AVIAN AND BAT PROTECTION PLAN FOR THE SPRING VALLEY WIND ENERGY FACILITY

Prepared for

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CONTENTS

Appendix

A. Mortality Tracking Spreadsheets

Figures

Tables

1.0 INTRODUCTION

1.1 Background

In order to address the growing interest in developing wind energy resources and National Energy Policy recommendations to increase renewable energy production capability, the Bureau of Land Management (BLM) began evaluating wind energy potential on public lands and developing a wind energy policy. In October 2003, the BLM started preparation of a *Wind Energy Development Programmatic Environmental Impact Statement* (PEIS) to analyze the potential impacts of wind energy development on public lands and to minimize those impacts to natural, cultural, and socioeconomic resources. The PEIS was published in June 2005, and in December 2005 the Record of Decision was signed to implement a comprehensive Wind Energy Development program on BLM-administered lands in the western United States. The program has established policies and best management practices (BMPs) to address the administration of wind energy development actions on BLM lands and has identified mitigation measures. The programmatic policies and BMPs of the Wind Energy Development Program allow project-specific analysis to focus on the site-specific issues and concerns of individual projects. On August 24, 2006, the BLM Washington Office issued Instruction Memorandum (IM) 2006-216, Right-of-Way Management, Wind Energy Land Use Plan Amendments, Wind Energy. The IM provided guidance on issuing rights-of-way (ROWs) for wind energy testing, monitoring, and development. Until then, the BLM had an interim wind energy policy, issued in 2002.

In January 2006, Babcock and Brown (since acquired by Pattern Energy [Pattern]), through Spring Valley Wind LLC (SVW), applied for a testing and monitoring ROW in Spring Valley, north of Ely, Nevada. Since then, it has maintained anemometers to determine the suitability of the project for wind energy development. In October 2007, SVW applied for a wind energy development ROW grant from BLM. The ROW grant would be for the construction, operation, and maintenance of the 75-turbine, 150-megawatt (MW) Spring Valley Wind Energy Facility (SVWEF) and associated facilities. Additionally, a mineral materials permit would be issued for gravel pits and associated access roads connected to the facility. The SVWEF would be located on approximately 7,673 acres in the project area (Table 1) and consist of 75 turbines and associated infrastructure.

In December 2008, a new IM, 2009-044, was issued to update policy and give further guidance on processing Wind Energy Facilities (WEFs) on BLM-administered lands. SVW updated its Plan of Development (POD) to comply with the new guidance. The POD was tentatively finalized in October 2009 but may change in response to comments on the preliminary Environmental Assessment (EA).

The PEIS describes the types of impacts that may occur from wind energy development on BLM-administered lands, and the SVWEF EA provides site-specific analysis tiered to the PEIS. Using the EA and PEIS for guidance, the Avian and Bat Protection Plan (ABPP) for the SVWEF was developed in order to provide project-specific guidelines for mitigating avian and bat impacts that may result from the project.

In July 2010, a new IM, 2010-156, was issued to provide direction to renewable energy projects for complying with the Bald and Golden Eagle Protection Act. This ABPP has been prepared in compliance with the 2010 IM.

Table 1. Legal Description of Project Area

Township	Range	Section	Quarter-Quarter-Quarter Quadrangle
14N	66E	1	All
		2	All of SE
		12	All
		13	N1/2 of NW
			N1/2 of NE
			E1/2 of SE
			All of SENE
	67E	4	W1/2 of NW (or Lot 4 and All of SWNW)
			W1/2 of SW
		5	All
		6	All
		7	All
		8	All
		9	W1/2 of NW
			W1/2 of SW
			W1/2 of NENW
			W1/2 of SENW
			W1/2 of NESW
			W1/2 of SESW
		18	All
		17	All
		16	All of NWNW
15N	66E	35	All of SESE
		36	All of S1/2
	67E	29	All of SWSW
			W1/2 of SESW
		30	S1/2 of SW (or Lot 4 and All of SESW)
			S1/2 of SE
		31	All
		32	All of S1/2
			All of NW

1.2 Facility Description

The principal components of the SVWEF would consist of wind turbine generators (WTGs), an underground electrical collection system for collecting the power generated by each WTG, electrical substation and switchyard, access roads, Operation and Maintenance (O&M) building, temporary laydown and storage areas, concrete batch plant, sand and gravel source, fiber-optic communications, one permanent meteorological (MET) tower, two radar units, and a microwave tower. The short-term (the period from beginning of construction until reclamation) and long-term (the duration of the project) disturbance areas for this alternative are described in Tables 2 and 3. The SVWEF totals approximately

7,673 acres, all of which are on BLM land covered by the requested ROW. This is to allow for the necessary set back distances and spacing between individual WTGs and linear arrays. The total area estimated for use by the wind energy facility (including both short- and long-term disturbance) is approximately 430.1 acres, or approximately 5.6% of the total ROW.

Table 2. SVWEF Components: Maximum Short-Term Disturbance Summary Table

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Short-Term Disturbance (acres)	% Project Area
Turbine foundations and crane pads (×75)	400[1]	N/A	217.5	0.028
Laydown, batching plant, and parking area	820	530	10.0	0.001
Access roads	129,542	40	118.96	0.016
Collection system	138,579	20	63.63	0.008
Fiber-optic line[2]	390	20	0.18	NA
Radar fiber-optic line	500	20	0.23	0.000
Gravel Pits A & B and access[‡]	660	660	10.0	0.001
Footprint overlap[≠]	N/A	N/A	−95.1	−0.012
Total			**325.4**	0.042

[1] This measurement represents the diameter of the disturbance area.

[2] Outside project area but contributes to overall disturbance footprint.

[3] 10.0-acre Gravel Pit B is an off-site existing disturbance and is not included in the overall disturbance acreage.

[≠] Overlap is the intersection of two different component disturbance areas and is therefore removed from the total disturbance. For example, a temporary turbine work area may partially overlap the collection system. In that case, the overlapping turbine acreage has been subtracted in order to not double-count disturbance.

Table 3. SVWEF Components: Maximum Long-Term Disturbance Summary Table

Facility Component	Disturbance Length (feet)	Disturbance Width (feet)	Long-Term Disturbance (acres)	% Project Area
Turbine foundations and crane pads (×75)	75[1]	N/A	22.5	0.003
Access roads (add 2 radar access roads – 0.23 acre each)	129,542	28	83.27	0.011
MET tower	50[1]	N/A	0.1	0.000
Spring Valley substation, Osceola substation, and O&M building (includes 2 Microwave Towers)	1,080	805	20.0	0.003
Radars	25	35	0.02	0.000
Fence[2]	34,470	12	9.5	NA
Footprint overlap[≠]	N/A	N/A	−30.72	−0.004
Total			**104.67**	0.013

[1] This measurement represents the diameter of the disturbance area.

[≠] Overlap is the intersection of two different component disturbance areas and is therefore removed from the total disturbance. For example, a temporary turbine work area may partially overlap the collection system. In that case, the overlapping turbine acreage has been subtracted in order to not double-count disturbance.

[2] Outside project area but contributes to overall disturbance footprint.

Since wind turbine technology is continually improving and the cost and availability of specific types of WTGs vary from year to year, a representative range of turbine types that are most likely to be used for the project are listed in Table 4. Seventy-five WTG sites have been identified that provide not only the highest wind speeds but also the most consistent wind resource, which provides the highest overall energy output and reliability. Each turbine experiences a small percentage of parasitic load, meaning that each turbine typically consumes between 5 and 10 kilowatts of power during operation. Additionally, a small amount of power is consumed by the substation, further reducing the amount of power available for output. Therefore, no matter which turbine is selected, no more than the maximum 149.1 MW agreed to under the Power Purchase Agreement (PPA) will be output into the system and somewhat less than that amount may be produced if the 1.8-MW turbines were selected.

Table 4. Wind Turbine Specifications

Turbine	Hub Height	Rotor Diameter	Total Height	Rated Capacity Wind Speed	Rotor Speed	Tower Base Diameter
2.3-MW Siemens	80 m	101 m	130.5 m	12–13 m/s	6–16 rpm	14.76 feet (4.5 m)
2.0-MW Gamesa G90/G97	78 m	90 m/97 m	125 m/126.5 m	15 m/s	9–19 rpm	13 feet (4 m)
RePower 2.0	80 m	92.5 m	126 m	12 m/s	9–18 rpm	13 feet (4.0 m)
1.8-MW V90 Vestas	80 m	90–100 m	125 m	12 m/s	9–14.9 rpm	< 15 feet

Notes: m/s = meters per second; rmp = rotations per minute.

Turbines would be placed in a series of east-west-oriented rows (or arrays) to best use Spring Valley's north-south wind flows. North-south-oriented rows cannot be used because they would reduce power generation to levels that the project would no longer be commercially viable. Turbines within each array would be connected by gravel surface access roads and underground 34.5-kilovolt (kV) collection circuits. To minimize downwind array losses, spacing between turbine rows would be at least 10× rotor diameters (RD) (1,010 meters [m]) and 2.4 to 3.5 RD (242–354 m) for in-row spacing. Turbine towers and foundations would be designed to survive a gust of wind more than 133.1 miles per hour (mph) with the blades pitched in their safest position. Turbine blade tip speed is variable and would not exceed 90 meters per second (m/s) or 201 mph. The total maximum rotor swept area for the facility would be 600,583.9 m^2. Turbine foundations would be approximately 8 feet deep, with a projection of approximately 6 inches above final grade, and would use approximately 350 cubic yards of concrete. Each tubular steel tower would have a maximum 15-foot-diameter (4.5-m-diameter) base. A detailed description of the WTG layout and operation can be found in the Spring Valley Proposed Wind Energy Project Environmental Assessment (BLM 2010).

The existing NV Energy 230-kV transmission line, which passes from east to west through the project site, would be the primary power transmission line for the SVWEF. A 34.5-kV underground electrical collector system would be installed to connect the turbines to the Spring Valley substation. The power would be stepped up by the main transformer at the Spring Valley substation to a 230-kV high-voltage (HV) system. The HV system would then be interconnected to the Osceola switchyard and the grid. For the connection of the Osceola Switching station to the existing transmission line, there would be a 400-foot overhead span from the existing transmission line connecting to the Osceola substation. In addition, there would be a 70-foot overhead span (no poles would be required) connecting the Osceola substation to the Spring Valley substation. Approximately 27.2 miles of collector cables would be placed underground in trenches that are adjacent to access roads. A detailed description of the electrical system can be found in the Spring Valley Proposed Wind Energy Project Environmental Assessment (BLM 2010).

1.3 Key Avian and Bat Laws, Regulations, Authorizations

The project is subject to all relevant federal, state, and local statutes, regulations, and plans as described in the EA. The key federal, state, and local agency approvals, reviews, and permitting requirements for avian and bat species that are anticipated to be needed are presented in Table 5.

Table 5. Key Avian and Bat Laws, Regulations, and Authorizations Table

Authorization	Agency Authority	Statutory Reference
Federal		
National Environmental Policy Act (NEPA) Compliance to Grant Right0of-Way (Tiered to Programmatic Environmental Impact Statement)	BLM	NEPA (Public Law [PL] 91-190, 42 United States Code [USC] 4321−4347, January 1, 1970, as amended by PL 94-52, July 3, 1975, PL 94-83, August 9, 1975, and PL 97-258, §4[b], Sept. 13, 1982)
Endangered Species Act Compliance	U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (PL 93-205, as amended by PL 100-478 [16 USC 1531 *et seq*.]); 50 Code of Federal Regulations (CFR) 402
Migratory Bird Treaty Act	USFWS	16 USC 703–711; 50 CFR 21 Subchapter B
Bald and Golden Eagle Protection Act	USFWS	16 USC 668−668(d)
State		
Incidental Take Permit	Nevada Department of Wildlife	Nevada Revised Statutes 503.584–503.589; Nevada Administrative Code 503.093

Based on existing data and preconstruction surveys (SWCA Environmental Consultants [SWCA] 2009a, 2009b), the project footprint does not occur within a major migration corridor for birds. The closest major migratory corridor is a principle route of the Pacific Flyway that basically follows the Lahontan and Humboldt River valleys north and west of the project area. In terms of raptor migration specifically, the closest known major raptor migration site is at the Goshute Mountains, approximately 100 miles north of the project area; it is believed that most of the birds from this site travel down the Snake and Deep Creek ranges east of the project area or the Egan and Schell Creek ranges west of the project area. The regulatory framework for protecting birds includes the Endangered Species Act of 1973, as amended (ESA), the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA) of 1940, and Executive Order (EO) 13186. The PEIS discusses the ESA in Section 4.6.5.1, and other regulations stated above are discussed in Section 4.6.2.2.6 of the PEIS. All of the birds observed during preconstruction surveys are protected by the MBTA, with the exception of the European starling (*Sturnus vulgaris*). The MBTA prohibits the take of migratory birds and does not include provisions for allowing unauthorized take. This project affords substantial design measures to avoid and minimize the likelihood of take, but if take occurs, it will be reported to the U.S. Fish and Wildlife Service (USFWS) for further action. Additionally, this ABPP has been developed to meet BLM and USFWS requirements for addressing the ESA, MBTA, and BGEPA. Both the BGEPA and the MBTA prohibit take as defined as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, disturb, or otherwise harm eagles, their nests, or their eggs. Under the BGEPA, “disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. However, on September 11, 2009 (*Federal Register*, 50 Code of Federal Regulations [CFR] 13 and 22), the USFWS set in place rules establishing two new permit types: 1) take of bald and golden eagles that is associated with, but not the purpose of, the activity; and 2) purposeful take of eagle nests that pose a threat to human or eagle safety. At this time the USFWS is not currently issuing such permits for golden eagles due to concerns with possible declines in local and regional populations. However, the USFWS recommends that project proponents prepare an ABPP to avoid, minimize, and mitigate project-related impacts to birds and bats and specifically golden eagles to ensure no-net-loss to the golden eagle population. Pursuant to BLM IM 2010-156, the BLM will request “concurrence” from the USFWS that the ABPP meets specific requirements.

No bat species are currently listed under the ESA that occur in or near the project area or relevant bat-specific regulations that provide a similar regulatory framework as the MBTA or BGEPA. However, Rose

Guano Cave is located approximately 4 miles east of the nearest proposed WTG and serves as a migratory stopover for over 1 million individual Brazilian free-tailed bats (*Tadarida brasiliensis*) during fall migration (Sherwin 2009). Other bat species have also been recorded using the cave. For example, three pallid bats (*Antrozous Pallidus*) were recorded in 2009 during capture sessions (Sherwin 2009). Therefore, as part of the proponent's policy and commitment to environmental protection (see Section 1.4), this ABPP also includes extensive design and operation mitigation and monitoring measures.

1.4 Policy and Commitment to Environmental Protection

Pattern is an independent, fully integrated energy company that develops, constructs, owns, and operates wind power projects across North America and parts of Latin America. Pattern commenced operations in June 2009 as one of the most experienced and best capitalized renewable energy companies in the United States. SVW, through Pattern, is dedicated to delivering the highest values for their partners and the communities where they work, while exhibiting a strong commitment to promoting environmental stewardship and corporate responsibility. The SVW team has a proven track record of using science and ground-breaking technology to build wind projects that successfully coexist with wildlife and protect the environment. SVW is committed to building environmentally responsible renewable energy projects and continues to work closely with environmental agencies to develop appropriate mitigation measures to reduce impacts to wildlife.

1.5 Monitoring and Surveying to Date

In response to concerns about wildlife impacts resulting from the development of the SVWEF, a variety of field studies and literature reviews were initiated. Field studies consisted of avian and bat surveys, which are summarized below in Table 6.

Table 6. Monitoring and Surveying Efforts

Study	Taxa	Survey Dates
Migratory Raptor Surveys (SWCA 2009b)	Raptors	March–May 2007 and 2008 September–November 2007 and 2008
Migratory Passerine Surveys (SWCA 2009b)	All Birds	March–May 2007 and 2008 September–November 2007 and 2008
General Use Surveys (SWCA 2009b)	All Birds	July, August, December 2007 and 2008 January and February 2008
Breeding Bird Point-Counts (SWCA 2009b)	All Birds	June 2007 and 2008
Raptor Nest Surveys (SWCA 2009b)	Raptors	June 2007 and 2008
AnaBat Acoustic Surveys (SWCA 2009b)	Bats	July 2007–December 2008
Rose Guano Cave Telemetry and Radar Study (Sherwin 2009)	Bats	August and September 2008

1.6 Environmental Setting

Spring Valley is situated between the Schell Creek Range to the west and the Snake Range to the east, in White Pine County, Nevada. The portion of Spring Valley in which the project area is located is approximately 10 miles wide. The project area is generally bounded on the west side by Nevada State Highway 893 and on the south and east sides by U.S. Highway 6/50. The SVWEF would be built entirely on lands managed by the BLM. Detailed descriptions of avian and bat habitat and use in the project area can be found in the *Spring Valley Wind Power Generating Facility Final Preconstruction Survey Results Report for Birds and Bats* (SWCA 2009b).

1.6.1 Vegetation

According to the Ely Resource Management Plan/Environmental Impact Statement (RMP/EIS) (BLM 2007), Spring Valley is located in Major Land Resource Areas 28A and 28B. These resource areas are described in the RMP/EIS as occurring from 4,000 to 6,500 feet (1,219–1,981 m) above mean sea level when they occur in basins. These resource areas are indicated by such plant species as Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), black sagebrush (*A. nova*), winterfat (*Krascheninnikovia lanata*), Utah juniper (*Juniperus osteosperma*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and needle and thread (*Heterostipa comata*).

No specific field surveys were conducted for general vegetation; landcover vegetation data from Southwest Regional Gap (SWReGAP) (U.S. Geological Survey 2004) indicate that four vegetation types are present in the project area. Of these, three vegetation types constitute more than 99% of the project area: Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Big Sagebrush Shrubland, and Great Basin Xeric Mixed Sagebrush Shrubland. The remaining 1% of vegetation is composed of Inter-Mountain Basins Greasewood Flat.

1.6.2 Bats

Pre-construction AnaBat acoustic surveys conducted from July 2007 through December 2008 identified 12 of 23 bat species known to occur in Nevada (SWCA 2009b). The bats observed were all BLM special-status species and include four state-listed species (Table 7). No species protected by the ESA are known to occur in the project area. AnaBat acoustic survey methods have inherent biases, as bat species that echolocate at a lower intensity have less chance of being detected (O'Farrell and Gannon 1999). Also, AnaBat acoustic equipment is limited in where it can be deployed. Bat activity data collected from the rotor swept area (RSA) were limited to one stratified microphone array installed on an existing MET tower. Despite these limitations, AnaBat acoustic methods are extremely useful for identifying baseline species data.

Table 7. Bat Species Identified from Acoustic Surveys, Spring Valley 2007–2008

Common Name	Scientific Name	6-Letter Code	State
Pallid bat	*Antrozous pallidus*	ANTPAL	Protected
Townsend's big-eared bat	*Corynorhinus townsendii*	CORTOW	Protected
Big brown bat	*Eptesicus fuscus*	EPTFUS	
Silver haired bat	*Lasionycteris noctivagans*	LASNOC	
Western red bat	*Lasiurus blossevillii*	LASBLO	Protected
Hoary bat	*Lasiurus cinereus*	LASCIN	
Western small-footed myotis	*Myotis ciliolabrum*	MYOCIL	
Long-eared myotis	*Myotis evotis*	MYOEVO	
Little brown bat	*Myotis lucifugus*	MYOLUC	
Long-legged myotis	*Myotis volans*	MYOVOL	
Yuma myotis	*Myotis yumanensis*	MYOYUM	
Brazilian free-tailed bat	*Tadarida brasiliensis*	TADBRA	Protected

Acoustic methods cannot be used to estimate populations, since an individual may be responsible for numerous detected calls; therefore, acoustic data are used to generate an index of activity (IA) value. Bat activity is presented as an IA value, which is obtained by taking the sum of 1-minute time increments for which a species was detected and dividing by the number of sampling nights (Miller 2001). The resulting value is then multiplied by a factor of 100 so that values consist of whole numbers (IA = minutes of activity/nights of recording × 100). The IA has been rounded to the nearest whole number for ease of use. Another useful feature of AnaBat acoustic data is the attached time and date information, which can be used to evaluate nightly and seasonal fluctuations in the IA.

Bat activity was generally much greater in survey locations near sources of water. Activity was dominated by four bat species: western small-footed myotis (*Myotis ciliolabrum*), little brown bat (*M. lucifugus*), long-eared myotis (*M. evotis*), and Brazilian free-tailed bat. The remaining eight species contributed 9% of all data. While all bats should be considered to be at risk from injury or mortality at WEFs, published literature indicates that some species are more commonly reported as mortalities in the western United States (Arnett et al. 2008; BLM 2005). For example, compilations of multiple bat mortality studies at other WEFs in the western United States, Arnett et al. (2008) and BLM (2005) have shown that the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), hoary bat (*L. cinereus*), little brown bat, and Brazilian free-tailed bat accounted for all identifiable bat carcasses from available bat mortality studies.

Nightly trends in bat activity were apparent, although these patterns differed between species. Four distinct patterns were demonstrated and included unimodal and bimodal distribution, in which dramatic peaks in activity were followed by equally dramatic drops in activity. These patterns contrasted with other patterns, the first of which exhibited an initial peak in activity that slowly declined throughout the night, and another that had no noticeable peaks, but sustained low levels of activity throughout the night. Figure 1 provides a look at nightly activity for all bat species, while Figure 2 provides nightly activity for the four dominant species.

Although the analysis of these trends has not taken into account other variables affecting them, such as weather, the large data set would suggest that these patterns are fairly consistent. Understanding nightly trends in activity may be useful from a management perspective, as these patterns could be used to identify times at night when the potential for impacts to bats is greatest. Peaks in activity could be used to design species specific mitigations, such as shutting down or feathering turbines during narrow windows of high activity.

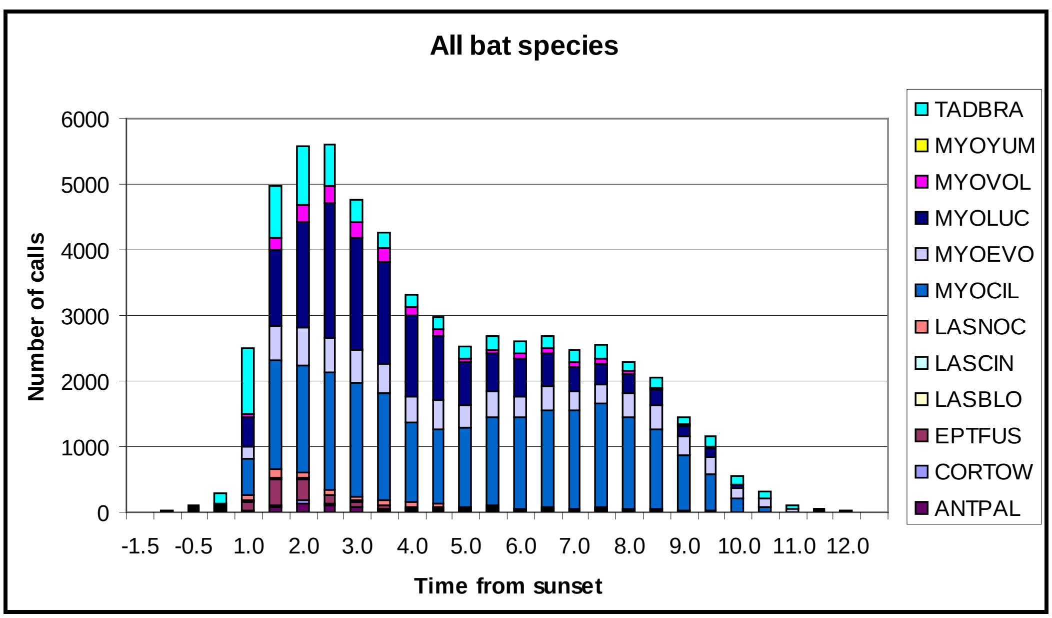

Figure 1. Nightly activity patterns of all bat species, 2007–2008.

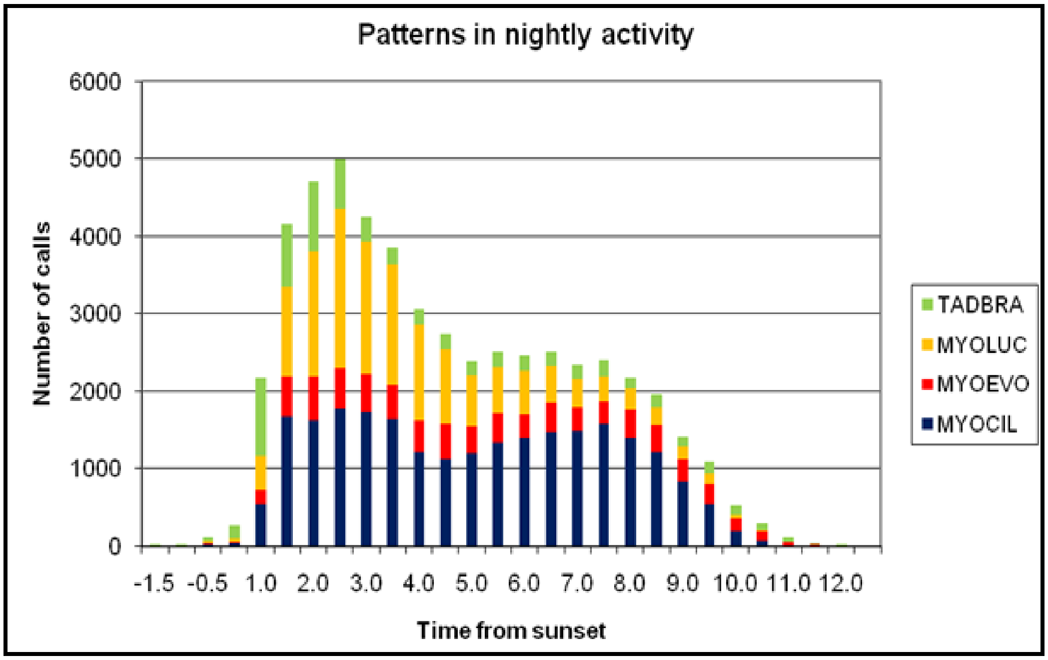

Figure 2. Nightly activity patterns of western small-footed myotis, long-eared myotis, little brown bat, and Brazilian free-tailed bat, 2007–2008.

In addition to nightly trends in activity, seasonal trends in activity were also observed. These trends followed patterns already documented by previous research, which has shown that migratory species tend to have spring and fall peaks in activity, with a more dramatic peak in the fall (Arnett et al. 2008). Interestingly, the silver-haired bat exhibited this pattern, but peaked earlier in the spring and later in the fall than the other migratory species. This is likely as a result of this species' preference for northern latitudes, higher elevations, and general tolerance of colder conditions (Bradley et al. 2006). In contrast, activity levels in the non-migratory species all followed a pattern of a gradual buildup in late spring, followed by a peak in mid-summer and a gradual decline in the fall. Figure 3 shows season activity patterns for all bat species, while Figure 4 compares activity between migratory and non-migratory species.

Seasonal trends in activity are useful for the same reasons as nightly trends. These can be used to assess when the potential for impacts to bats is greatest based on seasonality in order to craft effective mitigation measures. For example, mitigations for migratory species may only need to be enacted during the spring, summer, and fall, when the activity of these species is greatest.

1.6.3 Birds

Bird studies for the SVWEF incorporated several types of surveys, including raptor migration, general use, and breeding bird surveys. These efforts resulted in the observation of 92 species of birds, including diurnal raptors, passerines, waterfowl, and shorebirds. Total bird abundance was greatest during the winter months, when large flocks of horned larks (*Eremophila alpestris*) were present. Horned larks were the most abundant birds recorded during all surveys and were followed by common raven (*Corvus corax*), bohemian waxwings (*Bombycilla garrulus*), mountain bluebird (*Sialia currucoides*), and pinyon jay (*Gymnorhinus cyanocephalus*).

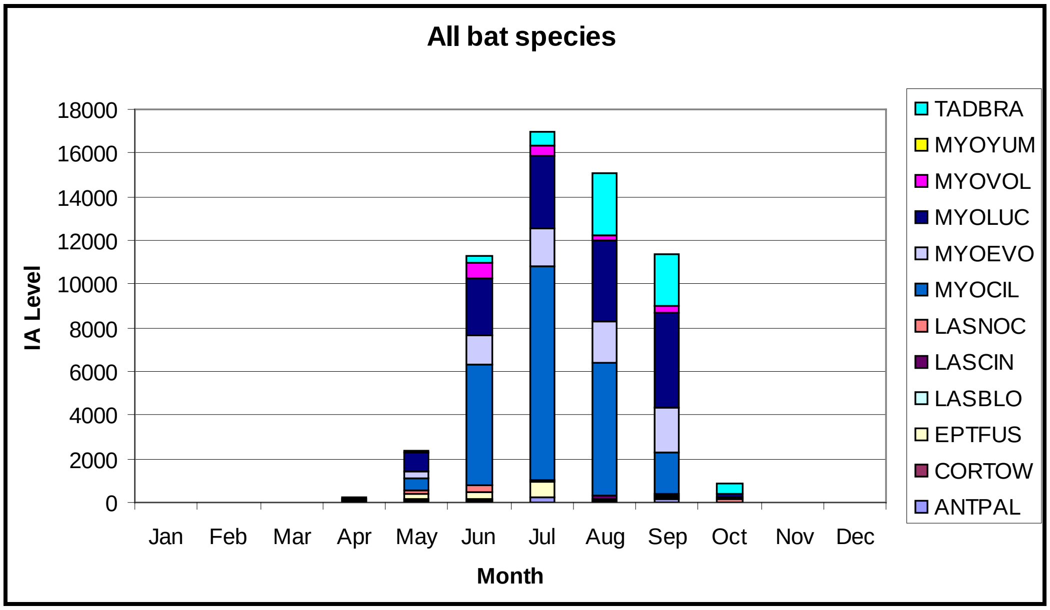

Figure 3. Seasonal activity patterns of all bat species, 2007–2008.

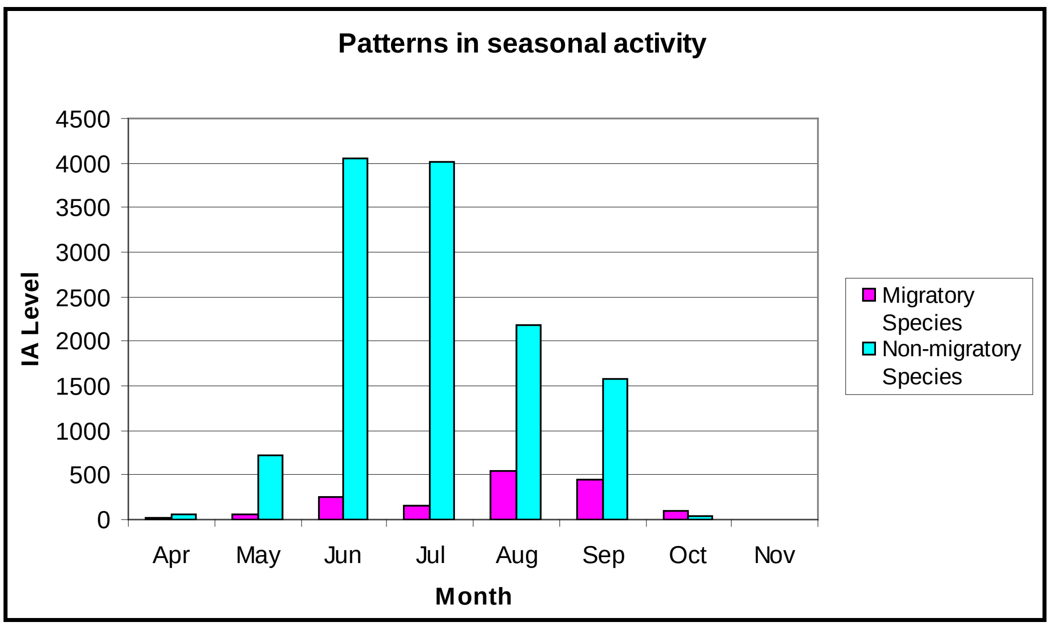

Figure 4. Seasonal patterns of migratory vs. non-migratory bat species, 2007–2008.

General bird surveys and migratory passerine surveys revealed that bird numbers in Spring Valley fluctuate greatly throughout the year. Numbers are fairly constant through the spring and early summer, but drop consistently just before migration. This could be as a result of birds congregating in staging areas before migrating south. If Spring Valley is not a typical staging area, then residents from Spring Valley would disperse elsewhere prior to migration. In both years, as the fall migration commenced, bird numbers began to greatly increase. These numbers only continued to increase throughout the fall, with the greatest spikes in activity occurring in December 2007 and February 2008, before dropping precipitously and returning to their relatively steady levels for the remainder of the year. Figure 5 shows overall avian abundance over time.

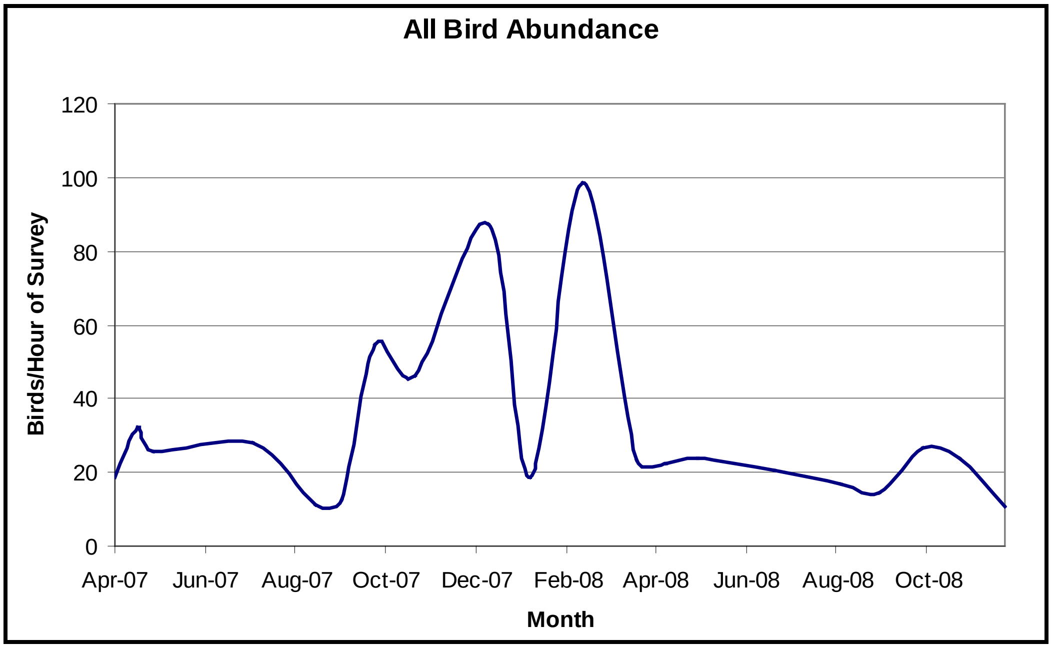

Figure 5. Overall bird abundance in Spring Valley throughout field surveys.

While raptors are not as abundant as passerines, they are a great concern at wind-generating facilities across the country. Raptor passage rates at the SVWEF (SWCA 2009b) are considerably lower than those at the nearby Goshute Mountains (Smith 2008); however, raptor mortalities are still a concern. Specifically, golden eagles (*Aquila chrysaetos*), Swainson's hawk (*Buteo swainsoni*), and ferruginous hawks (*Buteo regalis*) were all observed in the project area and flying within the RSA (SWCA 2009b). Additionally, concern over golden eagles has been recently elevated throughout its range.

Helicopter surveys performed specifically for nesting raptors within the project area and a 1-mile buffer revealed multiple nesting pairs of ferruginous and Swainson's hawks (SWCA 2009b). Of 25 raptor nests observed during helicopter surveys conducted in 2007 and 2008, three inactive nests and only one active raptor nest were observed in the current project area—a Swainson's hawk nest in the northern portion of the project area that fledged two chicks. The remaining nests are located within the initial northern project area or the 1-mile buffer but outside the current project area. Additionally, it is suspected that both northern harriers and American kestrels breed in the project area, although definitive evidence was never directly observed.

Golden eagles comprised 5% of the documented raptor migration through the project area. Eight individual golden eagle migrants were seen during 203.75 hours of observation, which is equivalent to one golden eagle every 25.5 hours. In contrast, HawkWatch International (HWI) has recorded 251 golden eagles per year over an average of 669.9 hours of observation each year at the Goshute Mountains Raptor Migration Project site (Smith 2010), or one golden eagle every 2.7 hours. Golden eagles have averaged less than 2% of the total migration at the Goshutes between 1990 and 2008. In conducting raptor migration counts at a number of sites near Ely, Nevada, HWI recorded 59 golden eagles during 329.89 hours of observation in the fall of 2004 and spring of 2005 (Smith 2005), or one golden eagle every 5.6 hours. For the Ely project, golden eagles comprised 5.8% of the overall migration for that project, similar to the 5.0% seen in Spring Valley. Overall, it appears that the migration through the project area is limited, and golden eagles appear to constitute a similar or slightly above normal percentage of all migrants. Figure 6 shows golden eagle abundance observed by month at the SVWEF.

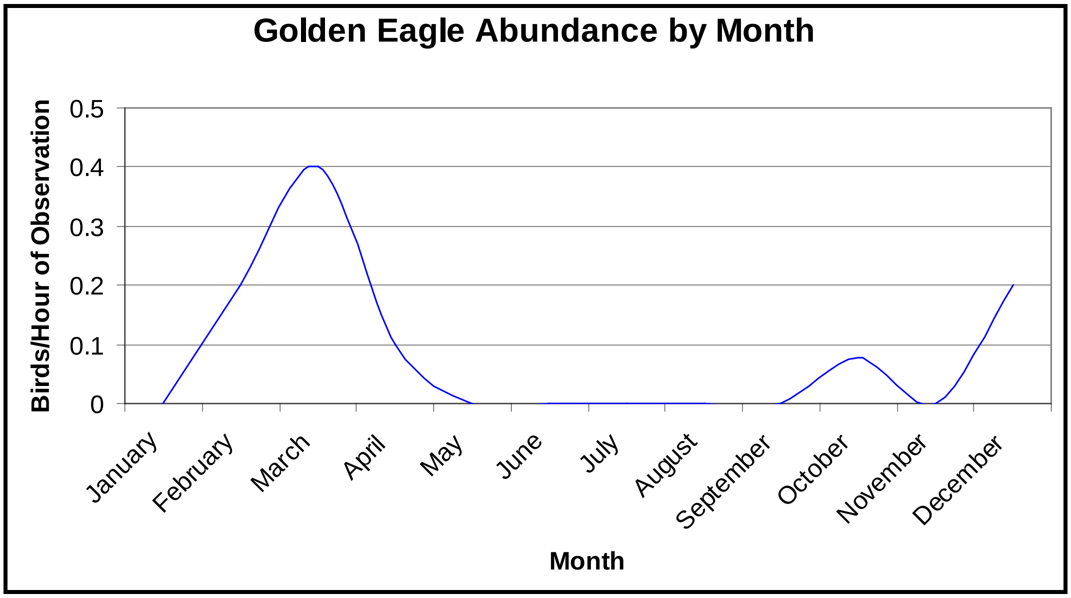

Figure 6. Golden eagle abundance at the SVWEF by month.

Golden eagles typically nest on large cliffs anywhere from 10 to 100 feet off the ground (Ehrlich et al. 1988). Golden eagles will also nest on tall, artificial structures, such as electrical poles and towers, and they may use these vertical structures to perch while hunting as well. They may also nest in trees, though less frequently. While there are no cliffs in the project area and very few large trees, multiple transmission lines run through the southern end of the project area and one runs along Nevada State Highway 893 on the western edge of the project area. However, no golden eagle nests were found on any of these transmission towers. Figure 7 shows all of the mapped cliff habitat within a 4-mile and 10-mile buffer of the project area, which provides the best nesting habitat near the project area. Nesting raptor data provided by the Nevada Department of Wildlife (NDOW) in 2010 shows one known nest approximately 4 miles from the project area and another within the 10-mile buffer (Figure 7). It should be noted that these nests have not been checked for activity in almost 30 years. In conducting surveys for the *Atlas of the Breeding Birds of Nevada* from 1997–2000, Floyd et al. (2007) found the closest breeding pair of golden eagles in the Schell Creek Range, northwest of the project area. This nest appears to be more than 10 miles from the project area, but the exact location is unknown.

In a study of four nesting pairs of golden eagles in southwestern Idaho, Collopy and Edwards (1989) found the average territory size to be 3,276 hectares (ha) (12.6 square miles). Assuming that the territory is roughly the shape of a circle extending an equidistance in all directions from the nest, most hunting activities during the nesting season would not extend much past 2 miles from the nest ($12.6 = \pi r^2$). Collopy and Edwards (1989) also site a study of Utah golden eagles that determined the average territory size to be 2,300 ha (8.9 square miles). This equates to a foraging extent of under 2 miles from the nest. Additionally, Pagel et al. (2010) site that golden eagles generally forage within 6 kilometers (3.7 miles) of the center of their territory. This territory data could explain the lack of observations in the project area from May through September. If there is very little nesting substrate in the project area and the closest nest is approximately 4 miles away (activity unknown), it is likely that golden eagles would spend very little time in the project area during any month of the breeding season. Therefore, it is assumed that there would be very little risk of mortality of golden eagles during the summer months.

According to the National Wind Coordinating Collaborative (NWCC 2004), it is estimated that 2.3 avian fatalities per turbine per year (3.1 per megawatt per year) occur in the United States, excluding California facilities, which are mainly composed of older generation turbines. Raptor fatalities in the Rocky Mountain Region are estimated at 0.03 raptor per turbine per year (0.05 raptor per megawatt per year).

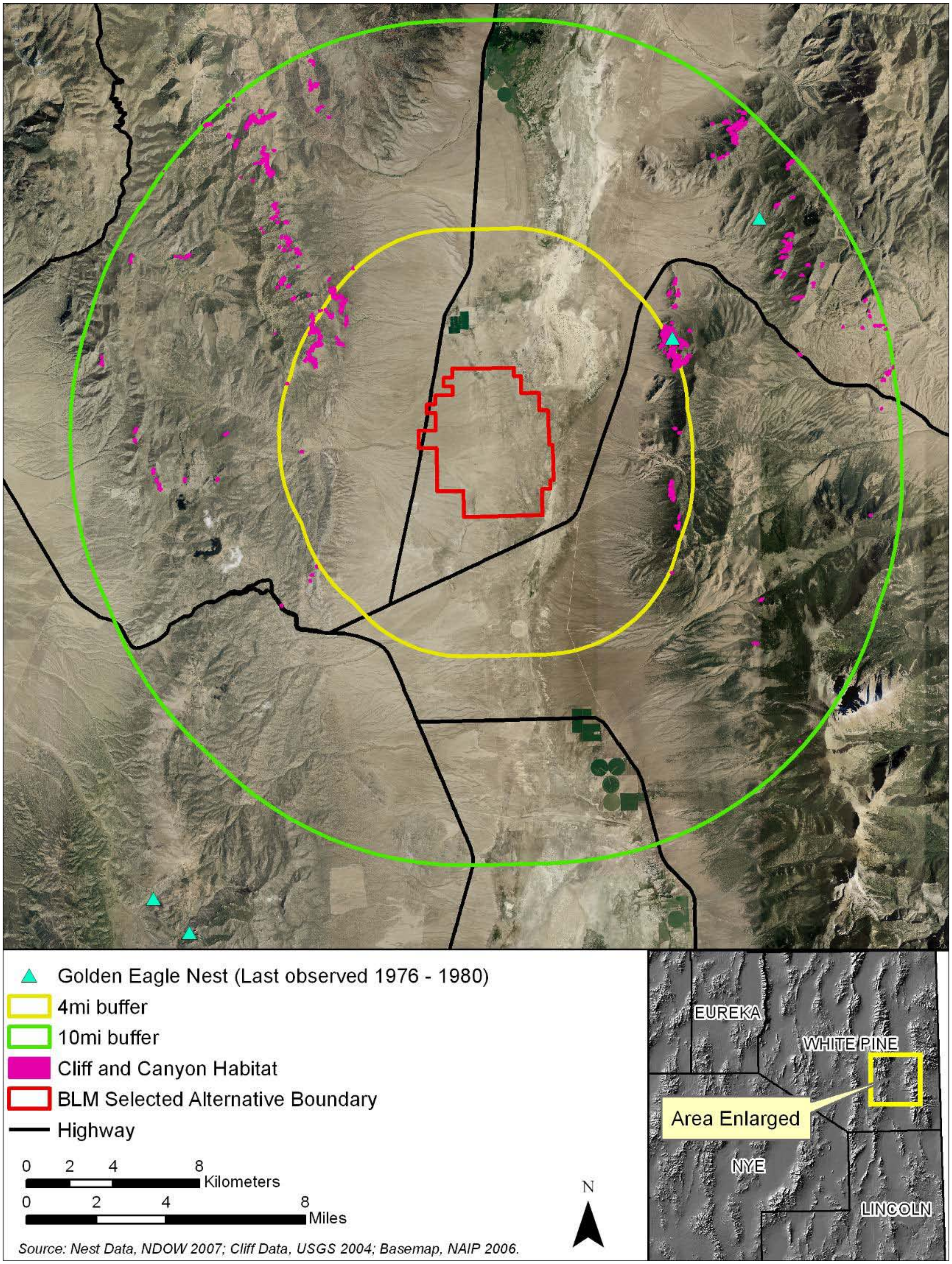

Figure 7. Golden eagle nesting habitat near the SVWEF.

2.0 MITIGATION, MONITORING, AND ADAPTIVE MANAGEMENT PROCESS

The process for addressing potential impacts to bird and bat species from implementation of the SVWEF is divided into three sections: 1) Initial Mitigation (i.e., curtailment, power line/pole retrofits, research, habitat enhancement, etc.), 2) Pre and Post-Construction Monitoring, and 3) Adaptive Management based on monitoring results.

Initial mitigation measures have been developed to address impacts that are likely to occur as disclosed in the EA. Post-construction monitoring is designed to evaluate the project during operation to determine actual impacts. Adaptive management has been designed to use monitoring data to evaluate whether impacts are nearing or exceeding those disclosed in the EA, and if so, to implement measures to reduce them to acceptable levels based on the EA or consider some other type of minimization or mitigation.

To help ensure that impacts to avian and bat species do not reach levels of significance (Sections 5.2 and 5.3) due to routine operations of the SVWEF, a Technical Advisory Committee (TAC) will monitor SVWEF activities, including mortality data, to determine the need for project mitigation. The TAC will consist of a single resource specialist (two members may be appropriate if one person specializes in birds and the other in bats) from the BLM, U.S. Fish and Wildlife Service (USFWS), and NDOW. The TAC will provide advice and recommendations to the BLM Authorized Officer on developing and implementing effective measures to monitor, avoid, minimize, and mitigate impacts to avian and bat species and their habitats related to operations. The BLM Authorized Officer will evaluate any recommendations of the TAC, including discussions with the proponent on new measures or measures that are not completely detailed in this ABPP, and make a decision on what measure(s) to require for implementation.

A TAC Lead will be designated for the group whose duties will include disseminating project data, including data on mortality events, setting up and moderating meetings, reviewing biweekly mortality data, and documenting mitigation recommendations for the SVWEF. Because the SVWEF occurs on BLM land and they are the federal decision-maker, BLM will provide a designated TAC Lead for the duration of the project. Because it is the TAC Lead's responsibility to coordinate meetings and involve all team members, the TAC Lead reserves the right to make recommendation decisions under extraordinary circumstances or when all TAC members are unable to meet.

A Memorandum of Agreement (MOA) will be signed by each party to ensure participation in the TAC. Unless there is a failure on the part of any of these representatives to respond or agree to participate, the TAC shall be formed prior to project operations.

The guiding principles, duties, and responsibilities of the TAC include the following.

- Approve TAC charter and sign MOA.
- Make recommendations based on best available science and to address specific issues resulting from this project.
- In the event decisions cannot be made by consensus, decisions of the TAC shall be made by simple majority vote.
- The TAC is only an advisory committee, and final management decisions will be made by the BLM Authorized Officer.
- Provide sufficient flexibility to adapt as more is learned about the project as well as strategies to reduce avian and bat impacts.
- Review initial and any subsequent revised monitoring protocols for mortality monitoring studies.

- Complete an annual review of predetermined mortality thresholds for mitigation (Section 5.0) and provide recommendations to the BLM Authorized Officer regarding any necessary adjustments to those thresholds.
- Review results of mortality monitoring.
- Recommend appropriate phase mitigation measure(s) to the BLM Authorized Officer for implementation in the event that thresholds for overall bats and/or birds have been exceeded (Section 5.2).
- Review species-specific mortality and recommend mitigation to the BLM Authorized Officer, if any, in the event that the species-specific thresholds for special-status species are exceeded (see Section 5.2).
- Review annual report on status of compliance with mitigation measures and permit conditions and provide recommendations to the BLM Authorized Officer, as necessary.
- Develop and recommend additional mitigation measures or research to the BLM Authorized Officer if predetermined mitigation is outdated or deemed ineffective or “unexpected fatalities” occur.
- Evaluate effectiveness of implemented mitigation strategies and provide the BLM Authorized Officer with recommendations based on findings.
- If selected as part of phased mitigation, recommend compensatory mitigation funding opportunities for implementation of off-site species or habitat enhancement or protection/conservation measures.
- The TAC will terminate when the BLM Authorized Officer determines that it is no longer a necessary pathway in reducing avian and bat impacts.

The TAC shall hold the first meeting prior to the commencement of operations to develop and approve the charter and requirements of this ABPP. The charter will include an MOA ensuring participation in the TAC and agreeing to how funds provided in this ABPP would be accessed. Thereafter, the TAC shall meet annually, unless data reveal that mortality thresholds have been exceeded. Attendance at TAC meetings shall be by invitation of its members only.

To ensure the TAC is fully functional, SVW will provide $290,000 over a period of ten years not to exceed $50,000 per year in the first three years, to assist with operational costs. Remaining funds would be contributed at an approximate rate of $20,000 per year during the remaining seven years. Funds would be deposited into an agreed upon interest bearing account and marked specifically for purposes of TAC operational expenses. Through an MOA, all TAC members would develop a cooperative agreement plan for how the funds are utilized.

3.0 INITIAL MITIGATION MEASURES

Initial mitigation measures will be implemented upon commencement of operation of the SVWEF.

3.1 Radar Monitoring and Mitigation System

SVW, through Pattern, has pioneered the use of avian and bat radar technology at wind energy sites over the past several years. In particular, they have been actively involved with DeTect (a leading avian radar manufacturer and operator) in developing technology to shut down turbines during high-risk periods for migrating birds, specifically when high avian activity is coupled with low visibility. This curtailment system is currently in place along the south Texas coast in Kennedy County for a project with high migratory bird use, Texas Gulf Wind, and to date, mortality has been at or below projected levels.
A similar study and mitigation strategy will be implemented at the SVWEF. However, the primary focus of the SVWEF radar monitoring system will be Brazilian free-tailed bats using Rose Guano Cave and any

related high-risk periods for bat movement as identified in the pre-construction bat studies (SWCA 2009a). Although focused on bat use associated with Rose Guano Cave, the radar system will also be used to mitigate other bat and avian species movements using the SVWEF.

The radar monitoring system will serve as a management tool to assist with selecting the most effective times for curtailment. The radar system will record timing (seasonal and temporal) of when groups of birds and bats (and insects) are present, as well as when and how many bats leave and enter Rose Guano Cave. Recordation of the exact number of individuals may be difficult due to picture resolution; however, estimates can be derived through plume size. These data will be used to help determine when curtailment and potentially even turbine shutdowns would be most effective. Given the proximity to Rose Guano Cave, this measure will be especially effective during August and September, when use is at its highest.

As described later in the phased mitigation measures, the radar system may also be used as an “early warning” system, providing advance detection of bird or bat activity that presents mortality risk with the ability to shut down turbines. If this method is implemented, any time the radar system detects a group of birds or bats (group size determined through at least a year of radar studies) within approximately 0.25 mile of the project area, coupled with low visibility for birds, and threshold number of species within the RSA, the system will communicate with the turbines and they will automatically break and feather until the group exits the project area. The distance out to which the radar could initiate shutdowns will be evaluated as enough data are collected and adjusted as necessary.

For the SVWEF, two permanent on-site MERLIN radar units (radar units) will be installed to analyze the presence and movement of birds and bats within the project area. Radar units will be placed in the northeastern and southeastern portions of the project area to provide coverage of the entire project area, as well as to detect bats from Rose Guano Cave prior to them reaching the project area. The radar units have a range of approximately 2.3 to 4.6 miles in the horizontal axis, depending on conditions, which can be used to identify the movement of birds and bats relative to the SVWEF. In the vertical axis, flight height information can be gathered in a radius of about 0.86 mile from the radar, but biological information is typically only considered valid out to 0.62 mile. These radar units will run full time and be connected directly into the Supervisory Control and Data Acquisition (SCADA) system so that radar data can be directly communicated to the turbines.

A Fixed-Beam Vertical Profile Radar (VESPER) will also be used to provide more detailed target categorization than the MERLIN radar system, specifically, differentiation and identification of birds, bats, and insect targets based on measurement of wingbeat frequencies as targets pass through the radar beam. The beam width will be sufficiently wide to allow even large, slow-flapping targets to reside in the beam for several seconds, allowing enough time for measurement. VESPER also provides higher-resolution altitude data for targets. It can track micro-insects up to at least 1,000 m, and larger targets such as bats can be tracked even higher. VESPER has a beam width of 7 degrees, and both the detection height and width are dependent on target size, with the effective range and beam width greater for larger targets. The more detailed target categorization and altitude data gathered by VESPER may provide valuable information on spatial and temporal distribution of insects; insects are the prey of bats and may be another important factor influencing bat distribution and therefore periods of high bat strike risk. Insect data measured by VESPER can be included in bat and bird mortality risk models and mitigation strategies for wind energy projects. The VESPER radar can be operated independently or in concert with the MERLIN radar. The location of the VESPER unit will likely be dynamic for the first several months of the study campaign. The optimum deployment of VESPER is highly dependent on bat movement and insect location. Proper deployment of the system will be assessed prior to any relocation necessary within the project boundary in an effort to minimize disturbance.

Additionally, an infrared beam-break system or remotely accessible bat acoustic detector will be placed at the entrance of the Rose Guano Cave to provide more detailed bat arrival and departure data.

This information will also provide presence/absence data important for teasing out how bat movements observed on radars relate to bats using the cave. The infrared beam-break system would be installed on a frame placed just inside the perimeter of the cave entrance, with infrared emitters and their corresponding receivers placed on opposite sides and the beam crossing the entrance. This system could be either battery or solar powered and the data would be stored in a data logger, although wireless data access may be available, depending on the final technology being used. The acoustic detector device, although it provides less detailed information, would still record a suitable index of bat activity based on frequency of bat calls and may prove to be more logistically feasible. If selected, this detector would be placed in a container near the cave entrance and would be solar powered, accessed remotely and wirelessly, and elevated on a pole if needed. The final selection of instrumentation and construction details will be determined after a site visit and assessment. The information collected from this system would provide additional data on use at the cave, which could help to refine mitigation measures and develop new measures.

3.2 Nocturnal Surveys

Radar that will already be on site will be used to monitor nocturnal avian activity. Data collected will be used to help develop additional monitoring (i.e., video surveillance) and to inform adaptive mitigation measures if avian mortality occurrences are found to correlate to nocturnal survey results.

3.3 Turbine Curtailment

Because of the close proximity of the project area to a known Brazilian free-tailed bat roost, curtailment of the turbines will be completed during the highest use periods of August 1 through September 31, from sunset to 4 hours after sunset (Sherwin 2009; SWCA 2009b). While curtailment is being initiated because of the presence of the Brazilian free-tailed bat, it is anticipated that this measure will also benefit other bat species.

A curtailment study will be completed during the first year to determine the most effective cut-in speed following methods based on those developed by Arnett et al. (2009) in which they evaluated the effectiveness of increasing cut-in speeds from an initial 4.0 m per second (m/s) to experimental speeds of 5.0 and 6.5 m/s. These increased cut-in speeds were effective in reducing bat mortality by 53%–87%, with minimal loss of revenue for the WEF (Arnett et al. 2009). No Brazilian free-tailed bats were evaluated in this study; therefore, testing is needed to determine the effectiveness of increased cut-in speed.

During this study, turbine cut-in speeds will be altered from sunset to 4 hours after sunset for a 62-day period (248 hours) during the highest use period of August 1 through September 31. The effectiveness of 4.0, 5.0, and 6.0 m/s cut-in speeds will be compared with the default turbine cut-in speed of 3.0 m/s, using 40 randomly selected turbines (~50%). Treatments will be randomly assigned to each of the 40 turbines for each night; however, the randomization will be limited so that each treatment type will be applied to 10 of the 40 turbines. All remaining turbines will be set at 5.0 m/s during that period to mitigate for potential impacts during peak Brazilian free-tailed bat activity.

During this study, a crew of biologists will conduct mortality searches every day for each of the 40 turbines studied. Searches will be completed within a 126 × 126–m area (approximately equal to the RSA), centered on the turbine mast, using transects spaced 6 m apart (Young et al. 2003). Biologists will record the location, species, sex, and age of each mortality observed. The condition of observed mortality will be recorded, and a photograph will be taken. After these data have been recorded, bats will be collected following standard protocols and kept for later use (upon approval by NDOW). Carcasses will either be used in searcher efficiency and carcass removal trials or provided to the TAC for additional studies such as necropsies and DNA and stable isotope analysis.

Searcher efficiency and carcass removal trials will be used to determine the average percentage of bats detected by surveyors and the persistence of bat carcasses in the field. These rates will be used improve the accuracy of bat mortality estimates. Detailed searcher efficiency and carcass removal protocols are explained in Sections 4.2 and 4.3, respectively.

The results of the curtailment study will be summarized in a report and provided to the TAC and BLM for review. The lowest of the cut-in speeds which demonstrates a statistically significant reduction in bat mortality would be selected as the default cut-in speed during the Brazilian free-tailed bat peak activity period throughout the duration of the operating life of the SVWEF. Statistical significance will be analyzed using an analysis of variance test. If neither of these turbine cut-in treatments have a statistically significant impact, the default cut-in speed for the turbines in the SVWEF would be set at 3.0 m/s or a cut-in speed recommended by the TAC based on current science specific to the project area may be used. If there is not enough statistical power from the study to determine an effective cut-in speed, the study will be redone with a larger dataset or a cut-in speed will be determined based on current relevant data.

Additionally, radar data may provide information that will allow curtailment to be limited to specific days within the season or times of day. If curtailment timing is changed, a study will be completed to assess the effectiveness of the change. If the initial curtailment plan/timing does not keep mortality under thresholds then additional amounts of curtailment are available as part of the phased mitigations. As part of those phased mitigation measures, adjustments to seasonal and daily timing may be made based upon mortality, radar, and AnaBat (for bats only) data.

3.4 Wildlife Fund

The project proponent will provide $500,000 ($200,000 prior to project construction, and $100,000 for the next three years) to fund wind/wildlife interaction studies, and habitat improvement and replacement projects. Funds would be deposited into an agreed upon interest bearing account and marked specifically for purposes of research, habitat improvements, and/or habitat replacement. Through an MOA, all TAC members would develop a cooperative agreement plan for utilization purposes, which could include required permitting, equipment, labor, and other related goods and services. The exact use of this money will be recommended by the TAC based on the results of the post-construction monitoring/mortality surveys and approved by the appropriate authorizing entity. Additionally, the BLM or other participating agencies may elect to contribute funding.

Examples of wind/wildlife research studies that could be funded through this program include:

- population-level studies for wildlife impacted by wind energy development in the region;
- effects of increased recreational use of facility access roads on wildlife; and
- the ability of deterrent devices to reduce impacts to birds and bats at WEFs.

3.5 Public Outreach

SVW will coordinate with key interest groups within the community to determine how capital contributions from the project can go toward local scholarship funds and/or worthwhile community projects. Additionally, SVW will join the White Pine County Chamber of Commerce and provide status updates on construction and operations which can be included in their publications. Lastly, a project fact sheet describing the project and measures that have been put in place to address avian and bat issues will be prepared and made available at the local BLM Ely District Office.

4.0 POST-CONSTRUCTION MONITORING

Post-construction monitoring for bats and birds is a critical component of this ABPP. The observations made during post-construction monitoring will be reported to the TAC, which will respond with appropriate management decisions should mortalities exceed the thresholds outlined in this ABPP (see Section 5.2). Post-construction monitoring will be completed for bats and birds concurrently, and detailed methods for these surveys are presented below. Since post-construction monitoring methods are constantly improving as researchers develop new and more accurate methods of survey, the TAC should consider recommendations to adopt new survey techniques and protocols as they become available.

Post-construction surveys will focus on mortality surveys for birds and bats. These surveys will be completed regularly to document the number and species of birds and bats killed as a result of the SVWEF. As part of these mortality surveys, the searcher efficiency rate (i.e., the ability of a surveyor to locate a mortality) and carcass removal rate (i.e., the average time that a carcass persists before a scavenger removes it) will be determined for bats and small and large bird size classes. For each mortality located, the appropriate (i.e., bat, small bird, large bird) searcher efficiency and scavenger removal rate will be used to estimate the actual number of bird and bat mortalities. Methods for completing post-construction surveys are described below.

4.1 Mortality Surveys

Mortality surveys for bats and birds will be completed for three years following construction. If mortality thresholds are being exceeded following the third year of study, the TAC may recommend that additional years of monitoring are required to evaluate the effectiveness of new mitigation. At such time that the BLM, in coordination with the TAC, has determined mortality thresholds are no longer exceeded, follow-up mortality surveys will be completed every fifth year until decommissioning to ensure that mortality levels remain below thresholds.

Mortality surveys will occur throughout the year to evaluate the overall impacts to bats and birds from the SVWEF. Surveys will be completed every other week for one-third of the operating turbines, with turbines grouped in threes and the middle turbine surveyed as the representative site for that group. In some instances, the number of turbines in a string will require turbines to be in groups of two or four, with one turbine selected for surveys. The Proposed Action would have 25 groups of turbines: three groups of two turbines, three groups with four turbines, and 19 groups with three turbines. The Alternate Development Alternative (if selected) would also have 25 turbine groups: two groups with two turbines, two groups with four turbines, and 21 groups with three turbines. Searches will be conducted within a 126-m x 126-m (170,900-square-foot) survey area (just larger than the RSA), centered on the WTG mast (Young et al. 2003). Transects will be spaced at 6 m (19.6 feet), with surveyors searching for 3 m (9.8 feet) of either side of the transect. Large raptors tend not to be scavenged and are easily detectible; therefore, due to the recent concerns over golden eagles, if a golden eagle fatality is discovered, the remaining unsurveyed turbines will be searched for additional eagle fatalities during that survey period.

Additionally, daily searches of the representative turbines will be conducted for a seven-day period, each season, corresponding to the timing for searcher efficiency (see Section 4.2) and carcass removal (see Section 4.3) trials. The seasonal daily data will provide additional mortality information that will help refine correction factors in order to provide more precise data. For the fall season, daily searches of 40 turbines will occur throughout August and September, and the additional week of daily searches will not be completed as in the other three seasons.

Data collected for each carcass will include estimated time since death, condition, type of injury, cover type, distance to nearest WTG location, distance to nearest road, and distance to nearest structure. All observed carcasses will be photo-documented and identified using the *Key to the Bats of Nevada*

(Bradley et al. 2006) and *The Sibley Guide to Birds* (Sibley 2000), respectively. All mortalities that cannot be identified will be recorded as an unidentified bat or bird. Contingent upon approval and permit by NDOW and the USFWS, it is recommended that carcasses be collected for use in searcher efficiency and scavenger removal trials. If requested by the TAC, collected carcasses may also be frozen and provided to the TAC for further discussion on the viability to perform necropsies and DNA and stable isotope analysis. With respect to eagles, the USFWS Reno Office of Law Enforcement (OLE) sends these carcasses to the National Eagle Repository; therefore, a freezer will be available at the O&M building on site and all eagle carcasses will be frozen and stored on site until OLE can retrieve them.

Searcher efficiency (see Section 4.2) and scavenger rate (see Section 4.3) studies will be used to develop correction factors that will be applied to mortality findings for each surveyed turbine. The corrected data for surveyed turbines will be used to evaluate the mortality per turbine thresholds described in Section 5.2. Additionally, survey intervals may need to be adjusted based on the findings for these studies in order to ensure precise correction factors, as described by Huso (2008).

4.2 Searcher Efficiency Trials

Searcher efficiency trials will be conducted throughout the year to correct observed bat and bird mortalities for bias created by the ability of the surveyor to detect bat and bird carcasses. These will be conducted for each searcher to address differences between searchers. Searcher efficiency trials will be completed during each season to account for different field conditions (i.e., snow, dense spring vegetation, dry summer vegetation) that may affect the ability of the surveyor to locate carcasses. Seasons will be defined as described by Erickson et al. (2003): spring migration (March 16–May 15), breeding season (May 16–August 15), fall migration (August 16–October 31), and winter (November 1–March 15). Although seasonal trials will not address fluke events, such as snow in June, they will address the overall time period.

Separate searcher efficiency rates will be determined for bats, small birds (passerines), and large birds (raptors). In order to have an adequate sample size (> 50, Huso [2008]), 20 carcasses will be used for each rate. Bat carcasses collected from the SVWEF will be used for bat searcher efficiency trials, as available. If an insufficient number of bat carcasses are available, small, drab passerines or brown mice carcasses will be used as substitutes. A minimum of two distinct sizes of bird carcasses will be used to determine searcher efficiency rates for passerines and larger birds. As available, bird carcasses collected from the SVWEF will be used in the searcher efficiency trials; however, substitute carcasses may be used as necessary. Substitute small bird carcasses may include species such as house sparrows (*Passer domesticus*) and European starlings, while carcasses substituted for the large bird size class may include waterfowl, pheasants, rock doves, or domestic fowl. In all cases, carcasses used will either be non-native, non-protected species provided by an authorized agency, or species collected through permitted take.

Prior to initiating the searcher efficiency trial, carcass locations will be randomly generated but constrained so that no more than three carcasses will be located at any one turbine at a time. An additional biologist who is not participating in the searcher efficiency trials will plant carcasses in pre-determined locations. Carcasses will be dropped from waist level, so that they land in a random position and location. The position and location will be recorded for later comparison with actual mortalities.

Bat carcasses will be marked by means of pulling an upper canine tooth as described by Arnett et al. (2009). Similarly, birds will be marked by notching the beak in order to avoid using chemically based marking methods, which may influence scavenger removal rates. When surveyors located a marked carcass, they will note the finding and notify the biologist who planted the carcass. The percentage of planted bats and birds located by surveyors will be used to generate a correction factor to estimate the actual number of bats killed, based on the number of actual mortalities observed.

4.3 Carcass Removal Trials

Carcass removal trials will be completed seasonally as described above in Section 4.2. Different seasonal rates for carcass removal are necessary to address changes in the scavenging throughout the season, as well as over time, as scavengers adapt to a novel food source. Carcasses will be placed as described for searcher efficiency trials. Carcasses will be checked at 1, 2, 3, 4, 5, 6, 7, 14, 21, and 28 days following placement, or until they are all removed. Separate carcass removal rates will be determined for bats, small birds (passerines), and large birds (raptors). Carcasses used for scavenger trials will be obtained as described above in Section 4.2. All animals used in the carcass removal trials will be handled with disposable nitrile gloves or an inverted plastic bag to avoid leaving a scent on the carcasses and interfering with the scavenger removal trial (Arnett et al. 2009).

4.4 AnaBat Acoustic Surveys

Post-construction bat acoustic surveys will be completed throughout the post-construction studies in order to help correlate bat activity levels with mortality events. One permanent MET tower will be installed at the SVWEF to measure weather conditions. Stratified AnaBat acoustic arrays, similar to those described by Arnett (2005), will be installed on this MET tower, with microphones installed at heights of approximately 3 m (9.8 feet), 30 m (98.4 feet), and 60 m (196.8 feet). All AnaBat acoustic data will be analyzed as described by O'Farrell and Gannon (1999) at least every 6 months. These data will be used to study trends in pre- and post-construction bat activity levels with impacts from wind energy turbines and will be used to help adjust curtailment times. It is hoped that eventually, pre-construction survey data would be able to be used to predict post-construction bat mortality levels.

4.5 Raptor Nest Surveys

Nest surveys will be conducted prior to the nesting season (approximately March 15 to July 30) and once each month during the nesting season during the first three years and every fifth year after that. Aerial or ground based raptor nest surveys will be conducted within the entire project area and a 1-mile buffer for raptors (BLM 2007), except for golden eagles. Golden eagle search distances will be 10 miles from the project area focused on suitable nesting habitat, based on current USFWS guidance. The complete 10-mile search area will be limited to once at the beginning of the golden eagle nesting season with monthly follow-up surveys only being completed for identified golden eagle or potential golden eagle nests. Where appropriate, activities will be restricted from May 1 through July 15 within 0.5 mile of any raptor nest site that has been active within the past 5 years. Nest locations found within the project area and within buffer will be documented by noting the species, dates of activity, Universal Transverse Mercator (UTM) NAD 83 coordinates, nest contents (where possible), and behavior. The data will be presented to the TAC to determine whether mitigation should be recommended to reduce impacts to nesting activities. Active raptor nests will be monitored to track the breeding success of resident raptors and evaluate the effectiveness of mitigation measures, if any are applied.

4.6 Avian Monitoring

To provide a comparison between pre-construction use and post-construction use at the site, avian point count surveys will be conducted twice each month during the first two years of operation. Point-count surveys will be completed using the same methods as pre-construction studies. Basic methods will include general use point-counts in the first few hours of the morning, followed by raptor counts during the middle of the day, and several hours of general use point-counts in the evening. General use point-count data will be collected to provide an accurate comparison between pre- and post-construction use to inform our understanding of avian exposure and probability of mortality as well as behavioral responses to the facility. Raptor count data would be collected to help determine how post-construction use compares to recorded mortality.

4.7 Reporting

Annual reports will be completed in the first quarter of each subsequent year. Reports will detail the findings of mortality surveys, raptor nest surveys, and AnaBat acoustic surveys. The results of the searcher efficiency and carcass removal trials will be described, and these rates will be used to correct the observed mortality rate. The most recent and acceptable methods (such as Huso 2008) will be used to determine mortality estimates.

In addition to the formal annual reports, data forms and a series of mortality tracking spreadsheets (Appendix A) will be submitted to the TAC Lead within one week following completion of each round of mortality monitoring surveys. The spreadsheet will be used to track the total number of mortalities of each species so that management actions can be implemented immediately should any avian or bat mortality threshold be exceeded.

The USFWS will also set up an account on their Migratory Bird Reporting site to document bird mortalities. Data will be entered into this system immediately following completion of the survey round tracking sheets. If golden or bald eagle mortalities are recorded, this data will be entered within 24 hours of observation. This data will be reviewed by the USFWS OLE. Furthermore, these data as well as any other data (raptor nest surveys, productivity, Anabat results, etc.) will be provided to the Nevada Fish and Wildlife Office (NFWO). Unless the TAC lead considers it necessary for immediate contact, data will be provided directly to the NFWO on an annual basis.

Finally, data collected from these studies will be made available to the TAC and other parties interested in publishing findings in peer-reviewed journals.

5.0 ADAPTIVE MANAGEMENT

The adaptive management techniques described in this section have been developed to ensure that potentially significant levels of mortality from operation of the SVWEF are effectively mitigated. This section describes different mitigation phases that will be applied based on mortality thresholds for avian and bat species. Changes in federal, state, and/or BLM status for wildlife species occurring within the project area may result in the addition of, or changes to, adaptive management strategies, as determined by the BLM through TAC recommendations.

5.1 Adaptive Management Process

A set of mortality thresholds has been designated for overall avian and bat species (see Section 5.2), as well as federally listed Threatened/Endangered (T/E) and state protected species (see Section 5.3). The TAC Lead will be provided a running mortality count every two weeks for review. The TAC will meet to discuss mitigation needs if the TAC Lead determines that a mortality threshold has been exceeded. At a minimum, the TAC will meet annually to review data and determine whether designated thresholds are still appropriate or whether they should be adjusted.

If mortality thresholds are exceeded, the TAC will be responsible for identifying and recommending suitable mitigation(s) from the appropriate mitigation phase identified in Section 5.4. The TAC may recommend one or multiple measures identified for that phase. In place of the listed mitigation measures, other measures of similar type (i.e., cost, level of effort, utility) may also be implemented.

The first time mortality thresholds are exceeded, mitigation will be selected from Phase I Mitigation, if determined necessary by the TAC and authorized by the BLM Authorized Officer. If the mortality thresholds are exceeded for a second time (threshold count starts over at zero each time a new mitigation measure is implemented), measure(s) from Phase II Mitigation would be available for selection. All previously implemented measures would continue to be implemented as well, unless a higher-phase mitigation replaces an old measure, i.e., increasing the amount of curtailment. Measures from earlier phases that have not been implemented may also be recommended for implementation by the TAC. This process would continue until thresholds are no longer exceeded. If thresholds are still exceeded following implementation of all mitigation measures for all phases, the BLM would meet with the TAC, other appropriate land and wildlife management agency representatives, and the proponent to determine necessary management strategies. The adaptive management process is depicted in Figure 8 below.

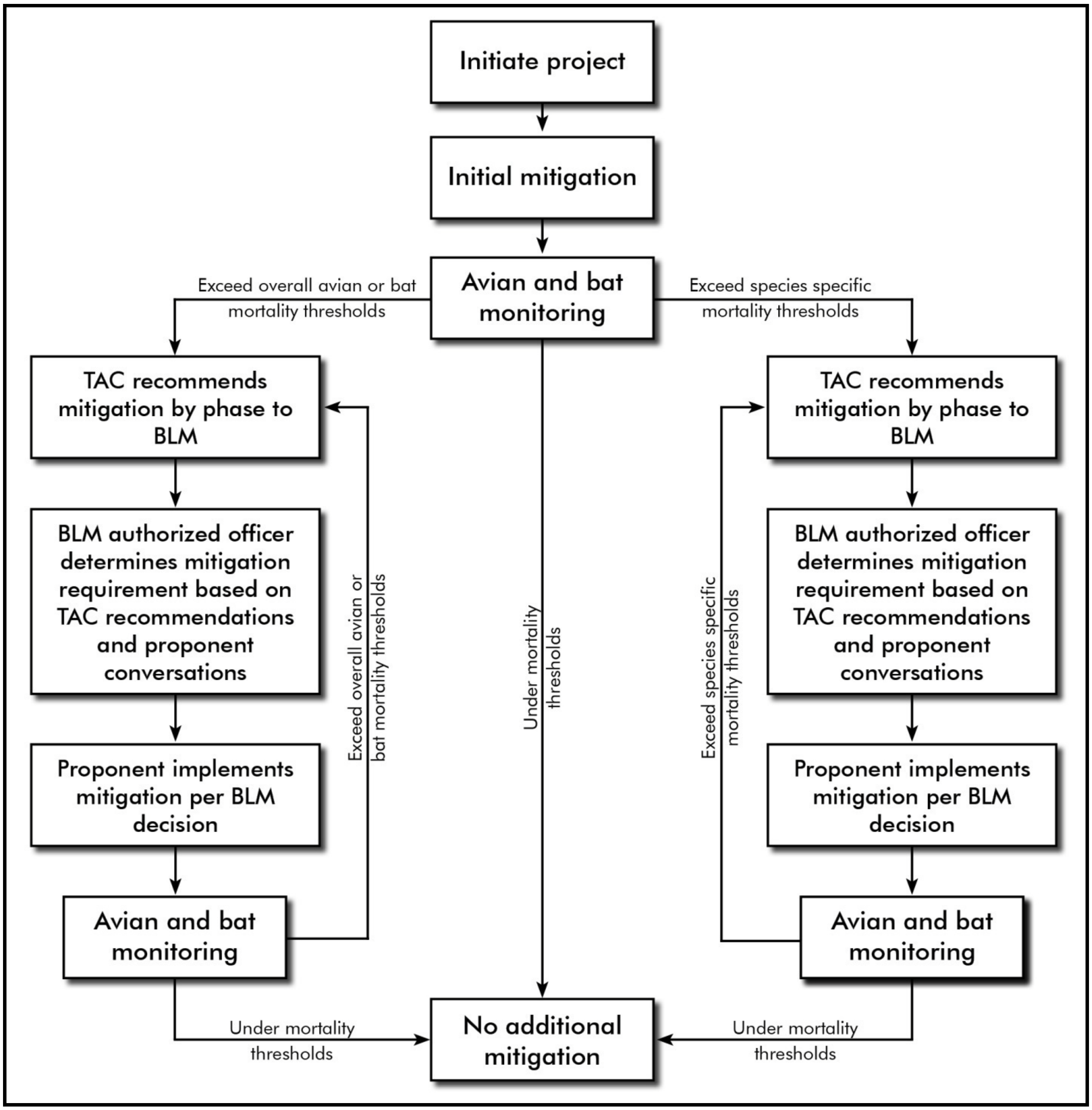

Figure 8. Adaptive Management Process.

5.2 Overall Avian and Bat Mortality Thresholds

Yearly mortality thresholds for overall avian and bat species were determined using a regional average of 11 mortality monitoring projects that occur in similar habitat (Table 8). It is understood that mortality estimates for these projects, excluding the Judith Gap Study (TRC Environmental Corporation 2008), have been adjusted to account for both searcher efficiency and scavenging rates. It is unknown whether correction factors have been applied for Judith Gap. Thresholds were developed through coordination between the BLM, NDOW, USFWS, and other wildlife professionals/experts. However, it is assumed that these thresholds are a starting point and that the TAC will review them annually to determine their effectiveness as well as to determine whether new data are available that would help refine them; it is also assumed that the TAC will provide recommendations to the BLM Authorized Officer regarding whether or not to increase or decrease them. Additionally, if new mortality estimators are used, such as Huso (2008), thresholds may need to be adjusted to be consistent with new methods.

If any of the criteria below are met, mitigation will be required and the TAC will meet to determine the appropriate measure for recommendation to the BLM Authorized Officer:

- Average mortality across all surveyed WTGs in the SVWEF (25 WTGs) exceeds the average for bird mortality per WTG per year (2.70) identified in Table 4.
- Average mortality across all surveyed WTGs in the SVWEF (25 WTGs) exceeds the average for bat mortality per WTG per year (2.56) identified in Table 4.
- Mortality at any representative WTG surveyed exceeds 10.0 bats and/or birds per year.

Table 8. Comparison of 11 Operating Wind Projects with Habitat Types Similar to Spring Valley

Reference	WEF Study Area Location	Dates of Study	Turbines in WEF	Turbine/Project MW	Avian Mortality per Turbine per year	Bats Mortality per Turbine per year
Young et al. (2003)	Foote Creek Rim, WY	11/98–6/02	69	600 kilowatt (kW) / 41.4 MW	1.50	1.34
Erickson et al. (2003)	Nine Canyon, WA	09/02–08/03	37	Bonus 1.3 MW / 48.1 MW	3.59	3.21
Erickson et al. (2004)	Stateline, OR/WA	01/02–12/03	454	Vestas 660 kW / 299.64 MW	1.93	1.12
Johnson et al. (2003)	Klondike, OR	02/02–02/03	16	Enron 1.5 MW / 24 MW	1.42	1.16
Erickson et al. (2000)	Vansycle, OR	01/99–12/99	38	Vestas 660 kW / 24.9 MW	0.63	0.74
TRC (2008)	Judith Gap, MT	Fall 06–Spring 07	90	GE 1.5 SLE / 135 MW	4.52	13.40
NWC and WEST (2007)	Klondike II, OR	2006	50	GE / 75 MW	4.71	0.63
Young et al. (2006)	Combine Hills, OR	02/04–02/05	41	Mitsubishi MWT-1000A / 41 MW	2.56	1.88
Kronner et al. (2008)	Big Horn, WA	2006–2007	133	GE / 199.5 MW	3.81	2.86
Erickson et al. (2008)	Wild Horse, WA	01/08–12/08	127	V80 / 229 MW	2.79	0.71
Young et al. (2007)	Hopkins Ridge, WA	01/06–12/06	83	Vestas / 150 MW	2.21	1.13
Average					**2.70**	2.56

5.3 Overall Avian and Bat Mortality Mitigation Phases

One or multiple measures under a mitigation phase may be applied if mortality thresholds for birds or bats are exceeded. Phases are to be implemented chronologically as avian and/or bat thresholds are repeatedly exceeded, until thresholds are no longer exceeded. Mortality thresholds for birds and bats may be exceeded at different periods throughout the project; therefore, mitigation phases for birds and bats may differ. In the instance that a similar mitigation type (i.e., turbine curtailment) for birds and bats is selected, only the highest phase would apply (i.e., if in Phase I for birds and Phase III for bats, Phase III applies for both). Mitigation measures described below include actions that may require analysis as required by the National Environmental Policy Act (NEPA), which would be paid for by the proponent. Approximate costs and timeline for appropriate NEPA analysis, if necessary, should be considered as part of the mitigation selection process. Mitigation phases are summarized in Table 9 and described in detail below.

Table 9. Summary of Mitigation Phases

Mitigation Phase	Turbine Curtailment	Direct Mitigation[≠]
Phase I	Up to 744 hours of cut-in speed curtailment	Relocate nests if it is shown that specific resident bird species are being impacted; Retrofit up to 10 power poles; other direct mitigation as recommended by the TAC.
Phase II	Up to 900 hours of cut-in speed curtailment; WTG shutdowns for up to the equivalent of 15,000 turbine hours	Install avian flight-diverting poles in front of primary flight paths as shown by radar and mortality data; Retrofit up to 10 power poles; other direct mitigation as recommended by the TAC.
Phase III	Up to 1,080 hours of cut-in speed curtailment; WTG shutdowns for up to the equivalent of 22,500 turbine hours	Paint one turbine blade black in each group, in accordance with the color scheme suggested by Hodos (2003); Retrofit up to 10 power poles; other direct mitigation as recommended by the TAC.
Phase IV	Up to 1,080 hours of cut-in speed curtailment[±]; WTG shutdowns for up to the equivalent of 30,000 turbine hours[±]	Retrofit up to 10 power poles; other direct mitigation as recommended by the TAC.
Phase V	Up to 1,080 hours of cut-in speed curtailment; WTG shutdowns for up to the equivalent of 37,500 turbine hours[±]	Retrofit up to 10 power poles; other direct mitigation as recommended by the TAC.

[±] Additional cut-in speed curtailment hours may be utilized for an equivalent reduction (i.e., power generation loss is equivalent or less) in shutdown hours.

[≠] In place of the listed mitigation measures, other measures of similar type (i.e., cost, level of effort, utility) may also be implemented.

5.3.1 Phase I Mitigation

TURBINE CURTAILMENT

- Implement cut-in speed curtailment for up to 744 hours per year (i.e., the equivalent of 62 days per year, 12 hours per day). Additionally, adjustments to seasonal and daily timing may be adjusted based on mortality, radar, and AnaBat (for bats only) data. Cut-in speed changes should not exceed 12 hours per day. A curtailment measure must be in place long enough to determine its effectiveness before an additional phased mitigation is implemented. However, no more than two phases of curtailment will be implemented in a single year. If thresholds are exceeded after implementing a second phase of curtailment in a single year, the TAC will meet and discuss other appropriate mitigation measures. Additional curtailment phases within the same year would require proponent approval. It should also be noted that the phased measures provide the maximum that can be allowed for an entire year, but based on data, the maximum may not be needed initially. The TAC may recommend using a portion of the available curtailment time to address a mortality event, and if thresholds are still exceeded in that year, they may increase that time to the maximum within the same phase.

DIRECT MITIGATION

- As approved by the necessary entities, placement of visual markers on power lines in the valley to minimize collision by raptors and other migrating birds.
- As approved by the necessary entities, up to an additional 10 power poles (see Section 5.4.1, first bullet) determined to be unsafe will be retro-fitted and raptor proofed according to current Avian Powerline Interaction Committee (APLIC) guidelines (APLIC 2005).
- Relocation of nests if it is shown that specific resident bird species are being impacted and it is determined appropriate by the TAC and USFWS. All necessary permits would be obtained from the USFWS and NDOW.

5.3.2 Phase II Mitigation

TURBINE CURTAILMENT

- Implement cut-in speed curtailment for up to 900 hours per year (i.e., the equivalent of 75 days per year, 12 hours per day). Additionally, adjustments to seasonal and daily timing may be adjusted based on mortality, radar, and AnaBat (for bats only) data. Cut-in speed changes should not exceed 12 hours per day. A curtailment measure must be in place long enough to determine its effectiveness before an additional phased mitigation is implemented. However, no more than two phases of curtailment will be implemented in a single year. If thresholds are exceeded after implementing a second phase of curtailment in a single year, the TAC will meet and discuss other appropriate mitigation measures. Additional curtailment phases within the same year would require proponent approval. It should also be noted that the phased measures provide the maximum that can be allowed for an entire year, but based on data, the maximum may not be needed initially. The TAC may recommend using a portion of the available curtailment time to address a mortality event and if thresholds are still exceeded in that year, they may increase that time to the maximum within the same phase.
- Implement shutdowns corresponding to highest activity periods based on mortality survey, radar, and AnaBat (bats only) data, for up to the equivalent of 15,000 turbine hours (a turbine hour is the amount of time one turbine is or is not operating, i.e., 75 turbines × 200 hours per year = 15,000 turbine hours). Mortality is often exhibited at one or several turbines ("problem groups"); therefore, it may be more appropriate to apply shutdowns to one or several problem groups (based on survey groups) for a longer period of time instead of applying shutdowns to the entire project. Shutdown times do not include operational shutdowns due to maintenance and other operator needs.

DIRECT MITIGATION

- Install avian flight-diverting poles in front of primary flight paths as shown by radar and mortality data. Flight-diverting poles are installed to divert migrating birds around these turbines as they approach the wind facility and should be placed so that they do not divert flight into other turbine groups. Flight-diverting poles shall be simple structures erected for the sole purpose of diverting avian species away from WTGs and shall not require the decommissioning of existing WTGs.
- As approved by the necessary entities, up to an additional 10 power poles (see Section 5.4.1, first bullet) determined to be unsafe will be retro-fitted and raptor proofed according to current APLIC guidelines (APLIC 2005).

5.3.3 Phase III Mitigation

TURBINE CURTAILMENT

- Implement cut-in speed curtailment for up to 1,080 hours per year (i.e., the equivalent of 90 days per year, 12 hours per day). Additionally, adjustments to seasonal and daily timing may be adjusted based on mortality, radar, and AnaBat (for bats only) data. Cut-in speed changes should not exceed 12 hours per day. A curtailment measure must be in place long enough to determine its effectiveness before an additional phased mitigation is implemented. However, no more than two phases of curtailment will be implemented in a single year. If thresholds are exceeded after implementing a second phase of curtailment in a single year, the TAC will meet and discuss other appropriate mitigation measures. Additional curtailment phases within the same year would require proponent approval. It should also be noted that the phased measures provide the maximum that can be allowed for an entire year, but based on data, the maximum may not be needed initially. The TAC may recommend using a portion of the available curtailment time to address a mortality event, and if thresholds are still exceeded in that year, they may increase that time to the maximum within the same phase.
- Implement shutdowns corresponding to highest activity periods based on mortality survey, radar, and AnaBat data (for bats only), for up to the equivalent of 22,500 turbine hours. Mortality is often exhibited at "problem groups;" therefore, it may be more appropriate to apply shutdowns to one or several problem groups for a longer period of time instead of applying shutdowns to the entire project. Additional shutdown phases in the same year are to be implemented similar to as described for cut-in speed phases. Shutdown times do not include operational shutdowns due to maintenance and other operator needs.
- Further cut-in speed curtailment hours may be utilized for an equivalent reduction (i.e., power generation loss is equivalent or less) in shutdown hours.

DIRECT MITIGATION

- If mortality occurs at one or several turbine groups, one of the turbine blades could be painted black in each group, in accordance with the color scheme suggested by Hodos (2003). This technique has had positive laboratory tests but requires further study. This measure must be approved by the BLM and Federal Aviation Administration prior to implementation.
- As approved by the necessary entities, up to an additional 10 power poles (see Section 5.4.1, first bullet) determined to be unsafe will be retro-fitted and raptor proofed according to current APLIC guidelines (APLIC 2005).

5.3.4 Phase IV Mitigation

TURBINE CURTAILMENT

- Implement cut-in speed curtailment hours for up to 1,080 hours per year (i.e., the equivalent of 90 days per year, 12 hours per day). Additionally, adjustments to seasonal and daily timing may be adjusted based on mortality, radar, and AnaBat (for bats only) data. Cut-in speed changes should not exceed 12 hours per day. A curtailment measure must be in place long enough to determine its effectiveness before an additional phased mitigation is implemented. However, no more than two phases of curtailment will be implemented in a single year. If thresholds are exceeded after implementing a second phase of curtailment in a single year, the TAC will meet and discuss other appropriate mitigation measures. Additional curtailment phases within the same year would require proponent approval. It should also be noted that the phased measures provide the maximum that can be allowed for an entire year, but based on data, the maximum may not be needed initially. The TAC may recommend using a portion of the available curtailment time to address a mortality event, and if thresholds are still exceeded in that year, they may increase that time to the maximum within the same phase.

- Implement shutdowns corresponding to highest activity periods based on mortality survey, radar, and AnaBat data, for up to the equivalent of 30,000 turbine hours. Mortality is often exhibited at “problem groups;” therefore, it may be more appropriate to apply shutdowns to one or several problem groups for a longer period of time instead of applying shutdowns to the entire project. Additional shutdown phases in the same year are to be implemented similar to as described for cut-in speed phases. Shutdown times do not include operational shutdowns due to maintenance and other operator needs.
- Further cut-in speed curtailment may be utilized for an equivalent reduction (i.e., power generation loss is equivalent or less) in shutdown hours.

DIRECT MITIGATION

- As approved by the necessary entities, up to an additional 10 power poles (see Section 5.4.1, first bullet) determined to be unsafe will be retro-fitted and raptor proofed according to current APLIC guidelines (APLIC 2005).

5.3.5 Phase V Mitigation

TURBINE CURTAILMENT

- Implement cut-in speed curtailment for up to 1,080 hours per year (i.e., the equivalent of 90 days per year, 12 hours per day). Additionally, adjustments to seasonal and daily timing may be adjusted based on mortality, radar, and AnaBat (for bats only) data. Cut-in speed changes should not exceed 12 hours per day. It should also be noted that the phased measures provide the maximum that can be allowed for an entire year, but based on data, the maximum may not be needed initially. The TAC may recommend using a portion of the available curtailment time to address a mortality event, and if thresholds are still exceeded in that year, they may increase that time to the maximum within the same phase.
- Implement shutdowns corresponding to highest activity periods based on mortality survey, radar, and AnaBat data, for up to the equivalent of 37,500 turbine hours. Mortality is often exhibited at “problem groups;” therefore, it may be more appropriate to apply shutdowns to one or several problem groups for a longer period of time instead of applying shutdowns to the entire project. Shutdown times do not include operational shutdowns due to maintenance and other operator needs.
- Further cut-in speed curtailment hours may be utilized for an equivalent reduction (i.e., power generation loss is equivalent or less) in shutdown hours.

DIRECT MITIGATION

- As approved by the necessary entities, up to an additional 10 power poles (see Section 5.4.1, first bullet) determined to be unsafe will be retro-fitted and raptor proofed according to current APLIC guidelines (APLIC 2005).

5.4 Species-Specific Mortality Thresholds and Mitigation

In addition to the overall mortality thresholds, species-specific thresholds for T/E and state-protected bat and avian species have been developed. These species are provided protection by the federal (ESA, MBTA, BGEPA) and state government (Nevada Revised Statutes 503.584–585), respectively, who regulate and enforce unlawful take. These thresholds do not permit take under those protections but have been developed to address the higher potential for population impacts to those species (Table 10) in order to ensure impacts are not substantial. Additionally, although not specifically called out, other species such as BLM special-status species may also receive species specific consideration by the TAC.

Table 10. Species-Specific Mortality Thresholds

Common Name	Scientific Name	Relative Abundance[1]	Impact Indicator	Status Factor	Mortality Threshold
Bat Species					
Brazilian free-tailed bat[2]	*Tadarida brasiliensis*	11.4	7	2	14
Pallid bat[2]	*Antrozous pallidus*	1.2	1	2	2
Townsend's big-eared bat[2]	*Corynorhinus townsendii*	0.4	1[4]	2	2
Spotted bat[3]	*Euderma maculatum*	0.0[3]	1[4]	2	2
Western mastiff bat[3]	*Eumops perotis*	0.0[3]	1[4]	2	2
Allen's big-eared bat[3]	*Idionycteris phyllotis*	0.0[3]	1[4]	2	2
Western red bat[2]	*Lasirurs blossevillii*	0.0[3]	1[4]	2	2
California leaf-nosed bat[3]	*Macrotus californicus*	0.0[3]	1[4]	2	2
Fringed myotis[3]	*Myotis thysanodes*	0.0[3]	1[4]	2	2
Avian Species					
Bald eagle[2]	*Haliaeetus leucocephalus*	0.02	1[4]	1	1
Brewer's sparrow[2]	*Spizella breweri*	1.42	1	3	3
Ferruginous hawk[2]	*Buteo regalis*	0.09	1[4]	2	2
Golden eagle[2]	*Aquila chrysaetos*	0.25	1	1	1
Greater sage-grouse[2]	*Centrocercus urophasianus*	0.00[5]	1[4]	2	2
Greater sandhill crane[2]	*Grus Canadensis*	0.13	1[4]	2	2
Juniper titmouse[2]	*Baeolophus ridgwayi*	0.09	1[4]	3	3
Loggerhead shrike[2]	*Lanius ludovicianus*	1.12	1	3	3
Long-billed curlew[2]	*Numenius minutes*	0.28	1	2	2
Long-eared owl[2]	*Asio otus*	0.00	1[4]	2	2
Northern harrier[2]	*Circus cyaneus*	0.63	1	2	2
Peregrine falcon	*Falco peregrinus*	0.00[6]	1[4]	2	2
Pinyon jay[2]	*Gymnorhinus cyanocephalus*	3.70	2	3	6
Prairie falcon[2]	*Falco mexicanus*	0.04	1[4]	2	2
Red-naped sapsucker[2]	*Sphyrapicus nuchalis*	0.02	1[4]	3	3
Sage sparrow[2]	*Amphispiza belli*	1.77	1	3	3
Swainson's hawk[2]	*Buteo swainsoni*	0.49	1	2	2
Vesper sparrow[2]	*Pooecetes gramineus*	0.30	1	3	3
Western burrowing owl[2]	*Athene cunicularia*	0.00[6]	1[4]	2	2
Willet[2]	*Tringa semipalmata*	0.06	1[4]	3	3

[1] Represented as percentage of detections.

[2] State-protected species.

[3] This species accounted for less than 0.1% of all data.

[4] A minimum impact indicator value of 1 is given to species with minimal observations.

[5] Greater sage-grouse are believed to occur in the project area but were never observed during surveys.

[6] Western burrowing owls were only observed incidentally, which means numbers were not recorded.

Currently, no T/E avian or bat species are identified in the project area. To determine species-specific mortality thresholds, the relative abundance of that species has been determined using pre-construction survey data. That number is then used as a percentage of the overall mortality thresholds (avian: 25 surveyed turbines × 2.70 = 68/year; bats: 25 surveyed turbines × 2.56 = 64/year) to determine the species indicator. The indicator is then multiplied by a species status factor (Table 11) to determine the species-specific mortality threshold. Species-specific mortality thresholds will not initially have searcher efficiency or scavenger rate correction factors applied because they correct for general observations but do not provide species-specific information. However, if it becomes possible after sufficient mortality data collection has occurred to develop species-specific searcher efficiency and/or scavenger rate correction factors, then these will be calculated and applied so that species-specific mortality thresholds can be modified to include searcher efficiency and/or scavenger rates.

Table 11. Species Status Factors

Status Ranking	Criteria	Multiplication Factor
High	Federally listed T/E species that are considered to be in the most danger of extinction and bald and golden eagles due to their current status with the USFWS under the BGEPA.	1
Moderate	State sensitive species exhibiting slow population growth (late maturity and low reproduction rates [fewer than 3 offspring/year on average]), leading to a reduced ability to recover from new sources of mortality (Stahl and Madan 2006).	2
Low	State sensitive species exhibiting increased population growth (early maturity and high reproduction rates [more than 3 offspring/year on average]) that are more able to recover from new sources of mortality (Stahl and Madan 2006).	3

Species-specific mitigation has been developed to address bald and golden eagles due to their status under the BGEPA and MBTA and the USFWS and BLM requirements for compliance with the Acts. Mitigation has not been proposed for other specific species because it is currently unknown whether or which species would exceed mortality thresholds. Therefore, if species-specific thresholds are exceeded, the TAC will determine what mitigation, if any, should be recommended for implementation, and the BLM Authorized Officer would approve the measure if determined appropriate. Mitigation may include development of a phased approach for the species. In some cases, mitigation may not yet be warranted, or very specific measures may be needed. Therefore, the TAC shall consider species impacted, timing of impacts, and other pertinent information collected during mortality surveys as part of their mitigation determination. For example, raptor mitigation may include retrofitting powerlines in other areas of Nevada to meet Avian Powerline Interaction Committee standards which would reduce overall population impacts. If mitigation is selected, the measure should achieve the goal of reducing mortality below thresholds, but not require a level of effort resulting in excess mitigation. Funding for these measures is separate from that described in Section 3.4. Additionally, at the end of each year the TAC will review current data, determine whether species-specific threshold numbers or multiplication factors need to be adjusted for subsequent surveys, and provide recommendations to the BLM Authorized Officer, as necessary.

5.4.1 Bald and Golden Eagle Mitigation

The following measures were developed to address potential eagle mortality associated with the SVWEF and will be implemented as initial mitigation measures. Bald eagles are a rare occurrence at the SVWEF and therefore, mitigation measures are primarily developed to address potential golden eagle issues.

- Based upon an initial survey of the power lines within the project area, it was found that a Mt Wheeler transformer pole was not currently retro-fitted and posed a high risk to raptors. Based upon the high probability that the additional 18 Mt Wheeler transformer poles within Spring

Valley are also not retro-fitted, an additional survey will be conducted to confirm the need for retro-fitting these structures. Those poles determined to be unsafe will subsequently be retro-fitted and raptor proofed according to current APLIC guidelines (APLIC 2005). An additional survey will be conducted on all of Mt. Wheelers distribution lines within Spring Valley. SVW will work in conjunction with Mt Wheeler to ensure all of their remaining distribution lines within Spring Valley are retro-fitted and raptor safe. Facilities will be constructed to APLIC standards to reduce the likelihood of collision and electrocution.

- Install anti-perch devices on transmission poles within 2 miles of the project area, as allowed by transmission operators. The SVWEF will notify the USFWS of any transmission operators that are unwilling to allow SVWEF to retrofit their lines. The USFWS will provide outreach to these operators to encourage them to allow the work.
- During the appropriate time of year, conduct nest searches for bald and golden eagles within a 10-mile radius around the project area using USFWS 2010 guidelines (Pagel et al. 2010) to develop a baseline dataset for golden eagle territories.
- Additional monitoring for nests identified during these searches that are active will be visited once each month (from a distance so as not to disturb) during the nesting season (approximately March 15 to July 30) to determine nest success. This will occur for the first three years post construction and every fifth year after that. If a golden eagle is found as a mortality during the nesting season, all golden eagle territories identified will be searched to determine if the mortality appears to be from a resident bird. Understanding the status of the bird may help the TAC determine appropriate mitigation measures.
- If golden eagle nests with young are discovered within 6 miles of the project area, all nestlings designated by the TAC will be equipped with satellite telemetry transmitters for continued study regarding use of the area, dispersal, and survivability. Permits for such research will be requested and obtained from the USFWS Migratory Bird Office and NDOW.
- Mortality surveys would be completed for the first three years. Upon approval from the TAC, the surveys may be adjusted to occur every five years thereafter based on mortality levels.
- A Wildlife Education Program would be implemented during the operations of the Spring Valley Wind Farm for contractors, project operations staff, and other staff who will be on-site on a regular basis. This training will enable them to identify wildlife species that may occur in the Project area, record observations of these species in a standardized format, and take appropriate steps when downed wildlife are encountered. The program will be prepared by a qualified biologist. The program would include a wildlife education component consisting of briefings for staff and others on-site; printed reference materials; and protocols for documenting and reporting downed wildlife.
- Other on-site direct mitigation measures may be recommended by the TAC based on collected data and current literature.

6.0 CONCLUSION

This document was written to provide guidance for all required wildlife mitigation and monitoring prior to, during, and after construction of the SVWEF. The measures described in this document are intended to help protect and reduce impacts to wildlife, as well as to monitor potential impacts to wildlife following implementation of the SVWEF. It is anticipated that this ABPP will adaptively manage the SVWEF based on findings following construction.

7.0 LITERATURE CITED

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APPENDIX A: MORTALITY TRACKING SPREADSHEETS

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BIWEEKLY MORTALITY SURVEY DATA FORM

Site Name: Spring Valley Wind Energy Facility

Date: [mo/day/year]

Searchers: [Enter names]

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
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19																		
20																		
21																		
22																		
23																		
24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

SEASONAL MORTALITY TRACKING BY TURBINE

Site Name: Spring Valley Wind Energy Facility

Season: Spring (March 16–May 15)

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
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22																		
23																		
24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

SEASONAL MORTALITY TRACKING BY TURBINE

Site Name: Spring Valley Wind Energy Facility

Season: Summer (May 16–August 15)

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
4																		
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22																		
23																		
24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

SEASONAL MORTALITY TRACKING BY TURBINE

Site Name: Spring Valley Wind Energy Facility

Season: Fall (August 16–October 31)

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
4																		
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22																		
23																		
24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

SEASONAL MORTALITY TRACKING BY TURBINE

Site Name: Spring Valley Wind Energy Facility

Season: Winter (November 1–March 15)

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
4																		
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23																		
24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

ANNUAL MORTALITY TRACKING BY TURBINE

Site Name: Spring Valley Wind Energy Facility

Season: [Enter start and end dates]

	# of Mortalities Observed																	
	BATS						LARGE BIRDS						SMALL BIRDS					
Turbine Group #	Tabra	Anpal	Cortow	Lablo	[Add species]	**Total Bats**	BAEA	FEHA	GOEA	SWHA	[Add species]	**Total LB**	BRSP	JUTI	LOSH	PIJA	[Add species]	**Total SB**
1																		
2																		
3																		
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24																		
25																		
Total Uncorrected																		
Searcher Efficiency Factor																		
Scavenger Removal Rate Factor																		
Total Corrected																		

Total Bats per WTG	
Total Birds (LB and SB) per WTG	

ANNUAL MORTALITY SUMMARY

Site Name: Spring Valley Wind Energy Facility

	Mortality per WTG																												
Species	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**[Survey Date]**	**TOTAL**	**Threshold/WTG**	**Exceeded (Y/N)?**
Overall																													
Total Bats (Corrected)																												**64**	
Total Birds (Corrected)																												**68**	
Species Specific - Bats																													
Tadarida brasiliensis																												**14**	
Antrozous pallidus																												**2**	
Corynorhinus townsendii																												**2**	
Lasirurs blossevillii																												**2**	
Species Specific - Birds																													
Bald eagle																												**2**	
Brewer's sparrow																												**3**	
Ferruginous hawk																												**2**	
Golden eagle																												**2**	
Greater sage-grouse																												**2**	
Greater sandhill crane																												**2**	
Juniper titmouse																												**3**	
Loggerhead shrike																												**3**	
Long-billed curlew																												**2**	
Long-eared owl																												**2**	
Northern harrier																												**2**	
Pinyon jay																												**6**	
Prairie falcon																												**2**	
Red-naped sapsucker																												**3**	
Sage sparrow																												**3**	
Swainson's hawk																												**2**	
Vesper sparrow																												**3**	
Western burrowing owl																												**2**	
Willet																												**3**	

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