

**WILDLIFE MONITORING AT ALTAMONT PASS
WINTER 05 – EARLY FALL 06**

PRELIMINARY DRAFT RESULTS

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Altamont Pass Wind Resource Area**

Submitted by:

APWRA Avian Monitoring Team

**Principal Author:
WEST Inc.**

**Reviewed by:
University of California at Santa Cruz, Predatory Bird Research Group.
BioResource Consultants Inc.
Jones & Stokes**

REPORT NOTES AND ACKNOWLEDGEMENTS

The attached report contains preliminary data, preliminary data summaries and preliminary analyses from fatality monitoring, avian use surveys and carcass removal trials conducted within the APWRA from October 2005 – September 2006. This preliminary study was initiated in response to the Alameda County’s Conditional Use Permit requirements and implemented by the turbine owners with WEST as their consultant. This preliminary report was prepared by WEST for the purpose of aiding the Avian Monitoring Team and the SRC in their effort to review and potentially modify the APWRA monitoring program and management activities and should not be considered a final report for this study period. This report is based on data that is still going through quality control and quality assurance. While we do not anticipate any major changes in the data and the report that would impact the general conclusions, we anticipate that the point estimates, counts and results tables will change after this preliminary review is complete.

This report has been reviewed by members of the Avian Monitoring Team and the SRC, and their comments and suggestions were incorporated into this draft. The Alameda County Monitoring Team and the Scientific Review Committee were not involved in the conduct of any of the field studies being reported herein.

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INTRODUCTION

This report contains preliminary data, preliminary analyses, and a very brief and preliminary discussion of results for avian use, avian fatality monitoring, and carcass removal trials in the Altamont Pass Wind Resource Area (APWRA) from October 2005 – September 2006. WEST Inc. was responsible for data collection. Analysis and report writing for this data was conducted under a scope of work defined for the Avian Monitoring Team (UCSB, BRC, Jones and Stokes, and WEST). Wally Erickson (WEST) is the principle author of the report. The primary purpose of this preliminary report is to assist the Scientific Review Committee (SRC) and the Avian Monitoring Team with the development of the monitoring protocols that will be used in future studies. Given the rush to provide preliminary information, these data, data analyses, and report have not been completely reviewed for errors and inconsistencies. In addition, more background material and methods are needed to provide a complete report. We are releasing this preliminary information to help guide the SRC in reviewing and suggesting monitoring protocols within the APWRA. However, this information should not be considered complete or final until final data checks and final peer-review have occurred. Any references to this report should also include the disclaimers listed above.

The descriptive analyses in this report do not address the seasonal shutdown experiment specifically. We will be providing a supplemental analysis of the results of the seasonal shutdown.

EXPERIMENTAL DESIGN AND GENERAL FIELD METHODS

Methods for avian use and carcass searches are found in WEST (2005). This report includes fatality data collected from mid-October 2005 through September 2006, and avian use data collected from mid-December 2005 – August 2006. Modifications to the methods are generally described in this document.

Sampling Universe

All turbines of participating companies within the APWRA were considered, with the exception of the Buena Vista turbines that are planned for repowering. This resulted in approximately 4,800 turbines available for study (i.e., sample universe). The sample universe includes some turbines that were not sampled during the previous research by CEC (Smallwood and Thelander 2004), and excludes the Buena Vista turbines, and turbines from non-participating companies.

Primary Stratification of the APWRA

Two primary levels of stratification (geographic location and turbine size) were considered in designing the experiments for this monitoring and research study. The first stratification (geographical location) was used to implement the seasonal shutdown management action and to provide some level of interspersed of the sample sites across the entire APWRA. The North/West and the North/East portion of the APWRA, hereinafter referred to as the North stratum, includes turbines from participating companies located in the north and western portion of the area defined by: north of I-580 and north of Altamont Pass Road in both Alameda and Contra Costa Counties (Figure 1). The South/West and the South/East portion of the APWRA,

hereinafter referred to as the South stratum, consist of the western and eastern portions of the remaining turbines (Figure 1).

Turbines were grouped into three levels of turbine size (stratum) based on nameplate turbine size category. The three categories were:

Very Small:	40-65 kW
Small:	100-150 kW
Medium:	≥ 250 kW

Some other characteristics of the turbines in the sample are shown in Table 1.

Sampling Blocks

All turbine strings were grouped into sampling blocks (turbine blocks) using a Geographic Information System (GIS). The number of turbines per block varied from approximately 4 to 70 turbines and 1 to 7 strings. Turbine strings were grouped into blocks based on turbine size and type and proximity of strings to each other (Figure 1).

Samples of these turbine blocks were selected based on the sampling scheme below. This sampling approach (blocks of strings instead of individual strings) is more efficient and increases the time spent searching decreasing the time required to travel between search areas.

Sample Selection

A random sample (or census in some cases) of turbine blocks was selected within each of the combinations of strata yielding 2214 turbines within 70 blocks in the sample for the first year (Table 2, Figure 1). Fatality searches were conducted at all turbines within the selected turbine blocks (Table 2, Appendix A). Blocks ranged in size from 4 turbines to 66 turbines. An avian observation station was established at nearly all selected turbine blocks (some small adjacent blocks shared avian use stations), and 30-minute surveys were conducted at these locations.

Table 2 contains general characteristics (# turbines, # non-operational turbines, turbine size (kw), size strata and location of the selected turbine blocks. Figure 1 shows the location of the blocks selected and avian use survey locations.

Approximately 7 searches were conducted since late fall 2005 at the approximately 2200 turbines in the sample, with a mean search interval of approximately 50 days (Table 3). The original goal was to conduct searches every 30 days; however, due to delays in the process for obtaining contracts through the county, the search effort and avian use survey effort did not meet those objectives. We had fairly high turnover rate of field technicians, because of the difficulty in providing job security over the longer term due to the uncertainty in selection of the county contractor for monitoring. We had two to four technicians employed throughout the study period. The largest gap between searches was approximately 90 days between the late February/early March search and a May-June search. Searches were also conducted in October/early November 2006, but the data and searches were not included in the analysis (have not been completely entered and analyzed).

FATALITY SEARCH DATA

Details on search methods are found in WEST (2005). To ensure comparable data, fatality searches will be conducted using a protocol similar to the one used by Smallwood and Thelander (2004a,b). Searches were conducted within rectangular search plots with boundaries a minimum distance of 50 m from the turbines within each selected sample block. Methods were consistent with those used in Smallwood and Thelander (2004). We included all fatalities found during the searches when discussing species composition and when evaluating the turbine risk classifications previously defined by Smallwood and Spiegel (2005a, 2005b, 2005c). We eliminated records where only old bones were found when calculating observed fatality rates. We included fatality records from the first search (clearing search), which is consistent with Smallwood and Thelander (2004). However, once the October/November 2006 data have been included, we will calculate the fatality rates with and without the first search data.

These results should be considered preliminary and subject to change until all data checks are complete, and peer review occurs. A total of 583 fatality records were found within our plot search boundaries (Table 4). These included fatalities found during formal carcass searches, and incidental finds by searchers and wind farm personnel. For this analysis, the incidental finds by searchers and wind farm personnel found within our search plots were treated as if they would have been found during the searches. An additional 99 fatalities were also reported by field technicians (incidentals) and wind farm personnel (WRRS) at turbines not searched (away from our search plots). There may be a small number of fatalities that may have been counted twice in the database. In a few cases, evidence of a fatality of the same species was found over the course of two searches that may have come from the same bird. We are currently reviewing those potential cases and these will be discussed in future reports. There are only a few (less than 5) cases involving a raptor.

The most common raptors found on search plots were red-tailed hawk (102), barn owl (44), golden eagle (21), burrowing owl (20), and American kestrel (15). The most common non-raptor species recorded were rock pigeon (128), European starling (71), western meadowlark (61), common raven (14) and morning dove (14). Three bats were reported (2 hoary and 1 western red bat).

We calculated observed raptor mortality assuming our searches represented a year of surveys, and fatalities found during the study were killed during the study period. For these calculations, remains that did not include feathers or flesh (bones only) were excluded. We are currently reviewing the data on condition of carcasses to further screen the data, and remove fatalities with strong evidence that they occurred prior to the beginning of the study. Additional adjustments to these estimates are expected as well for refined estimates of the study period length and other possible factors in the final analysis. These data have not been adjusted for any of the potential biases (e.g., search area, searcher detection, scavenging).

Table 5 shows the observed fatality rate (fatalities/MW/year) from this study for the three strata of turbine size categories (very small: 40 – 65 kW, small: 100-150 kW, medium: 250-400 kW). Sample sizes for American kestrels, golden eagles, and burrowing owls are low, limiting our ability to provide strong statistical inferences for those species at this time. Observed red-tailed hawk mortality and all raptor mortality were 4 to 6 times higher on a per MW basis at the very small and small turbines (40 – 150 kW) compared to the medium sized turbines (250 – 400 kW).

While sample sizes are low, all golden eagle fatalities found on search plots were located at small turbines (100-150 kW).

Table 6 contains observed fatality rate estimates found in the August 2004 CEC report (Smallwood and Thelander 2004) and observed fatality rate estimates in this study. Final observed fatality estimates will be made in a future final report that will provide more detailed and sound estimates that better account for the survey period our study represents, and eliminates fatalities that are estimated to have occurred prior to the study. We assumed our study represented exactly one year of effort. These comparisons should be made with caution, because of differential search intervals between the studies. However, the average search intervals for this (50d) and the first set of turbines sampled during the CEC study (50d) were similar.

Observed mortality for red-tailed hawks was approximately 50-75% higher during this study than during either study period in the CEC study. Estimates for the other species were either within the range reported in the CEC study report (range defined by estimates from the first and 2nd sampling set) or were lower than the range. These comparisons assume the field and analysis methods are the same.

Spatial distribution of the fatalities within the APWRA is also illustrated in Figures 2 – 7. We also did some comparisons among different regions within the APWRA (Table 7). While the boundaries dividing east and west and north and south within the APWRA were relatively arbitrary, we do see some potential differences in target raptor mortality among the regions. For example, golden eagle mortality is highest in the northwest region, and the northern region of the APWRA was also the region with the highest golden eagle use during this study (Figure 8). This is consistent with historic golden eagle mortality records within the WRRS (J. Stewart, pers. Comm.), and also consistent with patterns in golden eagle use from a radio-telemetry study in the APWRA (Hunt 2002). Burrowing owl mortality was observed only in the eastern regions of the APWRA. The lowest total raptor mortality was observed in the southwest region. In the next report, statistical tests will be conducted to determine whether these observed differences are statistically significant. Cause of the apparent differences in fatality rates among regions may be due in part to factors other than location. For example, all turbine types and sizes are not represented within each of these regions, causing potential confounding effects.

EVALUATION OF COLLISION RISK CLASSIFICATIONS

The CEC has provided several classifications of target raptor collision risk for turbines in the APWRA. These risk classifications were primarily based on the univariate association analyses found in the August 2004 CEC report (Smallwood and Thelander 2004). The SRC is tasked with reviewing these turbine risk classifications and possibly other approaches and making their recommendations regarding turbines that should be considered for shutdown, removal, and /or relocation. We used the fatality locations from this study (i.e., an independent dataset) to provide some validation and evaluation of the different risk classifications developed from the previous datasets, provide some guidance as to the selection of the “best” classification, and provide estimates of the anticipated difference in fatality rates among the different turbine risk levels for those classifications. The SRC is tasked with reviewing the high risk turbine classification approaches that have been conducted, providing recommendations regarding which is the best approach to classification, or providing alternative approaches to this process. These analyses should provide some guidance to the SRC regarding this task. No statistical tests were

conducted. Each fatality was assigned to the turbine nearest the fatality. All fatality records (including bones only) were included in this analysis.

The following table contains the 3 variables and references for the different risk maps and datasets provided by the CEC (Smallwood and Spiegel 2005a, 2005b, 2005c).

Description	CEC Variable Name	Reference
January Assessment	Tier 30	Smallwood and Spiegel 2005a Smallwood pers. Comm..
March Assessment	Tier 70	Smallwood and Spiegel 2005b
June Assessment	Junes	Smallwood and Spiegel 2005c

We compared the percent of fatalities occurring at turbines within each of the different risk classifications (observed) to the percent of turbines in our sample within each of the different levels of risk (expected). The percent expected is calculated assuming the fatality locations are distributed at random among the sampled turbines. The ratio of observed/expected provides an indication of association. Values greater than 1 indicate more fatalities than expected by chance alone, and if the risk classifications are associated with true risk, we would expect the higher risk classes to have ratios greater than 1.

Between 383 and 392 turbines in our turbine sample have not been classified as to the risk level by CEC, and were reported as unclassified in the tables of results. These turbines were not included in the calculation of the observed percent or expected percent.

Sample sizes for American kestrel, burrowing owl, and golden eagle for this first year of effort were low, resulting in high uncertainty in evaluation of these models.

Our discussion focuses only on analyses of the target raptor species combined and all raptors combined (Tables 8 – 10). We used the variable “Tier30” as the risk categorization variable from the January Assessment. The independent evaluation of the January model suggested that the tier 1 turbines were more risky than the other turbines, with an observed all raptor fatality rate (1.2 per MW per year) approximately 36 – 42% higher than turbines in the other risk categories (Table 8). However, there was little difference in the observed fatality rates among turbines classified as Tiers 2 – 5. A similar result was suggested by the data for the target raptors combined. Tier 1 turbines had the highest observed fatality rate (0.94/MW/year); however, the Tier 2, 3, and 4 turbines had observed fatality rates similar to slightly lower (0.39 – 0.73/MW/year) than Tier 5 turbines.

The March analysis (Smallwood and Spiegel 2005b), which was requested by the companies to ensure turbine size was accounted for in determining risks, showed an increasing trend in observed target raptor mortality as a function of the risk values (ie., observed mortality proportional to estimated risk, Table 9). The tier 1 and 2 turbines had observed fatality estimates for target raptors approximately 2.3 times higher than the rates for the tier 5 turbines.

The June analysis (Smallwood and Spiegel 2005c), combines the results of January and March Assessments. For example, Tier 1 turbines in the June Assessment were both Tier 1 in the January Assessment and Tier 1 in the March Assessment. The June Assessment showed a little more variation than the March results, but also showed trends similar to the March analysis

(Table 10). Turbines generally considered higher risk had higher fatality rates within the new dataset.

These results suggest that of the three sets of turbine risk values, the March and June assessments are the best in terms of their apparent association with collision risk, with the March results showing slightly better performance than the June assessment (Table 11). These results suggest the raptor fatality rate (#/MW/yr) for turbines considered riskiest (top 5-8 percent) is approximately twice the rate (#/MW/yr) of the remaining turbines using the March or June Assessments. In other words, elimination of 1 MW worth of turbines considered higher risk on average would have the estimated same average target raptor mortality reduction as eliminating 2 MW of the remaining turbines considered less risky. Table 11 compares the observed fatality rates for the approximately 5 to 8 MW of highest risk turbines classified in our sample for the three assessments to the fatality rates of the remaining turbines. The March Assessment, which identifies a larger number of smaller turbines as high risk than the other assessments, appears to be the best based on the criteria used in our analysis, with a target raptor fatality rate over twice that of the rates of the remaining turbines. The March Assessment incorporated turbine size in a relatively arbitrary fashion, by dividing the total of a risk score assigned to each turbine by the MW of the turbine.

RAPTOR/MEDIUM-LARGE SIZED BIRD USE SURVEY RESULTS

Avian use surveys were conducted primarily in the winter (December – February) and summer (June – August). Additional avian use surveys were conducted in October 2006, but data entry is not complete. Gaps in the spring were due to shortage of technician help, due to our inability to provide job security for technicians. Several technicians left to take other positions because we could not provide them certainty in longer term employment until the County process for selection of the avian monitoring contractors could be completed. All data recorded out to a maximum of 800 m from the observer is included in this analysis. All raptor observations are being digitized and estimates from other viewsheds (e.g., 300 m) will be included in the next report.

Twenty-nine species (medium to large-sized birds) were observed during the surveys (Table 12). Gulls were the most common bird observed during the surveys, especially in the north near the landfill (Table 13). The most common raptor/vulture observed were red-tailed hawk (819 observations), turkey vulture (599), American kestrel (133), and golden eagle (127 observations). Less commonly observed raptors included northern harrier (51), prairie falcon (39), ferruginous hawk (27), burrowing owl (19), Swainson's hawk (4), osprey (2), white-tailed kite (1), and merlin (1). Note that while gulls and turkey vultures were observed frequently during searches, few were observed as fatalities.

Overall use and number of species/survey for the moderate to large-sized birds was higher in the winter (Table 14). The overall higher use in the winter was due primarily to the larger number of gulls observed near the landfill (Table 15). Overall raptor/vulture use was similar in the winter compared to the summer period (Figure 7). However, mean use rate (# observed/30-min survey) for red-tailed hawks and golden eagles in the winter was approximately twice the summer rates (Figure 7). Turkey vulture use in the summer was twice the winter rate (Table 15). All the burrowing owl observations were made during the summer period (Table 15). Red-tailed hawks were observed in over 86% of the winter surveys and over 63% of the summer surveys (Table 16). Common ravens were observed in 65.2% of the winter surveys and 42.7% of the summer

surveys. Golden eagles and American kestrels were also observed more frequently in the winter (27.8% and 27.4%) than in the summer (16.9% and 18.4%).

Raptor use was calculated separately for the northern (Figure 1, northwest and northeast area) and southern areas (Figure 1, southwest and southeast area). American kestrel, red-tailed hawk, and all target raptors combined showed relatively similar raptor use in the northern and southern areas (Figure 8). Golden eagles showed nearly twice the use in the northern area compared to the southern area. Overall raptor use was nearly identical in the northern and southern areas.

CARCASS REMOVAL TRIALS

Scavenging trials were conducted three times between fall 2005 and fall 2006. The first trial was initiated 4 October 06 and ended on 5 December 2005. The second trial was initiated in two phases, with one bird placed on 6 December 2005 and monitored through 8 February, and with 22 birds placed on 17 January 2006 and monitored through 20 March 2006. The third trial was initiated between 24 August and 5 September 2006 and is ongoing as of 25 October 2006.

Carcasses Used

Experimental scavenging carcasses were usually non-protected species such as house sparrows and rock pigeons, or commercially bred gamebirds. In winter 2005, WEST received permission from the USFWS to use protected species such as red-tailed hawks that were found as fatalities in the APWRA.

Fall 2005

During fall 2005 scavenging trials, 10 house sparrows and 10 rock pigeons were placed at 20 turbines within the Gate 1A area on 4 October.

Winter 2005/2006

A fresh red-tailed hawk electrocution fatality was moved to turbine 1075 in the Gate 1A area on 6 December 2005. This carcass was monitored for 64 days until 8 February 2006.

On 17 January 2006, 10 rock pigeons, 10 house sparrows, and 2 red-tailed hawks were placed at 22 turbines in the Gate 1A area.

Summer 2006

For the summer 2006 scavenging trial we placed 33 carcasses within surveyed plots across the APWRA study area. Our first group of carcasses, placed on 8/29/2006, consisted of 16 birds: 6 house sparrows, 7 rock pigeons, 2 common ravens, and 1 red-tailed hawk. The second group of carcasses, placed on 8/24/2006, consisted of 17 birds: 6 female mallards and 11 juvenile male Muscovy ducks, purchased from a local duck breeder.

Five additional carcasses were placed within the Diablo Winds project area on 5 September. We used 5 ring-necked pheasant hens, purchased from the Modesto Junior College Poultry Club.

Carcass Placement Fall 2005 and Winter 2005/2006

During the first two scavenging trials, carcasses were placed at turbines that were not part of any regular carcass searching plots. Carcass location was determined by randomly selecting a compass bearing and distance (within the regular search area of 50m) using the “=RANDBETWEEN” function in Excel.

Carcasses were dropped from waist height at each predetermined location. Upon placing carcasses, we noted the species, whether the bird was belly-up or belly-down, utm coordinates, date, and time. Turbines where experimental carcasses were placed were marked with a pin flag, but the actual location of each carcass was unmarked to avoid alerting scavengers to the carcass location.

Carcasses were monitored over a 62-day period. Carcasses were checked every day for the first 3 days after placement, every other day for the next two weeks, then once per week for the remainder of the 62-day trial. At each visit we noted whether the carcass was intact (I), scavenged (S), a feather spot (FS; >10 feathers), or absent (0; <10 feathers). In addition we described the type and degree of scavenging and possible scavengers. We removed all remaining trial carcasses and feathers after the trial period.

Carcass Placement Summer 2006

Monitoring Study

To achieve a systematic distribution of carcasses across the study area, we selected every other turbine block from a list of our sampled turbine blocks. A coin toss determined whether we began with the first or second block on the list. Within each block we placed carcasses at a random location within 50 m of a turbine. Random locations were chosen as follows: a random turbine was selected from each block. For each of these turbines, we selected a random compass bearing between 1 and 360, and a random distance between 1 and 50 using the =RANDBETWEEN function in Excel.

In the field, we placed a flag at each random location, but the actual carcass was placed 10 m north of the flag in order to help conceal the carcass. We marked each carcass with green electrical tape on both legs for recognition by searchers and wind farm personnel, and each carcass was dropped from waist height. Upon placing carcasses, we noted the species, degree of exposure (1-3), utm coordinates, date, and time. We also took photos of each carcass.

We checked experimental carcasses over a period of 60 days. Carcasses were checked every day for the first 3 days after placement, twice a week for the next two weeks, then once per week for the remainder of the 60-day trial. At each visit we noted whether the carcass was intact (I), scavenged (S), a feather spot (FS; >10 feathers), or absent (0; <10 feathers). In addition we described the type and degree of scavenging and possible scavengers, and took photos if the carcass had noticeably changed from the previous visit. We removed all remaining trial carcasses and feathers after the 60-day period.

Diablo Study

Five ring-necked pheasant carcasses were placed within the Diablo Winds project area on 5 September 2006 using the same procedures described above with the exception that carcasses were placed within 75 meters of the turbine, which is consistent with the larger search radius for the Diablo turbines. We placed one pheasant at every 6th turbine beginning with turbine WTG-3 as a random starting point. For each of the 5 turbines we selected a random compass bearing between 1 and 360, and random distance between 1 and 75 meters. Diablo Winds carcasses were marked with white tape on both legs. We dropped carcasses from waist height at a location 10 m north of the randomly generated position. We checked the Diablo Winds carcasses on the same schedule as above (i.e., every day for the first 3 days, twice a week for the next 2 weeks, and once a week for the remainder of the 60-day trial), making note of the type and degree of scavenging on each visit.

Similar patterns in results were observed in all three trials for the groups of birds common to the three trials (rock pigeons and house sparrows, Appendix B). In all three trials, house sparrows were removed relatively quickly (median time to removal=5d, 5.5d, 5d). In all three trials, removal of the rock dove carcasses was quite slow (med time to removal = 51d, 45d, >61d). Sample sizes were low for raptors and corvids. Of the 7 trial carcasses (4 red-tailed hawks, 1 burrowing owl, 2 common ravens), only 1 carcass was considered removed by the end of the trial, a red-tailed hawk estimated removed at 45 days. One of the red-tailed hawks was a fresh fatality and it lasted until the end of the trial.

In the last trial, we also obtained fresh mallard and muscovy duck carcasses. These also were removed very slowly (med time to removal > 60 days), with similar removal times to raptors/corvids and rock pigeons. Figure 15 provides estimates of the percent of carcasses remaining by day since placement for pooled data across the three trials for house sparrows, rock pigeons, waterfowl/gamebirds, and raptors/corvids.

Table 17 provides some comparisons of the approximate sizes of the species used in the trials and the target raptor species. Our results suggest that birds the size of rock pigeons and larger are removed very slowly by scavengers, and that very small carcasses, like the house sparrows, are removed by scavengers quite quickly. There is still uncertainty about the removal rate of burrowing owls and American kestrels, which are much larger than house sparrows, but approximately one-half to two-thirds the weight of rock pigeons. We had only 1 burrowing owl carcass used in the removal trials, and this carcass was not removed during the trial (left >61 days). Factors other than carcass size might also affect rates of scavenging and carcass removal (e.g., color of carcass, habitat).

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Table 1. Characteristics of turbines selected within our sample.

Wind turbine manufacturer	Size (kW)	Size Category	# in Sample	Rotor diameter (m)	Tip Speed (kph)	Rated wind speed (kph)	Tower Height (m)	Lower Blade reach
Enertech	40	Very small	144	13.5	148.0	48.3	18.5	11.8
Micon	65	Very small	220	16.0	149.6	54.7	24.6	16.6
Nordtank	65	Very small	126	16.0	143.2	54.7	24.6	16.6
Bonus	65	Very small	211	16.0	na ^a	na	na	na
Windmatic	65	Very small	26	14.8	136.8	56.3	18.5	11.1
KCS-56	100	Small	898	17.8	246.2	46.7	18.5	9.6
KCS-56	100	Small	70	17.8	246.2	46.7	24.6	15.7
KCS-56	100	Small	56	17.8	246.2	46.7	43.1	34.2
Polenko	100	Small	12	18.2	149.6	49.9	24.6	15.5
Vestas	100	Small	128	17.2	167.3	67.6	24.6	16.0
Bonus	120	Small	137	19.5	146.4	64.4	24.6	14.9
Bonus	150	Small	43	23.4	173.8	64.4	25.2	13.5
W.E.G.	250	Medium	20	25.2	212.4	48.3	24.6	12.0
Howden	330	Medium	86	31.4	239.7	43.4	24.6	8.9
KVS-33	400	Medium	36	33.2	180.2	43.0	24.6	8.0
KVS-33	400	Medium	1	33.2	180.2	43.0	36.9	20.3

^a not available at this time

Table 2. Plot characteristics for monitoring study carcass searching in APWRA

PlotID	# Turbines	# Non-op	Turbine Size	Size Category	Area
1	20	1	400	Medium	North/West
2	40	7	100	Small	North/West
5	34	4	100	Small	North/West
10	57	19	100	Small	North/West
24	23	5	100	Small	North/West
29	31	2	100	Small	North/West
31	32	3	100	Small	North/West
33	50	1	100	Small	North/West
35	7	0	400	Medium	South/West
36	9	0	400	Medium	South/West
39	14	0	120	Small	South/West
40	30	2	100	Small	South/West
41	26	3	100	Small	South/West
42	55	7	100	Small	South/West
44	4	0	250	Medium	South/West
47	45	8	100	Small	South/West
48	28	3	100	Small	North/West
51	38	3	100	Small	North/West
54	57	0	100	Small	South/West
55	50	3	100	Small	South/West
56	21	0	100	Small	South/West
62	21	5	100	Small	North/East
63	25	0	330	Medium	North/East
64	25	9	330	Medium	North/East
65	26	2	330	Medium	North/East
68	10	1	330	Medium	North/East
81	25	1	100	Small	North/East
84	54	3	100\150	Small	North/East
87	46	0	120\150	Small	North/East
89	27	5	120	Small	North/East
93	22	0	120	Small	North/East
94	29	2	150	Small	North/East
98	25	6	100	Small	North/East
100	26	10	100	Small	North/East
105	33	0	120	Small	North/East
108	23	0	65	Very small	North/East
110	15	0	65	Very small	North/East
111	36	0	40	Very small	North/East
112	61	0	40	Very small	North/East
113	47	0	40	Very small	North/East
114	38	4	65	Very small	North/East
116	29	0	65	Very small	North/East
117	75	0	65	Very small	North/East
118	27	0	65	Very small	North/East
119	34	0	65	Very small	South/East
120	18	0	65	Very small	South/East

Table 2 (continued).

PlotID	# Turbines	# Non-op	Turbine Size	Size Category	Area
121	47	2	100	Small	South/West
123	66	8	100	Small	South/West
127	20	7	100	Small	South/East
128	12	0	65	Very small	South/East
129	25	5	100	Small	South/East
130	21	6	100	Small	South/East
132	53	7	100	Small	South/East
133	16	0	250	Medium	South/East
134	12	3	100	Small	South/East
137	24	0	65	Very small	South/East
138	36	0	65	Very small	South/East
139	19	0	65	Very small	South/East
141	45	0	65	Very small	South/East
144	25	0	65	Very small	South/East
145	40	0	65	Very small	South/East
148	93	0	65	Very small	South/East
151	8	0	65	Very small	South/East
153	34	0	65	Very small	South/East
155	11	1	100\400	Small\Med	South/East
160	30	4	100	Small	South/East
163	33	0	100	Small	South/East
165	43	4	100	Small	South/East
167	18	0	100	Small	South/East
172	15	3	100	Small	South/East
TOTAL	2214	169			

Table 3. Number of carcass searches and avian behavior observations at each plot.

Plot ID	# Searches	# Observations
1	7	7
2	7	7
5	6	7
10	7	7
24	7	6
29	7	6
31	7	6
33	6	6
35	7	7
36	7	7
39	7	6
40	7	6
41	7	6
42	6	6
44	7	6
47	7	7
48	7	6
51	7	6
54	7	7
55	7	7 (A&B)
56	7	7
62	6-7	7
63	6	6
64	6	6
65	6	6
68	6	6
81	7	6
84	7	6
87	5-6	6
89	7	6
93	6	6
94	6	6
98	7	6
100	7	6
105	6-7	6
108	7	2
110	7	6
111	7	6
112	7	2
113	7	6
114	7	6

Table 3 (continued.)

Plot ID	# Searches	# Observations
116	7	0
117	7	6
118	7	6
119	7	6
120	7	6
121	7	6
123	7	6 (A&B)
127	7	6
128	6	0
129	7	6
130	7	6
132	6	6
133	7	6
134	7	6
137	7	6
138	6	6
139	6	6
141	6	6
144	6	6
145	7	6
148	6-7	6
151	7	6
153	7	6
155	7	6
160	7	6
163	7	6
165	6-7	6
167	7	6
172	7	6

Table 4. List of fatalities observed during the study period.

Species	Total Fatalities	Fatalities in Plots
Red-tailed hawk	137	102
Rock pigeon	132	128
European starling	80	71
Western meadowlark	64	61
Barn owl	57	44
Golden eagle	28	21
Burrowing owl	24	20
Common raven	19	14
American kestrel	15	15
Mourning dove	14	14
Unk. large bird	12	11
unk. Medium-sized bird	8	8
Unk. small bird	6	6
Gull sp.	6	5
Loggerhead shrike	6	5
Mallard	6	4
Brewer's blackbird	5	5
Great-horned owl	5	5
American crow	5	3
Unk. passerine	5	3
Horned lark	4	3
Unknown bird	4	3
Cliff swallow	3	3
Red-winged blackbird	3	3
Turkey vulture	3	3
Hoary bat	2	2
Northern mockingbird	2	2
Rock wren	2	2
Ferruginous hawk	2	1
unk. Buteo	2	1
unk. Hawk	2	1
Blackbird Sp.	1	1
Cockatiel	1	1
Great blue heron	1	1
Great egret	1	1
Prairie falcon	1	1
Red-winged or Tri-colored blackbird	1	1
Sparrow Sp.	1	1
Swainson's hawk	1	1
Tree swallow	1	1
unk. Blackbird	1	1
unk. Duck	1	1
Western red bat	1	1
Western scrub jay	1	1
White-throated swift	1	1
California gull	1	0
Cooper's hawk	1	0
Hammond's flycatcher	1	0
House finch	1	0
TOTAL	682	583

Table 5. Estimated observed mortality (#/MW/year) by the turbine size categories used in the stratification. Estimates are unadjusted for searcher efficiency and scavenging biases.

Size Data	MW sampled	Observed mortality (#/MW/year)				
		American kestrel	burrowing owl	golden eagle	red-tailed hawk	All Raptors
250-400 kW	47.8	0.02	0.08	0.00	0.10	0.29
100-150 kW	136.8	0.05	0.05	0.14	0.48	1.00
40-65 kW	44.3	0.16	0.20	0.00	0.61	1.31
subtotal	228.3	0.07	0.09	0.08	0.43	0.92

Table 6. Comparisons of reported observed mortality from the CEC study (Smallwood et al. 2004) for the 1st and 2nd set of turbine sampled, and the estimates from this study.

Species/Taxonomic group	Mortality (deaths/MW/year)		
	CEC Study		
	1st Set ^a	2nd Set ^b	This Study ^c
Golden eagle	0.038	0.139	0.083
American kestrel	0.061	0.125	0.066
Burrowing owl	0.167	0.100	0.088
Red-tailed hawk	0.295	0.249	0.429
All raptors	0.953	1.233	0.916

^a initial set of turbines sampled during the CEC study (see Table 3.9 in Smallwood et al. (2004).

^b 2nd set of turbines sampled from November 2004 – May 2005 (see Table 3.9 in Smallwood et al. (2004)

^c it is assumed these data represent 1 year of fatality data; the final analysis may differ slightly when determining the exact time frame the fatality data from this study represent.

Table 7. Observed fatality rates by region within the APWRA (see Figure 1). Estimates are slightly different than the previous tables because these estimates are means of plot fatality means, while previous estimates are based on the ratio of the total number of fatalities over the total MW of turbines sampled (ratio of totals).

Group/species	obs. fatality/MW/year				Overall
	NW	NE	SW	SE	
American kestrel	0.081	0.059	0.047	0.089	0.070
burrowing owl	0.000	0.222	0.000	0.095	0.106
golden eagle	0.235	0.054	0.014	0.076	0.080
red-tailed hawk	0.456	0.567	0.446	0.307	0.440
all raptors	1.052	1.238	0.639	0.814	0.955

Table 8. Classification of the fatality locations and risk values (January Assessment: variable “Tier30”) of turbines. Sample sizes are very low for American kestrel, burrowing owl and golden eagle. Risk level 1 is the most risky.

Risk category	# fatalities	# turbines	MW	obs./exp.	#/MW/Year
<u>American kestrel</u>					
unclass.	3	383	38.6		
1	1	57	11.7	1.35	0.09
2	0	122	19.8	0.00	0.00
3	1	156	17.8	0.89	0.06
4	2	666	68.6	0.46	0.03
5	8	827	71.1	1.77	0.11
subtotal (1-5)	12	1828	189.0	1.00	0.06
<u>Burrowing owl</u>					
unclass.	1	383	38.6		
1	1	57	11.7	0.85	0.09
2	4	122	19.8	2.01	0.20
3	1	156	17.8	0.56	0.06
4	6	666	68.6	0.87	0.09
5	7	827	71.1	0.98	0.10
subtotal (1-5)	19	1828	189.0	1.00	0.10
<u>Golden eagle</u>					
unclass.	5	383	38.6		
1	2	57	11.7	2.02	0.17
2	3	122	19.8	1.79	0.15
3	1	156	17.8	0.66	0.06
4	9	666	68.6	1.55	0.13
5	1	827	71.1	0.17	0.01
subtotal (1-5)	16	1828	189.0	1.00	0.08
<u>red-tailed hawk</u>					
unclass.	18	383	38.6		
1	7	57	11.7	1.35	0.60
2	7	122	19.8	0.80	0.35
3	4	156	17.8	0.51	0.22
4	30	666	68.6	0.98	0.44
5	36	827	71.1	1.14	0.51
subtotal (1-5)	84	1828	189.0	1.00	0.44
<u>target raptor species</u>					
unclass.	27	383	38.6		
1	11	57	11.7	1.36	0.94
2	14	122	19.8	1.02	0.71
3	7	156	17.8	0.57	0.39
4	47	666	68.6	0.99	0.68
5	52	827	71.1	1.06	0.73
subtotal (1-5)	131	1828	189.0	1.00	0.69
<u>all raptors</u>					
unclass.	36	383	38.6		
1	14	57	11.7	2.51	1.20
2	17	122	19.8	1.42	0.86
3	15	156	17.8	0.98	0.84
4	66	666	68.6	1.01	0.96
5	67	827	71.1	0.83	0.94
subtotal (1-5)	179	1828	189.0	1.00	0.95

Table 9. Classification of the fatality locations and risk values (March Assessment: variable “Tier70”) of turbines. Sample sizes are very low for American kestrel, burrowing owl and golden eagle.

Risk	# fatalities	# turbines	MW	Obs./ exp.	#/MW/ Year
<u>American kestrel</u>					
unclass.	3	392	39.1		
1	1	63	4.6	3.45	0.22
2	0	128	10.9	0.00	0.00
3	0	157	12.7	0.00	0.00
4	2	418	37.9	0.83	0.05
5	9	1053	122.4	1.15	0.07
subtotal (1-5)	12	1819	188.4		
<u>burrowing owl</u>					
unclass.	3	392	39.1		
1	3	63	4.6	7.30	0.66
2	2	128	10.9	2.03	0.18
3	1	157	12.7	0.87	0.08
4	1	418	37.9	0.29	0.03
5	10	1053	122.4	0.91	0.08
subtotal (1-5)	17	1819	188.4		
<u>golden eagle</u>					
unclass.	5	392	39.1		
1	1	63	4.6	2.59	0.22
2	4	128	10.9	4.32	0.37
3	1	157	12.7	0.93	0.08
4	6	418	37.9	1.87	0.16
5	4	1053	122.4	0.38	0.03
subtotal (1-5)	16	1819	188.4		
<u>red-tailed hawk</u>					
unclass.	18	392	39.1		
1	1	63	4.6	0.49	0.22
2	8	128	10.9	1.65	0.73
3	13	157	12.7	2.30	1.02
4	18	418	37.9	1.07	0.48
5	44	1053	122.4	0.81	0.36
subtotal (1-5)	84	1819	188.4		
<u>target raptor species</u>					
unclass.	29	392	39.1		
1	6	63	4.6	1.92	1.32
2	14	128	10.9	1.88	1.28
3	15	157	12.7	1.73	1.18
4	27	418	37.9	1.04	0.71
5	67	1053	122.4	0.80	0.55
subtotal (1-5)	129	1819	188.4		
<u>all raptors</u>					
unclass.	38	392	39.1		
1	6	63	4.6	1.40	1.32
2	17	128	10.9	1.66	1.56
3	20	157	12.7	1.68	1.58
4	44	418	37.9	1.24	1.16
5	90	1053	122.4	0.78	0.74
subtotal (1-5)	177	1819	188.4		

Table 10. Classification of the fatality locations and risk values (June Assessment: variable “Junes”) of turbines. Sample sizes are very low for American kestrel, burrowing owl and golden eagle.

Risk	# fatalities	# turbines	MW	Obs./ exp.	#/MW/ year
<u>American kestrel</u>					
unclass.	3	392	39.1		
1	1	13	1.3	11.66	0.79
2	0	30	3.0	0.00	0.00
3	0	50	5.0	0.00	0.00
4	0	90	8.4	0.00	0.00
5	1	495	42.6	0.31	0.02
6	10	1141	128.3	1.33	0.08
subtotal (Tiers 1-6)	12	1819	188.4	1.00	0.06
<u>burrowing owl</u>					
unclass.	3	392	39.1		
1	0	13	1.3	0.00	0.00
2	1	30	3.0	3.57	0.34
3	1	50	5.0	2.14	0.20
4	1	90	8.4	1.19	0.12
5	3	495	42.6	0.65	0.07
6	11	1141	128.3	1.03	0.09
subtotal (Tiers 1-6)	17	1819	188.4	1.00	0.09
<u>golden eagle</u>					
unclass.	4	392	39.1		
1	0	13	1.3	0.00	0.00
2	3	30	3.0	11.37	1.02
3	1	50	5.0	2.27	0.20
4	0	90	8.4	0.00	0.00
5	8	495	42.6	1.84	0.19
6	4	1141	128.3	0.40	0.03
subtotal (Tiers 1-6)	16	1819	188.4	1.00	0.08
<u>red-tailed hawk</u>					
unclass.	18	392	39.1		
1	0	13	1.3	0.00	0.00
2	2	30	3.0	1.44	0.68
3	3	50	5.0	1.30	0.60
4	8	90	8.4	1.92	0.96
5	22	495	42.6	0.96	0.52
6	49	1141	128.3	0.93	0.38
subtotal (Tiers 1-6)	84	1819	188.4	1.00	0.45
<u>target raptor species</u>					
unclass.	28	392	39.1		
1	1	13	1.3	1.08	0.79
2	6	30	3.0	2.82	2.03
3	5	50	5.0	1.41	1.00
4	9	90	8.4	1.41	1.08
5	34	495	42.6	0.97	0.80
6	74	1141	128.3	0.91	0.58
subtotal (Tiers 1-6)	129	1819	188.4	1.00	0.68

Table 10 (continued).

Risk	# fatalities	# turbines	MW	Obs./exp.	#/MW/year
<u>All raptors</u>					
unclass.	38	392	39.1		
1	1	13	1.3	0.79	0.79
2	7	30	3.0	2.40	2.37
3	6	50	5.0	1.23	1.20
4	12	90	8.4	1.37	1.43
5	53	495	42.6	1.10	1.24
6	98	1141	128.3	0.88	0.76
subtotal (Tiers 1-6)	177	1819	188.4	1.00	0.94

Table 11. Comparison of the observed target raptor fatality rates for high risk turbines sampled during this study that were identified in the January (Tier 30 variable), March (Tier 70 variable) and June Assessments.

Assessment	Risk set	% of sample	obs. fatality rate for risk set (R1)	obs. Fatality rate remaining turbines (R2)	Ratio (R1/R2)
January	Tiers 1	6.2%	0.94	0.68	1.39
March	Tiers 1&2	8.2%	1.30	0.63	2.06
June	Tiers 1 - 3	4.9%	1.18	0.66	1.80

Table 12. List of avian species (moderate to large-sized birds) observed during fixed-point surveys on the Altamont Project site.

Species/Group	Scientific Name
California gull	<i>Larus californicus</i>
double-crested cormorant	<i>Phalacrocorax auritus</i>
great blue heron	<i>Ardea herodias</i>
great egret	<i>Ardea alba</i>
ring-billed gull	<i>Larus delawarensis</i>
Canada goose	<i>Branta Canadensis</i>
common merganser	<i>Mergus merganser</i>
Mallard	<i>Anas platyrhynchos</i>
black-necked stilt	<i>Himantopus mexicanus</i>
Killdeer	<i>Charadrius vociferous</i>
American coot	<i>Fulica Americana</i>
American kestrel	<i>Falco sparverius</i>
burrowing owl	<i>Athene cunicularia</i>
Cooper's hawk	<i>Accipiter cooperii</i>
ferruginous hawk	<i>Buteo regalis</i>
golden eagle	<i>Aquila chrysaetos</i>
Merlin	<i>Falco columbarius</i>
northern harrier	<i>Circus cyaneus</i>
Osprey	<i>Pandion haliaetus</i>
prairie falcon	<i>Falco mexicanus</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
turkey vulture	<i>Cathartes aura</i>
white-tailed kite	<i>Elanus leucurus</i>
American crow	<i>Corvus brachyrhynchos</i>
common raven	<i>Corvus corax</i>
loggerhead shrike	<i>Lanius ludovicianus</i>
mourning dove	<i>Zenaida macroura</i>
rock pigeon	<i>Columba livia</i>
unidentified cormorant	
unidentified gull	
unidentified duck	
unidentified raptor	
unidentified bird	

Table 13. Medium to large-sized avian species observed while conducting fixed-point surveys (December 2005 - February 2006 and June - August, 2006) on the Project Site.

Species/Group	Winter		Summer		Overall	
	# obs.	# groups	# obs.	# groups	# obs.	# groups
Waterfowl/Waterbirds	8568	260	88	18	8656	278
California gull	15	1	0	0	15	1
double-crested cormorant	6	5	0	0	6	5
great blue heron	0	0	6	5	6	5
great egret	0	0	2	2	2	2
ring-billed gull	9	4	0	0	9	4
unidentified cormorant	1	1	0	0	1	1
unidentified gull	8510	243	20	9	8530	252
Canada goose	1	1	0	0	1	1
common merganser	6	1	0	0	6	1
mallard	11	3	60	2	71	5
unidentified duck	9	1	0	0	9	1
Shorebirds	0	0	7	6	7	6
black-necked stilt	0	0	3	2	3	2
killdeer	0	0	4	4	4	4
Coots						
American coot	0	0	6	1	6	1
Raptors	709	699	1122	1028	1831	1727
<i>Kites</i>						
white-tailed kite	1	1	0	0	1	1
<i>Accipiters</i>						
Cooper's hawk	1	1	0	0	1	1
<i>Buteos</i>	<i>475</i>	<i>472</i>	<i>375</i>	<i>370</i>	<i>850</i>	<i>842</i>
Swainson's hawk	0	0	4	4	4	4
ferruginous hawk	27	27	0	0	27	27
red-tailed hawk	448	445	371	366	819	811
<i>Northern Harriers</i>						
northern harrier	37	36	14	14	51	50
<i>Eagles</i>						
golden eagle	61	60	66	66	127	126
<i>Falcons</i>	<i>81</i>	<i>81</i>	<i>92</i>	<i>89</i>	<i>173</i>	<i>170</i>
American kestrel	56	56	77	74	133	130
merlin	1	1	0	0	1	1
prairie falcon	24	24	15	15	39	39
<i>Owls</i>						
burrowing owl	0	0	19	12	19	12
<i>Other Raptors</i>	<i>1</i>	<i>1</i>	<i>9</i>	<i>8</i>	<i>10</i>	<i>9</i>
Osprey	1	1	1	1	2	2
unidentified raptor	0	0	8	7	8	7

Table 13. Medium to large-sized avian species observed while conducting fixed-point surveys (December 2005 - February 2006 and June - August, 2006) on the Project Site.

Species/Group	Winter		Summer		Overall	
	# obs.	# groups	# obs.	# groups	# obs.	# groups
<i>Vultures</i>						
turkey vulture	52	47	547	469	599	516
Passerines	455	304	418	307	873	611
American crow	29	13	38	18	67	31
common raven	408	273	343	254	751	527
loggerhead shrike	18	18	37	35	55	53
Doves/Pigeons	168	47	160	58	328	105
mourning dove	10	5	11	10	21	15
rock pigeon	158	42	149	48	307	90
Unidentified Birds						
unidentified bird	2	2	0	0	2	2
Subtotal	9902	1312	1801	1418	11703	2730

Table 14. Mean use, mean # species/survey, total number of species, and total number of fixed-point surveys conducted by season and overall for the Project site.

Season	Mean Use^a	# Species/ Survey^b	# Species	# Surveys Conducted
Winter	66.670	3.403	22	152
Summer	6.621	2.482	21	272
Overall	32.356	2.877	29	424

^a # observations per 30-minute survey

^b mean number of bird species observed during each 30-minute survey

Table 15. Avian species observed within 800m of the observer and estimated mean use (#/30-minute survey) on the Project site.

Medium - Large Birds			
Winter		Summer	
Species/Group	Use	Species/Group	Use
unidentified gull	57.855	turkey vulture	2.011
red-tailed hawk	2.870	red-tailed hawk	1.364
common raven	2.518	common raven	1.261
turkey vulture	0.432	American kestrel	0.283
golden eagle	0.429	golden eagle	0.243
American kestrel	0.336	mallard	0.221
prairie falcon	0.229	American crow	0.140
northern harrier	0.222	unidentified gull	0.074
ferruginous hawk	0.152	burrowing owl	0.070
American crow	0.138	prairie falcon	0.055
Mallard	0.098	northern harrier	0.051
California gull	0.071	unidentified raptor	0.029
ring-billed gull	0.043	American coot	0.022
unidentified duck	0.043	great blue heron	0.022
common merganser	0.029	killdeer	0.015
double-crested cormorant	0.029	Swainson's hawk	0.015
Osprey	0.028	black-necked stilt	0.011
unidentified cormorant	0.028	great egret	0.007
Canada goose	0.005	osprey	0.004
Cooper's hawk	0.005		
Merlin	0.005		
white-tailed kite	0.005		

Table 16. Avian species observed within 800m of the observer and estimated frequency of occurrence (% of surveys species was observed) on the Project site.

<u>Medium-Large Birds</u>			
Winter		Summer	
Species/Group	% freq	Species/Group	% freq
red-tailed hawk	85.4	red-tailed hawk	63.2
common raven	65.2	turkey vulture	57.0
golden eagle	27.8	common raven	42.7
American kestrel	27.4	American kestrel	18.4
unidentified gull	25.9	golden eagle	16.9
turkey vulture	20.7	northern harrier	5.2
prairie falcon	19.2	prairie falcon	4.0
northern harrier	16.5	American crow	3.7
ferruginous hawk	11.3	unidentified gull	2.9
mallard	3.7	burrowing owl	2.2
American crow	2.9	unidentified raptor	2.2
osprey	2.8	great blue heron	1.8
unidentified cormorant	2.8	killdeer	1.5
double-crested cormorant	1.4	black-necked stilt	0.7
California gull	0.5	great egret	0.7
Canada goose	0.5	mallard	0.7
common merganser	0.5	Swainson's hawk	0.7
Cooper's hawk	0.5	American coot	0.4
merlin	0.5	Osprey	0.4
ring-billed gull	0.5		
unidentified duck	0.5		
white-tailed kite	0.5		

Table 17. Approximate size of target raptor species and other species used in the carcass removal trials. Values obtained from the Cornell Ornithological Lab web site (www.birds.cornell.edu).

Species	Length (cm)	Wingspan (cm)	Weight (g)
House sparrow	14-16	19-25	26-32
American kestrel	22-31	51-61	60-165
Burrowing owl	19-25	55	150
Rock pigeon	29-36	50-67	265-380
Red-tailed hawk	45-65	114-133	690-1460
Golden eagle	70-84	185-220	3000-6125
Mallard	50-65	82-95	1000-1300

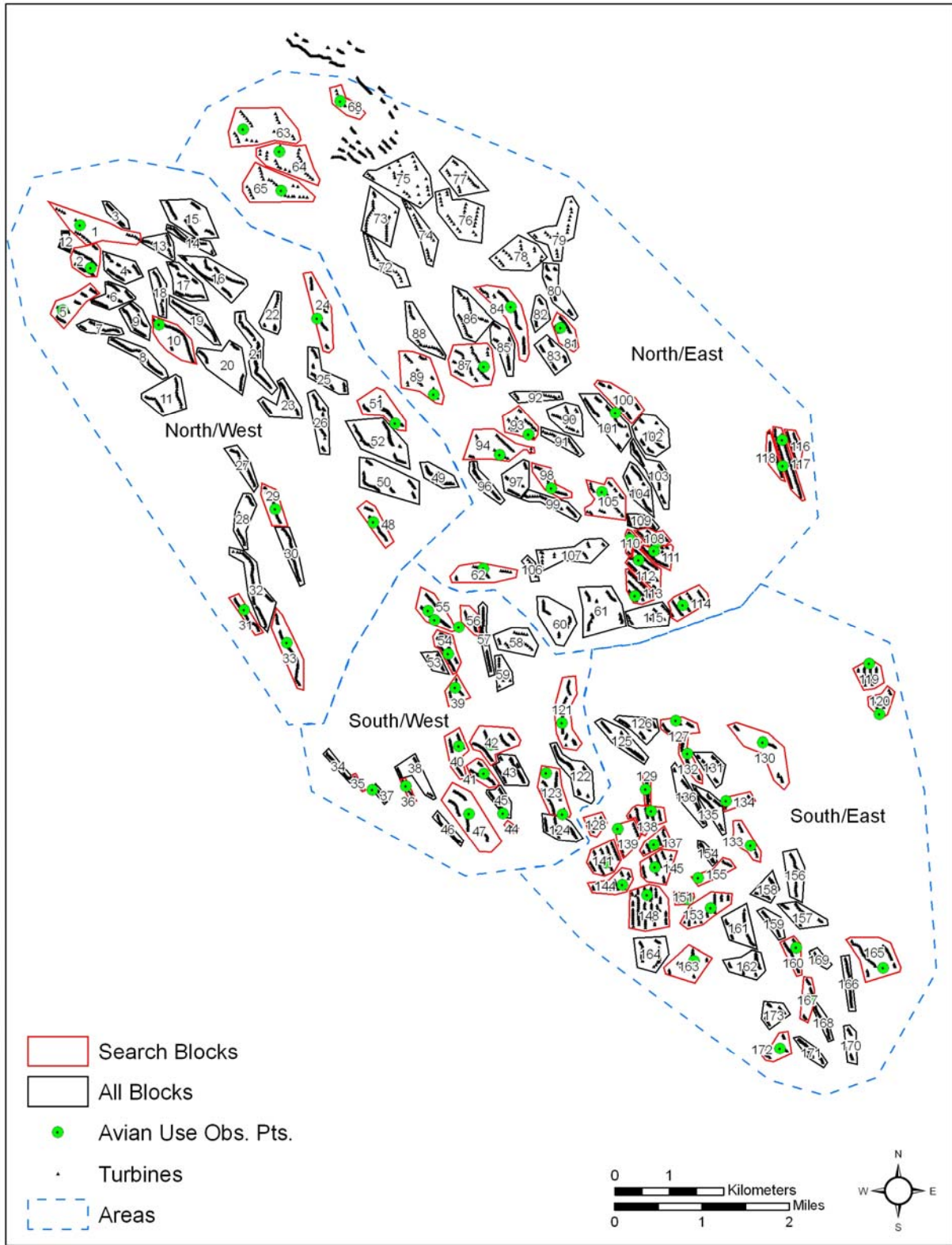


Figure 1. Sample universe of turbine blocks and those selected for carcass searches and avian use surveys.

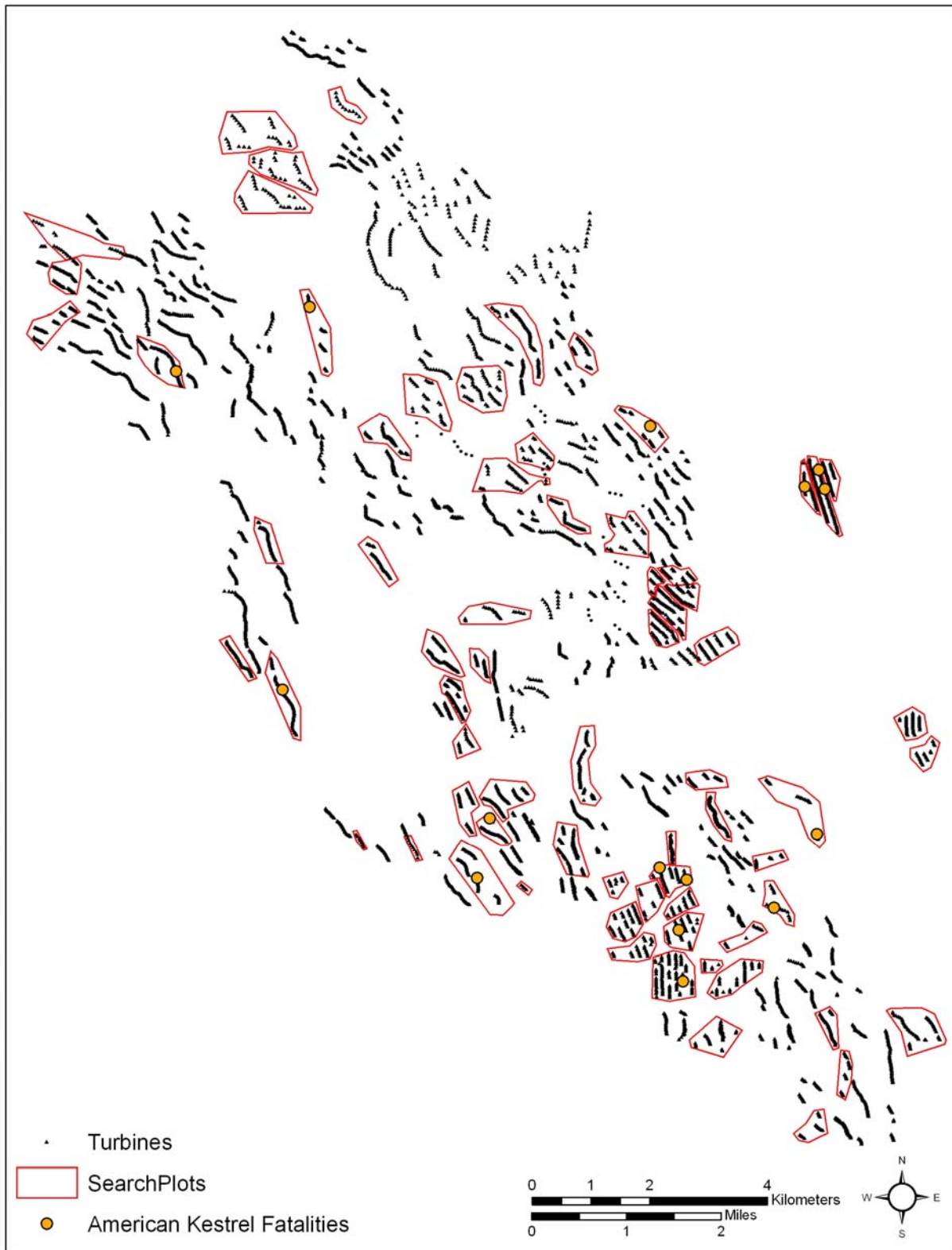


Figure 2. Location of American kestrel fatalities found on search plots.

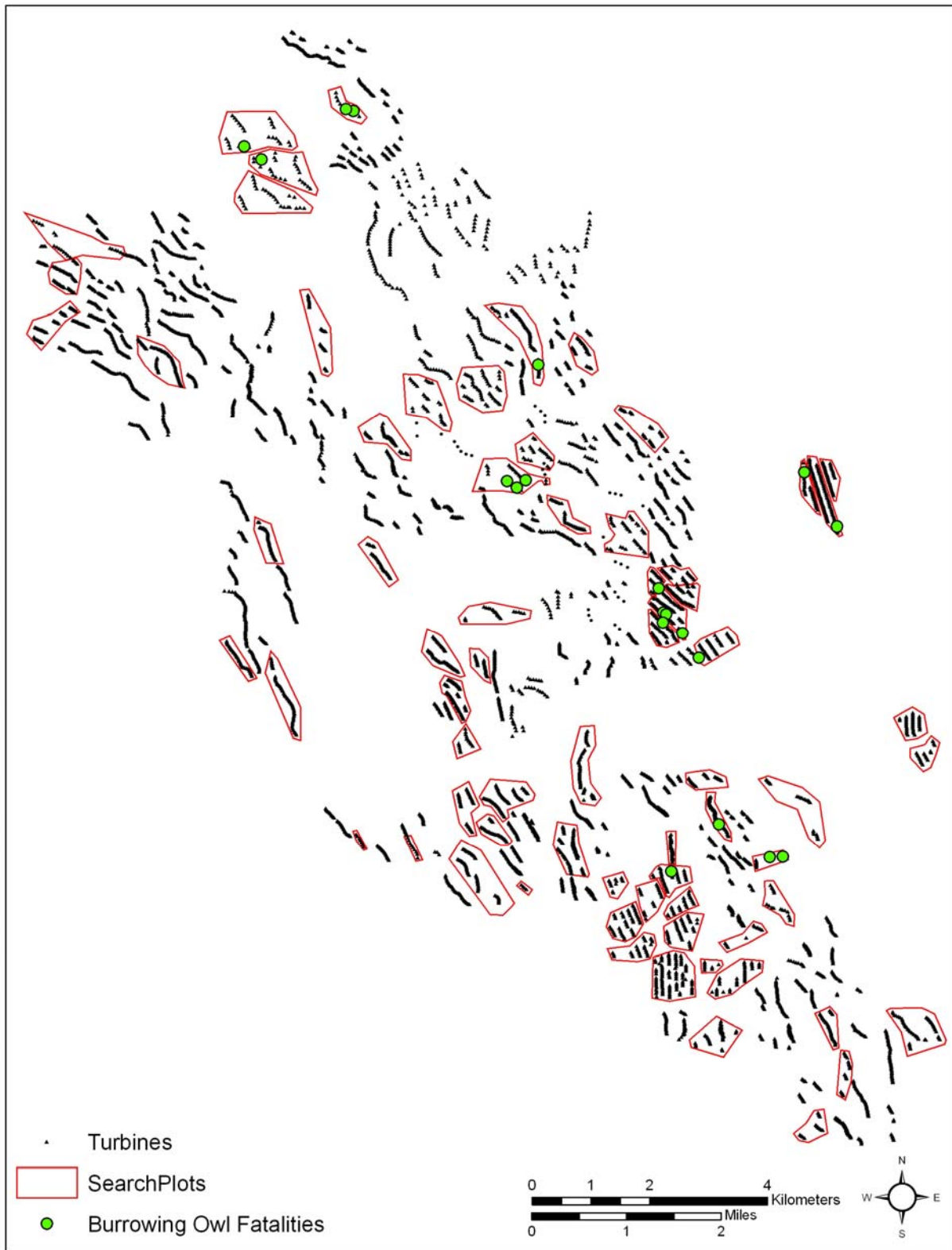


Figure 3. Location of burrowing owl fatalities found on search plots.

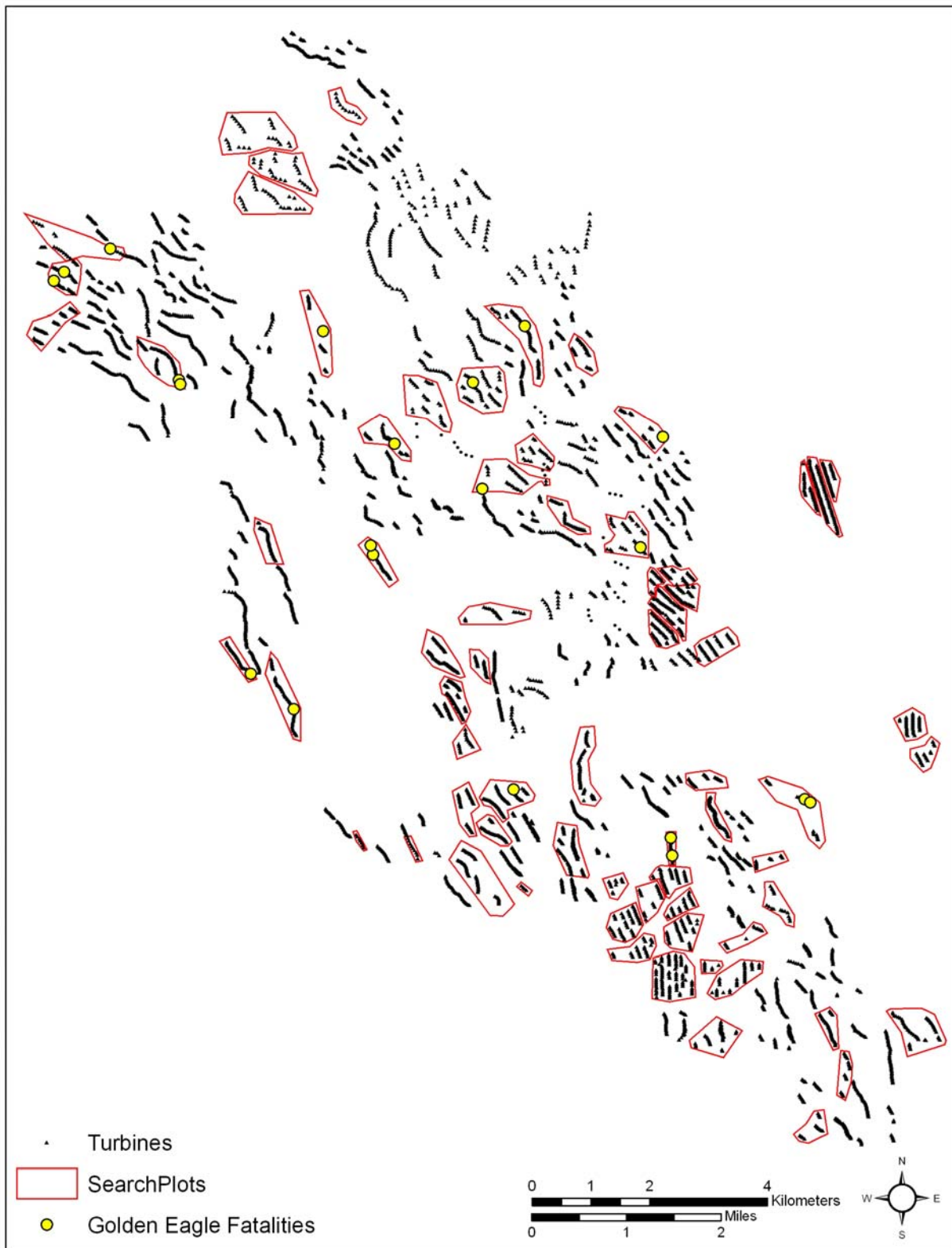


Figure 4. Location of golden eagle fatalities found on search plots.

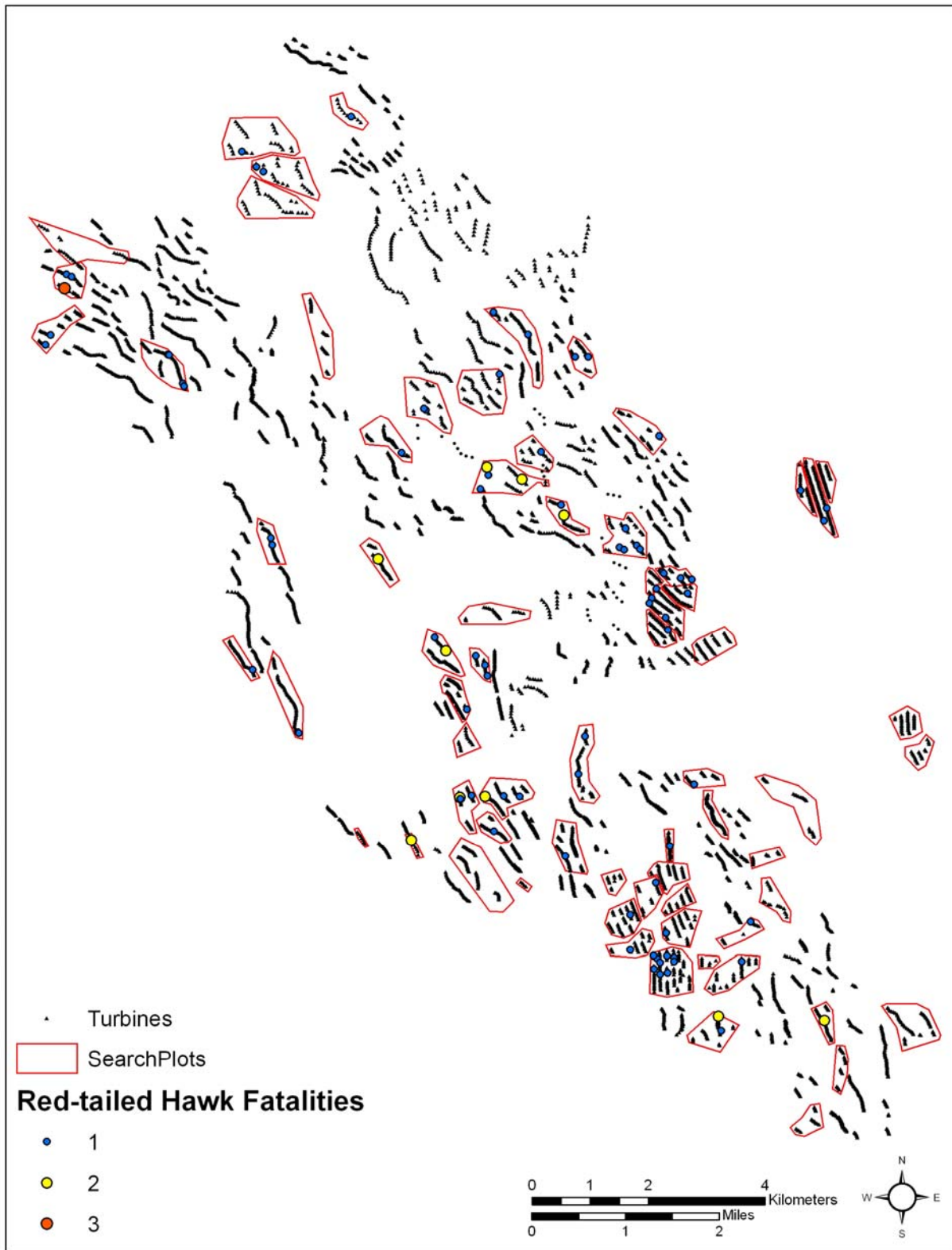


Figure 5. Location of red-tailed hawk owl fatalities found on search plots.

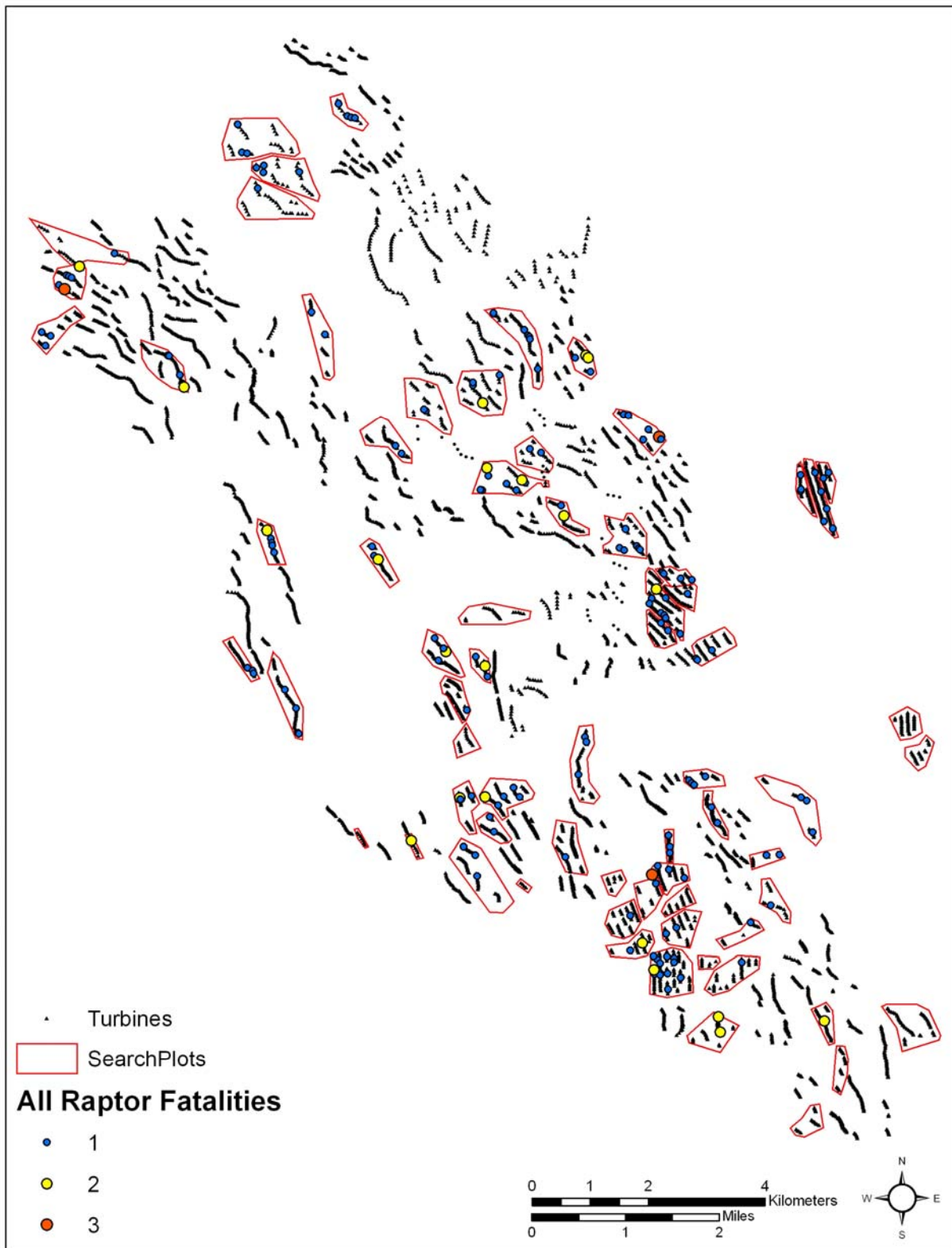


Figure 6. Location of all raptor fatalities found on search plots.

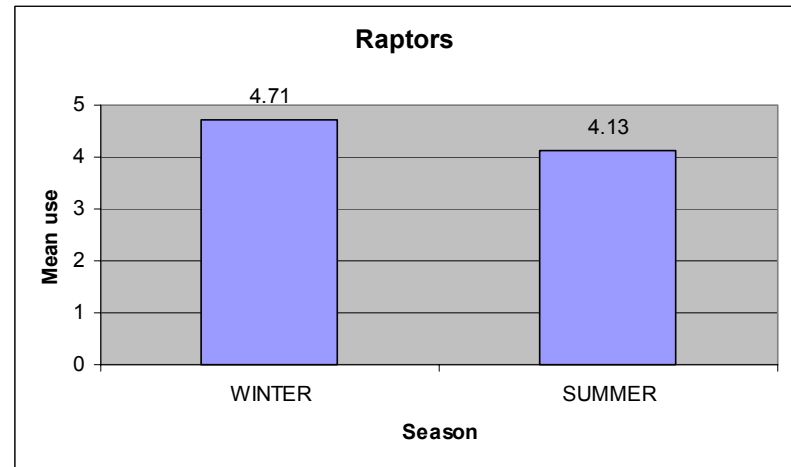
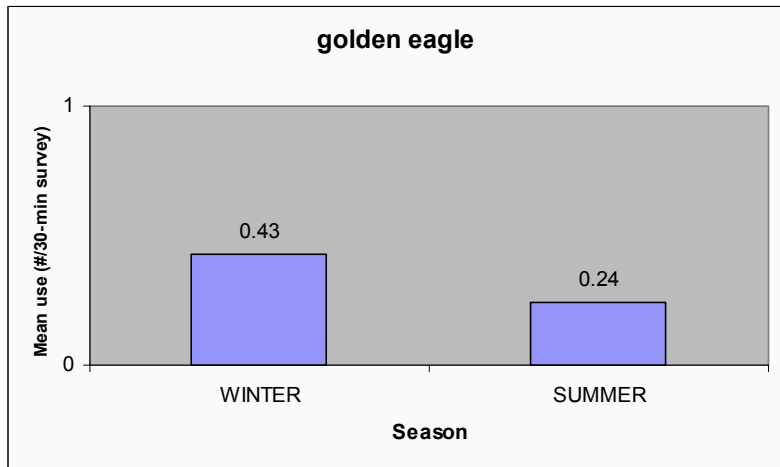
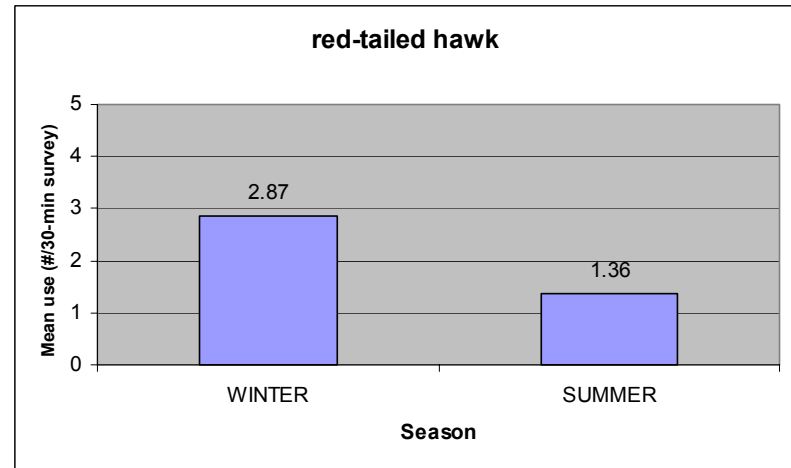
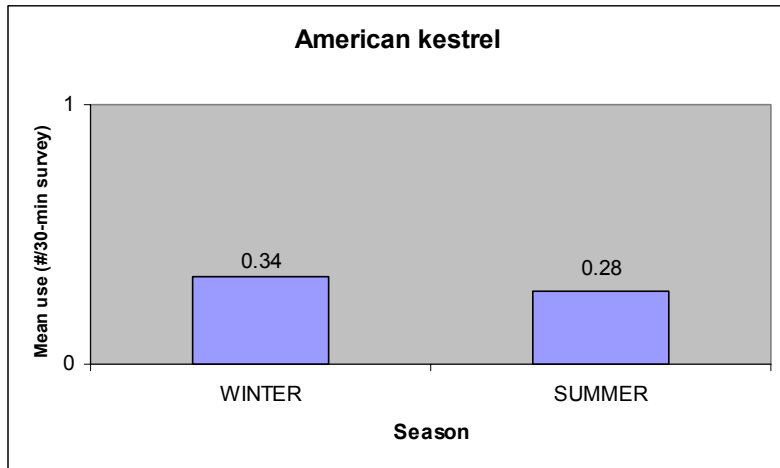


Figure 7. Estimates of the mean raptor use (#/30-minute survey) from the large viewshed surveys within the APWRA.

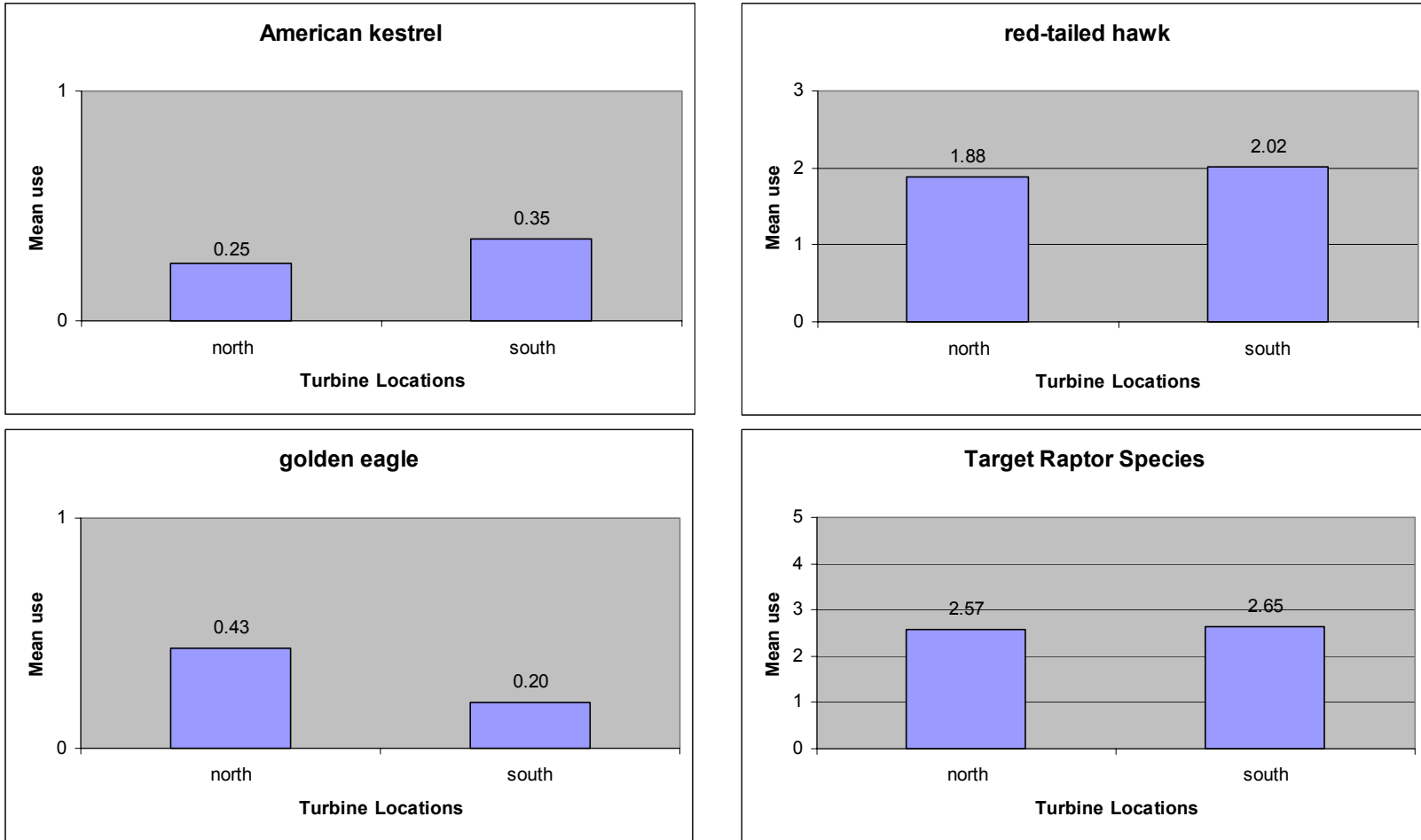


Figure 8. Estimates of the mean raptor use (#/30-minute survey) from the large viewshed surveys within the APWRA.

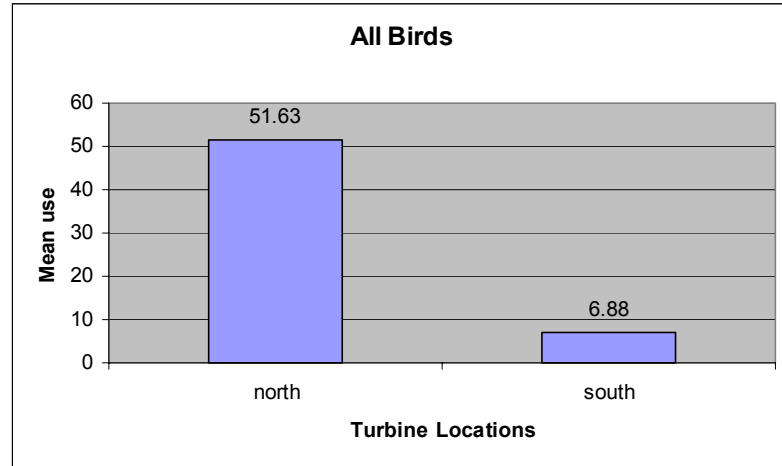
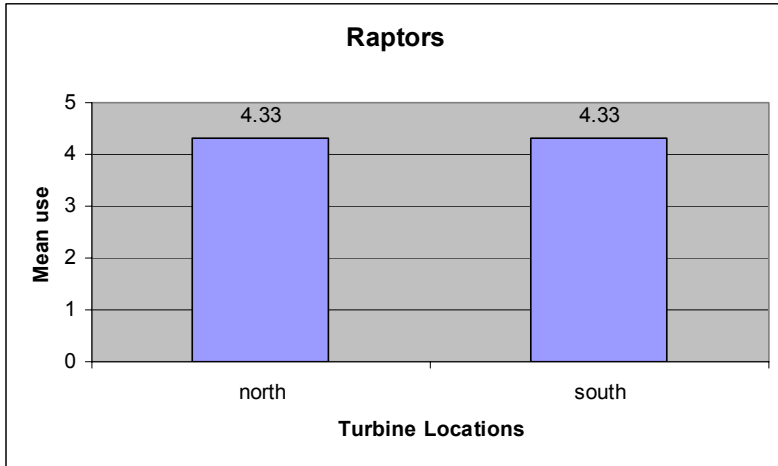


Figure 9. Estimates of the mean raptor use (#/30-minute survey) and all bird use from the large viewshed surveys within the APWRA.

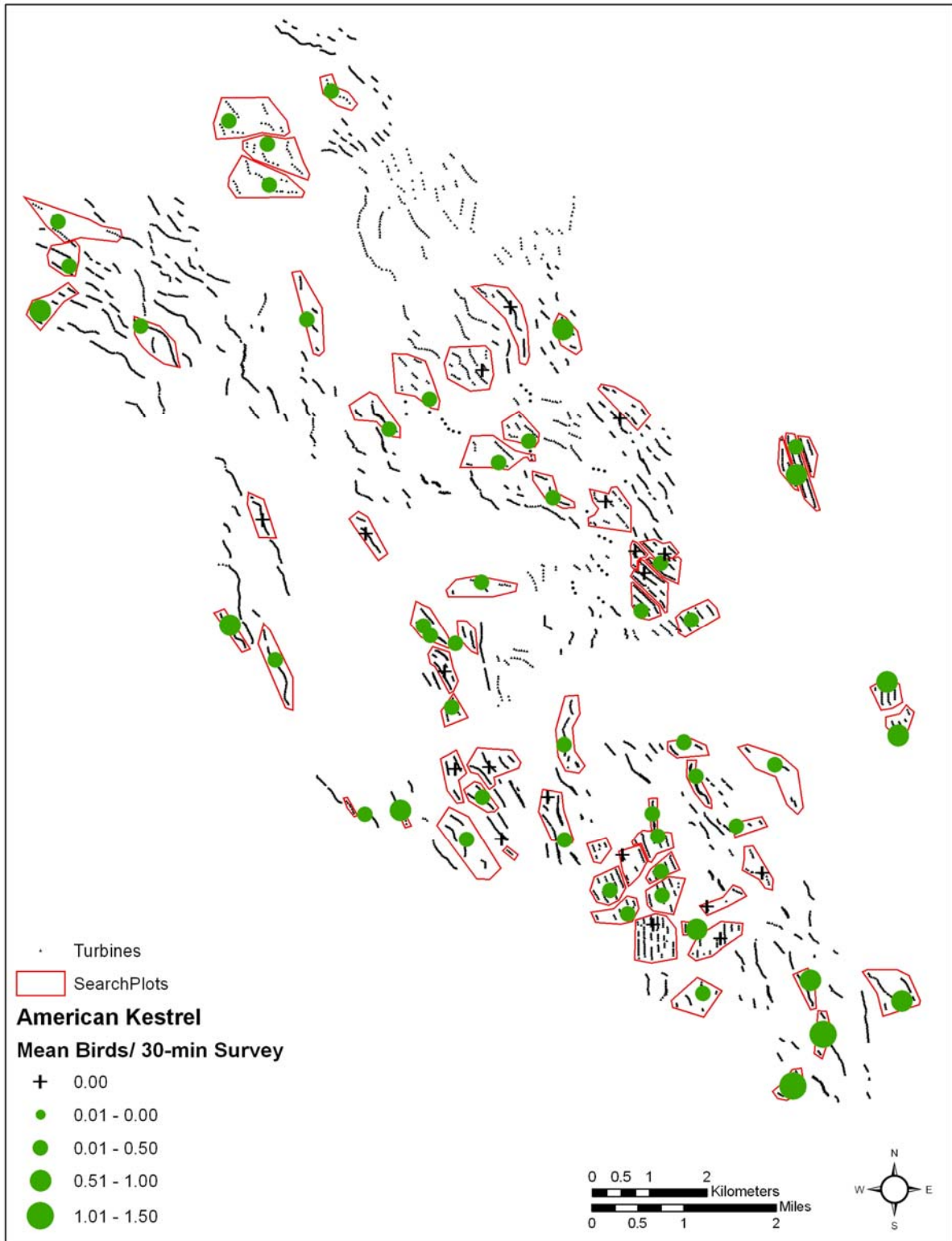


Figure 10. Estimates of American kestrel use by station.

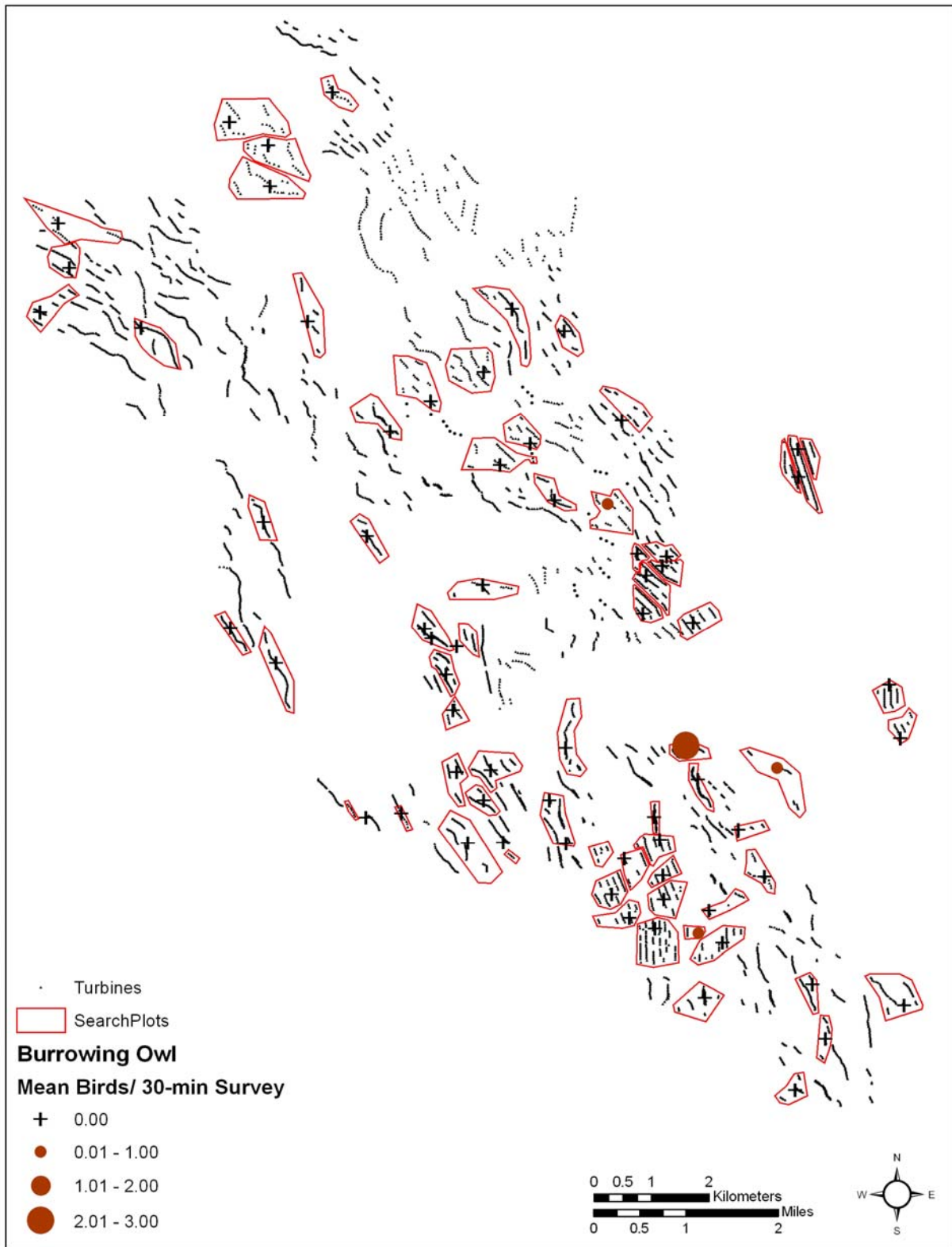


Figure 11. Estimates of burrowing owl use by station.

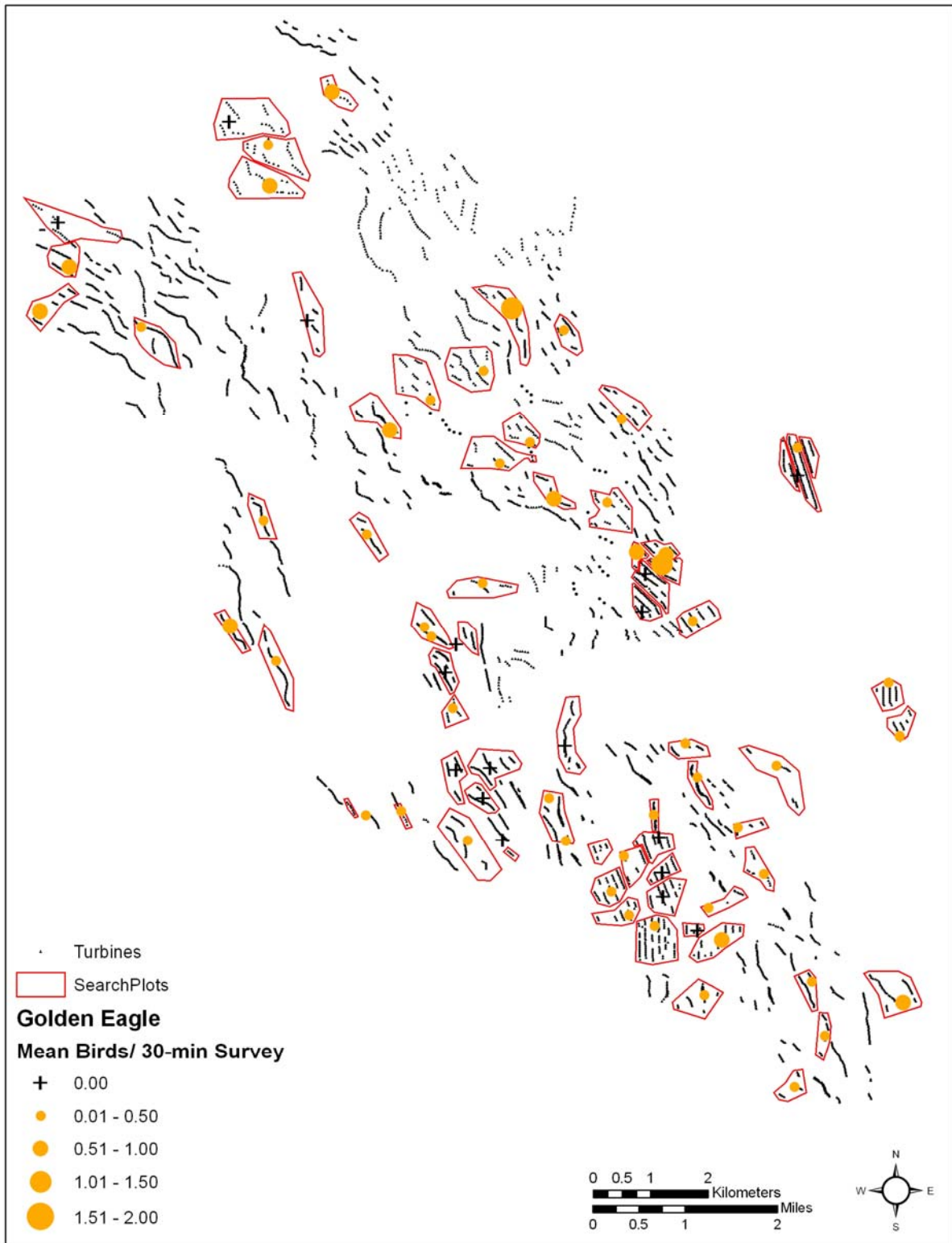


Figure 12. Estimates of golden eagle use by station.

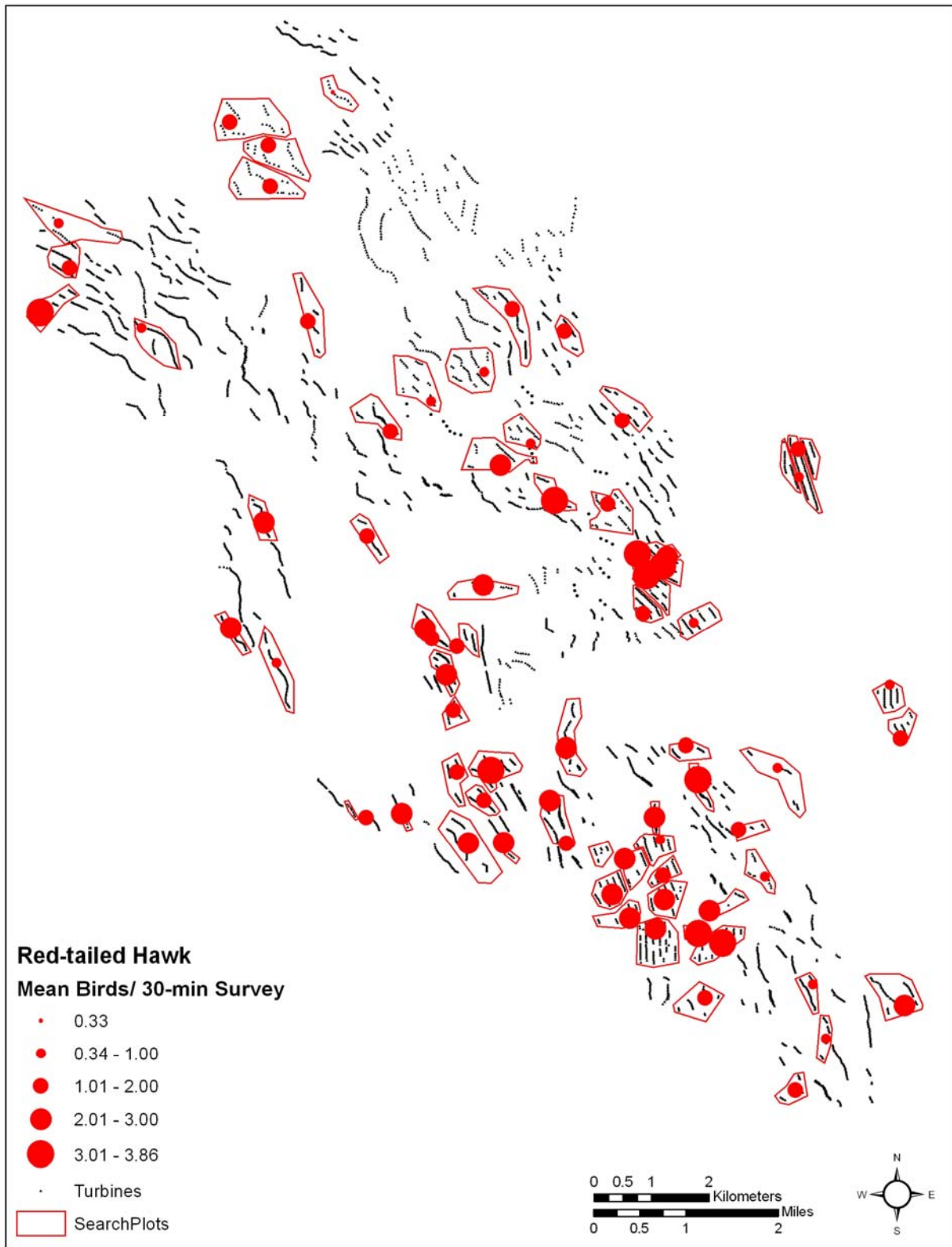


Figure 13. Estimates of red-tailed hawk use by station.

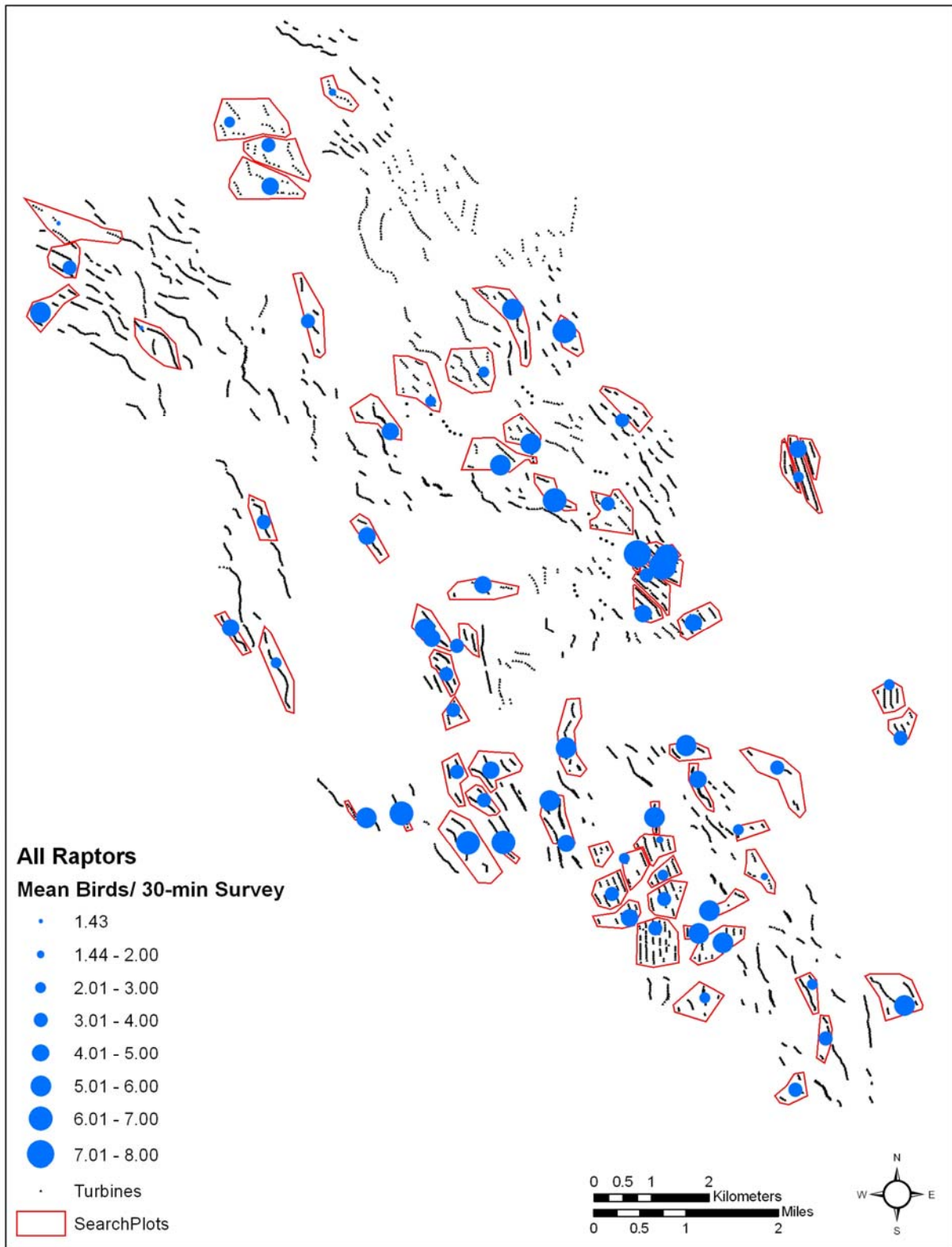


Figure 14. Estimates of all raptor use by station.

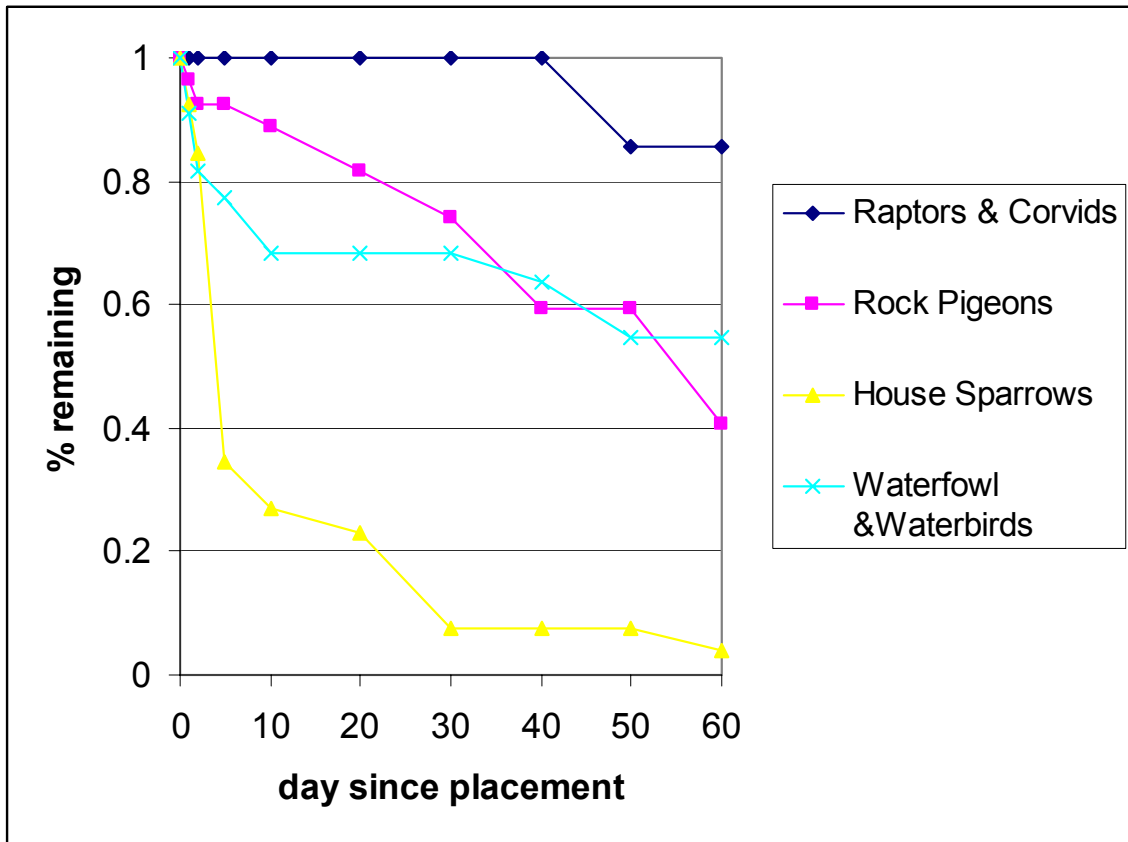


Figure 15. Estimated percentage of carcasses remaining as a function of day since the carcass removal trial began.

Appendix A. Information regarding turbine count, size, location, and searches for each plot in our sample.

Search history by string									
PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
1	274	4	0	400	North/West	2-Nov-05	4-Oct-06	48.0	7
1	275	2	0	400	North/West	2-Nov-05	4-Oct-06	48.0	7
1	277	8	0	400	North/West	2-Nov-05	4-Oct-06	48.0	7
1	282	6	1	400	North/West	2-Nov-05	4-Oct-06	48.0	7
2	278	4	1	100	North/West	2-Nov-05	4-Oct-06	48.0	7
2	279	20	4	100	North/West	2-Nov-05	4-Oct-06	48.0	7
2	501	10	1	100	North/West	2-Nov-05	4-Oct-06	48.0	7
2	502	6	1	100	North/West	2-Nov-05	4-Oct-06	48.0	7
5	283	8	0	100	North/West	16-Nov-05	4-Oct-06	53.7	7
5	284	10	1	100	North/West	16-Nov-05	4-Oct-06	53.7	7
5	505	6	1	100	North/West	16-Nov-05	5-Oct-06	53.8	7
5	506	5	1	100	North/West	16-Nov-05	5-Oct-06	53.8	7
5	507	5	1	100	North/West	16-Nov-05	5-Oct-06	53.8	7
10	515	10	1	100	North/West	2-Nov-05	5-Oct-06	48.1	7
10	517	38	9	100	North/West	2-Nov-05	5-Oct-06	48.1	7
24	317	8	1	100	North/West	2-Nov-05	5-Oct-06	48.1	7
24	324	5	2	100	North/West	25-Oct-05	9-Oct-06	49.9	7
24	325	7	0	100	North/West	25-Oct-05	16-Oct-06	50.9	7
24	326	3	2	100	North/West	25-Oct-05	16-Oct-06	50.9	7
29	334	2	1	100	North/West	25-Oct-05	5-Oct-06	49.3	7
29	335	29	1	100	North/West	25-Oct-05	5-Oct-06	49.3	7
31	342	32	3	100	North/West	25-Oct-05	9-Oct-06	49.9	7
33	344	7	1	100	North/West	1-Dec-05	9-Oct-06	52.0	7
33	345	43	0	100	North/West	1-Dec-05	9-Oct-06	52.0	7
35	132	7	0	400	South/West	26-Oct-05	11-Oct-06	50.0	7
36	134	9	0	400	South/West	26-Oct-05	11-Oct-06	50.0	7
39	25	5	0	120	South/West	26-Oct-05	11-Oct-06	50.0	7
39	26	9	0	120	South/West	26-Oct-05	11-Oct-06	50.0	7
40	362	12	1	100	South/West	27-Oct-05	12-Oct-06	50.0	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
40	613	10	1	100	South/West	27-Oct-05	12-Oct-06	50.0	7
40	614	8	0	100	South/West	26-Oct-05	12-Oct-06	50.1	7
41	365	22	3	100	South/West	27-Oct-05	11-Oct-06	49.9	7
41	616	4	0	100	South/West	27-Oct-05	12-Oct-06	50.0	7
42	363	11	1	100	South/West	30-Nov-05	12-Oct-06	52.7	7
42	364	6	0	100	South/West	30-Nov-05	12-Oct-06	52.7	7
42	617	21	5	100	South/West	30-Nov-05	12-Oct-06	52.7	7
42	667	17	1	100	South/West	30-Nov-05	12-Oct-06	52.7	7
44	368	4	0	250	South/West	26-Oct-05	11-Oct-06	50.0	7
47	138	15	0	100	South/West	26-Oct-05	11-Oct-06	50.0	7
47	139	11	3	100	South/West	26-Oct-05	11-Oct-06	50.0	7
47	615	11	4	100	South/West	26-Oct-05	11-Oct-06	50.0	7
47	625	8	1	100	South/West	26-Oct-05	11-Oct-06	50.0	7
48	360	5	2	100	North/West	25-Oct-05	19-Oct-06	51.3	7
48	361	23	1	100	North/West	25-Oct-05	19-Oct-06	51.3	7
51	347	7	2	100	North/West	25-Oct-05	16-Oct-06	50.9	7
51	348	19	0	100	North/West	25-Oct-05	16-Oct-06	50.9	7
51	349	6	1	100	North/West	25-Oct-05	16-Oct-06	50.9	7
51	350	3	0	100	North/West	25-Oct-05	16-Oct-06	50.9	7
51	680	3	0	100	North/West	25-Oct-05	16-Oct-06	50.9	7
54	90	28	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
54	91	4	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
54	92	4	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
54	93	3	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
54	94	18	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
55	95	36	3	100	South/West	3-Nov-05	11-Oct-06	48.9	7
55	98	14	0	100	South/West	3-Nov-05	11-Oct-06	48.9	7
56	99	8	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
56	100	13	0	100	South/West	24-Oct-05	11-Oct-06	50.3	7
62	596	5	0	121	North/East	3-Nov-05	11-Oct-06	47.3	7
62	597	13	5	100	North/East	3-Nov-05	11-Oct-06	49.6	7
62	598	3	0	100	North/East	4-Nov-05	16-Oct-06	49.4	7
63	224	4	0	330	North/East	11-Nov-05	20-Sep-06	52.2	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
63	225	7	0	330	North/East	11-Nov-05	20-Sep-06	52.2	7
63	226	3	0	330	North/East	11-Nov-05	20-Sep-06	52.2	7
63	227	4	0	330	North/East	11-Nov-05	21-Sep-06	52.3	7
63	228	5	0	330	North/East	11-Nov-05	21-Sep-06	52.3	7
63	496	2	0	330	North/East	11-Nov-05	21-Sep-06	52.3	7
64	229	2	0	330	North/East	12-Nov-05	20-Sep-06	52.0	7
64	230	3	2	330	North/East	12-Nov-05	20-Sep-06	52.0	7
64	231	3	1	330	North/East	12-Nov-05	2-Oct-06	54.0	7
64	234	6	0	330	North/East	10-Nov-05	East Bay Study	53.8	5
64	235	5	2	330	North/East	12-Nov-05	East Bay Study	53.3	5
64	497	6	4	330	North/East	12-Nov-05	East Bay Study	53.3	5
65	232	5	0	330	North/East	10-Nov-05	East Bay Study	53.8	5
65	233	19	0	330	North/East	10-Nov-05	East Bay Study	53.8	5
68	213	10	1	330	North/East	11-Nov-05	26-Sep-06	53.2	7
81	250	6	0	100	North/East	11-Oct-05	19-Oct-06	53.3	7
81	251	15	1	100	North/East	11-Oct-05	19-Oct-06	53.3	7
81	253	4	0	100	North/East	11-Oct-05	18-Oct-06	53.1	7
84	75	6	0	150	North/East	4-Nov-05	19-Oct-06	49.9	7
84	566	33	0	100	North/East	12-Oct-05	19-Oct-06	53.1	7
84	567	2	0	100	North/East	12-Oct-05	19-Oct-06	53.1	7
84	570	13	3	100	North/East	12-Oct-05	19-Oct-06	53.1	7
87	63	15	0	120	North/East	6-Dec-05	26-Oct-06	54.0	7
87	64	2	0	120	North/East	5-Dec-05	26-Oct-06	54.2	7
87	65	5	0	120	North/East	5-Dec-05	26-Oct-06	54.2	7
87	66	8	0	120	North/East	5-Dec-05	6-Sep-06	55.0	7
87	67	3	0	120	North/East	6-Dec-05	6-Sep-06	54.8	7
87	68	3	0	120	North/East	6-Dec-05	7-Sep-06	55.0	7
87	73	8	0	150	North/East	6-Dec-05	7-Sep-06	55.0	7
87	74	2	0	150	North/East	6-Dec-05	6-Sep-06	54.8	7
89	82	4	0	120	North/East	18-Oct-05	26-Oct-06	53.3	7
89	83	6	0	120	North/East	18-Oct-05	26-Oct-06	53.3	7
89	84	2	0	120	North/East	18-Oct-05	26-Oct-06	53.3	7
89	85	4	0	120	North/East	18-Oct-05	26-Oct-06	53.3	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
89	86	4	0	120	North/East	18-Oct-05	26-Oct-06	53.3	7
89	87	2	0	120	North/East	18-Oct-05	19-Oct-06	52.3	7
93	50	2	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
93	51	8	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
93	52	4	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
93	53	2	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
93	54	4	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
93	55	2	0	120	North/East	18-Oct-05	15-Aug-06	50.2	7
94	69	12	0	150	North/East	18-Oct-05	15-Aug-06	50.2	7
94	70	8	0	150	North/East	18-Oct-05	15-Aug-06	50.2	7
94	71	4	0	150	North/East	18-Oct-05	6-Sep-06	53.8	7
94	72	3	0	150	North/East	18-Oct-05	6-Sep-06	53.8	7
98	267	8	0	100	North/East	25-Oct-05	15-Aug-06	49.0	7
98	272	17	6	100	North/East	25-Oct-05	15-Aug-06	49.0	7
100	147	5	0	100	North/East	15-Nov-05	18-Oct-06	48.1	7
100	148	3	0	100	North/East	15-Nov-05	18-Oct-06	48.1	7
100	573	3	1	100	North/East	15-Nov-05	18-Oct-06	48.1	7
100	574	4	3	100	North/East	15-Nov-05	18-Oct-06	48.1	7
100	575	6	4	100	North/East	15-Nov-05	18-Oct-06	48.1	7
100	665	5	2	100	North/East	15-Nov-05	18-Oct-06	48.1	7
105	39	3	0	120	North/East	17-Oct-05	14-Aug-06	50.2	7
105	40	3	0	120	North/East	17-Oct-05	14-Aug-06	50.2	7
105	41	5	0	120	North/East	17-Oct-05	15-Aug-06	50.3	7
105	42	6	0	120	North/East	17-Oct-05	26-Oct-06	53.4	7
105	43	6	0	120	North/East	17-Oct-05	14-Aug-06	50.2	7
105	44	2	0	120	North/East	17-Oct-05	14-Aug-06	50.2	7
105	45	3	0	120	North/East	17-Oct-05	26-Oct-06	53.4	7
105	46	2	0	120	North/East	17-Oct-05	26-Oct-06	53.4	7
105	47	3	0	120	North/East	17-Oct-05	26-Oct-06	53.4	7
108	154	8	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7
108	155	3	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7
108	156	5	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7
108	157	6	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
108	158	1	0	65	North/East	12-Oct-05	16-Oct-06	52.7	7
110	152	4	0	65	North/East	10-Oct-05	18-Oct-06	53.3	7
110	153	9	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7
110	205	2	0	65	North/East	12-Oct-05	18-Oct-06	53.0	7
111	171	21	0	40	North/East	11-Oct-05	16-Oct-06	52.9	7
111	172	6	0	40	North/East	11-Oct-05	16-Oct-06	52.9	7
111	174	5	0	40	North/East	12-Oct-05	16-Oct-06	52.7	7
111	175	2	0	40	North/East	12-Oct-05	18-Oct-06	53.0	7
111	176	2	0	40	North/East	12-Oct-05	18-Oct-06	53.0	7
112	164	6	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
112	165	17	0	40	North/East	11-Oct-05	16-Oct-06	52.9	7
112	168	4	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
112	169	16	0	40	North/East	11-Oct-05	16-Oct-06	52.9	7
112	170	18	0	40	North/East	11-Oct-05	16-Oct-06	52.9	7
113	159	9	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
113	160	2	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
113	161	13	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
113	162	23	0	40	North/East	17-Oct-05	16-Oct-06	52.0	7
114	199	2	0	65	North/East	17-Oct-05	12-Oct-06	51.4	7
114	200	11	0	65	North/East	17-Oct-05	12-Oct-06	51.4	7
114	201	11	3	65	North/East	17-Oct-05	12-Oct-06	51.4	7
114	202	1	0	65	North/East	17-Oct-05	12-Oct-06	51.4	7
114	203	6	1	65	North/East	17-Oct-05	12-Oct-06	51.4	7
114	204	7	0	65	North/East	17-Oct-05	12-Oct-06	51.4	7
116	183	20	0	65	North/East	19-Oct-05	18-Oct-06	52.0	7
116	184	9	0	65	North/East	19-Oct-05	19-Oct-06	52.1	7
117	181	36	0	65	North/East	24-Oct-05	19-Oct-06	51.4	7
117	182	39	0	65	North/East	24-Oct-05	18-Oct-06	51.3	7
118	180	14	0	65	North/East	19-Oct-05	19-Oct-06	51.4	7
118	178	12	0	65	North/East	24-Oct-05	19-Oct-06	52.0	7
118	179	1	0	65	North/East	19-Oct-05	19-Oct-06	52.1	7
119	185	2	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7
119	186	11	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
119	187	13	0	65	South/East	24-Oct-05	19-Oct-06	51.3	7
119	188	8	0	65	South/East	24-Oct-05	19-Oct-06	51.3	7
120	189	8	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7
120	190	5	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7
120	191	2	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7
120	192	3	0	65	South/East	24-Oct-05	18-Oct-06	51.3	7
121	369	9	0	100	South/West	15-Nov-05	17-Oct-06	48.0	7
121	370	26	0	100	South/West	15-Nov-05	17-Oct-06	48.0	7
121	371	4	1	100	South/West	15-Nov-05	17-Oct-06	48.0	7
121	372	4	0	100	South/West	15-Nov-05	17-Oct-06	48.0	7
121	373	3	0	100	South/West	15-Nov-05	17-Oct-06	48.0	7
123	377	21	5	100	South/West	31-Oct-05	17-Oct-06	50.1	7
123	378	9	1	100	South/West	31-Oct-05	17-Oct-06	50.1	7
123	608	6	0	100	South/West	31-Oct-05	17-Oct-06	50.1	7
123	609	5	1	100	South/West	31-Oct-05	17-Oct-06	50.1	7
123	610	20	0	100	South/West	31-Oct-05	17-Oct-06	50.1	7
123	611	5	1	100	South/West	31-Oct-05	17-Oct-06	50.1	7
127	394	9	1	100	South/East	31-Oct-05	12-Oct-06	49.4	7
127	395	5	0	100	South/East	31-Oct-05	12-Oct-06	49.4	7
128	426	4	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
128	427	3	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
128	612	2	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
128	682	3	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
129	397	18	5	100	South/East	31-Oct-05	12-Oct-06	49.4	7
129	398	7	0	100	South/East	31-Oct-05	12-Oct-06	49.4	7
130	403	9	2	100	South/East	1-Nov-05	18-Oct-06	50.1	7
130	404	7	2	100	South/East	1-Nov-05	18-Oct-06	50.1	7
130	674	5	2	100	South/East	1-Nov-05	17-Oct-06	50.0	7
132	399	33	6	100	South/East	2-Dec-05	17-Oct-06	53.2	7
132	400	20	1	100	South/East	2-Dec-05	17-Oct-06	53.2	7
133	423	5	0	250	South/East	31-Oct-05	12-Oct-06	49.4	7
133	424	11	0	250	South/East	31-Oct-05	12-Oct-06	49.4	7
134	412	6	0	100	South/East	1-Nov-05	17-Oct-06	50.0	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
134	413	3	2	100	South/East	1-Nov-05	17-Oct-06	50.0	7
134	414	3	1	100	South/East	1-Nov-05	17-Oct-06	50.0	7
137	444	2	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
137	445	5	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
137	446	3	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
137	447	6	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
137	448	8	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
138	438	2	0	65	South/East	8-Nov-05	21-Sep-06	52.8	7
138	440	14	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
138	441	6	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
138	442	8	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
138	443	6	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
139	435	4	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
139	436	4	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
139	437	3	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
139	439	8	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
141	428	6	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
141	429	3	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
141	430	7	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
141	431	7	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
141	432	4	0	65	South/East	8-Nov-05	27-Sep-06	53.8	7
141	433	3	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
141	434	11	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
141	681	4	0	65	South/East	8-Nov-05	28-Sep-06	54.0	7
144	449	3	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
144	450	3	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
144	451	6	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
144	452	3	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
144	453	6	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
144	454	4	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
145	455	7	0	65	South/East	8-Nov-05	23-Oct-06	49.9	7
145	456	11	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
145	457	8	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
145	458	8	0	65	South/East	8-Nov-05	23-Oct-06	50.0	7
145	459	2	0	65	South/East	8-Nov-05	24-Oct-06	50.0	7
145	461	4	0	65	South/East	10-Nov-05	23-Oct-06	49.6	7
148	460	2	0	65	South/East	9-Nov-05	18-Sep-06	52.2	7
148	462	2	0	65	South/East	9-Nov-05	18-Sep-06	52.2	7
148	463	13	0	65	South/East	9-Nov-05	19-Sep-06	52.3	7
148	464	19	0	65	South/East	9-Nov-05	18-Sep-06	50-52.2	7
148	465	6	0	65	South/East	9-Nov-05	27-Sep-06	50.0	7
148	466	4	0	65	South/East	9-Nov-05	27-Sep-06	53.7	7
148	467	7	0	65	South/East	9-Nov-05	18-Sep-06	52.2	7
148	468	16	0	65	South/East	9-Nov-05	25-Oct-06	50-52.2	7
148	469	5	0	65	South/East	9-Nov-05	25-Oct-06	50.0	7
148	470	6	0	65	South/East	9-Nov-05	25-Oct-06	50-52.2	7
148	471	4	0	65	South/East	9-Nov-05	25-Oct-06	50.0	7
148	472	7	0	65	South/East	9-Nov-05	18-Sep-06	52.2	7
148	485	1	0	65	South/East	9-Nov-05	23-Oct-06	50.0	7
148	486	1	0	65	South/East	9-Nov-05	18-Sep-06	52.2	7
151	473	5	0	65	South/East	10-Nov-05	23-Oct-06	49.6	7
151	474	2	0	65	South/East	10-Nov-05	23-Oct-06	49.6	7
151	475	1	0	65	South/East	10-Nov-05	23-Oct-06	49.6	7
153	476	1	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	477	4	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	478	4	0	65	South/East	10-Nov-05	23-Oct-06	49.6	7
153	479	1	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	480	2	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	481	4	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	482	11	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	483	4	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
153	484	3	0	65	South/East	9-Nov-05	23-Oct-06	49.7	7
155	421	4	0	100	South/East	31-Oct-05	12-Oct-06	49.4	7
155	422	6	1	100	South/East	31-Oct-05	12-Oct-06	49.4	7
155	425	1	0	400	South/East	31-Oct-05	12-Oct-06	49.4	7
160	116	26	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7

Search history by string

PlotID	String ID	# turbines in String	# Non-Op	Size	AreaID	1st Search	Last Search	Avg. Days betw. Searches	# Searches
163	110	6	0	100	South/East	1-Nov-05	24-Oct-06	51.0	7
163	111	8	0	100	South/East	1-Nov-05	24-Oct-06	51.0	7
163	112	2	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
163	123	12	0	100	South/East	1-Nov-05	24-Oct-06	51.0	7
163	151	3	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
163	634	2	0	100	South/East	1-Nov-05	24-Oct-06	51.0	7
165	127	4	0	100	South/East	14-Nov-05	12-Sep-06	50.3	7
165	128, 130	22	4	100	South/East	14-Nov-05	23-Oct-06	49.0	5
165	670	2	0	100	South/East	14-Nov-05	23-Oct-06	49.0	7
165	671	12	0	100	South/East	14-Nov-05	23-Oct-06	49.0	7
165	672	3	0	100	South/East	14-Nov-05	23-Oct-06	49.0	7
167	119	4	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
167	652	5	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
167	653	5	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
167	654	4	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7
172	658	4	2	100	South/East	1-Nov-05	23-Oct-06	50.9	7
172	659	7	1	100	South/East	1-Nov-05	23-Oct-06	50.9	7
172	660	4	0	100	South/East	1-Nov-05	23-Oct-06	50.9	7

Appendix B. Carcass removal trial bird results.

Trial	Trial #	Species	When Placed	Turbine #	Fresh/Frozen Thawed	Estimated Removal time (d)
Oct-05	1	rock pigeon	10/4/2005	1133	Frozen	2
Oct-05	1	rock pigeon	10/4/2005	1122	Frozen	9
Oct-05	1	rock pigeon	10/4/2005	1106	Frozen	12
Oct-05	1	rock pigeon	10/4/2005	1071	Frozen	30
Oct-05	1	rock pigeon	10/4/2005	1087	Frozen	51
Oct-05	1	rock pigeon	10/4/2005	1097	Frozen	51
Oct-05	1	rock pigeon	10/4/2005	1086	Frozen	51
Oct-05	1	rock pigeon	10/4/2005	1075	Frozen	58
Oct-05	1	rock pigeon	10/4/2005	1092	Frozen	>62
Oct-05	1	rock pigeon	10/4/2005	1101	Frozen	>62
Oct-05	1	house sparrow	10/4/2005	1098	Frozen	1
Oct-05	1	house sparrow	10/4/2005	1091	Frozen	2
Oct-05	1	house sparrow	10/4/2005	1080	Frozen	3
Oct-05	1	house sparrow	10/4/2005	1130	Frozen	5
Oct-05	1	house sparrow	10/4/2005	1117	Frozen	5
Oct-05	1	house sparrow	10/4/2005	1094	Frozen	5
Oct-05	1	house sparrow	10/4/2005	1072	Frozen	5
Oct-05	1	house sparrow	10/4/2005	1068	Frozen	5
Oct-05	1	house sparrow	10/4/2005	1108	Frozen	7
Oct-05	1	house sparrow	10/4/2005	1103	Frozen	51
Dec-05	2a	red-tailed hawk	6-Dec-05	1075	Fresh	>64
Jan-06	2b	red-tailed hawk	1/17/2006	1127	Thawed	45
Jan-06	2b	red-tailed hawk	1/17/2006	1089	Thawed	>62
Jan-06	2b	rock pigeon	1/17/2006	1094	Thawed	1
Jan-06	2b	rock pigeon	1/17/2006	1072	Thawed	24
Jan-06	2b	rock pigeon	1/17/2006	1080	Thawed	31
Jan-06	2b	rock pigeon	1/17/2006	1101	Thawed	31
Jan-06	2b	rock pigeon	1/17/2006	1130	Thawed	38
Jan-06	2b	rock pigeon	1/17/2006	1117	Thawed	52
Jan-06	2b	rock pigeon	1/17/2006	1068	Thawed	>62
Jan-06	2b	rock pigeon	1/17/2006	1086	Thawed	>62
Jan-06	2b	rock pigeon	1/17/2006	1091	Thawed	>62
Jan-06	2b	rock pigeon	1/17/2006	1106	Thawed	>62
Jan-06	2b	house sparrow	1/17/2006	1092	Thawed	2
Jan-06	2b	house sparrow	1/17/2006	1097	Thawed	3
Jan-06	2b	house sparrow	1/17/2006	1108	Thawed	3
Jan-06	2b	house sparrow	1/17/2006	1098	Thawed	5
Jan-06	2b	house sparrow	1/17/2006	1122	Thawed	5
Jan-06	2b	house sparrow	1/17/2006	1133	Thawed	5
Jan-06	2b	house sparrow	1/17/2006	1087	Thawed	11
Jan-06	2b	house sparrow	1/17/2006	1071	Thawed	24
Jan-06	2b	house sparrow	1/17/2006	1075	Thawed	24
Jan-06	2b	house sparrow	1/17/2006	1103	Thawed	24
Aug-06	3a	burrowing owl	24-Aug-06	1252	Thawed	>61

			When		Fresh/Frozen	Estimated
Trial	Trial #	Species	Placed	Turbine #	Thawed	Removal time (d)
Aug-06	3a	common raven	24-Aug-06	1058	Thawed	>61
Aug-06	3a	common raven	24-Aug-06	WEG-15	Thawed	>61
Aug-06	3a	red-tailed hawk	24-Aug-06	VK-21	Thawed	>61
Aug-06	3a	rock pigeon	24-Aug-06	230	Thawed	19
Aug-06	3a	rock pigeon	24-Aug-06	V3-24	Thawed	37
Aug-06	3a	rock pigeon	24-Aug-06	898	Thawed	>61
Aug-06	3a	rock pigeon	24-Aug-06	V-82	Thawed	>61
Aug-06	3a	rock pigeon	24-Aug-06	J-2	Thawed	>61
Aug-06	3a	rock pigeon	24-Aug-06	6104	Thawed	>61
Aug-06	3a	rock pigeon	24-Aug-06	4745	Thawed	>61
Aug-06	3a	house sparrow	24-Aug-06	4264	Thawed	1
Aug-06	3a	house sparrow	24-Aug-06	3072	Thawed	4
Aug-06	3a	house sparrow	24-Aug-06	PO-28	Thawed	4
Aug-06	3a	house sparrow	24-Aug-06	1334	Thawed	7
Aug-06	3a	house sparrow	24-Aug-06	WEG-18	Thawed	19
Aug-06	3a	house sparrow	24-Aug-06	6351	Thawed	>61
Aug-06	3b	mallard	29-Aug-06	GF-1	Fresh	0
Aug-06	3b	muscovy duck	29-Aug-06	2527	Fresh	2
Aug-06	3b	muscovy duck	29-Aug-06	329	Fresh	4
Aug-06	3b	mallard	29-Aug-06	217	Fresh	8
Aug-06	3b	muscovy duck	29-Aug-06	210	Fresh	8
Aug-06	3b	mallard	29-Aug-06	5017	Fresh	39
Aug-06	3b	mallard	29-Aug-06	5192	Fresh	46
Aug-06	3b	muscovy duck	29-Aug-06	2950	Fresh	46
Aug-06	3b	mallard	29-Aug-06	CD-9	Fresh	>63
Aug-06	3b	mallard	29-Aug-06	A-3006	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	1411	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	1547	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	116	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	291	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	S-3010	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	4013	Fresh	>63
Aug-06	3b	muscovy duck	29-Aug-06	4543	Fresh	>63
Aug-06	3c	ring-necked pheasant	6-Sep-06	WTG-27	Frozen	1
Aug-06	3c	ring-necked pheasant	6-Sep-06	WTG-21	Frozen	2
Aug-06	3c	ring-necked pheasant	6-Sep-06	WTG-03	Frozen	>62
Aug-06	3c	ring-necked pheasant	6-Sep-06	WTG-09	Frozen	>62
Aug-06	3c	ring-necked pheasant	6-Sep-06	WTG-15	Frozen	>62