euma	2013						14.1	17.1	12.7	21.7			
Euma	2014					12.5	13.6	16	11.3				
Euma	2015						10.8	8.9	17				
Labo	2014								23.1				
Labo	2015									12.3			
Laci	2012								6.7	4.7			
Laci	2013					8.5	13.6	18.3	16.3	17.1			
Laci	2014					10.8	8.7	11.5	14.8	9			
Laci	2015					9							
Lano	2012								25.4	17.1			
Lano	2013				13.2	4.4	12.7	19.3	12.8	10.7	12.5		
Lano	2014				2.6	7.7	10.5	11.3	8	13.6			
Myci	2012								25.7		19.6		
Myci	2013				8.4	12.2			13.2	25.2	12.7	10.8	3.4
Myci	2014	-1			4.1	9.4	18.4	11	17.9	12.5			
Myev	2012								14.1	3.9	8.2		
Myev	2013					11	12.2	12.8	12.7	14.3	6.5		
Myev	2014					8.5	8	11.5	15.6	8.4			
Myev	2015				0								
Mylu	2012								21.1	17.9			
Mylu	2013					12.5	13	16.5	13.3	14			
Mylu	2014				5.9	9.4	9.8	12	18.9	10			
Mylu	2015									20.8	17.3		
Epfu	2015						15.1						
Euma	2015						12.7		20.3	19.8			
Euma	2016				17.6	18.4							
Labo	2015								19.1	14.1			
Laci	2015						13.2						
Myci	2015						24.2					4.6	7
Myci	2016	2.9	9	5.9									

Myci	2017	9.4	2.4										
Myev	2016			12.2	14.3								
Mylu	2016				20.6						19.6		

Table 12. Monthly Minimum bat pass temperatures recorded for definitive call sequences of species across the detector network compared to mine sites[1]

Species	Minimum Temperature Recorded (°C)							
	Across Network	**West Decker Mine**	**Spring Creek Mine**	**Otter Creek Coal Tract**	**Big Sky Mine**	**Absaloka Mine**	**Rosebud Mine**	**Signal Peak Mine**
Pallid Bat (*Antrozous pallidus*)	5.2			15	5.2			
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	5.7			6.7				11.7
Big Brown Bat (*Eptesicus fuscus*)	-4.8	11.7	17	16.8	3.7	11.7	7	-2.0
Spotted Bat (*Euderma maculatum*)	1.1							8.9
Eastern Red Bat (*Lasiurus borealis*)	1.6	6.5	19.8	14	13.6	**1.6**	12.5	15.8
Hoary Bat (*Lasiurus cinereus*)	-0.6	9	8.9	8.9	6.7	0.8	7.4	4.7
Silver-haired Bat (*Lasionycteris noctivagans*)	-4.9	2.9	8.2		-4.1	-1.8	5.7	0.3
Western Small-footed Myotis (*Myotis ciliolabrum*)	-4.8	7.4	7.5	13	-1.0	16.3	10	-1.0
Long-eared Myotis (*Myotis evotis*)	-2.1	5.4	6.5	8.2	9.2	0.3	6	-0.3
Little Brown Myotis	-0.5	0.4	6.0	15.3	3.9	-0.5	5.4	5.9

Species	Minimum Temperature Recorded (°C)							
	Across Network	West Decker Mine	Spring Creek Mine	Otter Creek Coal Tract	Big Sky Mine	Absaloka Mine	Rosebud Mine	Signal Peak Mine
(*Myotis lucifugus*)								
Fringed Myotis (*Myotis thysanodes*)	3.1							
Long-legged Myotis (*Myotis volans*)	5.5						9.4	16.6

[1] Temperatures should only be regarded as being indicative of the general temperature at the time of detection. Temperatures were recorded at the detector approximately 1-meter above ground level while the microphone was mounted at approximately 3-meters above ground level and bats were in flight at an unknown altitude, but probably typically within 30-meters of ground level. Temperatures of the bat's roost environment at the time flights were initiated are also obviously unknown.

Figure 1. Network of long term ultrasonic acoustic detectors as of Summer 2017

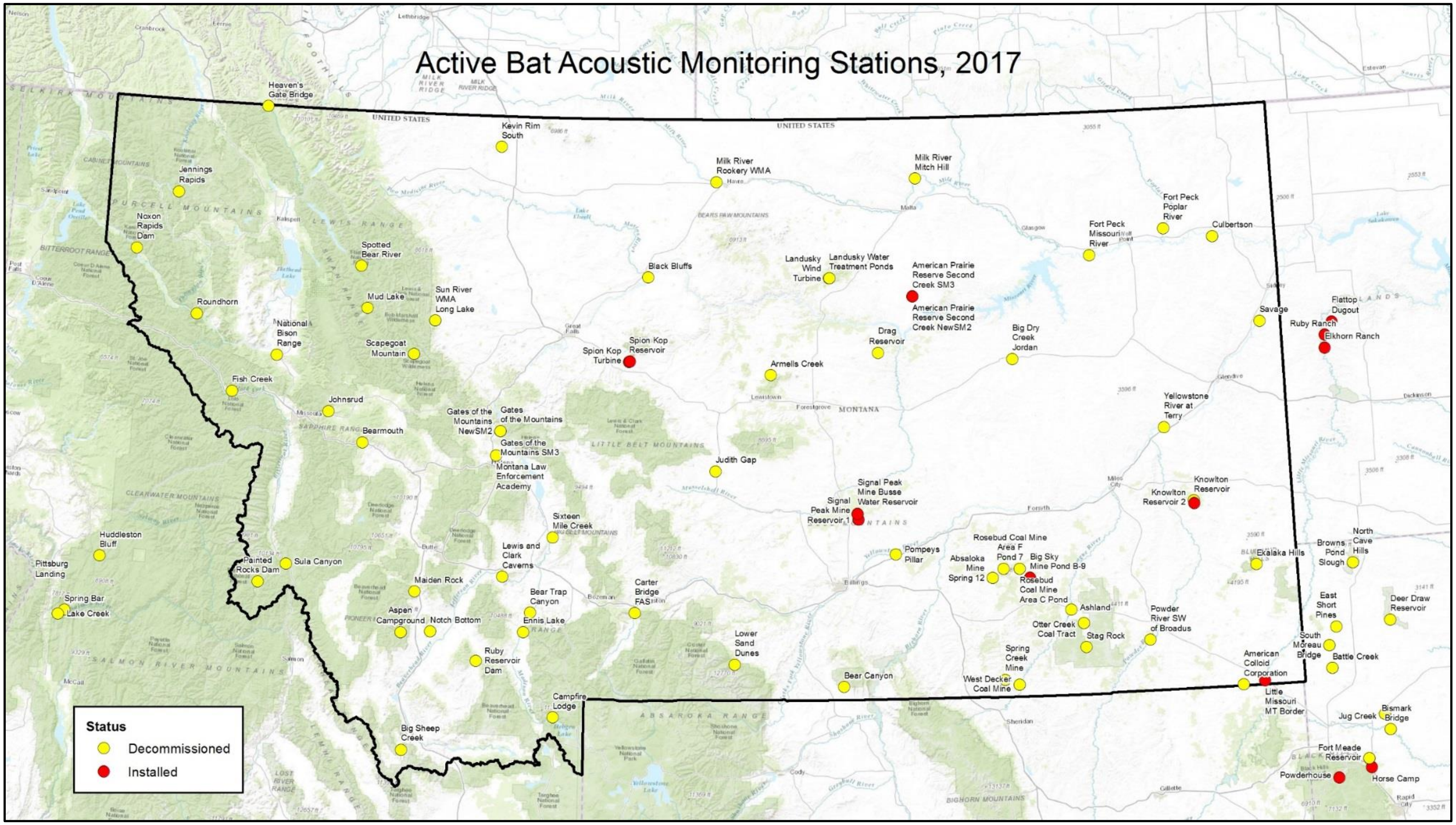


Figure 2a. Overview showing the locations of the West Decker Mine, Spring Creek Mine, and Otter Creek Coal Tract detector recorders (blue pins).

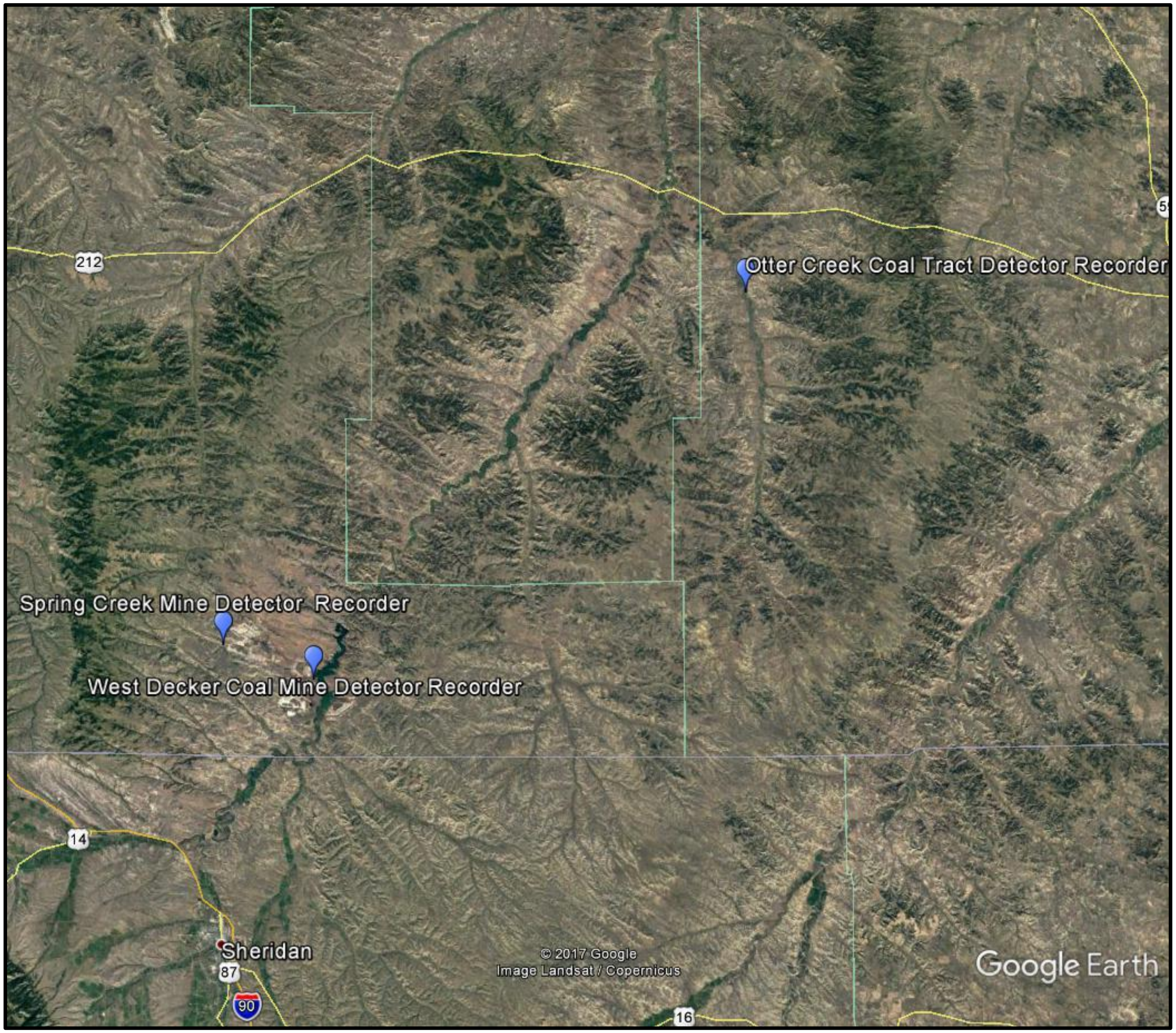


Figure 2b. Overview showing the locations of the detector recorders placed at the Big Sky, Absaloka, and Rosebud mines (blue pins).

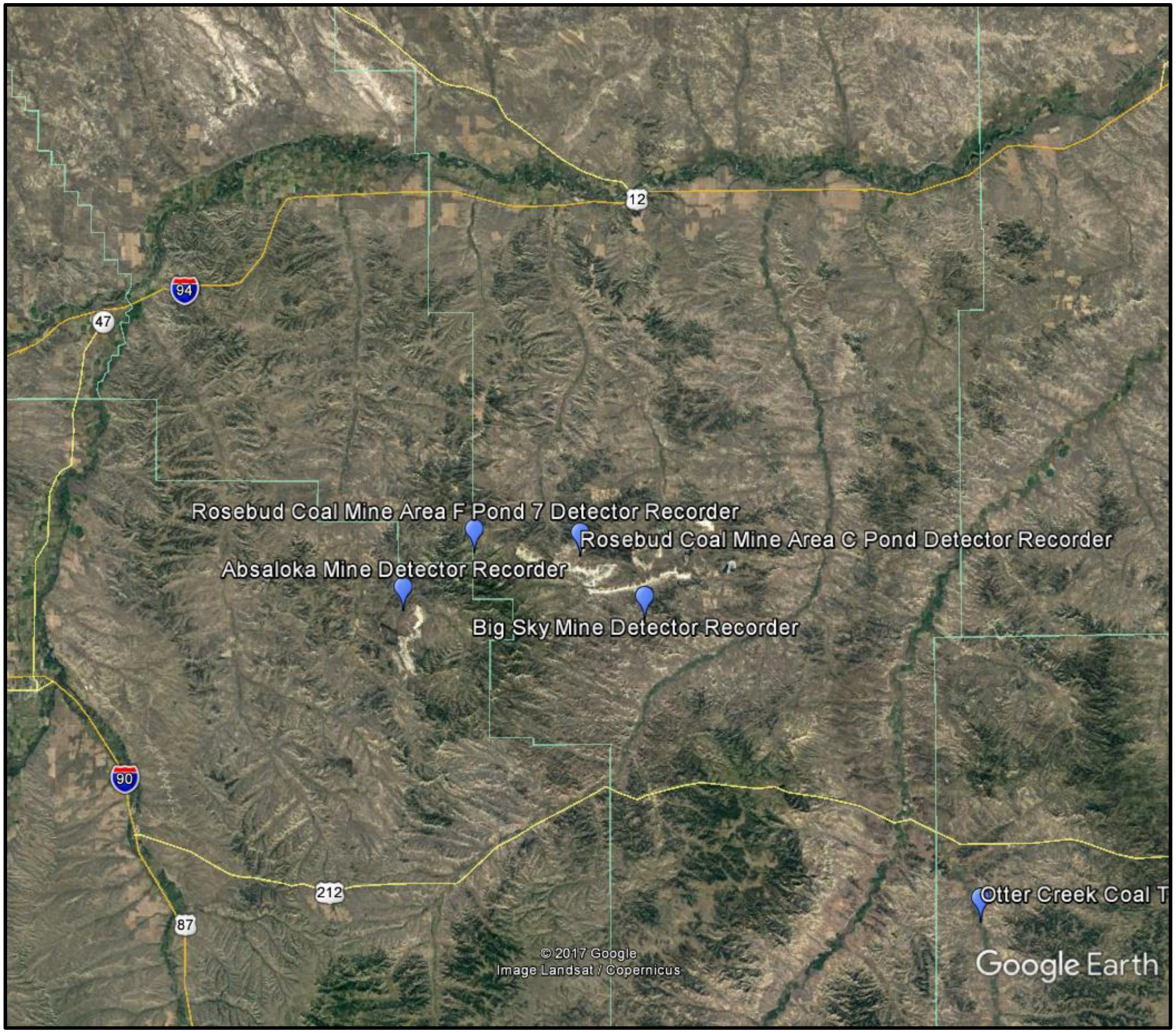


Figure 2c. Overview showing the locations of the detector recorders placed at the Signal Peak Mine (blue pins).

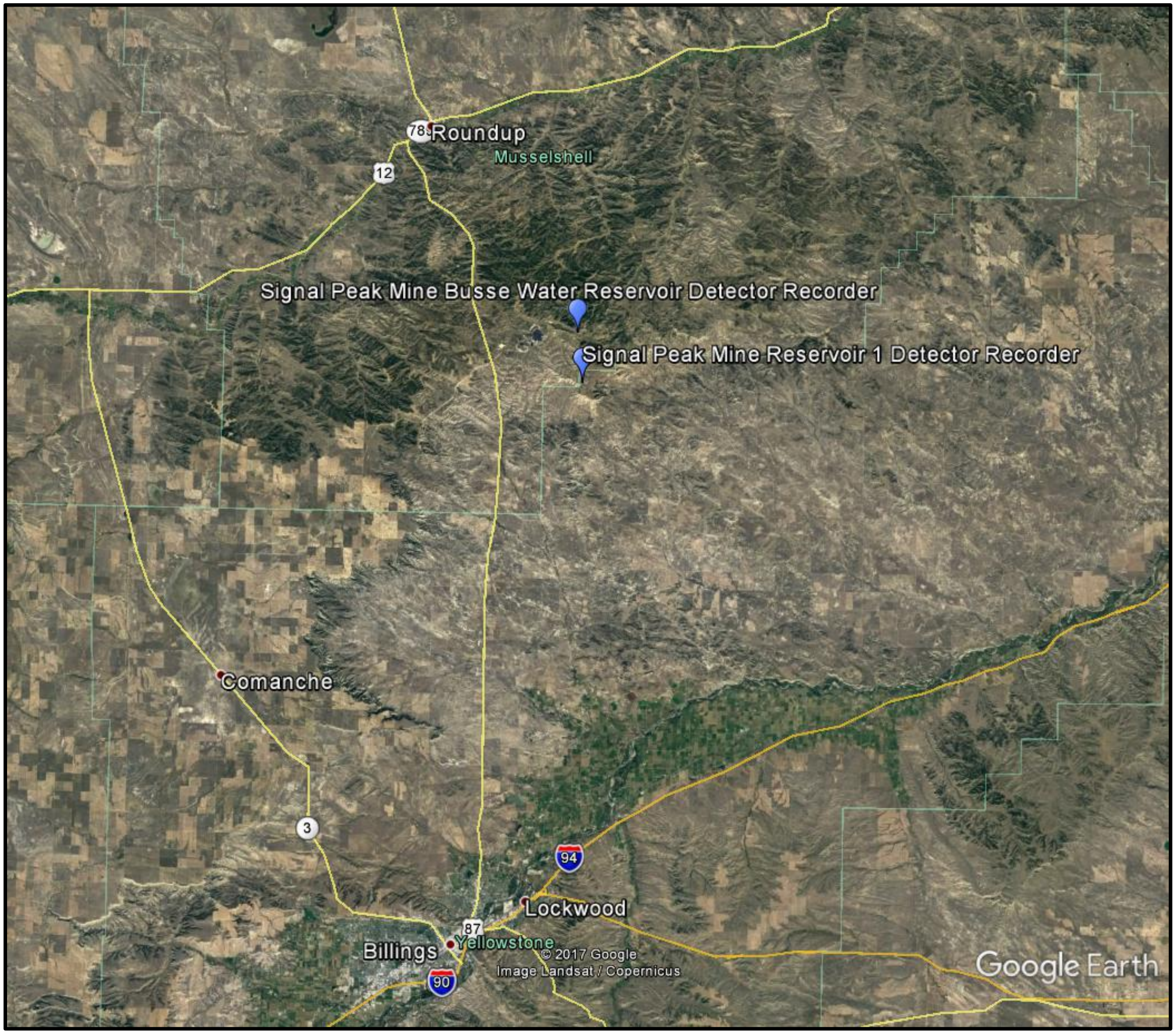


Figure 3. Local images of the placements of detector recorders at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine.

(a)

(b) 
Spring Creek Mine Detector Recorder
Hwy 3-14
© 2017 Google
Google Earth


Otter Creek Coal Tract Detector Recorder
484
© 2017 Google
Google Earth

(c)

(d) 

(e) 
Absaloka Mine Detector Recorder
Sarpy Rd
© 2017 Google
Google Earth

(f) 
Rosebud Coal Mine Area F Pond 7 Detector Recorder
Sarpy Cr Rd
© 2017 Google
Google Earth
Rosebud Coal Mine Area C Pond Detector Recorder
Castle Rock Rd
© 2017 Google
Google Earth


Signal Peak Mine Reservoir 1 Detector Recorder
© 2017 Google
Google Earth
Fattig Creek Rd
Signal Peak Mine Busse Water Reservoir Detector Recorder
Busse Water
© 2017 Google
Google Earth

(g)

Figure 4. Site photos of detector placements (red star) at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine.

(a) West Decker

(b) Spring Creek Mine

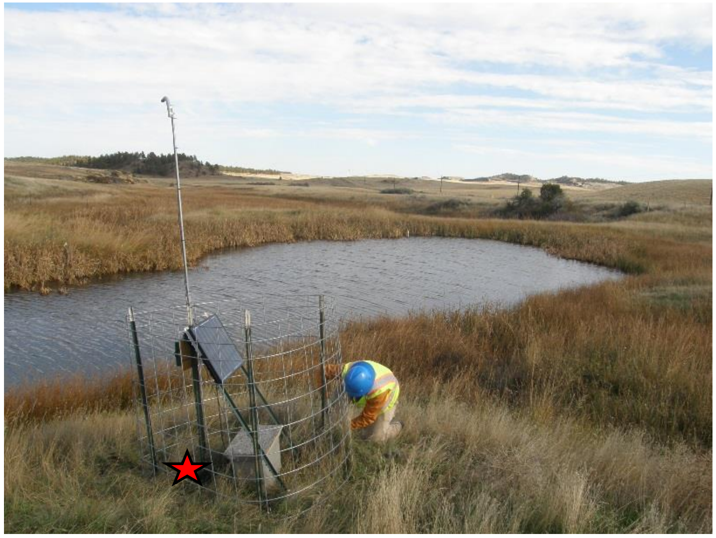
(c) Otter Creek Coal Tract

(d) Big Sky Mine

(e) Absaloka Mine

(f) Rosebud Mine Area F

(f cont.) Rosebud Mine Area C

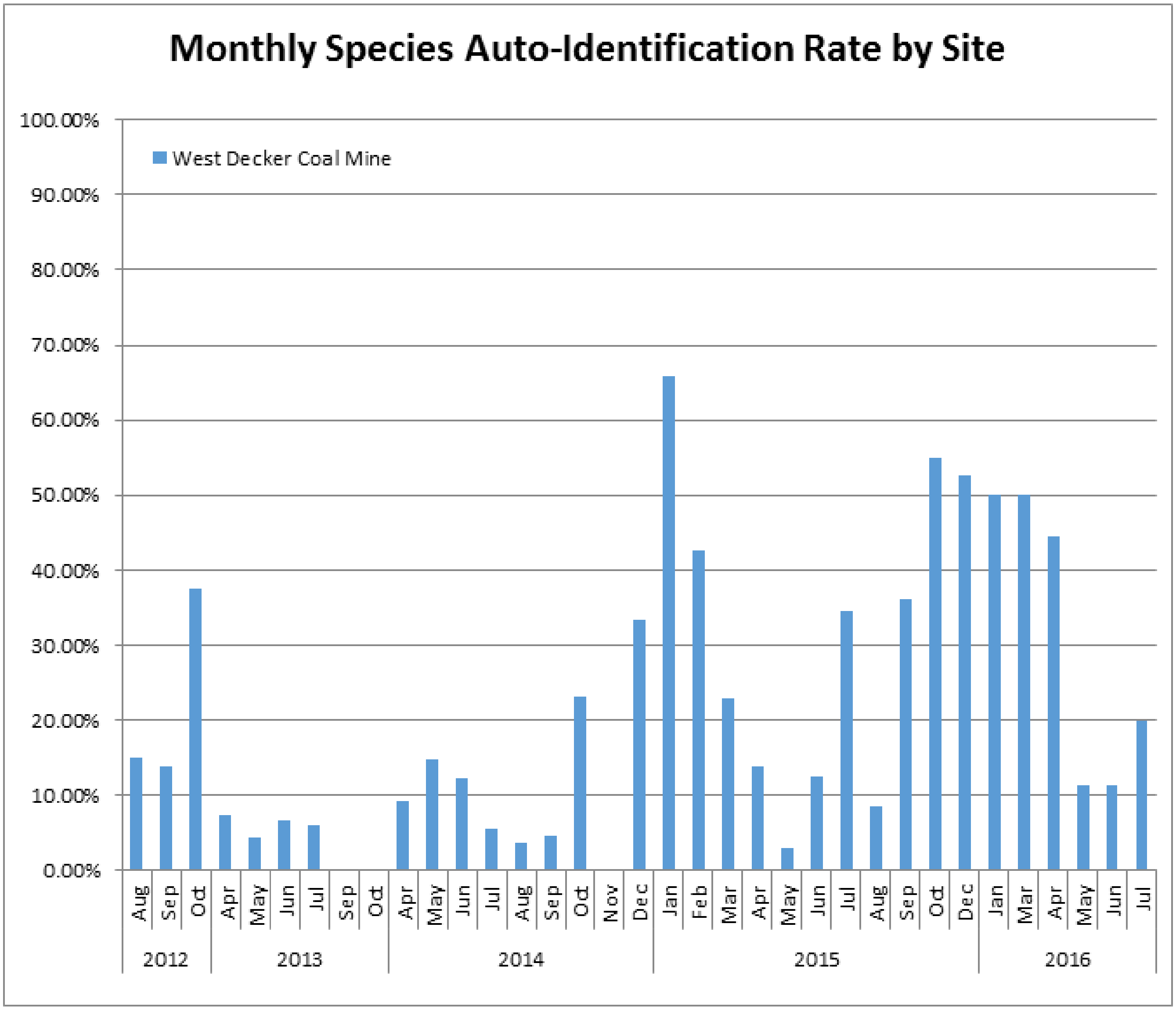


(g) Signal Peak Reservoir 1

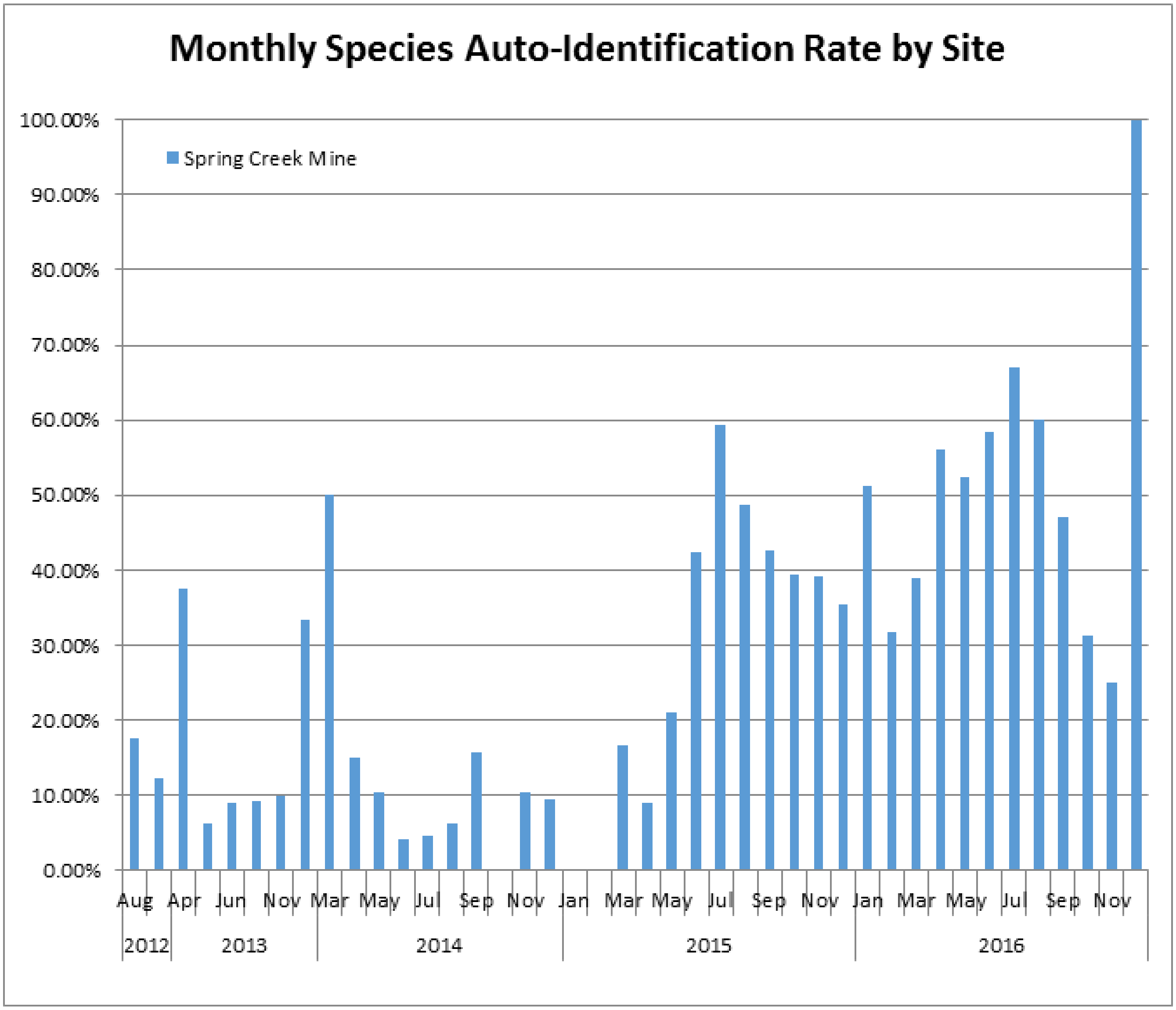
(g cont.) Signal Peak Mine Busse Water Reservoir

Figure 5. Percent of call sequences auto-identified to species each month for: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine.

(a)

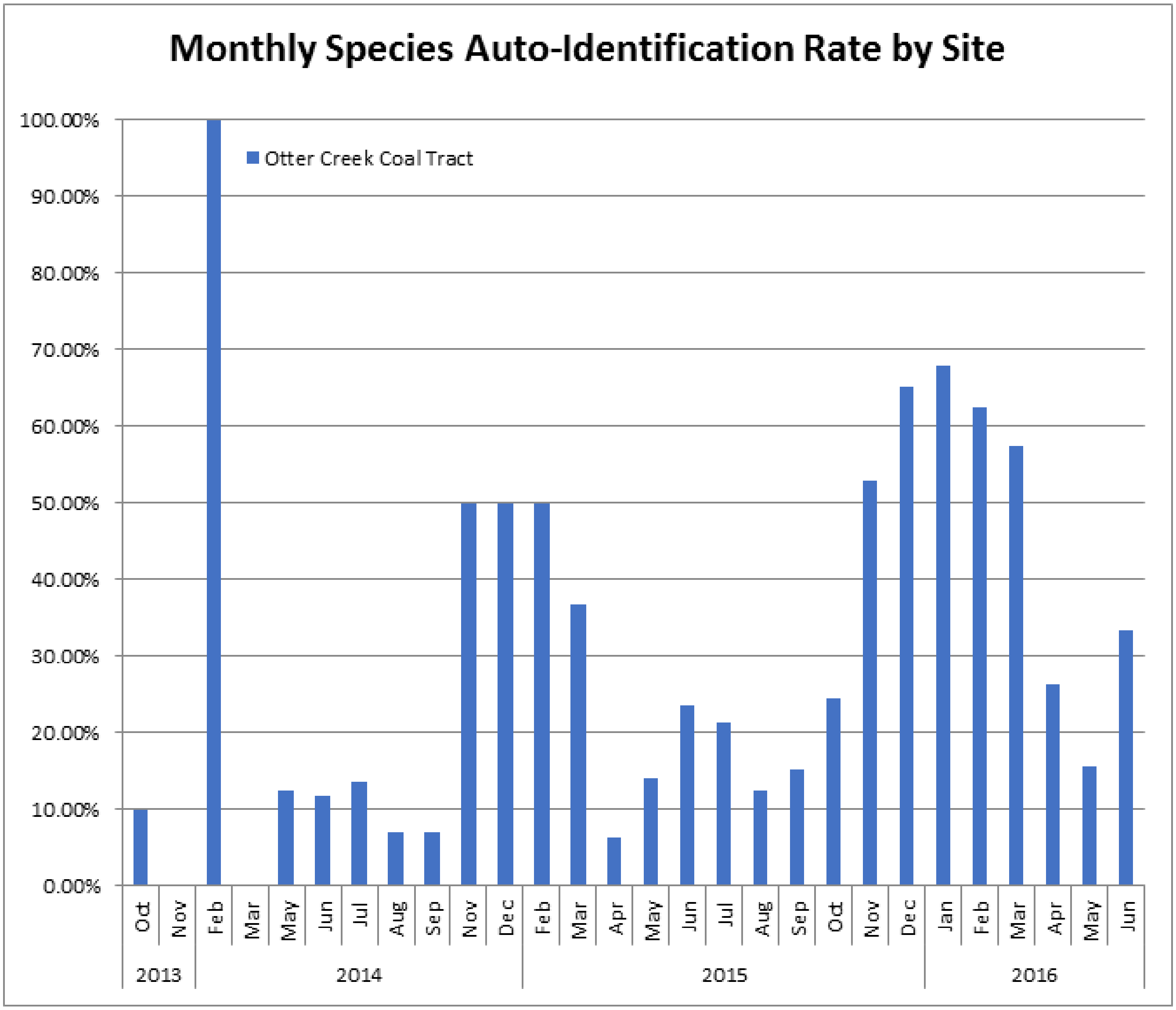


(b)



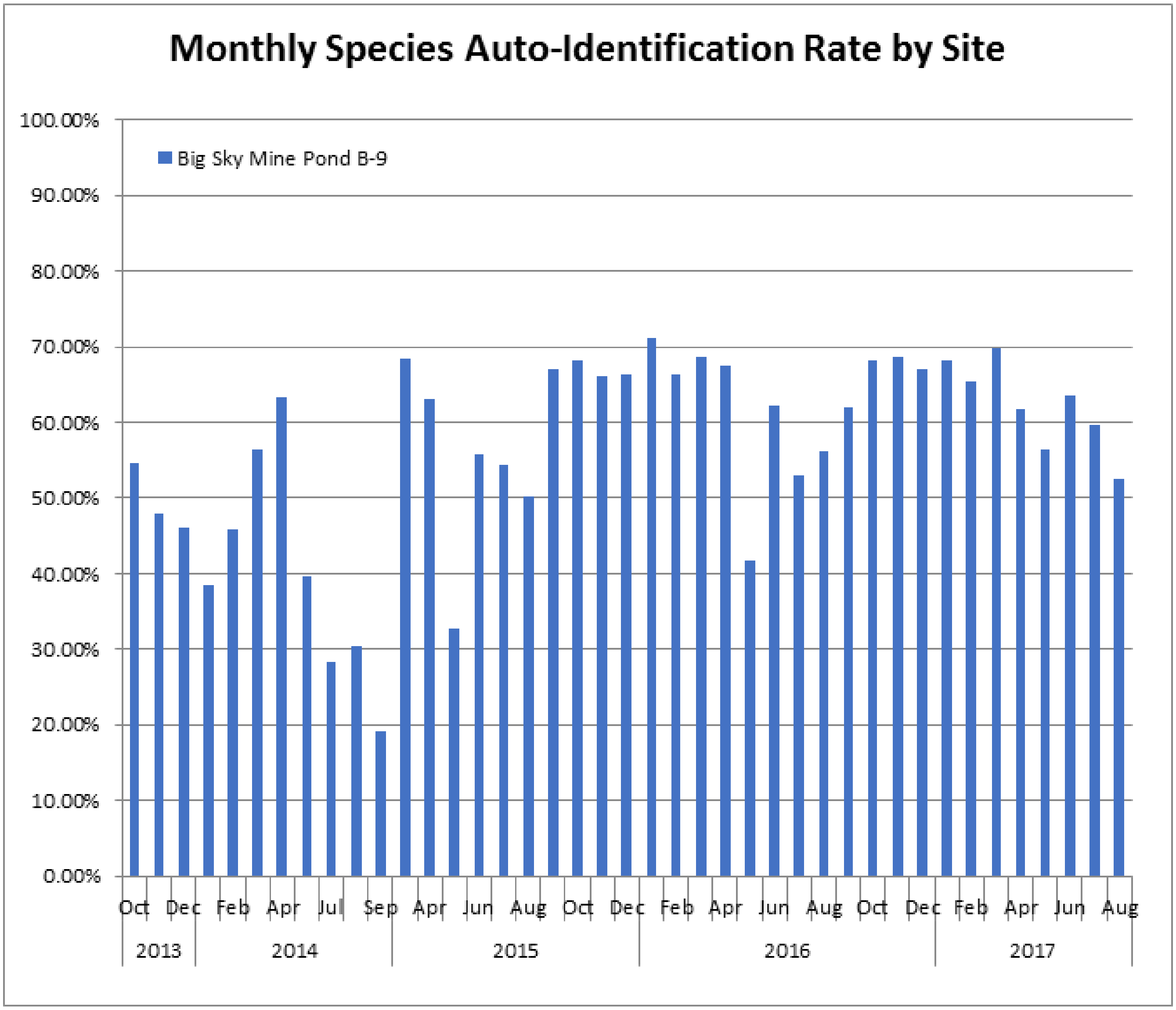
Monthly Species Auto-Identification Rate by Site
Spring Creek Mine
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Aug
Apr
Jun
Nov
Mar
May
Jul
Sep
Nov
Jan
Mar
May
Jul
Sep
Nov
Jan
Mar
May
Jul
Sep
Nov
2012
2013
2014
2015
2016

(c)



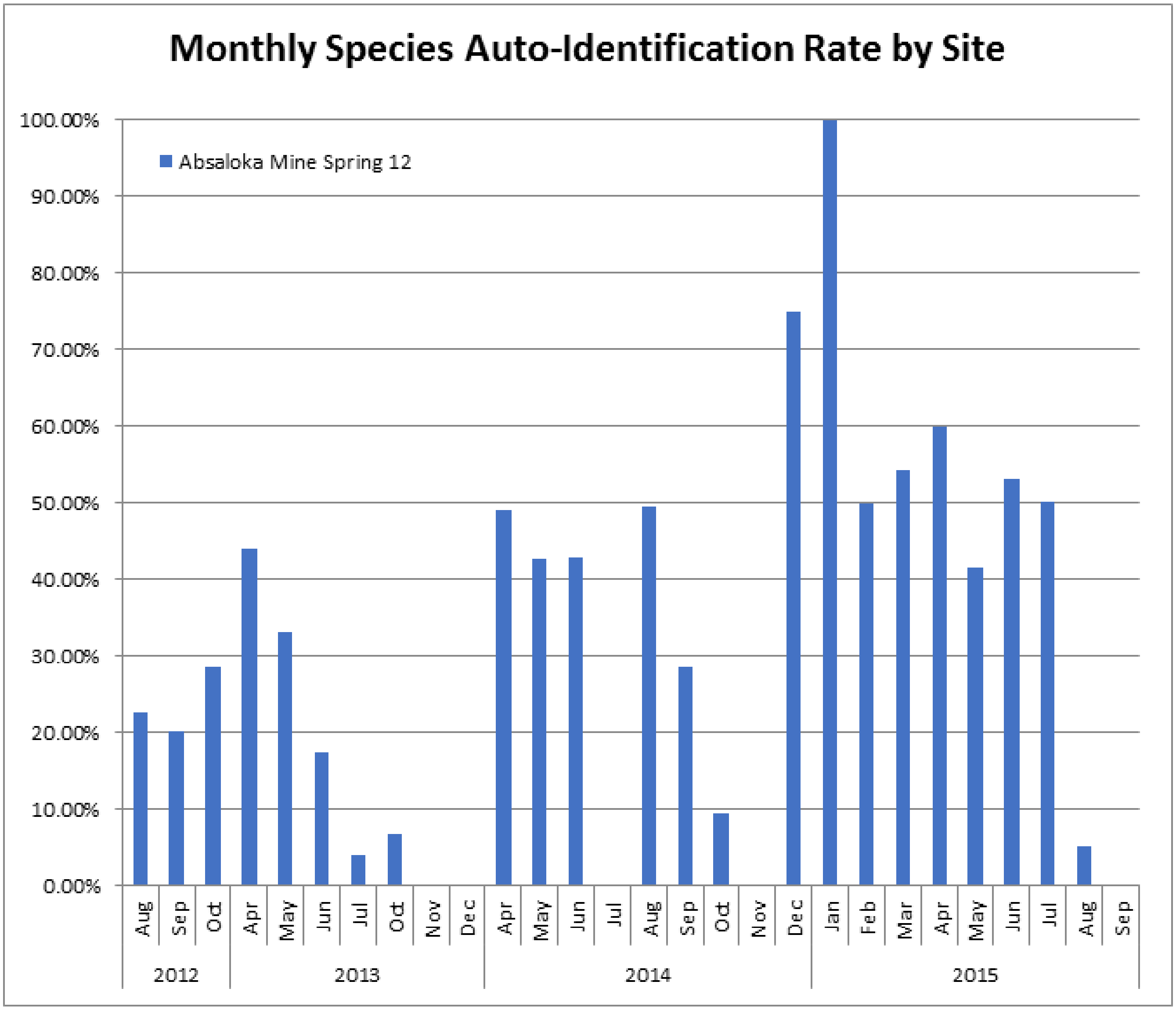
Monthly Species Auto-Identification Rate by Site
Otter Creek Coal Tract
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Oct Nov Feb Mar May Jun Jul Aug Sep Nov Dec Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun
2013
2014
2015
2016

(d)



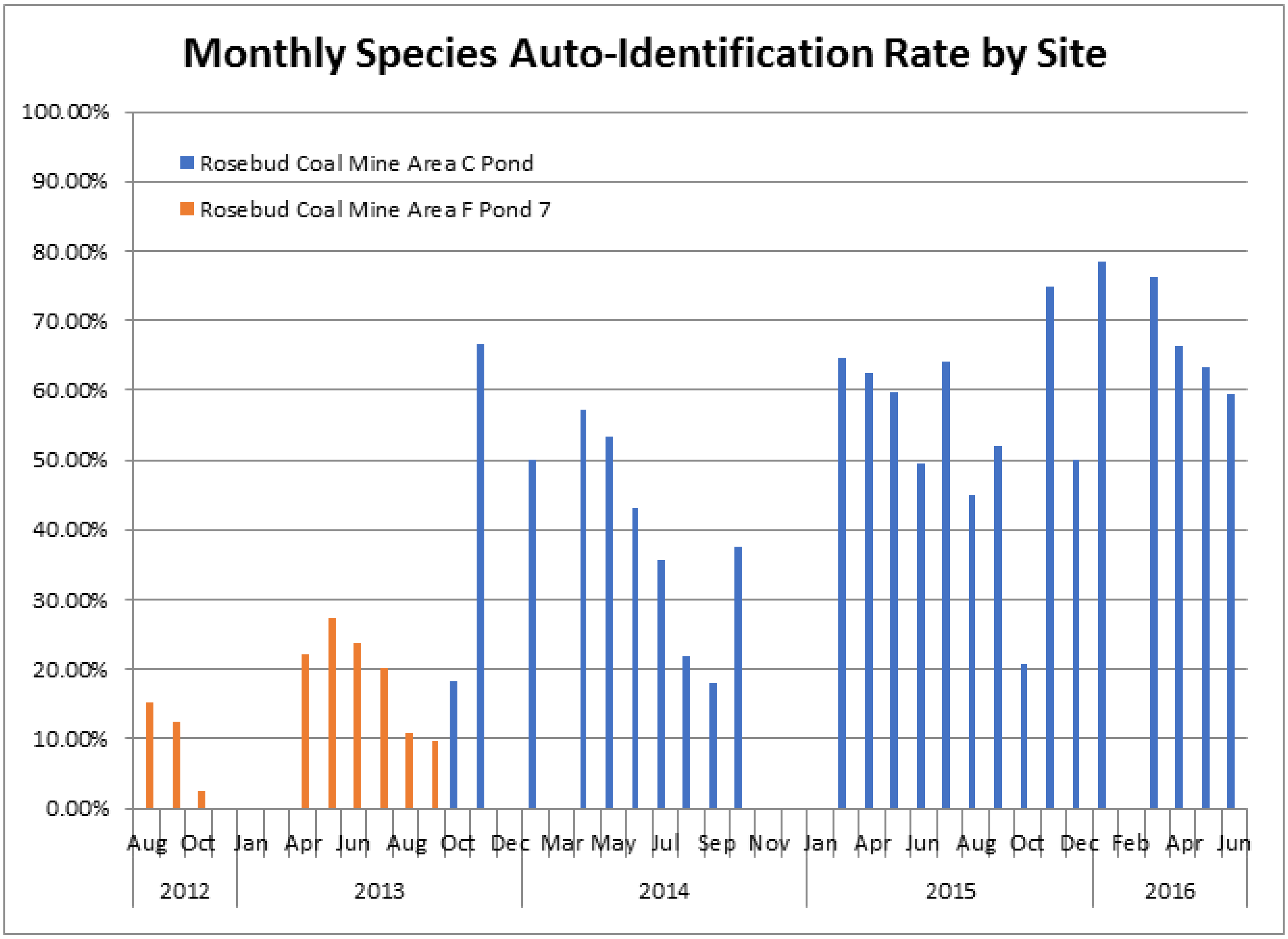
Monthly Species Auto-Identification Rate by Site
Big Sky Mine Pond B-9
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Oct Dec Feb Apr Jul Sep Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug
2013 2014 2015 2016 2017

(e)

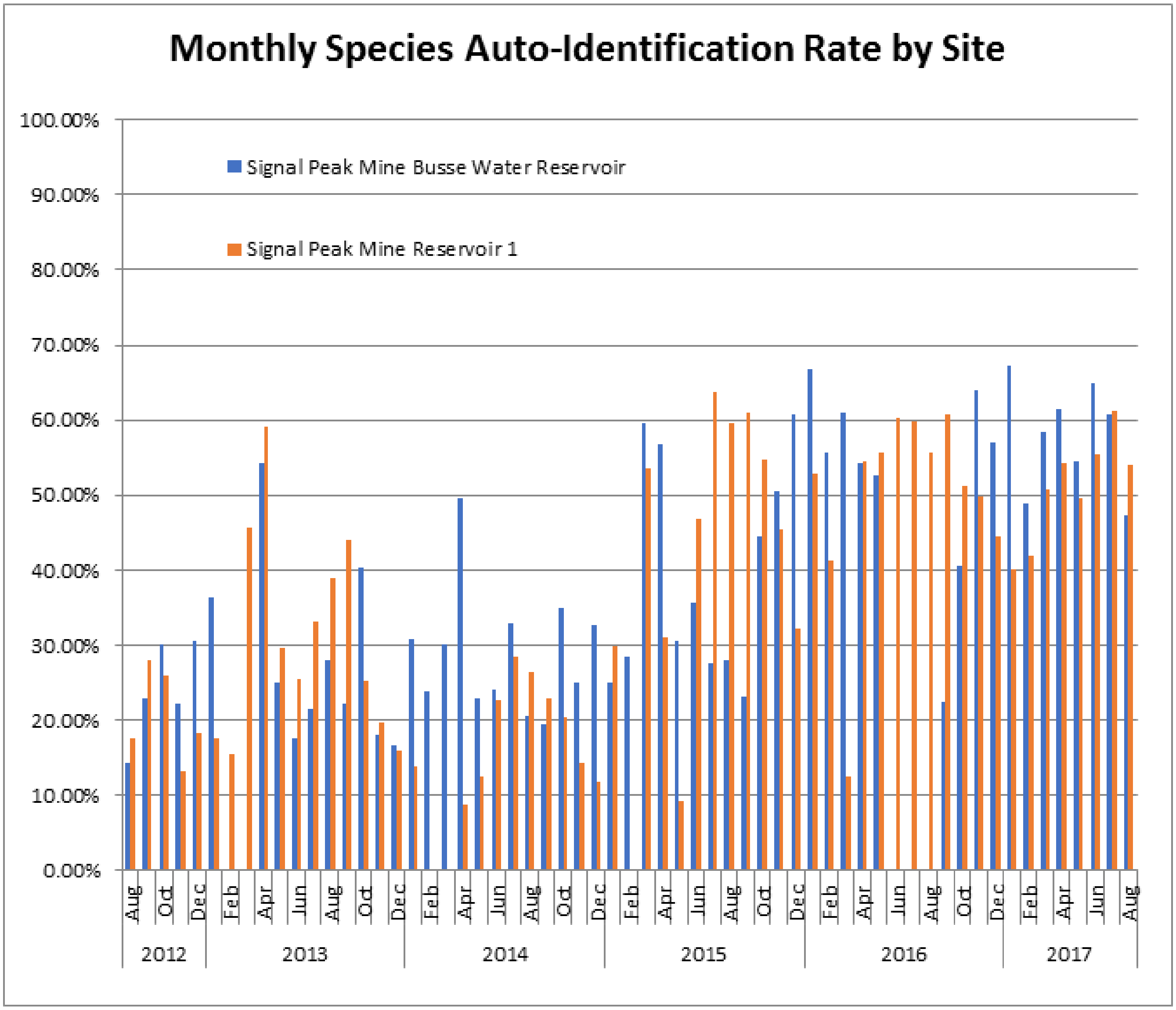


Monthly Species Auto-Identification Rate by Site
Absaloka Mine Spring 12
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Aug
Sep
Oct
Apr
May
Jun
Jul
Oct
Nov
Dec
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
2012
2013
2014
2015

(f)


Monthly Species Auto-Identification Rate by Site
Rosebud Coal Mine Area C Pond
Rosebud Coal Mine Area F Pond 7
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Aug Oct Jan Apr Jun Aug Oct Dec Mar May Jul Sep Nov Jan Apr Jun Aug Oct Dec Feb Apr Jun
2012
2013
2014
2015
2016

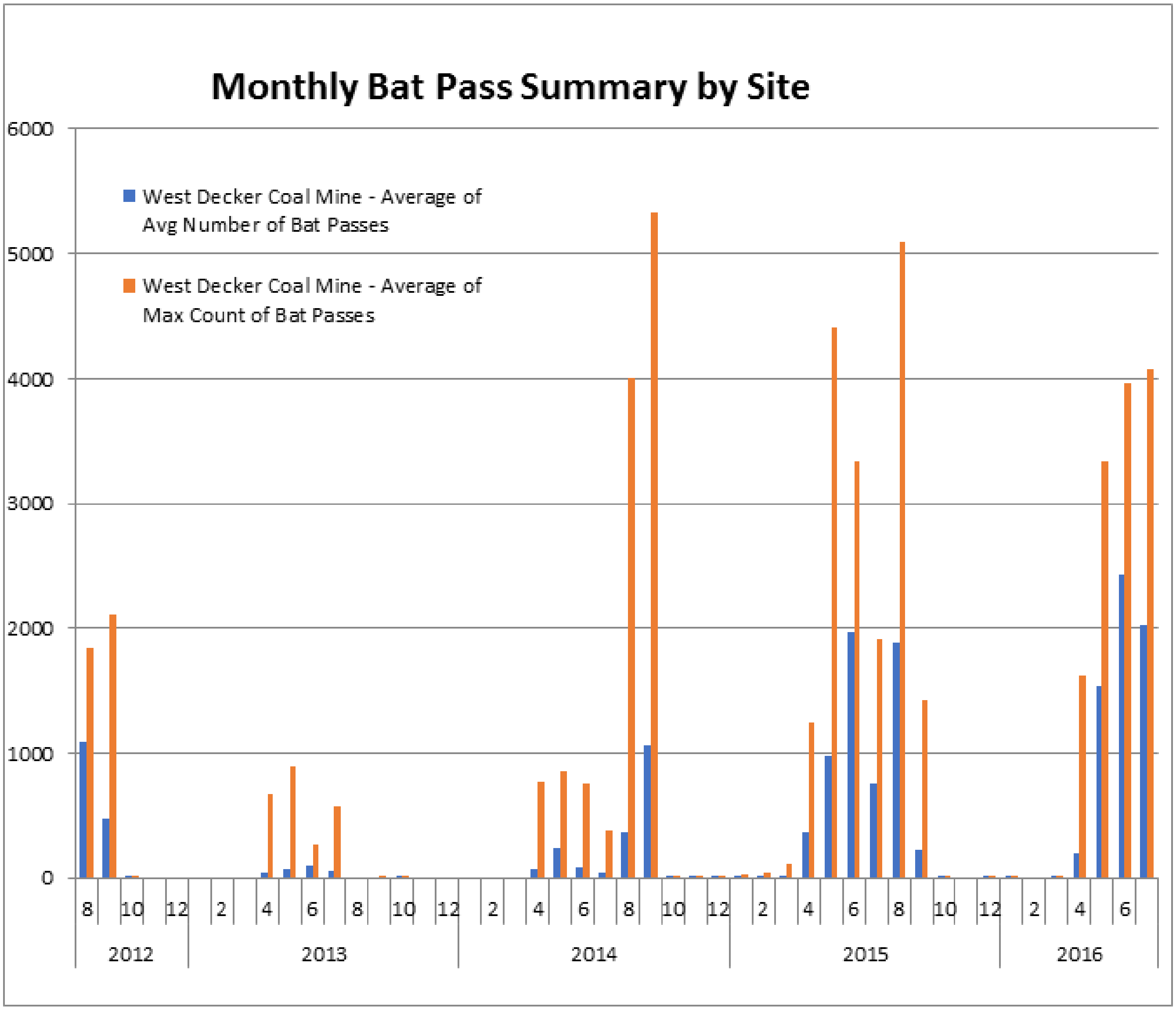
(g)



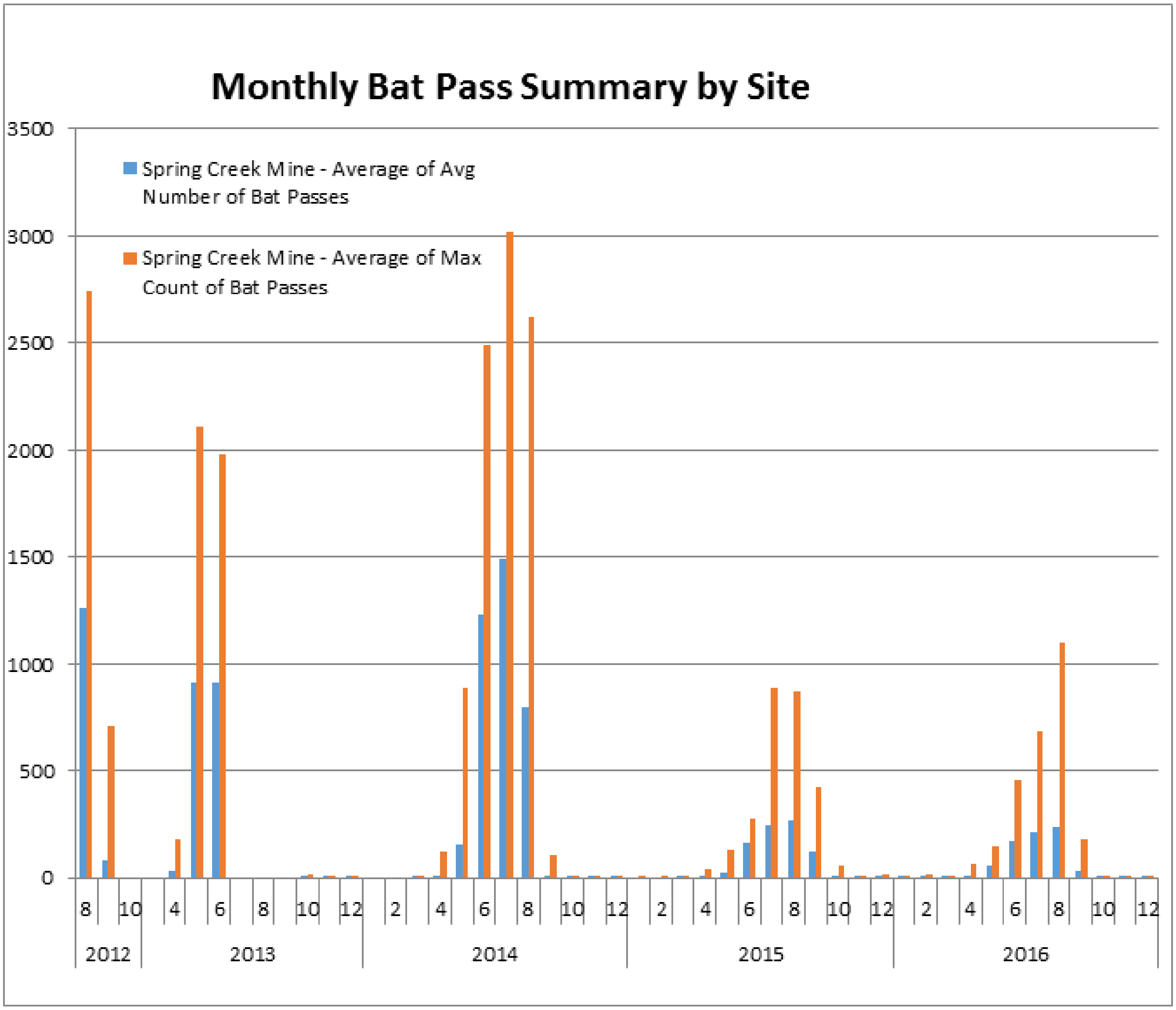
Monthly Species Auto-Identification Rate by Site
Signal Peak Mine Busse Water Reservoir
Signal Peak Mine Reservoir 1
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
2012
2013
2014
2015
2016
2017

Figure 6. Average (blue) and maximum counts (red) of bat passes per night by month for: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Numbers on X-axis are years and months.

(a)

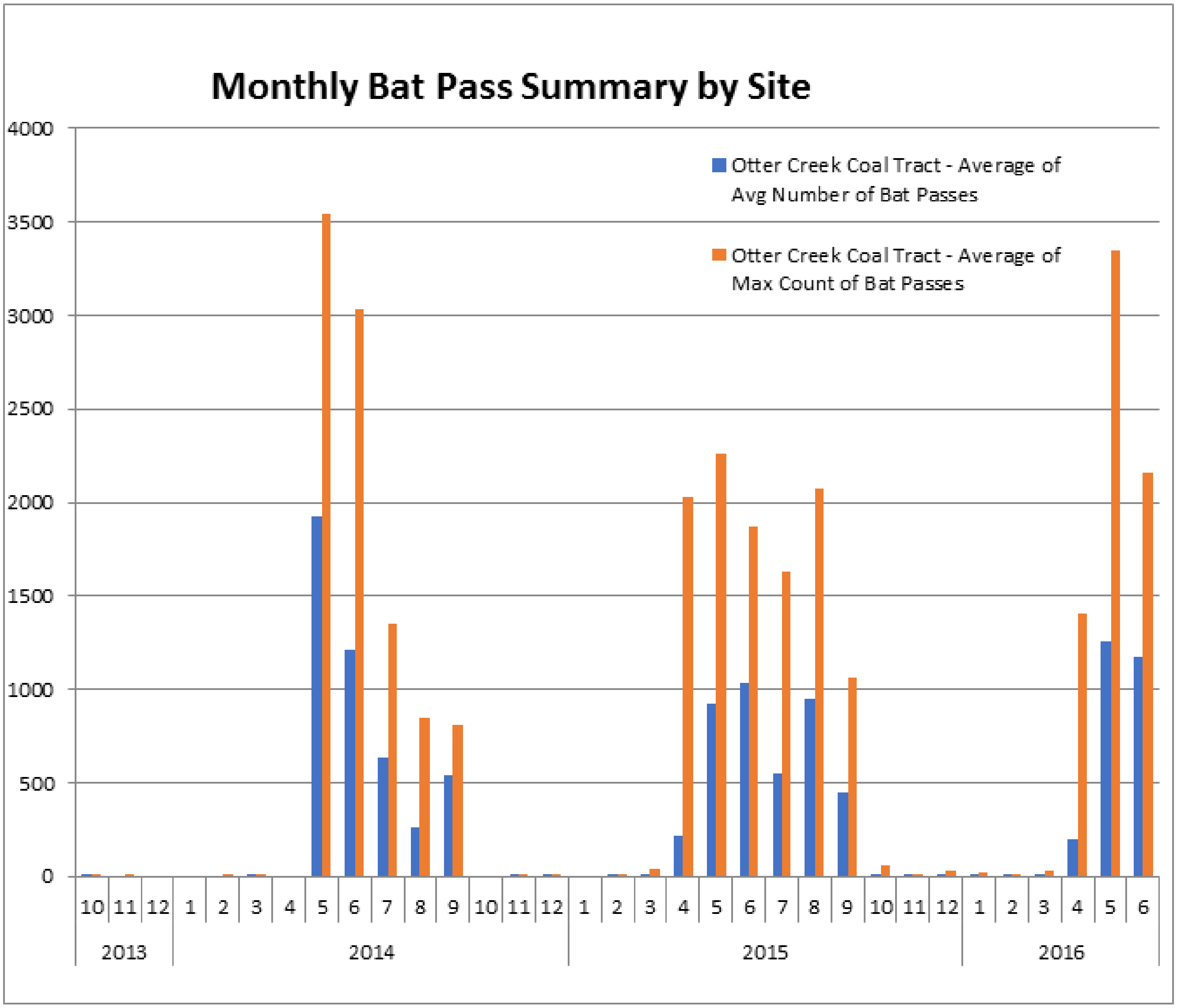


(b)

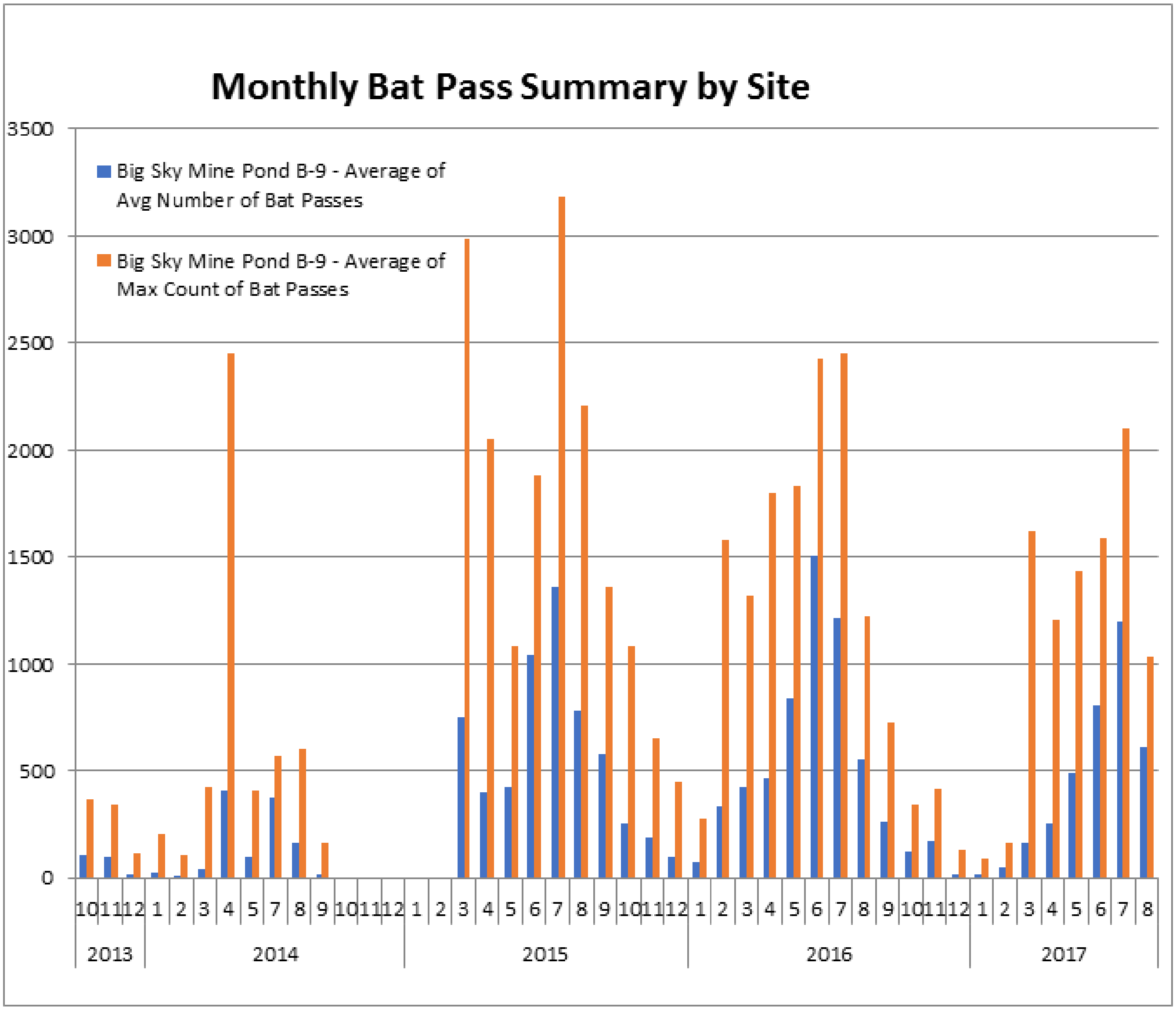


Monthly Bat Pass Summary by Site
3500
3000
2500
2000
1500
1000
500
0
Spring Creek Mine - Average of Avg Number of Bat Passes
Spring Creek Mine - Average of Max Count of Bat Passes
8
10
4
6
8
10
12
2
4
6
8
10
12
2
4
6
8
10
12
2
4
6
8
10
12
2012
2013
2014
2015
2016

(c)

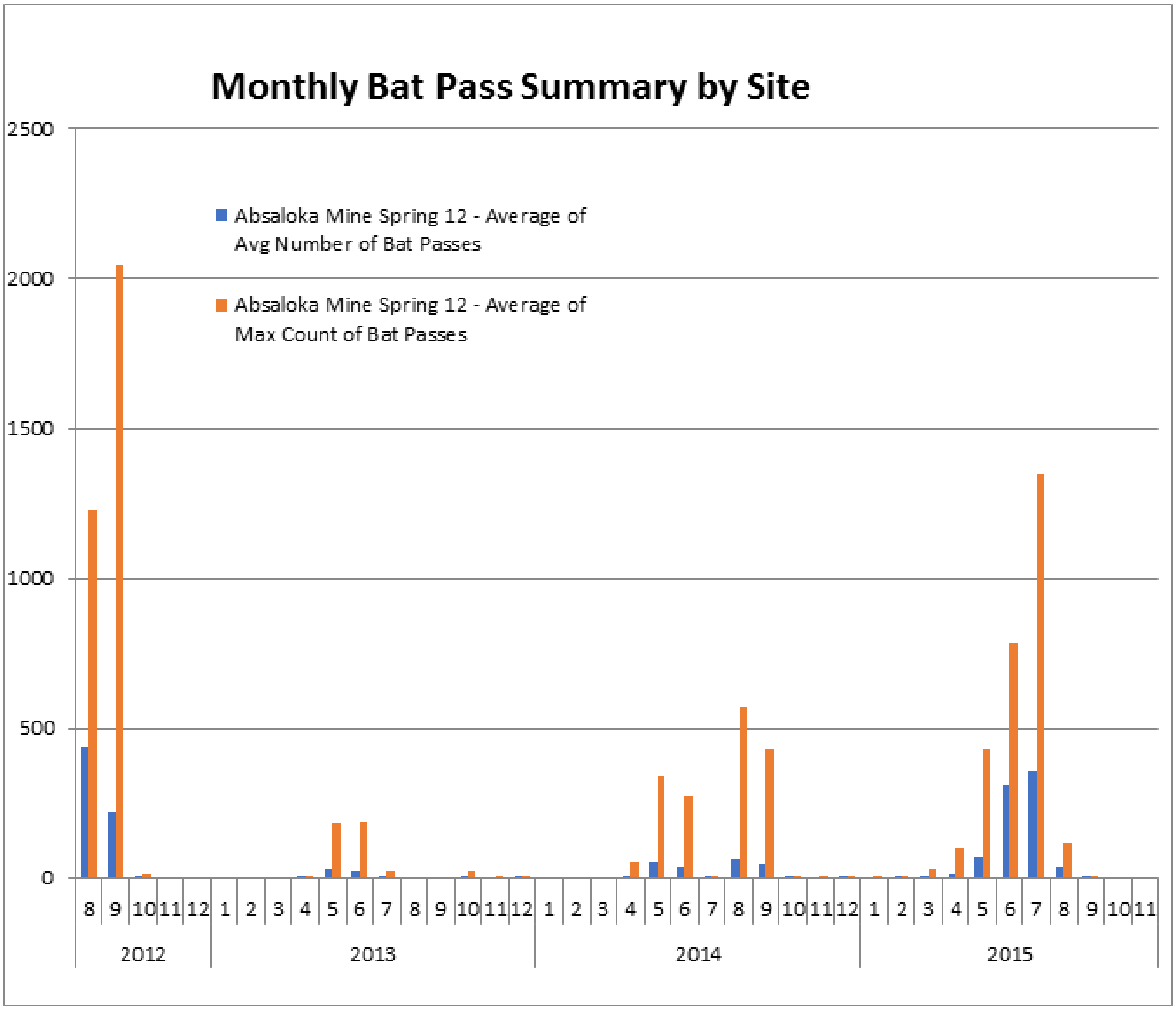

Monthly Bat Pass Summary by Site
Otter Creek Coal Tract - Average of Avg Number of Bat Passes
Otter Creek Coal Tract - Average of Max Count of Bat Passes
4000
3500
3000
2500
2000
1500
1000
500
0
10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
2013
2014
2015
2016

(d)

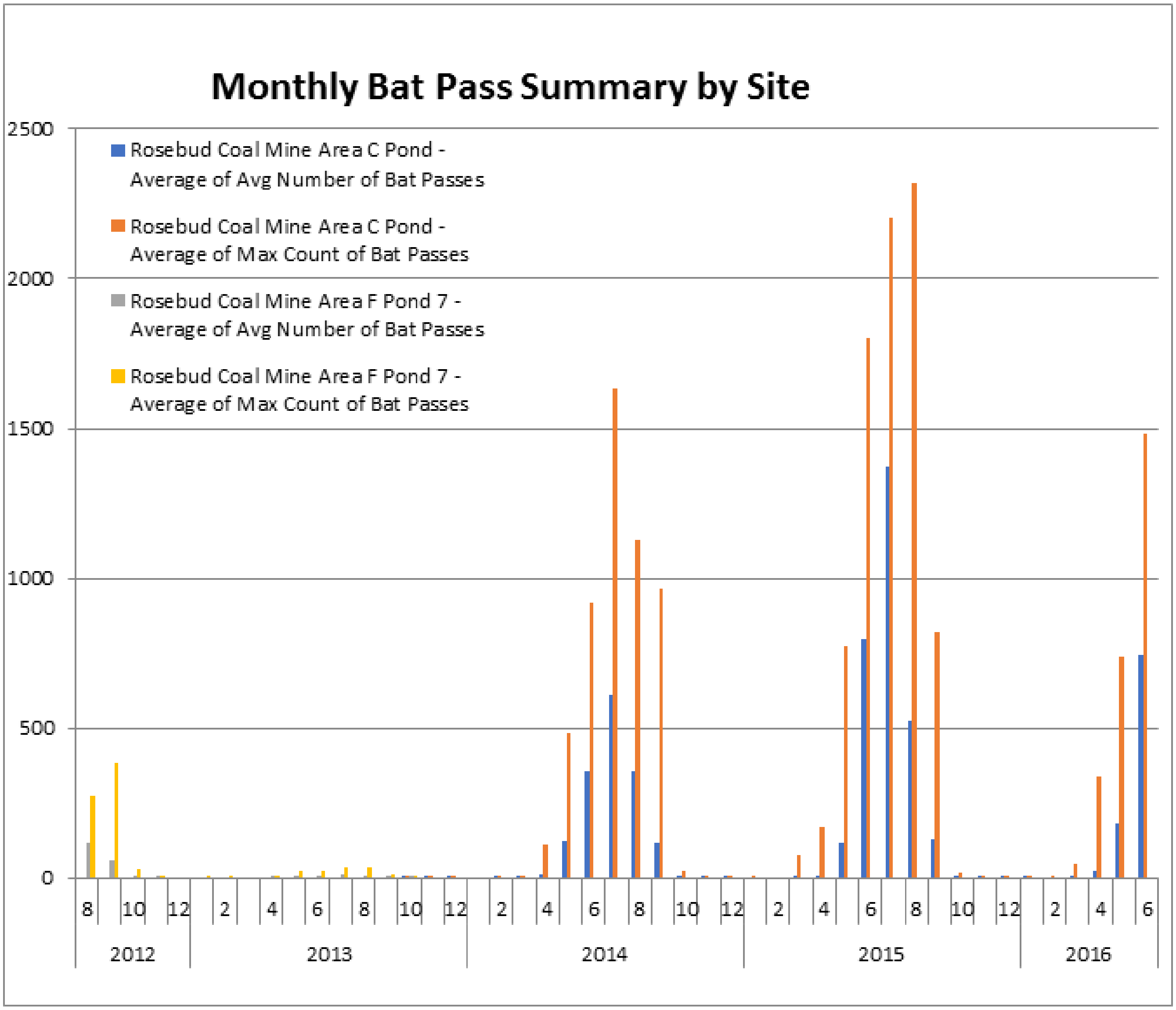


Monthly Bat Pass Summary by Site
Big Sky Mine Pond B-9 - Average of Avg Number of Bat Passes
Big Sky Mine Pond B-9 - Average of Max Count of Bat Passes
3500
3000
2500
2000
1500
1000
500
0
10 11 12 1 2 3 4 5 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8
2013
2014
2015
2016
2017

(e)


Monthly Bat Pass Summary by Site
2500
2000
1500
1000
500
0
Absaloka Mine Spring 12 - Average of Avg Number of Bat Passes
Absaloka Mine Spring 12 - Average of Max Count of Bat Passes
8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
2012
2013
2014
2015

(f)


Monthly Bat Pass Summary by Site
2500
2000
1500
1000
500
0
Rosebud Coal Mine Area C Pond - Average of Avg Number of Bat Passes
Rosebud Coal Mine Area C Pond - Average of Max Count of Bat Passes
Rosebud Coal Mine Area F Pond 7 - Average of Avg Number of Bat Passes
Rosebud Coal Mine Area F Pond 7 - Average of Max Count of Bat Passes
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6
2012
2013
2014
2015
2016

(g)

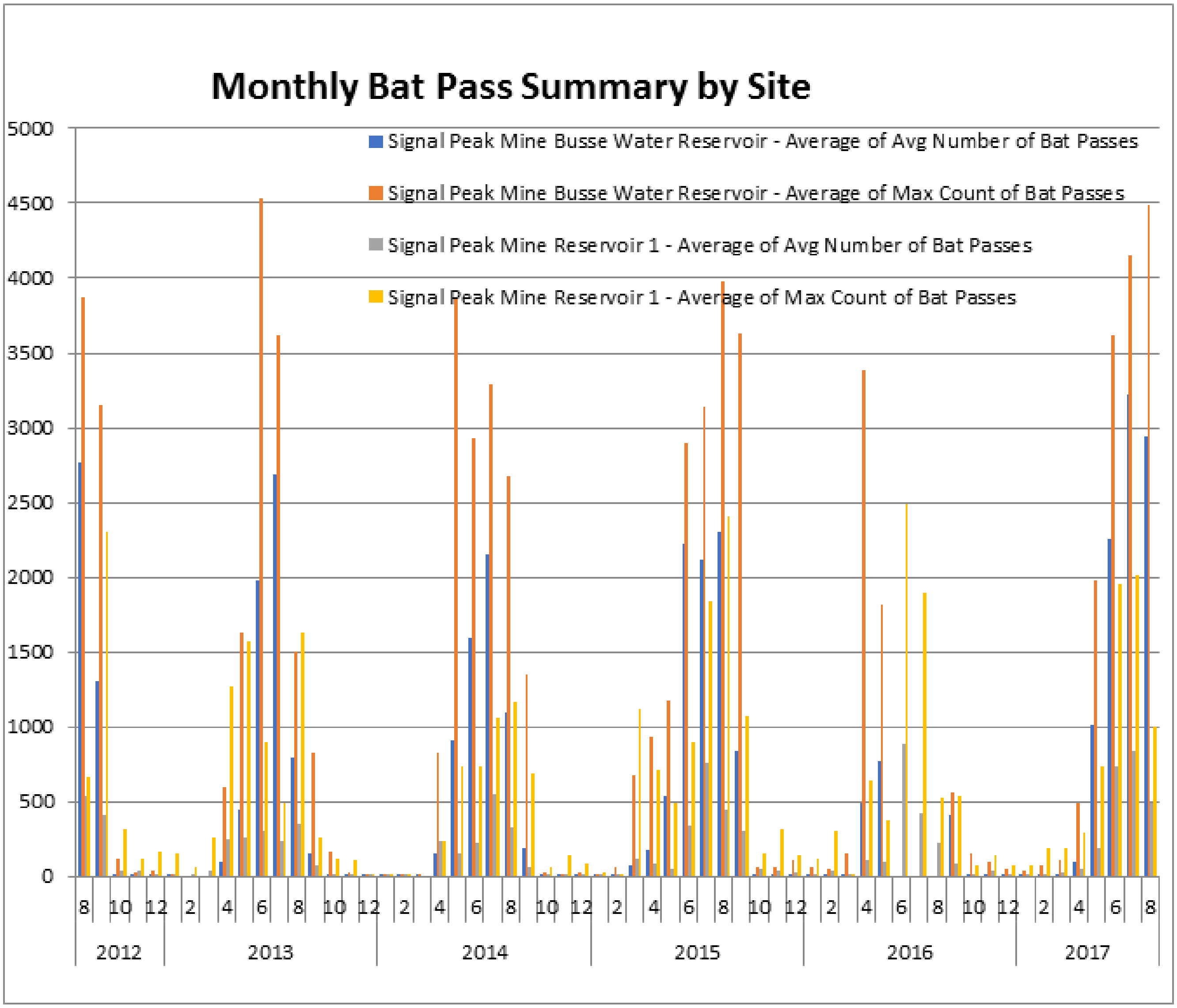
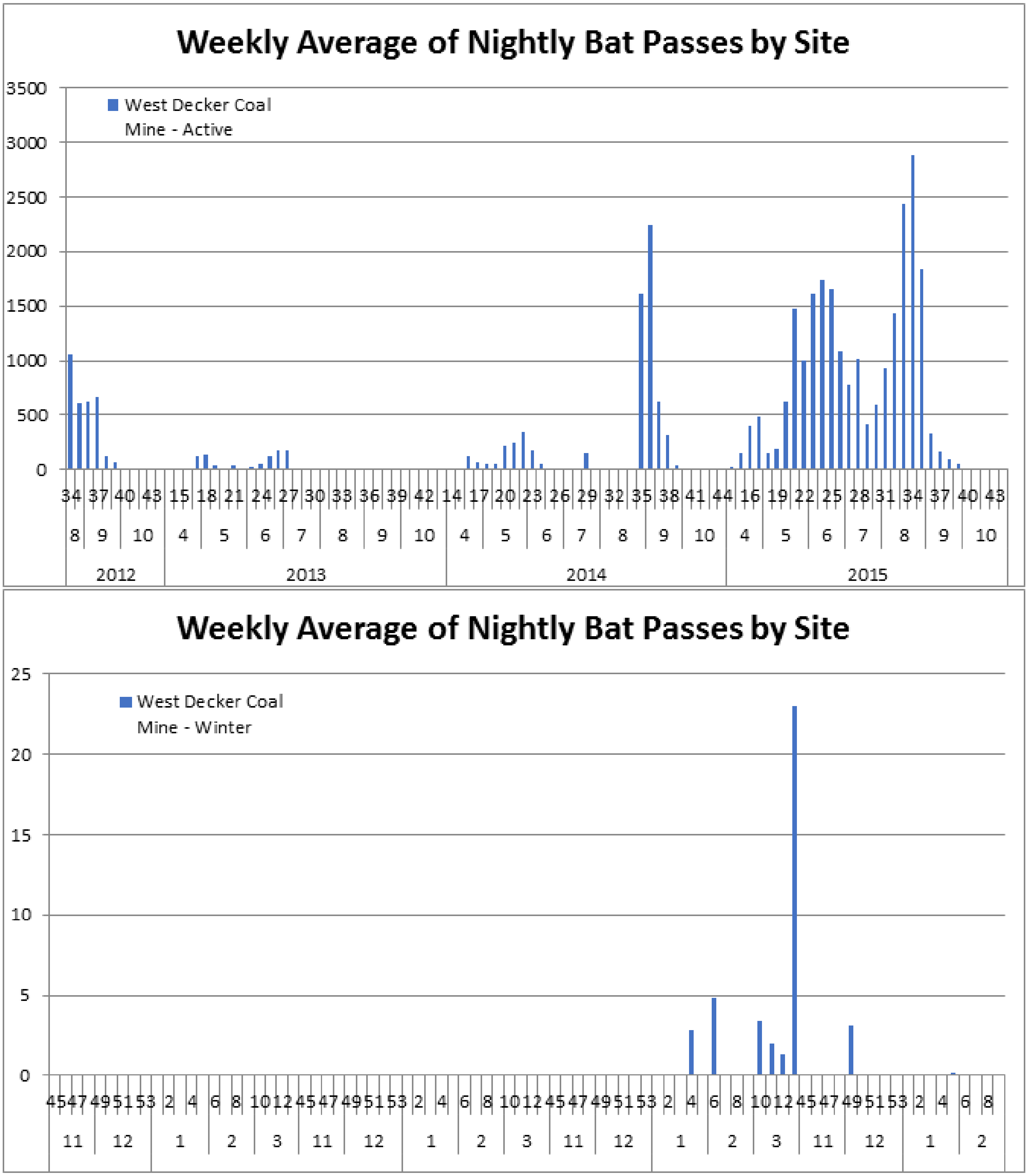
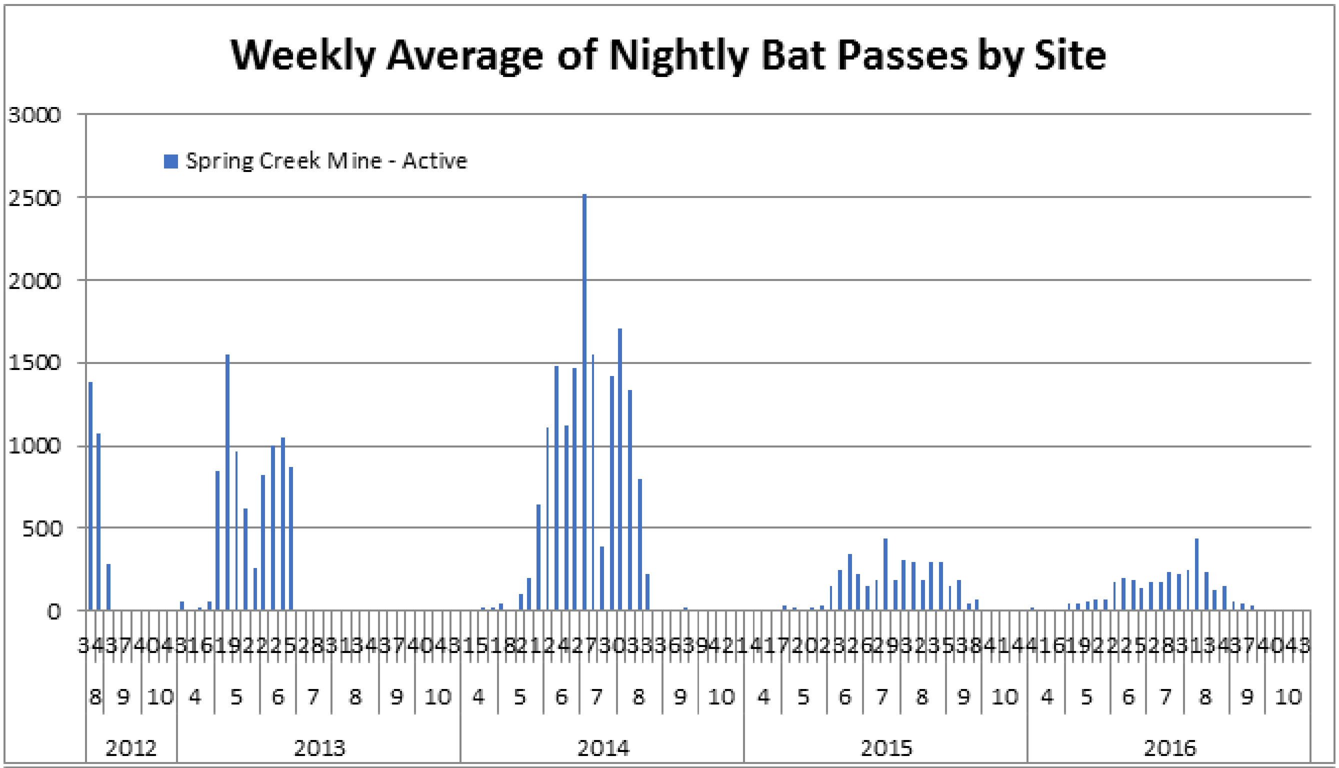

Monthly Bat Pass Summary by Site
Signal Peak Mine Busse Water Reservoir - Average of Avg Number of Bat Passes
Signal Peak Mine Busse Water Reservoir - Average of Max Count of Bat Passes
Signal Peak Mine Reservoir 1 - Average of Avg Number of Bat Passes
Signal Peak Mine Reservoir 1 - Average of Max Count of Bat Passes
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8
2012
2013
2014
2015
2016
2017

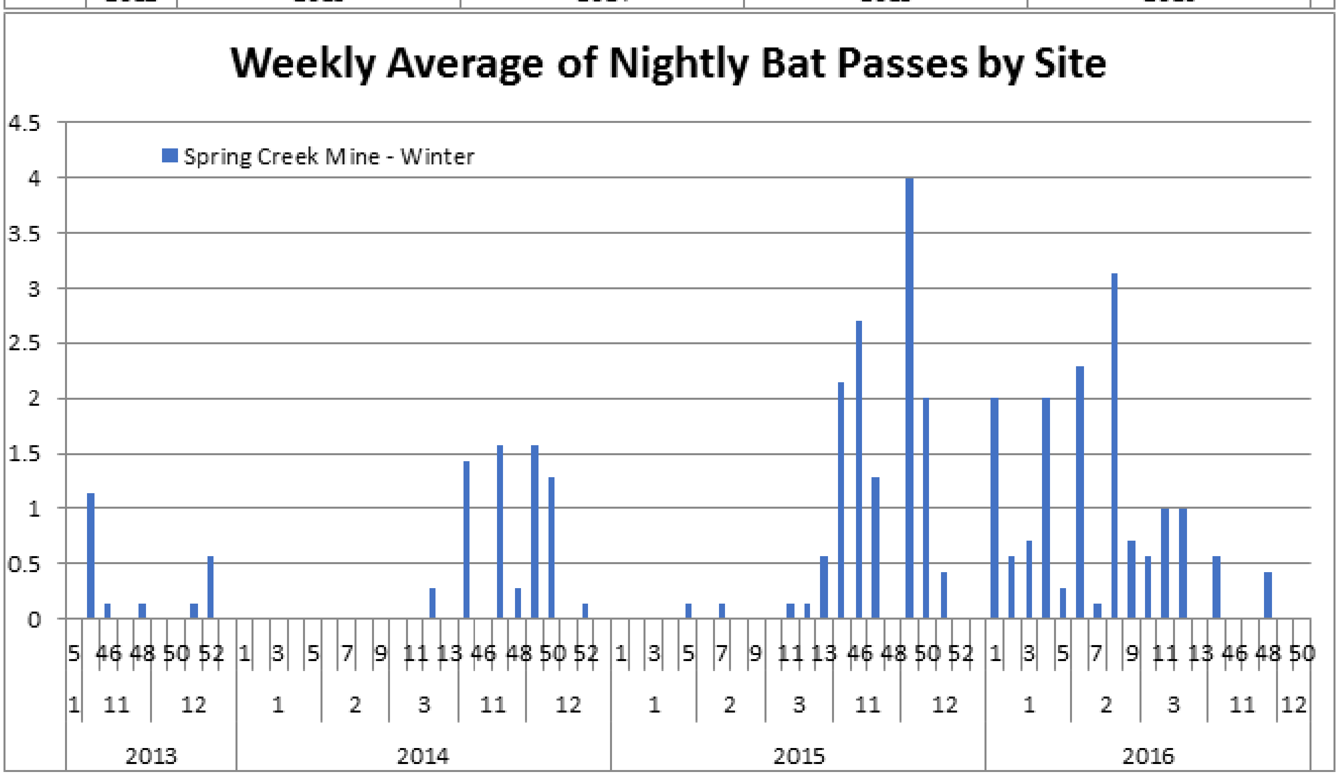
Figure 7. Average number of bat passes per night by week for the active and inactive season at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Numbers on X axis are years, months, and weeks.



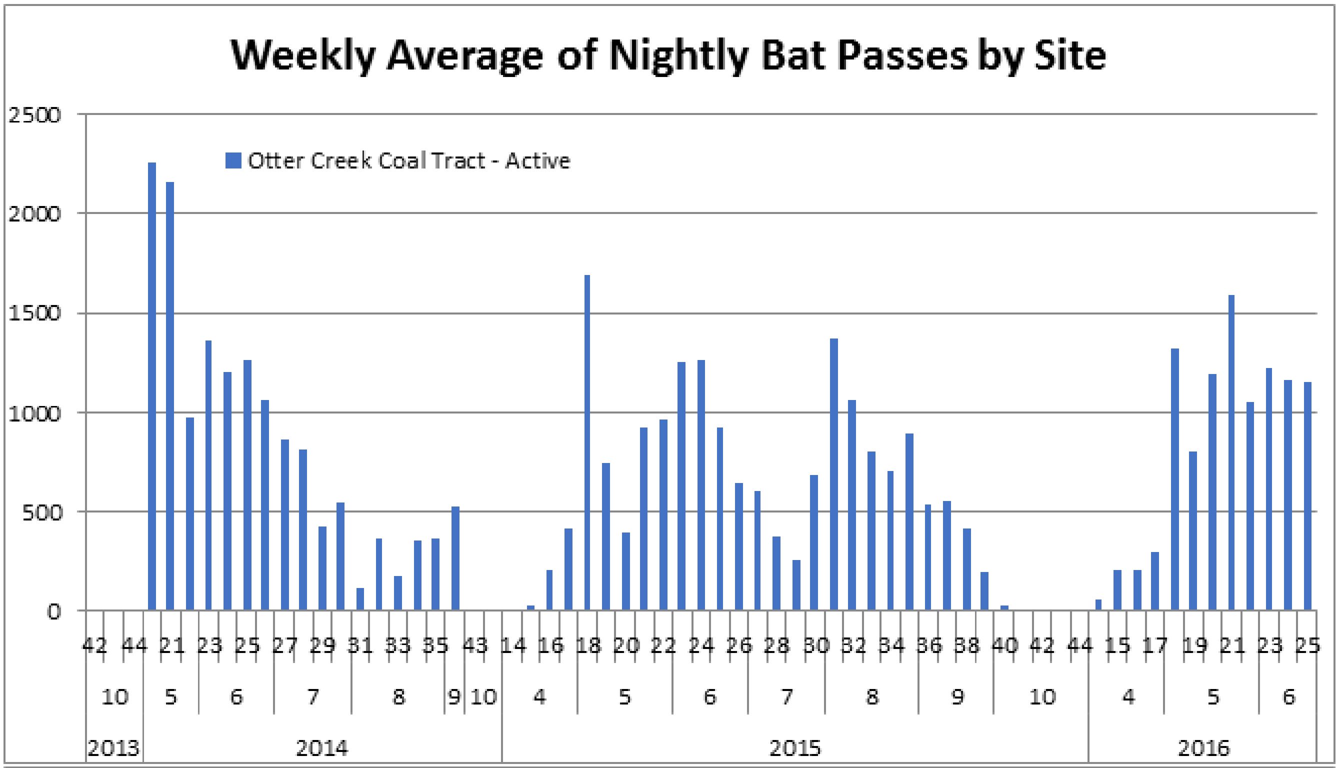
(a)

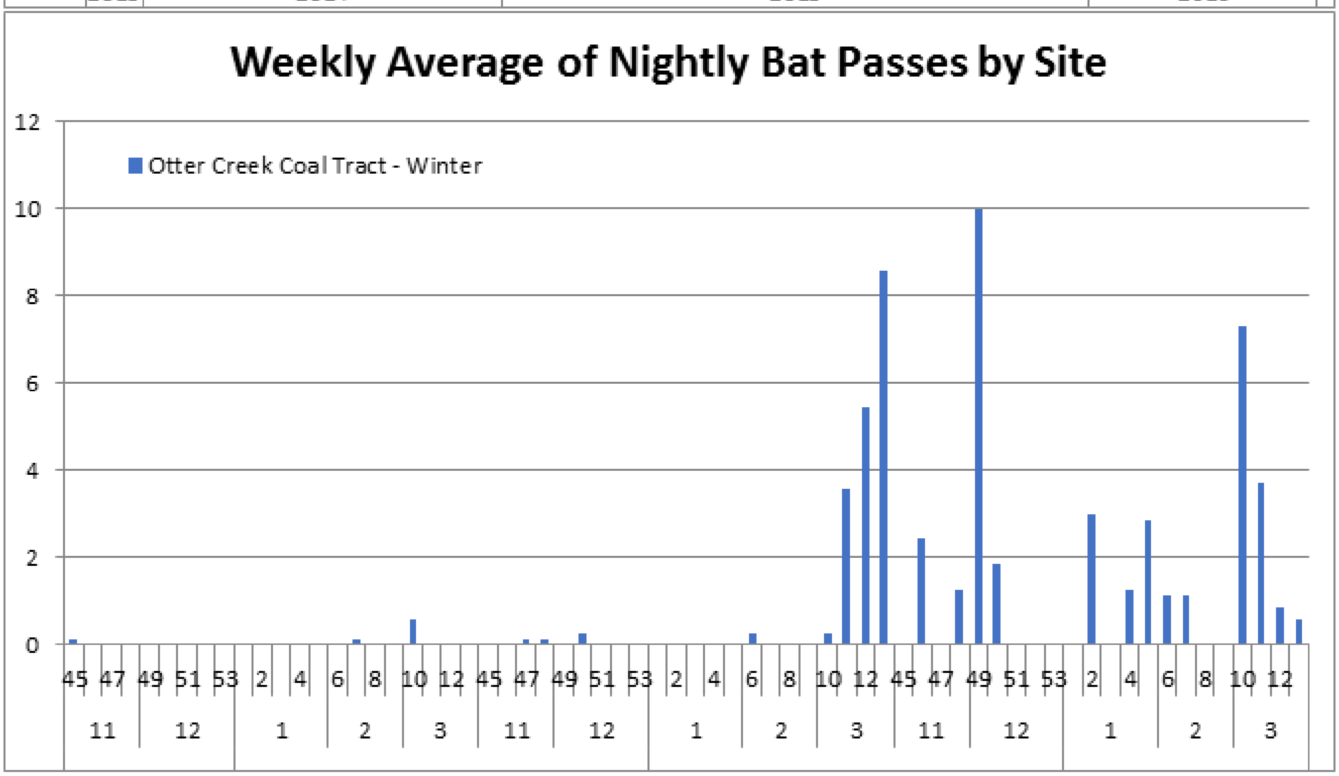

Weekly Average of Nightly Bat Passes by Site
Spring Creek Mine - Active

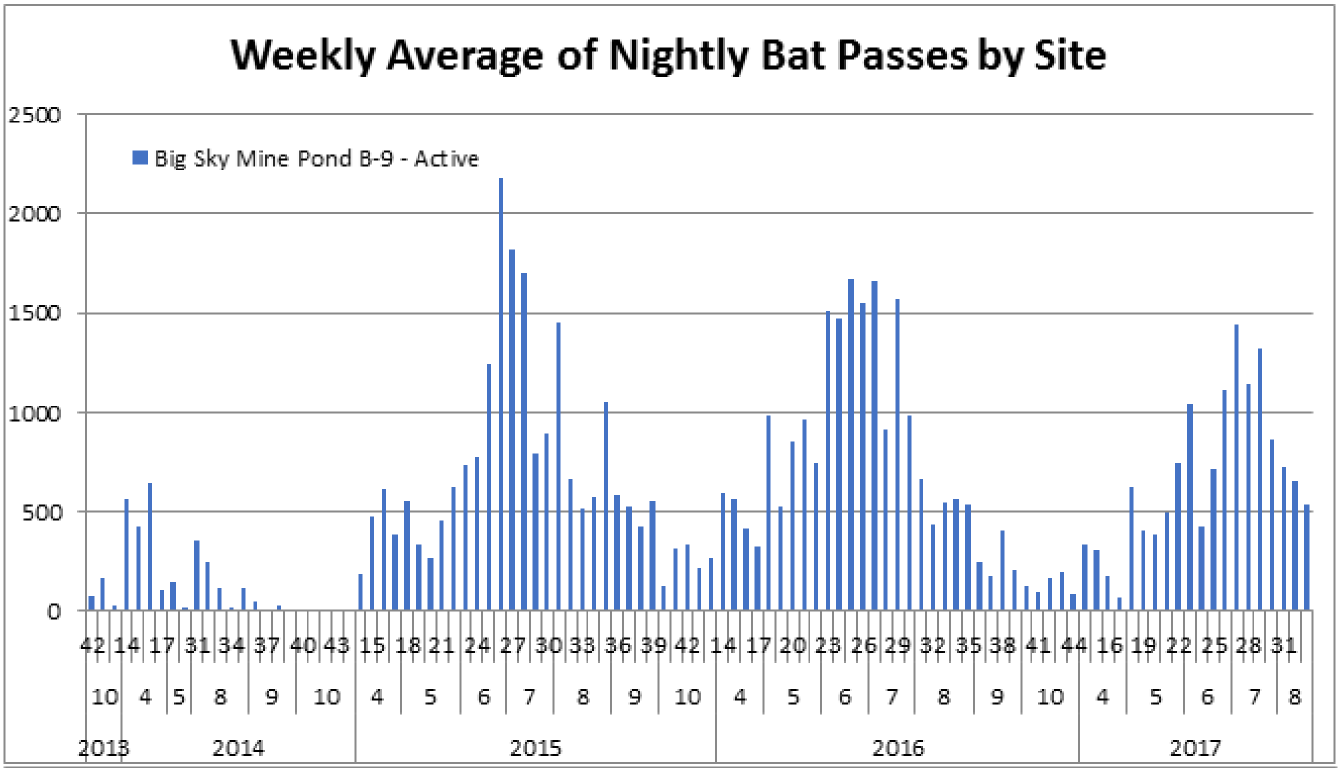
(b)


Weekly Average of Nightly Bat Passes by Site
Spring Creek Mine - Winter

(c)

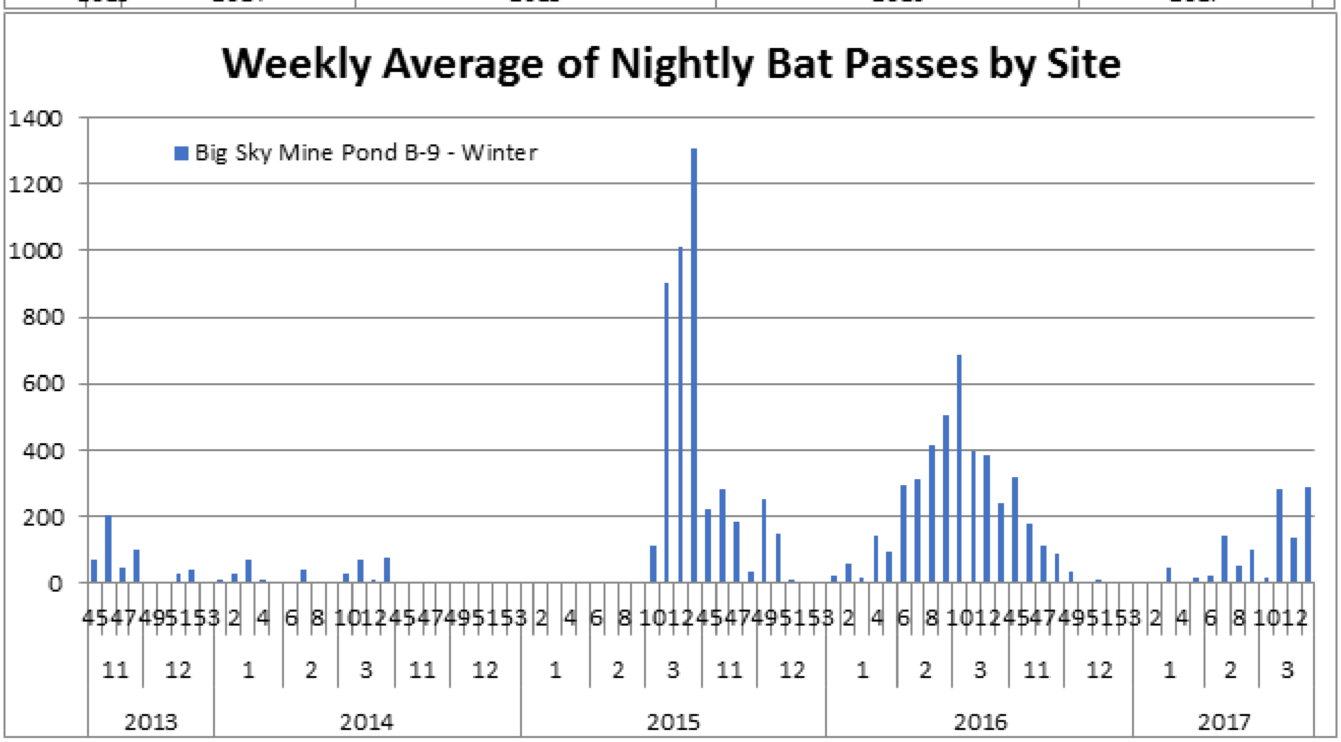

Weekly Average of Nightly Bat Passes by Site
Otter Creek Coal Tract - Active
2500
2000
1500
1000
500
0
42 44 21 23 25 27 29 31 33 35 43 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 15 17 19 21 23 25
10 5 6 7 8 9 10 4 5 6 7 8 9 10 4 5 6
2013 2014 2015 2016


Weekly Average of Nightly Bat Passes by Site
Otter Creek Coal Tract - Winter
12
10
8
6
4
2
0
45 47 49 51 53 2 4 6 8 10 12 45 47 49 51 53 2 4 6 8 10 12 45 47 49 51 53 2 4 6 8 10 12
11 12 1 2 3 11 12 1 2 3 11 12 1 2 3

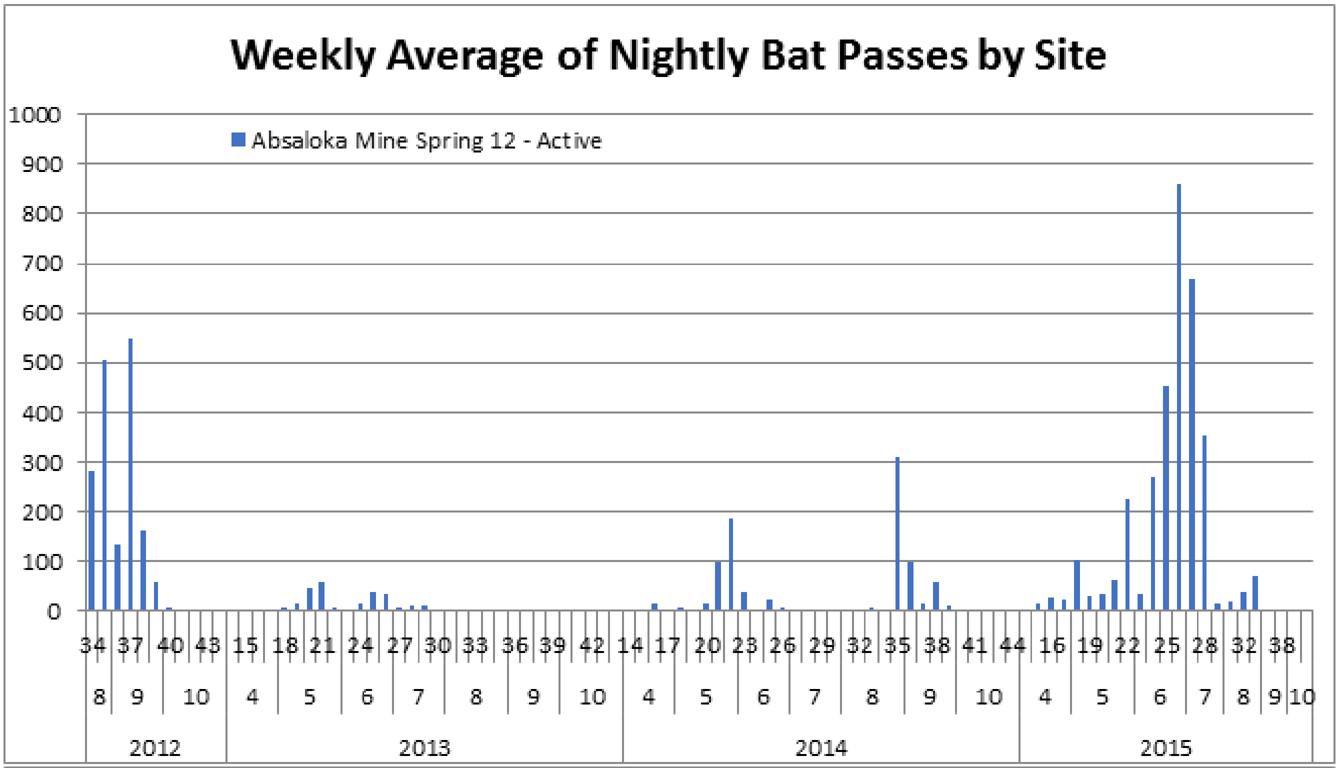


Weekly Average of Nightly Bat Passes by Site
Big Sky Mine Pond B-9 - Active

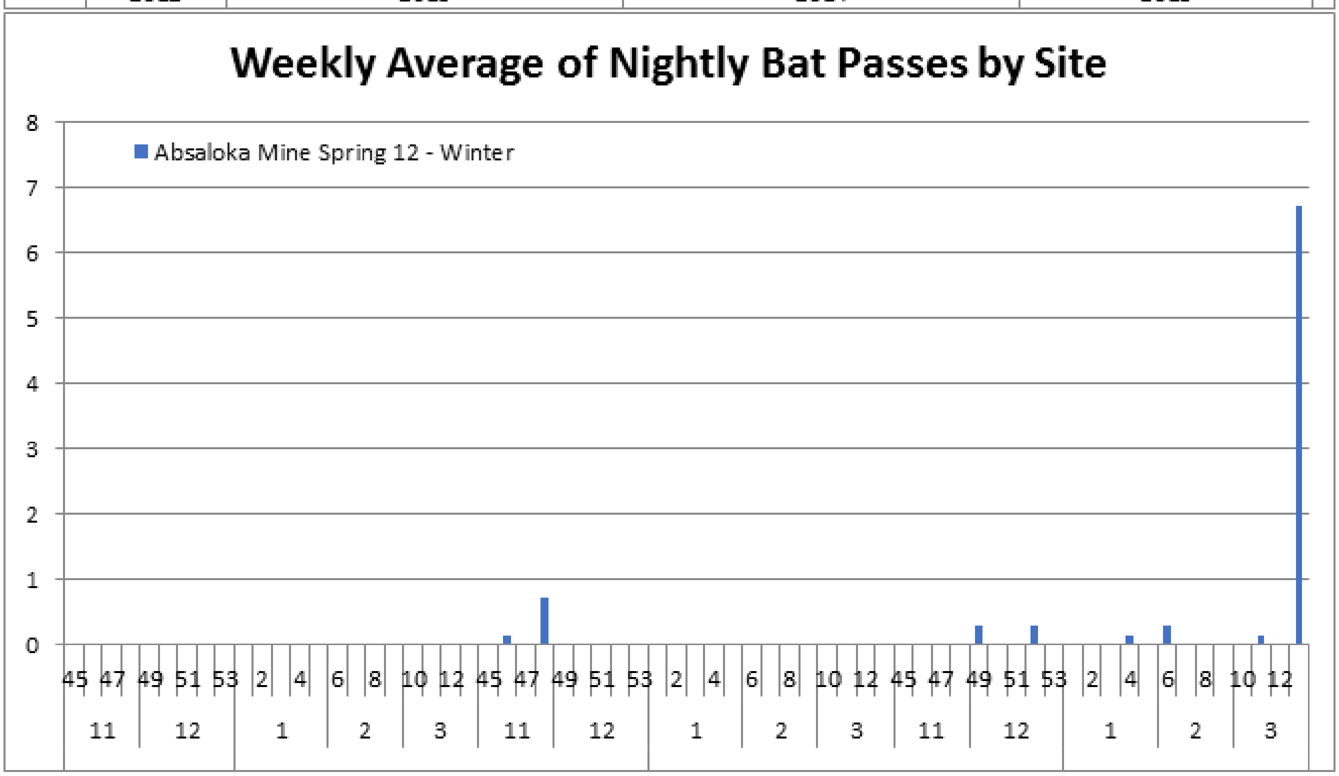
(d)

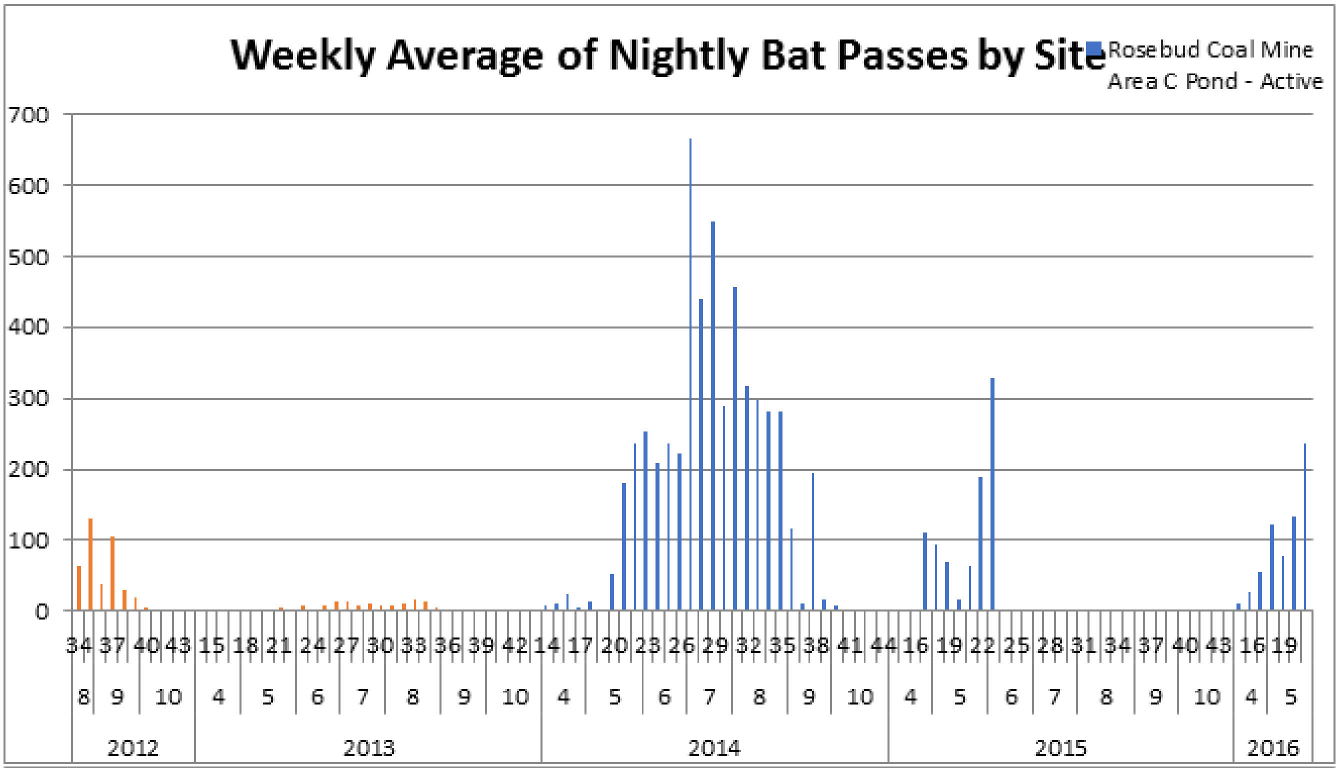


Weekly Average of Nightly Bat Passes by Site
Big Sky Mine Pond B-9 - Winter


Weekly Average of Nightly Bat Passes by Site
Absaloka Mine Spring 12 - Active
2012
2013
2014
2015

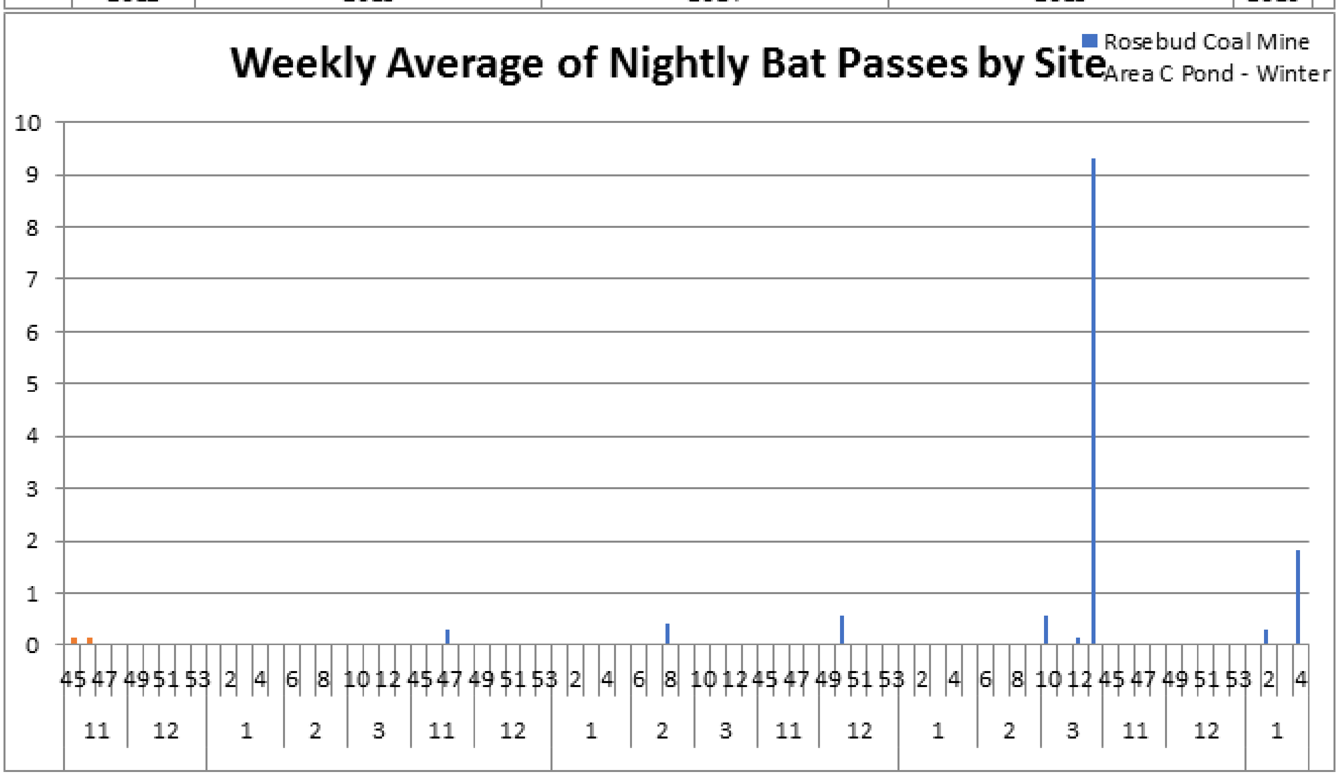
(e)


Weekly Average of Nightly Bat Passes by Site
Absaloka Mine Spring 12 - Winter

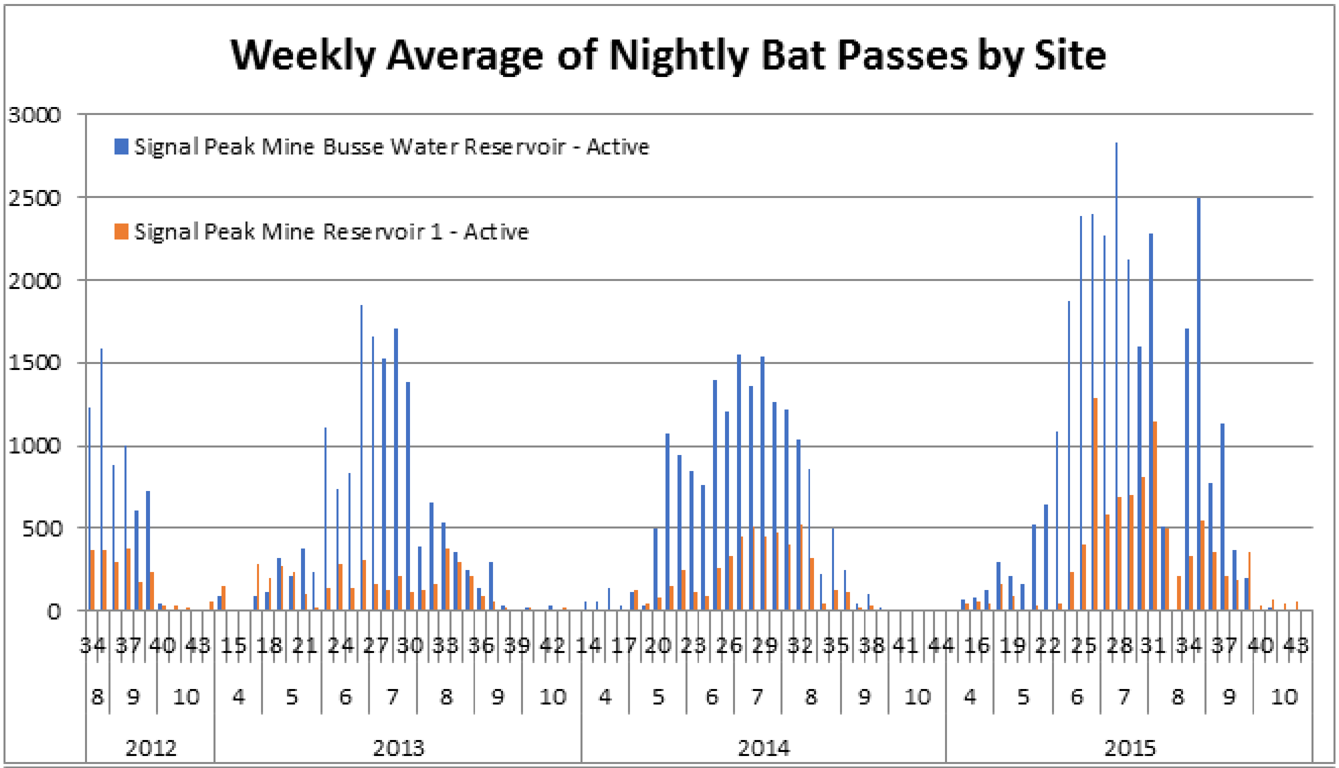


Weekly Average of Nightly Bat Passes by Site
Rosebud Coal Mine Area C Pond - Active
2012
2013
2014
2015
2016

(f)



Weekly Average of Nightly Bat Passes by Site
Rosebud Coal Mine Area C Pond - Winter


Weekly Average of Nightly Bat Passes by Site
Signal Peak Mine Busse Water Reservoir - Active
Signal Peak Mine Reservoir 1 - Active
0
500
1000
1500
2000
2500
3000
2012
2013
2014
2015

(g)

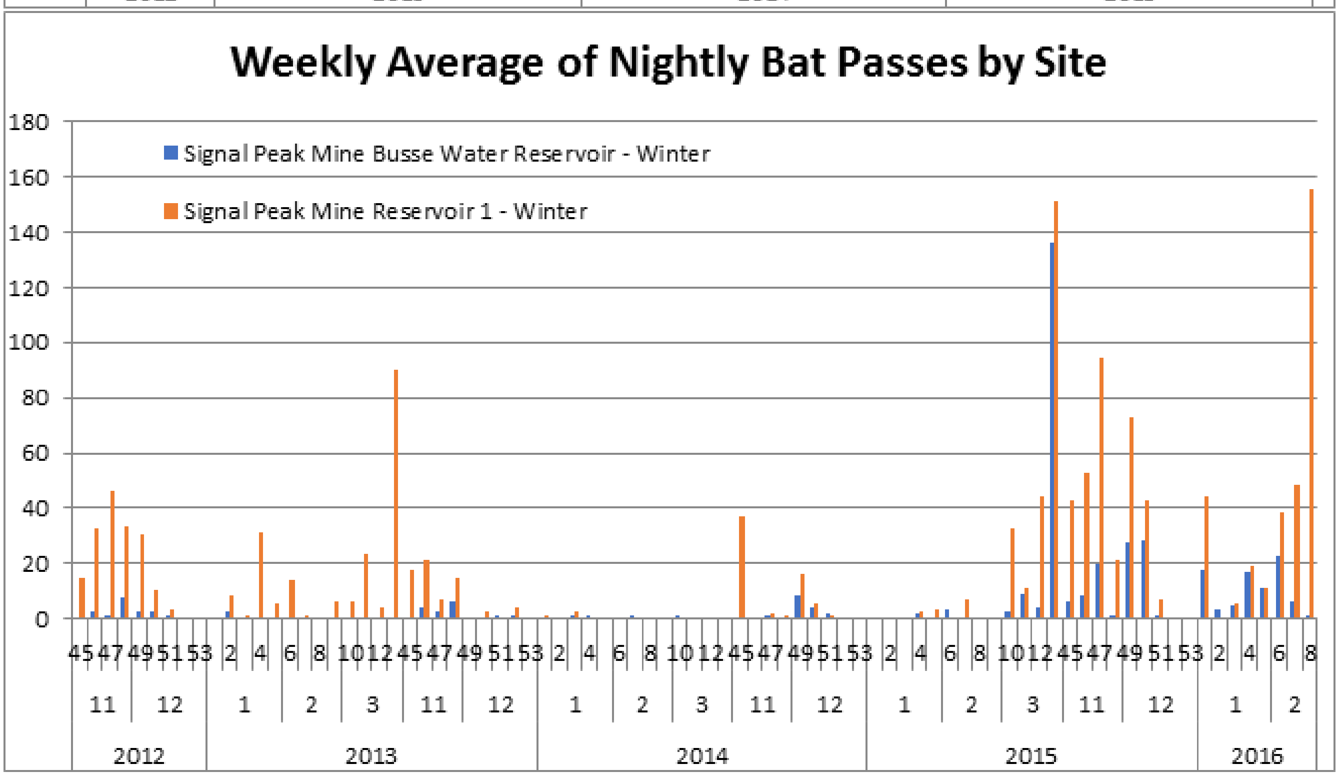
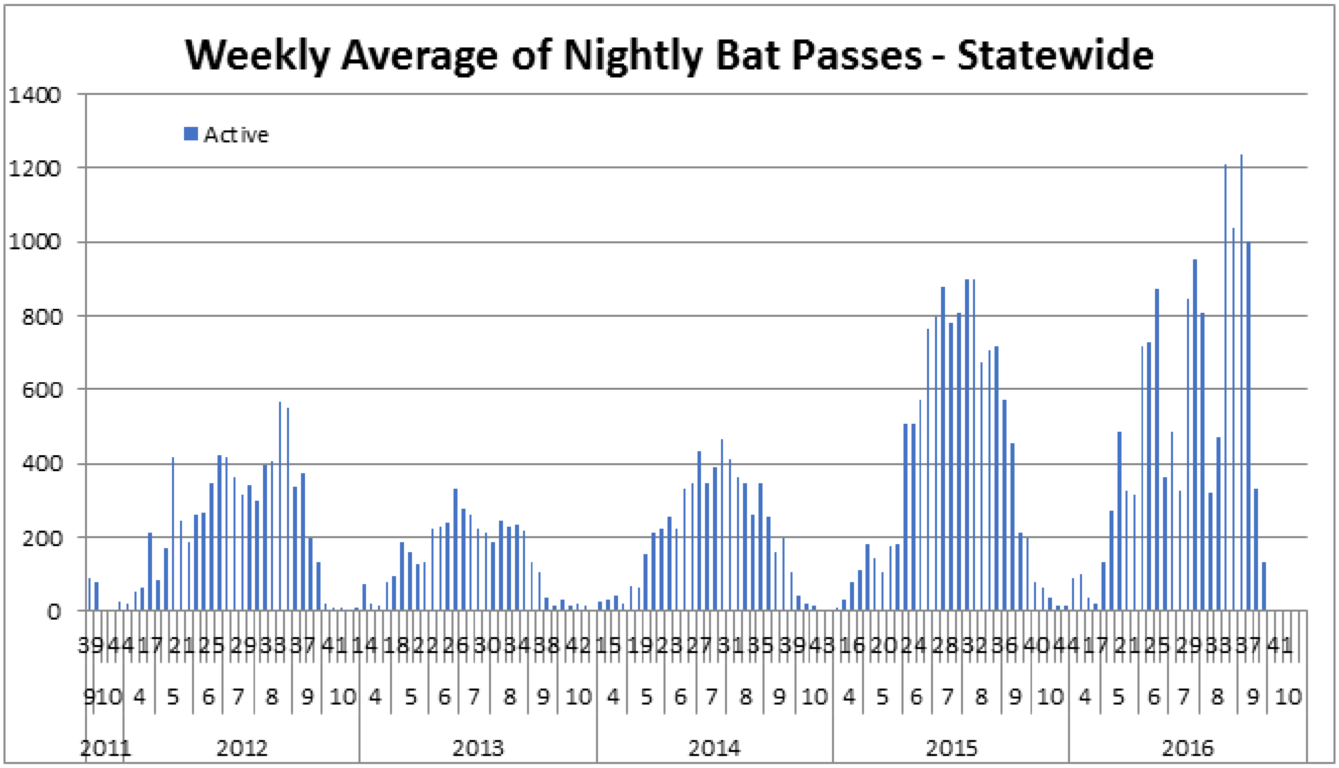

Weekly Average of Nightly Bat Passes by Site
Signal Peak Mine Busse Water Reservoir - Winter
Signal Peak Mine Reservoir 1 - Winter
0
20
40
60
80
100
120
140
160
180
2012
2013
2014
2015
2016

Figure 8. Average number of bat passes per night by week across the detector network for active season (a) and inactive season (b). Numbers on X axis are years, months, and weeks.

(a)



(b)

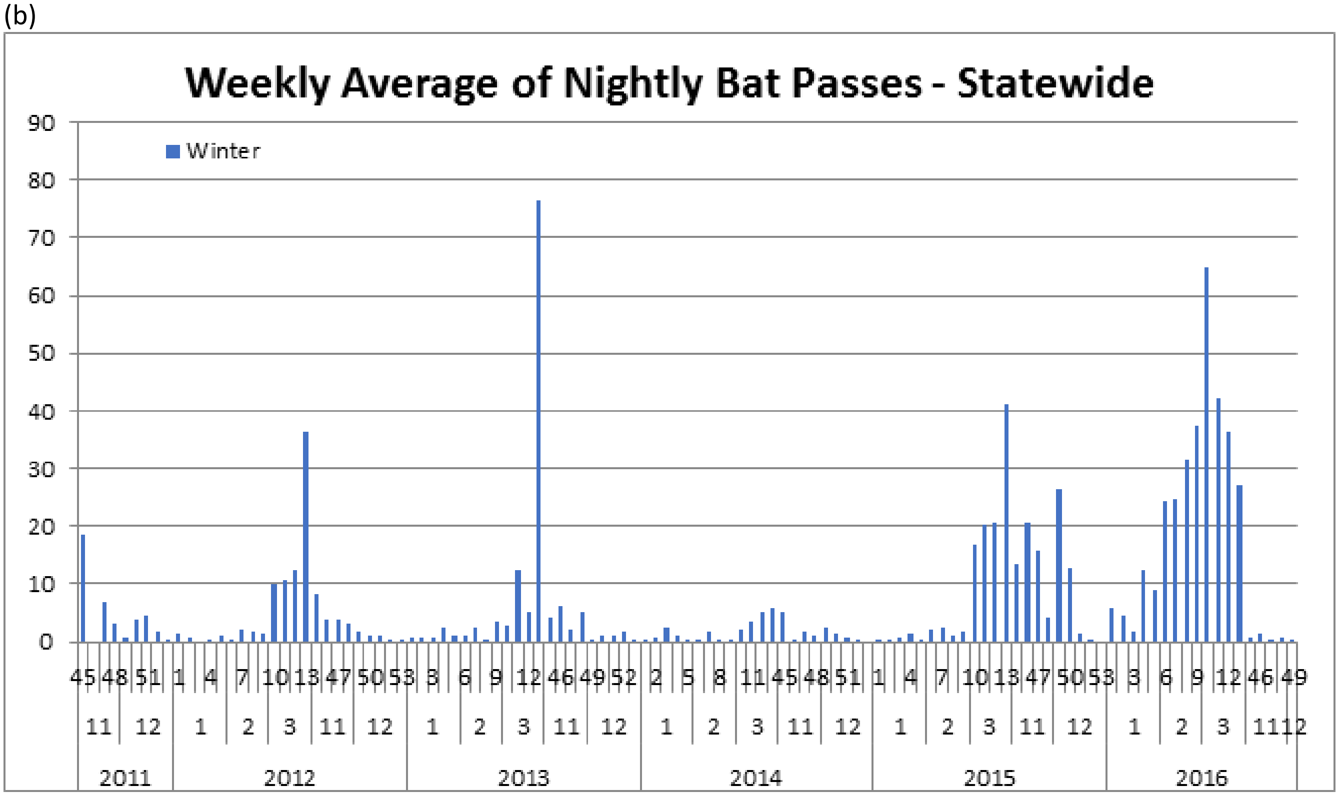
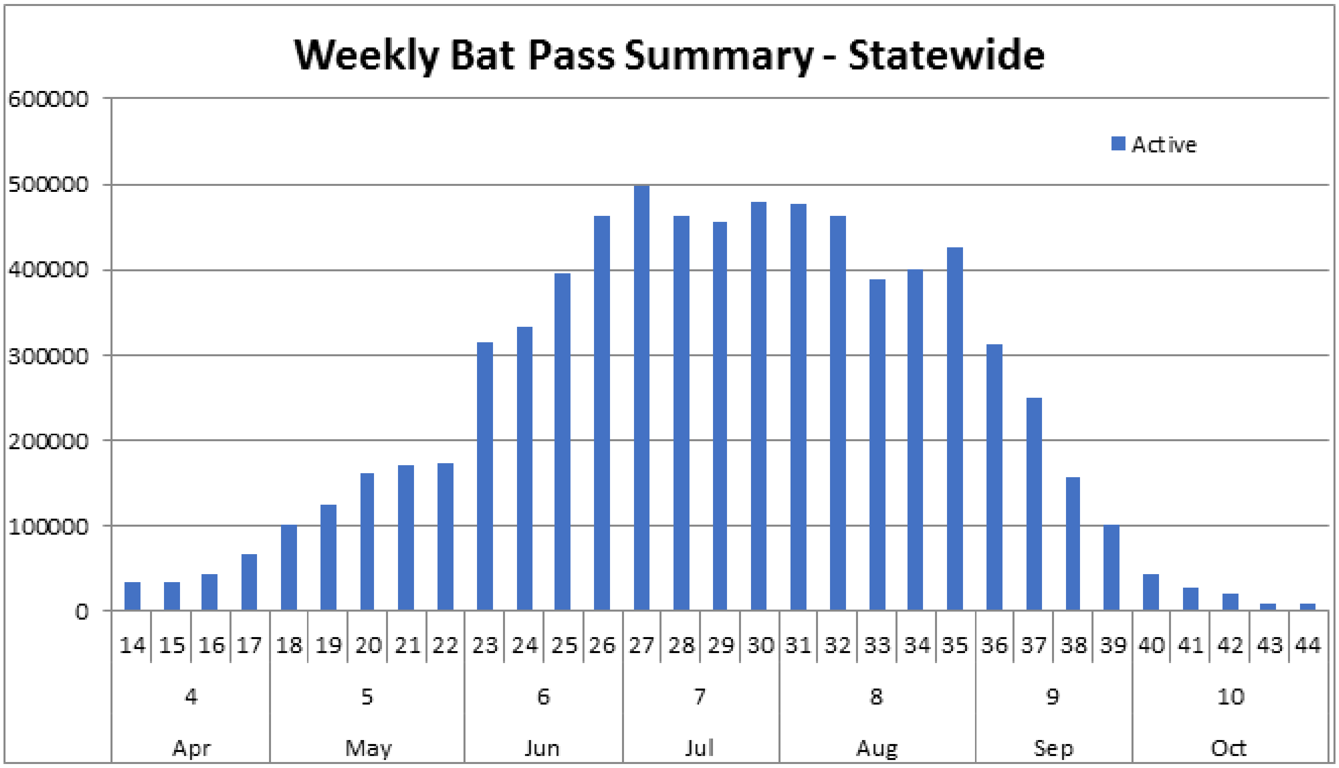


Figure 9. Total number of bat passes per night by week across the detector network across all years for active season (a) and inactive season (b). Numbers on X axis are weeks.

a)



(b)

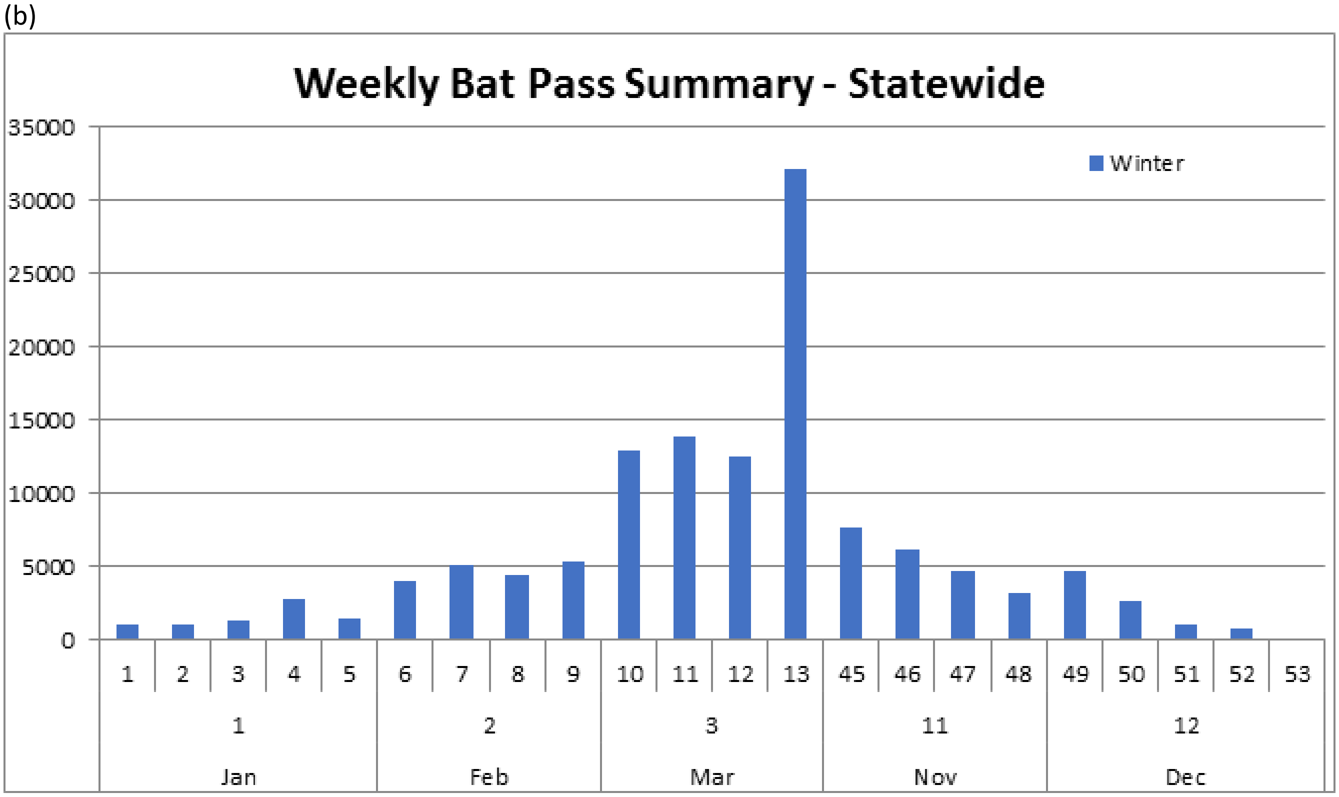
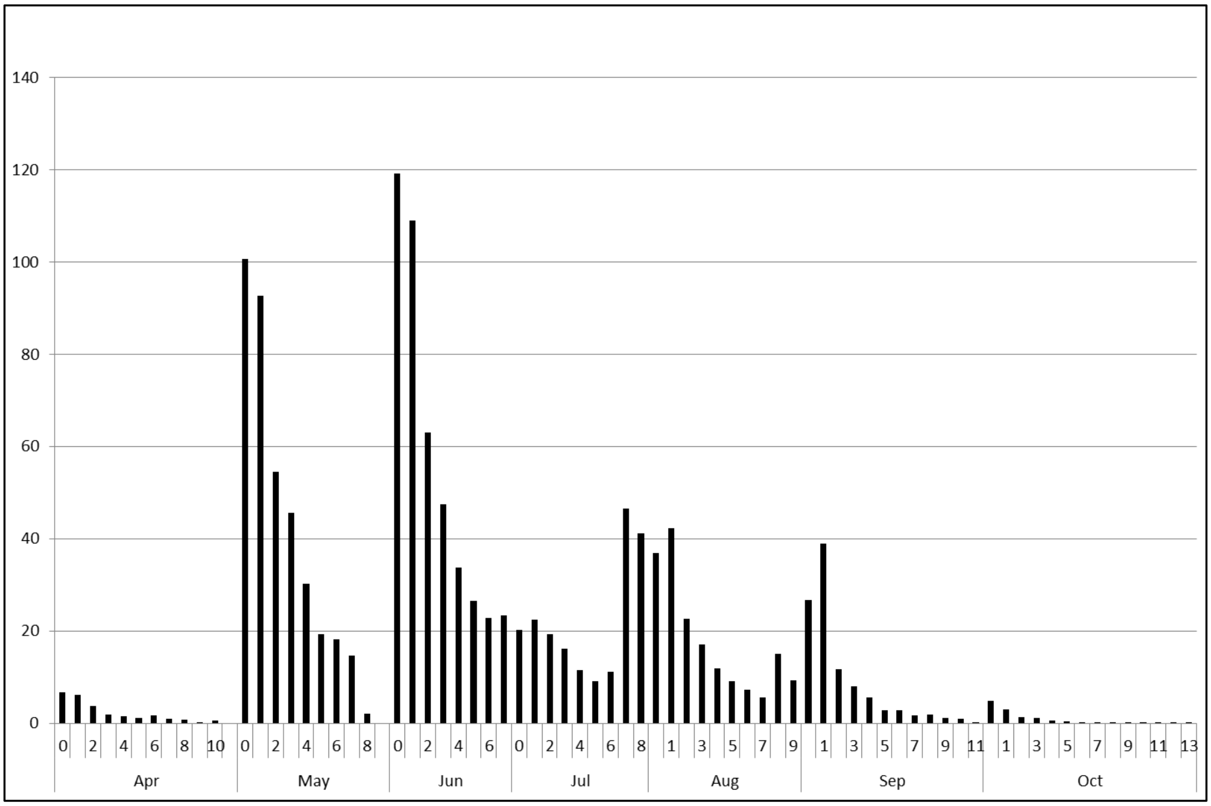


Figure 10. Average number of bat passes each hour after sunset across all years during active (a) and inactive season (b). Numbers on X axis are weeks.

(a)



(b)

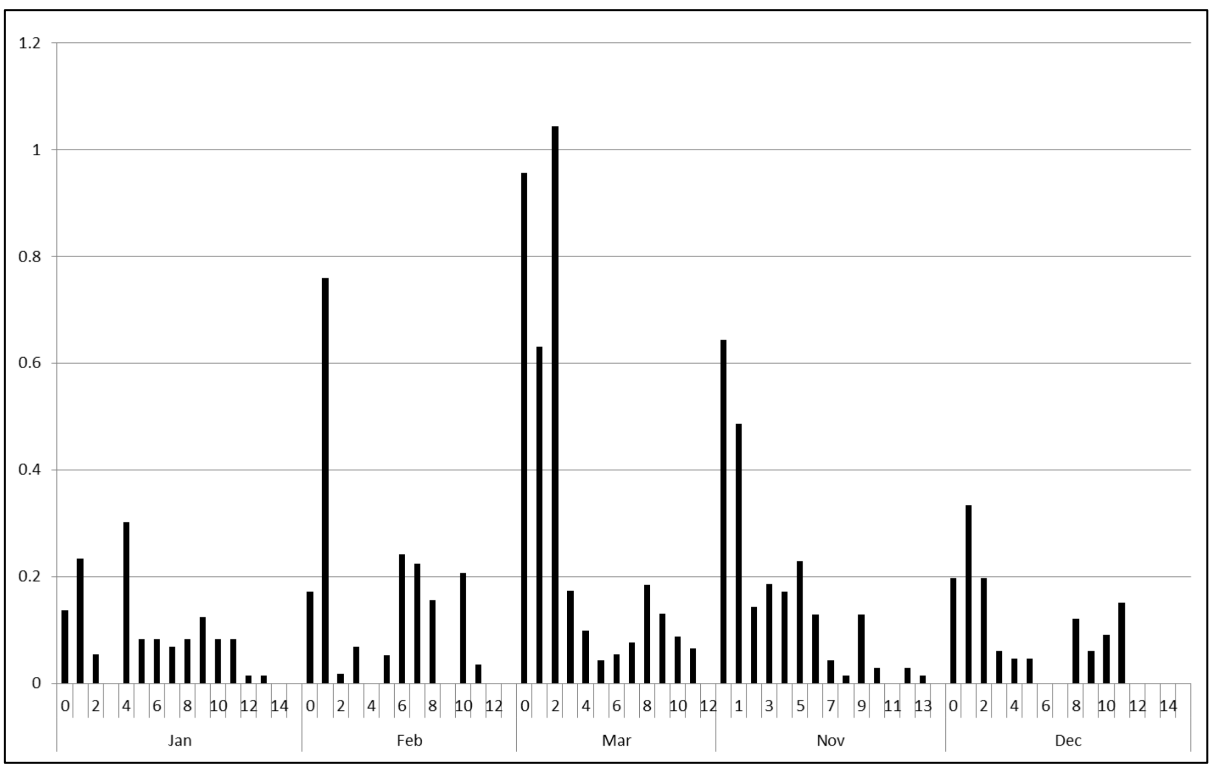
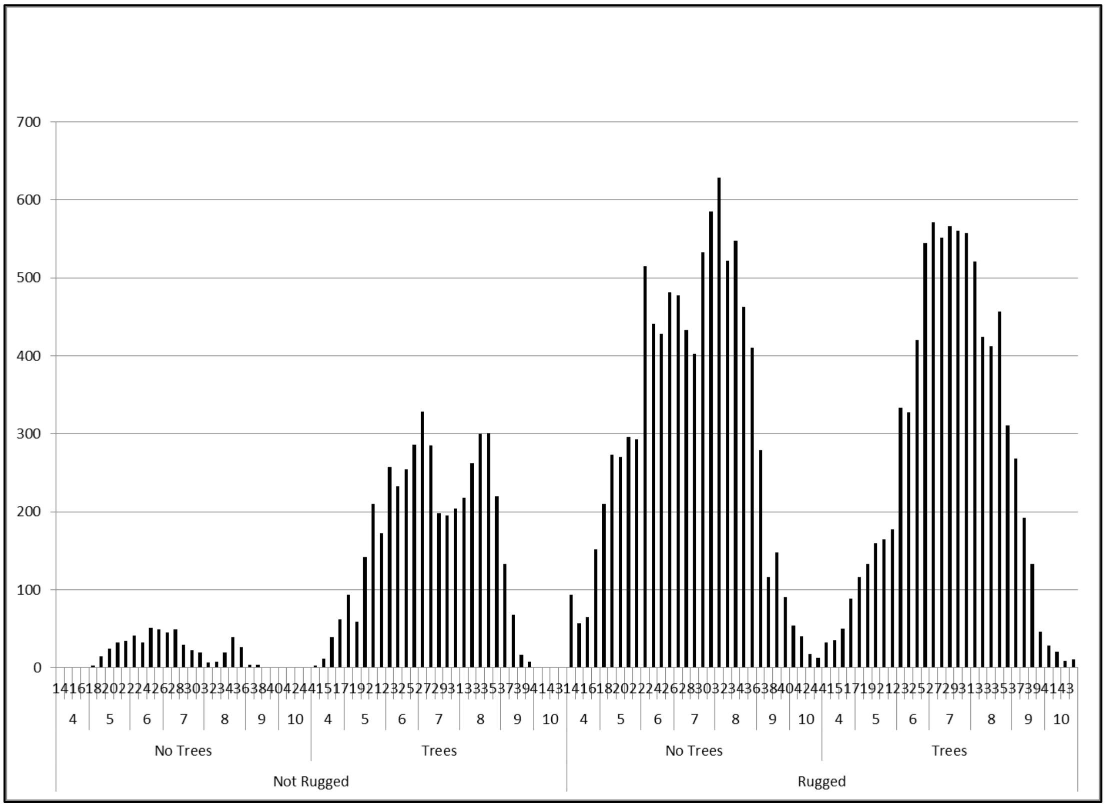


Figure 11. Average number of bat passes per night by week across the detector network and across all years for active season (a) and inactive season (b) in rugged and non-rugged landscapes with and without trees. Numbers on X axis are months and weeks.

(a)



(b)

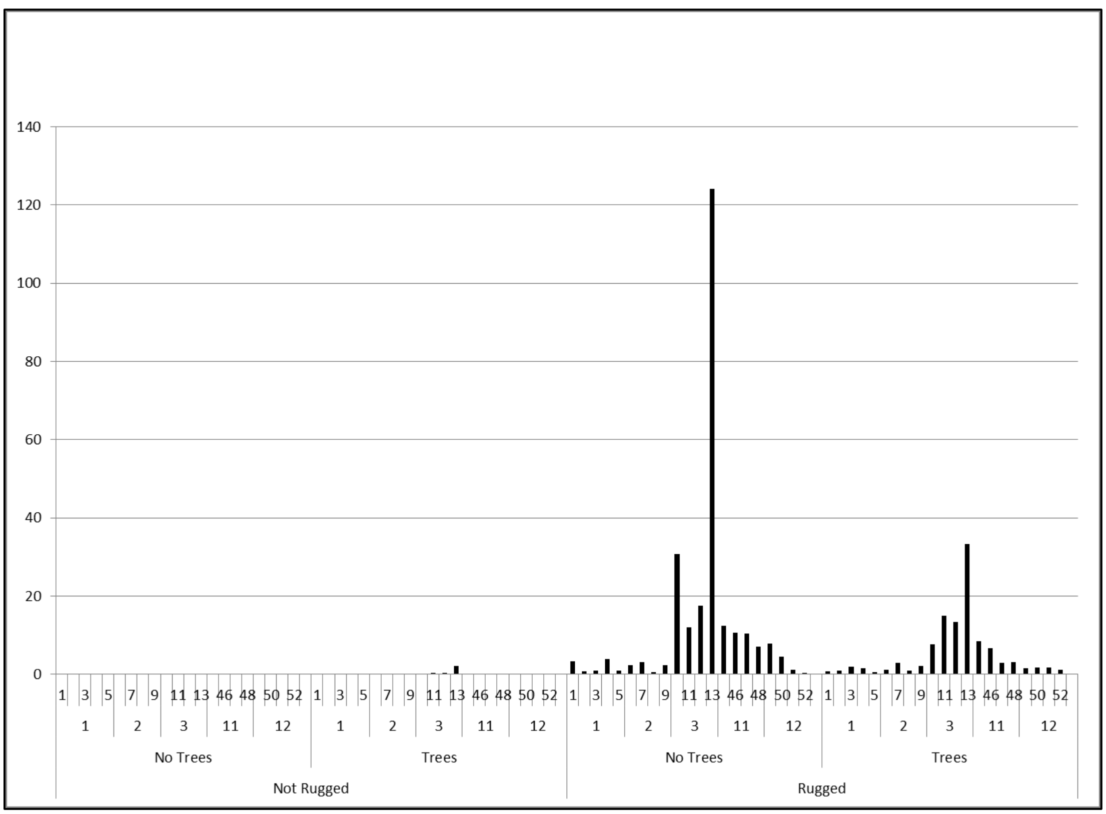
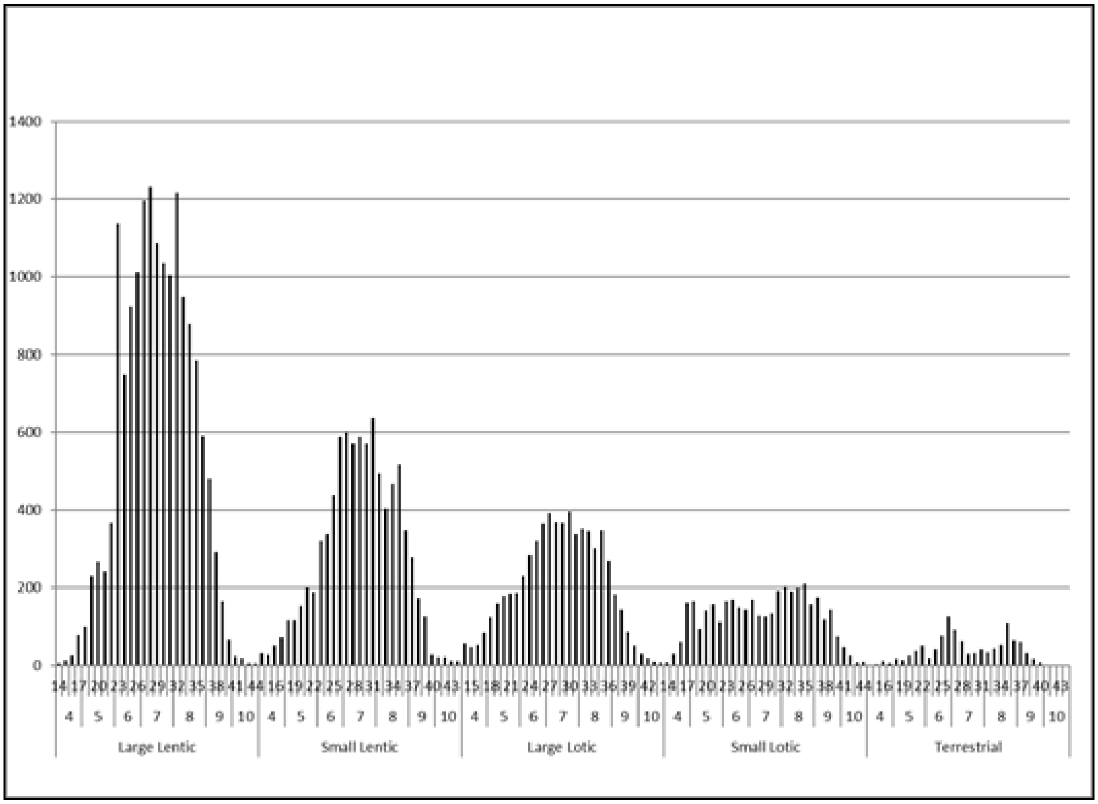


Figure 12. Average number of bat passes per night by week across the detector network and across all years for active season (a) and inactive season (b) at different water body types. Numbers on X axis are months and weeks.

(a)



(b)

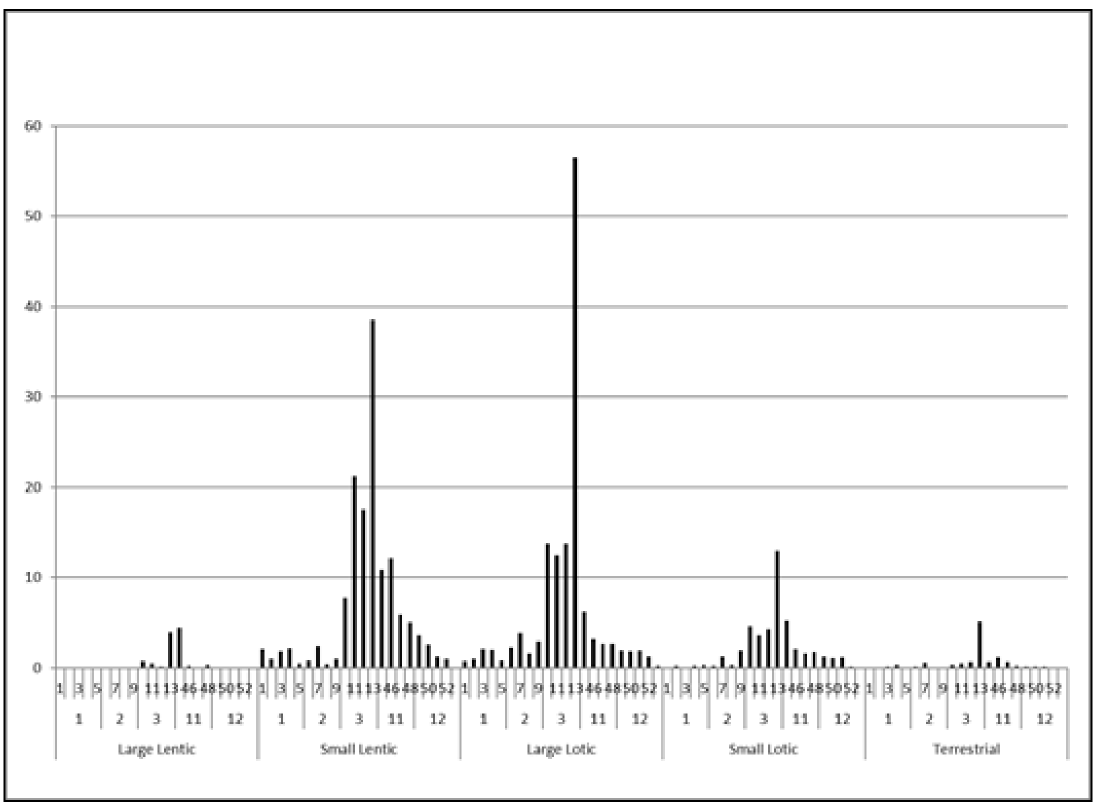
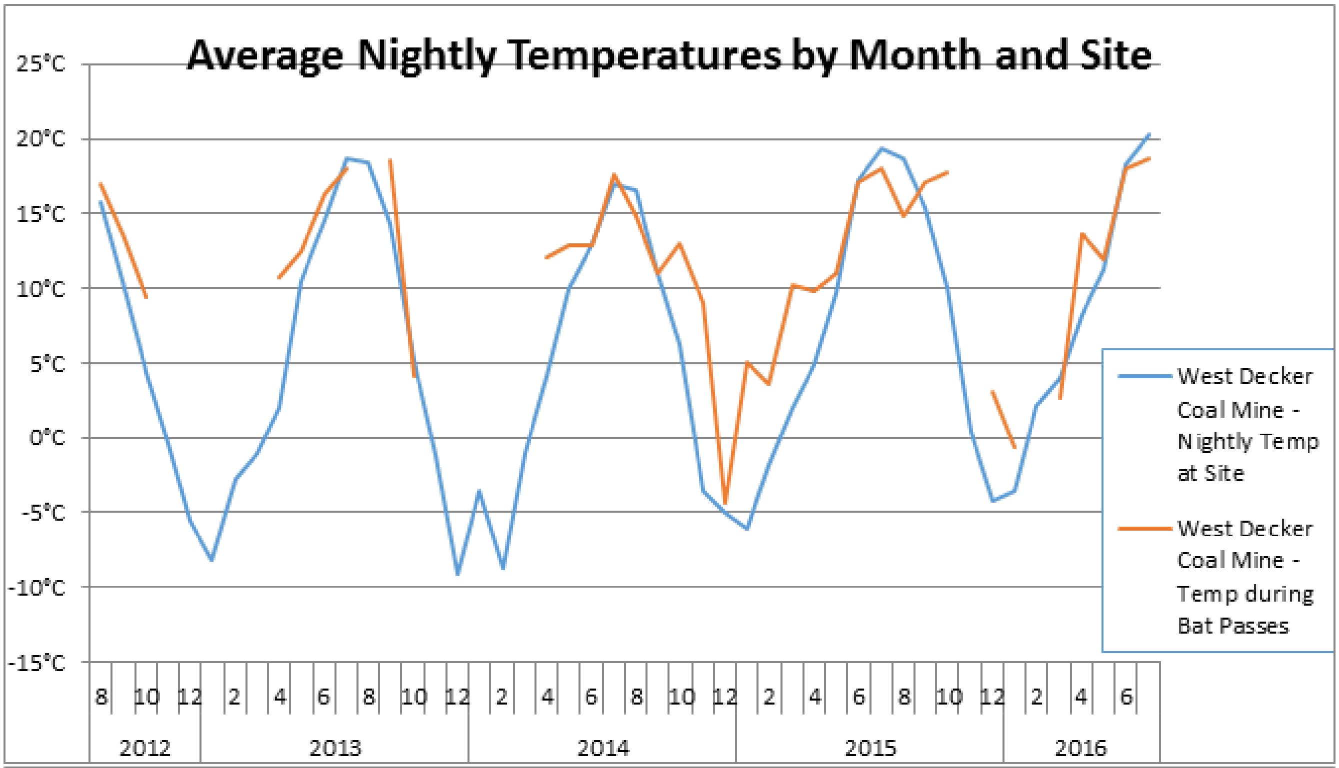
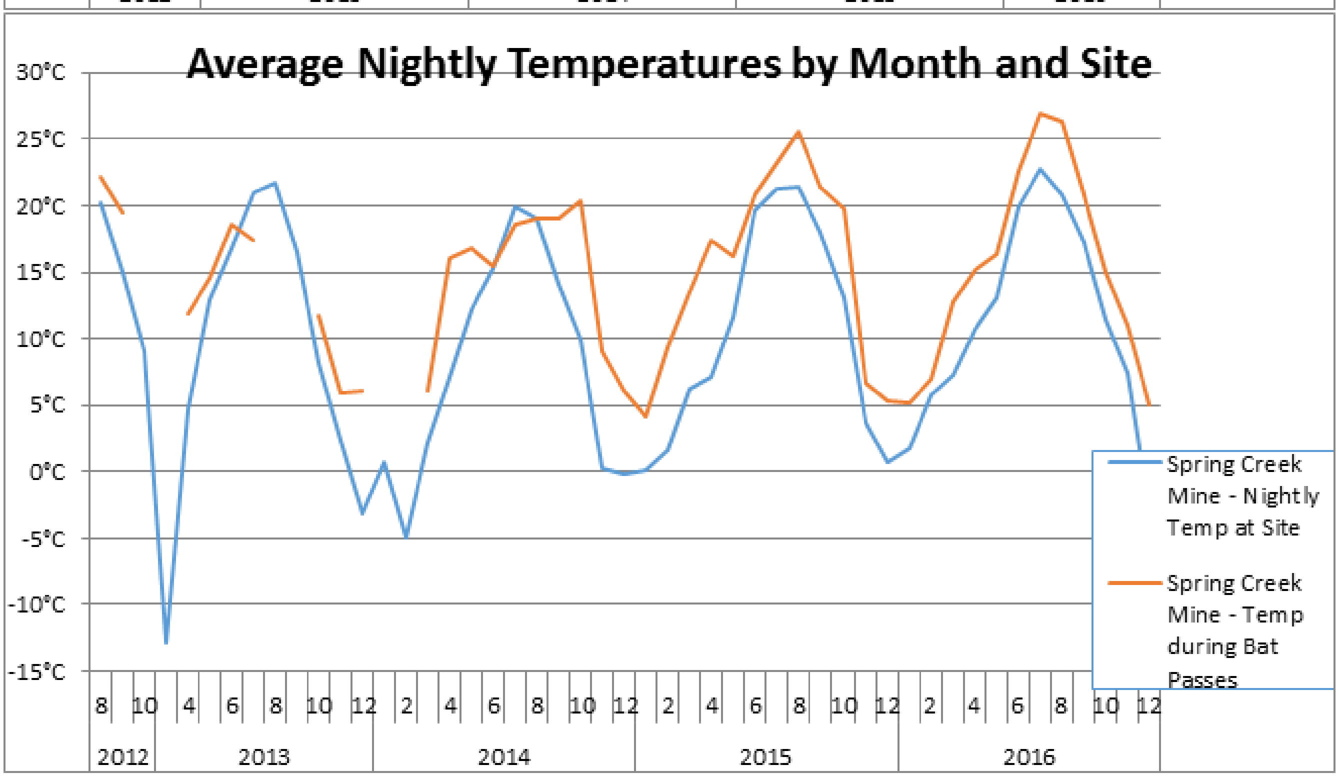


Figure 13. Average nightly background (blue) and bat pass (red) temperatures by month at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Numbers on X axis are years and months.

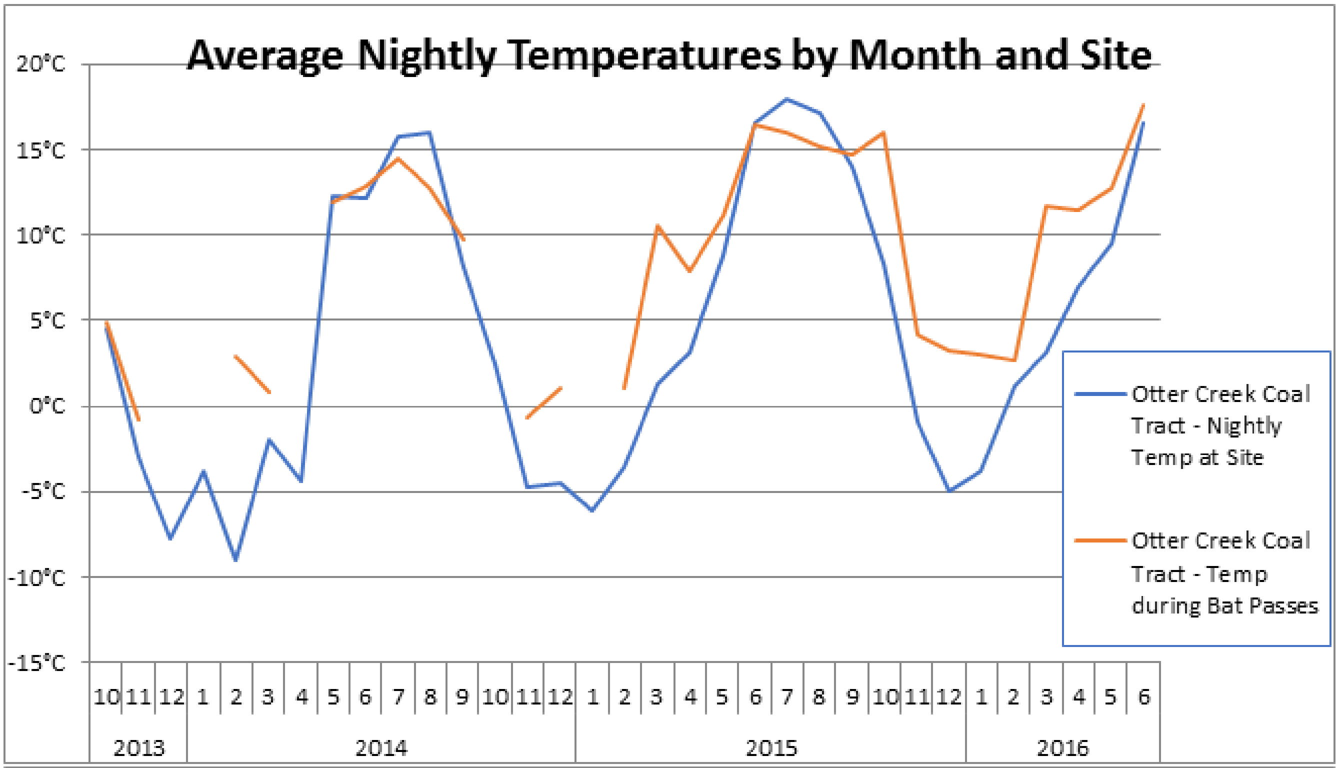


(a)



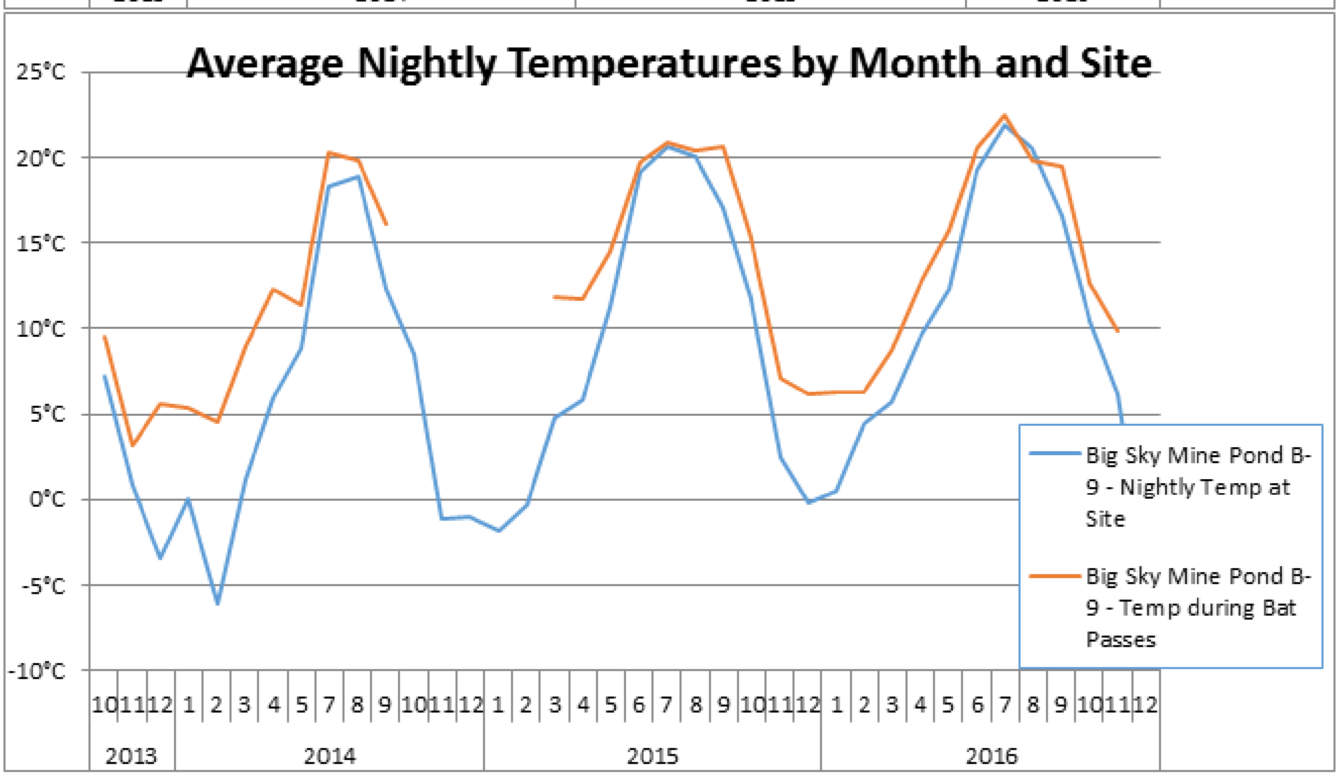
(b)

(c)

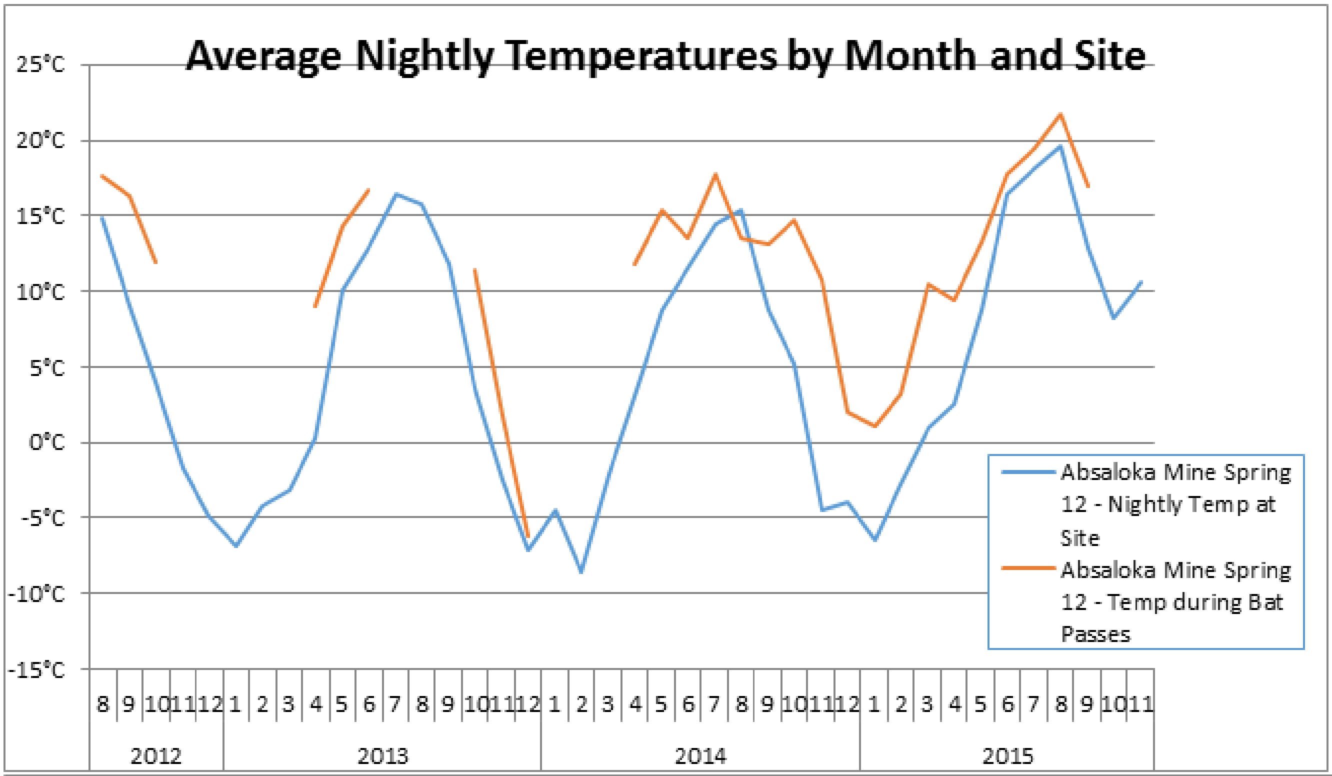


Average Nightly Temperatures by Month and Site
20°C
15°C
10°C
5°C
0°C
-5°C
-10°C
-15°C
10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
2013
2014
2015
2016
Otter Creek Coal Tract - Nightly Temp at Site
Otter Creek Coal Tract - Temp during Bat Passes

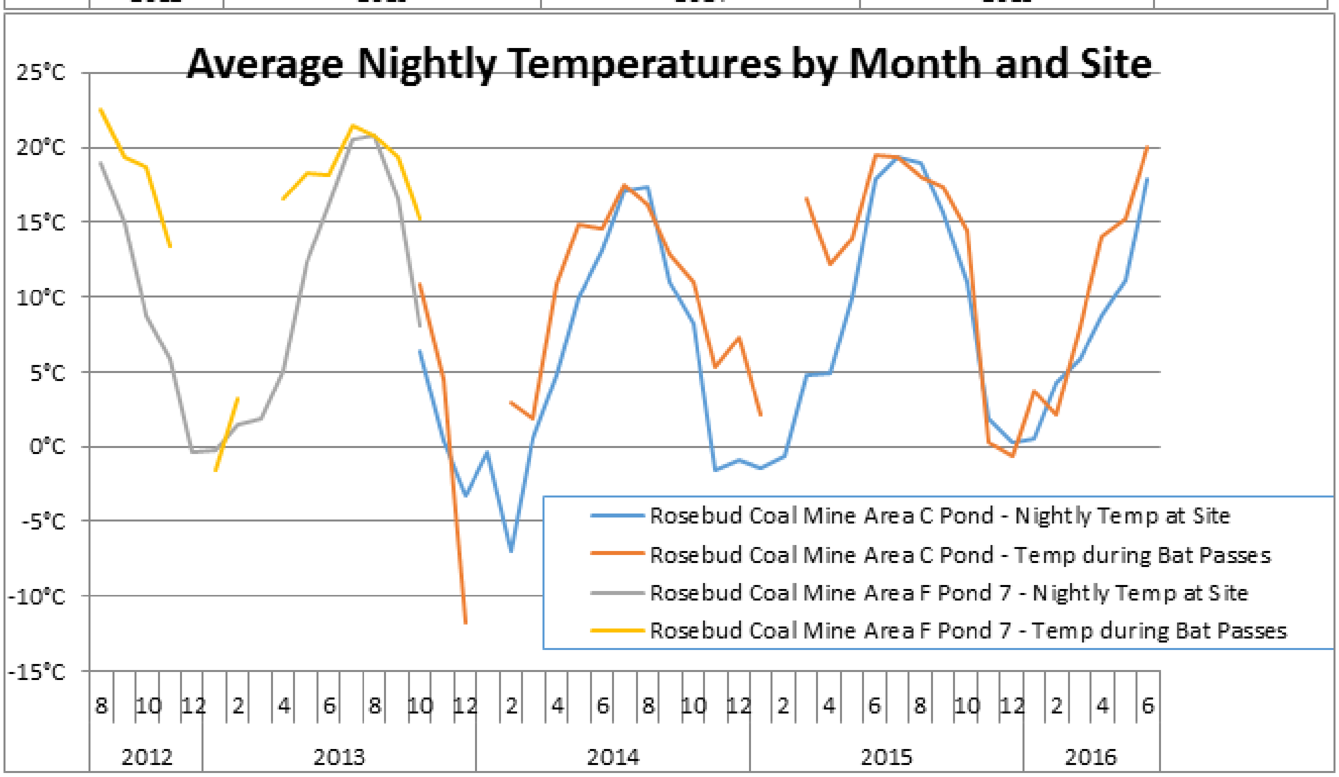
(d)



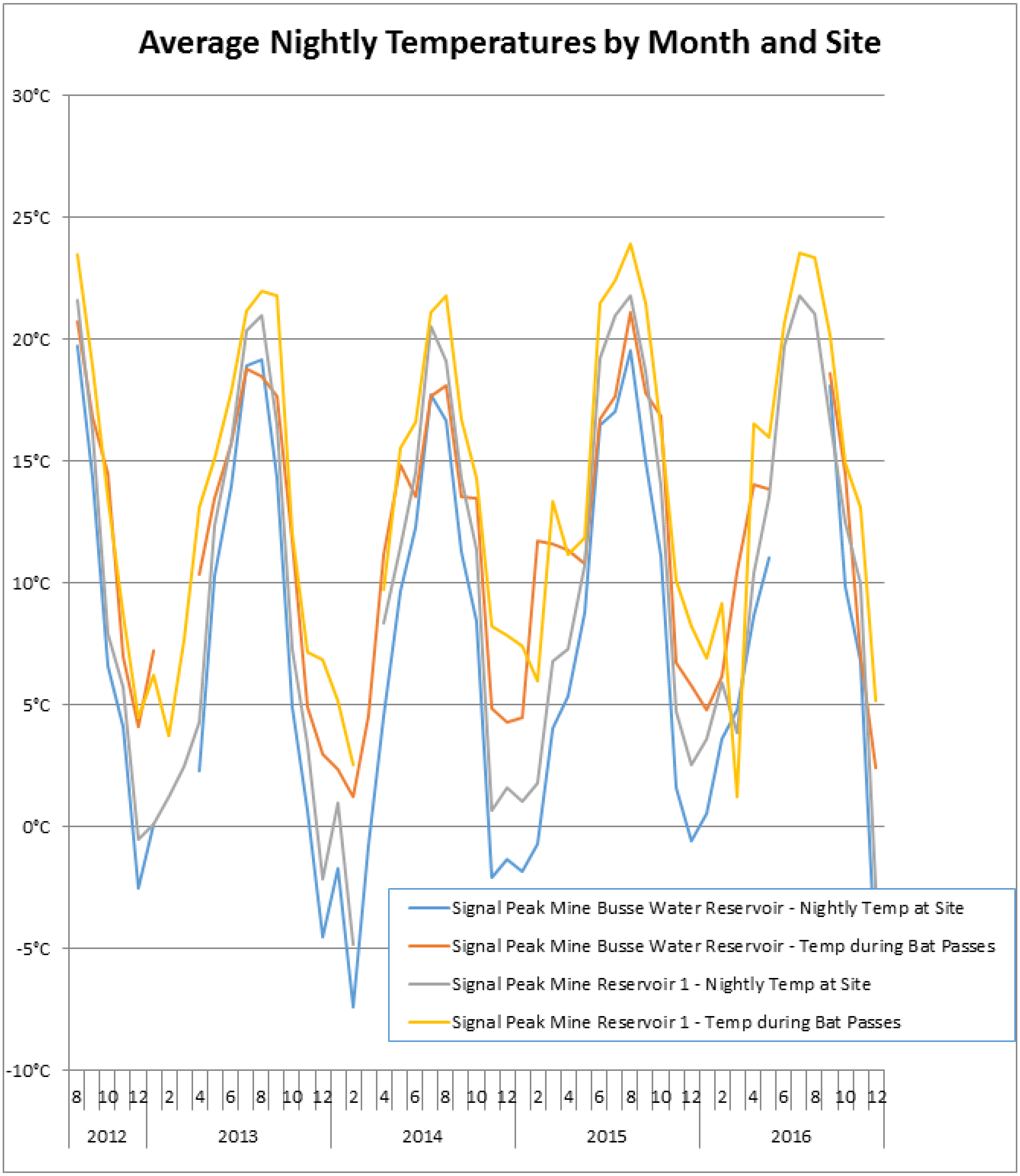
Average Nightly Temperatures by Month and Site
25°C
20°C
15°C
10°C
5°C
0°C
-5°C
-10°C
10 11 12 1 2 3 4 5 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
2013
2014
2015
2016
Big Sky Mine Pond B-9 - Nightly Temp at Site
Big Sky Mine Pond B-9 - Temp during Bat Passes


Average Nightly Temperatures by Month and Site
25°C
20°C
15°C
10°C
5°C
0°C
-5°C
-10°C
-15°C
8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11
2012
2013
2014
2015
Absaloka Mine Spring 12 - Nightly Temp at Site
Absaloka Mine Spring 12 - Temp during Bat Passes

(e)


Average Nightly Temperatures by Month and Site
25°C
20°C
15°C
10°C
5°C
0°C
-5°C
-10°C
-15°C
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6
2012
2013
2014
2015
2016
Rosebud Coal Mine Area C Pond - Nightly Temp at Site
Rosebud Coal Mine Area C Pond - Temp during Bat Passes
Rosebud Coal Mine Area F Pond 7 - Nightly Temp at Site
Rosebud Coal Mine Area F Pond 7 - Temp during Bat Passes

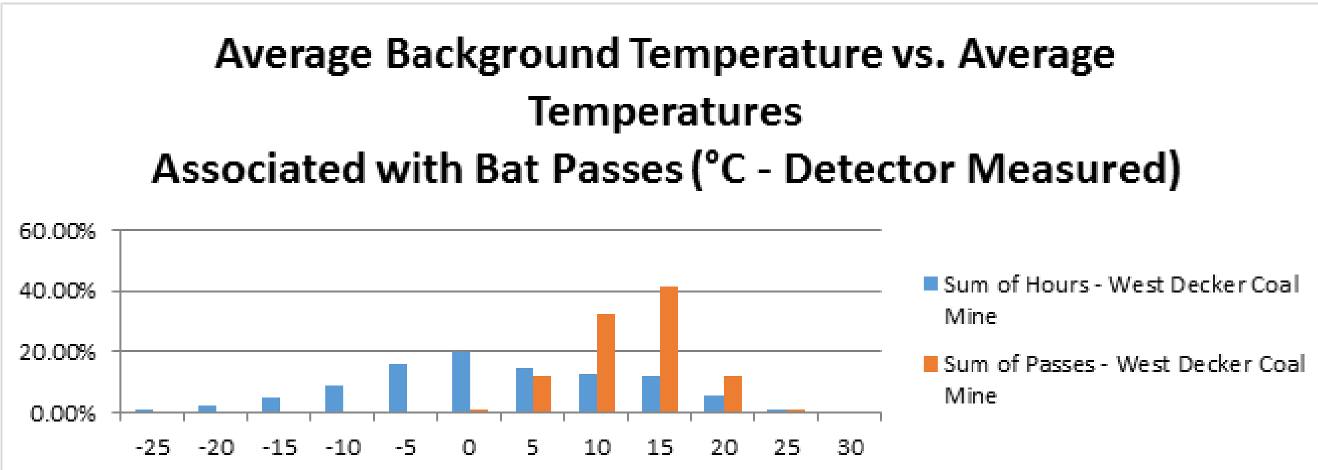
(f)



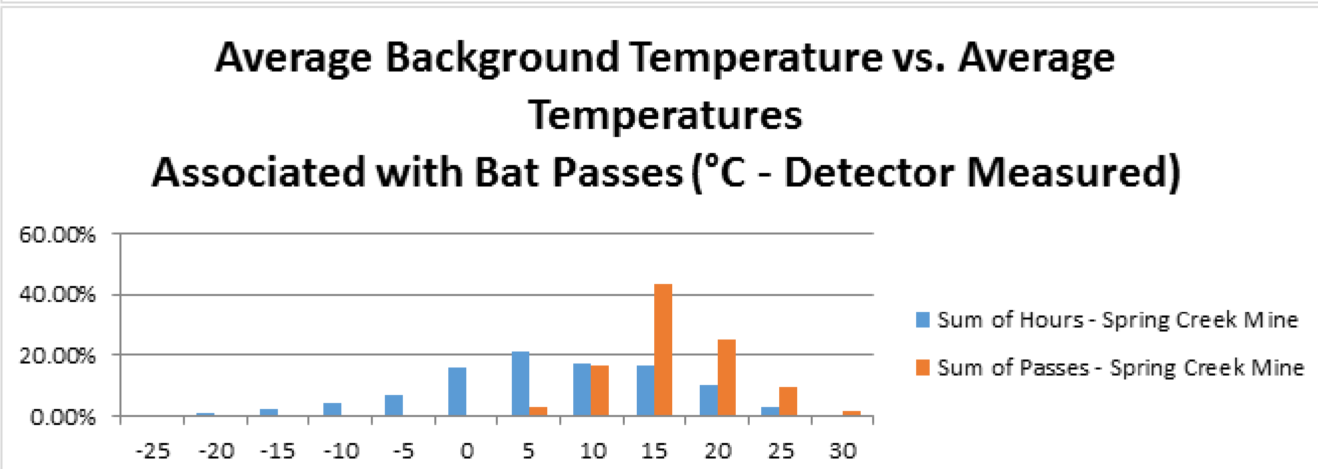
Average Nightly Temperatures by Month and Site
30°C
25°C
20°C
15°C
10°C
5°C
0°C
-5°C
-10°C
Signal Peak Mine Busse Water Reservoir - Nightly Temp at Site
Signal Peak Mine Busse Water Reservoir - Temp during Bat Passes
Signal Peak Mine Reservoir 1 - Nightly Temp at Site
Signal Peak Mine Reservoir 1 - Temp during Bat Passes
8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12 2 4 6 8 10 12
2012
2013
2014
2015
2016

(g)

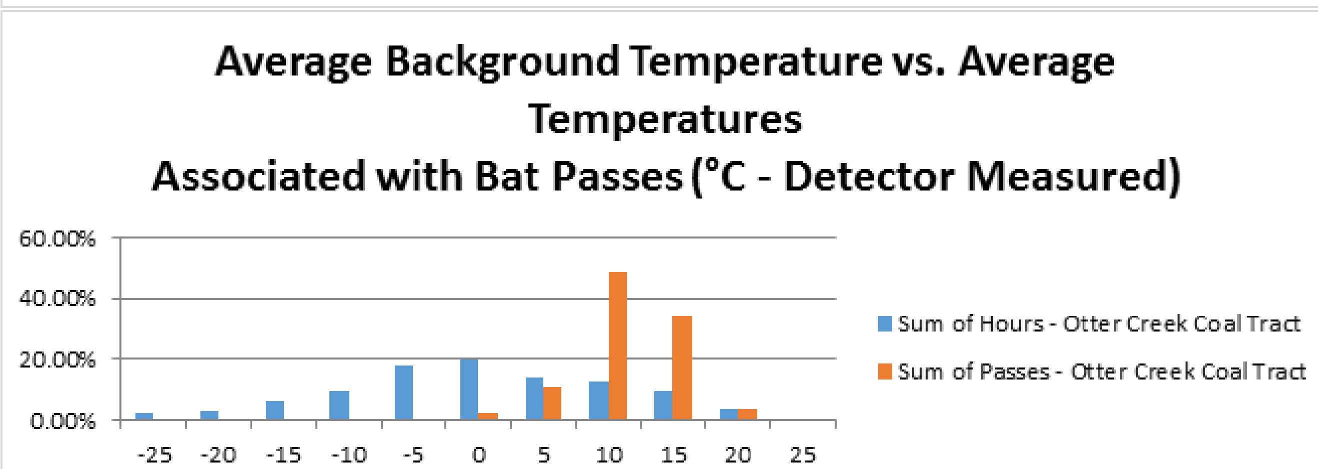
Figure 14. Percent of nightly hours with average background temperatures (blue) and average temperatures associated with bat passes (red) for the closest weather station at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Numbers are lower ends of °C temperature bins.



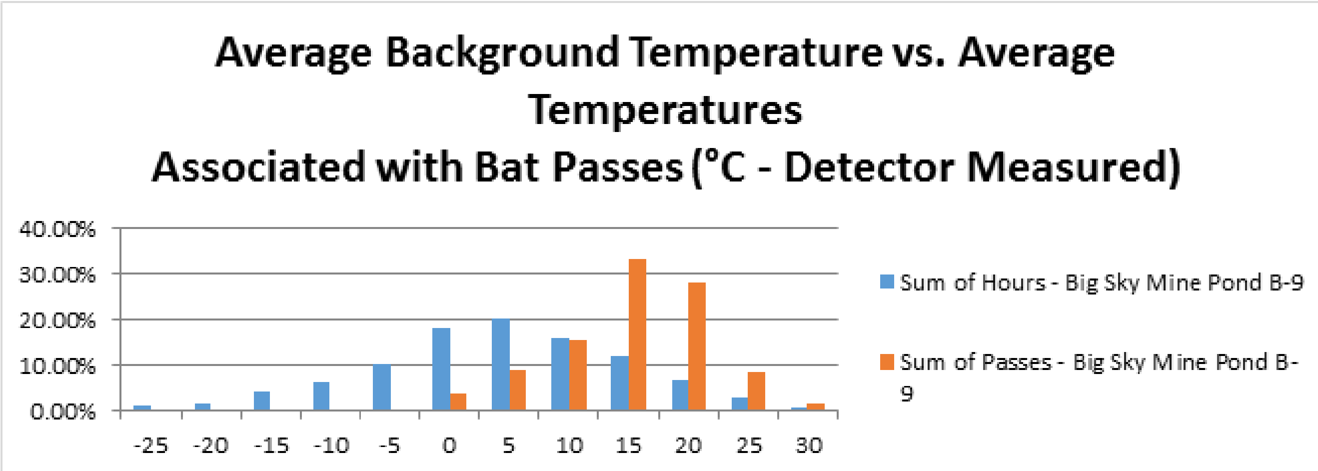
(a)



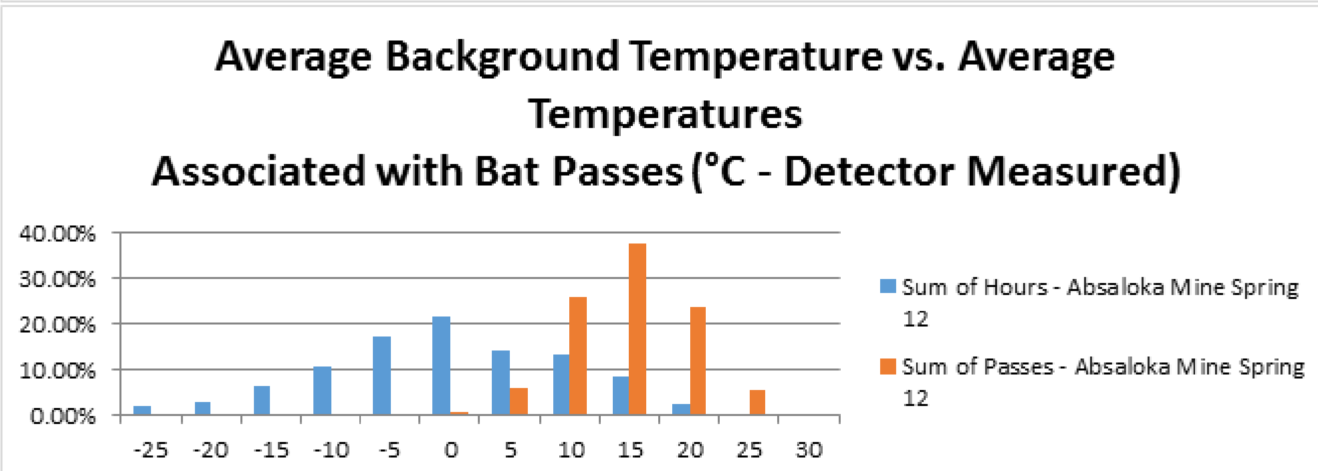
(b)



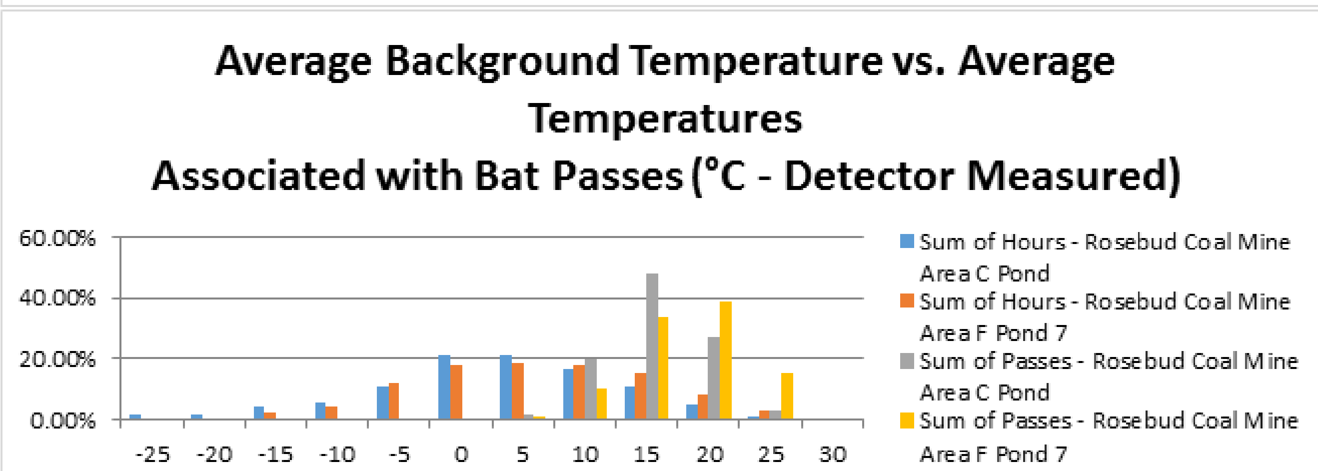
(c)


Average Background Temperature vs. Average Temperatures
Associated with Bat Passes (°C - Detector Measured)
40.00%
30.00%
20.00%
10.00%
0.00%
-25 -20 -15 -10 -5 0 5 10 15 20 25 30
Sum of Hours - Big Sky Mine Pond B-9
Sum of Passes - Big Sky Mine Pond B-9

(d)


Average Background Temperature vs. Average Temperatures
Associated with Bat Passes (°C - Detector Measured)
40.00%
30.00%
20.00%
10.00%
0.00%
-25 -20 -15 -10 -5 0 5 10 15 20 25 30
Sum of Hours - Absaloka Mine Spring 12
Sum of Passes - Absaloka Mine Spring 12

(e)


Average Background Temperature vs. Average Temperatures
Associated with Bat Passes (°C - Detector Measured)
60.00%
40.00%
20.00%
0.00%
-25 -20 -15 -10 -5 0 5 10 15 20 25 30
Sum of Hours - Rosebud Coal Mine Area C Pond
Sum of Hours - Rosebud Coal Mine Area F Pond 7
Sum of Passes - Rosebud Coal Mine Area C Pond
Sum of Passes - Rosebud Coal Mine Area F Pond 7

(f)

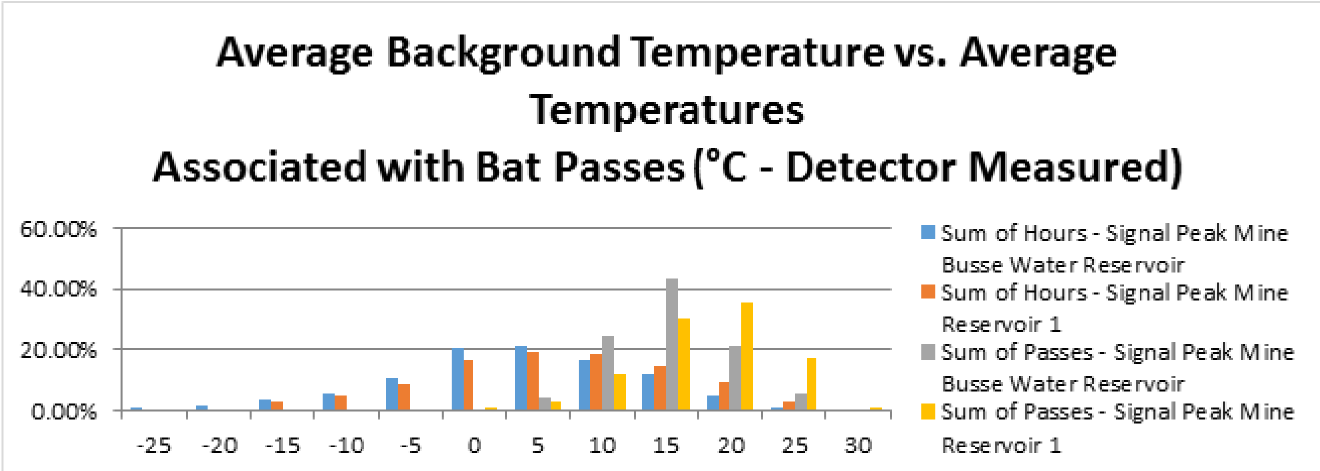
(g) 
Average Background Temperature vs. Average Temperatures
Associated with Bat Passes (°C - Detector Measured)
60.00%
40.00%
20.00%
0.00%
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Sum of Hours - Signal Peak Mine Busse Water Reservoir
Sum of Hours - Signal Peak Mine Reservoir 1
Sum of Passes - Signal Peak Mine Busse Water Reservoir
Sum of Passes - Signal Peak Mine Reservoir 1

Figure 15. Percent of nightly hours with average background temperatures (blue) and average temperatures associated with bat passes (red) across the regional network of detectors. Numbers are lower ends of °C temperature bins. Of the 572,897 hours that detectors have been deployed, temperature data was available from nearby weather stations for 559,321 hours (98%). Note that some detectors were up to 43 kilometers from the weather station where temperatures were recorded (X = 15.9 km, SD = 10.5 km).

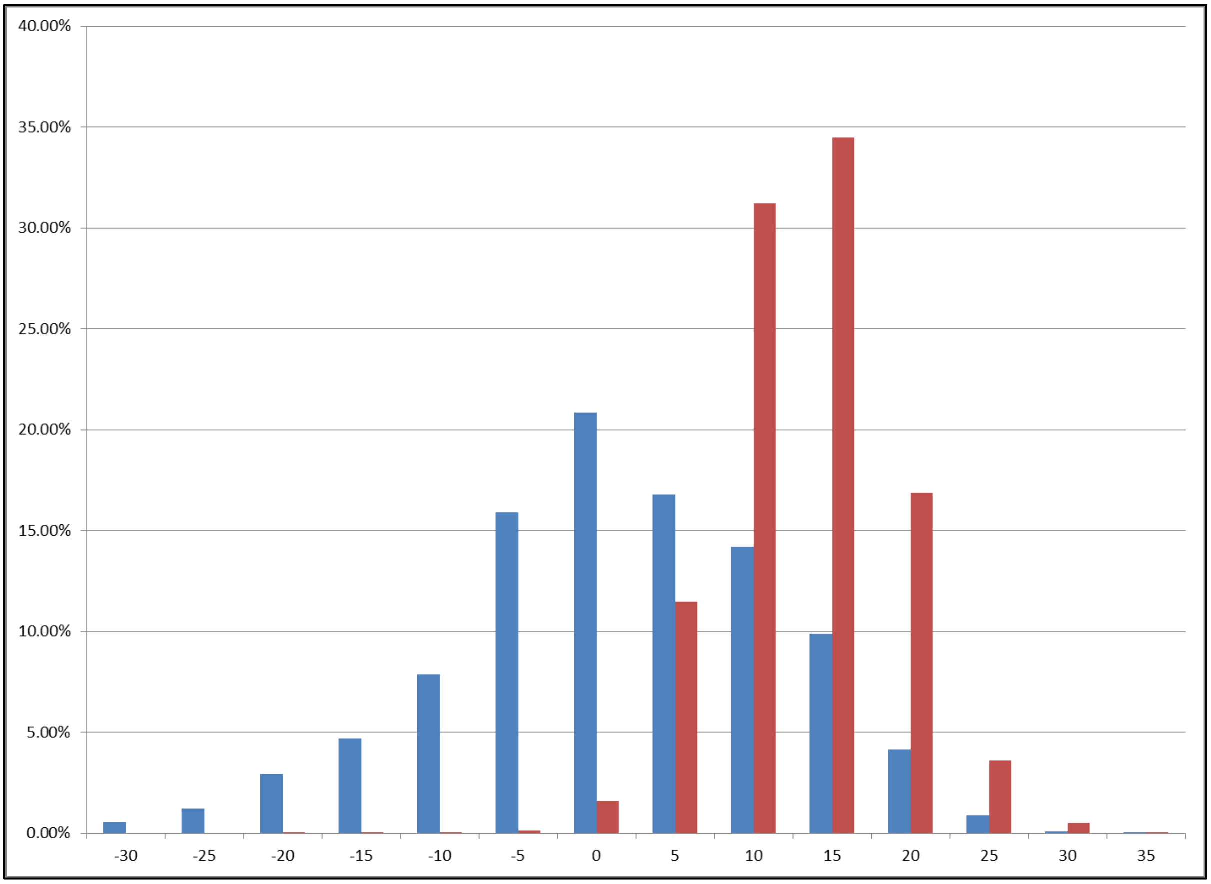
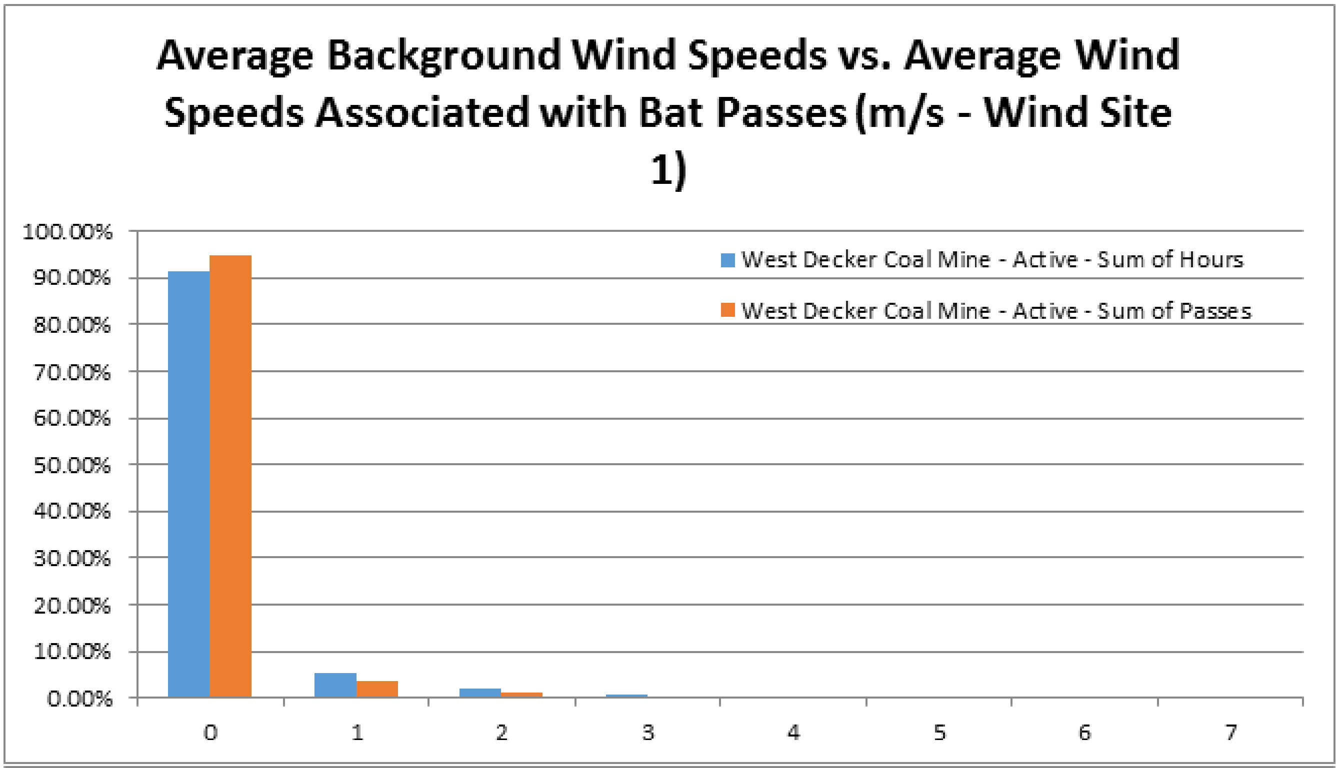
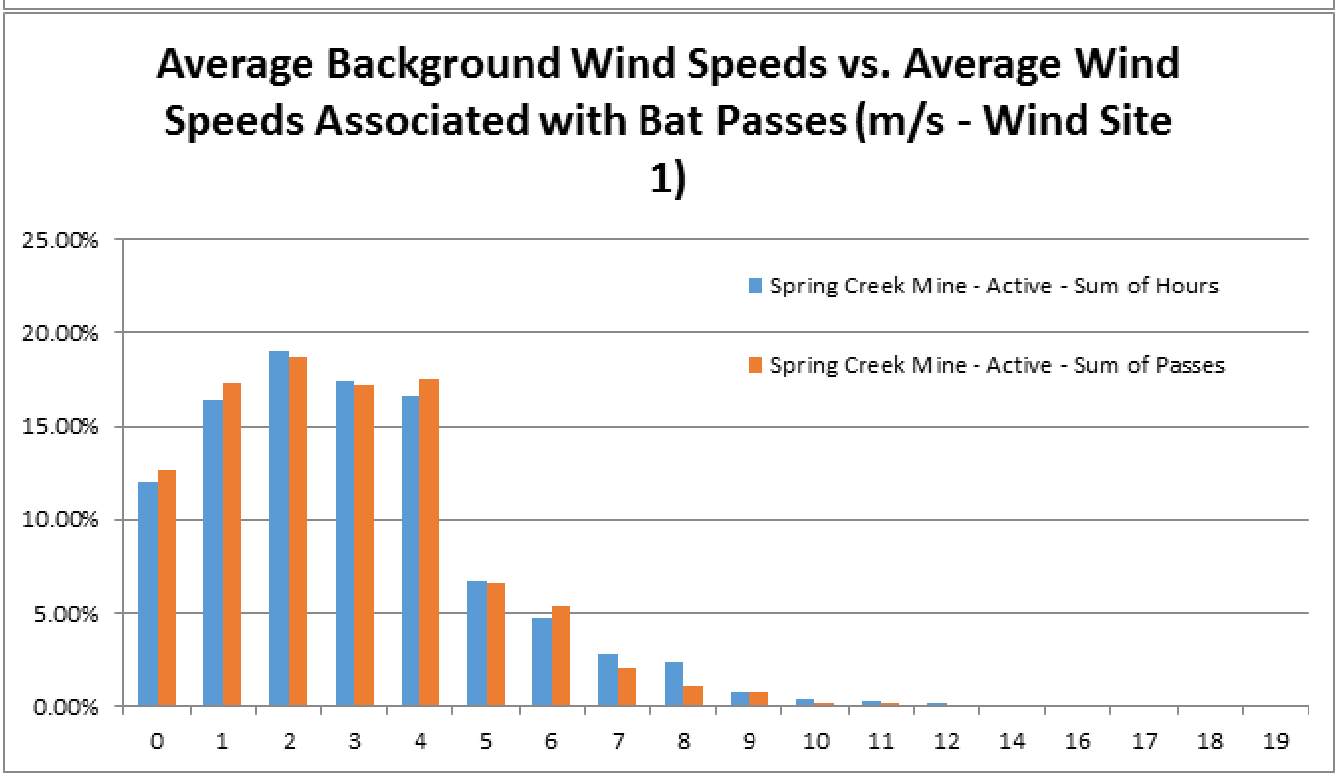


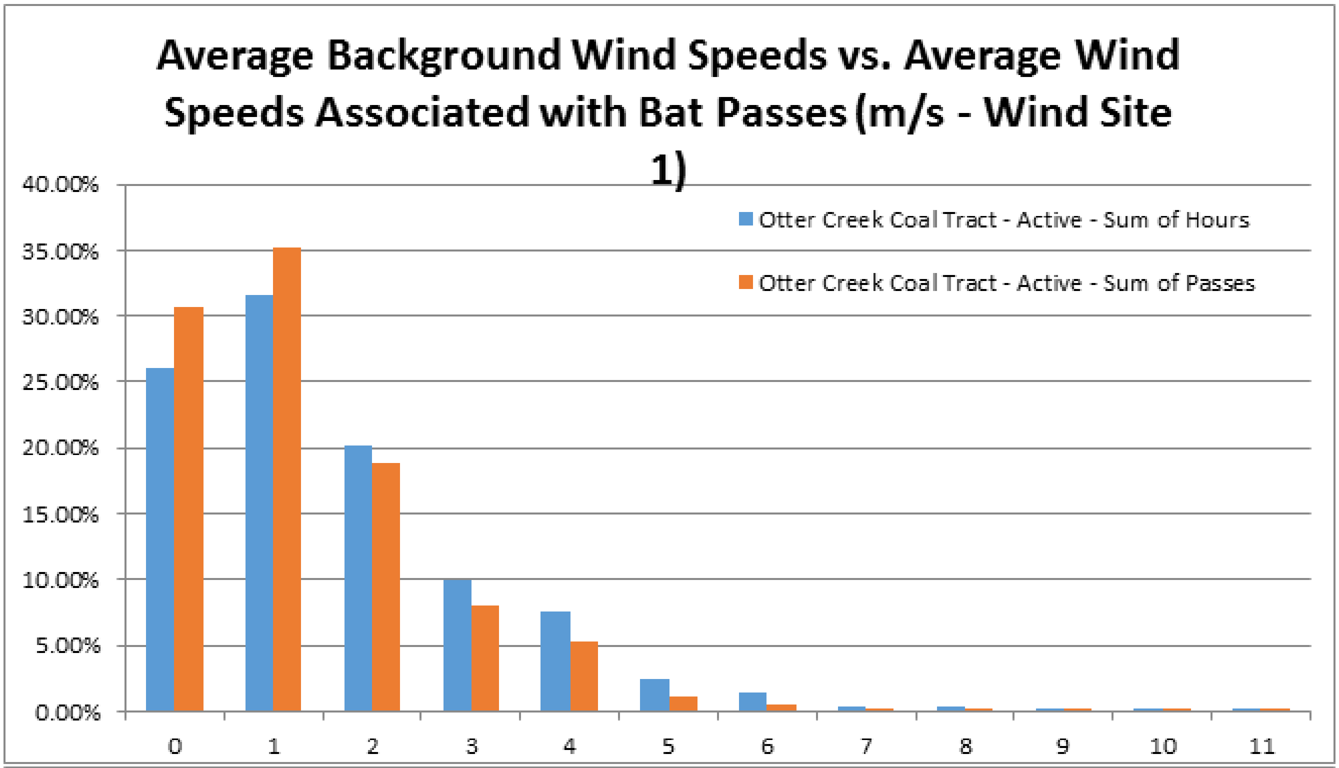
Figure 16. Percent of hours with average background wind speeds (blue) and average wind speeds associated with bat passes (red) at the closest associated weather station at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Wind speed categories are meters per second. Numbers are lower ends of wind speed bins.



(a)

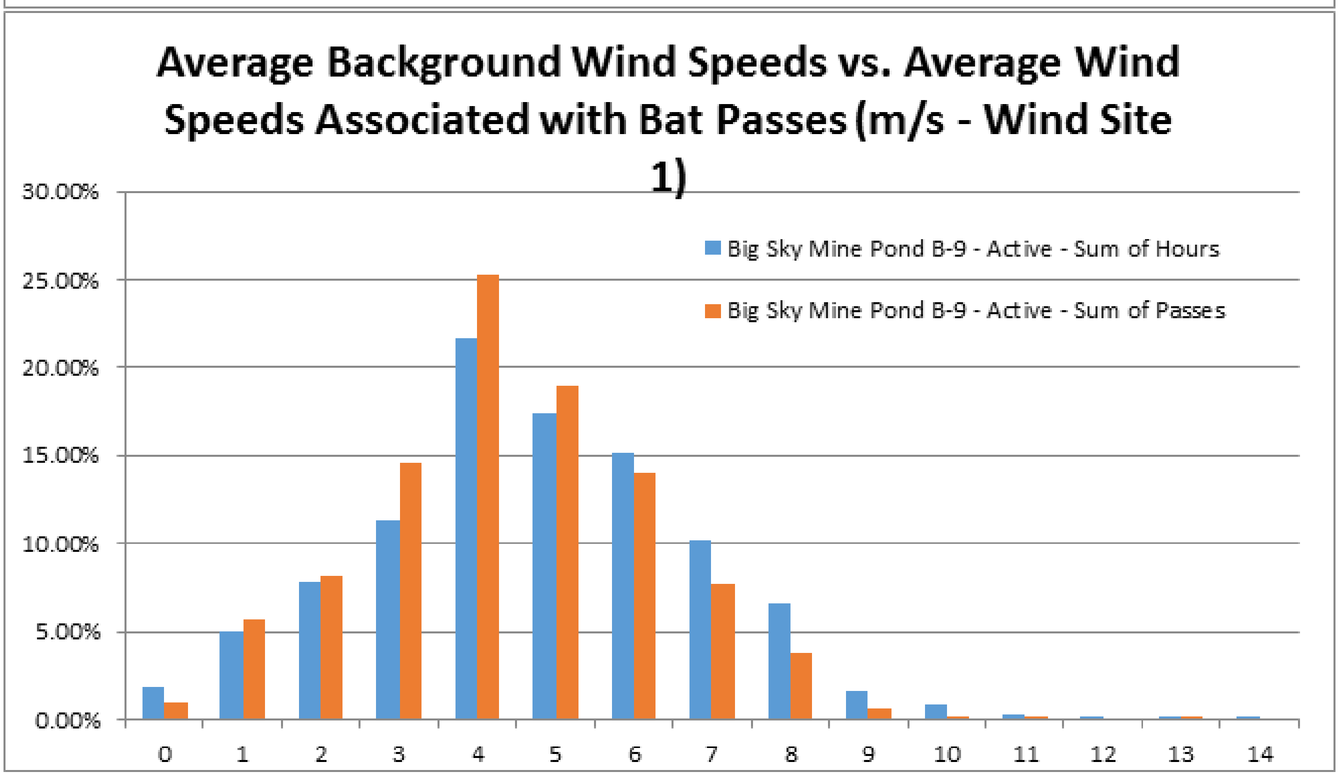


(b)



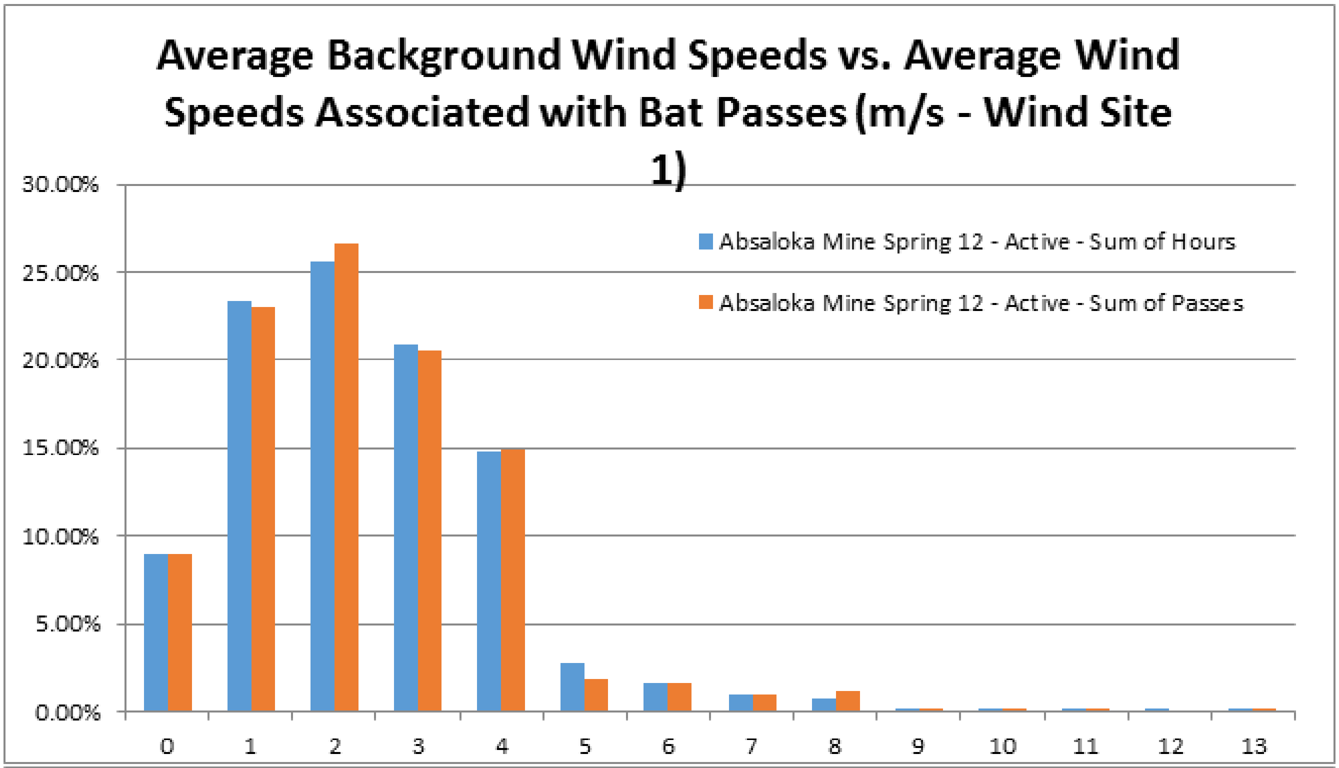
Average Background Wind Speeds vs. Average Wind Speeds Associated with Bat Passes (m/s - Wind Site 1)
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Otter Creek Coal Tract - Active - Sum of Hours
Otter Creek Coal Tract - Active - Sum of Passes
0 1 2 3 4 5 6 7 8 9 10 11

(c)

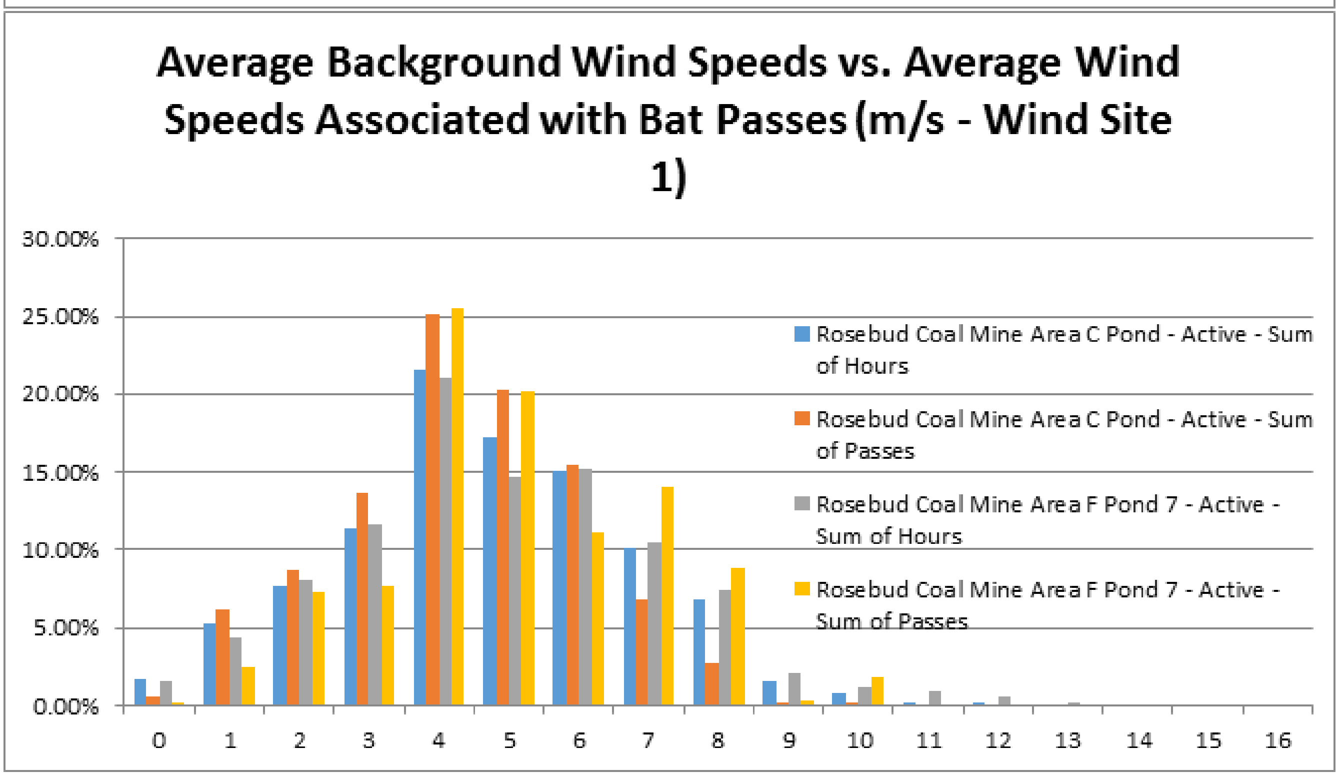


Average Background Wind Speeds vs. Average Wind Speeds Associated with Bat Passes (m/s - Wind Site 1)
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Big Sky Mine Pond B-9 - Active - Sum of Hours
Big Sky Mine Pond B-9 - Active - Sum of Passes
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

(d)


Average Background Wind Speeds vs. Average Wind Speeds Associated with Bat Passes (m/s - Wind Site 1)
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Absaloka Mine Spring 12 - Active - Sum of Hours
Absaloka Mine Spring 12 - Active - Sum of Passes
0 1 2 3 4 5 6 7 8 9 10 11 12 13

(e)


Average Background Wind Speeds vs. Average Wind Speeds Associated with Bat Passes (m/s - Wind Site 1)
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rosebud Coal Mine Area C Pond - Active - Sum of Hours
Rosebud Coal Mine Area C Pond - Active - Sum of Passes
Rosebud Coal Mine Area F Pond 7 - Active - Sum of Hours
Rosebud Coal Mine Area F Pond 7 - Active - Sum of Passes
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

(f)

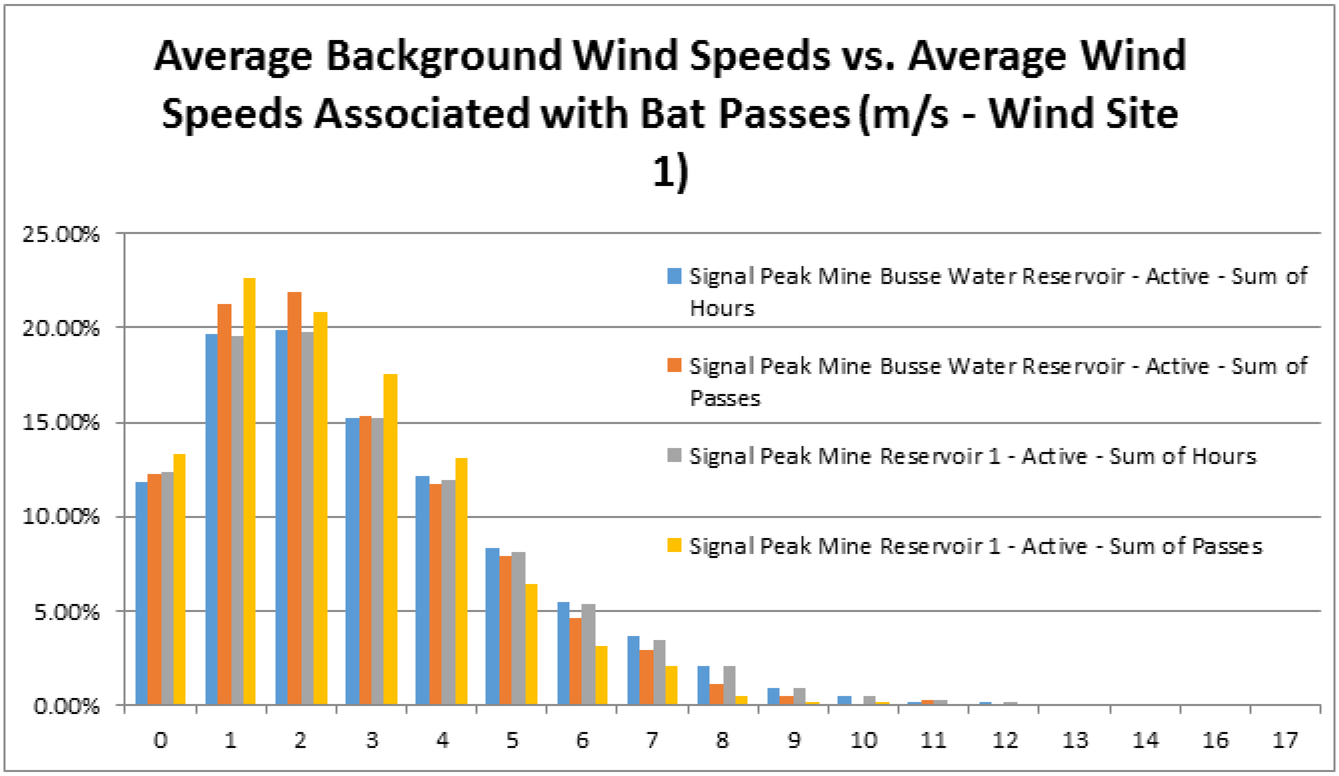
(g) 
Average Background Wind Speeds vs. Average Wind Speeds Associated with Bat Passes (m/s - Wind Site 1)
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
16
17
Signal Peak Mine Busse Water Reservoir - Active - Sum of Hours
Signal Peak Mine Busse Water Reservoir - Active - Sum of Passes
Signal Peak Mine Reservoir 1 - Active - Sum of Hours
Signal Peak Mine Reservoir 1 - Active - Sum of Passes

Figure 17. Percent of hours with average background wind speeds (blue) and average wind speeds associated with bat passes (red) across the regional network of detectors. Wind speed categories are meters per second. Numbers are lower ends of wind speed bins. Of the 572,897 hours that detectors have been deployed, wind speed data was available from nearby weather stations for 556,720 hours (97%). Note that some detectors were up to 43 kilometers from the weather station where wind speeds were recorded (X = 17.9 km, SD = 10.5 km).

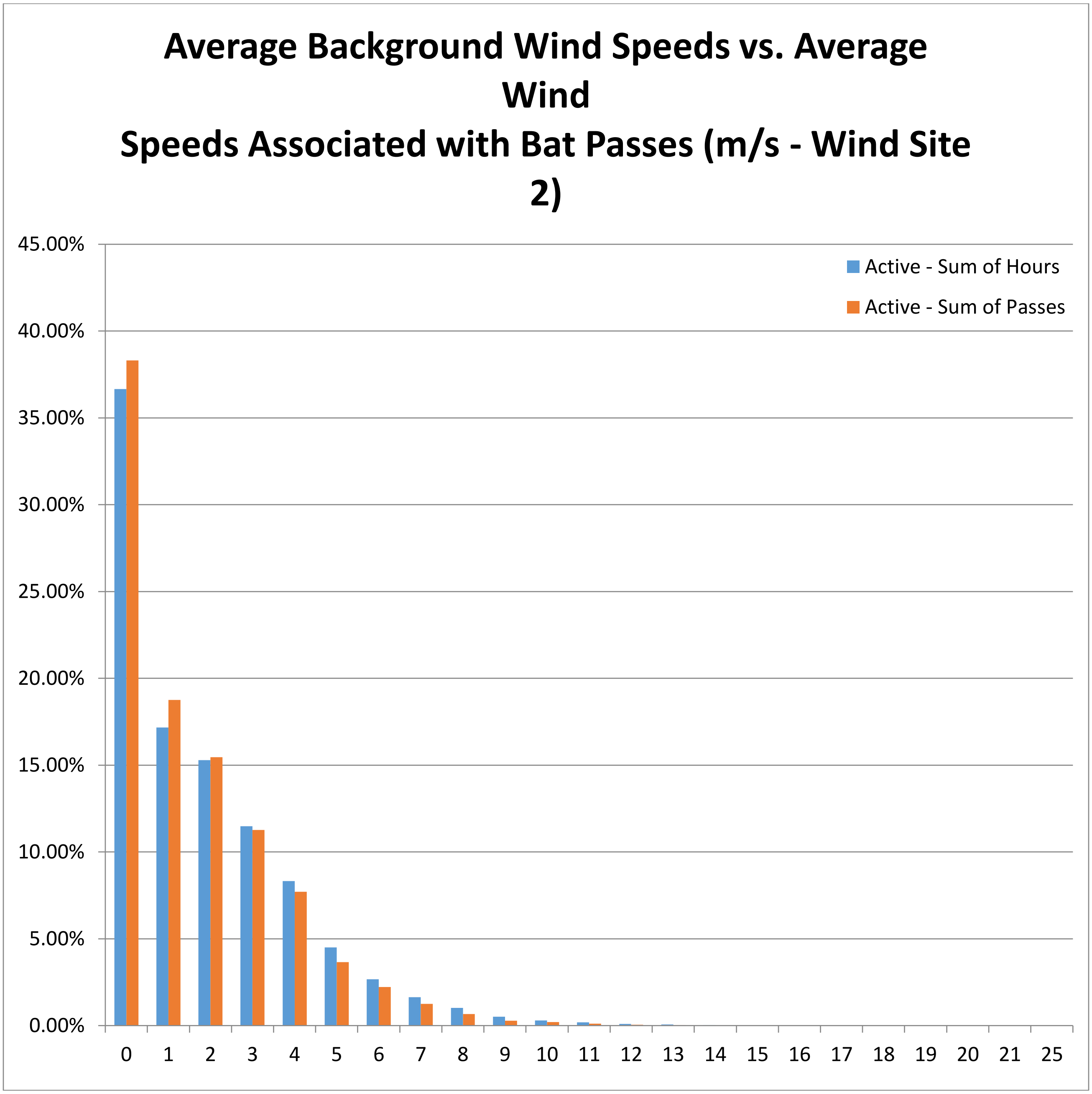
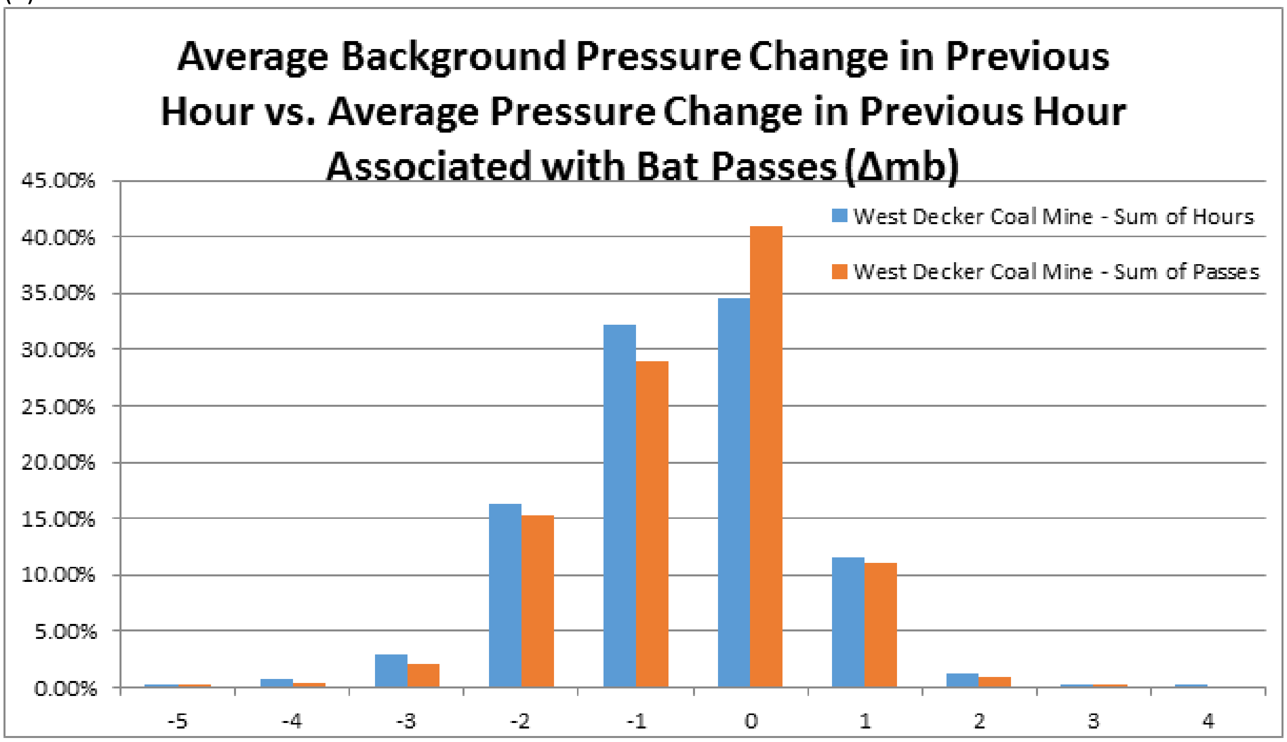
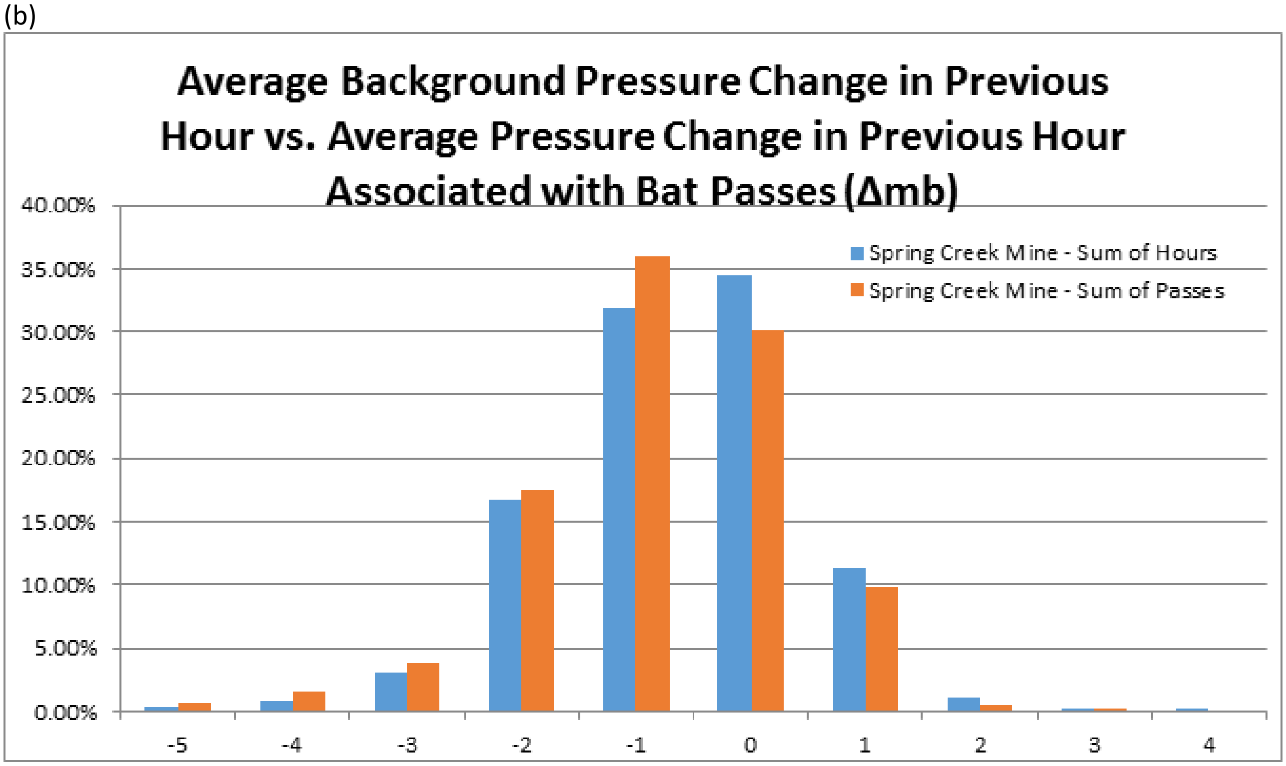


Figure 18. Percent of hours with background barometric pressure changes (blue) and barometric pressure changes associated with bat passes (red) at the closest associated weather station at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine. Numbers shown are the lower ends of categories of millibars of change per hour. Pressure data were unavailable for both Signal Peak Mine Detectors, so this relationship is not shown for detectors places at this mine.

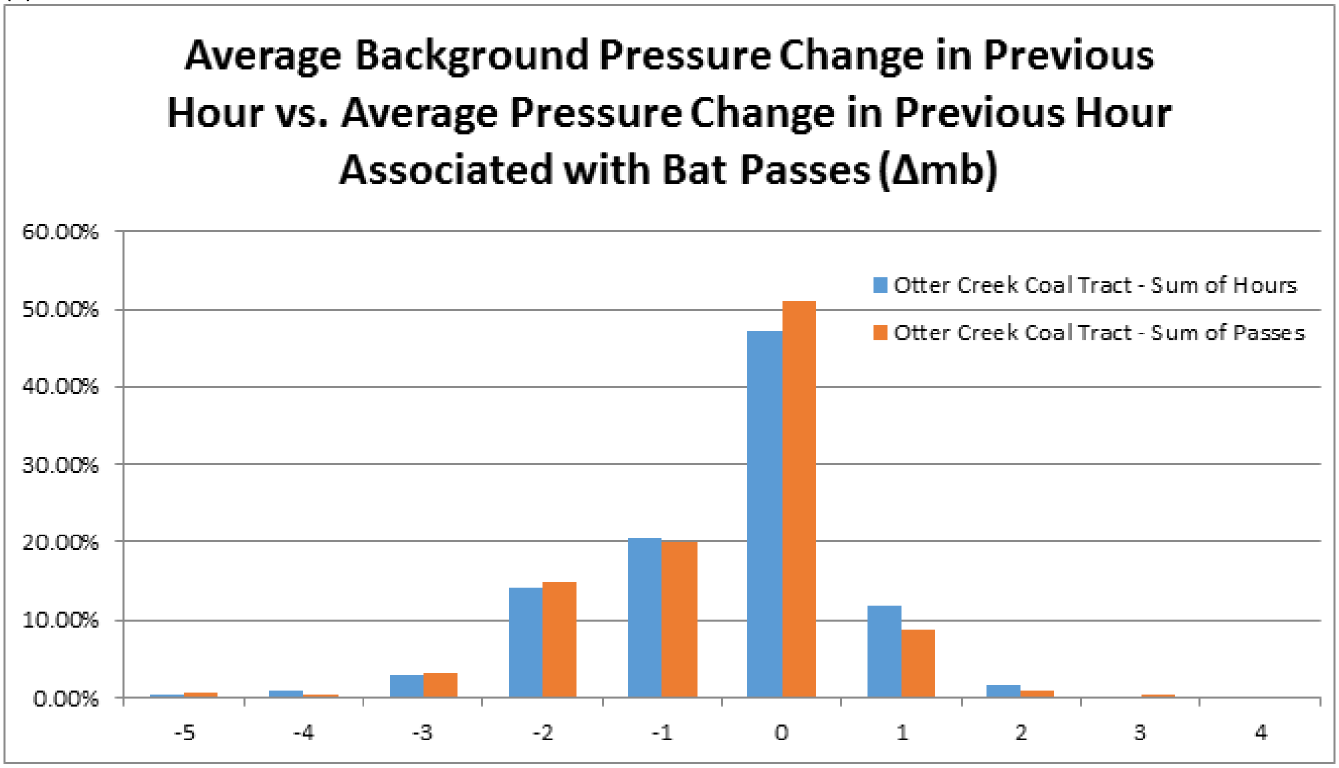
(a)



(b)

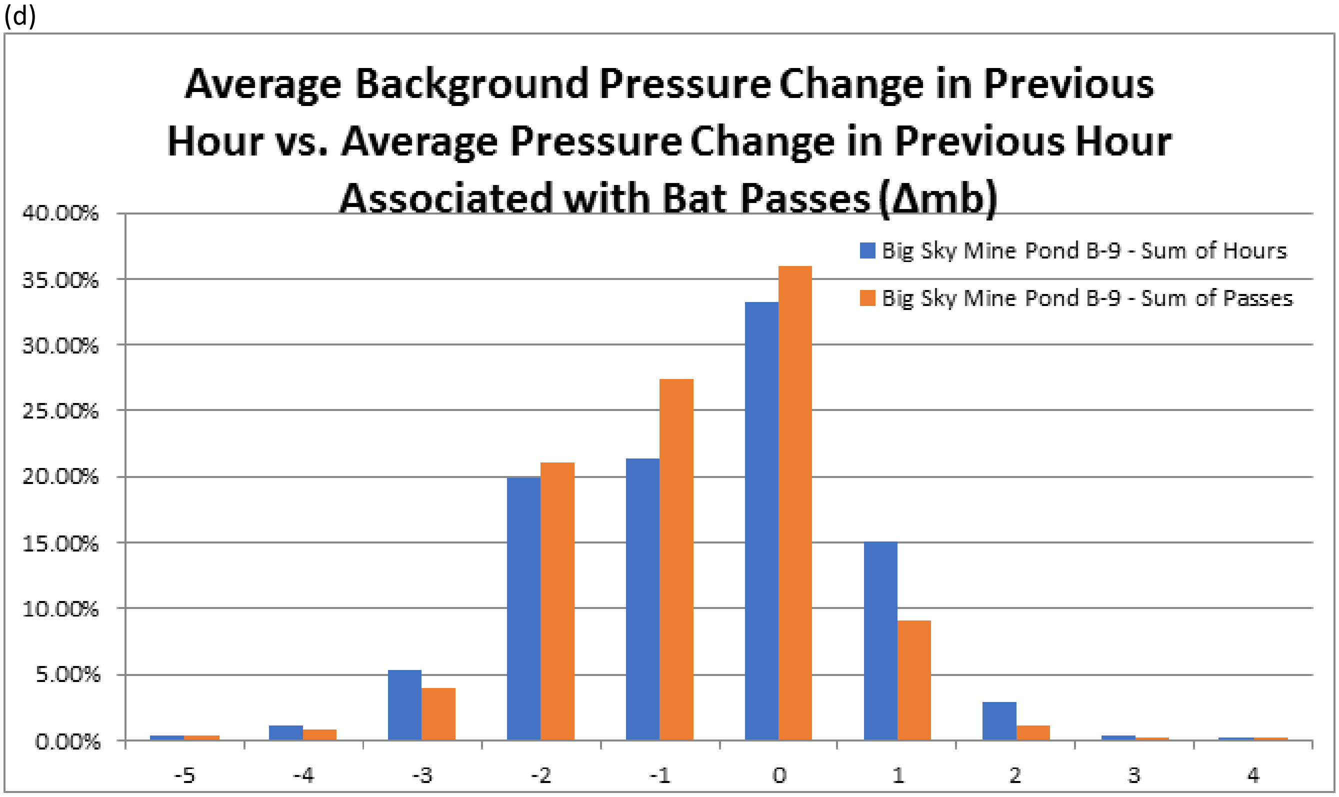


(c)



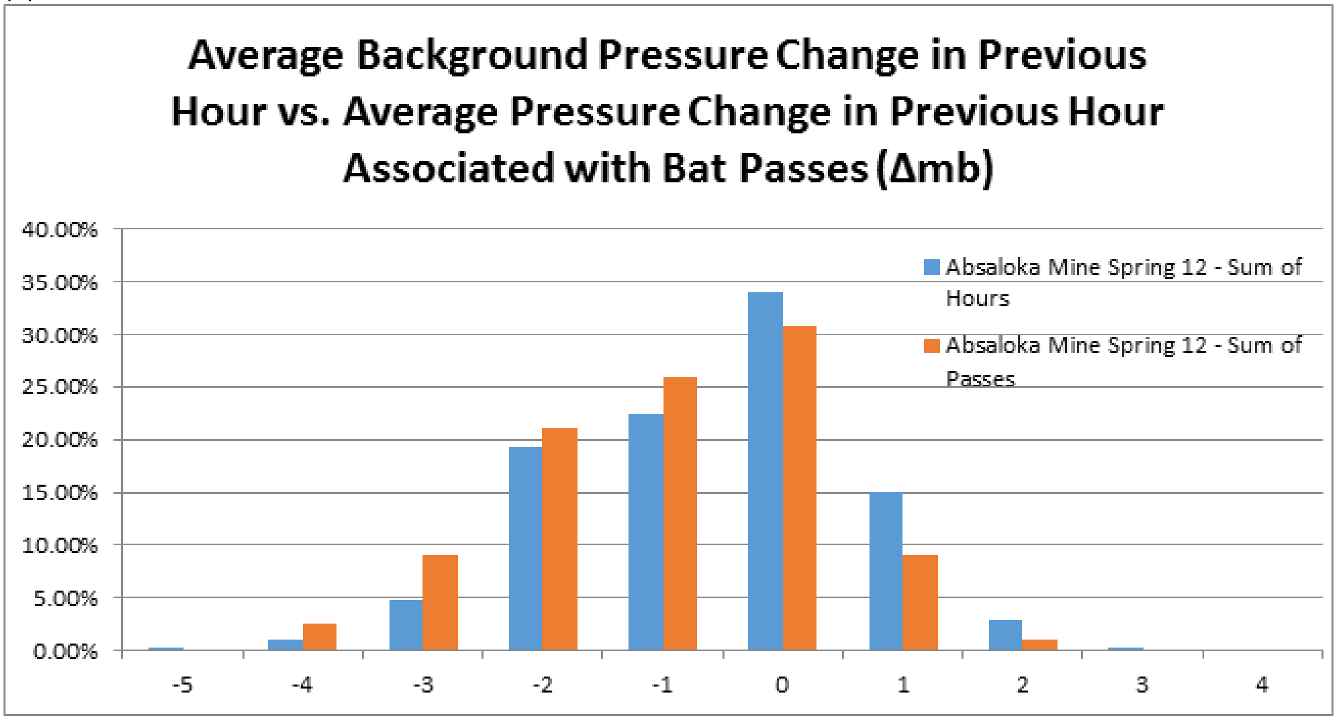
Average Background Pressure Change in Previous Hour vs. Average Pressure Change in Previous Hour Associated with Bat Passes (Δmb)
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Otter Creek Coal Tract - Sum of Hours
Otter Creek Coal Tract - Sum of Passes
-5
-4
-3
-2
-1
0
1
2
3
4

(d)



Average Background Pressure Change in Previous Hour vs. Average Pressure Change in Previous Hour Associated with Bat Passes (Δmb)
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Big Sky Mine Pond B-9 - Sum of Hours
Big Sky Mine Pond B-9 - Sum of Passes
-5
-4
-3
-2
-1
0
1
2
3
4

(e)


Average Background Pressure Change in Previous Hour vs. Average Pressure Change in Previous Hour Associated with Bat Passes (Δmb)
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
-5
-4
-3
-2
-1
0
1
2
3
4
Absaloka Mine Spring 12 - Sum of Hours
Absaloka Mine Spring 12 - Sum of Passes

(f)

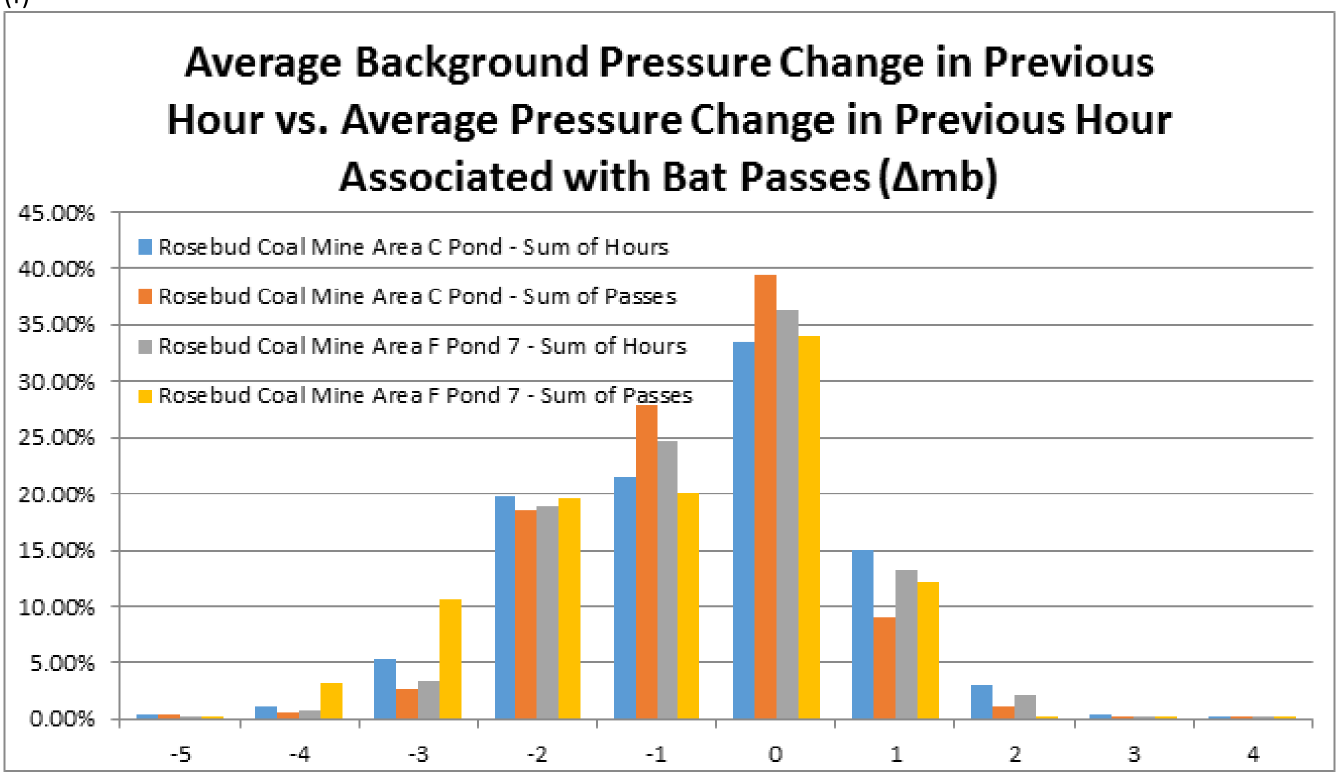

Average Background Pressure Change in Previous Hour vs. Average Pressure Change in Previous Hour Associated with Bat Passes (Δmb)
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
-5
-4
-3
-2
-1
0
1
2
3
4
Rosebud Coal Mine Area C Pond - Sum of Hours
Rosebud Coal Mine Area C Pond - Sum of Passes
Rosebud Coal Mine Area F Pond 7 - Sum of Hours
Rosebud Coal Mine Area F Pond 7 - Sum of Passes

Figure 19. Percent of hours with background barometric pressure changes (blue) and barometric pressure changes associated with bat passes (red) across the regional network of detectors. Numbers shown are the lower ends of categories of millibars of change per hour. Of the 572,897 hours that detectors have been deployed, barometric pressure data was available from nearby weather stations for 517,468 hours (90%). Note that some detectors were up to 94 kilometers from the weather station where barometric pressures were recorded (X = 37.1 km, SD = 21.5 km).

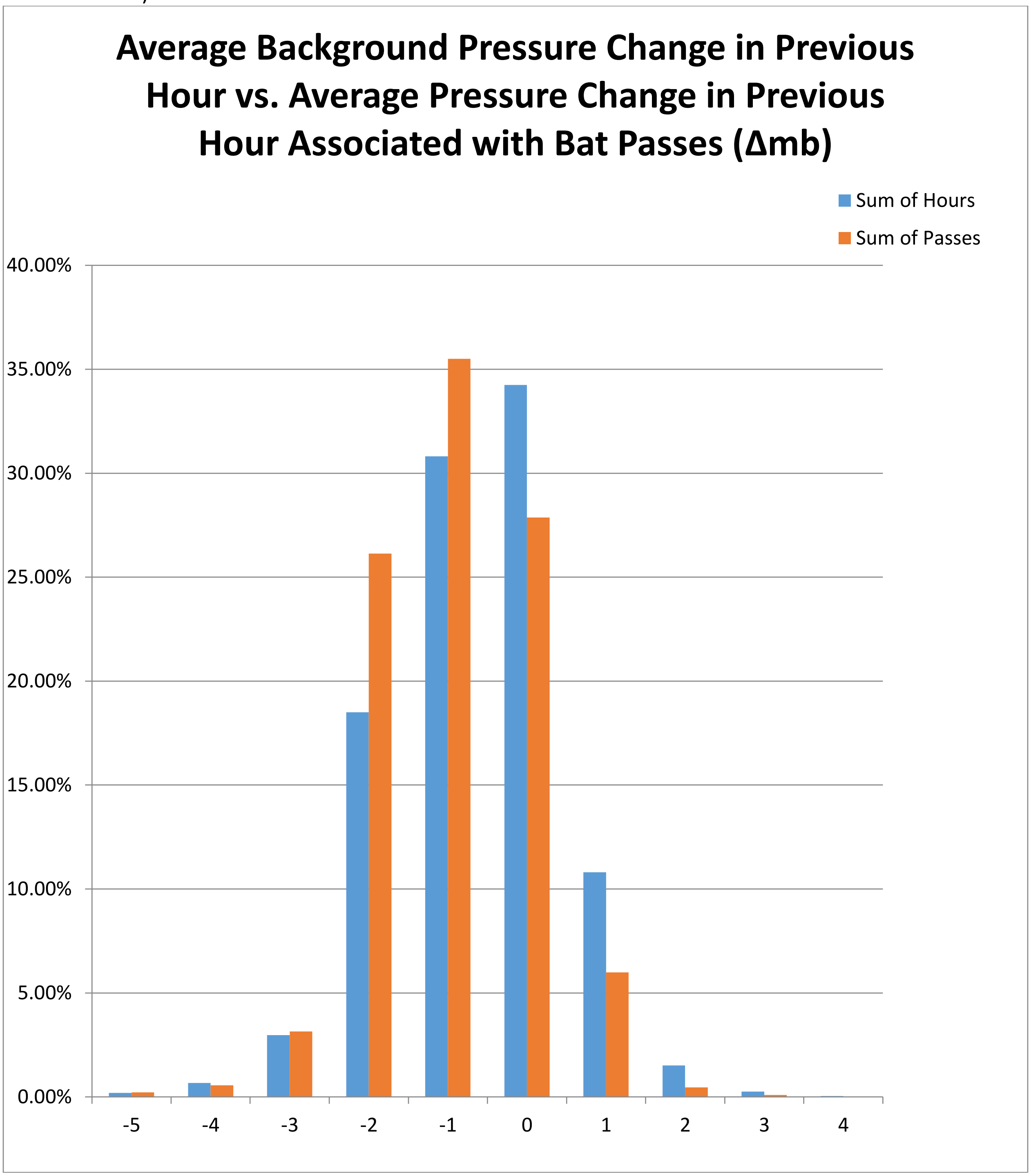
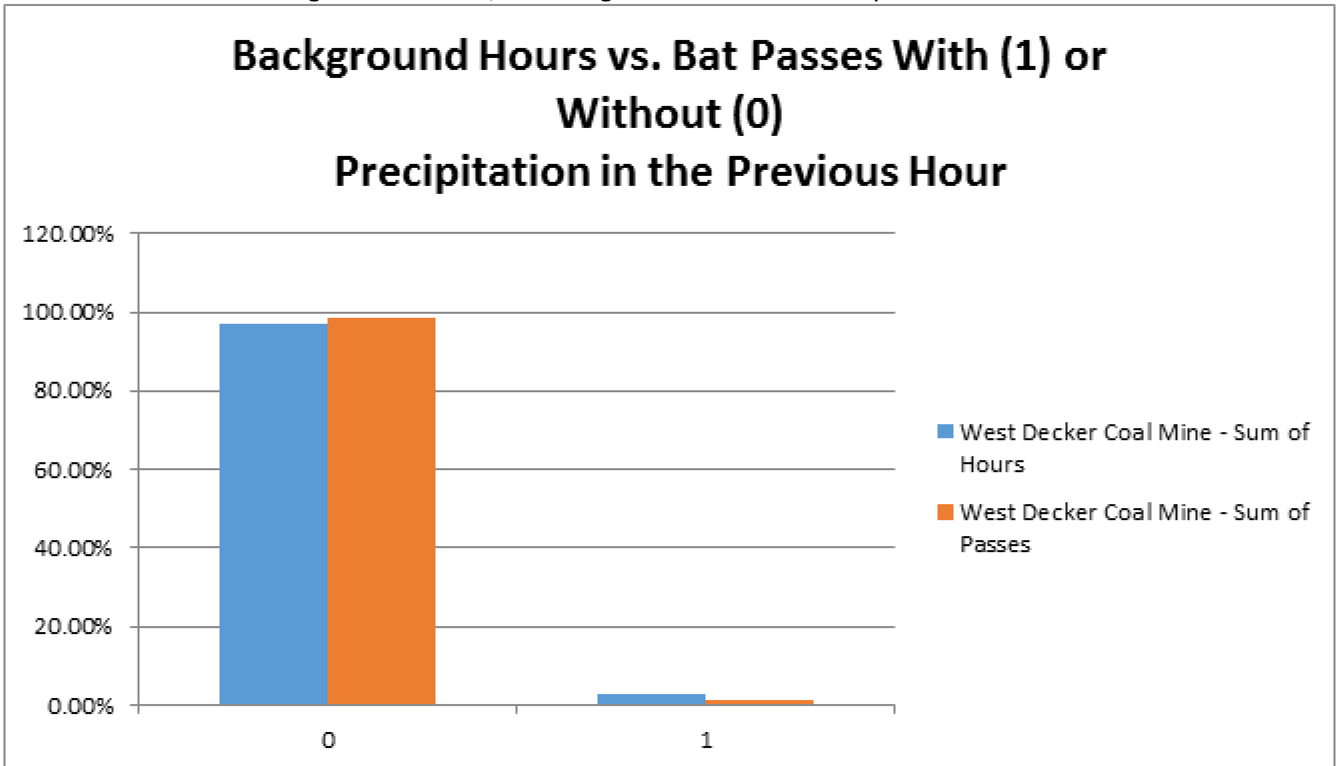
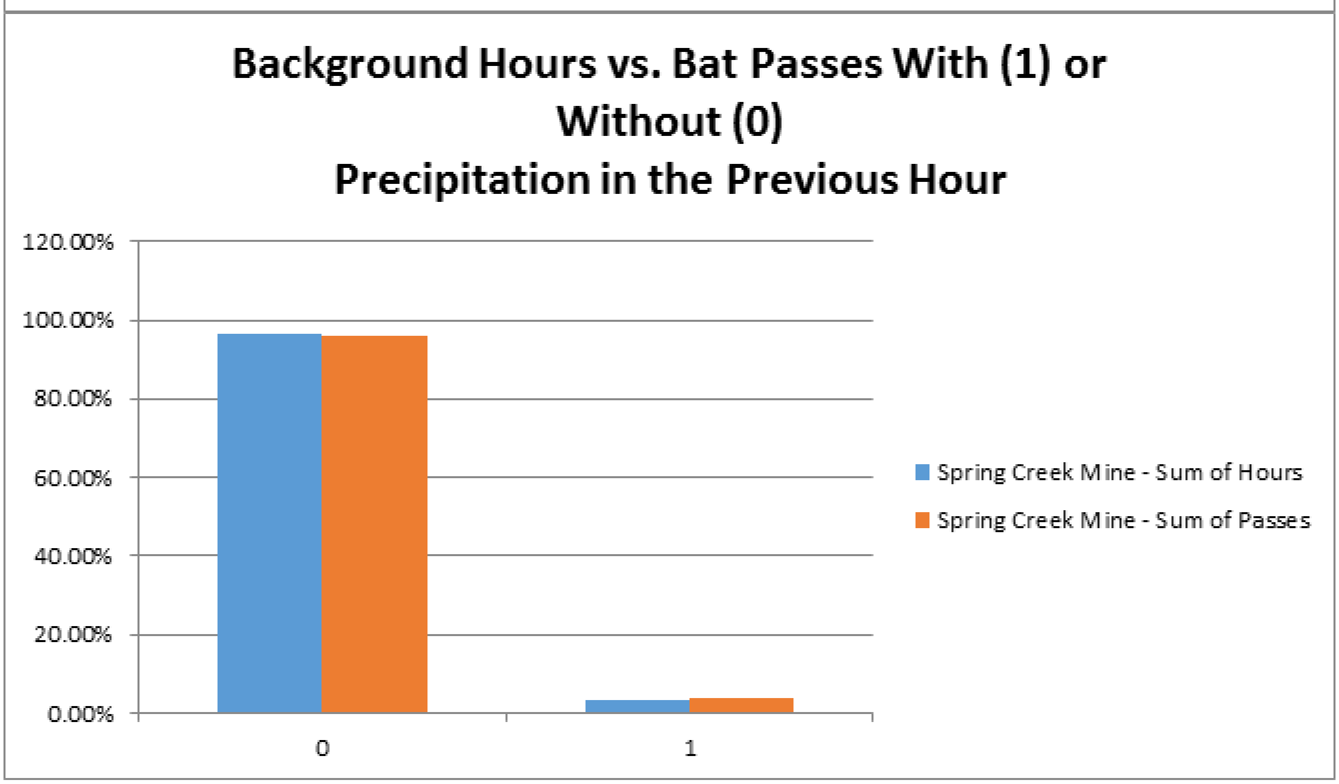


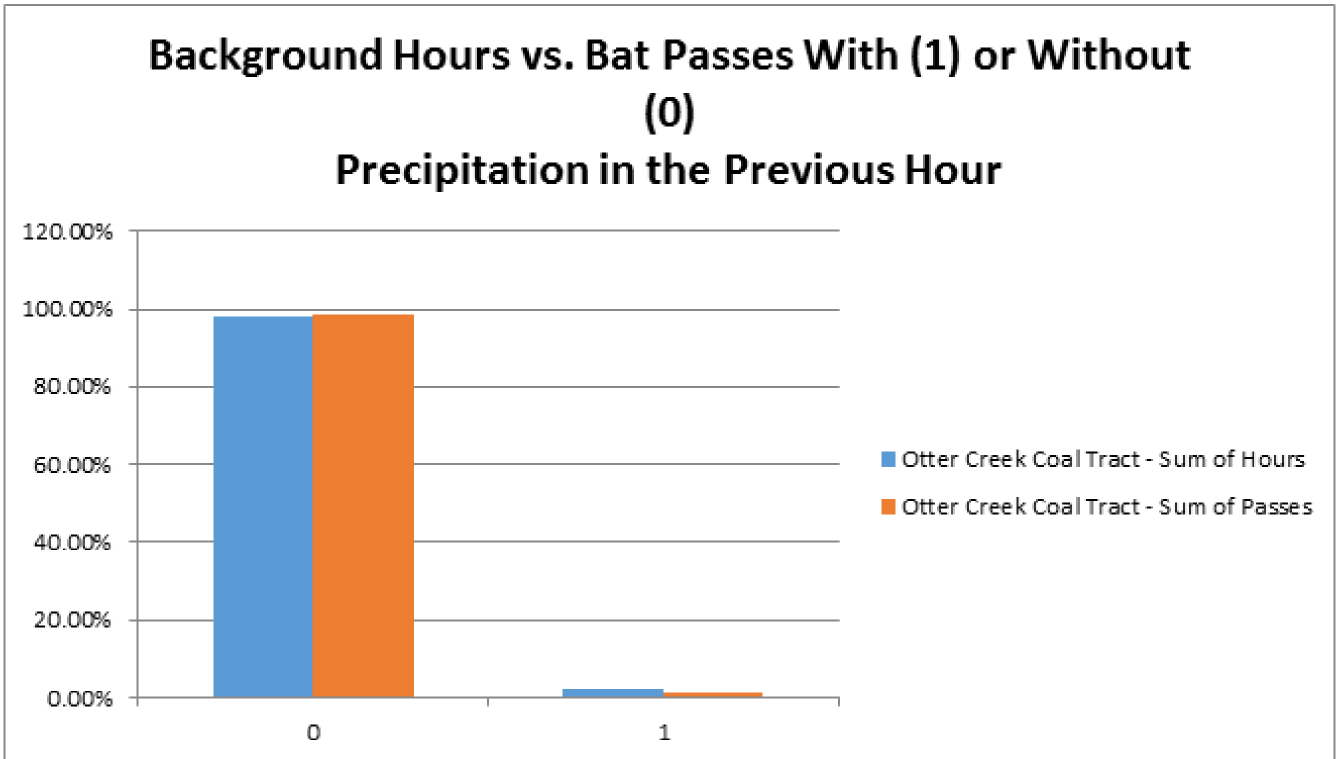
Figure 20. Percent of background hours (blue) and hours with bat passes (red) with (1) and without (0) precipitation at the closest weather station to: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine. Precipitation data was not available for the Signal Peak Mine, so the figure for this site is not provided.



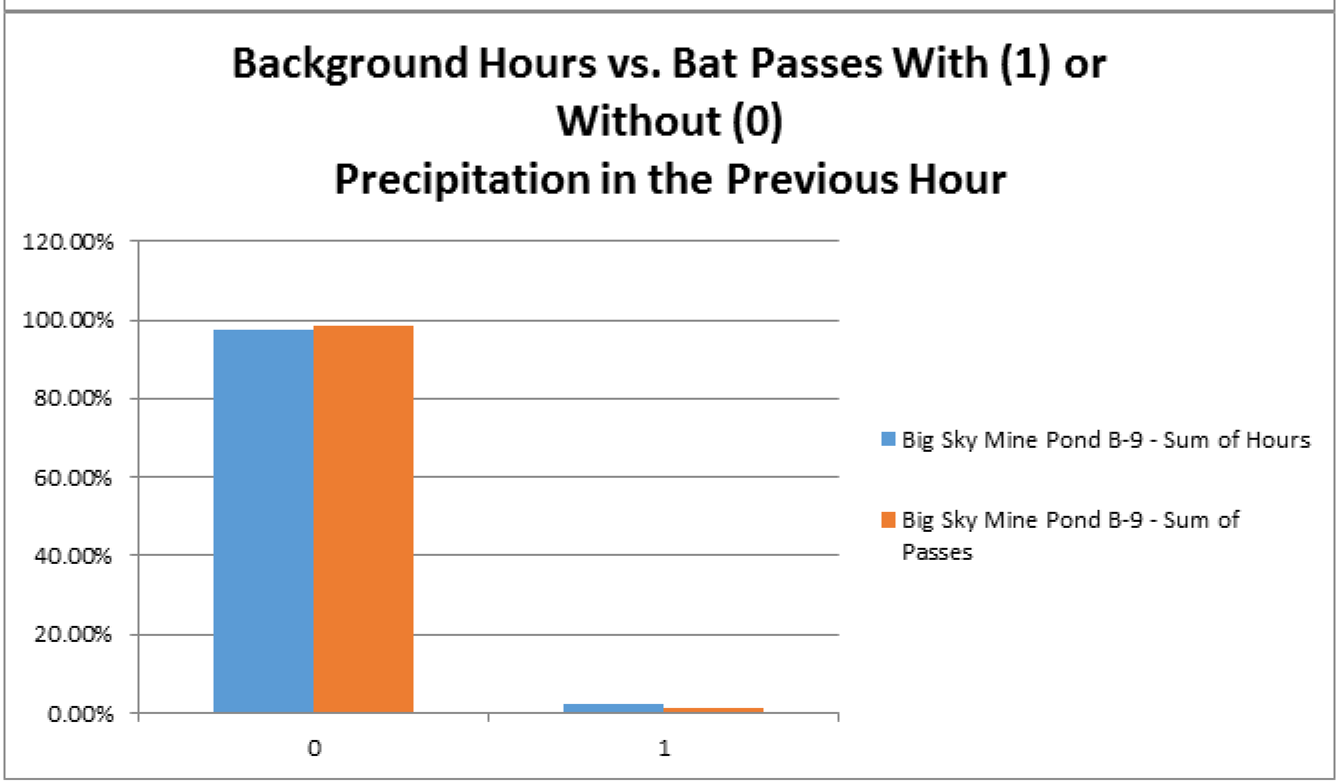
(a)



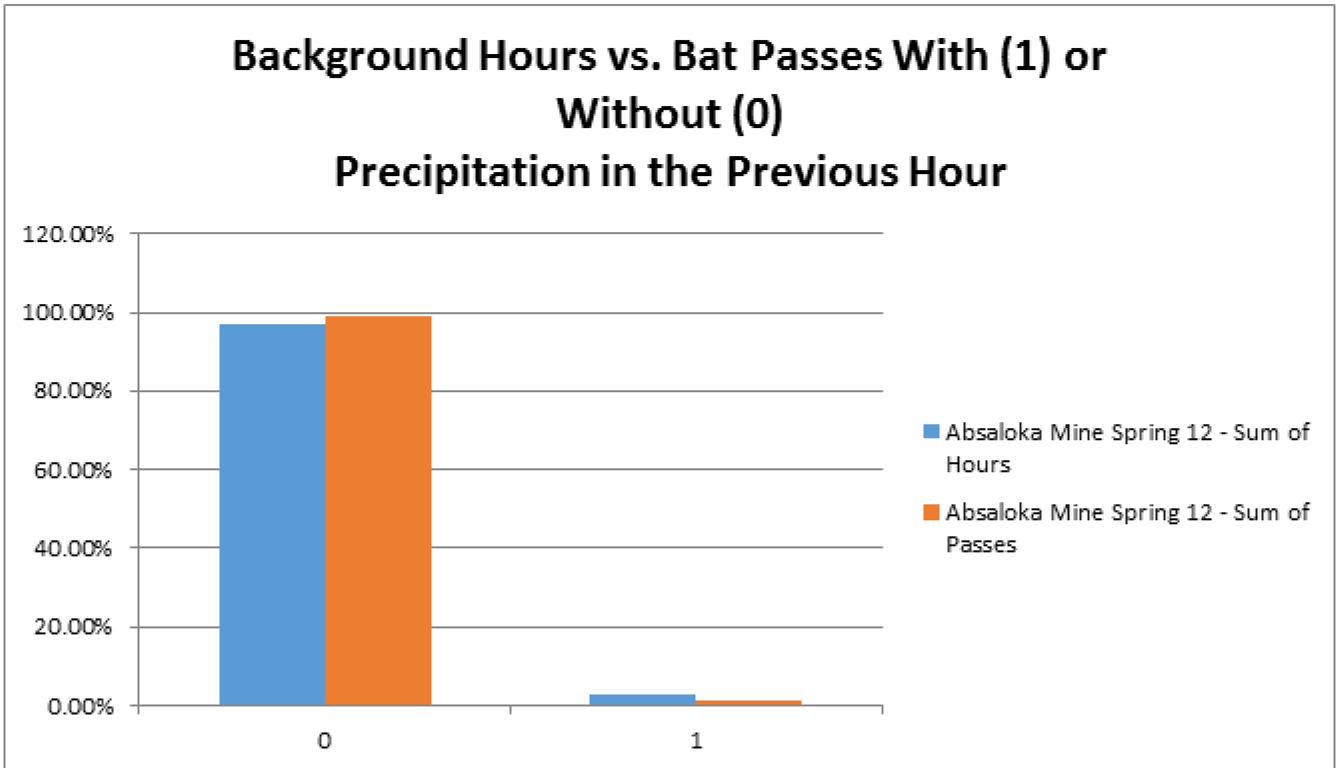
(b)


Background Hours vs. Bat Passes With (1) or Without (0)
Precipitation in the Previous Hour
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
0
1
Otter Creek Coal Tract - Sum of Hours
Otter Creek Coal Tract - Sum of Passes

(c)

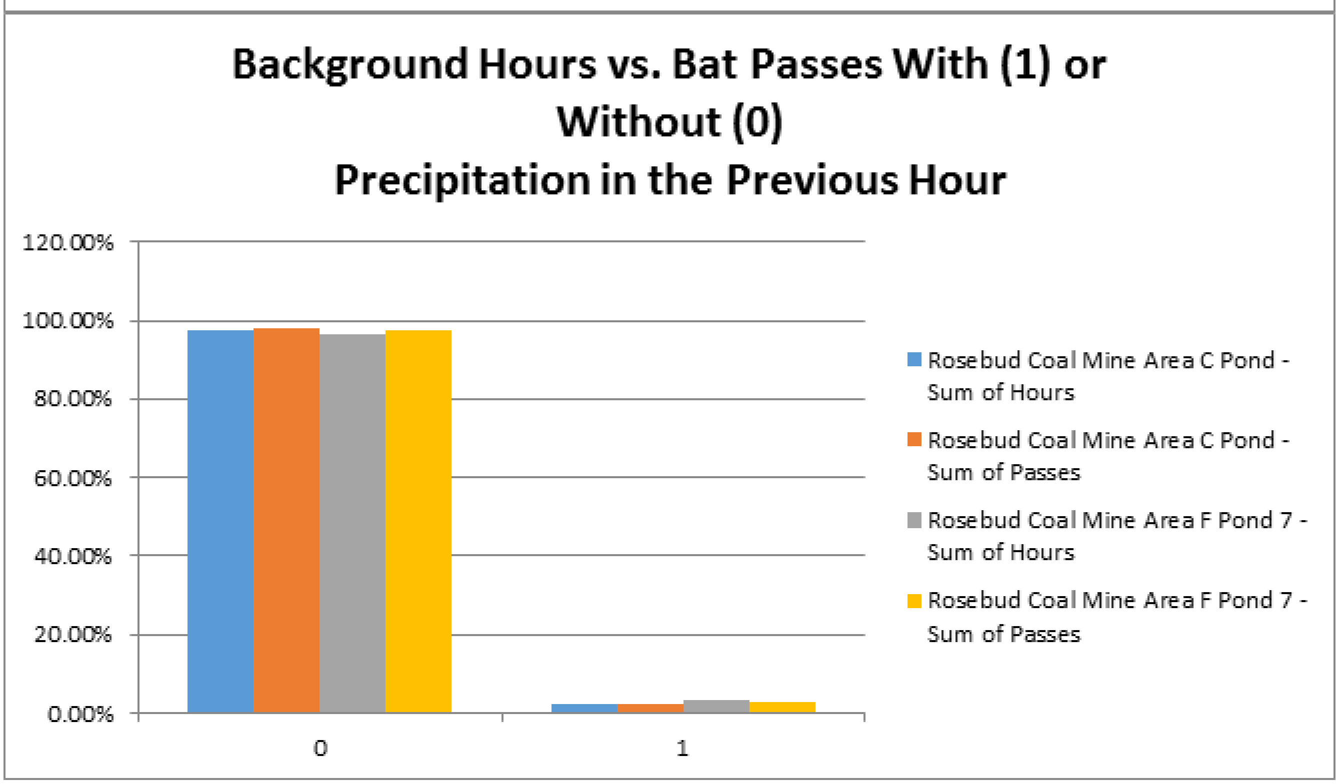

Background Hours vs. Bat Passes With (1) or Without (0)
Precipitation in the Previous Hour
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
0
1
Big Sky Mine Pond B-9 - Sum of Hours
Big Sky Mine Pond B-9 - Sum of Passes

(d)



Background Hours vs. Bat Passes With (1) or Without (0) Precipitation in the Previous Hour
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
0
1
Absaloka Mine Spring 12 - Sum of Hours
Absaloka Mine Spring 12 - Sum of Passes

(e)



Background Hours vs. Bat Passes With (1) or Without (0) Precipitation in the Previous Hour
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
0
1
Rosebud Coal Mine Area C Pond - Sum of Hours
Rosebud Coal Mine Area C Pond - Sum of Passes
Rosebud Coal Mine Area F Pond 7 - Sum of Hours
Rosebud Coal Mine Area F Pond 7 - Sum of Passes

(f)

Figure 21. Percent of background hours (blue) and hours with bat passes (red) with (1) and without (0) precipitation across the regional network of detectors. Of the 572,897 hours that detectors have been deployed, precipitation data was available from nearby weather stations for 556,881 hours (97%). Note that some detectors were up to 75 kilometers from the weather station where precipitation events were recorded (X = 20.70 km, SD = 15.2 km) and bats are capable of flight within minutes of the passing of a rain shower.

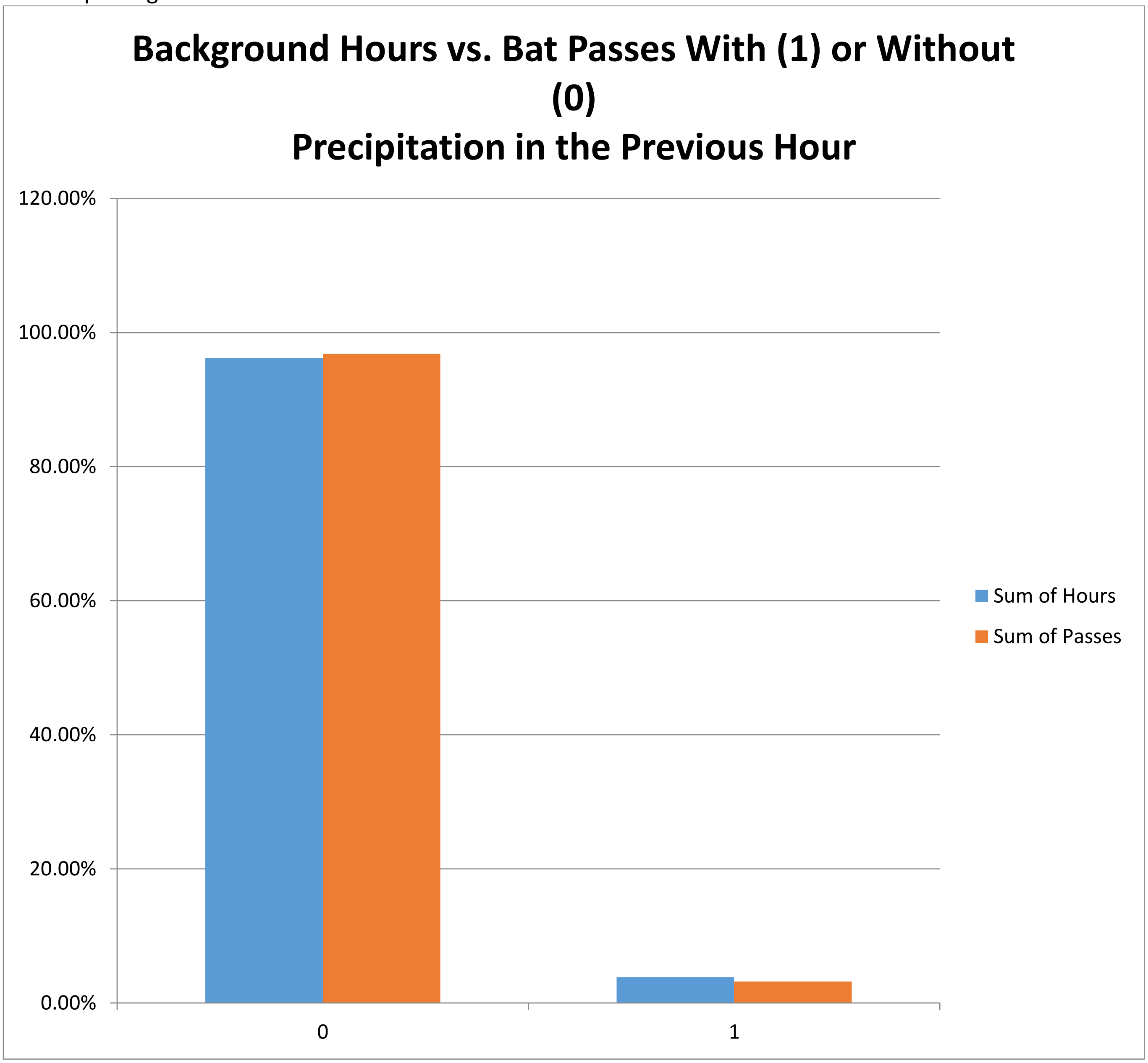
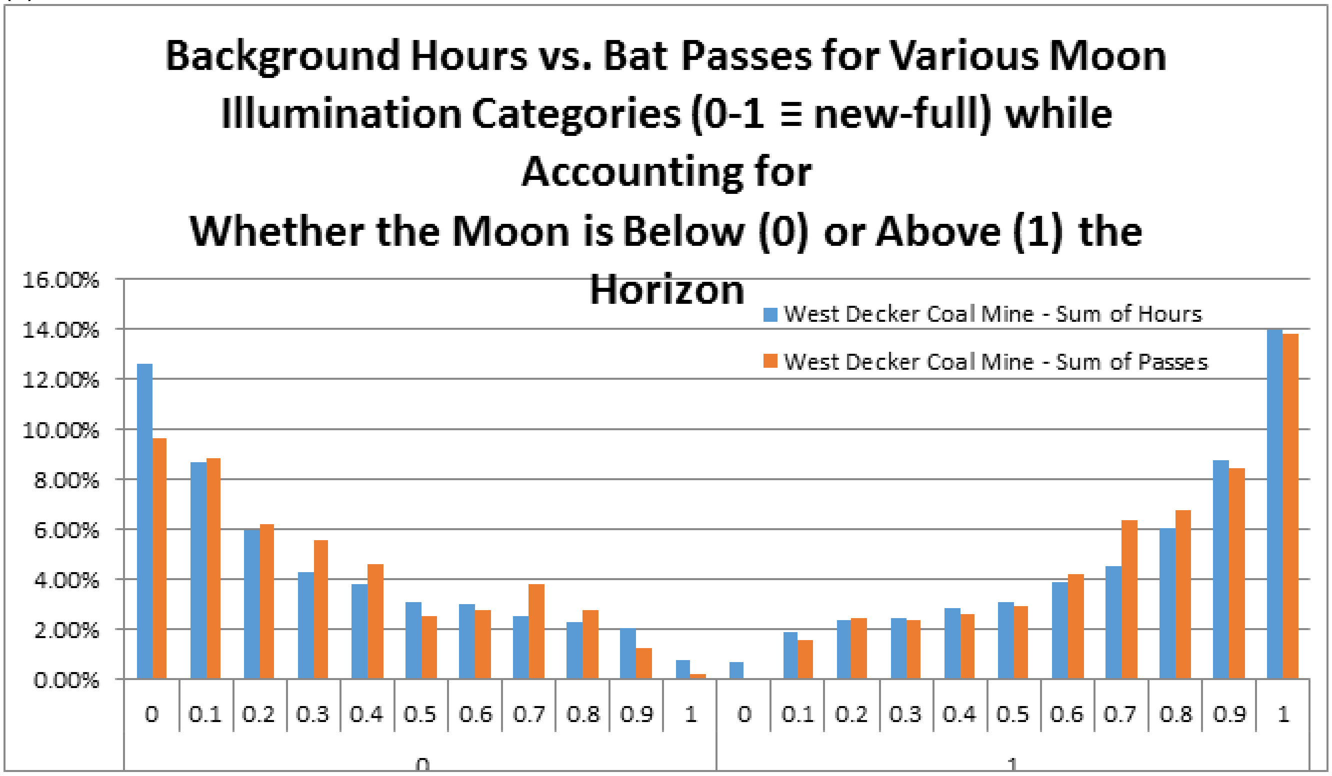
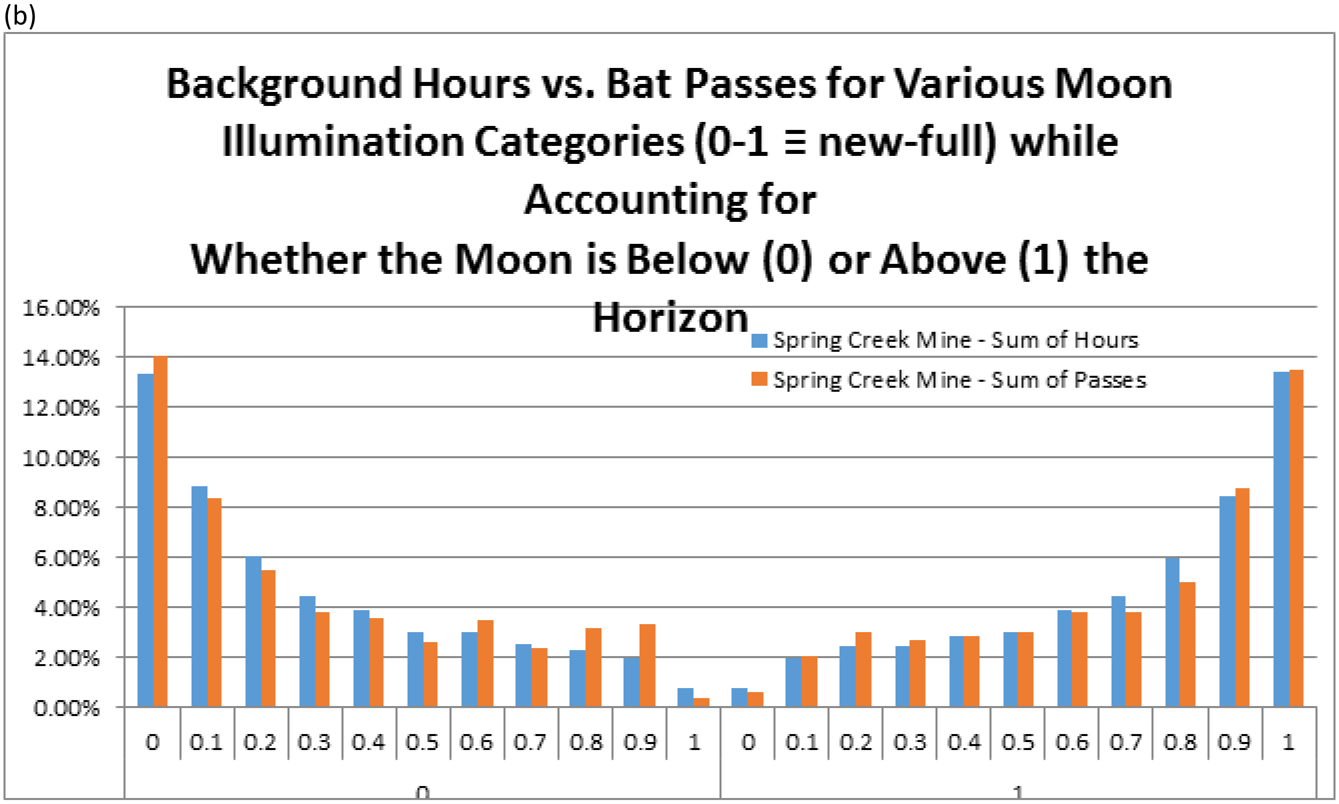


Figure 22. Percent of background hours (blue) and hours with bat passes (red) at various moon illumination categories (0 = no illumination and 1 = full moon) and with the moon above and below the horizon at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine.

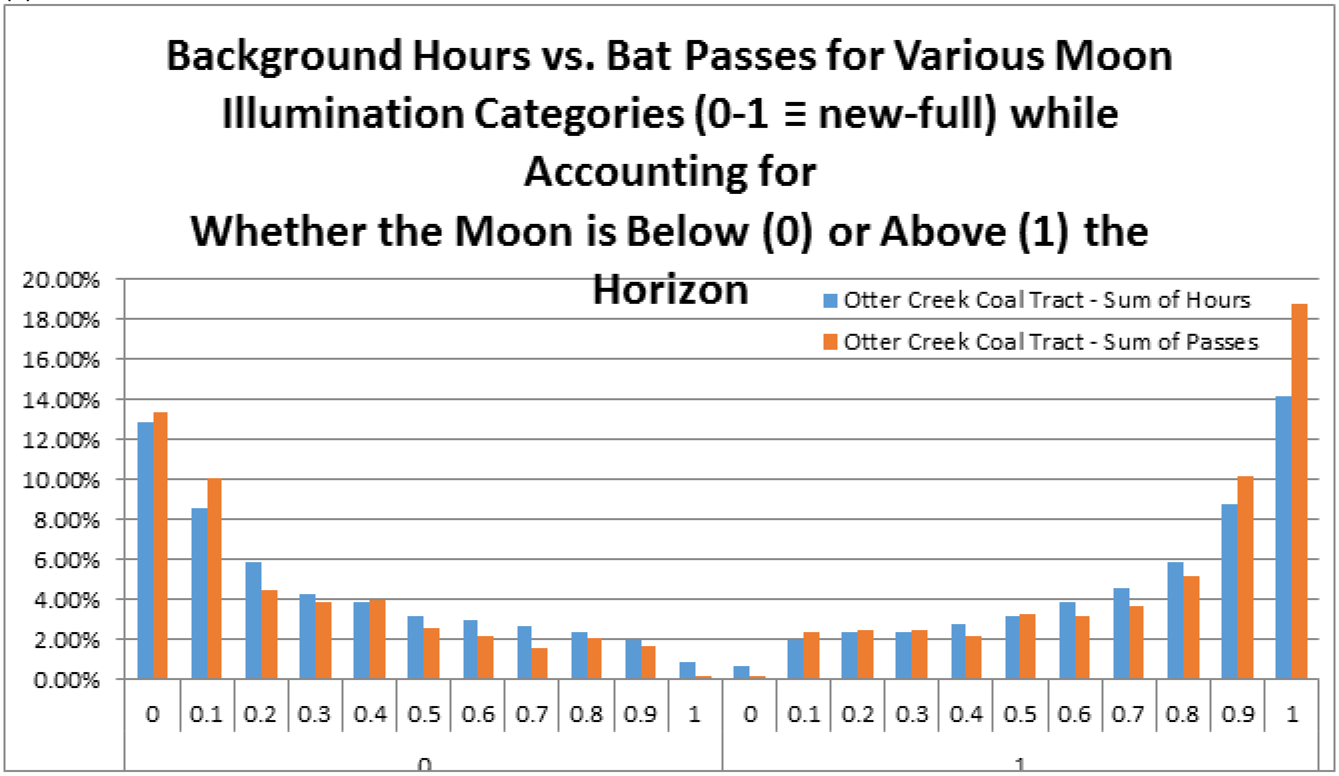
(a)



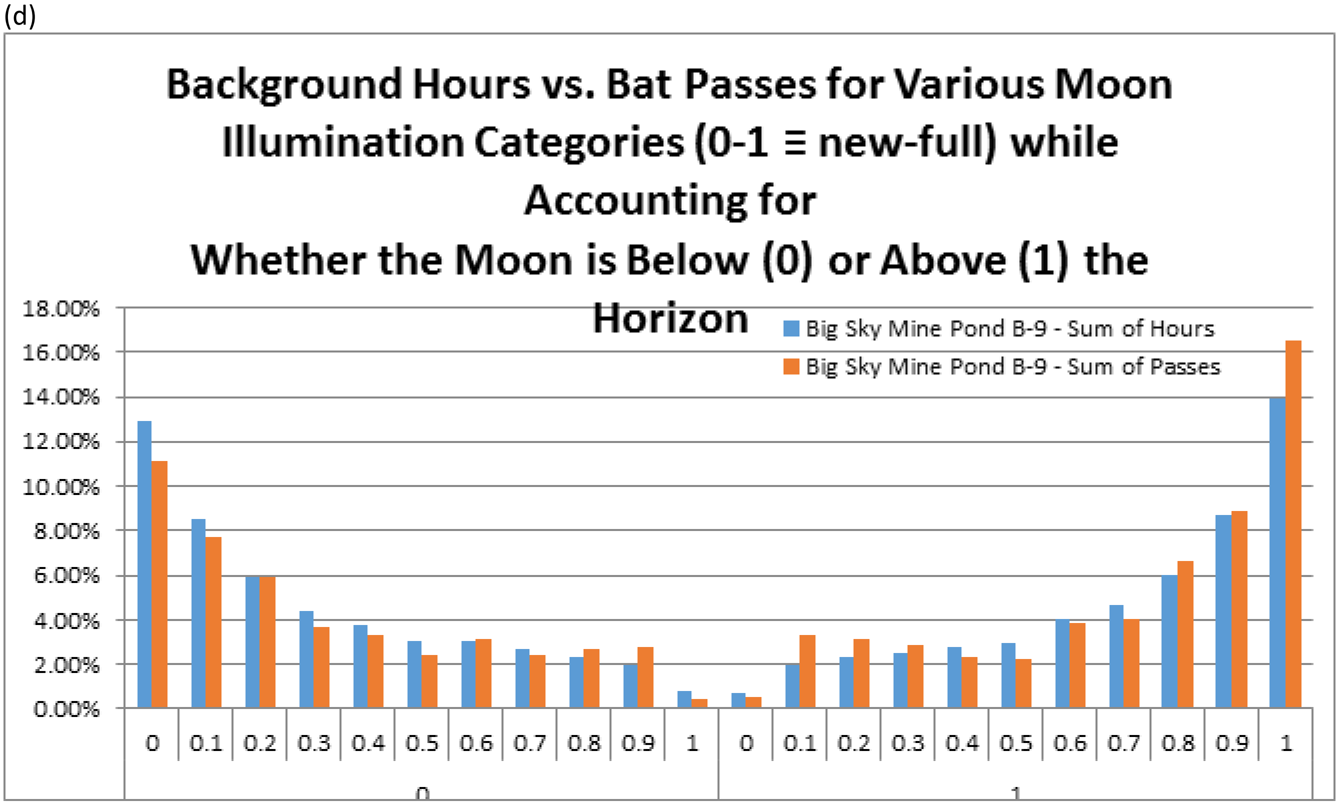
(b)



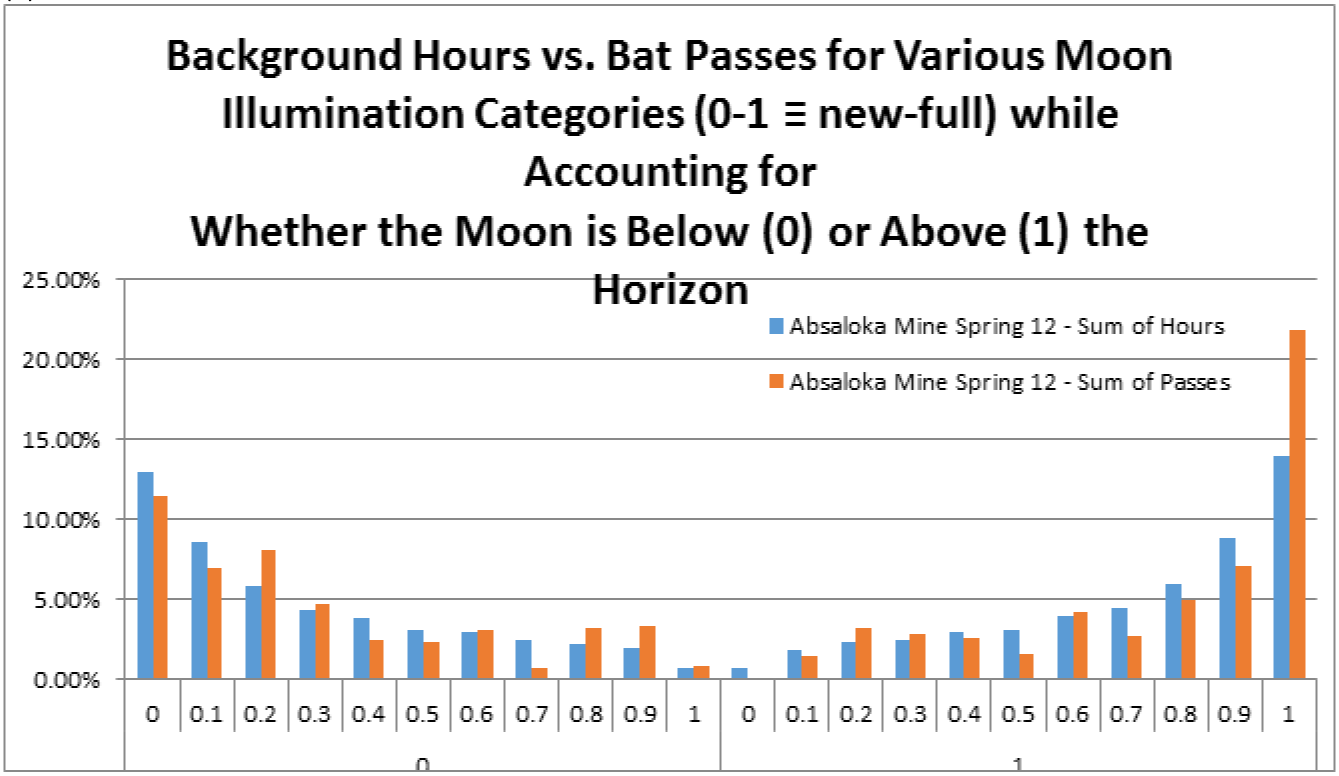
(c)


Background Hours vs. Bat Passes for Various Moon Illumination Categories (0-1 ≡ new-full) while Accounting for
Whether the Moon is Below (0) or Above (1) the Horizon
Otter Creek Coal Tract - Sum of Hours
Otter Creek Coal Tract - Sum of Passes
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
0
1

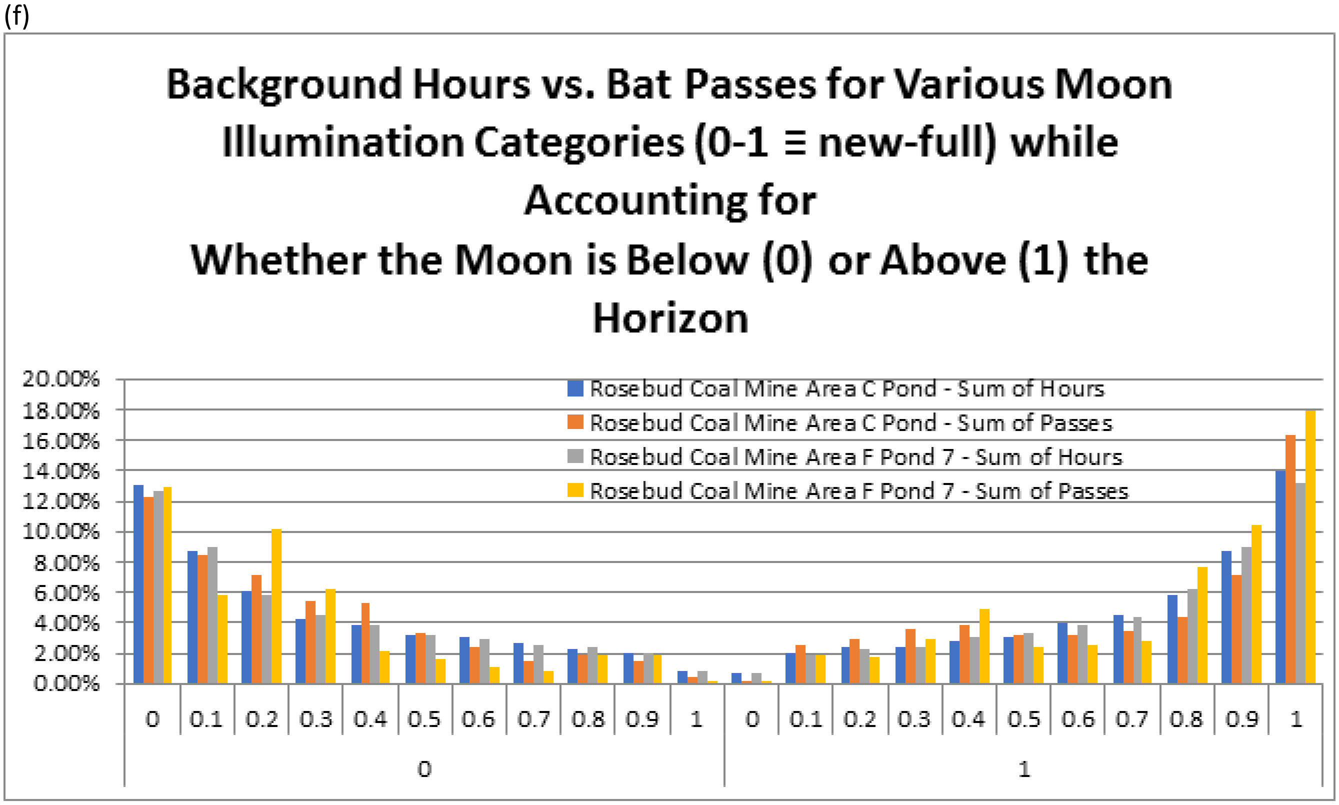
(d)


Background Hours vs. Bat Passes for Various Moon Illumination Categories (0-1 ≡ new-full) while Accounting for
Whether the Moon is Below (0) or Above (1) the Horizon
Big Sky Mine Pond B-9 - Sum of Hours
Big Sky Mine Pond B-9 - Sum of Passes
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1 0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
0
1

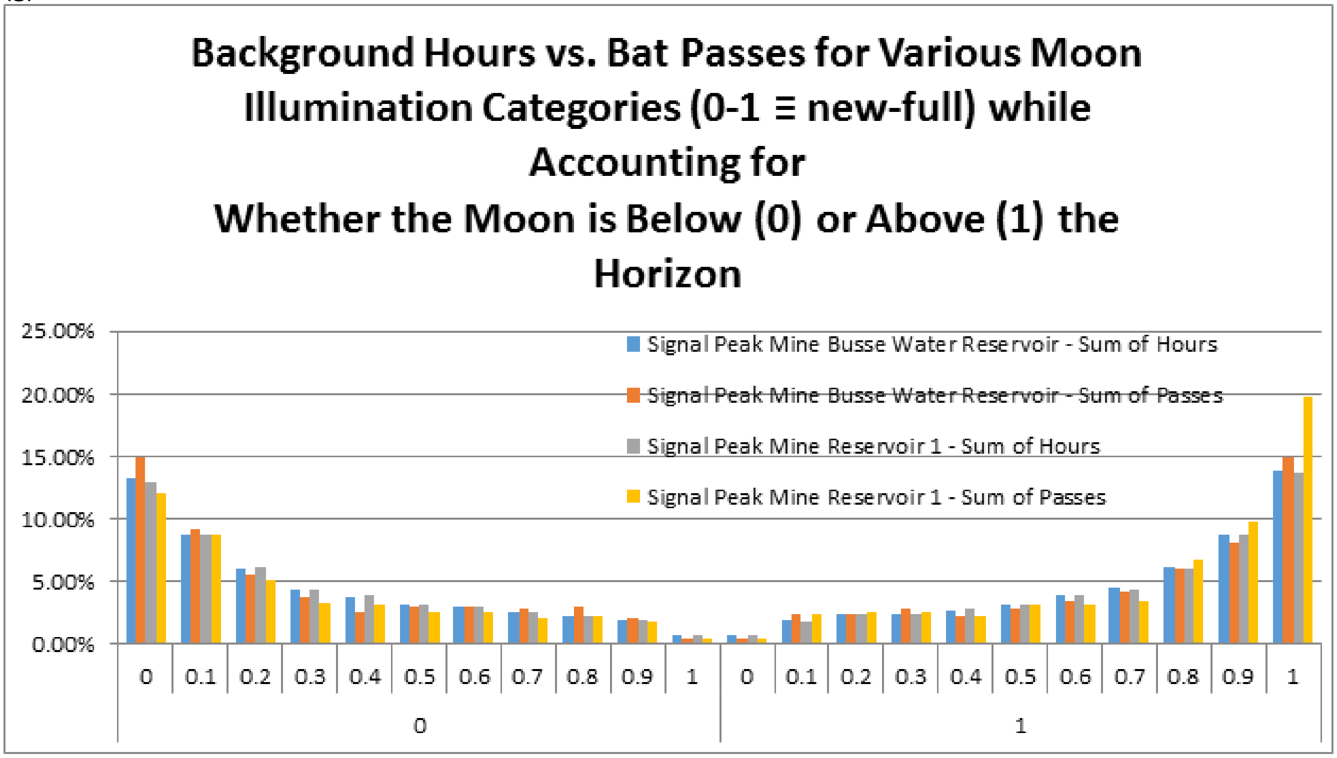
(e)


Background Hours vs. Bat Passes for Various Moon Illumination Categories (0-1 ≡ new-full) while Accounting for
Whether the Moon is Below (0) or Above (1) the Horizon
Absaloka Mine Spring 12 - Sum of Hours
Absaloka Mine Spring 12 - Sum of Passes
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1

(f)


Background Hours vs. Bat Passes for Various Moon Illumination Categories (0-1 ≡ new-full) while Accounting for
Whether the Moon is Below (0) or Above (1) the Horizon
Rosebud Coal Mine Area C Pond - Sum of Hours
Rosebud Coal Mine Area C Pond - Sum of Passes
Rosebud Coal Mine Area F Pond 7 - Sum of Hours
Rosebud Coal Mine Area F Pond 7 - Sum of Passes
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1

(g)



Background Hours vs. Bat Passes for Various Moon Illumination Categories (0-1 ≡ new-full) while Accounting for
Whether the Moon is Below (0) or Above (1) the Horizon
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Signal Peak Mine Busse Water Reservoir - Sum of Hours
Signal Peak Mine Busse Water Reservoir - Sum of Passes
Signal Peak Mine Reservoir 1 - Sum of Hours
Signal Peak Mine Reservoir 1 - Sum of Passes
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
1

Figure 23. Percent of background hours (blue) and hours with bat passes (red) associated with various moon illumination categories (0 = no illumination and 1 = full moon) and with the moon below or above the horizon across the regional network of detectors. Moon illumination values could be calculated for 100% of the 572,897 hours that detectors have been deployed.

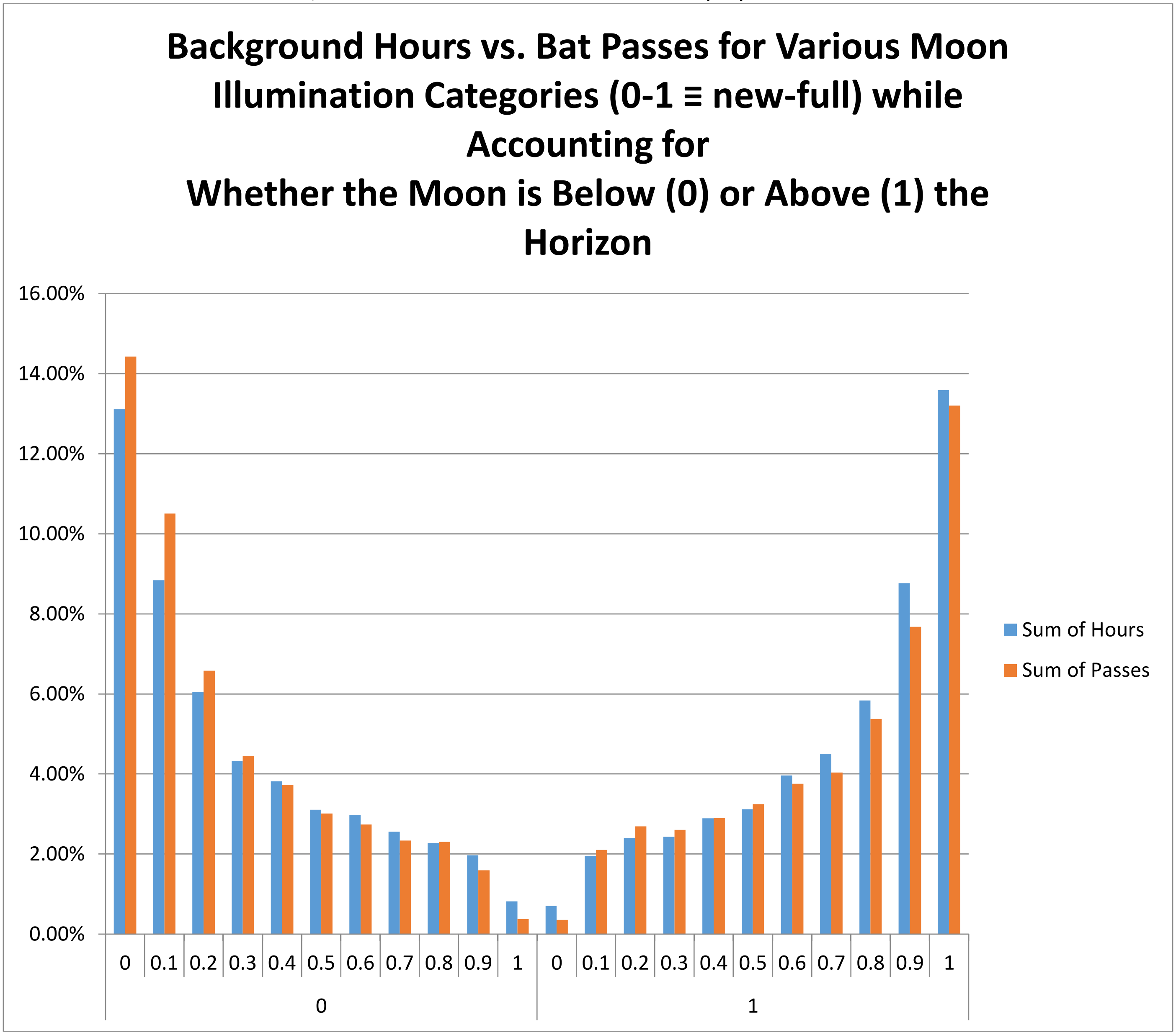
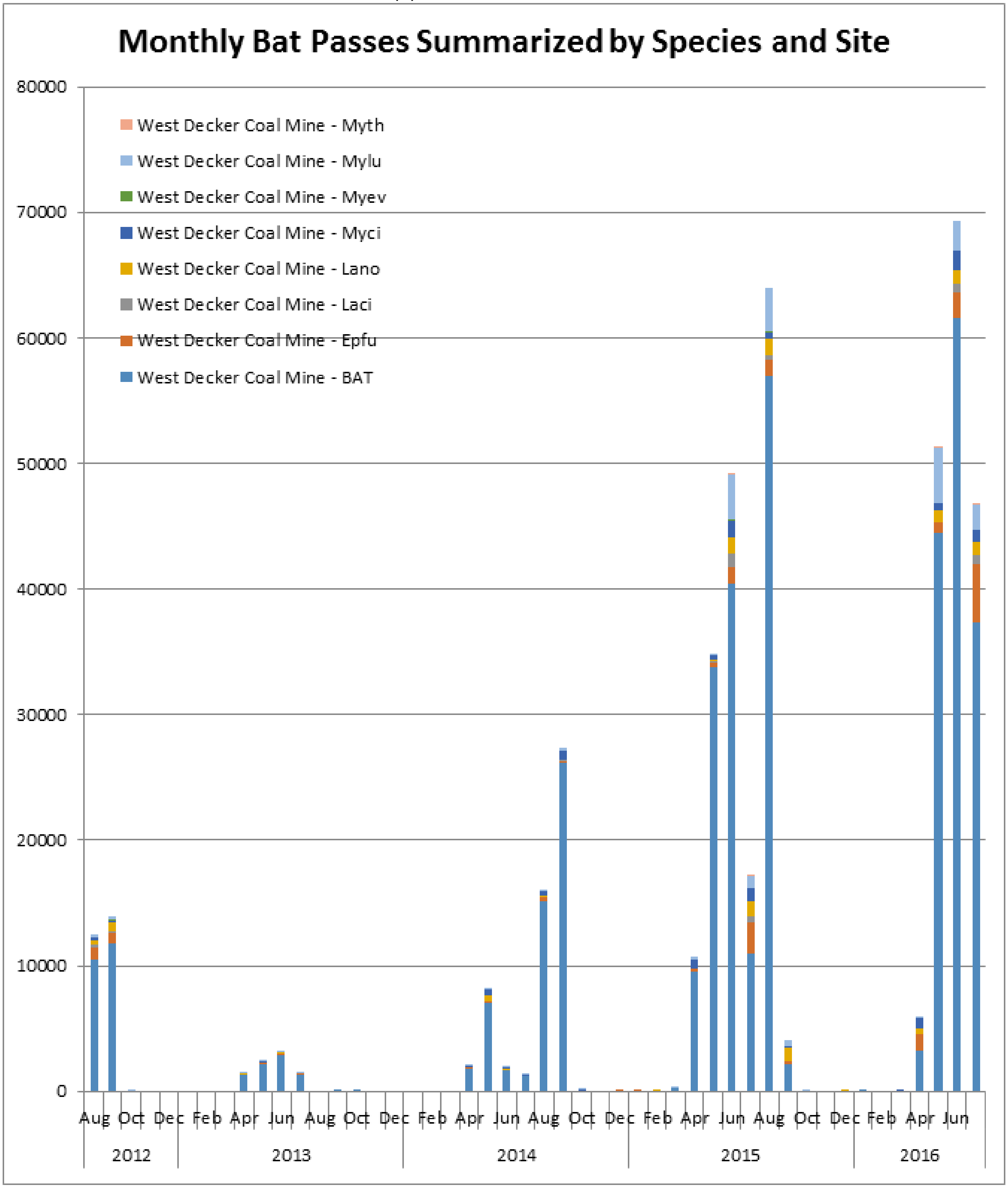
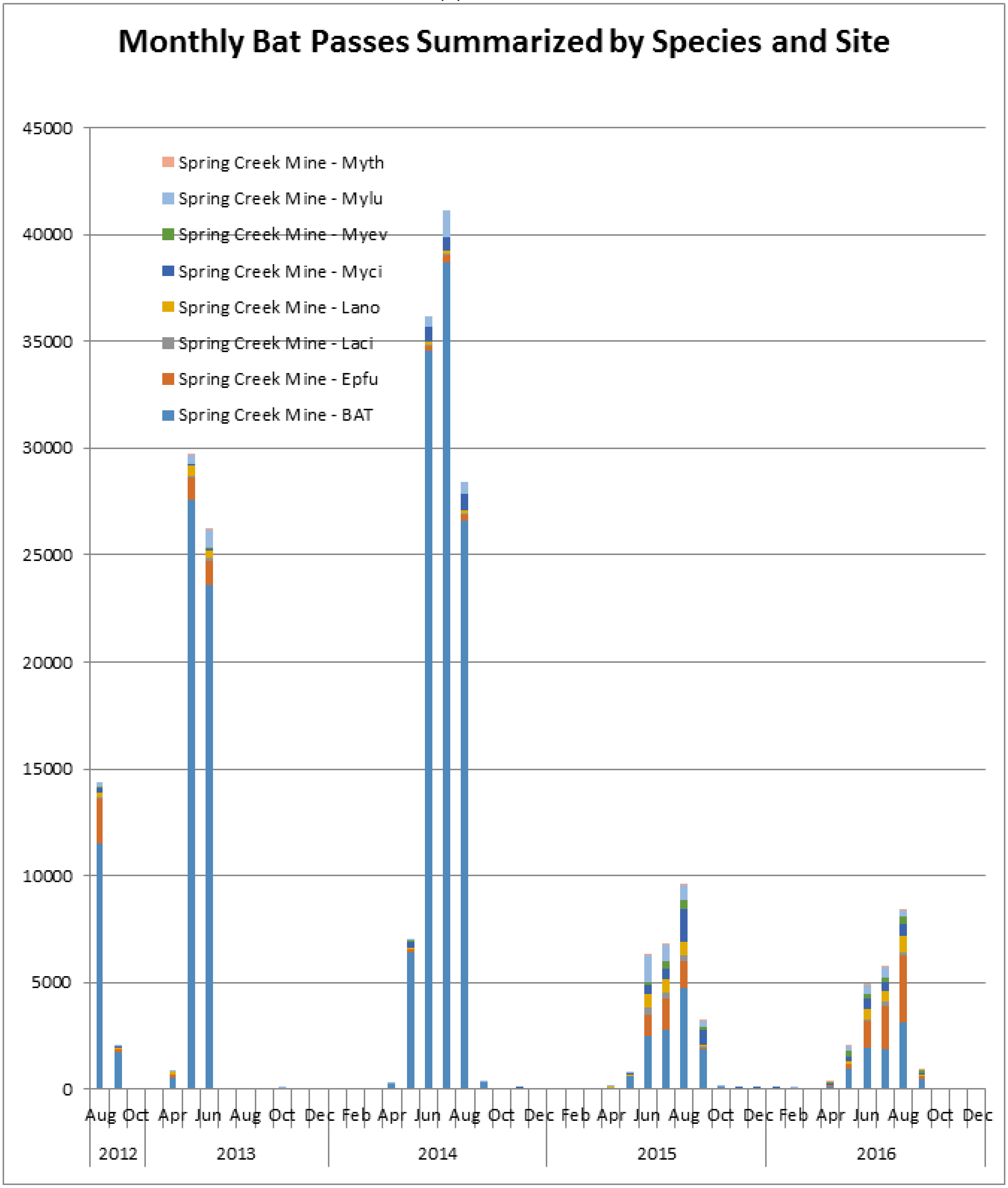


Figure 24. Average number of nightly bat passes each week auto-identified by species at: (a) West Decker Coal Mine, (b) Spring Creek Mine, (c) Otter Creek Coal Tract, (d) Big Sky Mine, (e) Absaloka Mine, (f) Rosebud Mine, (g) Signal Peak Mine. Numbers on X axis are years and weeks.

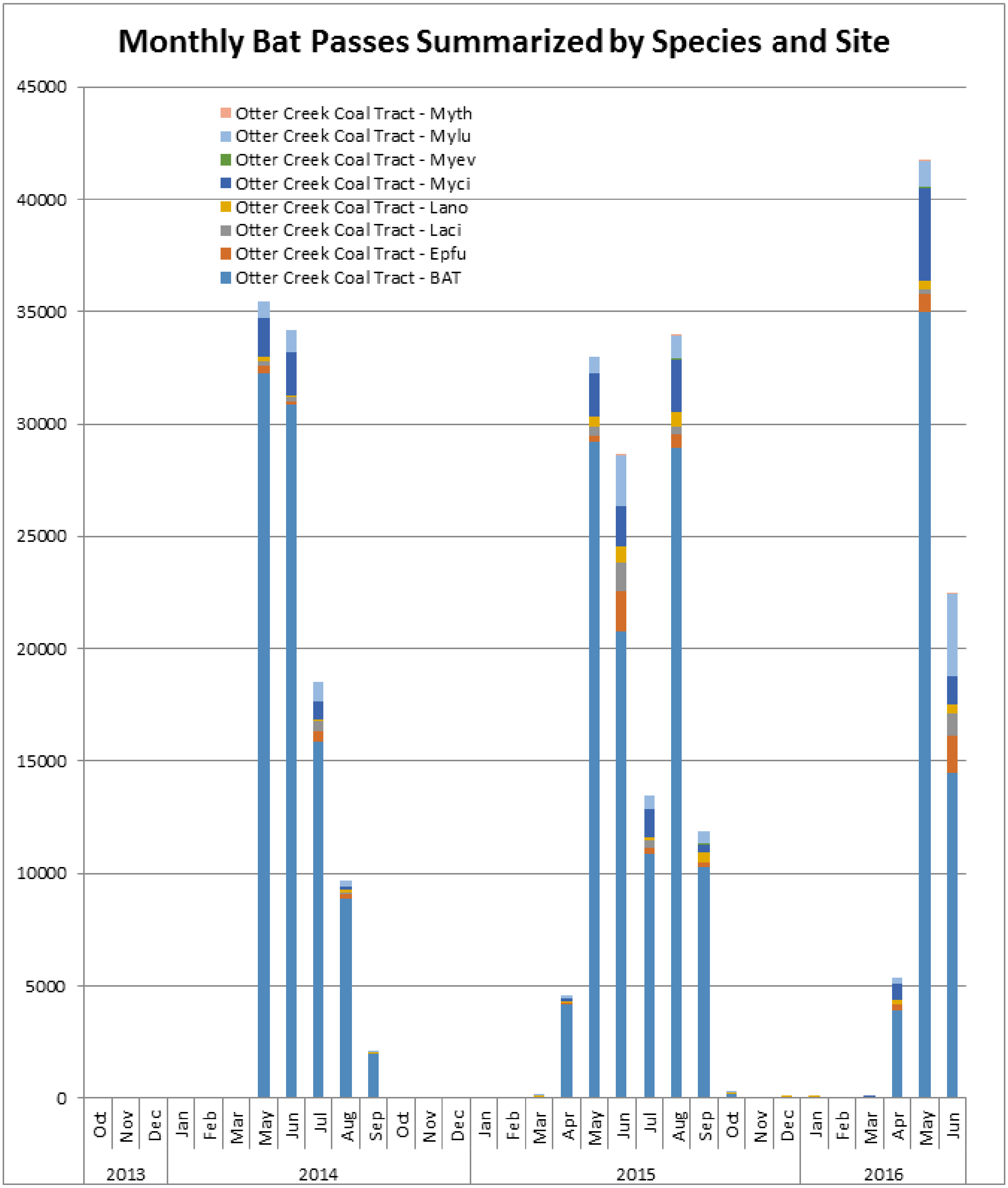
(a)



(b)

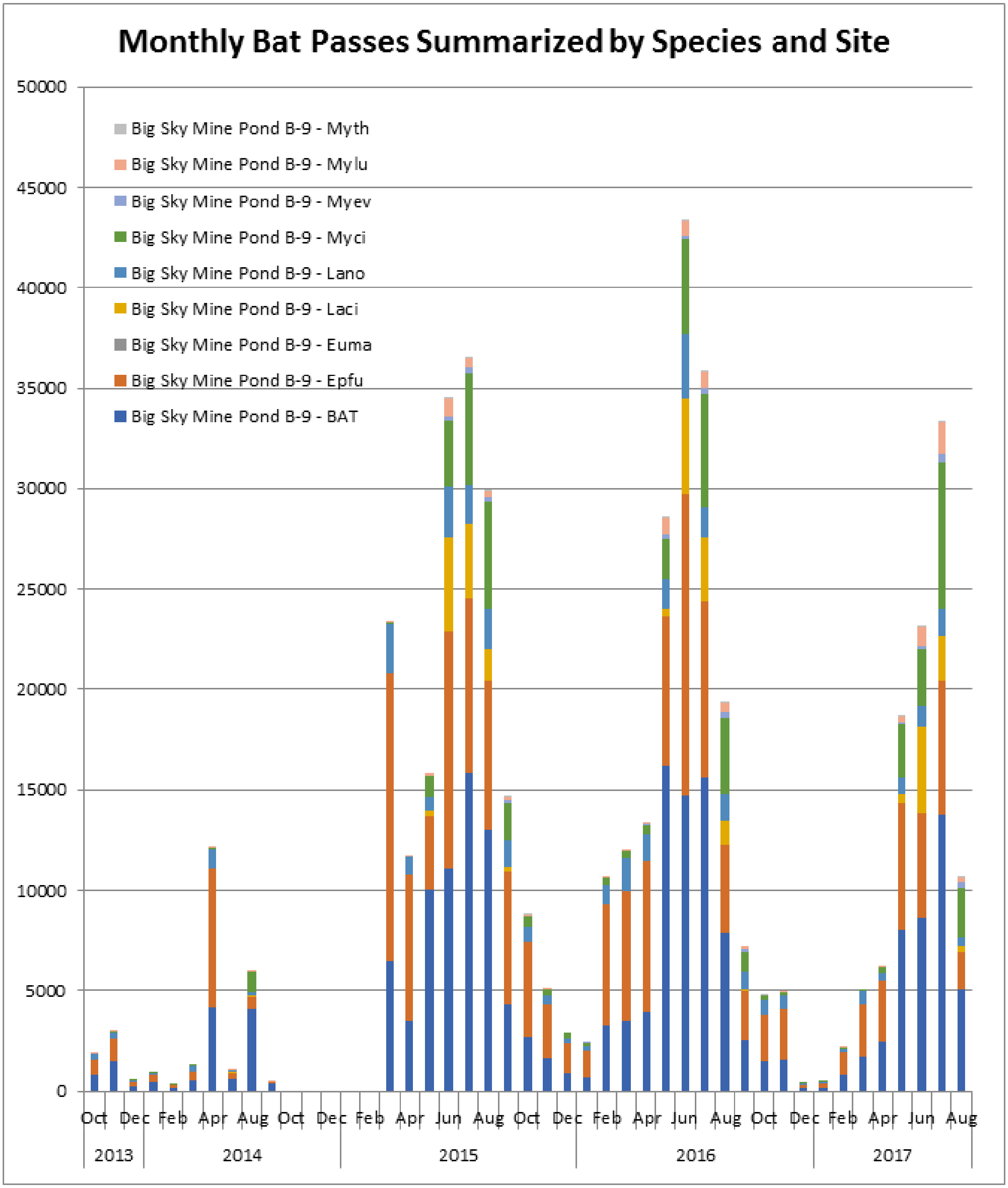

Monthly Bat Passes Summarized by Species and Site
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Spring Creek Mine - Myth
Spring Creek Mine - Mylu
Spring Creek Mine - Myev
Spring Creek Mine - Myci
Spring Creek Mine - Lano
Spring Creek Mine - Laci
Spring Creek Mine - Epfu
Spring Creek Mine - BAT
Aug Oct Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec
2012
2013
2014
2015
2016

(c)



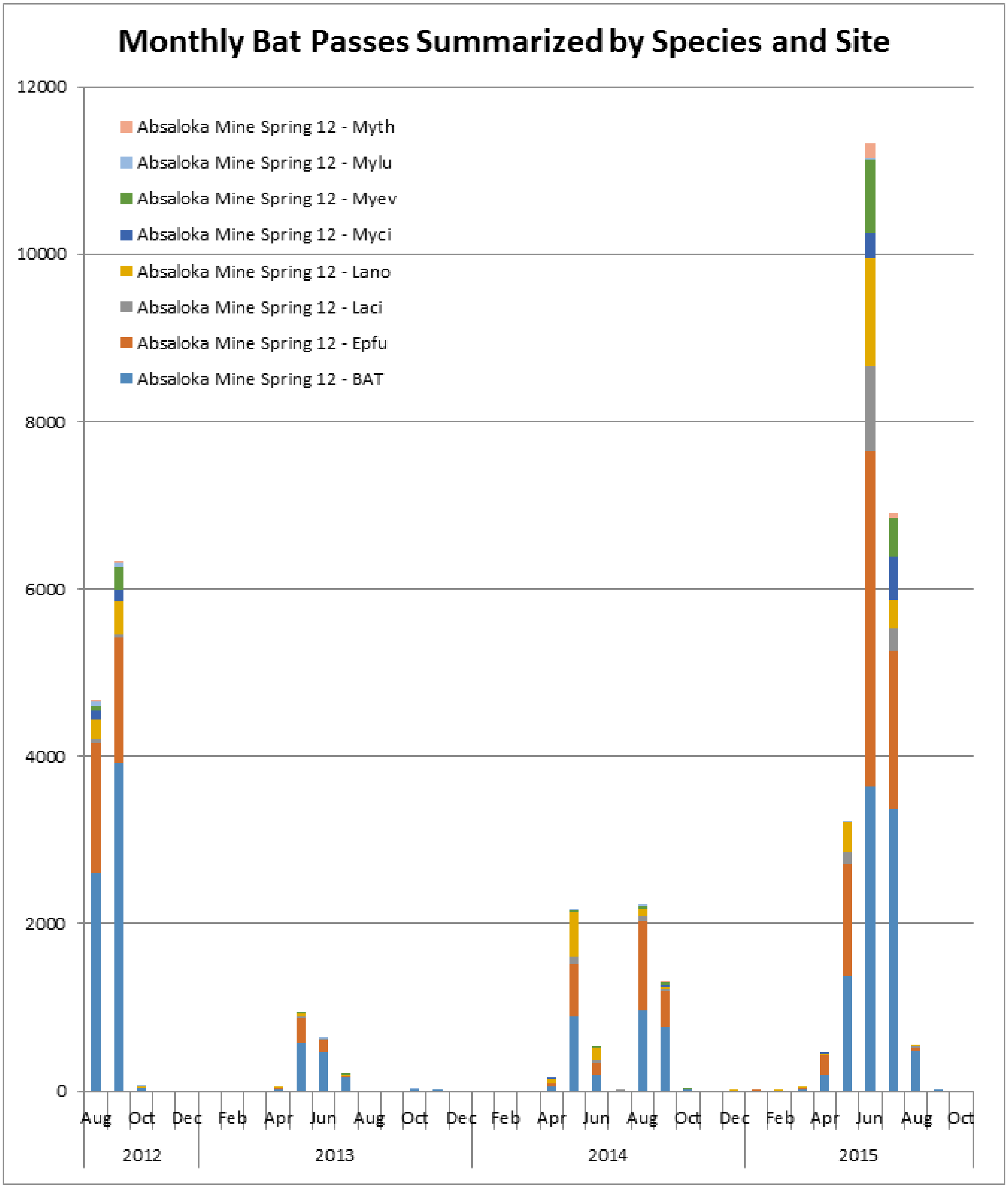
Monthly Bat Passes Summarized by Species and Site
Otter Creek Coal Tract - Myth
Otter Creek Coal Tract - Mylu
Otter Creek Coal Tract - Myev
Otter Creek Coal Tract - Myci
Otter Creek Coal Tract - Lano
Otter Creek Coal Tract - Laci
Otter Creek Coal Tract - Epfu
Otter Creek Coal Tract - BAT
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
2013
2014
2015
2016

(d)



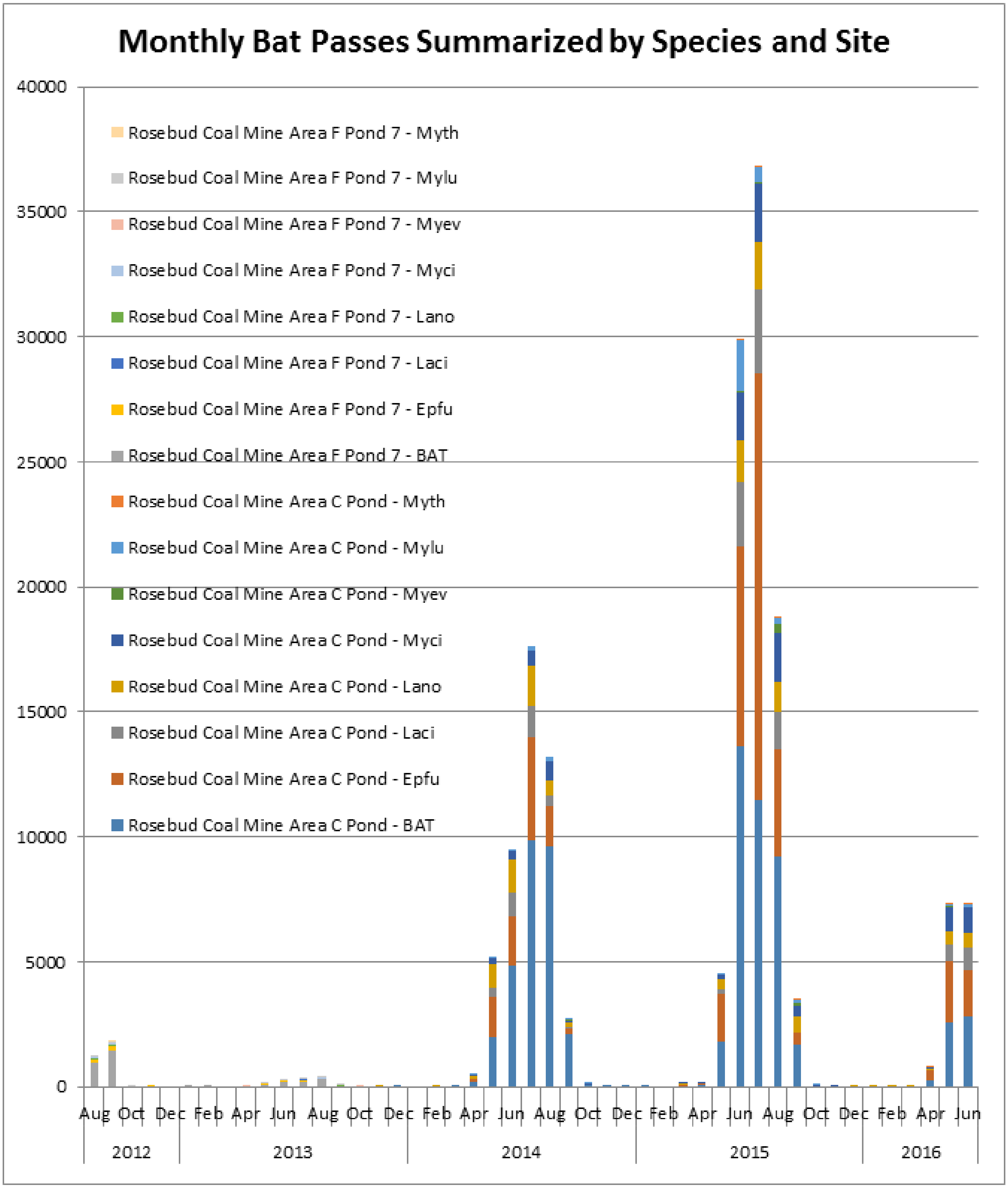
Monthly Bat Passes Summarized by Species and Site
Big Sky Mine Pond B-9 - Myth
Big Sky Mine Pond B-9 - Mylu
Big Sky Mine Pond B-9 - Myev
Big Sky Mine Pond B-9 - Myci
Big Sky Mine Pond B-9 - Lano
Big Sky Mine Pond B-9 - Laci
Big Sky Mine Pond B-9 - Euma
Big Sky Mine Pond B-9 - Epfu
Big Sky Mine Pond B-9 - BAT
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Oct
Dec
Feb
Apr
Jun
Aug
2013
2014
2015
2016
2017

(e)

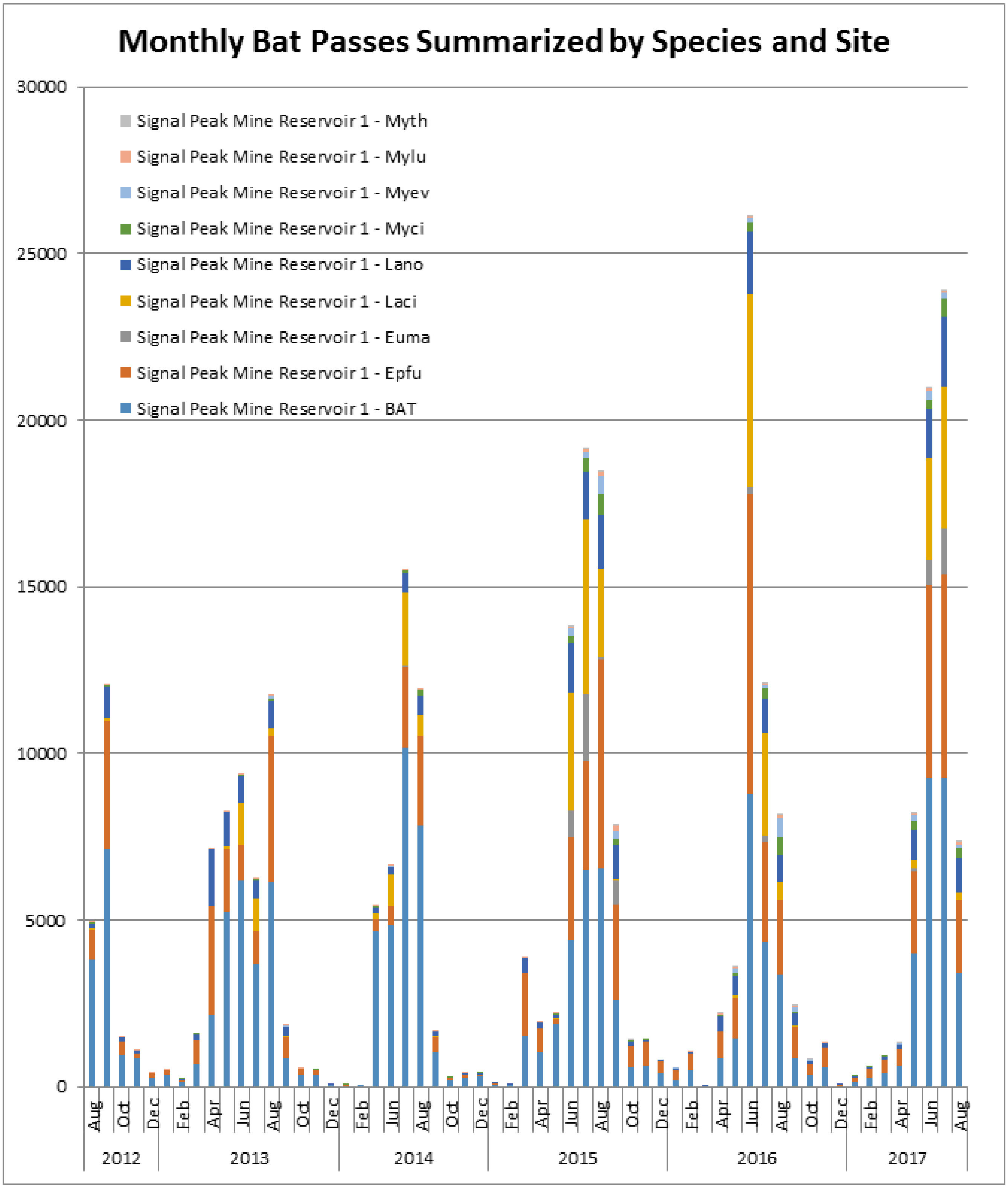


Monthly Bat Passes Summarized by Species and Site
12000
10000
8000
6000
4000
2000
0
Absaloka Mine Spring 12 - Myth
Absaloka Mine Spring 12 - Mylu
Absaloka Mine Spring 12 - Myev
Absaloka Mine Spring 12 - Myci
Absaloka Mine Spring 12 - Lano
Absaloka Mine Spring 12 - Laci
Absaloka Mine Spring 12 - Epfu
Absaloka Mine Spring 12 - BAT
Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct
2012
2013
2014
2015

(f)

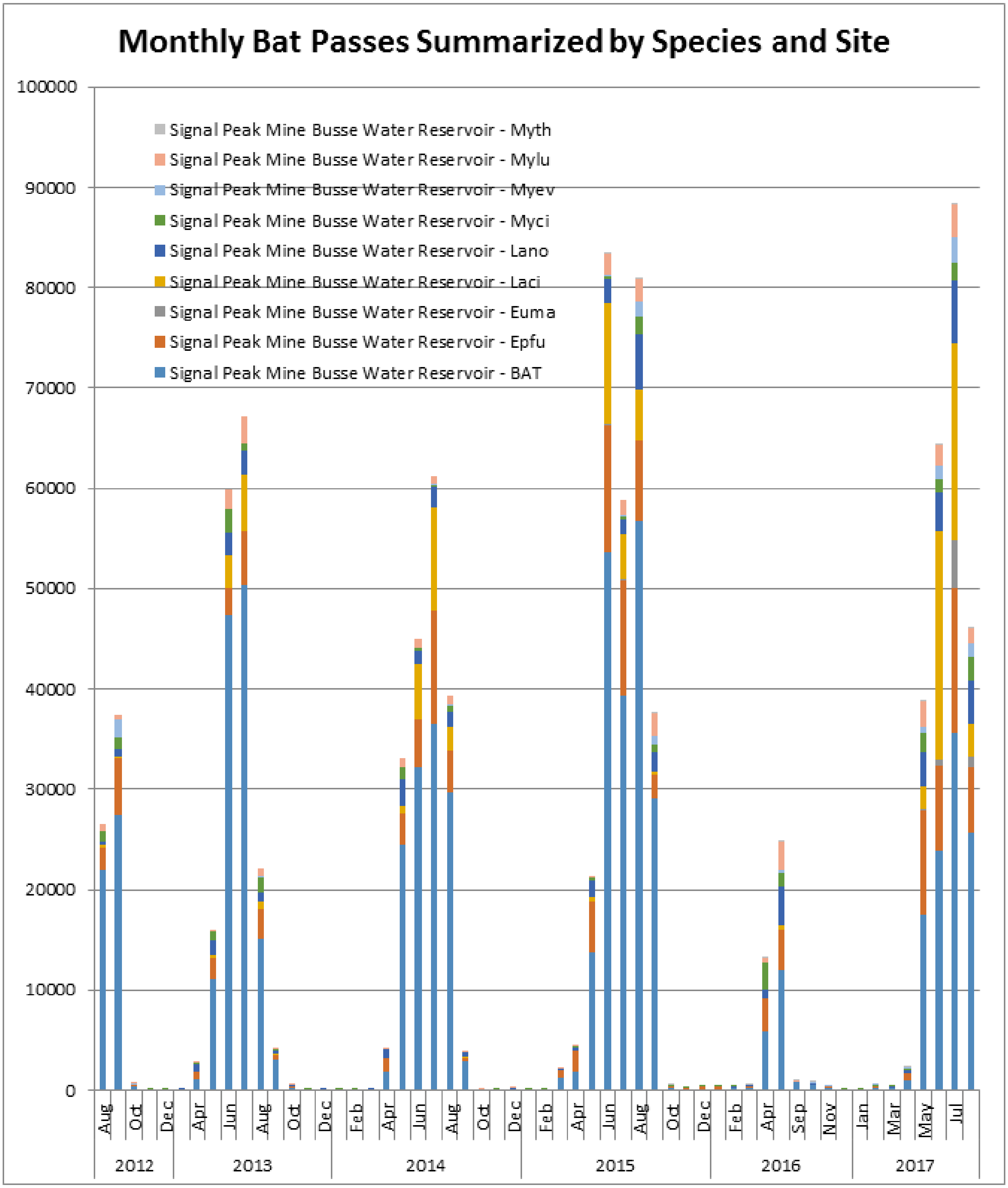


Monthly Bat Passes Summarized by Species and Site
40000
35000
30000
25000
20000
15000
10000
5000
0
Rosebud Coal Mine Area F Pond 7 - Myth
Rosebud Coal Mine Area F Pond 7 - Mylu
Rosebud Coal Mine Area F Pond 7 - Myev
Rosebud Coal Mine Area F Pond 7 - Myci
Rosebud Coal Mine Area F Pond 7 - Lano
Rosebud Coal Mine Area F Pond 7 - Laci
Rosebud Coal Mine Area F Pond 7 - Epfu
Rosebud Coal Mine Area F Pond 7 - BAT
Rosebud Coal Mine Area C Pond - Myth
Rosebud Coal Mine Area C Pond - Mylu
Rosebud Coal Mine Area C Pond - Myev
Rosebud Coal Mine Area C Pond - Myci
Rosebud Coal Mine Area C Pond - Lano
Rosebud Coal Mine Area C Pond - Laci
Rosebud Coal Mine Area C Pond - Epfu
Rosebud Coal Mine Area C Pond - BAT
Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun
2012
2013
2014
2015
2016



Monthly Bat Passes Summarized by Species and Site
30000
25000
20000
15000
10000
5000
0
Signal Peak Mine Reservoir 1 - Myth
Signal Peak Mine Reservoir 1 - Mylu
Signal Peak Mine Reservoir 1 - Myev
Signal Peak Mine Reservoir 1 - Myci
Signal Peak Mine Reservoir 1 - Lano
Signal Peak Mine Reservoir 1 - Laci
Signal Peak Mine Reservoir 1 - Euma
Signal Peak Mine Reservoir 1 - Epfu
Signal Peak Mine Reservoir 1 - BAT
Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug
2012
2013
2014
2015
2016
2017

(g)



Monthly Bat Passes Summarized by Species and Site
Signal Peak Mine Busse Water Reservoir - Myth
Signal Peak Mine Busse Water Reservoir - Mylu
Signal Peak Mine Busse Water Reservoir - Myev
Signal Peak Mine Busse Water Reservoir - Myci
Signal Peak Mine Busse Water Reservoir - Lano
Signal Peak Mine Busse Water Reservoir - Laci
Signal Peak Mine Busse Water Reservoir - Euma
Signal Peak Mine Busse Water Reservoir - Epfu
Signal Peak Mine Busse Water Reservoir - BAT
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Aug Oct Dec Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Jun Aug Oct Dec Feb Apr Sep Nov Jan Mar May Jul
2012 2013 2014 2015 2016 2017

Appendix A

References on Wind Turbine and other Human Structure Impacts on Bats

Compiled by Bryce A. Maxell, Senior Zoologist, Montana Natural Heritage Program

September 2015

An * in front of a citation, indicates the article has particular value for wind turbine impacts to bats and turbine management in Montana. Additional information on wind turbine impacts to bats and other wildlife can be found at the Wind-Wildlife Impacts Literature Database (WILD) at http://wild.nrel.gov

Ahlén, I. 2003. Wind turbines and bats—a pilot study. Uppsala, Sweden. http://publikationer.slu.se/Filer/08WindBatFinalReport.pdf

Anderson, R.L., D. Strickland, J. Tom, N. Neumann, W. Erickson, J. Cleckler, G. Mayorga, G. Nuhn, A. Leuders, J. Schneider, L. Backus, P. Becker and N. Flagg. 2000. Avian monitoring and risk assessment at Tehachapi Pass and San Gorgonio Pass wind resource areas, California: Phase 1 preliminary results. Proceedings of the National Avian-Wind Power Planning Meeting 3:31-46. National Wind Coordinating Committee, Washington, D.C.

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Appendix B

Bat Pass temperatures summarized by species and month for all project detectors

Location	Species	Year	Month	Bat Pass Temp C Avg (SD) N	Bat Pass Min Temp C	Bat Pass Max Temp C
Absaloka Mine Spring 12	Epfu	2012	8	17.2 (4.4) 1446	2.4	26.2
Absaloka Mine Spring 12	Epfu	2012	9	16.5 (4.7) 1616	1.6	24.7
Absaloka Mine Spring 12	Epfu	2012	10	14 (4.3) 8	9.2	18.3
Absaloka Mine Spring 12	Epfu	2013	4	9.6 (3.1) 14	5.4	13.6
Absaloka Mine Spring 12	Epfu	2013	5	15.1 (3.4) 302	5.5	19.1
Absaloka Mine Spring 12	Epfu	2013	6	17.6 (3.6) 105	8.4	25.2
Absaloka Mine Spring 12	Epfu	2013	10	8.7 (0.7) 2	8.2	9.2
Absaloka Mine Spring 12	Epfu	2014	4	12.2 (5.6) 40	-0.1	18.6
Absaloka Mine Spring 12	Epfu	2014	5	16.1 (4.6) 472	2.2	27.2
Absaloka Mine Spring 12	Epfu	2014	6	14.1 (2) 277	7.7	19.1
Absaloka Mine Spring 12	Epfu	2014	8	12.4 (2.6) 981	7.5	22.4
Absaloka Mine Spring 12	Epfu	2014	9	13.8 (4.2) 496	1.3	22.2
Absaloka Mine Spring 12	Epfu	2014	12	0.7 (0.6) 2	0.3	1.1
Absaloka Mine Spring 12	Epfu	2015	1	1.1 () 1	1.1	1.1
Absaloka Mine Spring 12	Epfu	2015	3	10.2 (4.5) 19	0.9	16
Absaloka Mine Spring 12	Epfu	2015	4	9.1 (4.5) 232	0.6	17
Absaloka Mine Spring 12	Epfu	2015	5	13.4 (3.1) 882	2.1	19.1
Absaloka Mine Spring 12	Epfu	2015	6	16.8 (2.9) 549	10.3	22.6
Absaloka Mine Spring 12	Epfu	2015	6	18.9 (3.8) 3670	8.4	29
Absaloka Mine Spring 12	Epfu	2015	7	17.8 (3.7) 2147	10.7	29.7
Absaloka Mine Spring 12	Epfu	2015	8	23.5 (4.3) 35	12.7	28.9
Absaloka Mine Spring 12	Laci	2012	8	17.2 (5.4) 37	5.7	24.4
Absaloka Mine Spring 12	Laci	2012	9	13.1 (5.5) 53	-0.1	20.4
Absaloka Mine Spring 12	Laci	2013	4	6 (0) 2	6	6
Absaloka Mine Spring 12	Laci	2013	5	16 (3.7) 8	7.9	18.9
Absaloka Mine Spring 12	Laci	2013	6	15.9 (2.7) 9	12.2	20.4
Absaloka Mine Spring 12	Laci	2014	4	13.1 (6.3) 4	6.4	18.6
Absaloka Mine Spring 12	Laci	2014	5	15.9 (4.3) 77	9	26.4
Absaloka Mine Spring 12	Laci	2014	6	13.4 (2.3) 64	4.6	18.6
Absaloka Mine Spring 12	Laci	2014	7	19.6 () 1	19.6	19.6
Absaloka Mine Spring 12	Laci	2014	8	14.3 (2.6) 57	7.5	17.6
Absaloka Mine Spring 12	Laci	2014	9	10.4 (5.2) 32	0.8	21.9
Absaloka Mine Spring 12	Laci	2015	3	9.1 (5.2) 11	2.4	15.1
Absaloka Mine Spring 12	Laci	2015	4	8.7 (4.6) 64	-1.6	16.3
Absaloka Mine Spring 12	Laci	2015	5	13.1 (3) 145	2.7	18.9

Absaloka Mine Spring 12	Laci	2015	6	17.8 (1.2) 28	15	19.6
Absaloka Mine Spring 12	Laci	2015	6	18.7 (3.3) 949	9.4	29
Absaloka Mine Spring 12	Laci	2015	7	18.4 (3.8) 305	10.7	29.7
Absaloka Mine Spring 12	Laci	2015	8	17.8 (3.2) 3	14.1	19.9
Absaloka Mine Spring 12	Lano	2012	8	18.1 (4.5) 232	3.6	25.7
Absaloka Mine Spring 12	Lano	2012	9	10.6 (5.2) 402	-1.8	24.1
Absaloka Mine Spring 12	Lano	2012	10	8.8 (2.5) 4	6.9	12.2
Absaloka Mine Spring 12	Lano	2013	4	6 () 1	6	6
Absaloka Mine Spring 12	Lano	2013	5	14.4 (3.5) 34	4.6	18.9
Absaloka Mine Spring 12	Lano	2013	6	17.9 (5.5) 3	11.7	22.2
Absaloka Mine Spring 12	Lano	2014	4	11.1 (5.4) 55	1.9	18.6
Absaloka Mine Spring 12	Lano	2014	5	14.1 (4.9) 394	4.1	27.2
Absaloka Mine Spring 12	Lano	2014	6	13.4 (2.3) 281	4.4	19.1
Absaloka Mine Spring 12	Lano	2014	8	14.3 (2.3) 64	8.2	18.1
Absaloka Mine Spring 12	Lano	2014	9	9.2 (4.6) 60	-0.8	17.9
Absaloka Mine Spring 12	Lano	2014	10	10.5 (0) 2	10.5	10.5
Absaloka Mine Spring 12	Lano	2014	12	3.4 (0) 2	3.4	3.4
Absaloka Mine Spring 12	Lano	2015	2	2.1 () 1	2.1	2.1
Absaloka Mine Spring 12	Lano	2015	3	15.6 () 1	15.6	15.6
Absaloka Mine Spring 12	Lano	2015	4	10.4 (4.3) 29	2.6	16.1
Absaloka Mine Spring 12	Lano	2015	5	13.6 (3.1) 183	2.1	19.3
Absaloka Mine Spring 12	Lano	2015	6	17 (2.4) 187	11	21.9
Absaloka Mine Spring 12	Lano	2015	6	18 (3.3) 1201	8.4	29
Absaloka Mine Spring 12	Lano	2015	7	17.7 (3.5) 406	10.7	29.7
Absaloka Mine Spring 12	Lano	2015	8	27.1 (1.6) 2	26	28.2
Absaloka Mine Spring 12	Myci	2012	8	19.5 (4.1) 94	7.9	25.5
Absaloka Mine Spring 12	Myci	2012	9	19.7 (4.3) 141	6	24.1
Absaloka Mine Spring 12	Myci	2012	10	15.9 (3.8) 3	11.5	18.4
Absaloka Mine Spring 12	Myci	2013	6	16.9 (2.8) 4	14.3	20.8
Absaloka Mine Spring 12	Myci	2013	10	12.3 (0) 3	12.3	12.3
Absaloka Mine Spring 12	Myci	2014	4	16.9 (1.1) 3	15.6	17.6
Absaloka Mine Spring 12	Myci	2014	5	15.6 () 1	15.6	15.6
Absaloka Mine Spring 12	Myci	2014	6	13.7 (3.5) 2	11.2	16.1
Absaloka Mine Spring 12	Myci	2014	8	16.8 (1.3) 7	14.1	17.9
Absaloka Mine Spring 12	Myci	2014	9	16.2 (3) 14	12.5	21.4
Absaloka Mine Spring 12	Myci	2015	4	10.3 () 1	10.3	10.3
Absaloka Mine Spring 12	Myci	2015	5	17.6 () 1	17.6	17.6
Absaloka Mine Spring 12	Myci	2015	6	18.8 () 1	18.8	18.8
Absaloka Mine Spring 12	Myci	2015	6	22 (4.2) 282	10.3	29
Absaloka Mine Spring 12	Myci	2015	7	21.3 (2.9) 539	13.3	29
Absaloka Mine Spring 12	Myev	2012	8	17.4 (3.8) 56	11.7	24.1
Absaloka Mine Spring 12	Myev	2012	9	10.5 (4.8) 266	0.4	23.9
Absaloka Mine Spring 12	Myev	2012	10	-1.3 () 1	-1.3	-1.3
Absaloka Mine Spring 12	Myev	2013	5	11.3 (1.8) 2	10	12.5

Absaloka Mine Spring 12	Myev	2013	6	18.4 (1.7) 4	16.8	19.9
Absaloka Mine Spring 12	Myev	2014	5	10.4 (0.4) 2	10.2	10.7
Absaloka Mine Spring 12	Myev	2014	6	13 () 1	13	13
Absaloka Mine Spring 12	Myev	2014	8	16.4 (1.3) 33	9.4	17.8
Absaloka Mine Spring 12	Myev	2014	9	11.9 (5.9) 34	-0.1	18.1
Absaloka Mine Spring 12	Myev	2014	10	11.7 (0.9) 2	11	12.3
Absaloka Mine Spring 12	Myev	2015	5	14.7 (4.8) 2	11.3	18.1
Absaloka Mine Spring 12	Myev	2015	6	20.6 (3.8) 590	12.5	29
Absaloka Mine Spring 12	Myev	2015	7	20.3 (2.4) 739	12.2	28.5
Absaloka Mine Spring 12	Mylu	2012	8	15.8 (3.7) 56	12.3	22.7
Absaloka Mine Spring 12	Mylu	2012	9	19.8 (5.9) 66	-0.5	23.4
Absaloka Mine Spring 12	Mylu	2012	10	18.4 () 1	18.4	18.4
Absaloka Mine Spring 12	Mylu	2013	6	15 () 1	15	15
Absaloka Mine Spring 12	Mylu	2013	10	12.2 () 1	12.2	12.2
Absaloka Mine Spring 12	Mylu	2014	5	11.7 (2.3) 8	10.2	17.1
Absaloka Mine Spring 12	Mylu	2014	8	15.9 (2) 3	13.6	17.4
Absaloka Mine Spring 12	Mylu	2014	9	16.3 (3.5) 6	10	19.9
Absaloka Mine Spring 12	Mylu	2015	5	12.7 (3.7) 4	9.8	17.6
Absaloka Mine Spring 12	Mylu	2015	6	20.7 (4.3) 20	13.5	26.7
Absaloka Mine Spring 12	Mylu	2015	7	23.6 (0.6) 6	22.9	24.2
Absaloka Mine Spring 12	Myth	2012	8	19.2 (4.6) 5	13	25.1
Absaloka Mine Spring 12	Myth	2012	9	18.3 (3.9) 5	13	22.1
Absaloka Mine Spring 12	Myth	2014	9	14.9 (3.2) 6	11.8	20.9
Absaloka Mine Spring 12	Myth	2015	6	20.6 (4.1) 168	8.5	29
Absaloka Mine Spring 12	Myth	2015	7	18.7 (3) 56	14.3	25.5
Big Sky Mine Pond B-9	Epfu	2013	10	9.7 (3.3) 720	0	15
Big Sky Mine Pond B-9	Epfu	2013	11	3.5 (3.3) 1113	-2.9	11
Big Sky Mine Pond B-9	Epfu	2013	12	5.6 (2.7) 237	0	12.3
Big Sky Mine Pond B-9	Epfu	2014	1	5.6 (2.7) 307	-2.6	11.5
Big Sky Mine Pond B-9	Epfu	2014	2	4.9 (2) 124	0.8	10.3
Big Sky Mine Pond B-9	Epfu	2014	3	8.5 (4.6) 448	-1.1	15.1
Big Sky Mine Pond B-9	Epfu	2014	4	12.9 (4.4) 6951	0.6	22.1
Big Sky Mine Pond B-9	Epfu	2014	5	12.5 (0.8) 283	9.7	14.5
Big Sky Mine Pond B-9	Epfu	2014	7	18.4 (3.9) 56	13.3	23.4
Big Sky Mine Pond B-9	Epfu	2014	8	19.2 (4) 548	13.3	29.8
Big Sky Mine Pond B-9	Epfu	2014	9	14.1 (3) 62	9.7	21.4
Big Sky Mine Pond B-9	Epfu	2015	3	12.3 (4.5) 14296	-0.1	22.1
Big Sky Mine Pond B-9	Epfu	2015	4	12.5 (4.1) 7490	-1.3	19.1
Big Sky Mine Pond B-9	Epfu	2015	5	14.5 (3.7) 3006	4.9	21.9
Big Sky Mine Pond B-9	Epfu	2015	6	18.6 (2.5) 1536	12.5	25.9
Big Sky Mine Pond B-9	Epfu	2015	6	21 (3.5) 10169	11.3	30.5
Big Sky Mine Pond B-9	Epfu	2015	7	19.9 (3.1) 10342	12.5	30.7
Big Sky Mine Pond B-9	Epfu	2015	8	19.5 (2.9) 5006	8.9	30.2
Big Sky Mine Pond B-9	Epfu	2015	9	21.1 (3.7) 7945	8.5	29.3

Big Sky Mine Pond B-9	Epfu	2015	10	15.7 (4.9) 4269	0.3	23.4
Big Sky Mine Pond B-9	Epfu	2015	11	7 (3.9) 2985	-1.3	17.4
Big Sky Mine Pond B-9	Epfu	2015	12	6.5 (4.4) 1589	-3.9	17.3
Big Sky Mine Pond B-9	Epfu	2016	1	6.4 (3.4) 1335	-4.9	14.3
Big Sky Mine Pond B-9	Epfu	2016	2	6.5 (3) 5479	-1.8	15.8
Big Sky Mine Pond B-9	Epfu	2016	3	9 (3.4) 7043	-0.3	17.1
Big Sky Mine Pond B-9	Epfu	2016	4	13 (3.1) 7616	0.3	19.4
Big Sky Mine Pond B-9	Epfu	2016	5	15.9 (2.7) 6844	4.4	24.6
Big Sky Mine Pond B-9	Epfu	2016	6	20.1 (4) 15390	10.8	32
Big Sky Mine Pond B-9	Epfu	2016	7	21.4 (3.8) 9213	12	34.6
Big Sky Mine Pond B-9	Epfu	2016	8	19.7 (3.7) 3914	10.7	32.3
Big Sky Mine Pond B-9	Epfu	2016	9	19.3 (3.5) 2719	9.2	30.3
Big Sky Mine Pond B-9	Epfu	2016	10	12.2 (4.5) 1939	2.1	22.7
Big Sky Mine Pond B-9	Epfu	2016	11	10.3 (3) 1938	2.6	19.8
Big Sky Mine Pond B-9	Euma	2015	6	23.6 () 1	23.6	23.6
Big Sky Mine Pond B-9	Laci	2013	10	10.2 (3.9) 81	0	15
Big Sky Mine Pond B-9	Laci	2013	11	2.3 (3.4) 236	-2.9	10
Big Sky Mine Pond B-9	Laci	2013	12	5.3 (2.3) 15	1.6	9.2
Big Sky Mine Pond B-9	Laci	2014	1	4.9 (2.9) 35	-0.6	10.5
Big Sky Mine Pond B-9	Laci	2014	2	4.6 (1.6) 15	2.2	8
Big Sky Mine Pond B-9	Laci	2014	3	7.4 (4.7) 55	-0.6	14.3
Big Sky Mine Pond B-9	Laci	2014	4	10.1 (4.4) 532	1.1	22.1
Big Sky Mine Pond B-9	Laci	2014	5	11.3 (2.4) 41	4.7	14.3
Big Sky Mine Pond B-9	Laci	2014	7	16.3 (5.1) 3	13.2	22.2
Big Sky Mine Pond B-9	Laci	2014	8	16.4 (2.8) 80	12.3	26
Big Sky Mine Pond B-9	Laci	2014	9	11.7 (1.4) 3	10	12.5
Big Sky Mine Pond B-9	Laci	2015	3	10.7 (4.7) 701	-0.1	21.2
Big Sky Mine Pond B-9	Laci	2015	4	9.3 (4.9) 212	-1.3	18.1
Big Sky Mine Pond B-9	Laci	2015	5	16 (4.2) 199	6	21.1
Big Sky Mine Pond B-9	Laci	2015	6	18.4 (3) 453	12.5	26.4
Big Sky Mine Pond B-9	Laci	2015	6	21.2 (3.5) 4081	11.8	30.5
Big Sky Mine Pond B-9	Laci	2015	7	19.6 (3.8) 4218	12.7	31.3
Big Sky Mine Pond B-9	Laci	2015	8	17.8 (2.1) 1266	7.2	29.5
Big Sky Mine Pond B-9	Laci	2015	9	19.9 (4.5) 254	8.7	29.3
Big Sky Mine Pond B-9	Laci	2015	10	12.9 (5.6) 200	2.2	23.1
Big Sky Mine Pond B-9	Laci	2015	11	5.1 (3.6) 176	-0.8	14.5
Big Sky Mine Pond B-9	Laci	2015	12	3.6 (3.9) 105	-1.1	14.3
Big Sky Mine Pond B-9	Laci	2016	1	6.5 (3.8) 73	-4.8	11.8
Big Sky Mine Pond B-9	Laci	2016	2	4.9 (2.7) 347	-1.3	11.8
Big Sky Mine Pond B-9	Laci	2016	3	6.3 (3.6) 373	-1.6	16.1
Big Sky Mine Pond B-9	Laci	2016	4	12.4 (3.6) 445	0.6	19.3
Big Sky Mine Pond B-9	Laci	2016	5	15.8 (4) 316	7.5	24.6
Big Sky Mine Pond B-9	Laci	2016	6	19.3 (4.3) 4843	10.7	32.2
Big Sky Mine Pond B-9	Laci	2016	7	20.6 (3.8) 3294	11.7	34.6

Big Sky Mine Pond B-9	Laci	2016	8	17.2 (2.1) 1121	10.3	32.3
Big Sky Mine Pond B-9	Laci	2016	9	18 (2.3) 110	11	23.9
Big Sky Mine Pond B-9	Laci	2016	10	12.3 (4.1) 102	5.4	22.4
Big Sky Mine Pond B-9	Laci	2016	11	8.8 (2.9) 110	2.6	15
Big Sky Mine Pond B-9	Lano	2013	10	8.6 (3.6) 235	0	15
Big Sky Mine Pond B-9	Lano	2013	11	1.8 (3.1) 309	-4.1	10.7
Big Sky Mine Pond B-9	Lano	2013	12	3.7 (2.3) 88	-0.5	10.2
Big Sky Mine Pond B-9	Lano	2014	1	3.9 (3.5) 83	-2.6	11
Big Sky Mine Pond B-9	Lano	2014	2	3.7 (1.1) 36	2.2	5.4
Big Sky Mine Pond B-9	Lano	2014	3	10.1 (3.9) 332	-0.6	14.8
Big Sky Mine Pond B-9	Lano	2014	4	9.9 (3.8) 997	1.9	22.1
Big Sky Mine Pond B-9	Lano	2014	5	12.1 (1.2) 65	4.7	14.5
Big Sky Mine Pond B-9	Lano	2014	7	16.1 (3.2) 26	13.3	22.4
Big Sky Mine Pond B-9	Lano	2014	8	16.7 (3.6) 154	13.3	28.7
Big Sky Mine Pond B-9	Lano	2014	9	13.8 (2.3) 14	10.2	17.3
Big Sky Mine Pond B-9	Lano	2015	3	10.4 (3.7) 2427	-0.1	22.1
Big Sky Mine Pond B-9	Lano	2015	4	10.4 (3.2) 881	-0.6	18.6
Big Sky Mine Pond B-9	Lano	2015	5	14.1 (4.1) 627	5.2	21.9
Big Sky Mine Pond B-9	Lano	2015	6	18.4 (2.6) 466	12.3	24.9
Big Sky Mine Pond B-9	Lano	2015	6	20.6 (3.3) 2045	11.8	30.2
Big Sky Mine Pond B-9	Lano	2015	7	19.4 (3.1) 2289	12.5	30.7
Big Sky Mine Pond B-9	Lano	2015	8	18.3 (3) 1478	5.5	27.4
Big Sky Mine Pond B-9	Lano	2015	9	17.8 (3.8) 1621	8.4	28.7
Big Sky Mine Pond B-9	Lano	2015	10	15.2 (4.5) 733	2.2	23.2
Big Sky Mine Pond B-9	Lano	2015	11	4.9 (3.8) 504	-1.5	16.8
Big Sky Mine Pond B-9	Lano	2015	12	3.6 (4.1) 286	-4.1	16.8
Big Sky Mine Pond B-9	Lano	2016	1	5.5 (3.8) 182	-4.8	13.3
Big Sky Mine Pond B-9	Lano	2016	2	5.3 (3.1) 792	-2.1	14.1
Big Sky Mine Pond B-9	Lano	2016	3	8.7 (3.8) 1837	-1.6	16.5
Big Sky Mine Pond B-9	Lano	2016	4	12.1 (3.4) 1388	0.3	19.1
Big Sky Mine Pond B-9	Lano	2016	5	15.4 (3.2) 1371	4.4	24.4
Big Sky Mine Pond B-9	Lano	2016	6	19.7 (3.8) 3311	10.8	31.7
Big Sky Mine Pond B-9	Lano	2016	7	20.5 (3.5) 1545	12	33.6
Big Sky Mine Pond B-9	Lano	2016	8	17.5 (2.8) 1201	10	30.8
Big Sky Mine Pond B-9	Lano	2016	9	16.6 (3.3) 949	8.5	29.8
Big Sky Mine Pond B-9	Lano	2016	10	11.7 (4.6) 540	3.2	22.7
Big Sky Mine Pond B-9	Lano	2016	11	9 (3.6) 557	2.6	17.6
Big Sky Mine Pond B-9	Myci	2013	10	5.7 (1.7) 3	4.1	7.4
Big Sky Mine Pond B-9	Myci	2013	11	2.4 (4.1) 28	-3.9	12
Big Sky Mine Pond B-9	Myci	2013	12	6 (1.8) 5	3.6	8.4
Big Sky Mine Pond B-9	Myci	2014	1	4.3 (3.5) 11	-1	8.9
Big Sky Mine Pond B-9	Myci	2014	2	4.3 (1.1) 11	2.1	5.1
Big Sky Mine Pond B-9	Myci	2014	3	4.7 (2.8) 8	0.3	7.2
Big Sky Mine Pond B-9	Myci	2014	4	14.3 (5.5) 58	3.6	21.9

Big Sky Mine Pond B-9	Myci	2014	5	12.2 (0.6) 12	10.8	12.7
Big Sky Mine Pond B-9	Myci	2014	7	21 (2.1) 144	13.3	23.4
Big Sky Mine Pond B-9	Myci	2014	8	20.9 (3.3) 822	11	30.7
Big Sky Mine Pond B-9	Myci	2014	9	16.5 (2.4) 35	10.5	20.8
Big Sky Mine Pond B-9	Myci	2015	3	13.3 (4.7) 47	2.2	17.9
Big Sky Mine Pond B-9	Myci	2015	4	9.6 (4.2) 47	2.9	17
Big Sky Mine Pond B-9	Myci	2015	5	15.9 (2) 765	6.5	21.6
Big Sky Mine Pond B-9	Myci	2015	6	18.3 (1.6) 873	14	24.9
Big Sky Mine Pond B-9	Myci	2015	6	21.7 (3.3) 2123	12.2	30.3
Big Sky Mine Pond B-9	Myci	2015	7	21.7 (2.4) 6402	12.8	30.2
Big Sky Mine Pond B-9	Myci	2015	8	21.4 (2.8) 4604	10.3	30.7
Big Sky Mine Pond B-9	Myci	2015	9	22 (3.7) 2252	9.7	29.2
Big Sky Mine Pond B-9	Myci	2015	10	14.5 (5.4) 484	0.1	23.1
Big Sky Mine Pond B-9	Myci	2015	11	7.2 (3.8) 329	-0.6	17.4
Big Sky Mine Pond B-9	Myci	2015	12	6.2 (4) 260	-0.8	17.3
Big Sky Mine Pond B-9	Myci	2016	1	6.3 (2.6) 153	0.8	13.5
Big Sky Mine Pond B-9	Myci	2016	2	6 (3.2) 401	-0.8	14
Big Sky Mine Pond B-9	Myci	2016	3	7.7 (2.9) 358	1.7	15.3
Big Sky Mine Pond B-9	Myci	2016	4	13.5 (3.1) 504	2.2	18.8
Big Sky Mine Pond B-9	Myci	2016	5	17.5 (2.4) 1759	8.4	24.7
Big Sky Mine Pond B-9	Myci	2016	6	21.9 (3.5) 4938	10.7	32.2
Big Sky Mine Pond B-9	Myci	2016	7	23.5 (3.5) 6040	13.3	34.3
Big Sky Mine Pond B-9	Myci	2016	8	20.8 (4.3) 3375	11.5	32.2
Big Sky Mine Pond B-9	Myci	2016	9	21 (3.4) 1127	9.2	29.8
Big Sky Mine Pond B-9	Myci	2016	10	14.5 (4.4) 193	2.7	22.7
Big Sky Mine Pond B-9	Myci	2016	11	10.4 (3.4) 120	2.9	18.6
Big Sky Mine Pond B-9	Myev	2014	7	22.9 (0) 2	22.9	22.9
Big Sky Mine Pond B-9	Myev	2014	8	20.2 (6.5) 8	12.2	30
Big Sky Mine Pond B-9	Myev	2014	9	15.3 () 1	15.3	15.3
Big Sky Mine Pond B-9	Myev	2015	4	4.2 () 1	4.2	4.2
Big Sky Mine Pond B-9	Myev	2015	5	14.3 (3) 26	8.9	20.8
Big Sky Mine Pond B-9	Myev	2015	6	18.2 (1.6) 7	14.6	19.3
Big Sky Mine Pond B-9	Myev	2015	6	21.7 (3.3) 240	12.3	29.8
Big Sky Mine Pond B-9	Myev	2015	7	21.7 (3.3) 323	12.8	28.7
Big Sky Mine Pond B-9	Myev	2015	8	20.5 (3.7) 172	10.2	29.2
Big Sky Mine Pond B-9	Myev	2015	9	19.4 (4.6) 156	10.2	28.4
Big Sky Mine Pond B-9	Myev	2016	1	7.5 () 1	7.5	7.5
Big Sky Mine Pond B-9	Myev	2016	3	12.3 () 1	12.3	12.3
Big Sky Mine Pond B-9	Myev	2016	4	14 (2.1) 6	11.3	17.9
Big Sky Mine Pond B-9	Myev	2016	5	13.2 (3.5) 230	6.4	23.9
Big Sky Mine Pond B-9	Myev	2016	6	20.9 (4.9) 184	12.3	31.5
Big Sky Mine Pond B-9	Myev	2016	7	22.5 (4.1) 292	15.3	34
Big Sky Mine Pond B-9	Myev	2016	8	20.2 (4.6) 257	10.3	31
Big Sky Mine Pond B-9	Myev	2016	9	21.2 (4.8) 88	10	29.8

Big Sky Mine Pond B-9	Myev	2016	10	18.9 (0) 2	18.9	18.9
Big Sky Mine Pond B-9	Myev	2016	11	14.5 () 1	14.5	14.5
Big Sky Mine Pond B-9	Mylu	2013	10	12 (2.3) 3	10.3	14.6
Big Sky Mine Pond B-9	Mylu	2013	11	2.7 (3.1) 4	0	5.5
Big Sky Mine Pond B-9	Mylu	2014	4	16.5 (5.3) 26	1.7	21.6
Big Sky Mine Pond B-9	Mylu	2014	5	10.4 (4.4) 10	3.9	14.1
Big Sky Mine Pond B-9	Mylu	2014	7	20.4 () 1	20.4	20.4
Big Sky Mine Pond B-9	Mylu	2014	8	21.8 (3.3) 42	14.1	28.7
Big Sky Mine Pond B-9	Mylu	2014	9	15.2 (3.2) 8	9.5	18.3
Big Sky Mine Pond B-9	Mylu	2015	3	11.4 (4.9) 16	5.4	17
Big Sky Mine Pond B-9	Mylu	2015	4	10.9 (4.3) 13	2.9	18.4
Big Sky Mine Pond B-9	Mylu	2015	5	15.2 (2.5) 98	6.2	20.8
Big Sky Mine Pond B-9	Mylu	2015	6	18.4 (2) 119	14.5	24.4
Big Sky Mine Pond B-9	Mylu	2015	6	21.8 (2.2) 749	15.3	30
Big Sky Mine Pond B-9	Mylu	2015	7	22.8 (3) 524	12.7	30.5
Big Sky Mine Pond B-9	Mylu	2015	8	20.8 (3.5) 235	9.8	30.7
Big Sky Mine Pond B-9	Mylu	2015	9	20.5 (3.8) 177	11.5	27.9
Big Sky Mine Pond B-9	Mylu	2015	10	18.8 (2.2) 14	13.8	23.1
Big Sky Mine Pond B-9	Mylu	2015	11	6.6 (4.3) 5	2.6	13.6
Big Sky Mine Pond B-9	Mylu	2016	2	9.1 (2.5) 3	6.4	11.2
Big Sky Mine Pond B-9	Mylu	2016	3	10.1 (2) 2	8.7	11.5
Big Sky Mine Pond B-9	Mylu	2016	4	11.3 (2.7) 116	7.5	18.6
Big Sky Mine Pond B-9	Mylu	2016	5	14.4 (4.1) 653	3.6	24.7
Big Sky Mine Pond B-9	Mylu	2016	6	22.4 (3.4) 805	11.3	32.2
Big Sky Mine Pond B-9	Mylu	2016	7	25.1 (3.5) 872	14.6	33.6
Big Sky Mine Pond B-9	Mylu	2016	8	23.1 (4.7) 361	13	32.2
Big Sky Mine Pond B-9	Mylu	2016	9	20.4 (4) 204	10.3	30
Big Sky Mine Pond B-9	Mylu	2016	10	17.6 (3.8) 9	13	21.9
Big Sky Mine Pond B-9	Mylu	2016	11	16.6 (0.1) 3	16.5	16.6
Big Sky Mine Pond B-9	Myth	2015	6	22 (3.8) 15	15	27.7
Big Sky Mine Pond B-9	Myth	2015	6	17.4 (2.5) 2	15.6	19.1
Big Sky Mine Pond B-9	Myth	2015	7	23.1 (3.2) 22	12.7	27.4
Big Sky Mine Pond B-9	Myth	2015	8	17.8 (0.7) 9	16	18.3
Big Sky Mine Pond B-9	Myth	2015	9	20.5 (4.9) 3	16.6	26
Big Sky Mine Pond B-9	Myth	2015	10	17 (1.2) 2	16.1	17.8
Big Sky Mine Pond B-9	Myth	2016	5	15.4 (2.2) 17	12.8	21.1
Big Sky Mine Pond B-9	Myth	2016	6	20.8 (4.9) 11	14.1	27
Big Sky Mine Pond B-9	Myth	2016	7	24.6 (3.5) 14	19.3	30.7
Big Sky Mine Pond B-9	Myth	2016	8	18.2 (4.7) 9	13.6	28.9
Big Sky Mine Pond B-9	Myth	2016	10	10.2 (0.5) 2	9.8	10.5
Otter Creek Coal Tract	Epfu	2013	10	8.3 (7.4) 2	3.1	13.5
Otter Creek Coal Tract	Epfu	2014	3	0.8 (0) 3	0.8	0.8
Otter Creek Coal Tract	Epfu	2014	5	14.4 (2.8) 303	8	22.1
Otter Creek Coal Tract	Epfu	2014	6	13.8 (2.4) 207	8.4	18.9

Otter Creek Coal Tract	Epfu	2014	7	16.2 (3.8) 460	9.4	23.1
Otter Creek Coal Tract	Epfu	2014	8	12.8 (1.7) 190	9.2	22.6
Otter Creek Coal Tract	Epfu	2014	9	9.3 (2.1) 38	5.7	14.5
Otter Creek Coal Tract	Epfu	2015	2	0.6 () 1	0.6	0.6
Otter Creek Coal Tract	Epfu	2015	3	10.4 (5.9) 5	4.1	17.8
Otter Creek Coal Tract	Epfu	2015	4	9.8 (2.8) 40	5.5	15.6
Otter Creek Coal Tract	Epfu	2015	5	13.5 (2.9) 267	6.4	18.9
Otter Creek Coal Tract	Epfu	2015	6	18.2 (1.8) 214	13.3	21.1
Otter Creek Coal Tract	Epfu	2015	6	19.3 (2.5) 1545	12.7	24.2
Otter Creek Coal Tract	Epfu	2015	7	17 (3.4) 418	11.3	27.7
Otter Creek Coal Tract	Epfu	2015	8	16.4 (3.9) 505	9.4	27.9
Otter Creek Coal Tract	Epfu	2015	9	17.9 (3.6) 240	6.5	26
Otter Creek Coal Tract	Epfu	2015	10	14.2 (3.8) 34	8.7	19.1
Otter Creek Coal Tract	Epfu	2015	11	4.2 (0) 2	4.2	4.2
Otter Creek Coal Tract	Epfu	2015	12	2.6 (2) 50	-0.1	6.4
Otter Creek Coal Tract	Epfu	2016	1	3 (1.7) 25	0.8	6.5
Otter Creek Coal Tract	Epfu	2016	2	2.6 (1.2) 9	0.8	4.9
Otter Creek Coal Tract	Epfu	2016	3	11.4 (2.2) 34	7	14.3
Otter Creek Coal Tract	Epfu	2016	4	13.6 (2.6) 289	5.2	17.4
Otter Creek Coal Tract	Epfu	2016	5	15 (2.5) 778	3.2	19.1
Otter Creek Coal Tract	Epfu	2016	6	19.2 (3.9) 1668	9.2	29.5
Otter Creek Coal Tract	Euma	2015	8	16.8 (1.3) 7	14.5	18.6
Otter Creek Coal Tract	Euma	2015	9	16.2 (1.2) 4	14.8	17.4
Otter Creek Coal Tract	Euma	2015	10	16.6 (1) 21	14.6	18.8
Otter Creek Coal Tract	Laci	2014	5	13.7 (3) 155	7.5	22.6
Otter Creek Coal Tract	Laci	2014	6	14.5 (2.9) 205	6.7	19.8
Otter Creek Coal Tract	Laci	2014	7	16.5 (4.2) 434	7.5	23.4
Otter Creek Coal Tract	Laci	2014	8	12.3 (1.4) 80	8	15.8
Otter Creek Coal Tract	Laci	2014	9	8.1 (1.7) 29	5.7	12.7
Otter Creek Coal Tract	Laci	2015	3	6.4 (3.1) 5	3.9	11.5
Otter Creek Coal Tract	Laci	2015	4	10.3 (3.4) 29	5.5	14.6
Otter Creek Coal Tract	Laci	2015	5	12.3 (2.3) 341	5.5	19.3
Otter Creek Coal Tract	Laci	2015	6	17.4 (2.7) 185	10.8	21.1
Otter Creek Coal Tract	Laci	2015	6	17.9 (2.7) 1059	11.7	24.2
Otter Creek Coal Tract	Laci	2015	7	15.4 (3.1) 406	9.7	27.9
Otter Creek Coal Tract	Laci	2015	8	15 (2.7) 247	7.4	26.4
Otter Creek Coal Tract	Laci	2015	9	14.7 (3.9) 39	6.2	22.2
Otter Creek Coal Tract	Laci	2015	10	14.6 (1.5) 3	13.2	16.1
Otter Creek Coal Tract	Laci	2015	11	4.2 (0) 8	4.2	4.2
Otter Creek Coal Tract	Laci	2015	12	4.6 (0.2) 11	4.4	4.9
Otter Creek Coal Tract	Laci	2016	1	2.9 (0) 13	2.9	2.9
Otter Creek Coal Tract	Laci	2016	2	3.5 (0.8) 2	2.9	4.1
Otter Creek Coal Tract	Laci	2016	3	11.9 (1.9) 14	7	13.5
Otter Creek Coal Tract	Laci	2016	4	12 (4.2) 60	3.1	16.1

Otter Creek Coal Tract	Laci	2016	5	14.5 (2.4) 117	5.1	18.8
Otter Creek Coal Tract	Laci	2016	6	18.3 (4.6) 1074	9.2	29.2
Otter Creek Coal Tract	Lano	2013	10	3.4 () 1	3.4	3.4
Otter Creek Coal Tract	Lano	2014	2	2.9 () 1	2.9	2.9
Otter Creek Coal Tract	Lano	2014	5	13.1 (3) 242	6.7	21.4
Otter Creek Coal Tract	Lano	2014	6	13.8 (2.2) 84	7.5	18.6
Otter Creek Coal Tract	Lano	2014	7	15.1 (3.9) 113	7.7	22.4
Otter Creek Coal Tract	Lano	2014	8	12.3 (1) 51	8.9	15.3
Otter Creek Coal Tract	Lano	2014	9	8.5 (2.1) 87	4.9	12.7
Otter Creek Coal Tract	Lano	2014	11	-2.8 () 1	-2.8	-2.8
Otter Creek Coal Tract	Lano	2014	12	1.3 () 1	1.3	1.3
Otter Creek Coal Tract	Lano	2015	3	10.3 (3.9) 36	3.7	18.3
Otter Creek Coal Tract	Lano	2015	4	10 (3.1) 115	1.7	17.9
Otter Creek Coal Tract	Lano	2015	5	11.8 (2.8) 501	5.7	18.9
Otter Creek Coal Tract	Lano	2015	6	18.1 (2) 131	12.8	21.1
Otter Creek Coal Tract	Lano	2015	6	18.3 (2.4) 586	12.3	24.1
Otter Creek Coal Tract	Lano	2015	7	14.6 (2.4) 123	10.3	21.9
Otter Creek Coal Tract	Lano	2015	8	15.7 (3.2) 479	2.2	26.4
Otter Creek Coal Tract	Lano	2015	9	15.2 (3.8) 627	6.7	27.2
Otter Creek Coal Tract	Lano	2015	10	15.3 (5) 8	8.7	19.4
Otter Creek Coal Tract	Lano	2015	12	4.2 (0.8) 8	2.7	5.5
Otter Creek Coal Tract	Lano	2016	1	4.2 () 1	4.2	4.2
Otter Creek Coal Tract	Lano	2016	3	11.6 (0.4) 7	10.8	11.8
Otter Creek Coal Tract	Lano	2016	4	11.9 (3) 187	4.4	17.6
Otter Creek Coal Tract	Lano	2016	5	14 (3) 393	4.2	19.1
Otter Creek Coal Tract	Lano	2016	6	19 (3.8) 399	10.7	29.5
Otter Creek Coal Tract	Myci	2013	10	13 () 1	13	13
Otter Creek Coal Tract	Myci	2014	5	11.9 (2.6) 1589	6	22.1
Otter Creek Coal Tract	Myci	2014	6	12.3 (2.7) 2001	7	18.9
Otter Creek Coal Tract	Myci	2014	7	14.7 (2.1) 815	9.2	21.7
Otter Creek Coal Tract	Myci	2014	8	14.4 (1.9) 104	10.7	20.6
Otter Creek Coal Tract	Myci	2014	9	12.2 (1.9) 35	4.9	15
Otter Creek Coal Tract	Myci	2015	3	10.5 () 1	10.5	10.5
Otter Creek Coal Tract	Myci	2015	4	10.6 (2.4) 111	3.4	16.1
Otter Creek Coal Tract	Myci	2015	5	12.3 (1.8) 1774	3.2	17.6
Otter Creek Coal Tract	Myci	2015	6	14.6 (1.7) 714	10.7	20.4
Otter Creek Coal Tract	Myci	2015	6	17.2 (1.8) 1161	12.8	24.2
Otter Creek Coal Tract	Myci	2015	7	16.8 (1.9) 1785	11.7	27
Otter Creek Coal Tract	Myci	2015	8	17.4 (2.4) 1684	9.2	26.9
Otter Creek Coal Tract	Myci	2015	9	18.1 (2.5) 541	11	25.9
Otter Creek Coal Tract	Myci	2015	10	16 (3.3) 3	12.2	18.1
Otter Creek Coal Tract	Myci	2016	3	13.6 (1.3) 5	12.3	15.3
Otter Creek Coal Tract	Myci	2016	4	14.1 (2.1) 786	7.7	18.3
Otter Creek Coal Tract	Myci	2016	5	14.3 (2.3) 3887	7.2	19.1

Otter Creek Coal Tract	Myci	2016	6	17.9 (2.8) 1487	9	29.7
Otter Creek Coal Tract	Myev	2014	5	9.5 () 1	9.5	9.5
Otter Creek Coal Tract	Myev	2014	6	12.8 () 1	12.8	12.8
Otter Creek Coal Tract	Myev	2014	7	14.8 () 1	14.8	14.8
Otter Creek Coal Tract	Myev	2014	8	11.2 (0.2) 3	11	11.3
Otter Creek Coal Tract	Myev	2014	9	8.2 () 1	8.2	8.2
Otter Creek Coal Tract	Myev	2015	3	17.3 () 1	17.3	17.3
Otter Creek Coal Tract	Myev	2015	5	12.1 (2) 2	10.7	13.5
Otter Creek Coal Tract	Myev	2015	6	17.7 (2.7) 38	14.3	23.6
Otter Creek Coal Tract	Myev	2015	7	16.9 (2.6) 23	11.5	20.8
Otter Creek Coal Tract	Myev	2015	8	15.2 (3.3) 28	10.5	22.2
Otter Creek Coal Tract	Myev	2015	9	14.2 (2.1) 21	11.2	19.1
Otter Creek Coal Tract	Myev	2016	4	10.8 (5.7) 3	7.4	17.4
Otter Creek Coal Tract	Myev	2016	5	8.8 (3) 31	3.9	15.3
Otter Creek Coal Tract	Myev	2016	6	18 (3.8) 24	10.3	24.9
Otter Creek Coal Tract	Mylu	2013	10	12.8 () 1	12.8	12.8
Otter Creek Coal Tract	Mylu	2014	5	11.9 (3.2) 676	6.4	22.7
Otter Creek Coal Tract	Mylu	2014	6	13.4 (2.2) 1008	7.7	18.6
Otter Creek Coal Tract	Mylu	2014	7	14.5 (2) 886	7.9	22.7
Otter Creek Coal Tract	Mylu	2014	8	13.4 (1.8) 222	9.4	19.3
Otter Creek Coal Tract	Mylu	2014	9	10.3 (2.2) 69	6.5	15.3
Otter Creek Coal Tract	Mylu	2015	3	11.6 (0.7) 4	10.7	12.3
Otter Creek Coal Tract	Mylu	2015	4	8.5 (2.8) 159	0.9	15.6
Otter Creek Coal Tract	Mylu	2015	5	11.3 (2) 658	0	18.6
Otter Creek Coal Tract	Mylu	2015	6	15.5 (2) 183	11	21.1
Otter Creek Coal Tract	Mylu	2015	6	17.7 (2.3) 1784	12	24.4
Otter Creek Coal Tract	Mylu	2015	7	16.8 (2.3) 1004	9	27.9
Otter Creek Coal Tract	Mylu	2015	8	15.3 (3.3) 814	4.4	25.2
Otter Creek Coal Tract	Mylu	2015	9	14.2 (3.5) 652	6.4	24.6
Otter Creek Coal Tract	Mylu	2015	10	16.6 () 1	16.6	16.6
Otter Creek Coal Tract	Mylu	2016	4	10.2 (4) 278	2.7	17.1
Otter Creek Coal Tract	Mylu	2016	5	9.8 (4.2) 1045	1.1	19.1
Otter Creek Coal Tract	Mylu	2016	6	18 (2.5) 3713	9.5	29.3
Otter Creek Coal Tract	Myth	2015	6	19.7 (2.3) 9	16	22.9
Otter Creek Coal Tract	Myth	2015	8	15.3 (3.9) 4	9.4	17.8
Otter Creek Coal Tract	Myth	2016	5	12 () 1	12	12
Otter Creek Coal Tract	Myth	2016	6	19.4 (5.3) 9	9.7	24.4
Rosebud Coal Mine Area C Pond	Epfu	2014	4	11.2 (4.9) 95	5.4	18.8
Rosebud Coal Mine Area C Pond	Epfu	2014	5	14.9 (3.9) 1177	3.6	25.7
Rosebud Coal Mine Area C Pond	Epfu	2014	6	14.1 (2.5) 2301	6.7	20.3

Rosebud Coal Mine Area C Pond	Epfu	2014	7	18.3 (3.5) 4341	9.5	27.5
Rosebud Coal Mine Area C Pond	Epfu	2014	8	17.6 (2.9) 1381	10.5	26.7
Rosebud Coal Mine Area C Pond	Epfu	2014	9	13.2 (3.3) 320	6	19.6
Rosebud Coal Mine Area C Pond	Epfu	2014	10	16.2 (3.5) 19	3.4	19.8
Rosebud Coal Mine Area C Pond	Epfu	2015	3	16.4 (5.7) 68	8	21.6
Rosebud Coal Mine Area C Pond	Epfu	2015	4	12.2 (2.1) 88	-4.9	14.1
Rosebud Coal Mine Area C Pond	Epfu	2015	5	14.6 (3.8) 1766	3.7	20.9
Rosebud Coal Mine Area C Pond	Epfu	2015	6	19.5 (3.6) 1263	12	25.1
Rosebud Coal Mine Area C Pond	Epfu	2015	6	21.6 (3.2) 6137	12	28.2
Rosebud Coal Mine Area C Pond	Epfu	2015	7	19.6 (3.3) 18553	12	28.5
Rosebud Coal Mine Area C Pond	Epfu	2015	8	18.6 (3.2) 3496	6.7	28.7
Rosebud Coal Mine Area C Pond	Epfu	2015	9	18.4 (3.3) 578	9.8	25.7
Rosebud Coal Mine Area C Pond	Epfu	2015	11	5.9 (0) 3	5.9	5.9
Rosebud Coal Mine Area C Pond	Epfu	2015	12	0.4 () 1	0.4	0.4
Rosebud Coal Mine Area C Pond	Epfu	2016	1	5 (1.4) 10	3.9	7
Rosebud Coal Mine Area C Pond	Epfu	2016	3	8.2 (0.2) 38	7.9	8.4
Rosebud Coal Mine Area C Pond	Epfu	2016	4	14 (3) 405	5.7	17.8
Rosebud Coal Mine Area C Pond	Epfu	2016	5	15.3 (3.1) 1976	5.9	22.4
Rosebud Coal Mine Area C Pond	Epfu	2016	6	21.1 (4.2) 2329	12.7	29.2
Rosebud Coal Mine Area C Pond	Laci	2014	4	9.3 (3.7) 64	3.7	17.6
Rosebud Coal Mine Area C Pond	Laci	2014	5	15.1 (3.7) 300	5.2	25.7
Rosebud Coal Mine Area C Pond	Laci	2014	6	14.5 (2.7) 1012	6.7	20.1
Rosebud Coal Mine Area C Pond	Laci	2014	7	16.3 (4.3) 1245	9.5	25.4
Rosebud Coal Mine Area C Pond	Laci	2014	8	14.7 (2.7) 375	9.8	27.2

Rosebud Coal Mine Area C Pond	Laci	2014	9	10.9 (3.4) 64	4.2	18.4
Rosebud Coal Mine Area C Pond	Laci	2014	10	11.6 (11.6) 2	3.4	19.8
Rosebud Coal Mine Area C Pond	Laci	2015	1	2.1 () 1	2.1	2.1
Rosebud Coal Mine Area C Pond	Laci	2015	3	4.9 () 1	4.9	4.9
Rosebud Coal Mine Area C Pond	Laci	2015	4	10.9 (5.4) 11	-4.9	13.5
Rosebud Coal Mine Area C Pond	Laci	2015	5	15.2 (2.6) 113	7	20.6
Rosebud Coal Mine Area C Pond	Laci	2015	6	16.9 (3.5) 182	12	24.6
Rosebud Coal Mine Area C Pond	Laci	2015	6	19.8 (3.6) 2202	9.8	28.2
Rosebud Coal Mine Area C Pond	Laci	2015	7	17.9 (3.2) 3884	10.8	28.7
Rosebud Coal Mine Area C Pond	Laci	2015	8	16.4 (2.8) 1114	3.9	26.4
Rosebud Coal Mine Area C Pond	Laci	2015	9	17.3 (3.4) 50	7.4	24.7
Rosebud Coal Mine Area C Pond	Laci	2016	4	14.5 (2.8) 38	5.7	18.6
Rosebud Coal Mine Area C Pond	Laci	2016	5	14.3 (2.4) 484	5.9	22.2
Rosebud Coal Mine Area C Pond	Laci	2016	6	19.4 (3.7) 1074	10	29.2
Rosebud Coal Mine Area C Pond	Lano	2013	11	4.9 (0) 2	4.9	4.9
Rosebud Coal Mine Area C Pond	Lano	2014	2	2.9 (0) 2	2.9	2.9
Rosebud Coal Mine Area C Pond	Lano	2014	4	12 (3.7) 145	5.2	18.8
Rosebud Coal Mine Area C Pond	Lano	2014	5	15 (3.3) 690	3.7	25.1
Rosebud Coal Mine Area C Pond	Lano	2014	6	14.2 (2.2) 1585	6.7	20.3
Rosebud Coal Mine Area C Pond	Lano	2014	7	16.2 (3.5) 1711	9.5	26.7
Rosebud Coal Mine Area C Pond	Lano	2014	8	15.2 (2.4) 476	10.7	27
Rosebud Coal Mine Area C Pond	Lano	2014	9	12.1 (2.8) 181	1.6	18.1
Rosebud Coal Mine Area C Pond	Lano	2014	10	6.2 (5) 16	3.4	16
Rosebud Coal Mine Area C Pond	Lano	2015	3	17.2 (5.2) 11	9.2	20.9

Rosebud Coal Mine Area C Pond	Lano	2015	4	13.2 (0.9) 2	12.5	13.8
Rosebud Coal Mine Area C Pond	Lano	2015	5	15.3 (3.5) 384	4.1	20.8
Rosebud Coal Mine Area C Pond	Lano	2015	6	19.4 (3.9) 534	12	25.1
Rosebud Coal Mine Area C Pond	Lano	2015	6	20.5 (3.3) 1106	12	28.2
Rosebud Coal Mine Area C Pond	Lano	2015	7	18 (3) 2201	11.7	28.2
Rosebud Coal Mine Area C Pond	Lano	2015	8	17.1 (3) 1005	3.4	27.4
Rosebud Coal Mine Area C Pond	Lano	2015	9	16.4 (4.3) 689	7.7	26.2
Rosebud Coal Mine Area C Pond	Lano	2015	10	16.5 (0.2) 3	16.3	16.6
Rosebud Coal Mine Area C Pond	Lano	2015	12	0.4 () 1	0.4	0.4
Rosebud Coal Mine Area C Pond	Lano	2016	1	3.9 (0) 2	3.9	3.9
Rosebud Coal Mine Area C Pond	Lano	2016	3	8.1 (0.3) 5	7.9	8.4
Rosebud Coal Mine Area C Pond	Lano	2016	4	14.5 (2.8) 62	1.1	17.8
Rosebud Coal Mine Area C Pond	Lano	2016	5	16.2 (3.4) 468	6.2	22.4
Rosebud Coal Mine Area C Pond	Lano	2016	6	20.6 (4.6) 717	11.8	29.2
Rosebud Coal Mine Area C Pond	Myci	2013	10	12.3 (2.9) 3	9	14
Rosebud Coal Mine Area C Pond	Myci	2014	4	11.6 (4.6) 24	6.2	17.8
Rosebud Coal Mine Area C Pond	Myci	2014	5	14.7 (2.7) 189	5.7	24.6
Rosebud Coal Mine Area C Pond	Myci	2014	6	13.2 (2.3) 372	7.9	19.8
Rosebud Coal Mine Area C Pond	Myci	2014	7	16.8 (3) 729	9.8	27.5
Rosebud Coal Mine Area C Pond	Myci	2014	8	17.2 (3) 662	10.5	26.7
Rosebud Coal Mine Area C Pond	Myci	2014	9	12.4 (2.7) 126	2.2	19.3
Rosebud Coal Mine Area C Pond	Myci	2014	10	9.1 (3.3) 19	2.6	14.8
Rosebud Coal Mine Area C Pond	Myci	2015	3	16.6 (6.2) 3	9.5	20.9
Rosebud Coal Mine Area C Pond	Myci	2015	4	12.4 (0.8) 17	9.8	13.2

Rosebud Coal Mine Area C Pond	Myci	2015	5	13.5 (1.9) 144	7.4	17.8
Rosebud Coal Mine Area C Pond	Myci	2015	6	19.1 (3.7) 64	13.2	25.1
Rosebud Coal Mine Area C Pond	Myci	2015	6	19 (2.5) 1666	9.8	27.9
Rosebud Coal Mine Area C Pond	Myci	2015	7	19.3 (2.6) 2595	11.3	28
Rosebud Coal Mine Area C Pond	Myci	2015	8	18.4 (3) 1711	8.5	28.4
Rosebud Coal Mine Area C Pond	Myci	2015	9	18 (3.2) 481	9.8	24.7
Rosebud Coal Mine Area C Pond	Myci	2015	10	17.6 (3.8) 9	13.6	24.2
Rosebud Coal Mine Area C Pond	Myci	2015	12	2.7 (0) 5	2.7	2.7
Rosebud Coal Mine Area C Pond	Myci	2016	4	12.8 (4) 33	4.9	19.9
Rosebud Coal Mine Area C Pond	Myci	2016	5	15.6 (2.2) 709	2.7	22.1
Rosebud Coal Mine Area C Pond	Myci	2016	6	18.8 (2.6) 1235	11	28.5
Rosebud Coal Mine Area C Pond	Myev	2014	5	6.4 (4.7) 3	1.9	11.3
Rosebud Coal Mine Area C Pond	Myev	2014	6	19.3 () 1	19.3	19.3
Rosebud Coal Mine Area C Pond	Myev	2014	7	14 (2.5) 5	11	17.9
Rosebud Coal Mine Area C Pond	Myev	2014	8	17.1 (3.7) 7	12	22.7
Rosebud Coal Mine Area C Pond	Myev	2014	9	9.8 (3) 4	5.7	12.8
Rosebud Coal Mine Area C Pond	Myev	2015	6	20.4 (2.3) 91	16.3	27
Rosebud Coal Mine Area C Pond	Myev	2015	7	19.3 (2.5) 105	11.5	23.9
Rosebud Coal Mine Area C Pond	Myev	2015	8	16.9 (2.9) 320	10.2	24.7
Rosebud Coal Mine Area C Pond	Myev	2015	9	15.5 (4.2) 98	8.4	27.2
Rosebud Coal Mine Area C Pond	Myev	2016	4	6 (1.1) 2	5.2	6.7
Rosebud Coal Mine Area C Pond	Myev	2016	5	15.6 (3.4) 14	8.4	19.6
Rosebud Coal Mine Area C Pond	Myev	2016	6	19.9 (4.8) 15	11.7	26.7
Rosebud Coal Mine Area C Pond	Mylu	2014	4	15.5 (1.1) 3	14.3	16.5

Rosebud Coal Mine Area C Pond	Mylu	2014	5	11.9 (4) 16	3.9	18.3
Rosebud Coal Mine Area C Pond	Mylu	2014	6	14.1 (3.3) 80	8.7	20.3
Rosebud Coal Mine Area C Pond	Mylu	2014	7	17.1 (3.2) 166	11.2	23.2
Rosebud Coal Mine Area C Pond	Mylu	2014	8	17.4 (3.2) 117	9.8	25.7
Rosebud Coal Mine Area C Pond	Mylu	2014	9	11.8 (3.2) 34	2.9	16.8
Rosebud Coal Mine Area C Pond	Mylu	2014	10	8.7 (1.4) 5	6.7	10.2
Rosebud Coal Mine Area C Pond	Mylu	2015	5	12.9 (3.4) 15	9	18.6
Rosebud Coal Mine Area C Pond	Mylu	2015	6	19.6 (3.1) 30	14.6	24.1
Rosebud Coal Mine Area C Pond	Mylu	2015	6	19.4 (2) 1766	12	28.2
Rosebud Coal Mine Area C Pond	Mylu	2015	7	20.3 (2.3) 846	11.7	26.5
Rosebud Coal Mine Area C Pond	Mylu	2015	8	17.8 (3.1) 217	8.5	26.5
Rosebud Coal Mine Area C Pond	Mylu	2015	9	17 (3.1) 158	9.4	23.2
Rosebud Coal Mine Area C Pond	Mylu	2015	10	20.8 (4.8) 2	17.4	24.2
Rosebud Coal Mine Area C Pond	Mylu	2016	4	17.5 (0.7) 4	17.1	18.6
Rosebud Coal Mine Area C Pond	Mylu	2016	5	13.7 (3.1) 41	4.1	18.9
Rosebud Coal Mine Area C Pond	Mylu	2016	6	20.8 (3.7) 174	13	28.7
Rosebud Coal Mine Area C Pond	Myth	2015	6	21.4 (2) 6	19.3	23.7
Rosebud Coal Mine Area C Pond	Myth	2015	7	20.3 (1.6) 3	19.4	22.1
Rosebud Coal Mine Area C Pond	Myth	2015	8	16.4 (3.3) 3	13.3	19.8
Rosebud Coal Mine Area C Pond	Myth	2015	9	12.4 (3.8) 6	9.8	18.4
Rosebud Coal Mine Area C Pond	Myth	2016	4	11.6 (4.3) 3	6.7	14.5
Rosebud Coal Mine Area C Pond	Myth	2016	6	18.6 () 1	18.6	18.6
Rosebud Coal Mine Area F Pond 7	Epfu	2012	8	22.9 (4.9) 116	11.5	31.8
Rosebud Coal Mine Area F Pond 7	Epfu	2012	9	17.8 (4.9) 175	4.1	26.7

Rosebud Coal Mine Area F Pond 7	Epfu	2012	11	8.5 () 1	8.5	8.5
Rosebud Coal Mine Area F Pond 7	Epfu	2013	4	18.4 () 1	18.4	18.4
Rosebud Coal Mine Area F Pond 7	Epfu	2013	5	20.3 (5.5) 24	11.7	25.7
Rosebud Coal Mine Area F Pond 7	Epfu	2013	6	19.1 (3.4) 63	11.7	27.5
Rosebud Coal Mine Area F Pond 7	Epfu	2013	7	22 (2.9) 63	15.6	27.2
Rosebud Coal Mine Area F Pond 7	Epfu	2013	8	20.6 (3.3) 24	15.8	28.2
Rosebud Coal Mine Area F Pond 7	Epfu	2013	9	15.9 (4.1) 8	9.7	22.4
Rosebud Coal Mine Area F Pond 7	Epfu	2013	10	12.7 () 1	12.7	12.7
Rosebud Coal Mine Area F Pond 7	Laci	2012	9	13.7 (3.7) 9	8.5	19.9
Rosebud Coal Mine Area F Pond 7	Laci	2013	5	19.5 (6.6) 3	12.5	25.5
Rosebud Coal Mine Area F Pond 7	Laci	2013	6	18.9 (2.4) 6	16.1	21.7
Rosebud Coal Mine Area F Pond 7	Laci	2013	7	19.8 (1.5) 7	18.4	22.7
Rosebud Coal Mine Area F Pond 7	Laci	2013	8	16.4 (1.7) 7	13	17.8
Rosebud Coal Mine Area F Pond 7	Lano	2012	8	22.9 (4.2) 54	11.5	27.2
Rosebud Coal Mine Area F Pond 7	Lano	2012	9	17.5 (4.3) 64	8.9	24.6
Rosebud Coal Mine Area F Pond 7	Lano	2013	4	15.6 () 1	15.6	15.6
Rosebud Coal Mine Area F Pond 7	Lano	2013	5	21.9 (3.5) 19	15.5	25.7
Rosebud Coal Mine Area F Pond 7	Lano	2013	6	17.1 (3.3) 16	10.2	20.3
Rosebud Coal Mine Area F Pond 7	Lano	2013	7	21.4 (3.5) 28	16.3	27.2
Rosebud Coal Mine Area F Pond 7	Lano	2013	8	19.2 (3.9) 11	12.3	25.9
Rosebud Coal Mine Area F Pond 7	Lano	2013	9	19.4 (6.8) 4	12.2	27.9
Rosebud Coal Mine Area F Pond 7	Myci	2012	8	21.2 (4.6) 49	10.8	32
Rosebud Coal Mine Area F Pond 7	Myci	2012	9	18.8 (4.1) 59	10.3	26.4
Rosebud Coal Mine Area F Pond 7	Myci	2012	10	18.3 (3.7) 4	13.5	21.9

Rosebud Coal Mine Area F Pond 7	Myci	2013	5	20 (1.2) 5	18.1	20.9
Rosebud Coal Mine Area F Pond 7	Myci	2013	6	16.7 (3.6) 10	11	20.9
Rosebud Coal Mine Area F Pond 7	Myci	2013	7	22.5 (3.6) 9	16.1	27.4
Rosebud Coal Mine Area F Pond 7	Myci	2013	8	20.7 (3.7) 15	17	29.8
Rosebud Coal Mine Area F Pond 7	Myci	2013	9	19.9 (4.2) 3	15	22.7
Rosebud Coal Mine Area F Pond 7	Myev	2012	8	19.7 (6.2) 22	8.2	32
Rosebud Coal Mine Area F Pond 7	Myev	2012	9	14.5 (5) 19	6.2	22.6
Rosebud Coal Mine Area F Pond 7	Myev	2013	4	14.1 () 1	14.1	14.1
Rosebud Coal Mine Area F Pond 7	Myev	2013	5	9.2 () 1	9.2	9.2
Rosebud Coal Mine Area F Pond 7	Myev	2013	6	14.4 (4.1) 3	12	19.1
Rosebud Coal Mine Area F Pond 7	Myev	2013	7	19.5 (1.4) 6	17.1	20.9
Rosebud Coal Mine Area F Pond 7	Myev	2013	8	17.4 (4.8) 6	12.7	25.9
Rosebud Coal Mine Area F Pond 7	Myev	2013	9	26.5 () 1	26.5	26.5
Rosebud Coal Mine Area F Pond 7	Myev	2013	10	15 () 1	15	15
Rosebud Coal Mine Area F Pond 7	Mylu	2012	8	22 (3.5) 12	14.6	25.2
Rosebud Coal Mine Area F Pond 7	Mylu	2012	9	17.8 (4.7) 28	9.2	24.7
Rosebud Coal Mine Area F Pond 7	Mylu	2013	5	13.6 () 1	13.6	13.6
Rosebud Coal Mine Area F Pond 7	Mylu	2013	6	14.5 (3.1) 3	11.7	17.8
Rosebud Coal Mine Area F Pond 7	Mylu	2013	7	25.4 () 1	25.4	25.4
Rosebud Coal Mine Area F Pond 7	Mylu	2013	8	19.4 (6.2) 6	11.5	30.3
Rosebud Coal Mine Area F Pond 7	Mylu	2013	9	21 (4.5) 2	17.8	24.1
Rosebud Coal Mine Area F Pond 7	Myth	2012	9	20.8 () 1	20.8	20.8
Signal Peak Mine Busse Water Reservoir	Epfu	2012	8	21.1 (4.2) 1887	7	30.2
Signal Peak Mine Busse Water Reservoir	Epfu	2012	9	17.2 (3.4) 6229	3.9	26.9

Signal Peak Mine Busse Water Reservoir	Epfu	2012	10	14.5 (3.4) 79	5.2	19.9
Signal Peak Mine Busse Water Reservoir	Epfu	2012	11	7.8 (4.5) 11	1.3	13.6
Signal Peak Mine Busse Water Reservoir	Epfu	2012	12	2.1 (3.2) 33	-2.3	5.7
Signal Peak Mine Busse Water Reservoir	Epfu	2013	4	10.8 (2.8) 709	3.4	17.6
Signal Peak Mine Busse Water Reservoir	Epfu	2013	5	14.5 (4.5) 1737	2.4	24.4
Signal Peak Mine Busse Water Reservoir	Epfu	2013	6	15.8 (2.7) 2856	5.7	23.7
Signal Peak Mine Busse Water Reservoir	Epfu	2013	7	18.4 (3.2) 5388	10.7	26
Signal Peak Mine Busse Water Reservoir	Epfu	2013	8	19.3 (3.8) 2844	11.8	28
Signal Peak Mine Busse Water Reservoir	Epfu	2013	9	19 (3) 590	9	25.9
Signal Peak Mine Busse Water Reservoir	Epfu	2013	10	12.3 (2.2) 99	4.7	17
Signal Peak Mine Busse Water Reservoir	Epfu	2013	11	3.9 (4.4) 26	-1.3	10.7
Signal Peak Mine Busse Water Reservoir	Epfu	2013	12	-2 (0) 5	-2	-2
Signal Peak Mine Busse Water Reservoir	Epfu	2014	1	5.4 (2.8) 2	3.4	7.4
Signal Peak Mine Busse Water Reservoir	Epfu	2014	2	1.9 (1.9) 3	0.8	4.1
Signal Peak Mine Busse Water Reservoir	Epfu	2014	3	7 (0.1) 5	7	7.2
Signal Peak Mine Busse Water Reservoir	Epfu	2014	4	11.5 (2.7) 1264	0	17.3
Signal Peak Mine Busse Water Reservoir	Epfu	2014	5	15.1 (4) 2660	3.7	23.1
Signal Peak Mine Busse Water Reservoir	Epfu	2014	6	12.5 (3.8) 5005	2.2	20.4
Signal Peak Mine Busse Water Reservoir	Epfu	2014	7	17 (3.7) 12051	8.9	26.5
Signal Peak Mine Busse Water Reservoir	Epfu	2014	8	19 (3.6) 3660	7	28.5
Signal Peak Mine Busse Water Reservoir	Epfu	2014	9	13.7 (4.1) 418	4.6	22.4
Signal Peak Mine Busse Water Reservoir	Epfu	2014	10	15.8 (5.6) 28	0.6	20.6
Signal Peak Mine Busse Water Reservoir	Epfu	2014	11	1.7 (3.7) 5	-4.4	5.1
Signal Peak Mine Busse Water Reservoir	Epfu	2014	12	3.9 (3.3) 43	-1.3	10.2

Signal Peak Mine Busse Water Reservoir	Epfu	2015	1	2.9 (3) 5	-0.8	5.1
Signal Peak Mine Busse Water Reservoir	Epfu	2015	2	13.5 (2.8) 24	0.3	14.1
Signal Peak Mine Busse Water Reservoir	Epfu	2015	3	11 (3.4) 779	-1.6	18.4
Signal Peak Mine Busse Water Reservoir	Epfu	2015	4	11.2 (3.3) 2612	2.4	17.1
Signal Peak Mine Busse Water Reservoir	Epfu	2015	5	10.6 (3.1) 4025	0.4	20.6
Signal Peak Mine Busse Water Reservoir	Epfu	2015	6	17.2 (3.2) 10157	9.5	27.4
Signal Peak Mine Busse Water Reservoir	Epfu	2015	6	17 (3.2) 2661	11.2	24.9
Signal Peak Mine Busse Water Reservoir	Epfu	2015	7	17.2 (2.9) 12908	8.7	27.9
Signal Peak Mine Busse Water Reservoir	Epfu	2015	8	20.7 (3.9) 3690	4.6	29.5
Signal Peak Mine Busse Water Reservoir	Epfu	2015	8	23.3 (4.2) 2087	7.5	30.7
Signal Peak Mine Busse Water Reservoir	Epfu	2015	9	20.4 (3.5) 1987	9.7	28
Signal Peak Mine Busse Water Reservoir	Epfu	2015	9	18.2 (3.9) 1698	5.5	26.7
Signal Peak Mine Busse Water Reservoir	Epfu	2015	10	16.9 (3.4) 32	6.7	24.1
Signal Peak Mine Busse Water Reservoir	Epfu	2015	10	18.5 (4) 141	9.5	26.4
Signal Peak Mine Busse Water Reservoir	Epfu	2015	11	5.9 (2.7) 103	1.9	9
Signal Peak Mine Busse Water Reservoir	Epfu	2015	12	7.5 (4.7) 209	-2	14.8
Signal Peak Mine Busse Water Reservoir	Epfu	2016	1	4.9 (2.9) 175	-4.6	10.3
Signal Peak Mine Busse Water Reservoir	Epfu	2016	2	7.8 (3) 104	0.4	12.3
Signal Peak Mine Busse Water Reservoir	Epfu	2016	3	10.5 (6.2) 148	-0.6	17.8
Signal Peak Mine Busse Water Reservoir	Epfu	2016	4	13.9 (3.2) 3321	2.7	21.9
Signal Peak Mine Busse Water Reservoir	Epfu	2016	5	14 (4) 3996	6.5	22.1
Signal Peak Mine Busse Water Reservoir	Epfu	2016	9	18.8 (1.6) 31	16.8	21.9
Signal Peak Mine Busse Water Reservoir	Epfu	2016	10	13.5 (4.3) 51	6.9	19.4
Signal Peak Mine Busse Water Reservoir	Epfu	2016	11	5 (4.1) 172	-0.3	15.8

Signal Peak Mine Busse Water Reservoir	Epfu	2016	12	3.2 (2.1) 56	0.8	5.7
Signal Peak Mine Busse Water Reservoir	Epfu	2017	1	4.8 (3.1) 53	-2	8.4
Signal Peak Mine Busse Water Reservoir	Epfu	2017	2	4.9 (3) 134	0.3	10.8
Signal Peak Mine Busse Water Reservoir	Epfu	2017	3	8.8 (2.8) 60	1.4	12.2
Signal Peak Mine Busse Water Reservoir	Euma	2013	6	15.6 (0.9) 29	14.1	17.3
Signal Peak Mine Busse Water Reservoir	Euma	2013	7	18.3 (2) 7	17	22.4
Signal Peak Mine Busse Water Reservoir	Euma	2013	8	18 (3.5) 4	12.7	19.8
Signal Peak Mine Busse Water Reservoir	Euma	2013	9	21.7 () 1	21.7	21.7
Signal Peak Mine Busse Water Reservoir	Euma	2014	5	12.5 () 1	12.5	12.5
Signal Peak Mine Busse Water Reservoir	Euma	2014	6	13.8 (0.4) 2	13.6	14.1
Signal Peak Mine Busse Water Reservoir	Euma	2014	7	19.2 (2.5) 18	16	24.9
Signal Peak Mine Busse Water Reservoir	Euma	2014	8	20.6 (3.8) 19	11.3	28.2
Signal Peak Mine Busse Water Reservoir	Euma	2015	6	18.3 (4.4) 15	10.8	24.7
Signal Peak Mine Busse Water Reservoir	Euma	2015	6	15.4 (3.9) 9	12.7	20.6
Signal Peak Mine Busse Water Reservoir	Euma	2015	7	17.7 (2.4) 117	8.9	23.6
Signal Peak Mine Busse Water Reservoir	Euma	2015	8	19.4 (2.6) 21	17	26.9
Signal Peak Mine Busse Water Reservoir	Euma	2015	8	23.3 (3.1) 14	20.3	28.2
Signal Peak Mine Busse Water Reservoir	Euma	2015	9	19.8 (0) 2	19.8	19.8
Signal Peak Mine Busse Water Reservoir	Euma	2016	4	17.8 (0.2) 2	17.6	17.9
Signal Peak Mine Busse Water Reservoir	Euma	2016	5	18.4 (0) 4	18.4	18.4
Signal Peak Mine Busse Water Reservoir	Laci	2012	8	19.4 (6.2) 151	6.2	28
Signal Peak Mine Busse Water Reservoir	Laci	2012	9	17.4 (4.6) 197	4.7	26.5
Signal Peak Mine Busse Water Reservoir	Laci	2012	10	14.4 (2.5) 4	12.2	17
Signal Peak Mine Busse Water Reservoir	Laci	2012	11	4.5 (4.5) 2	1.4	7.7

Signal Peak Mine Busse Water Reservoir	Laci	2012	12	0.9 () 1	0.9	0.9
Signal Peak Mine Busse Water Reservoir	Laci	2013	4	12.6 (2.3) 155	3.6	17.8
Signal Peak Mine Busse Water Reservoir	Laci	2013	5	11.6 (3.1) 177	4.4	24.2
Signal Peak Mine Busse Water Reservoir	Laci	2013	6	17.1 (3) 3107	5.7	23.9
Signal Peak Mine Busse Water Reservoir	Laci	2013	7	18.8 (3.4) 5893	10.8	26
Signal Peak Mine Busse Water Reservoir	Laci	2013	8	18.4 (3.5) 651	11.8	28
Signal Peak Mine Busse Water Reservoir	Laci	2013	9	19.3 (3.3) 92	8.9	25.4
Signal Peak Mine Busse Water Reservoir	Laci	2013	10	9.8 (3.7) 4	4.7	13.5
Signal Peak Mine Busse Water Reservoir	Laci	2013	11	4.1 (4.4) 4	1.9	10.7
Signal Peak Mine Busse Water Reservoir	Laci	2013	12	-2 () 1	-2	-2
Signal Peak Mine Busse Water Reservoir	Laci	2014	1	6.1 (2.3) 3	3.4	7.4
Signal Peak Mine Busse Water Reservoir	Laci	2014	4	10 (3.1) 278	0	17.3
Signal Peak Mine Busse Water Reservoir	Laci	2014	5	12.9 (4.5) 611	4.4	23.1
Signal Peak Mine Busse Water Reservoir	Laci	2014	6	13.6 (2.6) 5194	2.2	20.4
Signal Peak Mine Busse Water Reservoir	Laci	2014	7	18.1 (3.5) 10937	8.9	26.5
Signal Peak Mine Busse Water Reservoir	Laci	2014	8	18.2 (3) 1923	7	28.4
Signal Peak Mine Busse Water Reservoir	Laci	2014	9	13.1 (3.4) 176	6.7	20.4
Signal Peak Mine Busse Water Reservoir	Laci	2014	10	11.7 (3.3) 2	9.4	14
Signal Peak Mine Busse Water Reservoir	Laci	2014	11	3 (1.5) 3	1.3	4.2
Signal Peak Mine Busse Water Reservoir	Laci	2014	12	6.4 (5.8) 9	-1.3	10.3
Signal Peak Mine Busse Water Reservoir	Laci	2015	2	12.3 (4.9) 8	0.3	14.1
Signal Peak Mine Busse Water Reservoir	Laci	2015	3	11.5 (3.3) 482	5.9	18.4
Signal Peak Mine Busse Water Reservoir	Laci	2015	4	12 (2.8) 307	3.7	17.1
Signal Peak Mine Busse Water Reservoir	Laci	2015	5	10.3 (2.6) 339	0.4	20.4

Signal Peak Mine Busse Water Reservoir	Laci	2015	6	17.1 (3.5) 6047	9.4	27
Signal Peak Mine Busse Water Reservoir	Laci	2015	6	16.4 (3) 5902	11.2	24.9
Signal Peak Mine Busse Water Reservoir	Laci	2015	7	18.1 (3.2) 5386	8.5	27.9
Signal Peak Mine Busse Water Reservoir	Laci	2015	8	20.4 (4.4) 1161	4.9	29.8
Signal Peak Mine Busse Water Reservoir	Laci	2015	8	23.7 (4.7) 2254	6.2	30.7
Signal Peak Mine Busse Water Reservoir	Laci	2015	9	22.5 (3.1) 1018	5.4	28
Signal Peak Mine Busse Water Reservoir	Laci	2015	9	19.6 (3.8) 223	7.9	24.1
Signal Peak Mine Busse Water Reservoir	Laci	2015	10	19.3 (5.5) 5	9.5	22.2
Signal Peak Mine Busse Water Reservoir	Laci	2015	12	5.2 (2.3) 4	2.9	7.2
Signal Peak Mine Busse Water Reservoir	Laci	2016	1	4.4 (2.9) 29	-1.3	7.4
Signal Peak Mine Busse Water Reservoir	Laci	2016	2	4 (3.2) 9	1.1	9
Signal Peak Mine Busse Water Reservoir	Laci	2016	3	7.8 (6.2) 21	-0.6	17.8
Signal Peak Mine Busse Water Reservoir	Laci	2016	4	13.9 (3.1) 463	5.1	21.7
Signal Peak Mine Busse Water Reservoir	Laci	2016	5	12.4 (3.2) 511	5.7	22.1
Signal Peak Mine Busse Water Reservoir	Laci	2016	9	15 () 1	15	15
Signal Peak Mine Busse Water Reservoir	Laci	2016	10	10.7 () 1	10.7	10.7
Signal Peak Mine Busse Water Reservoir	Laci	2016	11	8.8 (1.3) 22	4.2	10.2
Signal Peak Mine Busse Water Reservoir	Laci	2016	12	1.8 (0.2) 5	1.6	1.9
Signal Peak Mine Busse Water Reservoir	Laci	2017	1	-2 (0) 4	-2	-2
Signal Peak Mine Busse Water Reservoir	Laci	2017	2	5.2 (1.5) 6	2.6	6.5
Signal Peak Mine Busse Water Reservoir	Lano	2012	8	21.3 (4.3) 273	6.4	30.2
Signal Peak Mine Busse Water Reservoir	Lano	2012	9	15.9 (4.1) 751	5.1	26.5
Signal Peak Mine Busse Water Reservoir	Lano	2012	10	10.5 (2.4) 31	8	16.1
Signal Peak Mine Busse Water Reservoir	Lano	2012	11	5.1 (3.3) 12	2.4	10.5

Signal Peak Mine Busse Water Reservoir	Lano	2012	12	4.4 (3) 7	-2.3	5.7
Signal Peak Mine Busse Water Reservoir	Lano	2013	1	8.7 (0) 4	8.7	8.7
Signal Peak Mine Busse Water Reservoir	Lano	2013	4	9.1 (2.7) 851	0.8	17
Signal Peak Mine Busse Water Reservoir	Lano	2013	5	12.9 (3.4) 1364	0.6	24.4
Signal Peak Mine Busse Water Reservoir	Lano	2013	6	15.5 (2.9) 2376	6.2	23.7
Signal Peak Mine Busse Water Reservoir	Lano	2013	7	19.8 (3.1) 2524	10.8	25.7
Signal Peak Mine Busse Water Reservoir	Lano	2013	8	18.4 (3.4) 831	11.7	28
Signal Peak Mine Busse Water Reservoir	Lano	2013	9	17.4 (3.9) 437	6.9	25.4
Signal Peak Mine Busse Water Reservoir	Lano	2013	10	13.9 (3) 131	5.7	17
Signal Peak Mine Busse Water Reservoir	Lano	2013	11	4.9 (5.2) 12	-0.8	10.7
Signal Peak Mine Busse Water Reservoir	Lano	2013	12	6.2 (3.3) 2	3.9	8.5
Signal Peak Mine Busse Water Reservoir	Lano	2014	1	1.9 (3.7) 8	-0.8	7.4
Signal Peak Mine Busse Water Reservoir	Lano	2014	2	7 () 1	7	7
Signal Peak Mine Busse Water Reservoir	Lano	2014	3	5 (2.5) 4	2.9	7.2
Signal Peak Mine Busse Water Reservoir	Lano	2014	4	10.6 (3.2) 948	-0.5	17.1
Signal Peak Mine Busse Water Reservoir	Lano	2014	5	14.2 (3.5) 2398	5.2	23.1
Signal Peak Mine Busse Water Reservoir	Lano	2014	6	13.6 (3.3) 1551	2.2	20.4
Signal Peak Mine Busse Water Reservoir	Lano	2014	7	18 (3.8) 2235	8.9	26.5
Signal Peak Mine Busse Water Reservoir	Lano	2014	8	17.6 (3.9) 1377	7	28.5
Signal Peak Mine Busse Water Reservoir	Lano	2014	9	11.5 (3.5) 506	3.9	22.1
Signal Peak Mine Busse Water Reservoir	Lano	2014	10	6.3 (5.7) 13	0.6	15.5
Signal Peak Mine Busse Water Reservoir	Lano	2014	12	5.6 (5.5) 16	-1.3	10.3
Signal Peak Mine Busse Water Reservoir	Lano	2015	2	10.6 (6.9) 4	0.3	14.1
Signal Peak Mine Busse Water Reservoir	Lano	2015	3	10.3 (3.2) 127	-1.6	18.4

Signal Peak Mine Busse Water Reservoir	Lano	2015	4	10.9 (4) 331	2.9	17.1
Signal Peak Mine Busse Water Reservoir	Lano	2015	5	11 (2.6) 1224	0.4	20.1
Signal Peak Mine Busse Water Reservoir	Lano	2015	6	17.6 (3.9) 1704	9.4	27.2
Signal Peak Mine Busse Water Reservoir	Lano	2015	6	16.7 (3.2) 936	11.2	24.9
Signal Peak Mine Busse Water Reservoir	Lano	2015	7	18 (3) 1688	9.5	27.9
Signal Peak Mine Busse Water Reservoir	Lano	2015	8	21.1 (4.3) 1652	5.1	29.5
Signal Peak Mine Busse Water Reservoir	Lano	2015	8	23.1 (4.6) 2883	6	30.7
Signal Peak Mine Busse Water Reservoir	Lano	2015	9	17.3 (4.9) 1870	5.4	27.9
Signal Peak Mine Busse Water Reservoir	Lano	2015	9	15.6 (5) 728	4.1	26.5
Signal Peak Mine Busse Water Reservoir	Lano	2015	10	15.4 (4) 6	10.7	18.9
Signal Peak Mine Busse Water Reservoir	Lano	2015	10	19 (3.1) 21	15	25.4
Signal Peak Mine Busse Water Reservoir	Lano	2015	11	7.5 (4.3) 5	4.2	14.8
Signal Peak Mine Busse Water Reservoir	Lano	2015	12	5.2 (1.5) 9	3.6	8.4
Signal Peak Mine Busse Water Reservoir	Lano	2016	1	5 (1.8) 33	1.3	10.2
Signal Peak Mine Busse Water Reservoir	Lano	2016	2	5.6 (3.8) 16	0.1	10.7
Signal Peak Mine Busse Water Reservoir	Lano	2016	3	11 (6.8) 179	-0.6	17.8
Signal Peak Mine Busse Water Reservoir	Lano	2016	4	14.8 (3.2) 908	6.5	21.2
Signal Peak Mine Busse Water Reservoir	Lano	2016	5	13.8 (3) 3800	4.4	21.9
Signal Peak Mine Busse Water Reservoir	Lano	2016	9	18.9 (1.3) 18	17	19.9
Signal Peak Mine Busse Water Reservoir	Lano	2016	10	12.7 (3.7) 20	6.9	19.4
Signal Peak Mine Busse Water Reservoir	Lano	2016	11	5.4 (4.5) 24	0.4	13.6
Signal Peak Mine Busse Water Reservoir	Lano	2016	12	1.7 (2) 5	0.8	5.2
Signal Peak Mine Busse Water Reservoir	Lano	2017	1	4.5 (3.4) 14	-2	8.4
Signal Peak Mine Busse Water Reservoir	Lano	2017	2	7.1 (3.9) 26	2.2	10.8

Signal Peak Mine Busse Water Reservoir	Lano	2017	3	10.2 (2.3) 7	7.5	12.2
Signal Peak Mine Busse Water Reservoir	Myci	2012	8	21.6 (4.3) 954	6.4	30.2
Signal Peak Mine Busse Water Reservoir	Myci	2012	9	17.8 (3.4) 1201	6.4	26.7
Signal Peak Mine Busse Water Reservoir	Myci	2012	10	17.2 (3.2) 12	11.3	19.6
Signal Peak Mine Busse Water Reservoir	Myci	2012	11	8 (2.2) 9	5.9	11.5
Signal Peak Mine Busse Water Reservoir	Myci	2012	12	5.6 (5) 7	1.1	11
Signal Peak Mine Busse Water Reservoir	Myci	2013	4	11.9 (2.8) 29	4.1	16.6
Signal Peak Mine Busse Water Reservoir	Myci	2013	5	13.9 (2) 848	6.9	24.1
Signal Peak Mine Busse Water Reservoir	Myci	2013	6	15.7 (2.1) 2367	9	23.7
Signal Peak Mine Busse Water Reservoir	Myci	2013	7	19 (2.6) 644	11	26
Signal Peak Mine Busse Water Reservoir	Myci	2013	8	18.1 (3.3) 1574	11.7	27.5
Signal Peak Mine Busse Water Reservoir	Myci	2013	9	18.8 (3.4) 96	8.4	26
Signal Peak Mine Busse Water Reservoir	Myci	2013	10	10.8 (1.6) 10	7	12.7
Signal Peak Mine Busse Water Reservoir	Myci	2013	11	4.5 (4.4) 12	-1.6	10.8
Signal Peak Mine Busse Water Reservoir	Myci	2013	12	3.4 () 1	3.4	3.4
Signal Peak Mine Busse Water Reservoir	Myci	2014	1	-0.7 (0.4) 4	-1	-0.3
Signal Peak Mine Busse Water Reservoir	Myci	2014	2	4.5 (1.2) 3	3.1	5.2
Signal Peak Mine Busse Water Reservoir	Myci	2014	4	13 (3) 57	4.1	17
Signal Peak Mine Busse Water Reservoir	Myci	2014	5	16.4 (2.6) 909	5.9	22.6
Signal Peak Mine Busse Water Reservoir	Myci	2014	6	14 (2.2) 499	5.7	19.4
Signal Peak Mine Busse Water Reservoir	Myci	2014	7	17.9 (3.2) 256	9	26.4
Signal Peak Mine Busse Water Reservoir	Myci	2014	8	18 (3.3) 550	8.9	28.5
Signal Peak Mine Busse Water Reservoir	Myci	2014	9	15.3 (3.8) 124	4.9	21.2
Signal Peak Mine Busse Water Reservoir	Myci	2014	10	13.6 (2.6) 7	10.7	17.3

Signal Peak Mine Busse Water Reservoir	Myci	2014	11	-0.1 (0) 2	-0.1	-0.1
Signal Peak Mine Busse Water Reservoir	Myci	2014	12	-0.8 (0) 2	-0.8	-0.8
Signal Peak Mine Busse Water Reservoir	Myci	2015	1	9.7 () 1	9.7	9.7
Signal Peak Mine Busse Water Reservoir	Myci	2015	2	2.7 () 1	2.7	2.7
Signal Peak Mine Busse Water Reservoir	Myci	2015	3	12.7 (3.3) 21	8.2	18.3
Signal Peak Mine Busse Water Reservoir	Myci	2015	4	11.4 (4.4) 70	1.9	17.1
Signal Peak Mine Busse Water Reservoir	Myci	2015	5	12.9 (2) 278	2.7	16.1
Signal Peak Mine Busse Water Reservoir	Myci	2015	6	16.8 (3.3) 204	9.7	27.2
Signal Peak Mine Busse Water Reservoir	Myci	2015	6	17 (2.8) 154	11.3	24.7
Signal Peak Mine Busse Water Reservoir	Myci	2015	7	17.6 (2.7) 467	8.9	25.5
Signal Peak Mine Busse Water Reservoir	Myci	2015	8	20.8 (4.3) 519	4.7	29.8
Signal Peak Mine Busse Water Reservoir	Myci	2015	8	22.3 (4.4) 865	9.4	30.7
Signal Peak Mine Busse Water Reservoir	Myci	2015	9	20.6 (4.6) 980	9.7	28
Signal Peak Mine Busse Water Reservoir	Myci	2015	9	18 (4.3) 186	9.4	25.5
Signal Peak Mine Busse Water Reservoir	Myci	2015	10	13.4 (1.7) 3	11.8	15.1
Signal Peak Mine Busse Water Reservoir	Myci	2015	10	17.1 (5.2) 57	8.9	26.5
Signal Peak Mine Busse Water Reservoir	Myci	2015	11	8.3 (4.1) 38	0.1	13.6
Signal Peak Mine Busse Water Reservoir	Myci	2015	12	3 (2.3) 64	-2.1	8.7
Signal Peak Mine Busse Water Reservoir	Myci	2016	1	3.5 (2.3) 26	-1	7.2
Signal Peak Mine Busse Water Reservoir	Myci	2016	2	2.7 (2.6) 33	-0.5	9
Signal Peak Mine Busse Water Reservoir	Myci	2016	3	12.3 (6) 43	0.6	18.1
Signal Peak Mine Busse Water Reservoir	Myci	2016	4	17.1 (3.1) 2653	1.6	21.9
Signal Peak Mine Busse Water Reservoir	Myci	2016	5	17.6 (2.6) 1334	8.2	22.1
Signal Peak Mine Busse Water Reservoir	Myci	2016	9	19 (2.4) 47	9.8	21.9

Signal Peak Mine Busse Water Reservoir	Myci	2016	10	14.7 (2.7) 75	8.9	19.8
Signal Peak Mine Busse Water Reservoir	Myci	2016	11	10.5 (4.9) 66	-1.3	17.8
Signal Peak Mine Busse Water Reservoir	Myci	2016	12	1 (0.8) 11	-1.3	1.9
Signal Peak Mine Busse Water Reservoir	Myci	2017	1	6.4 (3.3) 17	-3.3	9.4
Signal Peak Mine Busse Water Reservoir	Myci	2017	2	4.1 (4.4) 19	0.1	11
Signal Peak Mine Busse Water Reservoir	Myci	2017	3	7.1 (1.8) 8	3.2	8.4
Signal Peak Mine Busse Water Reservoir	Myev	2012	8	20.1 (4.1) 62	14.1	27
Signal Peak Mine Busse Water Reservoir	Myev	2012	9	14.4 (2.3) 1931	3.6	25.1
Signal Peak Mine Busse Water Reservoir	Myev	2012	10	15.9 (1.9) 23	8.2	19.8
Signal Peak Mine Busse Water Reservoir	Myev	2013	5	11.7 (1.4) 6	9.4	13.5
Signal Peak Mine Busse Water Reservoir	Myev	2013	6	14.1 (2.2) 34	8.9	19.1
Signal Peak Mine Busse Water Reservoir	Myev	2013	7	18.2 (3.7) 5	12.8	22.7
Signal Peak Mine Busse Water Reservoir	Myev	2013	8	19.5 (2.8) 20	12.7	23.6
Signal Peak Mine Busse Water Reservoir	Myev	2013	9	16.8 (4.7) 18	7.7	24.7
Signal Peak Mine Busse Water Reservoir	Myev	2013	10	8 (2.4) 3	6.5	10.8
Signal Peak Mine Busse Water Reservoir	Myev	2014	5	13 (5.7) 9	3.9	21.4
Signal Peak Mine Busse Water Reservoir	Myev	2014	6	11.5 (3.4) 9	8	18.4
Signal Peak Mine Busse Water Reservoir	Myev	2014	7	19 (3.1) 43	11	26.4
Signal Peak Mine Busse Water Reservoir	Myev	2014	8	18.8 (4.1) 49	7	27
Signal Peak Mine Busse Water Reservoir	Myev	2014	9	13.7 (4.4) 14	8.4	19.3
Signal Peak Mine Busse Water Reservoir	Myev	2014	10	16 () 1	16	16
Signal Peak Mine Busse Water Reservoir	Myev	2015	4	8.5 (6.1) 6	0	16
Signal Peak Mine Busse Water Reservoir	Myev	2015	5	12.3 (2.8) 15	7.4	15.5
Signal Peak Mine Busse Water Reservoir	Myev	2015	6	18.6 (4) 34	9.7	26.4

Signal Peak Mine Busse Water Reservoir	Myev	2015	6	17.8 (3.8) 69	11.3	24.7
Signal Peak Mine Busse Water Reservoir	Myev	2015	7	17.9 (3) 59	11.5	24.6
Signal Peak Mine Busse Water Reservoir	Myev	2015	8	21.3 (4.2) 150	10	29.5
Signal Peak Mine Busse Water Reservoir	Myev	2015	8	22.8 (4.7) 1006	5.4	30.7
Signal Peak Mine Busse Water Reservoir	Myev	2015	9	18.5 (4.6) 1155	5.9	28
Signal Peak Mine Busse Water Reservoir	Myev	2015	9	17.1 (4.9) 77	5.2	24.1
Signal Peak Mine Busse Water Reservoir	Myev	2015	10	15.2 (6.3) 21	7.7	25.4
Signal Peak Mine Busse Water Reservoir	Myev	2015	11	9.2 (1.3) 3	7.7	10
Signal Peak Mine Busse Water Reservoir	Myev	2016	3	9.5 (4.6) 9	1.4	12.2
Signal Peak Mine Busse Water Reservoir	Myev	2016	4	12.4 (4.9) 112	1.3	21.7
Signal Peak Mine Busse Water Reservoir	Myev	2016	5	14 (4.1) 272	4.7	22.1
Signal Peak Mine Busse Water Reservoir	Myev	2016	9	19.5 (1.6) 47	16.8	22.9
Signal Peak Mine Busse Water Reservoir	Myev	2016	10	15.8 (3.4) 23	5.7	18.9
Signal Peak Mine Busse Water Reservoir	Myev	2016	11	3.4 () 1	3.4	3.4
Signal Peak Mine Busse Water Reservoir	Myev	2017	3	9.7 () 1	9.7	9.7
Signal Peak Mine Busse Water Reservoir	Mylu	2012	8	21.4 (4.5) 618	14	29.3
Signal Peak Mine Busse Water Reservoir	Mylu	2012	9	18.7 (3.6) 335	9	26.7
Signal Peak Mine Busse Water Reservoir	Mylu	2012	10	14.4 (4.9) 5	9	19.6
Signal Peak Mine Busse Water Reservoir	Mylu	2013	4	12.5 (0.3) 5	12.3	13
Signal Peak Mine Busse Water Reservoir	Mylu	2013	5	13.6 (2.2) 212	5.7	23.6
Signal Peak Mine Busse Water Reservoir	Mylu	2013	6	15.9 (2) 1755	2.9	23.6
Signal Peak Mine Busse Water Reservoir	Mylu	2013	7	19.4 (2.9) 2886	11	26
Signal Peak Mine Busse Water Reservoir	Mylu	2013	8	17.6 (3.3) 773	11.7	25.5
Signal Peak Mine Busse Water Reservoir	Mylu	2013	9	17.7 (3.2) 68	10.3	25.2

Signal Peak Mine Busse Water Reservoir	Mylu	2013	10	8.7 (1.3) 5	7	10.3
Signal Peak Mine Busse Water Reservoir	Mylu	2014	4	9.8 (3.6) 9	2.9	14.5
Signal Peak Mine Busse Water Reservoir	Mylu	2014	5	16.3 (2.7) 826	1.9	23.1
Signal Peak Mine Busse Water Reservoir	Mylu	2014	6	14.4 (2) 1005	2.4	20.4
Signal Peak Mine Busse Water Reservoir	Mylu	2014	7	17.8 (2.7) 834	8.9	26.2
Signal Peak Mine Busse Water Reservoir	Mylu	2014	8	18.2 (2.9) 883	7.2	28.5
Signal Peak Mine Busse Water Reservoir	Mylu	2014	9	13.5 (3.2) 81	5.5	20.4
Signal Peak Mine Busse Water Reservoir	Mylu	2014	10	13.7 (4.6) 3	8.4	17
Signal Peak Mine Busse Water Reservoir	Mylu	2014	12	3.8 (5.2) 2	0.1	7.5
Signal Peak Mine Busse Water Reservoir	Mylu	2015	3	15.3 (3.4) 11	11.2	18.4
Signal Peak Mine Busse Water Reservoir	Mylu	2015	4	12 (4.3) 10	4.2	15.8
Signal Peak Mine Busse Water Reservoir	Mylu	2015	5	12.3 (2.3) 186	2.9	15.8
Signal Peak Mine Busse Water Reservoir	Mylu	2015	6	17.7 (4) 583	9.5	27.4
Signal Peak Mine Busse Water Reservoir	Mylu	2015	6	17 (2.3) 1488	11.2	24.2
Signal Peak Mine Busse Water Reservoir	Mylu	2015	7	18.2 (2.3) 1661	8.9	27.5
Signal Peak Mine Busse Water Reservoir	Mylu	2015	8	19.5 (3.9) 462	5.4	29.5
Signal Peak Mine Busse Water Reservoir	Mylu	2015	8	21.5 (4.7) 1396	6	30.7
Signal Peak Mine Busse Water Reservoir	Mylu	2015	9	18 (5) 2174	5.4	28
Signal Peak Mine Busse Water Reservoir	Mylu	2015	9	14.2 (4.5) 385	7	26
Signal Peak Mine Busse Water Reservoir	Mylu	2015	10	13.6 (3.2) 3	11.8	17.3
Signal Peak Mine Busse Water Reservoir	Mylu	2015	10	18.6 (0.2) 6	18.4	18.8
Signal Peak Mine Busse Water Reservoir	Mylu	2016	4	8.6 (4.6) 942	3.4	21.6
Signal Peak Mine Busse Water Reservoir	Mylu	2016	5	12.7 (3.7) 2325	4.2	21.6
Signal Peak Mine Busse Water Reservoir	Mylu	2016	9	18.2 (3.8) 125	10	23.1

Signal Peak Mine Busse Water Reservoir	Mylu	2016	10	14.2 (3.7) 46	6.2	19.6
Signal Peak Mine Busse Water Reservoir	Myth	2012	8	19.1 (2.4) 2	17.4	20.8
Signal Peak Mine Busse Water Reservoir	Myth	2012	9	21.6 () 1	21.6	21.6
Signal Peak Mine Busse Water Reservoir	Myth	2015	6	21.5 (3.7) 2	18.8	24.1
Signal Peak Mine Busse Water Reservoir	Myth	2015	8	21 (5) 34	12.3	29.7
Signal Peak Mine Busse Water Reservoir	Myth	2015	9	18.3 (4.3) 45	9	24.7
Signal Peak Mine Busse Water Reservoir	Myth	2015	10	10.7 () 1	10.7	10.7
Signal Peak Mine Busse Water Reservoir	Myth	2016	3	11.5 (1.9) 6	9.8	14
Signal Peak Mine Busse Water Reservoir	Myth	2016	4	9.2 (4.5) 12	3.7	18.6
Signal Peak Mine Busse Water Reservoir	Myth	2016	5	13.3 (4.7) 16	4.6	21.9
Signal Peak Mine Busse Water Reservoir	Myth	2016	9	19.4 (1) 25	16.8	22.6
Signal Peak Mine Reservoir 1	Epfu	2012	8	24.7 (3.6) 901	15.8	29.3
Signal Peak Mine Reservoir 1	Epfu	2012	9	19.1 (3.4) 3910	5.1	26.5
Signal Peak Mine Reservoir 1	Epfu	2012	10	13.8 (3.1) 335	3.1	19.9
Signal Peak Mine Reservoir 1	Epfu	2012	11	8.2 (3.8) 154	2.2	16.1
Signal Peak Mine Reservoir 1	Epfu	2012	12	4 (4) 127	-2.1	11.8
Signal Peak Mine Reservoir 1	Epfu	2013	1	5.1 (2.5) 128	0.1	10.2
Signal Peak Mine Reservoir 1	Epfu	2013	2	3.1 (1.7) 53	-1.6	7.7
Signal Peak Mine Reservoir 1	Epfu	2013	3	8 (2.8) 548	0.4	16.3
Signal Peak Mine Reservoir 1	Epfu	2013	4	12.5 (3.1) 3478	1.4	20.3
Signal Peak Mine Reservoir 1	Epfu	2013	5	14.9 (2.6) 1892	5.2	26.7
Signal Peak Mine Reservoir 1	Epfu	2013	6	19.3 (2.6) 1026	7	24.7
Signal Peak Mine Reservoir 1	Epfu	2013	7	22.1 (2.6) 1156	13.6	27.7
Signal Peak Mine Reservoir 1	Epfu	2013	8	22.7 (3) 4154	13.6	27.4

Signal Peak Mine Reservoir 1	Epfu	2013	9	23 (2.8) 801	8.4	27.5
Signal Peak Mine Reservoir 1	Epfu	2013	10	13.3 (2.4) 154	6	16.1
Signal Peak Mine Reservoir 1	Epfu	2013	11	8.4 (4.2) 128	0.6	14
Signal Peak Mine Reservoir 1	Epfu	2013	12	6.8 (1.8) 17	4.2	11.3
Signal Peak Mine Reservoir 1	Epfu	2014	1	6.4 (0) 9	6.4	6.5
Signal Peak Mine Reservoir 1	Epfu	2014	4	9.6 (1.6) 20	6.4	11.5
Signal Peak Mine Reservoir 1	Epfu	2014	5	16 (3.8) 308	6.7	25.1
Signal Peak Mine Reservoir 1	Epfu	2014	6	17 (2.3) 554	12	22.2
Signal Peak Mine Reservoir 1	Epfu	2014	7	21.6 (3.4) 2788	11.2	28
Signal Peak Mine Reservoir 1	Epfu	2014	8	22 (2.9) 2359	9.7	30.7
Signal Peak Mine Reservoir 1	Epfu	2014	9	17.2 (3.3) 465	6.2	24.2
Signal Peak Mine Reservoir 1	Epfu	2014	10	14.4 (2.4) 85	8	17.9
Signal Peak Mine Reservoir 1	Epfu	2014	11	6.8 (2.5) 95	0.8	13.6
Signal Peak Mine Reservoir 1	Epfu	2014	12	8.2 (3.1) 56	-1.3	13
Signal Peak Mine Reservoir 1	Epfu	2015	1	7.1 (3) 31	2.7	12.7
Signal Peak Mine Reservoir 1	Epfu	2015	2	8.7 () 1	8.7	8.7
Signal Peak Mine Reservoir 1	Epfu	2015	3	13.4 (2.5) 1877	5.9	20.4
Signal Peak Mine Reservoir 1	Epfu	2015	4	10 (3.1) 754	1.6	21.1
Signal Peak Mine Reservoir 1	Epfu	2015	5	12.7 (1.8) 118	3.9	17.6
Signal Peak Mine Reservoir 1	Epfu	2015	6	20.5 (2.1) 81	15.6	25.4
Signal Peak Mine Reservoir 1	Epfu	2015	6	22.6 (3.3) 2825	14.1	29.5
Signal Peak Mine Reservoir 1	Epfu	2015	7	23 (2.8) 4590	14.5	30.3
Signal Peak Mine Reservoir 1	Epfu	2015	8	24.4 (3.5) 4382	7.9	33.5
Signal Peak Mine Reservoir 1	Epfu	2015	9	22.8 (3.4) 3572	12.8	30

Signal Peak Mine Reservoir 1	Epfu	2015	10	15.8 (6.4) 635	3.9	28.2
Signal Peak Mine Reservoir 1	Epfu	2015	11	9.7 (3.1) 672	3.4	16.6
Signal Peak Mine Reservoir 1	Epfu	2015	12	8.3 (3) 392	-0.8	15.6
Signal Peak Mine Reservoir 1	Epfu	2016	1	6.6 (2.6) 318	3.1	12
Signal Peak Mine Reservoir 1	Epfu	2016	2	9.3 (3.3) 494	1.1	14.8
Signal Peak Mine Reservoir 1	Epfu	2016	3	0.8 (0) 2	0.8	0.8
Signal Peak Mine Reservoir 1	Epfu	2016	4	16.5 (4) 818	2.7	24.1
Signal Peak Mine Reservoir 1	Epfu	2016	5	15.6 (3.3) 1095	10.8	25.2
Signal Peak Mine Reservoir 1	Epfu	2016	6	20.4 (3.9) 9146	12	30.8
Signal Peak Mine Reservoir 1	Epfu	2016	7	24.2 (2.8) 3326	15	30.5
Signal Peak Mine Reservoir 1	Epfu	2016	8	24.1 (3.4) 1577	10	30.7
Signal Peak Mine Reservoir 1	Epfu	2016	9	20.7 (2.8) 1053	13	28.5
Signal Peak Mine Reservoir 1	Epfu	2016	10	14.6 (4.6) 285	6.2	23.2
Signal Peak Mine Reservoir 1	Epfu	2016	11	12.9 (3.3) 585	3.7	20.9
Signal Peak Mine Reservoir 1	Epfu	2016	12	5 (1.7) 69	0	6.9
Signal Peak Mine Reservoir 1	Epfu	2017	1	8.9 (3.2) 160	1.9	13.3
Signal Peak Mine Reservoir 1	Epfu	2017	2	9.7 (3) 265	3.9	15
Signal Peak Mine Reservoir 1	Epfu	2017	3	10.3 (0.7) 35	9.7	11.7
Signal Peak Mine Reservoir 1	Euma	2012	9	20.4 (0) 2	20.4	20.4
Signal Peak Mine Reservoir 1	Euma	2013	4	12 () 1	12	12
Signal Peak Mine Reservoir 1	Euma	2013	6	17.3 (2.1) 2	15.8	18.8
Signal Peak Mine Reservoir 1	Euma	2013	7	23.6 () 1	23.6	23.6
Signal Peak Mine Reservoir 1	Euma	2013	8	23.9 () 1	23.9	23.9
Signal Peak Mine Reservoir 1	Euma	2014	5	19 (5.4) 6	9	24.9

Signal Peak Mine Reservoir 1	Euma	2014	6	16.7 (2) 8	13.6	19.1
Signal Peak Mine Reservoir 1	Euma	2014	7	20.3 (3.3) 38	13.2	27.2
Signal Peak Mine Reservoir 1	Euma	2014	8	19.3 (1.9) 11	15.3	21.2
Signal Peak Mine Reservoir 1	Euma	2014	10	16.5 (0.6) 6	15.5	17.1
Signal Peak Mine Reservoir 1	Euma	2015	4	11.5 (0) 2	11.5	11.5
Signal Peak Mine Reservoir 1	Euma	2015	6	22.8 (2.7) 655	14.3	28
Signal Peak Mine Reservoir 1	Euma	2015	7	21.6 (2.3) 2181	14.8	28.5
Signal Peak Mine Reservoir 1	Euma	2015	8	23.8 (4) 81	7.9	32.5
Signal Peak Mine Reservoir 1	Euma	2015	9	19.4 (3.1) 706	14.3	26.4
Signal Peak Mine Reservoir 1	Euma	2016	4	20.7 (1.9) 29	15	21.4
Signal Peak Mine Reservoir 1	Euma	2016	5	13.1 (1.6) 9	12.5	17.4
Signal Peak Mine Reservoir 1	Euma	2016	6	20.3 (3.7) 204	12.3	29.8
Signal Peak Mine Reservoir 1	Euma	2016	7	23.9 (1.8) 188	19.1	28.7
Signal Peak Mine Reservoir 1	Euma	2016	8	19.9 (0) 2	19.9	19.9
Signal Peak Mine Reservoir 1	Euma	2016	10	16.1 (0.1) 2	16	16.1
Signal Peak Mine Reservoir 1	Laci	2012	8	25.6 (3.1) 39	19.1	29.3
Signal Peak Mine Reservoir 1	Laci	2012	9	18.1 (2.9) 79	10.7	25.7
Signal Peak Mine Reservoir 1	Laci	2012	10	16.2 (4.7) 19	2.6	19.6
Signal Peak Mine Reservoir 1	Laci	2012	11	5.2 (4.1) 12	-0.3	12.3
Signal Peak Mine Reservoir 1	Laci	2012	12	4.2 (1.1) 2	3.4	4.9
Signal Peak Mine Reservoir 1	Laci	2013	1	8.5 (0.5) 5	8	8.9
Signal Peak Mine Reservoir 1	Laci	2013	2	3.3 (1.3) 6	0.9	4.2
Signal Peak Mine Reservoir 1	Laci	2013	3	9.3 (4.6) 17	2.2	14.3
Signal Peak Mine Reservoir 1	Laci	2013	4	14.7 (2.1) 64	4.9	17.9

Signal Peak Mine Reservoir 1	Laci	2013	5	16.9 (2.6) 69	11.8	26.4
Signal Peak Mine Reservoir 1	Laci	2013	6	18.9 (3.2) 1151	10	24.9
Signal Peak Mine Reservoir 1	Laci	2013	7	22.7 (3) 1127	15.3	27.7
Signal Peak Mine Reservoir 1	Laci	2013	8	22 (3) 208	15.8	26.5
Signal Peak Mine Reservoir 1	Laci	2013	9	22.8 (3.7) 34	14.5	27.5
Signal Peak Mine Reservoir 1	Laci	2013	10	9.4 (2.6) 4	7.2	12.2
Signal Peak Mine Reservoir 1	Laci	2013	11	8.6 (2.4) 9	2.4	9.5
Signal Peak Mine Reservoir 1	Laci	2014	4	11.2 (0.8) 7	9.5	11.5
Signal Peak Mine Reservoir 1	Laci	2014	5	16 (2.8) 183	7.4	24.6
Signal Peak Mine Reservoir 1	Laci	2014	6	17.8 (2.1) 916	11.3	22.2
Signal Peak Mine Reservoir 1	Laci	2014	7	22 (3.3) 2360	11.2	28.2
Signal Peak Mine Reservoir 1	Laci	2014	8	20.9 (3.5) 473	10.8	30.2
Signal Peak Mine Reservoir 1	Laci	2014	9	16.3 (3.5) 60	8	23.7
Signal Peak Mine Reservoir 1	Laci	2014	12	5.1 (3.2) 6	-1.3	6.7
Signal Peak Mine Reservoir 1	Laci	2015	1	12 (0) 3	12	12
Signal Peak Mine Reservoir 1	Laci	2015	2	5.7 () 1	5.7	5.7
Signal Peak Mine Reservoir 1	Laci	2015	3	14.4 (2.1) 148	8.2	20.4
Signal Peak Mine Reservoir 1	Laci	2015	4	11.9 (2.4) 51	6.9	20.6
Signal Peak Mine Reservoir 1	Laci	2015	5	13 (0.9) 11	11.2	14.8
Signal Peak Mine Reservoir 1	Laci	2015	6	20.8 (2) 47	14.5	24.4
Signal Peak Mine Reservoir 1	Laci	2015	6	22.9 (3.5) 3145	14.1	29.3
Signal Peak Mine Reservoir 1	Laci	2015	7	22.5 (3.1) 6363	14.1	30.3
Signal Peak Mine Reservoir 1	Laci	2015	8	23.4 (3.4) 1858	8.2	33.5
Signal Peak Mine Reservoir 1	Laci	2015	9	24.4 (4.1) 65	14.8	29.8

Signal Peak Mine Reservoir 1	Laci	2015	10	10 (6.7) 15	3.9	19.9
Signal Peak Mine Reservoir 1	Laci	2015	11	11.1 (1) 49	7.7	13
Signal Peak Mine Reservoir 1	Laci	2015	12	9.8 (4.6) 24	-0.6	15.5
Signal Peak Mine Reservoir 1	Laci	2016	1	6.6 (0.8) 11	4.1	6.9
Signal Peak Mine Reservoir 1	Laci	2016	2	9.1 (2.6) 14	6.9	13.3
Signal Peak Mine Reservoir 1	Laci	2016	4	15.8 (3.7) 26	9.8	23.4
Signal Peak Mine Reservoir 1	Laci	2016	5	16.5 (3.9) 61	10.5	25.2
Signal Peak Mine Reservoir 1	Laci	2016	6	21.3 (4.2) 5809	11.7	30.8
Signal Peak Mine Reservoir 1	Laci	2016	7	23 (3) 3209	14.5	30.5
Signal Peak Mine Reservoir 1	Laci	2016	8	23.1 (4.4) 341	14.3	30.7
Signal Peak Mine Reservoir 1	Laci	2016	9	21.7 (4.2) 51	10.5	28.5
Signal Peak Mine Reservoir 1	Laci	2016	11	12 (4.3) 23	7	17
Signal Peak Mine Reservoir 1	Laci	2016	12	2.3 (4) 3	0	6.9
Signal Peak Mine Reservoir 1	Laci	2017	1	12.6 (0.8) 2	12	13.2
Signal Peak Mine Reservoir 1	Laci	2017	2	11.2 (5.6) 3	4.7	14.5
Signal Peak Mine Reservoir 1	Laci	2017	3	9.7 () 1	9.7	9.7
Signal Peak Mine Reservoir 1	Lano	2012	8	22.7 (4.5) 127	8.5	29.2
Signal Peak Mine Reservoir 1	Lano	2012	9	17.8 (2.9) 968	8	26
Signal Peak Mine Reservoir 1	Lano	2012	10	13.5 (4.4) 96	2.6	19.8
Signal Peak Mine Reservoir 1	Lano	2012	11	8 (4) 73	-0.6	14.3
Signal Peak Mine Reservoir 1	Lano	2012	12	3.7 (4.2) 43	-2.1	11.3
Signal Peak Mine Reservoir 1	Lano	2013	1	5 (3) 15	0.3	10.2
Signal Peak Mine Reservoir 1	Lano	2013	2	3 (2.4) 27	-1.8	7.7
Signal Peak Mine Reservoir 1	Lano	2013	3	8.1 (3.4) 174	0.3	15.3

Signal Peak Mine Reservoir 1	Lano	2013	4	14.9 (3.5) 1703	5.1	20.3
Signal Peak Mine Reservoir 1	Lano	2013	5	15.7 (2.8) 983	7.5	26.7
Signal Peak Mine Reservoir 1	Lano	2013	6	18.3 (2.4) 759	10.7	24.7
Signal Peak Mine Reservoir 1	Lano	2013	7	20.3 (2.8) 599	14.1	27.7
Signal Peak Mine Reservoir 1	Lano	2013	8	21.2 (3.2) 773	13.6	27.5
Signal Peak Mine Reservoir 1	Lano	2013	9	20.5 (4.4) 278	7.9	27.5
Signal Peak Mine Reservoir 1	Lano	2013	10	13.8 (3.8) 16	6.2	17.4
Signal Peak Mine Reservoir 1	Lano	2013	11	7 (3.5) 22	0.6	11
Signal Peak Mine Reservoir 1	Lano	2013	12	5.6 (2) 8	3.1	8
Signal Peak Mine Reservoir 1	Lano	2014	1	6.5 (0) 2	6.5	6.5
Signal Peak Mine Reservoir 1	Lano	2014	4	10.7 (0) 2	10.7	10.7
Signal Peak Mine Reservoir 1	Lano	2014	5	15 (4.1) 154	7.5	25.5
Signal Peak Mine Reservoir 1	Lano	2014	6	16.4 (2.3) 204	11.2	22.2
Signal Peak Mine Reservoir 1	Lano	2014	7	21 (3.9) 647	11.2	27.9
Signal Peak Mine Reservoir 1	Lano	2014	8	20.6 (3.4) 502	9.8	27.9
Signal Peak Mine Reservoir 1	Lano	2014	9	16.1 (3.8) 176	7.2	24.2
Signal Peak Mine Reservoir 1	Lano	2014	10	14.7 (1.9) 9	12.2	17.6
Signal Peak Mine Reservoir 1	Lano	2014	11	5.9 (3.1) 7	0.8	9.4
Signal Peak Mine Reservoir 1	Lano	2014	12	4.1 (4.3) 20	-1.3	11
Signal Peak Mine Reservoir 1	Lano	2015	1	7.2 (6.3) 6	-0.5	12.7
Signal Peak Mine Reservoir 1	Lano	2015	2	5.7 () 1	5.7	5.7
Signal Peak Mine Reservoir 1	Lano	2015	3	12.7 (2.2) 461	5.9	20.4
Signal Peak Mine Reservoir 1	Lano	2015	4	10.7 (2.4) 206	1.6	20.6
Signal Peak Mine Reservoir 1	Lano	2015	5	11.3 (3) 90	2.6	15.8

Signal Peak Mine Reservoir 1	Lano	2015	6	20.3 (2) 35	15.5	23.7
Signal Peak Mine Reservoir 1	Lano	2015	6	21.8 (3.3) 1161	14.1	29.3
Signal Peak Mine Reservoir 1	Lano	2015	7	22.1 (2.8) 1856	14.8	30.3
Signal Peak Mine Reservoir 1	Lano	2015	8	23.4 (4.6) 1319	8	33.5
Signal Peak Mine Reservoir 1	Lano	2015	9	19.7 (4.6) 1169	8.9	29.8
Signal Peak Mine Reservoir 1	Lano	2015	10	16.9 (5.4) 126	3.9	27
Signal Peak Mine Reservoir 1	Lano	2015	11	10.2 (3.5) 59	3.9	16.8
Signal Peak Mine Reservoir 1	Lano	2015	12	6.7 (2.5) 67	0	15.5
Signal Peak Mine Reservoir 1	Lano	2016	1	7.4 (2) 29	5.1	11.2
Signal Peak Mine Reservoir 1	Lano	2016	2	9.3 (3.6) 50	3.4	14
Signal Peak Mine Reservoir 1	Lano	2016	3	0.8 () 1	0.8	0.8
Signal Peak Mine Reservoir 1	Lano	2016	4	16.6 (4.3) 449	2.7	23.6
Signal Peak Mine Reservoir 1	Lano	2016	5	15.7 (3.2) 515	6.9	25.1
Signal Peak Mine Reservoir 1	Lano	2016	6	20 (3.6) 1927	12	30.5
Signal Peak Mine Reservoir 1	Lano	2016	7	23.5 (3) 1133	15	30.3
Signal Peak Mine Reservoir 1	Lano	2016	8	22.5 (4) 589	10	30.7
Signal Peak Mine Reservoir 1	Lano	2016	9	19 (3.7) 374	10	28
Signal Peak Mine Reservoir 1	Lano	2016	10	14.6 (4.1) 56	9	22.6
Signal Peak Mine Reservoir 1	Lano	2016	11	12.8 (4.4) 96	4.4	20.9
Signal Peak Mine Reservoir 1	Lano	2016	12	6.3 (1.3) 13	2.2	6.9
Signal Peak Mine Reservoir 1	Lano	2017	1	8.1 (4.9) 29	0.9	13.3
Signal Peak Mine Reservoir 1	Lano	2017	2	10.5 (2.5) 49	4.1	14.5
Signal Peak Mine Reservoir 1	Lano	2017	3	9.7 (0.1) 6	9.7	9.8
Signal Peak Mine Reservoir 1	Myci	2012	8	22.7 (3.7) 36	15.5	28.7

Signal Peak Mine Reservoir 1	Myci	2012	9	18.6 (2.4) 43	13.2	24.9
Signal Peak Mine Reservoir 1	Myci	2012	10	13.3 (3.8) 19	7.2	19.3
Signal Peak Mine Reservoir 1	Myci	2012	11	7.8 (1.6) 7	5.9	10.2
Signal Peak Mine Reservoir 1	Myci	2012	12	4.5 (2.9) 7	3.2	11
Signal Peak Mine Reservoir 1	Myci	2013	1	6.4 (2.3) 12	0	8.2
Signal Peak Mine Reservoir 1	Myci	2013	2	2.1 (1.1) 2	1.4	2.9
Signal Peak Mine Reservoir 1	Myci	2013	3	2 (2.4) 6	-0.6	4.9
Signal Peak Mine Reservoir 1	Myci	2013	4	8.8 (3.8) 6	1.7	12.2
Signal Peak Mine Reservoir 1	Myci	2013	5	15.4 (2.9) 18	7.4	18.9
Signal Peak Mine Reservoir 1	Myci	2013	6	17.2 (2.7) 42	12.8	23.2
Signal Peak Mine Reservoir 1	Myci	2013	7	21 (2.7) 57	13.8	26.9
Signal Peak Mine Reservoir 1	Myci	2013	8	22.2 (2.8) 93	15.8	27.5
Signal Peak Mine Reservoir 1	Myci	2013	9	21.9 (1.1) 9	19.6	23.4
Signal Peak Mine Reservoir 1	Myci	2013	10	12.8 (1.4) 10	10.2	14.1
Signal Peak Mine Reservoir 1	Myci	2013	11	6.2 (0.6) 3	5.5	6.5
Signal Peak Mine Reservoir 1	Myci	2014	1	2.7 (0) 4	2.7	2.7
Signal Peak Mine Reservoir 1	Myci	2014	5	16.7 (3) 33	9	21.2
Signal Peak Mine Reservoir 1	Myci	2014	6	15 (2) 36	11.7	18.9
Signal Peak Mine Reservoir 1	Myci	2014	7	20.8 (3.2) 106	11.3	27.4
Signal Peak Mine Reservoir 1	Myci	2014	8	21.5 (3.9) 146	9.8	30.5
Signal Peak Mine Reservoir 1	Myci	2014	9	16.9 (3.3) 16	11	23.1
Signal Peak Mine Reservoir 1	Myci	2014	10	19.3 (2.3) 2	17.6	20.9
Signal Peak Mine Reservoir 1	Myci	2014	11	8.2 (1.1) 2	7.4	9
Signal Peak Mine Reservoir 1	Myci	2014	12	4.1 () 1	4.1	4.1

Signal Peak Mine Reservoir 1	Myci	2015	3	13.8 () 1	13.8	13.8
Signal Peak Mine Reservoir 1	Myci	2015	4	9.6 (1.4) 3	8.2	11
Signal Peak Mine Reservoir 1	Myci	2015	5	12.3 (1.2) 2	11.5	13.2
Signal Peak Mine Reservoir 1	Myci	2015	6	17.8 (2.3) 2	16.1	19.4
Signal Peak Mine Reservoir 1	Myci	2015	6	21 (3.2) 234	14.1	28.5
Signal Peak Mine Reservoir 1	Myci	2015	7	23 (3) 484	15.5	29.3
Signal Peak Mine Reservoir 1	Myci	2015	8	23.8 (3.7) 531	13.2	32.2
Signal Peak Mine Reservoir 1	Myci	2015	9	19.6 (4) 239	12.8	28.7
Signal Peak Mine Reservoir 1	Myci	2015	10	13.9 (7.1) 38	4.7	26.4
Signal Peak Mine Reservoir 1	Myci	2015	11	11.6 (3.5) 27	2.9	14.1
Signal Peak Mine Reservoir 1	Myci	2016	1	3.6 (4.4) 3	-1.3	7
Signal Peak Mine Reservoir 1	Myci	2016	2	6.3 (2.2) 21	3.9	9.4
Signal Peak Mine Reservoir 1	Myci	2016	4	18.2 (3.6) 23	11	24.1
Signal Peak Mine Reservoir 1	Myci	2016	5	19.4 (4.2) 47	12.8	25.4
Signal Peak Mine Reservoir 1	Myci	2016	6	20 (4.1) 291	12.2	29.3
Signal Peak Mine Reservoir 1	Myci	2016	7	23.8 (2.7) 363	16.3	30.5
Signal Peak Mine Reservoir 1	Myci	2016	8	22.7 (3.5) 405	13.8	30.7
Signal Peak Mine Reservoir 1	Myci	2016	9	20.1 (3.6) 77	13.3	28
Signal Peak Mine Reservoir 1	Myci	2016	10	15.8 (4.4) 12	7	23.2
Signal Peak Mine Reservoir 1	Myci	2016	11	14 (3.8) 26	4.1	19.8
Signal Peak Mine Reservoir 1	Myci	2016	12	2.4 () 1	2.4	2.4
Signal Peak Mine Reservoir 1	Myci	2017	1	2.1 () 1	2.1	2.1
Signal Peak Mine Reservoir 1	Myci	2017	2	7.4 () 1	7.4	7.4
Signal Peak Mine Reservoir 1	Myci	2017	3	5.7 () 1	5.7	5.7

Signal Peak Mine Reservoir 1	Myev	2012	8	21.7 (4.1) 9	14.5	28.2
Signal Peak Mine Reservoir 1	Myev	2012	9	16.9 (3.8) 35	7.5	24.9
Signal Peak Mine Reservoir 1	Myev	2012	10	18.4 () 1	18.4	18.4
Signal Peak Mine Reservoir 1	Myev	2013	4	12.3 (0.1) 2	12.2	12.3
Signal Peak Mine Reservoir 1	Myev	2013	5	15.8 (5.6) 11	-0.3	19.3
Signal Peak Mine Reservoir 1	Myev	2013	6	17.7 (2.1) 18	13	21.4
Signal Peak Mine Reservoir 1	Myev	2013	7	19.9 (2.2) 14	17	23.2
Signal Peak Mine Reservoir 1	Myev	2013	8	21.1 (3.1) 51	14	26.7
Signal Peak Mine Reservoir 1	Myev	2013	9	22.1 (4.2) 29	14.5	27.5
Signal Peak Mine Reservoir 1	Myev	2013	10	9.5 (2.5) 2	7.7	11.3
Signal Peak Mine Reservoir 1	Myev	2014	5	16.2 (2.5) 21	11	19.4
Signal Peak Mine Reservoir 1	Myev	2014	6	15.6 (3.2) 30	10.8	21.2
Signal Peak Mine Reservoir 1	Myev	2014	7	20.2 (2.7) 21	15.1	24.6
Signal Peak Mine Reservoir 1	Myev	2014	8	21.9 (3.4) 20	16	26.9
Signal Peak Mine Reservoir 1	Myev	2014	9	15 (3.7) 12	8.2	20.1
Signal Peak Mine Reservoir 1	Myev	2015	5	13.6 () 1	13.6	13.6
Signal Peak Mine Reservoir 1	Myev	2015	6	15.6 (0.1) 2	15.5	15.6
Signal Peak Mine Reservoir 1	Myev	2015	6	21.2 (3) 191	14.1	27.7
Signal Peak Mine Reservoir 1	Myev	2015	7	21.9 (2.7) 179	15.1	30.3
Signal Peak Mine Reservoir 1	Myev	2015	8	23.9 (4.3) 489	8.7	33.5
Signal Peak Mine Reservoir 1	Myev	2015	9	20 (4.3) 267	11.7	28.9
Signal Peak Mine Reservoir 1	Myev	2015	10	17.4 (4.8) 8	9.2	23.2
Signal Peak Mine Reservoir 1	Myev	2016	1	6.2 () 1	6.2	6.2
Signal Peak Mine Reservoir 1	Myev	2016	4	16.4 (4.9) 37	5.7	23.9

Signal Peak Mine Reservoir 1	Myev	2016	5	16.3 (3.7) 137	6.9	25.1
Signal Peak Mine Reservoir 1	Myev	2016	6	20 (3.8) 164	12.2	29
Signal Peak Mine Reservoir 1	Myev	2016	7	23.6 (2.8) 126	17.9	29
Signal Peak Mine Reservoir 1	Myev	2016	8	22.8 (4) 456	9.8	30.7
Signal Peak Mine Reservoir 1	Myev	2016	9	17.7 (3.8) 119	9.8	28.5
Signal Peak Mine Reservoir 1	Myev	2016	10	15.4 (2.3) 8	11.2	17.4
Signal Peak Mine Reservoir 1	Mylu	2012	8	22 (3.3) 21	17.3	29.2
Signal Peak Mine Reservoir 1	Mylu	2012	9	18.4 (3.4) 52	6.5	25.2
Signal Peak Mine Reservoir 1	Mylu	2012	10	7.2 () 1	7.2	7.2
Signal Peak Mine Reservoir 1	Mylu	2012	11	9.6 (0.6) 4	9	10.2
Signal Peak Mine Reservoir 1	Mylu	2012	12	3.4 () 1	3.4	3.4
Signal Peak Mine Reservoir 1	Mylu	2013	1	4.4 () 1	4.4	4.4
Signal Peak Mine Reservoir 1	Mylu	2013	4	12.9 (2.2) 10	11.3	18.9
Signal Peak Mine Reservoir 1	Mylu	2013	5	15.5 (2.9) 47	7.9	25.7
Signal Peak Mine Reservoir 1	Mylu	2013	6	16.7 (2.1) 62	14	22.6
Signal Peak Mine Reservoir 1	Mylu	2013	7	20.3 (2.8) 35	15.8	27.5
Signal Peak Mine Reservoir 1	Mylu	2013	8	21.2 (3) 53	15.8	26.7
Signal Peak Mine Reservoir 1	Mylu	2013	9	20.6 (4.2) 7	13.6	27.2
Signal Peak Mine Reservoir 1	Mylu	2013	10	12.6 (1.1) 11	9.8	13.3
Signal Peak Mine Reservoir 1	Mylu	2014	4	10.1 (2) 2	8.7	11.5
Signal Peak Mine Reservoir 1	Mylu	2014	5	14.3 (2.7) 15	7.4	18.4
Signal Peak Mine Reservoir 1	Mylu	2014	6	16.8 (2.6) 25	9.5	21.2
Signal Peak Mine Reservoir 1	Mylu	2014	7	20 (3.6) 21	14	25.2
Signal Peak Mine Reservoir 1	Mylu	2014	8	22.5 (1.9) 32	19.1	27.7

Signal Peak Mine Reservoir 1	Mylu	2014	9	19.5 (3.5) 4	15.6	23.7
Signal Peak Mine Reservoir 1	Mylu	2014	11	15.5 () 1	15.5	15.5
Signal Peak Mine Reservoir 1	Mylu	2015	3	13.9 (0.2) 2	13.8	14.1
Signal Peak Mine Reservoir 1	Mylu	2015	4	11.1 (1.2) 4	9.5	12.2
Signal Peak Mine Reservoir 1	Mylu	2015	5	12.9 (2.6) 3	10.2	15.3
Signal Peak Mine Reservoir 1	Mylu	2015	6	21.4 () 1	21.4	21.4
Signal Peak Mine Reservoir 1	Mylu	2015	6	22.5 (3.4) 17	15.1	25.9
Signal Peak Mine Reservoir 1	Mylu	2015	7	23 (2.5) 108	17	28
Signal Peak Mine Reservoir 1	Mylu	2015	8	21.7 (4.7) 116	10.8	30.3
Signal Peak Mine Reservoir 1	Mylu	2015	9	19.1 (3.3) 162	12	26.4
Signal Peak Mine Reservoir 1	Mylu	2015	10	19.3 () 1	19.3	19.3
Signal Peak Mine Reservoir 1	Mylu	2016	2	9.4 () 1	9.4	9.4
Signal Peak Mine Reservoir 1	Mylu	2016	4	17.8 (1.1) 4	16.1	18.4
Signal Peak Mine Reservoir 1	Mylu	2016	5	21 (4.2) 25	12.2	24.9
Signal Peak Mine Reservoir 1	Mylu	2016	6	21.5 (4.2) 24	14.5	29.8
Signal Peak Mine Reservoir 1	Mylu	2016	7	23.2 (2.3) 61	16.6	28.9
Signal Peak Mine Reservoir 1	Mylu	2016	8	23.1 (3.7) 54	15.6	30.2
Signal Peak Mine Reservoir 1	Mylu	2016	9	17.3 (3.1) 61	13.3	24.1
Signal Peak Mine Reservoir 1	Mylu	2016	10	17.4 () 1	17.4	17.4
Signal Peak Mine Reservoir 1	Mylu	2016	11	17.8 () 1	17.8	17.8
Signal Peak Mine Reservoir 1	Myth	2013	8	23.2 () 1	23.2	23.2
Signal Peak Mine Reservoir 1	Myth	2015	6	21.3 (3.4) 15	15	27.4
Signal Peak Mine Reservoir 1	Myth	2015	7	21.7 (2.1) 9	19.3	26.5
Signal Peak Mine Reservoir 1	Myth	2015	8	23.8 (4.1) 20	19.8	31.3

Signal Peak Mine Reservoir 1	Myth	2015	9	24.5 (5.2) 2	20.8	28.2
Signal Peak Mine Reservoir 1	Myth	2015	10	17.4 () 1	17.4	17.4
Signal Peak Mine Reservoir 1	Myth	2016	4	18 (3.7) 6	11.8	23.6
Signal Peak Mine Reservoir 1	Myth	2016	5	16.5 (3.9) 13	7	21.7
Signal Peak Mine Reservoir 1	Myth	2016	6	22.5 (3.8) 14	15.3	28
Signal Peak Mine Reservoir 1	Myth	2016	7	24 (1.6) 5	22.6	26.2
Signal Peak Mine Reservoir 1	Myth	2016	8	23.3 (4.7) 23	14.5	29.3
Signal Peak Mine Reservoir 1	Myth	2016	9	19.3 (5.7) 10	10	25.7
Spring Creek Mine	Epfu	2012	8	24.9 (2.8) 2083	12.5	30.7
Spring Creek Mine	Epfu	2012	9	21.2 (2.5) 190	13.5	25.7
Spring Creek Mine	Epfu	2013	4	12.5 (1.9) 137	6.2	17.6
Spring Creek Mine	Epfu	2013	5	17.5 (2.9) 989	6	26.2
Spring Creek Mine	Epfu	2013	6	20.1 (3) 1123	9.5	28
Spring Creek Mine	Epfu	2013	10	14 () 1	14	14
Spring Creek Mine	Epfu	2014	3	6 () 1	6	6
Spring Creek Mine	Epfu	2014	4	15.6 (4) 14	9	19.6
Spring Creek Mine	Epfu	2014	5	18.2 (4.5) 89	8	27.4
Spring Creek Mine	Epfu	2014	6	18.4 (2.7) 243	7	25.5
Spring Creek Mine	Epfu	2014	7	22.5 (3.3) 341	14.1	29.7
Spring Creek Mine	Epfu	2014	8	21.1 (2.4) 230	15.5	26.4
Spring Creek Mine	Epfu	2014	9	18 (4.7) 6	11.3	22.1
Spring Creek Mine	Epfu	2014	11	3.6 () 1	3.6	3.6
Spring Creek Mine	Epfu	2014	12	6.7 () 1	6.7	6.7
Spring Creek Mine	Epfu	2015	3	17.3 () 1	17.3	17.3
Spring Creek Mine	Epfu	2015	4	21.7 (4.6) 21	11.3	24.6
Spring Creek Mine	Epfu	2015	5	16.4 (3.4) 57	8.2	21.7
Spring Creek Mine	Epfu	2015	6	20.2 (2) 39	16.8	23.6
Spring Creek Mine	Epfu	2015	6	23 (2.5) 947	16.8	29
Spring Creek Mine	Epfu	2015	7	24.5 (2.8) 1566	15.5	30.8
Spring Creek Mine	Epfu	2015	8	26.3 (4.1) 1109	12.8	32.8
Spring Creek Mine	Epfu	2015	9	21.4 (3.6) 134	13.5	29.7
Spring Creek Mine	Epfu	2015	10	17.3 (3.4) 13	10	23.6
Spring Creek Mine	Epfu	2015	11	5.5 (0) 2	5.5	5.5
Spring Creek Mine	Epfu	2015	12	0 (0) 2	0	0
Spring Creek Mine	Epfu	2016	1	4.9 (2.7) 5	2.9	7.9
Spring Creek Mine	Epfu	2016	2	7.4 (0.8) 6	6.9	8.4
Spring Creek Mine	Epfu	2016	3	16 (2) 5	12.7	17.9

Spring Creek Mine	Epfu	2016	4	16.4 (3.7) 63	3.6	21.4
Spring Creek Mine	Epfu	2016	5	17.3 (3) 184	8.5	23.2
Spring Creek Mine	Epfu	2016	6	24.4 (3.2) 1223	13.8	32.8
Spring Creek Mine	Epfu	2016	7	28.5 (3.3) 2486	15.3	34.3
Spring Creek Mine	Epfu	2016	8	28.5 (3.2) 2723	15.6	32.5
Spring Creek Mine	Epfu	2016	9	22.3 (4.7) 114	14.1	29.7
Spring Creek Mine	Epfu	2016	12	5.1 () 1	5.1	5.1
Spring Creek Mine	Laci	2012	8	21.1 (3.9) 27	10.2	27.4
Spring Creek Mine	Laci	2012	9	16.6 (2.3) 11	13	21.4
Spring Creek Mine	Laci	2013	4	12.2 (1.7) 95	10	17.6
Spring Creek Mine	Laci	2013	5	15 (3.5) 83	6.9	22.2
Spring Creek Mine	Laci	2013	6	19.9 (2.9) 177	12.7	27
Spring Creek Mine	Laci	2013	10	11.2 () 1	11.2	11.2
Spring Creek Mine	Laci	2014	4	11.7 () 1	11.7	11.7
Spring Creek Mine	Laci	2014	5	15.6 (1.6) 4	13.5	16.8
Spring Creek Mine	Laci	2014	6	17.1 (3.7) 44	8.5	24.6
Spring Creek Mine	Laci	2014	7	22.2 (3.6) 103	13.6	29.7
Spring Creek Mine	Laci	2014	8	20.2 (2.4) 51	15.5	25.4
Spring Creek Mine	Laci	2014	9	10 (2.5) 5	8.7	14.5
Spring Creek Mine	Laci	2015	5	19.1 (1.8) 2	17.8	20.4
Spring Creek Mine	Laci	2015	6	18.8 (1.1) 4	17.6	20.3
Spring Creek Mine	Laci	2015	6	22.6 (2.7) 351	15	28.7
Spring Creek Mine	Laci	2015	7	22.8 (3.3) 361	15.3	30.8
Spring Creek Mine	Laci	2015	8	23.5 (4.3) 197	12.5	32.5
Spring Creek Mine	Laci	2015	9	22 (2.8) 110	13.8	28.7
Spring Creek Mine	Laci	2015	10	17.6 () 1	17.6	17.6
Spring Creek Mine	Laci	2016	3	17.9 () 1	17.9	17.9
Spring Creek Mine	Laci	2016	5	19.7 (2.5) 12	15.1	23.6
Spring Creek Mine	Laci	2016	6	23.9 (3.7) 135	15	33.1
Spring Creek Mine	Laci	2016	7	25.7 (3.5) 163	14.8	33.1
Spring Creek Mine	Laci	2016	8	24.2 (4.5) 142	13.6	31.8
Spring Creek Mine	Laci	2016	9	19.2 (3.3) 13	14	26
Spring Creek Mine	Lano	2012	8	24.7 (4.1) 221	12.5	30.2
Spring Creek Mine	Lano	2012	9	18.6 (3.2) 66	13.2	24.4
Spring Creek Mine	Lano	2013	4	12.4 (2.2) 161	7	17.6
Spring Creek Mine	Lano	2013	5	17.4 (2.9) 463	2.2	24.4
Spring Creek Mine	Lano	2013	6	19.6 (3.5) 340	8.7	28
Spring Creek Mine	Lano	2013	10	14.2 (1.2) 6	11.7	15
Spring Creek Mine	Lano	2013	11	6.7 (3.6) 4	1.3	9
Spring Creek Mine	Lano	2013	12	7.3 (3.8) 2	4.6	10
Spring Creek Mine	Lano	2014	3	6 () 1	6	6
Spring Creek Mine	Lano	2014	4	16.4 (3.1) 16	10.8	19.6
Spring Creek Mine	Lano	2014	5	17.7 (4.5) 86	10.5	27.2
Spring Creek Mine	Lano	2014	6	18.2 (2.7) 187	8.5	24.6

Spring Creek Mine	Lano	2014	7	22 (3.6) 176	12	29.7
Spring Creek Mine	Lano	2014	8	20.5 (2.2) 119	16.5	25.1
Spring Creek Mine	Lano	2014	9	17.5 (2.4) 11	12.7	22.1
Spring Creek Mine	Lano	2014	11	13.5 (0) 2	13.5	13.5
Spring Creek Mine	Lano	2015	3	16 () 1	16	16
Spring Creek Mine	Lano	2015	4	18.8 (8.5) 3	8.9	23.7
Spring Creek Mine	Lano	2015	5	17.3 (1.6) 10	15.1	20.6
Spring Creek Mine	Lano	2015	6	21.5 (0.6) 6	20.9	22.2
Spring Creek Mine	Lano	2015	6	22.2 (2.7) 599	14.5	29.2
Spring Creek Mine	Lano	2015	7	23.2 (3) 654	15.5	30.2
Spring Creek Mine	Lano	2015	8	24.1 (4.2) 502	8	32.7
Spring Creek Mine	Lano	2015	9	21 (3.7) 211	11.7	28.9
Spring Creek Mine	Lano	2015	10	15.9 (4) 12	9	20.3
Spring Creek Mine	Lano	2015	11	3.8 (0.6) 10	3.1	4.4
Spring Creek Mine	Lano	2015	12	3.4 (2.3) 6	0	4.9
Spring Creek Mine	Lano	2016	1	3 (3.6) 13	0.9	10.2
Spring Creek Mine	Lano	2016	2	6.9 (0) 3	6.9	6.9
Spring Creek Mine	Lano	2016	3	16.5 () 1	16.5	16.5
Spring Creek Mine	Lano	2016	4	16.3 (4.9) 34	3.6	21.4
Spring Creek Mine	Lano	2016	5	17.6 (3.2) 137	9.2	23.6
Spring Creek Mine	Lano	2016	6	22.8 (4) 462	14.8	32.8
Spring Creek Mine	Lano	2016	7	25.8 (3.4) 648	15.1	34.1
Spring Creek Mine	Lano	2016	8	25.1 (3.6) 604	13.8	32.3
Spring Creek Mine	Lano	2016	9	19.9 (4.2) 96	11.7	29.5
Spring Creek Mine	Lano	2016	10	12.3 () 1	12.3	12.3
Spring Creek Mine	Myci	2012	8	23.1 (3.6) 209	14.1	30.2
Spring Creek Mine	Myci	2012	9	21 (2.6) 38	14	24.7
Spring Creek Mine	Myci	2013	4	14.5 (3.2) 7	7.5	16.3
Spring Creek Mine	Myci	2013	5	15 (6) 55	2.1	22.4
Spring Creek Mine	Myci	2013	6	20 (3.3) 97	11.5	26.5
Spring Creek Mine	Myci	2013	10	13 (1.1) 2	12.2	13.8
Spring Creek Mine	Myci	2014	4	16.5 (2.7) 18	10.8	19.3
Spring Creek Mine	Myci	2014	5	17.5 (2.9) 285	7.5	26.9
Spring Creek Mine	Myci	2014	6	16.3 (2.4) 638	8.5	22.4
Spring Creek Mine	Myci	2014	7	20.2 (3.3) 704	11.3	29.5
Spring Creek Mine	Myci	2014	8	20.2 (2.2) 720	15.6	26.5
Spring Creek Mine	Myci	2014	9	20.4 (3.4) 41	11.7	25.4
Spring Creek Mine	Myci	2014	11	3.4 () 1	3.4	3.4
Spring Creek Mine	Myci	2014	12	5.6 (0.1) 2	5.5	5.7
Spring Creek Mine	Myci	2015	4	16.6 (3.5) 2	14.1	19.1
Spring Creek Mine	Myci	2015	5	16.5 (2.3) 75	9.4	21.7
Spring Creek Mine	Myci	2015	6	19.6 (2.3) 27	14.5	24.1
Spring Creek Mine	Myci	2015	6	21.5 (3) 369	15.6	28.5
Spring Creek Mine	Myci	2015	7	23.7 (3.5) 542	15.8	30.8

Spring Creek Mine	Myci	2015	8	27 (3.9) 1324	12.8	32.8
Spring Creek Mine	Myci	2015	9	21.7 (3.9) 789	10.8	29.7
Spring Creek Mine	Myci	2015	10	19.8 (5) 30	7.9	24.2
Spring Creek Mine	Myci	2015	11	7.1 (3.1) 8	3.7	11.2
Spring Creek Mine	Myci	2015	12	4.9 (2.2) 8	3.2	10.2
Spring Creek Mine	Myci	2016	1	6.6 (4.7) 3	1.1	9.4
Spring Creek Mine	Myci	2016	2	9.2 (2.5) 5	5.1	11.3
Spring Creek Mine	Myci	2016	4	14.1 (4.1) 70	4.6	21.2
Spring Creek Mine	Myci	2016	5	17.6 (2.7) 186	11.7	23.6
Spring Creek Mine	Myci	2016	6	22.2 (4.2) 474	13.2	32.8
Spring Creek Mine	Myci	2016	7	27.1 (4.3) 408	16.8	34.1
Spring Creek Mine	Myci	2016	8	25.2 (4) 504	13.6	32.2
Spring Creek Mine	Myci	2016	9	23 (3.9) 105	12.2	29.5
Spring Creek Mine	Myci	2016	10	14.1 (7.8) 4	7.5	23.1
Spring Creek Mine	Myci	2016	11	12.4 (2.3) 2	10.8	14.1
Spring Creek Mine	Myev	2012	8	21.8 (3.7) 49	14.3	29.3
Spring Creek Mine	Myev	2012	9	21 (3.4) 5	16.6	24.4
Spring Creek Mine	Myev	2013	4	17 () 1	17	17
Spring Creek Mine	Myev	2013	5	15.4 (4) 36	6	22.1
Spring Creek Mine	Myev	2013	6	19.3 (3.4) 60	10.3	26.5
Spring Creek Mine	Myev	2014	4	14.3 (3.6) 2	11.7	16.8
Spring Creek Mine	Myev	2014	5	13.9 (2.2) 11	11	19.1
Spring Creek Mine	Myev	2014	6	14.3 (3.2) 11	8.9	18.6
Spring Creek Mine	Myev	2014	7	20.7 (1.7) 19	17.8	24.2
Spring Creek Mine	Myev	2014	8	21.4 (2.5) 26	17.1	24.4
Spring Creek Mine	Myev	2014	9	16.6 (5.6) 4	8.7	21.9
Spring Creek Mine	Myev	2015	5	13.2 (2.8) 4	10.7	16.6
Spring Creek Mine	Myev	2015	6	23.6 () 1	23.6	23.6
Spring Creek Mine	Myev	2015	6	21.1 (2.9) 170	15.8	28.2
Spring Creek Mine	Myev	2015	7	22.6 (3.1) 388	14.8	29.7
Spring Creek Mine	Myev	2015	8	23.3 (4.8) 396	12.5	32.3
Spring Creek Mine	Myev	2015	9	19.7 (3.6) 160	11	29.3
Spring Creek Mine	Myev	2016	4	14.8 (3.1) 10	11.2	19.9
Spring Creek Mine	Myev	2016	5	14.4 (3.6) 224	7	23.6
Spring Creek Mine	Myev	2016	6	19.6 (4.2) 304	13	30.5
Spring Creek Mine	Myev	2016	7	25.1 (4.3) 278	14.6	34
Spring Creek Mine	Myev	2016	8	23.9 (4.3) 293	14.6	32.3
Spring Creek Mine	Myev	2016	9	19.7 (3.7) 135	9.2	28.9
Spring Creek Mine	Mylu	2012	8	24 (3.9) 209	12.7	29.8
Spring Creek Mine	Mylu	2012	9	21.6 (3.1) 40	12.5	24.9
Spring Creek Mine	Mylu	2013	4	14.7 (1.3) 14	12.2	16.8
Spring Creek Mine	Mylu	2013	5	17.4 (4.3) 365	3.4	26.2
Spring Creek Mine	Mylu	2013	6	21.3 (3) 868	8.4	28
Spring Creek Mine	Mylu	2013	11	7.2 () 1	7.2	7.2

Spring Creek Mine	Mylu	2014	4	17.1 (3) 6	11.2	19.3
Spring Creek Mine	Mylu	2014	5	17.8 (5) 44	7	26.9
Spring Creek Mine	Mylu	2014	6	16.4 (2.7) 512	7	21.6
Spring Creek Mine	Mylu	2014	7	20.9 (3.2) 1252	12.7	29.8
Spring Creek Mine	Mylu	2014	8	21 (2.5) 567	14.8	26.4
Spring Creek Mine	Mylu	2014	9	19.4 (5.1) 9	9.5	24.2
Spring Creek Mine	Mylu	2015	4	8.7 () 1	8.7	8.7
Spring Creek Mine	Mylu	2015	5	16.3 (4.6) 52	6	22.1
Spring Creek Mine	Mylu	2015	6	19.1 (2.4) 35	14.6	24.2
Spring Creek Mine	Mylu	2015	6	21.1 (3) 1168	14.5	29.2
Spring Creek Mine	Mylu	2015	7	22 (3.2) 947	14.8	31
Spring Creek Mine	Mylu	2015	8	24.7 (4.9) 573	8	32.7
Spring Creek Mine	Mylu	2015	9	20.5 (4.1) 298	12.2	29.7
Spring Creek Mine	Mylu	2015	10	22.4 (1.6) 7	19.1	23.9
Spring Creek Mine	Mylu	2016	2	4.2 () 1	4.2	4.2
Spring Creek Mine	Mylu	2016	4	13.1 (4) 5	9.2	18.6
Spring Creek Mine	Mylu	2016	5	15.9 (3.8) 191	6.2	23.4
Spring Creek Mine	Mylu	2016	6	22 (4.2) 448	13.6	33.3
Spring Creek Mine	Mylu	2016	7	25.3 (4.3) 534	14.3	34.5
Spring Creek Mine	Mylu	2016	8	24.4 (4.4) 227	15.5	32
Spring Creek Mine	Mylu	2016	9	21.2 (3.5) 57	12.2	29.5
Spring Creek Mine	Mylu	2016	10	22.9 () 1	22.9	22.9
Spring Creek Mine	Myth	2013	6	17.7 (0.8) 2	17.1	18.3
Spring Creek Mine	Myth	2015	6	21.7 (2.5) 22	17.4	26.4
Spring Creek Mine	Myth	2015	7	22.8 (3.4) 72	14.8	28.5
Spring Creek Mine	Myth	2015	8	21.8 (5.2) 87	12	32.5
Spring Creek Mine	Myth	2015	9	19.9 (3) 14	15.1	25.4
Spring Creek Mine	Myth	2016	4	16.8 () 1	16.8	16.8
Spring Creek Mine	Myth	2016	5	14.9 (3.9) 42	6.9	23.1
Spring Creek Mine	Myth	2016	6	21.4 (5.1) 45	14	31.2
Spring Creek Mine	Myth	2016	7	24.1 (4.8) 62	16	34
Spring Creek Mine	Myth	2016	8	24.9 (3.7) 58	17.9	31.8
Spring Creek Mine	Myth	2016	9	20.2 (3.4) 30	15	29.7
West Decker Coal Mine	Epfu	2012	8	16.9 (4.3) 905	5.9	24.7
West Decker Coal Mine	Epfu	2012	9	16.3 (2.7) 852	6.2	22.4
West Decker Coal Mine	Epfu	2012	10	9.7 (6.2) 4	3.7	17.3
West Decker Coal Mine	Epfu	2013	4	12.9 (1.4) 97	8.5	15
West Decker Coal Mine	Epfu	2013	5	14.7 (3.2) 75	6.5	21.4
West Decker Coal Mine	Epfu	2013	6	16.2 (2.5) 155	11.3	23.6
West Decker Coal Mine	Epfu	2013	7	17.8 (3.3) 72	13	23.2
West Decker Coal Mine	Epfu	2014	4	10.5 (2.7) 25	8.5	16.3
West Decker Coal Mine	Epfu	2014	5	13.9 (2.8) 112	5.9	19.9
West Decker Coal Mine	Epfu	2014	6	15 (2.1) 66	11.5	18.4
West Decker Coal Mine	Epfu	2014	7	20.6 (0.6) 4	20.1	21.4

West Decker Coal Mine	Epfu	2014	8	14.6 (2.3) 265	11.5	20.1
West Decker Coal Mine	Epfu	2014	9	14.4 (3.3) 174	3.4	21.1
West Decker Coal Mine	Epfu	2014	10	10.5 () 1	10.5	10.5
West Decker Coal Mine	Epfu	2014	12	3.4 () 1	3.4	3.4
West Decker Coal Mine	Epfu	2015	1	5 (0.1) 30	4.9	5.1
West Decker Coal Mine	Epfu	2015	2	6 (3.7) 5	4.2	12.7
West Decker Coal Mine	Epfu	2015	3	13.7 (1.3) 14	11.5	15.1
West Decker Coal Mine	Epfu	2015	4	13.6 (3.9) 237	4.6	20.8
West Decker Coal Mine	Epfu	2015	5	13.8 (2) 288	5.2	19.9
West Decker Coal Mine	Epfu	2015	6	15.6 (1.8) 143	13	20.9
West Decker Coal Mine	Epfu	2015	6	20.3 (3.1) 1152	13.8	27.4
West Decker Coal Mine	Epfu	2015	7	17.8 (2.8) 3000	11	27.5
West Decker Coal Mine	Epfu	2015	8	16.2 (2.8) 953	7.9	28.2
West Decker Coal Mine	Epfu	2015	9	20.7 (3.1) 269	12.7	26.5
West Decker Coal Mine	Epfu	2015	10	20.7 (1.8) 11	17.9	22.4
West Decker Coal Mine	Epfu	2015	12	3.1 (0) 8	3.1	3.1
West Decker Coal Mine	Epfu	2016	4	15 (1.4) 1283	10.5	19.3
West Decker Coal Mine	Epfu	2016	5	13.5 (2.9) 728	9.5	21.1
West Decker Coal Mine	Epfu	2016	6	19.7 (3.5) 2143	10.5	29.2
West Decker Coal Mine	Epfu	2016	7	17.5 (2.8) 4637	11.2	29.8
West Decker Coal Mine	Laci	2012	8	13.5 (3.5) 244	8.7	24.1
West Decker Coal Mine	Laci	2012	9	14.7 (3.4) 152	4.4	20.8
West Decker Coal Mine	Laci	2013	5	11 () 1	11	11
West Decker Coal Mine	Laci	2013	6	17.6 (2.2) 3	15.1	18.9
West Decker Coal Mine	Laci	2014	5	15.9 (2.2) 19	11.3	20.3
West Decker Coal Mine	Laci	2014	6	14.8 (2.8) 17	9.4	18.4
West Decker Coal Mine	Laci	2014	7	18.8 (2.2) 4	16.3	21.2
West Decker Coal Mine	Laci	2014	8	13.9 (1.8) 40	11.8	19.6
West Decker Coal Mine	Laci	2014	9	12.8 (3.2) 94	5.7	21.2
West Decker Coal Mine	Laci	2014	10	11.3 (2.6) 2	9.5	13.2
West Decker Coal Mine	Laci	2015	3	9.5 (3.5) 8	7	15.1
West Decker Coal Mine	Laci	2015	4	14.3 (3.4) 28	7.5	19.4
West Decker Coal Mine	Laci	2015	5	13.5 (3) 61	6.7	18.8
West Decker Coal Mine	Laci	2015	6	16 (1.3) 25	13.6	20.3
West Decker Coal Mine	Laci	2015	6	20.4 (2.9) 936	12.2	27
West Decker Coal Mine	Laci	2015	7	18.2 (2.6) 647	12.3	27.4
West Decker Coal Mine	Laci	2015	8	15.6 (2.3) 250	9.4	24.2
West Decker Coal Mine	Laci	2015	9	16.7 (3.6) 90	9	27
West Decker Coal Mine	Laci	2015	10	20.1 (1.1) 2	19.4	20.9
West Decker Coal Mine	Laci	2016	1	0.9 () 1	0.9	0.9
West Decker Coal Mine	Laci	2016	4	14.6 (2.2) 36	10.7	18.6
West Decker Coal Mine	Laci	2016	5	16.4 (2.9) 73	7	21.1
West Decker Coal Mine	Laci	2016	6	18.9 (3.7) 663	10.5	29.3
West Decker Coal Mine	Laci	2016	7	18.9 (2.9) 778	11.8	29.5

West Decker Coal Mine	Lano	2012	8	14.9 (3.3) 341	5.7	23.9
West Decker Coal Mine	Lano	2012	9	12.4 (3.7) 765	3.1	20.9
West Decker Coal Mine	Lano	2012	10	9.1 (3.5) 6	2.9	12
West Decker Coal Mine	Lano	2013	4	12.6 (2) 24	8.4	15
West Decker Coal Mine	Lano	2013	5	13.8 (3.8) 37	8	21.4
West Decker Coal Mine	Lano	2013	6	16.1 (2.7) 45	8.5	21.4
West Decker Coal Mine	Lano	2013	7	18.6 (3.2) 22	15	23.7
West Decker Coal Mine	Lano	2014	4	13.3 (3.2) 49	8.9	18.3
West Decker Coal Mine	Lano	2014	5	14.4 (3.5) 388	2.6	23.9
West Decker Coal Mine	Lano	2014	6	15.1 (2.2) 84	9.2	18.4
West Decker Coal Mine	Lano	2014	7	16.6 (3.5) 6	13.8	22.7
West Decker Coal Mine	Lano	2014	8	13.7 (1.7) 48	11.3	17.4
West Decker Coal Mine	Lano	2014	9	12.4 (4.2) 55	4.1	21.2
West Decker Coal Mine	Lano	2014	10	15.5 (0) 2	15.5	15.5
West Decker Coal Mine	Lano	2015	2	4.7 (1.7) 23	4.2	12.7
West Decker Coal Mine	Lano	2015	3	13.2 () 1	13.2	13.2
West Decker Coal Mine	Lano	2015	4	8.9 (3.2) 38	4.9	20.4
West Decker Coal Mine	Lano	2015	5	13.1 (2.9) 177	4.4	19.3
West Decker Coal Mine	Lano	2015	6	15.4 (1.8) 23	12.2	18.6
West Decker Coal Mine	Lano	2015	6	19.9 (2.8) 1133	12.2	27.4
West Decker Coal Mine	Lano	2015	7	17.8 (3) 1637	11	27.7
West Decker Coal Mine	Lano	2015	8	15.4 (2.5) 874	7.5	24.2
West Decker Coal Mine	Lano	2015	9	17.6 (3.2) 1109	8.2	26.5
West Decker Coal Mine	Lano	2015	10	17.9 (2.6) 14	14.8	20.8
West Decker Coal Mine	Lano	2015	12	3.1 (0) 2	3.1	3.1
West Decker Coal Mine	Lano	2016	4	14 (2.4) 523	5.9	19.8
West Decker Coal Mine	Lano	2016	5	14.3 (2.9) 768	7.5	21.4
West Decker Coal Mine	Lano	2016	6	18.5 (3.5) 1192	10.3	29.2
West Decker Coal Mine	Lano	2016	7	19.1 (3) 1015	11.2	29.8
West Decker Coal Mine	Myci	2012	8	17.7 (3.1) 189	7.4	24.1
West Decker Coal Mine	Myci	2012	9	16.1 (2.6) 170	8.7	21.4
West Decker Coal Mine	Myci	2013	4	12.4 (1.8) 16	8	14.5
West Decker Coal Mine	Myci	2013	5	13.6 (2.1) 20	5.9	16
West Decker Coal Mine	Myci	2013	6	16.4 (2.3) 67	7.7	20.9
West Decker Coal Mine	Myci	2013	7	18.6 (1.2) 35	15.6	20.8
West Decker Coal Mine	Myci	2014	4	11.4 (3.5) 68	4.7	17.8
West Decker Coal Mine	Myci	2014	5	12.9 (2.5) 409	2.4	24.7
West Decker Coal Mine	Myci	2014	6	13.1 (2.2) 137	8.9	17.6
West Decker Coal Mine	Myci	2014	7	16.9 (2.4) 55	13.5	22.7
West Decker Coal Mine	Myci	2014	8	15.5 (1.7) 75	11.8	19.3
West Decker Coal Mine	Myci	2014	9	14.1 (2.2) 1091	4.9	21.7
West Decker Coal Mine	Myci	2014	10	15 (2.5) 13	11.8	19.4
West Decker Coal Mine	Myci	2015	3	11.3 (1.4) 20	8.7	14.3
West Decker Coal Mine	Myci	2015	4	9.9 (2.2) 752	0.3	18.6

West Decker Coal Mine	Myci	2015	5	11.9 (2.3) 279	3.4	19.8
West Decker Coal Mine	Myci	2015	6	15.7 (1.5) 126	12.2	19.6
West Decker Coal Mine	Myci	2015	6	17.8 (2.1) 1134	12.3	25.9
West Decker Coal Mine	Myci	2015	7	18.3 (2.6) 1096	11	25.4
West Decker Coal Mine	Myci	2015	8	16.5 (2.8) 394	7.9	28.2
West Decker Coal Mine	Myci	2015	9	17.9 (3.4) 202	10.5	26
West Decker Coal Mine	Myci	2015	10	17.4 (2.5) 9	13.3	20.3
West Decker Coal Mine	Myci	2016	3	15.1 () 1	15.1	15.1
West Decker Coal Mine	Myci	2016	4	13.1 (1.6) 908	6.7	18.3
West Decker Coal Mine	Myci	2016	5	13.5 (2.7) 551	4.1	20.8
West Decker Coal Mine	Myci	2016	6	18.7 (2.9) 1558	10.3	29.2
West Decker Coal Mine	Myci	2016	7	19.5 (2.5) 986	11.5	29.7
West Decker Coal Mine	Myev	2012	8	14.1 (4.7) 3	9.7	19.1
West Decker Coal Mine	Myev	2012	9	14.5 (3) 6	9.2	17.9
West Decker Coal Mine	Myev	2013	4	7.2 () 1	7.2	7.2
West Decker Coal Mine	Myev	2013	5	15 () 1	15	15
West Decker Coal Mine	Myev	2013	6	13.7 (3.7) 2	11	16.3
West Decker Coal Mine	Myev	2014	5	13.6 () 1	13.6	13.6
West Decker Coal Mine	Myev	2014	6	17.4 () 1	17.4	17.4
West Decker Coal Mine	Myev	2014	8	16.1 (1.2) 2	15.3	17
West Decker Coal Mine	Myev	2014	9	12.4 (5.3) 12	5.4	23.1
West Decker Coal Mine	Myev	2015	5	8.4 (1.6) 4	7.5	10.8
West Decker Coal Mine	Myev	2015	6	19 (2.3) 50	15.1	25.2
West Decker Coal Mine	Myev	2015	7	17.7 (3.1) 38	12.8	24.2
West Decker Coal Mine	Myev	2015	8	15.7 (2.7) 36	10.8	21.2
West Decker Coal Mine	Myev	2015	9	14.6 (4) 17	8.4	22.1
West Decker Coal Mine	Myev	2016	4	13.4 (1) 5	11.7	14.3
West Decker Coal Mine	Myev	2016	5	12.4 (3.3) 18	4.7	15.8
West Decker Coal Mine	Myev	2016	6	18 (3.2) 37	12.3	23.6
West Decker Coal Mine	Myev	2016	7	19 (3.1) 23	12.3	24.2
West Decker Coal Mine	Mylu	2012	8	17.1 (2.8) 232	9.8	23.4
West Decker Coal Mine	Mylu	2012	9	13.1 (3.7) 253	0.4	21.4
West Decker Coal Mine	Mylu	2012	10	9.5 (4.8) 5	2.4	15.8
West Decker Coal Mine	Mylu	2013	4	10.6 (3.1) 8	3.7	14.5
West Decker Coal Mine	Mylu	2013	5	11.6 (2) 4	8.7	12.7
West Decker Coal Mine	Mylu	2013	6	17.6 (2) 15	12.7	21.4
West Decker Coal Mine	Mylu	2013	7	18.1 (1.3) 4	17.1	19.9
West Decker Coal Mine	Mylu	2014	4	11.4 (5) 31	-0.3	18.1
West Decker Coal Mine	Mylu	2014	5	13.2 (2.2) 157	1.1	18.1
West Decker Coal Mine	Mylu	2014	6	13.9 (2.2) 20	10.8	17.6
West Decker Coal Mine	Mylu	2014	7	18 (2.1) 11	13.2	20.3
West Decker Coal Mine	Mylu	2014	8	15.5 (1.9) 58	12.8	19.8
West Decker Coal Mine	Mylu	2014	9	13.6 (3.8) 207	2.4	21.1
West Decker Coal Mine	Mylu	2014	10	12.7 (3) 2	10.5	14.8

West Decker Coal Mine	Mylu	2015	3	9.4 () 1	9.4	9.4
West Decker Coal Mine	Mylu	2015	4	9.7 (2.2) 233	4.6	16.5
West Decker Coal Mine	Mylu	2015	5	11.9 (3.3) 131	-0.8	19.3
West Decker Coal Mine	Mylu	2015	6	15.4 (1.7) 87	12.2	20.3
West Decker Coal Mine	Mylu	2015	6	18.9 (2.6) 3439	12.2	27.4
West Decker Coal Mine	Mylu	2015	7	18.2 (3) 1196	10.8	27.5
West Decker Coal Mine	Mylu	2015	8	15 (2.9) 3094	3.6	27.4
West Decker Coal Mine	Mylu	2015	9	17.2 (3.2) 821	8.5	25.7
West Decker Coal Mine	Mylu	2015	10	14.4 (4.8) 2	11	17.8
West Decker Coal Mine	Mylu	2016	4	12.9 (2.7) 121	6.5	17.9
West Decker Coal Mine	Mylu	2016	5	11.3 (3.3) 4165	2.7	21.2
West Decker Coal Mine	Mylu	2016	6	17.8 (3.7) 2563	10.5	29.2
West Decker Coal Mine	Mylu	2016	7	19.5 (3.6) 1937	11.3	31.2
West Decker Coal Mine	Myth	2015	6	18.1 (0.7) 2	17.6	18.6
West Decker Coal Mine	Myth	2015	7	17.3 () 1	17.3	17.3
West Decker Coal Mine	Myth	2016	5	11 () 1	11	11
West Decker Coal Mine	Myth	2016	6	14.3 (2.9) 2	12.2	16.3
West Decker Coal Mine	Myth	2016	7	18.6 () 1	18.6	18.6

Appendix C

Overview of Roosting Habitat and Home Range / Foraging Distance Documented for Montana Bats

Bryce A. Maxell, Montana Natural Heritage Program - 24 February 2015

Updated 30-June-2017 by Dan Bachen

The table, figures, and images below summarize and provide examples of what is known about winter, maternity, and day/night roost habitat use for Montana bat species in the state and/or elsewhere across their ranges. Protection of these cave, mine, cliff, rock outcrop, ground crevice, large tree, bridge, and building habitats with cracks and crevices ranging from $^{1}/_{3}$ to 1 inch in width and associated temperature and humidity regimes, is essential for protection and conservation of Montana's bats. Artificial bat roosts that provide summer maternity, night, and day roosts, can be deployed to serve as a surrogate for large diameter tree and other roosts that have been lost and/or to encourage roosting away from buildings where bats would be in close proximity to sleeping humans. Artificial winter roost habitat is not a viable management option at the present time.

Species / Comments	Winter Roost	Summer Maternity Roost	Summer Day/Night Roost	Home Range/Foraging Distance
Pallid Bat (***Antrozous pallidus***) Low roost site fidelity with 90% of inter-night movements of 50-600 meters. [3] Highly social, often using day and night roosts in groups of 20 or more guided by social vocalizations and odors.[2, 4] Yearling females typically give birth to a single pup, but older females typically give birth to 2 pups.[4, 43]	Not documented in Montana, but likely occurs in deep rock crevices if the species is present.[1, 4]	Not documented in Montana. Elsewhere in vertical and horizontal rock crevices, under rock slabs, in buildings, and on taller and larger diameter live trees and tree snags with loose bark in mature stands with southerly aspects and lower percentages of overstory.[4, 37, 38, 41, 42, 44]	Under rock slabs, in horizontal and vertical rock crevices, and on farm equipment in Montana.[1] Elsewhere occasionally on buildings, bridges, caves, mines, vertical and horizontal rock crevices that are typically on east or southeast aspects, and taller and larger diameter live trees and tree snags with loose bark in mature stands with southerly aspects and lower percentages of overstory.[2, 4, 21, 22, 23, 30, 37, 38, 39, 40, 41, 44]	Lactating females moved an average of 2,450 meters +/- 845 from roost to foraging areas and had an average foraging area size of 1.56 square km +/- 0.88 SE. Post-lactating females moved an average of 210 meters from roost to foraging areas and had an average foraging area size of 5.97 square km +/- 2.69 SE in northern California.[37] Individuals commuted 1 to 4 km between day roosting and foraging areas, 0.5 to 1.5 km between day roosts and night roosts, and switched day roosts often, usually moving <200 meters between roosts (range 25 to 3,660 meters) in eastern Oregon. [38, 39] Individuals typically commuted 1-2 km from day roosts to foraging areas, but one male often used different day roosts separated by 10 km in California. [42]
Townsend's Big-eared Bat (***Corynorhinus townsendii***)	Twilight areas of caves, mines, and unused tunnels in Montana.[1, 31, 32, 75, 84] Limestone	Caves and mines, often in twilight areas in Montana.[1, 75] Reported in caves, mines,	In Montana, usually in caves and mines, often in twilight areas, but more rarely building	Average one-way travel distances between day roosts and foraging areas was 3.2 km +/- 0.5 SD for

High fidelity to maternity and hibernacula roosts, lower interseasonal roost site fidelity, and travel up to 24 km from hibernacula to summer foraging areas.[73] Forage and commute adjacent to vegetation.[72]	or lava tube caves and mines are known to be used elsewhere with arousal and movement within or between sites, possibly responding to changing temperature.[5, 73, 74, 82]	buildings, and basal tree hollows elsewhere.[2, 5, 72, 73, 81, 82, 83] Females prefer cooler maternity roosts than other vespertilionid bat species.[2]	attics, root cellars, and pocket/daylight caves.[1, 21, 31, 32, 75] Reported in caves, mines, buildings and large diameter basal tree hollows elsewhere.[2, 5, 72, 81, 82, 83]	males and 1.3 km +/- 0.2 SD for females in coastal California; maximum distance traveled from the day roost was 10.5 km.[72]
Species / Comments	**Winter Roost**	**Summer Maternity Roost**	**Summer Day/Night Roost**	**Home Range/Foraging Distance**
Big Brown Bat (*Eptesicus fuscus*) Males often roost solitarily during summer. Rarely move more than 80 km between summer and winter roosts.[2, 6] Roost switching is common at natural roosts, but show high fidelity to man-made roosts.[64, 65, 71]	Caves, mines, and some evidence for rock crevices which are probably the most widespread winter roost in Montana.[1, 31, 84] Known to use narrow deep rock crevices or erosion holes in steep valley walls on the Canadian prairie and buildings in Ohio.[6, 62]	Buildings, bridges, large diameter trees snags with hollows or loose bark in Montana.[1, 75] Primarily large diameter tree snag hollows and crevices, but also live aspen hollows, in more sparsely spaced stands, deep rock crevices, and older human structures are known to be used elsewhere.[6, 29, 59, 64, 65, 66, 67, 68, 71]	Rock crevices, buildings, bridges, and caves in Montana.[1, 22, 31] Larger diameter tree snags with hollows and crevices and preferential selection for older more sparsely spaced stands, older buildings, and rock crevices with good solar exposure are known to be used elsewhere.[27, 29, 30, 64, 65, 66, 67, 68, 69, 71] Caves and mines known to be used as night roosts elsewhere.[70,]	Average of 1.5 km +/- 0.9 SD (range 0.4 to 1.8 km) from roosts to capture locations with average movement between successive roosts of 1.1 km +/- 0.7 SD (range 0.4 to 2.0 km) in the Black Hills of South Dakota.[29] Average one-way travel distances between day roosts and foraging areas of 1.8 km +/- 0.1 SE) range (0.3 to 4.4 km) in southern British Columbia.[64]
Spotted Bat (*Euderma maculatum*) High roost site fidelity with multiple individuals following the same nightly commuting routes up side canyons to foraging areas at speeds of up to 53 km/hr.[8, 49] Forage over clearings and along cliff rims.[49, 50, 51]	Not documented in Montana. Deep rock cracks and crevices are commonly used elsewhere and caves and human structures are rarely used elswhere.[1, 2, 7, 51]	Not documented in Montana. Rock cracks and crevices in upper portions of tall remote south facing cliffs near perennial waters are used elsewhere.[1, 2, 7, 8, 50]	Buildings and other human structures in Montana.[1, 47] Rock cracks and crevices in upper portions of tall remote cliffs near perennial waters, and, apparently more rarely, cave entrances and buildings elsewhere.[2, 7, 8, 45, 46, 47, 48, 49, 50, 51]	50-60 km round trip flight distances nightly with average home range size of 297 +/- 25 SE (range = 242.5 to 363.8) square km in northern Arizona.[8] Nightly round trip commutes of >77 km between day roosts, foraging areas, and night roosts that differed in elevation by ca. 2,000 meters in northern Arizona.[49] Nightly round trip foraging flights of 12 to 20 km in British Columbia.[50]
Silver-haired Bat (*Lasionycteris noctivagans*)	Not documented in Montana. Known to use loose bark, basal tree cavities, cavities under tree roots, and rock crevices	Large diameter tree snags with loose bark or cavities in Montana.[1, 9, 26] Hollows and crevices in live aspen and	Large diameter tree snags with loose bark or cavities and a building in Montana.[1, 26, 78] Large diameter trees or tree	Distance between capture locations and roost snags ranged from 0.1 to 3.4 km (averages for juvenile males, juvenile females, adult males, and

	on more southerly aspects and in older stands of trees, elsewhere with retreat to more underground sites at lower temperatures. [93] Use of mines is also known. [94]	large diameter and taller trees or tree snags in older lower canopy closure stands known to be used elsewhere. [9, 59, 86, 90, 91, 92, 95, 96]	snags in older stands with hollows and crevices are predominant summer roost elsewhere, but rock crevices, buildings, bridges, and other human structures also used.[9, 22, 86, 90, 91, 96]	adult females were 1.3, 1.5, 1.8, and 0.5 km, respectively) in northeastern Washington. [96]

Species / Comments	Winter Roost	Summer Maternity Roost	Summer Day/Night Roost	Home Range/Foraging Distance
Eastern Red Bat (*Lasiurus borealis*) Species is a solitary rooster at heights of 1 to 6 meters from the ground, but forage and migrate in groups. [10]	Not documented in Montana and thought to migrate far to the south where they use tree roosts on warmer days and nights and retreat below leaf litter when temperatures dip below freezing. [10, 54]	Maternity roosts or lactating individuals have not been detected in Montana. Elsewhere, known to roost mostly in dense foliage that provides shade and protection from the wind, but also on trunks, of larger diameter mature deciduous and conifer trees, often in riparian areas. [10, 52, 53, 55, 56, 57]	Not documented in Montana. Elsewhere, known to roost mostly in denser foliage, but also on trunks, of larger diameter mature deciduous and conifer trees, often in riparian areas. Also more rarely in shrubs, under leaf litter, and on human structures. [10, 52, 53, 55, 56, 57]	Maximum distances traveled to foraging areas averaged 1.24 km (range 0.19 to 3.28) and foraging areas averaged 94.4 Ha +/- 20.2 SE with no significant differences between sex and age classes in Mississippi. [52] Maximum distances traveled from diurnal roosts to foraging areas ranged from 1.2 to 5.5 km for females and 1.4 to 7.4 km for males with average foraging area size of 334 Ha in Kentucky [53]
Hoary Bat (*Lasiurus cinereus*) Species is a solitary rooster at heights of 3 to 5 meters from the ground, but forage and migrate in groups. [11]	Not documented and thought to migrate far to the south of Montana in the winter. [11]	Only a bridge roost documented in Montana.[1] Known to be a solitary rooster in deciduous and conifer tree foliage that offers shelter from the wind and more southern exposure to the sun elsewhere. [11, 85, 86, 87, 88, 89]	A bridge and cottonwood foliage in Montana.[1] Known to roost in deciduous and conifer tree foliage elsewhere. [1, 11, 85, 86, 87]	Females traveled one-way distances up to 20 km from day roosts while on first of up to five nightly foraging bouts in Manitoba Canada.[85]
California Myotis (*Myotis californicus*) Roosts alone or in groups. [12]	Recent acoustic and telemetry data indicates species likely overwinters in rock crevices in Montana.[1, Nate Schwab, personal communication] Rock crevices, caves, mines, tunnels, and buildings are used elsewhere. [2, 12, 25, 61]	Not documented in Montana. Elsewhere known to roost under loose bark or in holes or cracks in more isolated larger diameter tree snags in areas with lower canopy closure.[58, 59] More rarely, known to use buildings elsewhere. [60]	A house and a cellar in Montana. [32] Elsewhere known to roost under loose bark or in holes or cracks in more isolated larger diameter tree snags in areas with lower canopy closure.[58, 59] Also known to use rock crevices, bridges, buildings, and other human structures elsewhere. [12, 21, 22, 30, 60]	*No documentation found.
Western Small-footed Myotis (*Myotis ciliolabrum*) Mostly a solitary rooster, but sometimes aggregates in small groups. Fidelity to roost areas is shown, but roost switching	Caves and mines documented in Montana.[1, 76, 84] Known to use lava tube caves, deep cracks in ground, deep rock crevices, tunnels, and drill holes in rock elsewhere. [2, 13, 77]	Rock outcrop crevices with good solar exposure in Montana. [1] Known to rely mostly on vertical and horizontal crevices in cliffs and rock outcrops, but also	Rock outcrop crevices, bridges, caves, mines, and buildings in Montana. [1, 31, 32] Known to use rock outcrops, cracks in ground, tree hollows, and trees with loose bark	6 to 24 km round trip travel distances from roosts to foraging areas in north central Oregon. [63]

within those areas is frequent [13, 63] Also show a high fidelity to commuting corridors.[63]		documented using buildings elsewhere. [13, 63]	elsewhere. [13, 63] No bats were detected using night roosts in a north central Oregon study.[63]	

Species / Comments	Winter Roost	Summer Maternity Roost	Summer Day/Night Roost	Home Range/Foraging Distance
Long-eared Myotis (*Myotis evotis*) Suspected of only traveling short distances between summer and winter roosts. [14] Have low fidelity to individual roosts, but high fidelity to roost areas.[97, 98, 99]	Caves and mines.[1, 75, 84] May also use deeper rock crevices. [14]	Caves, cliff and rock outcrop crevices, and large diameter trees in Montana.[1, 26, 76] Known to use sheltered erosion cavities on stream banks, crevices in basalt, conifer stumps, conifer snags, buildings, and mine tunnels elsewhere. [14, 97, 98, 99]	Large diameter trees, rock outcrops, buildings, and caves in Montana. [1, 26, 31, 79] Known to use buildings, trees/snags with loose bark, trestle bridges, mines, rock crevices, stream bank cavities, and sink holes elsewhere. [14, 21, 27, 97, 98, 99]	Traveled an average of 970 meters (range 35-5,154 meters) between roosts in western Montana.[26] Moved 1 to 812 meters between day roosts and had roosting home ranges that ranged from 0.08 to 1.93 ha in Alberta.[97] Traveled 620 meters from capture sites to day roosts in western Oregon .[98] Traveled an average distance between day roosts of 148.9 m in northeastern Washington.[99]
Little Brown Myotis (*Myotis lucifugus*) Show high fidelity to summer colonies and hibernacula across years, but some individuals relocated between years a median distance of 315 km between hibernacula (range 6 to 563 km) and 431 km between summer roosts (range 25 to 464 km).[100] Males and nonreproductive females occupy cooler roosts than pregnant or lactating females.[15]	Caves and mines with high humidities and temperatures above freezing in Montana and elswhere. [1, 31, 36, 75, 84] May also use deeper rock crevices. [15] Predominantly documented using caves elsewhere. [100]	Attics and roofs of buildings, bridges, and bat houses in Montana. [1] Known to use cracks or hollows in larger diameter tree snags in older stands, rock crevices, and buildings elsewhere. [2, 15, 35, 90, 101, 102, 103]	Large diameter tree, rock crevices, buildings, bridges, caves, and bat houses in Montana. [1, 26, 31, 80] Known to use cracks or hollows in larger diameter tree snags in older stands, wood piles, and rock crevices elsewhere.[15, 35, 90] Caves and mines known to be used as night roosts elsewhere.[70]	Average 970 meters (range 35-5,154 meters) between roosts in western Montana.[26] Traveled 10 to 647 km from hibernacula to summer colonies in Manitoba and northwestern Ontario, Canada.[100] Female home range averaged 30.1 ha +/- 15.0 SD during pregnancy and 17.6 ha +/-9.1 SD during lactation in Quebec, Canada.[101] Males moved and average of 275 m +/- 406 SD between successive roosts, had mean minimum roosting areas of 3.9 ha +/- 7.9 SD, mean minimum foraging areas of 52.0 ha +/- 57.4 SD, mean distance between roosting and foraging areas of 254 m +/- 254.2 SD, and mean distances between capture sites and first roosts of 761 m +/- 623 SD in New Brunswick.[102] Mean home range area was 143 ha +/- 71.0 SE in New York.[103]

Species / Comments	Winter Roost	Summer Maternity Roost	Summer Day/Night Roost	Home Range/Foraging Distance
Northern Myotis (*Myotis septentrionalis*) Low roost site fidelity, but often stay in same general area within a season. May travel up to 56 km between summer and winter roosts. [16]	Only known from a single abandoned coal mine in Montana.[1, 75] Known from caves, with a preference to cluster in deep crevices and possibly move between caves within a winter elsewhere. [16]	Not documented in Montana. Known to use bark and hollows of larger diameter trees, usually in decay, and building crevices and bat houses elsewhere. [16, 29, 35, 69, 102]	Not documented in Montana. Known to use bark and hollows of larger diameter trees, usually in decay, and building crevices and bat houses elsewhere.[16, 29, 35, 69] Caves and mines known to be used as night roosts elsewhere.[70,]	Average of 2.2 km +/- 1.4 SD (range 0.1 to 5.9 km) from roosts to capture locations with average movement between successive roosts of 0.6 km +/- 0.5 SD (range 0.1 to 1.5 km) in the Black Hills of South Dakota.[29] Females/males moved and average of 457/158 m +/- 329/127 SD between successive roosts, had mean minimum roosting areas of 8.6/1.4 ha +/- 9.2/1.4 SD, mean minimum foraging areas of 46.2/13.5 ha +/- 44.4/8.3 SD, mean distance between roosting and foraging areas of 584.6/293.0 m +/- 405.8/282.8 SD, and mean distances between capture sites and first roosts of 1001/402 m +/- 693/452 SD in New Brunswick.[102]
Fringed Myotis (*Myotis thysanodes*) Very sensitive to roost site disturbance. [17] Maintain at least some level of group integrity when switching roosts. [29]	Winter presence in Montana known from a single individual found roosting in a cave. Some individuals may migrate south of Montana. [1]	Caves. [1] Known to use cracks and hollows of larger diameter trees, usually in decay, rock crevices on south-facing slopes, and buildings elsewhere. [17, 29]	Caves in Montana. [1, 32] Known to use cracks and hollows of larger diameter trees, usually in decay, rock crevices on south-facing slopes, mines, buildings, and bridges elsewhere. [17, 21, 22, 29]	Average of 1.0 km +/- 0.6 SD (range 0.1 to 2.0 km) from roosts to capture locations with average movement between successive roosts of 0.5 km +/- 0.6 SD (range 0.1 to 2.0 km) in the Black Hills of South Dakota.[29]
Long-legged Myotis (*Myotis volans*)	Caves and mines in Montana and elsewhere. [1, 19, 31, 36, 75, 84]	Large diameter trees in Montana. [1, 26] Elsewhere in taller, but random to normal diameter tree snags with loose bark or cracks, especially in areas with less habitat fragmentation, greater snag density but with greater tree spacing. [28, 33, 34, 35] Also in rock crevices, cracks in the ground, and buildings are known to be used elsewhere with south-facing roosts preferred. [2, 29]	Buildings, mines, caves and large diameter trees in Montana. [1, 26, 31, 32, 78, 79] Elsewhere in taller but random to larger diameter tree snags with loose bark or cracks, especially in areas with less habitat fragmentation, greater snag density but with greater tree spacing, are known to be used elsewhere with south-facing roosts preferred. [27, 28, 29, 30, 33, 34, 35] Also in buildings, cracks in the ground, rock crevices, and caves. [19, 36]	Average of 2.0 km +/- 0.1 SE from roosts to capture locations with average movement between successive roosts of 1.4 km +/- 0.1 SE across four study areas in Washington and Oregon.[28] Average of 1.9 km +/- 1.6 SD (range 0.4 to 3.7 km) from roosts to capture locations with average movement between successive roosts of 0.7 km +/- 0.5 SD (range 0.2 to 1.6 km) in the Black Hills of South Dakota.[29] Average home range size of 647 ha +/- 354 SE (range 16.5 to 3,029 ha) for males, 448 ha +/- 78.7 SE for pregnant

				females, and 304 ha +/- 53.8 SE for lactating females in Idaho.[33]

Species / Comments	Winter Roost	Summer Maternity Roost	Summer Day/Night Roost	Home Range/Foraging Distance
Yuma Myotis (*Myotis yumanensis*) Sensitive to roost site disturbance.[2]	Not documented in Montana, but acoustic evidence indicates overwintering in rock crevices in cliffs.[1]	Building, bridges, and bat houses in Montana.[1] Buildings, bridges, caves, mines, and abandoned cliff swallow nests are known elsewhere.[2, 20, 21, 22, 25]	Buildings, bridges, and bat houses in Montana.[1, 79] Large diameter trees, buildings, rock/cliff crevices and abandoned cliff swallow nests elsewhere.[2, 21, 22, 23, 24, 25, 30]	Average of 2 km (range 0.59-3.5 km) from roosts to capture locations in California.[24] 4 km from maternity roost to foraging areas in British Columbia.[25]

[1] supported by observations in Montana's statewide point observation database.

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[10] Shump, K.A. Jr. and A.U. Shump. 1982. *Lasiurus borealis*. Mammalian Species Account 183:1-6.

[11] Shump, K.A. Jr. and A.U. Shump. 1982. *Lasiurus cinereus*. Mammalian Species Account 185:1-5.

[12] Simpson, M.R. 1993. *Myotis californicus*. Mammalian Species Account 428:1-4.

[13] Holloway, G.L. and R.M.R. Barclay. 2001. *Myotis ciliolabrum*. Mammalian Species Account 670:1-5.

[14] Manning, R.W. and J.K. Jones, Jr. 1989. *Myotis evotis*. Mammalian Species Account 329:1-5.

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