Klondike III (Phase 1) Wind Power Project
Wildlife Monitoring Year One Summary
October 2007–October 2008

Prepared for:

Iberdrola Renewables
Klondike Wind Power III LLC
1125 NW Couch St., Suite 700
Portland, Oregon 97209

Prepared by:

Bob Gritski, Scott Downes, Karen Kronner

Northwest Wildlife Consultants, Inc.
815 NW 4th St.
Pendleton, Oregon 97801

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1.0 INTRODUCTION

1.1 Wind Project Description

Klondike III Wind Project (Project), located in Sherman County, Oregon is a wind-powered electric generating plant with an average electric generating capacity of approximately 125 megawatts (MW) and a peak generating capacity of not more than 375 MW. It was developed and is operated by Klondike Wind Power III LLC (Iberdrola Renewables, originally PPM Energy) of Portland, Oregon. There are two phases, referred to simply as Klondike III (Phase 1) and Klondike IIIa (Phase 2), both permitted by the State of Oregon through the Energy Facility Siting Council (EFSC) process. Klondike Wind Power III LLC received a Site Certificate from the EFSC through the Oregon Department of Energy on June 30, 2006 and a Site Certificate for Klondike IIIa on November 16, 2007. Klondike III Phase 1 was commissioned and fully operational in October, 2007 and consists of 122 turbines. Of these 122 turbines, 80 are 1.5 MW GE turbines and 42 are Siemens 2.3 MW turbines. Phase 2 consists of 51, 1.5 MW turbines. The MW listed is a nameplate capacity and does not reflect actual production. Wildlife monitoring is required for each phase. Phase 1 is the subject of this annual wildlife monitoring report; Phase 2 annual wildlife monitoring report will be prepared in late-2009.

1.2 Post-construction Wildlife Monitoring Study

This first annual report summarizes methods and results of the first year of the two-year avian and bat monitoring study for the Klondike III Wind Project since the Project was constructed in October 2007 including:

- Wildlife fatality monitoring including reporting of all casualties found, results of Carcass Removal and Searcher Efficiency Trials, and estimated fatalities per MW in the eight categories (7 avian, 1 bat) as described in the Wildlife Monitoring and Mitigation Plan (WMMP, page A-5) filed under the EFSC site certificate (OEFSC, 2007).
- Raptor nest monitoring surveys in 2008
- Avian use surveys

Wildlife fatality monitoring results include all casualties found at the Project from October 15, 2007 through October 29, 2008 including all incidental finds, casualties found during the initial “clean-up search” conducted from October 15–30, 2007, and casualties found during the first four seasons of formal monitoring conducted from winter season 2007–2008 through fall season 2008. Previously unidentified or unconfirmed specimens were examined after the end of the first year of monitoring to determine species where possible. Wildlife fatality estimates included in this report were summarized from data collected during the first year of a two-year monitoring study and, therefore, are considered preliminary.

2.0 METHODS

Wildlife monitoring study protocol methods are available in detail in the Klondike III Wildlife Monitoring and Mitigation Plan (Attachment A of the Final Order on Amendment #3 of the Site Certificate for the Klondike III Wind Project, dated November 16, 2007; OEFSC, 2007). Those methods are summarized in this section.

2.1 Study Design

The study design consists of a sampling of the 122 Phase 1 turbines (of two sizes) to be searched during the first year of monitoring (Figure 1). Of the 80 1.5 MW turbines, 23 of these turbines were searched during year one (29%). Of the 42 Siemens 2.3 MW turbines, 23 of these were searched during year one (55%). Of the 122 turbines installed as of October 2007, 46 were searched during year one (38%). The 1.5 MW turbines had a square search plot of approximately 240 meters (m) on each side centered on the turbine (120 m from the turbine base in all directions). The 2.3 MW turbines had a square search plot of approximately 252 m on each side centered on the turbine (126 m from the turbine base in all directions).

The 240 meter and 256 meter search plot areas overlapped into adjoining non-searched turbines. To account for the overlapping area, the sample size used the "effective area searched" rather than number of search plots. The effective area searched was calculated using ArcView 9.2 and the sample size of searched turbines was adjusted to reflect the effective search area. For year one turbines, the effective area searched for the 1.5 MW turbines was 27.30 turbines and for the 2.3 MW turbines the effective area searched was 24.83 turbines. Fatality estimates used this correction factor and discussion of observed fatalities per turbine also used this correction factor.

Personnel trained in proper search techniques ("the searchers") conducted the carcass searches by walking parallel transects within the search plots. Transects were set at 6 meter intervals. The searchers walked at a rate of approximately 45 to 60 meters per minute along each transect, searching both sides out to three meters for casualties. Search pace varied by searcher and in different habitat types.

2.1.1 Search Schedule

Search periods were divided into two primary intervals—searches were conducted twice a month during spring and fall migration periods, and once a month during summer and winter seasons. Dates for these search periods and actual dates that searches began are shown in Table 1. Due to inclement weather during some seasons, actual search intervals were longer than planned search intervals. An example of this was winter period where the searches for January 2008 were delayed due to snow cover and/or freezing fog resulting in unsafe field conditions.

Table 1. Standardized carcass search periods at Klondike III Wind Project 2007–2008.

Season	Search Period	Search Conducted	# of Searches
Clean-up	October 15–30, 2007	October 15	1
Winter	November 1, 2007–March 15, 2008	November 15 December 13 January 21 February 18	4
Spring	March 16–May 13, 2008	March 17, 31 April 14, 28	4
Summer	May 14 to August 15, 2008	May 14 June 19 July 16	3
Fall	August 16 to October 31, 2008	August 18 September 9, 22 October 8, October 22	5

2.1.2 Search Protocol, Data Collection, and Incidentals

For all searches, the field staff recorded the condition of each carcass found, using the following condition categories:

- Intact – A carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger.
- Scavenged – An entire carcass, which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location (e.g., wings, skeletal remains, legs, pieces of skin, etc.).
- Feather Spot – Ten or more feathers or three or more primaries (the outermost 9 – 12 wing feathers) at one location indicating predation or scavenging.
- Dismembered – A carcass in two or more pieces, not readily attributed to scavengers. May not include all parts of the carcass.

Casualties were assigned to a taxonomic group. The basic definitions of the taxonomic groups which were found are as follows:

- Dove – Any member of the order of Columbiformes.
- Galliformes – Any gallinaceous bird. These included gray partridge and ring-necked pheasant on the study.
- Heron – Any member of the order Ciconiiformes, which includes heron and egret species. This group is represented by great-blue heron in this report.
- Passerine – Any member of the order of Passeriformes, or perching birds.
- Rail – Any member of the family Rallidae. This group is represented by Virginia rail in this report.
- Raptor – Any diurnal or nocturnal bird of prey belonging to the orders of Falconiformes or Strigiformes. This includes falcons, hawks and owls (USFWS 2002).

All carcasses found were labeled with a unique number, bagged and frozen for future reference and possible necropsy. A freezer tag with pertinent information for each carcass was inserted with the bagged specimen. All casualties located were photographed as found and plotted on a detailed map of the study area. For each carcass found, searchers recorded species, sex, and age when possible, date and time collected, location (distance and direction from turbine), condition (as detailed above), and any comments relevant to cause of death. All carcasses were collected and stored in accordance with appropriate Oregon Department of Fish and Wildlife (ODFW) and U.S. Fish and Wildlife Service (USFWS) collection and salvage permits obtained by NWC prior to field activities.

Incidentals

"Incidentals" are defined as bird and bat casualties found in non-search areas (e.g., near a turbine but not included in the search area) or not during scheduled searches at turbine plots.

Avian or bat casualties found in search plots by Iberdrola Renewables (IBR) maintenance personnel and others not conducting the formal searches were left undisturbed, recorded using the incident report form, and reported to the Project biologist. These casualties were left on-site, unless the animal was found alive and injured. By leaving the casualty on a search plot, researchers could determine if that casualty was found by searchers during the next scheduled search or had been removed by scavengers or not detected during searcher efforts on the plot. ODFW and USFWS permits included allowances for the collection and transport of injured animals discovered during Project activities. The specific permit compliance protocol for the handling and reporting of injured or dead birds and bats is included in the Klondike III Wildlife Monitoring and Mitigation Plan. Further details on IBR

Klondike III Wind Project Wildlife Reporting and Handling System can be found in the Klondike III Wildlife Monitoring and Mitigation Plan (OEFSC, 2007).

2.2 Carcass Removal Trials

The objective of the carcass removal (or "persistence") trials is to estimate the average length of time avian and bat carcasses remain in the search area before being removed by scavengers or reach a deteriorated condition where the ability to detect the animal is not possible, and is inclusive of other influences on carcass persistence. Estimates of carcass removal rates are used to adjust carcass counts for removal bias. "Carcass removal" is the disappearance of a carcass from the search area. "Carcass persistence" is the mirror image of this, the persistence of a carcass in the search area in spite of potential scavenging. For consistency with terminology used for regional wind project wildlife fatality monitoring studies, collectively these are referred to as "removal" or removal/persistence trials in this report; analysis of each was not conducted separately.

The trials were conducted within each of the seasons defined above (Table 1) during the study. Trials were spread throughout the year to incorporate the effects of varying weather, farming practices, and scavenger densities. Each trial used at least 20 carcasses. For each trial, 10 small bird carcasses and 10 large bird carcasses were distributed spatially throughout the Project. Two trials were placed each season, resulting in 20 small and 20 large birds placed per season for a total of 160 trials for the year (80 small and 80 large). The WMMP (page A-3) states that for each season one trial will be conducted resulting in at least 10 small and 10 large placed. NWC increased the sample size for large and small per season to enable more defined examination of the CRT rates by season rather than lumping the four seasons together. As with the first year, there will be 160 trials for the year in the second year.

Trial carcasses were marked discreetly for recognition by searchers and other personnel to ensure that these carcasses would not be confused with actual turbine mortalities. Trial carcasses were left at the location until the end of the carcass removal trial. Trials lasted for 35 days and were checked every day for the first four days and again on day 7, day 10, day 14, day 21, day 28, and day 35. At the end of the 35-day trial period, any remaining birds and feathers were removed. Birds were placed in all available habitat groups and in three different exposure classes; fully exposed, partially hidden, and fully hidden. This data was used to determine scavenging rates based on statistical methods presented below.

Two size classes, "large" (raptor size) and "small" (songbird size) were used to simulate fatalities. Native species were used whenever possible, but due to their limited availability, non-native species were also used. Small brown game bird chicks were used as surrogates for bat fatalities.

2.3 Searcher Efficiency Trials

Searcher efficiency (SEEF) trials were conducted during turbine plot searches to determine the probability of a searcher detecting a carcass known to be present. A Project biologist placed carcasses at random times and locations on search plots for searchers to detect. These were blind trials, meaning that the searcher did not know of the trial prior to searching that plot and each searcher was independent of other searchers, due to the fact that searchers did not discuss their results while the trial was on-going, but waited until searches were completed. A trial is considered a single animal and the result is either a find or a miss by the searcher. Treatment of this data is discussed below in statistical methods. The Project biologist removed the SEEF carcasses immediately following each day's trials to prevent attracting scavengers to the site.

Searcher efficiency trials were conducted on the fatality monitoring search plots in both grassland/shrub-steppe and cultivated agriculture habitat types. Searcher efficiency was estimated by season and carcass size. Estimates of searcher efficiency were used to adjust observed fatalities for detection bias.

Searcher efficiency trials were conducted in each season as defined above (Table 1), during the fatality monitoring year. Trials were spread throughout the year to incorporate the effects of seasonal variations in weather, farming practices, and vegetative cover. At least two sets of trials were conducted in each season. Each set consisted of a variable number of carcasses so that the searchers did not know the total number of trial carcasses being used in any given trial. For each trial set, both small bird and large bird carcasses were used. For the year, 129 large bird carcasses were placed and 143 small bird carcasses for a total of 272 trials. The WMMP (page A-4) requires a minimum of 100 total carcasses per year. As described previously under Carcass Removal Trials, additional trials were used during the first year and will be used during the second year to allow analysis of each season independently instead of lumping all four seasons together.

On the day of a fatality monitoring search but before the beginning of the search, efficiency trial carcasses were placed at random locations within areas to be searched. Carcasses were randomly placed in a variety of postures to simulate a range of conditions. For example, birds were: 1) placed in an exposed posture (thrown over the shoulder), 2) hidden to simulate a crippled bird, and 3) partially hidden.

In order to ensure that SEEF trial carcasses were not mistaken for actual turbine casualties, each trial bird used as a SEEF carcass was discreetly marked so that it could be correctly identified as an efficiency trial carcass after it was found. The number and location of the efficiency trial carcasses found during the carcass search was recorded. The number of efficiency trial carcasses available for detection during each trial, e.g., not removed by scavengers, was determined immediately after the trial by the person responsible for distributing the carcasses. If a scavenger removed the carcass the trial was not used as it was not possible to determine if the bird was available for detection or not.

SEEF was estimated separately for two sizes classes, large and small. Native species were used whenever possible, but due to their limited availability, non-native species were also used. Small carcasses (e.g., non-native species like quail, and juvenile ringed-necked pheasants, and native passerine species) were used to represent small birds such as passerines. Large carcasses (e.g. adult ring-necked pheasants, rock doves, chukars, and mallards were used to simulate large birds such as raptors, game birds, and waterfowl. Due to lack of available bat carcasses, small brown game bird chicks were used as surrogates for bats.

2.4 Statistical Methods for Estimating Fatalities

2.4.1 Removal Trials

Estimates of the probability that a carcass will not be removed in the interval between searches are used to adjust carcass counts for removal bias. Removal includes removal by predation, scavenging, farm practices, wind, or decomposition. In most fatality monitoring efforts, it is assumed that carcass removal occurs at a constant rate that is not dependent on the time since death. This simplifying assumption allows us to estimate fatality when search intervals exceed one day.

The length of time a carcass remains in the study area before it is removed is typically modeled as an exponentially distributed random variable. The probability that a carcass is not removed during an interval of length *I* can be approximated as

$$r_m = \sum_{d=1}^{I} \exp(-(d-0.5)/t)/I$$

, the average probability of persisting given its death might have occurred on any day (*d*) in the interval.

2.4.2 Searcher Efficiency Trials

Estimates of the probability that a carcass will be detected by an observer during a search (searcher efficiency) are used to adjust carcass counts for observer bias. The failure of an observer to detect a carcass that is on the search plot may be due to its size or color, or time since death, as well as conditions in its immediate vicinity, such as vegetation density, shade, weather, etc. In most mortality monitoring efforts, because we cannot measure time since death, it is assumed that a carcass' observability is constant over the period of the search interval.

Data from searcher efficiency trials were fit to a logistic regression model, with odds of observing a carcass modeled as a function of size and season and their interaction. Using alpha=0.15, there was a marginally significant effect of the interaction of size with season (χ^2_3 = 5.39, p=0.146) and significant main effects of size (χ^2_1 = 4.07, p=0.044) and season (χ^2_3 = 8.10, p=0.044). Bootstrapped samples were fit to logistic regression models with size, season and their interaction as explanatory variables.

2.4.3 Fatality Estimates

The annual estimated fatality rate is reported as an estimate of (assumed wind project related) collision-induced bird and bat fatalities in eight primary categories as defined under the monitoring plan (OEFSC, 2007; page A-5): 1) all birds, 2) small birds, 3) large birds, 4) raptors, 5) grassland birds, 6) nocturnal migrants, 7) State Sensitive Species listed under OAR 635-100-0040, and 8) bats. Grassland birds are defined as all native bird species that rely on grassland habitat and are either resident species, occurring year round, or species that nest in the area, excluding horned lark, burrowing owl, and northern harrier (OEFSC, 2007; page A-10). Small birds are defined as any bird under nine niches in total length and large birds are defined as any bird greater than nine inches in total length. This measurement is consistent with previous reports (Kronner et al., 2008, Gritski et al., 2008).

All carcasses located within areas surveyed, regardless of species, were recorded and if a different cause of death was not apparent, the fatality was attributed to Project operation, consistent with the approach commonly used at other regional fatality studies. The total number of avian and bat carcasses found were adjusted with removal and searcher efficiency bias trial data to determine the fatality estimate.

Because there are two sizes of turbines installed at this site, investigators were interested in estimating fatalities rates for each turbine size as well as fatality rates for all birds, small birds, large birds, raptors, grassland birds, state sensitive species, nocturnal migrants and bats. As specified in the monitoring and mitigation plan (OEFSC, 2007; page A-7) estimates were calculated using the Schoenfeld method. The Schoenfeld estimator was used in analyses for the Klondike II wind project (NWC and WEST, 2007) and the Stateline wind project (Erickson et al., 2004). For comparison, an estimator used by Huso was also calculated. The estimator proposed by Huso (*in review*) has been used in the Big Horn (Kronner et al., 2008) and Leaning Juniper (Gritski et al., 2008) wildlife monitoring post-

construction studies. Huso (*in review*) has shown the Schoenfeld estimator to be strongly biased under some conditions, but to have relatively little bias under others. In general, the Schoenfeld estimator is comparable to the Huso estimator when search intervals are long and carcass persistence times are short, conditions that generally prevailed in this study. Where differences in the two estimators occurred, the Schoenfeld estimator was used for comparisons to thresholds set forth in OEFSC 2007. For methods on how the Schoenfeld estimator is calculated refer to OEFSC 2007. Huso methods are outlined below.

In this analysis, a bootstrap sample of carcass persistence data for each size and season combination was drawn and average carcass persistence time for each size in each season was estimated from it. A bootstrap sample of the searcher efficiency data for each size and season was drawn and searcher efficiency for each size in each season was estimated from it. These estimates were merged with the casualty data and adjusted estimates of fatality calculated for each animal using the following equation: $\frac{c_{ijk}}{\hat{p}_{jk} * \hat{r}_{jk} * \hat{e}_{jk}} = \hat{f}_{ijk}$

where c_{ijk} is the observed number of carcasses in the k^{th} size class at the i^{th} turbine during the j^{th} search, $\hat{f}_{ijk}$ is the estimated fatality in the k^{th} size class that occurred at the i^{th} turbine during the j^{th} search, $\hat{p}_{jk}$ is the estimated probability that a carcass in the k^{th} size class that is on the ground during the j^{th} search will actually be seen by the observer, $\hat{r}_{jk}$ is the probability than an individual bird or bat that died during the interval preceding the j^{th} search will not be removed by scavengers and $\hat{e}_{jk}$ is the effective interval, i.e. the ratio of the length of time before 99% of carcasses can be expected to be removed to the search interval. $\hat{p}_{jk}$ was estimated through searcher efficiency trials with estimates given above. $\hat{r}_{jk}$ is a function of the average carcass persistence time, estimated through carcass persistence trials, and the length of the interval preceding the j^{th} search. $\hat{r}_{jk}$, $\hat{e}_{jk}$ and $\hat{p}_{jk}$ are assumed not to differ among turbines, but differ with season (i.e. search *j*) and carcass size (*k*).

For each turbine size, the estimate of the annual per turbine fatality were calculated as $\hat{f} = \frac{\sum_{i=1}^{23}\sum_{j=1}^{n_i}\sum_{k=1}^{2}\hat{f}_{ijk}}{t}$ where n_i is the number of searches carried out at turbine *i*, *i*= 1, …, 23, and *t* is the effective number of turbines searched (27.30 of 80 1.5MW GE turbines, and 24.83 of 42 2.3MW Siemens turbines). The per turbine estimate and confidence limits were multiplied by 80 and 42, respectively, to give total annual fatality estimates (Cochran, 1977).

No closed form solution is available for the variance of this estimator, so 90% confidence intervals of this estimate were calculated by bootstrapping (Manly, 1997) as described above.

These estimates were summed across all turbines, then divided by the effective number of turbines searched (27.30 of the 80 1.5 MW GE turbines, and 24.83 of the 42 2.3 MW Siemens turbines) to give annual per turbine fatality rate. Per turbine estimates were multiplied by the total number of turbines in the respective size class to give total site fatality and divided by their respective megawatt label to give per MW fatality. A

bootstrapped 90% confidence interval on annual per turbine fatality was achieved by repeating this process 1000 times and reporting the central 90% limits of the resulting distribution.

2.5 Raptor Nest Monitoring

Raptor nest surveys were conducted in spring/summer 2008, the first nesting season after construction. The objective of this study is to estimate the size of the local breeding populations of tree or other above-ground-nesting raptor species in the vicinity of the facility and to determine whether operation of the facility ultimately results in a reduction of nesting activity or nesting success in the local populations of the following raptor species: Swainson's hawk, golden eagle, and ferruginous hawk. These were the primary target species for the 2008 aerial and ground-based surveys; other species observed nesting or assumed nesting (such as America kestrel) were also recorded as encountered incidentally while searching for nests of the three target species. As specified on page A-11 of the WMMP, data from the 2008 survey year will be combined with data from the 2012 survey year and analysis conducted to determine whether a reduction in either nesting success or nest use has occurred in the vicinity of Klondike III facility (this is inclusive of Phase I and Phase II (Klondike III and IIIa).

The 2007 nest survey year data and supplemental notes for the 2006 or earlier nesting years were reviewed and used for planning the 2008 monitoring. Only one nest site surveyed in 2007 was not part of the 2008 aerial survey buffer; this was due to a slight change in the two-mile survey buffer of planned vs. actual turbine locations.

On May 9, 2008, an aerial survey was conducted within the Klondike III site boundary and a 2-mile buffer around turbines to determine nest *occupancy* (Figure 2), as per the WMMP, page A-11. The survey was conducted by an experienced helicopter pilot and wildlife biologist. All appropriate nesting areas including trees, rock formations, and power lines were investigated by air to provide complete coverage of the Project areas to the extent possible. Areas immediately surrounding houses were not surveyed to avoid human or livestock disturbances and areas near operating wind turbines were not flown due to safety reasons. In addition to the aerial survey, while biologists were on site conducting other wildlife monitoring, several nests were checked for raptors in flight or incubating.

All potential and confirmed raptor nests were recorded, regardless of activity status. Determination of nest status (active, inactive, unknown) was made using a combination of visual clues such as adult behavior, presence of eggs or young, presence or absence of whitewash (excrement), or supplemental observational data from the ground-based surveys. Inactive nests (without sign of current year's use) were assessed as to the type of bird that may have used the nest previously. Large stick nests, potentially used by golden eagles or ferruginous hawk were recorded and noted as such because these species are target species for monitoring in future years. Stick nests that appeared to have been constructed, and may have been used by common ravens, were conservatively included in "Inactive" status as these structures may be used by buteo raptors in future years. All nest locations were recorded using a hand-held Global Positioning System (GPS) receiver, typically with an accuracy of 8 meters while stationary.

Follow-up surveys to determine nesting success were conducted from the ground within the leased land boundary during the period from May 31 through June 18. All active or unknown status nests recorded during the aerial survey were checked, where feasible. Nests were monitored a minimum of one time as specified in the WMMP, but most were checked two or more times. For areas not leased by Iberdrola and where access permission was not likely (due to other wind lease arrangements or feasibility), nests were checked with spotting

scopes and binoculars from public roads. In addition, a second aerial survey was conducted on July 23 in areas not able to be checked through ground surveys to check the final status of nests not viewable from public roads as well as to check nests within the leased land boundary that were challenging to monitor from the ground-based vantage points.

Data was managed in an Excel spreadsheet and in ArcMap version 9.3 GIS. Analysis for potential impacts from operating Klondike III turbines will be conducted after the second year of monitoring in 2012.

2.6 Avian Use Surveys

In addition to standardized fatality searches, avian use surveys were conducted during each fatality monitoring search throughout the year. The purpose of recording avian use while conducting the fatality monitoring, as specified in the WMMP (page A-12), is to identify additional avian species that may not have been listed in the original baseline survey report. In addition, these point count surveys may provide a basis on which to evaluate, in general terms, whether the species with the highest fatality numbers are also the most common species at the site during the monitoring study year.

Observers recorded birds detected in a ten-minute period at approximately one-third of the turbines (15 plots) within the fatality monitoring sample plot, using standard variable circular-plot point count survey methods (Reynolds et al., 1980). In all, for the monitoring year there were 210 avian surveys conducted.

3.0 RESULTS

This section summarizes the results of Klondike III Wind Project wildlife monitoring for the period October 15, 2007 through October 31, 2008. This is a summary of data collected through the first year of a two-year study and, therefore, fatality estimate results are considered preliminary until two complete years of data are available.

3.1 Summary of Findings Prior to Formal Monitoring

3.1.1 Incidentals

One incidental casualty was found before monitoring began; a silver-haired bat was found on October 15, 2007 (Appendix A).

3.1.2 Clean-up Search

As stated above, the clean-up search was performed to clear the search plot area of casualties before formal monitoring was initiated. During the clean-up search conducted from October 15–30, 2007, 8 casualties were found: 5 birds and 3 bats. Birds found as casualties included 4 ring-necked pheasants, and 1 dark-eyed junco. Bats found as casualties included 1 silver-haired bat, 1 hoary bat, and 1 bat not able to be identified to species. Further details are available in Appendix A.

3.2 Standardized Scheduled Searches and Incidentals

3.2.1 Scheduled Searches

Between the first standardized scheduled search on November 15, 2007 and the last on October 29, 2008 a total of 80 casualties were found during 16 standardized searches (Table 2), 56 birds and 24 bats. Horned larks comprised the majority of fatalities found

during scheduled searches (33.9%). A total of 22 species were found during scheduled searches, with an additional three fatalities that could not be identified to species as of this report (1 each of unidentified kinglet spp., unidentified warbler spp., and an unidentified passerine).

Passerines comprised the largest number of observed avian fatalities for the first year of monitoring (48), followed by galliformes (3), doves (2), raptors (1 short-eared owl), herons (1 great-blue heron), and rails (1 Virginia rail) (Table 3). All bird species found are listed in Table 2. All avian casualties were fatalities (no live, injured birds); however, 1 live injured silver-haired bat was found as a casualty (it was transported to Blue Mountain rehabilitation center and was later released). All bats identified to species were of two species, hoary bat and silver-haired bat, with the exception of one big brown bat (Table 2). The majority of bats (22 of 24) were found during fall season. Details of all casualties are found in Appendix A.

3.2.2 Incidentals

Incidentals found after the start of the formal monitoring period include 3 birds and 1 bat. One bird, a Swainson's hawk, was found during summer season by operations staff. Other incidental finds were located by NWC personnel in-transit to scheduled search plots. A second raptor, an American kestrel, was also found during the summer season. In addition, one horned lark was found during summer season and one hoary bat was found incidentally during fall season (Appendix A).

Table 2. Summary of avian and bat species and percent composition of all fatalities found at the Klondike III Wind Project, fall season 2007–fall season 2008.

Listed by highest to lowest % search composition (second column)	**Total Found During Scheduled Searches**	**% Composition**	**Total Including Incidentals***	**% Composition Including Incidentals**
Avian Species				
horned lark	19	33.9	20	31.3
white-crowned sparrow	4	7.1	4	6.3
savannah sparrow	3	5.4	3	4.7
Townsend's warbler	3	5.4	3	4.7
dark-eyed junco	2	3.6	3	4.7
golden-crowned kinglet	2	3.6	2	3.1
gray partridge (*n*)	2	3.6	2	3.1
mourning dove	2	3.6	2	3.1
winter wren	2	3.6	2	3.1
yellow-rumped warbler	2	3.6	2	3.1
American goldfinch	1	1.8	1	1.6
Brewer's blackbird	1	1.8	1	1.6
common yellowthroat	1	1.8	1	1.6
European starling (*n*)	1	1.8	1	1.6
great-blue heron	1	1.8	1	1.6
hermit thrush	1	1.8	1	1.6

Listed by highest to lowest % search composition (second column)	**Total Found During Scheduled Searches**	**% Composition**	**Total Including Incidentals***	**% Composition Including Incidentals**
kinglet species	1	1.8	1	1.6
Lincoln's sparrow	1	1.8	1	1.6
ring-necked pheasant (*n*)	1	1.8	5	7.8
ruby-crowned kinglet	1	1.8	1	1.6
short-eared owl	1	1.8	1	1.6
unidentified passerine	1	1.8	1	1.6
Virginia rail	1	1.8	1	1.6
warbler species	1	1.8	1	1.6
western meadowlark	1	1.8	1	1.6
American kestrel	0	0.0	1	1.6
Swainson's hawk	0	0.0	1	1.6
Avian Subtotal	**56**	**100.00**	**64**	**100.00**
		Bat Species		
hoary bat	12	50.0	14	48.3
silver-haired bat	10	41.6	12	41.4
big brown bat	1	4.2	1	3.4
unidentified bat	1	4.2	2	6.9
Bat Subtotal	**24**	**100.00**	**29**	**100.00**

Table 2 footnotes:

* Includes both scheduled search findings and incidental observations (including clean-up searches conducted fall 2007)

n = a non-native species

Table 3. Cumulative list of all wildlife casualties found during the first four seasons of formal monitoring at the Klondike III Wind Project, listed by taxonomic group.

Taxa Group	**# of Fatalities Winter 2007–2008**	**# of Fatalities Spring 2008**	**# of Fatalities Summer 2008**	**# of Fatalities Fall 2008**	**# of Fatalities Monitoring Year One***
Raptor	1	0	2 incidentals	0	1 + 2 incidentals
Galliform	1	0	1	1	3
Passerine	9	18	6 + 1 incidental	15	48 + 1 incidental
Dove	1	1	0	0	2
Heron	0	0	1	0	1
Rail	0	0	0	1	1
Bats	0	0	2	22 + 1 incidental**	24 + 1 incidental
Total	**12**	**19**	**10 + 3 Incidentals**	**39 + 1 incidental**	**80 + 4 incidentals**

*This table does not include fatalities found incidentally or during clean-up searches prior to the start of formal monitoring on November 1, 2007.

**This includes 1 bat casualty of a live bat which was transported to a rehabilitation center.

3.2.3 Nocturnal Migrants

Species that were found during the spring and fall migration season scheduled searches that did not breed or winter on the Project were classified under nocturnal migrants. A total of 18 avian fatalities were classified as nocturnal migrants, comprising 9 species and 1 unidentified warbler. Species included in the nocturnal migrant category were 4 white-crowned sparrow, 3 Townsend's warbler, 2 yellow-rumped warbler, 2 winter wren, 2 golden-crowned kinglet, 1 Lincoln's sparrow, 1 hermit thrush, 1 ruby-crowned kinglet, 1 common yellowthroat, and the aforementioned unidentified warbler. This list does not include fatalities found as incidentals or during clean-up searches as those fatalities will not be included under the estimated annual fatalities.

3.2.4 Avian Groups of Concern

Under the monitoring plan established for Klondike III (OEFSC 2007), thresholds were set for several groups of avian species. These groups included raptors, raptor species of special concern, and State Sensitive species listed under OAR 635-100-0040, not including raptors which are covered under the raptor species of special concern. In addition to these categories, thresholds were also set for grassland avian species. This category includes all native species breeding in the area or residing year around that rely on grasslands, but excludes horned larks.

Grassland Birds

Birds included in this category found during the first year of monitoring included 3 savannah sparrows, 1 western meadowlark, and 1 short-eared owl. The short-eared owl is discussed under raptors below.

Raptors

One raptor was found during scheduled searches, a short-eared owl found on February 8, 2008 on turbine V-10. Two other raptors were found as incidental finds during the first year of monitoring. These two raptors were a Swainson's hawk found on June 18, 2008 on turbine K-3 and an American kestrel found on June 19, 2008 on turbine R-4.

State Sensitive Species

No State listed avian species were found as fatalities during the first year of monitoring.

Two species of State Sensitive mammals were found as fatalities. Silver-haired bat and hoary bat are listed as a Sensitive-Vulnerable species. Twelve hoary bats were found during scheduled searches (14 total) and ten silver-haired bats were found during scheduled searches (12 total) (Table 2).

3.2.5 Lit vs. Un-lit Turbines

As specified in the WMMP (page A-9), differences in observed nocturnal migrant and bat fatality rates for lit vs. un-lit turbines will be compared for the final report after the second year of monitoring. No analysis is being conducted at this time due to small sample size.

3.3 Carcass Removal Trials

Large birds had an average removal time ranging from slightly more than 8 days in the winter to almost 30 days in the summer. Small birds mirrored the large bird category in terms of seasonal difference. Birds remained for the shortest period in the winter at just over 4 days and remained the longest in summer at almost 15 and one-half days.

Bootstrapped average carcass removal times and 90% confidence limits are presented in Table 4.

Table 4. Bootstrapped average Carcass Removal times and 90% confidence limits during the first year of wildlife monitoring at Klondike III Wind Project.

Season	N	tbar	Lower CI[1]	Upper CI
		Large Size		
Spring	20	23.12	17.08	34.19
Summer	20	29.79	19.85	49.95
Fall	20	14.21	9.44	21.30
Winter	20	8.36	6.47	10.99
		Small Size		
Spring	20	12.00	8.69	16.65
Summer	20	15.46	10.29	23.74
Fall	20	7.37	4.85	10.94
Winter	20	4.34	2.93	6.09

[1] lower and upper limits of the 90% confidence interval (CI)

3.4 Searcher Efficiency Trials

Searcher efficiency rates for large birds were the highest in the winter with an average probability of detection of 82% and the lowest in the summer and fall at 48% and 45% respectively. For small birds there were minimal differences in probability of detection by season. The highest seasons of detection were fall and winter at 55% and 54% respectively and the lowest seasons were spring and summer at 45% and 42% respectively. Bootstrapped average probability of a searcher finding a carcass and 90% confidence limits for the two size classes in each season are given in Table 5.

Table 5. Bootstrapped Searcher Efficiency (SE) and 90% confidence limits during the first year of wildlife monitoring at Klondike III Wind Project.

Season	# Found	# Placed	SE	Lower CI[1]	Upper CI
		Large Size			
Spring	24	35	0.69	0.54	0.80
Summer	24	50	0.48	0.36	0.60
Fall	10	22	0.45	0.27	0.64
Winter	18	22	0.82	0.68	0.95
		Small Size			
Spring	19	42	0.45	0.33	0.60
Summer	20	48	0.42	0.31	0.54
Fall	16	29	0.55	0.41	0.69
Winter	13	24	0.54	0.38	0.71

[1] lower and upper limits of the 90% confidence interval

3.5 Estimated Annual Fatality Rates

During the study period 80 carcasses whose deaths were attributable to the turbines were found in the search plots.

The total site fatality estimates, per turbine estimates, and per megawatt estimates and 90% confidence limits derived using the Schoenfeld estimator are presented in Table 6, and those derived using the Huso estimator for comparison are shown in Table 7. Because in this study, the search interval was long and carcass persistence times generally 2 weeks or less (except for large carcasses in spring and summer) estimates from the two estimators are very similar. The particular combination of search interval and average carcass persistence times at this site satisfied the conditions under which the two estimators show little difference from one another.

The 90% confidence interval of the estimated number of raptor fatalities per MW (0.05–0.08) did not exceed the stated threshold (0.09/MW). This estimate is based on the retrieval of a single short eared owl carcass, a very small number on which to base an estimate for the entire site. However, two incidental raptor finds indicate that this was not the only raptor casualty at the site. Estimated per MW fatality of grassland birds of 0.24 was below the stated threshold (0.59/MW).There were no special status raptors or State Sensitive avian species found on scheduled searches, so their fatality rates were both 0.00 per MW. No group exceeded the threshold levels as outlined on page A-10 of the WMMP (OEFSC 2007).

When comparing the "all bird" fatality rate of the two different size turbines (Table 8) it is estimated on a per MW basis that the larger 2.3 MW turbines had 32% (90% CI:24-40%) fewer fatalities per MW than the 1.5 MW turbines (Table 8). It should be noted that this is year one of a two year study and a bigger sample will be available after year two is completed. On a per turbine basis the fatality rates are similar for the all bird category.

Table 6. Bootstrapped fatality estimates and 90% confidence intervals, derived using the *Schoenfeld Estimator*, for the first year of wildlife monitoring at Klondike III Wind Project.

Categories[1]	# Found	Total Site Fatality Estimates		Estimates per Turbine		Estimates per MW	
		Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range
All Birds	56	715.6	552.9–936.6	5.87	4.53–7.68	3.30	2.55–4.32
Small Birds	49	654.8	497.5–874.4	5.37	4.08–7.17	3.02	2.30–4.04
Large Birds[2]	7	60.8	49.0–75.3	0.50	0.40–0.62	0.28	0.23–0.35
Raptors[2]	1	13.6	9.9–18.4	0.11	0.08–0.15	0.06	0.05–0.08
Grassland Birds[2]	5	51.0	41.0–61.4	0.42	0.34–0.53	0.24	0.19–0.30
Nocturnal Migrants	18	168.9	123.0-231.1	1.38	1.01–1.89	0.78	0.57–1.07
Bats	24	273.6	186.3–397.0	2.24	1.53–3.25	1.26	0.86–1.83

[1]As defined in OEFSC, 2007.

[2]There were too few carcasses found in these groups to consider these accurate estimates.

Table 7. Bootstrapped fatality estimates and 90% confidence intervals, derived using the *Huso Estimator*, for the first year of wildlife monitoring at Klondike III Wind Project.

Categories[1]	# Found	Total Site Fatality Estimates		Estimates per Turbine		Estimates per MW	
		Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range
All Birds	56	768.1	602.0–996.7	6.30	4.93–8.17	3.55	2.78–4.60
Small Birds	49	701.8	538.9–926.9	5.75	4.42–7.60	3.24	2.49–4.28
Large Birds[2]	7	66.3	54.0–81.6	0.54	0.44–0.67	0.31	0.25–0.38
Raptors[2]	1	13.7	9.9–18.6	0.11	0.08–0.15	0.06	0.05–0.08
Grassland Birds[2]	5	55.7	45.1–70.2	0.46	0.37–0.58	0.26	0.21–0.32
Nocturnal Migrants	18	188.8	141.8–252	1.55	1.16–2.07	0.87	0.65–1.16
Bats	24	288.8	203.1–411.0	2.37	1.66–3.37	1.33	0.94–1.90

[1]As defined in OEFSC, 2007.

[2]There were too few carcasses found in these groups to consider these accurate estimates.

Table 8. Comparison of all bird fatality estimates of the 1.5 MW Turbines and 2.3 MW turbines during the first year of wildlife monitoring at Klondike III Wind Project.

Total Site Fatality Estimates for All Birds

Turbine Size	# Found	Huso Estimator		Shoenfeld Estimator	
		Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range
1.5 MW	26	496.39	378.33–662.84	468.82	350.64–630.98
2.3 MW	30	268.62	215.00–338.42	246.61	194.27–313.70

Per MW Fatality Estimates for All Birds

Turbine Size	# Found	Huso Estimator		Shoenfeld Estimator	
		Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range
1.5 MW	26	4.14	3.15–5.52	3.91	2.92–5.26
2.3 MW	30	2.78	2.23–3.50	2.55	2.01–3.25

Per Turbine Fatality Estimates for All Birds

Turbine Size	# Found	Huso Estimator		Shoenfeld Estimator	
		Estimate	90% Confidence Interval Range	Estimate	90% Confidence Interval Range
1.5 MW	26	6.20	4.73–8.29	5.86	4.38–7.89
2.3 MW	30	6.40	5.12–8.06	5.87	4.63–7.47

3.6 Raptor Nest Monitoring

On May 9, 2008, an aerial survey was conducted within the Klondike III and IIIa site boundary and a 2-mile buffer around turbines to determine nest *occupancy*. Within the nest survey area, there were a total of 14 active nests,19 inactive nests, and 1 nest not present in 2008 (Figure 2 and Appendix B). In addition, one active long-eared owl nest and four active American kestrel nests (exact location unknown) were observed incidentally, but not monitored. Nine inactive common raven or buteo species nests in the 2007 database that are not within the Klondike III or IIIa project boundaries were not relocated in 2008 for various reasons (nest was likely too obstructed for viewing, was blown out of tree or was missed by surveyor). The number of active nests of each species within the survey area is listed as follows:

Target Species	Other Species or Inactive Nests
6 Swainson's hawk	4 American kestrel (exact location unknown)
1 golden eagle	5 red-tailed hawk
1 ferruginous hawk	1 unknown buteo
	1 long-eared owl
	17 inactive stick nests
	2 inactive large stick nests – i.e. golden eagle

As previously described in the Methods section (page 8), to determine *success* and to estimate number of young likely fledged, nests of target species that were recorded as active or likely active during the first aerial or ground survey (Swainson's hawk, golden eagle, and ferruginous hawk) were subsequently checked from the ground on the leased Project land (onsite) and where needed elsewhere, during a second aerial survey. The following summarizes the success for the target species. Distances to turbines reflect only Klondike III and IIIa turbines, not Klondike I and II turbines. Refer to Appendix B for number of young likely fledged and additional details.

Swainson's hawk (Record #s)

Six active nests –

Three were onsite within the Klondike III or IIIa facility boundaries (42, 49 and 52), 42 and 52 were successful, the success of nest 49 was unconfirmed. Nests 42 and 52 were within 0.5 miles of KIII turbines.

Three were offsite (48, 55, 66), two successful, and one success unconfirmed.

Golden eagle

1 active nest (89), but not onsite and not within 0.50 mile of turbines.

Ferruginous hawk

1 active nest (50) onsite, but not within 0.50 mile of turbines.

3.7 Avian Use Surveys

During the 210 point-count surveys conducted over four seasons from November 14, 2007–October 13, 2008 there a total of 650 individual bird detections comprised of 16 species (Table 9). Overall mean use (number of birds/10-minute survey) was highest in fall (4.700), followed by spring (3.667), and winter (2.707), with the lowest use in summer (1.911). The species with the highest overall mean use was horned lark (1.690) which had the highest use in the winter season (2.067). Western meadowlark had the second highest mean use overall (0.543), the highest use for this species was in spring season (1.400), followed by Brewer's blackbird (overall 0.286) which was only detected in fall (2.000). The raptor species with the highest overall use was red-tailed hawk (0.038). The season with the highest raptor use was spring (0.200). The lowest raptor use was observed in summer season and the only raptor species observed during summer season was Swainson's hawk.

Table 9. Relative abundance and mean use of species observed by season at Klondike III Wind Project during avian use surveys from November 14, 2007–October 13, 2008.

Species	Winter		Spring		Summer		Fall		Overall	
	# Birds	Mean[1] Use	# Birds	Mean Use	# Birds	Mean Use	# Birds	Mean Use	# Birds	Mean Use
Waterfowl	**8**	**0.107**	**0**	**0.000**	**0**	**0.000**	**0**	**0.000**	**8**	**0.038**
Canada goose	8	0.107	0	0.000	0	0.000	0	0.000	8	0.038
Raptors	**10**	**0.133**	**12**	**0.200**	**5**	**0.111**	**4**	**0.133**	**31**	**0.148**
northern harrier	*3*	*0.040*	*0*	*0.000*	*0*	*0.000*	*0*	*0.000*	*3*	*0.014*
Buteos	*5*	*0.067*	*6*	*0.100*	*5*	*0.111*	*3*	*0.100*	*19*	*0.090*
Swainson's hawk	0	0.000	0	0.000	5	0.111	0	0.000	5	0.024
red-tailed hawk	1	0.013	4	0.067	0	0.000	3	0.100	8	0.038
rough-legged hawk	4	0.053	2	0.033	0	0.000	0	0.000	6	0.029
Falcons	*2*	*0.027*	*5*	*0.083*	*0*	*0.000*	*1*	*0.033*	*8*	*0.038*
American kestrel	1	0.013	3	0.050	0	0.000	1	0.033	5	0.024
prairie falcon	1	0.013	2	0.033	0	0.000	0	0.000	3	0.014
Vultures	*0*	*0.000*	*1*	*0.017*	*0*	*0.000*	*0*	*0.000*	*1*	*0.005*
turkey vulture	0	0.000	1	0.017	0	0.000	0	0.000	1	0.005
Game Birds	**1**	**0.013**	**12**	**0.200**	**4**	**0.089**	**0**	**0.000**	**17**	**0.081**
ring-necked pheasant	1	0.013	12	0.200	4	0.089	0	0.000	17	0.081
Passerines	**184**	**2.453**	**193**	**3.217**	**76**	**1.689**	**137**	**4.567**	**590**	**2.810**
Songbirds	*178*	*2.373*	*190*	*3.167*	*74*	*1.644*	*137*	*4.567*	*579*	*2.757*
Brewer's blackbird	0	0.000	0	0.000	0	0.000	60	2.000	60	0.286
European starling	15	0.200	0	0.000	0	0.000	0	0.000	15	0.071
horned lark	155	2.067	106	1.767	41	0.911	53	1.767	355	1.690
unidentified passerine	2	0.027	0	0.000	12	0.267	21	0.700	35	0.167
western meadowlark	6	0.080	84	1.400	21	0.467	3	0.100	114	0.543
Corvids	*6*	*0.080*	*3*	*0.050*	*2*	*0.044*	*0*	*0.000*	*11*	*0.052*
common raven	6	0.080	3	0.050	2	0.044	0	0.000	11	0.052
Doves/Pigeons	**0**	**0.000**	**2**	**0.033**	**1**	**0.022**	**0**	**0.000**	**3**	**0.014**
mourning dove	0	0.000	2	0.033	1	0.022	0	0.000	3	0.014
Woodpeckers	**0**	**0.000**	**1**	**0.017**	**0**	**0.000**	**0**	**0.000**	**1**	**0.005**
northern flicker	0	0.000	1	0.017	0	0.000	0	0.000	1	0.005
Total	**203**	**2.707**	**220**	**3.667**	**86**	**1.911**	**141**	**4.700**	**650**	**3.095**

Seasons:
Winter November 14, 2007–March 11, 2008 5 visits to 15 sites (75 surveys)
Spring March 25, 2008–May 12, 2008 4 visits to 15 sites (60 surveys)
Summer June 11, 2008–August 14, 2008 3 visits to 15 sites (45 surveys)
Fall September 5, 2008–October 13, 2008 2 visits to 15 sites (30 surveys)

[1]Mean Use: mean number of individuals observed per 10-minute point count for each species or group provides an index of the magnitude of avian use, but it does not describe density.

The primary purposes of post-construction 10-minute point count surveys (as stated in the methods) was to identify additional species that may not have been listed in the original baseline study and to evaluate, in general terms, whether the species with the highest fatality numbers are also the most common species at the site. A complete analysis of avian use will be done following year two of monitoring, but preliminary results from the first year

show that to date, all species observed during post-construction avian use surveys had also been detected during pre-construction avian use surveys on-site (Table 10; Mabee et al., 2005). Baseline surveys from Klondike I are also presented in Table 10 due to the close proximity to Klondike III and also because avian use surveys were conducted for a full year at Klondike I.

The species with both the highest number of fatalities and highest mean use during post-construction avian use surveys was horned lark. The avian species with the second highest number of fatalities was white-crowned sparrow and this species was not detected on post-construction or pre-construction point count surveys of Klondike III, however, it was detected during baseline studies of nearby Klondike I (Table 10).

Two of the three raptor species found as fatalities were detected during post-construction avian use surveys, Swainson's hawk and American kestrel. The Swainson's hawk was found as a fatality during summer and detected during summer season point count surveys. The American kestrel was found during summer, but none were detected during summer season avian use surveys, as this species had its highest use in spring season. Short-eared owl was the one raptor species that was found as a fatality, but not observed during avian use surveys, either post- or pre-construction (Table 10). Eight other species were found as fatalities during the first year of monitoring that were not observed during avian use surveys either post- or pre- construction at Klondike III or nearby Klondike I: golden-crowned kinglet, ruby-crowned kinglet, Townsend's warbler, hermit thrush, yellow-rumped warbler, winter wren, gray partridge, Virginia rail (Table 10). Six of the eight species are considered to be nocturnal migrants. The remaining two species not detected during point counts, Virginia rail and gray partridge, are not species that avian use surveys detect on a regular basis. Two additional species were found as fatalities at Klondike III that, while they were not detected during Klondike III avian point counts, had been observed during point counts at nearby Klondike I including: American goldfinch and common yellowthroat.

Table 10. Avian species found at Klondike III and Klondike I Wind Projects during avian use surveys, and avian species found as fatalities during the first year of monitoring at Klondike III Wind Project.

Common Name	Scientific Name	Post-construction		Pre-construction	
		KIII Fatality 2007–08	KIII Avian Use 2007–08	KIII Avian Use[1] 2004–05	KI Avian Use[2] 2001–02
American crow	*Corvus brachyrhynchos*			x	
American goldfinch	*Carduelis tristis*	x			x
American kestrel	*Falco sparverius*	x	x	x	x
American pipit	*Anthus rubescens*				x
American robin	*Turdus migratorius*			x	x
barn swallow	*Hirundo rustica*			x	x
black-billed magpie	*Pica hudsonia*				x
Brewer's blackbird	*Euphagus cyanocephalus*	x	x	x	x
brown-headed cowbird	*Molothrus ater*			x	
Canada goose	*Branta canadensis*		x	x	x
chukar	*Alectoris chukar*			x	
cliff swallow	*Hirundo pyrrhonota*				x
common raven	*Corvus corax*		x	x	x
common redpoll	*Carduelis flammea*			x	
common yellowthroat	*Geothypis trichas*	x			x

Common Name	Scientific Name	Post-construction		Pre-construction	
		KIII Fatality 2007–08	KIII Avian Use 2007–08	KIII Avian Use[1] 2004–05	KI Avian Use[2] 2001–02
dark-eyed junco	*Junco hyemalis*	x		x	
European starling	*Sturnus vulgaris*	x	x	x	x
ferruginous hawk	*Buteo regalis*				x
golden-crowned kinglet	*Regulus satrapa*	x			
golden eagle	*Aquila chrysaetos*			x	x
grasshopper sparrow	*Ammodramus savannarum*			x	
gray partridge	*Perdix perdix*	x			
great-blue heron	*Ardea herodias*	x		x	x
hermit thrush	*Catharus guttatus*	x			
horned lark	*Eremophila alpestris*	x	x	x	x
house finch	*Carpodacus mexicanus*			x	x
killdeer	*Charadrius vociferus*			x	x
lark sparrow	*Chondestes grammacus*				x
loggerhead shrike	*Lanius ludovicianus*			x	x
long-billed curlew	*Numenius americanus*				x
mourning dove	*Zenaida macroura*	x	x	x	x
northern flicker	*Colaptes auratus*		x	x	x
northern harrier	*Circus cyaneus*		x	x	x
northern rough-winged swallow	*Stelgidopteryx serripennis*			x	x
prairie falcon	*Falco mexicanus*		x	x	x
red-winged blackbird	*Agelaius phoeniceus*			x	x
red-tailed hawk	*Buteo jamaicensis*		x	x	x
ring-necked pheasant	*Phasianus colchius*	x	x	x	x
rock pigeon	*Columba livia*				
rough-legged hawk	*Buteo lagopus*		x	x	x
ruby-crowned kinglet	*Regulus calendula*	x			
savannah sparrow	*Passerculus sandwichensis*	x		x	
Say's phoebe	*Sayornis saya*			x	x
short-eared owl	*Asio flammeus*	x			
spotted towhee	*Pipilo erythrophtalmus*			x	x
Swainson's hawk	*Buteo swainsoni*	x	x	x	x
Townsend's warbler	*Dendroica townsendi*	x			
tree swallow	*Tachycineta bicolor*				x
trumpeter swan	*Cygnus buccinator*			x	
turkey vulture	*Cathartes aura*		x	x	
unidentified bird					x
unidentified blackbird				x	
unidentified buteo				x	x
unidentified eagle				x	
unidentified falcon				x	
unidentified finch				x	x
unidentified gull				x	
unidentified kinglet		x			
unidentified passerine		x	x	x	x
unidentified raptor				x	
unidentified shrike				x	
unidentified sparrow					x

Common Name	Scientific Name	Post-construction		Pre-construction	
		KIII Fatality 2007–08	KIII Avian Use 2007–08	KIII Avian Use[1] 2004–05	KI Avian Use[2] 2001–02
unidentified swallow				*x*	*x*
unidentified warbler		*x*			
vesper sparrow	*Pooecetes gramineus*			*x*	
violet-green swallow	*Tachycineta thalassina*			*x*	*x*
Virginia rail	*Rallus limicola*	*x*			
western kingbird	*Tyrannus verticalis*			*x*	*x*
western meadowlark	*Sturnella neglecta*	*x*	*x*	*x*	*x*
white-crowned sparrow	*Zonotrichia leucophrys*	*x*			*x*
winter wren	*Troglodytes troglodytes*	*x*			
yellow-rumped warbler	*Dendroica coronata*	*x*			

[1] Klondike III pre-construction avian use surveys were conducted in two seasons, winter and spring (Nov. 4, 2004–March 14, 2005). For detailed methods see Mabee et al., 2005.

[2] Klondike I pre-construction avian use surveys were conducted at sites adjacent to Klondike III during four seasons from April 2001–April 2002. For detailed methods see Johnson et al., 2002.

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6.0 APPENDICES

Appendix A. Summary of wildlife casualties* found at Klondike III Wind Project from October 15, 2007–October 29, 2008.

Species**	Date Found	Turbine	Condition	Notes
Casualties Found Prior To Scheduled Searches (5 birds, 4 bats)				
		Birds		
ring-necked pheasant	10/15/07	C-6	Feather spot	Clean-up search
ring-necked pheasant	10/15/07	C-6	Feather spot	Clean-up search
dark-eyed junco	10/15/07	C-6	Intact	Clean-up search
ring-necked pheasant	10/15/07	C-6	Feather spot	Clean-up search
ring-necked pheasant	10/15/07	C-7	Feather spot	Clean-up search
		Bats		
silver-haired bat	10/15/07	M-7	Intact	Incidental
unidentified bat	10/15/07	C-6	Scavenged	Clean-up search
hoary bat	10/15/07	B-8	Intact	Clean-up search
silver-haired bat	10/30/07	V-11	Intact	Clean-up search
Winter Season 2007–2008 Casualties (12 birds, 0 bats)				
		Birds		
gray partridge	11/15/07	C-6	Feather spot	Scheduled search
horned lark	11/16/07	G-5	Dismembered	Scheduled search
American goldfinch	11/16/07	G-4	Intact	Scheduled search
unidentified kinglet	11/16/07	G-5	Scavenged	Scheduled search
horned lark	02/06/08	V-7	Feather spot	Scheduled search
short-eared owl	02/08/08	V-10	Feather spot	Scheduled search
horned lark	02/18/08	D-10	Feather spot	Scheduled search
dark-eyed junco	02/19/08	J-6	Intact	Scheduled search
horned lark	02/20/08	L-6	Scavenged	Scheduled search
mourning dove	02/21/08	M-5	Feather spot	Scheduled search
horned lark	02/21/08	R-1	Scavenged	Scheduled search
European starling	02/22/08	S-8	Scavenged	Scheduled search
Spring Season 2008 Casualties (19 birds, 0 bats)				
		Birds		
horned lark	03/18/08	L-5	Feather spot	Scheduled search
horned lark	03/19/08	R-1	Intact	Scheduled search
mourning dove	03/19/08	M-1	Scavenged	Scheduled search
horned lark	04/02/08	M-2	Feather Spot	Scheduled search
horned lark	04/07/08	S-8	Feather Spot	Scheduled search
western meadowlark	04/07/08	V-7	Feather Spot	Scheduled search
savannah sparrow	04/14/08	B-9	Intact	Scheduled search

Species**	Date Found	Turbine	Condition	Notes
Lincoln's sparrow	04/14/08	D-11	Intact	Scheduled search
white-crowned sparrow	04/14/08	D-11	Intact	Scheduled search
white-crowned sparrow	04/16/08	L-2	Intact	Scheduled search
white-crowned sparrow	04/16/08	L-5	Intact	Scheduled search
horned lark	04/16/08	S-2	Scavenged	Scheduled search
yellow-rumped warbler	04/16/08	R-1	Feather Spot	Scheduled search
hermit thrush	04/16/08	S-8	Intact	Scheduled search
ruby-crowned kinglet	04/18/08	V-11	Scavenged	Scheduled search
yellow-rumped warbler	04/28/08	D-11	Feather Spot	Scheduled search
Brewer's blackbird	04/29/08	H-4	Intact	Scheduled search
white-crowned sparrow	04/29/08	E-1	Scavenged	Scheduled search
horned lark	05/05/08	V-7	Intact	Scheduled search
Summer Season 2008 Casualties (11 birds, 2 bats)				
		Birds		
savannah sparrow	05/15/08	D-10	Scavenged	Scheduled search
horned lark	05/16/08	L-5	Feather Spot	Scheduled search
horned lark	05/19/08	V-4	Scavenged	Scheduled search
Swainson's hawk	06/18/2008	K-3	Scavenged	Incidental
horned lark	06/19/2008	M-6	Scavenged	Scheduled search
American kestrel	06/19/2008	R-4	Scavenged	Incidental
horned lark	06/20/2008	S-6	Scavenged	Incidental
horned lark	06/20/2008	S-8	Feather Spot	Scheduled search
gray partridge	06/20/2008	V-7	Scavenged	Scheduled search
great-blue heron	07/18/2008	H-4	Feather spot	Scheduled search
horned lark	07/18/2008	K-4	Scavenged	Scheduled search
		Bats		
silver-haired bat	05/19/08	S-8	Intact	Scheduled search
unidentified bat	07/18/2008	P-5	Scavenged	Scheduled search
Fall Season 2008 Casualties (17 birds, 23 bats)				
		Birds		
Virginia rail	08/19/2008	E-1	Scavenged	Scheduled search
Townsend's warbler	08/19/2008	F-1	Scavenged	Scheduled search
Townsend's warbler	09/09/2008	J-6	Intact	Scheduled search
unidentified warbler	09/09/2008	P-5	Scavenged	Scheduled search
unidentified passerine	09/09/2008	P-5	Scavenged	Scheduled search
common yellowthroat	09/23/2008	G-4	Scavenged	Scheduled search
Townsend's warbler	09/24/2008	P-6	Intact	Scheduled search
horned lark	10/08/2008	P-6	Scavenged	Scheduled search
dark-eyed junco	10/10/2008	S-8	Intact	Scheduled search
winter wren	10/10/2008	S-8	Scavenged	Scheduled search
golden-crowned kinglet	10/22/2008	C-6	Intact	Scheduled search
winter wren	10/23/2008	P-6	Scavenged	Scheduled search

Species**	Date Found	Turbine	Condition	Notes
golden-crowned kinglet	10/23/2008	F-1	Scavenged	Scheduled search
horned lark	10/27/2008	R-1	Feather Spot	Scheduled search
horned lark	10/28/2008	S-8	Scavenged	Scheduled search
ring-necked pheasant	10/28/2008	R-5	Feather Spot	Scheduled search
savannah sparrow	10/28/2008	R-6	Scavenged	Scheduled search
		Bats		
hoary bat	08/19/2008	D-11	Intact	Scheduled search
big brown bat	08/20/2008	J-12	Intact	Scheduled search
hoary bat	10/10/2008	S-8	Intact	Scheduled search
hoary bat	10/08/2008	I-3	Scavenged	Scheduled search
hoary bat	10/09/2008	L-6	Scavenged	Incidental
hoary bat	09/24/2008	K-4	Scavenged	Scheduled search
hoary bat	09/24/2008	M-5	Scavenged	Scheduled search
silver-haired bat	09/24/2008	M-5	Injured	Scheduled search
silver-haired bat	09/25/2008	M-6	Scavenged	Scheduled search
hoary bat	09/26/2008	V-3	Scavenged	Scheduled search
hoary bat	09/29/2008	V-11	Scavenged	Scheduled search
silver-haired bat	09/29/2008	V-11	Intact	Scheduled search
silver-haired bat	09/24/2008	L-5	Scavenged	Scheduled search
silver-haired bat	09/10/2008	M-1	Scavenged	Scheduled search
hoary bat	09/11/2008	S-7	Scavenged	Scheduled search
silver-haired bat	09/11/2008	R-6	Intact	Scheduled search
hoary bat	09/11/2008	S-8	Scavenged	Scheduled search
hoary bat	09/22/2008	B-9	Scavenged	Scheduled search
hoary bat	09/08/2008	D-4	Intact	Scheduled search
silver-haired bat	09/08/2008	D-11	Intact	Scheduled search
hoary bat	09/08/2008	E-1	Scavenged	Scheduled search
silver-haired bat	09/09/2008	H-4	Scavenged	Scheduled search
silver-haired bat	10/29/2008	V-4	Scavenged	Scheduled search

* Includes all casualties found. All are attributable to the wind project operations in the absence of sufficient information to determine causes of death.

** Includes those identified to species and for those where species identification could not be confirmed, taxonomic group or other is used. Previously unidentified specimens were examined to determine species when possible. Changes have been incorporated into this table and supersede any species identification in previous reports.

Appendix B. Results of Klondike III 2008 raptor nest monitoring* and distance to nearest Klondike III or IIIa turbine.

Nest Record[1] red = within ½ mi of Klondike III or IIIa Turbines	Inside Klondike III or Klondike IIIa Boundary	2008 Status, Species, Number Fledged[2], Other Notes (red = Successful nests of the three target species)	Distance to Nearest Turbine (Turbine # and Feet)	Likely Associated Nests (Nest Record #)
41	III	Inactive	L8 1,948 ft.	-
42	III	SWHA 1 fledged	P5 1,811 ft.	43, 295
43	III	Inactive	P5 2,085 ft.	42, 295
45	III	Inactive	J7 1,837 ft.	-
46	III	RTHA 3 fledged	K2 994 ft.	-
49	IIIa	SWHA Success unconfirmed. nest gone at last visit 7/19, may have blown out	G1 1,864 ft.	-
50	IIIa	FEHA 1 fledged	M8 2,925 ft.	-
52	III	SWHA 2 fledged	D10 879 ft.	-
84	IIIa	RTHA Unknown number fledged	BB6 2,081 ft.	-
86	III	Unknown buteo Success unconfirmed	AA1 2,598 ft.	-
99	III	Inactive SWHAs observed near nest	H1 700 ft.	-
295	III	2007 nest but not present in 2008	P6 910 ft.	42, 43, 294
Nests Not In Klondike III or IIIa Boundary				
37	No	Inactive	P1 10,174 ft.	-
38	No	Inactive	V1 8,451 ft.	-
39	No	Inactive	V1 6,599 ft.	40
40	No	Inactive	V1 6,625 ft.	39
44	No	RTHA Success unconfirmed	J2 6,695 ft.	-
47	No	RTHA	K4 3,205 ft.	-
48	No	SWHA 1 fledged	K4 5,502 ft.	-
55	No	SWHA Success unconfirmed, no whitewash present	Z1 10,472 ft.	-
56	No	Inactive	Z1 8,712 ft.	-
57	No	Inactive	Z1 5,771 ft.	-
58	No	Inactive[3]	Z1 1,276 ft.	59
59	No	Inactive[4]	Z1 1,411 ft.	58
61	No	Inactive	D13 3,807 ft.	60, 62, 63
62	No	Inactive	D13 4,252 ft.	60, 61, 63

Nest Record[1] red = within ½ mi of Klondike III or IIIa Turbines	Inside Klondike III or Klondike IIIa Boundary	2008 Status, Species, Number Fledged[2], Other Notes (red = Successful nests of the three target species)	Distance to Nearest Turbine (Turbine # and Feet)	Likely Associated Nests (Nest Record #)
63	No	Inactive	D13 3,742 ft.	60, 61, 62
65	No	Inactive	B17 7,473 ft.	-
66	No	SWHA 1 fledged	B17 3,908 ft.	-
67	No	RTHA 2 fledged	B3 7,639 ft.	-
81	No	Inactive	BB5 8,157 ft.	-
85	No	Inactive	G9 1,823 ft.	-
89	No	GOEA 2 fledged	X7 4,906 ft.	133, 134
91	No	Inactive	AA1 6,472 ft.	263
2007 Nest Sites Not within K-III or K-IIIa Boundaries and Not Relocated During 2008 Surveys[5]				
		2007 and 2008 Notes		
129	No	CORA in 2007	P1 7,956 ft.	-
131	No	CORA in 2007	X7 4,207 ft.	-
134	No	GOEA in 2007 Associated with 2008 active GOEA #89 nest	X7 5,182 ft.	89
253	No	Inactive in 2007 May not be raptor or raven but magpie	B17 4,141 ft.	-
255	No	Inactive in 2007	C8 2,118 ft.	-
267	No	Inactive in 2007	AA1 4,878 ft	-
269	No	2007 notes indicate "old" nest (may have blown out by 2008)	AA1 1,867 ft.	-
277	No	RTHA in 2007	B10 8,356 ft.	-
278	No	Inactive in 2007	B5 1,709 ft.	-

* Does not include some species such as American kestrel and long-eared owl

[1] Some nests are very near others and are considered one traditional nest "site" with two or more tree nests or cliff shelf platforms used alternatively through the years. These side–by-side nests are not likely to be used by multiple birds in the same year.

[2] Number of young likely fledged successfully based on final nest check

[3] SWHA flying

[4] Unknown activity status - appeared to have had some activity, no whitewash present, likely not used, close to #58

[5] For some nests not relocated, nest was likely too obstructed for viewing, was blown out of tree or was missed by surveyor. This list does not include 2007 American kestrel assumed nesting sites.

Species Codes (where shown, nest was determined to be Active)

SWHA – Swainson's Hawk GOEA – Golden Eagle
RTHA – Red-Tailed Hawk FEHA – Ferruginous Hawk CORA – Common Raven

Active = observed perched on nest, repairing nest, incubating, etc.
Inactive = no sign of use
Not present = no nest present
Unsuccessful = bird confirmed incubating and/or young present but no young documented fledged

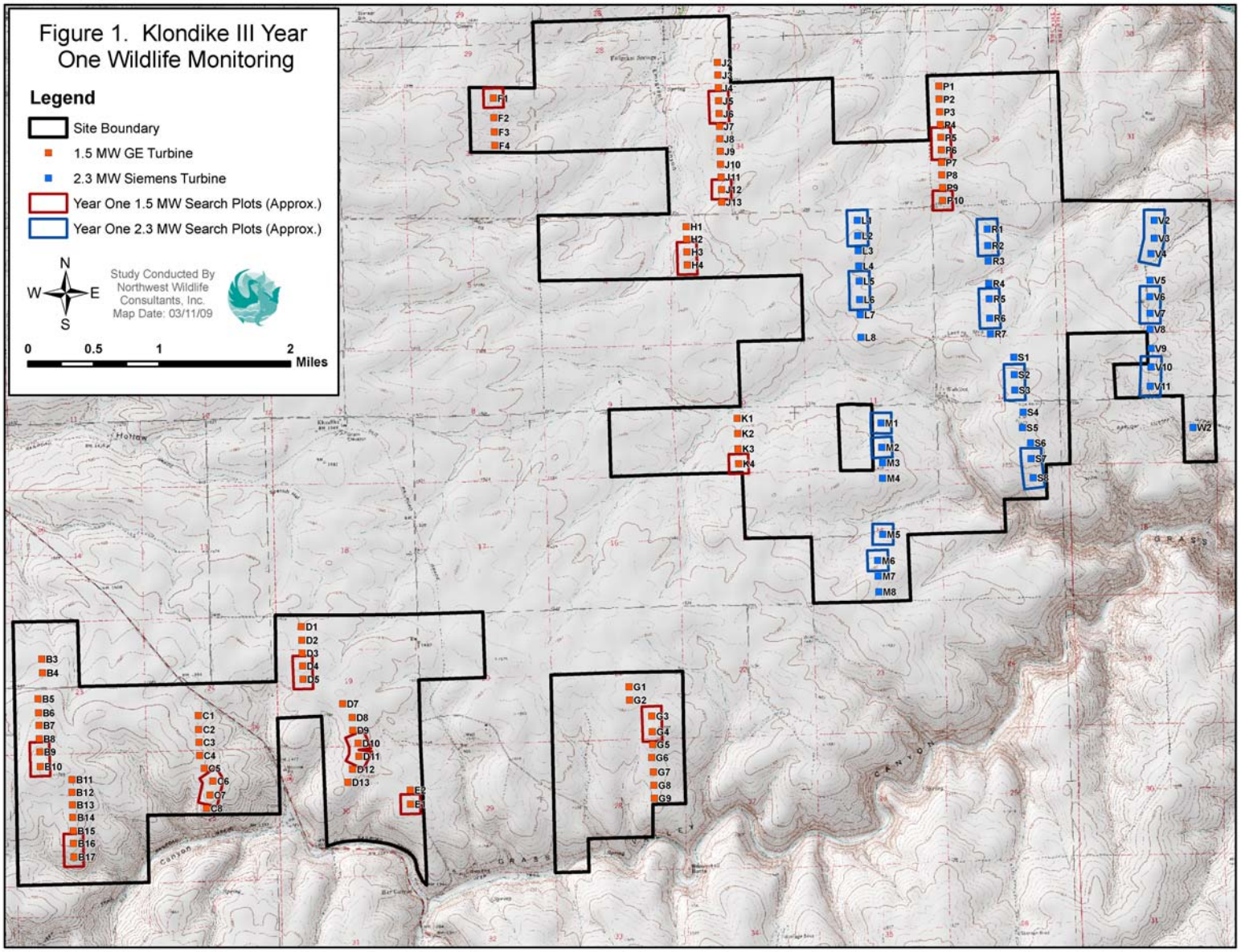
Figure 1. Klondike III Year One Wildlife Monitoring
Legend
Site Boundary
1.5 MW GE Turbine
2.3 MW Siemens Turbine
Year One 1.5 MW Search Plots (Approx.)
Year One 2.3 MW Search Plots (Approx.)
N
W
E
S
Study Conducted By
Northwest Wildlife
Consultants, Inc.
Map Date: 03/11/09
0
0.5
1
2
Miles