CUMULATIVE IMPACTS ANALYSIS FOR AVIAN AND OTHER WILDLIFE RESOURCES FROM PROPOSED WIND PROJECTS IN KITTITAS COUNTY, WASHINGTON

FINAL REPORT

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1.0 BACKGROUND AND INTRODUCTION

In recent years there has been a surge of interest in wind power development in Kittitas County, Washington. Potential impacts to natural resources, and in particular avian resources, are often of concern with proposed wind developments. Wind power proposals are commonly scrutinized by natural resource agencies and private conservation groups. Frequently, extensive baseline studies are conducted at proposed development sites to gather site specific information used in the overall impact assessment and siting of the project.

Currently, two different developers have proposed construction of three projects within the county. The three proposed projects are: (1) the Kittitas Valley Wind Project (KVWP), (2) the Desert Claim Wind Project (DCWP), and (3) the Wild Horse Wind Project (WHWP) (Figure 1). The DCWP has been proposed by Desert Claim Wind Power, LLC, wholly owned and operated by enXco, Inc. The KVWP is proposed by Sagebrush Power Partners, LLC and the WHWP is proposed by Wind Ridge Power Partners, LLC both of which are owned and operated by Zilkha Renewable Energy. As currently proposed the KVWP would be either 121 or 151 turbines (181 MW capacity), the DCWP would be 120 turbines (180 MW capacity), and the WHWP would be approximately 120 turbines (up to 249 MW capacity). For all three projects combined a total of approximately 361 to 391 turbines are proposed for Kittitas County. The actual number of turbines developed could vary based on a number of factors including turbine model selected, electricity markets, transmission constraints, and results of site surveys and permitting requirements.

The analysis presented in this report is based on the three projects proposed in Kittitas County. The total study area using the lease area boundaries of the three projects is approximately 17,000 acres (26 mi^2). Over the past one to two years the avian resources at each of these sites has been studied in detail. A one-year baseline study for the DCWP was completed in March 2003. Results of this study are reported in Young et al. (2003a). The KVWP site was studied from February to November, 2002 and January to March 2003 and results are presented in Erickson et al. (2003a). Studies of the WHWP site took place from May to June 2002 and September 2002 to May 2003; Erickson et al. (2003b). The three baseline studies were similar in field surveys and methods. For avian resources, point count stations were established on all three sites from which approximately weekly surveys were conducted during the respective study periods. Raptor nest surveys were conducted at all three sites within an area encompassed by a two-mile buffer around each project-specific study area. For the KVWP and DCWP, winter roadside surveys for bald eagles were conducted from routes that dissected and were near the individual project sites. For all three study areas, observations of big game animals (deer and elk) also were recorded during the standardized bird surveys and incidentally while observers were on site, and surveys for sensitive plant species and vegetation mapping were conducted. Detailed descriptions of the methods and data analyses for each project-specific study are reported in the respective baseline study reports. Please refer to those studies for additional information.

This report provides a cumulative impacts analysis based on the studies prepared for the DCWP, the KVWP and the WHWP. The results of the data analyses and an estimate of potential avian impacts from each individual project are provided in those individual reports (see Erickson et al.

2003a and 2003b, Young et al. 2003a). Additional details about each study and the data analysis methods can be found in those reports. This report does not reiterate results from the individual project specific reports. This report is intended to provide a broader analysis utilizing the combined data sets from all three projects as well as a cumulative impacts analyses of potential impacts to avian resources, nesting raptors, bald eagles, and big game. For this report, each data set was analyzed separately and then averaged for each season, except for the flight height and exposure index tables where , the three data sets were combined into one database. The results of this analysis are presented below. Areas in which the results varied significantly from the individual project analyses are identified and discussed. In addition, we provide an estimated cumulative impacts analysis of the three projects on bats based on results of studies from other wind power projects because bats were not studied at any of the three project sites during the baseline studies.

The data sets analyzed in this report were collected using similar methods, and were collected from the same general geographical area, which provides a useful basis for the cumulative impacts analysis presented in this report.

Site Certificates for the KVWP and the WHWP are being pursued through the Washington State Energy Facilities Site Evaluation Council (EFSEC), while Desert Claim is seeking a development permit for the DCWP through Kittitas County. Currently, all three projects are undergoing some level of environmental analysis. For example, Kittitas County is preparing an Environmental Impact Statement (EIS) for the DCWP while EFSEC is preparing an EIS for the KVWP, but EFSEC is currently only performing a preliminary site analysis of the WHWP.

This report is designed to support the EISs currently being prepared by the County and EFSEC and to support EFSEC's analysis of the WHWP. The larger data set analyzed in this report strengthens the basis of much of the impact analysis for the individual projects, because of the increased spatial and temporal replication within the Kittitas Valley. The combined data set and the cumulative impacts analysis presented in this report is intended to provide an additional level of impact analysis that may be used in the EIS currently being prepared by the County for the DCWP, the EIS currently being prepared by EFSEC for the KVWP, and in EFSEC's analysis of the WHWP. and in EFSEC's analysis of the WHWP.

2.0 RESULTS

2.1 Fixed-point Surveys

The KVWP surveys were conducted at 11 fixed-point count stations located within the study area and adjacent areas to the west (see Erickson et al. 2003a). For the DCWP, surveys were initially conducted at 4 fixed-point stations. Two new points were added to the study when additional area was included within the project boundaries (Young et al. 2003a). For the WHWP, surveys were conducted at 8 fixed-point stations within the study area (Erickson et al. 2003b). At each site, each point was surveyed on an approximately weekly basis during the respective study periods but some surveys were missed due to bad weather. For all of the sites,

a total of 628 individual 20-minute point count surveys[1] were conducted.

For all study areas combined, a total of 109 avian species and an additional 13 unidentified bird types (best possible identification, e.g., unidentified buteo) were observed during the fixed-point surveys (Table 1). Over all studies, 8,924 total observations in 2,538 different groups[2] were recorded during the fixed-point surveys (Table 1). These are raw counts of observations, that are not standardized by the number of hours of observation, but do provide an overall list of what was observed. These counts likely contain duplicate sightings of the same birds. Of the 109 avian species listed in Table 1, eleven species were only observed during the last ten minutes of surveys for DCWP or WHWP and, because this report is based on a standardized 20-minute point count survey, these eleven species do not appear in any tables after Table 1.

Over all three studies, passerines were by far the most numerous group comprising approximately 57.36% of all groups and 75.82% of all birds observed. For all of the study areas, European starling (*Sturnis vulgaris*), American robin (*Turdus migratorius*), horned lark (*Eremophila alpestris*), and American pipit (*Anthus cervinus*) were the most numerous passerines observed. Raptors comprised approximately 21.55% of all groups but only 6.33% of all birds observed. For all study areas, red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), rough-legged hawk (*Buteo lagopus*), and northern harrier (*Cyanus circus*) were the most common raptors observed. For all study areas combined, corvids (magpies, crows, and ravens) comprised 11.86% of all groups and 5.50% of all birds observed; waterfowl/waterbirds comprised 1.77% of all groups and 8.47% of all birds observed; shorebirds comprised 3.11% of all groups and 1.30% of all birds observed; upland gamebirds comprised 1.34% of all groups and 1.56% of all birds observed, and other birds (doves, woodpeckers, hummingbirds, nighthawk, etc.) comprised 2.99% of all groups and 1.02% of all birds observed. Within these groups some of the more common species seen were mallard (*Anas platyrhynchos*), Canada goose (*Branta canadensis*), common raven (*Corvus corax*), and black-billed magpie (*Pica hudsonia*) (Table 1).

2.1.1 Avian Use

To standardize the data for comparison between sites, points, seasons, and other studies; avian use, frequency of occurrence, and species composition were calculated from observations within 800 m (~1/2 mile) of the survey point. Avian use by species was calculated as the mean number of observations per 20-minute survey[3] (Table 2). Because individual birds were not marked, counts do not distinguish between individuals; rather, they provide an estimate of avian use of the study area. For example, if one red-tailed hawk was observed during five surveys, it is unknown if this was the same bird seen five times or five different birds seen once. This provides an index of how often or frequent red-tailed hawks occur in the study area, and therefore are at risk of being affected by the proposed project. Because of this, references to abundance are use estimates and are not absolute density or numbers of individuals.

[1] 30-minute surveys were conducted at the DCWP and WHWP sites. For the purposes of this report, the surveys were standardized to a 20-minute count for all three project sites.

[2] Group is defined as an observation of a species of bird regardless of number seen together. For example, a flock of eight American robins flying together is considered a group as well as an individual robin observed by itself.

[3] Fixed-point surveys on the DCWP and WHWP were conducted for 30 minutes. For this analysis, only those observations recorded within the first 20 minutes of the observation period were included.

Use varied across seasons (Table 2). For spring, based on an average use across the three areas, the five most abundant species in the study area were American pipit (2.034 detections/20-minute survey), American robin (1.372 detections/survey), horned lark (1.369 detections), western meadowlark (*Sturnella neglecta*) (1.233 detections), and European starling (1.024 detections). Together these species comprised 55.73% of the total bird use during the spring (Table 3). The high use by pipits was due to migrant flocks passing through the area as they were not recorded in the summer. During the summer, the five most abundant species were European starling (1.193), western meadowlark (1.136 detections/survey), Brewer's blackbird (*Euphagus cyanocephalus*) (0.970), horned lark (0.827) and vesper sparrow (0.817). These species comprised 54.50% of the total bird use during the summer for the DCWP and KVWP sites (Table 3). In the fall, again based on an average use across the three areas, the five most abundant species were American robin (1.760 detections), horned lark (1.425), mountain bluebird (*Sialia currucoides*) (0.570), cedar waxwing (*Bombycilla cedrorum*) (0.506), and European starling (0.483), which comprised 54.05% of the total bird use (Table 3). Winter was the only season where the top five species were not all passerines. European starling (5.645) had the highest used followed by, snow bunting (*Plectrophenax nivalis*) (2.686), mallard (2.424), American robin (1.762), and common raven (0.715). These species comprised 81.93% of the total bird use for the winter (Table 2). Overall seasons, European starling was the most common bird observed with 2.087 detections per survey, followed by American robin (1.305), horned lark (1.051), mallard (0.714), and snow bunting (0.675) (Table 2). These five species comprised one-half (50.05%) of all bird use of the sites for the study periods (Table 3)

Averaged over all seasons and based on use, passerines were the most abundant group observed followed by waterfowl, raptors, and corvids (Table 2). Passerines as a group had the highest use in all four seasons. Waterfowl had the second highest use in the winter, while raptors had the second highest use estimates in for the rest of the seasons. The high winter waterfowl use was due primarily to large flocks of mallards that frequented the DCWP study area during the winter season (see Table 1). Because winter surveys at the KVWP site consisted of driving surveys focusing on bald eagles, standardized winter use estimates contained in this report are based on surveys at DCWP and WHWP only.

2.1.2 Species Composition and Frequency of Occurrence

Species composition is represented by the mean use for a species divided by the total use for all species and multiplied by 100 to provide percent composition (Table 3). Frequency of occurrence was calculated as the percent of surveys where a particular species was observed (Table 4). Frequency of occurrence and percent composition provide relative estimates of the avian diversity of the study area. For all three study areas combined, the species diversity was relatively high as would be expected based on the variety of habitats and large area studied overall. For example, only one species, western meadowlark (30.03% of surveys) was observed in roughly one-third (33%) of the surveys. Only, three other species, horned lark (27.34%), common raven (*Corvus corax*) (23.10%), and red-tailed hawk (20.51%) were observed in more than 1/5th (20%) of the surveys. Together, these four species made up 20.39% of all bird use. In contrast, European starling alone made up 17.91% of all bird use for all three sites but was only observed in 6.02% of the surveys. The higher bird use for starling was due to the majority of observations being large flocks (see Table 1). Four other species, vesper sparrow (18.98), black-billed magpie (13.39%), American

kestrel (*Falco sparverius*) (11.55%), and American robin (10.94%) were observed in more than 10% of the surveys. The majority of species were observed in less than 5% of the surveys (Table 4) indicating that the total avian use was spread over a variety of species.

As a group, and due primarily to the abundance of several common species, passerines comprised 77.14% of the avian use on sites (Table 3) and were observed in 73.34% of all surveys (Table 4). Raptors as a group comprised 6.45% of the avian use of the sites (Table 3) and were observed in 24.65% of the surveys (Table 4).

2.1.3 Flight Height Characteristics and Exposure Indices

The proportion of observations of a bird species flying within the rotor swept area provides a rough estimate of the propensity of that species to fly within the area occupied by the turbine rotors (Table 5). Because turbine manufacturers have not been selected for each project, this report uses an estimated maximum turbine size and tower and tower height. Based on this maximum for the projects, approximate maximum height with the blade pointed straight up would be 393 feet (120 m). Based on the maximum turbine envelope (i.e., a maximum blade height pointed straight up of 393 feet (120 m) and maximum rotor diameters of 262 feet (80 m), the "zone of risk" analyzed in this report includes the area from approximately 82 feet (25 m) above ground level (AGL) to 410 feet (125 m) AGL. This range is a conservative estimate that includes a buffer of approximately 16 feet (5 m) on the upper and lower limits, leading to an over estimate of potential bird exposure. Most of the passerines observed, with the exception of starlings, finches, sparrows, and swallows, were regularly observed flying less than 82 feet (25 m) above the ground (Table 5). The larger birds tend to fly higher, and frequently flew greater than 82 feet (25 m) high, which is within the primary zone of risk for turbine blades as analyzed in this report. As a group, 74.69% of waterfowl observed flying were observed in the zone of risk. Flying eagles were observed in the zone of risk approximately 58.06% of the time and flying buteos approximately 56.87% of the time. Flying passerines were observed within the zone of risk approximately 42.06 % of the time (Table 5). This estimate is heavily influenced by the large flocks of European starlings observed within the zone of risk. By eliminating European starlings, the observation of passerines flying within the zone of risk drops to approximately 30%. These estimates are consistent with estimates from other projects, and are an overestimate of exposure, since we used 82 feet (25 m) to 410 feet (125 m) as the zone of risk for this report.

The exposure index is a relative measure of the risk of each species observed on-site during the fixed-point surveys coming in contact with a turbine, based on the use (measure of abundance) of the site by the species and the flight characteristics observed for that species. European starling, American robin, and mallard had the highest exposure indices (Table 6). These three species were commonly observed on site and often observed flying in large flocks. Of the raptors, red-tailed hawk had the highest exposure index. Most of the other raptors were seen less frequently (i.e., use was lower) which reduced their exposure index. Common raven also had a relatively high exposure index due to its propensity to fly in the zone of risk.

2.2 Bald Eagle Surveys

Bald eagles occur in Washington year round and breeding bald eagles are most abundant in Washington west of the Cascade Mountain Range (Smith *et al.* 1997). Between 1980 and 1998, the state bald eagle population increased at an annual rate of 10% from approximately 105 occupied territories to 666 occupied territories (Watson *et al.* 2002). The distribution of breeding bald eagles also increased as areas unoccupied in 1980 experienced an influx of nesting pairs. In winter, Washington experiences a significant influx of bald eagles from Canada, Alaska, Montana, and California, and the population may increase to three to six times the breeding population size (Stinson *et al.* 2001). Winter surveys conducted from 1982-1989 showed an increase from approximately 1,200 to 2,800 individuals and it is estimated that the current winter population in Washington may exceed 4,500 bald eagles (Stinson *et al.* 2001).

Bald eagles are winter residents in the Kittitas Valley and are not known to breed in the area (Smith *et al.* 1997). No bald eagles were observed during the summer and fall survey periods at the three project sites. The Washington State Department of Fish and Wildlife (WDFW PHS Database) estimates that between 35-50 bald eagles winter in the Kittitas Valley along the Yakima River riparian corridor. Christmas bird count information for the Ellensburg count circle (latitude 47^{o}, longitude 120.6^{o}; approximately northwest Ellensburg town limits) indicates an increasing trend in bald eagle numbers from approximately 0-2 in the late 1970's to approximately 13-15 in 2000-2001. Nine roadside surveys in the KVWP vicinity conducted between February and April 2002 found a total of 50 bald eagles (duplicate observations possible). An additional 4 surveys conducted between January and mid-March 2003 in the vicinity of the KVWP documented 28 eagle observations. Eighteen roadside surveys in the DCWP vicinity conducted between March 1 and April 12, 2002 and December 12, 2002 and April 12, 2003 found a total of 39 eagles (duplicate observations possible). No specific winter surveys for bald eagles were conducted at the WHWP due to the reported very low bald eagle use of the site.

For the KVWP in 2002 and 2003, there were an average of 6.3 bald eagles per survey, with the highest count for any given survey being 12 eagles (March 12, 2002). Over the two-year study period this equates to 0.18 bald eagles per survey per mile of route. For the DCWP, an average of 2.4 bald eagles were observed per survey day with the maximum number of bald eagles observed during any one survey being 18. Over the study period at DCWP, an average of 0.11 bald eagles per survey per mile of route were observed. For both study areas combined (KVWP and DCWP) the overall average was 0.14 bald eagles per survey day per mile of route.

For all observations combined, approximately 56% of the observations were adults, 19% were subadults (1-3 years of age), 21% were juveniles (<1 year old), and 3% were unknown (unidentified due to poor visibility).

For the three projects combined, 21 bald eagles were observed in 19 groups during the point count surveys in the spring 2002 and winter of 2003. Standardizing these observations to 20-minute surveys lowers this number to 16 individuals in 15 groups observed in the first 20 minutes of the surveys. Based on these standardized 16 observations, the bald eagle use estimate for the three project sites during the winter was 0.055 observations per 20-minute survey and for the spring was

0.028 observations per 20-minute survey. Based on these use estimates, bald eagle was the 4th most common raptor for the KVWP and DCWP areas combined in the winter behind red-tailed hawk (0.155) observations/20-minute survey), rough-legged hawk (0.130), and northern harrier (0.056), and the fifth most common raptor in the spring behind red-tailed hawk (0.294 observations/20-minute survey), rough-legged hawk and American kestrel (0.167), turkey vulture (0.073), and northern harrier (0.039). Only one bald eagle was observed during weekly fixed-point surveys between February and April 2003 on the WHWP. The winter use estimate for bald eagle on the WHWP was the lowest of all raptors at only 0.021 observations per survey. No bald eagles were observed during the summer and fall survey periods at the three projects. Based on annual average use estimates, bald eagle (0.021 observations/20-minute survey) was the eighth most abundant raptor observed during point count surveys, behind red-tailed hawk (0.254), American kestrel (0.137), rough-legged hawk (0.086), turkey vulture (0.073), northern harrier (0.067), golden eagle (0.043), and sharp-shinned hawk (0.023).

Across all three project sites, bald eagle frequency of occurrence (percent of surveys in which species was observed) for the winter was 3.64% and for the spring was 2.44%. Based on annual average estimates, bald eagle was the eighth most frequently occurring raptor observed during point count surveys (1.52%), behind red-tailed hawk (20.51%), American kestrel (11.55%), rough-legged hawk (6.69%), turkey vulture (6.43%), northern harrier (6.21%) golden eagle (4.13%), and sharp-shinned hawk (1.65%).

For surveys at the three projects, 13 of the 16 bald eagle observations (81.25%) were of birds flying. Of these 13 observations, 4 (30.77%) were of eagles flying below 82 feet (25 m) above ground level (AGL), 8 of the observations (61.54%) were of eagles flying between in the zone of risk at 82 feet (25 m) to 410 feet (125m) AGL, and 1 eagle (7.69%) was flying above the zone of risk (Table 5). Based on these observations, the calculated exposure index for bald eagle was 0.010, (Table 6). Despite this, as stated in Section 3.3, it is unlikely that there would be any bald eagle fatalities associated with the projects and the cumulative impact from the projects on bald eagle habitat is small.

2.3 Raptor Nests

Surveys for raptor nests were conducted for each study area and the area within a 2-mile buffer of each project site. For all three areas combined a total of 171 square miles were surveyed. A total of 31 active raptor nests and 21 inactive nests were located during all of the surveys. The most common nesting raptor was red-tailed hawk. For all areas combined, all raptor (buteos, owls, prairie falcons) nest density was approximately 0.18 active nests per square mile (0.07 per km^2).

2.4 Big Game Observations

The KVWP, most of the DCWP, and all of the WHWP are located in mule deer winter range (WDFW Priority Habitats database). The WHWP also is located in elk winter range. The KVWP is not located in elk winter range, while the northern portion of the DCWP project is

located in elk winter range. There is also a defined elk migration corridor that crosses the northern portion of the DCWP. There may be a few turbines constructed in the northern portion of the DCWP that fall within the elk migration corridor; however, these will be near the periphery of the corridor near areas with higher levels of human development than the forests to the north. Both the KVWP and DCWP projects occur in areas where significant amounts of human activity have already occurred, including road and residential development. Highway 97, which accommodates an average of 2,200 vehicles a day, runs through the KVWP project area, with proposed turbine strings on both sides of the road. Bettas and Hayward roads, which also are in the KVWP area, each serve approximately 20 vehicles per day. Smithson Road, Reecer Creek Road, and other less traveled county roads cut through the DCWP. Several of the proposed turbine strings and associated roads in the KVWP and the DCWP are along existing roads currently used to access private property in the project areas.

Over the course of the studies, big game observations were recorded during the point count surveys and incidentally as they were seen in the study areas. For the KVWP, 349 mule deer, and 87 elk were seen on the study area during avian point count surveys. For the DCWP, a total of 58 mule deer were observed in 7 groups during the point count surveys. In addition, 42 mule deer in 2 groups and one group of 11 elk were seen while in-transit within or near the DCWP study area. Most of these observations of mule deer in the DCWP occurred during the winter. For the WHWP, 168 mule deer and 310 elk were observed. No effort was made to standardize these data; however, they do indicate that elk and mule deer occur in the area in low numbers during spring, summer and fall and that there is an influx of these animals into the study areas in the winter.

3.0 SUMMARY/DISCUSSION

Avian use over all the sites varied by season. Passerines made up the vast majority of use at all sites. Several common passerine species comprised the majority of avian use for the area studied. Typically there were a few species such as European starling, American robin, horned lark, and western meadowlark, that were seen either in large flocks (affecting total numbers seen) or observed in most of the surveys. This varied across seasons but had the effect of driving up use estimates for passerines. In contrast, raptors were observed fairly frequently (24.65% of surveys as a group) but were typically seen individually or in small group sizes. This resulted in lower use estimates for raptors than passerines and even waterfowl in one season. While these results are typical of many wind sites studied where passerines have the highest use estimates but where a few raptor species (e.g., red-tailed hawk, American kestrel) are seen regularly, they varied in that passerine use was spread over several species and not just one or two. These results are somewhat expected given the diversity of habitats across the three study areas and the size of the total area encompassed by combining the three projects.

3.1 Raptors

Based on the estimated levels of raptor use within the study areas, raptor mortality is expected to be slightly higher compared to other new generation wind projects with similar turbine types located in Minnesota, Oregon and Wyoming. At these other new-generation projects, raptor use estimates ranged from 0.4 to 0.6/20-minute survey at new wind projects (Condon Oregon, Vansycle Oregon, Foote Creek Rim, Wyoming, Buffalo Ridge, Minnesota) compared to an average estimate of 0.7 raptors/20-minute survey for projects analyzed in this report. Habitat for the three projects is most similar to the Foote Creek Rim, Wyoming wind project (Johnson *et al.* 2000). Estimated raptor use at the WHWP is lower than the KVWP and DCWP and has the overall effect of lowering raptor use slightly from estimates for KVWP and DCWP individually (see Erickson *et al*. 2003b and Young *et al.* 2003a).

Considering the calculated raptor use estimates developed in each of the baseline studies, it is estimated that potential raptor mortality within the combined study area would be approximately 0.038 raptors per turbine per year. Using this raptor mortality rate, we estimate approximately 14 raptor fatalities per year for the three projects (KVWP, DCWP, and WHWP) combined if 361 turbines are constructed, and 15 raptor fatalities per year if 391 turbines are constructed. Given typical home ranges of the raptors at risk of collision at the three projects (Table 7), we do not expect the same individual breeding raptors that use the KVWP and DCWP areas to use WHWP because the WHWP is located approximately 15 miles southeast of the DCWP (Figure 1). It should be noted that the fatality estimates may vary from the expected range based on many factors, including the number of occupied raptor nests near the wind projects after construction, turbine size and other site specific and/or weather variables.

Red-tailed hawks, American kestrels, and northern harriers account for much of the raptor use in spring, summer and fall at the three projects areas. In the winter and early spring, red-tailed and rough-legged hawks account for most of the raptor use. These species are expected to be the raptor species with the highest risk of mortality across the three projects. The potential exists for other raptor species to collide with turbines, including turkey vulture, golden eagle, bald eagle, Cooper's hawk, sharp-shinned hawk, and prairie falcon. However, the mortality risk associated with these species is expected to be much lower than the risk for red-tailed hawks and American kestrel due to the lower use of the sites. Common owl species such as great-horned owls, which are typically not effectively surveyed during the day, are also at risk of collision. Some raptors such as turkey vultures appear less susceptible to collision than most other raptors (Orloff and Flannery 1992). In addition, there have been very few northern harrier fatalities recorded at wind plants, and no bald eagle or rough-legged hawk fatalities have been observed at operating wind projects, based on recent published data (Erickson *et al.* 2002). Golden eagle use of the sites is low relative to other wind sites (e.g., Foote Creek Rim) and mortality for golden eagles is also expected to be very low.

3.2 Passerines

Passerines have been the most abundant avian fatality at other wind projects studied (see Johnson *et al.* 2002, Young *et al.* 2003b, Erickson *et al.* 2000, 2001, 2002), often comprising more than 80% of the avian fatalities. Both migrant and resident passerine fatalities have been observed. Given that

passerines make up the vast majority of the avian observations at the sites, it is expected passerines will make up the largest proportion of fatalities for all projects combined. Passerine species most common to the project sites will likely be most at risk, including European starling, American robin, western meadowlark, horned lark, cliff swallow, American goldfinch, Brewer's blackbird, American pipit, and vesper sparrow. There is little concern over potential mortality of European starlings, an introduced non-protected species. Horned larks have been the most commonly observed fatality at several wind projects, including Vansycle and Foote Creek Rim (Erickson *et al.* 2001, Young *et al.* 2003b). Nocturnal migrating species may also be affected, but it is not expected that they would be found in large numbers because there have been only two large mortality events reported at new generation wind projects in the U.S. based on data collected at other wind plants. For example, at Buffalo Ridge, Minnesota, fourteen migrating passerine fatalities (vireos, warblers, flycatchers) were observed at two turbines during a single night in May 2002 (Johnson *et al*. 2002), while approximately 25 to 30 migrating passerine fatalities (mostly warblers) were observed near one turbine and a well-lit substation at the Backbone Mountain West Virginia wind project. .

Mortality rates at other wind plants have ranged from approximately 0.6 birds per turbine per year to 2.8 birds per turbine per year (see Erickson *et al*. 2000, Johnson *et al*. 2000). Estimates from Foote Creek Rim, a site similar in habitat and bird use, were approximately 1.5 birds per turbine per year, based on a three-year study (Young *et al.* 2003b). At two wind plants closer to Kittitas County, recent estimates were 1.42 (Klondike Wind Plant, Oregon) and 1.7 (Stateline Wind Plant) birds per turbine per year (see Johnson *et al.* 2003a and Erickson *et al.* 2003c). Based on the mortality estimates from the other wind plants studied, it is expected that passerine mortality would fall within the mid range or approximately 1.2-1.8 birds per turbine per year. Under the assumption that 361 turbines are constructed for all three projects, the total range of passerine mortality would be 430 to 650 fatalities per year. If 391 turbines are constructed, the range would be approximately 460 to 740 fatalities per year. This level of mortality is not expected to have any population level consequences for individual species, due to the expected low fatality rates for most species and the high population sizes of the common species such as European starling, American robin, horned lark, American pipit, and western meadowlark.

3.3 Bald Eagles

Based on the available information and the baseline study results, bald eagles occupy the Kittitas Valley and projects' vicinity from approximately late December to early April. The number of bald eagles in the area appears to increase from late December to approximately mid-February. They are not the most common raptor in the area but their numbers appear to be increasing most likely due to overall recovery of the species in Washington as well as throughout the western states and North America. Many of the bald eagle observations made during the roadside and fixed-point surveys were associated with cattle operations and dead cows. Because bald eagles occupy the area near the projects in the winter and early spring and are frequently seen flying, they would presumably be at some risk of collision with turbines. However, to date, there have been no reported bald eagle fatalities at any wind plants in the U.S. This may be because the foraging behavior of wintering bald eagles, primarily scavenging in nature, may make them less susceptible to collision because they are presumably less focused on moving prey and more attentive to their surroundings while searching for carrion, which is what the bald eagles observed near the project sites were doing.

Impacts to bald eagle from the projects could conceivably be loss of winter habitat and fatalities. This should not be a factor, however, because neither the KVWP, DCWP, or WHWP will contribute to the loss of important bald eagle roosting habitat (Yakima River riparian corridor) or foraging areas (cattle lots and calving operations). No regular night roost sites were identified in or near the study areas and it appears as if bald eagles may opportunistically roost in suitable trees near foraging areas. Many of the eagle observations were associated with cattle lots and calving operations where they were observed foraging on carrion (dead cows) or calving byproducts/afterbirth. Only one bald eagle was observed in the WHWP and given the location and habitat, this site will not likely impact bald eagles. Based on these observations, the cumulative impacts to bald eagle winter habitat from all projects are small.

Potential mortality for bald eagles due to the proposed projects is difficult to predict. Given the very low bald eagle use at the WHWP, no bald eagle mortality is expected at that site. No bald eagle fatalities have been reported from other wind plants in the U.S. so the level of susceptibility to collision with turbines is presumably low. Because of this, based on the low use of the KVWP and DCWP project area, bald eagle fatalities are expected to be nearly zero. However, due to the nearby vicinity of important roosting (riparian) and foraging areas (cattle lots), bald eagles may regularly move through the wind plants, increasing their exposure. A conservative estimate would be that, assuming risk of collision is proportional to use, on average 1 bald eagle would be killed every 5-6 years at KVWP or DCWP. If both KVWP and DCWP wind projects are constructed, thereby approximately doubling the number of turbines in the area, the overall risk to bald eagle may increase to 1 bald eagle every 2-3 years. This may be a conservative estimate because no bald eagle mortality has been reported at any wind project in the U.S. Given the very low bald eagle use at the WHWP, this level of potential mortality would not increase measurably if that project were also constructed. Mortality over the long term is difficult to predict and likely will vary depending on the population levels of bald eagles near the projects. The effects of this low level of mortality on the increasing winter population in the Kittitas Valley and the State of Washington would be immeasurable.

3.4 Raptor Nests

For all three study areas, approximately 170 square miles (440 km^2) were surveyed for raptor nests. Nest density for raptor species effectively sampled from the air (e.g., buteos) was approximately 0.18 active nests per square mile (0.07 nests/km^2). This index of raptor nest density is lower than other wind plants that have been studied in the Oregon/Washington region. For example, raptor nest density within a similar 2-mile buffer around the Stateline Wind Plant (WA/OR) is 0.20 nest/mi^2 (0.08 nest/km^2) (URS and WEST 2001), while the nest density within a 5-mile buffer around the proposed Maiden wind farm was approximately 0.16 nest/mi^2 (0.06 nest/km^2) (Young *et al*. 2002) and the nest density within a 5-mile buffer around the proposed Combine Hills wind plant (Umatilla County, Oregon) is approximately 0.24 nest/mi^2 (0.09 nest/km^2) (Young *et al.* 2003c).

The higher quality raptor nesting habitat within the project areas falls along riparian corridors dissecting the three project areas and along the numerous powerlines running through the KVWP and DCWP site. It is unlikely that the projects will directly affect (i.e., take) nesting raptors by

destroying a nest since the turbines will be constructed in open areas and because few trees, if any, will be cut down to accommodate the wind plants. Instead, the projects are more likely to affect nesting raptors through disturbance or displacement during construction. Construction activity during the nesting season may disturb raptors nesting in the area and in an extreme case cause abandonment of an active nest. There is little likelihood that this will occur, however, because, based on the raptor surveys, there are very few nests within ½ mile of project facilities, and thus there is little chance that these nests would be disturbed during construction.

3.5 Big Game

Based on available data and observations collected during the baseline studies, mule deer and elk occur within the areas proposed for development in relatively low to moderate numbers. There appears to be a year-round presence of these species with an increase in numbers in the winter. Due to the lack of knowledge regarding the potential impacts of energy development on big game, it is difficult to predict with certainty the effects of the proposed wind projects on mule deer and elk. Some temporary displacement of wintering mule deer and elk is anticipated from winter construction activities in the projects. These temporary impacts may be higher if construction occurs simultaneously on two or all three of the projects since a larger area would be subjected to disturbances. 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 mule deer or elk. If tolerance thresholds during regular maintenance activities are exceeded, some animals are likely to be displaced and utilize areas away from the wind project development areas. Given the amount of existing residential development and the existing roads and disturbance in the vicinity of the KVWP and DCWP projects, (e.g., half the roads in the KVWP project are existing roads that will be improved), disturbance levels during operation will not increase greatly. The WHWP is located in a relatively undeveloped area which is used primarily for livestock grazing and recreation (e.g., hunting, antler hunting) creating seasonal increases in the level of human activity in this area. Human activity levels due to operation and maintenance activity at WHWP will be less seasonal but occur at a low level year round. Activity at the WHWP will be controlled by the developer, and overall human activity may be less than before the project during the spring, summer and fall periods. While operational impacts to wintering mule deer and elk at WHWP may be a greater change than the existing condition, cumulatively for all projects, impacts are expected to be low.

3.6 Bats

The potential for bats to occur is based on key habitat elements such as food sources, water, and roost sites. Potential roost structures such as trees are abundant along the riparian areas within the three project areas. Bat research at other wind plants indicates that migratory bat species are at some risk of collision with wind turbines, mostly during the fall migration season. At the Buffalo Ridge Wind Plant in Minnesota, based on a 2-year study, bat mortality was estimated to be 2.05 bats per turbine per year (Johnson et al. 2003b). At the Foote Creek Rim Wind Plant in Wyoming, based on two years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young et al., 2003b). At the Vansycle Ridge Wind Plant in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson et al. 2000).

Based on research and observations at other wind projects in the U.S., it is likely that bat fatalities would occur at the three projects. Most bat fatalities found at other wind plants have been tree-dwelling migratory bats, with hoary and silver-haired bats being the most prevalent fatalities. Although no specific surveys for bats were conducted, it is expected that both hoary bats and silver-haired bats may use the forested habitats near the project sites and likely migrate through the area of the three projects.

Although potential mortality of migratory bats is difficult to predict, an estimate can be calculated based on levels of mortality documented at other wind plants. Using an approximate range of estimates from other wind plants in the west and mid-west (approximately 1 to 2 bat fatalities per turbine per year), annual bat mortality resulting from the three projects is expected to be approximately 361 to 722 bat fatalities per year, if 361 turbines are built, and 391 to 782 bat fatalities per year, if 391 turbines are built. Actual levels of mortality 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.

The significance of the bat mortality from the three projects is hard to predict since there is very little information available regarding bat populations in the study area. Moreover, studies at other wind plants suggest resident bats do not appear to be significantly impacted by wind turbines (Johnson *et al.* 2003b, Gruver 2002), since nearly all mortality is observed during the fall migration period. Furthermore, hoary bats, which are expected to be the most common bat fatality, are one of the most widely distributed bats in North America.

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Table 1. Avian species observed during fixed-point surveys for all projects combined (KVWP, DCWP[a], WHWP[a]).

Seasons	Spring[b]		Summer		Fall		Winter		Totals	
Group/Species	obs	grp	obs	grp	obs	grp	obs	grp	obs	grp
Waterfowl/Waterbird	**254**	**19**	**14**	**8**	**9**	**3**	**479**	**15**	**756**	**45**
blue-winged teal	0	0	3	1	0	0	0	0	3	1
Canada goose	173	5	1	1	0	0	32	2	206	8
mallard	71	12	7	4	0	0	443	12	521	28
northern pintail	0	0	0	0	0	0	4	1	4	1
unidentified duck	0	0	0	0	7	1	0	0	7	1
great blue heron	0	0	3	2	1	1	0	0	4	3
herring gull	2	1	0	0	0	0	0	0	2	1
ring-billed gull[c]	8	1	0	0	0	0	0	0	8	1
unidentified gull[c]	0	0	0	0	1	1	0	0	1	1
Shorebirds	**75**	**53**	**25**	**18**	**8**	**5**	**8**	**3**	**116**	**79**
common snipe	15	15	6	6	0	0	0	0	21	21
greater yellowlegs	1	1	0	0	0	0	0	0	1	1
killdeer	58	36	18	11	8	5	8	3	92	55
long-billed curlew	1	1	0	0	0	0	0	0	1	1
Wilson's phalarope	0	0	1	1	0	0	0	0	1	1
Raptors	**210**	**203**	**138**	**133**	**138**	**134**	**79**	**77**	**565**	**547**
Accipiters	***11***	***11***	***1***	***1***	***17***	***17***	***5***	***5***	***34***	***34***
Cooper's hawk	5	5	0	0	5	5	3	3	13	13
northern goshawk	0	0	0	0	2	2	0	0	4	4
sharp-shinned hawk	5	5	1	1	9	9	2	2	15	15
unidentified accipiter	1	1	0	0	1	1	0	0	2	2
Buteos	***79***	***78***	***56***	***52***	***54***	***54***	***43***	***43***	***232***	***227***
red-tailed hawk	54	53	53	49	42	42	23	23	172	167
rough-legged hawk	24	24	0	0	10	10	20	20	54	54
unidentified buteo	1	1	3	3	2	2	0	0	6	6
Eagles	***17***	***17***	***3***	***3***	***8***	***8***	***18***	***16***	***46***	***44***
bald eagle	9	9	0	0	0	0	12	10	21	19
golden eagle	7	7	2	2	8	8	6	6	23	23
unidentified eagle	1	1	1	1	0	0	0	0	2	2
Falcons	***78***	***73***	***52***	***51***	***15***	***13***	***3***	***3***	***148***	***140***
American kestrel	64	59	51	50	13	11	1	1	129	121
merlin	3	3	0	0	1	1	0	0	4	4
prairie falcon	9	9	1	1	1	1	2	2	13	13
unidentified falcon	2	2	0	0	0	0	0	0	2	2

Table 1. Avian species observed during fixed-point surveys for all projects combined (KVWP, DCWP[a], WHWP[a]).

Seasons	Spring[b]		Summer		Fall		Winter		Totals	
Group/Species	obs	grp	obs	grp	obs	grp	obs	grp	obs	grp
Other Raptors										
northern harrier	9	8	0	0	36	35	7	7	52	50
great-horned owl	3	3	0	0	2	2	3	3	8	8
osprey	1	1	0	0	0	0	0	0	1	1
turkey vulture	12	12	26	26	6	5	0	0	44	43
Corvids	**181**	**113**	**33**	**27**	**143**	**91**	**134**	**70**	**491**	**301**
American crow	1	1	2	2	0	0	5	2	8	5
black-billed magpie	65	36	13	10	42	34	57	26	177	106
common raven	113	74	16	14	93	51	72	42	294	181
Stellar's jay	2	2	2	1	8	6	0	0	12	9
Passerines	**2220**	**592**	**1058**	**489**	**1739**	**274**	**1749**	**101**	**6766**	**1456**
American goldfinch	0	0	17	6	42	10	84	6	143	22
American pipit	537	2	0	0	75	4	0	0	612	6
American redstart	0	0	1	1	0	0	0	0	1	1
American robin	249	29	38	20	475	32	225	17	987	98
bank swallow	4	2	0	0	0	0	0	0	4	2
barn swallow	8	3	45	7	13	3	0	0	66	13
black-capped chickadee	1	1	2	2	15	6	14	5	32	14
black-headed grosbeak	0	0	1	1	0	0	0	0	1	1
Brewer's blackbird	87	16	124	32	0	0	0	0	211	48
Brewer's sparrow	35	22	5	3	2	1	0	0	42	26
brown-headed cowbird	0	0	18	7	0	0	0	0	18	7
Bullock's oriole	5	4	6	6	0	0	0	0	11	10
Cassin's finch	0	0	0	0	1	1	0	0	1	1
cedar waxwing	2	1	17	7	123	2	0	0	142	10
chipping sparrow	5	2	33	18	10	2	0	0	48	22
cliff swallow	4	1	30	6	0	0	0	0	34	7
dark-eyed junco	2	2	0	0	53	7	104	7	159	16
eastern kingbird	1	1	9	8	1	1	0	0	11	10
European starling	217	16	105	11	212	8	883	13	1417	48
golden-crowned kinglet	4	1	0	0	4	1	0	0	8	2
golden-crowned sparrow	0	0	0	0	1	1	0	0	1	1
gray-crowned rosy finch	0	0	0	0	43	5	15	2	58	7
horned lark	363	132	163	75	301	77	50	15	877	299
house finch	6	3	1	1	5	2	78	2	90	8
house wren[c]	1	1	0	0	0	0	0	0	1	1
lark sparrow[c]	0	0	2	1	0	0	0	0	2	1
lazuli bunting	0	0	6	5	0	0	0	0	6	5
Lincoln's sparrow	0	0	0	0	3	2	0	0	3	2
loggerhead shrike	4	3	0	0	0	0	0	0	4	3

Table 1. Avian species observed during fixed-point surveys for all projects combined (KVWP, DCWP[a], WHWP[a]).

Seasons	Spring[b]		Summer		Fall		Winter		Totals	
Group/Species	obs	grp	obs	grp	obs	grp	obs	grp	obs	grp
Macgillivray's warbler	0	0	1	1	0	0	0	0	1	1
mountain bluebird	31	15	20	11	104	21	1	1	156	48
mountain chickadee	7	3	0	0	4	1	0	0	11	4
Nashville warbler	3	1	0	0	0	0	0	0	3	1
northern shrike	0	0	0	0	5	5	13	12	18	17
orange-crowned warbler	6	3	1	1	0	0	0	0	7	4
pine grosbeak	0	0	1	1	0	0	0	0	1	1
purple finch	7	1	0	0	0	0	0	0	7	1
red crossbill	0	0	5	1	0	0	0	0	5	1
red-breasted nuthatch	0	0	0	0	1	1	0	0	1	1
red-winged blackbird	59	7	0	0	0	0	5	3	64	10
rock wren[c]	0	0	0	0	1	1	0	0	1	1
ruby-crowned kinglet	5	3	0	0	3	2	1	1	9	6
sage sparrow	12	8	0	0	0	0	0	0	12	8
sage thrasher	45	44	11	11	1	1	0	0	57	56
savannah sparrow	1	1	0	0	61	11	0	0	62	12
Say's phoebe	1	1	2	2	1	1	0	0	4	4
scarlet tanager[c]	1	1	0	0	0	0	0	0	1	1
snow bunting	0	0	0	0	1	1	140	4	141	5
song sparrow	2	2	4	4	0	0	0	0	6	6
spotted towhee	24	19	31	28	9	4	2	1	66	52
Townsend's solitaire	2	2	0	0	2	2	0	0	4	4
Townsend's warbler	1	1	1	1	0	0	0	0	2	2
tree swallow	0	0	7	4	0	0	0	0	7	4
unidentified bluebird	0	0	12	2	0	0	0	0	12	2
unidentified empidonax	2	1	0	0	1	1	0	0	3	2
unidentified finch	0	0	14	2	8	1	120	1	142	4
unidentified flycatcher	0	0	1	1	0	0	0	0	1	1
unidentified passerine	6	2	4	2	12	1	3	1	25	6
unidentified swallow	1	1	3	1	1	1	0	0	5	3
varied thrush[c]	0	0	0	0	0	0	1	1	1	1
Vaux's swift	0	0	2	1	0	0	0	0	2	1
vesper sparrow	118	77	114	77	13	6	0	0	245	160
violet-green swallow	8	5	0	0	0	0	0	0	8	5
warbling vireo	0	0	5	4	0	0	0	0	5	4
western bluebird[c]	0	0	0	0	6	1	0	0	6	1
western kingbird	6	3	11	7	0	0	0	0	17	10
western meadowlark	219	129	175	102	59	30	9	8	462	269
western tanager	0	0	5	3	0	0	0	0	5	3
western wood-pewee	0	0	4	4	0	0	0	0	4	4
white-crowned sparrow	2	1	0	0	46	9	0	0	48	10
winter wren[c]	0	0	0	0	0	0	1	1	1	1

Table 1. Avian species observed during fixed-point surveys for all projects combined (KVWP, DCWP[a], WHWP[a]).

Seasons	Spring[b]		Summer		Fall		Winter		Totals	
Group/Species	obs	grp	obs	grp	obs	grp	obs	grp	obs	grp
yellow-headed blackbird	1	1	0	0	0	0	0	0	1	1
yellow-rumped warbler	114	17	1	1	21	8	0	0	136	26
Upland Gamebirds	**17**	**10**	**12**	**8**	**60**	**9**	**50**	**7**	**139**	**34**
blue grouse	3	3	0	0	4	1	0	0	7	4
California quail	8	3	11	7	35	7	44	5	98	22
chukar[c]	2	1	0	0	0	0	0	0	2	1
gray partridge	2	1	0	0	21	1	5	1	28	3
ring-necked pheasant	2	2	0	0	0	0	1	1	3	3
ruffed grouse	0	0	1	1	0	0	0	0	1	1
Other Birds	**30**	**25**	**23**	**16**	**15**	**15**	**9**	**8**	**91**	**76**
mourning dove	2	2	7	5	5	5	0	0	14	12
common nighthawk	2	2	16	9	0	0	0	0	18	11
downy woodpecker	2	2	0	0	0	0	0	0	2	2
Lewis's woodpecker	0	0	1	1	1	1	0	0	2	2
northern flicker	23	18	3	3	14	14	9	8	49	43
Rufous hummingbird	2	2	2	2	0	0	0	0	4	4
unidentified hummingbird[c]	1	1	1	1	0	0	0	0	2	2
TOTAL	**2989**	**1017**	**1310**	**704**	**2117**	**536**	**2508**	**281**	**8924**	**2538**

[a] Includes all observations even those in the last ten minutes of surveys.
[b] One June survey was included in the spring
[c] Only observed in the last ten minutes of either the DCWP or WHWP surveys.

Table 2. Estimated mean use (number of observations per 20-minute survey) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Waterfowl	**0.454**	**0.031**	**0.000**	**2.573**	**0.764**
blue-winged teal	0.000	0.000	0.000	0.000	0.000
Canada goose	0.049	0.006	0.000	0.118	0.043
mallard	0.404	0.026	0.000	2.424	0.714
northern pintail	0.000	0.000	0.000	0.030	0.008
unidentified duck	0.000	0.000	0.000	0.000	0.000
Waterbirds	**0.008**	**0.031**	**0.010**	**0.000**	**0.012**
great blue heron	0.000	0.031	0.010	0.000	0.010
herring gull	0.008	0.000	0.000	0.000	0.002
Shorebirds	**0.380**	**0.259**	**0.045**	**0.052**	**0.184**
common snipe	0.106	0.063	0.000	0.000	0.042
greater yellowlegs	0.004	0.000	0.000	0.000	0.001
killdeer	0.267	0.192	0.045	0.052	0.139
long-billed curlew	0.004	0.000	0.000	0.000	0.001
Wilson's phalarope	0.000	0.005	0.000	0.000	0.001
Raptors/Vultures	**0.891**	**0.852**	**0.757**	**0.505**	**0.751**
Accipiters	***0.047***	***0.005***	***0.088***	***0.017***	***0.039***
Cooper's hawk	0.024	0.000	0.014	0.017	0.014
northern goshawk	0.000	0.000	0.007	0.000	0.002
sharp-shinned hawk	0.019	0.005	0.068	0.000	0.023
unidentified accipiter	0.004	0.000	0.000	0.000	0.001
Buteos	***0.461***	***0.372***	***0.247***	***0.284***	***0.341***
red-tailed hawk	0.294	0.367	0.201	0.155	0.254
rough-legged hawk	0.167	0.000	0.046	0.130	0.086
unidentified buteo	0.000	0.005	0.000	0.000	0.001
Eagles	***0.052***	***0.010***	***0.083***	***0.108***	***0.063***
bald eagle	0.028	0.000	0.000	0.055	0.021
golden eagle	0.024	0.010	0.083	0.054	0.043
unidentified eagle	0.000	0.000	0.000	0.000	0.000
Small Falcons	***0.178***	***0.301***	***0.080***	***0.008***	***0.142***
American kestrel	0.167	0.301	0.072	0.008	0.137
merlin	0.011	0.000	0.008	0.000	0.005
Large Falcons					
prairie falcon	0.023	0.000	0.016	0.011	0.013
unidentified falcon	0.004	0.000	0.000	0.000	0.001
Other - Raptors					
great-horned owl	0.009	0.000	0.014	0.020	0.011
northern harrier	0.039	0.000	0.174	0.056	0.067

Table 2. Estimated mean use (number of observations per 20-minute survey) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
osprey	0.004	0.000	0.000	0.000	0.001
turkey vulture	0.073	0.164	0.055	0.000	0.073
Corvids	**0.702**	**0.212**	**0.635**	**1.123**	**0.668**
American crow	0.000	0.016	0.000	0.038	0.013
black-billed magpie	0.277	0.087	0.223	0.370	0.239
common raven	0.417	0.099	0.384	0.715	0.404
Stellar's jay	0.008	0.010	0.027	0.000	0.011
Passerines	**10.025**	**7.393**	**6.823**	**11.720**	**8.990**
American goldfinch	0.000	0.219	0.116	0.505	0.210
American pipit	2.034	0.000	0.310	0.000	0.586
American redstart	0.000	0.005	0.000	0.000	0.001
American robin	1.372	0.328	1.760	1.762	1.305
bank swallow	0.049	0.000	0.000	0.000	0.012
barn swallow	0.065	0.286	0.100	0.000	0.113
black-capped chickadee	0.004	0.005	0.079	0.111	0.050
black-headed grosbeak	0.000	0.005	0.000	0.000	0.001
Brewer's blackbird	0.536	0.970	0.000	0.000	0.376
Brewer's sparrow	0.102	0.010	0.007	0.000	0.030
brown-headed cowbird	0.000	0.091	0.000	0.000	0.023
Bullock's oriole	0.012	0.063	0.000	0.000	0.019
Cassin's finch	0.000	0.000	0.003	0.000	0.001
cedar waxwing	0.025	0.109	0.506	0.000	0.160
chipping sparrow	0.015	0.173	0.034	0.000	0.056
cliff swallow	0.015	0.152	0.000	0.000	0.042
dark-eyed junco	0.009	0.000	0.169	0.008	0.046
eastern kingbird	0.012	0.041	0.000	0.000	0.013
European starling	1.024	1.193	0.483	5.645	2.087
golden-crowned kinglet	0.015	0.000	0.000	0.000	0.004
golden-crowned sparrow	0.000	0.000	0.003	0.000	0.001
gray-crowned rosy finch	0.000	0.000	0.146	0.279	0.106
horned lark	1.369	0.827	1.425	0.584	1.051
house finch	0.023	0.005	0.017	0.000	0.011
lazuli bunting	0.000	0.030	0.000	0.000	0.008
Lincoln's sparrow	0.000	0.000	0.007	0.000	0.002
loggerhead shrike	0.004	0.000	0.000	0.000	0.001
Macgillivray's warbler	0.000	0.005	0.000	0.000	0.001
mountain bluebird	0.112	0.165	0.570	0.000	0.212
mountain chickadee	0.027	0.000	0.013	0.000	0.010
Nashville warbler	0.028	0.000	0.000	0.000	0.007
northern shrike	0.000	0.000	0.025	0.070	0.024

Table 2. Estimated mean use (number of observations per 20-minute survey) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
orange-crowned warbler	0.034	0.005	0.000	0.000	0.010
pine grosbeak	0.000	0.005	0.000	0.000	0.001
purple finch	0.027	0.000	0.000	0.000	0.007
red crossbill	0.000	0.025	0.000	0.000	0.006
red-breasted nuthatch	0.000	0.000	0.003	0.000	0.001
red-winged blackbird	0.390	0.000	0.000	0.032	0.105
ruby-crowned kinglet	0.019	0.000	0.003	0.009	0.008
sage sparrow	0.030	0.000	0.000	0.000	0.007
sage thrasher	0.150	0.135	0.008	0.000	0.073
savannah sparrow	0.004	0.000	0.262	0.000	0.066
Say's phoebe	0.004	0.010	0.000	0.000	0.003
snow bunting	0.000	0.000	0.016	2.686	0.675
song sparrow	0.009	0.031	0.000	0.000	0.010
spotted towhee	0.106	0.169	0.024	0.000	0.074
Townsend's solitaire	0.008	0.000	0.007	0.000	0.004
Townsend's warbler	0.000	0.005	0.000	0.000	0.001
tree swallow	0.000	0.063	0.000	0.000	0.016
unidentified bluebird	0.000	0.065	0.000	0.000	0.016
unidentified empidonax	0.000	0.000	0.007	0.000	0.002
unidentified finch	0.000	0.035	0.027	0.000	0.016
unidentified flycatcher	0.000	0.005	0.000	0.000	0.001
unidentified passerine	0.023	0.020	0.040	0.000	0.021
unidentified swallow	0.004	0.000	0.010	0.000	0.004
Vaux's swift	0.000	0.010	0.000	0.000	0.003
vesper sparrow	0.582	0.817	0.066	0.000	0.366
violet-green swallow	0.038	0.000	0.000	0.000	0.009
warbling vireo	0.000	0.025	0.000	0.000	0.006
western kingbird	0.057	0.114	0.000	0.000	0.043
western meadowlark	1.233	1.136	0.266	0.030	0.667
western tanager	0.000	0.010	0.000	0.000	0.003
western wood-pewee	0.000	0.020	0.000	0.000	0.005
white-crowned sparrow	0.008	0.000	0.222	0.000	0.057
yellow-headed blackbird	0.004	0.000	0.000	0.000	0.001
yellow-rumped warbler	0.445	0.005	0.089	0.000	0.135
Gamebirds	**0.075**	**0.130**	**0.423**	**0.155**	**0.196**
blue grouse	0.011	0.000	0.013	0.000	0.006
California quail	0.027	0.125	0.243	0.148	0.135
gray partridge	0.019	0.000	0.167	0.000	0.046
ring-necked pheasant	0.019	0.000	0.000	0.008	0.007
ruffed grouse	0.000	0.005	0.000	0.000	0.001

Table 2. Estimated mean use (number of observations per 20-minute survey) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Doves/Pigeons					
mourning dove	0.007	0.041	0.032	0.000	0.020
Other Birds	**0.080**	**0.122**	**0.051**	**0.020**	**0.068**
common nighthawk	0.004	0.091	0.000	0.000	0.024
downy woodpecker	0.013	0.000	0.000	0.000	0.003
Lewis's woodpecker	0.000	0.006	0.003	0.000	0.002
northern flicker	0.055	0.015	0.047	0.020	0.035
Rufous hummingbird	0.008	0.010	0.000	0.000	0.004

[a] One June survey was included in the spring Wild Horse results.

Table 3. Estimated percent composition (mean use divided by total use for all species) for each species observed within 800 m of the survey point all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Waterfowl	**3.59**	**0.34**	**0.00**	**15.93**	**6.56**
blue-winged teal	0.00	0.00	0.00	0.00	0.00
Canada goose	0.39	0.06	0.00	0.73	0.37
mallard	3.20	0.28	0.00	15.01	6.12
northern pintail	0.00	0.00	0.00	0.19	0.07
unidentified duck	0.00	0.00	0.00	0.00	0.00
Waterbirds	**0.06**	**0.34**	**0.12**	**0.00**	**0.11**
great blue heron	0.00	0.34	0.12	0.00	0.09
herring gull	0.06	0.00	0.00	0.00	0.02
Shorebirds	**3.01**	**2.86**	**0.51**	**0.32**	**1.58**
common snipe	0.84	0.69	0.00	0.00	0.36
greater yellowlegs	0.03	0.00	0.00	0.00	0.01
killdeer	2.11	2.11	0.51	0.32	1.19
long-billed curlew	0.03	0.00	0.00	0.00	0.01
Wilson's phalarope	0.00	0.06	0.00	0.00	0.01
Raptors/Vultures	**7.06**	**9.39**	**8.63**	**3.13**	**6.45**
Accipiters	***0.37***	***0.06***	***1.00***	***0.10***	***0.34***
Cooper's hawk	0.19	0.00	0.16	0.10	0.12
northern goshawk	0.00	0.00	0.08	0.00	0.01
sharp-shinned hawk	0.15	0.06	0.77	0.00	0.20
unidentified accipiter	0.03	0.00	0.00	0.00	0.01
Buteos	***3.66***	***4.10***	***2.81***	***1.76***	***2.93***
red-tailed hawk	2.33	4.04	2.29	0.96	2.18
rough-legged hawk	1.33	0.00	0.52	0.80	0.74
unidentified buteo	0.00	0.06	0.00	0.00	0.01
Eagles	***0.41***	***0.11***	***0.94***	***0.67***	***0.54***
bald eagle	0.22	0.00	0.00	0.34	0.18
golden eagle	0.19	0.11	0.94	0.33	0.37
unidentified eagle	0.00	0.00	0.00	0.00	0.00
Small Falcons	***1.41***	***3.32***	***0.91***	***0.05***	***1.22***
American kestrel	1.32	3.32	0.82	0.05	1.17
merlin	0.09	0.00	0.09	0.00	0.04
Large Falcons	***0.21***	***0.00***	***0.18***	***0.07***	***0.12***
prairie falcon	0.18	0.00	0.18	0.07	0.11
unidentified falcon	0.03	0.00	0.00	0.00	0.01
Other - Raptors					
great-horned owl	0.07	0.00	0.16	0.13	0.09
northern harrier	0.31	0.00	1.98	0.35	0.58

Table 3. Estimated percent composition (mean use divided by total use for all species) for each species observed within 800 m of the survey point all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
osprey	0.03	0.00	0.00	0.00	0.01
turkey vulture	0.58	1.81	0.63	0.00	0.63
Corvids	**5.56**	**2.34**	**7.23**	**6.95**	**5.73**
American crow	0.00	0.17	0.00	0.23	0.11
black-billed magpie	2.19	0.96	2.54	2.29	2.05
common raven	3.31	1.10	4.38	4.42	3.47
Stellar's jay	0.06	0.11	0.31	0.00	0.10
Passerines	**79.43**	**81.49**	**77.75**	**72.58**	**77.14**
American goldfinch	0.00	2.41	1.33	3.12	1.80
American pipit	16.12	0.00	3.53	0.00	5.03
American redstart	0.00	0.06	0.00	0.00	0.01
American robin	10.87	3.61	20.05	10.91	11.20
bank swallow	0.39	0.00	0.00	0.00	0.11
barn swallow	0.51	3.15	1.14	0.00	0.97
black-capped chickadee	0.03	0.06	0.90	0.68	0.43
black-headed grosbeak	0.00	0.06	0.00	0.00	0.01
Brewer's blackbird	4.25	10.69	0.00	0.00	3.23
Brewer's sparrow	0.81	0.11	0.08	0.00	0.25
brown-headed cowbird	0.00	1.00	0.00	0.00	0.20
Bullock's oriole	0.10	0.69	0.00	0.00	0.16
Cassin's finch	0.00	0.00	0.04	0.00	0.01
cedar waxwing	0.20	1.20	5.76	0.00	1.37
chipping sparrow	0.12	1.91	0.38	0.00	0.48
cliff swallow	0.12	1.67	0.00	0.00	0.36
dark-eyed junco	0.07	0.00	1.92	0.05	0.40
eastern kingbird	0.10	0.45	0.00	0.00	0.11
European starling	8.12	13.15	5.51	34.96	17.91
golden-crowned kinglet	0.12	0.00	0.00	0.00	0.03
golden-crowned sparrow	0.00	0.00	0.04	0.00	0.01
gray-crowned rosy finch	0.00	0.00	1.66	1.73	0.91
horned lark	10.85	9.12	16.24	3.62	9.02
house finch	0.18	0.06	0.19	0.00	0.10
lazuli bunting	0.00	0.33	0.00	0.00	0.07
Lincoln's sparrow	0.00	0.00	0.08	0.00	0.01
loggerhead shrike	0.03	0.00	0.00	0.00	0.01
Macgillivray's warbler	0.00	0.06	0.00	0.00	0.01
mountain bluebird	0.89	1.82	6.49	0.00	1.82
mountain chickadee	0.21	0.00	0.15	0.00	0.09
Nashville warbler	0.22	0.00	0.00	0.00	0.06
northern shrike	0.00	0.00	0.29	0.43	0.20

Table 3. Estimated percent composition (mean use divided by total use for all species) for each species observed within 800 m of the survey point all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
orange-crowned warbler	0.27	0.06	0.00	0.00	0.08
pine grosbeak	0.00	0.06	0.00	0.00	0.01
purple finch	0.21	0.00	0.00	0.00	0.06
red crossbill	0.00	0.28	0.00	0.00	0.05
red-breasted nuthatch	0.00	0.00	0.04	0.00	0.01
red-winged blackbird	3.09	0.00	0.00	0.20	0.91
ruby-crowned kinglet	0.15	0.00	0.04	0.06	0.07
sage sparrow	0.24	0.00	0.00	0.00	0.06
sage thrasher	1.19	1.49	0.09	0.00	0.63
savannah sparrow	0.03	0.00	2.98	0.00	0.57
Say's phoebe	0.03	0.11	0.00	0.00	0.03
snow bunting	0.00	0.00	0.18	16.63	5.80
song sparrow	0.07	0.34	0.00	0.00	0.09
spotted towhee	0.84	1.86	0.27	0.00	0.64
Townsend's solitaire	0.06	0.00	0.08	0.00	0.03
Townsend's warbler	0.00	0.06	0.00	0.00	0.01
tree swallow	0.00	0.69	0.00	0.00	0.13
unidentified bluebird	0.00	0.71	0.00	0.00	0.14
unidentified empidonax	0.00	0.00	0.08	0.00	0.01
unidentified finch	0.00	0.39	0.31	0.00	0.13
unidentified flycatcher	0.00	0.06	0.00	0.00	0.01
unidentified passerine	0.18	0.22	0.46	0.00	0.18
unidentified swallow	0.03	0.00	0.12	0.00	0.03
Vaux's swift	0.00	0.11	0.00	0.00	0.02
vesper sparrow	4.61	9.01	0.75	0.00	3.14
violet-green swallow	0.30	0.00	0.00	0.00	0.08
warbling vireo	0.00	0.28	0.00	0.00	0.05
western kingbird	0.46	1.26	0.00	0.00	0.37
western meadowlark	9.77	12.53	3.03	0.19	5.72
western tanager	0.00	0.11	0.00	0.00	0.02
western wood-pewee	0.00	0.22	0.00	0.00	0.04
white-crowned sparrow	0.06	0.00	2.53	0.00	0.49
yellow-headed blackbird	0.03	0.00	0.00	0.00	0.01
yellow-rumped warbler	3.53	0.06	1.01	0.00	1.16
Gamebirds	**0.59**	**1.43**	**4.82**	**0.96**	**1.68**
blue grouse	0.09	0.00	0.15	0.00	0.05
California quail	0.21	1.37	2.76	0.91	1.16
gray partridge	0.15	0.00	1.90	0.00	0.40
ring-necked pheasant	0.15	0.00	0.00	0.05	0.06
ruffed grouse	0.00	0.06	0.00	0.00	0.01

Table 3. Estimated percent composition (mean use divided by total use for all species) for each species observed within 800 m of the survey point all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Doves/Pigeons	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
mourning dove	0.06	0.45	0.37	0.00	0.17
Other Birds	**0.64**	**1.35**	**0.58**	**0.13**	**0.59**
common nighthawk	0.03	1.01	0.00	0.00	0.21
downy woodpecker	0.10	0.00	0.00	0.00	0.03
Lewis's woodpecker	0.00	0.06	0.04	0.00	0.02
northern flicker	0.44	0.17	0.54	0.13	0.30
Rufous hummingbird	0.06	0.11	0.00	0.00	0.04

[a] One June survey was included in the spring Wild Horse results.

Table 4. Estimated frequency of occurrence (average percent of surveys species/group is recorded) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Waterfowl	**6.14**	**2.62**	**0.00**	**4.24**	**3.25**
blue-winged teal	0.00	0.00	0.00	0.00	0.00
Canada goose	0.76	0.56	0.00	0.91	0.56
mallard	5.39	2.07	0.00	3.33	2.70
northern pintail	0.00	0.00	0.00	0.76	0.19
unidentified duck	0.00	0.00	0.00	0.00	0.00
Waterbirds	**0.38**	**1.56**	**1.04**	**0.00**	**0.75**
great blue heron	0.00	1.56	1.04	0.00	0.65
herring gull	0.38	0.00	0.00	0.00	0.09
Shorebirds	**19.47**	**10.91**	**2.76**	**1.67**	**8.70**
common snipe	5.93	6.25	0.00	0.00	3.05
greater yellowlegs	0.38	0.00	0.00	0.00	0.09
killdeer	16.86	9.34	2.76	1.67	7.66
long-billed curlew	0.38	0.00	0.00	0.00	0.09
Wilson's phalarope	0.00	0.51	0.00	0.00	0.13
Raptors/Vultures	**32.77**	**29.55**	**29.13**	**7.14**	**24.65**
Accipiters	***4.34***	***0.51***	***6.29***	***1.67***	***3.20***
Cooper's hawk	2.44	0.00	1.38	1.67	1.37
northern goshawk	0.00	0.00	0.67	0.00	0.17
sharp-shinned hawk	1.52	0.51	4.57	0.00	1.65
unidentified accipiter	0.38	0.00	0.00	0.00	0.09
Buteos	***29.04***	***29.40***	***19.66***	***21.30***	***24.85***
red-tailed hawk	24.82	28.90	16.82	11.52	20.51
rough-legged hawk	11.20	0.00	4.11	11.45	6.69
unidentified buteo	0.00	0.51	0.00	0.00	0.13
Eagles	***4.45***	***0.51***	***8.27***	***8.99***	***5.56***
bald eagle	2.44	0.00	0.00	3.64	1.52
golden eagle	2.39	0.51	8.27	5.36	4.13
unidentified eagle	0.00	0.00	0.00	0.00	0.00
Small Falcons	***15.19***	***26.50***	***5.27***	***0.76***	***11.93***
American kestrel	14.45	26.50	4.47	0.76	11.55
merlin	1.12	0.00	0.79	0.00	0.48
Large Falcons					
prairie falcon	2.32	0.00	1.59	1.14	1.26
unidentified falcon	0.43	0.00	0.00	0.00	0.11
Other - Raptors					
great-horned owl	0.93	0.00	1.38	2.05	1.09
northern harrier	3.88	0.00	15.31	5.65	6.21
osprey	0.38	0.00	0.00	0.00	0.09
turkey vulture	6.36	15.89	3.46	0.00	6.43

Table 4. Estimated frequency of occurrence (average percent of surveys species/group is recorded) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
Corvids	**34.84**	**15.99**	**35.95**	**49.74**	**34.13**
American crow	0.00	1.56	0.00	1.52	0.77
black-billed magpie	15.65	6.66	14.07	17.16	13.39
common raven	22.53	7.27	23.29	39.33	23.10
Stellar's jay	0.76	0.51	2.02	0.00	0.82
Passerines	**85.09**	**93.28**	**68.58**	**46.40**	**73.34**
American goldfinch	0.00	7.81	3.77	3.33	3.73
American pipit	0.38	0.00	2.17	0.00	0.64
American redstart	0.00	0.51	0.00	0.00	0.13
American robin	11.18	13.94	11.52	7.12	10.94
bank swallow	2.47	0.00	0.00	0.00	0.62
barn swallow	2.16	4.09	1.72	0.00	1.99
black-capped chickadee	0.38	0.51	3.09	3.33	1.83
black-headed grosbeak	0.00	0.51	0.00	0.00	0.13
Brewer's blackbird	8.56	21.80	0.00	0.00	7.59
Brewer's sparrow	6.41	0.51	0.34	0.00	1.81
brown-headed cowbird	0.00	3.54	0.00	0.00	0.88
Bullock's oriole	1.23	6.27	0.00	0.00	1.88
Cassin's finch	0.00	0.00	0.34	0.00	0.08
cedar waxwing	1.23	3.60	1.38	0.00	1.55
chipping sparrow	0.38	7.68	0.67	0.00	2.18
cliff swallow	0.38	2.53	0.00	0.00	0.73
dark-eyed junco	0.90	0.00	2.14	0.76	0.95
eastern kingbird	1.23	3.58	0.00	0.00	1.20
European starling	7.85	10.91	2.76	2.58	6.02
golden-crowned kinglet	0.38	0.00	0.00	0.00	0.09
golden-crowned sparrow	0.00	0.00	0.34	0.00	0.08
gray-crowned rosy finch	0.00	0.00	2.52	5.00	1.88
horned lark	38.43	28.60	30.01	12.31	27.34
house finch	1.14	0.51	0.67	0.00	0.58
lazuli bunting	0.00	2.53	0.00	0.00	0.63
Lincoln's sparrow	0.00	0.00	0.34	0.00	0.08
loggerhead shrike	0.37	0.00	0.00	0.00	0.09
Macgillivray's warbler	0.00	0.51	0.00	0.00	0.13
mountain bluebird	4.66	8.79	10.01	0.00	5.87
mountain chickadee	1.14	0.00	0.34	0.00	0.37
Nashville warbler	0.93	0.00	0.00	0.00	0.23
northern shrike	0.00	0.00	2.51	6.97	2.37
orange-crowned warbler	1.68	0.51	0.00	0.00	0.55
pine grosbeak	0.00	0.51	0.00	0.00	0.13
purple finch	0.38	0.00	0.00	0.00	0.09
red crossbill	0.00	0.51	0.00	0.00	0.13
red-breasted nuthatch	0.00	0.00	0.34	0.00	0.08

Table 4. Estimated frequency of occurrence (average percent of surveys species/group is recorded) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
red-winged blackbird	4.08	0.00	0.00	1.67	1.44
ruby-crowned kinglet	1.18	0.00	0.34	0.91	0.61
sage sparrow	1.71	0.00	0.00	0.00	0.43
sage thrasher	10.57	11.44	0.79	0.00	5.70
savannah sparrow	0.38	0.00	4.78	0.00	1.29
Say's phoebe	0.38	1.01	0.00	0.00	0.35
snow bunting	0.00	0.00	1.59	7.86	2.36
song sparrow	0.93	3.08	0.00	0.00	1.00
spotted towhee	6.66	14.29	0.67	0.00	5.40
Townsend's solitaire	0.76	0.00	0.67	0.00	0.36
Townsend's warbler	0.00	0.51	0.00	0.00	0.13
tree swallow	0.00	3.13	0.00	0.00	0.78
unidentified bluebird	0.00	1.06	0.00	0.00	0.27
unidentified empidonax	0.00	0.00	0.68	0.00	0.17
unidentified finch	0.00	0.51	0.34	0.00	0.21
unidentified flycatcher	0.00	0.51	0.00	0.00	0.13
unidentified passerine	0.76	1.01	0.34	0.00	0.53
unidentified swallow	0.38	0.00	1.04	0.00	0.36
Vaux's swift	0.00	0.51	0.00	0.00	0.13
vesper sparrow	32.08	41.10	2.76	0.00	18.98
violet-green swallow	2.11	0.00	0.00	0.00	0.53
warbling vireo	0.00	2.02	0.00	0.00	0.51
western kingbird	2.04	7.77	0.00	0.00	2.45
western meadowlark	53.27	52.53	12.06	2.27	30.03
western tanager	0.00	0.51	0.00	0.00	0.13
western wood-pewee	0.00	1.52	0.00	0.00	0.38
white-crowned sparrow	0.38	0.00	4.11	0.00	1.12
yellow-headed blackbird	0.38	0.00	0.00	0.00	0.09
yellow-rumped warbler	6.23	0.51	3.15	0.00	2.47
Gamebirds	**4.67**	**8.84**	**3.89**	**1.89**	**4.82**
blue grouse	1.14	0.00	0.34	0.00	0.37
California quail	0.76	8.84	2.76	1.14	3.37
gray partridge	0.93	0.00	0.79	0.00	0.43
ring-necked pheasant	1.85	0.00	0.00	0.76	0.65
ruffed grouse	0.00	0.51	0.00	0.00	0.13
Doves/Pigeons					
mourning dove	0.75	3.60	3.22	0.00	1.89
Other Birds	**7.28**	**7.17**	**4.72**	**2.05**	**5.30**
common nighthawk	0.43	4.59	0.00	0.00	1.26
downy woodpecker	1.30	0.00	0.00	0.00	0.33
Lewis's woodpecker	0.00	0.56	0.34	0.00	0.22

Table 4. Estimated frequency of occurrence (average percent of surveys species/group is recorded) for each species observed within 800 m of the survey point for all projects combined (KVWP, DCWP, WHWP).

Group/Species	Spring[a]	Summer	Fall	Winter	Overall
northern flicker	4.79	1.52	4.38	2.05	3.18
Rufous hummingbird	0.76	1.01	0.00	0.00	0.44

[a] One June survey was included in the spring Wild Horse results

Table 5. Flight height characteristics of bird species and groups observed during the fixed-point surveys at KVWP, DCWP, and WHWP.

				% w/i Height Categories		
Group/Species	**Number groups flying**	**Number birds flying**	**Percent of birds flying**	**<25 m**	**25-125m**	**> 125 m**
Waterfowl	**16**	**478**	**85.36**	**4.39**	**74.69**	**20.92**
blue-winged teal	1	3	100.00	100.00	0.00	0.00
Canada goose	2	113	72.90	0.00	11.50	88.50
mallard	12	358	91.56	5.03	94.97	0.00
northern pintail	1	4	100.00	0.00	100.00	0.00
unidentified duck	0	0	0.00	0.00	0.00	0.00
Waterbirds	**3**	**5**	**100.00**	**80.00**	**20.00**	**0.00**
great blue heron	2	3	100.00	66.67	33.33	0.00
herring gull	1	2	100.00	100.00	0.00	0.00
Shorebirds	**34**	**54**	**63.53**	**59.26**	**40.74**	**0.00**
common snipe	11	11	68.75	0.00	100.00	0.00
greater yellowlegs	1	1	100.00	100.00	0.00	0.00
killdeer	21	41	62.12	75.61	24.39	0.00
long-billed curlew	1	1	100.00	0.00	100.00	0.00
Wilson's phalarope	0	0	0.00	0.00	0.00	0.00
Raptors	**379**	**391**	**80.62**	**44.76**	**44.76**	**10.49**
Accipiters	***26***	***26***	***86.67***	***42.31***	***42.31***	***15.38***
Cooper's hawk	8	8	72.73	50.00	50.00	0.00
northern goshawk	2	2	100.00	0.00	50.00	50.00
sharp-shinned hawk	15	15	100.00	46.67	33.33	20.00
unidentified accipiter	1	1	50.00	0.00	100.00	0.00
Buteos	***155***	***160***	***75.47***	***32.50***	***56.87***	***10.63***
red-tailed hawk	119	124	77.50	27.42	59.68	12.90
rough-legged hawk	31	31	67.39	54.84	45.16	0.00
unidentified buteo	5	5	83.33	20.00	60.00	20.00
Eagles	***30***	***31***	***83.78***	***22.58***	***58.06***	***19.35***
bald eagle	12	13	81.25	30.77	61.54	7.69
golden eagle	16	16	84.21	18.75	56.25	25.00
unidentified eagle	2	2	100.00	0.00	50.00	50.00
Small Falcons	***81***	***86***	***80.37***	***59.30***	***36.05***	***4.65***
American kestrel	77	82	79.61	58.54	37.80	3.66
merlin	4	4	100.00	75.00	0.00	25.00
Large Falcons						
prairie falcon	7	7	87.50	57.14	42.86	0.00
unidentified falcon	1	1	50.00	100.00	0.00	0.00
Other - Raptors						
great-horned owl	0	0	0.00	0.00	0.00	0.00

Table 5. Flight height characteristics of bird species and groups observed during the fixed-point surveys at KVWP, DCWP, and WHWP.

				% w/i Height Categories		
Group/Species	**Number groups flying**	**Number birds flying**	**Percent of birds flying**	**<25 m**	**25-125m**	**> 125 m**
northern harrier	40	40	97.56	85.00	15.00	0.00
osprey	0	0	0.00	0.00	0.00	0.00
turkey vulture	39	40	95.24	37.50	37.50	25.00
Corvids	**165**	**285**	**73.08**	**62.11**	**32.28**	**5.61**
American crow	1	3	50.00	100.00	0.00	0.00
black-billed magpie	57	98	72.06	87.76	12.24	0.00
common raven	101	176	74.58	46.02	44.89	9.09
Stellar's jay	6	8	66.67	87.50	12.50	0.00
Passerines	**403**	**3797**	**68.53**	**57.94**	**42.06**	**0.00**
American goldfinch	11	41	40.59	46.34	53.66	0.00
American pipit	5	607	100.00	88.47	11.53	0.00
American redstart	1	1	100.00	100.00	0.00	0.00
American robin	44	668	83.50	28.89	71.11	0.00
bank swallow	2	4	100.00	50.00	50.00	0.00
barn swallow	10	55	90.16	49.09	50.91	0.00
black-capped chickadee	2	8	26.67	100.00	0.00	0.00
black-headed grosbeak	1	1	100.00	100.00	0.00	0.00
Brewer's blackbird	30	134	75.71	88.81	11.19	0.00
Brewer's sparrow	0	0	0.00	0.00	0.00	0.00
brown-headed cowbird	1	1	5.56	100.00	0.00	0.00
Bullock's oriole	3	3	50.00	100.00	0.00	0.00
Cassin's finch	0	0	0.00	0.00	0.00	0.00
cedar waxwing	4	127	94.78	13.39	86.61	0.00
chipping sparrow	3	19	40.43	100.00	0.00	0.00
cliff swallow	6	31	91.18	77.42	22.58	0.00
dark-eyed junco	3	31	68.89	100.00	0.00	0.00
eastern kingbird	3	3	42.86	100.00	0.00	0.00
European starling	25	990	93.05	30.91	69.09	0.00
golden-crowned kinglet	0	0	0.00	0.00	0.00	0.00
golden-crowned sparrow	0	0	0.00	0.00	0.00	0.00
gray-crowned rosy finch	5	34	100.00	41.18	58.82	0.00
horned lark	108	463	56.26	90.06	9.94	0.00
house finch	3	6	50.00	100.00	0.00	0.00
lazuli bunting	0	0	0.00	0.00	0.00	0.00
Lincoln's sparrow	0	0	0.00	0.00	0.00	0.00
loggerhead shrike	0	0	0.00	0.00	0.00	0.00
Macgillivray's warbler	0	0	0.00	0.00	0.00	0.00
mountain bluebird	26	99	67.81	83.84	16.16	0.00
mountain chickadee	2	6	54.55	100.00	0.00	0.00

Table 5. Flight height characteristics of bird species and groups observed during the fixed-point surveys at KVWP, DCWP, and WHWP.

				% w/i Height Categories		
Group/Species	**Number groups flying**	**Number birds flying**	**Percent of birds flying**	**<25 m**	**25-125m**	**> 125 m**
Nashville warbler	0	0	0.00	0.00	0.00	0.00
northern shrike	5	5	55.56	100.00	0.00	0.00
orange-crowned warbler	0	0	0.00	0.00	0.00	0.00
pine grosbeak	0	0	0.00	0.00	0.00	0.00
purple finch	1	7	100.00	100.00	0.00	0.00
red crossbill	0	0	0.00	0.00	0.00	0.00
red-breasted nuthatch	1	1	100.00	100.00	0.00	0.00
red-winged blackbird	3	25	45.45	88.00	12.00	0.00
ruby-crowned kinglet	1	1	50.00	100.00	0.00	0.00
sage sparrow	0	0	0.00	0.00	0.00	0.00
sage thrasher	3	3	6.82	100.00	0.00	0.00
savannah sparrow	7	37	59.68	100.00	0.00	0.00
Say's phoebe	1	1	33.33	100.00	0.00	0.00
snow bunting	5	141	100.00	39.01	60.99	0.00
song sparrow	0	0	0.00	0.00	0.00	0.00
spotted towhee	3	3	5.00	100.00	0.00	0.00
Townsend's solitaire	1	1	25.00	0.00	100.00	0.00
Townsend's warbler	0	0	0.00	0.00	0.00	0.00
tree swallow	1	2	50.00	100.00	0.00	0.00
unidentified bluebird	2	12	100.00	100.00	0.00	0.00
unidentified empidonax	0	0	0.00	0.00	0.00	0.00
unidentified finch	2	15	100.00	100.00	0.00	0.00
unidentified flycatcher	1	1	100.00	100.00	0.00	0.00
unidentified passerine	4	17	77.27	94.12	5.88	0.00
unidentified swallow	2	2	100.00	50.00	50.00	0.00
Vaux's swift	1	2	100.00	100.00	0.00	0.00
vesper sparrow	13	19	8.37	100.00	0.00	0.00
violet-green swallow	4	7	100.00	28.57	71.43	0.00
warbling vireo	0	0	0.00	0.00	0.00	0.00
western kingbird	5	7	46.67	42.86	57.14	0.00
western meadowlark	26	47	11.24	97.87	2.13	0.00
western tanager	0	0	0.00	0.00	0.00	0.00
western wood-pewee	0	0	0.00	0.00	0.00	0.00
white-crowned sparrow	1	4	9.09	100.00	0.00	0.00
yellow-headed blackbird	1	1	100.00	100.00	0.00	0.00
yellow-rumped warbler	11	104	81.25	100.00	0.00	0.00
Gamebirds	**1**	**4**	**4.49**	**100.00**	**0.00**	**0.00**
blue grouse	1	4	57.14	100.00	0.00	0.00
California quail	0	0	0.00	0.00	0.00	0.00
gray partridge	0	0	0.00	0.00	0.00	0.00

Table 5. Flight height characteristics of bird species and groups observed during the fixed-point surveys at KVWP, DCWP, and WHWP.

				% w/i Height Categories		
Group/Species	**Number groups flying**	**Number birds flying**	**Percent of birds flying**	**<25 m**	**25-125m**	**> 125 m**
ring-necked pheasant	0	0	0.00	0.00	0.00	0.00
ruffed grouse	0	0	0.00	0.00	0.00	0.00
Doves/Pigeons						
mourning dove	11	12	100.00	83.33	16.67	0.00
Other Birds	**23**	**30**	**53.57**	**36.67**	**56.67**	**6.67**
common nighthawk	9	16	94.12	0.00	87.50	12.50
downy woodpecker	1	1	50.00	100.00	0.00	0.00
Lewis's woodpecker	2	2	100.00	50.00	50.00	0.00
northern flicker	7	7	22.58	71.43	28.57	0.00
Rufous hummingbird	4	4	100.00	100.00	0.00	0.00
Overall	**1035**	**5056**	**70.00**	**52.10**	**44.76**	**3.14**

Table 6. Exposure indices calculated for species observed during fixed-point surveys at KVWP, DCWP, and WHWP.

Group/Species	Mean use	Percent flying	Percent flying within RSA	Exposure Index
Waterfowl	**0.648**	**85.36**	**74.69**	**0.413**
blue-winged teal	0.000	100.00	0.00	0.000
Canada goose	0.041	72.90	11.50	0.003
mallard	0.602	91.56	94.97	0.523
northern pintail	0.006	100.00	100.00	0.006
unidentified duck	0.000	0.00	0.00	0.000
Waterbirds	**0.009**	**100.00**	**20.00**	**0.002**
great blue heron	0.007	100.00	33.33	0.002
herring gull	0.002	100.00	0.00	0.000
Shorebirds	**0.169**	**63.53**	**40.74**	**0.044**
common snipe	0.036	68.75	100.00	0.025
greater yellowlegs	0.001	100.00	0.00	0.000
killdeer	0.130	62.12	24.39	0.020
long-billed curlew	0.001	100.00	100.00	0.001
Wilson's phalarope	0.001	0.00	0.00	0.000
Raptors	**0.748**	**80.62**	**44.76**	**0.270**
Accipiters	***0.042***	***86.67***	***42.31***	***0.015***
Cooper's hawk	0.014	72.73	50.00	0.005
northern goshawk	0.002	100.00	50.00	0.001
sharp-shinned hawk	0.024	100.00	33.33	0.008
unidentified accipiter	0.001	50.00	100.00	0.001
Buteos	***0.331***	***75.47***	***56.87***	***0.142***
red-tailed hawk	0.245	77.50	59.68	0.113
rough-legged hawk	0.084	67.39	45.16	0.026
unidentified buteo	0.001	83.33	60.00	0.001
Eagles	***0.061***	***83.78***	***58.06***	***0.030***
bald eagle	0.019	81.25	61.54	0.010
golden eagle	0.042	84.21	56.25	0.020
unidentified eagle	0.000	100.00	50.00	0.000
Small Falcons	***0.152***	***80.37***	***36.05***	***0.044***
American kestrel	0.146	79.61	37.80	0.044
merlin	0.006	100.00	0.00	0.000
Large Falcons				
prairie falcon	0.014	87.50	42.86	0.005
unidentified falcon	0.002	50.00	0.00	0.000
Other - Raptors				
great-horned owl	0.010	0.00	0.00	N/A
northern harrier	0.071	97.56	15.00	0.010

Table 6. Exposure indices calculated for species observed during fixed-point surveys at KVWP, DCWP, and WHWP.

Group/Species	Mean use	Percent flying	Percent flying within RSA	Exposure Index
osprey	0.001	0.00	0.00	N/A
turkey vulture	0.064	95.24	37.50	0.023
Corvids	**0.659**	**73.08**	**32.28**	**0.155**
American crow	0.010	50.00	0.00	0.000
black-billed magpie	0.232	72.06	12.24	0.020
common raven	0.403	74.58	44.89	0.135
Stellar's jay	0.014	66.67	12.50	0.001
Passerines	**8.924**	**68.53**	**42.06**	**2.572**
American goldfinch	0.168	40.59	53.66	0.037
American pipit	0.721	100.00	11.53	0.083
American redstart	0.001	100.00	0.00	0.000
American robin	1.306	83.50	71.11	0.776
bank swallow	0.012	100.00	50.00	0.006
barn swallow	0.098	90.16	50.91	0.045
black-capped chickadee	0.047	26.67	0.00	0.000
black-headed grosbeak	0.001	100.00	0.00	0.000
Brewer's blackbird	0.316	75.71	11.19	0.027
Brewer's sparrow	0.054	0.00	0.00	0.000
brown-headed cowbird	0.021	5.56	0.00	0.000
Bullock's oriole	0.013	50.00	0.00	0.000
Cassin's finch	0.001	0.00	0.00	N/A
cedar waxwing	0.183	94.78	86.61	0.150
chipping sparrow	0.056	40.43	0.00	0.000
cliff swallow	0.040	91.18	22.58	0.008
dark-eyed junco	0.059	68.89	0.00	0.000
eastern kingbird	0.011	42.86	0.00	0.000
European starling	1.813	93.05	69.09	1.165
golden-crowned kinglet	0.005	0.00	0.00	N/A
golden-crowned sparrow	0.001	0.00	0.00	N/A
gray-crowned rosy finch	0.086	100.00	58.82	0.051
horned lark	1.309	56.26	9.94	0.073
house finch	0.014	50.00	0.00	0.000
lazuli bunting	0.007	0.00	0.00	N/A
Lincoln's sparrow	0.002	0.00	0.00	N/A
loggerhead shrike	0.002	0.00	0.00	N/A
Macgillivray's warbler	0.001	0.00	0.00	N/A
mountain bluebird	0.234	67.81	16.16	0.026
mountain chickadee	0.013	54.55	0.00	0.000
Nashville warbler	0.007	0.00	0.00	N/A
northern shrike	0.020	55.56	0.00	0.000

Table 6. Exposure indices calculated for species observed during fixed-point surveys at KVWP, DCWP, and WHWP.

Group/Species	Mean use	Percent flying	Percent flying within RSA	Exposure Index
orange-crowned warbler	0.010	0.00	0.00	N/A
pine grosbeak	0.001	0.00	0.00	N/A
purple finch	0.008	100.00	0.00	0.000
red crossbill	0.006	0.00	0.00	N/A
red-breasted nuthatch	0.001	100.00	0.00	0.000
red-winged blackbird	0.107	45.45	12.00	0.006
ruby-crowned kinglet	0.010	50.00	0.00	0.000
sage sparrow	0.014	0.00	0.00	N/A
sage thrasher	0.092	6.82	0.00	0.000
savannah sparrow	0.081	59.68	0.00	0.000
Say's phoebe	0.003	33.33	0.00	0.000
snow bunting	0.468	100.00	60.99	0.286
song sparrow	0.008	0.00	0.00	N/A
spotted towhee	0.077	5.00	0.00	0.000
Townsend's solitaire	0.005	25.00	100.00	0.001
Townsend's warbler	0.001	0.00	0.00	N/A
tree swallow	0.009	50.00	0.00	0.000
unidentified bluebird	0.015	100.00	0.00	0.000
unidentified empidonax	0.002	0.00	0.00	N/A
unidentified finch	0.017	100.00	0.00	0.000
unidentified flycatcher	0.001	100.00	0.00	0.000
unidentified passerine	0.026	77.27	5.88	0.001
unidentified swallow	0.003	100.00	50.00	0.002
Vaux's swift	0.002	100.00	0.00	0.000
vesper sparrow	0.373	8.37	0.00	0.000
violet-green swallow	0.011	100.00	71.43	0.008
warbling vireo	0.006	0.00	0.00	N/A
western kingbird	0.034	46.67	57.14	0.009
western meadowlark	0.673	11.24	2.13	0.002
western tanager	0.002	0.00	0.00	N/A
western wood-pewee	0.005	0.00	0.00	N/A
white-crowned sparrow	0.065	9.09	0.00	0.000
yellow-headed blackbird	0.001	100.00	0.00	0.000
yellow-rumped warbler	0.162	81.25	0.00	0.000
Gamebirds	**0.176**	**4.49**	**0.00**	**0.000**
blue grouse	0.008	57.14	0.00	0.000
California quail	0.113	0.00	0.00	N/A
gray partridge	0.048	0.00	0.00	N/A
ring-necked pheasant	0.006	0.00	0.00	N/A
ruffed grouse	0.001	0.00	0.00	N/A

Table 6. Exposure indices calculated for species observed during fixed-point surveys at KVWP, DCWP, and WHWP.

Group/Species	Mean use	Percent flying	Percent flying within RSA	Exposure Index
Doves/Pigeons			**0.00**	
mourning dove	0.019	100.00	16.67	0.003
Other Birds	**0.076**	**53.57**	**56.67**	**0.023**
common nighthawk	0.022	94.12	87.50	0.018
downy woodpecker	0.003	50.00	0.00	0.000
Lewis's woodpecker	0.002	100.00	50.00	0.001
northern flicker	0.043	22.58	28.57	0.003
Rufous hummingbird	0.005	100.00	0.00	0.000

Table 7. Information on home range sizes of breeding raptors that occur or could potentially occur near the KVWP, DCWP and WHWP.

Species	Home range/territory size Dimension and reference
red-tailed hawk	1.5 mi^2 (3.9 km^2) home range, territory up to 3 mi^2/pair (7.8 km^2/pair) (Brown 1985) nesting territory 0.5-3 mi^2 (1.3-7.8 km^2) (Thomas 1973) 1 nest/1.4 mi^2 (1 nest/3.6 km^2) (Richmond, B.C., Runyan 1987) 1 pair per 2.7 mi^2 (1 pair per 7.0 km^2) (Wisconsin, Orians and Kuhlman 1956) 1 pair per 2.8 mi^2 (1 pair per 7.2 km^2) (Alberta, Luttich et al. 1971) 1 pair per 2.2 mi^2 (1 pair per 5.7 km^2) (New York, Hagar 1957) 1 pair per 0.5 mi^2 (1 pair per 1.3 km^2) (California, Fitch et al. 1946) .5 mi^2 (1.3 km^2) ranging from 0.2 – 0.8 mi^2 (0.5 – 2.1 km^2) (Wisconsin, Peterson 1979) Preston and Beans (1993) describe home ranges as smaller in areas with large expanses of open terrain
Swainson's hawk	2.4 mi^2 (6.3 km^2) (females – 1.3 mi^2 (3.4 km^2), males – 3.5 mi^2 (9.1 km^2)) (Washington, Fitzner 1980) 10.7 mi^2 (27.7 km^2) (California, Estep 1989) 16.6 mi^2 (43.0 km^2) (California, Babcock 1995) 12.6 mi^2 (32.6 km^2) (California, Sernka 1999) 0.3-10.7 mi^2 (0.8-27.7 km^2); average home ranges were 2.4-3.4 mi^2 (6.2-8.8 km^2), with individual sizes ranging from 1.0-7.8 mi^2 (2.6-20.2 km^2) (SE Washington, England et al. 1997)
ferruginous hawk	12.0-30.5 mi^2 (31–79 km^2) (Washington, Leary 1996) 2.9 mi^2 (7.6 km^2) (Idaho, McAnnis 1990)
rough-legged hawk	n/a, migrant and wintering only, winter range data unavailable
golden eagle	Home range 4 mi (6.4 km) (radius; territory 5.5-8.0 mi^2 (14.2-20.7 km^2) (Brown 1985) home range 4-10 mi^2 (10.4-25.9 km^2) (Wyoming, Postovit, pers. comm.) 7.7-12.4 mi^2 (20–32 km^2) (western U.S., Kochert et al. 2002); 95% locations within Core areas. Mean distance traveled during breeding season 0.7 mi (1.0 km) (Marzluff et al. 1997).
bald eagle	home range – 4 mi (6.4 km) radius (Brown 1985)
American kestrel	home range – 0.4 mi^2 (1.1 km^2) breeding; 1.7 mi^2 (4.5 km^2) winter; territory 0.4 mi^2 (1.1 km^2) breeding, 0.4 mi^2 (1.1 km^2) winter (Brown 1985) home range diameter – 0.4-1.5 mi (0.7-2.4 km) (Smallwood and Bird 2002)
merlin	n/a, transient only

Table 7. Information on home range sizes of breeding raptors that occur or could potential occur near the KVWP, DCP and WHWP.

Species	Home range/territory size Dimension and reference
prairie falcon	home range up to 4.5 mi^2 (11.7 km^2) winter (Brown 1985) 22.8-121.6 mi^2 (59 -315 km^2), with 41.7-121.6 mi^2 (108–315 km^2) documented in SW Idaho; Home ranges not used equally. Mean distance traveled from nests during hunting is 4.3 mi (7 km) with a max of > 12.4 mi (20 km) (home ranges sizes based on MCP methods, Steenhof 1998)
peregrine falcon	n/a, transient only
northern harrier	home range 0.4-3.4 mi^2 (1.0-8.9 km^2), breeding; 0.05-1.0 mi^2) (0.1-2.6 km^2), winter; territory up to 0.1 mi^2 (0.3 km^2) (Brown 1985)
turkey vulture	not available
burrowing owl	home range 0.1-4.0 acres (0.04-1.6 ha), average 2 acres (0.8 ha) (Brown 1985) 0.05-1.86 mi^2 (0.14–4.81 km^2) (day and night observations) (Haug and Oliphant 1990)
short-eared owl	home range 3.5 mi (5.6 km) radius, territory size 0.08-0.39 mi^2 (0.20-1.01 km^2) (Brown 1985)

Figure 1. Region map of wind projects proposed for Kittitas County.