

2005-2006 Avian Survey

Tule Wind Resource Area
San Diego County, California



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PPM Energy, Inc.

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TETRA TECH EC, INC.

EXECUTIVE SUMMARY

Tetra Tech, EC, Inc. (TtEC) was contracted by PPM Energy, Inc. (PPM) to undertake avian use surveys for the proposed Tule Wind Resource Area (WRA) in San Diego County, California. The studies were conducted to identify potential avian impacts associated with building and/or operating the wind conversion facility. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures. Surveys were performed at the Tule WRA from March 25, 2005 to March 10, 2006. Fixed point count surveys (800-meter radius) were conducted at 14 points distributed throughout the Tule WRA.

A total of 3,500 birds of 51 identified and 11 species not able to be identified (from 9 species groups) were recorded during 300 fixed-point count surveys. Overall mean bird use within the Tule WRA was 11.67 birds/30 min, ranging from 0 to 49 birds per 30-minute point count. Comparing annual bird use rates for existing wind energy facilities throughout the country, the Tule WRA ranked second out of 3 for raptor use, and third out of 3 for non-raptor use, and varied in ranking when compared to seasonal mean use estimates.

Songbirds had the highest mean use out of all species groups observed (6.54 birds/30 min). The western scrub-jay (1.87 birds/30 min), common raven (1.41 birds/30 min), and bushtit (1.06 birds/30 min) were the most commonly observed species. Common ravens had the highest encounter rates in the spring, fall, and winter as they often flew within the rotor swept area (RSA); however, common ravens are widespread species and have relatively stable populations (Sauer et al. 2007). White-throated swifts had the highest encounter rates during the summer as they also flew primarily within the RSA. The stability of white-throated swift populations is relatively unknown, but the range is thought to be expanding in California, although a long-term decrease has been noted at Palos Verdes, CA. Local mortality is not expected to have population level consequences for most species observed.

Red-tailed hawks and turkey vultures, the major contributors to overall raptor use (0.58 birds/30 min), had mean use rates of 0.29 and 0.21 birds/30 min, respectively. These species had the highest encounter rates of all raptors because they often flew within the RSA. However, compared to other wind energy facilities, encounter rates and raptor use were not especially high.

Non-raptors were most abundant in the summer, and decreased from fall, to spring, to winter. Raptors were most abundant in the spring, and decreased from summer, to spring, to winter. Use by both raptors and non-raptors was relatively consistent across all point count locations in the Tule WRA.

Two turbine types with differing heights were compared: 3 MW turbines, with a rotor-swept area (RSA) of 60 to 150 m above ground, and 1.5 MW turbines with a RSA of 41.5 to 118.5 m above ground. Birds had higher encounter rates when analyzed with the 1.5 MW turbines due to the fact that they more often flew within the RSA. Forty-eight percent of raptors flew within the 3 MW turbine RSA versus 67 percent within the 1.5 MW RSA. Nineteen percent of non-

raptors flew within the 3 MW turbine RSA, compared to 26 percent within the 1.5 MW turbine RSA.

Listed and Sensitive Species

Nesting Cooper's hawk, sharp-shinned hawk, northern harrier, loggerhead shrike, and yellow warbler are all listed as State Species of Special Concern in California by the California Department of Fish and Game. Only the Cooper's hawk and yellow warbler (1 individual of each species seen incidentally) were observed during summer surveys, which could indicate nesting individuals. This wind energy facility would not likely cause negative impacts on these species while breeding.

Recommendations

The greatest potential impact of the Tule WRA on avian species is direct mortality or injury from collisions with turbines and associated overhead transmission lines and loss of habitat. TtEC recommends the following standard best management practices:

- Minimize the use of power lines; if necessary, outfit the power poles with bird perch guards.
- Minimize the use of lights on turbines in accordance with state, local, and federal requirements.
- Map and flag any raptor nests and place turbines as far from nests as practicable and out of the direct line of sight. Avoid removal of trees. Construction and operation of turbines may need to be scheduled for least impact to the nests.
- Minimize impacts to native vegetation.
- Develop a management plan to prevent spread of noxious weeds.

Additionally, we recommend conducting raptor nest surveys to understand and minimize potential impacts to avian species. We also recommend conducting post-construction mortality monitoring.

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1.0 INTRODUCTION

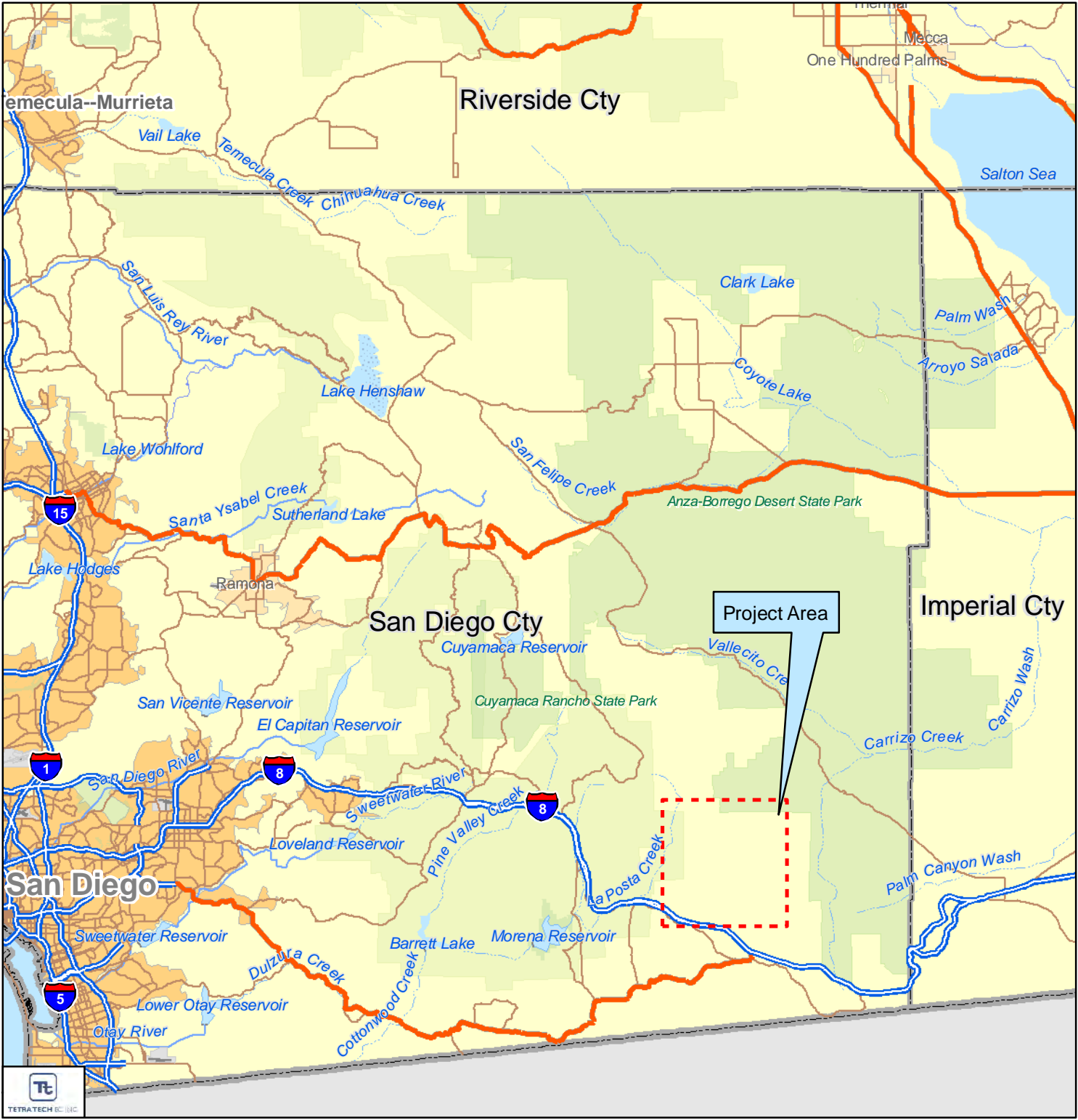
PPM Energy, Inc. (PPM) is planning to develop a wind energy conversion facility in San Diego County, California. The Tule Wind Resource Area (WRA) is located on private land in southern California, northeast of the town of Boulevard (Figure 1). PPM is committed to environmental due diligence and has contracted Tetra Tech EC, Inc. (TtEC) to conduct avian surveys at the Tule WRA to quantify local avian use in the area and to identify potential avian impacts associated with building and/or operating the proposed facility.

The Tule WRA is approximately 7,000 acres and is located west of the Anza Borrego Desert State Park. The Tule WRA is located in the Sonoran Basin and Range ecoregion, and is characterized by chaparral habitats. The area contains the In-Ko-Pah Mountains, which have few dramatic peaks but are characterized by broad rolling upland areas strewn with numerous large granite rock formations. The mountains are oriented generally northwest to southeast, and rise gradually above the McCain Valley in the west and drop off into the Carrizo Canyon in the east. Some trees are present, and are generally associated with houses and campgrounds. The area is managed to provide for a variety of uses, including recreation, wildlife conservation, cattle grazing, and protection of archaeological resources (DesertUSA 2008).

Wind energy provides a clean, renewable energy source that is in high demand. As wind power has become more common, the need to address potential environmental impacts has increased. Birds have been identified as a group at risk because of collisions with wind turbines and power lines and displacement due to the presence of the associated structures (Erickson et al. 2005, Drewitt and Langston 2006). Specifically, raptors and migrant passerines (e.g., songbirds) were found more often in post-construction mortality monitoring compared to other groups of birds (Erickson et al. 2005, Drewitt and Langston 2006).

To evaluate avian risk at wind energy facilities, standardized protocols for pre-construction point counts have been established and were used here. Data collected from these counts can then be used to identify species or species groups of concern and may provide additional information for micro-siting to minimize impacts to birds. To facilitate identifying species at risk, results in this report are presented in terms of species groupings, and highlight federally listed species, state listed species, and species of concern.

California has 634 documented bird species and is situated within the Pacific Flyway, one of the main bird migratory routes (CBRC 2007, BNC 2004). The Pacific Flyway runs through the western portion of the United States and subsequently, the Tule WRA. Most birds that move along the Pacific Flyway travel from the western Arctic, including Alaska and the Aleutian Islands and the Rocky Mountain and Pacific coast regions of Canada, through the United States and Mexico, and south to where the Pacific Flyway becomes blended with other flyways in Central and South America (BNC 2004).



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TETRA TECH INC.

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January 29, 2008

Figure 1.
Tule Vicinity Map
San Diego County, California

Reference	Transportation
County Boundary	Limited Access
Water Bodies	Highway
Rivers/Streams	Major Road
Lakes/Reservoirs	



2.0 METHODS

2.1 Diurnal Fixed-point and Incidental Avian Use Surveys

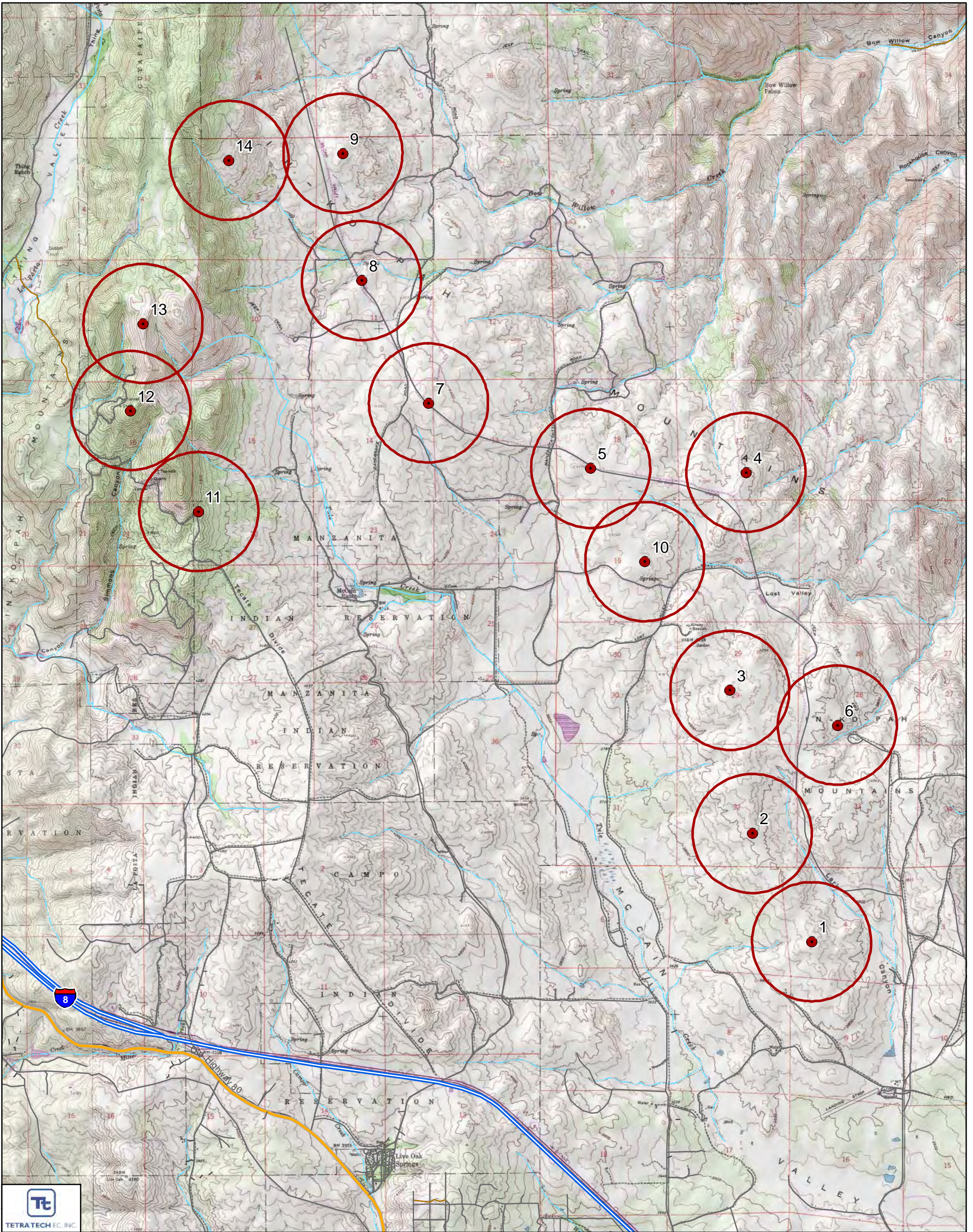
Fixed-point Surveys

Avian point count surveys were conducted to evaluate avian use, behavior, and species composition at the Tule WRA. Fixed-point surveys (described below) were conducted for 30 minutes at 14 circular plots (Figure 2). Locations of survey points were selected to cover a diversity of habitats, and to ensure the best possible viewshed. Surveys were conducted approximately every two weeks between March 25, 2005 and March 10, 2006 (Table 1).

Data were collected on all birds observed within an 800-meter radius circle centered on the point count location. Birds outside the 800-meter radius circle were recorded as incidentals (see below). Surveys at each point lasted for 30 minutes, during which time the observer continuously scanned for birds and recorded any visual or auditory observations. Point counts were conducted sequentially, by one observer. Counts were scheduled to cover all daylight hours. Data that were recorded and used in the analysis include species, number of individuals, time, height above ground, behavior, and flight direction. The order in which point count locations were surveyed differed among weeks to account for species variation during the day. Flight heights and distances from the observer were estimated by experienced field ornithologists, who had existing meteorological towers, local transmission lines, and topographic maps available for reference.

The survey protocol used in this study was designed to collect data on all bird species and to provide results that are comparable with other studies of avian use at wind farms (see discussion), rather than to target specific taxa. The benefit of using this method is that it estimates avian use throughout the day and captures activity by a variety of bird species. During the breeding season, songbirds are most active in the morning and can be difficult to detect during the afternoon. In contrast, raptors become active as the sunlight heats the air and creates thermals, which individuals use for soaring (Ballam 1984). Thus, raptors are more readily detected several hours after sunrise. Thus, the survey method used in this study is appropriate for the bird community using the Tule WRA.

Thirty-minute survey periods were selected because they provide adequate time to detect both raptors and non-raptors. However, time periods of 30 minutes may lead to double-counting of songbirds (i.e., counting the same individual more than once) because individuals may appear and disappear from view. For example, if a horned lark is detected perched on a fence then disappears from view, and 6 minutes later, a horned lark is seen flying, these birds are recorded as separate observations because it is not possible to distinguish individuals. Double-counting of birds is not problematic for this type of survey because the objective is to document use in terms of number of birds noted per 30-minute survey, not number of distinct individual birds.




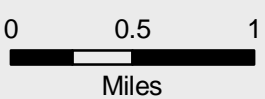












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Figure 2. Tule Avian Survey Points San Diego County, California

 Avian Survey Points	Transportation
 800m Buffer Avian Survey Points	 Freeway
Water Bodies	 Major Road
 Perennial Stream	 Local Road
 Intermittent Stream	 Minor Road
	 Ramp
	 Trail



Detectability varies among species and potentially not all individuals within the 800-meter survey were counted. This variation in detectability results in an overestimate of mean use in conspicuous species and an underestimate of mean use in reclusive species (Thompson 2002). Birds not easily identifiable, such as those seen under low light conditions, were identified to the lowest taxonomic level possible. Hence, unidentified birds are presented in the results.

Incidental Observations

Incidental observations were those recorded outside of the official 30-minute survey period and beyond 800 m from the point count sites. Incidental observations included observations that occurred 1) during travel between points, 2) before or after the official 30-minute survey period, and 3) outside the 800-meter radius circular plot. These observations were recorded on separate data sheets and were not used in the formal analysis; however, a summary of incidental birds is presented to provide additional information about species found in the local area.

Data Quality Assurance/Quality Control

QA/QC measures were implemented during all stages of data collection, analysis, and report preparation. To ensure legibility and completeness of data sheets, each observer reviewed, and clarified if needed, all data sheets before data entry into a Filemaker™ relational database for data storage and analysis. Prior to analysis, an independent reviewer conducted a 100 percent quality review of the data entries. Any questions that arose at this time were directed toward and answered by field personnel.

2.2 Analysis

Species Groupings

We considered two primary groups of interest: raptors and non-raptors. We defined raptors as vultures, hawks, eagles, falcons, and owls. Although vultures are more closely related to storks, their flight behavior is similar to raptors and they are often included as raptors in other studies; therefore, we have included them with raptors for the purpose of our analyses. Non-raptors were defined as all other species groups.

Avian Use of the Tule WRA

Avian use of the Tule WRA was derived by calculating the average number of birds observed per point count location. To evaluate the diversity and composition of avian species using the Tule WRA, the number of individuals and species were summarized. In addition, the number of observations is also presented, where an observation can be either an individual bird or a discrete flock of birds. This information helps evaluate if a high mean use is driven by a single event (e.g., flock of birds moving through the rotor swept area).

Flight Behavior

Flight behavior was evaluated by calculating the proportion of flying birds that were observed below, within, or above the turbine rotor swept area (RSA). Turbines proposed for this site are either 3 MW or 1.5 MW. Therefore, two RSAs were compared; the first between 60 and 150 meters (3 MW turbines), and the second between 41.5 and 118.5

meters (1.5 MW turbines) above ground. A bird was considered to have flown within the RSA if any of its recorded heights overlapped the RSA. That is, if a bird flew at heights that correspond to the RSA at any time during the survey, it was considered to have occurred within the RSA.

Encounter Rate

To estimate the rate at which a species fly though the anticipated RSA, the following equation was applied:

$$\text{Encounter Rate} = A * P_f * P_t$$

where A is the mean number of birds/30 min, P_f is the proportion of all activity observations of species i that were observed flying; and P_t is the proportion of species i that were observed flying within the turbine RSA. The encounter rate provides information on the rate at which a species moves through the RSA. This information is an important component in evaluating risk; however, this number alone does not indicate risk to a species.

3.0 RESULTS

3.1 Tule WRA

About 12 square miles of the Tule WRA were surveyed during point count surveys, covering 90 percent of the total area of the Tule WRA. The 14 point count locations were surveyed 22 times, with the exception of four point count locations that were only surveyed 20 times as they were added after the initiation of surveys, which resulted in 300 total 30-minute surveys.

3.2 Species Composition

A total of 3,500 birds of 51 identified species and 11 species not able to be identified, from 9 species groups, were recorded during 300 fixed-point count surveys. The most frequently observed birds were the western scrub-jay (16.0 percent of all birds observed), common raven (12.1 percent), bushtit (9.1 percent), California towhee (8.2 percent), house finch (7.3 percent), and California quail (5.9 percent; Table 2). Each remaining species comprised 4.5 percent or less of the total number of birds observed.

3.3 Avian Use

Overall mean bird use within the Tule WRA was 11.67 birds/30 min, ranging from zero to 49 birds per 30-minute point count. The non-raptors with the highest mean use were the western scrub-jay (1.87 birds/30 min), common raven (1.41 birds/30 min), and bushtit (1.06 birds/30 min). Mean use by non-raptors was moderate (11.09 birds/20 min). Among species groups, mean use was highest for songbirds (6.54 birds/30 min). The top species, bushtit (1.06 birds/30 min) accounted for 16.2 percent of individuals in this species group. Other songbirds commonly observed included California towhee (0.96 birds/30 min), house finch (0.86 birds/30 min), and spotted towhee (0.52 birds/30 min; Table 3).

Crows and allies had the second highest mean use (3.31 birds/30 min) and included western scrub-jay (1.87 birds/30 min), common raven (1.41 birds/30 min) and American crow (0.02 birds/30 min). Among the remaining species groups, gamebirds and raptors had the next highest mean use, 0.76 birds/30 min and 0.58 birds/30 min, respectively.

Raptors, because of their propensity to fly at heights similar to those encompassed by a turbine RSA, are a group of special interest. Overall mean use for raptors was 0.58 birds/30 min. The raptors with the highest use were the red-tailed hawk (0.29 birds/30 min) and the turkey vulture (0.21 birds/30 min). Species with lower use included unidentified raptors (0.03 birds/30 min), Cooper's hawk (0.03 birds/30 min), American kestrel (0.01 birds/30 min) and a single northern harrier.

3.4 Seasonal and Spatial Avian Use

Mean use of non-raptors was relatively consistent the spring, summer, and fall; but lowest in the winter (Figure 3). Mean use was highest on August 11, 2005, with a mean use of 22.79 birds/30 min. Dominant species observed during this survey, out of 303 non-raptors, included the western scrub-jay (64 birds), bushtit (50 birds) and California towhee (39 birds). The most common species had variable use throughout the year. Western scrub-jays were most common in the summer, fall, and winter; common ravens were most common in the spring and winter; and bushtits were most common in the summer and fall, but not observed during the spring surveys (Table 2). Non-raptors were relatively evenly distributed throughout the Tule WRA, although mean use at the 14 point count locations varied from 2.67 to 23.80 birds/30 min throughout the year of surveys (Figure 4). The highest mean use was observed at point count locations 5 and 9 during the summer with 22.0 birds/30 min at both points, which was dominated by bushtits and western scrub-jays (40 and 39 individuals, respectively, out of 220 total birds observed at both points; Figure 4).

Mean use of raptors was highest during the spring and summer (Figure 5). Mean use was highest on March 25, 2005 and April 7, 2005. Mean use during these two surveys was dominated by turkey vultures and red-tailed hawks (16 turkey vultures and 12 red-tailed hawks over two surveys, out of 33 total raptors observed). Mean use of the two most common raptor species, red-tailed hawk and turkey vulture, was variable throughout the year, with red-tailed hawks occurring most often in the winter, and turkey vultures occurring most often in the summer (Table 3). Raptors were relatively evenly distributed throughout the Tule WRA during the summer, fall, and winter, although mean use varied from 0 to 1.80 birds/30 min during these seasons. Mean use was highest at point 11 during spring surveys (5.0 birds/30 min, 5 total turkey vultures observed). However, this point count location was only surveyed on a single occasion; thus, the mean use estimate may not be representative of the entire season (Figure 6).

Figure 3: Mean non-raptor use by survey date (2005-2006)

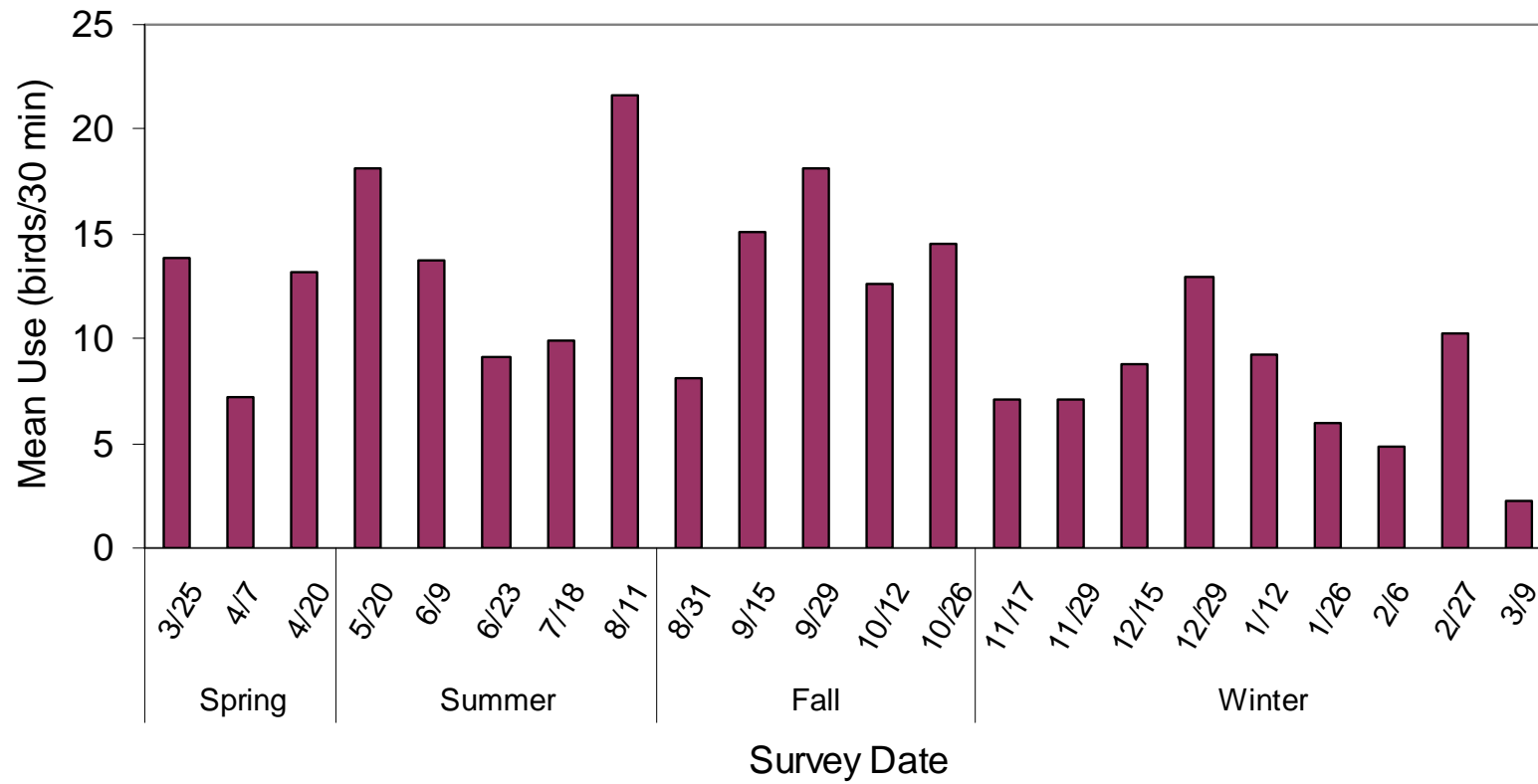


Figure 4. Mean non-raptor use by point count location (2005-2006)

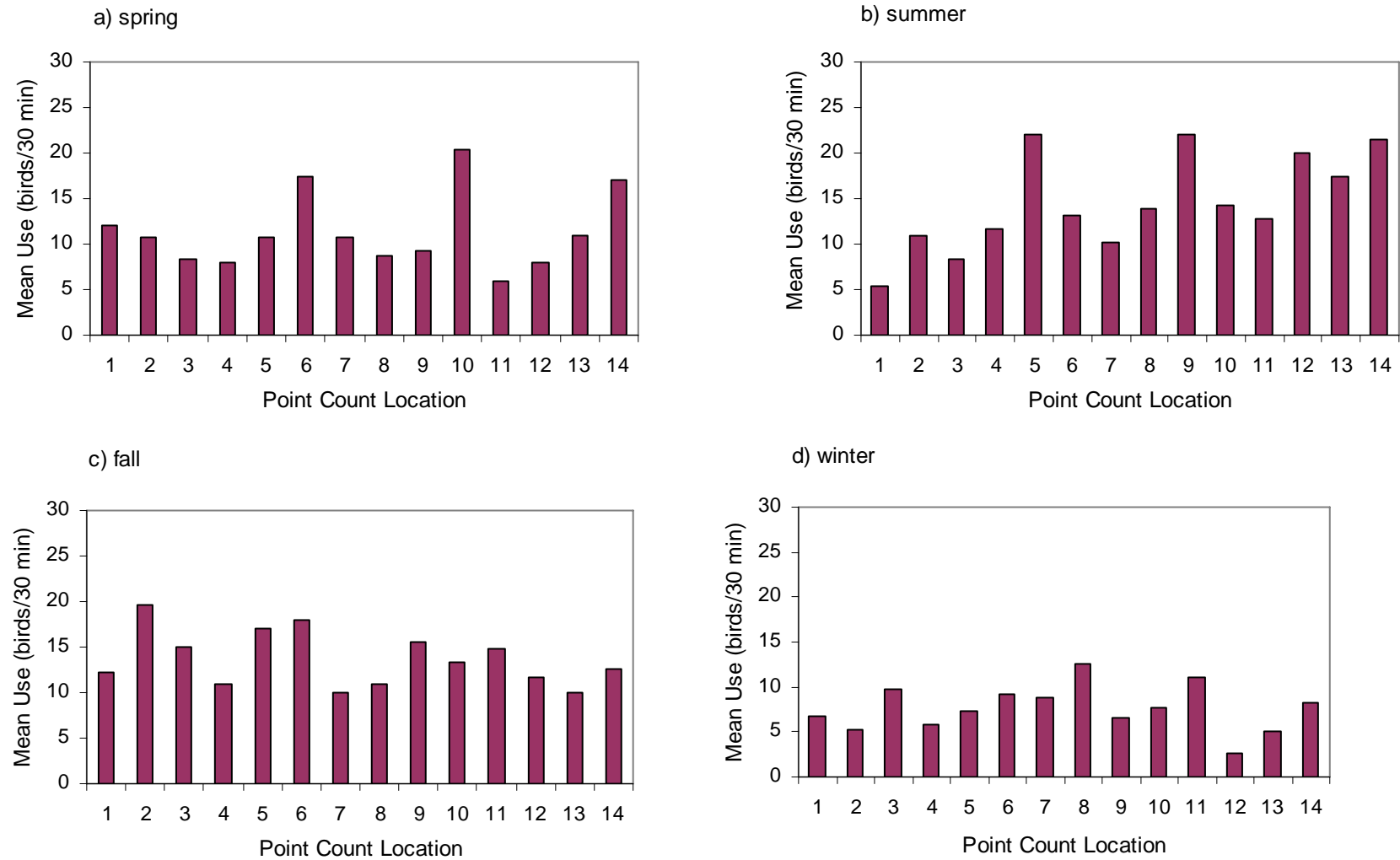


Figure 5: Mean raptor use by survey date (2005-2006)

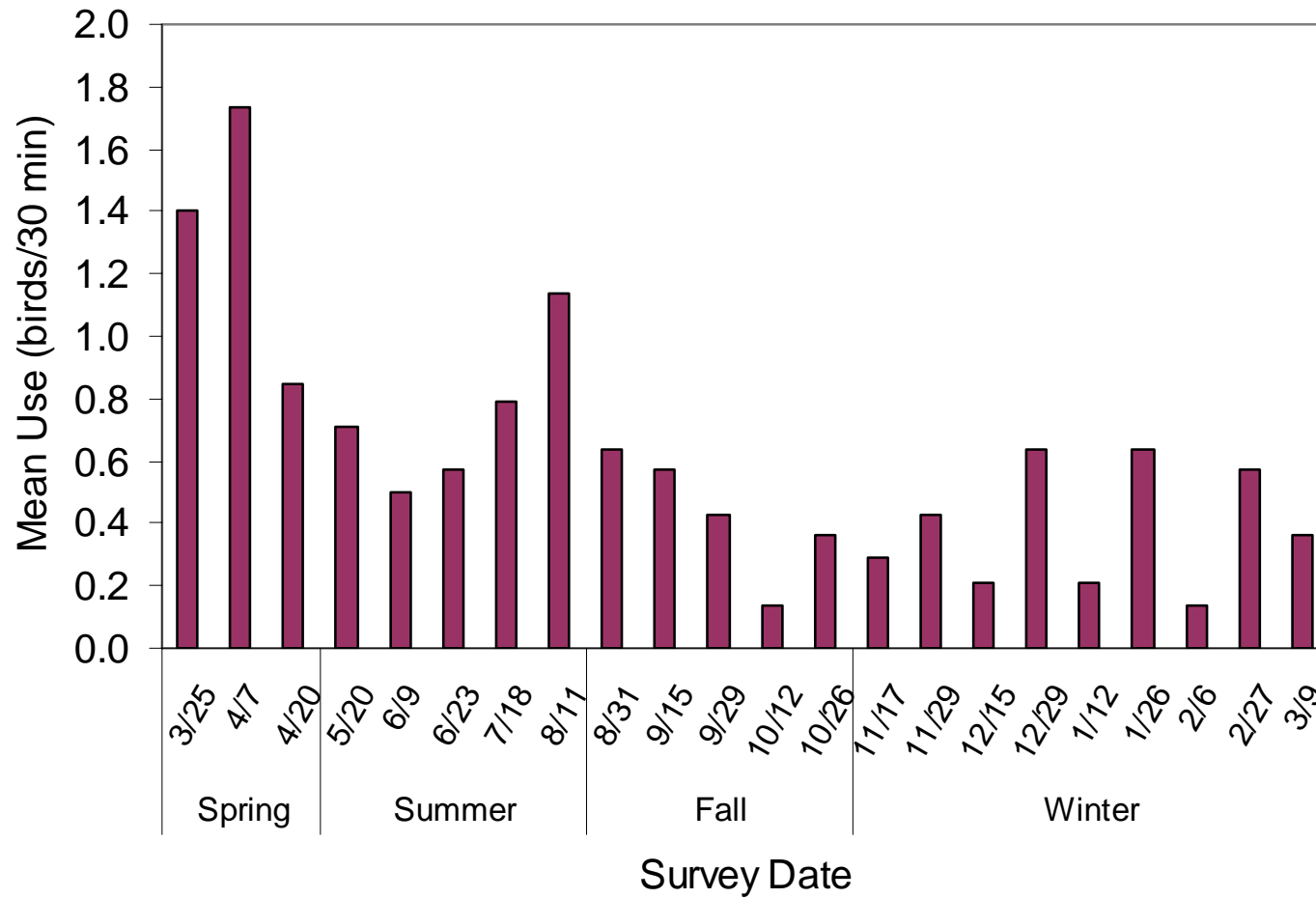
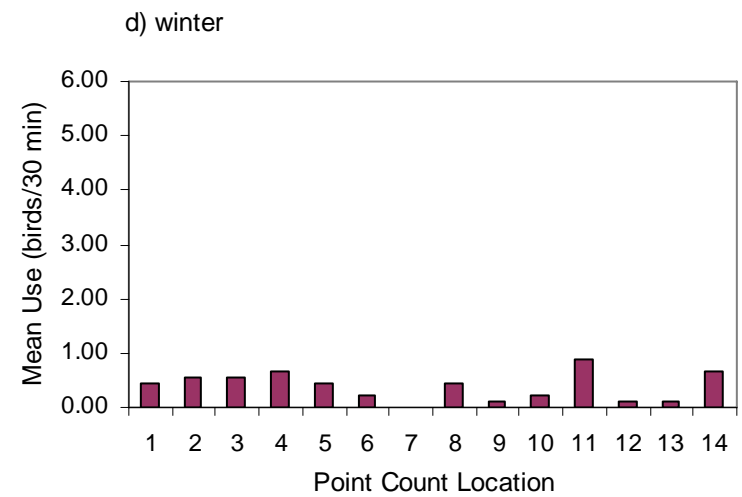
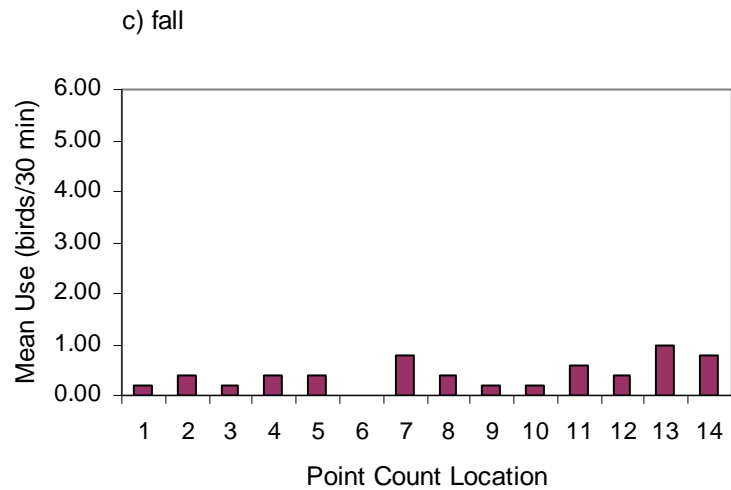
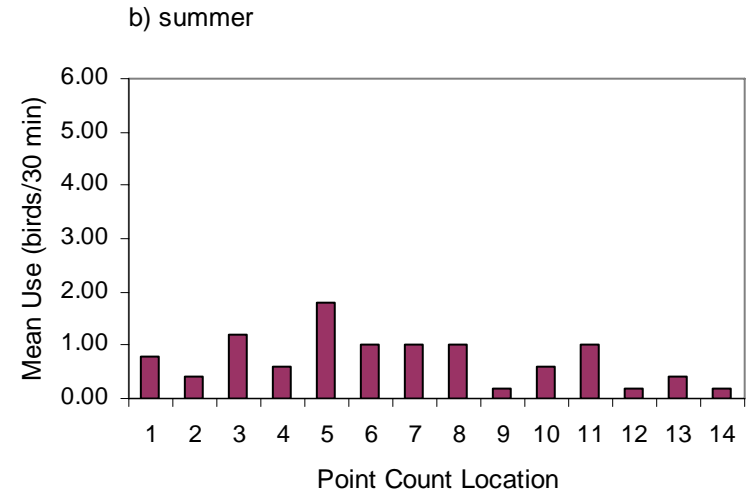
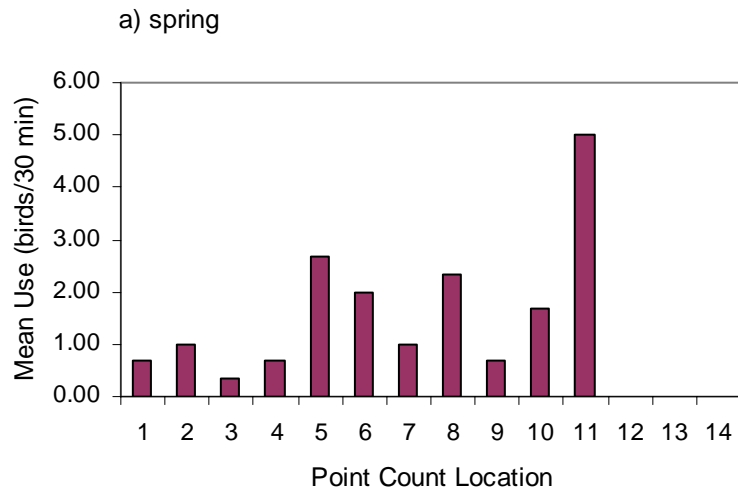


Figure 6. Mean raptor use by point count location (2005-2006)



3.5 Frequency of Occurrence

Songbirds were present in the most surveys and widely distributed throughout the Tule WRA (Table 4); California towhees (49.3 percent of all surveys), spotted towhees (29.3 percent), wrentits (25.0 percent), Bewick's wrens (24.3 percent), house finches (23.3 percent), and bushtits (20.0 percent) occurred the most often (Table 4). Each other songbird species was detected in less than 15.7 percent of surveys.

Crows and allies were the second most common species group observed during fall surveys. Western scrub-jays (69.3 percent) and common ravens (45.7 percent) were observed regularly. The American crow was also observed at the Tule WRA, although in low numbers.

3.6 Flight Height and Encounter Rate

During fall avian use surveys, behavioral data were collected for 98.9 percent of all birds observed during point count surveys. Of these birds, 32.9 percent were observed flying with flight height data available for 97 percent and flight direction available for 96.1 percent. Two different types of turbines are being considered for use at the Tule WRA. For this reason, two different RSAs are used to determine avian encounter rates.

3 MW Turbines (60-150 m RSA)

For flying raptor species, 51 percent flew below the RSA, 48 percent flew within the RSA, and 1 percent flew above (Table 6a). For all other species, 80 percent flew below the anticipated RSA, 19 percent flew within the anticipated RSA, and 1 percent flew above the anticipated RSA. Common ravens had the highest encounter rate of all species during spring, fall, and winter surveys (1.24, 0.37, 0.31 birds flying within the RSA/30 min, respectively; Tables 7a-d). The white-throated swift had the highest encounter rate during summer surveys (0.54 birds flying within the RSA/30min; Table 7b). Other species with notable encounter rates included the turkey vulture (spring: 0.37, summer: 0.22, and fall: 0.03 birds flying within the RSA/30 min), red-tailed hawk (spring: 0.25, summer: 0.14, fall: 0.09, and winter: 0.15 birds flying within the RSA/30 min), and western bluebird (winter: 0.12 birds flying within the RSA/30 min). All other species had encounter rates of 0.07 or fewer birds flying within the RSA/30 min over all survey seasons (Tables 7a-d).

1.5 MW Turbines (41.5-118.5 m RSA)

For flying raptor species, 67 percent flew within the RSA, 31 percent flew below the RSA, and 2 percent flew above the RSA (Table 6b). For all other species, 73 percent occurred below the RSA, 26 percent flew within the RSA, and 1 percent flew within the RSA.

Common ravens had the highest encounter rate of all species during spring, fall, and winter surveys (1.46, 0.49, 0.48 birds flying within the RSA/30 min, respectively; Tables 7e-h). The white-throated swift had the highest encounter rate during summer surveys (0.63 birds flying within the RSA/30min; Table 7f). Other species with notable encounter rates included the turkey vulture (spring: 0.47, summer: 0.35, fall: 0.07, and

winter: 0.02 birds flying within the RSA/30 min), red-tailed hawk (spring: 0.28, summer: 0.20, fall: 0.13, and winter: 0.17 birds flying within the RSA/30 min), barn swallow (spring: 0.18 birds flying within the RSA/30 min), house finch (fall: 0.24 birds flying within the RSA/30 min), and western bluebird (winter: 0.12 birds flying within the RSA/30 min). All other species had encounter rates of 0.06 or fewer birds flying within the RSA/30 min over all survey seasons (Tables 7e-h).

3.7 Flight Direction

Birds observed flying during surveys were observed flying in variable directions. No patterns emerged showing birds flying primarily in a single direction during any survey season. The highest percentage of time birds spent flying in a single direction was during summer surveys, when birds were observed flying north 21.7 percent of the time, and the least was during winter surveys when birds flew to the southeast only 1.8 percent of the time (Table 8a-d).

3.8 Incidental Surveys

During incidental surveys, staff documented 45 species and 4 groups that could not be identified to species, from 9 species groups, and a total of 948 birds (Table 9). California quail were the most commonly recorded species during incidental surveys within the Tule WRA (159 birds). Thirteen species, the black-headed grosbeak, black phoebe, Cassin's kingbird, hooded oriole, Lawrence's goldfinch, Say's phoebe, white-eyed vireo, yellow warbler, lesser nighthawk, rufous hummingbird, great horned owl, sharp-shinned hawk, and white-tailed kite were documented as incidentals, but not detected during point count surveys. Several raptor species were observed both as incidentals and during the point count surveys including the American kestrel, Cooper's hawk, northern harrier, red-tailed hawk, and turkey vulture.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Raptor Use and Encounter Rate

Mean raptor use was highest during spring surveys, then decreased from summer through winter. The red-tailed hawk, the most abundant raptor species, occurred most commonly during winter surveys. The turkey vulture, the next most abundant raptor species, occurred most commonly during summer surveys. Raptor use was relatively consistent across all point count locations; although it was highest at point 11 in the spring where 5 turkey vultures were observed during the single count.

Overall raptor use at the Tule WRA varied between seasons, and was generally moderate when compared to annual raptor use rates reported for existing wind energy facilities throughout the country (Table 10). Compared to other facilities with seasonal use rates, the Tule WRA ranked fourth out of 18 in spring, eighth out of 17 in summer, eleventh out of 16 in fall, and eighth out of 18 in winter (Table 10). Because studies of avian use do not share identical methodologies (e.g., length of survey period), comparisons of avian use represent generalizations only. High raptor use has been associated with high raptor mortality at wind farms (Erickson 2007). However, the conclusion is based on two data

points for high raptor use (>2.0 birds/20 minutes). Similarly, raptor mortality appears to be low when raptor use is low (<1.0 birds/20 min; Erickson 2007). Continued monitoring and additional analysis of encounter rate and post-construction mortality data will help elucidate the relationship between these two variables.

Red-tailed hawks and turkey vultures were the most common raptor species seen in the Tule WRA. Red-tailed hawks had some of the highest encounter rates for raptors Table 7a-h), because they most often flew within the RSA; however, compared to other wind energy facilities these encounter rates are rather low. Red-tailed hawks have commonly been documented as fatalities at existing wind farms (e.g., Erickson et al. 2004, Jain 2005, NWC and WEST 2007). The turkey vulture also had some of the highest encounter rates because they often flew within the RSA. Turkey vultures have been found dead at other wind energy facilities but in very low numbers (e.g., Kerns and Kerlinger 2004, Kerlinger et al. 2005). Both the red-tailed hawk and turkey vulture have widespread and generally stable populations (Preston and Beane 1993, Kirk and Mossman 1998), and mortalities caused by this wind facility would not likely cause population level impacts.

Cooper's hawks, American kestrels, and northern harriers were also observed at the Tule WRA (Table 3). All of these species had relatively low encounter rates (0.3 or fewer birds flying within the RSA/30 min) due to the fact that they were not very abundant and did not commonly fly within the RSA (Tables 7a-h). Hence, mortalities that could occur at the wind energy facility would not likely have population level impacts.

When comparing the two proposed turbine types, encounter rates were higher for the 1.5 MW turbines based on the fact that more birds flew within the RSA. When analyzing flight heights with the 3 MW turbine (60-150 m above ground), 48 percent of raptors flew within the RSA, compared to 67 percent within the 1.5 MW turbine RSA (41.5-118.5 m above ground). Encounter rates during the 2005-2006 surveys suggest that the 3 MW turbines would likely cause fewer raptor mortalities than the 1.5 MW turbines.

4.2 Non-Raptor Use and Encounter Rate

Mean use of non-raptors was relatively consistent the spring, summer, and fall; but lowest in the winter (Figure 3). Seasonal mean use trends varied by species. The western scrub-jay, the most abundant non-raptor species, occurred most commonly during fall, summer, and winter surveys. The common raven, the next most abundant non-raptor species, occurred most commonly during winter surveys. The third most abundant species, the bushtit, was most common during fall and summer surveys. Non-raptor use was relatively consistent across all point count locations.

Overall non-raptor use at the Tule WRA varied between seasons, and was generally moderate when compared to annual raptor use rates reported for existing wind energy facilities throughout the country (Table 10). Compared to other facilities with seasonal use rates, the Tule WRA ranked fifth out of 10 in spring, third out of 9 in summer, third out of 8 in fall, and ninth out of 10 in winter (Table 10). Songbirds had the highest mean use out of all groups during all seasons (6.54 birds/30 min for all seasons), and mean use was less than 3.31 birds/30 min for each remaining species groups.

The second most commonly observed species, the common raven (1.41 birds/30 min) had the highest encounter rates of all birds during spring, fall, and winter surveys due to the fact that they commonly flew within the RSA. Common ravens have been found as mortalities at existing wind energy facilities (Thelander et al. 2003, Anderson et al. 2005) although in low numbers, and a post-construction mortality study in Oregon and Washington found that common ravens were commonly seen in the area of wind turbines but were not found as mortalities (Erickson et al. 2004). Additionally, common raven populations appear to be widespread and stable (Boarman and Heinrich 1999); hence, mortalities that may occur at this wind energy facility would not likely cause population level impacts.

During summer surveys, white-throated swifts had the highest encounter rate of all birds as they flew within the RSA the majority of the time. White-throated swifts have also been found as mortalities at existing wind energy facilities, although in low numbers (Erickson et al. 2000, Anderson et al. 2005, Kerlinger et al. 2005). The stability of white-throated swift populations is relatively unknown, due to difficulty of detection and the patchy distribution of this species. However, a long-term decrease has been noted at Palos Verdes, CA between 1972 and 1996 for unknown reasons, but the range is thought to be expanding in British Columbia, California, and Texas (Ryan and Collins 2000). Population numbers in California are estimated to be about 50,000 birds (PIF 2004); hence, due to the relatively low numbers of birds seen in the Tule WRA (65 individuals over all seasons) any mortality caused by this wind energy facility are unlikely to cause population level impacts.

The three most common species excluding the common raven, the western scrub-jay (1.87 birds/30 min), bushtit (1.06 birds/30 min, and California towhee (0.96 birds/30 min) all had very low encounter rates because they did not regularly fly through the RSA. Most of the other local resident non-raptors were observed flying below the RSA and thus had very low encounter rates as well.

When comparing the two proposed turbine types, encounter rates were higher for the 1.5 MW turbines based on the fact that more birds flew within the RSA. When analyzing flight heights with the 3 MW turbine (60-150 m above ground), 19 percent of non-raptors flew within the RSA, compared to 26 percent within the 1.5 MW turbine RSA (41.5-118.5 m above ground). Encounter rates during the 2005-2006 surveys suggest that the 3 MW turbines would likely cause fewer non-raptor mortalities than the 1.5 MW turbines.

4.3 Listed and Sensitive Species

No state or federally listed endangered or threatened species were observed during the avian surveys at the Tule WRA. However, five of the species (Cooper's hawk, sharp-shinned hawk, northern harrier, loggerhead shrike, and yellow warbler) are listed as California Department of Fish and Game (CDFG) Species of Special Concern when nesting. The CDFG defines certain species as Species of Special Concern because declining population levels, limited ranges, and/or continuing threats have made them

vulnerable to extinction. The goal of designating species as “Species of Special Concern” is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long term viability (CDFG 2007). All of these species were relatively rare on the Tule WRA, and only the Cooper’s hawk (1 individual seen incidentally) and yellow warbler (1 individual seen incidentally) were seen during the summer which could potentially indicate a breeding bird..

4.4 Potential Impacts to Avian Species

The possible impacts to avian species from the construction and operation of the Tule wind farm are direct mortality and injury from collisions with wind turbines and/or guy wires, temporary or permanent habitat loss, and displacement of birds from habitats near turbines (Drewitt and Langston 2006). Historically, raptor mortality has received the most attention. Raptor mortality at newer generation wind projects has been low relative to previous generation wind farms (Erickson et al. 2002). A number of mortality monitoring studies at newer generation wind projects have found fewer than five individual raptor mortalities (e.g., Erickson et al. 2003, Jain et al. 2007, Johnson et al. 2002, Kerns and Kerlinger 2004), but one study at the Stateline Wind Project in Oregon and Washington found as many as 17 dead raptors within a 2.5 year monitoring period (Erickson et al. 2004). Although raptor mortality is reduced, mortality may not be eliminated by advances in turbine technology and local micro-siting and site evaluation efforts are still necessary.

At newer generation wind energy facilities outside of California, approximately 80 percent of documented mortalities have been passerines (e.g., songbirds); of which 50 percent were night migrants (Erickson et al. 2002). It is estimated that less than 0.01 percent of migrant songbirds that pass over wind farms are killed, based on radar data and mortality monitoring at wind farms in Oregon, Washington, and Minnesota (Erickson 2007). Resident species may have lower mortality than migrants because many songbirds do not fly within the RSA. However, some resident species have behaviors that increase the risk of collisions with turbines because they fly within the RSA. For example, horned larks have been commonly found as fatalities at wind farms (Erickson et al. 2002).

In addition to mortality associated with wind farms, concerns have been raised that bird species may avoid areas near turbines after the wind farm is in operation (Drewitt and Langston 2006). For example, at the Buffalo Ridge wind energy facility in Minnesota, densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. It was suggested that the reduced density may be due to avoidance of turbine noise and maintenance activities, and reduced habitat quality due to the presence of access roads and large gravel pads surrounding the turbines (Leddy et al. 1999). Reduced abundance of grassland songbirds was found within 50 meters of a turbine pad for a wind farm in Washington and Oregon, but the investigators attributed displacement to the direct loss of habitat or reduced habitat quality and not the presence of the turbines (WEST and NWC 2004). Although breeding grassland songbirds have not shown strong avoidance to date,

other species groups (e.g., prairie grouse) may respond differently based on avoidance of other anthropogenic features on the landscape (Pitman et al. 2005).

4.5 Tule Project Area Conclusions and Recommendations

Overall non-raptor use at the Tule WRA varied between seasons, and most non-raptors detected were songbirds. Songbirds had the highest mean use out of all species groups observed (6.54 birds/30 min). The most commonly observed species; the western scrub-jay and common raven are both widespread species and have relatively stable populations (Sauer et al. 2007). Thus, local mortality of resident species is not expected to have population level consequences. However, night migrants may pass through the Tule WRA and would not be detected by the survey methods used in this study. Although nocturnal migrants were not surveyed, mortality of migrants at the Tule WRA is not expected to have population implications because less than 0.01 percent of night migrants that fly through wind farms are killed (Erickson 2007).

Raptor use at the Tule WRA was lower than that for Altamont Pass and Montezuma Hills in California, where high rates of raptor mortality occurred at both old generation and new generation turbines (Erickson et al. 2002, Strickland and Johnson 2006). Preliminary data suggests that high fatalities may occur at new generation wind facilities when raptor use is high. Raptor use at the Tule WRA is moderate compared to other new wind energy facilities. (Erickson 2007). Impacts that may occur could be minimized if turbines are sited away from areas of high raptor use, active raptor nests, and saddles along ridgelines, and are offset from ridge edges. The following Best Management Practices and recommended studies should provide measures to minimize impacts to birds from the construction and operation of the Tule wind facility.

Best Management Practices

Several best management practices can be implemented at wind farm facilities in order to avoid and minimize potential impacts to avian species and habitat. These practices are important not only to reduce the potential for individuals to be injured or killed by turbines, transmission lines, or other wind farm components, but to also protect and enhance habitat for species of concern.

Standard Best Management Practices

- Studies have shown that birds, including bald eagles, are susceptible to electrocution by power lines (APLIC 2006). Therefore, the use of overhead power lines should be minimized; when they are necessary, power poles should be fitted with bird perch guards to minimize bird use.
- The use of lights on turbines should be minimized when practicable in accordance with state, federal, and local requirements, because lights may attract migrating birds to the vicinity of turbines, particularly during certain weather conditions (Evans et al. 2007).
- Active raptor nests may require timing restrictions for construction or operation activities, or alterations to the turbine design plan. Raptor nests discovered during construction should be mapped and flagged. Turbines should be placed as far away from raptor nests as project and engineering constraints permit and avoid

- removal of trees. If the nest is identified to belong to a species of concern, it may be designated a 'no disturbance zone' during the construction phase (APLIC and USFWS 2005, APLIC 2006). Turbines should be placed out of a direct line of sight of the nest.
- Habitat loss is typically the leading cause of population declines in a number of species of concern. Bird species are dependent on the native plants for food, cover, and breeding habitat. Degraded vegetative communities or the presence of invasive plant species can reduce the amount of available quality habitat for birds in these areas. In order to decrease the loss of bird habitat, the following practices are recommended:
 - To the greatest extent possible, minimize impacts to native vegetation and riparian areas during design and construction of turbines and associated infrastructure.
 - If native vegetation is disturbed or removed during construction of roads or turbines, these areas should be reseeded or planted with native material.
 - Where practical, existing degraded habitat could also be enhanced through the removal and replacement of invasive species with plants native to the site.
 - To maintain high quality native habitats used by birds, a management plan should be developed to prevent the spread of noxious weeds throughout the Tule WRA or adjacent areas during construction and ongoing operations. Any area that is disturbed or altered should be managed appropriately to avoid the introduction or spread of noxious species. This practice is important to reduce detrimental impacts to avian habitat. The appropriate weed control board should be consulted to develop this plan.

Additional Recommended Studies

- Although a raptor nest survey was conducted in April of 2005, TtEC recommends additional raptor nest surveys as use may have changed in the interim three years. Raptor nest surveys should be conducted after leaves have dropped from trees. Any raptor nest identified during the preliminary nest survey should be revisited in April to June to determine breeding activity.
- Post-construction mortality monitoring is recommended to quantify impacts to avian species.

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TABLES

Table 1. Tule Wind Resource Area 2005 -2006 point count survey dates.

	Survey Number	Date
Spring		
	1	March 25
	2	April 7
	2	April 8
	3	April 20
	3	April 21
Summer		
	1	May 20
	1	May 21
	2	June 9
	2	June 10
	3	June 23
	3	June 24
	4	July 18
	4	July 19
	5	August 11
	5	August 12
Fall		
	1	August 31
	1	September 1
	2	September 15
	2	September 16
	3	September 29
	3	September 30
	4	October 12
	4	October 13
	4	October 14
	5	October 26
	5	October 27

Table 1. Tule Wind Resource Area 2005 -2006 point count survey dates.

Survey Number	Date
Winter	
1	November 17
1	November 18
2	November 29
2	November 30
3	December 15
3	December 16
4	December 29
4	December 30
5	January 12
5	January 13
6	January 26
6	January 27
7	February 6
7	February 7
8	February 27
8	February 28
9	March 9
9	March 10

Table 2. Avian species observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*
western scrub-jay	40	38	1.18	177	112	2.53	182	127	2.60	162	111	1.29	561	388	1.87
common raven	103	43	3.03	61	33	0.87	96	54	1.37	164	82	1.30	424	212	1.41
bush-tit	0	0	0.00	109	26	1.56	167	38	2.39	41	11	0.33	317	75	1.06
California towhee	44	39	1.29	109	71	1.56	84	63	1.20	51	41	0.40	288	214	0.96
house finch	0	0	0.00	4	3	0.06	98	45	1.40	155	52	1.23	257	100	0.86
California quail	29	23	0.85	69	39	0.99	64	41	0.91	44	26	0.35	206	129	0.69
spotted towhee	23	21	0.68	74	55	1.06	24	22	0.34	35	33	0.28	156	131	0.52
unidentified songbird	5	4	0.15	22	11	0.31	65	30	0.93	29	13	0.23	121	58	0.40
wrentit	8	7	0.24	31	24	0.44	34	32	0.49	42	34	0.33	115	97	0.38
Bewick's wren	15	12	0.44	25	19	0.36	29	29	0.41	27	25	0.21	96	85	0.32
red-tailed hawk	19	15	0.56	22	16	0.31	10	10	0.14	37	31	0.29	88	72	0.29
black-chinned sparrow	11	7	0.32	72	47	1.03	0	0	0.00	4	4	0.03	87	58	0.29
black-throated sparrow	14	9	0.41	45	31	0.64	17	12	0.24	6	4	0.05	82	56	0.27
white-throated swift	5	4	0.15	53	11	0.76	7	3	0.10	0	0	0.00	65	18	0.22
turkey vulture	20	17	0.59	30	25	0.43	8	7	0.11	6	6	0.05	64	55	0.21
dark-eyed junco	17	13	0.50	0	0	0.00	9	5	0.13	37	15	0.29	63	33	0.21
white-crowned sparrow	5	3	0.15	0	0	0.00	18	12	0.26	27	16	0.21	50	31	0.17
California thrasher	13	13	0.38	16	13	0.23	6	6	0.09	11	8	0.09	46	40	0.15
phainopepla	0	0	0.00	3	1	0.04	8	3	0.11	29	26	0.23	40	30	0.13
ash-throated flycatcher	4	2	0.12	32	25	0.46	4	4	0.06	0	0	0.00	40	31	0.13
western bluebird	0	0	0.00	0	0	0.00	0	0	0.00	38	6	0.30	38	6	0.13

* Mean use=# birds/30 min.

Table 2. Avian species observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*
unidentified hummingbird	6	5	0.18	20	15	0.29	7	7	0.10	0	0	0.00	33	27	0.11
rock wren	5	5	0.15	8	6	0.11	8	7	0.11	11	9	0.09	32	27	0.11
unknown bird	5	5	0.15	15	11	0.21	7	7	0.10	2	2	0.02	29	25	0.10
mountain quail	0	0	0.00	1	1	0.01	12	11	0.17	6	6	0.05	19	18	0.06
mourning dove	7	4	0.21	8	7	0.11	0	0	0.00	0	0	0.00	15	11	0.05
unidentified swallow	0	0	0.00	13	1	0.19	0	0	0.00	0	0	0.00	13	1	0.04
white-winged dove	0	0	0.00	0	0	0.00	0	0	0.00	12	1	0.10	12	1	0.04
western kingbird	0	0	0.00	11	3	0.16	1	1	0.01	0	0	0.00	12	4	0.04
rufous-sided towhee	11	7	0.32	0	0	0.00	0	0	0.00	0	0	0.00	11	7	0.04
northern flicker	1	1	0.03	4	3	0.06	0	0	0.00	5	4	0.04	10	8	0.03
unidentified raptor	2	2	0.06	0	0	0.00	3	3	0.04	4	2	0.03	9	7	0.03
Cooper's hawk	2	2	0.06	0	0	0.00	5	4	0.07	2	2	0.02	9	8	0.03
house wren	0	0	0.00	8	1	0.11	0	0	0.00	0	0	0.00	8	1	0.03
oak titmouse	3	3	0.09	2	1	0.03	0	0	0.00	2	2	0.02	7	6	0.02
American crow	0	0	0.00	4	3	0.06	0	0	0.00	3	2	0.02	7	5	0.02
Scott's oriole	0	0	0.00	6	4	0.09	0	0	0.00	0	0	0.00	6	4	0.02
barn swallow	6	1	0.18	0	0	0.00	0	0	0.00	0	0	0.00	6	1	0.02
unidentified woodpecker	0	0	0.00	1	1	0.01	2	2	0.03	2	2	0.02	5	5	0.02
hermit thrush	0	0	0.00	0	0	0.00	1	1	0.01	4	4	0.03	5	5	0.02
ruby-crowned kinglet	0	0	0.00	0	0	0.00	0	0	0.00	4	3	0.03	4	3	0.01
cliff swallow	0	0	0.00	4	1	0.06	0	0	0.00	0	0	0.00	4	1	0.01

* Mean use=# birds/30 min.

Table 2. Avian species observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*	# Birds	# Obs.	Mean Use*
American kestrel	1	1	0.03	0	0	0.00	3	3	0.04	0	0	0.00	4	4	0.01
northern mockingbird	0	0	0.00	1	1	0.01	2	2	0.03	0	0	0.00	3	3	0.01
loggerhead shrike	0	0	0.00	0	0	0.00	0	0	0.00	3	3	0.02	3	3	0.01
lesser goldfinch	2	1	0.06	0	0	0.00	0	0	0.00	1	1	0.01	3	2	0.01
European starling	1	1	0.03	2	1	0.03	0	0	0.00	0	0	0.00	3	2	0.01
black-chinned hummingbird	0	0	0.00	3	3	0.04	0	0	0.00	0	0	0.00	3	3	0.01
yellow-rumped warbler	2	1	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	1	0.01
unidentified vireo	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.01	2	2	0.01
unidentified sparrow	2	2	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
unidentifed quail	0	0	0.00	2	1	0.03	0	0	0.00	0	0	0.00	2	1	0.01
unidentified finch	0	0	0.00	2	1	0.03	0	0	0.00	0	0	0.00	2	1	0.01
tree swallow	2	2	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
blue grosbeak	0	0	0.00	0	0	0.00	2	2	0.03	0	0	0.00	2	2	0.01
white-throated sparrow	1	1	0.03	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.00
unidentified swift	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
orange-crowned warbler	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
northern harrier	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
greater roadrunner	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
great egret	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
blue-gray gnatcatcher	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
Grand Total	434	314	12.76	1069	627	15.27	989	599	14.13	1008	589	8.00	3500	2129	11.67

* Mean use=# birds/30 min.

Table 3. Avian mean use, by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use
Songbirds															
bushtit	0	0	0.00	109	26	1.56	167	38	2.39	41	11	0.33	317	75	1.06
California towhee	44	39	1.29	109	71	1.56	84	63	1.20	51	41	0.40	288	214	0.96
house finch	0	0	0.00	4	3	0.06	98	45	1.40	155	52	1.23	257	100	0.86
spotted towhee	23	21	0.68	74	55	1.06	24	22	0.34	35	33	0.28	156	131	0.52
unidentified songbird	5	4	0.15	22	11	0.31	65	30	0.93	29	13	0.23	121	58	0.40
wrentit	8	7	0.24	31	24	0.44	34	32	0.49	42	34	0.33	115	97	0.38
Bewick's wren	15	12	0.44	25	19	0.36	29	29	0.41	27	25	0.21	96	85	0.32
black-chinned sparrow	11	7	0.32	72	47	1.03	0	0	0.00	4	4	0.03	87	58	0.29
black-throated sparrow	14	9	0.41	45	31	0.64	17	12	0.24	6	4	0.05	82	56	0.27
dark-eyed junco	17	13	0.50	0	0	0.00	9	5	0.13	37	15	0.29	63	33	0.21
white-crowned sparrow	5	3	0.15	0	0	0.00	18	12	0.26	27	16	0.21	50	31	0.17
California thrasher	13	13	0.38	16	13	0.23	6	6	0.09	11	8	0.09	46	40	0.15
phainopepla	0	0	0.00	3	1	0.04	8	3	0.11	29	26	0.23	40	30	0.13
ash-throated flycatcher	4	2	0.12	32	25	0.46	4	4	0.06	0	0	0.00	40	31	0.13
western bluebird	0	0	0.00	0	0	0.00	0	0	0.00	38	6	0.30	38	6	0.13
rock wren	5	5	0.15	8	6	0.11	8	7	0.11	11	9	0.09	32	27	0.11
unknown bird	5	5	0.15	15	11	0.21	7	7	0.10	2	2	0.02	29	25	0.10
unidentified swallow	0	0	0.00	13	1	0.19	0	0	0.00	0	0	0.00	13	1	0.04
western kingbird	0	0	0.00	11	3	0.16	1	1	0.01	0	0	0.00	12	4	0.04
rufous-sided towhee	11	7	0.32	0	0	0.00	0	0	0.00	0	0	0.00	11	7	0.04
house wren	0	0	0.00	8	1	0.11	0	0	0.00	0	0	0.00	8	1	0.03
oak titmouse	3	3	0.09	2	1	0.03	0	0	0.00	2	2	0.02	7	6	0.02

* Mean use=# birds/30 min.

Table 3. Avian mean use, by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use
Scott's oriole	0	0	0.00	6	4	0.09	0	0	0.00	0	0	0.00	6	4	0.02
barn swallow	6	1	0.18	0	0	0.00	0	0	0.00	0	0	0.00	6	1	0.02
hermit thrush	0	0	0.00	0	0	0.00	1	1	0.01	4	4	0.03	5	5	0.02
ruby-crowned kinglet	0	0	0.00	0	0	0.00	0	0	0.00	4	3	0.03	4	3	0.01
cliff swallow	0	0	0.00	4	1	0.06	0	0	0.00	0	0	0.00	4	1	0.01
northern mockingbird	0	0	0.00	1	1	0.01	2	2	0.03	0	0	0.00	3	3	0.01
loggerhead shrike	0	0	0.00	0	0	0.00	0	0	0.00	3	3	0.02	3	3	0.01
lesser goldfinch	2	1	0.06	0	0	0.00	0	0	0.00	1	1	0.01	3	2	0.01
European starling	1	1	0.03	2	1	0.03	0	0	0.00	0	0	0.00	3	2	0.01
yellow-rumped warbler	2	1	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	1	0.01
unidentified vireo	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.01	2	2	0.01
unidentified sparrow	2	2	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
unidentified finch	0	0	0.00	2	1	0.03	0	0	0.00	0	0	0.00	2	1	0.01
tree swallow	2	2	0.06	0	0	0.00	0	0	0.00	0	0	0.00	2	2	0.01
blue grosbeak	0	0	0.00	0	0	0.00	2	2	0.03	0	0	0.00	2	2	0.01
white-throated sparrow	1	1	0.03	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.00
unidentified swift	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
orange-crowned warbler	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
blue-gray gnatcatcher	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
Group Total	199	159	5.85	614	357	8.77	588	325	8.40	560	313	4.44	1961	1154	6.54
Raptors/Vultures/Owls															
red-tailed hawk	19	15	0.56	22	16	0.31	10	10	0.14	37	31	0.29	88	72	0.29
turkey vulture	20	17	0.59	30	25	0.43	8	7	0.11	6	6	0.05	64	55	0.21

* Mean use=# birds/30 min.

Table 3. Avian mean use, by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use
unidentified raptor	2	2	0.06	0	0	0.00	3	3	0.04	4	2	0.03	9	7	0.03
Cooper's hawk	2	2	0.06	0	0	0.00	5	4	0.07	2	2	0.02	9	8	0.03
American kestrel	1	1	0.03	0	0	0.00	3	3	0.04	0	0	0.00	4	4	0.01
northern harrier	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
Group Total	44	37	1.29	52	41	0.74	30	28	0.43	49	41	0.39	175	147	0.58
Woodpeckers															
northern flicker	1	1	0.03	4	3	0.06	0	0	0.00	5	4	0.04	10	8	0.03
unidentified woodpecker	0	0	0.00	1	1	0.01	2	2	0.03	2	2	0.02	5	5	0.02
Group Total	1	1	0.03	5	4	0.07	2	2	0.03	7	6	0.06	15	13	0.05
Crows and Allies															
western scrub-jay	40	38	1.18	177	112	2.53	182	127	2.60	162	111	1.29	561	388	1.87
common raven	103	43	3.03	61	33	0.87	96	54	1.37	164	82	1.30	424	212	1.41
American crow	0	0	0.00	4	3	0.06	0	0	0.00	3	2	0.02	7	5	0.02
Group Total	143	81	4.21	242	148	3.46	278	181	3.97	329	195	2.61	992	605	3.31
Gamebirds															
California quail	29	23	0.85	69	39	0.99	64	41	0.91	44	26	0.35	206	129	0.69
mountain quail	0	0	0.00	1	1	0.01	12	11	0.17	6	6	0.05	19	18	0.06
unidentified quail	0	0	0.00	2	1	0.03	0	0	0.00	0	0	0.00	2	1	0.01
Group Total	29	23	0.85	72	41	1.03	76	52	1.09	50	32	0.40	227	148	0.76
Pigeons/Doves															
mourning dove	7	4	0.21	8	7	0.11	0	0	0.00	0	0	0.00	15	11	0.05
white-winged dove	0	0	0.00	0	0	0.00	0	0	0.00	12	1	0.10	12	1	0.04

* Mean use=# birds/30 min.

Table 3. Avian mean use, by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring			Summer			Fall			Winter			Overall		
	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use	# Birds	# Obs.	Mean Use
Group Total	7	4	0.21	8	7	0.11	0	0	0.00	12	1	0.10	27	12	0.09
Swifts/Hummingbirds															
white-throated swift	5	4	0.15	53	11	0.76	7	3	0.10	0	0	0.00	65	18	0.22
unidentified hummingbird	6	5	0.18	20	15	0.29	7	7	0.10	0	0	0.00	33	27	0.11
black-chinned hummingbird	0	0	0.00	3	3	0.04	0	0	0.00	0	0	0.00	3	3	0.01
Group Total	11	9	0.32	76	29	1.09	14	10	0.20	0	0	0.00	101	48	0.34
Wadingbirds															
great egret	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
Group Total	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.01	1	1	0.00
Other															
greater roadrunner	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
Group Total	0	0	0.00	0	0	0.00	1	1	0.01	0	0	0.00	1	1	0.00
Grand Total	434	314	12.76	1069	627	15.27	989	599	14.13	1008	589	8.00	3500	2129	11.67

* Mean use=# birds/30 min.

Table 4. Avian percent composition and frequency, sorted by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring		Summer		Fall		Winter		Overall	
	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency
Songbirds										
bushtit	0.0	0.0	10.2	34.3	16.9	37.1	4.1	7.9	0.1	20.0
California towhee	10.1	73.5	10.2	64.3	8.5	61.4	5.1	27.8	0.1	49.3
house finch	0.0	0.0	0.4	4.3	9.9	42.9	15.4	29.4	0.1	23.3
spotted towhee	5.3	32.4	6.9	45.7	2.4	21.4	3.5	23.8	0.0	29.3
unidentified songbird	1.2	8.8	2.1	14.3	6.6	31.4	2.9	9.5	0.0	15.7
wrentit	1.8	20.6	2.9	22.9	3.4	32.9	4.2	23.0	0.0	25.0
Bewick's wren	3.5	26.5	2.3	24.3	2.9	32.9	2.7	19.0	0.0	24.3
black-chinned sparrow	2.5	14.7	6.7	37.1	0.0	0.0	0.4	3.2	0.0	11.7
black-throated sparrow	3.2	20.6	4.2	34.3	1.7	17.1	0.6	3.2	0.0	15.7
dark-eyed junco	3.9	26.5	0.0	0.0	0.9	7.1	3.7	8.7	0.0	8.3
white-crowned sparrow	1.2	8.8	0.0	0.0	1.8	14.3	2.7	11.9	0.0	9.3
California thrasher	3.0	29.4	1.5	15.7	0.6	8.6	1.1	5.6	0.0	11.3
phainopepla	0.0	0.0	0.3	1.4	0.8	4.3	2.9	16.7	0.0	8.3
ash-throated flycatcher	0.9	5.9	3.0	25.7	0.4	4.3	0.0	0.0	0.0	7.7
western bluebird	0.0	0.0	0.0	0.0	0.0	0.0	3.8	4.0	0.0	1.7
rock wren	1.2	11.8	0.7	8.6	0.8	10.0	1.1	6.3	0.0	8.3
unknown bird	1.2	11.8	1.4	14.3	0.7	8.6	0.2	1.6	0.0	7.3
unidentified swallow	0.0	0.0	1.2	1.4	0.0	0.0	0.0	0.0	0.0	0.3
western kingbird	0.0	0.0	1.0	2.9	0.1	1.4	0.0	0.0	0.0	1.0
rufous-sided towhee	2.5	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
house wren	0.0	0.0	0.7	1.4	0.0	0.0	0.0	0.0	0.0	0.3
oak titmouse	0.7	8.8	0.2	1.4	0.0	0.0	0.2	1.6	0.0	2.0
Scott's oriole	0.0	0.0	0.6	4.3	0.0	0.0	0.0	0.0	0.0	1.0

Table 4. Avian percent composition and frequency, sorted by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring		Summer		Fall		Winter		Overall	
	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency
barn swallow	1.4	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
hermit thrush	0.0	0.0	0.0	0.0	0.1	1.4	0.4	3.2	0.0	1.7
ruby-crowned kinglet	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.4	0.0	1.0
cliff swallow	0.0	0.0	0.4	1.4	0.0	0.0	0.0	0.0	0.0	0.3
northern mockingbird	0.0	0.0	0.1	1.4	0.2	2.9	0.0	0.0	0.0	1.0
loggerhead shrike	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	0.0	1.0
lesser goldfinch	0.5	2.9	0.0	0.0	0.0	0.0	0.1	0.8	0.0	0.7
European starling	0.2	2.9	0.2	1.4	0.0	0.0	0.0	0.0	0.0	0.7
yellow-rumped warbler	0.5	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
unidentified vireo	0.0	0.0	0.0	0.0	0.1	1.4	0.1	0.8	0.0	0.7
unidentified sparrow	0.5	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
unidentified finch	0.0	0.0	0.2	1.4	0.0	0.0	0.0	0.0	0.0	0.3
tree swallow	0.5	5.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
blue grosbeak	0.0	0.0	0.0	0.0	0.2	2.9	0.0	0.0	0.0	0.7
white-throated sparrow	0.2	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
unidentified swift	0.0	0.0	0.0	0.0	0.1	1.4	0.0	0.0	0.0	0.3
orange-crowned warbler	0.0	0.0	0.0	0.0	0.1	1.4	0.0	0.0	0.0	0.3
blue-gray gnatcatcher	0.0	0.0	0.0	0.0	0.1	1.4	0.0	0.0	0.0	0.3
Group Total	45.9		57.4		59.5		55.6		0.6	
Raptors/Vultures/Owls										
red-tailed hawk	4.4	38.2	2.1	22.9	1.0	14.3	3.7	19.8	0.0	21.3
turkey vulture	4.6	38.2	2.8	25.7	0.8	10.0	0.6	4.8	0.0	14.7
unidentified raptor	0.5	5.9	0.0	0.0	0.3	4.3	0.4	1.6	0.0	2.3

Table 4. Avian percent composition and frequency, sorted by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring		Summer		Fall		Winter		Overall	
	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency
Cooper's hawk	0.5	5.9	0.0	0.0	0.5	5.7	0.2	1.6	0.0	2.7
American kestrel	0.2	2.9	0.0	0.0	0.3	4.3	0.0	0.0	0.0	1.3
northern harrier	0.0	0.0	0.0	0.0	0.1	1.4	0.0	0.0	0.0	0.3
Group Total	10.1		4.9		3.0		4.9		0.1	
Woodpeckers										
northern flicker	0.2	2.9	0.4	4.3	0.0	0.0	0.5	3.2	0.0	2.7
unidentified woodpecker	0.0	0.0	0.1	1.4	0.2	2.9	0.2	1.6	0.0	1.7
Group Total	0.2		0.5		0.2		0.7		0.0	
Crows and Allies										
western scrub-jay	9.2	52.9	16.6	80.0	18.4	85.7	16.1	58.7	0.2	69.3
common raven	23.7	67.6	5.7	35.7	9.7	54.3	16.3	40.5	0.1	45.7
American crow	0.0	0.0	0.4	2.9	0.0	0.0	0.3	1.6	0.0	1.3
Group Total	32.9		22.6		28.1		32.6		0.3	
Gamebirds										
California quail	6.7	35.3	6.5	41.4	6.5	42.9	4.4	16.7	0.1	30.7
mountain quail	0.0	0.0	0.1	1.4	1.2	12.9	0.6	4.8	0.0	5.3
unidentified quail	0.0	0.0	0.2	1.4	0.0	0.0	0.0	0.0	0.0	0.3
Group Total	6.7		6.7		7.7		5.0		0.1	
Pigeons/Doves										
mourning dove	1.6	11.8	0.7	10.0	0.0	0.0	0.0	0.0	0.0	3.7
white-winged dove	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.8	0.0	0.3
Group Total	1.6		0.7		0.0		1.2		0.0	

Table 4. Avian percent composition and frequency, sorted by species group, observed during point count surveys at the Tule Wind Resource Area, 2005 -2006.

Species Group Species	Spring		Summer		Fall		Winter		Overall	
	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency	Percent Comp.	Frequency
Swifts/Hummingbirds										
white-throated swift	1.2	11.8	5.0	11.4	0.7	4.3	0.0	0.0	0.0	5.0
unidentified hummingbird	1.4	11.8	1.9	18.6	0.7	10.0	0.0	0.0	0.0	8.0
black-chinned hummingbird	0.0	0.0	0.3	4.3	0.0	0.0	0.0	0.0	0.0	1.0
Group Total	2.5		7.1		1.4		0.0		0.0	
Wadingbirds										
great egret	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.0	0.3
Group Total	0.0		0.0		0.0		0.1		0.0	
Other										
greater roadrunner	0.0	0.0	0.0	0.0	0.1	1.4	0.0	0.0	0.0	0.3
Group Total	0.0		0.0		0.1		0.0		0.0	
Grand Total	100.0%		100.0%		100.0%		100.0%		100.0%	

Table 5a. Avian species observed by point during Spring point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			1	2	3	4	5	6	7
common raven	103	43	17	15	3	6	4	9	6
California towhee	44	39	4	4	2	4	2	8	3
western scrub-jay	40	38	2	0	1	5	6	2	11
California quail	29	23	0	2	3	2	0	4	2
spotted towhee	23	21	2	2	2	0	6	3	0
turkey vulture	20	17	2	1	1	1	4	1	1
red-tailed hawk	19	15	0	2	0	1	4	4	1
dark-eyed junco	17	13	0	3	3	0	2	2	2
Bewick's wren	15	12	3	0	1	0	1	2	1
black-throated sparrow	14	9	0	0	6	1	0	4	1
California thrasher	13	13	0	0	1	1	4	1	3
rufous-sided towhee	11	7	0	0	0	1	0	0	2
black-chinned sparrow	11	7	0	3	0	1	0	2	0
wrentit	8	7	0	0	0	0	1	0	1
mourning dove	7	4	1	0	1	0	0	4	0
unidentified hummingbird	6	5	0	0	0	2	1	0	0
barn swallow	6	1	0	0	0	0	0	0	0
white-throated swift	5	4	0	0	0	0	2	2	0
white-crowned sparrow	5	3	2	1	0	0	0	2	0
unidentified songbird	5	4	2	0	0	0	0	1	0
unknown bird	5	5	0	0	0	0	1	0	0
rock wren	5	5	0	2	2	1	0	0	0
ash-throated flycatcher	4	2	0	0	0	0	0	3	0
oak titmouse	3	3	1	0	0	0	0	0	0
yellow-rumped warbler	2	1	2	0	0	0	0	0	0
unidentified sparrow	2	2	0	0	0	0	2	0	0
unidentified raptor	2	2	0	0	0	0	0	0	1
tree swallow	2	2	0	0	0	0	0	0	0
lesser goldfinch	2	1	0	0	0	0	0	2	0
Cooper's hawk	2	2	0	0	0	0	0	1	0
white-throated sparrow	1	1	0	0	0	0	0	1	0
northern flicker	1	1	0	0	0	0	0	0	0
European starling	1	1	0	0	0	0	0	0	0
American kestrel	1	1	0	0	0	0	0	0	0
Grand Total	434	314	38	35	26	26	40	58	35

Table 5a. Avian species observed by point during Spring point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			8	9	10	11	12	13	14
common raven	103	43	4	0	33	2	0	4	0
California towhee	44	39	4	6	4	2	0	0	1
western scrub-jay	40	38	3	3	5	0	0	0	2
California quail	29	23	0	3	3	0	5	2	3
spotted towhee	23	21	2	1	1	0	0	0	4
turkey vulture	20	17	0	1	3	5	0	0	0
red-tailed hawk	19	15	4	1	2	0	0	0	0
dark-eyed junco	17	13	3	0	2	0	0	0	0
Bewick's wren	15	12	3	4	0	0	0	0	0
black-throated sparrow	14	9	0	0	0	1	0	1	0
California thrasher	13	13	0	0	2	0	0	0	1
rufous-sided towhee	11	7	0	8	0	0	0	0	0
black-chinned sparrow	11	7	0	0	1	0	0	0	4
wrentit	8	7	0	0	2	0	1	2	1
mourning dove	7	4	0	0	1	0	0	0	0
unidentified hummingbird	6	5	0	0	0	0	0	2	1
barn swallow	6	1	0	0	6	0	0	0	0
white-throated swift	5	4	0	1	0	0	0	0	0
white-crowned sparrow	5	3	0	0	0	0	0	0	0
unidentified songbird	5	4	0	2	0	0	0	0	0
unknown bird	5	5	1	0	1	0	2	0	0
rock wren	5	5	0	0	0	0	0	0	0
ash-throated flycatcher	4	2	1	0	0	0	0	0	0
oak titmouse	3	3	2	0	0	0	0	0	0
yellow-rumped warbler	2	1	0	0	0	0	0	0	0
unidentified sparrow	2	2	0	0	0	0	0	0	0
unidentified raptor	2	2	1	0	0	0	0	0	0
tree swallow	2	2	1	0	0	1	0	0	0
lesser goldfinch	2	1	0	0	0	0	0	0	0
Cooper's hawk	2	2	1	0	0	0	0	0	0
white-throated sparrow	1	1	0	0	0	0	0	0	0
northern flicker	1	1	1	0	0	0	0	0	0
European starling	1	1	1	0	0	0	0	0	0
American kestrel	1	1	1	0	0	0	0	0	0
Grand Total	434	314	33	30	66	11	8	11	17

Table 5b. Avian species observed by point during Summer point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			1	2	3	4	5	6	7
western scrub-jay	177	112	3	9	4	11	19	9	13
California towhee	109	71	6	9	4	9	9	10	7
bush-tit	109	26	0	7	7	15	27	7	3
spotted towhee	74	55	2	1	1	3	6	4	6
black-chinned sparrow	72	47	4	0	1	1	1	3	5
California quail	69	39	1	3	3	3	2	6	3
common raven	61	33	4	7	3	0	5	7	2
white-throated swift	53	11	0	0	0	0	0	0	0
black-throated sparrow	45	31	0	2	5	5	3	6	5
ash-throated flycatcher	32	25	2	3	7	5	2	3	2
wrentit	31	24	0	4	0	0	2	0	1
turkey vulture	30	25	3	1	2	3	8	0	4
Bewick's wren	25	19	2	1	1	2	5	1	2
unidentified songbird	22	11	0	1	3	0	4	3	0
red-tailed hawk	22	16	1	1	4	0	1	5	1
unidentified hummingbird	20	15	0	0	1	0	3	0	1
California thrasher	16	13	1	1	0	1	5	1	0
unknown bird	15	11	1	1	2	1	1	3	0
unidentified swallow	13	1	0	0	0	0	13	0	0
western kingbird	11	3	0	0	0	0	0	0	0
rock wren	8	6	0	2	0	1	0	0	0
mourning dove	8	7	1	3	0	0	1	0	1
house wren	8	1	0	0	0	0	0	0	0
Scott's oriole	6	4	0	0	0	0	0	0	0
northern flicker	4	3	0	1	0	0	0	0	0
house finch	4	3	0	0	0	0	0	0	0
cliff swallow	4	1	0	0	0	0	0	0	0
American crow	4	3	0	0	0	0	0	0	0
phainopepla	3	1	0	0	0	0	0	3	0
black-chinned hummingbird	3	3	0	0	0	0	0	0	0
unidentified quail	2	1	0	0	0	0	0	0	0
unidentified finch	2	1	0	0	0	0	0	0	0
oak titmouse	2	1	0	0	0	0	0	0	0
European starling	2	1	0	0	0	0	2	0	0
unidentified woodpecker	1	1	0	0	0	0	0	0	0
northern mockingbird	1	1	0	0	0	1	0	0	0
mountain quail	1	1	0	0	0	0	0	0	0
Grand Total	1069	627	31	57	48	61	119	71	56

Table 5b. Avian species observed by point during Summer point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			8	9	10	11	12	13	14
western scrub-jay	177	112	18	20	18	8	12	16	17
California towhee	109	71	7	10	6	7	6	6	13
bush-tit	109	26	8	13	4	7	3	5	3
spotted towhee	74	55	4	8	7	11	0	8	13
black-chinned sparrow	72	47	2	2	2	11	13	16	11
California quail	69	39	2	20	16	1	4	2	3
common raven	61	33	7	5	1	4	4	5	7
white-throated swift	53	11	0	0	0	5	43	2	3
black-throated sparrow	45	31	1	5	8	1	1	0	3
ash-throated flycatcher	32	25	2	3	1	0	0	1	1
wren-tit	31	24	0	3	0	3	0	11	7
turkey vulture	30	25	3	0	1	2	1	2	0
Bewick's wren	25	19	1	4	2	0	0	0	4
unidentified songbird	22	11	2	5	2	0	1	0	1
red-tailed hawk	22	16	2	1	2	3	0	0	1
unidentified hummingbird	20	15	5	2	0	0	2	4	2
California thrasher	16	13	0	3	0	1	1	0	2
unknown bird	15	11	0	0	0	1	0	5	0
unidentified swallow	13	1	0	0	0	0	0	0	0
western kingbird	11	3	0	0	0	0	8	3	0
rock wren	8	6	0	0	3	0	0	0	2
mourning dove	8	7	1	0	1	0	0	0	0
house wren	8	1	0	0	0	0	0	0	8
Scott's oriole	6	4	0	5	0	0	0	0	1
northern flicker	4	3	0	0	0	0	1	0	2
house finch	4	3	1	2	0	0	0	0	1
cliff swallow	4	1	0	0	0	4	0	0	0
American crow	4	3	4	0	0	0	0	0	0
phainopepla	3	1	0	0	0	0	0	0	0
black-chinned hummingbird	3	3	0	0	0	0	1	1	1
unidentified quail	2	1	0	0	0	0	0	2	0
unidentified finch	2	1	0	0	0	0	0	0	2
oak titmouse	2	1	2	0	0	0	0	0	0
European starling	2	1	0	0	0	0	0	0	0
unidentified woodpecker	1	1	1	0	0	0	0	0	0
northern mockingbird	1	1	0	0	0	0	0	0	0
mountain quail	1	1	1	0	0	0	0	0	0
Grand Total	1069	627	74	111	74	69	101	89	108

Table 5c. Avian species observed by point during Fall point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			1	2	3	4	5	6	7
western scrub-jay	182	127	9	17	6	9	14	26	10
bushtit	167	38	13	39	32	0	9	11	15
house finch	98	45	7	3	16	5	25	7	0
common raven	96	54	14	6	3	4	9	11	3
California towhee	84	63	6	8	1	7	5	7	4
unidentified songbird	65	30	0	0	2	3	2	1	6
California quail	64	41	3	14	2	6	4	14	0
wrentit	34	32	0	1	0	2	5	0	1
Bewick's wren	29	29	1	3	2	3	2	3	1
spotted towhee	24	22	1	0	1	3	2	1	0
white-crowned sparrow	18	12	0	0	0	4	3	0	1
black-throated sparrow	17	12	0	1	1	1	0	0	7
mountain quail	12	11	0	2	0	0	0	0	0
red-tailed hawk	10	10	1	1	0	1	1	0	0
dark-eyed junco	9	5	0	0	0	1	2	0	1
turkey vulture	8	7	0	1	0	1	0	0	3
rock wren	8	7	1	2	3	0	0	0	0
phainopepla	8	3	0	0	0	5	0	3	0
white-throated swift	7	3	0	0	3	0	0	0	0
unidentified hummingbird	7	7	1	1	2	0	0	0	0
unknown bird	7	7	1	0	0	1	1	0	0
California thrasher	6	6	2	0	0	1	1	1	0
Cooper's hawk	5	4	0	0	1	0	1	0	1
ash-throated flycatcher	4	4	0	0	1	0	0	2	0
unidentified raptor	3	3	0	0	0	0	0	0	0
American kestrel	3	3	0	0	0	0	0	0	0
unidentified woodpecker	2	2	0	0	0	0	0	2	0
northern mockingbird	2	2	1	1	0	0	0	0	0
blue grosbeak	2	2	0	0	0	0	1	1	0
western kingbird	1	1	0	0	0	0	0	0	0
unidentified vireo	1	1	0	0	0	0	0	0	0
unidentified swift	1	1	0	0	0	0	0	0	1
orange-crowned warbler	1	1	0	0	0	0	0	0	0
northern harrier	1	1	0	0	0	0	0	0	0
hermit thrush	1	1	0	0	0	0	0	0	0
greater roadrunner	1	1	1	0	0	0	0	0	0
blue-gray gnatcatcher	1	1	0	0	0	0	0	0	0
Grand Total	989	599	62	100	76	57	87	90	54

Table 5c. Avian species observed by point during Fall point count surveys at the Tule Wind Resource Area, 2005.

Species	Number of Birds	Number of Obs.	Points						
			8	9	10	11	12	13	14
western scrub-jay	182	127	14	18	17	14	14	5	9
bushy tit	167	38	6	14	13	7	2	5	1
house finch	98	45	8	16	5	1	1	0	4
common raven	96	54	6	2	10	4	9	11	4
California towhee	84	63	4	9	8	6	5	5	9
unidentified songbird	65	30	4	1	2	17	12	4	11
California quail	64	41	4	3	3	5	3	2	1
wrentit	34	32	2	1	1	5	3	6	7
Bewick's wren	29	29	2	3	0	2	3	2	2
spotted towhee	24	22	0	3	4	3	0	3	3
white-crowned sparrow	18	12	1	0	2	1	1	0	5
black-throated sparrow	17	12	1	1	1	2	0	1	1
mountain quail	12	11	0	0	0	2	2	4	2
red-tailed hawk	10	10	1	1	1	0	0	1	2
dark-eyed junco	9	5	0	3	0	0	2	0	0
turkey vulture	8	7	1	0	0	1	0	0	1
rock wren	8	7	0	0	0	0	0	0	2
phainopepla	8	3	0	0	0	0	0	0	0
white-throated swift	7	3	0	0	0	4	0	0	0
unidentified hummingbird	7	7	0	1	1	0	0	0	1
unknown bird	7	7	3	1	0	0	0	0	0
California thrasher	6	6	0	0	0	0	1	0	0
Cooper's hawk	5	4	0	0	0	0	0	2	0
ash-throated flycatcher	4	4	0	0	0	0	0	1	0
unidentified raptor	3	3	0	0	0	2	0	0	1
American kestrel	3	3	0	0	0	0	1	2	0
unidentified woodpecker	2	2	0	0	0	0	0	0	0
northern mockingbird	2	2	0	0	0	0	0	0	0
blue grosbeak	2	2	0	0	0	0	0	0	0
western kingbird	1	1	0	1	0	0	0	0	0
unidentified vireo	1	1	0	0	0	1	0	0	0
unidentified swift	1	1	0	0	0	0	0	0	0
orange-crowned warbler	1	1	0	0	0	0	0	0	1
northern harrier	1	1	0	0	0	0	1	0	0
hermit thrush	1	1	0	1	0	0	0	0	0
greater roadrunner	1	1	0	0	0	0	0	0	0
blue-gray gnatcatcher	1	1	0	0	0	0	0	1	0
Grand Total	989	599	57	79	68	77	60	55	67

Table 5d. Avian species observed by point during Winter point count surveys at the Tule Wind Resource Area, 2005-2006.

Species	Number of Birds	Number of Obs.	Points						
			1	2	3	4	5	6	7
common raven	164	82	15	9	39	6	8	3	0
western scrub-jay	162	111	1	14	5	13	13	28	11
house finch	155	52	5	4	11	3	4	10	27
California towhee	51	41	3	7	3	3	0	5	2
California quail	44	26	0	3	3	0	0	8	6
wrentit	42	34	0	0	0	0	2	1	0
bushtit	41	11	0	1	5	4	1	2	10
western bluebird	38	6	8	0	5	0	15	0	10
red-tailed hawk	37	31	3	4	5	5	1	2	0
dark-eyed junco	37	15	3	0	0	5	6	3	4
spotted towhee	35	33	0	2	2	0	4	2	2
unidentified songbird	29	13	0	2	0	0	2	14	2
phainopepla	29	26	2	3	0	8	3	1	2
white-crowned sparrow	27	16	6	0	1	5	2	0	1
Bewick's wren	27	25	2	0	1	0	4	1	2
white-winged dove	12	1	12	0	0	0	0	0	0
rock wren	11	9	0	2	4	2	0	1	0
California thrasher	11	8	3	0	2	1	0	1	0
turkey vulture	6	6	0	1	0	1	2	0	0
mountain quail	6	6	0	0	0	0	0	0	0
black-throated sparrow	6	4	0	0	3	1	0	0	0
northern flicker	5	4	0	0	0	0	2	0	0
unidentified raptor	4	2	1	0	0	0	0	0	0
ruby-crowned kinglet	4	3	0	0	0	0	0	0	0
hermit thrush	4	4	0	1	0	0	0	0	0
black-chinned sparrow	4	4	0	0	0	0	0	2	1
loggerhead shrike	3	3	0	0	1	0	0	0	0
American crow	3	2	0	0	0	0	0	0	0
unidentified woodpecker	2	2	0	0	0	0	0	1	0
unknown bird	2	2	0	0	2	0	0	0	0
oak titmouse	2	2	0	0	0	0	0	0	0
Cooper's hawk	2	2	0	0	0	0	1	0	0
unidentified vireo	1	1	0	0	0	0	0	0	0
lesser goldfinch	1	1	0	0	0	0	0	0	0
great egret	1	1	0	0	0	1	0	0	0
Grand Total	1008	589	64	53	92	58	70	85	80

Table 5d. Avian species observed by point during Winter point count surveys at the Tule Wind Resource Area, 2005-2006.

Species	Number of Birds	Number of Obs.	Points						
			8	9	10	11	12	13	14
common raven	164	82	10	4	19	21	10	20	0
western scrub-jay	162	111	18	13	14	10	1	4	17
house finch	155	52	26	5	9	25	3	5	18
California towhee	51	41	1	6	6	5	0	0	10
California quail	44	26	5	1	2	11	4	0	1
wrentit	42	34	3	7	4	12	0	7	6
bushtit	41	11	10	3	3	0	0	0	2
western bluebird	38	6	0	0	0	0	0	0	0
red-tailed hawk	37	31	4	0	2	8	0	1	2
dark-eyed junco	37	15	11	1	1	0	0	2	1
spotted towhee	35	33	3	6	4	4	0	2	4
unidentified songbird	29	13	3	1	1	0	1	0	3
phainopepla	29	26	8	1	0	0	0	1	0
white-crowned sparrow	27	16	1	1	2	4	0	2	2
Bewick's wren	27	25	4	5	2	3	0	1	2
white-winged dove	12	1	0	0	0	0	0	0	0
rock wren	11	9	0	0	0	0	0	0	2
California thrasher	11	8	0	0	0	0	0	0	4
turkey vulture	6	6	0	1	0	0	0	0	1
mountain quail	6	6	0	0	0	2	2	1	1
black-throated sparrow	6	4	0	0	1	0	1	0	0
northern flicker	5	4	1	0	0	1	0	1	0
unidentified raptor	4	2	0	0	0	0	0	0	3
ruby-crowned kinglet	4	3	1	2	0	1	0	0	0
hermit thrush	4	4	0	2	0	0	0	0	1
black-chinned sparrow	4	4	0	0	1	0	0	0	0
loggerhead shrike	3	3	1	1	0	0	0	0	0
American crow	3	2	3	0	0	0	0	0	0
unidentified woodpecker	2	2	1	0	0	0	0	0	0
unknown bird	2	2	0	0	0	0	0	0	0
oak titmouse	2	2	2	0	0	0	0	0	0
Cooper's hawk	2	2	0	0	0	0	1	0	0
unidentified vireo	1	1	0	0	0	0	1	0	0
lesser goldfinch	1	1	1	0	0	0	0	0	0
great egret	1	1	0	0	0	0	0	0	0
Grand Total	1008	589	117	60	71	107	24	47	80

Table 6a. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA) during point count surveys at Tule Wind Resource Area, 2005 -2006.

	Spring				Summer				Fall				Winter				Overall			
	Observations		Individuals		Observations		Individuals		Observations		Individuals		Observations		Individuals		Observations		Individuals	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Non-raptors																				
Above RSA (>150m)	1	1%	5	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%	5	1%
Below RSA (<60m)	54	75%	100	68%	65	83%	118	70%	136	91%	263	88%	128	85%	288	84%	383	66%	769	80%
Within RSA (60m – 150m)	17	24%	41	28%	13	17%	51	30%	13	9%	35	12%	22	15%	55	16%	65	11%	182	19%
Raptors/Vultures/Owls																				
Above RSA (>150m)	1	3%	1	3%	0	0%	0	0%	1	4%	1	4%	0	0%	0	0%	2	0%	2	1%
Below RSA (<60m)	13	42%	15	41%	20	53%	24	49%	16	62%	18	64%	23	58%	25	52%	72	12%	82	51%
Within RSA (60m – 150m)	17	55%	21	57%	18	47%	25	51%	9	35%	9	32%	17	43%	23	48%	61	10%	78	48%

Table 6b. Summary of avian flight heights (includes flying birds only) in relation to the turbine rotor swept area (RSA) during point count surveys at Tule Wind Resource Area, 2005 -2006.

	Spring				Summer				Fall				Winter				Overall			
	Observations		Individuals		Observations		Individuals		Observations		Individuals		Observations		Individuals		Observations		Individuals	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Non-raptors																				
Above RSA (>118.5m)	1	1%	5	3%	0	0%	0	0%	1	1%	1	0%	0	0%	0	0%	2	0%	6	1%
Below RSA (<41.5m)	49	68%	86	59%	59	76%	107	63%	128	86%	242	81%	119	79%	264	77%	355	61%	699	73%
Within RSA (41.5m – 118.5m)	22	31%	55	38%	19	24%	62	37%	20	13%	55	18%	31	21%	79	23%	92	16%	251	26%
Raptors/Vultures/Owls																				
Above RSA (>118.5m)	3	10%	3	8%	0	0%	0	0%	1	4%	1	4%	0	0%	0	0%	4	1%	4	2%
Below RSA (<41.5m)	7	23%	8	22%	9	24%	11	22%	11	42%	12	43%	17	43%	19	40%	44	8%	50	31%
Within RSA (41.5m – 118.5m)	21	68%	26	70%	29	76%	38	78%	14	54%	15	54%	23	58%	29	60%	87	15%	108	67%

Table 7a. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Spring 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	1.24	3.03	92.2	50.0	44.4	5.6
turkey vulture	0.37	0.59	95.0	33.3	66.7	0.0
red-tailed hawk	0.25	0.56	89.5	43.8	50.0	6.3
white-throated swift	0.03	0.15	100.0	80.0	20.0	0.0
unidentified raptor	0.03	0.06	100.0	50.0	50.0	0.0
yellow-rumped warbler	0.00	0.06	100.0	100.0	0.0	0.0
white-throated sparrow	0.00	0.03	100.0	100.0	0.0	0.0
wrentit	0.00	0.24	0.0	0.0	0.0	0.0
western scrub-jay	0.00	1.18	17.5	100.0	0.0	0.0
white-crowned sparrow	0.00	0.15	0.0	0.0	0.0	0.0
unidentified sparrow	0.00	0.06	50.0	100.0	0.0	0.0
unidentified songbird	0.00	0.15	0.0	0.0	0.0	0.0
unidentified hummingbird	0.00	0.18	66.7	100.0	0.0	0.0
unknown bird	0.00	0.15	0.0	0.0	0.0	0.0
tree swallow	0.00	0.06	100.0	100.0	0.0	0.0
spotted towhee	0.00	0.68	8.7	100.0	0.0	0.0
rufous-sided towhee	0.00	0.32	45.5	100.0	0.0	0.0
rock wren	0.00	0.15	20.0	100.0	0.0	0.0
oak titmouse	0.00	0.09	33.3	100.0	0.0	0.0
northern flicker	0.00	0.03	0.0	0.0	0.0	0.0
mourning dove	0.00	0.21	28.6	100.0	0.0	0.0
lesser goldfinch	0.00	0.06	100.0	100.0	0.0	0.0
European starling	0.00	0.03	0.0	0.0	0.0	0.0
dark-eyed junco	0.00	0.50	29.4	100.0	0.0	0.0
Cooper's hawk	0.00	0.06	50.0	100.0	0.0	0.0
California thrasher	0.00	0.38	0.0	0.0	0.0	0.0

Table 7a. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Spring 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
California quail	0.00	0.85	0.0	0.0	0.0	0.0
California towhee	0.00	1.29	11.4	100.0	0.0	0.0
black-throated sparrow	0.00	0.41	14.3	100.0	0.0	0.0
Bewick's wren	0.00	0.44	0.0	0.0	0.0	0.0
black-chinned sparrow	0.00	0.32	36.4	100.0	0.0	0.0
barn swallow	0.00	0.18	100.0	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.12	0.0	0.0	0.0	0.0
American kestrel	0.00	0.03	0.0	0.0	0.0	0.0

Table 7b. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Summer 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
white-throated swift	0.54	0.76	100.0	28.6	71.4	0.0
common raven	0.38	0.87	67.2	35.0	65.0	0.0
turkey vulture	0.22	0.43	100.0	48.3	51.7	0.0
red-tailed hawk	0.14	0.31	90.9	50.0	50.0	0.0
wrentit	0.00	0.44	0.0	0.0	0.0	0.0
western scrub-jay	0.00	2.53	3.4	100.0	0.0	0.0
western kingbird	0.00	0.16	0.0	0.0	0.0	0.0
unidentified woodpecker	0.00	0.01	0.0	0.0	0.0	0.0
unidentified swallow	0.00	0.19	100.0	100.0	0.0	0.0
unidentified quail	0.00	0.03	0.0	0.0	0.0	0.0
unidentified songbird	0.00	0.31	72.7	100.0	0.0	0.0
unidentified hummingbird	0.00	0.29	75.0	100.0	0.0	0.0
unidentified finch	0.00	0.03	100.0	100.0	0.0	0.0
unknown bird	0.00	0.21	13.3	100.0	0.0	0.0
spotted towhee	0.00	1.06	4.1	100.0	0.0	0.0
Scott's oriole	0.00	0.09	0.0	0.0	0.0	0.0
rock wren	0.00	0.11	0.0	0.0	0.0	0.0
phainopepla	0.00	0.04	0.0	0.0	0.0	0.0
oak titmouse	0.00	0.03	0.0	0.0	0.0	0.0
northern mockingbird	0.00	0.01	0.0	0.0	0.0	0.0
northern flicker	0.00	0.06	0.0	0.0	0.0	0.0
mountain quail	0.00	0.01	0.0	0.0	0.0	0.0
mourning dove	0.00	0.11	100.0	100.0	0.0	0.0
house wren	0.00	0.11	0.0	0.0	0.0	0.0
house finch	0.00	0.06	100.0	100.0	0.0	0.0
European starling	0.00	0.03	100.0	100.0	0.0	0.0

Table 7b. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Summer 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
cliff swallow	0.00	0.06	100.0	100.0	0.0	0.0
California thrasher	0.00	0.23	6.3	100.0	0.0	0.0
California quail	0.00	0.99	0.0	0.0	0.0	0.0
California towhee	0.00	1.56	5.5	100.0	0.0	0.0
bushtit	0.00	1.56	8.3	100.0	0.0	0.0
black-throated sparrow	0.00	0.64	4.4	100.0	0.0	0.0
Bewick's wren	0.00	0.36	0.0	0.0	0.0	0.0
black-chinned sparrow	0.00	1.03	0.0	0.0	0.0	0.0
black-chinned hummingbird	0.00	0.04	33.3	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.46	6.3	100.0	0.0	0.0
American crow	0.00	0.06	0.0	0.0	0.0	0.0

Table 7c. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Fall 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	0.37	1.37	84.4	67.9	32.1	0.0
red-tailed hawk	0.09	0.14	100.0	30.0	60.0	10.0
house finch	0.07	1.40	89.8	94.3	5.7	0.0
white-throated swift	0.04	0.10	100.0	57.1	42.9	0.0
turkey vulture	0.03	0.11	100.0	75.0	25.0	0.0
northern harrier	0.01	0.01	100.0	0.0	100.0	0.0
unidentified songbird	0.01	0.93	76.9	98.0	2.0	0.0
wrentit	0.00	0.49	0.0	0.0	0.0	0.0
western scrub-jay	0.00	2.60	13.2	100.0	0.0	0.0
western kingbird	0.00	0.01	100.0	100.0	0.0	0.0
white-crowned sparrow	0.00	0.26	0.0	0.0	0.0	0.0
unidentified woodpecker	0.00	0.03	0.0	0.0	0.0	0.0
unidentified vireo	0.00	0.01	0.0	0.0	0.0	0.0
unidentified swift	0.00	0.01	100.0	100.0	0.0	0.0
unidentified raptor	0.00	0.04	33.3	100.0	0.0	0.0
unidentified hummingbird	0.00	0.10	85.7	100.0	0.0	0.0
unknown bird	0.00	0.10	0.0	0.0	0.0	0.0
spotted towhee	0.00	0.34	0.0	0.0	0.0	0.0
rock wren	0.00	0.11	0.0	0.0	0.0	0.0
phainopepla	0.00	0.11	37.5	0.0	0.0	0.0
orange-crowned warbler	0.00	0.01	0.0	0.0	0.0	0.0
northern mockingbird	0.00	0.03	0.0	0.0	0.0	0.0
mountain quail	0.00	0.17	0.0	0.0	0.0	0.0
hermit thrush	0.00	0.01	0.0	0.0	0.0	0.0
greater roadrunner	0.00	0.01	0.0	0.0	0.0	0.0
dark-eyed junco	0.00	0.13	44.4	100.0	0.0	0.0

Table 7c. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Fall 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
Cooper's hawk	0.00	0.07	100.0	100.0	0.0	0.0
California thrasher	0.00	0.09	0.0	0.0	0.0	0.0
California quail	0.00	0.91	0.0	0.0	0.0	0.0
California towhee	0.00	1.20	7.1	100.0	0.0	0.0
bushtit	0.00	2.39	13.8	100.0	0.0	0.0
black-throated sparrow	0.00	0.24	17.6	100.0	0.0	0.0
blue grosbeak	0.00	0.03	50.0	100.0	0.0	0.0
blue-gray gnatcatcher	0.00	0.01	100.0	100.0	0.0	0.0
Bewick's wren	0.00	0.41	6.9	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.06	0.0	0.0	0.0	0.0
American kestrel	0.00	0.04	100.0	100.0	0.0	0.0

Table 7d. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Winter 2005-2006.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	0.31	1.30	94.5	74.8	25.2	0.0
red-tailed hawk	0.15	0.29	97.3	47.2	52.8	0.0
western bluebird	0.12	0.30	42.1	6.3	93.8	0.0
unidentified raptor	0.03	0.03	100.0	0.0	100.0	0.0
phainopepla	0.01	0.23	20.7	83.3	16.7	0.0
white-winged dove	0.00	0.10	100.0	100.0	0.0	0.0
wrentit	0.00	0.33	0.0	0.0	0.0	0.0
western scrub-jay	0.00	1.29	10.5	100.0	0.0	0.0
white-crowned sparrow	0.00	0.21	29.6	100.0	0.0	0.0
unidentified woodpecker	0.00	0.02	0.0	0.0	0.0	0.0
unidentified vireo	0.00	0.01	0.0	0.0	0.0	0.0
unidentified songbird	0.00	0.23	79.3	100.0	0.0	0.0
unknown bird	0.00	0.02	0.0	0.0	0.0	0.0
turkey vulture	0.00	0.05	100.0	100.0	0.0	0.0
spotted towhee	0.00	0.28	2.9	100.0	0.0	0.0
rock wren	0.00	0.09	0.0	0.0	0.0	0.0
ruby-crowned kinglet	0.00	0.03	50.0	100.0	0.0	0.0
oak titmouse	0.00	0.02	0.0	0.0	0.0	0.0
northern flicker	0.00	0.04	60.0	100.0	0.0	0.0
mountain quail	0.00	0.05	0.0	0.0	0.0	0.0
loggerhead shrike	0.00	0.02	0.0	0.0	0.0	0.0
lesser goldfinch	0.00	0.01	100.0	100.0	0.0	0.0
house finch	0.00	1.23	46.5	100.0	0.0	0.0
hermit thrush	0.00	0.03	0.0	0.0	0.0	0.0
great egret	0.00	0.01	100.0	100.0	0.0	0.0
dark-eyed junco	0.00	0.29	45.9	100.0	0.0	0.0

Table 7d. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Winter 2005-2006.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
Cooper's hawk	0.00	0.02	100.0	100.0	0.0	0.0
California thrasher	0.00	0.09	0.0	0.0	0.0	0.0
California quail	0.00	0.35	0.0	0.0	0.0	0.0
California towhee	0.00	0.40	7.8	100.0	0.0	0.0
bushy tit	0.00	0.33	12.2	100.0	0.0	0.0
black-throated sparrow	0.00	0.05	0.0	0.0	0.0	0.0
Bewick's wren	0.00	0.21	3.7	100.0	0.0	0.0
black-chinned sparrow	0.00	0.03	0.0	0.0	0.0	0.0
American crow	0.00	0.02	0.0	0.0	0.0	0.0

Table 7e. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Spring 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	1.46	3.03	92.2	42.2	52.2	5.6
turkey vulture	0.47	0.59	95.0	16.7	83.3	0.0
red-tailed hawk	0.28	0.56	89.5	25.0	56.3	18.8
barn swallow	0.18	0.18	100.0	0.0	100.0	0.0
white-throated swift	0.03	0.15	100.0	80.0	20.0	0.0
white-throated sparrow	0.03	0.03	100.0	0.0	100.0	0.0
unidentified raptor	0.03	0.06	100.0	50.0	50.0	0.0
Cooper's hawk	0.03	0.06	50.0	0.0	100.0	0.0
yellow-rumped warbler	0.00	0.06	100.0	100.0	0.0	0.0
wrentit	0.00	0.24	0.0	0.0	0.0	0.0
western scrub-jay	0.00	1.18	17.5	100.0	0.0	0.0
white-crowned sparrow	0.00	0.15	0.0	0.0	0.0	0.0
unidentified sparrow	0.00	0.06	50.0	100.0	0.0	0.0
unidentified songbird	0.00	0.15	0.0	0.0	0.0	0.0
unidentified hummingbird	0.00	0.18	66.7	100.0	0.0	0.0
unknown bird	0.00	0.15	0.0	0.0	0.0	0.0
tree swallow	0.00	0.06	100.0	100.0	0.0	0.0
spotted towhee	0.00	0.68	8.7	100.0	0.0	0.0
rufous-sided towhee	0.00	0.32	45.5	100.0	0.0	0.0
rock wren	0.00	0.15	20.0	100.0	0.0	0.0
oak titmouse	0.00	0.09	33.3	100.0	0.0	0.0
northern flicker	0.00	0.03	0.0	0.0	0.0	0.0
mourning dove	0.00	0.21	28.6	100.0	0.0	0.0
lesser goldfinch	0.00	0.06	100.0	100.0	0.0	0.0
European starling	0.00	0.03	0.0	0.0	0.0	0.0
dark-eyed junco	0.00	0.50	29.4	100.0	0.0	0.0

Table 7e. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Spring 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
California thrasher	0.00	0.38	0.0	0.0	0.0	0.0
California quail	0.00	0.85	0.0	0.0	0.0	0.0
California towhee	0.00	1.29	11.4	100.0	0.0	0.0
black-throated sparrow	0.00	0.41	14.3	100.0	0.0	0.0
Bewick's wren	0.00	0.44	0.0	0.0	0.0	0.0
black-chinned sparrow	0.00	0.32	36.4	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.12	0.0	0.0	0.0	0.0
American kestrel	0.00	0.03	0.0	0.0	0.0	0.0

Table 7f. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Summer 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
white-throated swift	0.63	0.76	100.0	17.1	82.9	0.0
common raven	0.42	0.87	67.2	27.5	72.5	0.0
turkey vulture	0.35	0.43	100.0	17.2	82.8	0.0
red-tailed hawk	0.20	0.31	90.9	30.0	70.0	0.0
cliff swallow	0.06	0.06	100.0	0.0	100.0	0.0
wrentit	0.00	0.44	0.0	0.0	0.0	0.0
western scrub-jay	0.00	2.53	3.4	100.0	0.0	0.0
western kingbird	0.00	0.16	0.0	0.0	0.0	0.0
unidentified woodpecker	0.00	0.01	0.0	0.0	0.0	0.0
unidentified swallow	0.00	0.19	100.0	100.0	0.0	0.0
unidentified quail	0.00	0.03	0.0	0.0	0.0	0.0
unidentified songbird	0.00	0.31	72.7	100.0	0.0	0.0
unidentified hummingbird	0.00	0.29	75.0	100.0	0.0	0.0
unidentified finch	0.00	0.03	100.0	100.0	0.0	0.0
unknown bird	0.00	0.21	13.3	100.0	0.0	0.0
spotted towhee	0.00	1.06	4.1	100.0	0.0	0.0
Scott's oriole	0.00	0.09	0.0	0.0	0.0	0.0
rock wren	0.00	0.11	0.0	0.0	0.0	0.0
phainopepla	0.00	0.04	0.0	0.0	0.0	0.0
oak titmouse	0.00	0.03	0.0	0.0	0.0	0.0
northern mockingbird	0.00	0.01	0.0	0.0	0.0	0.0
northern flicker	0.00	0.06	0.0	0.0	0.0	0.0
mountain quail	0.00	0.01	0.0	0.0	0.0	0.0
mourning dove	0.00	0.11	100.0	100.0	0.0	0.0
house wren	0.00	0.11	0.0	0.0	0.0	0.0
house finch	0.00	0.06	100.0	100.0	0.0	0.0

Table 7f. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Summer 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
European starling	0.00	0.03	100.0	100.0	0.0	0.0
California thrasher	0.00	0.23	6.3	100.0	0.0	0.0
California quail	0.00	0.99	0.0	0.0	0.0	0.0
California towhee	0.00	1.56	5.5	100.0	0.0	0.0
bushtit	0.00	1.56	8.3	100.0	0.0	0.0
black-throated sparrow	0.00	0.64	4.4	100.0	0.0	0.0
Bewick's wren	0.00	0.36	0.0	0.0	0.0	0.0
black-chinned sparrow	0.00	1.03	0.0	0.0	0.0	0.0
black-chinned hummingbird	0.00	0.04	33.3	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.46	6.3	100.0	0.0	0.0
American crow	0.00	0.06	0.0	0.0	0.0	0.0

Table 7g. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Fall 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	0.49	1.37	84.4	56.8	42.0	1.2
house finch	0.24	1.40	89.8	80.7	19.3	0.0
red-tailed hawk	0.13	0.14	100.0	0.0	90.0	10.0
turkey vulture	0.07	0.11	100.0	37.5	62.5	0.0
white-throated swift	0.04	0.10	100.0	57.1	42.9	0.0
northern harrier	0.01	0.01	100.0	0.0	100.0	0.0
unidentified songbird	0.01	0.93	76.9	98.0	2.0	0.0
wrentit	0.00	0.49	0.0	0.0	0.0	0.0
western scrub-jay	0.00	2.60	13.2	100.0	0.0	0.0
western kingbird	0.00	0.01	100.0	100.0	0.0	0.0
white-crowned sparrow	0.00	0.26	0.0	0.0	0.0	0.0
unidentified woodpecker	0.00	0.03	0.0	0.0	0.0	0.0
unidentified vireo	0.00	0.01	0.0	0.0	0.0	0.0
unidentified swift	0.00	0.01	100.0	100.0	0.0	0.0
unidentified raptor	0.00	0.04	33.3	100.0	0.0	0.0
unidentified hummingbird	0.00	0.10	85.7	100.0	0.0	0.0
unknown bird	0.00	0.10	0.0	0.0	0.0	0.0
spotted towhee	0.00	0.34	0.0	0.0	0.0	0.0
rock wren	0.00	0.11	0.0	0.0	0.0	0.0
phainopepla	0.00	0.11	37.5	0.0	0.0	0.0
orange-crowned warbler	0.00	0.01	0.0	0.0	0.0	0.0
northern mockingbird	0.00	0.03	0.0	0.0	0.0	0.0
mountain quail	0.00	0.17	0.0	0.0	0.0	0.0
hermit thrush	0.00	0.01	0.0	0.0	0.0	0.0
greater roadrunner	0.00	0.01	0.0	0.0	0.0	0.0
dark-eyed junco	0.00	0.13	44.4	100.0	0.0	0.0

Table 7g. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Fall 2005.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
Cooper's hawk	0.00	0.07	100.0	100.0	0.0	0.0
California thrasher	0.00	0.09	0.0	0.0	0.0	0.0
California quail	0.00	0.91	0.0	0.0	0.0	0.0
California towhee	0.00	1.20	7.1	100.0	0.0	0.0
bushtit	0.00	2.39	13.8	100.0	0.0	0.0
black-throated sparrow	0.00	0.24	17.6	100.0	0.0	0.0
blue grosbeak	0.00	0.03	50.0	100.0	0.0	0.0
blue-gray gnatcatcher	0.00	0.01	100.0	100.0	0.0	0.0
Bewick's wren	0.00	0.41	6.9	100.0	0.0	0.0
ash-throated flycatcher	0.00	0.06	0.0	0.0	0.0	0.0
American kestrel	0.00	0.04	100.0	100.0	0.0	0.0

Table 7h. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Winter 2005-2006.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
common raven	0.48	1.30	94.5	61.3	38.7	0.0
red-tailed hawk	0.17	0.29	97.3	38.9	61.1	0.0
western bluebird	0.12	0.30	42.1	6.3	93.8	0.0
unidentified raptor	0.03	0.03	100.0	0.0	100.0	0.0
turkey vulture	0.02	0.05	100.0	66.7	33.3	0.0
northern flicker	0.02	0.04	60.0	33.3	66.7	0.0
great egret	0.01	0.01	100.0	0.0	100.0	0.0
Cooper's hawk	0.01	0.02	100.0	50.0	50.0	0.0
phainopepla	0.01	0.23	20.7	83.3	16.7	0.0
white-winged dove	0.00	0.10	100.0	100.0	0.0	0.0
wrentit	0.00	0.33	0.0	0.0	0.0	0.0
western scrub-jay	0.00	1.29	10.5	100.0	0.0	0.0
white-crowned sparrow	0.00	0.21	29.6	100.0	0.0	0.0
unidentified woodpecker	0.00	0.02	0.0	0.0	0.0	0.0
unidentified vireo	0.00	0.01	0.0	0.0	0.0	0.0
unidentified songbird	0.00	0.23	79.3	100.0	0.0	0.0
unknown bird	0.00	0.02	0.0	0.0	0.0	0.0
spotted towhee	0.00	0.28	2.9	100.0	0.0	0.0
rock wren	0.00	0.09	0.0	0.0	0.0	0.0
ruby-crowned kinglet	0.00	0.03	50.0	100.0	0.0	0.0
oak titmouse	0.00	0.02	0.0	0.0	0.0	0.0
mountain quail	0.00	0.05	0.0	0.0	0.0	0.0
loggerhead shrike	0.00	0.02	0.0	0.0	0.0	0.0
lesser goldfinch	0.00	0.01	100.0	100.0	0.0	0.0
house finch	0.00	1.23	46.5	100.0	0.0	0.0
hermit thrush	0.00	0.03	0.0	0.0	0.0	0.0

Table 7h. Avian flight height characteristics in relation to the turbine rotor swept area (RSA) at the Tule Wind Resource Area, during Winter 2005-2006.

Species	Encounter Rate	Mean Use # birds/ 30 min.	Percent Flying	Percent Below RSA	Percent Within RSA	Percent Above RSA
dark-eyed junco	0.00	0.29	45.9	100.0	0.0	0.0
California thrasher	0.00	0.09	0.0	0.0	0.0	0.0
California quail	0.00	0.35	0.0	0.0	0.0	0.0
California towhee	0.00	0.40	7.8	100.0	0.0	0.0
bushtit	0.00	0.33	12.2	100.0	0.0	0.0
black-throated sparrow	0.00	0.05	0.0	0.0	0.0	0.0
Bewick's wren	0.00	0.21	3.7	100.0	0.0	0.0
black-chinned sparrow	0.00	0.03	0.0	0.0	0.0	0.0
American crow	0.00	0.02	0.0	0.0	0.0	0.0

Table 8a. Flight directions of birds observed during Spring point count surveys at the Tule Wind Resource Area, 2005.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
common raven	93	35	19.4	4.3	9.7	7.5	25.8	12.9	7.5	11.8	0.0
turkey vulture	19	16	21.1	0.0	0.0	5.3	31.6	0.0	36.8	5.3	0.0
red-tailed hawk	17	14	5.9	17.6	17.6	11.8	17.6	11.8	17.6	0.0	0.0
western scrub-jay	6	5	0.0	0.0	16.7	0.0	0.0	33.3	16.7	33.3	0.0
barn swallow	6	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
white-throated swift	5	4	20.0	0.0	0.0	0.0	20.0	20.0	0.0	40.0	0.0
rufous-sided towhee	5	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
dark-eyed junco	5	4	0.0	0.0	0.0	20.0	40.0	0.0	0.0	40.0	0.0
California towhee	5	4	60.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0
unidentified hummingbird	4	4	25.0	0.0	0.0	25.0	0.0	0.0	0.0	50.0	0.0
black-chinned sparrow	4	2	25.0	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
yellow-rumped warbler	2	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
unidentified raptor	2	2	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0
tree swallow	2	2	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0
spotted towhee	2	2	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0
mourning dove	2	2	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
lesser goldfinch	2	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
black-throated sparrow	2	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
white-throated sparrow	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
unidentified sparrow	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
rock wren	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
oak titmouse	1	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0

Table 8a. Flight directions of birds observed during Spring point count surveys at the Tule Wind Resource Area, 2005.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
Cooper's hawk	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Grand Total	188	106	16.0	5.9	11.2	8.0	19.7	11.2	16.0	11.7	0.0

Table 8b. Flight directions of birds observed during Summer point count surveys at the Tule Wind Resource Area, 2005.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
common raven	37	20	35.1	16.2	8.1	10.8	2.7	18.9	2.7	0.0	5.4
white-throated swift	35	6	0.0	0.0	5.7	0.0	65.7	0.0	0.0	8.6	20.0
turkey vulture	29	24	20.7	6.9	10.3	20.7	20.7	10.3	3.4	3.4	3.4
red-tailed hawk	20	14	15.0	0.0	5.0	20.0	5.0	25.0	5.0	0.0	25.0
unidentified songbird	16	7	0.0	0.0	31.3	0.0	12.5	25.0	31.3	0.0	0.0
unidentified swallow	13	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
unidentified hummingbird	10	8	20.0	0.0	0.0	0.0	30.0	20.0	10.0	20.0	0.0
bush-tit	9	2	0.0	0.0	55.6	0.0	0.0	0.0	44.4	0.0	0.0
mourning dove	8	7	0.0	12.5	12.5	0.0	50.0	25.0	0.0	0.0	0.0
western scrub-jay	6	5	16.7	0.0	16.7	0.0	0.0	0.0	66.7	0.0	0.0
California towhee	6	5	16.7	16.7	0.0	0.0	0.0	33.3	16.7	16.7	0.0
house finch	4	3	25.0	50.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0
cliff swallow	4	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
spotted towhee	3	2	66.7	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0
unidentified finch	2	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
unknown bird	2	2	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0
European starling	2	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
black-throated sparrow	2	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
ash-throated flycatcher	2	2	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0
California thrasher	1	1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
black-chinned hummingbird	1	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Grand Total	212	114	21.7	6.1	10.4	7.1	19.8	12.7	11.8	3.3	7.1

Table 8c. Flight directions of birds observed during Fall point count surveys at the Tule Wind Resource Area, 2005.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
house finch	88	42	5.7	2.3	12.5	2.3	15.9	23.9	35.2	2.3	0.0
common raven	80	40	41.3	13.8	6.3	7.5	1.3	1.3	6.3	1.3	21.3
unidentified songbird	50	23	10.0	12.0	4.0	16.0	18.0	20.0	16.0	4.0	0.0
western scrub-jay	24	14	4.2	4.2	20.8	12.5	8.3	16.7	25.0	8.3	0.0
bush tit	23	5	0.0	0.0	52.2	0.0	0.0	8.7	17.4	21.7	0.0
red-tailed hawk	10	10	20.0	10.0	10.0	10.0	20.0	10.0	0.0	0.0	20.0
turkey vulture	8	7	0.0	0.0	0.0	12.5	0.0	37.5	12.5	25.0	12.5
white-throated swift	7	3	0.0	0.0	42.9	0.0	0.0	0.0	14.3	0.0	42.9
California towhee	6	5	16.7	0.0	33.3	0.0	0.0	0.0	33.3	16.7	0.0
unidentified hummingbird	5	5	20.0	0.0	40.0	0.0	20.0	0.0	20.0	0.0	0.0
Cooper's hawk	5	4	0.0	20.0	0.0	0.0	40.0	40.0	0.0	0.0	0.0
dark-eyed junco	4	3	25.0	0.0	50.0	0.0	0.0	0.0	25.0	0.0	0.0
black-throated sparrow	3	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Bewick's wren	2	2	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
American kestrel	2	2	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
western kingbird	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
unidentified swift	1	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
unidentified raptor	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
northern harrier	1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
blue grosbeak	1	1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
blue-gray gnatcatcher	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Grand Total	323	172	15.8	6.8	14.2	6.8	10.5	13.9	18.6	5.6	7.7

Table 8d. Flight directions of birds observed during Winter point count surveys at the Tule Wind Resource Area, 2005-2006.

Species	Number Flying	Number of Observations	Percentage of Flights in Various Flight Directions								
			N	NE	E	SE	S	SW	W	NW	Variable
common raven	154	73	22.7	3.2	2.6	2.6	22.1	12.3	17.5	3.9	12.3
house finch	72	27	18.1	2.8	5.6	0.0	9.7	18.1	20.8	25.0	0.0
red-tailed hawk	31	26	16.1	0.0	3.2	0.0	16.1	16.1	29.0	0.0	12.9
unidentified songbird	22	8	18.2	9.1	13.6	0.0	13.6	45.5	0.0	0.0	0.0
western scrub-jay	17	11	5.9	11.8	11.8	5.9	41.2	0.0	23.5	0.0	0.0
dark-eyed junco	17	6	5.9	0.0	82.4	0.0	5.9	0.0	5.9	0.0	0.0
western bluebird	16	2	0.0	0.0	6.3	0.0	0.0	93.8	0.0	0.0	0.0
white-winged dove	12	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
white-crowned sparrow	7	2	14.3	0.0	0.0	0.0	0.0	0.0	85.7	0.0	0.0
turkey vulture	6	6	50.0	0.0	0.0	0.0	33.3	16.7	0.0	0.0	0.0
phainopepla	6	5	16.7	0.0	0.0	33.3	33.3	0.0	16.7	0.0	0.0
bushtit	5	3	40.0	0.0	40.0	0.0	20.0	0.0	0.0	0.0	0.0
unidentified raptor	4	2	0.0	0.0	25.0	0.0	75.0	0.0	0.0	0.0	0.0
California towhee	4	3	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
northern flicker	3	2	33.3	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0
ruby-crowned kinglet	2	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Cooper's hawk	2	2	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	0.0
spotted towhee	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
lesser goldfinch	1	1	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
great egret	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Bewick's wren	1	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Grand Total	384	184	17.4	3.4	8.9	1.8	18.0	17.2	20.3	6.3	6.0

Table 9. Incidental observations of birds during point counts at the Tule Wind Resource Area, 2005 -2006.

Species	Spring	Summer	Fall	Winter
	Number of individuals	Number of individuals	Number of individuals	Number of individuals
American kestrel	2	0	1	1
ash-throated flycatcher	7	2	0	0
black-chinned sparrow	3	7	0	0
Bewick's wren	2	9	1	0
blue-gray gnatcatcher	0	1	0	0
black-headed grosbeak	2	1	0	0
black phoebe	1	1	0	0
black-throated sparrow	5	11	0	0
bushy tit	0	89	35	0
Cassin's kingbird	0	1	0	0
California towhee	12	40	2	0
California quail	25	125	9	0
California thrasher	10	6	0	0
Cooper's hawk	0	1	3	2
common raven	11	37	84	0
dark-eyed junco	0	0	0	1
European starling	1	2	0	0
great horned owl	0	1	0	0
greater roadrunner	2	2	1	0
house finch	1	6	0	0
hooded oriole	0	1	0	0
Lawrence's goldfinch	0	30	0	0
lesser nighthawk	0	0	1	0
loggerhead shrike	0	0	1	0
mourning dove	2	3	0	0
northern flicker	1	1	2	0
northern harrier	0	0	0	2

Table 9. Incidental observations of birds during point counts at the Tule Wind Resource Area, 2005 -2006.

Species	Spring	Summer	Fall	Winter
	Number of individuals	Number of individuals	Number of individuals	Number of individuals
northern mockingbird	0	3	0	0
oak titmouse	1	0	1	0
phainopepla	0	3	2	0
red-tailed hawk	10	15	11	1
rufous hummingbird	0	1	0	0
Say's phoebe	0	0	0	1
spotted towhee	19	8	4	0
sharp-shinned hawk	0	0	0	1
turkey vulture	1	6	0	0
unknown bird	0	1	0	0
unidentified hummingbird	2	5	0	0
unidentified raptor	2	0	0	0
unidentified swallow	1	0	0	0
white-crowned sparrow	1	0	12	0
western bluebird	0	0	12	19
western kingbird	0	4	0	0
western scrub-jay	28	99	12	0
white-eyed vireo	0	0	1	0
wrentit	2	0	1	0
white-tailed kite	0	0	1	0
white-throated swift	1	45	0	0
yellow warbler	0	1	0	0
Grand Total	155	568	197	28

Table 10. Comparison of raptor and other bird use per 20-minute survey with other studies of western wind projects using the similar survey methodology.

Project Site	Mean Use by Raptors					Mean Use by Other Birds					Duration of Survey (minutes)	Plot Radius	Reference	Correction factor ^a
	Spr	Sum	Fall	Win	Ann	Spr	Sum	Fall	Win	Ann				
High Winds WRA, Montezuma Hills, CA					6.72					474 ^b	20	800m	Kerlinger et al. (2005)	
Altamont Pass WEC, CA	3.8	3.0	4.6	3.0		N/A	N/A	N/A	N/A		10	800m	Orloff and Flannery (1992)	x 2
Cotterel Mountain, ID	1.69	1.89	1.49	0.18		14.26	11.22	7.65	8.86		20	800m	USDI, BLM (2005)	
Klickitat County PEIS study area, WA	0.96	1.12	N/A	N/A		14.39	12.36	N/A	N/A		20	800m	Johnson et al. (2006)	
Tule WRA, CA	0.86	0.50	0.29	0.26	0.39	7.68	9.74	9.18	5.10	7.43	30	800m	This report	x 0.67
Windy Point, WA	0.79	N/A	N/A	0.77		16.41	N/A	N/A	13.55		20	800m	Johnson et al. (2006)	
Foote Creek WEC, WY	0.49	0.755	0.965	0.205		N/A	N/A	N/A	N/A		40	800m	Johnson et al. (2000)	x 0.5
Stateline Wind Project EIS WRA	0.59	0.4	0.25	0.42		7.09	5.47	29.34	9.04		20	800m	URS and West (2001)	
Stateline, OR/WA	0.28	0.26	0.16	0.02	0.22					23.08	10	800m	Erickson et al. (2004)	x 2
Buffalo Ridge RA	0.68	0.52	0.69	0.44		N/A	N/A	N/A	N/A		20	800m	Erickson et al. (2002)	
Buffalo Ridge Phase I	0.65	0.43	0.76	0.13		N/A	N/A	N/A	N/A		20	800m	Erickson et al. (2002)	
Buffalo Ridge Phase II	0.84	0.69	0.83	0.1		N/A	N/A	N/A	N/A		20	800m	Erickson et al. (2002)	
Buffalo Ridge Phase III	0.64	0.54	0.85	0.18		N/A	N/A	N/A	N/A		20	800m	Erickson et al. (2002)	
Klondike, OR Phase I	0.47	0.39	0.38	0.56		N/A	N/A	N/A	N/A		20	800m	Erickson et al. (2002)	
Klondike, OR Phase III				0.134					34.9		20	800m	Mabee et al. (2005)	
Wild Horse, WA	0.456	0.456	0.308	0.141		5.782	5.782	4.02	3.591		30	800m	Erickson et al. (2003)	x 0.67
Condon, OR	0.466	0.319	0.2	0.386		6.331	3.405	7.249	7.328		15	600m	URS Corporation et al. (2001)	x 1.33
Biglow Canyon, OR RA	0.369	0.335	0.114	0.248		6.76	5.085	6.713	17.07		30	800m	West (2005)	x 0.67
Biglow Canyon, OR project area	0.308	0.389	0.188	0.315		10.17	3.343	7.182	11.66		30	800m	West (2005)	x 0.67
Maiden, WA	0.295	0.348	0.623	0.154		4.576	4.71	11.93	8.576		30	800m	Young et al. (2002)	x 0.67

^a Multiplication factor to standardize mean use to birds/20 min.

^b Mostly unidentified blackbirds.