# Appendix A

*Elkhorn Valley Eagle Take Permit Application*
*Eagle Conservation Plan*

# ELKHORN VALLEY WIND FARM

# EAGLE CONSERVATION PLAN

**Telocaset Wind Power Partners LLC**

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# 1.0 INTRODUCTION

## 1.1 Background

Telocaset Wind Power Partners LLC ("Telocaset"), a subsidiary of EDP Renewables North America, LLC, owns and operates the Elkhorn Valley Wind Farm ("Elkhorn" or the "Project"), which is an existing wind energy facility located approximately six miles (9.6 kilometers [km]) south of the town of Union and approximately five miles (8.0 km) northeast of the town of North Powder in unincorporated Union County, Oregon. The Project in the context of this Eagle Conservation Plan (ECP) constitutes the operating wind turbines and a 1-km (0.6-mile) buffer area around all turbine locations.

The Project consists of 61 Vestas V82 1.65-megawatt (MW) turbines and has an installed capacity of 101 MW. Union County granted initial land use approval for the Project through its conditional use process in 2005 with final approval in 2007. Commercial operation began in the winter of 2007. Since the Project was operating prior to 2009, impact to eagles would be considered historic take already incorporated into the baseline take evaluated by the USFWS under the US Fish and Wildlife Service's (USFWS) Eagle Permit Rule (USFWS 2009a).

Since the start of operations in 2007 and as of the date of this ECP, twelve golden eagle (*Aquila chrysaetos*) carcasses and one bald eagle carcass have been found near Project turbines. The first carcass was discovered on May 6, 2009, approximately 18 months after the start of Project operations. Upon the initial discovery of the first golden eagle carcass, Telocaset contacted the USFWS to initiate conversations about how to reduce risk to eagles at the Project. In this light, Telocaset, in coordination with USFWS, developed a Golden Eagle Study Plan that included telemetry monitoring, observational point counts, nest monitoring, and continued standardized fatality monitoring beyond the two years initially planned. The intent of the Golden Eagle Study Plan was to try to determine key risk factors and use patterns at the Project that would lead to practicable and effective advanced conservation practices, such as operational curtailment strategies or habitat management actions that would reduce the risk of additional take. After implementing the first year of the Golden Eagle Study Plan (see Section 2.2, Post-Construction Use and Nesting Surveys), Telocaset undertook a Curtailment Analysis (see Section 4.2, Operational Risk Reduction Efforts) in accordance with avoidance and minimization principles.

As a means to implement additional risk reduction and mitigation strategies at the Project, Telocaset has prepared this ECP in order to meet the requirements of the Bald and Golden Eagle Protection Act (BGEPA; see Section 1.3, Regulatory Framework). This ECP is intended as a living document that will be updated through coordination with USFWS to support an application for an Eagle Take Permit (ETP).

This ECP summarizes the environmental conditions at the Project, avian and eagle studies that have been conducted and their results, an assessment of potential impacts to golden and bald eagles, avoidance and minimization elements that have been implemented during project development and operation, and compensatory mitigation for impacts to golden eagles.

## 1.2 Project Area

The Project is located in Union County, Oregon, approximately 18 miles (29 km) southeast of the city of La Grande (Figure 1.1). The 101-MW wind energy facility consists of 61 turbines, located in several strings on the ridges surrounding Antelope Valley (Figure 1.1). The Project is located in generally open terrain on privately-owned land, with small pockets of evergreen trees present within 1 km of the northern turbine strings, and large areas of tree canopy east of the project area. The Project area ranges in elevation from approximately 3,200 feet (ft; 975 meters [m]) near the Powder River to 4,500 ft (1,372 m) above sea level within the northeast section of the Project (Figures 1.1 and 1.2). The land is not irrigated and is used predominantly for cattle grazing. Adjacent uses include grazing, the cultivation of alfalfa and hay, and timber harvesting. The Project is located in the Blue Mountain Ecoregion (Thorson et al. 2003), and consists largely of sagebrush (*Artemisia* spp.) steppe habitats on ridgelines and grasslands in the valleys. The Powder River and Thief Valley reservoirs are located west and south of the Project, respectively, and the town of Union is located north of Elkhorn (Figure 1.1). The riparian corridor along the Powder River contains mature cottonwoods (*Populus trichocarpa*), willows (*Salix* spp.), and other shrubs. Scattered ponderosa pines (*Pinus ponderosa*) are present along the rim edge of the Powder River. Most of the area is grazed by cattle. There are no federally-owned or managed lands located within the Project.

According to the National Land Cover Dataset (USGS NLCD 2006, Fry et al. 2011; Table 1.1; Figure 1.3), the Project is dominated by shrub/sage-steppe (approx. 7,177 acres [29 $km^2$]; 94%). Evergreen forest (approx. 145 acres [0.6 $km^2$]), pasture/hay (approx. 100 acres [0.4 $km^2$]), and cropland (approx. 97 acres [0.4 $km^2$]) each compose between 1% and 2% of the area within one km of turbines. All other landcover types compose less than 1% of the Project area (Table 1.1; Figure 1.3).

**Table 1.1 Land cover present within one kilometer of turbines at the Elkhorn Valley Wind Farm. (US Geological Survey National Land Cover Data Set [USGS NLCD] 2006, Fry et al. 2011).**

| Cover Type | Acreage | % Composition |
|---|---|---|
| Open Water | 1.67 | 0.02 |
| Developed; Open Space | 28.89 | 0.38 |
| Developed; Low Intensity | 3.52 | 0.05 |
| Evergreen Forest | 145.81 | 1.93 |
| Shrub/Sage-steppe | 7,117.33 | 94.42 |
| Grassland | 43.33 | 0.57 |
| Pasture/Hay | 100.45 | 1.33 |
| Crops | 97.24 | 1.29 |
| **Total** | **7,538.24** | **100** |

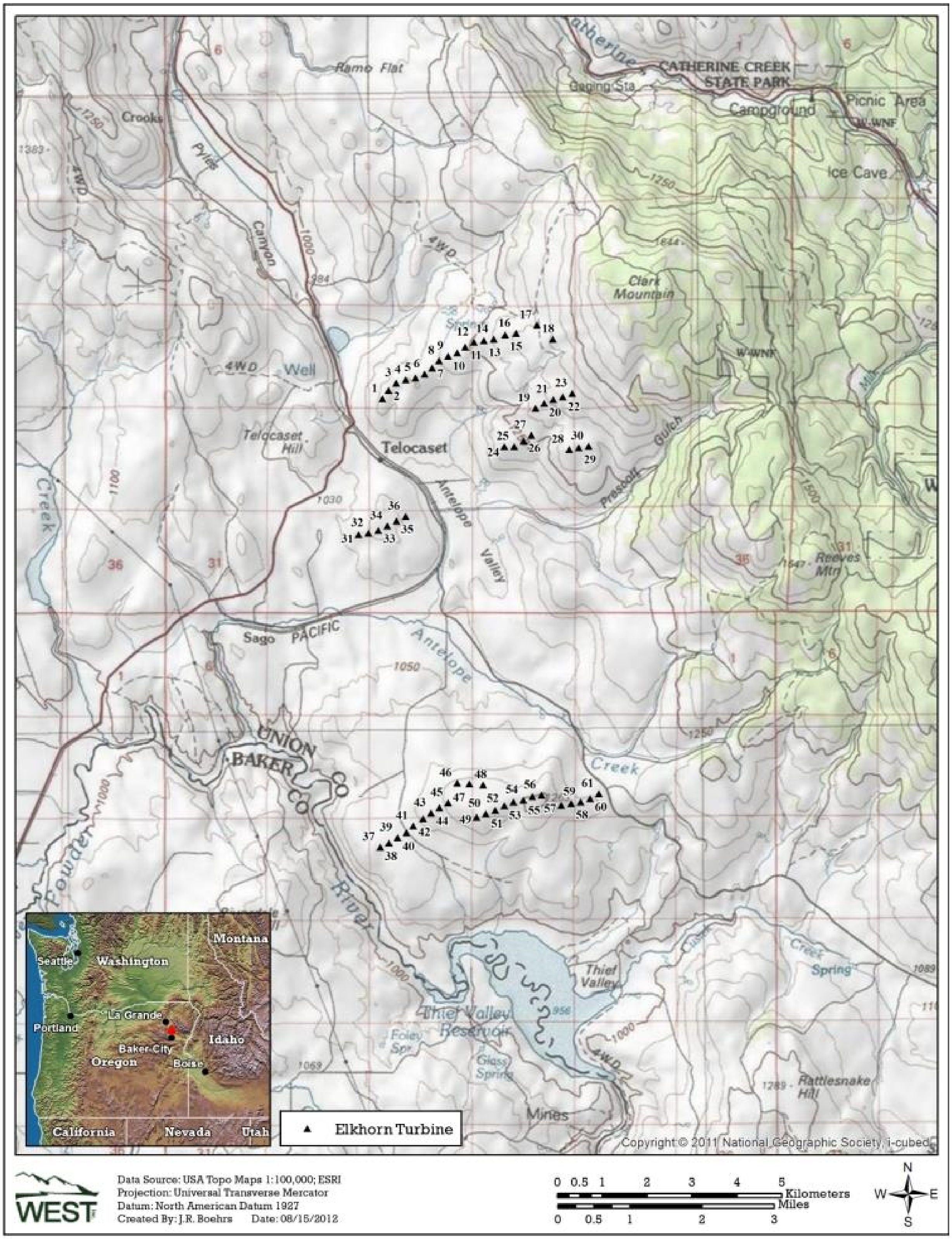


**Figure 1.1 General location and turbine layout at the Elkhorn Valley Wind Farm.**

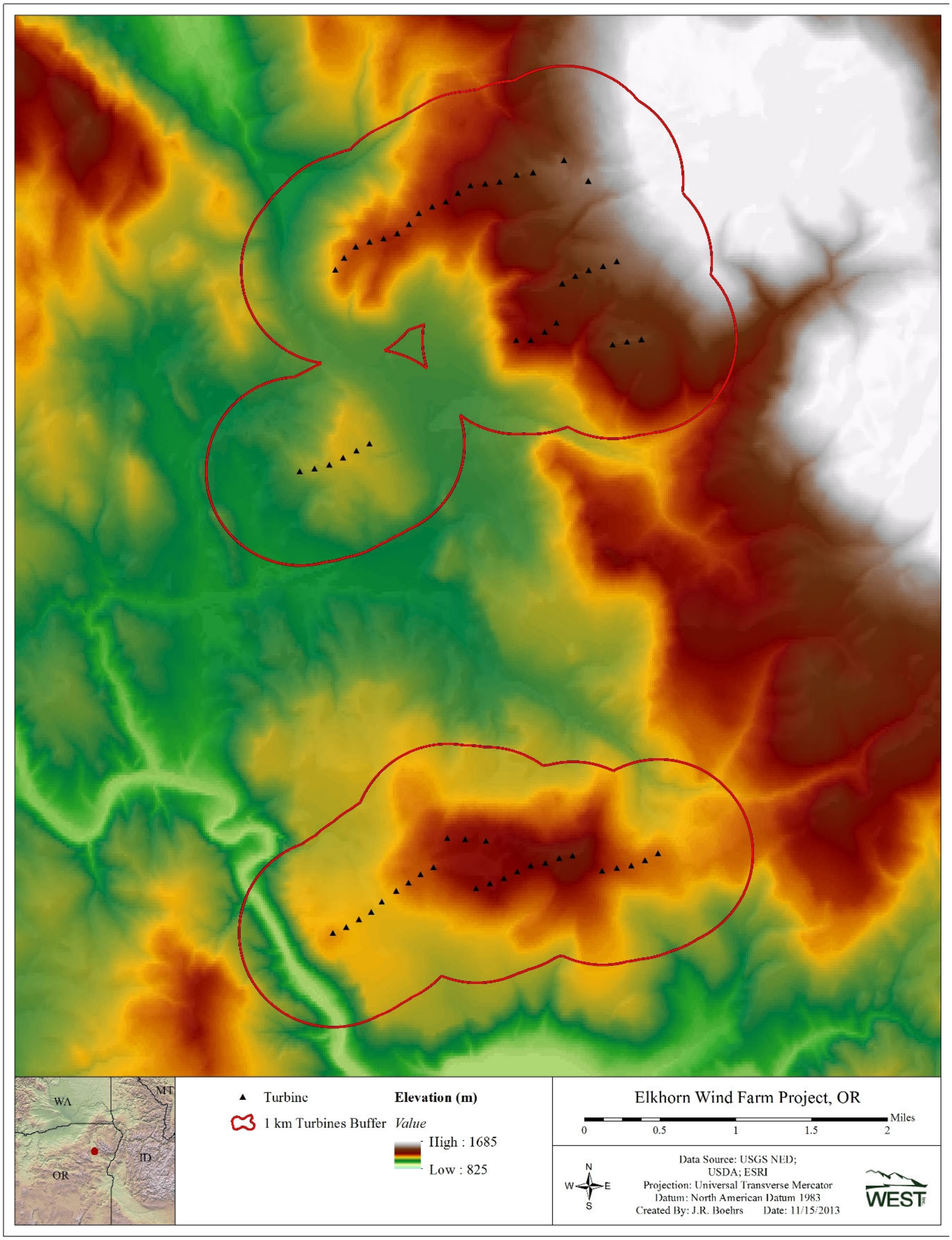


**Figure 1.2 Digital elevation map of the Elkhorn Valley Wind Farm.**

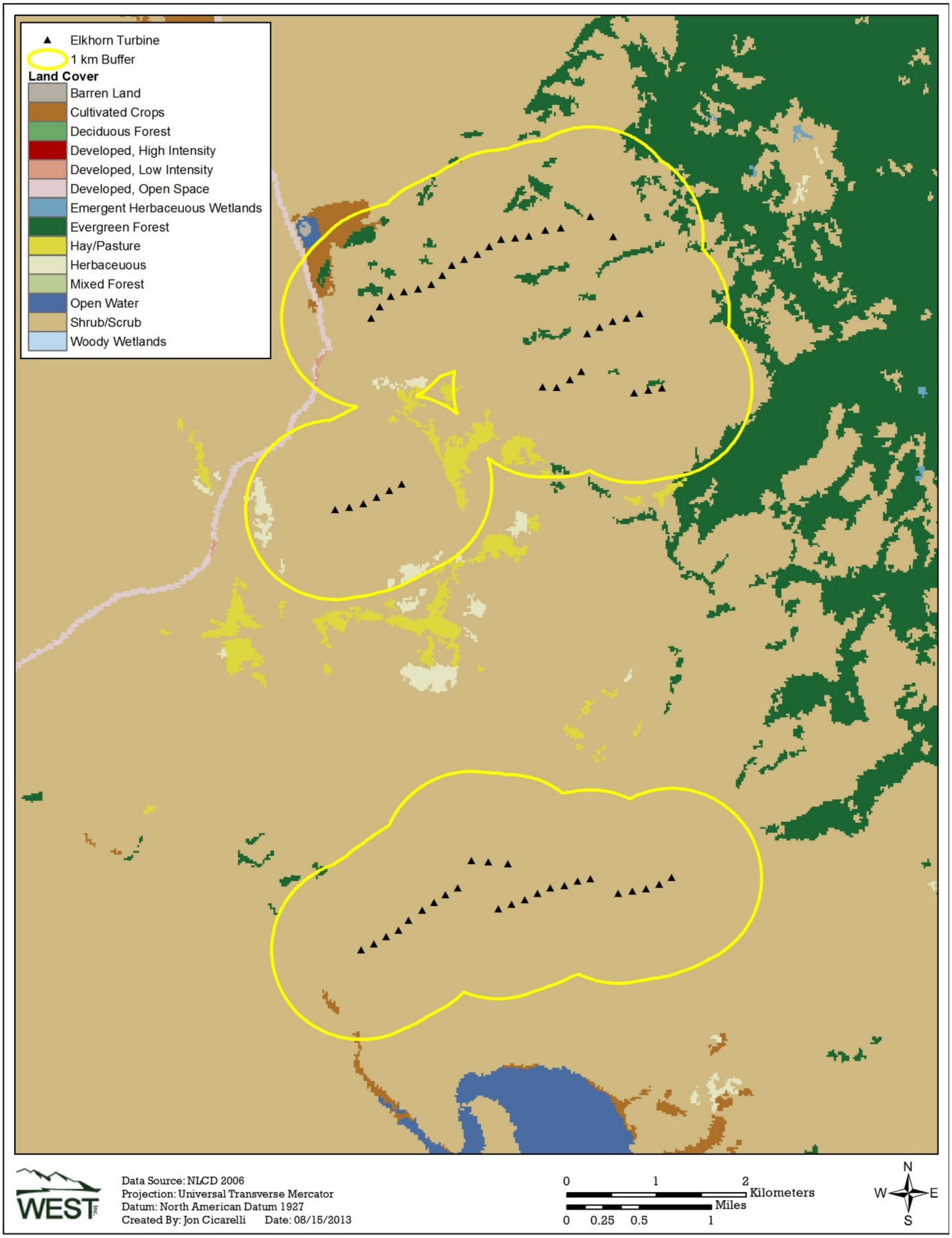


**Figure 1.3 Land cover within the Elkhorn Valley Wind Farm.**

## 1.3 Regulatory Framework

This section describes the regulations and guidelines relevant to this Eagle Conservation Plan.

### *1.3.1 Migratory Bird Treaty Act*

The Migratory Bird Treaty Act (MBTA) is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. It is a strict liability statute, meaning that proof of intent, knowledge, or negligence is not an element of an MBTA violation. The statute's language is clear that actions resulting in a "taking" or possession (permanent or temporary) of a protected species, in the absence of a USFWS permit or regulatory authorization, are a violation of the MBTA. The MBTA states, "Unless and except as permitted by regulations … it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import … transport or cause to be transported … any migratory bird, any part, nest, or eggs of any such bird …. [The Act] prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior" (16 United States Code [USC] 703). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 Code of Federal Regulations [CFR] 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

Although the MBTA does not include provisions for permits to authorize incidental take of migratory birds, the USFWS's *Land-Based Wind Energy Guidelines* (Guidelines; USFWS 2012b; discussed below) describe the USFWS's approach to enforcement in the absence of an incidental take permit program. Specifically, the USFWS will take a developer's adherence to the Guidelines and communication with the USFWS into account when deciding whether to refer for prosecution any alleged "take" of species. Although adherence to the Guidelines does not absolve parties from liability under the MBTA, the USFWS views such an effort as an appropriate means of avoiding "take" of protected species. In adherence with the Guidelines, Telocaset has prepared a Bird and Bat Conservation Strategy (BBCS) for the Project addressing impacts to non-eagle avian species (Telocast Wind Power Partners [TWPP] 2015).

### *1.3.2 Bald and Golden Eagle Protection Act*

The BGEPA (16 USC §§ 668-668d) of 1940 prohibits the take of bald (*Haliaeetus leucocephalus*) and golden eagles, unless authorized by federal regulation. The BGEPA defines "take" of an eagle as to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. Under the BGEPA, disturb means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."[1]

[1] 50 CFR § 22.3.

On September 11, 2009, the USFWS published a final rule (Eagle Permit Rule) authorizing limited issuance of permits to take bald and golden eagles.[2] A permit would authorize the take of bald and golden eagles where: (1) the take is compatible with the preservation of the bald eagle and the golden eagle; (2) the take is necessary to protect an interest in a particular locality where the activity or mitigation for the activity will provide a net benefit to eagles; (3) the take is associated with but not the purpose of an otherwise lawful activity; and, (4) for individual incidences of take, the take cannot be practicably avoided, and for programmatic take, the take is unavoidable even after implementation of advanced conservation practices. The *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013) notes that projects "in operation prior to 2009 that pose a risk to golden eagles may qualify for programmatic eagle take permits that do not automatically require compensatory mitigation…because the requirements for obtaining programmatic take authorization are designed to reduce take from historic, baseline levels, and the preamble to the Eagle Permit Rule specified that unavoidable take remaining after implementation of avoidance and minimization measures at such projects would not be subtracted from regional eagle take thresholds."

On December 8, 2013, the USFWS published in the Federal Register a final rule to extend the maximum term for ETPs to 30 years, subject to a recurring five-year review process throughout the permit life. The change was designed, in part, to provide more certainty for project proponents, all while continuing to conserve eagles. The new rule went into effect on January 8, 2014; however, this rule was successfully challenged in court based on National Environmental Policy Act ("NEPA"). It is Telocaset's desire to obtain a five-year ETP.

In May 2016, the USFWS released proposed revisions to the Eagle Permit Rule and an associated Programmatic Environmental Impact Statement (USFWS 2016). Subsequently, in January 2017 the USFWS issued a revised Eagle Permit Rule. The revised Rule generally focuses on three key issues: (1) standard for programmatic permits; (2) mitigation requirements and options; and (3) the USFWS's interpretation of the BGEPA "preservation" standard.

#### *1.3.3 Land-Based Wind Energy Guidelines*

In response to the growth of wind energy across the U.S., the USFWS has been developing and refining guidelines to address the impacts of wind energy development on wildlife, beginning with the 2003 *Interim Voluntary Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003 Interim Voluntary Guidelines; USFWS 2003a).[3] As a result of comments received during the eight months following the release of the 2003 Interim Voluntary Guidelines, the USFWS issued *Instructions for Implementation of Service Voluntary Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2004 Instructions; USFWS 2004) in 2004, which emphasized the voluntary, flexible nature of the 2003 Interim Voluntary Guidelines: "The Interim Guidelines are not to be construed as rigid requirements, which are applicable to every situation, nor should they be read literally". In March 2007, the USFWS formed a Federal Advisory Committee (FAC) to advise the USFWS on the development of more permanent guidelines, and



[2] 50 CFR § 22.26.
[3] 68 Federal Register (FR) 41174-41175 (July 10, 2003).

their final recommendations were submitted to the USFWS in 2010.[4] An initial draft of the wind energy guidelines was developed based on the federal advisory committee recommendations (*Draft Land-Based Wind Energy Guidelines: Recommendations on Measures to Avoid, Minimize, and Compensate for Effects to Fish, Wildlife, and Their Habitats*; Draft Guidelines; USFWS 2011), and after a public comment period and revisions, USFWS issued the final Guidelines in March 2012 (USFWS 2012b).[5]

The Guidelines revise and replace interim guidelines that the USFWS published in 2003; however, as the Project was built prior to the release of the Guidelines, only the 2003 Interim Voluntary Guidelines and 2004 Instructions were available to guide the development of the Project. Nevertheless, the Project attempted to adhere to each iteration of the USFWS guidelines as they were released. The Guidelines outline a voluntary and collaborative approach to implement a structured, scientific process for addressing wildlife conservation concerns, with the core objective of aiding wind developers in the implementation of a strategy to avoid, minimize, and mitigate for potential adverse effects on species of concern and their habitats.

While the USFWS states that the Guidelines provide the “best practical approach for conserving species of concern” under the Endangered Species Act (ESA), MBTA, and BGEPA, they are also “aware that it will take time for Service staff and other personnel, including wind energy developers and their biologists, to develop expertise in the implementation of the Guidelines.” Nonetheless, wind developers and operators are encouraged “to use them as soon as possible after publication” to receive consideration regarding enforcement priorities.

Wind project developers and operators are expected to implement those portions of the Guidelines relevant to the current project phase. To this end, the Guidelines provide a “tiered approach” to assess the “potential adverse effects to species of concern and their habitats.” For projects operating at the time of Guideline publication, developers “should confer with the [USFWS] regarding the appropriate period of fatality monitoring consistent with Tier 4, communicate and share information with the [USFWS] on monitoring results, and consider Tier 5 studies and mitigation options where appropriate.”

Under Tier 4, developers and operators are advised to estimate operational impacts through post-construction studies. This process can entail the following steps:

- Discuss extent and design of post-construction studies to conduct with the USFWS.
- Conduct post-construction studies to assess carcass discoveries and habitat-related impacts.
- Communicate results of all studies to USFWS field office in a timely manner.
- If necessary, discuss potential mitigation strategies with USFWS.
- Maintain appropriate records of data collected from studies.

[4] *See* 72 FR 11373 (March 13, 2007); 76 FR 9590 (Feb. 18, 2011).
[5] *See* 77 FR 17496 (March 26, 2012).

Under Tier 5, developers and operators are advised to:

- Communicate with the USFWS about the need for and design of other studies and research to conduct with the USFWS, when appropriate, particularly when impacts exceed predicted levels.
- Communicate with the USFWS about ways to evaluate cumulative impacts on species of concern, particularly species of habitat fragmentation concern.
- Conduct appropriate studies as needed.
- Communicate results of studies with the USFWS.
- Identify potential mitigation strategies to reduce impacts and discuss them with the USFWS.

In adherence with the Guidelines, Telocaset has prepared a Bird and Bat Conservation Strategy (BBCS) for the Project addressing impacts to non-eagle avian species (TWPP 2015).

#### *1.3.4 2013 Eagle Conservation Plan Guidance*

The USFWS ECPG, released in April 2013, provides guidance regarding the permit issuance criteria described in the final take permit regulations under 50 CFR 22.26. The USFWS also developed technical appendices (ECPG Technical Appendices), released in 2012 (USFWS 2012a), which recommend methods approved by USFWS for assessing and documenting eagle risk associated with wind project development. The *ECPG* is designed to assist wind energy developers in complying with the MBTA and the BGEPA and delineates the conditions for issuance of ETPs under BGEPA. A fundamental criterion for the issuance of an ETP is the implementation of avoidance and minimization measures, such that any residual take cannot practicably be avoided. Under 50 CFR 22.26, “Practicable” means “capable of being done after taking into consideration relative to the magnitude of the impacts to eagles (1) the cost of remedy compared to proponent resources; (2) existing technology; and (3) logistics in light of overall project purposes” (USFWS 2009a). Furthermore, compensatory mitigation must be employed when the permitted take would otherwise cause golden eagle populations to decline, such that no net population decline occurs. Because recent data indicates that golden eagle populations may be in decline already (FWS 2016), to achieve their goal of maintaining stable or increasing populations, the Service now requires that compensatory mitigation achieve a net population benefit for newly authorized take that would exceed the baseline take established in the 2009 Environmental Assessment. As discussed above, the Project is considered baseline take and therefore compensatory mitigation would not be expressly required by the Eagle Rule. The current take permit regulations under 50 CFR 22.26 have set the golden eagle take thresholds to zero for all management units and compensatory mitigation is required to meet a “no-net loss standard” relative to a 2009 baseline. The ECPG recommends five stages, each increasing in the level of detail, in the development of an ECP to support application for long-term permits for take of eagles: (1) an initial site assessment using publicly-available data to identify potential eagle use areas; (2) completion of rigorous on-site surveys designed to assess the potential risk of the project to eagles; (3) a prediction of eagle risk and fatalities; (4) identification and evaluation of the anticipated effectiveness of avoidance and minimization measures to avoid mortality and, if necessary, identification of compensatory mitigation; and (5) post-construction monitoring to determine whether actual take exceeds anticipated take such that adaptive management will be required.

As noted in the ECPG, preparation of an ECP and consultation with the USFWS are voluntary actions on the part of the developer. Moreover, the ECPG notes that, for projects already in the operational phase, implementation of all stages of the recommended approach may not be applicable or possible. Telocaset has developed this ECP consistent with the direction in the ECPG to the extent practicable, with the intent of supporting an ETP application.

Telocaset has been collecting data to support development of this ECP consistent with the ECPG since discovery of the first eagle fatality in 2009, and prepared the first draft of the ECP in 2013 in advance of a formal application for ETP and will continue to update the ECP as comments are received from USFWS. As such, this version of the document may not be the mechanism for permit issuance because Telocaset and USFWS may continue to confer on the content of the ECP and conditions of the permit, if issued. Telocaset submitted a formal ETP application and associated application fee with Version 2 of the ECP. The USFWS has indicated that Telocaset could initiate the preparation of an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) in parallel with further input and updates to this ECP.

## 1.4 Project History and Coordination with Resource Agencies

The Project site was initially targeted for development in 1999 as part of a wind monitoring program by Oregon State University's Energy Resource Research Lab, which sought to identify areas suitable for potential wind development, including near Pyles Canyon. In 2002 Zilkha Renewable Energy (ZRE), a predecessor to Telocaset, installed the first met tower at the Project and initiated the wildlife baseline study design. The USFWS 2003 Interim Voluntary Guidelines were used in the design of these studies and were incorporated into project planning and site design. The Project was issued a Conditional Use Permit (CUP) by Union County in 2005. Exhibit A outlines the consultation history for the Project. The Project was able to proceed to construction in 2007 for a number of reasons including general community support, appropriate County zoning, transmission line capacity, and interest by landowners to host wind turbines and participate in Project benefits.

Prior to construction and operation, Telocaset collaborated with the Oregon Department of Fish and Wildlife (ODFW) to develop a Wildlife Management Plan (WMP) for the Project. The WMP is attached as Exhibit B. The WMP describes the environmental baseline data collection methods, mitigation proposal, and operational monitoring methods for the Project. A separate, more detailed WMP was included as an appendix in the Conditional Use Permit Application. The WMP summarizes the pre-construction baseline studies, features of the Project that were designed to avoid or minimize impacts to wildlife, construction techniques and best management practices to minimize impacts to wildlife, operational best management practices to minimize impacts to wildlife, and the post-construction monitoring plan.

Additionally, portions of this ECP make reference to the Antelope Ridge Wind Project (Antelope Ridge), which was proposed by EDP Renewables North America. Antelope Ridge was a proposed

300-MW wind farm adjacent to the west and north of Elkhorn. An Application for Site Certificate (ASC) for Antelope Ridge was submitted to the Oregon Energy Facility Siting Council in October 2009. The ASC has since been withdrawn and development has ceased.

Since 2008, Telocaset has worked closely with the USFWS to reduce or compensate for the risk of impacts to eagles at the Project. Telocaset implemented an extensive Golden Eagle Study Plan designed in conjunction with USFWS in 2010 shortly after the first golden eagle carcass was found at the Project with the intention of determining possible avoidance measures. Although the study plan was focused on golden eagles, several study components also provided bald eagle data for the Project (e.g., fatality monitoring, eagle observation and nesting surveys). Appendix A provides a chronology of resource agency contact since Project initiation, including with representatives of Zilkha Renewable Energy (ZRE) and Horizon Wind Energy (Horizon), the predecessors to Telocaset.

## 2.0 STAGE 2: SITE-SPECIFIC USE AND NESTING SURVEYS

Starting in 2002, five years prior to commercial operation of the Project, Telocaset contracted with Western EcoSystems Technology, Inc. (WEST), to conduct baseline wildlife studies within the Elkhorn Project area. Protocols for the baseline wildlife studies were coordinated with the ODFW. Prior to initiating field surveys, WEST conducted a review of existing eagle information (WEST 2005). Two years of baseline wildlife studies were conducted from March 2003 to May 2005; however, surveys applicable to eagles were not conducted continuously throughout this period. Post-construction studies were conducted in 2008, 2010, and from 2011-2014 (Jeffrey et al. 2009; Enk et al. 2011a, 2011b, 2012; Hallingstad et al. 2013, 2014). The following sections provide a brief summary of the Elkhorn wildlife studies applicable to golden and bald eagles.

### 2.1 Pre-Construction Use and Nesting Surveys

Prior to construction of the Project, WEST conducted baseline wildlife studies in the Project boundary and adjacent areas between March 2003 and May 2005 (Figures 2.1 and 2.2; WEST 2005). These studies included two components related to eagle use and risk: raptor nest surveys and avian use surveys (Table 2.1). The scope and methods of baseline studies were developed in consultation with ODFW.

**Table 2.1 Complete list of pre-construction eagle studies.**

| Study Component | Timing | Methodology |
|---|---|---|
| Raptor Nest Survey | April 2002 | One aerial survey of development corridors and majority of 2-mile buffer. Roadside checks in areas not given access to fly over. |
| Winter/Early Spring Surveys for Bald Eagles and Other Sensitive Wildlife | March – April 2003 | Surveys conducted from public and private roads, from vehicle and on foot to search for eagle perch sites |
| Raptor Nest Survey | March 2004 | Visited known golden eagle nest sites during aerial big game surveys. |
| Raptor Nest Survey | March 2005 | Eagle nests observed during aerial big game surveys. |

| | | |
|---|---|---|
| General Avian Use Surveys | March – October 2003 | Approximately weekly point count surveys. |
| General Wildlife Observations | During all other study components. April 2002; March – October 2003; February, March, and April 2005 | Recording of sensitive wildlife during field activities. |

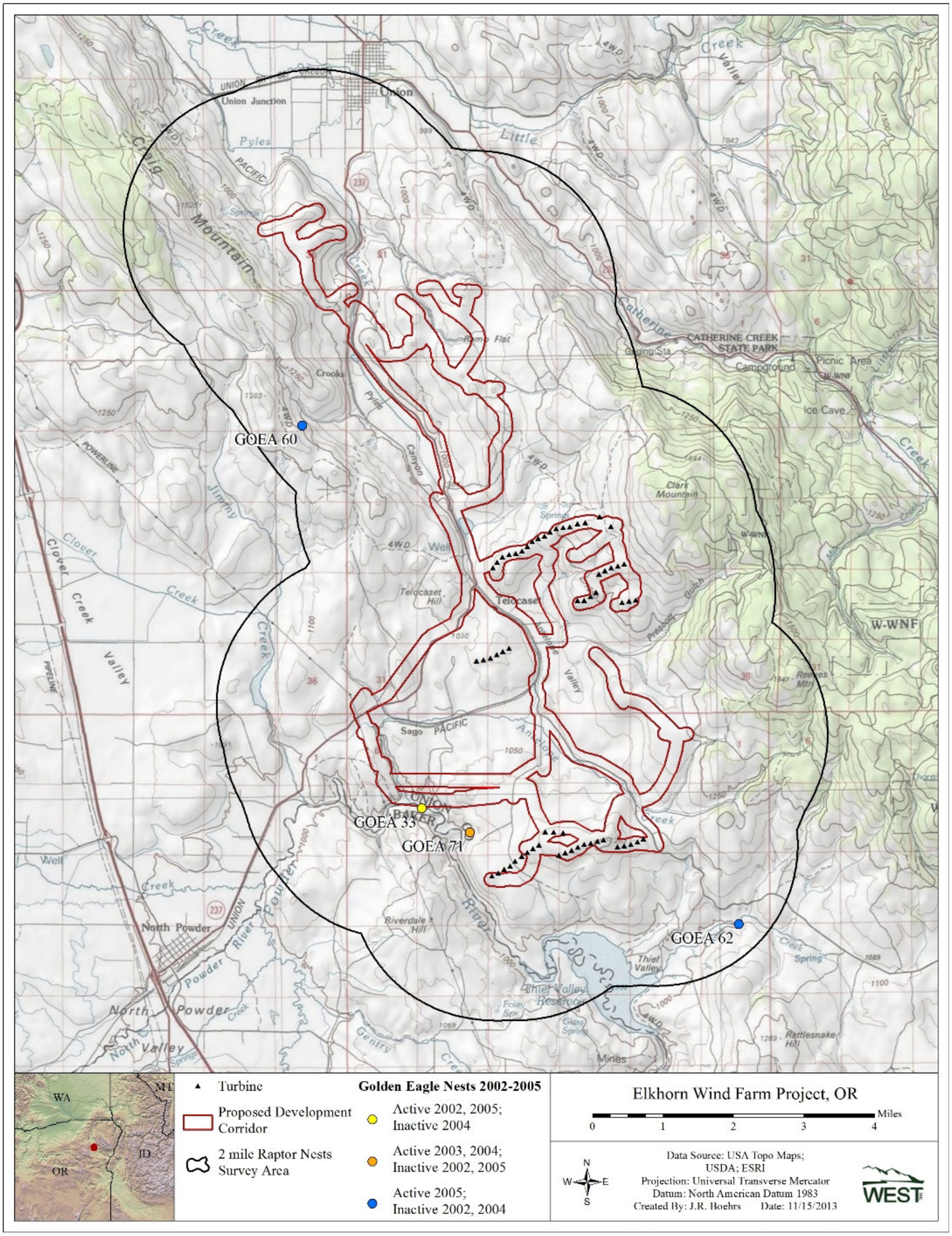


Figure 2.1 Location of eagle nests identified from 2002-2005 in the vicinity of the Elkhorn Valley Wind Farm and original proposed development corridors.

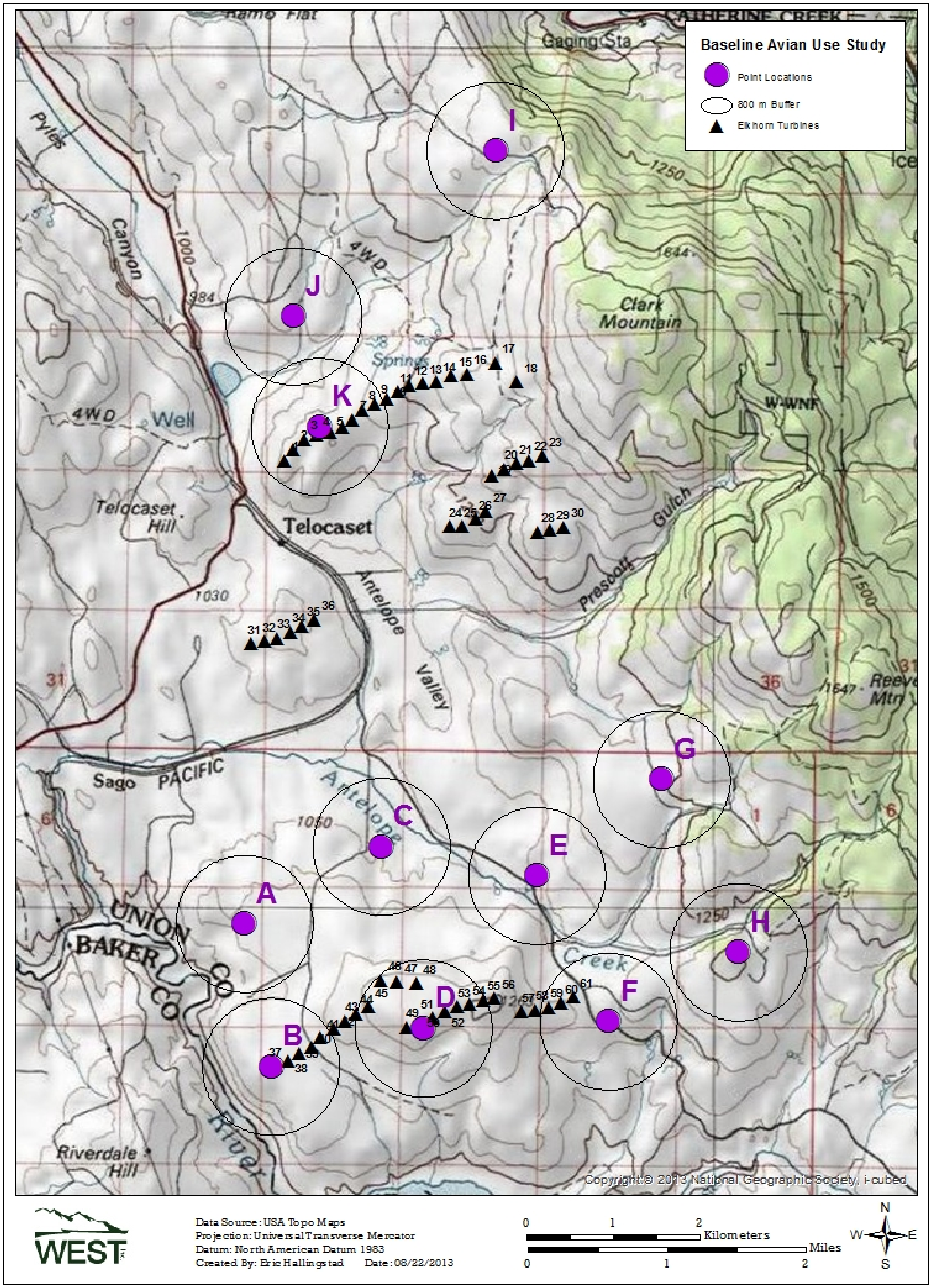


**Figure 2.2 Location of baseline avian use stations and associated 800-m radius plots for the Elkhorn Valley Wind Farm.**

### 2.1.1 Raptor Nest Surveys

#### 2.1.1.1 Methods

Prior to raptor nest surveys, historic raptor nest location data was requested from ODFW. ODFW provided the locations for two historic golden eagle nests within the Upper Powder River territory to the west of the Project[6] (nests #33 and #71; Figure 2.1). In April 2002, a raptor nest survey was conducted that combined aerial surveys of proposed development corridors and a 2-mile buffer with supplementary roadside ground surveys in areas not given access to fly over (Figure 2.1). In 2003, the nesting activity observed incidentally during avian use surveys was recorded. In March 2004, all known golden eagle and prairie falcon nest sites within the 2-mile buffer of development corridors were visited during aerial big game surveys. In 2005, all raptor nests observed within the 2-mile buffer during the aerial big game surveys in March were recorded (WEST 2005). Surveyors also searched for any visible raptor nests during ground-based sensitive-species surveys conducted within 300 ft (91 m) of proposed development corridors in May 2005.

Nests were classified as active or inactive in accordance with the following criteria:

- **Active** – adult observed sitting in nest, which indicates incubation likely;
- **Inactive** – nest was not decorated and no eagles were observed at the nest or in the vicinity.

#### 2.1.1.2 Results

In 2002, one active golden eagle nest site was documented (nest #33), although nests #60 and #62 were not documented as active (Figure 2.1). In 2003, one possible nesting pair of golden eagles was observed incidentally at the historic golden eagle nest (#71) on the east side of the Powder River on the boundary of the Project site, and as such this nest was assumed active in 2003. In 2004, nest #71 was identified as active, although nests #60 and #62 were again documented as inactive. In 2005, three active golden eagle nest sites (nests #33, #60, and #62) were recorded within two miles of the Project (Figure 2.1). No bald eagle nests were detected during any pre-construction survey year. As shown in Figure 2.1 and described further in Section 4.1 (Project Planning and Construction), the Project was ultimately modified to avoid impacts to identified eagle nests.

### 2.1.2 Winter/Early Spring Surveys for Bald Eagles and Other Sensitive Wildlife

#### 2.1.2.1 Methods

Surveys that combined walking and driving were conducted from March-April 2003. Observers surveyed a pre-established route once per week for approximately three hours. Survey routes were established along Highway 237, Telocaset Lane, Government Gulch Lane, Dean Bidwell Road, Thief Valley Road, and along private roads that follow the Powder River. Survey routes ranged from 1.8 to 7.4 miles (2.9 to 11.9 km) one-way. Along public roads, observers searched for eagles and other sensitive species within view of the road. When stopped, observers scanned

[6] The Upper Powder River Canyon territory was first documented in 1984, and the pair actively bred that year (unknown if structure #33 or #71 was used; F. Isaacs, pers. comm.). Nest site #61 was also first documented in 1984, and was active that year (F. Isaacs, pers. comm.). Nest status from 1985-2001 is unknown.

for perched eagles in areas with large trees. Timing of surveys alternated between morning and evening hours each week. When bald eagles or other special status wildlife were encountered, their locations were mapped on USGS 7.5-min quadrangle maps, and habitat, activity, and time of each observation were recorded.

The Project area coincides with critical winter range for mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*). In addition to the surveys described above, observations of eagles and other raptors were recorded during winter big game surveys conducted at the Project area. Big game surveys included aerial and ground-based surveys conducted during March 2004 and January and March 2005. Ten ground surveys were conducted at proposed turbine strings. Information on location, behavior, and flight pattern were recorded for each eagle or raptor observed during big game surveys.

### *2.1.3 Results*

During surveys conducted from March-April 2003, two bald eagles and one golden eagle were observed. One bald eagle was observed along the east part of Thief Valley Reservoir, and the other was observed along Highway 237 near Jimmy Creek. The golden eagle was observed on Thief Valley Road near Thief Valley Reservoir. During a separate trip on October 24, 2003, one golden eagle was observed incidentally at the Thief Valley Reservoir. In addition, 16 golden eagles and six bald eagles were observed either in-transit or incidentally within the Project area in 2003.

During big game ground surveys in March 2004, a single golden eagle was observed. In addition, six bald eagles were observed, four of which were associated with a large livestock calving area.

Twenty bald eagle observations were recorded during the 2005 big game surveys (15 during ground surveys and five during aerial surveys). There were also a total of 44 golden eagle observations during 2005 big game surveys (27 and 17 during ground and aerial surveys, respectively).

### *2.1.4 Avian Use Surveys*

#### 2.1.4.1 Methods

In 2003, a total of 11 observation stations (circular plots) were established within the area proposed for development so that the data collected on avian use was representative of the entire Project area (Figure 2.2). Constraints on locations of observation stations included land access, visibility limitations imposed by the terrain, and the conceptual nature of the turbine layout due to surveys being conducted in advance of final engineering layout for the project. Despite these constraints, a sampling approach was used to ensure that the most likely locations of turbine strings were well represented, with many of the proposed turbine strings located within view of observation stations. Surveys at approximately one-week intervals were conducted between March 1 and August 31, 2003, at stations A through H. Weekly surveys were conducted at stations A through K from September 1 through October 31, 2003. The survey radius of the circular plots was 2,625 ft (800 m). Plots were surveyed for 20 minutes during each survey.

#### 2.1.4.2 Results

Golden and bald eagles were observed during avian use surveys (WEST 2005). A total of 275 20-minute fixed-point surveys were conducted, during which 136 golden eagle observations were recorded in 108 groups, and three bald eagles were recorded in two groups (Table 2.2). Some surveys resulted in more than one observation. Golden eagles were observed in all seasons surveyed, while bald eagles were observed only in spring. Golden eagle use was relatively consistent among seasons, with the lowest use occurring during fall (0.24 eagles/800-m/20-minute survey) and the highest use during summer (0.33 eagles/800-m/20-minute survey). Observation frequency was also relatively consistent, with golden eagles seen during 15.4% of the surveys during summer and 18.1% during spring. The majority of flying golden eagles were observed within the approximate rotor-swept area (25-100 m AGL; WEST 2005). As a result, golden eagles had the fifth highest exposure index of all avian species observed in the Project area. Observations during all other surveys included 58 golden eagle observations in 46 groups and 34 bald eagle observations in 26 groups. All eagle flight paths observed during pre-construction avian use surveys at Elkhorn are shown in Figure 2.3. The baseline report concluded that golden eagle use at Elkhorn was relatively high compared to other existing wind projects.

**Table 2.2 Group and individual golden eagle observations during baseline avian use surveys at the Elkhorn Valley Wind Farm from March 7 to October 28, 2003.**

| | | Spring | | Summer | | Fall | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Scientific Name** | **# grps** | **# obs** | **# grps** | **# obs** | **# grps** | **# obs** | **# grps** | **# obs** |
| Golden Eagle | *Aquila chrysaetos* | 16 | 16 | 48 | 65 | 44 | 55 | 108 | 136 |
| Bald Eagle | *Haliaeetus leucocephalus* | 2 | 3 | 0 | 0 | 0 | 0 | 2 | 3 |

The pre-construction survey eagle minutes are represented by season in Table 2.3 below. The difference in total observations provided in Table 2.2 and eagle minutes in Table 2.3 stems from the fact that not all eagles observed during baseline avian use surveys were within 800 m of the observer and within 200 m of ground level, which are the plot dimensions recommended in Appendix C of the ECPG.

**Table 2.3 Elkhorn Valley Wind Farm pre-construction survey eagle minutes by season.**

| Season | Number of Points | Golden Eagle Minutes | Bald Eagle Minutes | Effort (Surveys) | Effort (Hours) |
|---|---|---|---|---|---|
| Fall | 11 | 23 | 0 | 99 | 33 |
| Spring | 11 | 13 | 3 | 72 | 24 |
| Summer | 11 | 34 | 0 | 104 | 34.66667 |
| **Total** | **11** | **70** | **3** | **275** | **91.66667** |

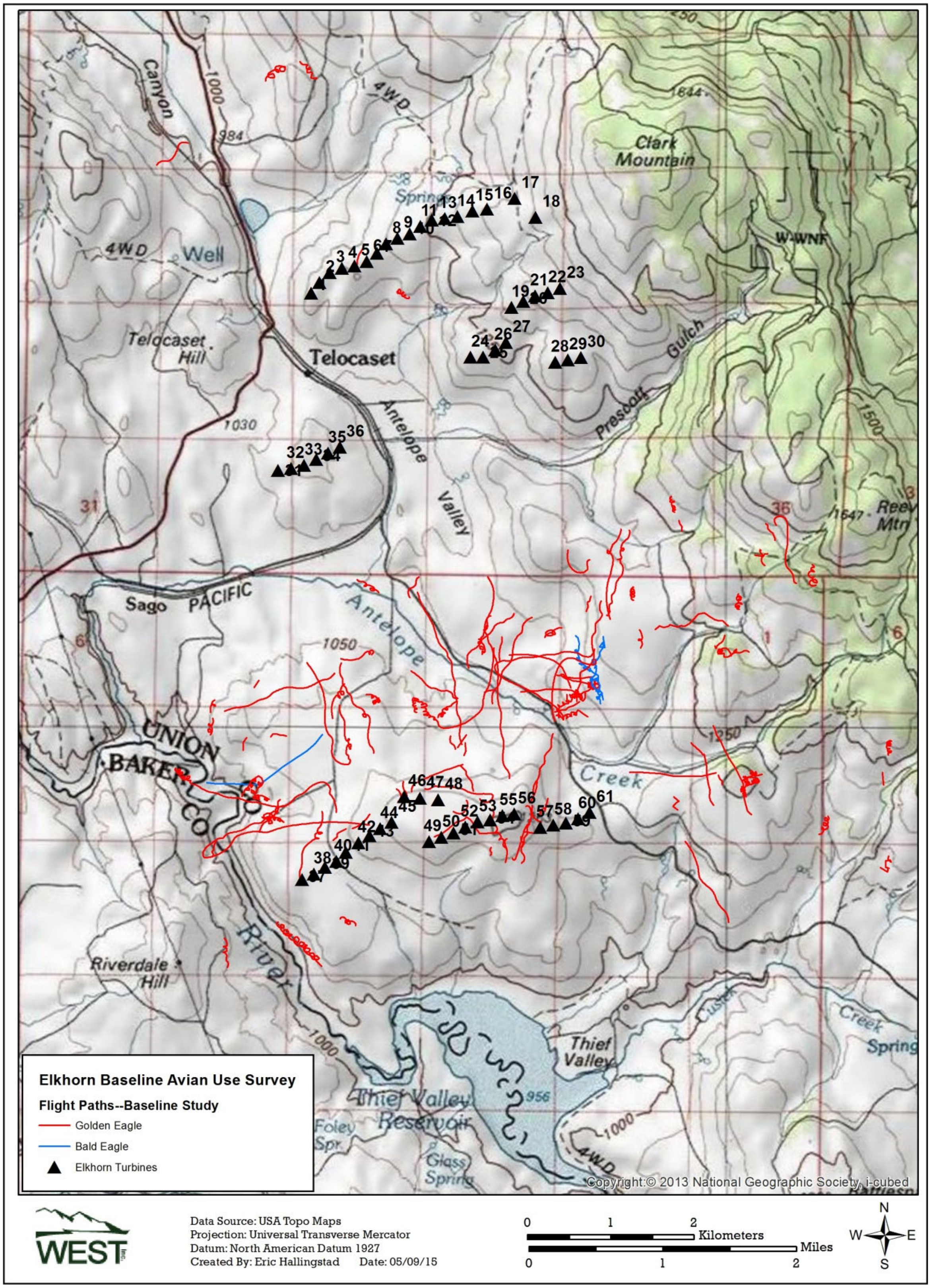


**Figure 2.3 Location of all bald and golden eagle flight paths documented during pre-construction surveys at the Elkhorn Valley Wind Farm.**

## 2.2 Post-Construction Use and Nesting Surveys

Four post-construction monitoring studies were conducted at Elkhorn with the purpose of informing decisions related to eagle risk and mitigation actions. Golden eagles were the focus of these studies since golden eagle carcasses were found at the Project, but the data collection included bald eagles. These studies included: 1) fixed-point avian use counts, with a focus on golden eagle habitat use and flight patterns relative to turbine locations; 2) eagle nest monitoring surveys conducted in 2011, 2012, 2013, and 2014; 3) a GPS telemetry study on golden eagles; and 4) fatality monitoring initiated in 2008 (see Section 5.2, Operations and Maintenance Monitoring). These monitoring activities are discussed below.

### *2.2.1 Eagle Observation Survey*

#### 2.2.1.1 Methods

Immediately following documentation of the second golden eagle carcass, in consultation with the USFWS, WEST re-initiated weekly avian point counts in March 2010, and these counts continued through February 2011. After examining the original point locations relative to turbine locations, two points (I and J; Figure 2.4) were moved to provide better coverage of the actual turbine locations. The resulting 800-m radius plots provided 40.5% coverage of the area within 1-km buffer of Elkhorn turbines, exceeding the 30% coverage recommended in the ECPG (USFWS 2013).

The objective of the post-construction avian point count surveys was to provide information regarding current use patterns, identify whether higher-risk areas could be identified to inform adaptive management actions, and determine if the use patterns have changed since baseline surveys were conducted. The survey radius of the circular plots was 2,625 ft (800 m), depending on terrain limitations. Observations of birds beyond the specified radius were recorded, but data collected on these birds were analyzed separately from data collected on birds observed within the plot. Plots were surveyed for 20 minutes each and each point was visited weekly. Flight paths for all eagles were mapped.

The Golden Eagle Study Plan prepared in consultation with USFWS extended the observation effort. Methodology was similar to that utilized during baseline and post-construction studies conducted through February 2011, with the exception of extending point duration to 30 minutes and decreasing visits from weekly to monthly. Counts were conducted through February 2013.

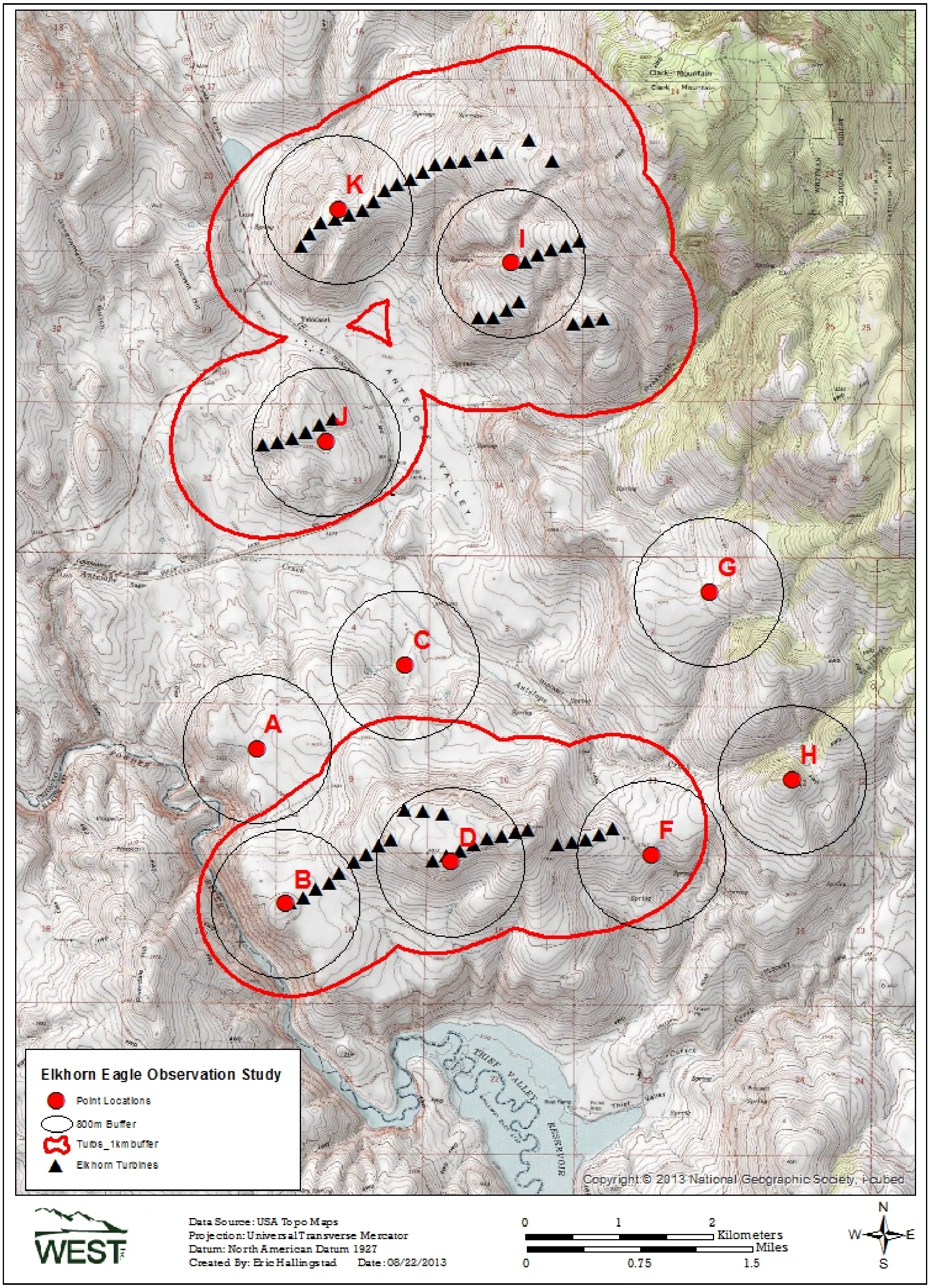


**Figure 2.4 Location of post-construction eagle observation points and associated 800-m radius plots for the Elkhorn Valley Wind Farm.**

2.2.1.2 Results

A total of 484 20-min fixed-point surveys were conducted between March 2010 and February 2011. Fifty-seven golden eagle observations were recorded during the fixed-point surveys, and an additional 15 were recorded incidentally. Mean annual golden eagle use was 0.09 birds/800-m/20-minute survey, with seasonal use estimates of 0.14 birds/800-m/20-minute survey in the spring, 0.10 in the summer and fall, and 0.07 in the winter. Golden eagle use at individual observation points ranged from less than 0.01 to 0.23 birds/800-m/20-minute survey. For bald eagles, 19 observations were recorded during surveys, with four observations in spring, one each in summer and fall, and 13 in winter. Mean annual bald eagle use was 0.04 birds/800-m/20-minute survey; with most use occurring in spring (0.03) and winter (0.08). All eagle flight paths observed during post-construction eagle use surveys at Elkhorn are shown in Figure 2.5.

A total of 230 30-min fixed-point eagle observation surveys were completed during 24 survey sessions conducted between February 12, 2011 and February 15, 2012. All points were surveyed 24 times except for Point C (surveyed 22 times) and Points G and H (surveyed 20 times each). Eighty golden eagle observations were recorded during standardized surveys, and 16 golden eagles were observed incidentally during the study. All eagle use estimates were standardized to 20-min periods for comparison to previous surveys through a 2/3 scaling factor. The estimated mean annual golden eagle use across all seasons and all points was 0.11 birds/800-m/20-min survey. Golden eagles were observed in all seasons with higher use in spring and fall (0.15 and 0.16 birds/800-m/20-min survey, respectively) compared with summer (0.11) and winter (0.07). Golden eagles were observed at all 10 survey points, with between two and 14 eagle observations at individual points. Mean golden eagle use at individual observation points ranged from less than 0.01 to 0.22 birds/800-m/20-min survey. Bald eagles were observed only in spring (two observations) and winter (three observations). Bald eagle use in spring was 0.03 birds/800-m/20-min survey and in winter it was 0.02; mean annual bald eagle use was 0.01. Bald eagles were observed at two observation points (Points F and J).

A total of 229 30-min fixed-point golden eagle observation surveys were completed during 24 survey sessions conducted between February 27, 2012 and February 2, 2013. Individual points were not visited during every survey due to access restrictions imposed by landowners during late winter and spring. Points were surveyed between 20 and 24 times. Sixty-two golden eagle observations were recorded during standardized surveys. All eagle use estimates were standardized to 20-min periods for comparison to previous surveys. The estimated mean annual golden eagle use across all seasons and all points was 0.08 birds/20-min survey. Golden eagles were observed in all seasons with higher use in summer and winter (0.08 and 0.11 birds/800-m/20-min survey, respectively) compared with spring (0.05) and fall (0.05). Golden eagles were observed at all 10 survey points, with between one and 13 eagles observed at individual points. Mean golden eagle use at individual observation points ranged from 0 to 0.20 birds/800-m/20-min survey. A total of 13 bald eagle observations were recorded, with five observations in winter, four in fall, and two each in spring and summer. Bald eagle use (based on observations within 800 m of the observer) was 0.01 birds/20-min survey in spring and fall, less than 0.01 in winter, and zero in summer. Bald eagles were recorded only at Points A, F, and K.

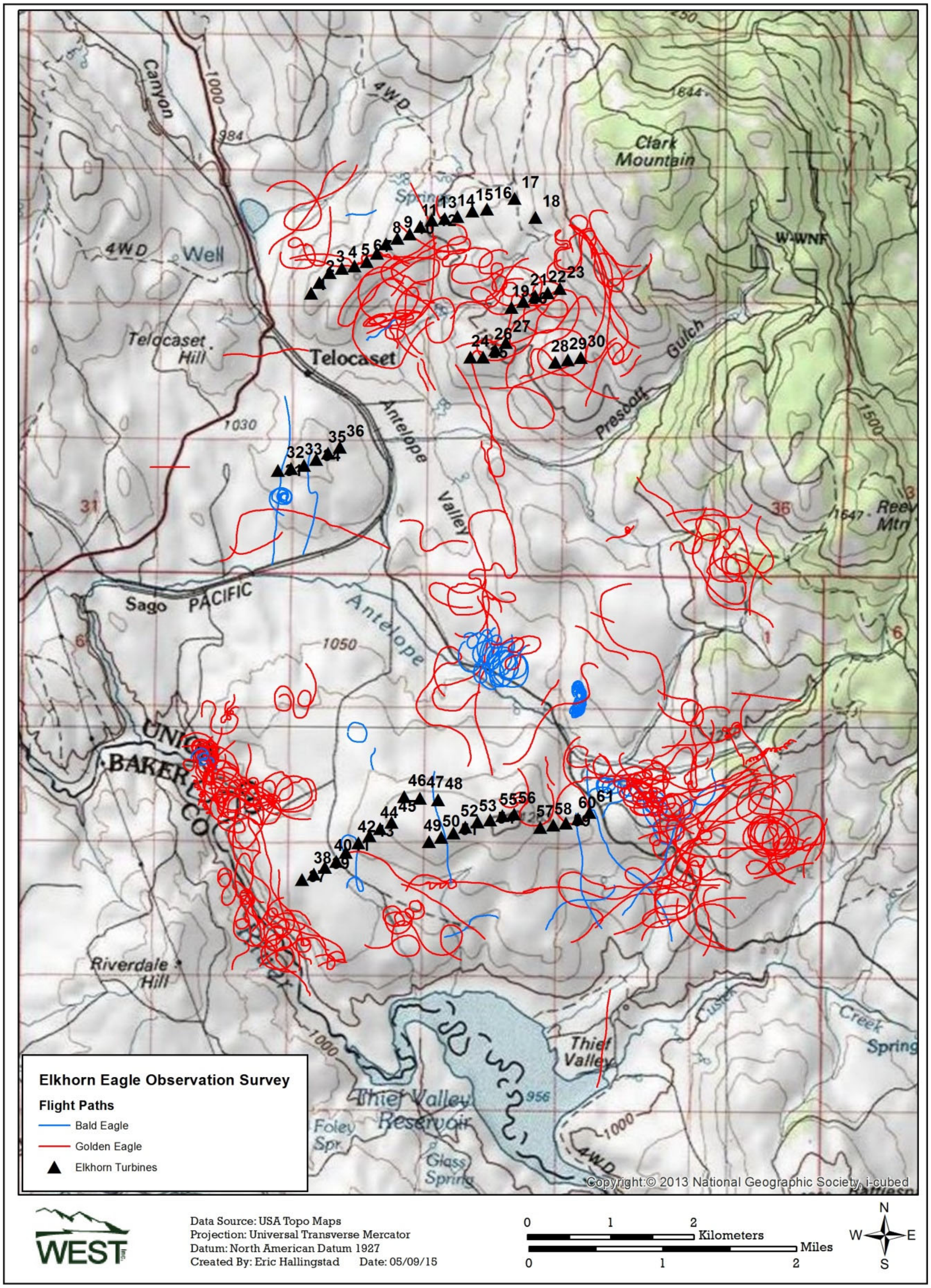


**Figure 2.5 Location of all eagle flight paths documented during post-construction surveys at the Elkhorn Valley Wind Farm.**

Table 2.4 below shows eagle observations below 200 m that were observed during surveys in 2010-2013.

**Table 2.4 Elkhorn Valley Wind Farm post-construction fixed-point survey eagle minutes by season.**

| Season | Number of Points | Golden Eagle Observations[1] (Eagle Minutes) | Bald Eagle Observations[1] (Eagle Minutes) | Effort (Surveys) | Effort (Hours)[2] |
|---|---|---|---|---|---|
| **2010-2011** | | | | | |
| Spring | 11 | 10 | 2 | 88 | 29.3 |
| Summer | 11 | 12 | 1 | 139 | 46.3 |
| Fall | 11 | 10 | 1 | 121 | 40.3 |
| Winter | 11 | 6 | 11 | 136 | 45.3 |
| **Total** | **11** | **38** | **15** | **484** | **161.3** |
| **2011-2012** | | | | | |
| **Season** | **Number of Points** | **Golden Eagle Minutes** | **Bald Eagle Minutes** | **Effort (Surveys)** | **Effort (Hours)[3]** |
| Spring | 10 | 20 | 3 | 46 | 22.8 |
| Summer | 10 | 10 | 0 | 48 | 24 |
| Fall | 10 | 16 | 0 | 50 | 25 |
| Winter | 10 | 12 | 2 | 86 | 43 |
| **Total** | **10** | **58** | **5** | **230** | **114.8** |
| **2012-2013** | | | | | |
| **Season** | **Number of Points** | **Golden Eagle Minutes** | **Bald Eagle Minutes** | **Effort (Surveys)** | **Effort (Hours)[3]** |
| Spring | 10 | 3 | 1 | 40 | 20 |
| Summer | 10 | 7 | 0 | 49 | 24.5 |
| Fall | 10 | 13 | 1 | 60 | 30 |
| Winter | 10 | 22 | 4 | 80 | 40 |
| **Total** | **10** | **45** | **6** | **229** | **114.5** |
| **Total** | | | | | |
| **Season** | **Number of Points** | **Golden Eagle Minutes** | **Bald Eagle Minutes** | **Effort (Surveys)** | **Effort (Hours)[3]** |
| Spring | 10 | 33 | 6 | 174 | 72.2 |
| Summer | 10 | 29 | 1 | 236 | 94.8 |
| Fall | 10 | 39 | 2 | 231 | 95.3 |
| Winter | 10 | 40 | 17 | 302 | 128.3 |
| **Total** | **10** | **141** | **26** | **943** | **390.6** |

[1] Minute data was only collected during 2011-2013 surveys
[2] Surveys from 2010-2011 were 20 minutes in length
[3] Surveys from 2011-2013 surveys were 30 minutes in length

2.2.1.3 Discussion

Golden eagle use occurs throughout the Project and during all seasons. While higher golden eagle use in the spring and fall seasons may be associated with eagle migration through the area, this seasonal use pattern varied by year. Four general levels of golden eagle use were assigned during each of the three years of post-construction monitoring:

- High Use >0.20 eagles/800-m/survey
- Moderate Use between 0.10 and 0.20 eagles/800-m/survey
- Low Use < 0.10 eagles/800-m/survey
- No Use = 0 eagles/800-m/survey

Survey plot areas are represented in Figure 2.4 above. Points A and B to the southwest of the project along Powder River Canyon were designated as "high use" during all three study years, Point H, located to the southeast with possible association to use in Thief Valley Territory was ranked "high use" in two of the three study years. Point F in the southeast project area and points I and K in the north project area were each ranked "high use" during one post-construction study year. The full breakdown of usage levels per year based on the above classification is included in Table 2.5.

**Table 2.5 Usage classifications of post-construction golden eagle observations.**

| Point | Year 1 Use Classification | Year 2 Use Classification | Year 3 Use Classification |
|---|---|---|---|
| A | High | High | High |
| B | High | High | High |
| C | No | Moderate | No |
| D | Moderate | Low | No |
| E | Moderate | No | n/a |
| F | Low | High | Low |
| G | Low | Moderate | Moderate |
| H | High | High | Moderate |
| I | No | High | Low |
| J | No | Low | No |
| K | Low | Low | High |

The 2010-2011, 2011-2012, and 2012-2013 annual mean golden eagle use estimates (0.09, 0.11, and 0.08 birds/800-m/20-minute survey, respectively) were lower than the pre-construction mean use estimate of 0.27 birds/800-m/20-minute survey (90% CI: 0.18 – 0.37 birds/800-m/20-min survey); however, not all survey stations were visited pre- and post-construction. A better comparison is made by restricting analysis to stations that were surveyed in both pre- and post-construction: A, B, C, D, F, G, H, and K. Additionally, only spring, summer, and fall data were used for this comparison, as pre-construction monitoring contained no winter data. Based on this subset of data, the pre-construction use estimate is 0.26 birds/800-m/20-min survey (SE = 0.001, 90% CI: 0.19 – 0.33 birds/800-m/20-min survey), and the overall post-construction estimate is 0.12 birds/800-m/20-min survey (SE = 0.001, 90% CI: 0.08 – 0.15 birds/800-m/20-min survey). A two-sample t-test comparing annual mean golden eagle use pre-construction to mean use post-construction (over all years), based on only spring, summer, and fall data shows a significant reduction in golden eagle use from pre-construction to post-construction (difference = 0.139, $t = 2.78$, $df = 37.1$, $p = 0.01$).

The decrease in golden eagle use between pre- and post-construction periods does not appear to be directly related to project turbines due to the fact that differences in use were more prevalent at points farther from turbine locations. Of the eight points sampled in both periods, four (B, D, F, and K) were located less than one km from the nearest turbine, and four (A, C, G, and H) were located more than one km from the nearest turbine. A two-sample t-test comparing pre-construction mean use to post-construction mean use was performed both for points less than one km from turbines and points greater than one km from turbines. While reductions in use were seen in both instances, the difference was statistically significant for the points farther from the Project (difference [post vs pre] = -0.18 birds/800-m/20-minute survey, t = 2.78, df = 4.34, p = 0.045), while it was insignificant for points closer to the Project (difference [post vs pre] = -0.06 birds/800-m/20-minute survey, t = 2.82, df = 4.34, p = 0.45).

These results indicate that there is insufficient evidence to conclude a significant difference between pre- and post-construction golden eagle use at survey points located within one km of Project turbines. It remains unknown what factors caused lower overall post-construction eagle use (e.g., population decline, weather parameters, prey availability, avoidance). Additionally, it is unknown whether the year in which baseline avian use surveys were conducted (2003) constituted an average, higher-than-average, or lower-than-average use period for the Project compared to historical and current trends. Many prey species experience population cycles. Prey availability may have been higher in 2003 than during post-construction survey years (2011-2013), which could have attracted higher levels of golden eagle use. In addition, local territory occupancy and nesting status likely affects the level of golden eagle use at the Project in any given year; however, pre-construction data on territory occupancy is unavailable for the Project.

Bald eagle use was highest during the winter season, with lower use in the spring and much lower use in the summer and fall. Most observations occurred during February and March. This seasonal use corresponds in time with livestock calving at ranches in the general Elkhorn area, and bald eagles likely scavenge on carcasses and afterbirth in the area. WEST observers have recorded numerous incidental observations of bald eagles in the calving areas during the late winter and early spring period.

### *2.2.2 Nest Surveys and Monitoring*

#### 2.2.2.1 Methods

The primary objectives of eagle nest surveys were to locate and monitor all eagle nests within six miles (9.7 km) of Elkhorn and Antelope Ridge (Figures 2.6 and 2.7) in 2011 and 2012, and within two miles of the Elkhorn in 2013 and 2014. Antelope Ridge is discussed above in Section 1.4 (Project History and Coordination with Resource Agencies). An aerial (helicopter) survey was conducted in accordance with standard nest survey protocols (see Pagel et al. 2010) from April 19 – April 21, 2011, to document all eagle nests within six miles of the greater Elkhorn/Antelope Ridge area. A second aerial reconnaissance survey was conducted on April 3, 2012, to verify the status of nests documented during the 2011 nest survey and help target 2012 nest monitoring efforts.

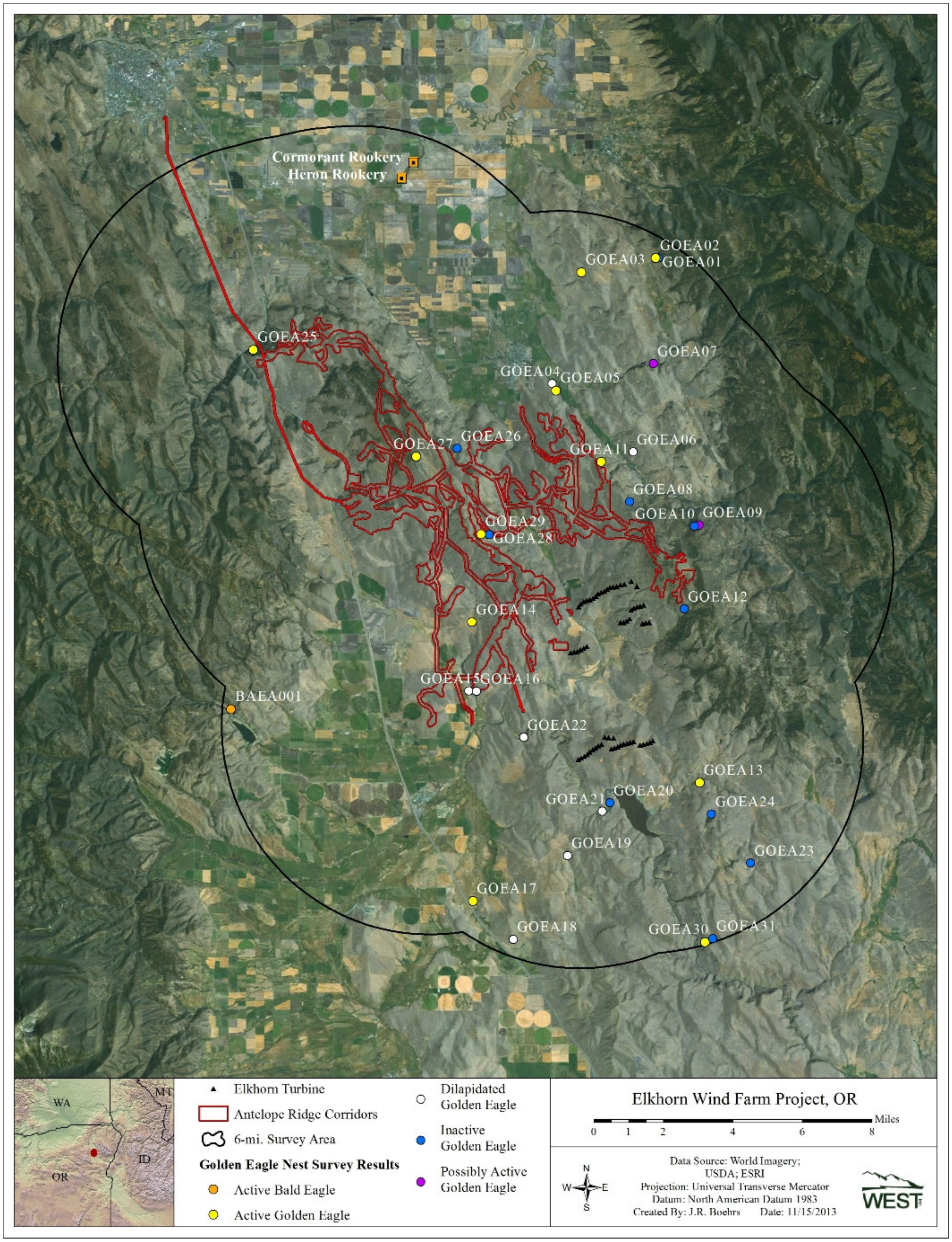


**Figure 2.6 2011 eagle nests and activity status in the greater Elkhorn/Antelope Ridge area and 6-mile buffer.**

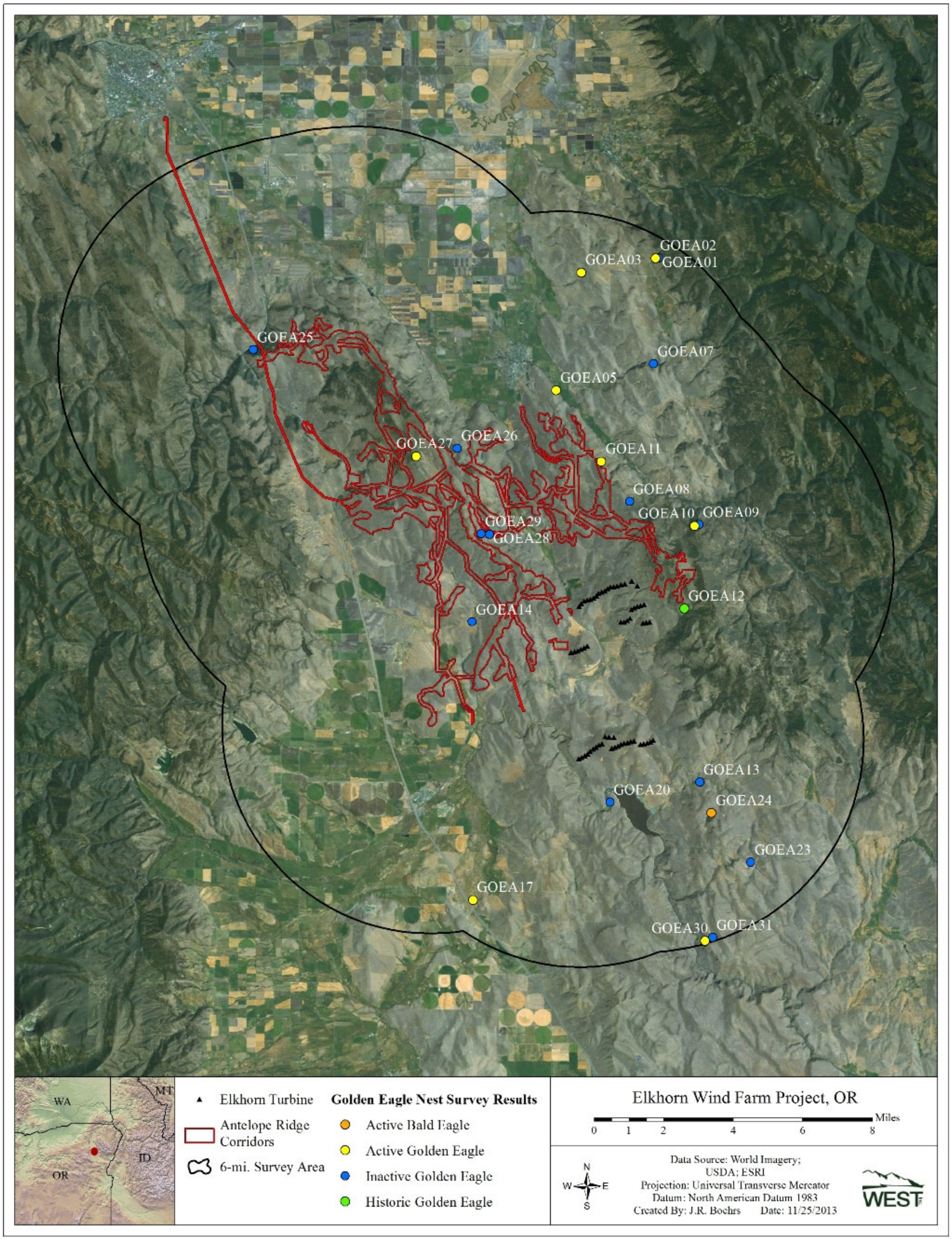


**Figure 2.7 2012 golden eagle nest survey results and activity status in the greater Elkhorn/Antelope Ridge area and 6-mile buffer.**

Ground-based nest monitoring of all active golden eagle nests was also conducted in 2011, 2012, 2013, and 2014. Aerial survey results were verified, and all nests determined to be active based on presence of attending adults and eggs/hatchlings were monitored every two weeks from March 15 through June 31 until the young fledged or the nest failed. In 2011 and 2012, ground-based monitoring occurred within the 6-mile buffer. In 2013 and 2014, only the four nests within two miles of the Project were checked following a request from the USFWS.

In 2011 and 2012, hatchlings captured from select active golden eagle nests near the Project were fitted with leg bands. Active nests were monitored until chicks were more than five weeks old, at which time chicks from select nests were targeted for banding. An experienced climber captured the chick(s), and lowered the chick(s) to a permitted bander (James McKinley; USGS permit #21454, ODFW permit #028-11) located on the ground. Once on the ground, each chick was examined, measured, and fitted with a USGS leg band.

#### 2.2.2.2 Results

Thirty-one golden eagle nests were documented during the 2011 aerial survey, of which 11 were classified as active, two possibly active, 10 inactive, and eight were considered dilapidated. One nest (GOEA14; Figure 2.6) appeared to be occupied during the aerial surveys, but since the nest was vacant during subsequent ground monitoring, the nest was reclassified as inactive for 2011 and the number of active golden eagle nests for the 2011 nesting season was reduced to 10. Additionally, the historic bald eagle nest on Wolf Creek Reservoir was active in 2011; this nest is approximately 10 miles (16.1 km) from the Project (Figure 2.6).

Nest monitoring, which was scheduled to begin March 15, was delayed in 2011 due to access issues (high snowfall and precipitation resulted in muddy roads); therefore, the 2011 nest monitoring efforts began March 25, 2011. Since the aerial nest survey had not yet been conducted at the outset of monitoring efforts, the only nests that were initially monitored in March 2011 were the seven nests known from previous studies (i.e., GOEA2, GOEA8, GOEA13, GOEA17, GOEA26, GOEA28, and GOEA29; Figure 2.6). After the 2011 aerial survey was completed, nine of the ten active nests within the 6-mile buffer were monitored from June 1 through July 10: GOEA02, GOEA03, GOEA05, GOEA11, GOEA13, GOEA17, GOEA25, GOEA27, and GOEA29 (Table 2.6, Figure 2.6). The active nest located on the cliffs along the Powder River (GOEA30) was not accessible for monitoring. Eight of the nine active nests accessible for monitoring in 2011 were successful (GOEA13 was not); these eight nests produced a total of 11 fledglings for a productivity rate of 1.22 fledglings per active nest. Seven chicks from five nests (GOEA2 [two chicks], GOEA3 [two], GOEA25, GOEA27, and GOEA29) were banded in 2011.

In 2012, the 23 non-dilapidated eagle nests documented in the 2011 survey were visited, with eight nests classified as active: GOEA02, GOEA03, GOEA05, GOEA10, GOEA11, GOEA17, GOEA27, and GOEA30 (Table 2.6, Figure 2.7). Fourteen nests were classified as inactive, and all classifications were verified through subsequent ground-based monitoring. One nest (GOEA12) that was inactive in 2011 was located in a tree that had fallen over and no longer existed. Additionally, nest GOEA24 was occupied by a bald eagle in 2012 (Table 2.6, Figure 2.7). This nest is over two miles (three km) from the Project.

**Table 2.6 Results of 2011 and 2012 aerial eagle nest survey in the greater Elkhorn Valley Wind Farm area and 6-mile buffer.**

| Nest ID | Nest Name | 2011 Nest Status | 2012 Nest Status | Distance to Nearest Elkhorn Turbine (in Miles) |
|---|---|---|---|---|
| GOEA01 | | Inactive | Inactive | 9.29 |
| **GOEA02** | **High Valley** | **Active** | **Active** | **9.28** |
| **GOEA03** | **Phys Ridge** | **Active** | **Active** | **8.92** |
| GOEA04 | | Dilapidated | --- | 6.06 |
| **GOEA05** | **Catherine Creek** | **Active** | **Active** | **5.82** |
| GOEA06 | | Dilapidated | --- | 3.70 |
| GOEA07 | | Possibly active | Inactive | 6.26 |
| GOEA08 | | Inactive | Inactive | 2.28 |
| GOEA09 | | Possibly Active | Inactive | 2.43 |
| GOEA10 | **North Clark Mountain** | Inactive | **Active** | 2.38 |
| **GOEA11** | **North Ramo Flats** | **Active** | **Active** | **3.50** |
| GOEA12 | | Inactive | Gone | 1.07 |
| **GOEA13** | **Thief Valley** | **Active** | Inactive | **1.81** |
| *GOEA14* | *Jimmy Creek* | *inactive* | Inactive | *2.91* |
| GOEA15 | | Dilapidated | --- | 3.14 |
| GOEA16 | | Dilapidated | --- | 2.94 |
| **GOEA17** | **Colwill/Interstate-84** | **Active** | **Active** | **5.05** |
| GOEA18 | | Dilapidated | --- | 5.49 |
| GOEA19 | | Dilapidated | --- | 2.77 |
| GOEA20 | | Inactive | Inactive (Canada Goose) | 1.53 |
| GOEA21 | | Dilapidated | --- | 1.64 |
| GOEA22 | | Dilapidated | --- | 1.70 |
| GOEA23 | | Inactive | Inactive | 4.48 |
| GOEA24 | | Inactive | Bald Eagle--Active | 2.68 |
| **GOEA25** | **Ladd Canyon** | **Active** | Inactive | **11.88** |
| GOEA26 | | Inactive | Inactive | 11.88 |
| **GOEA27** | **Craig Mountain** | **Active** | **Active** | **6.37** |
| GOEA28 | | Inactive | Inactive | 3.41 |
| **GOEA29** | **Pyles Canyon** | **Active** | Inactive | **3.45** |
| **GOEA30** | **Powder River Canyon** | **Active** | **Active** | **5.93** |
| GOEA31 | | Inactive | Inactive | 5.92 |

The 2012 nest monitoring efforts were initiated on March 15, 2012. Eight golden eagle nests determined to be active through the reconnaissance flight and subsequent ground-based monitoring were monitored through fledging in 2012. Nest GOEA30, which was inaccessible in 2011, was accessible in 2012; therefore, all eight active nests were monitored and all successfully fledged young. A total of ten chicks fledged, resulting in 1.25 fledglings per active nest in 2012. Six chicks from five nests (GOEA2, GOEA3 [two], GOEA10, GOEA11, and GOEA27) were banded in 2012.

Nest surveys in 2013 were limited to the four known eagle nests within a 2-mile buffer of the Project: GOEA12, GOEA13, GOEA20, and GOEA32 (Figure 2.8). All nests were active early in the breeding season, based on the presence of incubating adults at each nest. However, nest GOEA12 failed before the late breeding season monitoring visit. The remaining three nests successfully fledged a total of four young, resulting in 1.00 fledglings per active nest in 2013. No chick banding occurred in 2013.

The 2014 nest monitoring efforts were initiated on March 19, 2014. Each nest was visited at least three times (March, April, and May), with the northern nest requiring a fourth visit (June) to confirm nest status. During these visits, at least two 4-hour long surveys were conducted in weather conditions suitable for observation of the nests from a point greater than 500 m (1,640 ft).

Three of the four territories were confirmed as occupied (two resident adults within territory) due to either territorial displays or active nesting (Figure 2.9). Only one nest was active (Nest GOEA32), as an adult was observed incubating on April 20 and in a likely brooding position on May 11. However, a visit to this nest on June 24 showed neither young in the nest nor any indication that any young had successfully fledged. No tending, incubating/brooding adults, or young were observed at the other three nests. Furthermore, no adult golden eagles were observed within several kilometers of GOEA20, suggesting the associated territory may have been abandoned or subsumed. It is possible that eagles within the other two occupied territories were nesting at other, unknown locations; ground-based nest searches of the Prescott Gulch and Cusick Creek areas (nests GOEA12 and GOEA13, respectively) are problematic due to access limitations and topography.

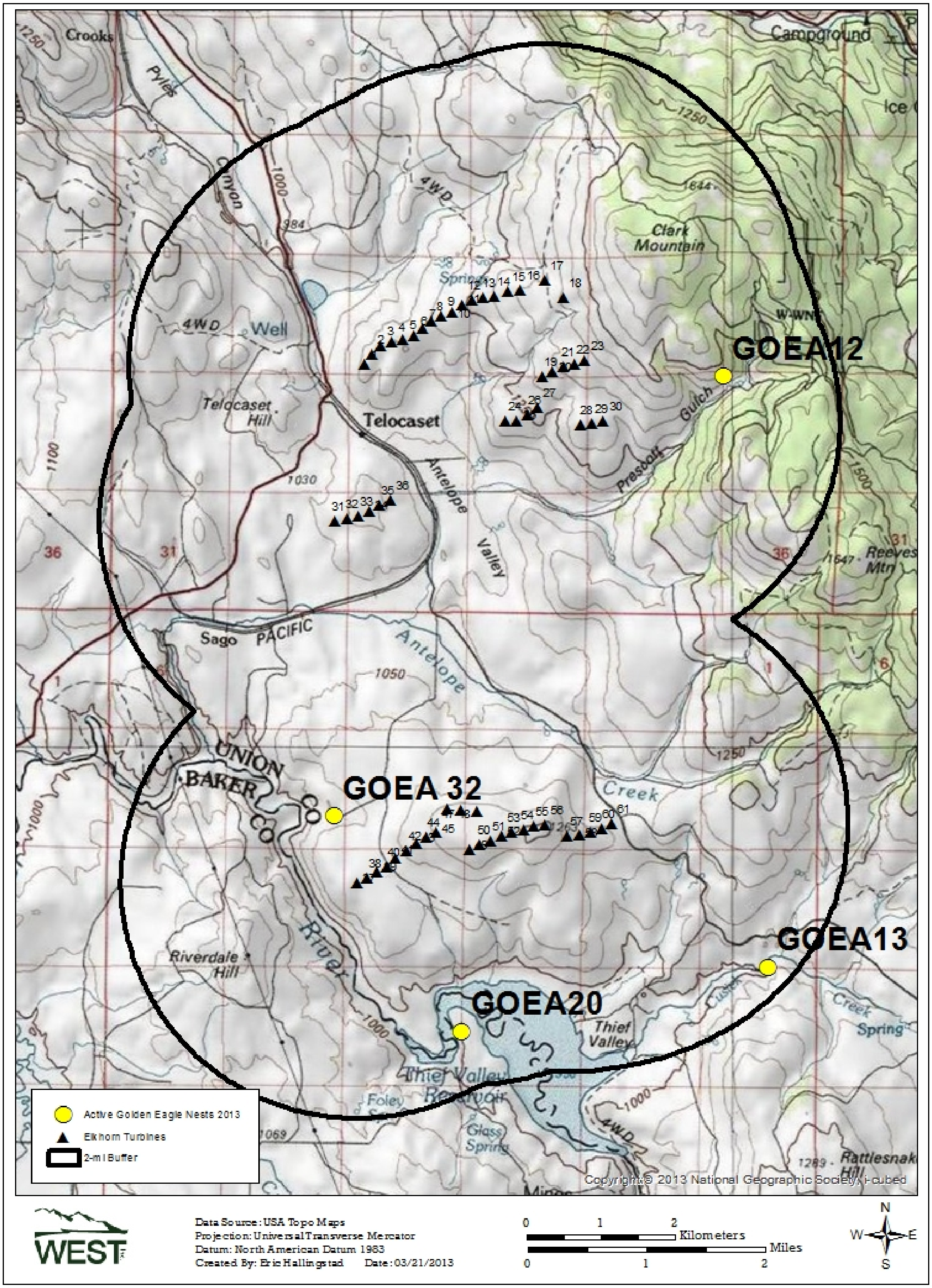


**Figure 2.8 2013 Golden eagle nests located within a 2-mile buffer of the Elkhorn Valley Wind Farm.**

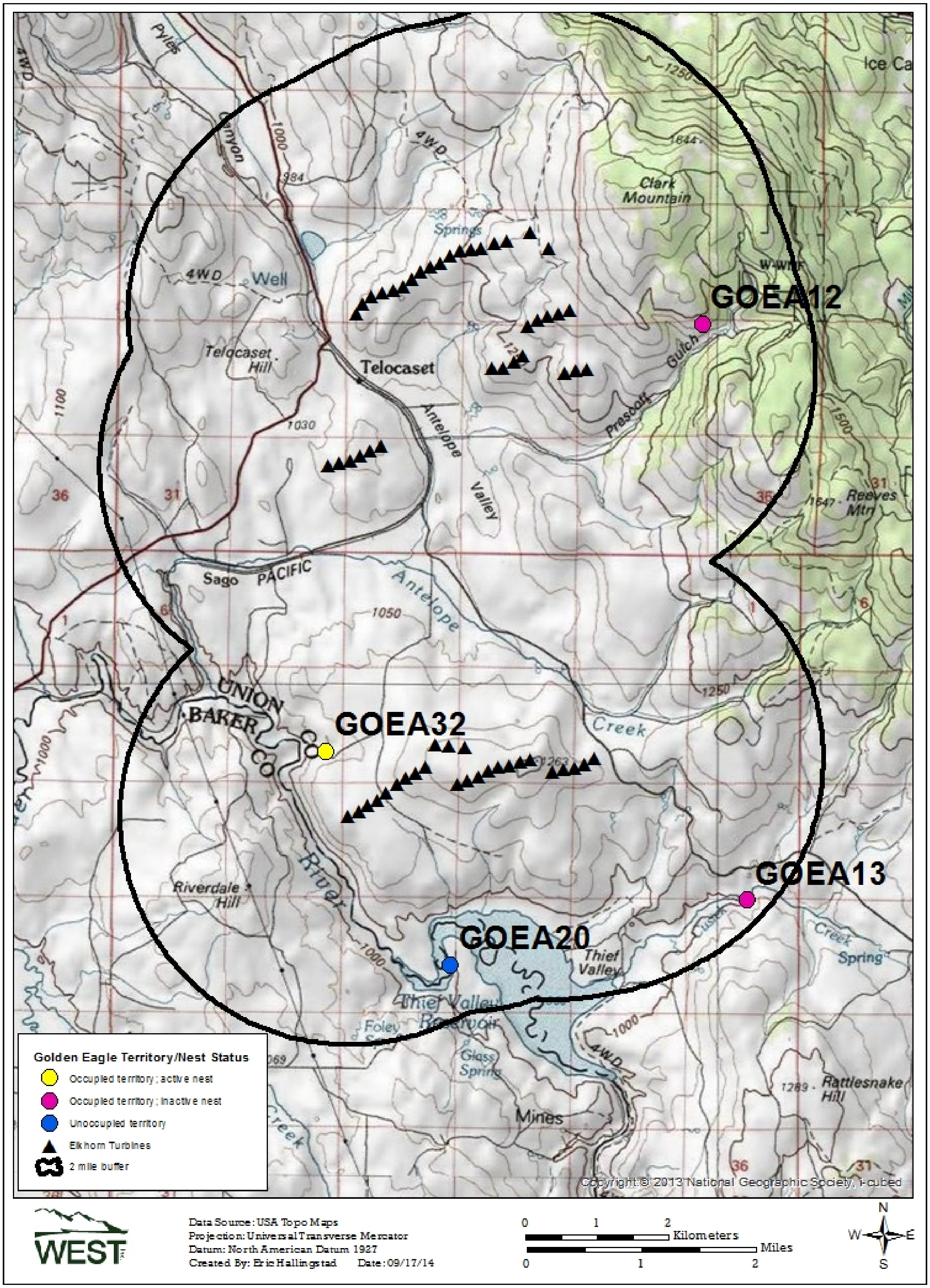


**Figure 2.9 2014 Golden eagle nests located within a 2-mile buffer of the Elkhorn Valley Wind Farm.**

#### 2.2.2.3 Discussion

One eagle nest was identified within one km of Elkhorn turbines; this was a newly constructed nest in 2013 within a known historic territory (see nests GOEA 33 and 71 in Figure 2.1). Golden eagle nests are generally distributed throughout the survey area, including three other nests within a 2-mile buffer of the Project turbines (range 1.1 to 1.8 mile [1.8 to 2.9 km]). The number of active nests within the 6-mile buffer decreased slightly between the 2011 and 2012 aerial surveys; however, many variables may affect inter-annual variation in nest occupancy. Additionally, the presence of three active, successful golden eagle nests within two miles of the project in 2013 suggests that Project operation is unlikely to have displaced nesting eagles in the 6-mile buffer used in 2011 and 2012. In 2014, golden eagle breeding success within two miles of Project turbines was lower than in any other previous year. It is unknown if local prey availability, spring weather, or other factors contributed to the low level of breeding success in 2014. Prey and weather have been shown to influence breeding activity in southwest Idaho, where the percentage of pairs that lay eggs ranged from 38 – 100% over a 22 year study (Steenhof et al. 1997). Among the four years of monitoring, the golden eagle nest productivity rates have remained consistent, and no significant displacement effects on local golden eagle nests were apparent. No bald eagle nests are known to occur within two miles of the Project, and no significant impacts on breeding bald eagles are anticipated to result from Project operations.

### *2.2.3 Golden Eagle GPS Telemetry Study*

The primary objectives of the telemetry study were to delineate resident golden eagle territories, identify habitat use (including high use areas and foraging habitats), evaluate spatial and temporal patterns of habitat use, and help assess eagle migration patterns. These data were collected in an effort to identify potential risk avoidance or minimization actions for both Elkhorn and the proposed Antelope Ridge.

#### 2.2.3.1 Methods

Resident adult golden eagles with established territories and/or active nests within six miles of the Elkhorn and Antelope Ridge project areas were targeted for capture and instrumentation with GPS backpacks manufactured by Microwave Telemetry, Inc. (GPS PTT-100). Capture and instrumentation methods and results are described in Enk et al. 2011b and 2012. The golden eagle GPS data from March 2011 through June 2013 were analyzed using a Brownian Bridge Movement Model (BBMM; Horne et al. 2007, Sawyer et al. 2009, Nielson et al. 2012) using R (R Development Core Team 2012). Since no large migratory or seasonal movements were observed among the instrumented eagles, Utilization Distributions (UDs; Kernohan et al. 2001) were calculated for each bird to estimate movement and habitat use for the entire year at the 50%, 75%, and 90% contour levels. UDs were also calculated using June 2013 – July 2014 data for comparisons to previous results.

Habitat and other variables thought to influence eagle movements were incorporated into a binary logistic regression equation to develop Resource Selection Functions (RSF; Table 2.7; Manly et al. 2002, Johnson et al. 2006) that predict the relative probability of golden eagle habitat use (see Enk et al. 2012). Habitat selection models based on March 2011 to June 2013 GPS data were developed for individual eagles using forward, stepwise selection (Neter et al. 1996) and the

Bayesian information criterion (BIC; Burnham and Anderson 2002). The resulting individual RSFs were used to estimate the relative probability of selection by the average golden eagle within the study area. Data collected between June 2013 and July 2014 were compared to previous RSFs to detect possible changes in habitat selection patterns.

**Table 2.7 Explanatory covariates used to model golden eagle habitat selection within the greater Elkhorn/Antelope Ridge area.**

| Covariate Name | Description |
|---|---|
| **Landscape Features** | |
| *elevation* | Elevation (m) |
| *elevation_mn* | Mean elevation within a 1.5-$km^2$ moving window |
| *slope*[a] | Slope (degrees; 0 to 90) |
| *slope_mn*[a] | Mean slope within a 1.5-$km^2$ moving window |
| *rugged*[a] | Terrain ruggedness (0 to 1; high values = high terrain variation) |
| *rugged_mn*[a] | Mean ruggedness within a 1.5-$km^2$ moving window |
| *radiation_mn* | Mean radiation (angle of sun at given time) within a 1.5-$km^2$ moving window |
| **Vegetation** | |
| *conifer_mn* | Proportion of conifer vegetation within a 1.5-$km^2$ moving window |
| *grass_mn* | Proportion of grass vegetation within a 1.5-$km^2$ moving window |
| *rip_mn* | Proportion of riparian vegetation within a 1.5-$km^2$ moving window |
| *shrub_mn* | Proportion of shrub vegetation within a 1.5-$km^2$ moving window |
| **Other** | |
| *nest* | Distance to eagle *nest*s (km)[a] |

[a] Quadratic term was included in model development to assess potential non-linear relationships

### 2.2.3.2 Results

Five golden eagles (four females and one male [EH2]) were instrumented with GPS transmitters, providing a total of 28,157 GPS locations (successful fixes) from March 1, 2011, through June 1, 2013. Due to the very limited duration of data collection and number of fixes for eagle EH1, calculation of UD was not feasible for this individual. UDs were calculated for the other four individuals, and the GPS platform transmitter terminal (PTT) location data were incorporated into the golden eagle RSF model. Two GPS backpacks remained active for the 2013 – 2014 survey period: EH4 and EH5. On August 9, 2014, the PTT on EH4 went static west of Interstate 84 (I-84) near Ladd Canyon Road. The backpack was retrieved, but no sign of the eagle was found. As of October 2014, only eagle EH5 was still instrumented with a GPS backpack that remains fully functional. This eagle remains in the greater Elkhorn/Antelope Ridge area.

All instrumented individuals had home ranges focused around each territory's nest location(s); these eagles did not make large migration movements during the summer and winter periods, suggesting that they utilize the habitat within their home ranges throughout the year. Golden eagle spatial use and territory sizes were estimated by calculating 50%, 75%, and 90% UD contours through the BBMM process (Figure 2.10). Three of the four instrumented eagles had similar territory sizes (EH2, EH4, and EH5, Figure 2.10), with each having one contiguous area within the 90% UD contour. The average area contained within the 90% UD's for these three eagles is 19.35 $km^2$. The 90% UD contour for one eagle was not contiguous and this eagle's territory was much larger than the other instrumented eagles (90% UD = 176.41 $km^2$). No evaluated eagle territories overlapped Project turbines, and the majority of the UDs were not in the proximity of the Project. Only a very small amount of eagle EH3's 90% UD was relatively close to turbines (Figure 2.10).

UDs were recalculated in 2014 using data collected from two active GPS backpacks during the 2013-2014 study period (EH4 and EH5). A total of 11,442 GPS locations (successful fixes) were collected from the two golden eagles between June 11, 2013, and July 9, 2014. Home range sizes and contours for golden eagles EH4 and EH5 were very similar to their UDs from 2011-2013 (Figures 2.11 and 2.12). The activity for golden eagle EH4 was concentrated near its nest location and in the hills on either side of I-84 at Ladd Canyon, and movements were generally in the southwest direction from the nest (Figure 2.11). Golden eagle EH5 was concentrated near its nest location along the east edge of Catherine Creek (Figure 2.12).

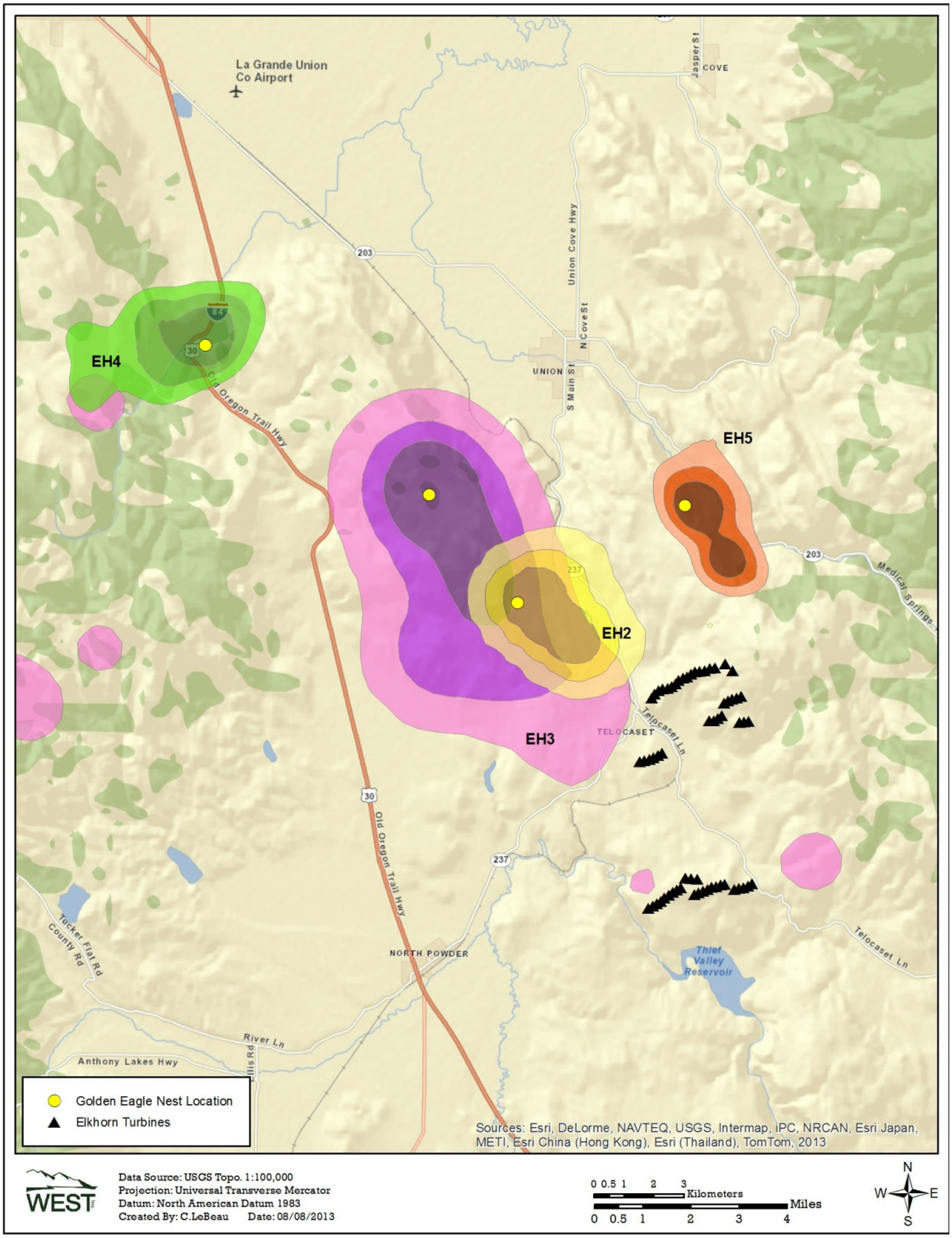


**Figure 2.10 2011-2013 Golden eagle territories as approximated using 50%, 75%, and 90% utility distribution contours. Nest locations for the instrumented eagles are shown.**

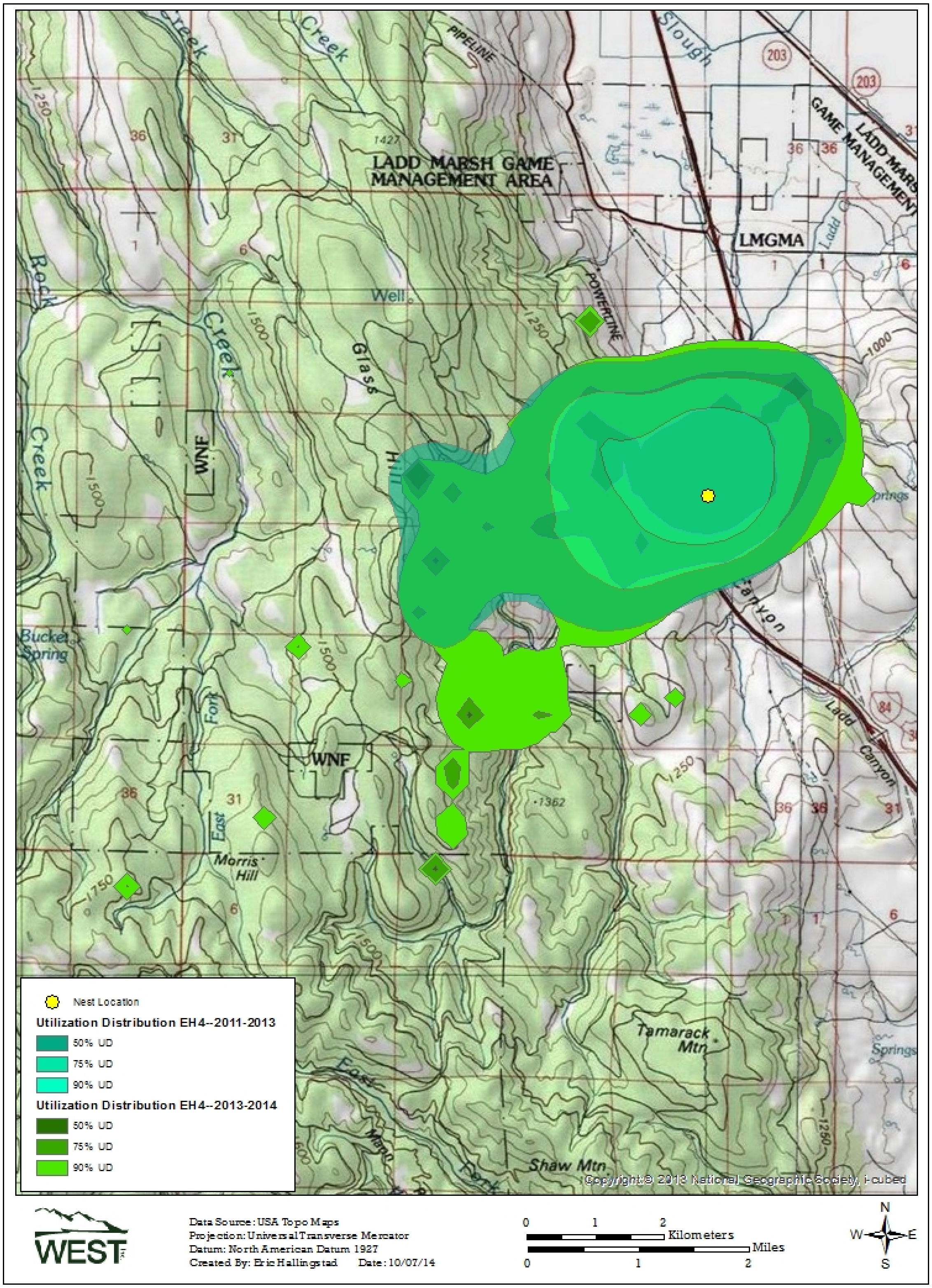


**Figure 2.11 Comparison of utilization distribution (UD) contours for golden eagle EH4 (PTT105029) based upon Brownian Bridge Movement Model (BBMM) analysis of global positioning system (GPS) locations acquired between June 12, 2013 - July 9, 2014, and between June 26, 2011 - June 9, 2013.**

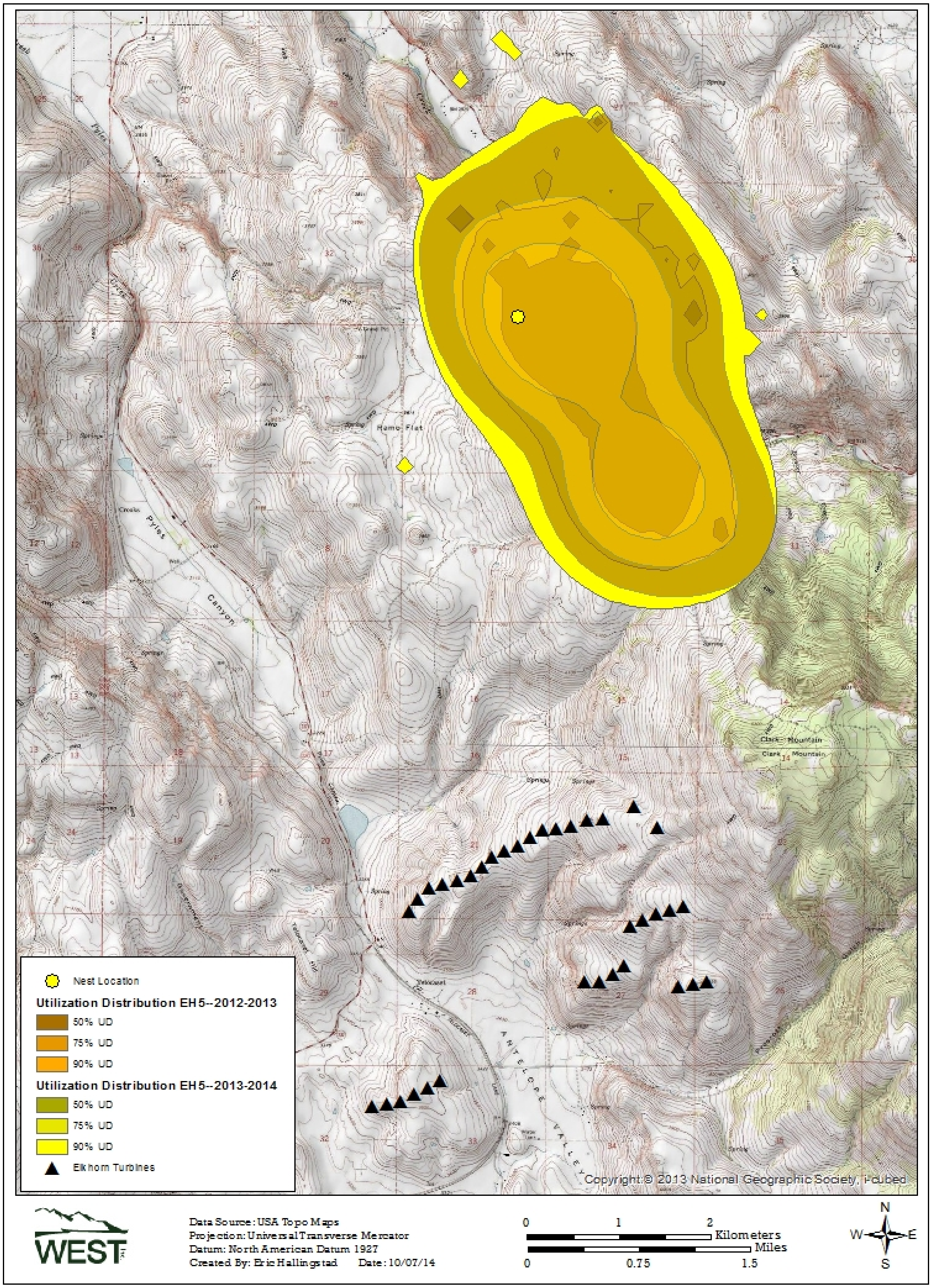


**Figure 2.12 Comparison of utilization distribution (UD) contours for golden eagle EH5 (PTT105026) based upon Brownian Bridge Movement Model (BBMM) analysis of global positioning system (GPS) locations acquired between June 11, 2013 - July 9, 2014, and between May 27, 2012 - June 10, 2013.**

The RSF models were developed to associate eagle observations with landcover, nesting and habitat covariates using data collected from March 2011 through June 2013. The RSF models developed for Elkhorn had good predictive ability based on covariates of proximity to nest, slope, vegetation, and ruggedness (Table 2.8). The average estimates from the RSF models identified for four individual eagles were used to predict the relative probability of golden eagle habitat selection within the study area (Figure 2.13). The assumption is that the preferences shown by instrumented eagles accurately represent the preferences of other eagles within the study area. The RSF values for all grid cells within the study area were then grouped into five equal bins so that each predicted use category had the same number of grid cells. Predicted eagle use within proximity to the Project was relatively high (Figure 2.14), with 51.2% of cells within one km of the turbines having high levels of predicted use. Medium and medium-high use comprised 24.7% and 24.1% of all cells within one km of the Elkhorn turbines, respectively.

Individual RSF models built off of data collected between June 2013 and July 2014 also contained some or all of the covariates for distance to nest, slope, elevation, radiation, vegetation, and terrain ruggedness (Table 2.9). None of the same landcover types were included in both models, while distance to nest and elevation were the only landscape features included in both models (Table 2.9). For both eagles, covariates that were significant in their individual RSFs for both study periods showed almost identical effects and magnitudes. For these reasons, the probabilities of golden eagle habitat selection were not changed.

**Table 2.8 Slope coefficients, odds ratios, and 90% confidence intervals (CI) in the top individual models for data collected March 2011 - June 2013.**

| Covariate* | Slope Coefficient** | 90% CI Lower | 90% CI Upper | Odds Ratio*** | 90% CI Lower | 90% CI Upper |
|---|---|---|---|---|---|---|
| **EH2/PTT-105027** | | | | | | |
| *(Intercept)* | 0.696 | | | | | |
| *nest* | -0.637 | -0.844 | -0.430 | -47.129 | -57.018 | -34.964 |
| *slope* | 0.102 | 0.081 | 0.123 | 10.739 | 8.399 | 13.130 |
| *rip_mn* | -4.041 | -18.763 | 10.681 | NA | NA | NA |
| *rugged* | 0.137 | 0.095 | 0.178 | NA | NA | NA |
| *rugged_quad* | -0.003 | -0.003 | -0.002 | NA | NA | NA |
| **EH3/PTT-105028** | | | | | | |
| *(Intercept)* | -9.153 | | | | | |
| *nest* | -0.658 | -0.936 | -0.379 | -48.188 | -60.796 | -31.525 |
| *radiation_mn* | 0.073 | -0.004 | 0.149 | NA | NA | NA |
| *slope* | 0.130 | 0.116 | 0.143 | 13.862 | 12.335 | 15.410 |
| *shrub_mn* | 2.227 | -0.971 | 5.426 | NA | NA | NA |
| *rugged* | 0.130 | 0.096 | 0.165 | NA | NA | NA |
| *rugged_quad* | -0.002 | -0.003 | -0.002 | NA | NA | NA |
| **EH4/PTT-105029** | | | | | | |
| *(Intercept)* | -10.495 | | | | | |
| *nest* | -0.688 | -0.980 | -0.395 | -49.737 | -62.482 | -32.664 |
| *slope* | 0.129 | 0.120 | 0.138 | 13.788 | 12.758 | 14.828 |
| *grass_mn* | 1.836 | -3.599 | 7.271 | NA | NA | NA |
| *elevation* | 0.000 | -0.003 | 0.003 | -0.006 | -0.284 | 0.273 |
| *radiation_mn* | 0.093 | -0.056 | 0.241 | NA | NA | NA |
| **EH5/PTT-105026** | | | | | | |
| *(Intercept)* | -3.356 | | | | | |
| *nest* | -0.722 | -1.103 | -0.341 | -51.422 | -66.829 | -28.861 |
| *shrub_mn* | 3.525 | -1.951 | 9.000 | NA | NA | NA |
| *rugged_mn* | 0.829 | 0.195 | 1.463 | NA | NA | NA |
| *rugged_mn_quad* | -0.073 | -0.199 | 0.054 | NA | NA | NA |
| *elevation_mn* | 0.004 | 0.001 | 0.007 | 0.369 | 0.061 | 0.679 |
| *rip_mn* | -22.684 | -50.253 | 4.886 | NA | NA | NA |

* please refer to Table 2.7 for covariate definitions

** statistical relationship between observed use and availability (CIs that do not inlcude zero indicate good predictive ability)

*** estimated percent change in relative probability of selection for a 1-unit change in a predictor variable

NA-Odds ratios were not calculated for CIs that included zero or quadratic effects.

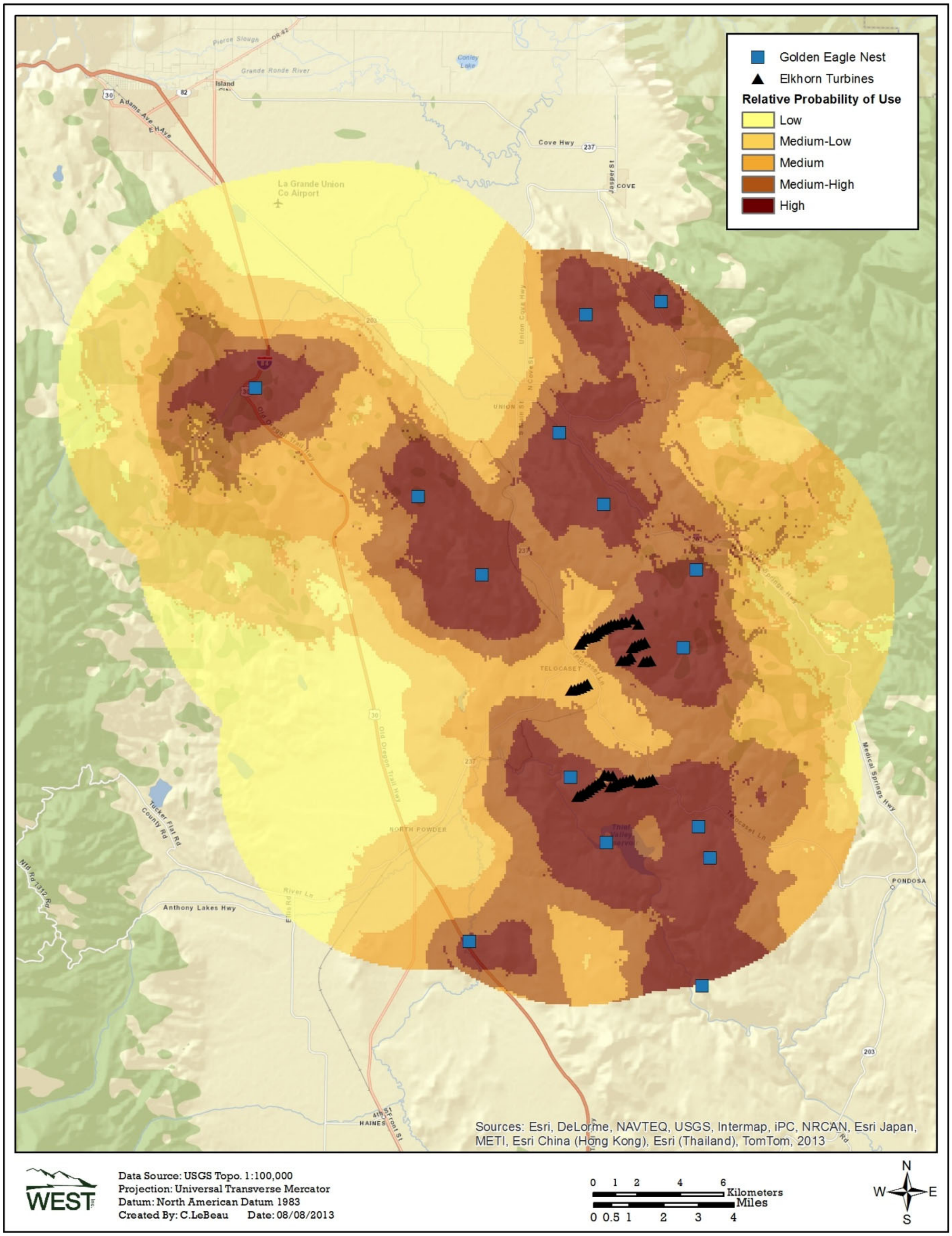


**Figure 2.13 Predicted golden eagle use within the study area (PTT territory reflects nest locations for marked birds and GOEA territories are locations of previously-documented unmarked golden eagle nest locations).**

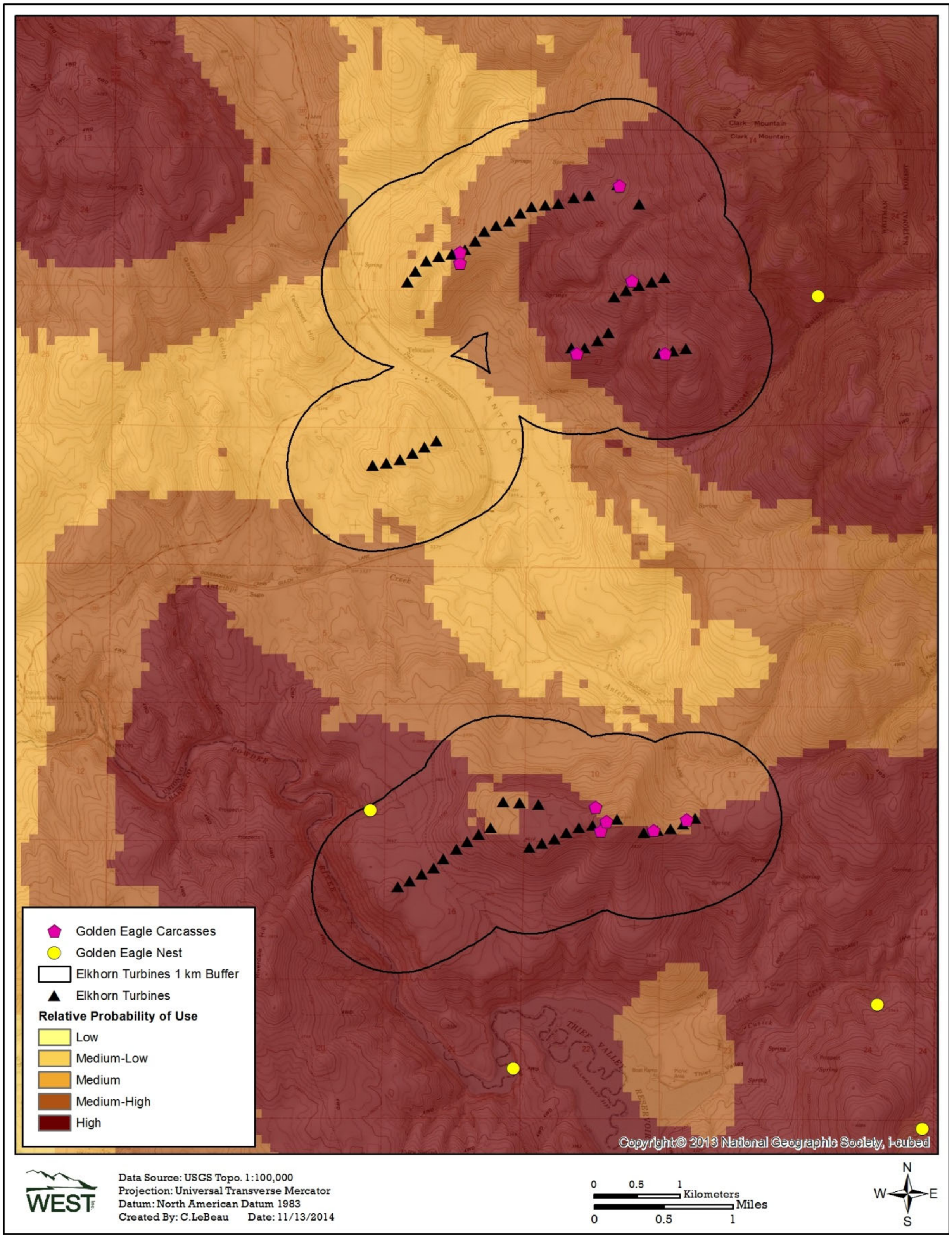


**Figure 2.14 Predicted golden eagle use and documented carcasses within one kilometer of turbines at the Elkhorn Valley Wind Farm.**

**Table 2.9 Slope coefficients, odds ratios, and 90% confidence intervals (CI) in the top individual models developed for eagles EH4 and EH5 using data collected between June 2013 – June 2014.**

| Covariate | Slope Coefficient | 90% CI Lower | 90% CI Upper | Odds Ratio | 90% CI Lower | 90% CI Upper |
|---|---|---|---|---|---|---|
| | | **EH4/PTT-105029** | | | | |
| *(Intercept)* | 5.007 | | | | | |
| *nest* | -0.792 | -1.051 | -0.532 | -54.696 | -65.044 | -41.285 |
| *slope* | 0.132 | 0.120 | 0.143 | 14.092 | 12.787 | 15.411 |
| *grass_mn* | 0.112 | -0.004 | 0.227 | NA | NA | NA |
| *elevation* | 0.007 | 0.004 | 0.010 | 0.728 | 0.423 | 1.034 |
| *radiation_mn* | -0.132 | -0.244 | -0.020 | -12.356 | -21.665 | -1.940 |
| | | **EH5/PTT-105026** | | | | |
| *(Intercept)* | 2.178 | | | | | |
| *nest* | -1.293 | -1.836 | -0.751 | -72.563 | -84.048 | -52.807 |
| *shrub_mn* | -5.648 | -13.329 | 2.034 | NA | NA | NA |
| *rugged_mn* | 0.548 | -0.873 | 1.968 | NA | NA | NA |
| *rugged_mn_quad* | -0.066 | -0.417 | 0.285 | NA | NA | NA |
| *elevation_mn* | 0.001 | -0.004 | 0.005 | NA | NA | NA |
| *rip_mn* | 19.078 | -14.431 | 52.588 | NA | NA | NA |

#### 2.2.3.3 Discussion

The eagles monitored during this study generally did not utilize areas within one km of the Elkhorn turbines; however, as discussed in Section 2.2.3.1 (Methods), the eagles targeted for monitoring were not located closest to the Project. Data collected during the golden eagle observation surveys indicates that eagles do utilize habitats throughout the Project and this is further supported by the predictive RSF model that depicts at least a medium relative probability of use for all areas within the Project. All instrumented individuals had home ranges focused around each territory's nest location(s). These eagles did not make large migration movements during the summer and winter periods, suggesting that they utilize the habitat within their home ranges during all seasons (i.e., breeding, nesting, summer, fall, and winter).

Statistical validation of the RSF models suggest that the models accurately predict the relative probability of eagle use within the study area. While resource use by migrants and floaters are not addressed in the RSF model, one might expect some consistency in the landscape features that appeal to resident and non-resident eagles (e.g., food, uplift, etc.). Therefore, these analyses provide some insight into the relative probability of use of the "average" golden eagle within the area. In fact, all of the eleven golden eagle carcass discoveries documented at the Project overlay the predicted medium-high or high use areas. It is worth noting that this model assumes occupancy of all territories with a known golden eagle nest. Occupancy of these territories may fluctuate from year to year, and assuming 100% occupancy is conservative as unoccupied territories will have lower use than predicted.

## 2.3 Evaluation of Temporal and Spatial Patterns of Golden Eagle Use

After the results of the first two years of the Study Plan, Telocaset contracted with WEST to conduct an in-depth assessment of potential correlations between golden eagle observations and multiple weather and landscape variables with the intent of identifying temporal or spatial golden eagle use patterns that would inform potential avoidance, minimization and research strategies at the Project. The analysis described below and further discussed in Section 4.0 (Stage 4: Avoidance and Minimization) was conducted in a spirit of adaptive management in order to identify trends or patterns of use at the site that would lead to effective and practicable operational adjustment or curtailment efforts. Bald eagles were not included in this evaluation due to sample size requirements.

### *2.3.1 Variables*

Temporal, weather, and landscape covariates were assessed for their potential relationships with golden eagles' use of the Project. Season and time of day were included to assess potential temporal effects on golden eagle use. Wind speed and direction data were collected every ten minutes by meteorological towers present on site before and after construction; these weather parameters were evaluated in relation to eagle observations. As golden eagle use may also be driven by features present on the landscape, several topographical and other landscape variables were included in the analyses. These variables were created as layers in ArcGIS: 1) ruggedness (degree of terrain variation), 2) slope, 3) aspect, 4) elevation, 5) habitat, 6) golden eagle nest locations, and 7) golden eagle carcass locations.

### *2.3.2 GIS Methods*

The area of interest for these analyses encompassed all areas within 3,500 m of turbines. This area includes almost the entire golden eagle flight path dataset collected during pre- and post-construction surveys, as well as four golden eagle nest sites. Values for variables were derived within each 30-m x 30-m grid using the ArcGIS 'Grid Index Features' tool.

The GRID data analysis queried and extracted data from five unique datasets to create five different variables. The datasets included: aspect, eagle flight paths, fixed-point avian use and eagle observation survey locations, ruggedness, and slope. The dependent variable was eagle flight path counts. The predictor variables included: aspect, survey location, ruggedness, and slope.

Aspect was derived from a USGS 1-Arc-Second National Elevation Dataset (NED) using the ArcGIS Spatial Analyst 'Aspect' tool. The aspect raster was created at a 30-m resolution consistent with the USGS NED from which it was derived. The aspect values are represented in degrees. Aspect was extracted at the GRID centroid using the ArcGIS Spatial Analyst 'Extract Values to Points' tool.

The golden eagle flight paths were derived from all fixed-point avian use and eagle observation surveys conducted by WEST. The flight paths were recorded on hard-copy data sheets in the field and then heads-up digitized in ArcMap. The eagle flight path count variable was extracted using the ArcGIS 'Spatial Join' tool. The counts represent the number of unique eagle flights that intersected each GRID. Eagle flight path length was extracted using the ArcGIS 'Intersect' tool. The resultant dataset was then aggregated by GRID using the ArcGIS 'Dissolve' tool.

The fixed-point avian use and eagle observation survey locations were derived from UTM coordinates recorded in a GPS unit. Survey location was extracted using the ArcGIS 'Spatial Join' tool. The GRID's (target features) were "joined" by a fixed-point avian use or eagle observation point based on nearest proximity to each GRID.

Vector Ruggedness Measure (VRM) measures terrain ruggedness as the variation in three-dimensional orientation of grid cells within a neighborhood. Vector analysis is used to calculate the dispersion of vectors normal (orthogonal) to grid cells within the specified neighborhood. This method effectively captures variability in slope and aspect into a single measure. Ruggedness values in the output raster can range from 0 (no terrain variation) to 1 (complete terrain variation). Typical values for natural terrains range between 0 and about 0.4.

VRM was adapted from a method first proposed by Hobson (1972). VRM appears to decouple terrain ruggedness from slope better than current ruggedness indices, such as TRI or LSRI. See Sappington et al. 2007 for further details. Ruggedness was extracted at the GRID centroid using the ArcGIS Spatial Analyst 'Extract Values to Points' tool.

Slope was derived from a USGS 1-Arc-Second NED using the ArcGIS Spatial Analyst 'Slope' tool. The slope raster was created at a 30 m resolution consistent with the USGS NED from which it was derived. Slope was extracted at the GRID centroid using the ArcGIS Spatial Analyst 'Extract Values to Points' tool.

### *2.3.3 Analysis Methods*

WEST conducted several analyses looking at each covariate and its correlation with golden eagle use as well as the interactions of covariates with eagle use. Analyses utilized existing data on golden eagle observations that had been collected at the Project during pre- and post-construction monitoring efforts (see Section 2.1, Pre-Construction Use and Nesting Surveys, and Section 2.2, Post-Construction Use and Nesting Surveys). The landscape covariates were compared by grid cell using flight paths corresponding to the eagle observations (Figure 2.15).

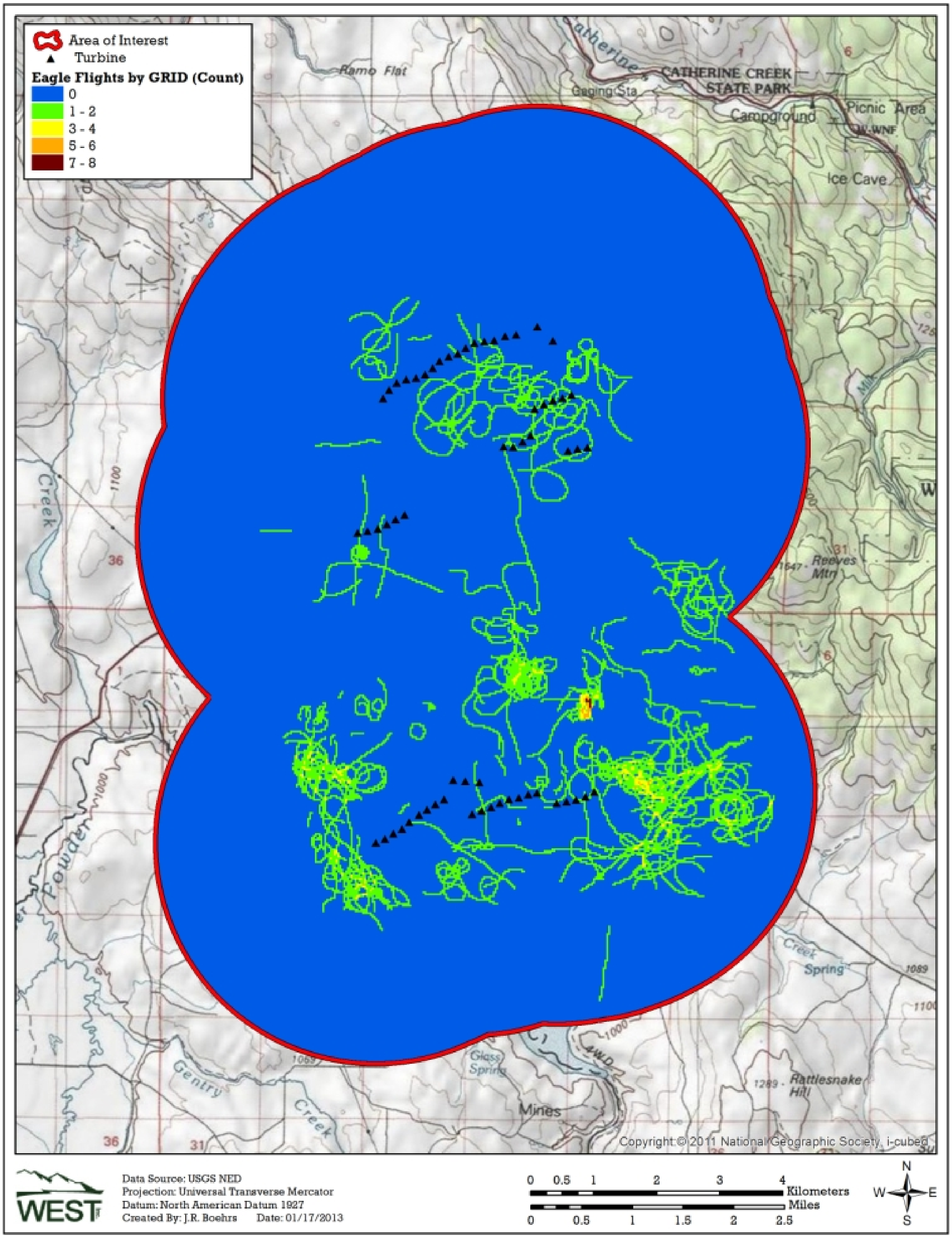


**Figure 2.15 Count of golden eagle flight paths recorded during pre- and post-construction surveys for the Elkhorn Valley Wind Farm as calculated within 30-m by 30-m grid cells using ArcGIS.**

Data on golden eagle use in the Project area collected through baseline studies and post-construction monitoring were analyzed as follows:

- Graphing golden eagle use from point count data by 1) hour of day, 2) wind speed, 3) wind direction, and 4) hour of day by season.
- Overlaying flight paths with GIS layers on the 30-m by 30-m grid placed over the observation points' viewsheds. For the analysis, each grid cell was weighted based on the number of flight paths that passed through the cell (Figure 2.15). These "use values" were then assessed in relation to the spatial predictor variables using univariate analyses. These analyses are commonly used prior to conducting multivariate analyses to describe the primary relationships contained within a dataset.
- The effects of interactions between variables on golden eagle use were also investigated to aid in understanding relationships amongst multiple variables. An interaction occurs when one variable's effects are dependent upon the levels of another variable. An example of a possible interaction could be wind direction and wind speed. The levels of use during higher wind speeds might only be high for a certain wind direction (e.g., a direction that creates updrafts) and not other directions. To determine if interactions between potential covariates were present, all pairwise combinations of predictor variables were plotted against observed "use values" and plots were visually inspected to look for an interaction between the explanatory variables.

Finally, the GIS layers described above were used to compare landscape characteristics of turbines where golden eagle carcasses were documented to characteristics of turbines without carcasses (see Section 3.2, Standardized Fatality Monitoring).

### *2.3.4 Results*

Based strictly on visual interpretation of the flight path maps (Figures 2.3 and 2.5), higher golden eagle use areas were apparent along the Powder River corridor running approximately one km off the southwest corner of the Project, and also along the slopes of Reeves Mountain to the southeast of the Project. Slope was the only predictor variable that showed a statistically significant relationship (alpha = 0.10) with golden eagle use (p-value = 0.06, Table 2.10). Generally, steeper slopes had more golden eagle use (Figure 2.16). Increased terrain ruggedness showed a positive but not statistically significant relationship with golden eagle use (p-value = 0.23, Figure 2.17). On a turbine-by-turbine basis, no variables were strongly correlated with fatalities; however, the small carcass sample size (n=5 at time of analysis) limited analysis strength. Slope showed the highest correlation with carcass locations (r = 0.20), suggesting that an increase in slope corresponds weakly with an increase in golden eagle fatality risk. No other spatial or temporal predictors showed a discernible relationship with golden eagle use at the univariate level.

**Table 2.10 Univariate analysis results for slope and golden eagle use at the Elkhorn Valley Wind Farm.**

| Slope Category | Definition | Flight Paths per Hour | Total Grid Cell Count |
|---|---|---|---|
| cat1 | 0 to 4 | 69.4 | 36950 |
| cat2 | 4 to 7.5 | 98.8 | 36848 |
| cat3 | 7.5 to 12.5 | 101.7 | 37229 |
| cat4 | 12.5 and up | 101.0 | 38085 |

chi-squared = 7.39, df = 3, p-value = 0.06

Several of the interaction plots of predictor variables showed weak patterns related to golden eagle use of the Project area: 1) increasing use with increasing slope during 1000 – 1600 hrs, 2) increasing use with increasing slope in all wind directions, and 3) increasing use with increasing slope at low-moderate wind speeds (Exhibit C). However, the statistical significance of these interactions was not assessed due to limitations in sample size and the lack of significance at the univariate level. No other interaction plots showed a clear relationship with golden eagle use (Exhibit C).

These results generally corroborate the results of the telemetry analysis where there appears to be a habitat preference for steeper slopes or more rugged terrain. No strong temporal patterns existed in the study.

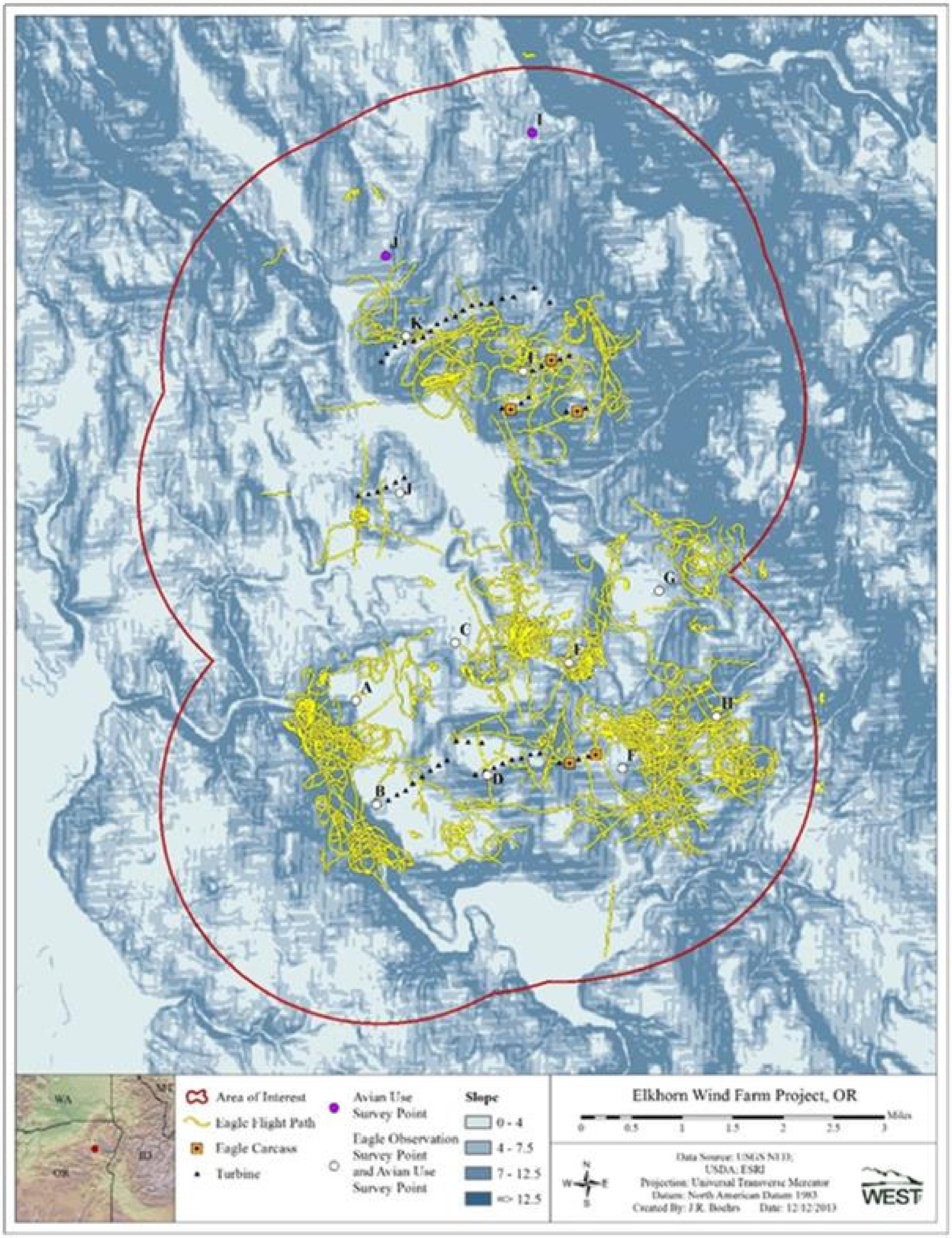


**Figure 2.16 Slope values and golden eagle flight paths recorded during pre- and post-construction surveys for the Elkhorn Valley Wind Farm as calculated within 30-m by 30-m grid cells using ArcGIS.**

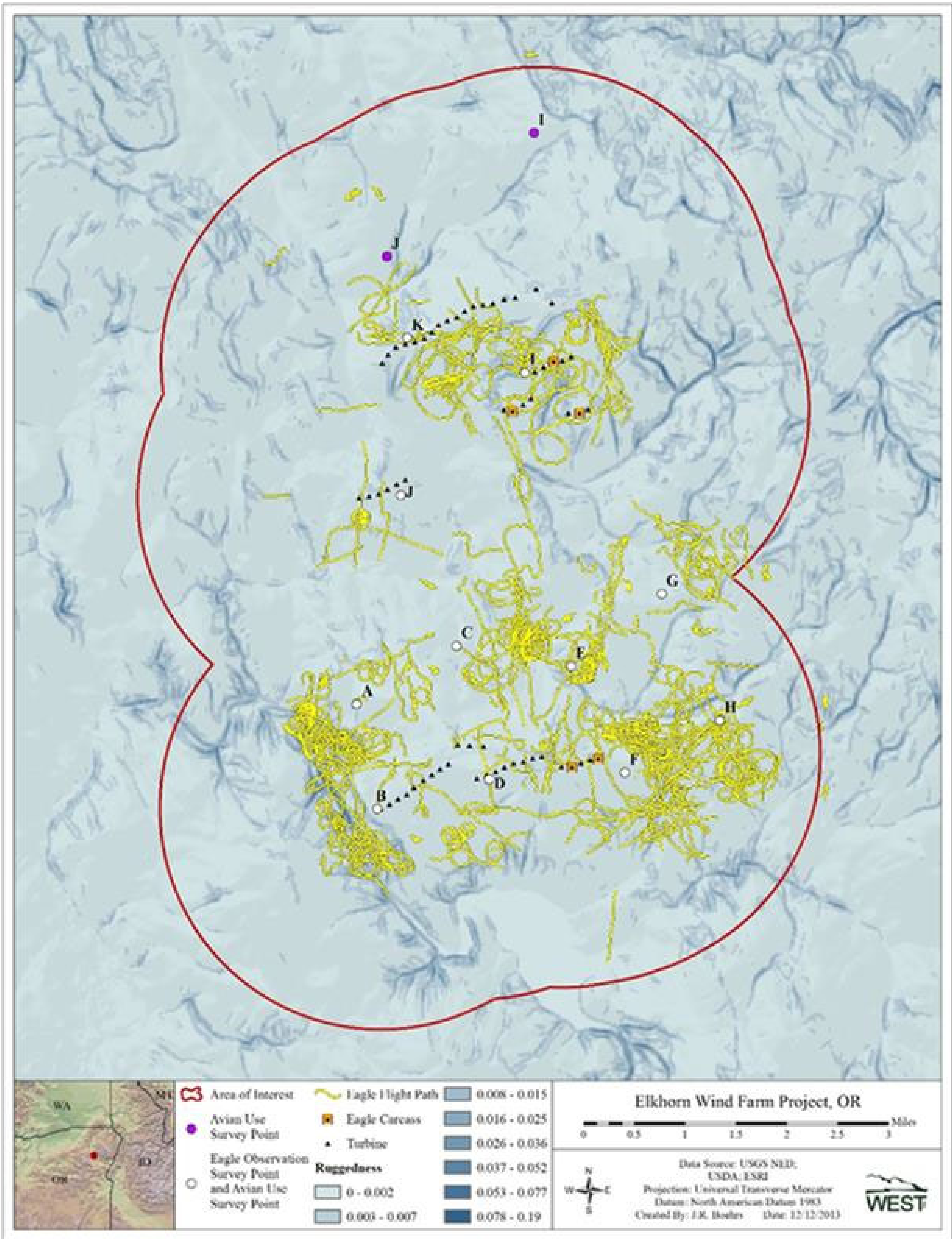


**Figure 2.17 Ruggedness values and golden eagle flight paths recorded during pre- and post-construction surveys for the Elkhorn Valley Wind Farm as calculated within 30-m by 30-m grid cells using ArcGIS.**

# 3.0 STAGE 3: ASSESSING EAGLE RISK AND PREDICTING FATALITIES

## 3.1 Nesting Eagles and Inter-Nest Distances

### *3.1.1 Nesting Eagles*

Nesting golden eagles have been documented in the Project vicinity through site-specific surveys since 2002, and a more detailed examination of nest productivity began in 2011. One active golden eagle nest was established in 2013 just within the one km buffer of Project turbines. Golden eagle nests are generally distributed throughout the survey area, including four nests within a 2-mile buffer of the Project (range 0.6 to 1.8 mile [1.0 to 2.9 km]). The number of active golden eagle nests within the 6-mile buffer decreased slightly between the 2011 and 2012 aerial surveys; however, many variables may affect inter-annual variation in nest occupancy. Additionally, the presence of four active nests, three of which were successful, within two miles of the Project in 2013 suggests that Project operation is unlikely to have displaced nesting eagles. No other pre- or post-construction nest survey recorded more than two active golden eagle nests within a 2-mile buffer of the Project. Furthermore, nest productivity rates have remained consistent among the three years of post-construction monitoring (2011-2013). For these reasons, no significant indirect impacts from the Project on local golden eagle nesting activity were apparent.

Only two active bald eagle nests have been documented through site-specific surveys. Neither nest was within two miles of the Project. Productivity information was not collected for bald eagle nests. The lack of breeding activity in close proximity to the Project and low spring and summer bald eagle use suggest low risk of direct or indirect Project impacts on the local bald eagle population.

Results from studies on impacts of wind development on nesting raptors vary across the U.S. The only published report of avoidance of wind turbines by nesting raptors occurred at Buffalo Ridge, Minnesota, where raptor nest density on 101 $mi^2$ of land surrounding a wind-energy facility was 5.94 nests/39 $mi^2$ (5.94 nests/101 $km^2$), yet no nests were present in the 12 $mi^2$ facility itself, even though habitat was similar (Usgaard et al. 1997). However, this analysis assumes that raptor nests are uniformly distributed across the landscape, an unlikely event. If the nests were distributed uniformly, only two would be expected for an area 12 $mi^2$ in size; no nests were found within the project area. Based on extensive monitoring using helicopter flights and ground observations at an eastern Washington wind-energy facility, raptors were found to nest in the area of the facility at approximately the same levels before and after construction, with several nests located within 0.5 mile (0.8 km) of turbines (Erickson et al. 2004). At the Foote Creek Rim Wind-Energy Facility in southern Wyoming, one pair of red-tailed hawks (*Buteo jamaicensis*) nested within 0.3 mile (0.5 km) of the turbine strings. Additionally, at Foote Creek Rim seven red-tailed hawk nests and one great horned owl (*Bubo virginianus*) and one golden eagle nest within one mile of the wind farm successfully fledged young (Johnson et al. 2000). The golden eagle pair successfully nested 0.5 mile from the wind farm for three different years after it became operational. At the Altamont Pass facility in California, all 58 territories occupied by golden eagle pairs in the vicinity of the facility in 2000 remained active in 2005 (Hunt and Hunt 2006). A Swainson's hawk (*Buteo swainsoni*) also nested within 0.25 mile (0.4 km) of a turbine string at the Klondike I wind-energy facility in Oregon after the facility was operational (Johnson et al. 2003) suggesting no apparent avoidance of the facility by the nesting Swainson's hawk pair.

Based on the comparisons of the pre- and post-construction periods, there doesn't appear to be indirect impacts of the Project on local golden eagle nesting activity. Similar numbers of active nests have been recorded during the two periods, and a new nest was established close to the Project within a known historic territory in 2013. This is the first evidence of breeding within this territory since regular nest surveys resumed in 2011.

### *3.1.2 Territory Delineation*

#### 3.1.2.1 Utilization Distribution of Instrumented Golden Eagles

As discussed in Section 2.2.3 (Golden Eagle GPS Telemetry Study), four resident golden eagle territories were delineated using GPS transmitters. If the sample of instrumented eagles is assumed to be representative of golden eagle territories in the general vicinity of the project, then some general observations can be made. As expected, all territories are irregularly shaped, and it also appears that most golden eagle territories in the project vicinity are generally similar in size. There was evidence of territories overlapping, and one eagle had a tendency to make irregular trips outside of its core territory. In terms of risk, this type of movement is difficult, and possibly impossible, to predict. In contrast, eagles that consistently remain on their territory have much smaller home ranges; these eagles have more predictable movements that could provide useful insight for minimization and avoidance of collision risk. Unfortunately, the shape and size of the occupied territories closest to the Project are unknown.

#### 3.1.2.2 Golden Eagle Inter-Nest Distance Calculation

The approach in the USFWS ECPG calls for careful evaluation of "projects that have eagle nests within half the mean project-area inter-nest distance of the project footprint…If it is likely eagles occupying these territories use or pass through the project footprint, category 1 designation may be appropriate" (USFWS 2013). While the data provided by the UD of instrumented golden eagles provided important insight into breeding eagle territory size, only four eagles were used in that assessment. Therefore, the average nearest neighbor distance for all golden eagle nests within the 6-mile survey buffer was calculated. The ECPG calls for the inclusion of "simultaneously occupied eagle territories" in the calculation of inter-nest distances. However, territory occupancy cannot always be determined during aerial nest surveys. To determine the average inter-nest distance for the Project, any active nest located at least two miles from another nest that was active in 2011, 2012, and/or 2013 was assumed to belong to a distinct territory and each of these territories was assumed to be simultaneously occupied during the study period. Using this approach, the average inter-nest distance within the survey area is 2.93 miles (4.72 km); half that distance (1.47 miles [2.37 km]) was the buffer used from nests to determine approximated territory overlap with the Project (Figure 3.1). The total corresponding territory area based on this inter-nest distance is 6.79 $mi^2$ (17.59 $km^2$). This approximate territory size calculated using inter-nest distances corresponds closely with the average 90% UD for three of the four instrumented eagles (19.4 $km^2$ [7.5 $mi^2$]).

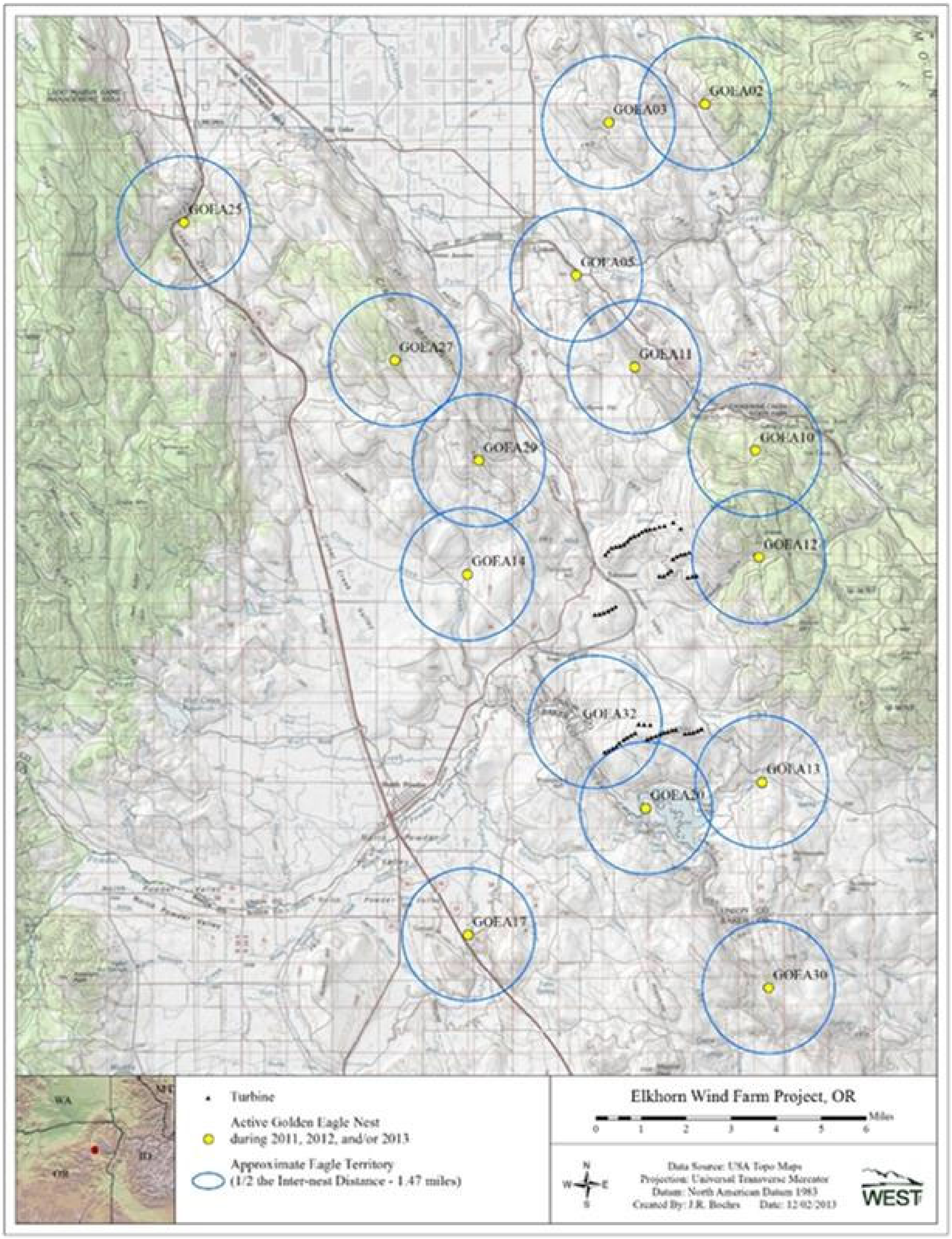


**Figure 3.1 Approximate eagle territories for the active golden eagle nests that have been identified in the vicinity of the Elkhorn Valley Wind Farm. A buffer distance of 1.47 miles was used based on half the inter-nest distance from all active nests identified during 2011, 2012, and 2013 surveys.**

Using this approach, two approximated territories associated with the occupied golden eagle nests overlap with turbine locations (GOEA 32 and GOEA 12; the approximated territory for GOEA 20 does not overlap turbine locations). Seventeen turbines are contained within a 1.47-mile approximate territory buffer surrounding each active golden eagle nest near the Project (Figure 3.1). It should be noted that the nearest nest to the Project, and thus the nest with the greatest inter-nest distance overlap with Project turbines, was first constructed in 2013, more than five years after Project operations began. Sixteen of the 17 turbines within half of the average inter-nest distance fall within the 1.47-mile buffer of this nest.

Landscape features such as topography, prey availability, and other eagle territories will influence the shape and size of golden eagle territories. For example, the concentration of flight paths within the Powder River canyon suggests that the eagles occupying this territory spend the majority of their time within the canyon and away from the Project. Therefore, using the inter-nest distance to determine the level of risk has limited applicability when defining potential risks posed by the Project. Continued monitoring of eagle nests within half the inter-nest distance from Project turbines may be warranted to determine the level of risk faced by resident eagles.

## 3.2 Standardized Fatality Monitoring

### *3.2.1 Methods*

In 2005, WEST developed a Wildlife Monitoring Plan for post-construction fatality monitoring for a minimum of one year after the Project became operational (WEST 2005). Year one monitoring was completed in 2008, and included monthly searches of all 61 turbines (Jeffrey et al. 2009). After completion of the first monitoring year, the Elkhorn Technical Advisory Committee (TAC) agreed that a second year of fatality monitoring should be implemented in 2010. For the second year of monitoring, the TAC modified the original monitoring protocol to include searches twice per month during the spring, summer, and fall at only one-half the turbines rather than at all turbines. In addition to the standardized fatality searches (WEST 2005), carcass removal trials and searcher efficiency trials were conducted.

After completion of the 2010 monitoring effort, a Golden Eagle Study Plan was developed for the Project (Enk 2011) in collaboration with USFWS and based on general guidance provided by the USFWS through the *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Eagle Management and Permit Issuance* (Pagel et al. 2010). The purpose of this monitoring effort was to locate and recover all eagle carcasses at the Project. Survey protocols included monthly fatality searches at every Project turbine starting in January 2011 and was suspended in January 2015. Individual turbine search plots were 220 x 220 m (689 x689 ft), and searchers walked parallel transects spaced approximately 20 m (66 ft) apart to scan for casualties.

### 3.2.2 Results

To date, twelve golden eagle and one bald eagle carcasses[7] have been documented during standardized monitoring surveys or incidentally (Table 3.1, Figure 3.2). Eight of the twelve golden eagle discoveries were of hatch-year or sub-adult golden eagles, two were of adults, and two carcasses could not be aged. Ten of the eleven golden eagle carcasses were found on the eastern portions of both the north and south sections of the Project. Five carcasses were found in the spring or early summer, three in the fall, two in the winter, and two in mid-summer. However, the actual date when the fatality occurred is often difficult to determine, as several of the carcasses identified during standardized monitoring were likely present on the landscape for a month or more based on the deteriorated carcass condition, lending evidence to long eagle carcass persistence. The four carcasses found incidentally by Telocaset operations staff were all in fresh condition.

**Table 3.1 Summary of eagle carcasses found during standardized surveys or incidentally at the Elkhorn Valley Wind Farm.**

| Date | Age | Nearest Turbine | UTM NAD 27 Z 11 E | UTM NAD 27 Z 11 N | Carcass Condition | Detection Method |
|---|---|---|---|---|---|---|
| 5/6/2009 | Adult | 61 | 438272 | 4988894 | Fresh | Incidental |
| 4/15/2010 | Unknown | 29 | 438016 | 4994321 | Desiccated | Standardized Monitoring |
| 2/15/2010 | Sub-Adult | 58 | 437888 | 4988766 | Decomposing--Early | Standardized Monitoring |
| 10/2/2010 | Sub-Adult | 25 | 436992 | 4994321 | Fresh | Incidental |
| 4/12/2012 | Adult | 21 | 437632 | 4995166 | Fresh | Incidental |
| 6/6/2013 | Sub-Adult | 55 | 437208 | 4989034 | Fresh | Incidental |
| 7/22/2013 | Hatch Year or Sub-Adult | 6 | 435629 | 4995370 | Feathers Only | Standardized Monitoring |
| 11/25/2013 | Hatch Year or Sub-Adult | 6 | 435634 | 4995514 | Feathers Only | Standardized Monitoring |
| 6/24/2014 | Sub-Adult | 54 | 437188 | 4988962 | Scavenged – Partially Intact | Standardized Monitoring |
| 9/19/2014 | Hatch Year | 24 | 437408 | 4996477 | Decomposing--Early | Standardized Monitoring |
| 9/21/2014 | Unknown | 55 | 437257 | 4989076 | Scavenged – Partially Intact | Standardized Monitoring |
| 7/31/2015[a] | Hatch Year | 47 | 436197 | 4989264 | Feathers Only | Incidental |
| 4/26/2018 | Adult (BAEA) | 10 | 436141 | 4996005 | Decomposing--Early | Incidental |

[a] The eagle found in July 2015 has been included here, but fatality analyses presented below (e.g., topography and other landscape characteristics relative to carcass locations) were conducted prior to this detection.

[7] The golden eagle carcass found in October 2010 was reported to EDPR staff by a local landowner. He reported seeing the eagle carcass from the road. However, the carcass did not appear to be visible from the road, as it was tucked under a large sagebrush bush. The tail and legs/talons of the eagle were missing.

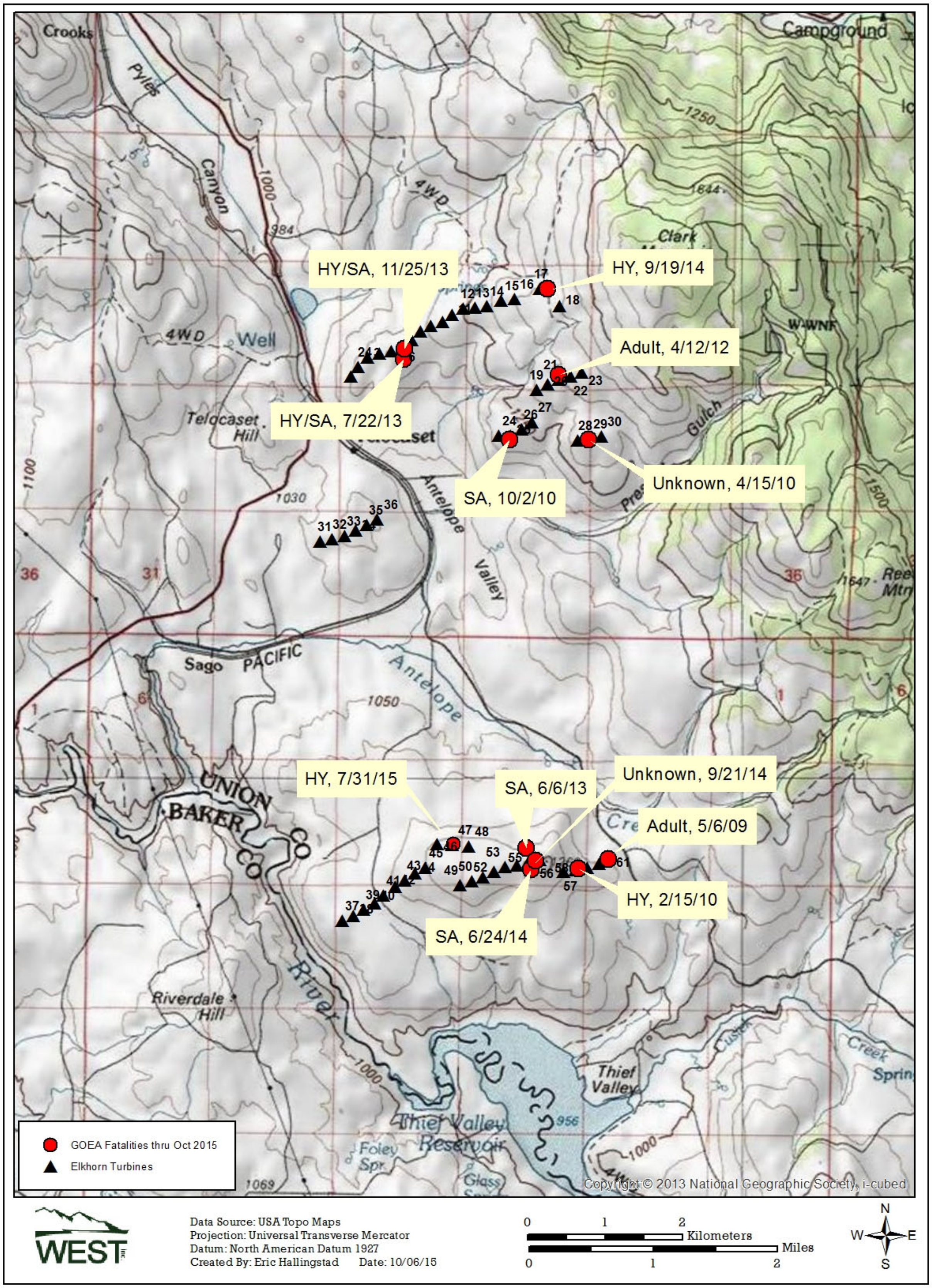


**Figure 3.2 Location of all eagle carcasses found to date at the Elkhorn Valley Wind Farm.**

### *3.2.3 Discussion*

The low number of bald eagle carcasses corroborates the results from other site-specific surveys which suggested low risk of Project impacts on this species. However, golden eagle carcasses were discovered throughout all seasons and multiple age classes, suggesting that collision risk is not specific to migrating, breeding, or over-wintering eagles. Only two of the ten eagles for which age class could be determined were adults. Higher numbers of adults and sub-adult golden eagle carcasses have been found at the Altamont Pass facility in California (Hunt 2002), suggesting that these age classes may be more vulnerable to collision than juvenile eagles. However, these age classes are estimated to comprise 80% of the overall golden eagle population (USFWS 2009b), and are therefore expected to have higher fatality rates than juvenile eagles.

Golden eagle carcasses were also spread relatively evenly throughout the Project, with 50% occurring in the southern portion and 50% in the northern portion. Analyses of landscape characteristics for turbines relative to carcass locations are presented in Section 2.3 (Evaluation of Temporal and Spatial Patterns of Golden Eagle Use). Results from the fatality monitoring surveys have also been incorporated into an estimate of annual eagle fatalities occurring at the Project. This information is presented in Section 3.3 (Eagle Fatality Estimate).

## 3.3 Eagle Fatality Estimate

### *3.3.1 Estimate Based on Observed Collision Rate*

#### 3.3.1.1 <u>Methods</u>

The estimated eagle fatality rates were prepared using extensive post-construction fatality monitoring data collected at the Project. The ECPG states that “during (Tier 5), post-construction surveys are conducted to generate empirical data for comparison with the pre-construction risk-assessment fatality and disturbance predictions“(USFWS 2013). Standardized fatality monitoring surveys were conducted at the Project in 2008, 2010, and from January 2011 to January 2015. Initial monitoring methods were approved by the Project’s TAC, and continued monitoring has been approved by the USFWS.

Eagle carcasses were not used for experimental bias trials at the Project. Due to differences in the searcher efficiency and removal rates expected for eagles compared to the species used for trials (e.g., rock pigeons, ring-necked pheasants, or domestic mallards), it is likely extremely conservative to use the large bird searcher efficiency and removal rates at a project to provide an adjusted mortality rate estimate for eagles. A review of existing studies and modeling efforts conducted by Smallwood (2007) reported that 88% of predicted large raptors would remain available for detection after 90 days and 100% would be detected by searchers regardless of vegetation cover. Further, a removal study conducted in Altamont Pass, California, indicated that approximately 94% of large raptors remained after 68 days (ICF Jones & Stokes 2008), which was significantly higher than the rate observed for the smaller and medium sized birds.

A more complete review by WEST, which compared detection rates for large raptors versus large bird non-raptor surrogates that are placed in the field during staged trial efforts, has shown significantly higher searcher efficiency rates and lower carcass removal rates for large raptors compared to the surrogates used in this and most studies. The searcher efficiency rate for large raptors was over 92% based on 49 trial carcasses (Table 3.2), compared to 74% for the large bird non-raptor surrogates.

**Table 3.2 Searcher efficiency rate comparison of raptors and owls versus large bird surrogates (p-values based on permutation tests).**

| Bird Type | # Found | # Available | Rate | p-Value |
|---|---|---|---|---|
| Large Raptors | 45 | 49 | 0.9184 | 0.0038 |
| Large Bird Surrogates - | 815 | 1102 | 0.7396 | |
| Small Raptors | 7 | 12 | 0.5833 | 0.2054 |
| Small Bird Surrogates | 845 | 1130 | 0.7478 | |
| Large Owls | 23 | 30 | 0.7667 | 0.6686 |
| Large Bird Surrogates | 828 | 1112 | 0.7446 | |
| Small Owls | 2 | 5 | 0.4000 | 0.0158 |
| Small Bird Surrogates | 847 | 1134 | 0.7469 | |

There was also a significant difference between large and small raptor mean removal times (p-value = 0.046; Table 3.3). WEST was unable to complete any tests comparing facilities with or without raptors, owls, or vultures, given that reports do not report mean removal times by individual carcasses placed. For those projects that did report mean removal rates, regardless of if they included raptor, owl, or vulture carcasses, the average carcass removal rate was 18.72 days.

**Table 3.3 Carcass removal rate comparisons.**

| Bird Types | # Placed | Standard Removal Time (Days) | p-Value |
|---|---|---|---|
| Owls | 20 | 53.35 | 0.8102 (owl and raptor) |
| Raptors | 24 | 60.00 | 0.7552 (raptor and vulture) |
| Vultures | 11 | 70.00 | 0.6212 (owl and vulture) |
| Large Owls | 14 | 68.75 | 0.3222 |
| Small Owls | 6 | 30.25 | |
| Large Raptors | 14 | 128.63 | 0.0456 |
| Small Raptors | 10 | 20.79 | |

Trial carcass removal rates for commercially available raptor surrogate species were estimated during 2008 and 2010 standardized post-construction fatality monitoring at the Project. Large trial carcass species included ring-necked pheasant (*Phasianus colchicus*), mallard (*Anas platyrhynchos*), and rock pigeon (*Columba livia*). In 2008, mean removal time was 40.95 days, with 50% of carcasses remaining on Day 30. In 2010, mean removal time was 19.83 days, with 20% of carcasses remaining on Day 30. However, the analysis above shows that these rates are likely conservative compared to carcass removal rates of large raptors such as golden eagles.

Based on this information, an assumption was made that the probability of an eagle being available for detection and detected by searchers would be 80% to 90% following Project monitoring protocols. Large raptor removal rates at the Project are expected to be low; visibility around turbines is quite high due to the large cleared area around turbines, and grassland or sagebrush/grassland vegetation types in the Project area are generally not dense enough that eagle carcasses would likely not be detected. Furthermore, residual evidence from scavenging activity (e.g., the remains of body parts or scattered feathers) also adds to the detectability of eagle carcasses. Large bird searcher efficiency during 2008 monitoring was 87.5% (n = 82, 6-8m transect spacing, see Jeffrey et al 2009) and during 2010 was 58.8% ( n = 90, 6-8, transects, see Enk et al. 2011).

#### 3.3.1.2 Results

As presented in Section 3.2 (Standardized Fatality Monitoring), twelve golden eagle carcasses have been documented since Project operations began in December 2007 (refer to Table 3.1). One golden eagle carcass was found in 2009, and another found in 2010 was believed to have occurred in 2009 due to the condition of the carcass. As 2009 was outside of the standardized survey periods, those carcasses were not included in the fatality estimate calculations which requires standardized data for the period of survey included in the estimates. Table 3.4 shows the estimated annual golden eagle fatality rates per MW and for the entire Project for years in which standardized fatality surveys were conducted. These estimates range from a low of 0 golden eagles/year for the Project (2008) to 4.37 (4.92, assuming 0.8 probability of detection) golden eagles/year (2010; Table 3.4). Averaging the fatality estimates over all survey years results in the estimated take of ~12 golden eagles over a five-year period for the entire Project.

No bald eagle carcasses were documented during the six years of standardized fatality monitoring. The resulting empirical estimate for bald eagle take is 0 bald eagles/year, although the incidental discovery of a bald eagle carcass outside of formal transect monitoring suggests that some risk of collision is present.

**Table 3.4 Golden eagle fatality estimates by survey year based on fatality monitoring survey results at the Elkhorn Valley Wind Farm.**

| Year | Documented # of Golden Eagle Carcasses | Assuming 0.9 Probability of Detection | | | Assuming 0.8 Probability of Detection | | |
|---|---|---|---|---|---|---|---|
| | | Estimated # of Golden Eagle Fatalities/MW/ Year | Estimated # of Golden Eagle Fatalities/Turbine/ Year | Estimated # of Golden Eagle Fatalities/ Year | Estimated # of Golden Eagle Fatalities/MW/ Year | Estimated # of Golden Eagle Fatalities/Turbine/ Year | Estimated # of Golden Eagle Fatalities/ Year |
| 2008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2010* | 2** | 0.043 | 0.072 | 4.373 | 0.049 | 0.081 | 4.919 |
| 2011 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 1 | 0.011 | 0.018 | 1.111 | 0.012 | 0.020 | 1.25 |
| 2013 | 3 | 0.033 | 0.055 | 3.333 | 0.037 | 0.061 | 3.750 |
| 2014*** | 3 | 0.040 | 0.066 | 4.000 | 0.045 | 0.074 | 4.500 |
| **Average** | | **0.021** | **0.035** | **2.136** | **0.024** | **0.039** | **2.403** |

* Only 31 of 61 turbines were searched during 2010 surveys, fatality estimate adjusted to reflect level of effort.
** Does not include carcass found in 2010, but believed to have occurred in 2009.
***Partial year, estimates are weighted accordingly.

### *3.3.2 Prediction Based on USFWS Bayesian Model*

The ECPG outlines a method for predicting eagle fatalities at projects under development utilizing observed rates of use during pre-construction avian use surveys. The Project has collected over five years of empirical data related to actual bald and golden eagle fatalities, and thus using only pre-construction usage rates to derive a predicted fatality output is a less accurate method for determining actual impact at the Project than using empirical fatality data. The fatality estimate based purely on this empirical data collection is presented in Section 3.3.1 (Estimated Based on Observed Collision Rate) above.

Fatality Capture Mark Recapture (FCMR) software (Peron and Hines 2014) was used to update the USFWS fatality prediction model with fatality data from almost six years of standardized surveys at the Project. Using these fatality estimates from FCMR in combination with the Bayesian fatality prediction model results in an annual mean fatality prediction of 2.6 golden eagles and 0.18 bald eagles, and an upper 80$^{th}$ percentile annual take prediction of 3.3 golden eagles and 0.26 bald eagles (Exhibit D). To be conservative, Telocaset's application for Eagle Take Permit requests authorization to take up to 16 golden eagles and two bald eagles over the five-year permit tenure.

# 4.0 STAGE 4: AVOIDANCE AND MINIMIZATION

## 4.1 Project Planning and Construction

As discussed in the WMP (Exhibit B), the Project was designed to avoid and minimize impacts to wildlife in accordance with the intention of the USFWS 2003 Interim Voluntary Guidelines. Although this guidance was intended to be voluntary, following is a discussion of some of the actions that were taken during Project design specifically related to the recommendations contained therein. Significant layout changes were also made based on recommendations from ODFW and environmental consultants performing studies at the site. Refer to Figure 4.1 for all previously considered turbine locations that were significantly retracted and modified in part to reduce risks to wildlife (see Section 4.1.1, Pre-Construction Layout Considerations).

### *4.1.1 Pre-Construction Layout Considerations*

The WMP approved by ODFW (Exhibit B) documents the changes to the Project that occurred due to concern for wildlife impacts and based on thorough coordination with ODFW over four years (see Table 1.2 for detailed consultation history). Many of these changes were originally proposed by WEST as early as 2003 in an effort to reduce potential wildlife impacts. The supporting documentation for this original recommendation has been provided as Exhibit E.

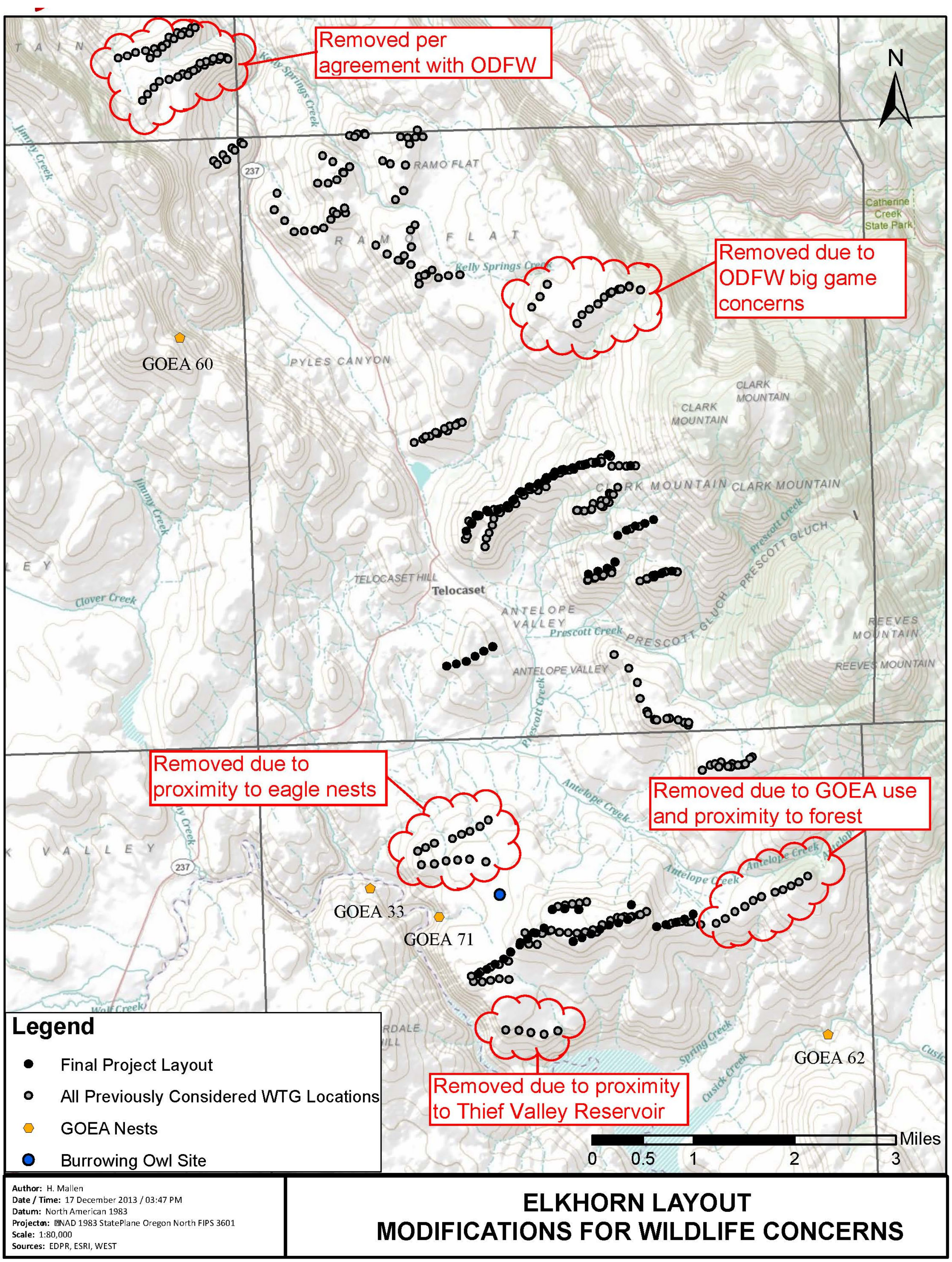


**Figure 4.1 Original Project layouts prior to accounting for biological considerations.**

Layout changes are demonstrated by Figure 4.1 and include:

- Elimination of proposed turbine row A, and a previous turbine row (originally between rows A and D) due to concerns over potential impacts to golden eagle nest #71 (Figure 2.1);
- Relocation of proposed turbine row E1-E3 northwards because the location on the upwind side of the ridge was likely used by raptors for updrafts;
- Elimination of proposed turbine row H due to its proximity to the Powder River Canyon and Thief Valley Reservoir as it was perpendicular to flight patterns of waterfowl coming off of the reservoir;
- Elimination of proposed turbines above row J due to their proximity to an area identified as particularly critical to wintering big game;
- Elimination of proposed turbines G5 through G15 because of potential golden eagle use for perching and general proximity to forested area;
- Elimination of end row turbine J1 near the edge of a ridge;
- Movement of turbine D1 further east to avoid high eagle use areas along the Powder River; and
- Modification of the road layout to eliminate potential impacts to a burrowing owl nesting pair and critical big game winter range.

The aforementioned layout changes highlight specific actions that were recommended by the 2003 Interim Voluntary Guidelines including, "configur[ing] turbine locations to avoid areas or features of landscape known to attract raptors", "orient[ing] rows of turbines parallel to known bird movements", and "avoid[ing] [the placement] of turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act." On August 19, 2003, WEST assessed the preliminary Project layout and recommended a number of changes based on their experience with wind energy impacts at that time. These aforementioned layout changes were the direct result of these suggestions. The recommendations as provided to Telocaset can be found in Exhibit E.

In order to quantify the degree to which impacts to golden eagles have been avoided as a result of pre-construction due diligence efforts, the results of the RSF outlined in Section 2.2.3 (Golden Eagle GPS Telelmetry Study) were used to assess the potential reduction in risk that occurred by avoiding placing turbines in areas that were identified in the WMP due to avian concerns. The RSF predictive model (see Figure 4.2) provides an estimation of the "relative probability of use" by golden eagles (relatively probability low = 1, to high = 5). Although this model was not available at the time of the original turbine siting decisions for the Project, the model confirms that the specific siting decisions that were made resulted in a reduced risk of avian impacts. Indeed, based on the comparison of the golden eagle RSF "relative probability of use" category between constructed and avoided turbines, there was 8.75% more risk-area per turbine associated with the 30 removed turbines, than the existing 61 turbines (Table 4.1).

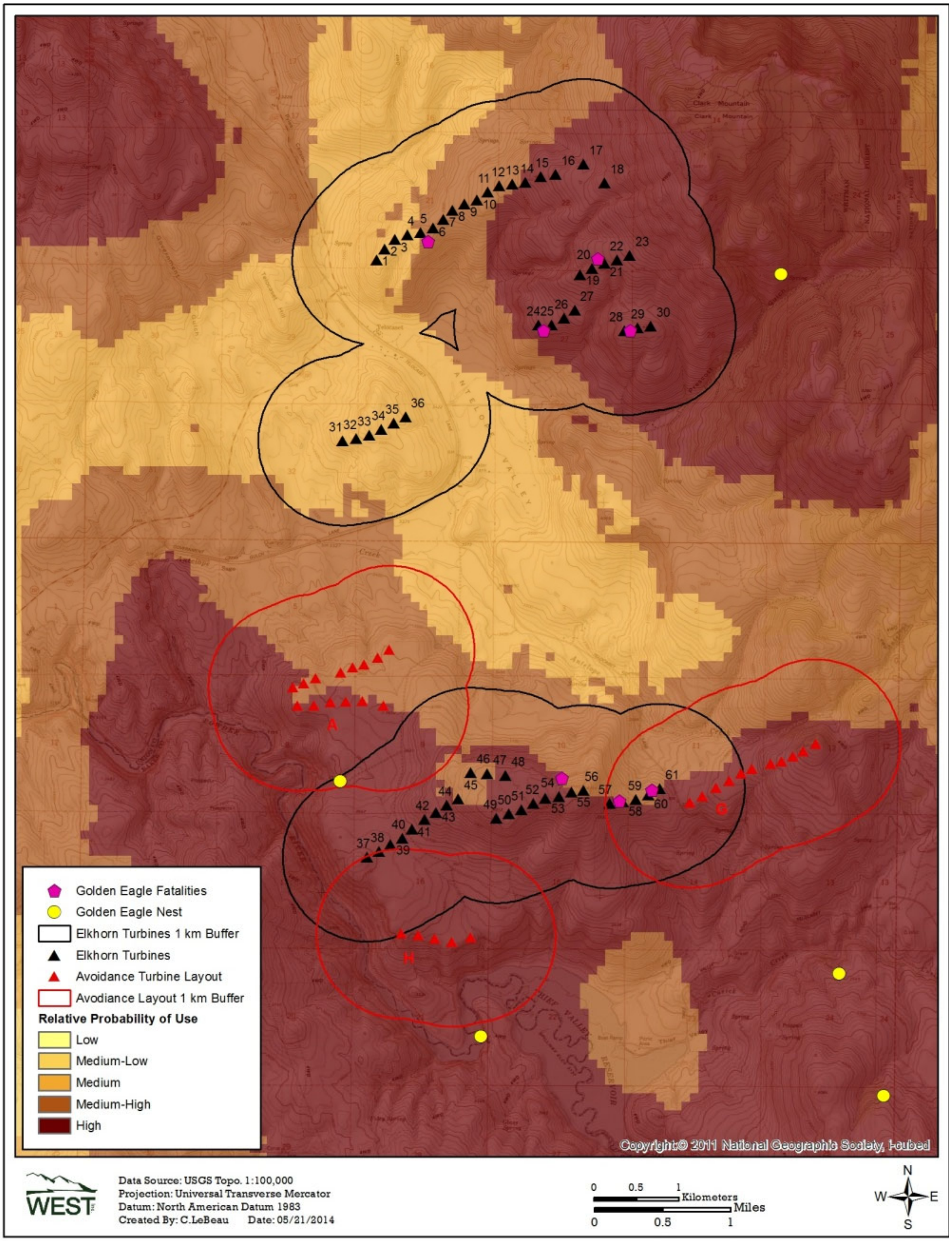


**Figure 4.2 Golden eagle probability of use for turbines avoided based on pre-construction recommendations.**

**Table 4.1. Relative risk, and risk-area, associated with current turbine layout, and turbines avoided from original layout**

| | Number of Turbines | Golden Eagle RSF Relative Probability of Use $(p)$ | Area within 200 m of Turbines (km²) $(A_{i,p})$ | Nearest Survey Station(s) | Pre-Construction Risk Index per Turbine | Post-Construction Risk Index per Turbine | Mean Overall $(m_i)$ | Risk Area |
|---|---|---|---|---|---|---|---|---|
| **Installed Turbines** | 10 | 3 | 0.73 | B, D, F, K | 0.009 | 0.005 | 0.007 | 0.036 |
| | 16 | 4 | 1.02 | B, D, F, K | 0.017 | 0.009 | 0.013 | 0.067 |
| | 35 | 5 | 2.73 | B, D, F, K | 0.058 | 0.029 | 0.044 | 0.224 |
| Avoided Turbines | 7 (1/2 of Group A) | 5 | 0.45 | A | 0.027 | 0.022 | 0.024 | 0.076 |
| | 7 (1/2 of Group A) | 4 | 0.58 | A | 0.028 | 0.022 | 0.025 | 0.078 |
| | 11 (String G) | 5 | 0.76 | F, H | 0.010 | 0.023 | 0.016 | 0.127 |
| | 5 (String H) | 5 | 0.45 | B | 0.019 | 0.016 | 0.017 | 0.074 |
| | | | | **Risk Index (Per Turbine)** | | | | |
| | | | | Avoided Turbines | 0.0840 | 0.0824 | 0.0832 | 0.327 |
| | | | | Current Turbines | 0.085 | 0.042 | 0.064 | 0.355 |
| | | | | **Relative Difference in Risk** | -1.3% | 97.0% | 31.1% | 8.8% |

A risk index was generated from mean use collected during pre-construction and post-construction surveys at stations associated with each turbine string standardized to proportion of area (within 200 m) in each golden eagle RSF "relative probability of use" category. The risk index can be thought of as weighted mean use, with weights generated by relative probability of use predicted by the RSF model within the 200-m buffer around each turbine string, or "risk-area" around each turbine string.

The risk index was calculated on a per turbine basis for the avoided 30 turbine locations and the current turbine layout of 61 turbines. The percent difference in risk index was calculated between the removed and current turbines, providing a quantitative assessment of risk reduction attributed to the avoidance of areas identified in the WMP.

The risk index is given by

$$r_j = \frac{A_{i,P} * p}{T_{tot}} * m_i$$

where,

$m_i = mean\ use\ (birds\ /800m/20\ minute\ survey)\ for\ the\ ith\ turbine\ string$
$p = RSF\ relative\ probability\ of\ use$
$A_{i,p} = area\ within\ 200m\ of\ turbine\ string\ i, with\ relative\ probability\ of\ use\ p.$
$T_{tot} = total\ number\ of\ turbines\ in\ the\ group\ of\ interest\ (avoided\ or\ current\ turbines)$

If $r_R$ is the risk index for the removed turbines, and $r_C$ is the risk index for the current turbines. Then the reduction in risk, $R_{reduce}$ is given by:

$$R_{reduce} = \frac{r_R - r_C}{r_C}.$$

The model described above generates a range of risk reduction depending on whether pre-construction, post-construction, or overall golden eagle use was used in the calculation. The relative difference in risk between avoided turbine locations and constructed turbine locations ranges from -1.3% to 97%, with a mean relative reduction of 31% (Table 4.1). Furthermore, the relative reduction in risk based exclusively on the RSF relative probability of use was 8.75%. The variation in relative change in risk is due to the variation in golden eagle mean use values across stations, pre- and post-construction. Although it is difficult to determine the actual level of impact reduction achieved by the avoidance of particular areas highlighted in the WMP, the analysis above demonstrates that some risk reduction did occur as a result of pre-construction layout considerations. Insufficient data was available to conduct a similar analysis for bald eagles.

### *4.1.2 Project Design and Construction Considerations*

Additional features designed to avoid or minimize impacts include the following:

- Choice of underground (vs. overhead) electrical lines wherever feasible to minimize perching locations and electrocution hazards to birds;

- Choice of turbines with low revolutions per minute (RPM) and use of tubular towers to minimize potential risk of bird collision with turbine blades and towers and minimize bird perching and nesting opportunities;
- Use of un-guyed permanent meteorological towers to minimize potential for avian collisions with guy wires;
- Equipping all overhead power lines within 1/4 mile of turbines with raptor perch guards to minimize perching by raptors; and
- Spacing all overhead power line conductors to minimize potential for raptor electrocution.

During construction, particularly sensitive habitat areas (such as raptor nests) were flagged and designated as “off limits” to all construction personnel (WMP at 7). Additional best management practices (BMPs) included the following:

- Establishing and enforcing reasonable driving speed limits (max. 25 mph) during construction to minimize potential for road kills;
- Properly storing and managing all wastes generated during construction;
- Requiring construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas; and
- Designating an environmental monitor during construction to monitor construction activities and sure compliance with mitigation measures (WMP at 7-8).

## 4.2 Operational Risk Reduction Efforts

### *4.2.1 Operational Management Practices*

Telocaset is taking the actions recommended in Appendix E of the ECPG regarding avoidance and minimization measures during Project operations. Specifically, Telocaset is implementing the following measures:

1. Maintain facilities and grounds in a manner that minimizes any potential impacts to eagles (e.g., minimize storage of equipment near turbines that may attract prey, avoid seeding forbs below turbines that may attract prey).[8] The Project operations team has removed weeds and brush from turbine pads by scrapping them with a skid steer and grader. Additionally, areas near turbines and along access roads are sprayed for noxious weeds each spring and fall.

[8] Note that Telocaset’s ongoing mitigation agreement with ODFW requires continual seeding of a habitat mitigation site within the Project area.

2. Avoid practices that attract/enhance prey populations and opportunities for scavenging within the project area. Telocaset provides an enclosed on-site trailer for disposal of any carcasses that may be identified on leased land, including carcasses identified during coyote baiting. Although Telocaset does not hold land rights to require the practice of coyote baiting to halt altogether, providing the enclosed trailer and removing the trailer to an off-site location for disposal has reduced eagle scavenging activity to the maximum extent practical. Furthermore, it is Telocaset's understanding that no coyote trapping activities have occurred during the past two years outside a central location approximately 2,200 ft from the nearest Project turbine. Project landowners do not conduct calving operations or place still born carcasses near turbines. Additionally, prior to Project construction, EDPR undertook a sage grouse lek survey, and avoided siting turbines in close proximity to identified leks, which are a main feeding ground for golden eagles.
3. Take actions to reduce vehicle collision risk to wildlife and remove carcasses from the Project area, such as deer, elk, and livestock. Telocaset has entered into an agreement with a contractor capable of removing any identified carcasses from the project area to reduce scavenging bald and golden eagles.
4. Instruct project personnel and visitors to drive at low speeds (<25 mph) and remain alert for wildlife, especially in low visibility conditions. Telocaset has posted speed limit signs on all turbine access roads, and conducts a safety orientation presentation covering speed limits to all new visitors to the site.
5. Provide training for operational personnel. In conjunction with the Project Wildlife Incident Reporting System, operational personnel will be trained in the reporting of any incidental avian and eagle carcasses that may be encountered during project operations.
6. Telocaset is coordinating with Project landowners to ensure that carcasses (e.g. livestock), which can attract both bald and golden eagles, are removed from the Project area or covered to prevent scavenging by eagles as soon as possible.

As designed, Project turbines idle below the nominal cut-in speed of 4.0 m per second (m/s; 13 ft/s), although the turbine blades continue to turn at a reduced speed during that time. At wind speeds between 0.5 m/s (1.6 ft/s) and 3.5 m/s (11.5 ft/s), the tip speed of the turbine blade would be moving at between 26 miles per hour (mph; 42 km per hour [kph]) and 106 mph (106 kph). Based on data collected at the project's permanent meteorological towers between January 2010 and December 2014, the wind blew between 0.5 m/s and 3.5 m/s approximately 27% of the time. In an effort to further reduce the potential impact to eagles during low-wind periods, Telocaset worked with the Project's turbine manufacturer to develop a software system that will allow wind turbines to be completely stopped when wind speeds are below 3.5 m/s. During initial testing it was determined that when temperatures are below freezing, full turbine stoppage has a high risk of component freezing and damage. Telocaset intends to implement this measure when weather conditions are conducive to turbine stoppage without risk of equipment damage.

### *4.2.2 Curtailment Analysis*

In 2010, soon after the first golden eagle carcass was discovered at the Project, Telocaset began taking measures to identify and evaluate various adaptive management actions that could be taken to reduce risk to golden eagles. In this light, through consultation with the USFWS, Telocaset implemented a robust Golden Eagle Study Plan (refer to Section 2.2, Post-Construction Use and Nesting Surveys) to gain a better understanding of eagle use and behavior within the Project area in order to identify practicable and effective “advanced conservation practices” that would avoid or minimize the risk of eagle take. Telocaset undertook an evaluation of temporal and spatial patterns of eagle use (see Section 2.3, Evaluation of Temporal and Spatial Patterns of Golden Eagle Use) in order to gain a better understanding of eagle use and behavior within the Project area.

These spatial and temporal analyses did not reveal a clear driver of golden eagle use within the Project area, and appeared to show most of the higher use areas outside the areas where turbines were located. For example, the density of flight paths seemed very high in the Powder River Canyon outside of direct interference with turbines as well as to the southeast of the Project. It was hoped that a clear temporal or weather pattern could be identified that could be shown to substantially increase golden eagles’ use of the Project area and thus lead to an increased risk during specific temporal periods. This would allow Telocaset to identify a focused curtailment regime that would effectively reduce risk of collision. Unfortunately, after looking at a number of variables and conducting univariate analyses and assessing interaction strength, no clear and strong temporal pattern of use that would lead to a viable curtailment strategy that would help reduce eagle collision was found, as shown in Exhibit C and discussed in Section 2.2 (Post-Construction Use and Nesting Surveys).

Only two predictor variables showed some correlation with areas of higher golden eagle use (slope and terrain ruggedness). The Project’s turbines are located almost exclusively on areas of moderate to high slopes and ruggedness (Figures 2.16 and 2.17). Although Telocaset is open and willing to consider reasonable curtailment strategies to reduce risk to eagles, such a curtailment strategy would need to be targeted to a specific set or sub-set of turbines in order to maintain project viability, and meet the terms of the Project’s power purchase agreement to supply power to the public. Curtailing the majority of the Project’s turbines based on topographic features alone would not meet common definitions of “practicability”.

The strength of the patterns in the interaction plots appear to range from non-existent to weak, meaning a significant combination of temporal and spatial variables could not be found. Given the lack of clear factors predicting eagle use across the landscape, analyses conducted to-date show little opportunity for a temporal operational adjustment regime that would both reduce risks to eagle collision, and maintain the viability of the Project.

On February 12, 2013, Telocaset consulted with representatives of the USFWS on the curtailment analyses conducted. Telocaset presented results of the analysis, noting that it did not appear that a feasible temporal curtailment regime was readily apparent. Since that time, Telocaset and

USFWS have been discussing future conservation measures that could be implemented as an adaptive management strategy for the Project (see Section 5.3, Adaptive Management Strategy).

# 5.0 STAGE 5: CONTINUED RISK-ASSESSMENT, ADVANCED CONSERVATION PRACTICES, AND COMPENSATORY MITIGATION

As discussed previously, the Project was in operation prior to the implementation of the 2009 Eagle Rule, and as such, eagle takes at the Project would be considered part of baseline take (see Section 1.3). Since cumulative analysis was conducted as part of the USFWS Environmental Assessment of the 2009 Eagle Rule, and the Project was considered part of the baseline, historical take levels, no cumulative analysis to assess potential Project-related impacts on eagle populations is included in this ECP, although such an analysis may be completed as part of the USFWS review under NEPA. However, Telocaset recognized the need to implement measures that intend to reduce eagle take from historic levels, and as such have prepared this ECP and proposed avoidance, minimization, and mitigation actions in an attempt to meet the intent of the 2009 Eagle Permit Rule and obtain an ETP for future potential eagle takes at the Project.

## 5.1 Permit Compliance Fatality Monitoring

This ECP is being developed in support of an application for incidental take of up to 3.3 golden eagles per year and 0.26 bald eagles per year. If Telocaset were to receive an ETP for the Project, additional permit compliance monitoring (PCM) would be conducted to verify that permit terms were being met. Fatality monitoring would be conducted by an independent 3rd party contracted by Telocaset but with a Memorandum of Understanding that directs the contractor to report results directly to the USFWS. Additional fatality monitoring ("Effectiveness PCM") may be required in response to the Project adaptive management strategy and may be conducted by Telocaset staff or direct contractors.

Permit compliance fatality monitoring would be conducted as outlined in permit terms and conditions and consist of eagle remains searches, searcher efficiency trials, carcass persistence trials.

*Enhanced Operational Monitoring*

In conjunction with the standard transect monitoring discussed above, the feasibility of a simplified Enhanced Operational Monitoring (EOM) system would be tested. EOM entails operations personnel[9] monitoring for eagle fatalities in order to provide a cost-effective alternative to full transect monitoring during future years. This EOM monitoring would be conducted in Year 1, and feasibility would be evaluated in consultation with USFWS prior to implementation in future years. In the event searcher efficiency is sufficiently high as determined in coordination with the Service for EOM monitoring, it could be implemented in future years to inform the adaptive management actions for the project.

[9] The Year 1 EOM may be conducted by professional biologists, or by operations personnel themselves (with proper training), since the search protocol would be equally suitable.

Prior to EOM detection trials, maps will be created that include three primary visibility/detection classes at the Project based on aerial photography, landcover habitat mapping, topography, and ground-truthing. Roads, gravel turbine pads, short grass and other short vegetation areas (vegetation typically less than 6 inches tall) will be considered high visibility areas. Shrub-steppe areas with sparse shrubs and short shrub cover will be considered moderate visibility areas, while dense taller shrub areas and steep rocky slopes will be considered low visibility areas. Viewsheds will also be mapped, identifying all unviewable areas that are out of sight from the turbine bases but within the standard 220 x 220-m search plots centered on each turbine (see Section 5.1.1 [Standard Transect Monitoring] above). Seasonal estimates of detection by visibility class and distance from pad will provide some understanding of variation in visibility across seasons.

During Year 1, EOM searches will occur monthly at each turbine. During the EOM searches, a searcher will drive to each turbine, scanning for potential raptor carcasses in the search plots as he/she drives. After searching the turbine pad for carcasses, the searcher will park the vehicle and walk around the edge of the turbine pad scanning for eagles and other large bodied carcasses with the aid of binoculars to confirm carcasses. The searcher will stop and scan the surrounding terrain by naked eye and with binoculars from the four cardinal directions (e.g. 0°, 90°, 180° and 270°), making several passes within each quadrant at various distances (e.g., 0-30 m , 30-60 m, etc.). Scans will typically be completed in roughly five minutes per turbine.

The same decoys placed under standard transect monitoring will be used to assess EOM detection rates, and detections will be documented identically to those found during transect searches (while specifying what search method led to each individual detection). When a potential carcass (decoy) is observed, the location of the carcass will be marked on a map. Importantly, for all decoys detected during EOM scans, it is assumed that they would have also been detected during standardized transect searches (i.e., these detections will also count toward transect search efficiency estimates). This is assumed in order to provide sufficient sample size for transect searcher efficiency estimates. After Year 1, results of EOM would be compared with viewsheds, and single, meandering transects may be added to provide adequate coverage of within-plot unviewable areas during future monitoring surveys. If searcher efficiency is acceptably high using EOM protocols, transect-based monitoring may not be needed in future years.

### 5.2 Operations and Maintenance Monitoring

In addition to any transect-based fatality monitoring or EOM discussed above, Telocaset maintains a Wildlife Incident Reporting System (WIRS) and continually scans work areas in the course of operation and maintenance activities. Project Operations & Maintenance (O&M) staff conduct semiannual and annual maintenance visits to each turbine as well as incidental visits for unanticipated maintenance needs. This frequency equates to approximately 6-10 individual turbines visited each week for each year during operations (40-60% of the 61 project turbines each month). O&M staff are trained to monitor for dead or injured eagles during their work activities. A data sheet that describes how Project personnel can recognize an injured or dead eagle is available to staff as part of the WIRS Procedure at the O&M facility. The WIRS Procedure includes instructions and the procedures that personnel shall take in the event an injured or dead eagle is discovered onsite, including whom to notify and what actions shall be taken. USFWS is notified within 24 hours upon positive identification by a qualified biologist of an eagle injury or carcass. Additionally, a summary report of the incident is prepared and sent to USFWS as soon as possible after reporting the carcass to USFWS. The WIRS procedure is provided as an appendix in the Project's BBCS for reference (TWPP 2015).

### 5.3 Adaptive Management Strategy

Adaptive management is integral to this ECP as an iterative process that will improve decisions for avoiding, minimizing and/or mitigating effects to eagles throughout the Project area. In adaptive management, an agreement is made to adjust management and/or mitigation measures if monitoring indicates that goals are not being met. For the Project, adaptive management will consist of assessing various management options and designing and implementing the management option determined to be the most appropriate for the situation. The management action will be assessed through monitoring and evaluation to determine if the desired results are being met, or if adjustments to the management action are warranted.

Adaptive management focuses on learning and adapting, allowing for flexibility in decision-making as new information is gathered. With an acknowledgement that uncertainties exist, adaptive management provides resource managers the latitude to change the direction of monitoring or mitigation to achieve a desired outcome. Adaptive management at the Project is based on learning and adapting in response to the ongoing results of long-term monitoring of effects to eagles from the Project. The findings of long-term monitoring could indicate the need for modification of operations and management strategies.

Telocaset will implement the adaptive management strategy outlined in permit terms and conditions in coordination with the Service.

### 5.4 Proposed Compensatory Mitigation

The ECPG notes that projects "in operation prior to 2009 that pose a risk to golden eagles may qualify for…eagle take permits that do not automatically require compensatory mitigation…because the requirements for obtaining…take authorization are designed to reduce take from historic, baseline levels, and the preamble to the Eagle Permit Rule specified that unavoidable take remaining after implementation of avoidance and minimization measures at such projects would not be subtracted from regional eagle take thresholds." Moreover, off-setting compensatory mitigation for bald eagles will likely only be required if: 1) annual take exceeds the threshold for the eagle management unit, or 2) annual take (together with cumulative effects) is greater than 5% of the local-area (43-mile radius) population (USFWS 2013). Since the Project was in operation prior to 2009, compensatory mitigation will not be required in order for the USFWS to issue an ETP.

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## 6.2 Regulations Cited

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16 United States Code (USC) § 703. 1918. Title 16 - Conservation; Chapter 7 - Protection of Migratory Game and Insectivorous Birds; Subchapter II - Migratory Bird Treaty; Section (§) 703 - Taking, Killing, or Possessing Migratory Birds Unlawful. 16 USC 703. [July 3, 1918, Chapter (ch.) 128, § 2, 40 Statute (Stat). 755; June 20, 1936, ch. 634, § 3, 49 Stat. 1556; Pub. L. 93–300, § 1, June 1, 1974, 88 Stat. 190; Pub. L. 101–233, § 15, December 13, 1989, 103 Stat. 1977; Public Law (Pub. L.) 108-447, divison E, title I, § 143(b), December 8, 2004, 118 Stat. 3071.].

50 Code of Federal Regulations (CFR) § 10.13. 1973. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§)10.13. List of Migratory Birds. 50 CFR 10.13 [38 Federal Register (FR) 22015, August 15, 1973, as amended 50 FR 52889, December 26, 1985.].

50 Code of Federal Regulations (CFR) § 10.12. 2010. Title 50 - Wildlife and Fisheries; Chapter I -United States Fish and Wildlife Service, Department of the Interior; Subchapter B Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 10 - General Provisions; Subpart B - Definitions; Section (§)10.12. Definitions. 50 CFR 10.12. [38 Federal Register (FR) 22015, Auguguest 15, 1973, as amended at 42 FR 32377, June 24, 1977; 42 FR 59358, November 16, 1977; 45 FR 56673, August 25, 1980; 50 FR 52889, December 26, 1985; 72 FR 48445, August 23, 2007].

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50 Code of Federal Regulations (CFR) § 22.26. 2009. Title 50 - Wildlife and Fisheries; Chapter I - United States Fish and Wildlife Service, Department of the Interior; Subchapter B - Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants; Part 22 - Eagle Permits; Subpart C - Eagle Permits; Section (§) 22.26 - Permits for Eagle Take that is Associated with, but Not the Purpose of, an Activity. 50 CFR 22.26. [74 FR 46877, September 11, 2009, as amended at 79 FR 73725, December 9, 2013].

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## Exhibit A: Chronology of Resource Agency Consultation

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| | | **Pre-Construction** | | |
| 2/5/2003 | WEST initial contact with ODFW | ODFW recommended conducting big game and sage grouse surveys in March/April. | N/A | *WEST:* Wally Erickson |
| 2/21/2003 | USFWS response to WEST list of sensitive species | USFWS provided "Federally Listed and Proposed Endangered and Threatened Species, Candidate Species and Species of Concern That May Occur in Baker and Union County." | USFWS Oregon State Office | *WEST:* Rhett Good |
| 3/5/2003 | WEST initial contact with USFWS | USFWS Nongame Landbird Program Coordinator, Mike Green, responded to a request from WEST Consultant Wally Erickson informing him of a USFWS field office in La Grande, Oregon, and identified Gary Miller as the appropriate contact at that location. | Mike Green | *ZRE:* Andrew Young, Chris Taylor, and Hilary Foote cc'd on correspondence.<br>*WEST:* Wally Erickson |
| 3/14/2003 | ODFW email to WEST | ODFW provided deer counts for area from Cove to Thief Valley Reservoir. | N/A | *ODFW:* Leonard Erickson<br>*WEST:* Wally Erickson |
| 8/22/2003 | ODFW facsimile to WEST | ODFW provided aerial census for elk in Union County. | N/A | *ODFW:* Leonard Erickson<br>WEST: Wally Erickson |
| 9/4/2003 | WEST email to ODFW | WEST provided draft of Interim Baseline Report. | N/A | *WEST:* Wally Erickson<br>*ODFW:* Jim Cadwell |
| 10/2/2003 | ODFW Site Tour | Tour Objectives: Viewed majority of the site, identified potential mitigation parcels, described revised Wildlife Mitigation Plan. Results: ODFW had some big game concerns, although they did not express concern about birds. | N/A | *ODFW:* Jim Cadwell, Mark Henjum, Leonard Erickson<br>*ZRE:* Chris Taylor<br>*WEST:* Jay Jeffrey |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 10/6/2003 | ZRE letter to ODFW | ZRE summarized conversations during site visit and noted that ZRE is working with road engineer to determine feasibility of ODFW's suggested road layout changes. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 11/12/2003 | WMP sent to ODFW | ZRE provided a first draft of the WMP for ODFW review and comment. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 12/16/2003 | ZRE letter to ODFW | ZRE proposed big game protocols and clarified items related to big game and sage grouse aerial surveys. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 1/6/2004 | ZRE email to ODFW | ZRE requested feedback on protocols and burrowing owl (*Athene cunicularia*) issues. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 1/28/2004 | ODFW letter to ZRE | ODFW provided input related to deer and elk distribution and density surveys, greater sage-grouse (*Centrocercus urophasianus*) lek surveys, and reduction of maintenance roads. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 2/11/2004 | ZRE letter to ODFW | ZRE proposed big game studies. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 2/24/2004 | Meeting between ZRE and ODFW | Discussed big game surveys, mitigation, burrowing owls, and other issues. | N/A | *ZRE:* Phil Stenstrom, Chris Taylor<br>*ODFW*: Jim Cadwell |
| 3/10/2004 | ZRE letter to ODFW | ZRE recapped February 24, 2004, in-person meeting. | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 3/11/2004 | ODFW letter to ZRE | ODFW documented agreement on post-construction monitoring and Technical Advisory Committee (TAC). | N/A | *ZRE:* Phil Stenstrom<br>*ODFW:* Jim Cadwell |
| 4/30/2004 | ZRE Letter to ODFW | Mentions setting up a TAC.<br>Provides summary of mitigation offered. | N/A | *ZRE:* Chris Taylor<br>*ODFW:* Jim Cadwell, Patty Snow (cc'd) |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 5/4/2004 | ZRE email to ODFW | ZRE included preliminary results of ground surveys for big game and sage grouse. | N/A | *ZRE:* Chris Taylor<br>*ODFW:* Jim Cadwell |
| 5/20/2004 | ODFW letter to ZRE | ODFW responded to a letter ZRE sent on April 30, 2004. The letter stated ODFW's agreement with establishing a TAC to monitor Elkhorn efforts and recommended having three total representatives from ODFW, USFWS, sportsmen and/ or conservation groups.<br>The letter also outlines tower placement with respect to big game and direct mitigation opportunities on site. | N/A | *ZRE:* Phil Stenstrom, Chris Taylor<br>*ODFW:* Jim Cadwell |
| 4/25/2005 | Meeting between ZRE, Union County Board of County Commissioners, and ODFW | Agenda and goals: Introduce the Project to ODFW regional representative and familiarize them with previous environmental work and interactions with local ODFW staff. Introduce proposed mitigation packages to ODFW and discuss. Approval of Wildlife Management Plan. | N/A | *ZRE:* Hilary Foote<br>*Union County BOCC:* Commissioner John Lammoreau<br>ODFW: Bruce Eddy (Regional) |
| 5/11/2005 | ZRE Wildlife Management Plan update to ODFW | ZRE contacted ODFW via e-mail to provide an update regarding the drafting of a Wildlife Management Plan and stated that sage grouse and big game survey data would be provided shortly once it has been processed. It was stated that ZRE planned to submit permit application to the county in the first half of June. | N/A | *ZRE:* Hilary Foote<br>*ODFW:* Jim Cadwell |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 6/15/2005 | Letter of support from ODFW to ZRE | ODFW sent a letter of support for the Wildlife Management Plan submitted by ZRE. In the Letter ODFW outlined 6 amendments to the Wildlife Management Plan that ZRE agreed to incorporate. | N/A | *ZRE:* Chris Taylor<br>*ODFW:* Jim Cadwell<br>*Union County Planning Dept:* Hanley Jenkins |
| 2/27/2007 | Final Mitigation Plan signed by ODFW | Habitat Mitigation Plan for Elkhorn prepared by CH2MHill and signed off by Telocaset and ODFW.<br>The Habitat Mitigation Plan was prepared to present a detailed plan for implementing the Habitat Mitigation requirements outlined in the Wildlife Management Plan. | N/A | Telocaset : Hilary Foote, Chris Taylor<br>ODFW: Jim Cadwell, Jon Paustain<br>CH2MHill: Peggy O'Neil |
| | | **Post-Construction** | | |
| 4/10/2008 | Communication between Telocaset and USFWS regarding TAC participation | - Communication took place via e-mail between USFWS and Telocaset in which Telocaset provided Marisa Meyer with necessary materials and information related to the first TAC meeting. Materials included Ecological Baseline Study, Wildlife Management Plan, Wildlife Mitigation Plan, Elkhorn Valley Fact Sheet, Habitat Mitigation Plan and Habitat Mitigation Plan Map. | Marisa Meyer | *Telocaset:* Hilary Foote |
| 5/7/2008 | Elkhorn TAC Meeting | - Main topics included: discussion of evolution of habitat mitigation plan including the County's action and its wildlife monitoring provisions. Identified key TAC role as identifying if large game was being displaced by the Project and proposing to address that effect if occurs.<br>- Copies of Habitat Mitigation Plan and quarterly reports were provided to TAC members as meeting follow up. | Marisa Meyer (TAC) | *Telocaset:* Dana Peck, Ryan Dela (TAC)<br>*ODFW:* Jim Cadwell (TAC)<br>*Local Resident:* Terry Edvalson (TAC)<br>*Landowner:* Dan Perkins (TAC)<br>*Union County Planning:* Cody Vavra (TAC)<br>*Wildlands Inc.:* Dave Bradney |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 8/6/2008 | Elkhorn TAC Meeting | - Meeting topics included: discussion of 2nd Quarter Report as well as presenting 1/2 year of data. | No representative present | *Telocaset:* Dana Peck, Ryan Dela (TAC)<br>*ODFW:* Jim Cadwell (TAC)<br>*Local Resident:* Terry Edvalson (TAC)<br>*Landowner:* Dan Perkins (TAC)<br>*Union County Planning:* Cody Vavra (TAC)<br>*WEST:* Jay Jeffrey |
| 1/28/2009 | Elkhorn TAC Meeting | - Main topics included: A summary of the preliminary third Quarter report, discussion of bat fatality causes, an update on mitigation parcel planting and an update on operations.<br>- Discussed concerns related to a landowner who was coyote-baiting on site. Telocaset asked if he could please discontinue that practice because it was in violation of the CUP and the landowner refused. Preventative measures for carcass relocation to the valley floor were discussed but this solution posed issues with private property and hunting rights. | Marisa Meyer (TAC) | *Telocaset*: Valerie Franklin, Ryan Dela (TAC)<br>*Wildlands Inc.:* Dave Bradney<br>*WEST:* Jay Jeffrey<br>*ODFW:* Jim Cadwell (TAC)<br>*Local Resident:* Terry Edvalson (TAC) |
| 5/6/2009 | First Eagle Carcass Found | **N/A** | **N/A** | **N/A** |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 5/11/2009 | Elkhorn TAC Meeting | - Reviewed draft of the first annual Post-Construction Avian and Bat Monitoring Report and prepared for the subsequent Elkhorn TAC public meeting.<br><br>- Disclosed and described the golden eagle carcass and outlined next steps.<br>- Group discussed how avian and bat monitoring compared to other wind projects in the Columbia Basin Ecoregion and Elkhorn Valley's results were the lowest of all other ecoregion projects with raptors on the low range and bats on par with the others.<br>- The coyote baiting issue was re-visited. The Landowner had visited Jim Cadwell and expressed concerns with property rights. Baiting is addressed in the cooperation clause of his lease. Marissa stated that in the event of a carcass discovery, Telocaset would technically be held responsible, but that the baiting on the landowner's property would be taken into account. | Marisa Myer (TAC) | *Telocaset:* Valerie Franklin, Wendy McMillen, Ann Siqveland, Ryan Dela (TAC)<br>*Project Landowner:* Dan Perkins (TAC)<br>*Union County:* Cody Vavara (TAC)<br>*Local Resident:* Terry Edvalson (TAC)<br>*ODFW:* Jim Cadwell (TAC)<br>*WEST:* Jay Jeffrey |
| 12/11/2009 | Telocaset TAC Transmittal | Transmitted an update on latest TAC activity and next steps for Elkhorn TAC. | Marisa Myer (TAC) | *Telocaset:* Valerie Franklin, Christina Calabrese sent to TAC members. |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 1/6/2010 | Elkhorn TAC Meeting | - The main purpose of the call was to discuss the 2010 Elkhorn Post Construction Fatality Monitoring Study set to begin in January 2010.<br>- Following a recommendation by WEST, Horizon propose a few methodological changes from the study format conducted in 2008 which would result in better design and a more robust data set. The proposed change involved sampling a smaller set of turbines but at a higher frequency based on current standard methodology in the industry. TAC agreed to move forward with the proposed changes. | Marisa Myer (TAC) | *Telocaset:* Christina Calabrese<br>*ODFW:* Jim Cadwell (TAC), Jon Paustain, Leonard Erickson<br>*Project Landowner:* Dan Perkins (TAC)<br>*Union County Planning:* Scott Hartell (TAC)<br>*WEST:* Jay Jeffrey, Wally Erickson<br>*Citizen Representative:* Terry Edvalson (TAC) |
| 1/20/2010 | Horizon-USFWS meeting | - Introduced Horizon to USFWS Portland and regional staff.<br>- Discuss Horizon's portfolio in Oregon.<br>- Discuss sage grouse issue and feasibility for CCAAs. | Paul Henson<br>Doug Young<br>Rick Szlemp<br>Jodie Delavan<br>Monty Knudsen<br>Rollie White<br>Joe Zisa<br>Miel Corbett<br>Nancy Gilbert<br>Gary Miller<br>Jerry Cordova<br>Marisa Meyer | *EDPR/Telocaset:* Arlo Corwin, Valerie Franklin, Christina Calabrese<br>*Stoel Rives:* Aaron Courtney |
| 2/15/2010 | Second Eagle Carcass Found | **N/A** | **N/A** | **n/a** |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 3/8/2010 | Telocaset-USFWS Email Correspondence | - Telocaset responded to a request from USFWS for a copy of pre-construction wildlife management documents. | Marisa Meyer | *Telocaset:* Christina Calabrese |
| 3/31/2010 | Horizon – USFWS Meeting to discuss Horizon response to USFWS Antelope Ridge ASC comment letter and golden eagles | -Horizon sought guidance from USFWS for the 2010 golden eagle survey design; a work session was scheduled for that afternoon with a smaller group to draft the survey design.<br>- Horizon asked about the new law allowing for Incidental take Authorizations (ITAs) under the BGEPA. USFWS indicated that although the law had been passed to provide for ITAs, there was currently no guidance yet from DC on implementation, although it would likely be in the form of a programmatic permit. Thus, USFWS was unprepared to discuss what would be required for an ITA due to an absence of a defined ITA permit process. Timeline on process guidelines were not known.<br>- USFWS advised Horizon to prepare an Avian Protection Plan (APP) for eagles in the absence of an ITA permit process, and USFWS was open to input on good conservation measures and the framework of an APP.<br>- At the end of the meeting, USFWS expressed its appreciation for Horizon's initiative in working collaboratively on the Project. | Gary Miller | *EDPR/Telocaset:* Arlo Corwin (phone), Valerie Franklin, Christina Calabrese, Nick Benjamin |
| | | | Marisa Meyer<br>Robert Romero<br>Cindi Bockstadter<br>Doug Young (phone)<br>Mike Greene (phone) | *WEST:* Clayton Derby, Terry Enk |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 4/1/2010 | Elkhorn TAC Committee Meeting | - The main purpose of the meeting was to provide TAC members updates on the 2010 Post-construction Fatality Monitoring Study and Elkhorn Habitat Mitigation Project and Monitoring and to discuss the revised Draft Big Game Report findings.<br>- Update on 2010 post-construction fatality monitoring outlined methodological changes, discussed the most recent golden eagle carcass discovery and informed the TAC that as a response, Horizon had reinitiated avian point counts at the Project to assess golden eagle use of the area.<br>- TAC agrees to reconvene prior to making the Big Game Report public and allow ample time for meeting members to send comments to Horizon. | Marisa Meyer (TAC) | *Telocaset:* Christina Calabrese, Eddie Kolitz (TAC)<br>*ODFW:* Jim Cadwell (TAC), Bruce Eddy<br>*Project Landowner:* Dan Perkins (TAC)<br>*Union County Planning:* Cody Vavra (TAC)<br>*WEST:* Clayton Derby, Terry Enk<br>*Wildlands Inc.:* David Bradney<br>*Citizen Representative:* Terry Edvalson (TAC) |
| 4/16/2010 | Third Eagle Carcass Found | **N/A** | **N/A** | **N/A** |
| 4/30/2010 | Telocaset sends letter to USFWS regarding golden eagles | - Transmit technical memorandum for third golden eagle strike.<br>- Reiterate commitment to further monitoring and on-site and offsite mitigation to minimize golden eagle fatalities at Elkhorn.<br>- Formalize commitment to further 2010 eagle studies and the development of a Golden Eagle Protection Plan for Antelope Ridge.<br>- Reiterate interest in applying for an Incidental Take Authorization for both Elkhorn and Antelope Ridge when the programmatic permit is available. | Gary Miller (addressee)<br>Marisa Meyer<br>Cindi Bockstadter<br>Doug Young | *EDPR/Telocaset:* Christina Calabrese (signatory), Rene Braud, Arlo Corwin, Valerie Franklin, Michael Hulse, Eddie Kolitz<br>*ODFW:* Craig Ely, Jim Cadwell |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 5/12/2010 | Telocaset Transmittal to TAC Members | - Transmittal of Draft Meeting Minutes and request for next Elkhorn TAC meeting. | Marisa Meyer (TAC) | *Telocaset:* Christina Calabrese sent to TAC members. |
| 5/3/2010 | Telocaset-USFWS Meeting regarding Elkhorn golden eagles | - Meeting to discuss golden eagle carcass discoveries at Elkhorn and solicit feedback on additional golden eagle post-construction surveys that are being conducted. | Marisa Meyer<br>Cindi Bockstadter (phone) | *Telocaset:* Christina Calabrese |
| 6/16/2010 | Horizon-USFWS Elkhorn and Antelope Ridge Site Visit and Meeting | - Horizon provided a site tour of Elkhorn and each golden eagle carcass discovery location to look collaboratively for obvious opportunities for immediate implementation (e.g., removing a perching opportunity). However, none were identified.<br>- Horizon also provided a site tour of the proposed Antelope Ridge project area.<br>- Telocaset-USFWS meeting held at the Elkhorn O&M Building to lay the framework for the site tour, discuss golden eagle concerns and the progress of the 2010 surveys Horizon is currently conducting to inform mitigation and monitoring plans. | Gary Miller<br>Marisa Meyer<br>Robert Romero<br>Cindi Bockstadter<br>(Declined to attend: Doug Young<br>Paul Henson<br>Mike Green) | *EDPR/Telocaset:* Christina Calabrese, Valerie Franklin, Nick Benjamin, Eddie Kolitz, Michael Hulse<br>*WEST:* Clayton Derby, Terry Enk |
| 7/6/2010 | USFWS Law Enforcement sends letter to Horizon | - Purpose is to inform Horizon of environmental responsibilities and potential liabilities under USFWS jurisdictional federal law.<br>- Letter emphasized continued dialog with the USFWS. | Robert Romero (signatory)<br>Paul Chang<br>Paul Henson<br>Mike Green<br>Don Steffeck | *Telocaset:* Christina Calabrese |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 7/7/2010 | Telocaset Transmittal to TAC Members | - Transmittal of documents for TAC member's review and comment and request for next Elkhorn TAC meeting. Documents sent included: Final draft of Elkhorn Big Game Monitoring Report, document from WEST summarizing how they responded to each of ODFW's comments on the report, and 4/1/2010 TAC meeting notes. | Marisa Meyer (TAC) | *Telocaset*: Christina Calabrese sent to TAC members. |
| 8/10/210 | Letter to USFWS related to Antelope Ridge EFSC process | Provided chronology of coordination with USFWS. Reiterated commitment to applying for incidental take permit for both Antelope Ridge and Elkhorn when the programmatic permit is available. | Paul Henson<br>Robert Romero<br>Mike Green<br>Gary Miller<br>Marisa Meyer | *EDPR/Telocaset:* Valerie Franklin |
| 8/26/2010 | Telocaset-USFWS Phone call | Discussed the possibility of setting up a technical meeting to discuss eagles for Antelope Ridge and Elkhorn.<br>Discussed intent for meeting to discuss APP outline.<br>USFWS indicated that by the time of the meeting they would possibly have released formal guidance. | Marisa Meyer | *EDPR/Telocaset:* Christina Calabrese |
| 9/22/2010 | Horizon-USFWS technical conference call regarding golden eagles | - Call was primarily to solicit an update on the status of BGEPA permitting implementation and guidance<br>- WEST went over all the surveys to date related to golden eagles at both Elkhorn and Antelope Ridge | Marisa Meyer<br>Gary Miller<br>Doug Young<br>Cindi Bockstadter<br>Michael Green | *EDPR/Telocaset:* Christina Calabrese, Valerie Franklin, Nick Benjamin Rene Braud, Johanne Beaulieu, Arlo Corwin<br>*WEST:* Terry Enk<br>*Stoel Rives:* Barb Craig |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
| --- | --- | --- | --- | --- |
| 10/02/2010 | Fourth Eagle Carcass Found | ***N/A*** | ***N/A*** | ***N/A*** |
| 11/5/2010 | USFWS – Telocaset E-mail Communication | Requested to schedule a meeting the week of November 15. | Monty Knudson<br>Doug Young (copied) | *EDPR/Telocaset:* Arlo Corwin (author)<br>Christina Calabrese (copied)<br>Valerie Franklin (copied) |
| 11/17/2010 | USFWS-Telocaset Meeting | Meeting to discuss the Elkhorn Golden Eagle Study Plan for 2011 and Draft APP Outline submitted to USFWS.<br>Paul Henson noted the additional monitoring proposed by the company for the Elkhorn Project (telemetry, golden eagle use, nest monitoring, etc.) is necessary and appropriate. The information can also help inform Antelope and other future projects. In addition to this proposed monitoring and the mitigation/offsetting measures mentioned above, some level of continued fatality monitoring and a commitment for implementing adaptive management are necessary components of a successful ABPP for both projects.<br>Curtailment was discussed, noting that there would need to be a direct causal link to risk reduction based on studies, and that open-ended curtailment would render the Project infeasible. | Paul Henson<br>Doug Young<br>Joe Zisa<br>Monty Knudsen<br>Marisa Meyer<br>Gary Miller<br>Vanessa Loverti<br>Cindi Bockstadter | *EDPR/Telocaset:* Valerie Franklin, Christina Calabrese, Nick Benjamin, Eddie Kolitz, Johanne Beaulieu, Arlo Corwin<br>*WEST:* Terry Enk<br>*Stoel Rives:* Barb Craig |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
| --- | --- | --- | --- | --- |
| 12/09/2010 | Telocaset letter to USFWS | Requested information related to eagle carcasses collected to-date in order to provide useful biological information that would help improve understanding of the fatalities and lead to conservation measures. | Paul Henson<br>Joe Zisa<br>Doug Young<br>Robert Romero<br>Cindi Bockstadter<br>Mike Green<br>Gary Miller<br>Marisa Meyer | *Telocaset:* Johanne Beaulieu, Christina Calabrese |
| 12/09/2010 | USFWS Comments on APP Outline | Because the Project is already operating, the USFWS expects the Project APP will provide more conservation emphasis on monitoring, operational measures to minimize take, significant and meaningful adaptive management in response to impacts, long term injury and mortality monitoring, and mitigation. | Gary Miller | *Telocaset:* Christina Calabrese, Johanne Beaulieu, Valerie Franklin, Arlo Corwin |
| 12/14/2010 | Conference Call to Discuss Golden Eagle Study Plan | USFWS and Telocaset met to discuss the draft Golden Eagle Study Plan and clarify methods. | Doug Young<br>Gary Miller<br>Marisa Meyer<br>Vanessa Loverti | *Horizon:* Christi Calabrese, Valerie Franklin, Johanne Beaulieu, Nick Benjamin, *Stoel Rives:* Barb Craig<br>*WEST:* Terry Enk |
| 2/7/2011 | USFWS letter to Telocaset | Declined to provide data requested in 12/09/10 letter. | Paul Henson | *Telocaset:* Johanne Beaulieu, Christina Calabrese, Arlo Corwin |
| 9/21/2011 | Telocaset Transmittal to TAC Members | - Transmittal of Draft 2010 Elkhorn Post-Construction Monitoring Report for TAC member's review and comment and request for next Elkhorn TAC meeting. | Marisa Meyer (TAC) | *Telocaset:* Christina Calabrese |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 10/20/2011 | Elkhorn TAC Committee Meeting (Final) | - Main purpose of the meeting was to discuss the results of the 2010 post-construction fatality monitoring report and provide update on the golden eagle studies being conducted.<br>- Based on the two years of post-construction fatality monitoring data, there is no evidence of a particular turbine or turbine string that is problematic.<br>- Fatality monitoring is still ongoing and occurs once a month at every turbine.<br>- TAC members decided that it was not necessary for the TAC to continue to meet but Telocaset will continue to coordinate with ODFW and USFWS for ongoing efforts related to habitat mitigation parcel and golden eagle studies. | Marisa Meyer (TAC) | *Telocaset:* Christina Calabrese, Eddie Kolitz (TAC), Jon VanDerZee<br>*ODFW:* Jim Cadwell (TAC)<br>*Project Landowner:* Dan Perkins (TAC)<br>*Union County Planning:* Scott Hartell (TAC)<br>WEST: Terry Enk<br>*Citizen Representative:* Terry Edvalson (TAC) |
| 1/25/2012 | Conference Call with USFWS to discuss 2012 golden eagle surveys | - Terry discussed plans for 2012 studies, main points included: GPS component, nest monitoring, observation points, and fatality monitoring.<br>- Gary requested interim telemetry data and general effectiveness of telemetry studies were discussed. Gary indicated that the revised ECPG to be released in upcoming months would provide insight for optimal study methodology. | Marisa Myer<br>Gary Miller<br>Vanessa Loverti<br>Cindi Bockstadter | *Telocaset:* Jon VanDerZee, Johanne Gatto<br>*Stoel Rives:* Tim McMahan<br>*ODFW:* Nick Myatt<br>*WEST:* Terry Enk |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
| --- | --- | --- | --- | --- |
| 2/6/2012 | Conference Call with USFWS to discuss Elkhorn/ Antelope Ridge telemetry study | - Call was held to discuss interim data and continuation of telemetry survey in 2012.<br>- USFWS recommended continuance of telemetry survey.<br>- Telocaset agreed to focus telemetry study in area of nests between Antelope Ridge and Elkhorn. | Gary Miller<br>Vanessa Loverti<br>Marisa Myer | *Telocaset:* Jon VanDerZee, Johanne Gatto<br>*ODFW:* Jim Cadwell<br>*WEST:* Terry Enk |
| 4/12/2012 | Fifth Eagle Carcass Found | **N/A** | **N/A** | **N/A** |
| 5/21/2012 | Conference Call with USFWS to provide 2012 GOEA survey update | - Call was primarily to discuss golden eagle surveys and provide updates.<br>- WEST described first capture session and laid out plans for subsequent session. First year report was coming out in July and next steps were to be discussed with USFWS at that time. | Gary Miller<br>Marisa Myer | *Telocaset:* Jon VanDerZee<br>*WEST:* Terry Enk |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 9/5/2012 | In-Person Meeting between Telocaset and USFWS | - WEST presented first year study results from nest surveys and monitoring, fatality monitoring, observation surveys and telemetry study.<br>- Based on results, there didn't appear to be many easy on-site opportunities for avoidance, and off-site compensatory mitigation for unavoidable take appeared to be most feasible. Any trends between carcass discoveries and high use areas are difficult to translate into operational adjustments. The possibilities and draw-backs of radar technology are discussed, including lack of demonstrated radar ability to distinguish golden eagles from other avian species.<br>- AWWI Eagle Mitigation Workshop was discussed and next steps for developing mitigation plan were proposed. Mitigation possibilities discussed included roadside carcass search/removal and lead abatement. Group discussed reconvening in 2-3 months to narrow down mitigation opportunities.<br>Targeted modifications to study plan are discussed. | Gary Miller<br>Marisa Meyer<br>David Leal<br>Cindi Bockstadter (phone)<br>Jeff Everett (phone) | *Telocaset:* Hilary Foote, Jon VanDerZee<br>*WEST:* Eric Hallingstad, Wally Erickson (phone)<br>*Stoel Rives:* Barbara Craig (phone) |
| 9/26/2012 | USFWS email to Telocaset | -Requested changes to the first-year Golden Eagle Study Plan report to include documentations of the eagle carcasses found incidentally. Telocaset included this information in revised reports. | Marisa Meyer | *Telocaset:* Jon VanDerZee |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 11/5/2012 | USFWS Letter to Telocaset | - Letter outlined concerns USFWS had related to the eagle carcass discoveries at Elkhorn and recommended Telocaset collect additional information on golden eagle habitat use, interaction with turbines, and population levels at the Project area. USFWS requests further exploration of operational changes, curtailment and potential turbine removal. | Gary Miller (Sent letter) | *Telocaset:* Jon VanDerZee (received) |
| 11/12/2012 | Telocaset correspondence letter back to USFWS | - Letter responded to USFWS concerns and stated that Telocaset was in agreement that it was "time to determine the appropriate and effective scientifically sound measures to help ensure the protection of golden eagles at the Project." Telocaset began implementing an analysis of operational adjustment possibilities. | Gary Miller (received) | *Telocaset:* Jon VanDerZee (sent letter) |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
| --- | --- | --- | --- | --- |
| 2/12/2013 | In-Person Meeting between Telocaset and USFWS to discuss curtailment analysis and compensatory mitigation | - Operational adjustment analysis effort was discussed with the caveat that any adjustment needs to align with "practicability" language in the Eagle Permit Rule. WEST noted that in their analysis, the only strong correlation is based on terrain slope and no strong temporal patterns are readily apparent. Telocaset noted openness to operational adjustment if temporal high-risk periods could be identified.<br>- Due to inability to identify a feasible operational avoidance regime, Telocaset requested continual exploration of compensatory mitigation options. USFWS clarified that they were not intending to prohibit this exploration in their November 5 letter, rather wanted to make sure avoidance options were investigated to fullest extent.<br>- Top regional causes of mortality are identified and discussed: lead poisoning, electrocution, habitat loss, car collision, poaching.<br>- Modifications to study plan are discussed based on first-year results and shifting focus to avoidance and mitigation implementation. Next steps include Telocaset and WEST continued exploration of operational adjustment with updated wind data, and continuing conversations related to compensatory mitigation. | Gary Miller<br>Marisa Meyer<br>David Leal (phone)<br>Cindi Bockstadter<br>Jeff Everett (phone) | *Telocaset:* Hilary Foote (phone), Jon VanDerZee<br>*WEST:* Eric Hallingstad, Wally Erickson (phone)<br>*Stoel Rives:* Barbara Craig<br>*ODFW:* Jim Cadwell |
| 4/16/2013 | Phone call between Telocaset and USFWS | - Telocaset introduced the concept of a conservation easement at Antelope Ridge as a means of providing compensatory mitigation at Elkhorn. | David Leal | *Telocaset:* Jon VanDerZee |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 6/6/2013 | Sixth Eagle Carcass Found | **N/A** | **N/A** | **N/A** |
| 6/10/2013 | Conference Call between Telocaset and USFWS | - Presented current progress and research on potential mitigation measures including: Antelope Ridge conservation easement, voluntary lead abatement, roadside carcass removal, and deterrence devices. USFWS expressed interest particularly in the conservation easement concept. Cindi noted that deterrence research was not currently being considered as an acceptable form of mitigation.<br>- Next steps included Telocaset/Stoel crafting a memo elaborating on conservation easement concept, Gary to follow up with possibility for private-public partnership to reduce lead ammunition use during wildlife control efforts, Telocaset to forward Mohave ECP to meeting attendees. | Gary Miller<br>Marisa Meyer<br>David Leal<br>Jeff Everett<br>Cindi Bockstadter (phone) | *Telocaset:* Jon VanDerZee<br>*WEST:* Eric Hallingstad<br>*Stoel Rives:* Barbara Craig |
| 7/10/2013 | In-Person Meeting between Telocaset and USFWS | Main topic focused on: Antelope Ridge conservation easement.<br>- USFWS discussed latest internal conversations on the conservation easement concept.<br>- Jon provided white paper prepared to clarify the concept proposal.<br>- Group discussion regarding easement implementation and logistics. Group agreed to reconvene in two weeks. | Nanette Setto<br>Shauna Ginger<br>David Leal<br>Jeff Everett<br>Gary Miller (phone)<br>Marisa Myer (phone) | *Telocaset:* Jon VanDerZee<br>*Stoel Rives:* Barbara Craig<br>*Crowell:* Steve Quarles (phone) |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 7/23/2013 | Conference Call | -USFWS discussed internal conversations related to acceptability of conservation easement concept proposal. The USFWS was not clear on whether the concept would be seen as acceptable by the national Eagle Team under the ECPG. | Nanette Setto<br>Jeff Everett<br>David Leal<br>Marisa Meyer<br>Cindi Bockstadter<br>Bob Anderson | *Telocaset:* Jon VanDerZee |
| 7/23/2013 | Seventh Eagle Carcass Found | **N/A** | **N/A** | **N/A** |
| 8/6/2013 | Conference Call | USFWS informed Telocaset that a conservation easement at Antelope Ridge would not be in alignment with the ECPG, but could potentially be revisited during the upcoming ANOPR process. | Nanette Setto<br>David Leal<br>Cindi Bockstadter<br>Sheila O'Conner | *Telocaset:* Jon VanDerZee<br>*Stoel Rives:* Barb Craig |
| 9/27/2013 | USFWS-EDPR/ Telocaset Phone Call | Telocaset provided update on progress with ECP and reviewed timeline.<br>Telocaset inquired about APHIS contact for implementation of lead mitigation.<br>Discussed status of broader lead abatement meeting being organized by USFWS. | David Leal | *Telocaset:* Jon VanDerZee |
| 12/29/2013 | Email submittal of ECP | Telocaset submitted the first version of the ECP. | Jeff Everett<br>David Leal<br>Marisa Meyer<br>Gary Miller | *Telocaset:* Jon VanDerZee |
| 2/20/2014 | Email submittal of ECP Comments | USFWS submitted written comments on Version 1 of ECP. | Marisa Meyer | *Telocaset:* Jon VanDerZee |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 2/25/2014 | Meeting in LaGrande, Oregon | Discussed USFWS comments on Version 1 of ECP. | Marisa Meyer<br>Matt Stuber<br>Gary Miller<br>Cindi Bockstadter | *Telocaset:* Jon VanDerZee,<br>Andrew Young<br>*WEST:* Eric Hallingstad, Wally Erickson<br>*Stoel Rives:* Barb Craig |
| 3/18/2014 | Webinar | Telocaset and WEST provided a re-cap on the temporal curtailment analysis that was performed in 2013. | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee<br>*WEST:* Eric Hallingstad |
| 3/19/2014 | Webinar | Telocaset and TetraTech provided detail on the proposed Roadside Carcass Removal mitigation program. | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee<br>*TetraTech:* Laura Nagy |
| 3/28/2014 | Telephone Call to discuss NEPA process | USFWS provided Telocaset direction on the anticipated NEPA process and contractor selection. | Matt Stuber | *Telocaset:* Jon VanDerZee |
| 6/9/2014 | Email submittal of ECP Version 2 | Telocaset submitted the second version of the ECP | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee |
| 7/28/2014 | Meeting in LaGrande, Oregon | Discussed Version 2 of the Project ECP<br>USFWS provided direction on NEPA process, preliminary outline, and potential alternatives. | Matt Stuber<br>Marisa Meyer<br>Gary Miller<br>Cindi Bockstadter | *Telocaset:* Jon VanDerZee<br>*Stoel Rives:* Sarah Stauffer Curtiss<br>*WEST:* Eric Hallingstad |
| 8/1/2014 | Telephone Call | Discussed curtailment effort and issues with implementation. | Matt Stuber | *Telocaset:* Jon VanDerZee |
| 8/12/2014 | Conference Call | Discussed possibility for Habitat Conservation as Mitigation.<br>USFWS confirmed process for treatment of pre-2009 projects. | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee |

| Date | Description | Major Topics | USFWS Attendees or Recipients | Other Attendees |
|---|---|---|---|---|
| 8/15/2014 | Email submittal of ECP Comments | USFWS submitted written comments on Version 2 of ECP. | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee |
| 11/4/2014 | Site Visit | Elkhorn site visit to visit Project facilities and view avian survey points. | Marisa Meyer<br>Gary Miller<br>Cindi Bockstadter | *Telocaset:* Jon VanDerZee<br>Other: Shawn Smallwood |
| 12/16/2014 | Email submittal of ECP Version 3 | Telocaset submitted Version 3 of the ECP. | Marisa Meyer<br>Matt Stuber<br>Gary Miller | *Telocaset:* Jon VanDerZee |
| 3/30/2015 | Meeting in LaGrande, Oregon | -Discussed current status of ECP and next steps regarding advanced conservation practices and mitigation.<br>-USFWS presented results of eagle fatality prediction model.<br>-Confirmed addition of bald eagles to the project ECP. | Matt Stuber<br>Marisa Meyer | *Telocaset:* Jon VanDerZee, Christi Calabrese<br>*Stoel Rives:* Barb Craig<br>*WEST:* Eric Hallingstad<br>*ICF:* Brad Norton, Brad Schafer |
| 7/27/2015 | Email submittal of ECP Comments | USFWS submitted written comments on Version 3 of ECP. | Marisa Meyer<br>Matt Stuber | Telocaset: Jon VanDerZee |
| 9/1/2015 | Meeting in Boise, Idaho | Discussed USFWS comments on Version 3 of ECP, particularly minimization measures and mitigation requirements. | Matt Stuber<br>David Leal | *Telocaset:* Jon VanDerZee<br>*Stoel Rives:* Barb Craig<br>*WEST:* Eric Hallingstad<br>*ICF:* Brad Norton, Brad Schafer |

# Exhibit B: Wildlife Management Plan

# Wildlife Management Plan
# for the
# Elkhorn Wind Power Project

June 2005

Prepared for:

**Zilkha Renewable Energy, LLC**
**210 SW Morrison Street, #310**
**Portland, Oregon 97204**

Prepared by:


WEST Inc.
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Cheyenne, WY 82001


WEST, Inc.

*Specializing in Ecological Field Studies*

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## 1. INTRODUCTION AND BACKGROUND

Zilkha Renewable Energy, LLC (the "Applicant") is proposing the development of a wind power facility in Union County, Oregon. The Applicant has contracted with Western Ecosystems Technology, Inc. (WEST) to assist in developing a Wildlife Management Plan (WMP) for the Elkhorn Wind Power Project (the "Project"). The WMP (this document) is a comprehensive document that describes the environmental baseline data collection methods, mitigation proposal, and operational monitoring methods for the proposed wind power Project. The WMP has been developed in coordination with Oregon Department of Fish and Wildlife biologists (ODFW) since February 2003. Exhibit A contains detailed methods and results of the pre-project baseline wildlife and habitat studies, and Exhibit B contains a detailed protocol for the proposed operational monitoring studies.

## 2. PRE-PROJECT BASELINE HABITAT AND WILDLIFE STUDIES

The following section summarizes the methods used in collection of pre-project baseline studies at the proposed Elkhorn Wind Project. More detailed descriptions are found in the baseline study report (Exhibit A).

### 2.1 Methods

The principal objectives of the baseline study for this proposed Project were to (1) describe the temporal and spatial use of wildlife at the Project site, (2) describe the habitat in the general Project area, (3) describe the occurrence of any federal and state threatened, endangered, proposed, candidate, or sensitive-status animals and their potential habitat that may be affected by the Project, (4) estimate any potential impacts to habitat and wildlife that could result from the construction and operation of the proposed Project, and (5) identify potential project modifications and/or mitigation measures that could reduce potentially negative impacts.

These objectives were addressed by a combination of data collected at the proposed Project site and from baseline and post-construction monitoring data collected at other wind power project sites. The baseline study report also provides information that can be used to design a post construction (operational) monitoring study as appropriate.

In addition to site-specific data, the baseline study utilized existing information and results of studies conducted at other wind plants. Data collected at existing wind power projects have greatly enhanced our ability to estimate potential bird and bat mortality at proposed developments. For several wind power projects, standardized baseline data on avian use, raptor nesting, and habitat information have been collected in association with standardized post-construction (operational) mortality monitoring, allowing comparisons of avian use to mortality. Additional information about species that are known or likely to occur in the vicinity of the proposed Project has been gathered from the appropriate agency databases and from reports developed for other regional projects (wind and other types of development).

The site-specific baseline study consists of the following components: 1) vegetation and general project mapping, 2) winter/spring surveys for bald eagles and other sensitive wildlife, 3) avian use surveys, 4) Thief Valley Reservoir bird counts, 5) big game use surveys, 6) sage grouse lek surveys, 7) Federal and State sensitive wildlife, wildlife habitat, and raptor nest surveys, and 8) general wildlife observations.

### *2.1.1. Vegetation and General Project Mapping*

Key information about vegetation and physical characteristics and observations within the general Project area were maintained in a comprehensive mapping system.

### *2.1.2. Winter/Early Spring Surveys for Bald Eagles and Other Sensitive Wildlife*

Existing information had indicated that wintering bald eagles were potentially occurring within the general area. Focused winter/early spring surveys have been conducted to document the presence and quantify the distribution of wintering bald eagles and other species of concern. Surveyors drove a pre-determined survey route at weekly intervals between early March and late April 2003. Additional information was collected for eagles and all other raptors during aerial and ground based winter big game surveys during March 2004 and January and March 2005.

### *2.1.3. Avian Use Surveys*

The objective of avian use surveys was to provide information that can be used to predict potential impacts, and identify methods of avoiding and/or mitigating impacts by estimating temporal and spatial use of the general Project area by birds. The avian use surveys consisted of counts of birds observed within circular plots around observation points. Surveys were conducted between March 7, 2003 and October 28, 2003; the highest expected period of overall bird use.

#### *2.1.4. Thief Valley Reservoir Bird Counts*

The primary objective of counts of waterfowl and other birds at Thief Valley Reservoir was to document the presence and species composition of waterfowl, waterbirds (e.g., cranes), shorebirds, and other avian species. Surveys were conducted between May 8, 2003 and October 28, 2003.

#### *2.1.5. Big Game Use Surveys*

All big game observed on the Project site during avian use surveys were counted to supplement the annual winter surveys conducted by the Oregon Department of Fish and Wildlife (ODFW). ODFW has been conducting annual winter surveys over the past 20 years in the vicinity of the Project area. Counts of big game during avian use surveys were conducted between March 7, 2003 and October 28, 2003. In addition to regular ODFW annual big game surveys, aerial surveys of the Project area and surrounding areas were conducted during March 2004 and between February and March 2005. These surveys documented spatial use and density of mule deer and elk occupying the winter range on the Project site and adjacent properties. In addition, ten big game ground surveys were conducted (one in March 2004 and nine between January and March 2005), to further document spatial use, to document use immediately near proposed turbine strings and also to examine behavior using time budgets by recording activities (e.g., foraging, resting, alert, fleeing) along line transects associated with turbine strings. Both aerial and ground surveys provide the necessary baseline information for comparison with data, which will be collected while monitoring big game after commencement of Project operations.

#### *2.1.6. Sage Grouse Lek Surveys*

The Project area is apparently located at the northern end of the current distribution of sage grouse in Oregon. Surveys conducted by ODFW in the mid to latter part of the 1990's did not document sage grouse leks (strutting grounds) within the current Project boundary. Recently active sage grouse leks were documented approximately 3 miles south of the Project area in Baker County. An historic lek also exists west of Highway 237 about 2 miles from proposed construction and development activities. This site has been abandoned, apparently due to grazing practices near the site. Three ground-based surveys were conducted in March 2003 and in April 2004 in suitable habitat south of Government Gulch and Telocaset Lanes (see Field Methods section in Exhibit A of "Wildlife Management Plan for the EWPP" for details on location). Additional information was collected for sage grouse during aerial and ground based winter big game surveys during March 2004 and between January and March 2005. Using ODFW protocols, suitable lek habitats were surveyed by helicopter between 0600 and 0800 hrs during the March 2004 and February and March 2005 aerial surveys.

#### *2.1.7. Federal and State Listed Wildlife, Wildlife Habitat, and Raptor Nest Surveys*

Areas within 300 feet (91 m) of proposed turbine strings and new roads with suitable habitat for federal and state listed and otherwise sensitive status wildlife were surveyed once in the spring (May 2005) during the nesting/breeding season. Specifically, searches focused on sensitive species such as white-tailed jackrabbit (Federal Species of Concern, State Sensitive-Undetermined), burrowing owl (Federal Species of Concern, State Sensitive-Critical), Columbia spotted frog (Federal Candidate and State Sensitive-Undetermined), and other potentially occurring sensitive species. In addition, visible areas of suitable nesting habitat for buteos, falcons, and other raptors were scanned during this survey with binoculars to document nesting raptors most at risk to be impacted by the Project. Historic raptor nest site locations obtained from ODFW, results of nest surveys conducted in 2003 in the vicinity of the Project, and nests observed during the 2004 and 2005 big game surveys were also reviewed.

#### *2.1.8. General Wildlife Observations*

The objective of the general wildlife or 'in-transit' observations was to document general wildlife habitat and wildlife occurrence on site. All wildlife species of interest or species not previously documented on site through other surveys that were sighted while field observers traveled between plots or while in the general Project area were recorded and mapped.

## 3. MITIGATION PLAN

The following is a comprehensive mitigation plan for the Project. The potential direct impacts to plants and animals from the Project can be grouped into two main categories, loss of habitat from construction and operation of the Project, and potential mortality to individual birds or other animals from construction and operation of the Project. The loss of habitat associated with the Project can be further broken down into "temporary" and "permanent" habitat impacts. "Temporary" impacts are those arising from ground disturbance necessary for the construction of Project infrastructure but that will not be permanently occupied once construction is complete. Examples include trenches for underground electrical collector cables, construction staging areas, etc. These areas will be disturbed during the eight to twelve month construction period but will be replanted after construction is finished. The vast majority of the total area impacted by construction of the Project will only be temporarily disturbed. The remainder will continue to be occupied by the Project, such as string roads, turbine foundation pads, the Project substation and the O&M facility. These are considered "permanent" impacts for the purpose of this analysis.

A comprehensive mitigation package for plants and animals is proposed for this Project. It consists of several categories of actions, including:

- Thorough study and analysis to avoid impacts;
- Project design features to minimize impacts;
- Construction techniques and (Best Management Practices) BMPs to minimize impacts;
- Post-construction restoration of temporarily disturbed areas;
- Operational BMPs to minimize impacts;
- Monitoring and adaptive management to minimize impacts during operations; and
- Protection and enhancement of on-site habitat or other equitable mitigation measure

### 3.1 Thorough Study and Analysis to Avoid Impacts

The Applicant has commissioned extensive studies by qualified wildlife biologists at the Project site to avoid impacts to sensitive populations. These studies, of which methods and results are described in Exhibit A, include:

- Habitat/vegetation mapping
- Avian use surveys
- Winter/spring bald eagle surveys
- Sage grouse surveys
- Big game surveys
- Sensitive-Status wildlife surveys
- Raptor nest surveys

The results and recommendations from these studies (Exhibit A) have been incorporated into the proposed design, construction, operation and mitigation for the Project (see section 3.2).

### 3.2 Project Design Features to Avoid and/or Minimize Impacts

The proposed design of the Project incorporates numerous features to avoid and/or minimize impacts to plants and wildlife. These features are based on site surveys, experience at other wind power projects, and recommendations from ODFW and consultants performing studies at the site. Features of the Project that are designed to avoid or minimize impacts to plants and animals include the following:

- Avoidance of road and turbine construction in sensitive areas
- Modifications of the layout to reduce impacts, including:
    - One turbine row was eliminated due to concerns over potential impacts to nesting raptors, including golden eagles
    - One turbine was eliminated due to its proximity to the Powder River Canyon.
    - One turbine row was eliminated due to its proximity to an area identified by ODFW as particularly critical to wintering big game.

- The road layout was modified to eliminate potential impacts to a burrowing owl nesting pair and critical winter range.

- Minimizing new road construction by improving and using existing roads and trails instead of constructing new roads;
- Choice of underground (vs. overhead) electrical lines wherever feasible to minimize perching locations and electrocution hazards to birds;
- Choice of turbines with low RPM and use of tubular towers to minimize potential risk of bird collision with turbine blades and towers;
- Use of unguyed permanent meteorological towers to minimize potential for avian collisions with guy wires;
- Equipping all overhead power lines within ¼ mile of turbines with raptor perch guards to minimize perching by raptors; and
- Spacing of all overhead power line conductors to minimize potential for raptor electrocution.

### 3.3 Construction Techniques and BMPs to Minimize Impacts

Construction of the Project has the potential to impact both habitat and wildlife in a variety of ways. The Applicant proposes the use of construction techniques and Best Management Practices (BMPs) to minimize these potential impacts. These include the following:

- Use of BMPs to minimize construction-related surface water runoff and soil erosion;
- Use of certified "weed free" straw bales during construction to avoid introduction of noxious or invasive weeds;

Flagging of any particularly sensitive habitat areas (such as locations of raptor nests) within ¼ mile of proposed areas of construction activity and designation of such areas as "off limits" to all construction personnel.

- Development and implementation of a fire control plan, in coordination with local fire districts, to minimize risk of accidental fire during construction and respond effectively to any fire that does occur;
- Establishment and enforcement of reasonable driving speed limits (max 25 mph) during construction to minimize potential for road kills;

- Proper storage and management of all wastes generated during construction;
- Require construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas;
- Flagging of all sensitive habitat areas (e.g. raptor nests, wetlands, etc) as "off limits" to all construction personnel;
- Designation of an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.

### 3.4 Post-Construction Restoration of Temporarily Disturbed Areas

All temporarily disturbed areas will be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed to accelerate the revegetation of these areas and to prevent the spread of noxious weeds. The Applicant will consult with Oregon Department of Fish and Wildlife regarding the appropriate seed mixes for the Project area.

### 3.5 Operational BMPs to Minimize Impacts

During Project operations, appropriate operational BMPs will be implemented to minimize impacts to plants and animals. These include the following:

- Implementation of a fire control plan, in coordination with local fire districts, to avoid accidental wildfires and respond effectively to any fire that might occur;
- Establishment and enforcement of reasonable driving speed limits during construction to minimize potential for road kills;
- Operational BMPs to minimize storm water runoff and soil erosion;
- Implementation of an effective noxious weed control program, in coordination with the Union County Noxious Weed Control Board, to control the spread and prevent the introduction of noxious weeds;
- Identification and removal of carcasses of livestock, etc. from within the Project that may attract foraging bald eagles or other raptors.

### 3.6 Monitoring and Adaptive Management to Minimize Impacts During Operations

The Applicant plans to convene a Technical Advisory Committee (TAC) to evaluate the mitigation and monitoring program and provide recommendations to Union County regarding the need for any further studies or mitigation measures. The TAC representatives will include the facility owner, landowners, ODFW, USFWS and the Union County Planning Commission (if those agencies elect to participate). The post-construction monitoring plan should be developed in coordination with the TAC. A draft of the plan is provided in Exhibit B.

The Applicant proposes to develop a post-construction monitoring plan for the Project to quantify impacts to avian and bat species and wintering big game and to assess the adequacy of mitigation measures implemented and the possible need for additional measures. The monitoring plan will include (1) fatality monitoring, involving standardized carcass searches, scavenger removal trials, searcher efficiency trials, and reporting of incidental fatalities by maintenance personnel and others, and (2) a big game study designed to provide information on the possible disturbance/displacement impacts of the Project on mule deer and elk. If indirect impacts to winter range are observed, additional mitigation may be negotiated with the County through the TAC.

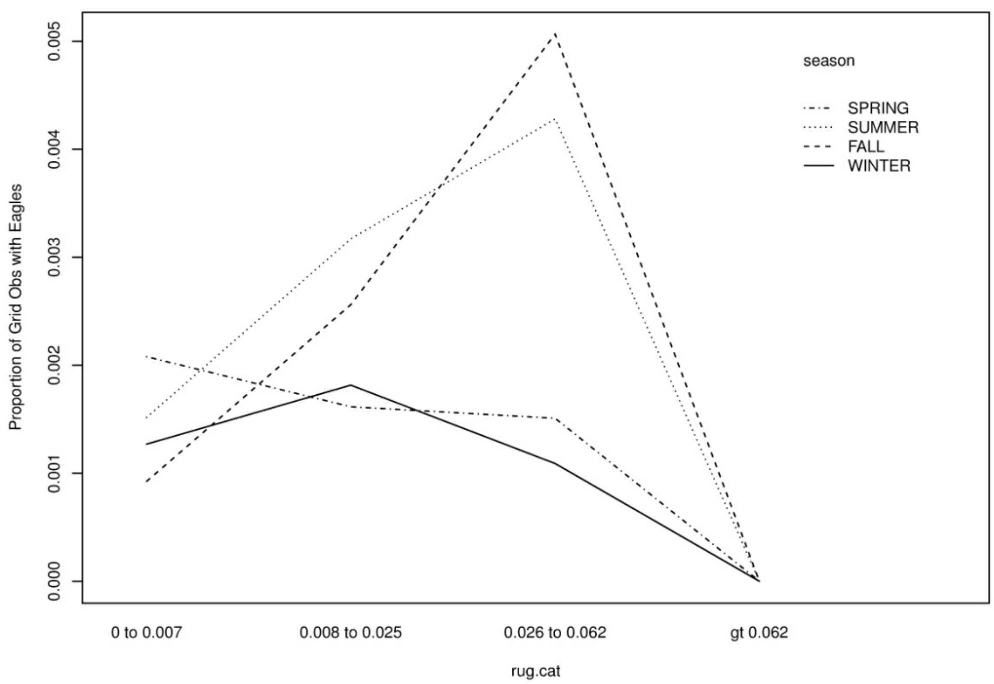
### 3.7 Mitigation of Direct Habitat Loss

The Applicant has agreed to mitigate for the direct loss of habitat due to the footprint of the Project facilities. Approximately two acres of suitable replacement shrub-steppe or riparian habitat for every acre of habitat that is permanently impacted by the Project will be protected for the life of the Project through a conservation easement.

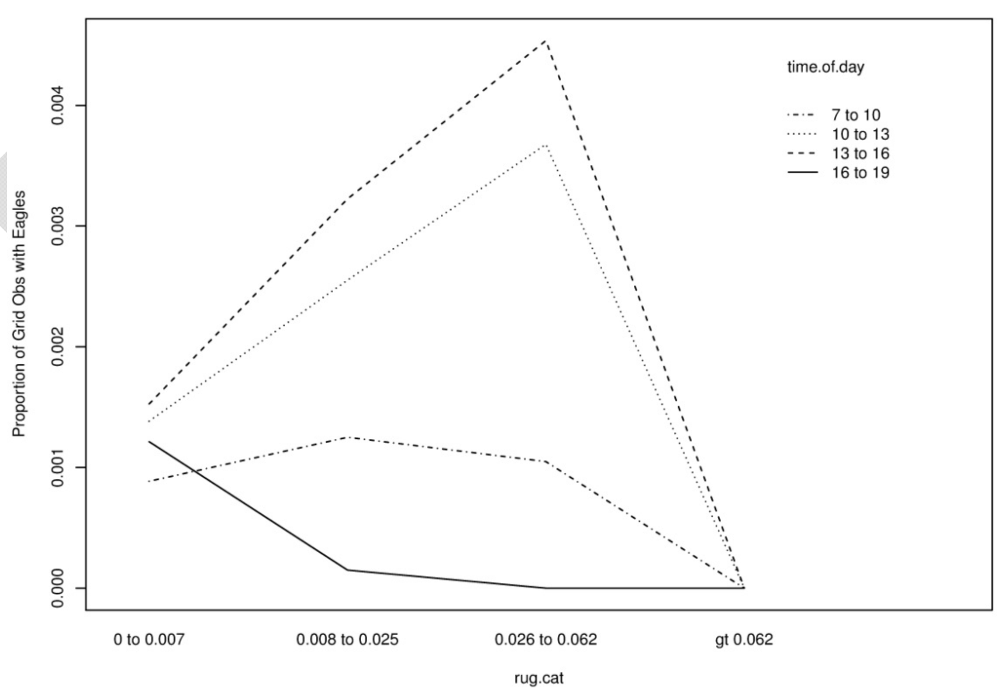
The mitigation area will be fenced off and excluded, for the life of the Project, from domestic grazing, land development or industrial, commercial, or residential purposes or any other purpose or use inconsistent with habitat protection. Applicant will maintain the mitigation area as reasonably necessary by conducting restoration, improvement, fire control, monitoring, and other necessary maintenance. Such activities may include planting of vegetation, removal of nonnative or invasive plant species, other vegetation management, removal of introduced animal species, and installation of boundary markers and fences. This mitigation effort is expected to result in a significant improvement in habitat function and value over time as degrading forces are removed.

The Applicant is in the process of negotiating a conservation easement agreement over suitable mitigation properties identified in coordination with ODFW

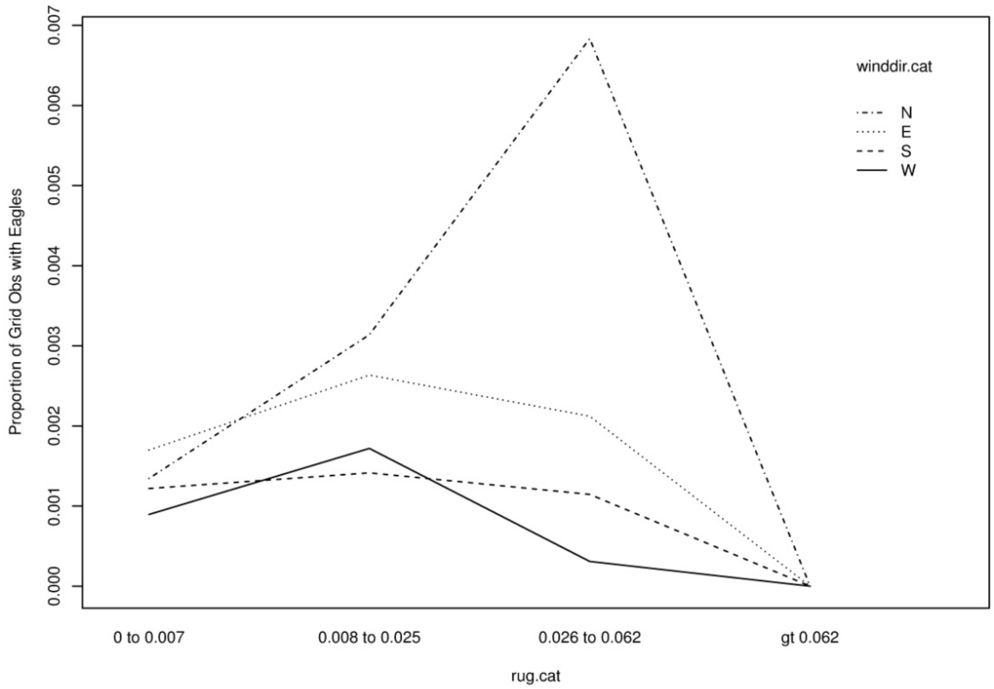
**Exhibit C: Interaction Plots Resulting from Curtailment Analyses**



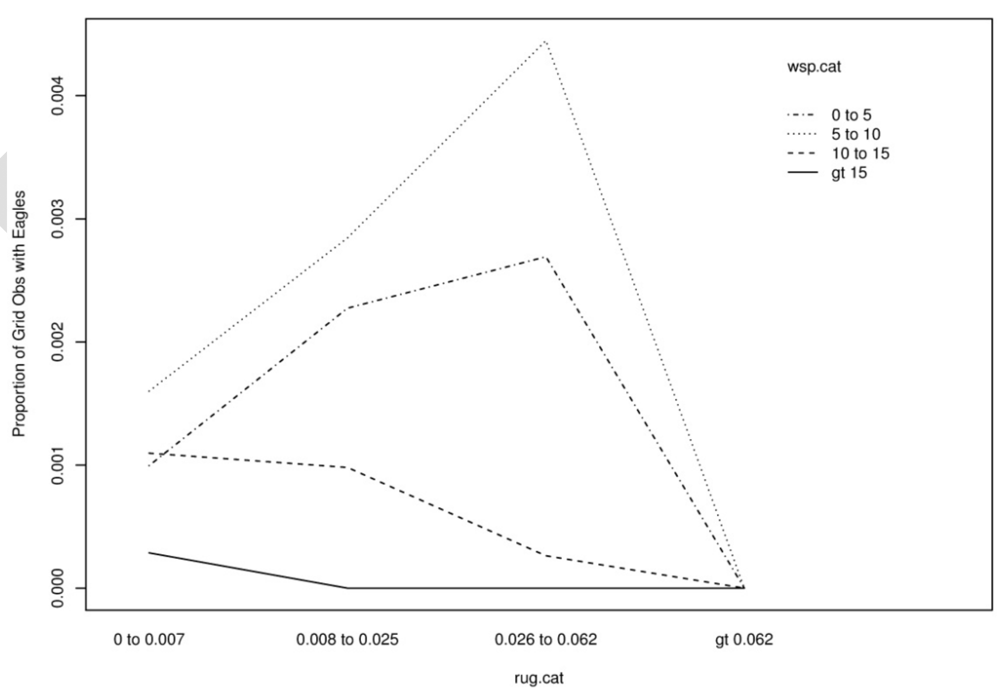

Interaction Plot A: Ruggedness * Season x Eagle Use.



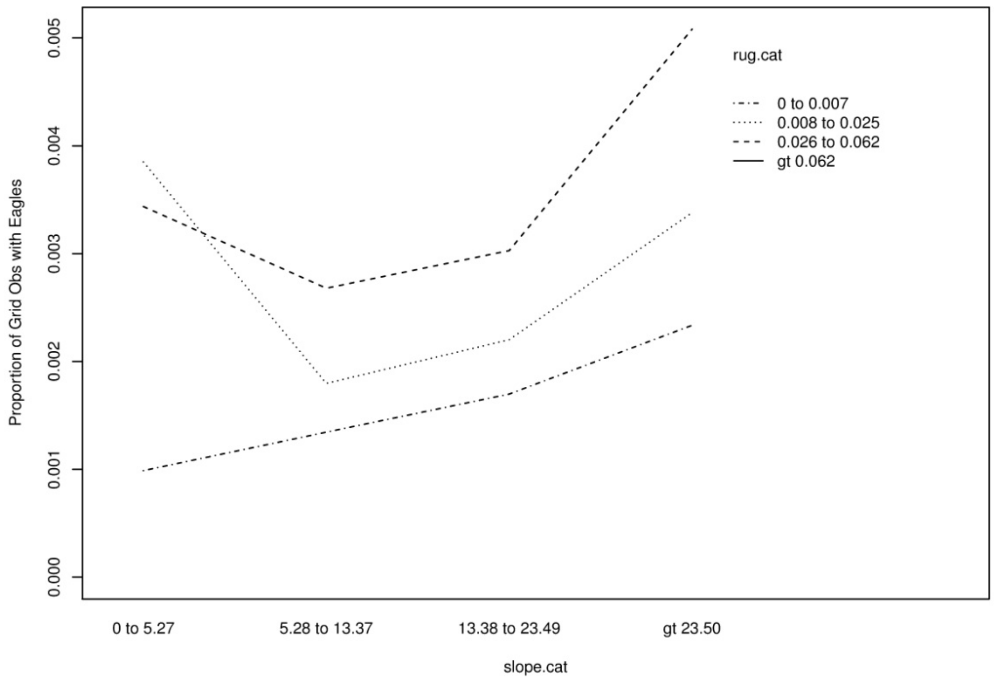

Interaction Plot B: Ruggedness * Time of Day x Eagle Use.



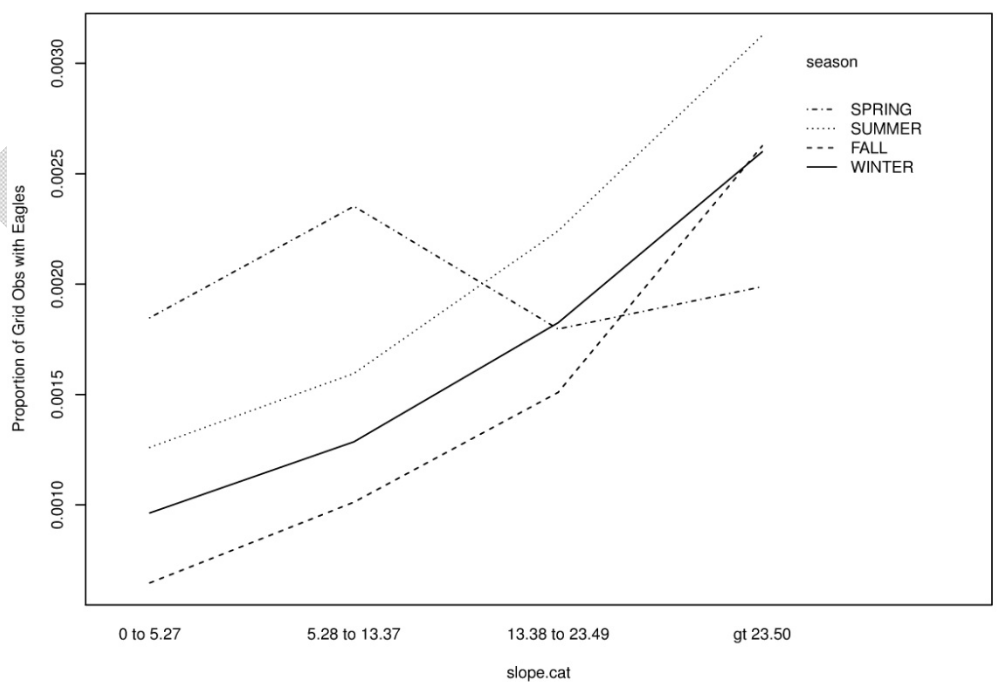

Interaction Plot C: Ruggedness * Wind Direction x Eagle Use.



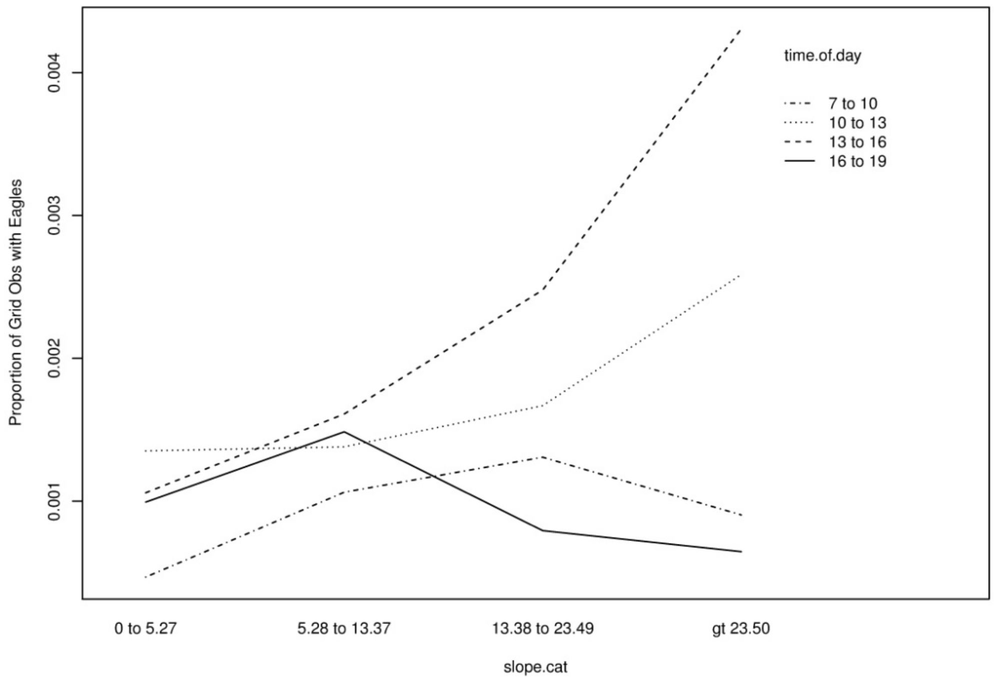

Interaction Plot D: Ruggedness * Wind Speed x Eagle Use.



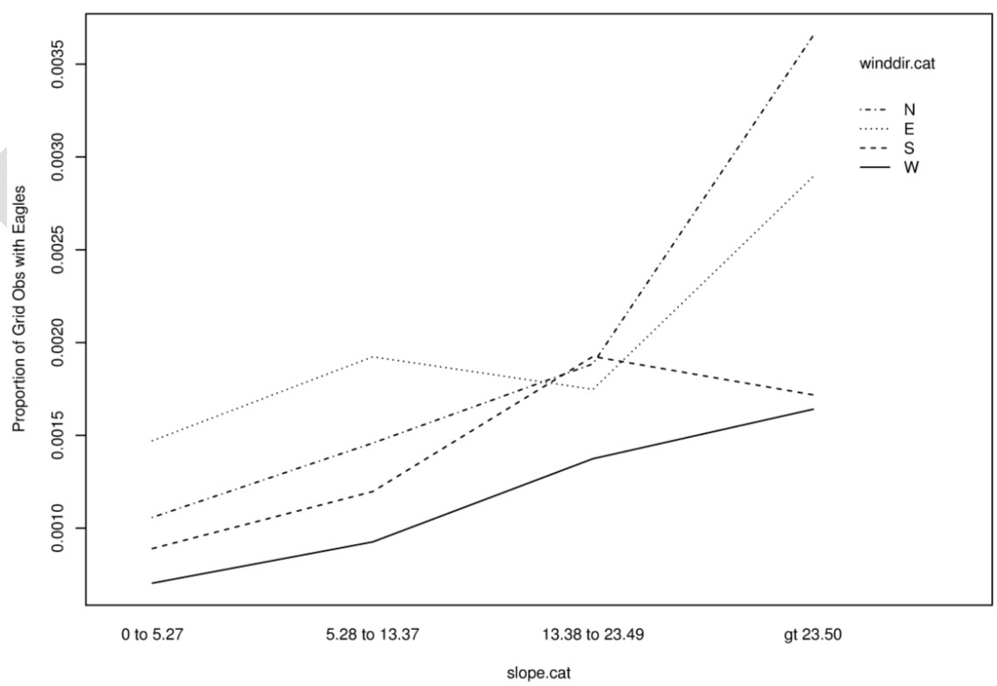

Interaction Plot E: Slope * Ruggedness x Eagle Use.



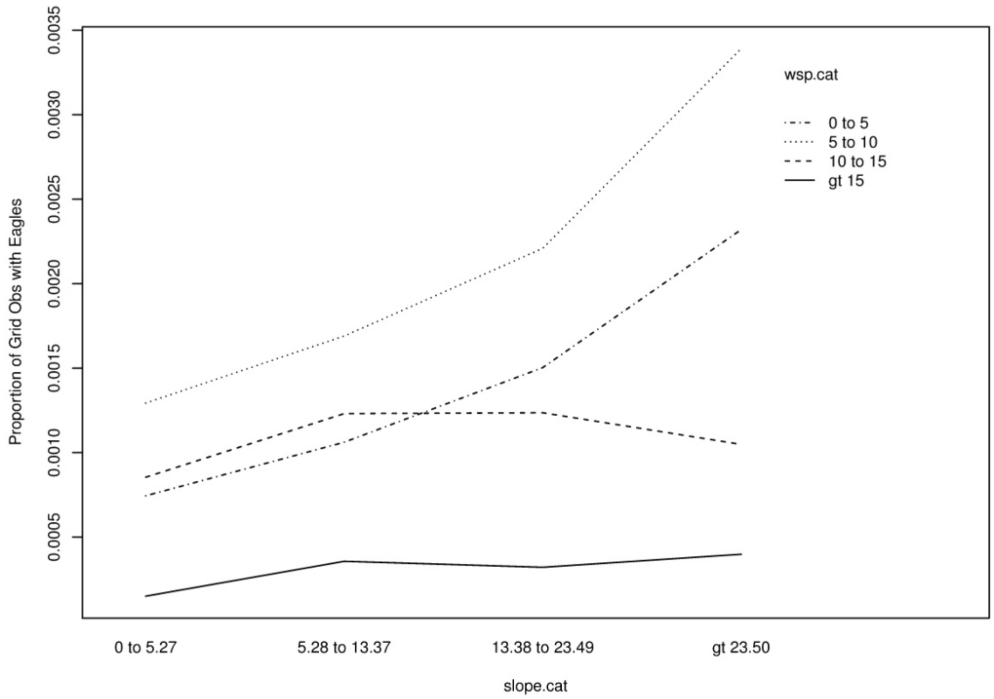

Interaction Plot F: Slope * Season x Eagle Use.



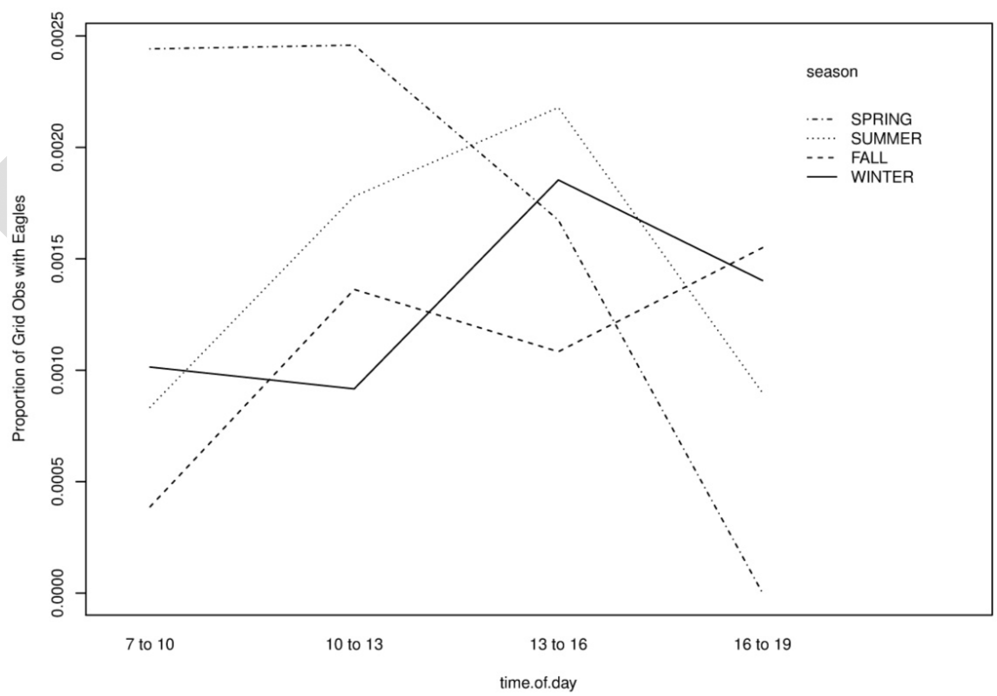

Interaction Plot G: Slope * Time of Day x Eagle Use.



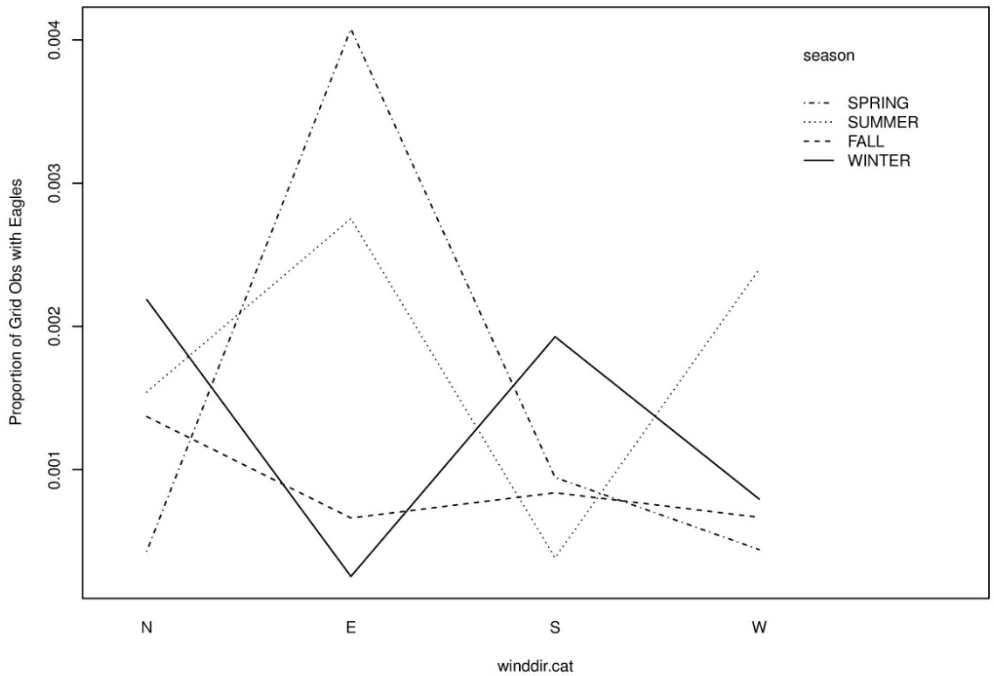

Interaction Plot H: Slope * Wind Direction x Eagle Use.



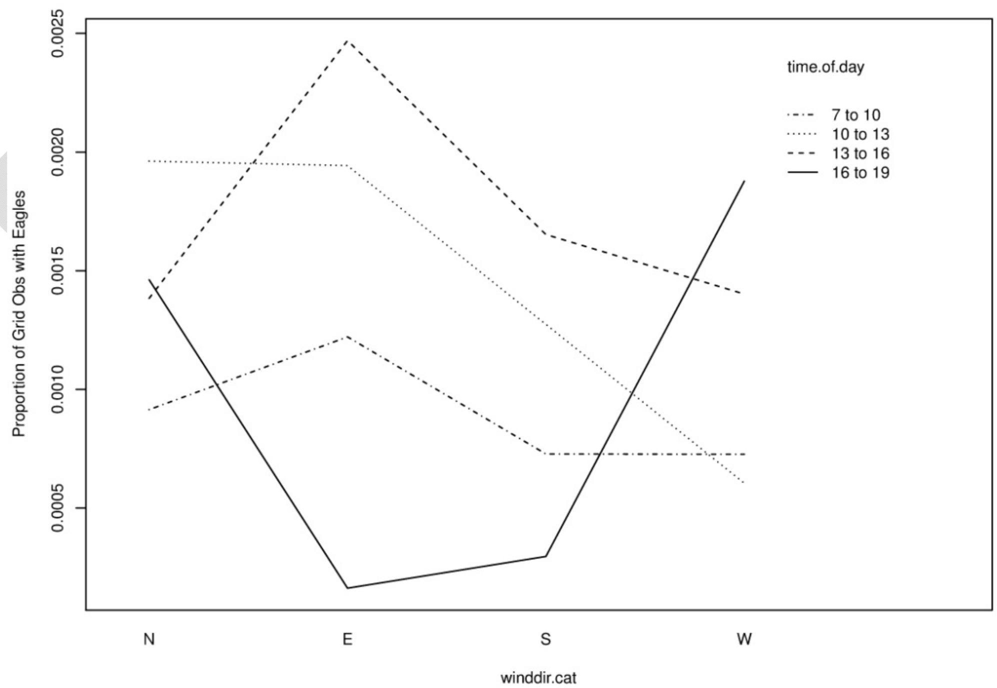

Interaction Plot I: Slope * Wind Speed x Eagle Use.



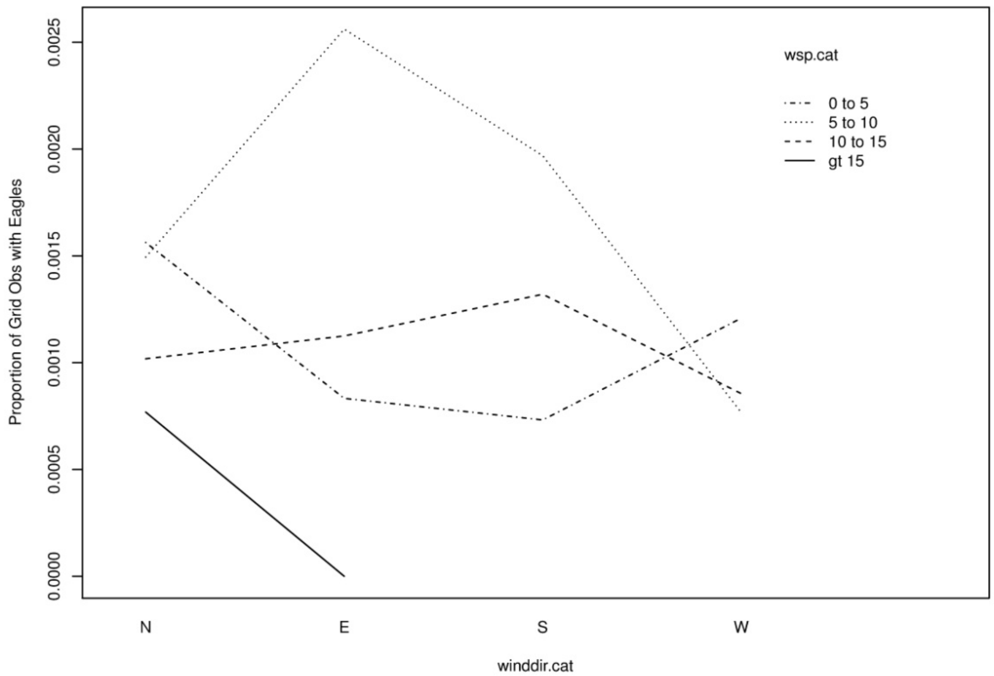

Interaction Plot J: Time of Day * Season x Eagle Use.



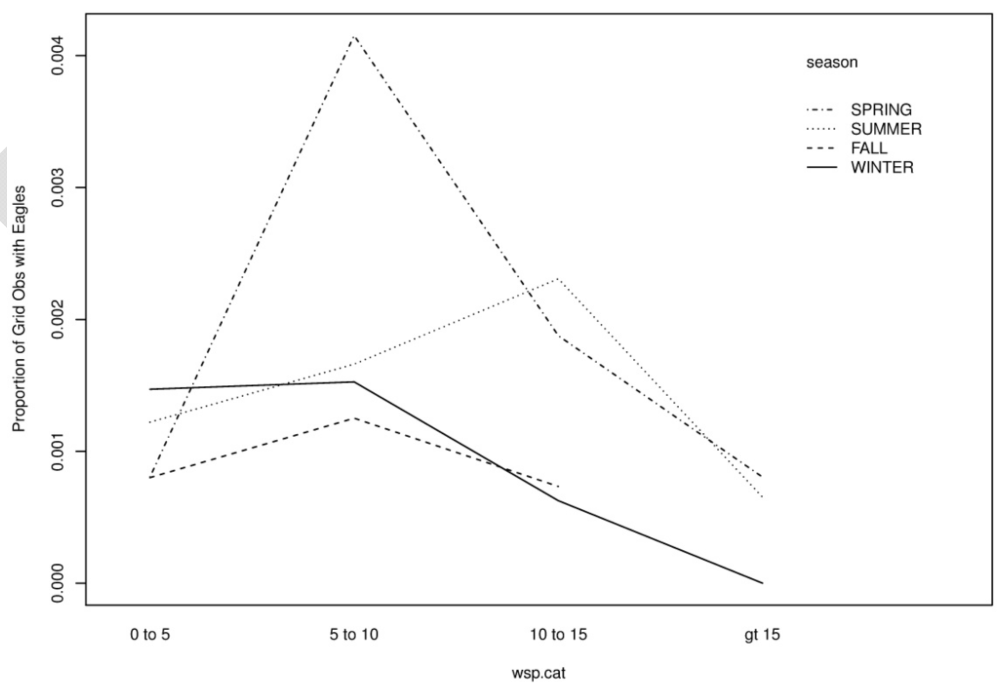

Interaction Plot K: Wind Direction * Season x Eagle Use.



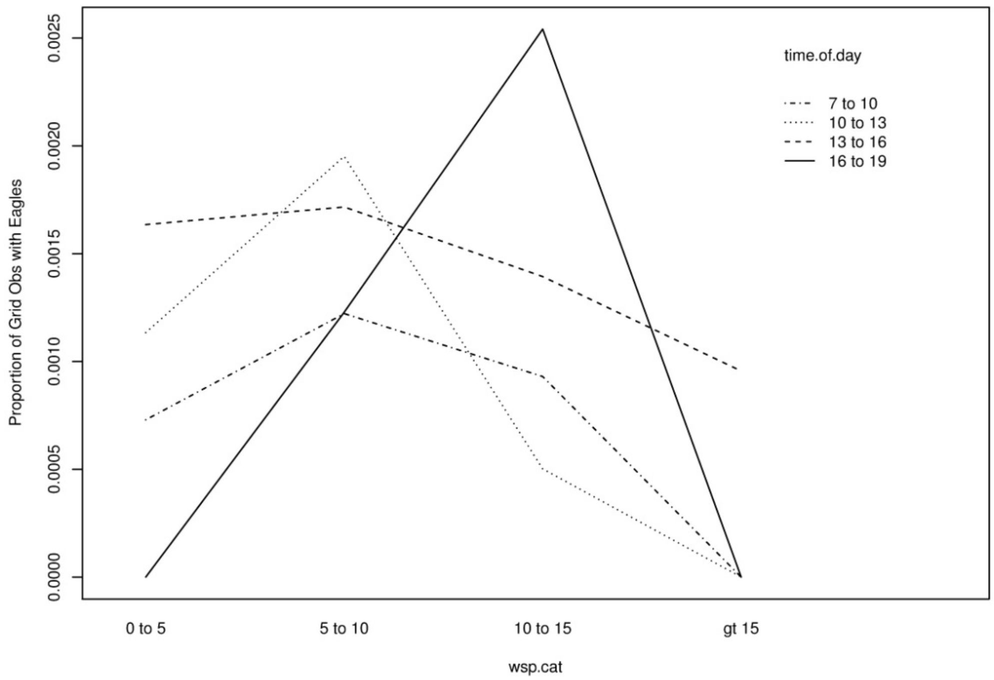

Interaction Plot L: Wind Direction * Time of Day x Eagle Use.




Interaction Plot L: Wind Direction * Wind Speed x Eagle Use.




Interaction Plot M: Wind Speed * Season x Eagle Use.




Interaction Plot N: Wind Speed * Time of Day x Eagle Use.

**Exhibit D: Results of Empirical Data in Combination with the Bayesian Fatality Prediction Model as Provided by USFWS**

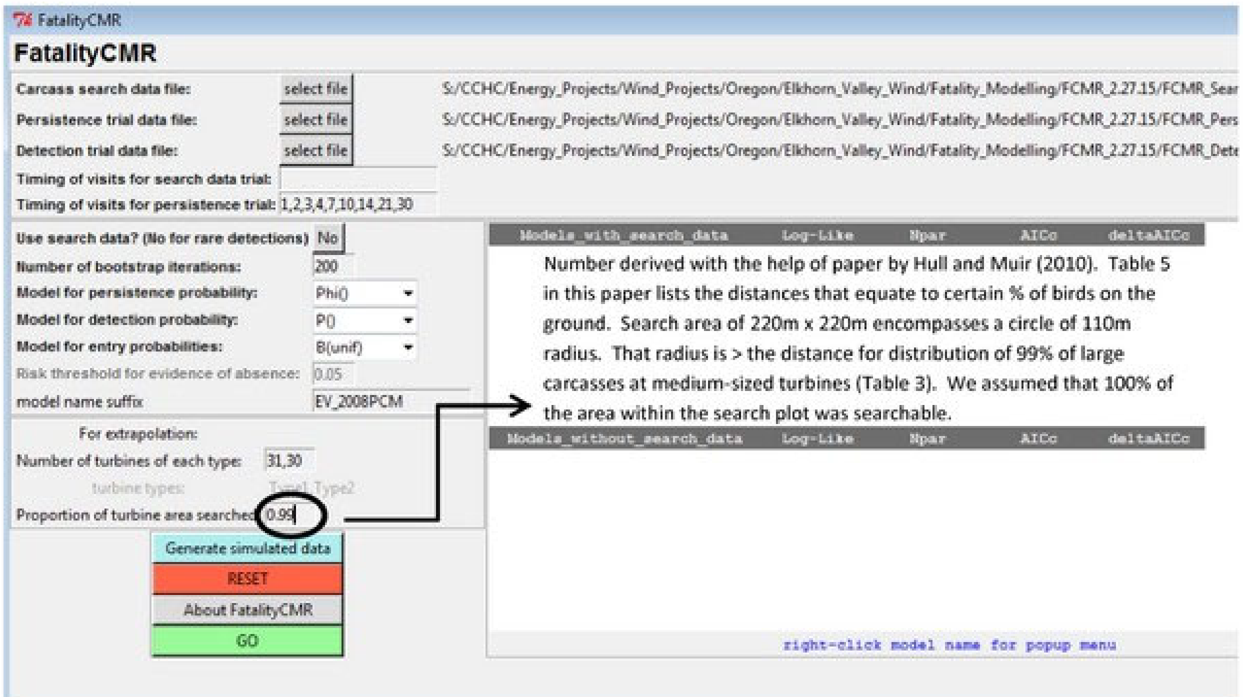
**DRAFT: Elkhorn Valley Wind Project – Golden Eagle Fatality Prediction (9/25/15)**

**Summary of Steps:**

1) Determine the mean annual fatality estimate at Elkhorn Valley using 2008 PCM (done at 61 of 61 turbines).
2) Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 1.
3) Extract parameters from the collision probability posterior calculated in Step 2 and use them to define the collision probability prior in Step 5.
4) Determine the mean annual fatality estimate at Elkhorn Valley using 2010 PCM (done at 31 of 61 existing turbines).
5) Run the annual Bayesian fatality prediction model for the entire project (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual fatality estimate derived in Step 4 to update the collision probability prior described in Step 3.
6) Extract parameters from the collision probability posterior calculated in Step 5, and use them to define the collision probability prior in Step 8.
7) Determine the mean annual fatality estimate at Elkhorn Valley using 2011-2014 PCM (don't at 61 of 61 existing turbines)
8) Run the annual Bayesian fatality prediction model for Elkhorn Valley (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual estimate derived in Step 7 to update the collision probability prior described in Step 6. THIS WILL BE THE FATALITY PREDICTION FOR THE PROJECT AND WHAT WILL BE ON THE PERMIT, if issued
9) Subtract the mean fatality prediction derived in Step 8, from the 80$^{th}$ quantile prediction derived in Step 8. THIS WILL BE THE OFFSETTING COMPENSATORY MITIGATION REQUIREMENT, if permit is issued.

**SEE DETAILED STEPS AND OUTPUTS FROM MODELLING BELOW**

**Step 1:** Determine the mean estimated fatalities at Elkhorn Valley using 2008 PCM (done at all 61 turbines)




Note: Persistence data was from 2008 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**------------------------------------------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**------------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| **Type1** | **0.0173** | **0.0017** | **0.0116** | **0.0022** |
| **Type2** | **0.0173** | **0.0017** | **0.0116** | **0.0022** |
| **sum** | **0.0346** | **0.0034** | **0.0164** | **0.0031** |

Fatality Estimate in 2008 based on 2008 PCM only.

**Step 2:** Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 1

**CODE:**

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-c(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(70),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084))                    Derived in Step 1
Dead<-c(0.0346)
AddTot<-TRUE

setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-c(ExpSvy$nCnt*CntHr*ExpSvy$CntKM3)
ExpFac<-c(ExpSvy$DayLtHr*HazKM3)
postBH1<-simFatal(BMin=ExpSvy$EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=2.31,bPriCPr=396.69)

postCPr<-attr(postBH1,"CPr")
postCPr
```

**COLLISON PROBABILIY POSTERIOR**

```
       Mean          SD
0.002477527 0.001615156
```

**Step 3:** Extract parameters from the collision probability posterior calculated in Step 2 and use them to define the collision probability prior in Step 5

**CODE:**

```
estBetaParams <- function(mu, var) {
  alpha <- ((1 - mu) / var - 1 / mu) * mu ^ 2
  beta <- alpha * (1 / mu - 1)
  return(params = list(alpha = alpha, beta = beta))
}

estBetaParams(0.002477527,0.001615156^2)
```

→ Derived in Step 2

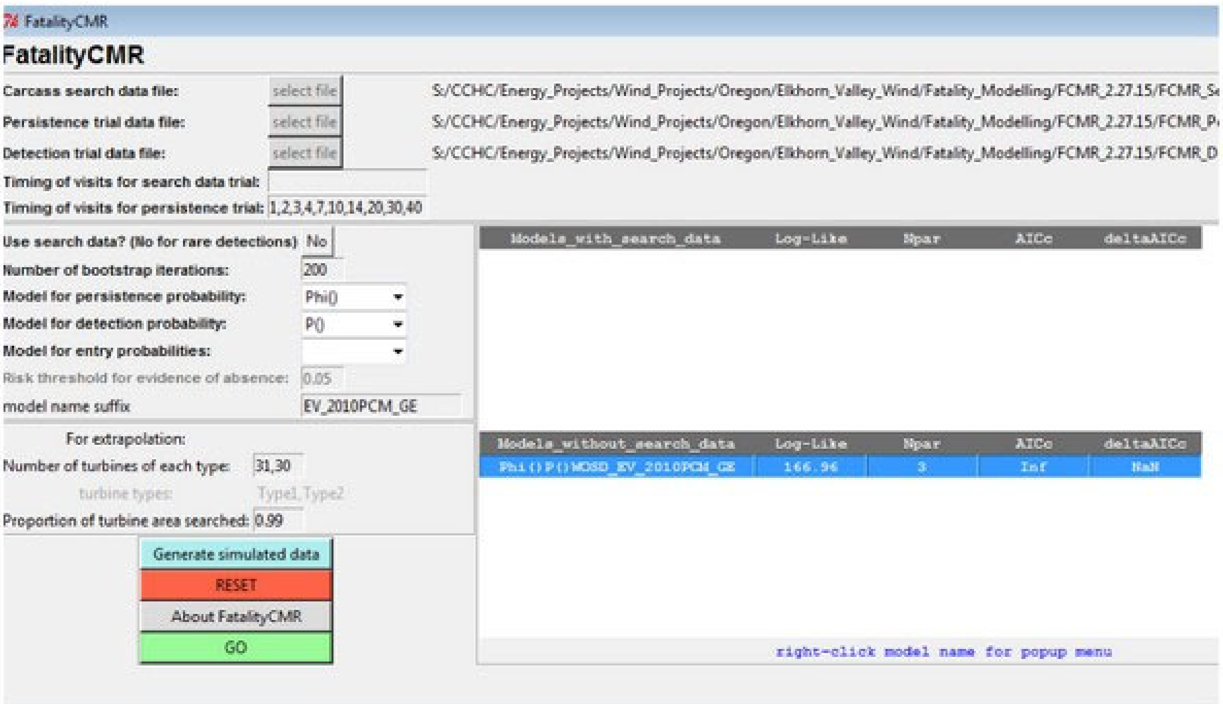
**PARAMATERS FOR NEW COLLISION PROBABILITY DISTRIBUTION**

```
$alpha
[1] 2.344617

$beta
[1] 944.009
```

→ New alpha and beta parameters for collision probability prior.

**Step 4:** Determine the mean annual fatality estimate at Elkhorn Valley using 2010 PCM (done at 31 of 61 turbines).




Note: Persistence data was from 2010 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**------------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| Type1 | 2.3959 | 2.4032 | 0.3945 | 0.3954 |
| Type2 | 2.4732 | 2.4807 | 0.4072 | 0.4082 |
| sum | 4.8692 | 4.8839 | 0.5670 | 0.5683 |

Fatality Estimate in 2010 based on 2010 PCM only.

**Step 5:** Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 4

CODE:

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-c(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(70),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084)
Dead<-c(4.8692)
```

Derived in Step 4

```
AddTot<-TRUE

setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-c(ExpSvy$nCnt*CntHr*ExpSvy$CntKM3)
ExpFac<-c(ExpSvy$DayLtHr*HazKM3)
postBH1<-simFatal(BMin=ExpSvy$EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=2.344617,bPriCPr=944.009)
```

Derived in Step 3

```
postCPr<-attr(postBH1,"CPr")
postCPr
```

```
COLLISON PROBABILIY POSTERIOR
       Mean          SD
0.004840688 0.001795511
```

**Step 6:** Extract parameters from the collision probability posterior calculated in Step 5 and use them to define the collision probability prior in Step 7

**CODE:**

```
estBetaParams <- function(mu, var) {
  alpha <- ((1 - mu) / var - 1 / mu) * mu ^ 2
  beta <- alpha * (1 / mu - 1)
  return(params = list(alpha = alpha, beta = beta))
}

estBetaParams(0.006005473,0.003580848^2)
```

Derived in Step 5

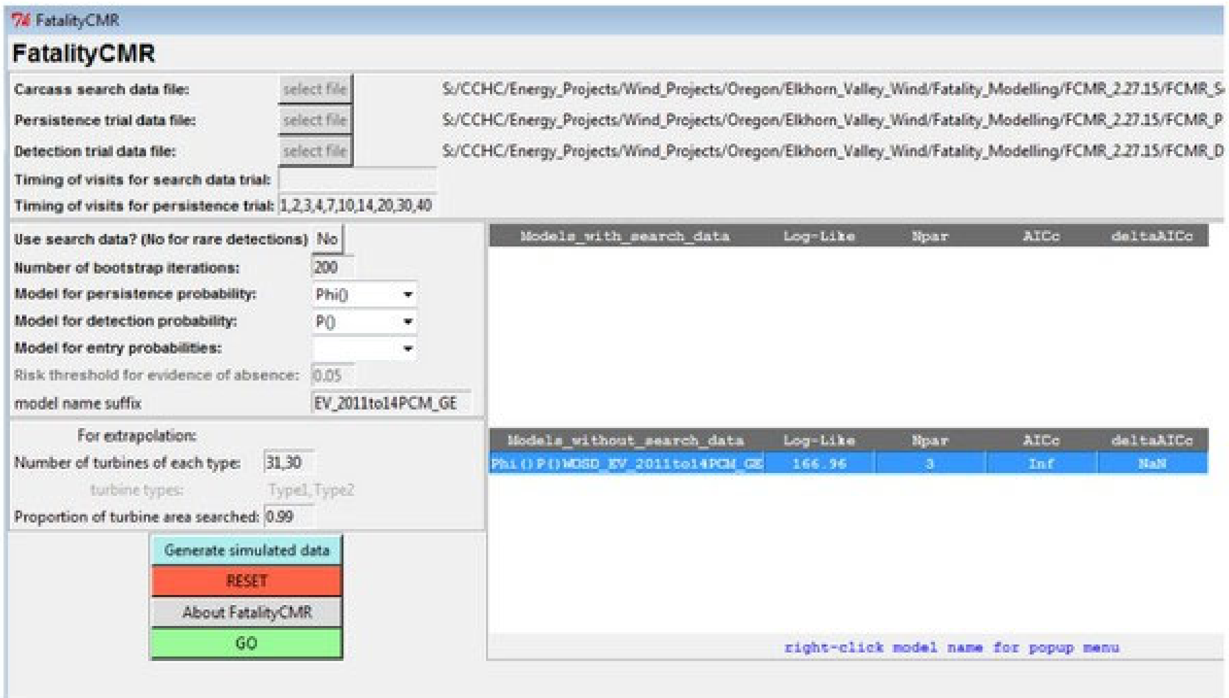
**PARAMATERS FOR NEW COLLISION PROBABILITY DISTRIBUTION**

```
$alpha
[1] 2.789798

$beta
[1] 461.7528
```

New alpha and beta parameters for collision probability prior.

**Step 7:** Determine the mean annual fatality estimate at Elkhorn Valley using 2011-2014 PCM (done at 61 of 61 turbines).




Note: Persistence data was from 2010 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**-----------------------------------------------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**-----------------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| **Type1** | **4.7582** | **4.7814** | **0.7310** | **0.7552** |
| **Type2** | **3.6046** | **3.6231** | **0.5848** | **0.6042** |
| **sum** | **8.3628** | **8.4046** | **0.9361** | **0.9671** |

Fatality Estimate for time period monitored between 2011 and 2014. This time period is approx. 1301 days, or ~3.5 years.

**8.3628 / 3.5 = 2.3894 (annual estimate)**

**Step 8:** Run the annual Bayesian fatality prediction model for Elkhorn Valley (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual estimate derived in Step 7 to update the collision probability prior described in Step 6.

CODE:

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-sum(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(70),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084))
Dead<-c(2.3894)
AddTot<-TRUE
```

Derived in Step 7

```
setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-with(ExpSvy,nCnt*CntHr*CntKM3)
ExpFac<-c(DayLtHr*HazKM3)
tmp<-with(ExpSvy,mapply(simFatal,BMin=EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=7.228362,bPriCPr=1486.023,SIMPLIFY=FALSE))
```

Derived in Step 6

```
Fatalities<-rvnorm(nSvy)
Exp<-data.frame(Mean=rep(NA,nSvy),SD=NA,row.names=cSvy)
for(i in 1:nSvy){
 # i<-1
 Fatalities[i]<-tmp[[i]]
 Exp[i,]<-attr(tmp[[i]],"Exp")
}
rm(tmp)
names(Fatalities)<-cSvy

nSvy<-length(Fatalities)
if(is.null(nSvy))nSvy<-1
```

```
FatalStats<-RVSmry(cSvy,Fatalities,probs=UCI)
if(AddTot){
  FatalStats<-rbind(
    FatalStats,
    RVSmry("Total",sum(Fatalities),probs=UCI)
  )
}

## Look at the results
print(ExpSvy)
print(Exp,digits=3)
print(FatalStats,digits=2)
nPlot<-nSvy+as.integer(AddTot)
nCol<-floor(sqrt(nPlot))
nRow<-ceiling(nPlot/nCol)
xlim<-range(rvrange(Fatalities))
if(!is.null(PlotFile))jpeg(PlotFile)
par(mfrow=c(nRow,nCol))
for(iPlot in 1:nSvy){
  # iPlot<-1
  plotFatal(Fatalities[iPlot],probs=UCI,
          # xlim=xlim,add=FALSE, # uncomment this line to put the graphs for all of the strata
          # on the same scale
          main=cSvy[iPlot])
}
if(AddTot)plotFatal(sum(Fatalities),main="Total")
if(!is.null(PlotFile))dev.off()
```

**RESULTS:**

```
> print(ExpSvy)
       EMin nCnt     CntKM3 DayLtHr....c.4464.084.
Annual   70  275 0.4021239                4464.084
> #Exposure rate
> print(Exp,digits=3)
       Mean    SD
Annual  1.9 0.225
> #Annual Collision Fatalities
> print(FatalStats,digits=2)
   Names Mean   SD CI50 CI80 CI90 CI95
1 Annual  2.6 0.89  2.5  3.3  3.8  4.2
2  Total  2.6 0.89  2.5  3.3  3.8  4.2
```

Mean Annual Golden Eagle Fatality prediction for the Elkhorn Valley Wind Project

Annual Golden Eagle Fatality prediction (at 80th quantile) for the Elkhorn Valley Wind Project

**<u>Step 9:</u>** Subtract the mean fatality prediction derived in Step 8, from the 80th quantile prediction derived in Step 9 (to calculate offsetting compensatory mitigation requirement, if permit is issued)

Fatality prediction for at the 80th quantile: **3.3 GOEAs per year**

**3.3 x 5 years = 16.5 GOEAs per 5 years (round up to 17 GOEAs)**

Fatality prediction at the mean: **2.6 GOEAs per year**

**2.6 x 5 years = 13 GOEAs per 5 years**

**17 GOEAs – 13 GOEAs = 4 GOEAs per 5 years**

If permit is issued, the applicant will be required to offset take of 4 GOEAs for a 5 year permit. The method used for this mitigation must be quantifiable (i.e. power pole retrofits)

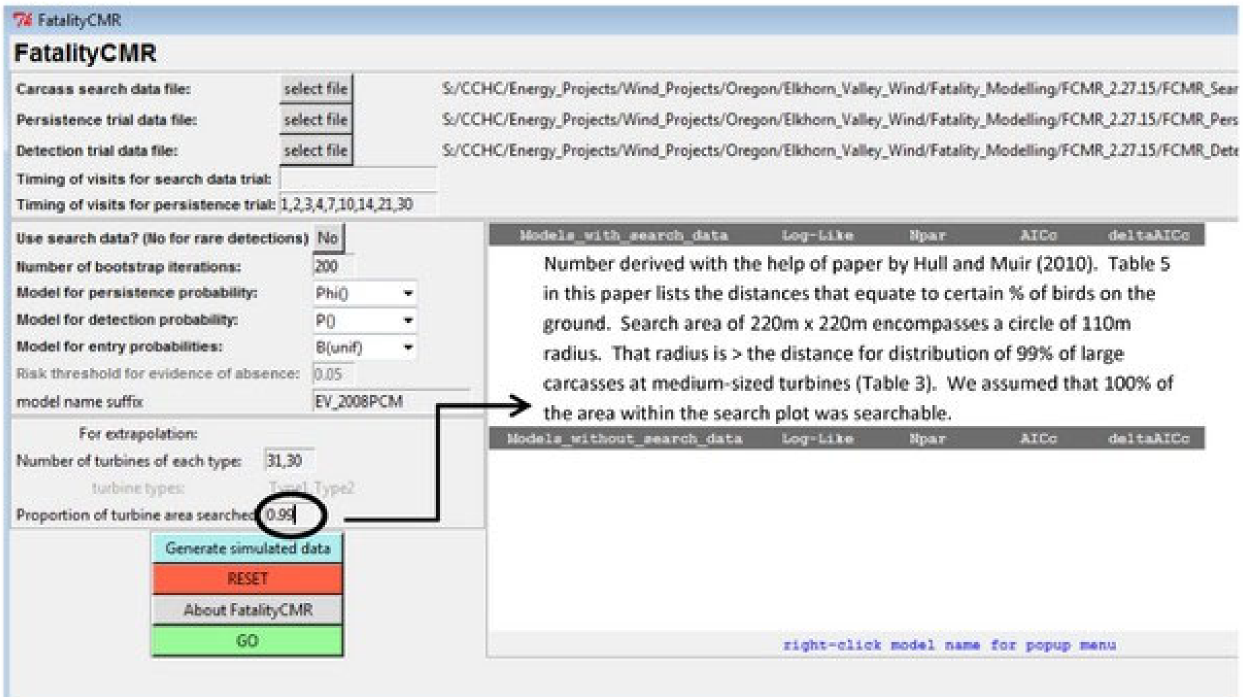
**DRAFT: Elkhorn Valley Wind Project – Bald Eagle Fatality Prediction (9/25/15)**

**Summary of Steps:**

1) Determine the mean annual fatality estimate at Elkhorn Valley using 2008 PCM (done at 61 of 61 turbines).
2) Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 1.
3) Extract parameters from the collision probability posterior calculated in Step 2 and use them to define the collision probability prior in Step 5.
4) Determine the mean annual fatality estimate at Elkhorn Valley using 2010 PCM (done at 31 of 61 existing turbines).
5) Run the annual Bayesian fatality prediction model for the entire project (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual fatality estimate derived in Step 4 to update the collision probability prior described in Step 3.
6) Extract parameters from the collision probability posterior calculated in Step 5, and use them to define the collision probability prior in Step 8.
7) Determine the mean annual fatality estimate at Elkhorn Valley using 2011-2014 PCM (don't at 61 of 61 existing turbines)
8) Run the annual Bayesian fatality prediction model for Elkhorn Valley (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual estimate derived in Step 7 to update the collision probability prior described in Step 6. THIS WILL BE THE FATALITY PREDICTION FOR THE PROJECT AND WHAT WILL BE ON THE PERMIT, if issued
9) Multiply annual fatality prediction by the # of years the permit is valid

**SEE DETAILED STEPS AND OUTPUTS FROM MODELLING BELOW**

**Step 1:** Determine the mean estimated fatalities at Elkhorn Valley using 2008 PCM (done at all 61 turbines)




Note: Persistence data was from 2008 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**---------------------------------------------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**---------------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| Type1 | 0.0173 | 0.0017 | 0.0116 | 0.0022 |
| Type2 | 0.0173 | 0.0017 | 0.0116 | 0.0022 |
| sum | 0.0346 | 0.0034 | 0.0164 | 0.0031 |

Fatality Estimate in 2008 based on 2008 PCM only.

**Step 2:** Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 1

**CODE:**

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-c(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(3),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084))
Dead<-c(0.0346)
AddTot<-TRUE
```

EMin=c(3) → Bald eagle minutes during same surveys that produced 70 GE Minutes

Dead<-c(0.0346) → Derived in Step 1

```
setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-c(ExpSvy$nCnt*CntHr*ExpSvy$CntKM3)
ExpFac<-c(ExpSvy$DayLtHr*HazKM3)
postBH1<-simFatal(BMin=ExpSvy$EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=2.31,bPriCPr=396.69)

postCPr<-attr(postBH1,"CPr")
postCPr
```

**COLLISON PROBABILIY POSTERIOR**

```
       Mean          SD
0.005455605 0.003538211
```

**Step 3:** Extract parameters from the collision probability posterior calculated in Step 2 and use them to define the collision probability prior in Step 5

**CODE:**

```
estBetaParams <- function(mu, var) {
  alpha <- ((1 - mu) / var - 1 / mu) * mu ^ 2
  beta <- alpha * (1 / mu - 1)
  return(params = list(alpha = alpha, beta = beta))
}

estBetaParams(0.005455605,0.003538211^2)
```

→ Derived in Step 2

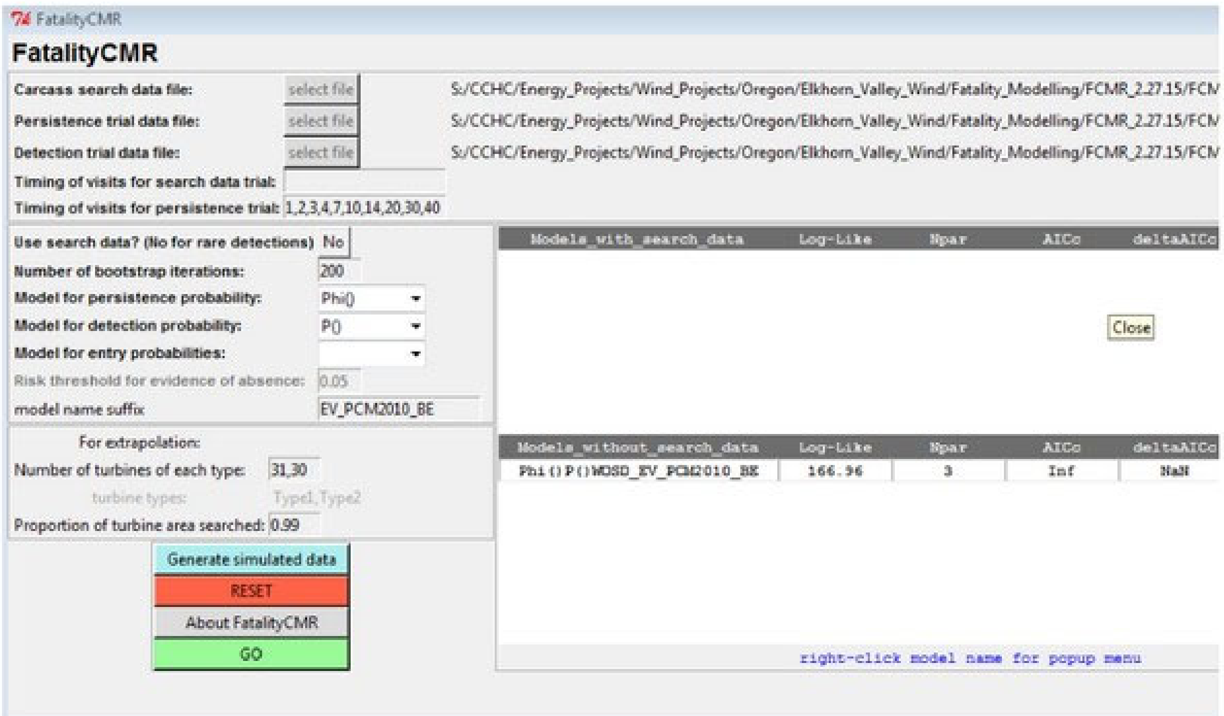
**PARAMATERS FOR NEW COLLISION PROBABILITY DISTRIBUTION**

```
$alpha
[1] 2.359062

$beta
[1] 430.0516
```

→ New alpha and beta parameters for collision probability prior.

**Step 4:** Determine the mean annual fatality estimate at Elkhorn Valley using 2010 PCM (done at 31 of 61 turbines).




Note: Persistence data was from 2010 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**-----------------------------------------------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**-----------------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| **Type1** | **0.2077** | **0.2113** | **0.1883** | **0.1892** |
| **Type2** | **0.2144** | **0.2181** | **0.1943** | **0.1953** |
| **sum** | **0.4222** | **0.4294** | **0.2706** | **0.2720** |

Fatality Estimate in 2010 based on 2010 PCM only.

**Step 5:** Perform conjugate update on the collision probability prior using the mean annual fatality estimate from Step 4

CODE:

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-c(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(3),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084)                    Derived in Step 4
Dead<-c(0.4222))
AddTot<-TRUE

setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-c(ExpSvy$nCnt*CntHr*ExpSvy$CntKM3)
ExpFac<-c(ExpSvy$DayLtHr*HazKM3)
postBH1<-simFatal(BMin=ExpSvy$EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=2.359062,bPriCPr=430.0516)
                                                  Derived in Step 3
postCPr<-attr(postBH1,"CPr")
postCPr
```

```
COLLISON PROBABILIY POSTERIOR
       Mean          SD
0.006005473 0.003580848
```

**Step 6:** Extract parameters from the collision probability posterior calculated in Step 5 and use them to define the collision probability prior in Step 7

**CODE:**

```
estBetaParams <- function(mu, var) {
  alpha <- ((1 - mu) / var - 1 / mu) * mu ^ 2
  beta <- alpha * (1 / mu - 1)
  return(params = list(alpha = alpha, beta = beta))
}

estBetaParams(0.006005473,0.003580848^2)
```

Derived in Step 5

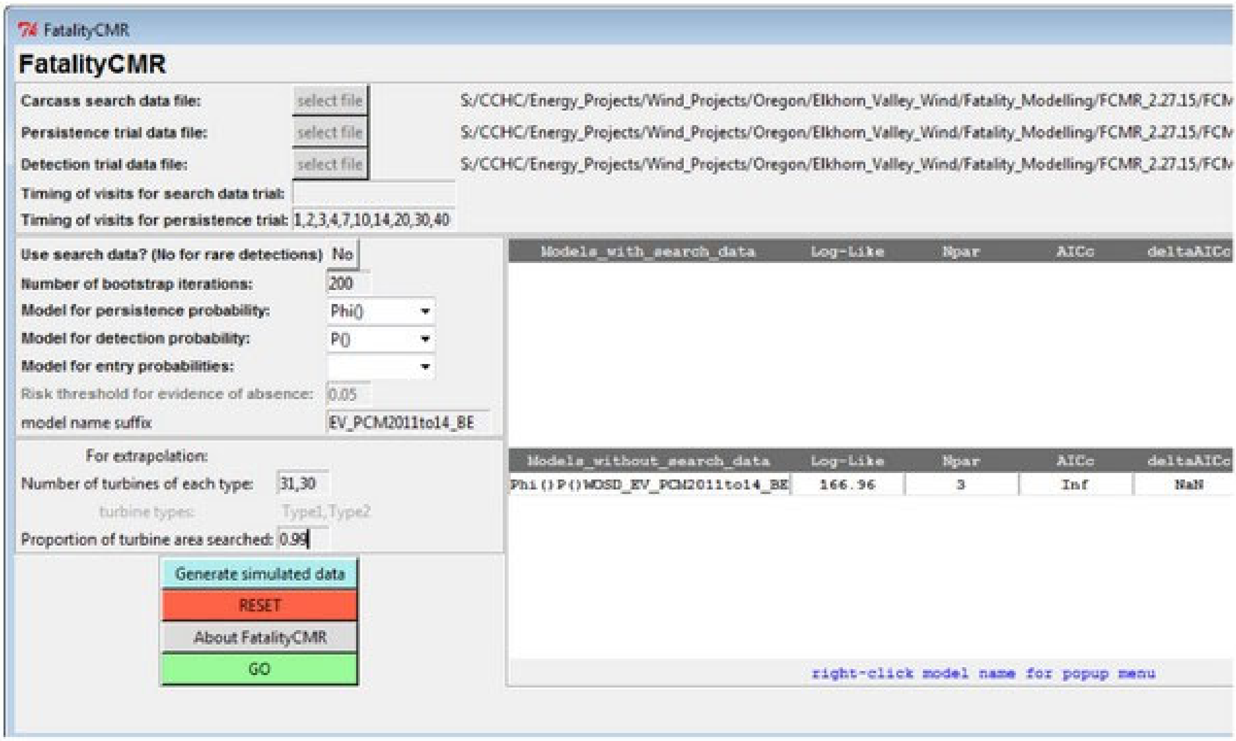
**PARAMATERS FOR NEW COLLISION PROBABILITY DISTRIBUTION**

```
$alpha
[1] 2.789798

$beta
[1] 461.7528
```

New alpha and beta parameters for collision probability prior.

**Step 7:** Determine the mean annual fatality estimate at Elkhorn Valley using 2011-2014 PCM (done at 61 of 61 turbines).




Note: Persistence data was from 2010 only; however detection data used was from 2008 and 2010 combined

**Extrapolations to whole wind farm ---------------------------------------**

**-----------------------------------------------------------------------**

**Ad-hoc estimate of the number of fatalities**

**-----------------------------------------------------------------------**

| | Uniform entry rate | Pulsed entry rate | SE(unif) | SE(pulse) |
|---|---|---|---|---|
| **Type1** | **0.1414** | **0.1464** | **0.1215** | **0.1252** |
| **Type2** | **0.1414** | **0.1464** | **0.1215** | **0.1252** |
| **sum** | **0.2827** | **0.2928** | **0.1719** | **0.1770** |

Fatality Estimate for time period monitored between 2011 and 2014. This time period is approx. 1301 days, or ~3.5 years.

**0.2827 / 3.5 = 0.0808 (annual estimate)**

**Step 8:** Run the annual Bayesian fatality prediction model for Elkhorn Valley (61 turbines), using all pre-construction data to update the exposure rate prior, and using the mean annual estimate derived in Step 7 to update the collision probability prior described in Step 6.

CODE:

```
UCI<-c(0.5,0.8,0.9,0.95)
nSim<-100000
nTurbine<-c(61)
HazRadKm<-c(41/1000)
HazKM3<-sum(nTurbine*0.2*pi*HazRadKm^2)
CntHr<-c(20/60)
ExpSvy<-data.frame(row.names=c("Annual"),
EMin=c(3),
nCnt=c(275),
CntKM3=c(0.2*pi*0.8^2),
DayLtHr<-c(4464.084))                  → Derived in Step 7
Dead<-c(0.0808)
AddTot<-TRUE

setnsims(nSim)
getnsims()
PlotFile<-NULL
nSvy<-nrow(ExpSvy)
cSvy<-(rownames(ExpSvy))
SmpHrKM3<-with(ExpSvy,nCnt*CntHr*CntKM3)
ExpFac<-c(DayLtHr*HazKM3)
tmp<-with(ExpSvy,mapply(simFatal,BMin=EMin,
Fatal = Dead,
SmpHrKm=SmpHrKM3,ExpFac=ExpFac,aPriExp=0.9684375,bPriExp=0.5519703,
aPriCPr=2.789798,bPriCPr=461.7528,SIMPLIFY=FALSE))
                                       → Derived in Step 6
Fatalities<-rvnorm(nSvy)
Exp<-data.frame(Mean=rep(NA,nSvy),SD=NA,row.names=cSvy)
for(i in 1:nSvy){
 # i<-1
 Fatalities[i]<-tmp[[i]]
 Exp[i,]<-attr(tmp[[i]],"Exp")
}
rm(tmp)
names(Fatalities)<-cSvy

nSvy<-length(Fatalities)
if(is.null(nSvy))nSvy<-1
```

```
FatalStats<-RVSmry(cSvy,Fatalities,probs=UCI)
if(AddTot){
  FatalStats<-rbind(
    FatalStats,
    RVSmry("Total",sum(Fatalities),probs=UCI)
  )
}
```

```
## Look at the results
print(ExpSvy)
print(Exp,digits=3)
print(FatalStats,digits=2)
nPlot<-nSvy+as.integer(AddTot)
nCol<-floor(sqrt(nPlot))
nRow<-ceiling(nPlot/nCol)
xlim<-range(rvrange(Fatalities))
if(!is.null(PlotFile))jpeg(PlotFile)
par(mfrow=c(nRow,nCol))
for(iPlot in 1:nSvy){
  # iPlot<-1
  plotFatal(Fatalities[iPlot],probs=UCI,
          #  xlim=xlim,add=FALSE,  # uncomment this line to put the graphs for all of the strata
          # on the same scale
          main=cSvy[iPlot])
}
if(AddTot)plotFatal(sum(Fatalities),main="Total")
if(!is.null(PlotFile))dev.off()
```

**RESULTS:**

```
> print(ExpSvy)
       EMin nCnt    CntKM3 DayLtHr....c.4464.084.
Annual    3  275 0.4021239               4464.084
> #Exposure rate
> print(Exp,digits=3)
        Mean     SD
Annual 0.106 0.0532
> #Annual Collision Fatalities
> print(FatalStats,digits=2)
   Names Mean   SD CI50 CI80 CI90 CI95
1 Annual 0.18 0.15 0.14 0.26 0.36 0.46
2  Total 0.18 0.15 0.14 0.26 0.36 0.46
```

Mean Annual Golden Eagle Fatality prediction for the Elkhorn Valley Wind Project

Annual Golden Eagle Fatality prediction (at 80th quantile) for the Elkhorn Valley Wind Project

**Step 9:** Multiply annual fatality prediction by the # of years the permit is valid

Fatality prediction for at the 80$^{th}$ quantile: **0.26 BAEAs per year**

**0.26 x 5 years = 1.3 BAEAs per 5 years (round up to 2 BAEAs)**

**Exhibit E: WEST Layout Recommendations – 8/19/2003**

**From:** Young, Andrew
**Sent:** Tuesday, August 19, 2003 9:19 AM
**To:** Foote, Hilary
**Subject:** FW: turbine ranks - problem locations on old layout sent to Wally
**Attachments:** Turbine ranks.doc

Andrew Young
Zilkha Renewable Energy
210 SW Morrison St., # 310
Portland, OR 97204
Tel. 503.222.9400 x 102
Fax. 503.222.9404
mob. 541.490.8495

-----Original Message-----
From: Wallace Erickson [mailto:werickson@west-inc.com]
Sent: Tuesday, August 19, 2003 8:42 AM
To: Chris Taylor; Philip Stenstrom; Andrew Young
Subject: turbine ranks

Attached is my first cut list of turbine strings that may pose a higher impact risk with birds in general at the Powder River Project. This is subject to change. I will have Jay Jeffrey review it as well. I am sending him the latest layout today.

Wally Erickson
WEST Inc.
2003 Central Ave.
Cheyenne, WY 82001
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fax: 307.637.6981
cell: 307.630.7830
email: werickson@west-inc.com

List of Riskiest Turbines
Powder River Project
August 19, 2003
draft and confidential, not for general distribution

The following is a draft list of turbines/strings that I believe may be associated with higher mortality. List is subject to change based on additional data collection (e.g. nest survey results). List is based on professional judgment using site specific data collection, and patterns of use and mortality observed at other wind projects.

| Turbines | Reason |
|---|---|
| String between A and D that was already deleted | proximity to historic golden eagle nest (possibly active this past year as well), burrowing owls to east and south of string |
| String H | proximity to Thief Valley Reservoir, perpendicular to flight patterns of waterfowl off of the reservoir |
| String E1 – E3 | Area likely used by raptors for updrafts, upwind side of ridge |
| G15 and possibly G14 | golden eagle use, point may be used for perched golden eagles (similar to FCR), proximity to forested area (higher bird use in general for passerines). |
| O7 | proximity to forested habitat, prominant point |
| J1, K1, L1, M1 and M2, N1, O1 | end row turbines near edge of ridge |
| | |