# Eagle Conservation Plan for the Horse Butte Wind Facility

Prepared for

**Horse Butte Wind I LLC**

Prepared by

**SWCA Environmental Consultants**

November 2013

# EAGLE CONSERVATION PLAN FOR THE HORSE BUTTE WIND FACILITY

Prepared for

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# 1 INTRODUCTION

In 2009, Utah Associated Municipal Power Systems (UAMPS) began coordinating with Bonneville County, the U.S. Fish and Wildlife Service (USFWS), the Idaho Department of Fish and Game (IDFG), and the East Idaho Uplands Sage-grouse Local Working Group regarding construction of the Horse Butte wind energy generation project (Project) located outside of Idaho Falls in Bonneville County, Idaho.[1] UAMPS acted as the Project developer and sold the Project to Horse Butte Wind I LLC (HBW). UAMPS is the sole purchaser of the power generated by the Project. In conjunction with this Eagle Conservation Plan (ECP), HBW has submitted an application for a programmatic eagle take permit.

Initially, UAMPS conducted studies to determine whether any threatened or endangered species or threatened or endangered species' habitat were likely located within the area where UAMPS planned to develop the Project. UAMPS discussed the results of these early studies with USFWS and IDFG. Additionally, UAMPS began corresponding with and attending meetings of the East Idaho Uplands Sage-grouse Local Working Group.

UAMPS has invested significant time and resources in characterizing wildlife use in the Project Area through site-specific wildlife studies. Since wildlife studies began in 2009, UAMPS has coordinated closely with USFWS and IDFG and has obtained their endorsement on biological survey methodology.[2] Additionally, UAMPS has visited with USFWS on several occasions over the past four years to disclose and discuss the results of these surveys.

As the Project developer, UAMPS obtained use permits authorizing development of the Project from Bonneville County in December 2010 and January 2011. The use permit record includes documentation of UAMPS' efforts and commitment to coordinate with USFWS and IDFG regarding biological studies for the Project.

Construction of the Project began in the fall of 2011 and the Project began commercial operation on August 15, 2012. Development of the Project was already well underway when USFWS published its *Land-based Wind Energy Guidelines* on February 8, 2011 and March 23, 2012 (Guidelines), and *Draft Eagle Conservation Plan Guidance* in January 2011 and *Eagle Conservation Plan Guidance, Version 2* in April 2013 (ECP Guidance). UAMPS has made efforts to become familiar with the Guidelines and ECP Guidance, to work with USFWS regarding how to apply the tiered approach recommended in the Guidelines, and to implement those portions of the Guidelines and ECP Guidance relevant to the continuing phases of the Project. The Project is considered to be an "on-ramp" project, construction of which was nearly complete at the time the voluntary Guidelines and ECP Guidance were released. The draft Guidelines and ECP Guidance as well as the current versions of the Guidelines and ECP Guidance acknowledge that for projects already in the development or operational phase, implementation of all tiers or stages of the recommended approach may not be applicable or possible. The ECP Guidance advises Project proponents with operating or soon-to-be operating facilities to consider where the Project is in the planning process relative to the appropriate tier and inform the Service what actions they will take to apply the Guidelines. UAMPS has consistently coordinated with the Service throughout the project planning and operation phases and been receptive to USFWS recommendations on how the Project can be more consistent with the ECP Guidance and Guidelines.

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[1] See Appendix B for correspondence documenting UAMPS' efforts to coordinate development of the Project with USFWS and IDFG. These efforts are referenced throughout this ECP.

[2] *Id.*

UAMPS initiated post-construction avian fatality searches in September 2012. UAMPS has set up an account in the USFWS Bird Fatality/Injury Reporting System (BIMRS). Avian fatalities associated with operation of the facility are being documented and reported to the USFWS Office of Law Enforcement (OLE) through the BIMRS. No eagle fatalities have been documented to date. UAMPS, on behalf of HBW, has been actively discussing implementing power pole retrofit mitigation work in local utility systems near the Project. While the USFWS is processing the take permit application, UAMPS intends to seek contracts with local utilities to conduct electrical pole retrofit mitigation to offset against one golden eagle and one bald eagle mortality based on fatality estimate calculations provided by the USFWS on August 2, 2013, and described in Section 3.1.5. UAMPS has already entered into one contract with a local utility to perform retrofit work 22 on electrical poles, which is projected to be completed in the fall of 2013.

On behalf of HBW, UAMPS is submitting this ECP as part of an application for a programmatic eagle take permit pursuant to 50 CFR § 22.26 and to proactively address potential impacts on eagles resulting from operation of the Project. This document includes information about the Project; existing site characteristics; field methods for collecting data regarding site characteristics; results from eagle studies; and a summary of UAMPS' efforts to avoid, minimize, or otherwise mitigate Project-related impacts to eagles. UAMPS has also included results from studies of bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*); fatality predictions and inter-nest distance calculations; and proposed advanced conservation practices to avoid and minimize risks to bald and golden eagles, including compensatory mitigation for any unavoidable take. This information is intended to support HBW's programmatic eagle take permit application. As explained in greater detail below, the implementation of the conservation practices and mitigation measures included in this ECP are intended to fully mitigate any Project-related impacts to eagles, to ensure no net loss to eagle populations.

## 1.1 Purpose of the Eagle Conservation Plan

The purpose of this ECP is to avoid and minimize risk to eagles protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). It also documents the steps that UAMPS has taken and plans to take to avoid, minimize, and mitigate Project-related impacts to eagles. Additionally, it serves as the basis for HBW's programmatic eagle take permit application. As such, it documents the steps that have been taken and will be taken pursuant to a permit, to avoid, minimize, and mitigate Project-related impacts to eagles, and ensure no net loss to eagle populations. Although this Project was developed prior to issuance of the Guidelines (USFWS 2012) and the ECP Guidance (USFWS 2013a), it is understood that the USFWS will exercise discretion in applying the Guidelines and the ECP Guidance to existing projects, and this ECP represents Project efforts to meet the intent of the law and ECP Guidance.

## 1.2 Legal Drivers and Permit Compliance

The regulatory framework for protecting eagles includes the BGEPA and the MBTA. The BGEPA provides that "unless permitted to do so as provided in the Act," it is unlawful to "take, possess, sell…any bald eagle…or any golden eagle, or any part, nest, or egg thereof…." The BGPA defines "take" to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The MBTA applies to migratory birds, which include bald and golden eagles, and provides that "[u]nless and except as permitted by regulations…, it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill…any migratory bird, any part, nest, or egg of any such bird…." The USFWS has not promulgated regulations under the MBTA providing permits for nonpurposeful take.

The Project includes measures to avoid and minimize the likelihood of the take of any bald or golden eagle, but if take occurs, it will be reported to the USFWS for further action. Additionally, this ECP has been developed to meet USFWS requirements for addressing the BGEPA and the MBTA as it relates to eagles.

On September 11, 2009, the USFWS established two new permit types under the BGEPA: (1) permits for take of bald and golden eagles that is associated with, but not the purpose of, the activity (50 CFR § 22.26) and (2) permits for purposeful take of an active or inactive eagle nest where necessary to alleviate a safety emergency; an inactive eagle nest when the removal is necessary to ensure public health and safety; an inactive nest that is built on a human-engineered structure and creates a functional hazard that renders the structure inoperable for its intended use; or an inactive nest, provided the take is necessary to protect an interest in a particular locality and the activity necessitating the take or the mitigation for the take will, with reasonable certainty, provide a clear and substantial benefit to eagles (50 CFR § 22.27). The USFWS has recently developed a process for issuing new permits for take of bald and golden eagles at wind energy facilities (50 CFR Parts 13 and 22). Consistent with an application for such a permit, this ECP has been prepared following the USFWS's recommendation that project proponents document the steps the project proponent takes to avoid, minimize, and otherwise mitigate project-related impacts to bald and golden eagles to ensure no net loss to eagle populations (USFWS 2012, 2013a).

## 1.3 UAMPS Corporate Policy

UAMPS is a governmental agency that provides comprehensive wholesale electric energy, on a nonprofit basis, to community-owned power systems throughout the Intermountain West. The UAMPS membership represents 45 members from Utah, Arizona, California, Idaho, Nevada, New Mexico, Oregon and Wyoming. UAMPS partners with its members to provide affordable and reliable electricity to their customers.

Upon the direction of its members, UAMPS sought development of the Horse Butte Wind Project in order to provide its members with a form of renewable energy generation. The Project is one of 15 projects that UAMPS members may participate in and is UAMPS' first renewable energy project. UAMPS is the sole purchaser of power generated by the Project.[3] The output from the Project provides renewable energy for 24 UAMPS members in five states.

## 1.4 Project Description

HBW has constructed the Project on 17,897 acres of private land in Bonneville County, Idaho (Project Area). The Project is located approximately 15 miles east of Idaho Falls (Figure 1). The Project's goals are to generate affordable renewable energy and renewable energy credits for UAMPS and its members.

The Project is a wind generation facility that includes 32 turbines producing approximately 57 megawatts (MW) of power, built on leased private lands. The Project is accessed via existing public roads, primarily the Kepps Crossing Road, and new roads accessing turbines and other infrastructure. All facilities associated with operation and maintenance of the Project is included in the Project Area. The facilities include, but are not limited to, the following:

- 32 wind turbines, foundations, and pad-mounted transformers
- On-site operations and maintenance facilities

[3] HBW has contracted with UAMPS to implement the post-construction mitigation measures and adaptive management discussed in Section 6 of this document.

- Electrical substations
- 1 permanent meteorological (met) towers and 3 temporary met towers[4]
- Access roads and crane pads necessary for construction and maintenance of all wind turbine generators[5]
- Modifications to Kepps Crossing Road east of the Willow Creek crossing
- A buried electrical energy collection system between turbines
- Two short segments of overhead line (approximately 150 feet long) from the Horse Butte substation to the Cattle Creek substation and from the Cattle Creek collection substation to the existing Palisades-Goshen 115-kV transmission line constructed to American Power Line Interaction Committee (APLIC [2006]) standards
- A temporary concrete batch plant for turbine foundations and other construction requirements

## 1.5 Pre-construction Site selection

UAMPS conducted a feasibility analysis using Sagebrush Energy, LLC (Sagebrush) and Idaho National Laboratories (INL) to assess the wind resource at the Project site. UAMPS also evaluated others sites, which presented by wind project developers. It was determined that the Project had a good wind resource profile and could be developed by UAMPS directly, which was the least cost option. V-Barr was hired to model the site using the compiled wind data (after INL and Sagebrush's initial feasibility work); with V-Barr's assistance additional met towers were added. Utilizing that data from the new met towers, V-Barr began micro-siting where to locate the turbines. Around the same time (2009), UAMPS engaged SWCA to help analyze micro-siting configuration of the turbines to identify how certain locations may impact avian resources and in particular eagles. Raptor and eagle nest surveys were initiated in February 2010. At this stage, UAMPS and SWCA initiated conversations with IDFG and USFWS staff to seek their input on the Project's development. Based on the results of the raptor and eagle nest surveys, a string of seven proposed turbines at the west edge of the Project Area was relocated to avoid potential impacts to a cluster of golden eagle nests (the Kepps territory and nest GE11 shown on Figure 7).

[4] The temporary met towers will not remain for the life of the project but are to assess the feasibility of Phase 2. The permanent met tower does not have guy wires, because it is a lattice tower. The three temporary met towers do have guy wires and have bird diverters on those guy wire lines.

[5] Access roads were created to grant access to the wind turbine generators. Some portions of the access roads were pre-existing and previously used by the landowners for agricultural purposes or as access roads for their property. UAMPS estimates 85% of access roads are new roads. The crane pads were reclaimed after construction by de-compacting and reseeding.

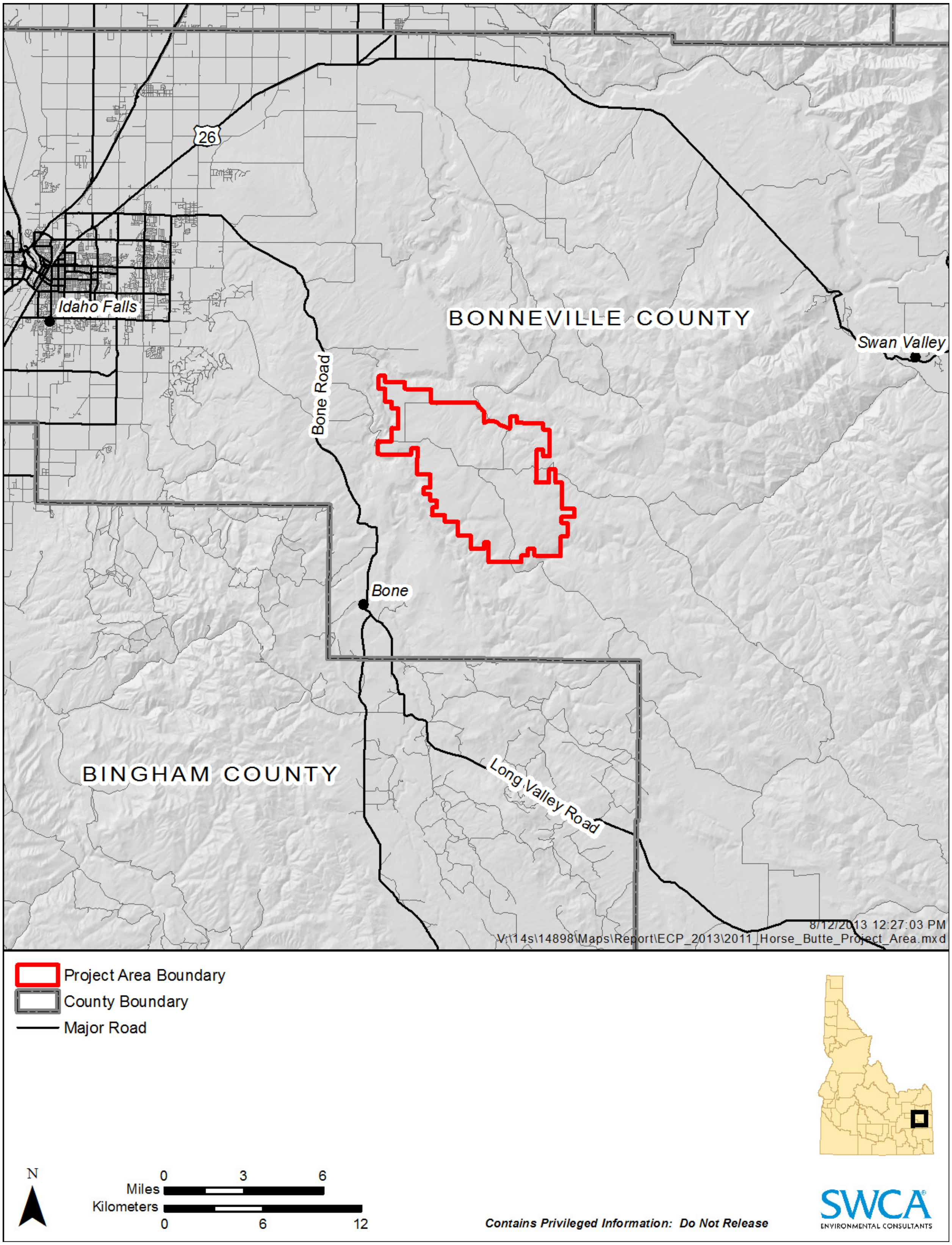


**Figure 1.** Horse Butte Project Area.

## 1.6 Environmental Setting

Although the Project is considered an on-ramp project because construction was nearly complete at the time the Guidelines (USFWS 2012) and ECP Guidance (USFWS 2013a) were issued, UAMPS did characterize habitat at the Project site starting in 2009 site prior to undertaking development. UAMPS has also coordinated with USFWS and IDFG via phone, email, and face-to-face meetings on many occasions since 2009 regarding the presence of eagles and their associated habitats.

Multiple site reconnaissance and habitat assessment surveys were conducted in 2009 and 2010 to identify and document plant communities, topography, and wildlife habitats in and within 1 mile of the Project Area (collectively referred to as the "Study Area"). The size of the Project Area was 8,175 acres. The size of the Study Area was 20,534 acres. In 2011, the size of the Project Area was increased from 8,175 acres to 17,897 acres, and thus the Study Area was also expanded from its previous size of 20,543 acres to 37,718 acres at that time.

The Project Area ranges from an elevation of 5,886 feet to 8,342 feet above mean sea level. It is broadly characterized by Basin and Wyoming big sagebrush, agricultural land, perennial grassland, and aspen forest. Three dominant plant communities occur in the Study Area: (1) agricultural land, (2) sagebrush interspersed with grasslands and rabbitbrush, and (3) aspen stringers. The agricultural plant community in the Study Area primarily consists of monotypic vegetation, which results in relatively low avian species diversity compared with the sagebrush and aspen stringer habitats. There are also other plant communities in small quantities interspersed through the area that provide habitat for wildlife. These plant communities include riparian habitats and cliff habitat. Table 1 provides a list of all landcover types that occur within the Project Area boundary. The Project Area boundary was expanded once additional leases were obtained from landowners and the expanded conditional use permit was acquired from Bonneville County.

**Table 1.** Acres of Landcover by Type in the Horse Butte Project Area

| Landcover Types* | Acres |
|---|---:|
| Cultivated crops | 1,768 |
| Deciduous forest | 487 |
| Developed, low intensity | 29 |
| Developed, open space | 100 |
| Emergent herbaceous wetlands | 69 |
| Evergreen forest | 298 |
| Grassland/herbaceous | 4,850 |
| Mixed forest | 55 |
| Pasture/hay | 124 |
| Shrub/scrub | 10,091 |
| Woody wetlands | 26 |
| **Total** | **17,897** |

* National Land Use Data

No critical habitat for any species listed under the Endangered Species Act (ESA) is present in the Project Area. The Project Area does not contain lands with an Important Bird Area designation and is not a Ramsar Convention site or Western Hemisphere Shorebird Reserve Network site. However, it is largely surrounded by the 31,000-acre IDFG Tex Creek Wildlife Management Area (WMA) (Figure 2), which is a state Important Bird Area as well as Conservation Reserve Program lands.

WMAs occur in seven IDFG regions and have been established to protect wildlife and their habitats. They are available for hunting, fishing, and other public enjoyment of wildlife. Rocky Mountain elk (*Cervus canadensis*) and mule deer (*Odocoileus hemionus*) begin moving north toward Tex Creek in the late fall. Greater sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus*), and gray partridge (*Perdix perdix*) are found in the dry shrublands in the Tex Creek WMA. Black-capped chickadees (*Poecile atricapillus*), brown creepers (*Certhia americana*), wrens, goldfinches, shrikes, and chipping sparrows (*Spizella passerina*) inhabit Tex Creek WMA's forest, riparian, and upland communities. Bald and golden eagles, Northern goshawks (*Accipiter gentilis*), and American kestrels (*Falco sparverius*) also frequent the area. When water flows are sufficient, the lower reaches of Tex Creek WMA's streams support native cutthroat trout (*Oncorhynchus clarkii*) and introduced brook trout (*Salvelinus fontinalis*) and German brown trout (*Salmo trutta*).

### 1.6.1 Riparian and Wetland Habitats

Field confirmation of National Wetland Inventory data reveals that wetlands are located within the Project Area (SWCA 2011a). They are restricted to wet meadows and riparian zones associated with drainage swales and ephemeral stream systems. SWCA Environmental Consultants (SWCA) identified one spring and one artesian well that appear to be more permanent sources of hydrology for some wetlands in the Project Area. Tex Creek and Willow Creek are perennial streams adjacent to the Project Area. These waterways support larger riparian zones dominated by cottonwoods and willows. No site-specific surveys were conducted for federally listed or special-status riparian- or wetland-obligate species. However, none of these species were identified during the wetland determination that SWCA conducted near the proposed new and existing access roads, turbine locations, and utility corridors in the Project Area. SWCA determined that no potentially jurisdictional waters were present in the construction footprint in the Project Area.[6]

### 1.6.2 Raptor Habitat and Prey Density

Woody vegetation and/or tree snags in the Project Area, along with rock ledges and other small canyons, provide potential substrates for raptor nests. Based on incidental observations, the Project Area appears to include some forage resources for large raptors. These forage resources are typical for ranchlands in southeast Idaho and include ground squirrels (*Spermophilus* spp., *Xerospermophilus* spp., *Ammospermophilus* spp.), white-tailed jackrabbit (*Lepus townsendii*), and cottontail rabbit (*Sylvilagus* spp.). As a "boom/bust" species, rabbits can be scarce in any one year but abundant in subsequent years. Observations during site surveys indicated a low potential presence of colonial rodents, such as ground squirrels, that may attract raptors to the area to forage. No concentrations of burrowing mammals were observed, and no prairie dog (*Cynomys* sp.) colonies were observed in the Project Area.

### 1.6.3 Tex Creek Canyon and Willow Creek Canyon

Tex Creek Canyon to the north and Willow Creek Canyon to the south of the Project Area are the most prominent canyons in the Study Area. Both Tex Creek and Willow Creek are perennial waterways characterized by large cliff walls, vertical cliff faces, and ledges. Tex Creek Canyon appears to also

[6] UAMPS received a letter of concurrence from the U.S. Army Corps of Engineers (USACE), dated June 15, 2012, confirming SWCA's findings and noting that "the 'study area' … is located in uplands and does not involve work in areas subject to [USACE's] jurisdiction." The USACE further concluded that the Project would not require a permit under Section 404 of the Clean Water Act.

function as an avian migratory corridor based on the SWCA 2009 and 2011 fall migration surveys (SWCA 2011b). Intensive fall raptor migration studies have been conducted in the Study Area, with survey points strategically located to determine raptor migration use. Results of raptor migration studies show some movement through this canyon corridor. During fall migration surveys, many of the raptors observed during the survey were observed flying west through the Tex Creek canyon and then flying south once they were west of the Project Area.

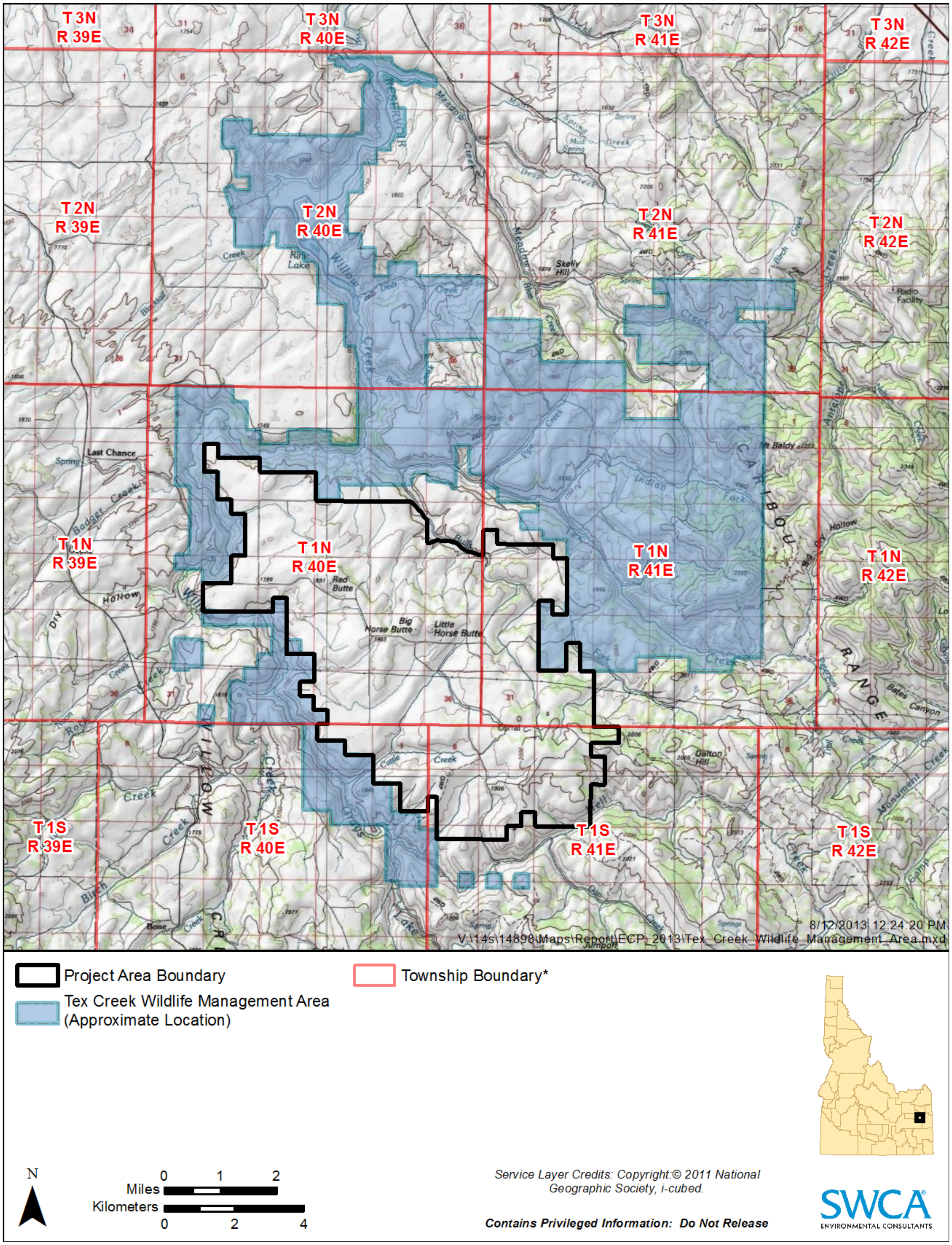


**Figure 2.** Tex Creek Wildlife Management Area.

# 2 SITE SUITABILITY AND PRE-CONSTRUCTION STUDIES

UAMPS has been committed to developing this Project in an environmentally responsible way. The Project was carefully planned over the course of four years with USFWS and IDFG involvement to best achieve this commitment and is based on an intensive pre-construction biological evaluation of the site, literature searches, and field studies, as described below. The USFWS office in Chubbuck, Idaho, provided input on survey methodologies, reviewed survey results and reports, and assisted with micro-siting turbines.

## 2.1 Pre-construction Field Studies

In January 2010, prior to conducting pre-construction biological studies, UAMPS coordinated with USFWS and IDFG regarding the biological survey methods to be used. UAMPS subsequently disclosed and discussed the results of these studies with the agencies on several occasions. Surveys conducted in 2009 and 2010 were conducted within the original Project Area, which was approximately 8,175 acres. Surveys conducted beginning in 2011 were conducted in the expanded 17,897-acre Project Area. The following is a summary of those pre-construction studies.

### *2.1.1 Raptor Nest Surveys*

Raptor nest surveys conducted by SWCA from 2010 to 2013 are summarized in Table 2 according to survey dates, type of survey (aerial or ground survey), and survey location. Intensive aerial (helicopter) raptor nest surveys were conducted in the winter of 2010 in the 8,175-acre Project Area plus a 1-mile buffer (SWCA 2011c) and in the winter of 2011 in the 17,897-acre expanded project area plus a 1-mile buffer (SWCA 2011d). Aerial surveys were conducted in the winter as directed by USFWS to avoid the potential for disturbance to active nests by helicopter surveys. Ground-based surveys were conducted during the spring in 2010 and 2011 during the active nesting season to confirm the occupancy status of each nest. The main objective of the surveys was to document diurnal raptor nesting within and adjacent to the Project Area.

**Table 2.** Raptor Nest Survey Dates, Type, and Location

| Survey Dates | Survey Type | Survey Location |
|---|---|---|
| February 23, 2010 | Aerial | Original project area plus 1-mile buffer |
| March 1, 2010 | Aerial | Original project area plus 1-mile buffer |
| April 30, 2010 | Ground | Nests documented during 2010 aerial surveys |
| May 1, 2, 6, 7, 8, 13, and 14, 2010 | Ground | Nests documented during 2010 aerial surveys |
| March 1–2, 2011 | Aerial | Expanded project area plus 1-mile buffer |
| May 5, 6, 10, 12, 23, and 25, 2011 | Ground | Nests documented during 2011 aerial surveys |
| June 12, 2012 | Ground | Nests documented during 2011 aerial surveys |
| June 13–15, 2013 | Aerial | Expanded project area plus 10-mile buffer* |

* The June 13–15, 2013 survey was for eagle nests only, not all raptors.

The combined results of the 2010 and 2011 surveys documented a total of 80 raptor nests within the expanded Project Area (SWCA 2011b, 2011d). Of the 80 nests, 28 were active in 2011. Of these 28 nests, two were occupied by bald eagles, and two were occupied by golden eagles. Active eagle nests were not monitored to determine productivity. The remaining 24 nests were occupied by non-eagle species. Forty of the 80 nests were detected within the Project Area, and 15 of those nests were active. These active nests detected in the Project Area included one golden eagle nest, nine red-tailed hawk (*Buteo jamaicensis*) nests, one Swainson's hawk (*Buteo swainsoni*) nest, one great horned owl *(Bubo virginianus*) nest, two common raven nests, and one unknown hawk nest.

In 2012, SWCA did not conduct raptor nest surveys according to the protocols used in 2010 and 2011 since two years of pre-construction data had been collected. However, while conducting unrelated fieldwork in the area, SWCA made incidental observations of raptor nests, including eagle nests.

In mid-June 2013, an eagle nest survey was conducted in the expanded Project Area plus a 10-mile buffer at the request of the USFWS. In 2013, 26 eagle nests were documented; 14 of the nests were newly documented and 12 of the nests had been previously documented during surveys conducted in 2010 and 2011. Five new eagle nests were documented in 2013: two golden eagle nests and three bald eagle nests.

## GOLDEN EAGLE

Raptor nest surveys conducted by SWCA from 2010 to 2013 documented golden eagle nest locations and nest occupancy. Surveys conducted in 2010 were conducted in the original Project Area plus a 1-mile buffer. Surveys conducted in 2011 were conducted in the expanded Project Area plus a 1-mile buffer. Surveys conducted in 2013 were conducted in the expanded project area plus a 10-mile buffer. Survey data yielded an estimate of the number of golden eagle nesting territories and, by mapping "territory centers" (i.e., half-mean inter-nest distance of occupied nesting territories), provided a means of describing risk associated with these nesting territories (see Section 2.3.1). Territory data are presented below and, in the context of risk, in Section 2.3.1.

Surveys focused on documentation of nest locations and nest occupancy. An occupied nest is a nest in which one or more of the following occurred: (1) young were raised; (2) eggs were laid; (3) an adult was observed sitting, presumably in incubation or brooding posture, in the nest; (4) two adults were observed perched on or near the nest; (5) an adult and a bird in immature plumage were observed at or near the nest, if mating behavior was observed (e.g., display flights, copulation); and/or (6) recent repairs (e.g., fresh greenery, sticks with fresh breaks), mute, or feathers were visible at or near the nest (Driscoll 2010; Postupalsky 1974; Steenhof and Newton 2007). An active nest is a nest in which an egg or eggs were laid and/or young were raised (Driscoll 2010; Postupalsky 1974). An active nest also is, by definition, occupied. The number of historically and currently occupied nesting territories was determined by observation of simultaneously active nests/nest clusters and disparate nests or nest clusters spaced >0.5 mile (0.8 kilometer [km]) for bald eagle and >1.9 miles (3.1 km) for golden eagle (Hodges and Robards 1982; Phillips et al. 1984; Sherrod et al. 1976).

In total, 13 golden eagle nest structures were detected within the 10-mile radius survey area during surveys conducted between 2010 and 2013. Seven territories were identified: Kepps (5 nests), Bull Fork (2 nests), Pinnacle (2 nests), Taylor Mountain (1 nest), Indian Fork (1 nest), Bone (1 nest), and Pine Mountain (1 nest) (Figure 3). Three of these nests are situated within the Project Area (Kepps territory: nests GE02, GE03, and GE04), and three are situated within 1 mile of the Project Area (Kepps territory: nest GE01; Bull Fork territory: nests GE09 and GE10). Table 3 shows the occupancy status of these nests by year and territory; Figure 3 shows the location of these nests.

**Table 3.** Nest Status of Golden Eagles within a 10-Mile Radius of the Horse Butte Project Area

| Territory Name | Nest ID | 2010 Nest Occupancy Status | 2011 Nest Occupancy Status | 2012 Nest Occupancy Status | 2013 Nest Occupancy Status |
|---|---|---|---|---|---|
| Bone | GE05 | — | Occupied – active | Unknown* | Occupied – active |
| Bull Fork | GE09 | — | Occupied | Unknown† | Unknown† |
| | GE10 | — | Occupied – active | Unknown† | Unknown† |
| Indian Fork | GE12 | — | Not occupied | Unknown† | Unknown† |
| Kepps | GE01 | — | Occupied | Unknown† | Not occupied‡ |
| | GE02 | Not occupied | Not occupied | Unknown† | Unknown† |
| | GE03 | Not occupied | Not occupied | Unknown† | Unknown† |
| | GE04 | Not occupied | Occupied – active | Unknown† | Unknown† |
| | GE11 | — | — | Occupied – active | Occupied – active |
| Pine Mountain | GE25 | — | — | — | Unknown† |
| Pinnacle | GE23 | — | — | — | Occupied – active |
| | GE24 | — | — | — | Unknown† |
| Taylor Mountain | GE027 | — | — | — | Occupied – active |
| **7 territories** | **13 nest structures** | | | | **2013 occupied nesting territories = 4+** |

Note: Table includes identified golden eagle nests but does not include nests of undetermined species, which could be eagle nests.
— indicates nest had not yet been found.
* Nest occupancy status unknown: nest not visited.
† Nest occupancy status unknown due to late season survey.
‡ Nest used by non-eagle species: common raven (*Corvus corax*; nest GE01), red-tailed hawk (*Buteo jamaicensis*; nest GE026).

## BALD EAGLE

Raptor nest surveys conducted by SWCA from 2010 to 2013 documented bald eagle nest locations and nest occupancy. As with the golden eagle nest occupancy data, the 10-mile radius survey in 2013 allowed for an estimate of the half-mean inter-nest distance of occupied nesting territories (see Section 2.3.1). Surveyors documented whether a nest was occupied and/or active, and disparate territories were distinguished, using the same methods as described above.

In total, five bald eagle nest structures were detected within the 10-mile radius survey area during the 2010–2013 surveys. Five territories were identified each with one nest: Deer Creek, Meadow Creek, Ririe Dam, Tex Creek, and Willow Creek. None of these nests are situated within the Project Area; two are situated within 1 mile of the Project Area (Tex Creek territory: nest BE07; Willow Creek territory: nest BE06). The proximity of these nests to the Project Area and to turbines is further described in Section 2.3.1. Table 4 shows the occupancy status of these nests by year and territory; Figure 3 shows the location of these nests.

**Table 4.** Nest Status of Bald Eagles within a 10-Mile Radius of the Horse Butte Project Area

| Territory Name | Nest ID | 2010 Nest Occupancy Status | 2011 Nest Occupancy Status | 2012 Nest Occupancy Status | 2013 Nest Occupancy Status |
|---|---|---|---|---|---|
| Deer Creek | BE14 | — | — | — | Occupied – active |
| Meadow Creek | BE15 | — | — | — | Occupied – active |
| Ririe Dam | BE16 | — | — | — | Occupied – active |
| Tex Creek | BE07 | Not occupied | Occupied – active | Occupied – active | Occupied – active |
| Willow Creek | BE06 | — | Occupied – active | Occupied – active | Occupied – active |
| **5 territories** | **5 nest structures** | | | | **2013 occupied nesting territories = 5** |

Note: Table includes identified bald eagle nests but does not include nests of undetermined species, which could be eagle nests.
— indicates nest had not yet been found.

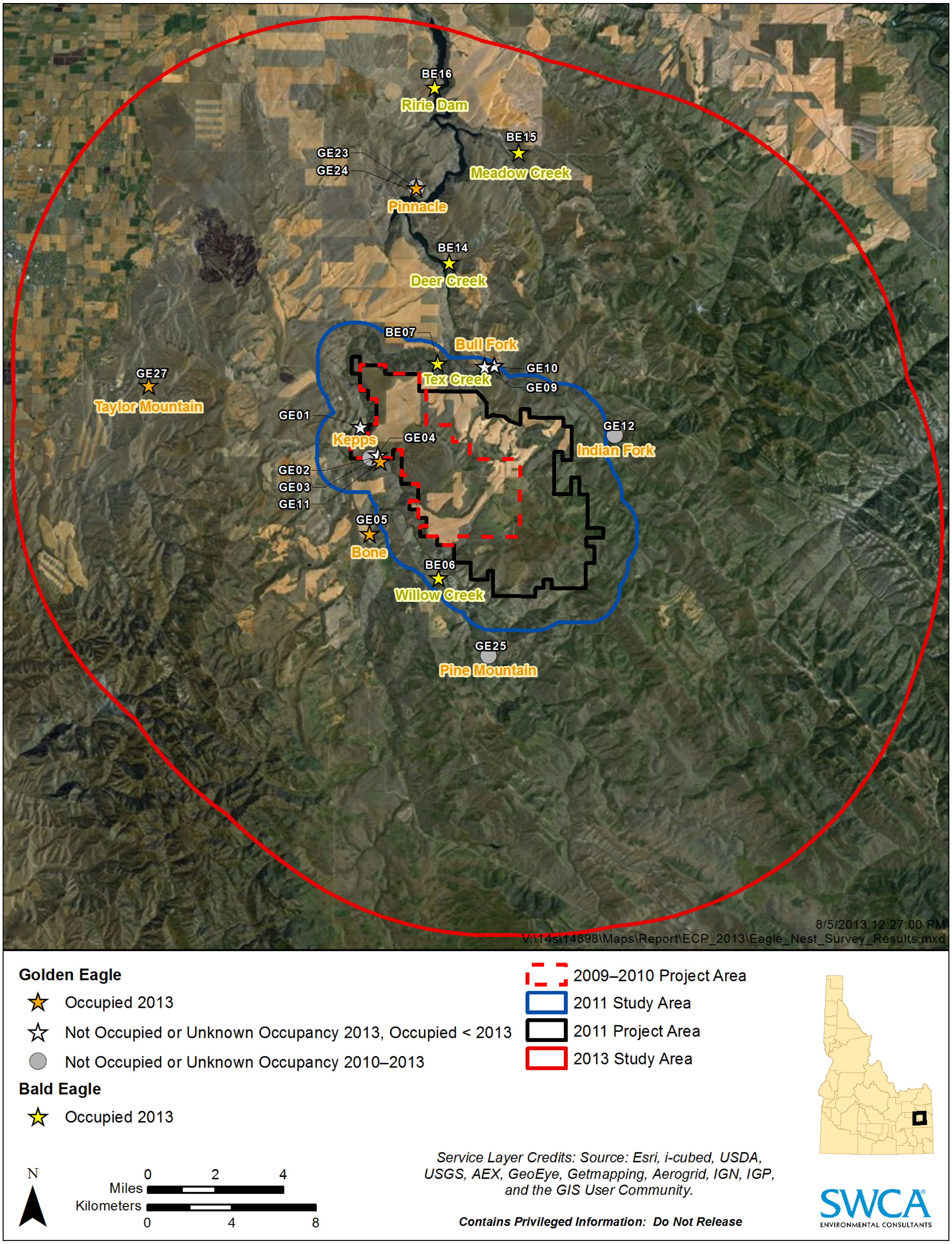


**Figure 3.** Eagle nest survey results, 2010–2013.

### 2.1.2 Raptor/Eagle Migration Surveys

USFWS (2013a) recommends conducting surveys ("HawkWatch" migration counts or point counts during peak migration) to assess presence of eagle migration corridors and stopover sites within and proximal to the Project footprint and to determine intensity of use by eagles during migration. SWCA conducted a desktop analysis to determine presence of migration corridors (see Section 1.6) and conducted fall and spring raptor/eagle migration counts from 2009 to 2011, in coordination with USFWS; results are summarized below.

Observation points were located at vantage points that offered unobstructed views of the surrounding terrain and airspace. The range of potential points and the general locations of these points were prescribed by the USFWS; migration counts are typically conducted at one to a few points within or adjacent to a proposed project (USFWS 2013a). The final location and number of points were dependent on (1) the general locations of potential turbines/core turbine areas, (2) the ability of avian surveyors to observe several potential turbine locations from a single point, and (3) the heterogeneity of the terrain and habitats. Sequence observation times covered most daylight hours and different weather conditions, such as windy days. The habitat types at the observation points consisted of sagebrush, juniper, low grass, and/or agricultural fields. However, the migration observation points were primarily selected based on quality of vantage points, ideally with good views of the surrounding landscape to maximize detection of migrating raptors/eagles.

#### PRESENCE OF EAGLE MIGRATION CORRIDORS/STOPOVER SITES

Bald and golden eagles tend to migrate along north-south-trending ridgelines, escarpments, upwind sides of slopes, canyons, and shorelines to take advantage of wind currents, and in the case or shorelines: to avoid large water bodies (National Wind Coordinating Collaborative [NWCC] 2010). Both species employ thermal and slope soaring and migrate at lower heights (within elevations typical of turbine rotor swept areas) when slope soaring—influenced by weather patterns (e.g., temperature, barometric pressure, winds aloft, storm systems, wind speed; Yates et al. 2001). Eagle use stopover sites generally have ample food supplies. For bald eagles, foraging is limited to lakes, rivers, streams, and other wetland systems (where turbine placement has typically been avoided) while for golden eagles foraging is often in upland systems along contours and north-south-trending ridgelines.

Important factors when assessing potential risk of a wind facility related to eagle migration include presence of landscape features that could concentrate eagles, high densities of small mammal prey and conditions favorable to high prey densities, and eagle abundance (NWCC 2010).

The Project Area proper does not contain the specific habitat features that are known to concentrate eagles during migration. Also, as described above (see Section 1.6), no concentrations of burrowing mammals were observed, and no prairie dog colonies were observed in the Project Area. Landscape features that could concentrate eagles are located east of the Project Area: the north-south-trending Snake River corridor and adjacent mountains (e.g., Rendezvous Mountain) and canyons (approximately 42 miles to the northeast) and, to a lesser extent, the northwest-southeast-trending Snake River corridor and adjacent mountains (e.g., Ross Peak) and canyons (approximately 19 miles to the east). The closest known raptor/eagle migration sites, at which HawkWatch International (HWI) has conducted raptor/eagle migration studies, include the Wellsville Mountains site in Utah, the Goshutes Mountains site in Nevada, and the Commissary Ridge site in Wyoming. These sites are located roughly 125 miles to the south, 200 miles to the southwest, and 80 miles to the east of the Project Area, respectively. The Wellsville Mountains site is located south along the same north-south-trending Snake River and Rendezvous Mountain area described above.

As described in Section 1.6, Willow Creek Canyon (located north, west, and south of the Project Area) and Tex Creek Canyon (northeast of the Project Area) are the most prominent canyons in the Study Area. Characterized by large cliff walls, vertical faces, and ledges, these canyons contain perennial streams with riparian vegetation. Eagle migration along these canyons, as documented during the 2009–2011 surveys, is described below.

## FALL MIGRATION

Fall raptor/eagle migration surveys were completed in 2009 and 2011; survey methods were based on techniques employed by HawkWatch International (HWI) (Smith 2005).

During the 2009 fall raptor/eagle migration surveys, one observation point in the Project Area was used for surveying fall migrating raptors across the entire Project Area (Figure 4; SWCA 2011b). This observation point was selected by SWCA to maximize migrant raptor counts; it was selected due to its view of the river corridor (north and west of the Project Area), and due to the predominant wind currents and thermals that converge from the adjacent buttes, creating good conditions for migrating raptors. To identify early-, mid-, and late-season migrants, the 2009 fall raptor migration surveys were conducted for two days in September and four days in October: September 24–25, October 6–7, and October 20–21, 2009. Dependent on weather, each 2009 count was between 3 and 6 hours in duration.

During the 2011 fall raptor/eagle migration surveys, four observation points were used due to an increase in the Project Area footprint and as requested by USFWS (Figure 5; SWCA 2011b). The four points were roughly located on an east-west axis and were spaced sufficiently apart to detect birds crossing the east-west axis count boundary while avoiding double counting of passing raptors/eagles. The 2011 fall migration surveys were conducted for four days in September and six days in October: September 20–23, October 4–5, and October 17–20, 2011. Dependent on weather, each 2011 count was between 3 and 8 hours in duration.

The 2009 fall raptor/eagle migration surveys yielded a cumulative passage rate of 0.71 raptor per hour (SWCA 2011b), and the 2011 fall raptor/eagle migration surveys yielded a cumulative passage rate of 0.13 raptor per hour. In total, four bald eagle observations (three in 2009, one in 2011) and four golden eagle observations (three in 2009, one in 2011) were recorded during the fall migration study; combined, the eagle observations represent 32% of all raptor species observations during the surveys. The most common species observed in both years were bald eagle, golden eagle, and northern harrier (*Circus cyaneus*). These fall migration raptor passage rates were extremely low when compared to active fall flyways such as the Wellsville Mountains (1997–2009 average: 9.6 raptors per hour), Goshute Mountains (1983–2011 average: 21.2 raptors per hour), and Commissary Mountains (2002–2011 average: 7.9 raptors per hour) sites (HWI 2013). The eagle passage rate at the Project Area was 0.24 eagle per hour (0.12 golden eagle per hour and 0.12 bald eagle per hour) in 2009 and 0.04 eagle per hour (0.02 golden eagle per hour and 0.02 bald eagle per hour) in 2011. The eagle passage rate at the HWI sites ranged from 0.38 to 0.85 eagle per hour (0.36–0.53 golden eagle per hour, 0.02–0.32 bald eagle per hour; HWI 2013).

During the fall migration period of both years, the majority of activity for both resident and migratory raptors/eagles was observed in Tex Creek Canyon. Generally the migratory raptors/eagles were observed flying from east to west through or near the canyon and then south once they were west of the Project Area. Tex Creek Canyon is adjacent to and outside of the Project Area boundary.

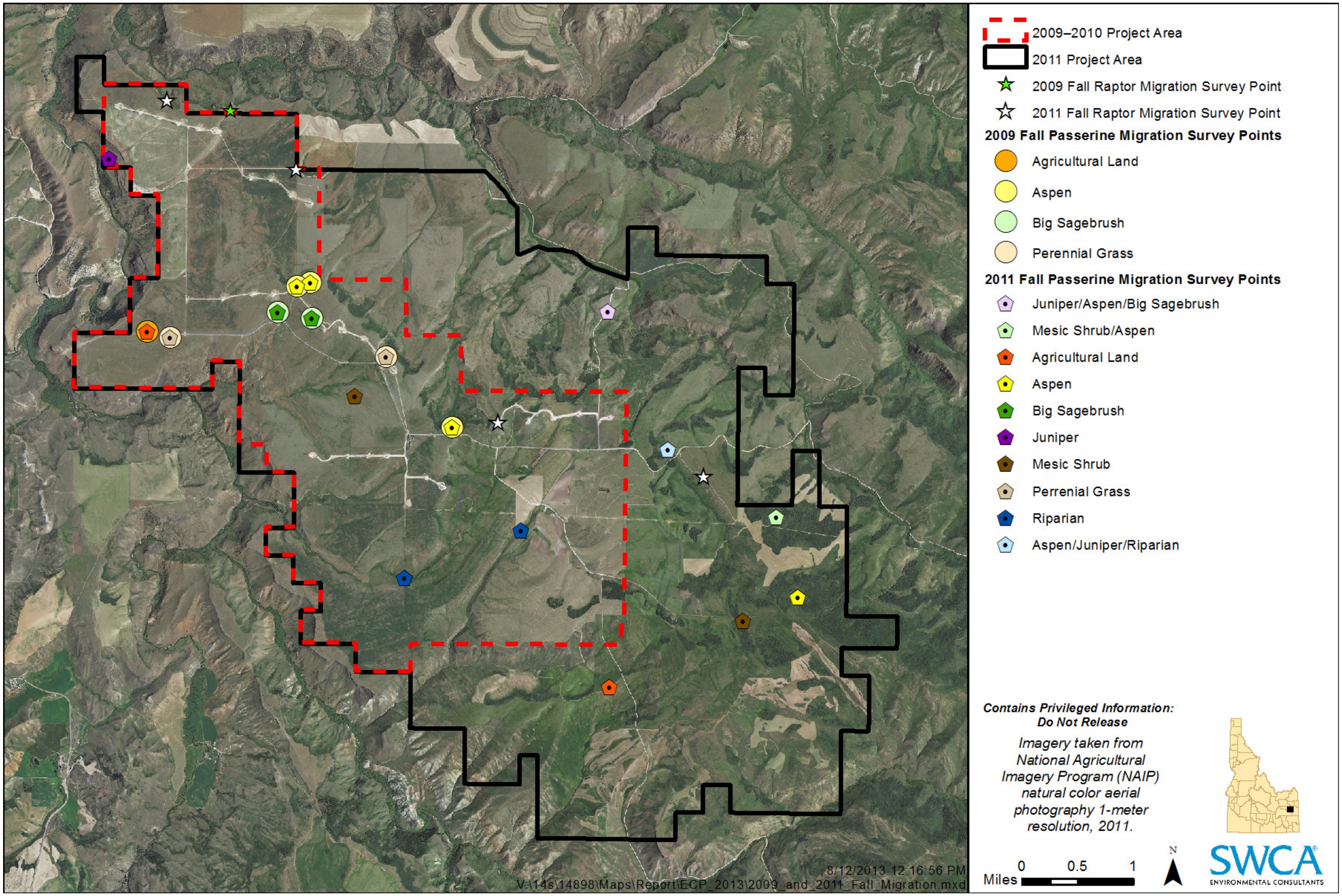


**Figure 4.** Observation points for 2009 and 2011 fall migration surveys.

## SPRING MIGRATION

Spring raptor/eagle migration surveys were completed in 2010 and 2011. The 2010 spring migration survey methodology followed the same general methodology that was used in the fall of 2009; however, unlike the fall migration survey, no single distinct high point with a good view of the entire southern area could be identified in the Project Area. After discussion with the USFWS, it was determined that three separate raptor migration observation points would be needed to accurately assess spring raptor migration in and near the Project Area; these three observation points were located in the northwestern, central, and southern portions of the Project Area (Figure 5). The surveys were conducted in three periods with each period lasting three days: April 30–May 2, May 6–8, and May 13–15, 2010 (SWCA 2011b). Spring snowstorms and washed-out roads prevented biologists from accessing the Project Area before April 30. During each survey period, each of the three observation points was surveyed once. Dependent on weather, each 2010 count was between 3.5 and 6 hours in duration.

The 2011 spring raptor/eagle migration surveys were conducted following the same methodology that was used for the fall 2010 surveys, except the number of observation points increased from three to six due to the expansion of the Project Area (see Figure 5; SWCA 2011c). Spring 2011 surveys were conducted on April 19–20, April 27–29, and May 11–13, 2011. Dependent on weather, each 2010 count was between 3.5 and 6 hours in duration.

The spring 2010 surveys yielded a cumulative raptor passage rate of 1.35 raptors per hour (SWCA 2011b), the spring 2011 surveys yielded a cumulative raptor passage rate of 0.68 raptor per hour (SWCA 2011c). Spring migration generally occurs in a broad front over a longer window of time relative to fall migration; therefore, HWI data comparisons are available for fall but not for spring data. The spring migration passage rates documented in the Project Area are extremely low relative to those recorded in the fall at HWI sites (see Fall Migration section above). In total, three bald eagle observations (two in 2010, one in 2011) and five golden eagle observations (one in 2010, four in 2011) were recorded during the spring migration study; combined, these observations represent 12% of all raptor species observations during the surveys The most common species observed in both years were red-tailed hawk, turkey vulture (*Cathartes aura*), and northern harrier. The eagle passage rate at the Project Area was 0.12 eagle per hour (0.04 golden eagle per hour and 0.08 bald eagle per hour) in 2010 and 0.11 eagle per hour (0.09 golden eagle per hour and 0.02 bald eagle per hour) in 2011.

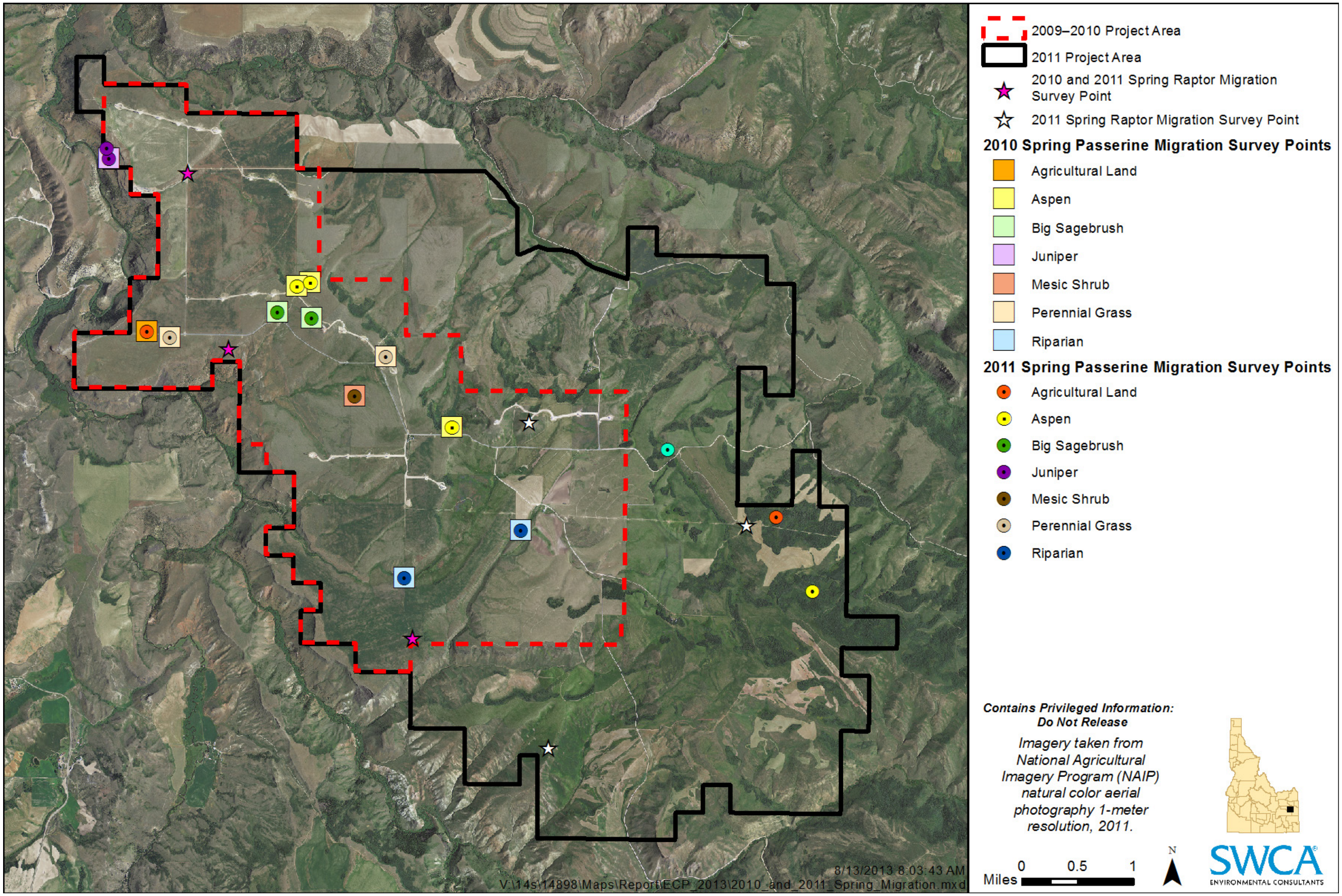


**Figure 5.** Observation points for 2010 and 2011 spring migration surveys.

### 2.1.3 Large-bird Use Surveys

USFWS (2013a) recommends conducting point count (use) surveys as the means of providing primary input for the model predicting fatality rate of eagles associated with wind turbines. Large-bird use surveys were conducted in the Project Area every two weeks from December 2011 through June 2013. UAMPS coordinated with the USFWS regarding the cessation of large-bird use surveys at a meeting with USFWS, UAMPS, and SWCA at Horse Butte Operations and Maintenance Facility, Ammon, Idaho, on June 7, 2013. Ten large-bird observation points were placed throughout the Project Area taking into consideration viewshed and topography to ensure that the Project Area was adequately sampled and that views surrounding each point were maximized (Figure 6). The habitat types at the large-bird observation points consisted of sagebrush, juniper, low grass, and/or agricultural fields. Surveys were conducted twice per month (December 10–11, 22–23, 2011, January 4–5, 27–28, February 6–7, 21–22, March 7–8, 22–23, April 3–4, 24–25, May 14–15, 24–25, June 11–12, 28–29, July 13, 25–26, August 8–9 and 22–23, 2012) for a total of 18 surveys over the course of the winter, spring, and summer. Each point was surveyed for a minimum of 20 minutes during each of the 18 survey visits. The 20-minute survey duration was chosen to allow for multiple points to be surveyed each survey session; and it was standard practice per Strickland et al. (2011) to use 20- to 40-minute counts, rather than 1, 2, or more hours, prior to the 2013 USFWS guidance. The time of day that each point was surveyed was varied so that each point was surveyed in the morning and afternoon during several surveys. All raptors seen during each survey were recorded and the following information was collected: species, number of individuals, age, sex, initial height above ground level (HAGL), maximum HAGL, minimum HAGL, flight direction, flight behavior (e.g., soaring, powered flight, hovering), and time. Observers plotted on topographic field maps the flight pathways taken by individuals and groups. These flight pathways were digitized into a geographical information system (GIS) format. Additionally, weather information, including temperature, wind speed, wind direction and cloud cover, was recorded for each point.

The surveys' focus was on raptors; however, all large-bird species were documented. From December 2011 through June 2013, 10 species of raptors were observed. In total, 523 raptors, including turkey vultures, were documented during the surveys. Within 800-meter (m) radius plots, 26 eagle observations (six bald eagles, 20 golden eagles) were recorded. Eagle use was determined to be 0.043 bald eagle per 800-m plot per 20-minute survey and 0.081 golden eagle per 800-m plot per 20-minute survey.

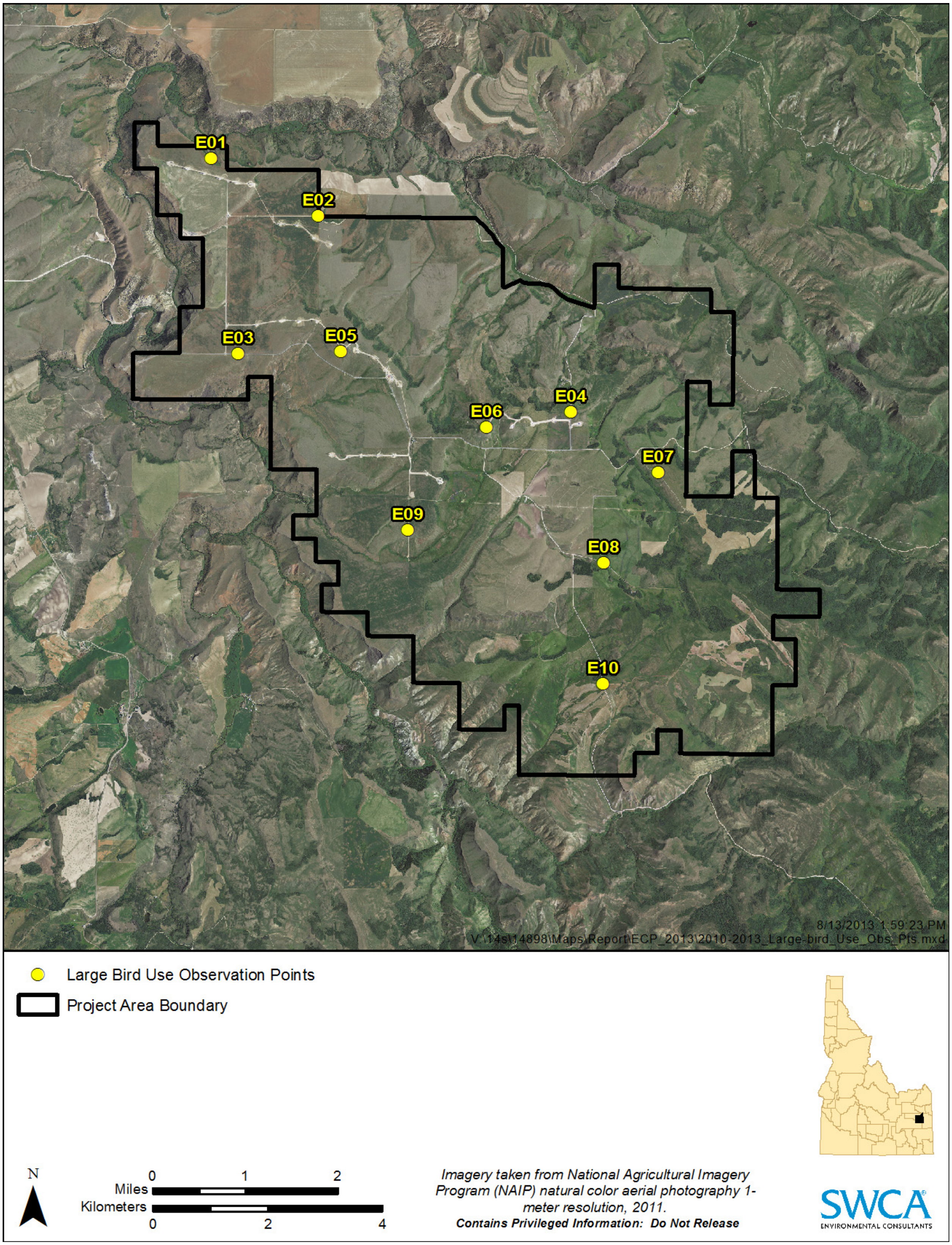


**Figure 6.** 2010–2013 large-bird use observation points.

# 3 RISK ASSESSMENT

Using the data gathered pursuant to UAMPS' various site assessments and field studies, as summarized in Section 2 above, UAMPS has analyzed the potential direct and cumulative impacts of the Project to eagles. This analysis is presented in the following section and specifically addresses the likely impacts of the Project in the context of collision, electrocution, disturbance/displacement, and habitat fragmentation for eagles.

## 3.1 Eagles

### *3.1.1 Collisions*

The approach recommended in the ECP Guidance (USFWS 2013a) for assessing potential fatality and disturbance effects of wind facilities on eagles is to (1) conduct a turbine-by turbine risk assessment, (2) conduct standardized surveys (i.e., use counts) to estimate eagle exposure, and (3) to augment these surveys with surveys to determine locations of important eagle use areas or migration concentration sites for the project-area eagle population (USFWS 2013a). As a means of determining locations of important eagle use areas, and to identify nesting territories most likely to be affected by disturbance, USFWS specifically recommends calculating and mapping the half-mean study-area (i.e., 10-mile radius survey area) inter-nest distance as a coarse approximation of a territory center. Eagle pairs and their offspring within this distance are considered to be potentially susceptible to disturbance effects and receive special attention and consideration (USFWS 2013a).

Only seven bald eagle fatalities have been reported as of 2012 at wind farms in the United States (Allison 2012). Preliminary data from a post-construction eagle use survey at a wind facility in Alaska suggest that bald eagles may actively avoid turbines (Sharp et al. 2010). Although there has been a lack of reported bald eagle fatalities at wind energy facilities operating within the species' range, a few features or conditions present at the Project indicate that a risk of collisions for bald eagles could exist. The Project Area is located between Willow Creek and Tex Creek, which contain high-quality nesting, foraging, and roosting habitat; the Willow Creek and Tex Creek territories are located approximately 0.6 mile from the Project Area boundary to the southwest and north, respectively.

Golden eagles generally appear to be more susceptible than bald eagles to wind turbine collisions, apparently due to differences in the ecology (e.g., distribution on the landscape, nesting habitat, hunting habitat and habits, migration ecology) of the species; however, publically available post-construction fatality data at sites with relatively high pre-construction bald eagle use are lacking. Although golden eagle fatalities have been reduced at wind farms with older-generation turbines (Kerlinger et al. 2006; Kerns and Kerlinger 2004; Orloff and Flannery 1992), golden eagle fatalities do still occur at wind farms with newer-generation turbines. Newer-generation wind farms for which golden eagle injuries or fatalities have been publicly reported include Diablo Winds, California (WEST 2008); High Winds, California (Kerlinger et al. 2006); Goodnoe Hills, Washington (*Seattle Times* 2009); and Elkhorn, Oregon (*Daily Journal of Commerce* 2010).

#### TURBINE-BY-TURBINE RISK ASSESSMENT

Risk of collision for eagles varies from turbine to turbine in a wind energy facility based on the presence of one or more risk factors. For this risk factor analysis, each turbine has been evaluated to determine which of the five risk factors below might be present (USFWS 2013a). The detailed turbine-by-turbine risk assessment has been completed separately, as described in Appendix A.

1. Topographic features conducive to slope soaring

   a. Based on the 10-m digital elevation model from the National Elevation Dataset, no turbines border the top of a slope (>45 degrees) oriented perpendicular to the prevailing wind direction.
   b. No turbines are within 50 m of a ridge-crest or cliff edge.

2. Topographic features that create potential flight corridors
   a. No turbines are in a saddle or low point on a ridge line.
   b. No riparian corridors occur in the Project Area. Willow Creek borders the Project Area, and Tex Creek is 800 m from the project area; however, no turbines occur within 100 m of wetland areas or the perennial watercourses within Tex Creek and Willow Creek canyons.
3. Proximity to potential foraging sites
   a. No turbines are near perennial or ephemeral water sources that support a robust fishery or harbor concentrations of waterfowl.
   b. No turbines are near a prairie dog colony or area of high ground-squirrel density based on field observations. No colonies or areas with multiple ground squirrels were observed.
   c. The area within 150 m of each turbine was cleared during construction and reseeded with native grasses. Therefore, no turbines will be near cover likely to support high abundance of rabbits or hares.
   d. The Project occurs next to the Tex Creek WMA where mule deer winter. Many mule deer die in this area and become accessible as food for wintering eagles.
   e. Big-game carrion may be present throughout the Project Area at times.
   f. The Project is not within or near a game dump or landfill, which could attract eagles.
4. Near likely perch structures or roost sites
   a. Limited large trees and limited cliff habitat occur in the Project Area. Most of the trees in the Project Area are too small to support nesting eagles.
5. In an area where eagles may frequently engage in territorial interactions
   a. This factor is analyzed in the detailed turbine-by-turbine risk assessment included in Appendix A.

The Project Area contains suitable big-game wintering habitat (SWCA 2011e), and the Tex Creek WMA, adjacent to the Project Area, is a critical wintering area for mule deer. Surveys for wintering big game conducted by SWCA (SWCA 2011e) document relatively high numbers of big game in and around the Project Area. Annual surveys conducted by IDFG show a robust population of big game in the greater landscape surrounding the Project Area (IDFG 2012). When mule deer, elk, or moose die during the winter, they become an accessible food source for resident wintering eagles. The presence of big-game carrion increases the risk of eagles colliding with turbines. Winter carrion surveys were not conducted for the project. Even if big-game carrion is not present in the Project Area in any given year, it is likely that eagles would fly through the Project Area to access big-game carrion on adjacent land. The relatively high numbers of eagles observed during the winter of 2011–2012 (see Section 2.2.4), coupled with the location and number of big game present in and around the Project Area, suggest eagles are likely using portions of the Project Area to forage on big-game carrion, therefore there is a risk of collision with turbines while foraging. This assumption is based on limited data but supported by scientific studies of eagle foraging behaviors (Hunt et al. 1995). The risk of collision is subject to change in location and intensity over time, depending on predator and prey abundance and annual weather patterns, among other factors.

Another risk factor for eagles colliding with turbines is related to the density and availability of small-mammal prey resources, such as colonial burrowing rodents and rabbits, which typically are important prey species for large raptors. Assemblages of prey resources could attract eagles to the Project to forage and create a potential for the risk of collision. Incidental observations of a few colonial burrowing rodents, such as ground squirrels were noted during site surveys. No concentrations of burrowing mammals and no prairie dog colonies were observed in the Project Area. It is not feasible to determine what level of collision risk the presence of prey species in the Project Area poses to eagles; however, due to the apparent low potential presence of prey species, this risk is likely low.

## USE COUNTS

The Project Area appears to support a wintering population of bald eagles (SWCA 2011b); however, no specific eagle concentration areas were recorded during pre-construction studies. Within the Study Area there are bald eagles year-round as shown by the large-bird use surveys. Although bald eagles are not commonly observed in the Project Area, they have been observed in the Project Area at all times of the year.

Because bald and golden eagles have been regularly detected during raptor surveys for the Project, there is likely a risk of collisions.

Chatfield and Erickson (2011) compiled publicly available golden eagle use and mortality data from 75 wind energy facilities throughout the United States and Canada to identify at which facilities golden eagles faced the greatest risk of mortality. This list excludes facilities like Altamont Pass that have varying turbine sizes and layouts. Of the 75 facilities analyzed, only four are known to have recorded golden eagle fatalities. All four of these facilities exhibit higher golden eagle use (0.26–0.36 golden eagles per 800-m plot per 20-minute survey) than was observed at the Project (0.11 golden eagles per 800-m plot per 20-minute survey). No fatalities are known to have occurred at facilities with golden eagle use similar to that observed in the Project Area. Furthermore, Chatfield and Erickson (2011) categorize wind energy facilities with golden eagle use similar to the Project as relatively low risk sites.

## HALF-MEAN STUDY AREA INTER-NEST DISTANCE

It is important to note that the 2013 10-mile radius nest occupancy survey was conducted late in the eagle breeding season. It is assumed, based on our experience conducting similar surveys at numerous sites throughout the western U.S., that an early season survey combined with a late season survey would identify several additional occupied golden eagle nests and such data would result in a substantially smaller half-mean inter-nest distance estimate for golden eagle. Thus, caution should be used in the interpretation of the 2013 half-mean inter-nest distance calculation for this species: the calculation and associated mapped buffers (Figure 7) should be considered to be extremely conservative. For bald eagle, each of the five territories contained an occupied nest at the time of the survey; therefore, the half-mean inter-nest distance calculated for the species is more accurate. Also important is the concept, supported in the literature, that resident breeding adults may be less susceptible to collision than sub-adults and non-breeding floaters (Fielding et al. 2006; Whitfield et al. 2008).

No turbines have been or will be constructed within 1 mile of the known occupied bald or golden eagle nests, but portions of the Project Area fall within the half-mean inter-nest distance for bald and golden eagles (see Figure 7).

As described above (see Section 2.2.1), seven golden eagle territories were identified within the 10-mile radius survey area in 2013. Of these four contained occupied nests (each was active): Bone territory (nest GE05), Kepps territory (nest GE11), Pinnacle territory (nest GE24), and Taylor Mountain territory (nest GE027). No occupied nests were situated within the Project Area, one nest was situated within 1 mile of the Project Area (GE11; 0.1 mile from the Project Area boundary; 1.0 mile from the nearest turbine), one nest was situated within 2 miles of the Project Area (GE05; 1.4 miles from the Project Area boundary; 2.3 miles from the nearest turbine), and the other two occupied nests were more than 5 miles from the Project Area and more than 5.6 miles from the nearest turbine. The 2013 half-mean inter-nest distance for golden eagle was 2.4 miles. Using this method, two occupied golden eagle nesting territories overlapped with turbines: the half-mean inter-nest distance buffer for GE11 overlapped with 19 turbines (turbines 8–26) and the buffer for GE05 overlapped with two turbines (turbines 22 and 23) (see Figure 7).

For bald eagle, five territories were identified within the 10-mile radius survey area in 2013; each of the five contained an occupied nest. None of the nests were situated within the Project Area. Two nests were situated within 1 mile of the Project Area (Tex Creek territory, nest BE07: 0.6 mile from the Project Area boundary, 1.2 miles from the nearest turbine; Willow Creek territory, nest BE06: 0.6 mile from the Project Area boundary, 2.7 miles from the nearest turbine), and the other three nests were more than 3 miles from the Project Area and nearest turbine. The 2013 half-mean inter-nest distance for bald eagle was 1.9 miles. One occupied bald eagle nesting territory overlapped with turbines: the half-mean inter-nest distance buffer for BE07 overlapped with eight turbines (turbines 4–11) (see Figure 7).

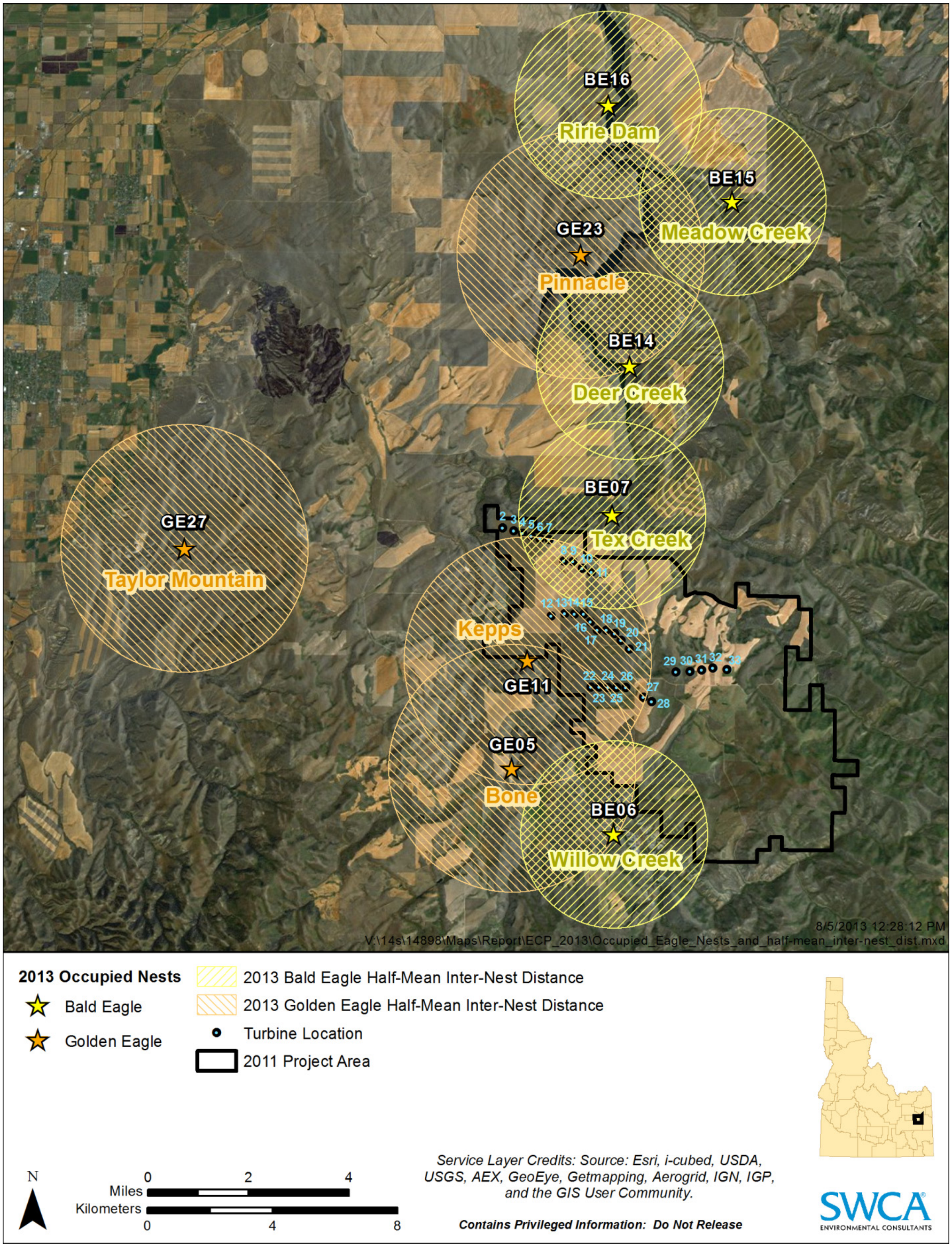


**Figure 7.** 2013 occupied eagle nests and half-mean inter-nest distance buffers.

### 3.1.2 Electrocution

Utility lines (transmission and distribution) can potentially result in electrocution of raptors, especially eagles, which often perch on power poles during foraging and have wing spans large enough that the bird can simultaneously contact two conductors or a conductor and grounded hardware. Therefore, any structures that allow for circuit completion (i.e., flesh-to-flesh contact between energized parts or an energized and grounded part) pose an electrocution risk.

The risk of electrocution to eagles from the Project is likely to be low because all electrical collection lines for the Project are buried and the two very short sections of aboveground transmission line from the Horse Butte substation to the Cattle Creek switchyard and from the Cattle Creek switchyard to the existing Palisade-Goshen 115-kV line have been designed following APLIC guidelines. This low risk has been further reduced through measures taken during the design and construction phases of the Project. These measures are described in detail below in Sections 4.1 to 4.3.

### 3.1.3 Disturbance/Displacement

Disturbance and displacement of eagles from wind farm development is not well studied. Chatfield and Erickson (2011) recently evaluated golden eagle use at 75 wind facilities throughout the United States and Canada, and the results of this study indicated that eagles continue to use the same habitat following construction of wind energy facilities. Thus, it is likely that the risk of disturbance and displacement to eagles at the Project is low.

### 3.1.4 Habitat Fragmentation

Habitat fragmentation can exacerbate the problem of habitat loss for eagles by decreasing patch area and increasing edge habitat. Habitat fragmentation can reduce eagle productivity through increased nest predation and parasitism and reduced pairing success. The Project is not likely to significantly increase the degree of habitat fragmentation in the area because the majority of the wind farm is located on habitat that is already fragmented due to intensive agriculture, with land uses consisting mostly of Conservation Reserve Program lands, homesteads, and access roads. Nevertheless, to the extent habitat fragmentation could occur, the likelihood has been reduced through measures taken during the design and construction phases of the Project. These measures are described in detail below in Sections 4.1 to 4.3 and include removing or eliminating turbines through macro- and micro-siting; burying all of the collection lines and designing the two very short sections of aboveground transmission line from the Horse Butte substation to the Cattle Creek switchyard and from the Cattle Creek switchyard to the existing Palisade-Goshen 115-kV line following APLIC guidelines; and minimizing surface disturbance to the maximum extent possible.

### 3.1.5 Eagle Fatality Prediction

Estimating potential eagle fatalities at wind facilities is a core component of the requirements for assessing environmental impacts in the ECP Guidance (USFWS 2013a). The USFWS's Basic Collision Fatality Model (Model) was used to estimate the annual take of eagles by the Project. The Model is in the process of development and revision by the USFWS.

#### HOW THE MODEL WORKS

The Model uses Bayesian statistics to calculate an estimate of eagle fatalities and credible intervals based on the equation:

$$F = \varepsilon\lambda C$$

Where,

- F is the estimated annual eagle fatalities from turbine collisions;
- $\varepsilon$ is an expansion factor, which is the product of daylight hours per year and the total hazardous area, with the total hazardous area calculated from the turbine length and number of turbines;
- $\lambda$ is the eagle exposure rate, which is the eagle minutes in the Project Area (from survey data), corrected by the time sampled and the amount of the Project Area sampled; and
- C is a measure of collision risk calculated from golden eagle fatalities at other wind farms, specifically Altamont Pass, Foote-Creek Rim, San Gorgonio, and Tehachapi.

The credible intervals are based on an assumed data distribution (gamma distribution), derived from Whitfield (2009) and other projects under USFWS review. They are not derived from variability in the survey data collected in the Project Area.

## RESULTS

UAMPS provided raw data from the large-bird use surveys conducted from December 2011 through June 2013 to USFWS. The USFWS ran the Model using these data, and provided UAMPS with the resulting project-specific annual collision fatality estimates for bald eagle and golden eagle (Table 5). The 80% upper credible interval is used by the USFWS for mitigation planning.

**Table 5.** Initial Eagle Fatality Estimates (per year)

| Species | Mean | Standard Deviation | 80% Upper Credible Interval |
|---|---|---|---|
| Bald eagle | 1.54 | 0.83 | 2.12 |
| Golden eagle | 2.4 | 0.92 | 3.10 |

### Planning Using a Likely Overestimation of Collision Rate

The fatality estimates produced by the Model are very conservative; that is, they are planning for a larger number of eagle fatalities than is likely to occur. The USFWS recently described their reasoning for this in a letter to New Era Wind dated January 14, 2013 (USFWS 2013b):

> The Service [USFWS] has adopted a “risk-averse” stance on collision risk analysis, which may result in an over-estimation of collision numbers. The Service believes it is better to decrease projected take numbers as post-construction data is made available, rather than try to implement additional conservation measures at a later date to account for unexpected fatalities. Collision risk estimates generated by the Service serve to show a range of collision probabilities, and do not reflect absolute certainty of impact to bald and golden eagles. Additionally, much of the collision risk estimates do not take into consideration avoidance, minimization, and mitigation measures that may be implemented by the project proponent to lower these take estimates.

The mean annual fatality estimate is the most likely scenario. A credible interval (i.e., a Bayesian confidence interval) predicts that the true value of the parameter has a particular probability of being in the confidence interval given the data actually obtained. So, the Model results for golden eagles indicate that there is an 80% probability that the annual eagle fatality rate would be less than 3.10 eagles. Use of the 80% upper credible interval for conservation planning is very conservative, consistent with the USFWS’s stated position. The USFWS further clarified in the letter to New Era Wind that, “It is important to note that the collision risk estimate generated by the Service is not a goal to reach, but rather represents a worst-case scenario that the Service and project proponent would strive to never achieve" (USFWS 2013b).

### *3.1.6 Conclusion*

In summary, the documented use of the site by bald and golden eagles demonstrates that the Project poses potential risks to these species. There is a low potential risk of eagle mortality as a result of collision with power lines and due to electrocution by power lines because all electrical collection lines have been buried, and there are only two very short segments of overhead line from the Horse Butte substation to the Cattle Creek switchyard and from the Cattle Creek switchyard to the existing Palisade-Goshen 115-kV line, which have been designed following APLIC guidelines. There is also a low potential risk of impacts to eagles due to collision with turbines or disturbance or displacement from existing habitats and due to habitat fragmentation.

UAMPS initiated post-construction fatality searches in September 2012. Year 1 fatality searches were conducted on approximately one-third of the 32 operational turbines (turbines 5, 6, 9, 10, 16, 20, 22, 25, 27, 29, and 31). Surveys were conducted every other week by a team of 2 biologists within a 126 ×126 m survey area centered on the turbine mast. Survey transects were spaced at 6-m (20-foot) intervals, with surveyors searching for 3 m (10 feet) on both sides of each transect. No eagle fatalities have been documented to date. Though there is currently not a strong linkage between pre-construction use studies (predicted risk) and recorded fatalities at wind facilities (Erickson et al. 2002; Ferrer et al. 2011; NWCC 2010), the Year 1 post-construction fatality data are consistent with the pre-construction use studies and desktop analyses, which indicated risk to eagles would be relatively low, largely because pre-construction use was low and there are no specific physical characteristics (e.g., prominent north-south ridgelines, riparian corridors, extensive water bodies, high prey density) that would concentrate raptors/eagles.

Nonetheless, UAMPS has undertaken conservation measures to avoid and minimize the risks to bald and golden eagles to ensure no net loss to eagle populations as required for an eagle take permit. These measures include relocating and eliminating turbines through macro- and micro-siting, implementing avoidance measures in Project design, implementing impact minimization measures during construction and operation, implementing a worker education awareness program, and implementing advanced conservation practices for bald and golden eagles. These measures are discussed in more detail in Sections 4.1 to 4.5.

## 3.2 Cumulative Effects

The USFWS is required to consider the cumulative effects of programmatic eagle take permits (50 CFR § 22.26; USFWS 2013a). "Cumulative effects" are defined as "the incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions" (50 CFR § 22.3). The ECP Guidance (USFWS 2013a) recommends that cumulative effects analyses be consistent with the principles of cumulative effects outlined by the Council on Environmental Quality (CEQ). The CEQ regulations (40 CFR § 1508.7) define cumulative impacts as past projects that occurred within the past five years, current projects, and reasonably foreseeable future projects that are planned to occur within the next 20 years and that have an "official" application or other formal process in place that would define them as "reasonably foreseeable." Cumulative effects are considered here for projects within approximately 75 miles from the project footprint.

The majority of past, present, and reasonably foreseeable projects in the area are roads, trails, and other similar projects that would result in minimal direct mortality to eagles. Although these projects could potentially contribute to habitat loss and fragmentation, the impact is low relative to the available high-quality habitat in the area.

Two other wind facilities are operational in Bonneville County, Idaho, and there are no known eagle fatalities that have occurred at those facilities. The first large-scale wind farm to be developed in Bonneville County was the 64.5-MW Wolverine Creek wind farm near Idaho Falls, which has been in operation since 2005. The second wind farm to be developed in Bonneville County was the Goshen North Wind Farm, which sits on roughly 11,000 acres of land located approximately 10 miles east of Idaho Falls. At 124.5 MW, the Goshen North Wind Farm is the largest wind farm in Idaho and became commercially operational in October 2010. The 119.7-MW Meadow Creek wind farm began operations in 2012. Two additional projects have been approved for development in Bonneville County, the 20-MW Black Canyon Rim wind farm and the 20-MW Schwendiman wind farm.

In nearby Power County, three wind farms began operating in 2011. The Rockland Wind Farm Project is an 80-MW facility that began operations in January 2012 and is located on 15,000 acres of land located southwest of the city of American Falls. The Power County Wind Park North and South, each 22.5-MW and located near American Falls, also began operating in 2011. UAMPS is not aware that any of these facilities have applied for or obtained programmatic eagle take permits.

Because of the good to excellent wind resource area located south of the Snake River Plain in southern Idaho, development of additional wind facilities can reasonably be expected to occur. Past and future wind development likely has contributed or may contribute to eagle mortality, loss of habitat, habitat fragmentation, avoidance, and displacement. However, careful siting of these facilities and appropriate mitigation efforts have been shown to substantially reduce impacts to eagles. While the cumulative effects of additional wind development are difficult to measure, they would be reduced through compliance with all federal and state laws and the application of the Guidelines.

As demonstrated in Sections 4 and 6, UAMPS has applied mitigation measures to reduce the likelihood of eagle takes and has provided compensatory mitigation to fully offset all unavoidable eagle takes. Collectively, these avoidance and mitigation measures will ensure no net loss to eagle populations as a result of Project operations. Therefore, the Project is not anticipated to have a significant cumulative effect when considered with other past and future wind projects.

# 4 PLANNING AND DESIGN STANDARDS AND IMPACT-REDUCING CONSERVATION MEASURES

This section identifies avoidance and minimization measures that have been incorporated into the planning and design of the Project to reduce impacts to eagles and their habitat during the construction, operation, and decommissioning of the Project. These measures are based on the best management practices provided in the Guidelines (USFWS 2012) and ECP Guidance (USFWS 2013a) and use current Project data to address site-specific concerns. This section also includes detailed advanced conservation measures to specifically address potential impacts to bald and golden eagles.

## 4.1 Macro- and Micro-siting

Originally, UAMPS had proposed siting turbines adjacent to Willow Creek. As noted in Section 2, several golden and bald eagle nests are located in the Willow Creek corridor. In response to concerns about the risk of collision for golden and bald eagles, UAMPS relocated or eliminated a string of seven proposed turbines that was originally sited within 0.5 mile of these nests. The USFWS accompanied UAMPS planners and engineers in the field and assisted with micro-siting turbines. In addition to considering the distance of a turbine to a nest, consideration was also given to topography and aspect of the nest with respect to the turbine. A few turbines are located within 0.5 mile of a red-tailed hawk nest, but in such cases the site-specific evaluation determined that the location of the turbine did not pose a high risk to the future breeding success of red-tailed hawks, nor did it increase the risk of collision of red-tailed hawks with the turbines.

## 4.2 Avoidance Measures in Project Design

The following avoidance measures were incorporated into the Project design:

- The Project has installed tubular turbines to reduce the ability of eagles to perch and to reduce risk of collision.
- The minimum number of lights has been installed to meet safety and Federal Aviation Administration (FAA) requirements as well as to reduce night sky lighting and impacts to birds and bats. FAA-approved red lights with short flash durations that emit no light during the “off phase” (i.e., those lights that have the minimum number of flashes per minute and the briefest flash duration allowable) will be used. Additionally, radar-activated lighting will be installed, and if approved by the FAA, will be used in place of continuously flashing lights.
- Auxiliary buildings will use lights that are motion sensitive rather than steady burning, and light will be cast downward.
- All electrical collection lines have been buried underground.
- Only two very short segments of line are aboveground (one from the Horse Butte substation to the Cattle Creek switchyard and one from the Cattle Creek switchyard to the existing Palisade-Goshen 115-kV line). These lines have been constructed to APLIC (2006) standards to reduce the likelihood of collision and electrocution.
- Guy wires can be hazardous to avian species; therefore, permanent met towers will be unguyed whenever practicable. If met towers must be guyed, guy wires will have USFWS-approved bird diverters installed to minimize collision risk.
- UAMPS initially proposed three permanent met towers, but subsequently reduced the number of met towers at the Project to one permanent met tower. Accordingly, the number of permanent met

towers has been kept to the minimum needed to accurately assess the wind resource in the Project Area. Three temporary met towers are also deployed in the Project Area to assess the feasibility of Phase 2.

- Turbines have been placed away from any edge of Willow Creek Canyon or similar ridge lines by at least 50 m in order to establish and maintain a non-disturbance buffer between the canyon and ridge line habitat and the Project. This distance was based on the risk factor analysis methods for individual turbines in the draft ECP Guidance (USFWS 2011a), which was the first version of the ECP Guidance to be released during turbine siting. The draft ECP Guidance defined *near*, in the context of individual turbine risk relative to placement adjacent to a ridge-crest or cliff edge, as "within 50 meters".
- Disturbance has been minimized by using existing roads, power lines, fences, and other infrastructure to the greatest extent practicable.
- The collection system in the vicinity of turbines 28 and 29 was moved to avoid two potential wetlands.
- The Operations & Maintenance building was originally going to be constructed on the Project site, but instead, the building was constructed in the town of Ammon to minimize the Project's footprint and eliminate operational lighting for the building within the Project site.

## 4.3 Impact Minimization Measures during Construction, Operation, and Decommissioning

The following impact minimization measures were implemented during construction and will continue to be implemented during operation and decommissioning as appropriate:

- Construction vehicle movement within the Project Area has been restricted to predesignated access, contractor-required access, and public roads.
- Vehicle collision risk with wildlife has been minimized by instructing Project personnel to drive at 25 miles per hour or less, be alert for wildlife, and use additional caution in low-visibility conditions.
- Surface restoration of temporary disturbance areas and restoration of construction roads not needed for operations included recontouring and reseeding with a seed mix approved by the Natural Resources Conservation Service, including seeding with native species as appropriate.
- Fire hazards from vehicles and human activities have been reduced (e.g., spark arrestors are used on power equipment, off-road driving is avoided).
- Management that indirectly results in attracting raptors to turbines, such as seeding forbs or maintaining rock piles that attract rabbits and rodents, has been avoided.
- Garbage and waste disposal on the Project site is managed to avoid creating attractive nuisances for wildlife.
- Stored parts and equipment, which may be used by small mammals for cover, have been moved away from wind turbines.
- When the Project is ready for decommissioning, the land used for operation of the facility will be restored to the original land use prior to construction within six months, according to the Use Authorization from Bonneville County and the conditions of the lease agreement with the landowner.

- Restoration will include the removal of all facilities (whether above or below ground) related to operating the Project. Disturbed lands will be reseeded with flora appropriate for the land use (e.g., native, agricultural, Conservation Reserve Program seed mixture). Local, state, and federal land management agencies will be consulted to determine the most appropriate seed mixture prior to seeding. A three-year weed abatement program will be implemented following reseeding.

## 4.4 Best Management Practices

The following best management practices (BMPs) will be implemented during operation of the Project to minimize impacts to eagles: Although they were developed for eagles, some of these measures will also address potential impacts to other avian species.

- **Invasive Species Management.** UAMPS has implemented a weed abatement plan which includes a Natural Resource Conservation Service approved a seed mix to be used in the Project Area in conjunction with the Conservation Reserve Program requirement. The seeds are obtained locally and are endemic to the area. UAMPS also consults with the County to manage invasive species.
- **Snow Management.** Snow banks can cause big game to run along roads, resulting in collisions with vehicles and increasing carcasses that are attractive to scavengers and eagles (USFWS 2011b). Therefore, snow banks along Project roads will either be removed or cuts will be created in snow banks at least every 500 feet that are large enough to allow ungulate movement across roads. This measure will reduce the prevalence of carcasses along roads, thereby preventing eagle attraction to the site and reducing the potential for collision.
- **Vegetation Management.** Natural materials (i.e., rock piles, woody debris piles) and tall vegetation (i.e., tall forbs, grass, weeds) will be removed/maintained beneath turbines to reduce shelter and forage for small mammals, thereby reducing prey availability for raptors and minimizing raptor foraging in proximity to turbines.
- **Wildlife Carcass Management Program.** Wildlife carcasses attract vultures, eagles, and other scavengers; therefore, the likelihood of collision increases when carcasses are present at a project site. UAMPS will work with local and state agencies to ensure the regular removal of any dead medium- and large-sized mammals from the area of the Project. If possible, UAMPS will work with IDFG to designate appropriate disposal areas for these carcasses that are safer and that could benefit the local eagle population. This measure is aimed at preventing eagle attraction to the site, reducing the potential for collision and impact to the regional eagle population. To reduce the likelihood of attracting eagles within the Project's footprint Project personnel will:
  - look for animal carcasses while traveling through the site. All carcasses identified will be reported to the site manager within 8 hours and removed from the site within 48 hours of notification.
  - look for kettles of vultures, eagles, or other scavenger birds that are circling in one area. Any kettles observed will be reported to the site manager within 8 hours, and the area below the kettle will be searched for carcasses within 24 hours. Any carcass found will be removed from the site within 48 hours of identification.
- **Power Line Marking.** Raptor strikes with power lines are a contributing factor impacting eagle populations. Therefore, improving visibility of those lines will help minimize overall mortality to bald and golden eagle populations. As approved by the necessary entities, visual markers will be placed on BPA's existing 115-kV power lines out to ten miles from the Project Area to minimize collision by bald and golden eagles and other raptors and migrating birds.

- **Risk Assessment.** Annual post-construction reports will discuss eagle fatalities in the context of predicted risk to assess the effectiveness of mitigation and adaptive management measures. The first annual post-construction report will describe post-construction fatality relative to the predicted risk and provide an updated predicted risk assessment based on use counts conducted during pre-construction and in year 1 post-construction. The second annual report will describe post-construction fatality relative to the updated predicted risk.

## 4.5 Worker Education Awareness Program

A worker education awareness program (WEAP) will be implemented during operation of the Project. Half-day training was given to all on-site personnel and Project operations staff on June 7, 2013. The WEAP provided instruction on avoiding harassment and disturbance of wildlife (including birds and bats), especially during reproductive (i.e., courtship, nesting) seasons. This training taught them to identify bird and bat species that may occur in the Project Area, record observations of these species in a standardized format, and take appropriate steps when downed birds and bats are encountered.

# 5 POST-CONSTRUCTION MONITORING AND REPORTING

As the developer of an "on-ramp" project, construction of which was underway when the Guidelines were developed in March 2012, UAMPS intends to comply with Stages 4 and 5 of the Guidelines. Along these lines, UAMPS intends (in drafting this ECP) to continue engaging in discussions with USFWS regarding the extent and design of post-construction studies to assess fatalities and habitat-related impacts and to conduct such post-construction studies for two years following commencement of operations. Additionally, as provided below, UAMPS will continue to communicate the results of these studies to USFWS. It is recognized that the post-construction monitoring plan—the methods and timeline described herein—may be adaptive as the Project progresses based on new scientific developments, USFWS feedback, and potential additional stipulations associated with an eagle take permit.

The post-construction monitoring plan includes all available and viable measures planned to avoid and minimize impacts to eagles, which are the focus of this ECP, as well as to non-eagle avian species and bat species that may occur during operation of the Project. However, as with any project, impacts that were not anticipated may occur during operation. This section provides methods to monitor and analyze both anticipated and unanticipated impacts that may occur during operation of the Project.

The primary objectives of post-construction monitoring and reporting are to document mean annual eagle, avian, and bat fatality rate, species composition of fatalities and to assess possible disturbance effects on eagle nests adjacent to the Project Area. Additionally, post-construction surveys will inform an adaptive management process; for example, fatality data will allow for identification of temporal and spatial patterns of fatalities.

## 5.1 Post-construction Fatality Monitoring

Post-construction monitoring for eagles is a critical component of this ECP. The initial post-construction monitoring will be used to estimate the actual level of fatality, compared with the estimated fatality (which may be qualitative if a quantitative estimate is not available) in the pre-construction risk analysis. Post-construction monitoring will be completed concurrently for eagles, other birds, and bats.

The primary objectives of fatality monitoring are to estimate eagle fatality rates for comparison with the model-based predictions prior to construction, to determine whether individual turbines or strings of turbines are responsible for the majority of eagle fatalities, and for any high-fatality turbines, to identify the factors associated with those turbines that might account for the fatalities and which might be addressed via conservation measures and advanced conservation practices (ACPs).

Detailed methods for these surveys are presented below. UAMPS may alter methods over time to incorporate new survey techniques and protocols as they become available.

### 5.1.1 Fatality Surveys

Surveys for eagle fatalities were initiated in September 2012 and will continue for two years following commencement of Project operations until August 2014 to evaluate fatality levels from operation of the Project. Following the detailed two-year fatality survey period, UAMPS will implement an internal monitoring program to be conducted by on-site workers to track fatalities for the rest of the life of the Project (see Section 5.3). Project personnel will report birds (including eagles) injured or killed due to Project operation, as well as any actions taken to address such events, to the USFWS BIMRS, maintained by the USFWS OLE. Per wildlife collection permit (Permit MB03589B-0) stipulations, reporting and disposition of carcasses will be handled differently for eagles, threatened and endangered species, and other migratory species and bats (see Section 5.1.4). As recommended by Strickland et al. (2011), approximately one-third (10; 31%) of the operating turbines will be systematically searched for carcasses. These 10 turbines will be randomly generated and stratified based on risk (i.e., proximity to ridgelines, habitat type, and proximity to active eagle nests) prior to the initial survey. UAMPS will communicate with the USFWS prior to final turbine selection. The same 10 turbines will be sampled each survey period to account for correction bias correction factors when estimating fatality rates.

Consistent with other long-term post-construction avian fatality surveys at wind energy facilities (Erickson et al. 2003; Erickson et al. 2004; Strickland et al. 2011; Young et al. 2003), but adapted for the Project, these surveys will occur throughout the year to evaluate the overall impacts to birds and bats. The 10 operating turbines will be surveyed at varying levels of frequency throughout the year. During peak spring migration (March 16–May 15) and peak fall migration (August 16–November 15), operating turbines will be surveyed every seven days. During other times of the year (November 16–March 15, May 16–August 15) operating turbines will be surveyed every other week. After year 1, carcass persistence studies will inform an adaptive process to determine whether monitoring intervals are appropriate for the site (see Section 5.1.3). Surveys will be conducted across a four- or five-day period during each survey session. Personnel trained and tested in proper search techniques will conduct the surveys.

Survey plots will be 134 × 134 m (17,956 $m^2$), centered on the wind turbine mast. Most birds and bats killed by wind turbines are found within 63 m of the turbine (reviewed by Young et al. 2003); therefore, surveying a plot that measures 134 × 134 m will ensure that all areas within 63 m of the turbine are surveyed. Searchers will look incidentally outside the 134 m × 134 m plots when conducting the survey. Although circular survey plots have been used for other fatality surveys (Baerwald et al. 2009; Kerns and Kerlinger 2004), Young et al. (2003) employed rectangular plots for ease of use, and others (e.g., Arnett et al. 2009; Erickson et al. 2000, SWCA 2013, Thompson et al. 2011) have used a similar plot shape (e.g., 126 × 120 m, 100 × 100 m, 120 × 120 m, 150 × 150 m) for fatality surveys. Transects will be spaced at 6-m (20-foot) intervals, with surveyors searching for 3 m (10 feet) on both sides of each transect (Arnett et al. 2009; Erickson et al. 2003; Erickson et al. 2004). After year 1, the distances at which carcasses were located from the turbine mast will be examined. Potential adjustment of the sampling frames will be based on the 95% confidence interval of the median distance of carcasses from turbine masts.

Data collected for each carcass will include, but will not be limited to, species, age, sex, estimated time since death, condition, type of injury, cover type, global positioning system (GPS) coordinates, distance to nearest wind turbine generator location, distance to nearest road, and distance to nearest structure. On the night before each survey session, wind speed, wind direction, temperature, and barometric pressure will be recorded using data collected by the met towers. In the field, surveyors will record wind speed, direction, temperature, sky conditions, precipitation events, and visibility at time of survey. All observed carcasses will be photo-documented and identified to the lowest taxonomic level possible using field notes, *The Sibley Guide to Birds* (Sibley 2000), and *Peterson Field Guide to Mammals of North America* (Reid 2006) as primary references.

Per the USFWS (2013a:Appendix H) recommendation, data on eagle carcasses found will include the date, species, age and sex when possible, band number and notation if wearing a radio transmitter or auxiliary marker, observer name, turbine or pole number or other identifying character, distance of carcass from turbine or pole, azimuth of carcass from turbine or pole, decimal-degree latitude longitude or UTM coordinates of the turbine/pole and carcass, habitat surrounding the carcass, condition of the carcass (entire, partial, scavenged), description of the carcass (e.g., intact, wing sheared, in pieces), rough estimate of time since death (e.g., less than one day, more than one week) and how estimated, digital photograph of the carcass, and information on carcass disposition.

Searcher efficiency studies and carcass removal studies will be done to quantify searcher bias and determine the rate at which carcasses are removed by scavengers or by other means. The results of these studies will be used to develop correction factors to estimate adjusted fatalities for the Project and for each surveyed turbine, as appropriate. Additionally, survey intervals may need to be adjusted based on the findings for these studies to ensure the use of precise correction factors, using methods similar to those described by Huso (2008, 2011).

### 5.1.2 Searcher Efficiency Studies

The primary objective of searcher efficiency studies is to estimate the percentage of bird and bat carcasses that searchers are able to find. Estimates of searcher efficiency are then used as a correction factor to calculate adjusted fatality. Searcher efficiency studies will closely follow methods described in previous studies (Arnett et al. 2009; Erickson et al. 2003; Erickson et al. 2004). Searchers will search for carcasses using the same methods presented in Section 5.1.1. The studies will be conducted four times per year (once per season) for up to two years following commencement of Project operations. The studies will be conducted for each two-person searcher team. Searcher efficiency studies 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 surveyors 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 studies will not address fluke events, such as snow in June, they will address field conditions relevant to the overall time period.

Separate searcher efficiency rates will be determined for the following categories:

- Bats
- Large birds, defined here as
  - raptors (Falconiformes [diurnal birds of prey] and vultures);
  - waterfowl (Anseriformes, or ducks, geese, and swans); and
  - waterbirds (bitterns, herons, egrets, ibises, and cranes)
- Small birds (nonlarge bird species, primarily passerines)

Carcasses of species that approximate the size of each species in these categories will be used for searcher efficiency studies, and these carcasses will be obtained from RodentPro. Mouse carcasses will be used to represent bats, quail carcasses will be used to represent small birds, and chicken carcasses will be used to represent large birds (Erickson et al. 2000; SWCA 2013). These surrogates are proposed as they are readily available and used by other similar studies; however, we will examine using other representative carcasses (e.g., bats to represent bats, pheasants to represent large birds) during the course of the study. Carcasses will be distributed throughout five of the survey plots, in locations unknown to the searchers.

Prior to initiating the searcher efficiency study, 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 to avoid predator swamping. An additional biologist who is not participating in the searcher efficiency studies will plant carcasses at these predetermined turbines. 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 fatalities. The biologist will record the location (taken of each carcass with a GPS unit), ground cover type, vegetation, turbine number, date, and time.

When surveyors locate a placed carcass, they will record the location using a handheld GPS unit, which will be compared in GIS to the locations recorded during placement. The percentage of planted mice, quail, and chickens located by surveyors will be used to generate a correction factor (by turbine as appropriate) to estimate the actual number of bats or birds killed, based on the number of observed fatalities

Searcher efficiency rates are expressed as the proportion of study carcasses that are detected by searchers in the searcher efficiency studies. These rates will be grouped by carcass size and season for the adjusted fatality estimate. The data will not be stratified by vegetation cover type, as the adjusted fatality estimate analysis only allows for one to two covariates (i.e., season and/or carcass size) and vegetation cover type is similar throughout the site (i.e., limited by sample size). In order to have an adequate sample size, 10 carcasses per stratum (i.e., bats, large birds, small birds) per season will be used.

### *5.1.3 Carcass Removal Studies*

The objectives of the carcass removal studies are to document the length of time carcasses remain in the surveyed area and are available to be found by searchers and to determine the appropriate frequency of carcass searches for turbine-associated fatalities within the search plots. Carcass removal studies will be completed seasonally and concurrently with the searcher efficiency studies described above. Different seasonal rates for carcass removal are necessary to address changes in scavenging throughout the season, as well as over time, because scavengers adapt to novel food sources.

Carcasses will be placed as described for searcher efficiency studies. They will be checked at intervals similar to those used by Erickson et al. (2003) and Young et al. (2003) on days 1, 2, 3, 5, 6, 7, 10, 14, 21, and 28 following placement, or until they are all removed. Separate carcass removal rates will be determined for bats, small birds (passerines), and large birds (raptors). All animals used in the carcass removal studies 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 study (Arnett et al. 2009).

The mean carcass removal rate will be derived from the carcass removal studies and will be used to adjust the search interval. For example, if the mean number of days that a carcass persists is six days (other studies have shown a range of two to 52 days), then search intervals of 12 days would be recommended. The appropriate frequency of searches will be investigated after year 1. Estimates of the probability that a carcass was not removed in the time between surveys, and therefore was available to be found by searchers, will be used to adjust carcass counts for removal bias (Huso 2011; Huso et al. 2012).

### 5.1.4 Adjusted Fatality Estimates

Unadjusted (observed) fatalities (i.e., raw carcass counts) and adjusted fatality estimates (raw carcass count data adjusted for imperfect detectability) will be presented in annual reports to be submitted during the first quarter in each of the first two years following commencement of Project operations, as discussed in greater detail in Section 5.4.1. Adjusted fatality estimates are based on observed carcasses found during formal carcass searches, the probability that a searcher will miss a carcass (searcher efficiency correction factor), the probability that a carcass will be removed before a searcher can locate it (carcass persistence correction factor), and the proportion of turbines searched to the total number of turbines at the facility. There are several statistical estimators available for calculating adjusted avian fatality estimates. In instances when searcher efficiency is low and carcass persistence time is short, sophisticated statistical estimators (e.g., Erickson et al. 2004; Huso 2011; Korner-Nievergelt et al. 2011) tend to overestimate the number of fatalities (Korner-Nievergelt et al. 2011). Huso (2011) showed that her estimator was more reliable than two commonly used estimators (Johnson et al. 2003 and Kerns and Kerlinger 2004), while Korner-Nievergelt et al. (2011) showed the estimators (Erickson et al. 2004; Huso 2011; and Korner-Nievergelt et al. 2011) performed similarly. Korner-Nievergelt et al. (2011) suggest that there may be no estimator that produces unbiased estimates in all situations due to heterogeneity in carcass persistence time and detectability related to carcass coloration and size; predator behavior; microclimate; season; vegetation height, type, and density; and differing search intervals and study periods between studies.

Avian fatality estimates will be calculated using an industry-accepted statistical estimator; searcher efficiency and carcass persistence results may inform the specific estimator used. The statistical estimator used in Huso (2011) and Huso et al. (2012) is currently thought to be reliable for reducing biases in the data. The estimator also can account for unsearched areas within the search plot. Adjusted avian fatality estimates will be presented by summary groups (i.e., birds overall, small birds, and large birds) per year for the total Project Area, per turbine per year, and per MW per year. Because adjusted fatality estimates are calculated for summary groups and not for individual species, if an eagle fatality is found, raw carcass data will be presented by eagle species.

### 5.1.5 Permits and Surveyor Qualifications

SWCA will be conducting the post-construction avian fatality and disturbance monitoring on UAMPS' behalf. SWCA is UAMPS' environmental contractor for the project and sub-permittee on the USFWS's Special Permit–Utility (SPUT) permit (50 CFR § 21.27) approved by USFWS on April 16, 2013 and IDFG's Scientific Collection Permit issued April 9, 2013. Among other things, these permits authorize the collection, transport, and temporary possession of migratory birds and bats found dead on utility property, structures, and rights-of-way for fatality monitoring purposes. SWCA biologists will be responsible for the proper handling and reporting of bird fatality and disturbance over the course of the Project. The biologists listed in the SPUT permit were responsible for characterization of the baseline avian conditions in and around the Horse Butte Project Area. Full descriptions of each biologist's background and expertise, including resumes, are included in the SPUT permit. The biologists are highly qualified to conduct baseline avian surveys (for large birds and passerines), eagle use surveys, avian nest surveys, avian migration surveys, avian fatality and disturbance surveys, and eagle tagging and telemetry.

### 5.1.6 Detection Procedures and Protocols

Per wildlife collection permit (Permit MB03589B-0) stipulations, the USFWS Eastern Idaho Field Office (FO) and OLE will be notified within 24 hours if any federally listed species or eagle is detected during avian fatality surveys. Any state-listed species fatality will be reported to IDFG within 48 hours.

If any eagle carcasses are found, the local USFWS Eastern Idaho FO and USFWS OLE will be contacted immediately to communicate best course of action. OLE preference regarding eagle carcass handling and disposition will be determined prior to conducting fatality searches. A freezer will be available at the Project's Operations and Maintenance building located nearby in Ammon, Idaho, for storage as needed. When a dead eagle is found, the following information will be recorded on a fatality data sheet: date, species, age and sex (if possible), band number and notation if wearing a radio-transmitter or auxiliary marker, observer name, turbine or pole number or other identifying characteristic, distance of the carcass from the turbine or pole, azimuth of the carcass from the turbine or pole, decimal-degree latitude and longitude or UTM coordinates of the turbine or pole and carcass, habitat surrounding the carcass, condition of the carcass (entire, partial, scavenged), description of the carcass (e.g., intact, wing sheared, in multiple pieces), a rough estimate of the time since death (e.g., less than one day, more than one week) and how estimated, a digital photograph of the carcass, and information on carcass disposition.

## 5.2 Disturbance Monitoring

Although the Project was sited based on pre-construction surveys to avoid and minimize proximity to any observed eagle nests, it is possible that the Project could potentially affect nest occupancy of eagles located adjacent to (i.e., within the mean inter-nest distance of the Project Area boundary) the Project Area as a result of the Project's operation. Therefore, UAMPS will monitor disturbance to eagles for two years following commencement of operations. The objectives of disturbance monitoring will be to compare pre- and post-construction nest occupancy.

Qualified biologists will survey known golden and bald eagle nests by helicopter within the mean inter-nest distance of the Project Area boundary to determine nest occupancy. Survey methods will follow those described in USFWS (2013a) and Pagel et al. (2010). Two annual aerial surveys completed in the following general time periods will be conducted annually for the Project Area:

1. Survey 1 – First Occupancy Survey. Conducted in early spring, a time of peak golden eagle nest occupancy when most adults have engaged in nest construction and/or repair; adults may be incubating at this time.
2. Survey 2 – Second Occupancy Survey. Conducted in mid-spring for determining nest occupancy when most active nests contain incubating adults or young nestlings.

Surveys will focus on determining nest occupancy; however, specific nest contents (e.g., egg[s], adult in incubation posture) will be recorded during each survey for reporting active nests.

Only biologists with at least three years of relevant survey experience, as specified by Pagel et al. (2010), and GIS specialists experienced in aerial eagle surveys will conduct the aerial surveys. GPS navigation equipment will be used, enabling the biologists, GIS specialist, and pilot to navigate to all nests, nesting habitats, and territories, whether already known or recently delineated as potentially suitable. Use of GPS units allows for collection of data points and transects and backup of data. Several backup data collection devices will be used to ensure high-quality data collection while in-flight, streamlining data entry and quality assurance/quality control. Additionally, a digital camera will be used to document nest condition and contents for each recorded nest. Aerial nest surveys will be sensitive to nest disturbance of nests and will be conducted during weather conditions favorable for aerial surveys.

If monitoring shows strong evidence of direct disturbance from the Project, UAMPS and the Service will consider additional ACPs that would be effective in reducing the effect.

## 5.3 Long-term Project Monitoring

Following the completion of the initial two years of post-construction monitoring, UAMPS will implement an internal monitoring program, which will be used by on-site Project personnel to record avian and bat fatalities over the long-term duration of operation. The intent of this monitoring program will be to ensure that the turbines at the site are frequently inspected for possible avian or bat impacts and that if impacts are identified, they are recorded, agencies are notified, and mitigation measures are identified and implemented. The monitoring program will be used for the life of the Project beginning after the first two years of post-construction monitoring studies. The main purposes are as follows:

- To provide a means of recording and collecting information on incidental avian and wildlife species found dead or injured within the Project Area by on-site Project personnel.
- To provide a set of standardized instructions for on-site Project personnel to follow in response to wildlife incidents in the Project vicinity.
- To keep on-site Project personnel mindful of wildlife interactions.

The following occurred during the first year of operations and will continue through the duration of operations:

- A WEAP will be provided to all contractors, Project operations staff, and other personnel who will be on-site on a regular basis. This training will teach them how to identify bird and bat species that may occur in the Project Area, record observations of these species in a standardized format including photo documentation, and take appropriate steps when downed birds and bats are encountered.
- Standardized data forms will be prepared and provided to on-site Project personnel.

The following will occur during operation, beginning in the fourth year after construction:

- Each time a turbine is visited by on-site Project personnel (typically at least once per month), it will be searched for carcasses via pedestrian survey.
- Pedestrian surveys to search for carcasses will cover the area immediately surrounding the turbine (concentric circles out to 10 m).

The following will occur if dead or injured birds or bats are found at the Project by on-site Project personnel:

- The Project manager will be notified immediately, and the Project manager will in turn notify the USFWS. If the fatality of a species listed under the Endangered Species Act or an eagle is recorded, the finding will be reported within 24 hours, if not sooner, and entered into BIMRS within five days of observation. If other migratory bird species fatalities are observed, they will be reported and entered into the BIMRS within 10 days of observation).
- The animal will not be moved or removed by any individual who does not have the appropriate permits.
- The location will be recorded using a GPS unit.
- An Avian and Wildlife Reporting form will be filled out, and photos will be taken. This information will be turned in to the Project manager and provided to the USFWS.
- Permits are required to handle wildlife. The Project manager will coordinate with the USFWS to arrange transportation and treatment of an injured threatened or endangered species or eagle. At the Project’s cost, animals that are approved for removal/relocation will be taken to a local

USFWS-approved rehabilitation center or disposed of as recommended by the USFWS. Non-eagle carcasses and parts will be legally distributed via licensed repositories.

## 5.4 Reporting

### 5.4.1 Initial Monitoring Reporting

Annual reports will be completed in the first quarter of each of the first two years following commencement of Project operations and provided to the USFWS for review. Reports will detail the findings of fatality surveys and avian use counts. Annual reports will also include a validation of risk assessments based on pre-construction data by comparison with post-construction data indicating realized impacts to birds and bats from Project operation.

Fatality data will first be assessed for bats, large birds, and small birds by sample area to determine the estimated fatality for the Project during that survey period using the following equation:

$$M_E = (M_O/T_S)(T_A)(C_E)(C_S).$$

$M_E$ equals the total estimated fatality for a sample area for bats, large birds, or small birds. $M_O$ equals the actual mortality observed in a sample area. $T_S$ is the number of turbines surveyed in a sample area. $T_A$ equals the total turbines in a sample area. The searcher efficiency ($C_E$) and carcass removal rates ($C_S$) will be calculated for each sample area and applied. The most recent acceptable methods (such as Huso 2011, Huso et al. 2012) will be used to determine searcher efficiency and scavenger rate correction factors. Estimated fatality for the entire Project during a survey period would be calculated by adding the $M_E$ values for all sample areas.

Overall fatality data for each category (bats, large birds, and small birds) will be presented per MW per year, per turbine per year, and per 100,000 $m^2$ Rotor Swept Area (RSA) per year. Species-specific fatality data will be presented as raw data. Adjusted fatality estimates will be presented for both eagle species; however, it should be noted that caution is used when interpreting adjusted fatality estimates for groups with fewer than five observed fatalities (Huso et al. 2012). Because adjusted fatality is calculated by groups (i.e., carcass type, season, sensitivity classification), correction factors are not generally used to adjust individual species numbers.

UAMPS has set up an account in the BIMRS database for submission of documentation on bird fatalities. The data will be entered into this system within five business days following completion of the survey round's tracking sheets. If golden or bald eagle fatalities are recorded, the data will be reported to the USFWS within 24 hours, or sooner, and entered into BIMRS within five days of observation. These data will be available for review and broad-scale evaluations by the USFWS OLE, as is done for the electric utility industry (APLIC 2006).

### 5.4.2 Long-term Monitoring Reporting

After the first two years following commencement of Project operations, the data will be logged in a tracking spreadsheet maintained by the Project manager and presented in annual reports to the USFWS. As allowed by law, confidentiality will be maintained between UAMPS and all agencies reviewing the Project reports.

# 6 COMPENSATORY MITIGATION MEASURES AND ADAPTIVE MANAGEMENT

UAMPS is proposing to implement compensatory mitigation consistent with the ECP Guidance (USFWS 2013a). This section identifies mitigation and adaptive management techniques to offset eagle mortality associated with operation of the Project that could affect species' populations with the goal of ensuring no net loss of eagle populations. These measures are being designed to improve birth rates regionally and reduce eagle collisions and deaths.

## 6.1 Compensatory Mitigation through Power Pole Retrofitting

Power pole electrocution has been shown to cause a significant number of eagle fatalities. Therefore, retrofitting electric poles is an effective way to minimize fatalities in the population generally (USFWS 2013a). Retrofits are also an effective and quantifiable compensatory mitigation measure that may be used to offset any fatalities that may occur as a result of operation of the Project. The USFWS recently provided resource equivalency analysis (REA) models for calculating appropriate golden eagle and bald eagle compensatory mitigation values for power pole retrofits (USFWS 2013a). The REAs for power pole retrofits use currently available information on golden and bald eagle life history inputs, effectiveness of retrofitting lethal electric poles, and an estimated annual take to develop a framework for power pole retrofits as compensatory mitigation for golden and bald eagle fatalities.

The USFWS defined eagle population demographics in the model (i.e., age distribution, age-specific survival rates, fledgling rate per eagle pair, and reproductive lifetime). These definitions represent assumptions about the population and are provided in the ECP Guidance (USFWS 2013a), in Table G-1 for golden eagles and in Table G-2 for bald eagles. At this time, UAMPS has no information about the Horse Butte eagle population that would cause an adjustment of these definitions. Thus, they will remain constant throughout the analyses.

Other variables that remain constant include an annual discount rate of 3%, a permit length of five years (assuming a constant eagle fatality rate for that period), the permit being issued in 2014, take starting in 2013, reproduction loss starting in 2014, and an analysis length of 30 years (the life expectancy of both golden eagle and bald eagle). On the mitigation side, it is assumed that pole retrofitting occurred in 2013 and the relative productivity of retrofitting electrical poles is 0.0036 eagle electrocution prevented per pole per year (USFWS 2013a). The analysis length exceeds the permit length because the eagles killed during the lifetime of the permit are expected to result in impacts (loss of eagle-years for those individuals killed and forgone reproduction by those individuals) that extend beyond five years.

## 6.2 REA Analysis Inputs

SWCA used the REA model prepared by the USFWS to estimate the amount of mitigation required (i.e., the number of electrical poles that need to be retrofitted) to offset estimated golden eagle and bald eagle fatalities at the Project. The data inputs to the REA included:

- The number of eagles killed during the five years permitted
  - Golden eagles: 3.10 eagle fatalities annually (80% upper credible interval)
  - Bald eagles: 2.12 eagle fatalities annually (80% upper credible interval)
- The length of time the pole retrofit is productive
  - 30 years

- 50 years

## 6.3 REA Analysis Results

The REA model measured indirect loss of eagles for two generations. The values of all resources analyzed are converted to present value using an economic discount rate, so the “currency” for balancing the losses and gains in this analysis is present value (PV) eagle-years.

The total debit (in PV eagle-years) accrued due to direct and indirect loss of eagles over five years of wind farm operation are summarized in Table 6. The total credit produced per retrofitted electrical pole (in PV eagle-years) is compared among two durations of pole retrofit productivity for eagles (Table 7). Using the REA results in a calculation of the number of poles that need to be retrofitted to mitigate for eagle fatalities anticipated with wind farm operation, and the total debit is divided by the credit per retrofitted pole. Mitigation due varied with eagle fatality rate, pole retrofit productivity, and the duration of retrofit productivity for eagles (Table 8).

**Table 6.** Total Debit (measured in PV eagle-years) Associated with Direct and Indirect Losses of Golden Eagles Resulting from Five Years of Wind Farm Operation

| Species | 80% Upper Credible Interval Fatality Estimate |
|---|---|
| Golden eagle | 190.04 |
| Bald eagle | 105.12 |

**Table 7.** Total Credit (measured in PV eagle-years) Associated with Avoiding Eagle Losses by Retrofitting Electrical Poles for Two Durations of Retrofit Productivity

| Species | Duration of Pole Retrofit Productivity (years) | Total Credit for Avoided Eagle Losses (PV eagle-years/pole) |
|---|---|---|
| Golden eagle | 30 | 0.97 |
| | 50 | 1.28 |
| Bald eagle | 30 | 0.79 |
| | 50 | 1.04 |

**Table 8.** Total Number of Electrical Poles That Need to Be Retrofitted to Offset Loss of Eagles in Five Years of Permitted Wind Farm Operation

| Species | Duration of Pole Retrofit Productivity (years) | Number of Electrical Poles to Retrofit |
|---|---|---|
| Golden eagle | 30 | 195.35 |
| | 50 | 148.82 |
| Bald eagle | 30 | 133.59 |
| | 50 | 101.77 |

The estimation of the number of electrical poles to retrofit generated by the REA is based on a conservative over-estimate of eagle fatality (i.e., the 80% upper credible interval of the fatality estimate) and is intended to plan for a larger number of eagle fatalities than is likely to occur. The number of electrical poles to be retrofitted in Table 8 represents the maximum amount of mitigation that would be necessary to mitigate for a worst-case scenario of eagle fatalities under a five-year eagle take permit.

## 6.4 Compensatory Mitigation Commitment

HBW proposes conducting compensatory mitigation to ensure that there is no net loss to the local bald and golden eagle populations. Mitigation for the Project will be achieved through retrofitting "high risk" transmission and distribution power poles (as defined in Section 6.1.1) near the Project.[7] The compensatory mitigation commitment is based on the Service's REA model as proposed in the April 2013 version of the ECP Guidance. The REA model makes two assumptions: (1) retrofits are presumed effective for 10 years through proper operations and maintenance and (2) the relative productivity of retrofitting is presumed to be 0.0036 eagle electrocution per pole per year, based on Lehman et. al (2010). Based on conversation with Service staff and consistent with ECP Guidance,[8] HBW proposes to use 30 years as the presumed effectiveness of retrofits. HBW's compensatory mitigation commitment is summarized in Table 9.

HBW's proposed compensatory mitigation assumes that a retrofit is effective for 30 years, not 10 years. Presuming the effectiveness of retrofitting at 10 years is inconsistent with what utility personnel experience with installing and maintaining retrofits. Utility personnel, with whom HBW will likely contract to perform the retrofits, believe the retrofits will remain effective for 30 years through proper maintenance, repair or replacement as may be necessary. This 30-year effectiveness is supported by manufacturing data as well as by personnel experience. To this end, when HBW contracts with third-party utilities to carry out retrofit work, those contracts will provide that proper operations and maintenance work is undertaken to achieve a 30-year effective useful life for the installed retrofit. In other special cases, HBW will present the Service with retrofits that should receive an effective useful life of longer than 30 years. For example, HBW has been in discussions with a local utility near the Project regarding a partnership to pay for the complete rebuild of non-APLIC compliant power poles. For these rebuilt poles, HBW proposes, based on utility data, that a useful life of 50 years should be recognized by the Service.

**Table 9.** Summary Compensatory Mitigation Commitment for Five-Year Term

| | Bald Eagle Mitigation | Golden Eagle Mitigation |
|---|---|---|
| Retrofit commitment | | |
| Total retrofits over five-year permit term | 134 poles* | 195 poles* |
| Annual number of poles to be retrofitted | 27 poles | 39 poles |
| Assumptions | | |
| Takes per year | 2.12 takes per year | 3.1 takes per year |
| Duration of pole retrofit productivity | 30 years | 30 years |

Note: The total number of poles to retrofit may decrease if the Service and HBW agree on a lower fatality estimate at the two year true-up point or if certain retrofits take the form of rebuilding non-APLIC compliant poles.

[7] Retrofits will be prioritized to be undertaken within the same local area population.

[8] Appendix G of the ECP Guidance (USFWS 2013a:90): "The Service uses a period of 10 years for crediting the project developer or operator for the avoided loss of eagles from power pole retrofits. This is a reasonable amount of time to assume that power pole retrofits will remain effective. However, project developers or operators should consider entering into agreements with utility companies or contractors for the long-term maintenance of retrofits. Evidence of this type of agreement could increase the amount of credit received by the project developer or operator and, as a result, decrease the amount of compensatory mitigation required."

### 6.4.1 Up-front Mitigation

#### ELECTRICAL POLE RETROFITS

Although the ECP Guidance suggests that the compensatory mitigation obligation commences coincident with signing a programmatic take permit,[9] HBW is in conversations with partner utilities to begin implementing compensatory mitigation as soon as practicable.

Applying the USFWS's REA with an assumed annual take for the Project of 3.10 golden eagles per year and 2.12 bald eagles per year (equating to a permitted take of 15.5 golden eagles and 10.6 bald eagles for the five-year permit term), the estimated total debit is 190.04 PV golden eagle-years and 105.12 PV bald eagle-years for the duration of the permit. Applying a 30-year duration of power pole retrofit productivity, the REA calculates the mitigation owed for golden eagles as 195 power pole retrofits and for bald eagles as 134 power pole retrofits. This equates to an estimated 13 poles for each golden eagle or bald eagle take.

Accordingly, UAMPS will commit to retrofitting a total of 26 poles within the Eagle Management Unit(s) defined in USFWS (2009) within which the Project is located and as close as feasible to the Project Area to bring them up to current APLIC standards, including anti-electrocution devices, within the first year after the permit is issued, or if no permit is issued, within two years after the Project became operational. This would effectively provide advance mitigation credit for two future eagle fatalities, based on recently revised calculations based on data provided by the USFWS on August 2, 2013.

#### Methods for Identifying Poles to Retrofit

With its partner utilities, HBW will prioritize the retrofitting of transmission or distribution poles at which there has been known eagle mortality by electrocution. Additionally, information obtained from HWI's communications with partner utility personnel, HBW will identify poles to retrofit that have not been identified as resulting in an eagle mortality as a result of electrocution but are likely to result in eagle mortality due to being non-APLIC compliant and posing a risk due to local factors. Such local factors may include: proximity of the pole to a known eagle nest, prey density near the area, known eagle habitat, proximity of the pole to key foraging spots (e.g., water for bald eagles and cliff lines for golden eagles) and proximity to known communal roost sites or migration corridors. Analysis of these factors will consist of scoring candidate poles, setting a minimum score for poles to qualify for retrofitting, and then prioritizing the poles with the highest score/risk.

#### Identification of Hot Spots

In addition to employing the methods described above, HBW will work with partner utilities to help identify "hot spot" areas as they emerge. "Hot spot" areas are locations where eagle mortality risk was previously thought to be low, but mortality has suddenly increased due to a variety of factors such as shift in eagle populations, habitat, prey availability, or other factors. If a "hot spot" area is identified, then HBW and the partner utility will work together to develop a plan to focus retrofits or other remedial measures in that area.

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[9] ECP Guidance (USFWS 2013a:21) states "the initial compensatory mitigation contribution effort should be sufficient to offset take at the upper 80% confidence limit (or equivalent) of the predicted number of eagle fatalities per year for a five-year period starting with the date the project becomes operational (*or, for operating projects, the date the permit is signed*)" (emphasis added).

### Tracking Retrofit Work during the Permit Term

As part of its annual eagle report, HBW will provide an accounting of the poles retrofitted in the previous year, monitoring data analyzing the efficacy of those retrofits, and a forecast of what poles will be retrofitted in the coming year.

### Post-Installation of Retrofit Monitoring

Retrofitted poles will be monitored for the first two years after installation to assess its effectiveness. For the first two years after retrofitting, trained biologists will complete monthly surveys for all retrofitted poles to look for mortalities as well as eagle use. Consistent with the ECP Guidance regarding adaptive management as a component of compensatory mitigation, any failures at retrofitted poles will be analyzed to determine what additional measures can be employed. Monitoring staff will report any mortalities to the Service using the appropriate protocols depending on the type of bird.

### FUNDING FOR WILDLIFE MANAGEMENT AREAS

Since 2011, UAMPS has been working with IDFG to facilitate the purchase of 120 acres of private land within the Tex Creek WMA. UAMPS created the Horse Butte Wildlife Fund and has deposited $150,000 into the fund to facilitate the purchase. The amount escrowed by UAMPS to facilitate the purchase is intended to allow IDFG to expand and perpetuate wildlife habitat in and around the Tex Creek WMA by securing sensitive areas of habitat and wildlife migration corridors.

## 6.5 Advanced Conservation Practices

HBW agrees to undertake implementation of advanced conservation practices (ACPs) at the conclusion of the five-year permit term, only if (1) the compensatory mitigation has not been effective to offset the actual take compared to the compensatory mitigation performed; and (2) the total cost of implementing the ACP shall not exceed fifty thousand (50,000) U.S. dollars.

## 6.6 Two-Year True-Up Point

Two years after the date of issuance of the programmatic take permit, HBW suggests that HBW and the Service convene to discuss the following: (1) the effectiveness of the retrofits performed; (2) the accrual of eagle take credits based on the number of retrofits installed being greater than what was required based on the fatality estimate model and REA model used to determine the retrofit debit owed by HBW; (3) revision of the estimated fatality for HBW and consequently the required compensatory mitigation obligation;[10] (4) results of disturbance monitoring; (5) the necessity of continuing post-construction monitoring; and (6) the need to conduct meta-analysis to satisfy adaptive management obligations by utilizing data from other wind farms.

## 6.7 Tiered Mitigation Approach with Adaptive Management

UAMPS proposes to retrofit additional power poles for each take beyond the permitted amount during the permit term as discussed below, should it occur. The power poles to be retrofitted will be selected

[10] See Table 2 of the ECP Guidance (USFWS 2013a:24), which states that the Service may "[e]ffect any necessary adjustments by crediting back excess compensatory mitigation, or by assessing additional compensatory mitigation for fatalities in excess of predictions."; see also "the permittee will receive a credit for the excess compensation (the difference between the actual mean and the number compensated for)" (USFWS 2013a:30).

according to criteria developed by HWI for HBW. The selection criteria will be provided to USFWS for their review and endorsement.

### TIER 1

- **Trigger:** Tier 1 would be triggered by the first eagle fatality associated with the Project.
- **Compensatory Mitigation:** A total of 13 “high risk” power poles would be retrofitted according to the methods described in Section 6.4.3. In addition, the circumstances of the fatality as recommended by the USFWS (2013a:Appendix H) and detailed in Section 5.1.1 will be recorded and reported to the USFWS and IDFG.

### TIER 2

- **Trigger:** Tier 2 would be triggered by the second eagle fatality associated with the Project.
- **Compensatory Mitigation:** A total of 13 “high risk” power poles would be retrofitted according to the methods described in Section 6.4.3. In addition, the circumstances of the fatality as recommended by the USFWS (2013a:Appendix H) and detailed in Section 5.1.1 will be recorded and reported to the USFWS and IDFG.

### TIER 3

- **Trigger:** Tier 3 would be triggered by the third eagle fatality associated with the Project.
- **Compensatory Mitigation:** A total of 13 “high risk” power poles would be retrofitted according to the methods described in Section 6.4.3. In addition, the circumstances of the fatality as recommended by the USFWS (2013a:Appendix H) and detailed in Section 5.1.1 will be recorded and reported to the USFWS and IDFG. If there is evidence of a pattern, UAMPS will provide the data to the USFWS and IDFG and discuss whether the data suggest additional actions that could be taken to reduce risk to eagles.

### ADDITIONAL TIERS

- Additional tiers would be activated by additional eagle fatalities found.
- This compensatory mitigation will pre-emptively offset all estimated take for the project term and provide additional mitigation for each documented take. At the end of the five-year permit period, UAMPS would work with the USFWS to revise the fatality estimate for the next five-year permit period if the number of fatalities found differed from the predictions for the initial permit.

# LITERATURE CITED

Allison, T.D. 2012. *Eagles and Wind Energy: Identifying Research Priorities.* Washington, D.C.: American Wind Wildlife Institute.

American Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Raptor Protection on Power Lines; the State of the Art in 2006*. Washington, D.C., and Sacramento, California: Edison Electric Institute, APLIC, and the California Energy Commission.

Arnett, E.B., M. Schirmacher, M.M.P. Huso, and J.P. Hayes. 2009. *Effectiveness of Changing Wind Turbine Cut-in Speed to Reduce Bat Fatalities at Wind Facilities.* Annual report submitted to the Bats and Wind Energy Cooperative. Austin, Texas: Bat Conservation International.

Baerwald, E.F., J. Edworthy, M. Holder, and R.M.R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. *Journal of Wildlife Management* 73(7):1077–1081.

Chatfield, A., and W. Erickson. 2011. *Golden Eagle Information for the North Sky River Wind Resource Area Kern County, California, Draft Report.* Cheyenne, Wyoming, and Walla Walla, Washington: Western EcoSystems Technology, Inc.

*Daily Journal of Commerce.* 2010. Grande Ronde area residents debate merits of massive wind farm. September 14. Available at: http://www.katu.com/news/business/102884509.html. Accessed December 16, 2011.

Driscoll, D.E. 2010. *Protocol for Golden Eagle Occupancy, Reproduction, and Prey Population Assessment.* Apache Junction, Arizona: American Eagle Research Institute.

Erickson, W.P., B. Gritski, and K. Kronner. 2003. *Nine Canyon Wind Power Project Avian and Bat Monitoring Report, September 2002–August 2003.* Submitted to Energy Northwest and the Nine Canyon Technical Advisory Committee. Cheyenne, Wyoming: Western Ecosystems Technologies, Inc.; Pendleton, Oregon: Northwest Wildlife Consultants, Inc.

Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. *Stateline Wind Project Wildlife Monitoring Final Report, July 2001–December 2003.* Submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee. Cheyenne, Wyoming, and Walla Walla, Washington: Western EcoSystems Technology, Inc.

Erickson, W.P., G.D. Johnson, M.D. Strickland, and K. Kronner. 2000. *Avian and Bat Mortality Associated with the Vansycle Wind Project, Umatilla County, Oregon, 1999 Study Year.* Prepared for Umatilla County Department of Resource Services and Development, Pendleton, Oregon. Cheyenne, Wyoming: Western EcoSystems Technology, Inc.

Erickson, W.P., G.D. Johnson, D.P. Young, M.D. Strickland, R.E. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. *Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting, and Mortality Information from Proposed and Existing Wind Developments.* Cheyenne, Wyoming: WEST, Inc.

Ferrer, M., M. de Lucas, G.F.E. Janss, E. Casado, A.R. Muñoz, M.J. Bechard, and C.P. Calabuig. 2011. Weak relationship between risk assessment studies and recorded mortality in wind farms. *Journal of Applied Ecology* 49:38–46.

Fielding, A.H., D.P. Whitfield, and D.R.A. McCleod. 2006. Spatial association as an indicator of the potential for future interactions between wind energy developments and golden eagles *Aquila chrysaetos* in Scotland. *Biological Conservation* 131:359–369.

HawkWatch International (HWI). 2013. *2009 and 2012 Count Totals.* Salt Lake City, Utah: HawkWatch International. Available at: http://www.hawkwatch.org/conservation-science/count-results. Accessed August 2013.

Hodges, J.I., and F.C. Robards. 1982. Observations of 3,850 bald eagle nests in southeast Alaska. In *A Symposium and Workshop on Raptor Management and Biology in Alaska and Western Canada*, edited by W.N. Ladd and P.F. Schempf, pp. 37–46. Anchorage, Alaska: U.S. Fish and Wildlife Service.

Hunt, G., R.E. Jackman, T.L. Brown, J.G. Gilardi, D.E. Driscoll, and L. Culp. 1995. *A Pilot Golden Eagle Population Project in the Altamont Pass Wind Resource Area, California.* Prepared for National Renewable Energy Laboratory. Santa Cruz, California: Predatory Bird Research Group, University of California, Santa Cruz.

Huso, M. 2008. Estimators of wildlife fatality: a critical examination of methods. Presented at the Wind Wildlife Research Meeting VII, held by the National Wind Coordinating Collaborative, October 28–29, 2008, Milwaukee, Wisconsin.

———. 2011. An estimator of wildlife fatality from observed carcasses. *Environmetrics* 22:318–329.

Huso, M., N. Som, and L. Ladd. 2012. *Fatality Estimator User's Guide.* Data Series 729. Reston, Virginia, U.S. Geological Survey.

Idaho Department of Fish and Game (IDFG). 2012. Wildlife Management Areas: Tex Creek. Available at: http://fishandgame.idaho.gov/public/wildlife/wma/#tex. Accessed June 12, 2012.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Sheperd, and D.A. Sheperd. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge. *American Midland Naturalist* 150:332–342.

Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. *Post Construction Avian and Bat Fatality Monitoring Study for the High Winds Wind Power Project. Solano County, California: Two Year Report.* Prepared for High Winds, LLC, FPL Energy. McLean, Virginia: Curry and Kerlinger, LLC.

Kerns, J., and P. Kerlinger. 2004. *A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for 2003.* Prepared for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee. McLean, Virginia: Curry and Kerlinger, LLC.

Korner-Nievergelt, F., P. Korner-Nievergelt, O. Behr, I. Niermann, R. Brinkmann, and B. Hellriegel. 2011. A new method to determine bird and bat fatality at wind energy turbines from carcass searches. *Wildlife Biology* 17:350–362.

Lehman, R.N., J.A. Savidge, P.L. Kennedy, and R.E. Harness. 2010. Raptor electrocution rates for a utility in the intermountain western United States. *Journal of Wildlife Management* 74:459–470.

National Wind Coordinating Collaborative (NWCC). 2010. *Wind Turbine Interactions with Birds, Bats, and Their Habitats: A Summary of Research Results and Priority Questions*. Washington, D.C.: National Wind Coordinating Collaborative. Available at: http://www.nationalwind.org/publications/bbfactsheet.aspx. Accessed February 2013.

Orloff, S., and A. Flannery. 1992. *Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989–1991.* Final report. Prepared for Alameda, Contra Costa, and Solano Counties and the California Energy Commission. Santa Cruz, California: Biosystems Analysis, Inc.

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Eagle Management and Permit Issuance.* U.S. Fish and Wildlife Service, Division of Migratory Bird Management.

Phillips, R.L., T.P. McEneaney, and A.E. Beske. 1984. Population densities of breeding golden eagles in Wyoming. *Wildlife Society Bulletin* 12:269–273.

Postupalsky, S. 1974. Raptor reproductive success: Some problems with methods, criteria, and terminology. In *Raptor Research Report No. 2: Management of Raptors*, edited by F.N. Hamerstrom, Jr., B.E. Harrell, and R.R. Olendorff, pp. 21–31. Vermillion, South Dakota: Raptor Research Foundation.

Reid, F.A. 2006. *A Field Guide to Mammals of North America*. 4th ed. New York, NY: Houghton Mifflin Company.

*Seattle Times*. 2009. Golden eagle killed by Wash. wind turbines. May 21. Available online at: http://seattletimes.nwsource.com/html/localnews/2009237912_apwawindturbineeagle1stldwritethru.html. Accessed December 12, 2011.

Sharp, L., C. Herrmann, R. Friedel, K. Kosciuch, and R. MacIntosh. 2010. Comparison of pre and post-construction bald eagle use at the Pillar Mountain Wind Project, Kodiak, Alaska, Spring 2007 and 2010. NWCC Wind Wildlife Research Meeting VIII, October 19–21, 2010, Lakewood, Colorado.

Sherrod, S.K., C.M. White, and F.S.L. Williamson. 1976. Biology of the bald eagle on Amchitka Island, Alaska. *Living Bird* 15:145–182.

Sibley, D.A. 2000. *The Sibley Guide to Birds.* New York: Chanticleer Press.

Smith, J.P. 2005. *Exploratory Raptor Migration Surveys at Sites near Ely, Nevada with Significant Windpower Generation Potential.* Salt Lake City, Utah: HawkWatch International, Inc.

Steenhof, K., and I. Newton. 2007. Assessing nesting success and productivity. In R*aptor Research and Management Techniques*, edited by D.M. Bird and K.L. Bildstein, pp. 181–192. Blaine, Washington: Hancock House Publishers.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L., Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions.* Washington, D.C.: National Wind Coordinating Collaborative.

SWCA. 2011a. *Wetland Delineation and Determination of Jurisdictional Waters of the U.S. for a Wind Farm Expansion near Ammon, Idaho.* Salt Lake City, Utah: SWCA Environmental Consultants.

———. 2011b. *Horse Butte Wind Power Generating Facility 2009–2010 Biological Survey Results Report: Raptor Nests, Breeding Bird, Bird Migration, Grouse, Big Game, and Bat.* Salt Lake City, Utah: SWCA Environmental Consultants.

———. 2011c. *Horse Butte Wind Power Generating Facility 2011 Spring Bird Migration Surveys Results Report.* Salt Lake City, Utah: SWCA Environmental Consultants.

———. 2011d. *Horse Butte Wind Power Generating Facility 2011 Raptor Nest Surveys Results Report.* Salt Lake City, Utah: SWCA Environmental Consultants.

———. 2011e. *Horse Butte Wind Power Generating Facility 2011 Biological Survey Results Report: Winter Big Game Surveys.* Salt Lake City, Utah: SWCA Environmental Consultants.

———. 2013. *Year 1 Post-Construction Avian and Bat Fatality at the Perrin Ranch Wind Energy Facility*. Prepared for U.S. Fish and Wildlife Service, Arizona Game and Fish Department, and Perrin Ranch Wind, LLC. Las Vegas, Nevada: SWCA Environmental Consultants.

Thompson, J., D. Solick, and K. Bay. 2011. *Post-Construction Fatality Surveys for the Dry Lake Phase I Wind Project Iberdrola Renewables, September 2009–November 2010*. Prepared for Iberdrola Renewables. WEST, Inc., Cheyenne, WY.

U.S. Fish and Wildlife Service (USFWS). 2009. *Final Environmental Assessment. Proposal to Permit Take Provided Under the Bald and Golden Eagle Protection Act.* Washington D.C: U.S. Fish and Wildlife Service, Division of Migratory Bird Management.

———. 2011a. Draft Eagle Conservation Plan Guidance. Arlington, Virginia: U.S. Fish and Wildlife Service.

———. 2011b. U.S. Fish and Wildlife Service Interim Guidance for Wind Energy Development in Wyoming. December 1, 2011. Wyoming Ecological Services Field Office, Cheyenne, WY. Available at: http://www.fws.gov/wyominges/PDFs/Energy/Wind/Wyoming%20Field%20Office%20Interim%20Wind%20Guidance%20_12_1_2011.pdf. Accessed September 19, 2013.

———. 2012. *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines*. Arlington, Virginia: U.S. Fish and Wildlife Service.

———. 2013a. *Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2.* Arlington, Virginia: U.S. Fish and Wildlife Service, Division of Migratory Bird Management.

———. 2013b. U.S. Fish and Wildlife Service's preliminary eagle collision risk estimates for New Era Wind Farm, Goodhue County, Minnesota. Letter to Deborah Pile, Energy Facility Permitting Supervisor, Minnesota Department of Commerce, from Tony Sullins, Field Supervisor, U.S. Fish and Wildlife Service, Twin Cities Field Office, dated January 14, 2013. Available at: http://legalectric.org/f/2013/01/usfws-jan-16.pdf. Accessed April 5, 2013.

WEST. 2008. *Diablo Winds Wildlife Monitoring Progress Report: March 2005–February 2007.* Prepared for Diablo Winds, LLC. Cheyenne, Wyoming: WEST, Inc.

Whitfield, D.P. 2009. *Collision Avoidance of Golden Eagles at Wind Farms under the "Band" Collision Risk Model.* Report to Scottish National Heritage. Banchory, United Kingdom: Natural Research Ltd.

Whitfield, D.P., A.H. Fielding, D.R.A. McCleod, and P.F. Haworth. 2008. *A conservation framework for the golden eagle: implications for conservation and management in Scotland*. Scottish Natural Heritage Commissioned Report No. 193. Scottish Natural Heritage, Battleby.

Yates, R.E., B.R. McClelland, P.T. McClelland, C.H. Key, and R.E. Bennetts. 2001. The influence of weather on golden eagle migration in northwestern Montana. *Journal of Raptor Research* 35:81–90.

Young, D.P., Jr., W.P. Erickson, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003. *Avian and Bat Mortality Associated with the Initial Phase of the Foote Creek Rim Wind Power Project, Carbon County, Wyoming: November 1998–June 2002.* Prepared for PacifiCorp, Inc., SeaWest Windpower, Inc., and Bureau of Land Management. Cheyenne, Wyoming: WEST, Inc.

# Appendix A

## Risk Factor Analysis for Individual Turbines

**Table A1.** Risk Factor Analysis Individual Turbines

| Turbine No. | UTM | | Slope Soaring | | Flight Corridor | | Proximate to Potential Foraging Sites | | | | | | Perch Roost | Territorial Interactions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | S | Top | Ridge | Saddle | Corridor | Water | P-Dog | Rabbits | Livestock | Carrion | Dumps | | |
| 2 | 436967 | 4809062 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 3 | 437316 | 4808965 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 4 | 437600 | 4808888 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 5 | 437879 | 4808798 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 6 | 438160 | 4808721 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 7 | 438453 | 4808692 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 8 | 438925 | 4808006 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 9 | 439219 | 4807991 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 10 | 439509 | 4807765 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 11 | 439807 | 4807647 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 12 | 438519 | 4806253 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 13 | 438950 | 4806319 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 14 | 439255 | 4806312 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 15 | 439560 | 4806313 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 16 | 439772 | 4806055 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 17 | 439990 | 4805796 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 18 | 440281 | 4805789 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 19 | 440553 | 4805684 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 20 | 440752 | 4805471 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 21 | 441021 | 4805191 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 22 | 439791 | 4803984 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 23 | 440060 | 4803981 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 24 | 440328 | 4803961 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 25 | 440619 | 4803964 | N | N | N | N | N | N | P | P | Y | N | N | Y |

**Table A1.** Risk Factor Analysis Individual Turbines

| Turbine No. | UTM | | Slope Soaring | | Flight Corridor | | Proximate to Potential Foraging Sites | | | | | | Perch Roost | Territorial Interactions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | S | Top | Ridge | Saddle | Corridor | Water | P-Dog | Rabbits | Livestock | Carrion | Dumps | | |
| 26 | 440910 | 4803962 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 27 | 441477 | 4803644 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 28 | 441739 | 4803507 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 29 | 442504 | 4804453 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 30 | 442958 | 4804468 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 31 | 443330 | 4804518 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 32 | 443689 | 4804580 | N | N | N | N | N | N | P | P | Y | N | N | Y |
| 33 | 444147 | 4804526 | N | N | N | N | N | N | P | P | Y | N | N | N |

Notes:
N = No
Y = Yes
P = Potentially though not likely consistently
T= Trees in the area, so some potential perching habitat

# Appendix B

## Correspondence between UAMPS, SWCA Environmental Consultants, and U.S. Fish and Wildlife Service