Wildlife and Habitat Baseline Study for the Whiskey Ridge Wind Power Project, Kittitas County, Washington

May 2007

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1.0 INTRODUCTION

Whiskey Ridge Power Partners, LLC is evaluating the feasibility of expanding wind power development in Kittitas County, Washington (Figure 1). The Whiskey Ridge Project will be adjacent to the existing Wild Horse Wind Power Project and is proposed to include approximately 22 turbines with capacity to produce approximately 44 megawatts (MW). To predict project impacts on wildlife, Whiskey Ridge Power Partners, LLC contracted Western Ecosystems Technology, Inc. (WEST) to conduct a wildlife and habitat baseline study. Study protocols were developed based upon WEST's experience with wildlife-wind turbine interactions at projects throughout the U.S. The Washington Department of Fish and Wildlife (WDFW) reviewed these protocols in February 2006 and slight modifications were made in early March 2006. The following document contains results of the 2006 baseline study, and an assessment of anticipated impacts to wildlife.

Overview of the Baseline Studies

The principal objectives of the baseline study for this proposed wind project are to: (1) document raptor nest density and location; (2) describe occurrence of any federal and state threatened, endangered, proposed, candidate, or sensitive-status fauna or flora and their potential habitat that may be affected by the project; (3) describe habitat types/ecotones in the general project area; (4) estimate any potential impacts to habitat and wildlife that could result from the construction and operation of the proposed wind energy project, and (5) identify potential project design and/or mitigation measures that could reduce negative impacts.

The Whiskey Ridge study consisted of the following research components: 1) raptor nest surveys, 2) Federal and State sensitive wildlife and wildlife habitat surveys, 3) rare plant surveys, 4) vegetation and habitat mapping, 5) sage grouse surveys, 6) bat echolocation surveys, and 7) general wildlife observations. Avian use surveys were not conducted for the Whiskey Ridge Project because these surveys were conducted at the Wild Horse Project (Erickson et al 2003; see Figure 2) which is immediately adjacent to the proposed Whiskey Ridge Project and no differences are expected for impact predictions.

2.0 STUDY AREA

The project site is located in central Washington's Kittitas County, between the towns of Kittitas and Vantage. More specifically, the project will be built on the high open ridges in the vicinity of Whiskey Dick Mountain, located approximately 10 miles east of Kittitas and approximately 4 miles north of the Old Vantage Highway.

The project area is located within the Columbia Basin physiographic province, which lies within the rain shadow of the Cascade Range. The province is characterized by semi-arid conditions, with low precipitation, warm-to-hot dry summers, and relatively cold winters. Average annual temperature in the project area is approximately 47^{o}F and average annual precipitation is approximately 9 inches, of which 1.3 inches typically occurs from June through August (Franklin and Dyrness 1988). The site features considerable topographic relief and ranges in elevation from approximately 3400 feet to approximately 3650 feet. Several intermittent/ephemeral drainages convey runoff from the site, and a few springs may be perennial (e.g., Basalt and Spike Springs).

3.0 METHODS

3.1 Rare Plant Surveys

Rare plant surveys were conducted by trained botanists during peak flowering and/or fruiting periods when target species are best identified. Study corridors included proposed facilities and a 164-ft (50-m) buffer, based upon an April 2006 layout with turbine strings, access roads, and laydown area. During the survey, botanists followed meandering transects, effectively zigzagging back and forth across the survey corridor. Botanists maintained a list of all vascular plants encountered, and made informal collections of unknown species for later identification using *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973). Additional information collected included general plant associations, land use patterns, unusual habitats, and photographs of habitat types and representative individual plants.

Target Species

For the rare plant survey, the target species included all plant taxa listed as 'Endangered' or 'Threatened' by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) that potentially occur in the project area. In addition, taxa that have been formally proposed or are candidate species for federal listing, or taxa listed as 'species of concern' that potentially occur within the project area were also considered as target species. The 'species of concern' status is an unofficial status for species that appear to be in jeopardy, but information is insufficient to support listing. Target species also included all plant taxa defined as 'Endangered', 'Threatened', 'Sensitive', Review', or 'Extirpated' by the Washington Natural Heritage Program (WHNP) that potentially occur within the project area. The WHNP, part of the WDNR, maintains the most complete database available for state-listed species. Taxa meeting the above criteria were targeted by the investigation to determine their presence or absence within the study area. Determinations of status for rare plant species were based on information provided by the USFWS and the WNHP's list of tracked plant species (WNHP 2005a).

Prefield Review

As part of the investigation, a review of available literature and other sources was conducted to identify the rare plant species potentially found within the project area. As per Section 7(c)(1) of the ESA, a letter was sent to the USFWS requesting a list of federally listed taxa that have potential to occur within the project area. In addition, the WNHP was contacted to obtain element occurrence records for any known rare plant populations in the project vicinity. To supplement the information provided by the above agencies, a number of other sources were consulted. These sources provided additional information such as habitat preferences, morphological characteristics, phenologic development timelines, and species ranges. Sources included taxonomic keys and species guides (USFWS, 2001; Cronquist et al. 1977; Hitchcock and Cronquist, 1973) and online databases of common and rare plant species (WHNP 2005b; USDA, 2006).

Using data collected during the pre-field review, a list of rare plant species potentially occurring in the project area was compiled (Table 1). Habitat preferences and identification periods were derived from the literature for each potential species. Using this information, along with topographic maps of the project area, a field survey plan was developed to guide the timing and intensity of the field surveys.

Field Investigation

Pedestrian surveys for rare plant species were conducted on April 27 and from June 10-14, 2006. Surveys were performed by qualified WEST botanists, including Kurt Flaig, Susan Komarek, and Jay Jeffrey. The surveys were timed to locate as many target species as possible, particularly those most likely to occur in the affected habitats (sagebrush steppe and grassland). The survey was accomplished by conducting meander pedestrian transects, zigzagging back and forth across the survey corridor. The intensity of the pattern, and the speed at which the surveyor walked, was variable, and depended upon the structural complexity of the habitat, the visibility of the target species, and the probability of sensitive species occurrence in a given area. In habitats of low visibility with a high probability of sensitive species occurrence, a tighter grid pattern was walked. Care was taken to thoroughly search all unique features and habitats encountered with high probability of occurrence of sensitive species. A GPS unit showing the survey boundaries and turbine locations was used for navigation, in addition to aerial photographs and 7.5 U.S. topographic maps of the site.

A list of vascular plant species encountered during the rare plant surveys was maintained. Flora of the Pacific Northwest (Hitchcock and Cronquist, 1973) was the primary authority used for plant identification.

3.2 Habitat Mapping

Vegetation in the Project area was mapped according to “habitat types,” which are considered to be generally recognizable assemblages of plant species that occur in a pattern across the landscape. Habitat types were determined based on visual assessment of dominant plant species. Commercially available black and white high-resolution digital aerial photography were used for the habitat mapping. The habitat types were mapped during the spring or summer of 2006. Initially, the roads in and around the Project area were driven in order to correlate habitat types with the signature (color, shading, texture) on the aerial photos. Each habitat type was mapped based on either visual observation of the habitat from a road or high point, or by walking the boundaries of the habitat. Due to the scale of the aerial photos used, fine-scale intermingling in transition areas and small inclusions of one habitat type within another was not be shown. Available literature on the vegetative communities of eastern Washington was consulted during development of the habitat map. The mapped boundaries of each habitat type was digitized using ArcView™.

3.3 Raptor Nest Surveys

The search for raptor and large bird nests within the Project area included an approximate 2-mile buffer; however, much of the 28.5 mi^2 (73.9 km^2) Whiskey Ridge Project area was searched in 2003 for the Wildhorse Project (Figure 1; Erickson et al 2003). Approximately 6.9mi^2 (17.9 km^2) of the northern part of the Whiskey Ridge Project was not surveyed for raptor nests in 2003 (Figure 1). Surveys were conducted from a helicopter with one observer on April 7, 2006. Construction of the Wildhorse Project was underway at this time. Therefore surveys were focused on the Whiskey Ridge Project facility area and a 2-mile buffer to the west, east, and north. The entire 2-mile buffer area was searched but much of the south and southeast areas were not as intensively searched due to ongoing construction activities (Figure 3). Raptor nests observed during two aerial flights for sage grouse leks covering the entire 2-mile buffer were also noted. Search paths were recorded with a real-time differentially-corrected Trimble Trimflight III Global Positioning System (GPS) at 5-second intervals; coordinates as Universal Transverse Mercator, UTM, NAD27. In addition to raptor nests, other notable wildlife observations were made.

Nest searches were conducted by searching habitat suitable for most aboveground nesting species, such as cottonwood, ponderosa pine, tall shrubs, and cliffs or rocky outcrops. During surveys, the helicopter was flown at an altitude of tree-top level to approximately 250 ft (76m) aboveground. If a nest was observed, the helicopter was moved to a position where nest status and species present could be determined. Efforts were made to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest at which the species could be identified. Those distances varied depending upon nest location and wind conditions. Data recorded for each nest location included species occupying the nest, nest status (inactive, bird incubating, young present, eggs present, adult present, unknown or other), nest substrate (pine, oak, cottonwood, juniper, shrub, rocky outcrop, cliff or power line), number of young present, time and date of observation and the nest location (recorded with both a handheld GPS and the differentially-corrected unit). Some nest sites were ground-truthed when activity was unknown.

3.4 Threatened, Endangered, and Sensitive (TES) Species

A list of state and federally protected species that potentially occur within the project area was generated to assess the potential for impacts to these species (Table 2). Species were identified based on the WDFW Species of Concern list, which includes state listed endangered, threatened, sensitive and candidate species; and the USFWS, Central Washington Ecological Services office list of Endangered, Threatened, Proposed, Candidate and Species of Concern for Kittitas County.

Information about occurrence of these species in the Project area is based largely on the following resources:

- Habitat mapping and predicted distribution from Washington State Gap Analysis Program (GAP) project;
- WDFW Priority Habitats and Species (PHS) records for the project area and a buffer or approximately 5 miles;
- Washington Natural Heritage Program (WNHP)
- Breeding Bird Atlas of Washington State, Location Data and Predicted Distributions (Smith et al. 1997);
- Baseline field studies being conducted on site (this report); and
- Other published literature where available.

TES species surveys focused on shrub-steppe obligate species such as sage sparrow, sage thrasher, burrowing owl, sage grouse, white-tailed and black-tailed jackrabbits. Areas within 305 meters (1000 feet) of the centerline of the proposed turbine corridors, new roads, substations, and transmission lines were surveyed for special status/sensitive wildlife three times between May 1 and June 30, 2006. Surveys consisted of walking transects spaced approximately 50 meters apart, and were conducted from dawn to no later than 12:00 PM with wind speeds not consistently exceeding 15 MPH. These three surveys were rotated among areas so that at least one or two of the visits occurs before 9:00 AM. All sage grouse and sage grouse scat were recorded as to location and condition. All observations were recorded using GPS and/or 1:24,000 scale topographic maps and later mapped using GIS. Notes on habitat and condition were also recorded. Observations of other wildlife such as amphibians, reptiles, small mammals, and raptors were also recorded.

3.5 Sage Grouse Surveys

Aerial: Aerial sage grouse lek surveys follow methods used at the Yakima Training Center (YTC). Two helicopter surveys were conducted on March 24 and April 7, 2006. The 2^{nd} survey was conducted in coordination with the raptor nest survey. Timing of the first survey was coordinated with YTC survey results. The survey was conducted at no greater than 40 feet above- ground and at an approximate speed of 40 MPH.

Ground: Sensitive species walking surveys will be used for documenting presence or absence of sage grouse using the Project area for nesting and brood-rearing. In addition to May and June TES ground surveys that may document nesting or brood-rearing, one additional sage grouse survey will be conducted in mid-July focusing on brood detection using the same pedestrian methods. General assumptions are as follows: mid to late March is peak female attendance at leks, nesting and incubation is 3-4 weeks from peak, mean hatch date is around May 28-June 1, brood-rearing is approximately 10 weeks from hatch, and successful broods disperse around 600 meters during the brood-rearing period (Connelly et al. 2004). Weather patterns may shift these general dates by a few weeks.

3.6 Incidental/In-transit Wildlife Observations

All wildlife species of concern, uncommon species, and big game observed while field observers were conducting various surveys were recorded on incidental/in-transit data sheets. Data recorded with incidental observations included GPS coordinates, observation number, date, time, species, number, sex/age class, height above ground, and habitat.

3.7 Bat Echolocation Study

The vast majority of bat mortality documented at U.S. wind farms has occurred in late summer and early fall, a time period that corresponds with fall migration of tree bats (e.g., hoary bat, silver-haired bat) and dispersal from summer breeding areas to hibernacula for the other species. It is not known if the mortality is occurring to migrating individuals or bats conducting other activities during the migration period. Although bat mortality during the breeding season has been low at existing wind farms, most of these wind farms are in open habitats (e.g., agricultural fields, grassland, shrub steppe) and breeding bats may be more prone to collision at wind farms constructed in or near bat foraging or roosting habitats, such as wetlands and forested areas. The Whiskey Ridge Project is located closer to the forest edge than the existing Wild Horse Project, therefore echolocation surveys conducted by trained Horizon personnel were proposed for 2006 to evaluate bat activity in the project area. However, no data collection occurred due to difficulties with personnel availability, and later with cable and pulley riggings interfering with anemometer instrumentation. Data collection will occur during spring through early fall of 2007, and these data will be compared to existing data at other wind plants. Methods and results for the 2007 echolocation bat study will be provided as a technical addendum to this report.

4.0 RESULTS

4.1 Habitat Mapping

Six habitat classifications were delineated within development corridors of the project: shrub-steppe moderate (79.3 acres), shrub-steppe sparse (260.1 acres), ponderosa pine (24.0 acres), mixed scrub (68.2 acres), talus (19.1 acres), and lithosol (73.9 acres) (Figure 4). The project area is located within the Columbia Basin physiographic province, which lies in the rain shadow of the Cascade Range. The province is characterized by semi-arid conditions, in which the majority of precipitation occurs during the relatively cold winters. As a result of these climatic conditions, shrub-steppe is the primary habitat that evolved in the region.

Shrub-steppe habitat within the project development area was classified using two categories based on relative spatial density of the shrub layer, being either moderate or sparse. Habitat mapped as shrub-steppe moderate featured between 30 and 70 percent shrub cover, and shrub-steppe sparse habitat supported less than 30 percent shrub cover. The latter habitat type typically occurred on shallower soils on ridgetops and knolls (Figure 4). Shrub-steppe moderate was mapped on side slopes below these ridges, and in other areas featuring slightly deeper soils (Figure 4). Big sagebrush (*Artemisia tridentata*) was a dominant shrub species within both density categories, but shrub-steppe sparse also included the dominant stiff sagebrush (*Artemisia rigida*).

The ponderosa pine (*Pinus ponderosa*) habitat was mapped immediately below a long ridge in the northwestern portion of the project area (Figure 4). This habitat typically featured a well-established shrub and herbaceous component. Larger tracts of this habitat were observed in the adjacent lands to the north and west of the site. Mixed scrub habitat consisted of big sagebrush, however antelope bitterbrush (*Purshia tridentata*) and squaw currant (*Ribes cereum*) were the dominant shrub species (Figure 4). Other shrub species observed included mountain snowberry (*Symphoricarpos oreophilus* var. *utahensis*), serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), and snowbrush (*Ceanthus velutinus*). Mixed scrub habitat also featured a relatively dense herbaceous component composed of a variety of grasses and forbs. Talus habitat is composed of rocks and cobbles, and occurred on some of the steeper slopes within the project area (Figure 4). Scattered shrubs and herbaceous vegetation, including bluebunch wheatgrass (*Pseudoroegneria spicatum*) and arrowleaf balsamroot (*Balsamorhiza sagittata*), were observed within this habitat. Lithosol communities were mapped in several locations within the project area (Figure 4). This habitat occurred on shallow, rocky substrates on exposed ridgetops and knolls, and featured relatively sparse shrub and forb species. Dominant vegetation included big sagebrush, stiff sagebrush, buckwheat (*Eriogonum* spp.), Sanberg's bluegrass (*Poa secunda*), and hedgehog cactus (*Pediocactus simpsonii* var. *robustior*).

4.2 Rare Plant Surveys

No USFWS or Washington state Endangered, Threatened, Proposed, or Candidate plant species were encountered during the field surveys. One plant species on the Washington State 'Review' list, hedgehog cactus, was detected in the survey area. Species on the review list are of potential concern within the state, but are in need of additional field work before a status can be assigned. The Review designation carries no legal requirement for protection; however, WNHP personnel are interested in tracking occurrences of Review species to aid in the assignment of status. A total of 3 subpopulations of hedgehog cactus were found within the project site, and 1 subpopulation was observed along the project boundary (Figure 4). All of the subpopulations occurred in lithosol habitats, and were typically observed along the rim of ridgetops and knolls throughout the site. Associated species observed with the cactus, comprising relatively low vegetation cover, included stiff sagebrush, big sagebrush, round-headed desert buckwheat, buckwheat, and Sandberg's bluegrass. Subpopulations ranged in size from 50 to over 200 individuals, and were composed of plants growing individually or in clumps of up to six individuals. The majority of the plants encountered were either in flower or fruit. A list of all vascular plant species observed and identifiable during the rare plant surveys is included in Appendix A.

4.3 Raptor Nest Surveys

Two active red-tailed hawk nests were observed during the aerial surveys. One of these is within the project area, located in a pine tree within a drainage less than 300 meters from a proposed road and transmission line, and approximately 0.5 miles from the nearest turbine (turbine D1, Figure 5). The second red-tailed hawk nest is approximately 1.5 miles southwest of the project area boundary, and west of the existing Wildhorse Wind Project. American kestrels likely nest within the project area as well, one suspected active nest was found near a nest box on a dead pine tree (Figure 5). No large old inactive nests were observed. Potential nesting habitat sites in ponderosa pines may have been reduced due to some broken tree tops and lateral branches, apparently from recent high winds or snowload, or both. These may provide new nesting sites later. One subadult golden eagle was observed during aerial surveys. Only one unknown-age golden eagle was observed during four ground TES surveys during May, June, and July.

4.4 Threatened, Endangered, and Sensitive (TES) Species

The USFWS lists 30 wildlife species as threatened or endangered within the state of Washington. Of these, 6 are terrestrial wildlife species and occur within Kittitas County including marbled murrelet, northern spotted owl, grizzly bear, bald eagle, gray wolf, and Canada lynx. Of these 6, only the bald eagle is likely to occur within the vicinity of the Whiskey Ridge site (Erickson et al. 2003). Furthermore, the State of Washington lists 36 threatened or endangered wildlife species. Of these, the ferruginous hawk (*Buteo regalis*) and greater sage-grouse (*Centrocercus urophasianus*) are the only species recently documented to occur in the vicinity of the Whiskey Ridge site (Erickson et al. 2003). Several other sensitive status species have the potential to occur on the project area (Table 2).

Development corridors were surveyed three times between 17 May and June 29, 2006. An additional survey was conducted on 21 and 22 July, 2006, primarily focused on sage grouse detection. During the May-June period, 48 sage thrashers, 4 sage sparrows, one loggerhead shrike, and one golden eagle were observed (Figure 5). An additional subadult golden eagle observation was made March 24, during an aerial survey (both observations mapped in Figure 5). During the TES survey, one possible ferruginous hawk observation was made of an individual soaring and then landing between turbine strings B and C, no coordinates were mapped due to the distance from the observer. Heat waves prevented positive identification.

4.5 Sage Grouse Surveys

Aerial lek surveys covered the project area with a 2-mile buffer and were conducted on March 24 and April 7, 2006 (Figure 6 and 7). Surveys were conducted between 0530 and 0730 hours, with wind less than 8 MPH and no precipitation. No sage grouse or sage grouse sign were seen at Whiskey Ridge during either the aerial lek surveys or walking ground surveys (see TES species surveys above). Whiskey Ridge had low canopy cover of sagebrush on top of ridges with a very rocky substrate, less big sagebrush, and more stiff sagebrush.

4.6 Incidental/In-transit Observations

One short-horned lizard was observed during TES surveys, as well as two blue grouse with young, and one prairie falcon. Elk were seen at turbine strings A, B, and C during TES sensitive species surveys, numbers were not recorded. Nineteen groups of 612 elk and 10 groups of 149 mule deer were seen during late March and early April aerial surveys (14 groups of 589 elk on April 7). One gyrfalcon was observed during the late March aerial survey.

5.0 DISCUSSION AND IMPACT ASSESSMENT

5.1 Evaluation Criteria

Impacts to avian and bat species are expected to occur from the proposed project. Measured use of the site by avian species in addition to mortality estimates from other existing wind plants is used to predict mortality of birds and bats from the project (site avian use data from Wildhorse Project baseline study; Erickson et al. 2003). For example, use of the site by raptors is relatively low compared to other wind plants and mortality estimates of raptors from other “newer generation” wind plants are relatively low (e.g. <0.04 raptors/turbine/year for Foote Creek Rim wind plant, Wyoming; <0.01 raptors/turbine/ year for the Buffalo Ridge wind plant, Minnesota). Therefore mortality estimates for raptors from the project are expected to be very low. Post construction monitoring is proposed to validate mortality predictions and monitor the actual level of mortality from the project.

Other impacts include direct loss of habitat due to the project facilities, and indirect impacts such as disturbance and displacement from the wind turbines, roads and human activities. Both construction (e.g., blasting) and operations impacts are discussed. Potential impacts are discussed for rare plants, birds, bats, big game, other mammals, reptiles and amphibians, and fish. Discussion of potential impacts to unique species including State and Federal listed species is also included.

5.2 Rare Plants

During the Whiskey Ridge rare plant surveys, no federally-listed 'Endangered', 'Threatened', 'Proposed' or 'Candidate' plant species were found, nor were any Washington state-listed 'Endangered', 'Threatened', or 'Sensitive' plant species found in the survey area. One Washington State 'Review' plant species was found, the hedgehog cactus (*Pediocactus simpsonii*). This species is listed in Review Group 1, meaning more research is needed before assigning a more definitive status. This species appears to be common in the region, and was documented to be relatively widespread during Wildhorse Project vegetation surveys (Lack et al. 2003). The hedgehog cactus populations found within the project area are located in lithosolic habitats. These habitats are well represented within the project area, interspersed among sagebrush steppe and grassland habitats.

Construction: Impacts ***to cactus may occur in development areas (Figure 4) if not marked and avoided, or physically translocated.***

Operations: No impacts to cactus are anticipated after road and facility construction.

5.3 Birds

Avian habitats on the Project area are primarily shrub-steppe, mixed scrub, lithosol, and pine trees. Some upper watershed drainages also provide riparian habitat near the proposed facility. A few springs on site with mixed scrub/shrub-steppe habitat likely provide important water and foraging opportunities for both resident and migrating avian species. The Project area is located within the Pacific Flyway, one of four principal north-south bird migration routes in North America. Bounded roughly by the Pacific Ocean and the Rocky Mountains, the Pacific Flyway extends from the arctic regions of Alaska and Canada to Central and South America. Within the flyway, certain groups of birds may travel along narrower migration corridors, with more well defined paths.

The Project's location along the east flank of the Cascades places it within possible migration corridors of several bird species. Given the limited riparian and other important stopover habitat (water bodies), use by migratory birds is likely low. It would be expected that areas further to the east along and closer to the Columbia River would be more important to migrating birds, including songbirds, waterfowl and raptors.

Potential impacts to birds using the study area include fatalities from collision with wind turbines or from construction equipment, loss of habitat, disturbance to foraging and breeding behavior, collision with overhead power lines, and electrocution. Project-related human activity could alter bird behavior and cause displacement during the construction phase of the Project, and the post-construction density of turbines and facilities on the developed portion of the site may alter avian use.

Construction: Wind plant construction may affect birds through loss of habitat, potential fatalities from construction equipment, and disturbance/displacement effects from construction and human occupation of the area. Potential ***mortality from construction equipment on site is expected to be quite low. Equipment used in wind plant construction generally moves at slow rates (e.g., cranes) or is stationary for long periods. The risk of mortality from construction to avian species is most likely limited to potential destruction of a nest with eggs or young for ground and shrub nesting species when equipment initially disturbs the habitat. Disturbance type impacts can be expected to occur if construction activity occurs near an active nest or primary foraging area. Birds displaced from these areas may move to areas with less disturbance, however, breeding effort may be affected and foraging opportunities altered during the life of the construction. A disturbance impact to one raptor nest, the red-tailed hawk nest north of turbine D1 (Figure 5), could occur if construction occurs on the***

proposed road and transmission line within 300 meters of the nest during the breeding and nesting season. Otherwise, no disturbance impacts to raptor nests are anticipated.

Operations: Substantial data on avian mortality at operational windplants are currently available (e.g., Erickson et al. 2001, Erickson et al. 2004, Young et al. 2006). Outside of California and based on the 2001 summary (Erickson et al. 2001), diurnal raptor fatalities composed only 2% of wind plant-related fatalities. Passerines (excluding house sparrows and European starlings) were the most common collision victims, composing 82% of the 225 fatalities documented. No other group (e.g., raptors, waterfowl) composed more than 5% of fatalities. Of 841 avian fatalities reported from California studies (>70% from Altamont Pass, CA) in Erickson et al. (2001), 39% were diurnal raptors, 19% were passerines (excluding house sparrows and European starlings), and 12% were owls. Non-protected birds including house sparrows, European starlings, and rock doves composed 15% of the fatalities. Other avian groups generally made up less than 10% of fatalities.

Because of differences in rotor swept area, and similarly nameplate MW output among turbines included in mortality studies, fatality rates are presented both in terms of estimated number of fatalities/MW/year and fatalities/turbine/year. The estimated number of fatalities/MW/year is used as the basis for predicting impacts of the project. This MW approach assumes that the fatality rates are approximately proportional to the MW nameplate of the turbine, which yields results similar to assuming fatality rates are proportional to the turbine's rotor swept area. Although some research suggests that larger turbines with slower rpm's and larger ground clearance may be safer for some bird groups such as raptors (e.g., Smallwood and Thelander 2004). However, this relationship for different sizes of newer generation turbines has not been clearly defined. Therefore, assuming fatality rates are proportional to a turbine's MW nameplate is considered a conservative approach for estimating impacts.

For all avian species combined, estimates of the number of bird fatalities per MW per year from individual studies have ranged from 0 at Searsburg, VT, and Algona, IA sites (Kerlinger 1997, Demastes and Trainer 2000, respectively) to approximately 10 (7.7/turbine/year) at the Buffalo Mountain, TN site (Nicholson et. al. 2003). The overall U.S. average number of avian collision fatalities is 2.19/turbine/year, or approximately 3/MW/year (Erickson et. al. 2001).

Project and turbine characteristics of five Pacific Northwest regional wind facilities where standardized fatality monitoring has been conducted are described in Table 4. Average fatality estimates from these projects for all birds have ranged from 0.6 to 3.6 fatalities/turbine/year or 0.9 to 2.9 fatalities/MW/year (Table 5). The only species representing more than 10% of the documented fatalities has been horned lark, the most commonly observed species at all of these facilities during daytime use surveys (Table 6). Using 2002-2003 Wildhorse Project baseline data, overall estimated bird use was not high relative to other open habitat project sites in the U.S., suggesting that mortality estimates observed at these projects provide a strong basis for predicting mortality impacts for the Project. The following addresses background information and wind facility operations impact assessment for raptors, passerines, and waterbirds.

5.3.1 Raptors

The Altamont Pass Wind Resource Area (APWRA) has had a history of high raptor mortality (Orloff and Flannery 1992, Smallwood and Thelander 2004). The APWRA consists of approximately 5000 mostly small (<200 kW) older wind turbines located in a 60 square mile area. Approximately 500 – 1300 raptors are estimated to be killed annually at this site (Orloff and Flannery 1992, Smallwood and Thelander 2004) based on estimates of approximately 1 to 2.2 raptor fatalities/MW/year. The most common raptors killed include red-tailed hawks, American kestrels, burrowing owls, golden eagles, and barn owls. Until just recently, the largest operating turbines were 330-kW turbines, with rotor diameters of 33 m.

Wind turbine design has changed significantly since the first large wind plants were developed in California such as those in the APWRA. Turbines are now typically installed on tubular steel towers instead of lattice towers and without open platforms at the top of the tower, eliminating perching and nesting opportunities for raptors and other birds. Raptors and ravens commonly nest one turbines within the APWRA. No observations have been made of raptors perched on the new turbine types during studies at Foote Creek Rim (WY) (Johnson et al. 2000a), Buffalo Ridge (MN) (Johnson et al. 2000b), Vansycle (OR) (Erickson et al. 2000), Hopkins Ridge (Young et al. 2007) and Stateline (OR/WA) (Erickson et al 2004), suggesting that new turbines are not a perch attractant for birds.

Collisions with wires and electrocutions have been a common source of mortality at Altamont Pass (CA) (Orloff and Flannery 1992) and other older wind projects, whereas electrical collection lines between turbines in new-generation wind plants are typically buried underground to eliminate perching opportunities, collisions with wires, and electrocutions. Overhead lines within new wind plants are typically designed to be raptor safe from electrocution and anti-perching devices are often installed (e.g., Stateline Wind Project, OR/WA, Nine Canyon Wind Project, WA).

Turbines are much larger, with blades moving at fewer revolutions per minute (rpm) and are therefore presumably more visible than blades on the smaller older turbines. For example, the blades of the 1.5-MW turbines installed at the Klondike (OR) wind plant turn at approximately 20 rpm's, contrasted to greater than 60 rpm's for the Kenetech 56-100 downwind turbine, the most common turbine at the Altamont Pass (CA) wind plant. Blade tip speeds are similar for both new generation and old generation wind turbines. While relationship between blade tip speed and mortality is unknown, it is presumed that rpm's play a factor in avian mortality due to decreasing ability to distinguish blades and blade position as rpm's increase.

Raptor mortality has been much lower at all new generation wind projects in the U.S compared to the APWRA. The highest reported raptor fatality rate at new generation wind projects occurred at the facility in Solano County, California. The High Winds Project is a 162-MW facilty consisting of 91 1.8-MW turbines located in an area with very high raptor use estimates compared to the APWRA, especially for American kestrels. Raptor mortality estimates of approximately 0.3/MW/year have been reported based on preliminary data, with most of mortality consisting of American kestrels. Overall raptor use at High Winds is estimated to be higher than estimated at APWRA overall (1.5 to approximately 2 times), and 7 times higher for American kestrels.

Mean raptor use at the Project site is relatively low (<0.5/20- min survey; 2002-2003 Wildhorse data) compared to several other wind plants in the U.S that have been surveyed using similar methods, and much lower than both the High Winds Facility (3.5/20-min survey) and the APWRA (~2.3/20 min survey) (Figure 8). Projects in the region consistently observe red-tailed hawk, American kestrel, northern harrier, and wintering rough-legged hawks as the most abundant raptor species.

Raptor nest density within the Whiskey Ridge site and a 2-mile buffer was 0.07/mi^2, which is much lower than the average raptor nest density for other representative proposed and existing wind facilities in mixed-habitat landscapes (Table 7). At Klondike I, OR, raptor nest density was 0.15/mi^2 within 5 miles of the project area but no raptor mortality was documented during a one-year fatality monitoring study (Johnson et al. 2003). At Buffalo Ridge, MN, raptor nest density was also 0.15/mi^2, and the only documented raptor mortality over a 6-year period was a single red-tailed hawk (Osborn et al. 2000, Johnson et al. 2002). Raptor nest density at the large Stateline Windplant on the OR/WA border was 0.21/ mi^2 and raptor mortality was estimated to be 0.09 raptor fatalities/MW/year, consisting primarily of red-tailed hawks and American kestrels. Raptor nest density for the 41-MW Combine Hills Wind Project, adjacent to Stateline, was estimated to be 0.24/mi^2, and no raptor fatalities were documented the first year of operation (Young et al. 2005). Raptor nest density for the recently permitted Hopkins Ridge Wind

Project in Columbia County, Washington was 0.43/mi^2 (Young et al. 2003), and raptor mortality was estimated to be 0.14 raptor fatalities/MW/year (Young et al. 2007). Raptor nest densities are also available for other wind plants in the region, including Condon, Oregon (0.06/mi^2), Nine Canyon, Washington (0.03/mi^2), and Zintel Canyon, Washington (0.08/mi^2). Very few raptor fatalities have been documented at those smaller facilities (1 rough-legged hawk at Condon; American kestrel, and short-eared owl at Nine Canyon).

Given the information on raptor use and nesting density at this and other projects, the habitat and topographic characteristics of the site, and relevant mortality data from nearby projects, raptor fatality rates are anticipated to be low (<0.1/MW/year). We expect the majority of the fatalities of diurnal raptors to consist of red-tailed hawks and American kestrels. Aside from great horned owls, red-tailed hawks and American kestrels have the largest estimated raptor population sizes in North American (979,000 and 2,175,000, respectively; Millsap and Allen 2006). Monitoring results from the Wildhorse Project for 2007 will provide additional data for raptor fatality predictions in this eastern Kittitas region.

5.3.2 Passerines/Songbirds

Passerines, often referred to as songbirds, have been the most abundant avian fatality at wind plants outside California often composing more than 80% of the total avian fatalities (Erickson et al. 2001, Erickson et al. 2002). Passerines are also the most commonly observed birds during point count surveys at all of these sites. Both migrant and resident passerine fatalities have been observed.

Songbird mortality at operating wind projects in eastern Oregon and Washington has been reasonably consistent. Horned larks have been the most commonly observed resident songbird fatality at agriculture and grassland projects in the Pacific Northwest (Table 6), and have been the most abundant songbird observed during point count surveys at these sites. Based on the U.S. Geological Survey's Breeding Bird Survey (BBS) data, horned larks are likely one of the most common birds in the Columbia Plateau. Otherwise, no other resident songbird species has composed a large proportion of the fatalities observed at the projects in the Pacific Northwest.

Studies of nocturnal migration at several wind plants suggest that the mortality compared to the number of birds passing through the area is low (Johnson et al. 2002, Mabee and Cooper 2002, McCrary et al. 1984). In much of the West, songbirds appear to migrate across a broad front, except in unique topographic situations such as coastlines, and large river valleys or riparian corridors. In the Pacific Northwest, nocturnal migration has been studied at the Stateline Wind Project on the Oregon/Washington border (Mabee and Cooper 2002), as well as some small sampling effort at the Nine Canyon Wind Project in Washington. The Stateline study was designed to monitor waterfowl, shorebird, and passerine movements during two fall migration seasons (2000 and 2001) and one spring migration seasons (2001). Marine radar was used to study nocturnal bird migration at two stations: one near the existing Vanscycle Wind Project near the southeastern end of the Stateline project area, and one to the north of the project area in Washington. The northern and southern stations had very similar passage rates, suggesting broad front movements throughout the project site.

There have been numerous events recorded at communication structures that document up to several hundred avian fatalities in one night, while there have been only two events reported, both reasonably small, at U.S. wind generation facilities. Fourteen fresh nocturnal migrating passerine fatalities were observed at two adjacent turbines during a single search at the Buffalo Ridge wind project in Minnesota during spring migration (Johnson et al. 2002). Approximately 25-30 nocturnal migrating passerine fatalities were observed at three turbines and a well-lit substation at the Backbone Mountain, WV facility during one or two nights of foggy weather (Kerns and Kerlinger 2004). The data suggest that sodium vapor lamps at the substation were the primary attractant, since fatality locations were correlated with the location of the substation, and the other turbines away from the substation had few fatalities documented the morning after the event. After the lights were turned off at the substation, no events occurred.

Tall, lighted structures are suspected of attracting nocturnal migrating birds, especially during inclement weather (Kerlinger 2000). Lighting at communication towers, where larger mortality events have been documented, is typically different than lighting at wind turbines. Communication towers commonly have more than one light location on a tower, while wind turbines have only one location for the light (on top of the nacelle, per FAA requirements). Communication towers often have one red pulsating or flashing light on the top of the tower, and several solid red lights at various heights1. Communication tower lighting may be more of an attractant than wind turbine lighting (Kerlinger 2004), but research and data are limited. No large measured differences in nocturnal migrant fatality rates have been documented between wind turbines that are lit with aircraft obstruction lighting and unlit turbines. At the Stateline (OR/WA) Wind Project, observed fatality rates at lit turbines were slightly higher than at unlit turbines, although none of the differences were statistically significant ($p>0.10$) (Erickson et al. 2004). Similar results were found at the Nine Canyon wind project, which has the same lighting characteristics (red-flashing at night) but on larger and taller turbines than Stateline turbines (Erickson et al. 2003b). The Buffalo Ridge wind project showed a similar result for turbines similar in size to Stateline, although lighting types differ (i.e., steady-burning red incandescent; Johnson et al. 2002). Buffalo Ridge wind project Phase I turbines were not lit, whereas Phase II turbines had approximately every other turbine lit with solid red lights (approximately 70 of 143 turbines). Six of the 138 Phase III turbines along the outer boundary of the site were lit with solid red lights. No statistical differences were found between lit and unlit turbines.

Based on mortality observed at other operating wind projects located in similar landscapes (Erickson et al. 2004, Erickson et al. 2003b, Johnson et al. 2003, Young et al 2005, 2007), an approximate range of 1.0 to 2.75 songbird fatalities/MW/year are predicted for the Project. The largest number of fatalities will likely be horned larks, a common grassland songbird. No other species (migrant or resident) is anticipated to make up a large proportion of the fatalities, based on the patterns of results of other regional studies. No impacts to threatened or endangered songbird species are anticipated.

5.3.3 Waterfowl and Other Waterbirds

Wind plants with year-round waterfowl use have shown the highest waterfowl mortality, although levels of waterfowl/waterbird mortality appear insignificant compared to use of the sites by these groups. Two Canada goose fatalities were documented at the Klondike I wind plant, OR, although several Canada geese flocks were observed during preconstruction surveys (Johnson et al. 2003). Few Canada goose fatalities have been observed at U.S. wind projects (Erickson et al. 2004).

The recently constructed Top of Iowa Windfarm, comprised of 89 turbines with tip heights of 97.5 meters (320 feet), is located in cropland between three Wildlife Management Areas (WMAs) with historically high bird use, including migrant and resident waterfowl, shorebirds, raptors, and songbirds. During a recent study, approximately 1 million total goose-use days and 120,000 total duck-use days were recorded in the WMAs during the fall and early winter, yet no waterfowl fatalities were documented during concurrent and standardized wind project fatality studies.

Similar findings were observed at the Buffalo Ridge Wind Project in southwestern Minnesota (Johnson et al 2000b), which is located in an area with relatively high waterfowl/waterbird use and some shorebird use. Some large flocks of snow geese, and Canada geese and mallards were the most common waterfowl observations. Five of the 55 fatalities observed during the fatality studies were waterfowl, including 2

[1] Recent FAA lighting regulations released in 2005 for wind turbines favor solid red lighting during the night, and white lights with some strobe during the day. Wind projects are to be "outlined" with lighting rather than every turbine being lighted.

mallards, 2 American coots, and 1 blue-winged teal. One herring gull, one pied-billed grebe, and one killdeer were the only other waterbird fatalities found.

Canada geese were the only waterfowl observed flying over the Project area in the 2002-2003 baseline study. Other migrant species may also fly over the Project area, however overall use of the site is predicted to be very low due to the predominant shrub-steppe habitat lacking stopover or foraging opportunities. Waterfowl mortality on average is expected to be very low. The possibility exists for a rare event involving several individuals of a flock colliding with wind turbines given unusual weather circumstances. However, this would have negligible effects, if any, on the Pacific population of Canada geese (exhibiting an increasing trend over the last decade, USFWS 2003).

5.3.4 Displacement Effects

The presence of wind turbines may alter the landscape so as to change wildlife habitat use patterns, thereby displacing wildlife from areas near turbines. Several studies have been conducted in the U.S. looking at the potential displacement effects on birds; however most of the studies focused on grassland bird and raptor species (e.g., Leddy et al. 1999, Erickson et al. 2004, Osborn et al. 1998). "Displacement" means that birds tend to avoid an area. However, avoidance of an area may not imply impacts on population parameters such as population size, and such impacts have not been documented. While displacement effects have been documented for some species/groups in U.S. and Europe, there is little information on whether displacement effects have any real impacts on population parameters such as population size and reproduction.

Avian baseline studies of the Foote Creek Rim (FCR), WY wind plant conducted in 1994 and 1995 documented mountain plovers (*Charadrius montanus*)[2] in the proposed development area. Construction of the Foote Creek Rim Wind Plant began in the fall of 1997. Phase I of the wind plant project as identified in the BLM Environmental Impact Statement was construction of turbines in several units on the southern end of Foote Creek Rim. Development of Phase I of the wind plant took place between 1997 and 2000 during which four construction units were completed totaling 133 turbines. This wind plant is located in shortgrass prairie habitat on a mesa topographic feature with a relatively flat top and steep sloping sides. Habitat on top of Foote Creek Rim is suitable for mountain plovers which prefer flat areas with a prevalence of bare ground and short vegetation. Transect surveys to census mountain plovers were conducted on an annual basis through 2004.

In 1995, the estimated mountain plover population size for the Foote Creek Rim wind plant was approximately 60 individuals. The estimated population size declined through 1999 to 18 individuals when only 39 total observations of mountain plovers were made during the surveys. After 1999, the estimated population size in the wind plant rose slowly to 36 during the 2003 and 2004 field seasons when 89 and 66 total plovers were observed, respectively. The period of plover population decline on Foote Creek Rim (1995-1999) also corresponds with the wind plant construction period (1998-2000). It is unknown whether plovers were simply displaced from the rim due to the construction activity or if the population in the area was experiencing a decline in numbers. The initial impression is that the low population on Foote Creek Rim from 1998-2000 followed by a steady recovery was related to displacement during construction of the wind plant and subsequent habituation to the facility by plovers. However, it is hard to separate potential displacement type effects from a broader decline in the mountain plover population. The Foote Creek Rim population appeared to be declining prior to the initiation of

[2] The U.S. Fish Wildlife Service proposed listing mountain plover as a threatened species under the Endangered Species Act in February 1999 (USFWS 1999). Prior to this time, mountain plover had been included on the USFWS list of *candidate* species. In 2003, the USFWS found that listing mountain plover as threatened was not warranted and the proposed rule was withdrawn stating that the threats to the species as identified are not as significant as earlier believed, and the plover is now not listed.

construction. Also, declines in other regional populations (southeast Wyoming - northeast Colorado) suggest a larger species-wide or regional decline during the decline observed at Foote Creek Rim.

Based upon European research summaries, displacement impacts on breeding waterbirds, shorebirds, and waterfowl have been less than impacts on non-breeding birds. European studies suggest variable levels of disturbance for feeding and roosting birds (Spaans et al. 1998). Based on this European summary, the authors concluded that with the exception of lapwings, black-tailed godwits, and redshanks, species used areas for breeding that were close to the wind farms. In general, the displacement effects (areas with reduced densities) rarely exceeded 100 m for breeding birds. During the non-breeding season many bird species of open landscapes avoided approaching wind parks closer than a few hundred meters, and this avoidance behavior was especially noted for waterfowl and shorebirds. Displacement effects of up to 600 m from wind turbines (reduced densities) have been reported for some waterfowl species (e.g., pink-footed goose *Anser brachyrhunchus*, and European white-fronted goose). However, a study in the U.S. did not document such a large scale displacement impact. Based on preliminary analysis at the large Top of Iowa wind facility, no large scale displacement of Canada geese was apparent based on counts and behavior observations of geese in areas with and without turbines (Koford and Jain 2004).

At a large wind plant on Buffalo Ridge in Minnesota, the abundance of shorebirds, waterfowl, upland gamebirds, woodpeckers, and several groups of passerines was found to be statistically significantly lower at survey plots with turbines than at plots without turbines. There were fewer differences in avian use as a function of distance from turbines, however, suggesting that the area of reduced use was limited primarily to those areas within 100 meters of the turbines (Johnson et al. 2000b). Some portion of these displacement effects is likely to be the result of direct loss of habitat near the turbine for the turbine pad and associated roads. These results are similar to those of Osborn et al. (1998), who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Also at Buffalo Ridge, Leddy et al. (1999) found that densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. Grasslands without turbines and portions of grasslands located at least 180 meters from turbines had bird densities four times greater than grasslands located near turbines. Reduced avian use near turbines was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness because of the presence of access roads and large gravel pads surrounding turbines (Leddy 1996, Johnson et al. 2000b).

Preliminary results from the Stateline (OR/WA) Wind Project suggest a relatively small-scale impact of the wind facility on grassland nesting passerines, with a large portion of the impact due to direct loss of habitat from turbine pads and roads and temporary disturbance of habitat between turbines and road shoulders (Erickson et al. 2004). Horned larks appeared least impacted, with some suggestion of displacement to grasshopper sparrows, although sample sizes were limited.

Some indirect impacts to birds in shrub-steppe habitat are anticipated. Given that displacement effects have been relatively low at other projects (reduced densities <100 m from turbines/roads), indirect impacts are anticipated to be minimal. Additionally, the majority of the proposed turbines are located in sparse shrub-steppe or lithosols, many of the shrub-steppe obligate species were observed away from proposed permanent facilities (Figures 4 and 5).

5.4 Big Game

The site receives some year-round use by mule deer and elk, but it is more concentrated in the winter. During the April 7, 2006, aerial sage grouse lek and raptor nest survey, 14 groups of 589 elk and 7 groups of 126 mule deer were observed within the project area and 2-mile buffer. WDFW have expressed concern over potential effects of wind project development and operation on wintering big game. Winter is a crucial period of time for the survival of many big game species. Severity of winter and availability of forage are important factors related to over-winter survival (Reeve and Lindzey 1991). Increases in human activity from vehicles and other sources and habitat fragmentation, depending on the levels, are postulated to affect over-winter survival (Stephenson et al. 1996, Brown 1992).

The Project is located within habitats designated by WDFW as winter range for mule deer and elk, and is located in the extreme southeast region of the Quilomene migration corridor. The Quilomene elk winter range is approximately 83,000 acres in size and winters approximately 1500-2000 elk. The Colockum elk calving area is north of the Project. The Quilomene mule deer winter range is approximately 40,000 acres in size and winters approximately 700-800 deer. The project area is not located within the high density deer sub-area of Quilomene mule deer winter range which winters 100-200 deer. This area begins approximately 1.5 miles to the north east of the Project area, and extends down to the Columbia River. The project area is also not located within the Quilomene primary winter range, a sub-area of the Quilomene winter range, which winters approximately 500 elk.

Wintering elk forage on native grass species such as Sandberg’s bluegrass, which greens up with fall and winter rains, while mule deer likely utilize more shrub species in the project area. Wind-blown slopes and ridges remain snow-free most of the year. West and south-facing slopes green up earlier and provide accessible nutritious forage during the harsh winter months and early spring. Mule deer and elk also use the site during other seasons. Nearby drainages and mid-elevation rock strata and springs provide riparian and mixed scrub habitats for cover and water. Mule deer and elk hunting have been allowed on the Project area lands historically.

Construction: Elk and mule deer are expected to be temporarily displaced from the site due to the influx of humans and heavy construction equipment and associated disturbance (e.g., blasting). Construction related disturbance and displacement is expected to be limited to the 9-12 month construction period. Most heavy construction is expected to take place during the summer months, minimizing construction disturbance to wintering big game. In addition, construction will likely not take place in severe winters, when big game impacts may be of most concern. Following completion of the Project, the disturbance levels from construction equipment and humans will diminish significantly and the primary disturbances will be associated with operations and maintenance personnel, occasional vehicular traffic, and the presence of the turbines and other facilities.

Operations: There is little information regarding wind project effects on big game. At the Foote Creek Rim wind project in Wyoming, antelope observed during raptor use surveys were recorded year round (Johnson et. al. 2000a). The mean number of antelope observed at the six survey points was 1.07 prior to construction of the wind farm and 1.59 and 1.14/survey the two years immediately following construction, indicating no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind farm avoidance could not be collected. A more recent study regarding interactions of elk populations with operating wind farms was recently conducted by David Walter in conjunction with the Rocky Mountain Elk Foundation, the Oklahoma Department of Wildlife Conservation, Nature Works, and the Oklahoma Cooperative Fish and Wildlife Research Unit (Walter et al. 2004). The study found no evidence that operating wind turbines have a measurable impact on elk use of the surrounding area. The operating Wildhorse wind facility, immediately adjacent to the proposed Whiskey Ridge project, has numerous observations of elk near operating wind turbines (WEST biotechnicians, pers. comm..). These observations have noted elk behavior of non-alarm or distress and include resting, grazing, and walking.

There are published studies of big game winter use related to other human developments such as oil and gas. Indirect impacts associated with human activity or development has been documented with elk (e.g., Lyon 1983, Wisdom et al. 1986, Czech 1991, Morrison et al. 1995, Rowland et al. 2000) and mule deer (e.g., Rost and Bailey 1979, Easterly et al. 1992, Merrill et al. 1994, Sawyer et al. 2004). In south-central Montana, Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during, and after the installation of a single oil well within an area used year round by elk. Drilling activities during their study ceased by November 15, however, maintenance activities continued throughout the year. Elk showed no shifts in home range between the pre and post drilling periods, however, elk shifted core use areas out of view from the drill pad during the drilling and post drilling periods. Elk also increased the intensity of use in core areas after drilling and slightly reduced the total amount of range used. It was not clear if the avoidance of the well site during the post-drilling period was related to maintenance activities or to the use of a new road by hunters and recreationists. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

A study by Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 656 ft (200m) of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. Road avoidance was greater where roads were more traveled. Only mule deer showed a clear avoidance of roads in the western portion of their study area, where winter range was assumed to be more limiting. Mule deer also showed greater avoidance of roads in shrub habitats versus more forested areas. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads.

Oregon radio-telemetry studies of elk and mule deer have been conducted in a large fenced experimental research area. Results of spring studies (April – early June) suggest that elk habitat selection may be negatively related to traffic and other human disturbance (Johnson et al. 2000c). Mule deer habitat selection appeared to be related to elk distribution, with mule deer avoiding areas used by elk. Traffic and roads did not appear to be an important factor in spring distribution of mule deer (Wisdom et al. 2002). Distances moved by elk tended to increase as a function of increased use by humans, including ATV use, hiking, and horseback riding. The same was true for mule deer, but the response was less than that of elk (Wisdom et al. 2002). In western Wyoming, a multi-year GPS/radio-telemetry study suggests that winter mule deer habitat selection and distribution patterns have been affected by natural gas development, specifically by road networks and well pads (Sawyer et al. 2004).

We are aware of no studies that have documented population level impacts. Most of the studies have focused on displacement of big game, but have not determined whether these displacement effects result in any significant population level effects such as decreases in survival. Due to the lack of data regarding the potential impacts of energy development on big game, it is difficult to predict with certainty the effects of the Project on wintering mule deer and elk. While human related activity at wind turbines during regular maintenance will be dramatically less than during the construction period, it is not known if human activity associated with regular maintenance activity will exceed tolerance thresholds for wintering elk and mule deer. The Project will have the benefit of being under the spatial umbrella of the Wildhorse project grazing management plan which is designed to support and expand optimal forage production and improved wildlife habitat. This Project area has historically been overgrazed, coordination with WDFW and Wildhorse project personnel may provide ideas for mitigating impacts to wintering big game habitat and wildlife habitat in general.

5.5 Bats

Due to the current lack of understanding of bat communities in North America, the species and relative abundance of bats occurring in the project area are difficult to determine. Little is known about bat species distribution, but several species of bats could occur in the Project area based on the Washington GAP project and inventories conducted on the Hanford Site, Arid Lands Ecology Reserve (ALE) located in Benton County to the south (Table 3). The potential for bats to occur is based on migratory patterns and key habitat elements such as food sources, water, and roost sites. The various springs within the Project area may be used as foraging and watering areas.

Construction: Impacts ***to bats or bat habitat on the site are unlikely during construction.***

Operations: Bat casualties have been reported from most windpower facilities where post-construction fatality data are available. Reported estimates of bat mortality at windpower facilities have ranged from 0.01 – 47.5 per turbine per year (0.9 – 43.2 bats/MW/year) in the U.S. with an average of 3.4 per turbine or 4.6 per MW (NWCC 2004). Most of the bat casualties at windpower facilities to date are non-hibernating migratory species that conduct long-distance migrations between summer breeding and wintering areas, namely the hoary bat, eastern red bat and silver-haired bat (Johnson 2005). A recent report documented from 25–38 bat fatalities per turbine during a 6 week study period at windpower facilities in West Virginia and Pennsylvania. Most of the species killed were eastern red bat, hoary bat, and eastern pipistrelle (Kerns et al. 2005). The West Virginia and Pennsylvania sites are located on prominent forested ridges in the Appalachian Mountains. A large number of hoary and silver-haired bats (532) were also found at a southern Alberta, Canada wind farm in 2005. Unlike the eastern U.S. wind farms with high bat mortality, the Alberta facility is in open grasslands and cropfields, although it is adjacent to foothills along the Rocky Mountains and may be in a bat migration corridor (Rowland 2006). The causes of the relatively high number of migratory bat deaths at windpower facilities are not well understood (Johnson 2005). Kerns et al. (2005) hypothesized that bats may have been attracted to turbines by ultrasound emissions, ephemeral increases in food sources, or bats may have investigated turbines for roosting sites or to glean insects from turbine blades. Researchers also theorized that clearings made in the forest for turbines and roads may have created attractive foraging areas for bats (Kerns et al. 2005).

Unlike the West Virginia and Pennsylvania sites, the proposed project area does not contain topographic features that may funnel migrating bats and is lacking large tracts of forest cover. The proposed project is not located near any large, known bat colonies, thus the majority of bat casualties are likely to be migrants. The proposed project will likely result in the mortality of some bats; however, fatality levels are not expected to reach those observed in the eastern U.S. or Alberta. Existing projects in Washington and Oregon have reported bat mortality near the low end of the national range (i.e., less than 3 bats/turbine/yr). At the Vansycle Ridge Wind Project in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson et al. 2000). At the Klondike Windpower Project, bat mortality was estimated at 1.16 bat fatalities per turbine per year (Johnson et al. 2003). At the Stateline Windpower Project, bat mortality was estimated at approximately 1 to 2 bat fatality per turbine per year (Erickson et al. 2004) from July 2001 through December 31, 2002. At the Nine Canyon Wind Project, bat mortality was estimated at approximately 3 bat fatalities per turbine per year (Erickson et al. 2003). Bat mortality patterns at wind plants in Washington and Oregon have followed patterns similar to the rest of the country. Over 90% of the mortality documented at wind projects in these open habitat projects has been hoary and silver-haired bats. The other mortalities have consisted of occasional big brown bats, little brown bats, and some unidentified bats. The hoary bat is a non-hibernating migratory species with the widest distribution of any bat in North America, ranging from just below the Canadian tree line to South America (Shump and Shump 1982). They are solitary bats that roost primarily in deciduous trees (Barbour and Davis 1969, Nordquist 1997) and occasionally in coniferous trees (Gruver 2002). Silver-haired bats are also migratory (Izor 1979, Kunz 1982, Barclay *et al.* 1988). Historically, silver-haired bats were also believed to be strictly solitary tree bats, but recent studies have documented maternal colonies of silver-haired bats (Barclay *et al.* 1998). Virtually all of the mortality at wind power sites has occurred in late summer and early fall, during the fall migration period for hoary and silver-haired bats.

Although potential future mortality of migratory bats is difficult to predict, an estimate can be calculated based on levels of mortality documented at other wind plants. Using the estimates from other wind plants, operation of the proposed project could result in approximately 20 to 60 bat fatalities per year. Actual levels of mortality are unknown and could be higher or lower depending on regional migratory patterns of bats, patterns of local movements through the area, and the response of bats to turbines, individually and collectively. Bat mortality estimates for the Wildhorse Project will be available in 2008, as well as echolocation data from the Whiskey Ridge project which will be collected concurrently with the Wildhorse avian and bat fatality monitoring research.

5.6 Other Mammals

Other mammals that likely exist within the Project site include, badger, coyote, pocket gopher, ground squirrels (*Spermophilus* species) and other small mammals such as rabbits, voles and mice. Construction of the wind project may affect these mammals on site through loss of habitat and direct mortality of individuals occurring in construction zones. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Road and facility construction will result in loss of foraging and breeding habitat for small mammals. Ground-dwelling mammals will lose the use of the permanently impacted areas; however, they are expected to repopulate the temporarily impacted areas. Some small mammal fatalities can be expected from vehicle activity during operations. Impacts are expected to be very low and not significant.

5.7 Reptiles and Amphibians

Twenty-seven species of reptiles and amphibians occur in Kittitas County and could be present in the project area. Short-horned lizards were observed within the Project area. Other reptiles that may likely occur in the project site include snakes such as the yellow-bellied racer and northern pacific rattlesnake. Amphibian and aquatic reptile habitat is limited within the Project area. Many amphibians migrate short distances during spring or fall breeding periods to and from suitable wetlands and during fall dispersal of juveniles. No migration corridors for reptiles or amphibians are known to be present in the Project area.

Construction: Impacts to reptiles and amphibians on site through loss of habitat and direct mortality of individuals may occur in construction zones. Provided best management practices are employed on site and compliance with applicable permits regarding runoff and sediment control is maintained, no amphibians should be affected by construction or operation of the project. The level of mortality to reptiles on site associated with construction would be based on the abundance of species on site. Some mortality may be expected with common slow-moving reptiles that may occur on site such as short-horned lizards and rattlesnakes. Reptiles that are dormant or using burrows or rock crevices for cover within development corridors may be vulnerable. Excavation for turbine pads, roads, or other Project facilities could kill individuals in underground burrows or rock refuges or hibernacula. While above ground, snakes are likely mobile enough to be less vulnerable to construction equipment, however, short horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some individual lizard fatalities can be expected from vehicle activity.

Operations: No impacts to amphibians are anticipated during operations. Impacts to reptiles during operation are likely limited to some potential direct mortality due to vehicle collisions. While above ground, yellow bellied racers and other snakes are likely mobile enough to escape most vehicles, however, short horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some lizard fatalities may occur from vehicle activity. Post construction monitoring for avian and bat fatalities should also document reptile use within turbine study plots. Snake and lizard observations have been made at other regional wind facilities and populations appear to persist in close association with operating wind turbines.

5.8 Fish

Based on available information, no fish occur in the project area. Provided best management practices are employed on site and compliance with applicable permits regarding runoff and sediment control is maintained, no fish should be affected by construction or operation of the project.

5.9 Threatened, Endangered, and Sensitive (TES) Species

No impacts to federally threatened or endangered species are anticipated from the project. Bald eagle is the only federal threatened or endangered species documented to occur on the project site.

5.9.1 Bald Eagle

Only one bald eagle observation was reported by Erickson et al. (2003) for the Wildhorse baseline study. This winter observation was about 1.5 miles southeast of the proposed project, of an adult flying high over Whiskey Creek. No bald eagle nests were observed during raptor nest surveys. Based on the apparent low use of the project area by bald eagles, impacts to the species are considered negligible. No bald eagle fatalities have been observed at other wind projects, and many have estimated bald eagle use similar or higher than this Project (Erickson *et al.* 2001). Although the risk is low, the potential exists for bald eagle fatalities during operation of the Project. The status of bald eagle in the Project area and range wide is not expected to change due to the Project. Bald eagle populations have been increasing and USFWS has proposed the species for delisting (USFWS 1999). Bald eagle populations in Washington and throughout North America will likely continue to increase during and after the project is constructed.

5.9.2 Golden Eagle

Erickson et al. (2003) reported low use year-round by golden eagles for the Wildhorse baseline study. No active nests were documented during 2002-2003 or 2006 aerial surveys. Golden eagles have nested historically within two miles of the proposed project area. Overall use of the proposed project area by golden eagles is relatively low compared to other wind plants where golden eagle fatalities have been documented. The project is in the northern area of the Great Basin Bird Conservation Region (BCR) which has a population estimated to be approximately twice the size of populations in all three other BCRs east of the cascades (Good et al. 2007). While the potential exists for golden eagles to collide with turbines at the proposed facility, overall risks to golden eagle populations are considered low and only a few individuals are expected to collide with turbines over the life of the project.

5.9.3 Sage Sparrow and Sage Thrasher

Sage sparrows and sage thrashers breed within sagebrush and shrub habitats within the proposed project area. Most sagebrush and other shrub habitats within the project area occur on the sides of ridges and in drainages, while most turbines will be located on ridge tops lacking dense shrub habitats. Observations of breeding individuals indicate that the species generally does not fly within blade height (Erickson et al. 2003). The potential exists for migrating individuals to collide with turbines. Displacment effects from operations my occur with these two species. However, the majority of the proposed turbines are located in sparse shrub-steppe or lithosols, many of the 2006 sage thrasher and sage sparrow observations were away from proposed permanent facilities (Figures 4 and 5; see 'Displacement Effects' section above). Overall impacts to sage sparrow and sage thrasher populations are considered negligible.

5.9.4 Sage Grouse

The project area was used historically by sage grouse (WDFW PHS Data), and is located along the western edge of the Colochum proposed sage grouse management unit (Stinson pers. comm.). The Colochum management unit primarily provides connectivity between the populations with the Yakima Training Center and the Douglas County population. No sage grouse or leks were observed during sage grouse surveys in March and April, 2003 within and surrounding the Wildhorse project. No sage grouse, sage grouse scat, or leks were observed during surveys from March through July, 2006. The nearest known active lek is approximately 7 miles south of the Wildhorse project on the Yakima Training Center. Sage grouse have historically been observed in the Project area, especially in the fall and winter. Broods have been observed in the general vicinity of the Project, suggesting some historical nesting may have occured near the Project. Presence of young broods at the Foote Creek Rim Wind Project suggest nesting has likely occured somewhere near wind turbines, although the nesting location relative to the wind project is not known (WEST, R. Good, pers. comm.). The proposed project is not expected to negatively impact nesting habitat for sage grouse. Given expansive intact shrub-steppe habitat to the east of the proposed project and existing Wildhorse project, the project should not impact connectivity between Douglas County populations and the Yakima and Kittitas County populations.

5.9.5 Peregrine Falcon

The nearest known peregrine eyrie is located approximately 6.5 miles from the Wildhorse project area. No peregrine falcon eyries were located during 2002-2003 or 2006 raptor nest surveys. Cliff habitat is not present within two miles of the project area. Most suitable peregrine falcon nesting habitat is located along the Columbia River and it is unlikely that peregrine falcons will nest within two miles of the project area. Use of the project area by peregrine falcons is likely limited to rare dispersal events or occasional individuals migrating or hunting within the project area. No peregrine falcon observations have been made in the project area during 2002-2003 or 2006 surveys. There is a very low risk over the life of the project that an individual peregrine falcon will collide with turbines.

5.9.6 Burrowing Owl

Although no burrowing owls have been documented within the project area during surveys, burrowing owl breeding areas have been designated by the WDFW 3-4 miles southeast of the Wildhorse project area. The potential exists for breeding burrowing owls to occur within the project area. However, considering the lack of sightings within the project area during 2002-2003 and 2006, burrowing owls likely occur only occasionally within the project area, if at all, and no impacts to burrowing owl populations are expected.

5.9.7 Other Bird Species

The potential range of several other species listed as candidates under the Washington Endangered Species Act overlap with the proposed project, including ferruginous hawk, flammulated owl, merlin, northern goshawk, sharp-tailed grouse, common loon, western grebe, loggerhead shrike, Lewis' woodpecker, white-headed woodpecker, and Vaux's swift (Table 2). The potential exists for these species to occur within the project area, however use of the project area is expected to occur very rarely during migration or dispersal events. The potential exists for a few individuals of each species to collide with turbines over the life of the project. Impacts to populations of these species are not anticipated.

5.9.8 Mammals

The Project occurs within the potential range of several species of federally and state protected mammals, which are unlikely to occur within the Project area due to habitat constraints and/or uncertain population status in Washington. These species include Townsend's big-eared bat, long-legged myotis, and long-eared myotis. These species are not expected to occur within the Project area and no impacts to these species are likely to occur.

Both the white-tailed and black-tailed jackrabbits have been documented within Kittitas County, and suitable habitat for these species is present in the Project area. The potential exists for individuals to be killed by vehicles on roads, and some suitable habitat for these species will be lost to turbine pads and road construction. Limits on vehicle speeds within the Project will minimize the potential for road kills, and the permanent loss of suitable habitat is relatively small. Overall, impacts to these species should be minimal.

Suitable habitat for three bat species, which are listed as federal species of concern, is present within the Project area: fringed myotis, small-footed myotis and Yuma myotis. However, only general descriptions of habitat requirements and potential distribution are available for the three species. Very little is known concerning the ecology of the three species, making it even more difficult to accurately predict potential impacts to these species. To date, we are unaware of any documented fatalities of these species at wind projects within the U.S.

Merriam's shrew has been documented within Kittitas County, and suitable habitat for the species occurs within the Project area. The potential also exists for the brush prairie pocket gopher to occur within the project area. Shallow-soiled sparse shrub-steppe and lithosols of the proposed development area limit the potential for these species to be impacted. Assuming these species are present within the Project development area, the construction of turbine pads and roads, and vehicle traffic has the potential to crush individuals within burrows or moving about above ground. Overall, total impacts to habitat are small and no significant impacts to populations of these species are expected to occur as a result of this Project.

5.9.9 Reptiles and Amphibians

The proposed project area occurs within the potential range of the striped whipsnake, sharptail snake, western toad, and Columbia spotted frog. There is very little suitable habitat for amphibians or aquatic reptiles (e.g., turtles) in the study area. None of these sensitive status reptiles or amphibians were documented on the project site and no impacts are anticipated.

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Table 1. Rare plant species for which surveys were conducted

Scientific Name/ Common Name	Flowering/ Fruiting Period	Status	Habitat	Species Encountered (Yes/No)
Agoseris elata Tall agoseris	June-August	S	Meadows, open woods, and exposed rocky ridgetops	No
Anemone nuttalliana Pasque flower	May-August	S	Prairies to mountain slopes, typically on well-drained soils	No
Astragalus arrectus Palouse milk-vetch	April-July	S	Grassy hillsides, sagebrush flats, river bluffs, and openings in ponderosa pine and Douglas fir forests	No
Astragalus columbianus Columbia milk-vetch	March-June	SOC/T	Sagebrush steppe	No
Astragalus misellus var. pauper Pauper milk-vetch	April-mid June	S	Open ridgetops and slopes	No
Camissonia pygmaea Dwarf evening-primrose	June-August	T	Unstable soil or gravel in steep talus, dry washes, banks and roadcuts	No
Camissonia scapoidea Naked-stemmed evening primrose	May-July	S	Sagebrush desert, typically in sandy, gravelly areas	No
Collomia macrocalyx Bristle-flowered collomia	Late May-early June	S	Dry, open habitats	No
Corydalis aurea Golden corydalis	May-July	R1	Varied habitats, moist to dry and well-drained soils	No
Cryptantha rostellata Beaked cryptantha	Late April-mid June	S	Very dry microsites within sagebrush steppe	No
Cyperus bipartitus Shining flatsedge	August-September	S	Streambanks and other wet, low places in valleys and lowlands	No

Table 1. Rare plant species for which surveys were conducted

Scientific Name/ Common Name	Flowering/ Fruiting Period	Status	Habitat	Species Encountered (Yes/No)
Delphinium viridescens Wenatchee larkspur	July	SOC/T	Moist meadows, moist microsites in coniferous forest, springs, seeps, and riparian areas	No
Eatonella nivea White eatonella	May	T	Dry, sandy or volcanic areas within sagebrush-steppe	No
Erigeron basalticus Basalt daisy	May-June	C/T	Crevices in basalt cliffs on canyon walls	No
Erigeron piperianus Piper's daisy	May-June	S	Dry, open places, often with sagebrush	No
Hackelia hispida var. *disjuncta* Sagebrush stickseed	May-June	S	Rocky talus	No
Iliamna longisepala Longsepal globemallow	June-August	S	Sagebrush steppe and open ponderosa pine and Douglas fir forest	No
Lomatium tuberosum Hoover's desert-parsley	March-early April	SOC/T	Loose talus and drainage channels of open ridgetops within sagebrush steppe	No
Mimulus suksdorfii Suksdorf's monkey-flower	Mid April-July	S	Open, moist to rather dry places in sagebrush steppe	No
Nicotiana attenuata Coyote tobacco	June-September	S	Dry, sandy bottom lands, dry rocky washes, and other dry open places	No
Oenothera cespitosa ssp. *cespitosa* Cespitose evening-primrose	Late April-mid June	S	Open sites on talus or other rocky slopes, roadcuts, and the Columbia River terrace	No
Pediocactus simpsonii var. *robustior* Hedgehog cactus	May-July	R1	Desert valleys and low mountains	Yes

Table 1. Rare plant species for which surveys were conducted				
Scientific Name/ Common Name	**Flowering/ Fruiting Period**	**Status**	**Habitat**	**Species Encountered (Yes/No)**
Pellaea breweri Brewer's cliff-brake	April-August	S	Rock crevices, ledges, talus slopes, and open rocky soils	No
Penstemon eriantherus var. *whitedii* Fuzzytongue penstemon	May-July	R1	Dry open places	No
Phacelia minutissima Least phacelia	July	SOC/S	Moist to fairly dry open places	No
Pyrrocoma hirta var. *sonchifolia* Sticky goldenweed	July-August	R1	Meadows and open or sparsely wooded slopes	No
Silene seelyi Seely's silene	May-August	SOC/T	Shaded crevices in ultramafic to basaltic cliffs and rock outcrops, and among boulders in talus	No
Tauschia hooveri Hoover's tauschia	March-April	SOC/T	Basalt lithosols within sagebrush steppe with low veg cover, bare rock and gravel prominent; flat microsites	No

Federal Status:
LT = Listed Threatened. Likely to become endangered
C = Candidate species. Sufficient information exists to support listing as Endangered or Threatened
SOC = Species of Concern. An unofficial status, the species appears to be in jeopardy, but insufficient information to support listing

State Status:
E = Endangered. In danger of becoming extinct or extirpated in Washington
T = Threatened. Likely to become Endangered in Washington
S = Sensitive. Vulnerable or declining and could become Endangered or Threatened in the state
R1 = State Review Group 1. Taxa for which there is insufficient data to support listing in Washington as Threatened, Endangered, or Sensitive

Table 2. Species of special status documented as occurring or likely to occur within the vicinity of the project area.

Group/Species	Status[a]	Notes
Mammals		
black-tailed jack rabbit (*Lepus californicus*)	SC	Documented as occurring near the project area. The species is likely to occur within the project area due to the presence of suitable sagebrush and shrub habitats.
white-tailed jack rabbit (*Lepus townsendi*)	SC	Documented as occurring near the project area. The species is likely to occur within the project area due to the presence of suitable sagebrush and shrub habitats.
brush prairie pocket gopher (*Thomomys talpoides douglasi*)	SC	Project occurs within the potential range of the species. No individuals have been documented near the project area.
Merriam's shrew (*Sorex merriami*)	SC	Project occurs within the potential range of the species. No individuals have been documented near the project area.
Townsend's big-eared bat (*Coryhorhinus townsendii*)	SC	Project occurs within the potential range of the species. No individuals have been documented near the project area.
Amphibians and Reptiles		
Columbia spotted frog (*Rana luteiventris*)	SC	The proposed project area occurs within the potential range for the species. Impacts to wetlands and springs on the project are not anticipated and no impacts to the species are anticipated.
western toad (*Bufo boreas*)	SC	The proposed project area occurs within the potential range for the species. Impacts to wetlands and springs on the project are not anticipated and no impacts to the species are anticipated.
sharptail snake (*Contia tenuis*)	SC	The proposed project area occurs within the potential range for the species. No impacts are anticipated, see section 5.9.
striped whipsnake (*Masticophis taeniatus*)	SC	The proposed project area occurs within the potential range for the species. No impacts are anticipated, see section 5.9.
Raptors		
bald eagle (*Haliaeetus leucocephalus*)	ST FT	See section 5.9.
golden eagle (*Aquila chrysaetos*)	SC	See section 5.9.
peregrine falcon (*Falco peregrinus*)	SS	See section 5.9.
burrowing owl (*Athene cunicularia*)	SC	See section 5.9.
ferruginous hawk (*Buteo regalis*)	ST	One possible sighting during 2006 TES surveys. The species is considered a rare migrant and potential breeder within the project area. No ferruginous hawks were observed during the 2002-2003 avian use study (Erickson et. al 2003a). No impacts to the species are anticipated.
merlin (*Falco columbarius*)	SC	Two merlin observations were made during the 2002-2003 avian use study (Erickson et al 2003a). The species is considered a rare transient through the project area and is not likely to breed within the project area. No impacts are expected.

Table 2. Species of special status documented as occurring or likely to occur within the vicinity of the project area.

Group/Species	Status[a]	Notes
flammulated owl (*Otus flammeolus*)	SC	The proposed project occurs within the potential range of flammulated owls. Suitable habitat exists for the species within patches of conifer within and to the north of the project area. If flammulated owls occur within the proposed project area, a low potential exists for the species to collide with turbines. Only one flammulated owl has been documented as a fatality at wind plants within the U.S. (Erickson et al. 2001).
northern goshawk (*Accipiter gentiles*)	SC	Two observations of two individuals were made within the project area during the winter of 2002 – 2003 (Erickson et al 2003a). Overall use of the project area by breeding northern goshawks appears to be relatively low, and no impacts to the species are anticipated.
Grouse		
sage grouse (*Centrocercus urophasianus*)	ST	The proposed project area occurs within a mapped area of historic high use. One documented lek is present approximately 2.75 miles from a proposed southern transmission route. No sage grouse or leks were observed during fixed point or lek surveys within the proposed project area, although pellets were found incidentally on the south side of Whiskey Dick Mountain in the fall. Although used historically, the proposed project area is not currently occupied used by sage grouse for leks and no impacts to the species are anticipated.
sharp-tailed grouse (*Tympanuchus phasianellus*)	ST	The WDFW has one record of a sharp-tailed grouse sighting from 1981 approximately 4 – 6 miles from the Wildhorse project. No sharp-tailed grouse were observed during surveys. It is very unlikely that the species occupies the proposed project area and no impacts are expected.
Waterbirds / Waterfowl		
common loon (*Gavia immer*)	SS	Common loons are considered a rare migrant through the project area. No loons were observed during surveys, and no impacts to the species are anticipated.
western grebe (*Aechmophorus occidentalis*)	SC	Western grebes are considered a rare migrant through the project area. No grebes were observed during surveys, impacts are considered unlikely and rare.
Songbirds		
Lewis' woodpecker (*Melanerpes lewis*)	SC	The proposed project occurs within the potential range of the Lewis' woodpecker. Suitable habitat exists for the species within patches of conifer within and to the north of the project area. No Lewis' woodpeckers were observed during surveys, but individuals may migrate through the area. Impacts are unlikely.
white-headed woodpecker (*Picoides albolarvatus*)	SC	The proposed project occurs within the potential range of the Lewis' woodpecker. Suitable habitat exists for the species within patches of conifer within and to the north of the project area. No Lewis' woodpeckers were observed during surveys,

Table 2. Species of special status documented as occurring or likely to occur within the vicinity of the project area.

Group/Species	Status[a]	Notes
		but individuals may migrate through the area. Impacts are unlikely.
loggerhead shrike (*Lanius ludovicianus*)	SC	Three observations totaling four individuals were observed within the project area during the spring of 2002 and 2003. An additional observation was made during 2006 surveys. Use of the project area by breeding loggerhead shrikes appears to be relatively low, and low impact to the species are anticipated.
sage sparrow (*Amphispiza belli*)	SC	See section 5.9.
sage thrasher (*Oreoscoptes montanus*)	SC	See section 5.9.
Vaux's swift (*Chaetura vauxi*)	SC	The proposed project area occurs within the potential range of the Vaux's swift. No individuals were observed during surveys. The potential exists for migrating individuals to collide with turbines, however, the overall risk to the species is considered low.

[a] FE Federal Endangered,
FT Federal Threatened
FC Federal Candidate
FSC Federal Species of Concern
SE State Endangered
ST State Threatened
SC State Candidate

Table 3. Potential occurrence of bat species in the Project area.

Common Name and Scientific Name	Typical Habitat	Expected Occurrence in Project Area	Occurrence Documentation
California bat *Myotis californicus*	Generally found in open habitats where it forages along tree edges, riparian areas, open water; roosts in cliffs, caves, trees	Possible; documented on ALE	WA GAP Analysis Project[a], 1999; England, 2000; Fitzner and Gray, 1991
small-footed myotis *Myotis ciliolabrum*	Varied arid grass/shrublands, ponderosa pine and mixed forests; roosts in crevices and cliffs; hibernates in caves, mines	Possibe; documented on ALE	WA GAP Analysis Project, 1999; England ,2000; West *et al.*, 1998, 1999
long-eared myotis *Myotis evotis*	Primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts snags, crevices, bridges, buildings, mines	Unlikely due to habitat; not documented on ALE	WA GAP Analysis Project, 1999; England, 2000; TNC, 1999
little brown bat *Myotis lucifugus*	Closely associated with water; riparian corridors; roosts buildings, caves, hollow trees; hibernates in caves	Possible; documented on ALE	WA GAP Analysis Project, 1999; England, 2000; West *et al.*, 1998, 1999
fringed myotis *Myotis thysanodes*	Primarily forested or riparian habitats; roosts buildings, trees; hibernates in mines and caves	Possible in suitable habitat; not documented on ALE	WA GAP Analysis Project, 1999; England, 2000; TNC, 1999
long-legged myotis *Myotis volans*	Coniferous and mixed forests, riparian areas; roosts caves, crevices, buildings, mines	Possible in suitable habitat; documented on ALE	WA GAP Analysis Project, 1999; England, 2000; Fitzner and Gray, 1991
yuma myotis *Myotis ymanensis*	Closely associated with water; varied habitats: riparian, shrublands, forests woodlands; roosts in mines, buildings, caves, bridges	Possible; documented on ALE	WA GAP Analysis Project, 1999; England, 2000; West *et al.*, 1998, 1999
hoary bat *Lasiurus cinereus*	Forested habitats, closely associated with trees; roosts in trees; migratory species	Possible in suitable habitat; probable migrant; documented on ALE	WA GAP Analysis Project, 1999; England, 2000; West *et al.*, 1998, 1999
silver-haired bat *Lasionycteris noctivagans*	Forested habitats; generally coniferous forests; roosts under bark; believed to be a migratory species	Possible in suitable habitat; probable migrant; documented on ALE	WA GAP Analysis Project, 1999; England, 2000; West *et al.*, 1998, 1999

Table 4. Project and turbine characteristics of six regional wind energy facilities where fatality monitoring studies are or have been conducted.

	Project Size		Turbine Characteristics			
Wind Project	# Turbines	# MW	RD (m)	Tip Height (m)	RSA m^2	MW/turbine
Pacific Northwest						
Stateline, OR/WA	454	300	47	74	1735	0.66
Vansycle, OR	38	25	47	74	1735	0.66
Klondike, OR Phase I	16	24	65	100	3318	1.50
Nine Canyon, WA Phase I	37	48	62	91	3019	1.30
Nine Canyon, WA Phase II	12	20	62	91	3019	1.30
Combine Hills, OR	41	41	61	84	2961	1.00

Table 5. Pacific Northwest regional annual fatality estimates on a per turbine,and per MW nameplate basis for all birds and for all raptors.
The Combine Hills project monitoring and results are not publicly available.

	Bird Fatality Rates		Raptor Fatality Rates	
Pacific Northwest Wind Project	#/ Turbine	#/ MW	#/ Turbine	#/ MW
Stateline, OR/WA	1.9	2.9	0.06	0.09
Vansycle, OR	0.6	1.0	0.00	0.00
Klondike, OR, Phase II	1.4	0.9	0.00	0.00
Nine Canyon, WA Phase I	3.6	2.8	0.07	0.05
Average	**1.9**	**1.9**	**0.03**	**0.04**

Table 6. Number and species composition of bird fatalities found at the Pacific Northwest regional wind facilities
(Johnson et al,. 2002; Erickson et al., 2000; Erickson et al., 2001; Erickson et al., 2003; Erickson et al., 2004).
N = Non-native species.

Species	% Composition	Number of Fatalities
horned lark	37.5	107
ring-necked pheasant (N)	9.1	26
golden-crowned kinglet	7.7	22
western meadowlark	4.9	14
gray partridge (N)	4.2	12
White-crowned sparrow	3.9	11
chukar (N)	3.5	10
red-tailed hawk	3.2	9
European starling (N)	2.5	7
American kestrel	2.1	6
unidentified passerine	2.1	6
yellow-rumped warbler	1.8	5
winter wren	1.8	5
Canada goose	1.1	3
dark-eyed junco	1.1	3
unidentified bird	1.1	3
House wren	1.1	3
unidentified sparrow	0.7	2
short-eared owl	0.7	2
savannah sparrow	0.7	2
ruby-crowned kinglet	0.7	2
rock dove (N)	0.7	2
vesper sparrow	0.7	2
White-throated swift	0.7	2
golden-crowned sparrow	0.7	2
red-breasted nuthatch	0.7	2
great blue heron	0.7	2
red-winged blackbird	0.4	1
black-billed magpie	0.4	1
ferruginous hawk	0.4	1
grasshopper sparrow	0.4	1
American pipit	0.4	1
Mallard	0.4	1
Swainson's thrush	0.4	1
Swainson's hawk	0.4	1
spotted towhee	0.4	1
northern flicker	0.4	1
Lewis's woodpecker	0.4	1
Macgillivray's warbler	0.4	1
House finch	0.4	1
Rough-legged hawk	0.4	1
Virginia rail	0.4	1
Total	**100.0**	**287**

Table 7. Estimated raptor nest densities from other regional proposed and existing wind projects.

	Raptor Nest Density (#/mi^2)							
Project Site	all raptors	SWHA	RTHA	FEHA	GOEA	PRFA	GHOW	SSHA
Biglow OR	0.15	0.04	0.08	0.00	0.00	0.00	0.02	0.00
Klondike OR	0.16	0.04	0.08	0.00	0.00	0.00	0.04	0.00
Stateline OR/WA	0.21	0.03	0.08	0.03	0.00	0.00	0.07	0.00
Nine Canyon, WA	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zintel Canyon, WA	0.08	0.04	0.02	0.02	0.00	0.00	0.00	0.00
Buffalo Ridge, MN	0.15	0.07	0.06	0.01	0.00	0.00	0.02	0.00
Klickitat County, WA	0.12	0.00	0.09	0.00	0.00	0.01	0.03	0.00
Combine Hills, OR	0.24	0.06	0.11	0.01	0.00	0.00	0.00	0.00
Columbia Hills, WA	0.30	0.04	0.18	0.00	0.02	0.02	0.02	0.02
Ponnequin, CO	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Hopkins Ridge, WA	0.43	0.01	0.27	0.01	0.00	0.00	0.08	0.00
Maiden, WA	0.18	0.05	0.04	0.03	0.00	0.03	0.02	0.00
AVERAGE	0.18	0.04	0.08	0.01	0.00	0.00	0.02	0.00

Figure 1. Map of Whiskey Ridge project area with 2-mi project area buffer. The 2-mi buffered area around the Wild Horse Project is shown in grey and was surveyed for raptor nests in 2003.

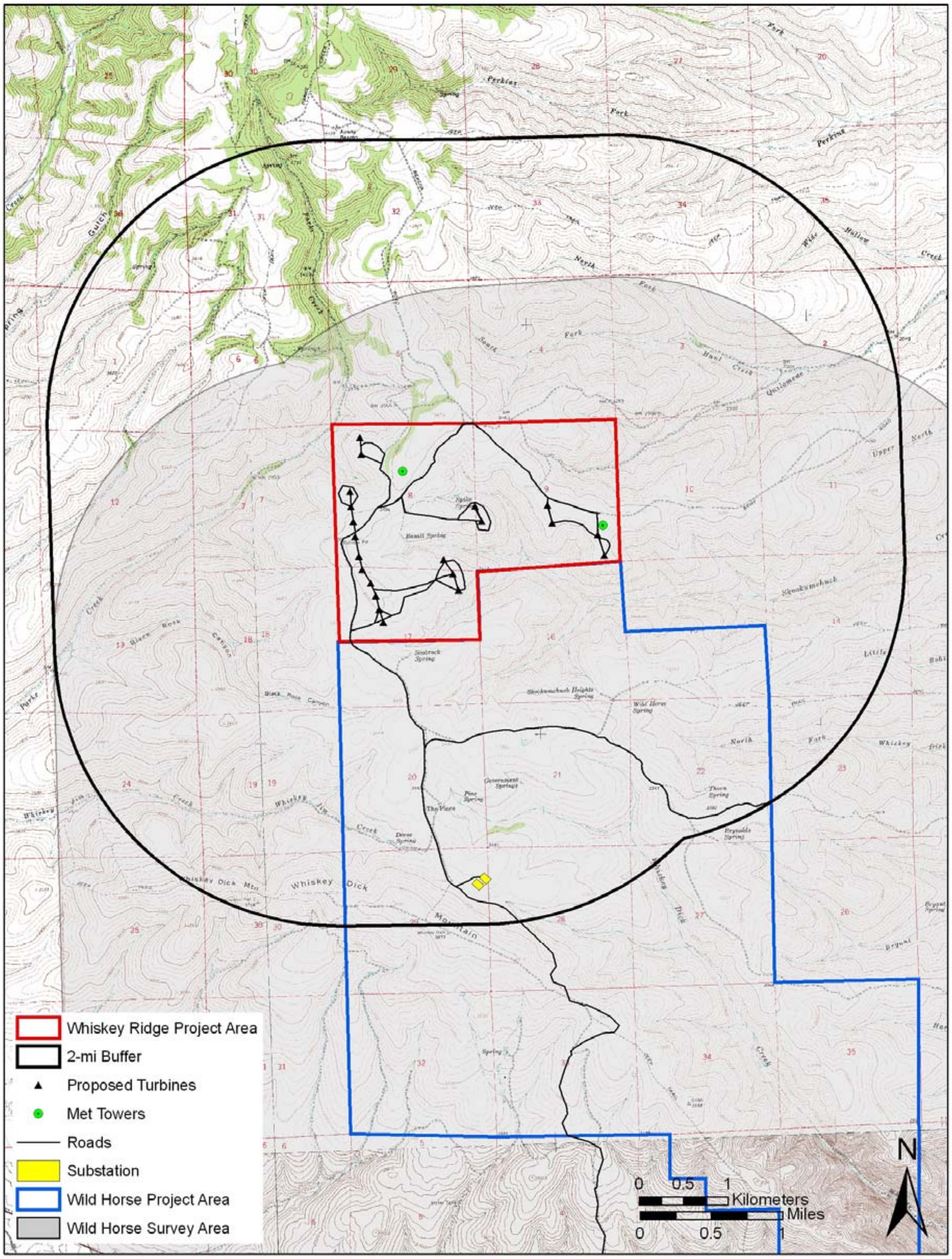


Figure 2. Location of Wild Horse Wind Power Project boundary and avian observation points in relation to the Whiskey Ridge Project area.

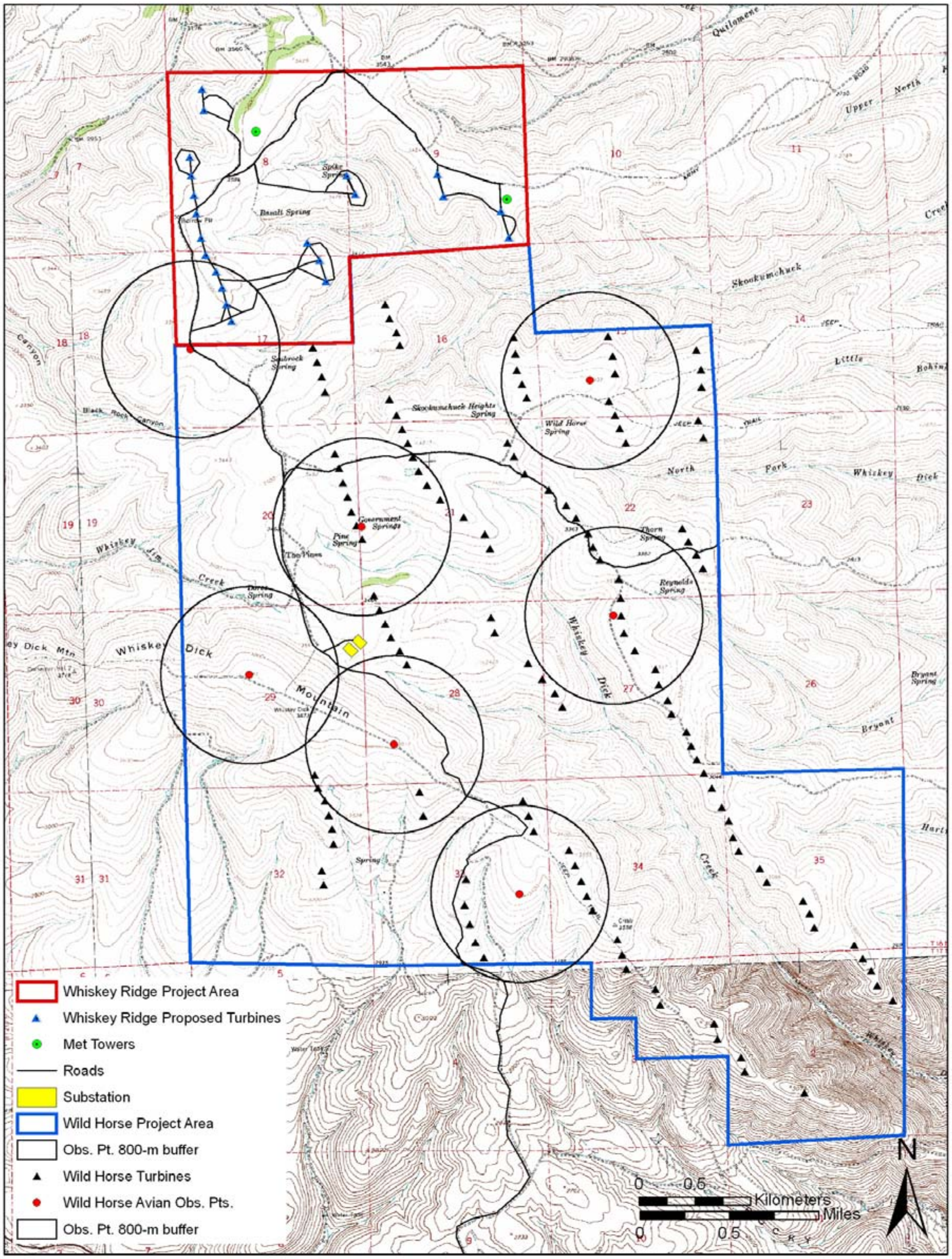


Figure 3. Aerial flight path for the 2007 raptor nest survey.

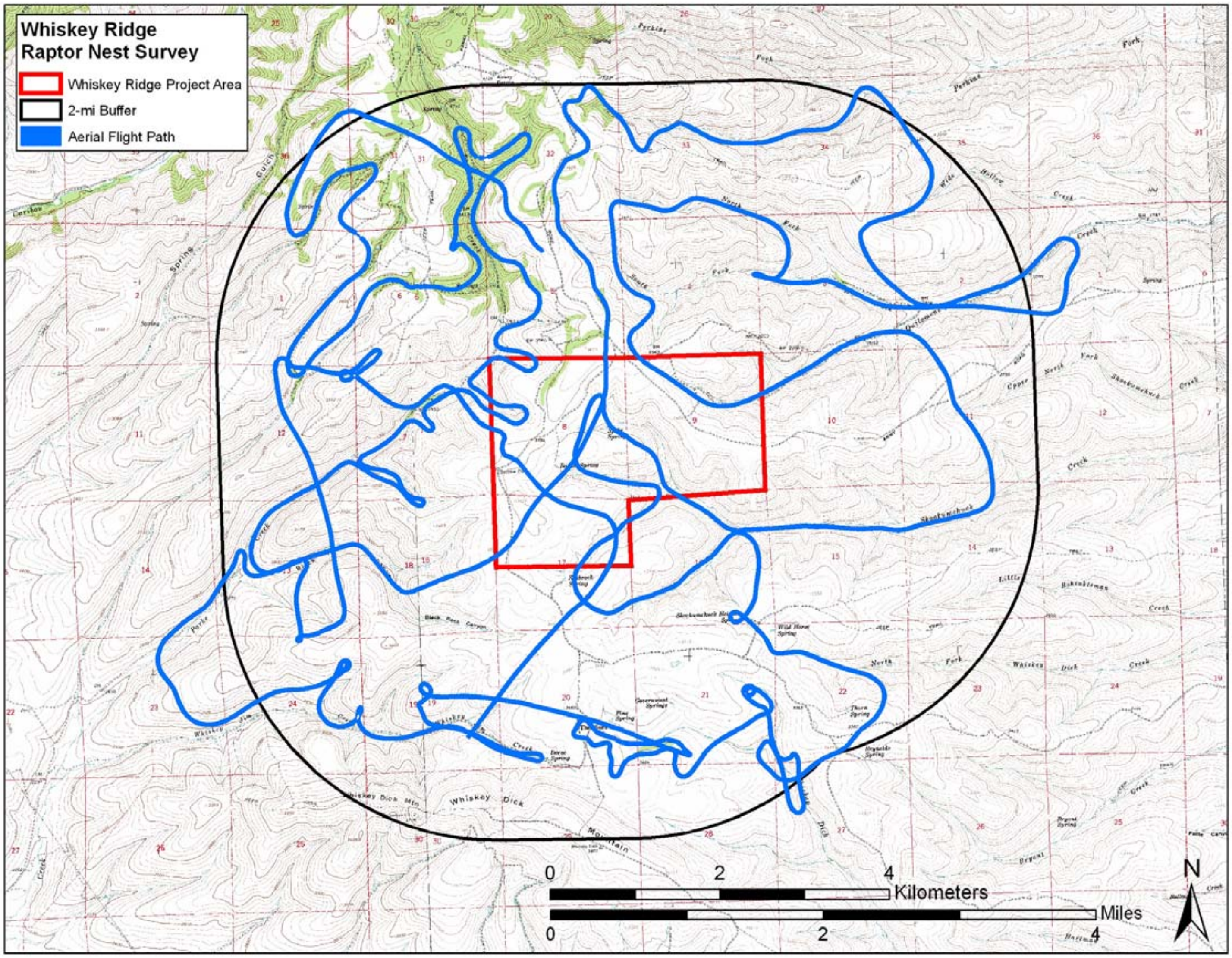


Figure 4. Habitat and hedgehog cactus (*Pediocactus simpsonii*) populations for the proposed Whiskey Ridge Project development area.

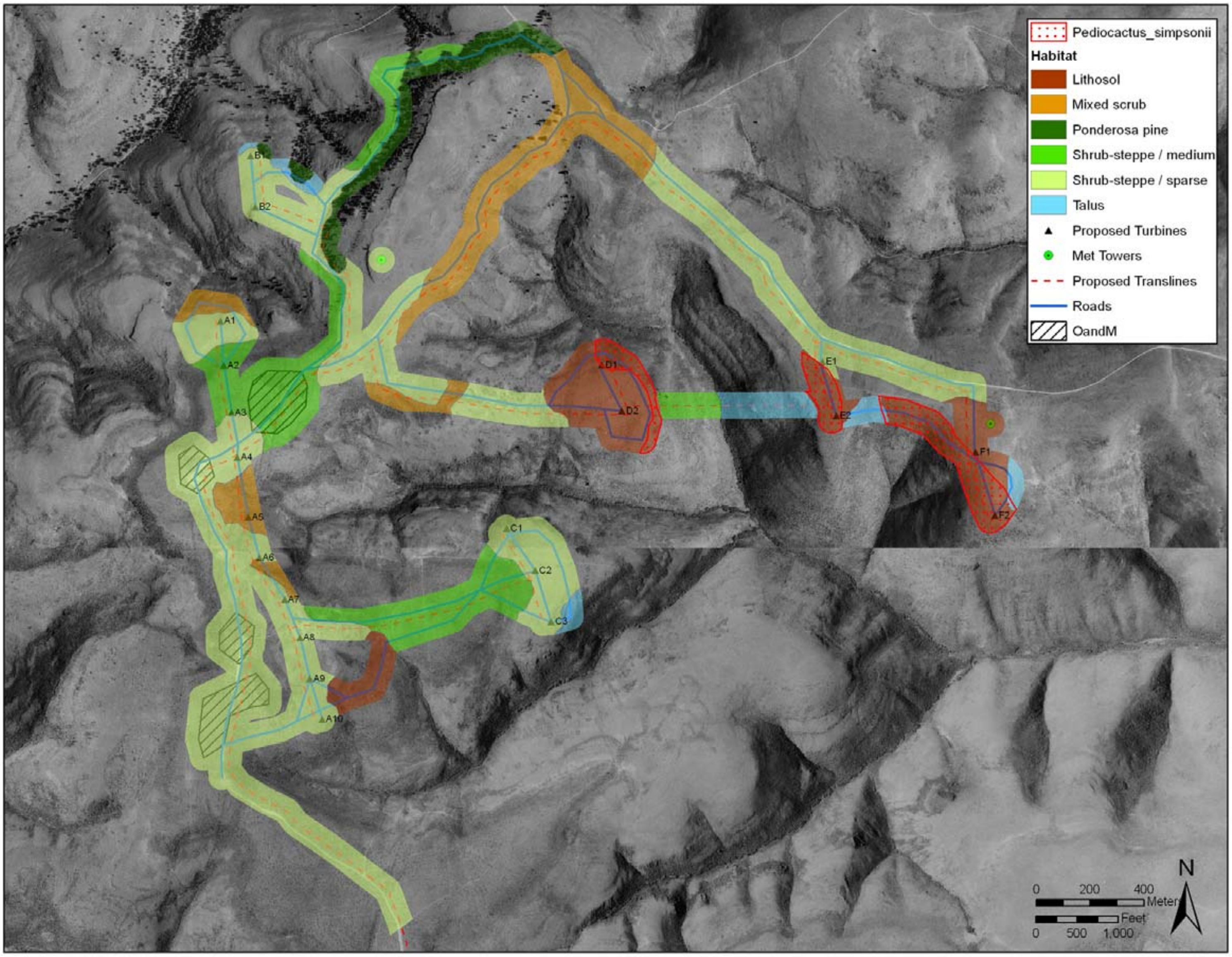
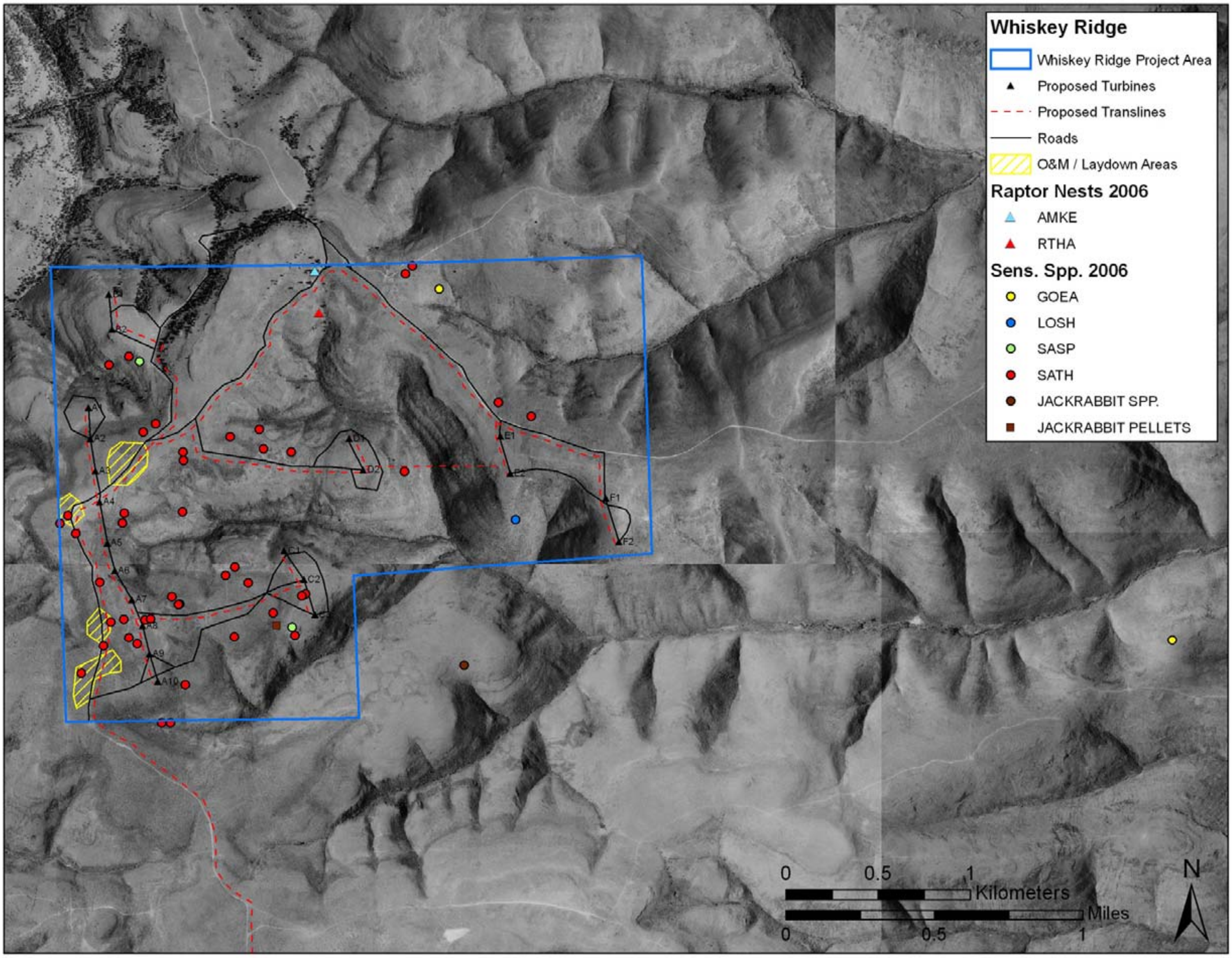


Figure 5. Raptor nests and threatened, endangered, and sensitive wildlife species for the proposed



Whiskey Ridge Project development area; surveys conducted 2006.

Figure 6. Aerial flight path for the first sage grouse lek survey, 24 March, 2006.

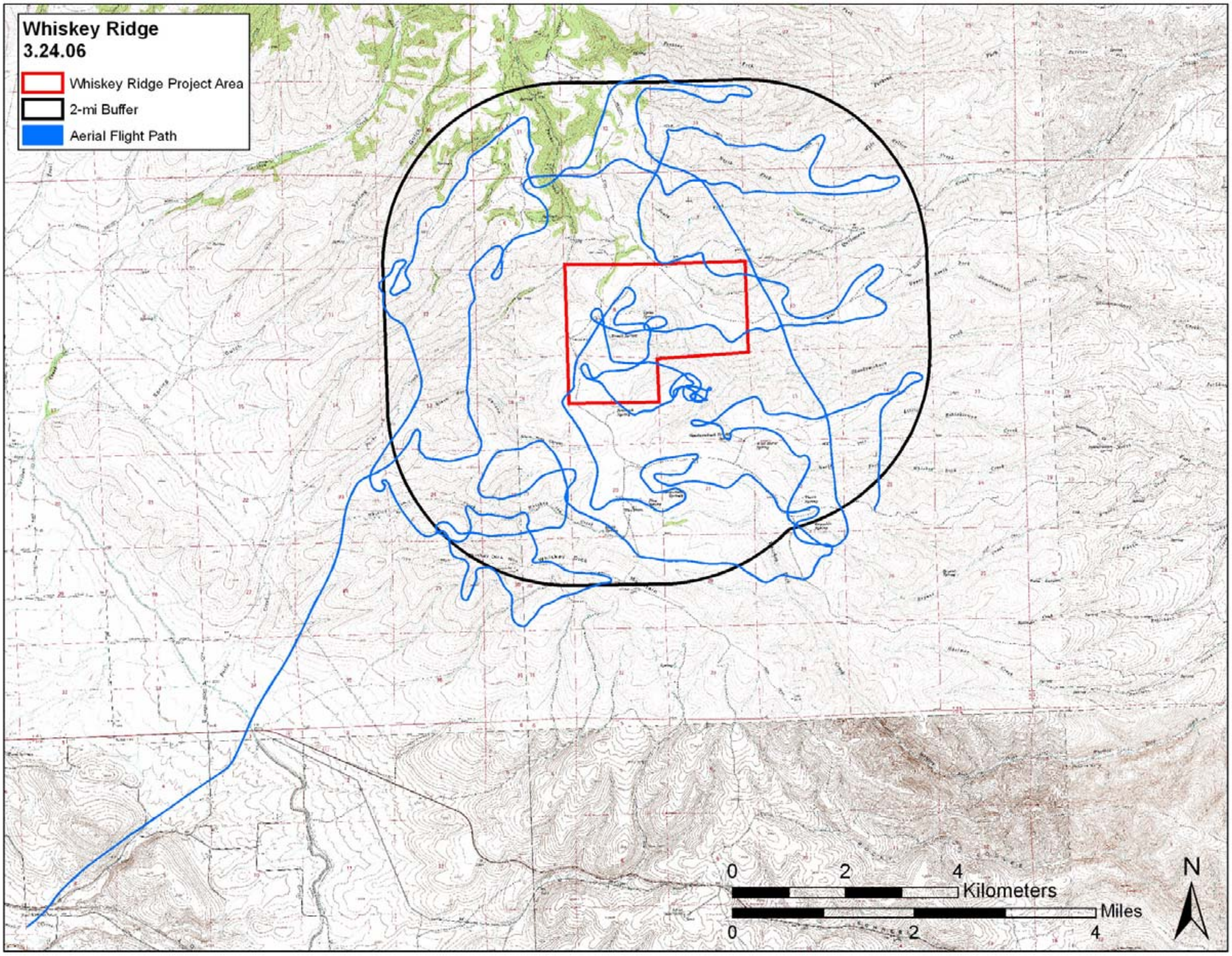
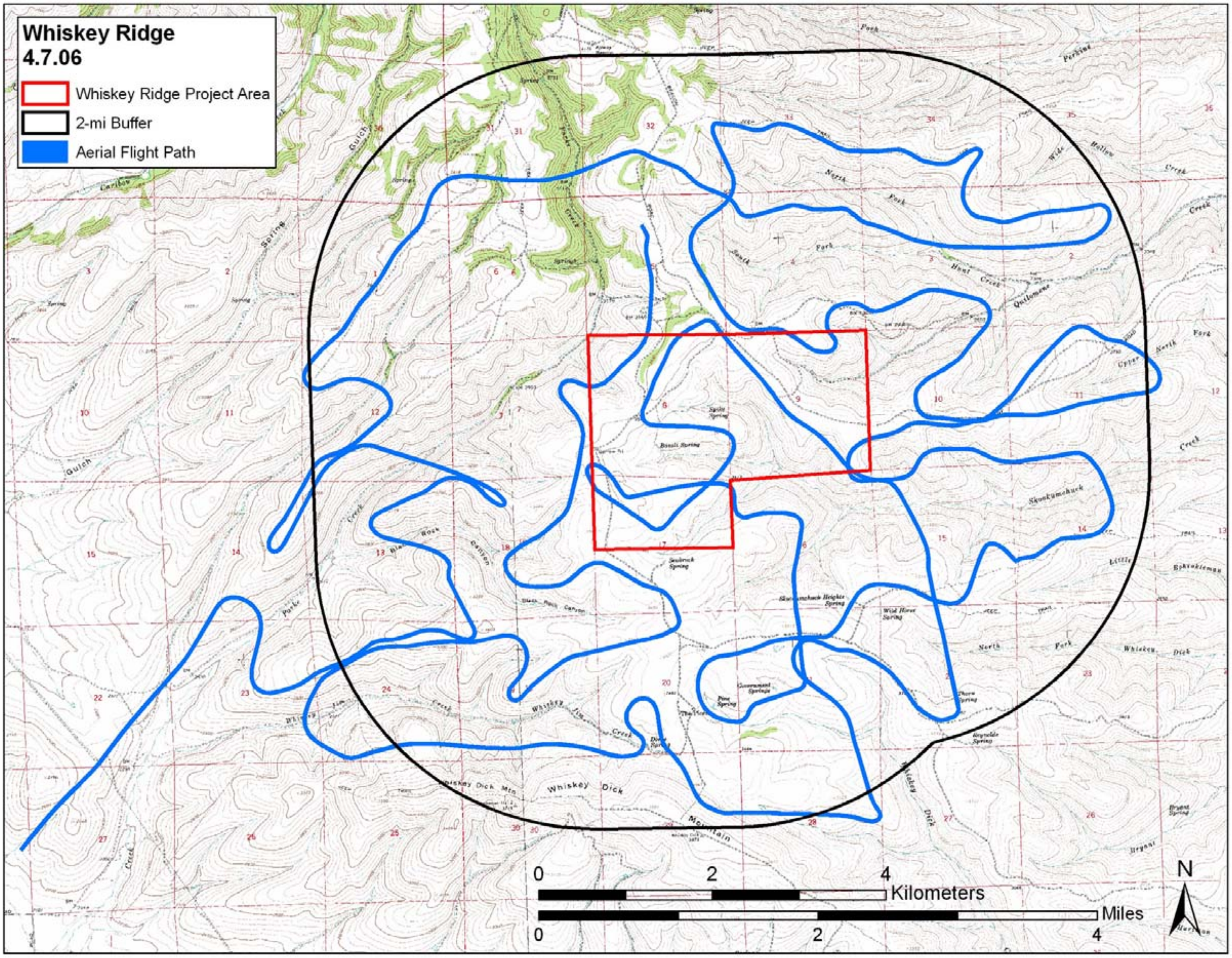


Figure 7. Aerial flight path for the second sage grouse lek survey, 7 April, 2006.



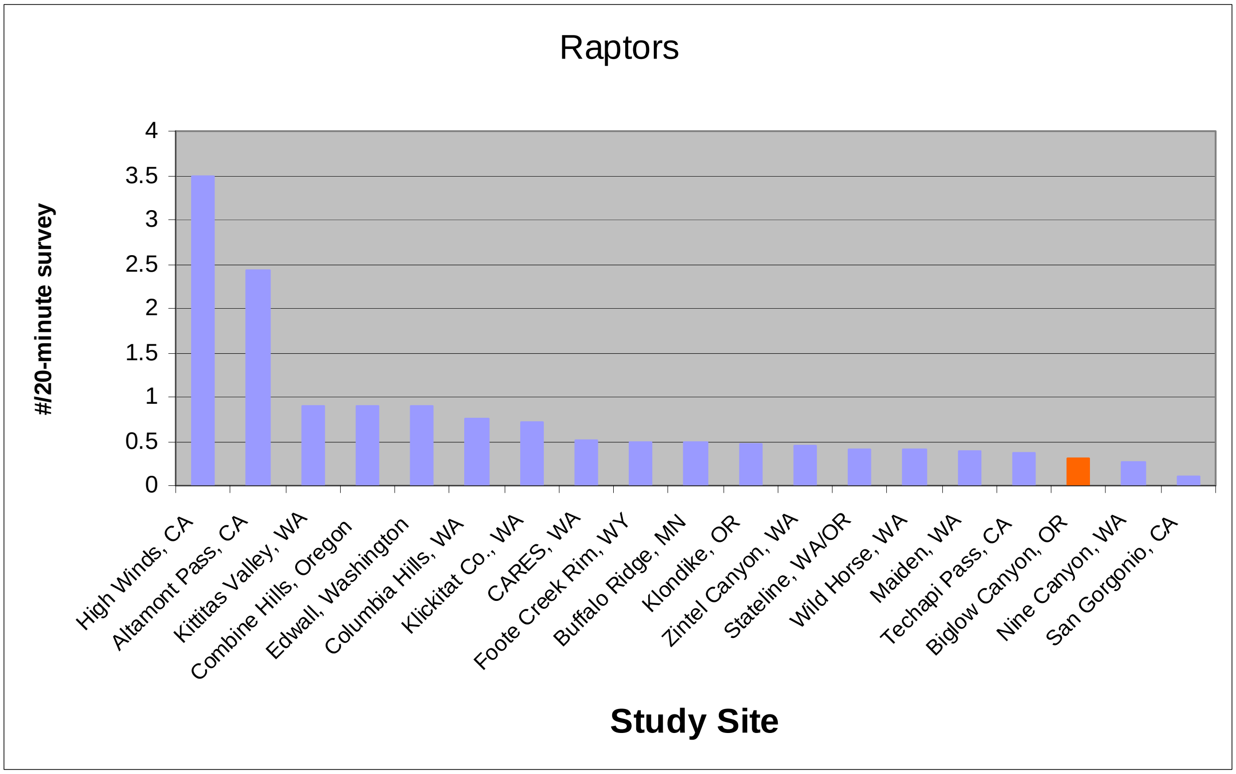


Figure 8. Raptor use estimates from at projects in the West and Midwest that have used similar methods of data collection.

Appendix A. List of Vascular Plant Species Encountered During the 2006 Whiskey Ridge Wind Project Rare Plant Surveys

Family	Scientific Name	Common Name
APIACEAE	*Lomatiun canbyi*	Canby's lomatium
	Lomatium dissectum	fern-leaved lomatium
	Lomatium macrocarpum	large-fruited lomatium
	Lomatium grayi	Gray's desert parsley
	Lomatium gormanii	salt and pepper
	Lomatium spp.	lomatium
	Osmorhiza sp.	sweet-root
ASTERACEAE	*Achillea millefolium*	common yarrow
	Agoseris sp.	agoseris
	Antennaria dimorpha	low pussytoes
	Antennaria spp.	pussytoes
	Artemisia rigida	stiff sagebrush
	Artemisia tridentata	big sagebrush
	Balsamorhiza sagittata	arrow-leaf balsamroot
	Balsamorhiza hookeri	Hooker's balsamroot
	Centaurea sp.	knapweed
	Chaenactis sp.	chaenactis
	Cirsium sp.	thistle
	Ericameria nauseosa ssp. *nauseosa*	gray rabbitbrush
	Erigeron sp.	fleabane
	Madia sp.	tarweed
	Senecio integerrimus	western groundsel
	Stenotus stenophyllus	woolly goldenweed
	Taraxacum officinale	common dandelion
	Tragopogon dubius	yellow salsify
BORAGINACEAE	*Amsinckia* sp.	fiddleneck
	Cryptantha spp.	cryptantha
	Lithospermum ruderale	Columbia puccoon
	Mertensia longiflora	long-flowered bluebells
BRASSICACEAE	*Arabis* sp.	rockcress
	Chorispora tenella	blue mustard
	Descurainia sp.	tanseymustard
	Erysimum asperum	rough wallflower
	Sisymbrium altissimum	tumble mustard
CACTACEAE	*Pediocactus simpsonii*	hedgehog cactus
CAPRIFOLIACEAE	*Sambucus nigra* ssp. *cerulea*	blue elderberry
	Symphoricarpos oreophilus var. *utahensis*	mountain snowberry
CARYOPHYLLACEAE	*Silene* sp.	silene
CHENOPODIACEAE	*Salsola kali*	Russian thistle
CRASSULACEAE	*Sedum sp.*	stonecrop
CRUCIFERAE	*Phoenicaulis cheiranthoides*	dagger-pod

Family	Scientific Name	Common Name
FABACEAE	*Astragalus* spp.	milkvetch
	Astragalus purshii	wooly-pod milkvetch
	Lupinus argenteus	silver lupine
	Trifolium macrecephalum	big-headed clover
	Vicia americana	American vetch
GROSSULARIACEAE	*Ribes aureum*	golden currant
	Ribes cereum	squaw currant
HYDRANGEACEAE	*Holodiscus* sp.	oceanspray
HYDROPHYLLACEAE	*Phacelia linearis*	threadleaf phacelia
	Phacelia sp.	phacelia
IRIDACEAE	*Iris missouriensis*	western blue flag
LAMIACEAE	*Salvia dorrii*	purple sage
LILIACEAE	*Allium* spp.	onion
	Calochortus spp.	mariposa
	Fritillaria pudica	yellow bell
	Maianthemum sp.	Solomon-plume
	Triteleia douglasii	Douglas' triteleia
	Zigadenus venenosus	death camas
ONOGRACEAE	*Epilobium* sp.	Willow herb
PINACEAE	*Pinus ponderosa*	ponderosa pine
POACEAE	*Bromus tectorum*	cheatgrass
	Festuca idahoensis	Idaho fescue
	Poa bulbosa	bulbous bluegrass
	Poa pratensis	Kentucky bluegrass
	Poa secunda	Sandberg's bluegrass
	Pseudoroegneria spicata	blue-bunch wheatgrass
POLEMONIACEAE	*Collomia grandiflora*	large flowered collomia
	Gilia aggregata	scarlet gilia
	Phlox hoodii	Hood's phlox
	Phlox longifolia	long-leaf phlox
POLYGONACEAE	*Eriogonum douglasii*	Douglas' buckwheat
	Eriogonum ovalifolium	cushion buckwheat
	Eriogonum sphaerocephalum	round-headed desert buckwheat
	Eriogonum sp.	Buckwheat
	Rumex acetosella	field sorrel
PORTULACACEAE	*Lewisia rediviva*	bitterroot
	Talinum spinescens	spiny fameflower
	Claytonia lanceolata	spring beauty
PRIMULACEAE	*Dodecatheon sp.*	shooting star
RANUNCULACEAE	*Delphinium nuttallianum*	larkspur
	Ranunculus testiculatus	hornseed buttercup
RHAMNACEAE	*Ceanothus velutinus*	snowbrush
ROSACEAE	*Amelanchier alnifolia*	serviceberry
	Crataegus douglasii	black hawthorn
	Geum triflorum	old man's whiskers
	Prunus virginiana	chokecherry

Family	Scientific Name	Common Name
	Purshia tridentata	bitterbrush
	Rosa woodsii	Wood's rose
SANTALACEAE	*Comandra umbellata*	bastard toad flax
SAXIFRAGACEAE	*Lithophragma* sp.	Lithophragma
SCROPHULARIACEAE	*Castilleja thompsonii*	Thompson's paintbrush
	Castilleja sp.	Paintbrush
	Penstemon gairdneri	Gairdner's penstemon
	Penstemon spp.	penstemon
VIOLACEAE	*Viola trinervata*	sagebrush violet