STUDY PLAN

Avian Impact Monitoring Plan for the Schumann Wind Energy Facility Umatilla County, Oregon

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INTRODUCTION AND BACKGROUND

Schumann Wind Energy Facility (Project or Facility) is an 8 megawatt (MW) wind energy conversion facility. The Project consists of up to five General Electric wind turbine generators (either 1.70 or 2.3 MW each) mounted on 80 meter (m; 262 foot [ft]) steel towers, and an interconnection transmission line (Figure 1). The Project transmission line will interconnect with the existing transmission line for the nearby Chopin Wind Energy Facility to carry power to the Weston substation.

The Project site consists of approximately 743 acres of privately owned land with one landowner. Specifically, the proposed Project would be located west of Highway 11 and Pine Creek in Umatilla County, Oregon. The site has generally rolling topography, with current land uses consisting primarily of dry agriculture and limited livestock grazing (Figure 2).

Schumann Wind, LLC (Schumann Wind) contracted Western EcoSystems Technology, Inc. (WEST, see key personnel resumes in Appendix A) to prepare an Avian Impact Monitoring Plan ("Plan") for the Facility. Post-construction monitoring is necessary to meet requirements set forth in Chapter 5 of section HHH - Commercial Wind Power Generation Facility of the Umatilla County Development Code and this Plan will be included as part of the Facility's application for a Conditional Use Permit (CUP) from Umatilla County.

Fish have not been included in this Plan, as no streams or wetlands lie within the Project's impact area and no impacts on fish are expected. Furthermore, the Project lies entirely within cultivated agricultural areas, surrounded by degraded and fragmented grasslands. Due to both the poor habitat quality and small Project size, non-avian wildlife impacts are not anticipated for the Project. While a specific wildlife component has not been included in this Plan, the Project's direct impacts on bats will be documented during the avian impact monitoring study. However, prior to Project development, WEST will conduct raptor nest and sensitive species surveys to assess, and, if applicable, inform possible avoidance and minimization measures to be implemented during Project construction and operation.

AVIAN IMPACT MONITORING PLAN

Introduction

This Avian Impact Monitoring Plan is developed to comply with the requirements of Section 152.616 (HHH)(5)(G) of the Umatilla County Development Code. The protocols are based on currently accepted fatality monitoring practices, follow the guidance provided in the USFWS Wind Energy Guidelines (USFWS 2012), and will be similar to other regional project protocols that went through Oregon's Energy Facility Siting Council's permitting process. This approach also facilitates comparison to regional fatality estimates, and incorporates feedback received from an advisory committee for the nearby Chopin Wind Energy Facility.

Monitoring objectives will include developing bird and bat fatality rates associated with operation of the Facility and evaluating potential effects on nesting raptors. The primary components of the Plan include:

- Fatality Monitoring Program
    - Standardized Carcass Searches
    - Searcher Efficiency Trials
    - Carcass Removal Trials
    - Wildlife Incident Response and Handling System
- Raptor Nest Surveys

Fatality Monitoring Program

The primary objective of the fatality studies is to estimate the number of avian and bat fatalities attributable to collisions for the entire Project (i.e., wind turbines and any permanent meteorological (met) tower) on an annual basis. The fatality and injured wildlife monitoring phase of the study will begin once all the turbines are constructed and operational. Injured birds and bats found during the monitoring study will also be factored into the annual estimate. The study will be conducted for one year, with a less intensive monitoring program (incidental monitoring) in place for the life of the Project. The methods are broken into four primary components: 1) standardized carcass searches, 2) searcher efficiency trials, 4) carcass removal trials, and 4) an incidental casualty and injured bird reporting system.

The following dates will be used for defining seasons in the study:

Spring Migration	March 16 – May 15
Summer/Breeding	May 16 – August 15
Fall Migration	August 16 – October 31
Winter	November 1 – March 15

Standardized Carcass Searches

The number of avian and bat fatalities attributable to wind turbine or met tower collisions will be estimated based on the number of avian and bat fatalities found in the casualty search plots whose death appears related to collision with these structures. All carcasses located within areas surveyed, regardless of species, will be recorded and a cause of death determined, if possible, based on inspection of the carcass. Some carcasses may be necropsied to aid in determining cause of death. Total number of avian and bat carcasses will be estimated by adjusting for "removal bias" (scavenging), search frequency, and searcher detection bias.

Traditional Survey Methods

Personnel trained in proper search techniques will conduct the carcass searches. All five (or four, if 2.3 MW turbines are selected) Project turbines will be included in the standardized searches. Square plots ~270 m (885 ft; or double turbine tip height) on a side and centered on the turbine will be searched by walking parallel transects (Figure 3). Studies at many wind facilities (Erickson et al. 2000, Johnson et al. 2000, Higgins et al. 1996, Young et al. 2006) indicate nearly all fatalities are found in this area, with a large majority of carcasses found within 40 m (131 ft) of the turbine. Transects will be set approximately 10 m (33 ft) apart in the area to be searched under most conditions. If planted crops become tall enough to impact detection ability, transect widths will be reduced accordingly. A searcher will walk at a rate of approximately 45-60 m per minute (~2 miles per hour) along each transect searching both sides

out to 5 m (16 ft) for casualties. Search area and speed may be adjusted by habitat type after evaluation of the first searcher efficiency trial. It should take approximately 120 minutes to search each turbine plot depending on the visibility and transect width. For example, plots in planted wheat fields will take longer to search than fields that are fallow or plowed.

The condition of each carcass found will be recorded using the following condition categories:

- Intact – a carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.

- Scavenged – an entire carcass, which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, legs, pieces of skin, etc.).

- Feather Spot - 10 or more feathers or 2 or more primaries at one location indicating predation or scavenging.

Appendix B contains examples of various field and laboratory forms for the carcass searches and fatalities discovered. All carcasses found will be labeled with a unique number, bagged and frozen for future reference and possible necropsy. A copy of the data sheet for each carcass will be maintained, bagged and frozen with the carcass at all times. For all casualties found, data recorded will include species, sex and age when possible, date and time collected, GPS location, condition (e.g., intact, scavenged, feather spot), and any comments that may indicate cause of death. All casualties located will be photographed as found and mapped on a detailed map of the study area showing the location of the wind turbines and associated facilities such as overhead power lines and met towers.

Road and Pad Survey Methods

It is recognized that for turbines placed in cropland, searching during summer growing periods when crops are high may not be prudent due to the very low probability of finding carcasses. Currently, the farmland within search plots is expected to be fallow during the monitoring year. However, active agricultural practices may be encountered. If so, it is recommended that only roads and pads be searched during these time periods, as WEST has done on other projects. At the Project, winter wheat (*Triticum aestivum*) is the primary crop; if planted, wheat is expected to be too dense and tall for traditional survey methods to be effective from June 1 to August 1. For consistency, all summer searches at all Project turbines will be road and pad searches if the search plots are actively farmed during the monitoring year.

Casualties or fatalities found outside the formal search area by carcass search technicians but within 150 m (492 ft) of a wind turbine, meteorological tower, substation, or Project overhead powerline will be treated following the above protocol as closely as possible. Casualties or fatalities found by maintenance personnel and others not conducting the formal searches within 150 m of a wind turbine, meteorological tower, substation or project overhead powerline will be documented using a wildlife incident reporting system (see below). Any carcass found within the standardized carcass search areas (i.e., within 135 m [443 ft] of turbines that are to be searched), but not during a scheduled search, will be collected or marked when first documented to avoid double counting. When non-study personnel discover carcasses or injured animals, a digital photograph will be taken, the Project Wildlife Coordinator will be notified and

will identify the casualty, or a Project biologist will be contacted to identify the casualty. Personnel potentially involved in searches will receive training prior to working in the Project. Casualties or fatalities found in non-search areas will be treated as incidental discoveries.

Any injured native birds found will be carefully captured by a trained Project biologist and transported to Blue Mountain Wildlife Rehabilitation Center or a nearby veterinary clinic in a timely fashion, after notifying appropriate agency personnel. The example protocol for handling injured birds provided in Appendix C will be used for this project. With WEST's assistance, Schumann Wind, LLC will obtain the appropriate collection permits from ODFW and USFWS, including a Special Purpose Utility Permit (SPUT). Collection of state or federal endangered, threatened, or protected species will be coordinated with the USFWS and ODFW through these permits.

Schedule

Carcass searches will be conducted at the sampled turbines and all permanent met towers once every month. Surveys will be conducted for one year which will begin when Project operation commences. If formed, a Technical Oversight Committee (see below) will convene at the end of the study to discuss monitoring results and the need for additional study.

The first search will be conducted approximately one month after the date all turbines become operational (commercially producing electricity). A hypothetical schedule for a search plot is illustrated below assuming all turbines become operational in September 2018 (Table 1). An extra fall search has been included in the Schumann schedule based on TOC feedback for the nearby Chopin Wind Energy Facility. This additional search will decrease the search interval during the fall season, when the agencies and Blue Mountain Audubon have the most concern regarding potential Project impacts on wildlife.

Table 1. Search schedule assuming turbines become operational in September 2018.

Date	Search #
10/15/2018	1
11/1/2018	2
12/1/2018	3
1/1/2019	4
2/1/2019	5
3/1/2019	6
4/1/2019	7
5/1/2019	8
6/1/2019	9
7/1/2019	10
8/1/2019	11
9/1/2019	12
10/1/2019	13

Searcher Efficiency Trials

Searcher efficiency studies will be conducted in the same areas carcass searches occur. Trials will be conducted by season within the major habitat type (cultivated agriculture). Searcher efficiency will be estimated by size of carcass, plot type (road and pad or full plot, and season.

Estimates of searcher efficiency will be used to adjust the number of carcasses found, correcting for detection bias.

Searcher efficiency trials will begin when turbines are placed into operation. Personnel conducting the searches will not know when trials are conducted or the location of the detection carcasses. During each season, approximately eight carcasses of birds of two different size classes[1] will be placed in the search area during each of the four seasons, for a total of approximately 64 searcher efficiency trial carcasses for the entire year. A minimum of two dates will be used each season for a minimum total of eight trial dates. An attempt will be made to use several small brown birds (house sparrows) during the summer and fall seasons to simulate bat carcasses if bat carcasses are not available. Legally obtained bat carcasses will be used if available.

All carcasses will be placed at random locations within areas being searched prior to the carcass search on the same day. If avian scavengers appear attracted by placement of carcasses, the carcasses will be distributed before dawn. Carcasses will be placed in a variety of postures to simulate a range of conditions.

Each trial carcass will be discreetly marked so that it can be identified as a study carcass after it is found. The number and location of the detection carcasses found during the carcass search will be recorded. The number of carcasses available for detection during each trial will be determined immediately after the trial by the person responsible for distributing the carcasses.

Carcass Removal Trials

The objective of carcass removal trials will be to determine the average length of time a carcass remains in the search plot and is available for detection by searchers, and the trial results will be used to adjust bird and bat fatality estimates for removal bias resulting from scavengers or agricultural activities. Carcass removal trials will be conducted throughout the year to incorporate seasonal variability in weather, vegetation, and scavenger densities. During each season within the major habitat type (cultivated agriculture), approximately eight carcasses of birds of two different size classes will be placed in the search during each of the four seasons, for a total of approximately 64 removal trial carcasses for the entire year. Trials will not be conducted at search turbines to minimize the potential for confusing a trial bird with a turbine casualty.

Two size classes of trial carcasses (small and large) will be randomly placed in an area that is similar in size to the carcass search plots. Carcasses generally include the same species used for the searcher efficiency trials, but will include large raptors if available. Field technicians will monitor the trial carcasses over a 40-day trial period, checking them every day for the first four days and then on days seven, 10, 14, 20, 30, and 40. Removal trial carcasses will be discreetly marked with electrical tape to distinguish from non-trial carcasses. The day on which the carcass is no longer present will be recorded, and any carcasses or evidence (e.g., feathers) remaining at day 40 will be removed.

[1] Carcass that will be used for searcher efficiency trials will consist of non-native or commercially available species: house sparrows, rock doves, and hen mallards or hen pheasants.

Wildlife Incident Response and Handling System

The Wildlife Incident Response and Handling System (WIRHS) is a monitoring program for reporting and handling avian and bat casualties or injured wildlife found incidentally by construction, operations, and maintenance personnel. Project personnel commonly on site will be trained in the methods. This monitoring program includes reporting of carcasses discovered incidental to construction, operation, and maintenance activities. This system will be in place for the life of the Project.

Any carcasses discovered by maintenance personnel will be recorded, photographed, and reported to the designated Project Wildlife Coordinator. The Wildlife Coordinator will be a Project point of contact responsible for identifying the fatality or contacting a Project biologist to have the fatality identified. The fatality will be collected or marked unless it is a protected species or unless given other direction from ODFW or USFWS. If injured birds are discovered by maintenance personnel, the procedure in Appendix C will be followed.

Analysis

Quality assurance and quality control (QA/QC) measures will be implemented at all stages of the study, including field studies, data entry, data analysis, and report writing. All field data sheets will be inspected for completeness, accuracy, and legibility. A sample of records from the electronic database will be compared to the raw data forms and any errors detected will be corrected. Irregular codes or data suspected as questionable will be discussed with the observer and/or project manager. Errors, omissions, or problems will be traced back to the raw data forms and rectified. All data sheets and electronic data files will be retained for reference.

Annual fatality estimates will be calculated for all birds, all bats, small birds, large birds, raptors, nocturnal avian migrants, raptor species of special concern, target grassland birds, and state sensitive avian species. Fatality estimates will be based upon the number of carcasses found during standardized searches as adjusted for searcher efficiency bias (proportion of trial carcasses not found by searchers), carcass removal bias (probability that a carcass remained in the study plot and was available for detection by the searchers over the 40-day trial period), and the density-weighted proportion of area searched (in the case of road and pad surveys). The following define the statistical methods utilized to develop adjusted annual fatality estimates. Several fatality estimation models exist (e.g. Shoenfeld, 2004, Huso 2010, etc.); the Huso estimator will be used to estimate fatalities for this study, unless a more appropriate estimator is available at the time of analysis.

Definition of Variables

The following variables are used in the equations below for the Huso estimator (Huso 2010; Huso USGS Guide, 2012):

c_i total number of carcasses in category *i* (e.g., combinations of size, visibility, season, search interval, etc.)

n number of turbines sampled at the Project

k number of carcass categories

$\hat{a}_i$ density-weighted area correction for category *i*

I_i time interval between the previous search and discovery for category *i*

$\hat{\hat{I}}_i$ effective search interval for carcasses in category *i*

$\hat{r}_i$ average probability of persistence for carcass in category *i*

$\hat{p}_i$ probability of detection for carcass in category *i*

$\hat{\pi}$ the estimated probability that a carcass is both available to be found during a search and is found, as determined by the removal trials and the searcher efficiency trials

$\widehat{F}_i$ per turbine mortality for category *i*

$\widehat{m}$ total per turbine mortality

Estimation of Carcass Persistence Rates

Estimates of carcass persistence rates are used to adjust carcass counts for removal bias. Carcass persistence is modeled as a function of carcass size, and possibly other variables including plot type, season, ground visibility, and the interactions between these variables. The average probability of persistence of a carcass $\widehat{r}_i$, is estimated from an interval censored survival regression model. Exponential, log-logistic, lognormal, and Weibull distributions are fit and the best model is selected using an information theoretic approach known as AICc, or corrected Akaike Information Criteria (Burnham et al. 2002).

Estimation of Searcher Efficiency Rates

Searcher efficiency rates, $\hat{p}_i$, are estimated for each size class using a logistic regression model. Additional covariates for this logistic regression model may include plot type, season, ground visibility, and the interactions between these variables. The logistic regression models the natural logarithm of the odds of finding an available carcass as a function of the above covariates. The model assumes that searchers have a single opportunity to discover a carcass. The best model is selected using AICc.

Density-weighted Area Correction

The size of each search plot is selected to encompass the area underneath each turbine where fatalities are most likely to fall; however, it is not always possible to search an entire plot due to ground cover (e.g., tall crops) and terrain. The carcass density-weighted proportion (DWP) of area searched will be modeled to account for unsearched area; separate estimates will be calculated for birds and bats. Searched area is weighted as a function of distance from the turbine, because the areas near the turbine tend to have a higher density of carcasses than areas farther from the turbine (Huso et al. 2014). The result is an estimate of the proportion of fatalities expected to land within searched areas around a turbine. If there are enough carcasses of a given type, a maximum likelihood estimation (MLE) modeling approach will be used. If carcass counts are too low to fit a MLE approach, a physics-based model which predicts the maximum fall distance for a given turbine height and rotor diameter will be used (Hull & Muir 2013). Area corrections based on the Hull & Muir model assume a linear decrease in density of carcasses from the turbine base out to the maximum predicted fall distance.

Modeling methods: Maximum Likelihood Estimates

Model parameters for six distributions are fit, via MLE, to carcass distance data. Fitted distributions include normal, gamma, Weibull, loglogistic, Gompertz, and Rayleigh. The candidate distributions can take a variety of shapes which may describe fatalities falling from a turbine. Models will be compared via AICc with the relative best-fit model being that with the lowest AICc (or within two AICc points of the lowest AICc score). Models are fit to the carcass distance data, taking into account the proportion of area searched in the 1-m wide annulus in which the carcass was found, as well as the probability that the carcass was found and available. These factors will be incorporated into the model by use of a weighted MLE/weighted distribution method. Once a model is selected, the density-weighted proportion (DWP) of area searched is calculated. To calculate the DWP, the proportion of area searched in each 1-m annulus from the base of the turbine out to the maximum plot radius is weighted by the selected model and summed from the minimum to the maximum distance searched underneath turbines.

Modeling methods: Hull & Muir Method

A physics-based model was developed in Hull and Muir (2010) to predict the maximum fall distance of animal carcasses around turbines. The model uses turbine hub height, rotor diameter, and size of the carcass (e.g. small, large bird, bat) to determine the maximum theoretical fall distance relative to the turbine base. A linear density is assumed from the turbine base out to the maximum fall distance. The DWP of area searched is estimated based on the linear density and the proportion of area searched in each 1-m annulus from the turbine base out to the maximum fall distance.

Carcasses Excluded from Fatality Estimation

One of the underlying assumptions of the Huso model is that searchers have a single opportunity to discover a carcass (Huso et. al. 2016). In practice, particularly when carcass persistence times are long, carcasses may be discovered that have been available for more than one search. In order to meet the assumptions of the Huso model, the estimated time since death is determined for each carcass, in the field. A carcass is excluded from fatality estimation if the estimated time since death is longer than the search interval associated with that carcass; in other words, a carcass with estimated time since death longer than the search interval is assumed to have been available for more than one search. Carcasses excluded from fatality estimation are also excluded from the calculation of a density-weighted area correction. However, all carcasses found during the study will be reported.

Adjusted Facility-Related Fatality Rates

The estimated probability that a carcass in category *i* was available and detected is:

$$\hat{\pi}_i = \hat{a}_i \cdot \hat{p}_i \cdot \hat{r}_i \cdot \hat{v}_i$$

where $\hat{v}_i$ = min(1, $\hat{\hat{I}}_i / I_i$). The model assumes that searchers have a single opportunity to find each carcass, even though some carcasses may persist through multiple searches before being detected. Therefore, a carcass is included in adjusted fatality estimates if it has been available since the last search, and no longer. The probable time since death, recorded in the field, is used to evaluate each carcass for inclusion in the final fatality estimates.

The total number of fatalities ($\hat{f}_i$) in category *i*, based on the number of carcasses found in category *i* is given by

$$\hat{f}_i = \frac{c_i}{\hat{\pi}_i}$$

The total per turbine fatality rate *($\hat{m}$)* is estimated by

$$\hat{m} = \frac{\sum_{i=1}^{k} \hat{m}_i}{n}$$

The standard errors and 90% confidence intervals will be calculated using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances, and confidence intervals for complicated test statistics. A total of 1,000 bootstrap samples will be used. The standard deviation of the bootstrap estimates will be the estimated standard error. The lower 5th and upper 95th percentiles of the 1,000 bootstrap estimates will be estimates of the lower limit and upper limit of 90% confidence intervals.

Raptor Nest Survey

The primary objectives of raptor nest surveys are: 1) to estimate the size of the local breeding populations of tree-nesting raptor species within two miles (3.2 kilometers) of the turbine locations, and 2) to collect data to assist in determination of potential operational effects on the nesting activity or nesting success in the local populations of target raptor species: Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), and great-horned owl (*Bubo virginianus*) and other tree nesting raptor species (e.g., ferruginous hawks [*Buteo regalis*]) that may be found in the area. No golden eagle (*Aquila chrysaetos*) nests are known to occur within 10 miles of the Project (see Enk et al. 2011, Enk 2011).

Following construction, ground-based raptor nest surveys will be conducted to gather nest success statistics on active nests, nests with young, and number of young fledged. Schumann Wind will share the data with state and federal biologists. Raptor nests will be monitored for one year prior to construction in 2017. Post-construction nest monitoring will also involve intensive ground surveys in April, May, and June in the first breeding season following construction of the Project. Nests documented during previous survey efforts that occur within two miles of the current layout will be checked for occupancy (Figure 4). Searches for new nest locations will also occur. All nests will be given identification numbers, and nest locations will be recorded on topographic maps. Global positioning system (GPS) coordinates will be recorded for any new nests not previously recorded. Locations of inactive nests will be recorded as they may become occupied during future years. Nest occupancy will be determined. For occupied nests of the target raptor species (listed above) within two miles of the Project, nesting success will be determined by a minimum of one ground visit (if land access is granted) to verify species, number of young, and nesting success. A successful nest means that the young have successfully fledged (flown from the nest).

TECHNICAL OVERSIGHT COMMITTEE

A Technical Oversight Committee (TOC) may be required as part of the CUP issued by Umatilla County, should one be granted. If formed, the TOC will serve as a recommending body for the Project. The TOC's role will be to review protocols and make recommendations to the Umatilla County Planning Commission based on the data collected during the course of the monitoring study. An introductory meeting to present this Project Plan to TOC members will occur prior to surveys taking place. Input received during this meeting may result in modifications to the Plan. TOC membership will be dictated by the CUP, but may include:

- a primary landowner/lessee;
- a facility owner/operator representative (chair);
- a representative from Oregon Department of Fish and Wildlife;
- one Umatilla County residents with no direct economic interest in the Project (appointed by the Umatilla County Board of Commissioners);
- a member of the Blue Mountain Audubon Society or a second Umatilla County resident;
- a representative from US Fish and Wildlife Service; and
- a member of the Umatilla County Planning Commission.

Following completion of the monitoring effort, the TOC will reconvene to discuss the results. All carcasses found during the study and estimated fatality rates will be evaluated. Of particular interest will be any fatalities or injuries to species of concern (e.g., golden eagle, ferruginous hawk). In such cases, the circumstances around each event, to the extent that they are known, will be provided by WEST for consideration. Additional monitoring may be recommended by the TOC, if appropriate.

REPORTING

This monitoring program will provide data for evaluating the impacts of the Project on birds and bats through fatality estimates. In addition, information on the occupancy and breeding success of raptors (those identified during 2010 helicopter surveys and other identified nests) within the vicinity of the turbines will be gathered. WEST will provide monthly updates on survey activities and fatalities via email, and WEST will notify Schumann Wind within 24 hours if any state- or federally-listed wildlife species or an eagle is found during searches. Schumann Wind will notify (email and phone) the USFWS within 24 hours if any federally-listed species or eagles are discovered. All data collection and reporting requirements identified in the Project's SPUT permit will be met, including quarterly and annual reports describing search effort and carcasses discovered and/or collected.

An annual report will be prepared at the end of the first year of monitoring and will be discussed with the TOC (if applicable) to review and provide recommendations. The final report will include all methods, analyses, trials results, fatality estimates, and comparisons to other studies in North America. In the final reporting process, data will be used to determine if fatality rates at the Project are lower, higher, or similar to rates reported at other wind energy facilities within the region and in the U.S., and to assess overall impacts of the Project on birds and bats. WEST

will evaluate and describe any spatial or temporal trends observed in the fatality data, and will assess any potential relationships with land cover and vegetation communities, topography, and weather patterns.

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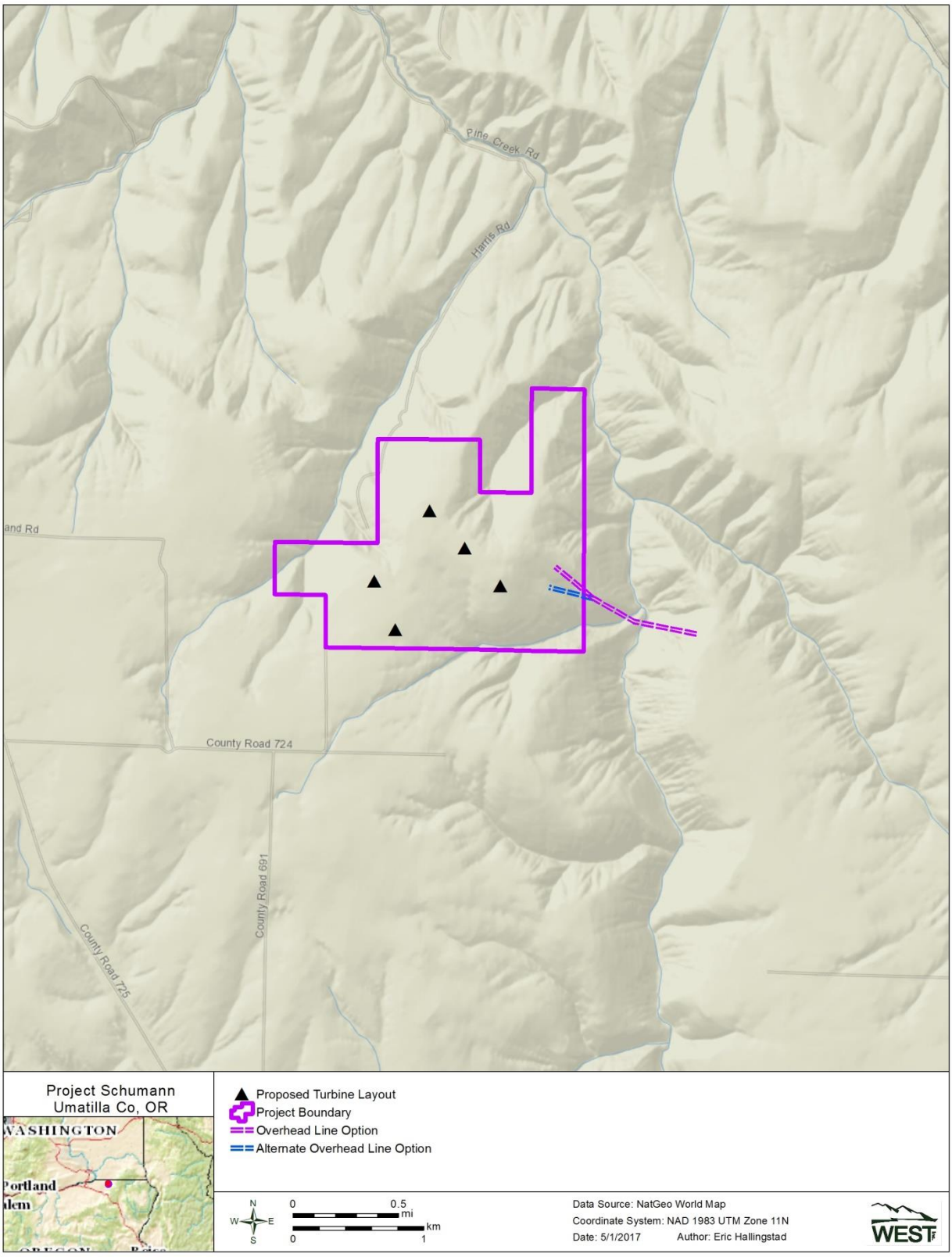

Figure 1. Overview of the Schumann Wind Energy Facility.

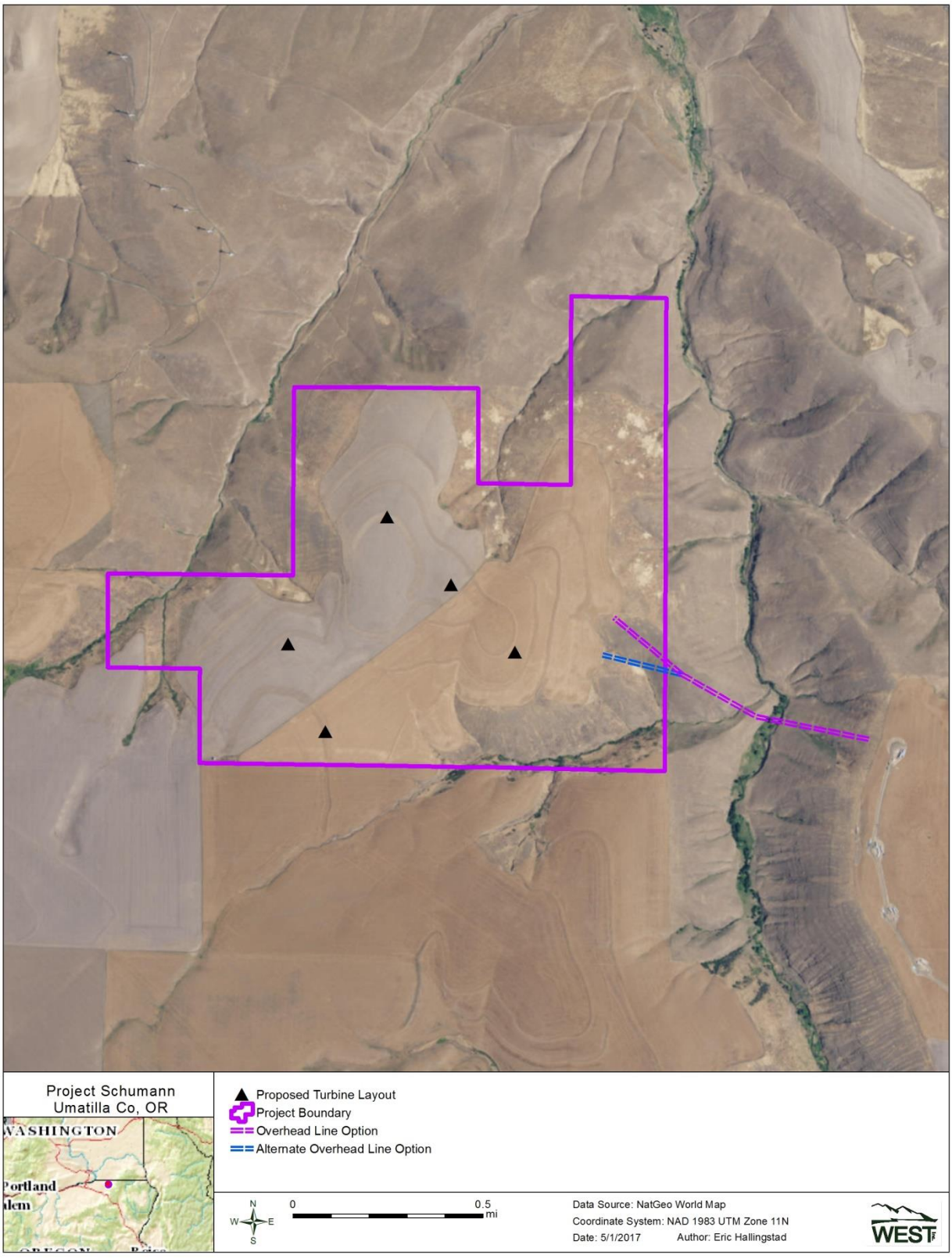

Figure 2. Aerial image of the Schumann Wind Energy Facility.

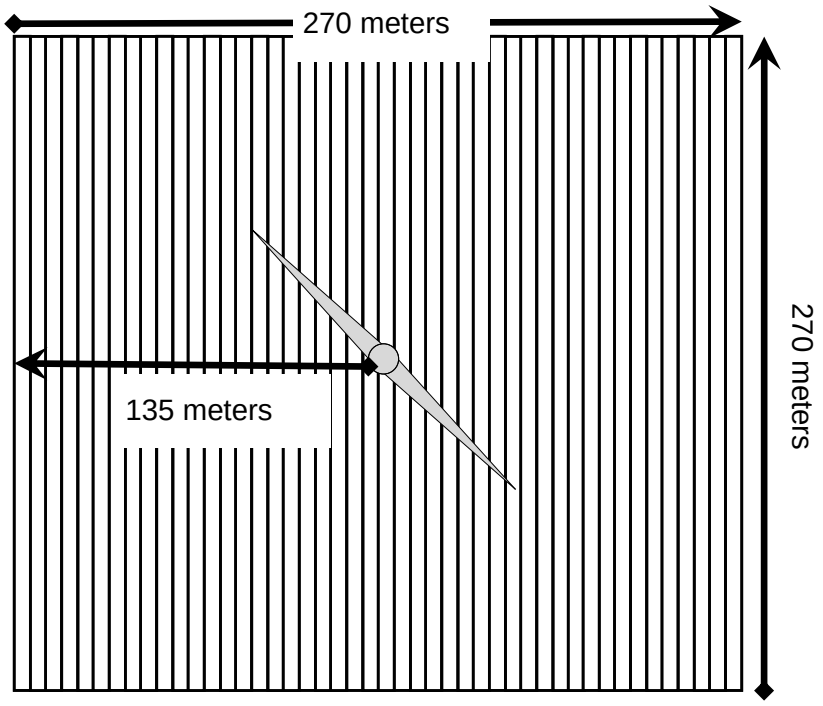

Figure 3. Schematic of turbine search plot dimensions and transects.

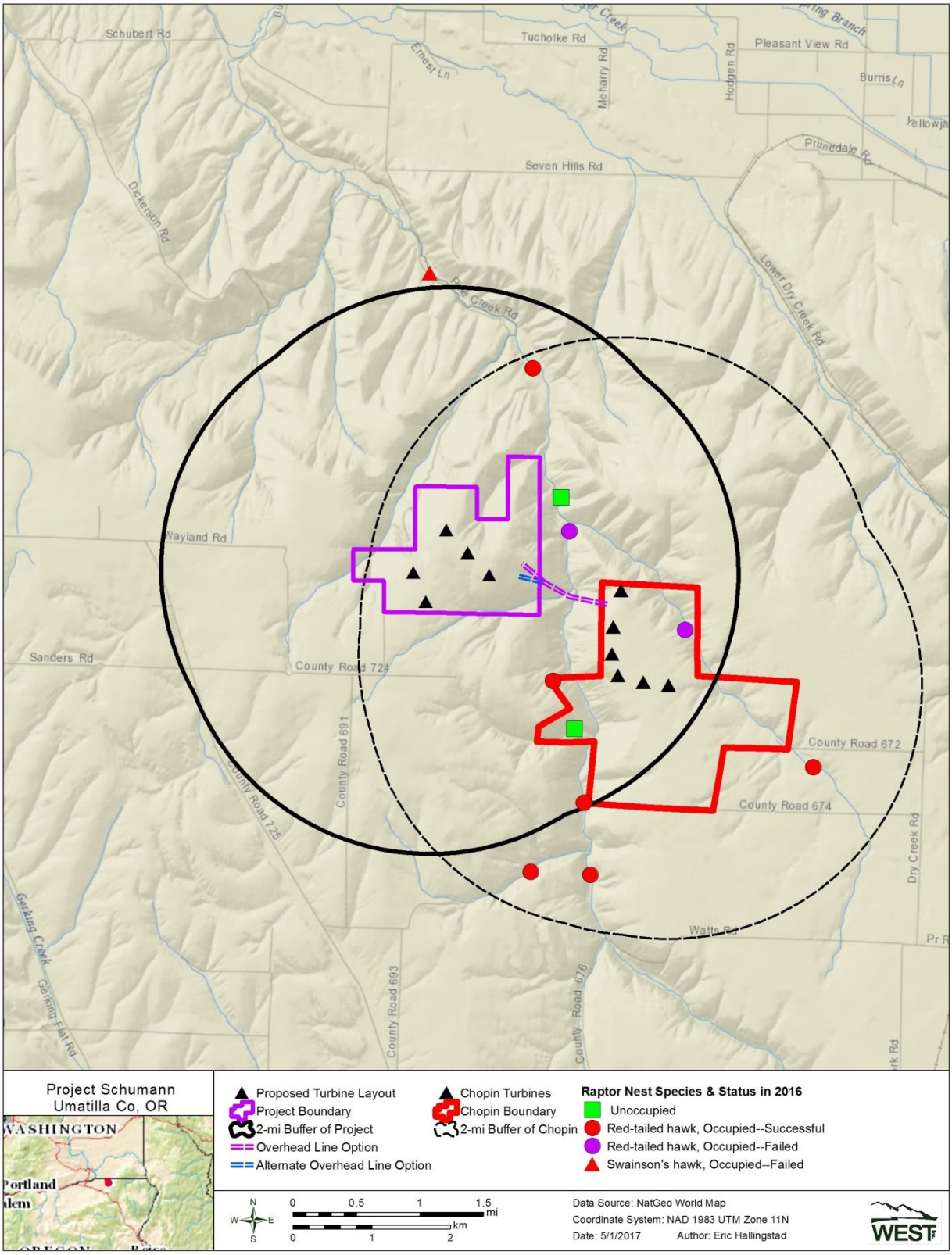

Figure 4. 2016 raptor nest survey results within two miles of Schumann Wind Energy Facility turbines. Surveys were performed for the nearby Chopin Wind Energy Facility.

APPENDIX A

RESUMES OF KEY PERSONNEL

Eric Hallingstad, *Wildlife Biologist*

PROFESSIONAL EXPERIENCE

2010-present	*Project Manager,* WEST, Inc.
2008-2009	*Field Technician,* WEST, Inc.
2008-2009	*Technical Writer,* United States Forest Service
2004-2008	*Hawk Trapper,* Idaho Bird Observatory
2007	*Avian Research Consultant,* Tetra Tech Environmental Consulting, Inc.
2007	*Seasonal Wildlife Biologist,* Idaho Fish and Game
2007	*Wildlife Research Consultant,* United States Forest Service
2006	*Shrubsteppe Avian Technician,* Idaho Bird Observatory
2005	*Goshawk Surveyor,* United States Forest Service
2004	*Avian Biologist,* Sage Science Consulting

FIELD EXPERIENCE

Project Management: Responsible for completion and reporting of all necessary vegetation and wildlife survey efforts in support of several wind projects throughout the Pacific Northwest. Coordinated survey design and implementation with the state and federal resource agencies and clients to ensure that surveys are conducted in accordance with appropriate protocols and are completed in a timely and cost-efficient manner. Clients include EDPR, EDF Renewables, and Iberdrola.

Field Supervisor: Supervisory experience with baseline wildlife and natural resource studies, including Site Characterization Studies, threatened and endangered species surveys, and pre-construction avian and bat studies. Has led many field crews on a variety of studies under a wide array of circumstances.

Raptor Studies: Graduated from the Raptor Biology program at Boise State University with a thesis focused on the seasonal variation of physiological parameters in the American kestrel. Contributed to eight raptor ecology studies including hawk migration, spotted owl demography, and harpy eagle reintroduction efforts. Assisted with capture and GPS instrumentation of both bald and golden eagles. Conducted aerial and ground-based eagle and other raptor nest surveys for multiple wind and pipeline projects. Experienced with leg-hold, net launcher, bow net, mist-net, dho-ghaza, bal-chatri, hand-grab, and noose pole capture techniques.

Wildlife Studies: Worked as a field biologist on 12 different non-raptor wildlife studies throughout the western US. Extensive experience in avian research, as well as threatened and endangered wildlife issues. Study species include Canada lynx, gray wolf, pileated woodpecker, Columbia spotted frog, willow flycatcher, greater sage-grouse, and other sensitive sagesteppe obligates.

ADDITIONAL TRAINING AND CERTIFICATION

Raptor Bander	North American Banding Council
Advanced Bat Capture	Bat Conservation International

EDUCATION

M.S.
Boise State University
Boise, Idaho
2008
Raptor Biology

B.S.
University of Wisconsin-Eau Claire
Eau Claire, Wisconsin
1998
Biology, minor: Chemistry

SCIENTIFIC ORGANIZATION MEMBERSHIPS

Raptor Research Foundation

Joel L. Thompson, *Wildlife Biologist/Project Manager*

PROFESSIONAL EXPERIENCE

2008-Present	*Wildlife Biologist/Project Manager,* Western EcoSystems Technology, Inc., Cheyenne, Wyoming
2008	*Field Biologist,* Western EcoSystems Technology, Cheyenne, Wyoming
2008	*Consulting Wildlife Biologist,* Green Diamond Resource Co., Korbel, California
2007-2008	*Hunting Guide/Ranch Hand,* Ringneck Ranch Inc., Tipton, Kansas
1998-2006	*Wildlife Survey Coordinator,* Green Diamond Resource Co., Korbel, California
1997	*Wildlife Assistant,* Arizona Game and Fish Department, Phoenix, Arizona
1993-1997	*Wildlife Field Specialist,* Simpson Timber Co., Korbel, California
1991-1992	*Research Assistant,* HSU Foundation, Humboldt State University, Arcata, California

EDUCATION

M.S.
Humboldt State University
Arcata, California
Natural Resources: Wildlife

B.S.
Humboldt State University
Arcata, California
Wildlife Management

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Wildlife Society

The Western Section of The Wildlife Society

Central Mountains and Plains States Section of The Wildlife Society

The Southwest Section of The Wildlife Society

SPECIALTY AREAS

Wildlife Research: Experience with various aspects of wildlife research, including project planning, data collection and management, supervision of field staff, and report/manuscript preparation. Extensive work with special status species in managed forest landscapes.

Wind and Solar Power Projects: Experience conducting pre-construction baseline and post-construction monitoring studies for wind and solar power projects in New Mexico, Arizona, California, and Kansas, including design and implementation of survey protocols, agency correspondence, and development of final reports.

Threatened, Endangered, and Sensitive Species: Extensive work experience with with spotted owls (northern and Mexican subspecies), fisher, and tree voles. Experience conducting species-specific surveys for southwestern willow flycatcher, peregrine falcon, bald eagle, golden eagle, burrowing owl, greater sage grouse, and lesser prairie chicken as well as general surveys for forest raptors, aquatic and terrestrial amphibians, and small mammals.

Field Related: Map and compass, orienteering, air photo interpretation, vegetation sampling, GPS, ATV and 4x4 vehicle use, boating on inland and ocean waters (inboard/outboard/jet), remote camera sampling, radio telemetry, aerial surveys (fixed-wing and helicopter), mist nesting, raptor banding, and snorkel surveys.

ADDITIONAL TRAINING AND CERTIFICATION

Animal Restraint and Handling
ATV certification, Chainsaw use, Hunters Safety Certificate
Wyoming Pocket Gopher Training
Desert Tortoise Handling Workshop

SELECTED PUBLICATIONS AND PRESENTATIONS

Thompson et al., IN PREP, Journal of Wildlife Management. Density of Fisher on Managed Timberlands in North Coastal California

Thompson et al., April 2002, *Northwestern Naturalist.* Relative abundance, nest site characteristics and nest dynamics of Sonoma tree voles in managed forests of north coastal California.

October 2010; Assessing Golden Eagle Use of Wind Resource Areas Using Observational Data. Poster presentation at the NWCC National Wildlife Research Meeting VIII, Lakewood, CO.

June 2010: Wildlife and Wild Lands Issues Associated with Wind Energy Development in Arizona. Invited speaker at Permitting Wind Development - What Counties Need to Know workshop, Northern Arizona University, Flagstaff, AZ.

Spring 2008. Humboldt State University M.Sc. Thesis: Abundance and density of fisher on managed timberlands in north coastal California.

Feb 2006: *Martes* symposium, Fisher and Marten in California – Invited Poster – Density of fisher on managed timberlands in north coastal California.

March 2004: Redwood Region Symposium - Oral Presentation – Summary of Pacific Fisher studies on Green Diamond Resource Co. Lands.

Jerry E. Baker, *Wildlife Biologist*

PROFESSIONAL EXPERIENCE

2006-Present *Wildlife Biologist,* Western EcoSystems Technology, Inc., Walla Walla, Washington
2001-2006 *Wildlife Biologist,* Northwest Wildlife Consultants, Pendleton, Oregon
1980-2007 *Professional Photographer,* Jerry Baker Photography, Athena, Oregon
1992-2000 *Partner/Owner,* Bar M Dude Ranch, Adams, Oregon
1975-1992 *Public Relations/Personnel Manager,* Bar M Dude Ranch, Adams, Oregon

WILDLIFE, THREATENED AND ENDANGERED SPECIES SURVEYS

Washington ground squirrel surveys for the Stateline Wind Project and Leaning Juniper Wind Project, Oregon

Bull trout surveys on the Umatilla River, ODFW protocol, Oregon

Rare plant surveys for the White Creek Wind project, Washington

Avian surveys for 25 different Wind Projects, Oregon, Washington and Nevada

Conducted and supervised surveys for sensitive species for the Pebble Springs Wind Project, Oregon

Winter big game surveys for the Elkhorn Wind Project, Oregon

Ferruginous and Swainson's Hawk nest monitoring for the Stateline Wind Project, Oregon

SELECTED PROFESSIONAL PUBLICATIONS

Erickson, W., **J. Baker** 2008 Site characterization study for the East Klickitat Wind Project. Final report to Horizon Wind.

Kronner, K, R. Gritski, **J. Baker**, 2005. Wildlife baseline study for the Leaning Juniper Wind Project, Oregon. Summary of results from 2004-2005 wildlife surveys. Final report to PPM Energy.

Kronner, K., R. Gritski, **J. Baker**, 2005. Baseline avian studies for the Bighorn Wind Project, Washington. Summary of results from 2004-2005 wildlife surveys, Klickitat County, Washington. Final Report to PPM Energy.

Kronner, K., **J. Baker**, 2006. Habitat description for a proposed transmission line, White Creek Wind Project, Klickitat County, Washington. Final Report to Klickitat County PUD,Washington.

SPECIAL TRAINING AND COURSES

Basic Wetland Delineation, Portland, Oregon, 2002

Bat Identification and Monitoring, Springfield, Oregon, 2001

Forest Bird Identification, hosted by USFS, Bar M Ranch, Oregon, 1998

EDUCATION

Continued Education
Blue Mountain Community College
Pendleton, Oregon
1987-1988
Studies in Botany, Ornithology, Zoology, and General Biology

B.S.
Oregon State University
Corvallis, Oregon
1982
Business: Minor in Forestry

SCIENTIFIC ORGANIZATION MEMBERSHIPS

The Native Plant Society of Oregon

The Audubon Society

Trout Unlimited

Blue Mountain Wildlife

APPENDIX B

CARCASS SEARCH AND SEARCHER EFFICIENCY TRIAL DATA FORMS

CASUALTY SEARCH FORM-keep with carcass **Schumann Wind Energy Facility**

DATE:_____ OBSERVER(s):_____ TURBINE NO.: _____
TIME BEGIN:_____ TIME END:_____ (observer #2) TIME BEGIN:_____ TIME END:_____

CASUALTIES FOUND:

Species	Casualty ID (e.g. 010109-BARS-1-1)	Dominant Veg Cover	Visibility Index

SEARCHER EFFICIENCY CARCASSES FOUND:

Species	Distance (m)/Bearing from turb	Id Tag	Dominant Veg Cover	Visibility Index
	/			
	/			

CASUALTY INFORMATION FORM - FIELD FORM ***Schumann Wind Energy Facility***

DATE:_____TIME:_____OBSERVER:_____

FOUND DURING (check one): SCHEDULED CARCASS SEARCH_____INCIDENTAL FIND ____

COLLECTED? Yes No SAMPLE NO.: _____ FILM ROLL/PHOTO NO: _____

PLOT TYPE (circle one): turbine met tower powerline other PLOT NO.: _____

LOCATION IF NOT ON PLOT _____

HABITAT: _____

SPECIES: _____ SEX(circle): M F U AGE(circle): A J U

CONDITION (circle one): injured intact scavenged dismembered feather spot other

DISTANCE & BEARING FROM NEAREST TOWER/POLE:

DESCRIPTION	DISTANCE (m)	BEARING (degrees)
Part 1 _____	_____	_____
Part 2 _____	_____	_____
Part 3 _____	_____	_____
Other _____		

Comments:

ESTIMATED TIME SINCE DEATH/INJURY: _____

WEATHER HISTORY [If carcass is estimated to be less than one week old, circle any of the following weather conditions that occurred at or before the estimated time of death/incident]:
clear calm fog cloudy rain snow storm gusty wind violent storm blizzard

WEATHER NOTES:

GENERAL COMMENTS (e.g. behavior observed if bird is injured; details of carcass - body parts missing, injuries, number of feathers in feather spot; indications of cause of death, field marks for identification, USFWS band no., etc.):

Agency Contact
USFWS Contact: Date:_____ Time: _____ Recovery Approval: yes no
Contact Person(s): Comments:
Disposition of Find _____
Transported to freezer _____ Date: _____ Time: _____
Release to USFWS: Person: _____ Date: _____ Time: _____

Searcher Efficiency Trials: Carcass Placement Log ***Schumann Wind Energy Facility***

General Information: Season_____ Month_____ Other_____

No.	Species/Age	Placed By	Date	Time	Plot: Location	Found? (yes/no)	Retrieved? (yes/no)	Notes
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Weather notes for days that carcasses are placed:

Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____
Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____
Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____
Date_____ Time_____ Temp_____ Wind Dir._____ Wind Speed_____ Precip_____

Carcass Removal Trials Form _____ ***Wind Energy Facility***

General Information: Season _____ Trial Period (e.g., 1 or 2) _____ Other _____

Information Regarding Carcass When Placed											UTM datum (1983)		Condition[6] of Carcass on Day Checked										
Carcass #	Placed by	Date	Time	Species[1]	Age[2]/ Size[3]	Dom Veg Cover[4]	Visibility Index[5]	Turbine #	Dist from Turbine (m)	Bearing from Turbine	Northing	Easting	Day	Day	Day	Day	Day	Day	Day	Day	Day	Day	Possible Scavenge[7]
1					/																		
2					/																		
3					/																		
4					/																		
5					/																		
6					/																		
7					/																		
8					/																		
9					/																		
10					/																		
											CHECKED BY:												

[1] Species = 4 letter code (e.g., MALL = mallard; BARS = barn swallow).
[2] Age: A =adult; J = juvenile; C = chick.
[3] Size: SB=Small Bird, LB=Large Bird, BAT.
[4] Dominant Veg: B = bare ground/gravel (e.g., dirt road or gravel pad); R = large rocks/boulders; GR = grassland; CRP=CRP; FR = forest/woodlot; CR = crop (e.g., corn, soybean, wheat); OT = other.
[5] Visibility Index: E = Easy (e.g., ≥90% bare ground; vegetation <6" tall); M = Moderate (e.g., 26-89% bare ground; vegetation <6" tall); D = Difficult (e.g., ≤25% bare ground; ≤25% of ground cover is ≥12" tall vegetation or rock/scrub); VD = Very difficult (e.g., ≤25% bare ground; >25% of ground cover is ≥12" tall vegetation or rock/scrub)
[6] Condition: **I** = intact, no evidence of scavenging, **S** = evidence of scavenging, **FS** = feather spot, **P** = partial carcass **0** = carcass not present or <10 feathers; **S**C = snow covered.
[7] Insects (IN) -- external scavenging/consumption by insects compared to infestation, Small carnivore (SC), Large carnivore (LC), Rodent (RO), Corvid or other bird (BIRD), Unknown (UNK). If scavenger was observed include the information in the notes on the back of this page. Also include if the scavenger was identified to species.

Brief Notes about habitat at carcass location. Condition by day noted on back, e.g., D#4=moved 5 m S, covered w/ ants, carrion beetles,etc.):

(1-4)_____

_____

(5-8)_____

_____

(9-12)_____

_____

Survey day weather, general comments / notes about location of each carcass, and other carcass specific comments:

APPENDIX C

INJURED WILDLIFE – PROCEDURES FOR REPORTING AND CARE

INJURED WILDLIFE – PROCEDURES FOR REPORTING AND CARE

The following procedures apply to injured birds or other wildlife:

RECORD DATA ON CASUALTY INFORMATION FORM but first, the primary objective is to provide immediate care for the injured animal. Capture the animal by covering it with a dark cloth or blanket. This will calm down the animal so it can be more easily handled. Place the animal in a box that has a towel or other material for the animal to hide under or grasp on to.

Quickly look the immediate area over for other injured animals as there may have been a flock, or a pair.

While capturing the animal, assess the injury so you'll know what to report to the Project Wildlife Coordinator or Project biologist, as well as the wildlife rehabilitator or veterinarian.

Do not provide additional stress. Keep the animal cool if it is a hot day, or keep it slightly warm if it is a cool day by placing the box in an office. Darken room if possible.

If it is a federally-listed or Oregon State Sensitive species, the Project Wildlife Coordinator or a Project biologist shall phone the Schumann Wind, LLC Representative (if other than the Project Wildlife Coordinator). They will contact Mark Kirsch, Oregon Department of Fish and Wildlife, at 541-276-2344, and Suzanne Anderson, USFWS at 541-962-8584. If the injured animal is found after normal weekday office hours, report it the next available working day.

If you can't reach the Project Wildlife Coordinator or Project biologist, phone Blue Mountain Wildlife directly (Lynn Tompkins, 541.278.0215). They will instruct you further. The rehabilitation center is required to report any injured raptor within 24 hours ODFW and USFWS. If it is an eagle, it is reported to Oregon State Police (in addition, all birds that may have been gunshot are reported to them). Describe the injury to the rehabilitation center and they will determine if it should go directly to a veterinary clinic.

Deliver the animal to the specified location. The doctor will need to fill out the "Casualty Examination Form." The clinic will make arrangements to deliver the animal to the designated rehabilitation center. The Project operator or owner(s) will pay for all veterinary bills.