SWCA®
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

# Draft Final Pre-construction Avian Survey Report for the Proposed Crescent Peak Wind Energy Facility

Prepared for

**Crescent Peak Renewables, LLC**

Prepared by

**SWCA Environmental Consultants**

December 2017, Revision 1.0 July 2018

# FINAL PRE-CONSTRUCTION AVIAN SURVEY REPORT FOR THE PROPOSED CRESCENT PEAK WIND ENERGY FACILITY

Prepared for

**Crescent Peak Renewables, LLC**
5538A La Jolla Boulevard
La Jolla, California 92037

Prepared by

**SWCA Environmental Consultants**
7210 Placid Street
Las Vegas, Nevada 89119
702-248-3880
www.swca.com

SWCA Project No. 26955

December 2017
Revision 1.0 July 2018

# CONTENTS



## Figures

## Tables

# 1.0 INTRODUCTION

Crescent Peak Renewables, LLC (CPR), a wholly owned subsidiary of Eolus North America, Inc., proposes to construct, operate, and maintain a 175- to 500-megawatt (MW) wind generation facility on a portion of 28,785 acres in the Crescent Peak Wind Project area (Figure 1). The Crescent Peak Wind Project (herein called the Project) consists of the construction, operation, and decommissioning of wind turbine generators (WTGs) and associated facilities necessary to successfully generate up to 500 MW on four sites (designated as Sites NV-1, NV-2, NV-3, and NV-4) constructed in two phases, located west of the town of Searchlight in Clark County, Nevada (see Figure 1).

The Project would be located mainly on Bureau of Land Management (BLM) lands, and would be administered from the BLM's Las Vegas Field Office. The proposed Project includes:

- up to 248 WTGs that would be erected on tubular monopole towers supported on concrete foundations. Each WTG would have a maximum generating capacity between 1.5 and 4.5 MW (expected range of 2.1 to 4.2 MW);
- for each WTG, there would be an adjacent or nacelle-mounted step-up transformer that would increase the voltage of the electricity from 570–1,000 volts to approximately 34.5 kilovolts (kV);
- an approximately 34.5-kV electric collection system, primarily located underground;
- access roads;
- operations and maintenance (O&M) facility;
- up to four on-site electrical collection substations owned and operated by CPR and associated control facilities to increase the voltage of the electricity to a level between 66 kV and 500 kV for transmission, and one Project interconnection substation (Project Substation) owned and operated by CPR or a local utility for interconnection with the area transmission grid;
- an overhead transmission line to transmit the 66 kV to 500 kV electricity from the collection substations to the Project Substation at an interconnection point with the existing Valley Electric Association 230-kV transmission system, approximately 22 miles north-northeast of the Project;
- staging areas, laydown yards, and batch plant areas; and
- up to 20 permanent meteorological (MET) towers.

Pre-construction bird and bat studies are generally required for wind energy projects on BLM-administered lands in Nevada. These studies must satisfy the requirements of BLM's *Final Wind Energy Programmatic Environmental Impact Statement* (PEIS), which recommends that "scientifically rigorous avian and bat use surveys shall be conducted" prior to construction (BLM 2005: pg. 2–12). The U.S. Fish and Wildlife (USFWS) also requests that pre-construction surveys be done to evaluate the impacts to sensitive wildlife and their habitat (USFWS 2012). Special emphasis is placed on eagles, for which specific protocols are recommended to adequately examine their use within a given project area (Pagel et al. 2010; USFWS 2013).

The methods described herein were designed to address the USFWS Land-Based Wind Energy Guidelines (USFWS 2012) Tier 3 and the USFWS Eagle Conservation Plan Guidance (ECPG) (USFWS 2013) Stage 2 pre-construction study objective, which is to assess potential use and risk of a project on avian species, including eagles. Methods follow a project-specific pre-construction wildlife study plan initially developed in 2011, incorporating recommendations from Nevada and California Offices of the BLM, the Nevada Department of Wildlife (NDOW), the National Park Service (NPS), and the USFWS. The study plan was revised in 2016 to incorporate new guidance provided by BLM-Nevada and NDOW.

Pre-construction avian field surveys began on November 3, 2015, and were completed on October 26, 2017.

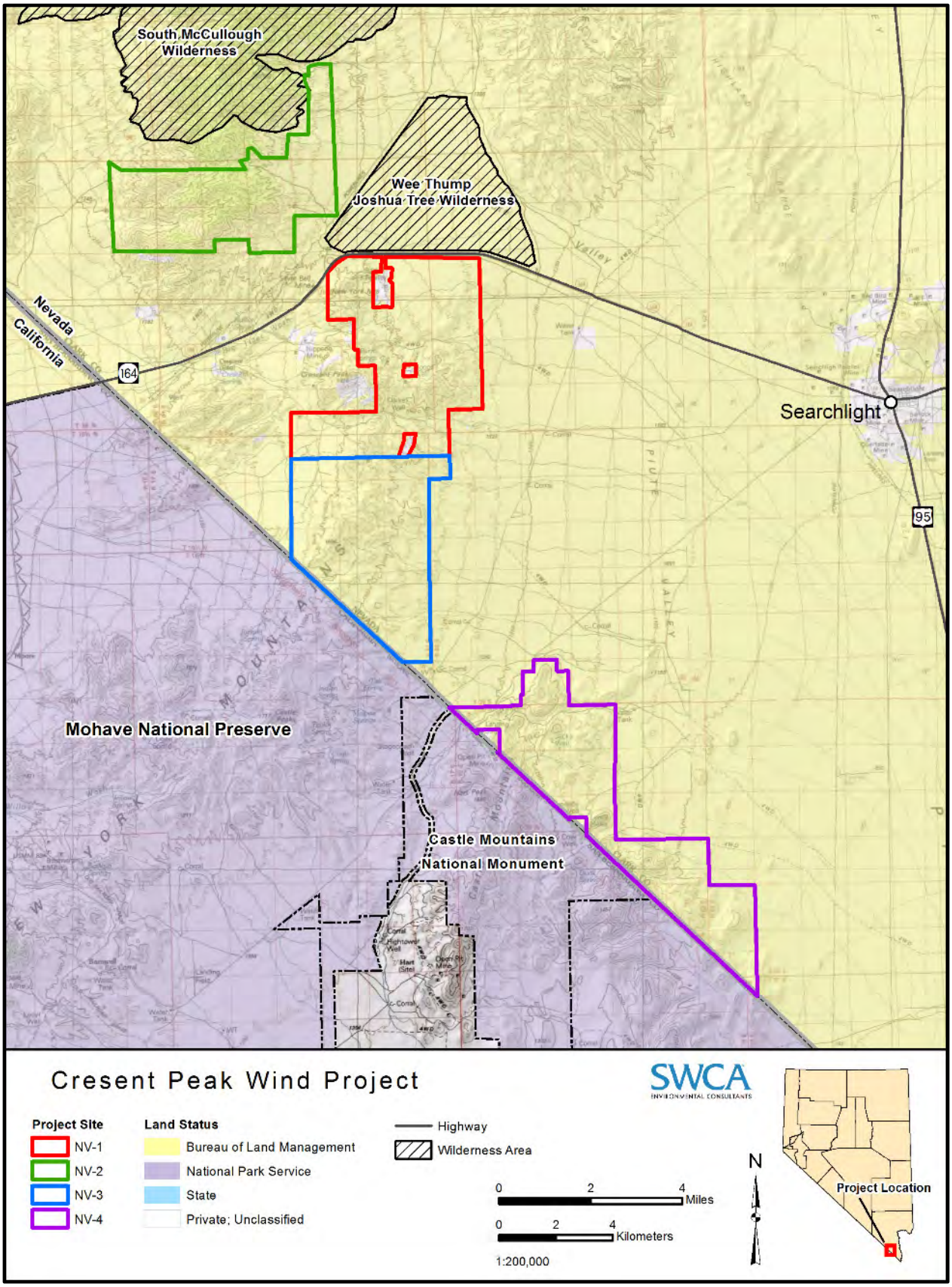


**Figure 1.** Project location.

This report includes methods and results for the avian surveys and presents findings of the following pre-construction surveys:

- eagle use counts
- large-bird use counts
- small-bird use counts
- eagle prey base surveys
- raptor nest inventory and occupancy

Avian use and prey base surveys were conducted for the entirety of the two-year survey period. Raptor nest inventory and occupancy surveys commenced on December 22, 2016, and were completed on March 20, 2017. An initial round of aerial nest surveys within a 10-mile radius of the proposed Project was completed in 2011. This data set was used as a baseline for additional re-visit surveys completed to identify 2016/2017 nest use and occupancy. This report mainly addresses avian use within the Project area, as this is the primary quantifiable measure for predicting risk at wind energy facilities (USFWS 2013). Maps of eagle flight paths (recommended in the ECPG) are also included.

## 1.1 Environmental Setting

Terrain within the project area is varied, ranging from rolling hills, rock outcrops, and ridges found at higher elevations (New York Mountains, Castle Mountains, McCullough Range) to valleys and ephemeral washes at lower elevations (Piute Valley). Vegetation within the Project area is predominantly Mojave Mid-Elevation Mixed Desert Scrub, which is dominated by blackbrush (*Coleogyne ramosissima*); smaller areas of Sonora-Mojave Creosotebush-White Bursage Desert Scrub are found along the eastern and western peripheries (USGS 2004). There are moderate levels of disturbance throughout the Project area. Dirt roads are present throughout the study area, including some inactive mining. The roads appear to have been used or being used primarily for recreational off-road travel and access to operational and exploratory mines. The Colorado River lies approximately 20 miles (32 kilometers [km]) east of the Project.

### *1.1.1 Site NV-1*

Site NV-1 is in the northern portion of the New York Mountains. Site NV-1 is bounded by State Route 164 to the north and northwest, the Wee Thump Joshua Tree Wilderness Area to the north, the Piute-Eldorado Valley Area of Critical Environmental Concern (ACEC) to the northwest and east, Site NV-3 to the south, and BLM-administered lands and small tracts of private land to the west. Site NV-1 is characterized by steep rocky slopes, dry canyons, and ephemeral washes typical of the New York Mountains.

### *1.1.2 Site NV-2*

Site NV-2 is located in the southern terminus of the McCullough Mountain Range and is bounded by the South McCullough Mountain Wilderness Area to the north, the Piute-Eldorado Valley ACEC to the east, south, and west, and the Wee Thump Joshua Tree Wilderness Area farther to the east. Topography within Site NV-2 consists of steep ridges and canyons, typical of the McCullough Range, in the upper elevations and ephemeral washes and foothills in the lower, more easterly portions of the site.

### *1.1.3 Site NV-3*

Site NV-3 is in the northern portion of the New York Mountains immediately south of Site NV-1, which delineates its northern boundary. Site NV-3 is bounded by the Piute-Eldorado Valley ACEC to the east, the Nevada–California state boundary and the Mojave National Preserve to the southwest, and BLM-administered land to the west. The north/south-trending New York Mountains rise to

5,600 feet (1,707 meters) above mean sea level at the center of the site, and numerous foothills, arroyos, and sloping bajadas are found in the site's lower elevations.

### *1.1.4 Site NV-4*

Site NV-4 is in the northern and eastern portions of the Castle Mountains and is bounded by the Piute-Eldorado Valley ACEC to the north and east and the Nevada–California state boundary and the Castle Mountains National Monument to the south and west. Topography within the site consists of steep, rocky slopes, rock outcrops, and alluvial fans typical of the Castle Mountains.

# 2.0 METHODS

## 2.1 Eagle Use Surveys

Eagle use surveys provide valuable data in understanding eagle use across a site and result in eagle-minute data that can be used to complete the USFWS Bayesian model for estimating eagle fatalities described in the ECPG (USFWS 2013) and Eagle Rule (USFWS 2016). Eagle-minutes are used to estimate eagle exposure, or the amount of time eagles spend flying in the rotor-swept area (RSA), which, for this Project, is expected to be between 35 and 182 m aboveground height (AGH) and is where fatalities could occur. For the purposes of determining eagle-minutes, the risk zone is considered below 200 m, and individuals at risk are considered only those that are flying in that area (USFWS 2013).

From November 3, 2015, to October 26, 2017, 1-hour eagle use counts were conducted at twenty-six 800-m radius plots twice per month (Figure 2). As recommended by the ECPG (USWFS 2013), the plots covered at least 30% of the Turbine Area, which is defined as the area within 1 km of proposed WTG locations. Survey plots were distributed to represent the site spatially and capture variable habitat conditions. Use count locations were determined using geographic information system (GIS) software; locations were micro-sited during an initial reconnaissance visit. When proposed WTG locations were updated in late April 2016, plots were moved (labeled "New" in Figure 2) to reflect the new WTG array and maintain the USFWS 30% coverage recommendation for the new Turbine Area. Survey locations labeled "Old" were abandoned, while survey point locations labeled "Year-round" were surveyed for the entire duration of avian surveys (see Figure 2). Figure 2 represents the most up-to-date Turbine Area, which, subsequently, has reincorporated portions of the originally planned Turbine Area. The final eagle use count locations (labeled "Year-Round" and "New" in Figure 2) covered 12,730 acres within the 41,803-acre 1-km buffer on the final proposed WTG array, or 30.5% of this most up-to-date Turbine Area. Surveys were conducted evenly across all seasons. In accordance with the ECPG, winter was defined as mid-December to mid-March, spring was mid-March to mid-June, summer was mid-June to mid-September, and fall was mid-September to mid-December.

Observers used the most efficient, logical route to move among survey points, changing the starting point with the beginning of each survey cycle, such that each point was surveyed during a range of daylight hours, as recommended by the ECPG and Eagle Rule (USFWS 2013, 2016). For each eagle use count survey plot, observers were positioned at the survey plot center point and recorded the total number of minutes of eagle flight activity within the 800- by 200–m cylinder.

Surveyors alternated between using binoculars and the unaided eye to detect close and distant eagles within the survey plot. For each eagle detected, the height (in meters AGH) and the distance from the point-count station to the eagle were estimated, denoting marked changes in behavior, flight height, and/or direction as a unique observation on the data form. The time for each observation was recorded to the nearest second. The total sample time for each eagle was rounded to the nearest 1-minute interval, recording the number of birds in flight within the plot in each interval (such that one eagle in flight in the cylinder in a given minute

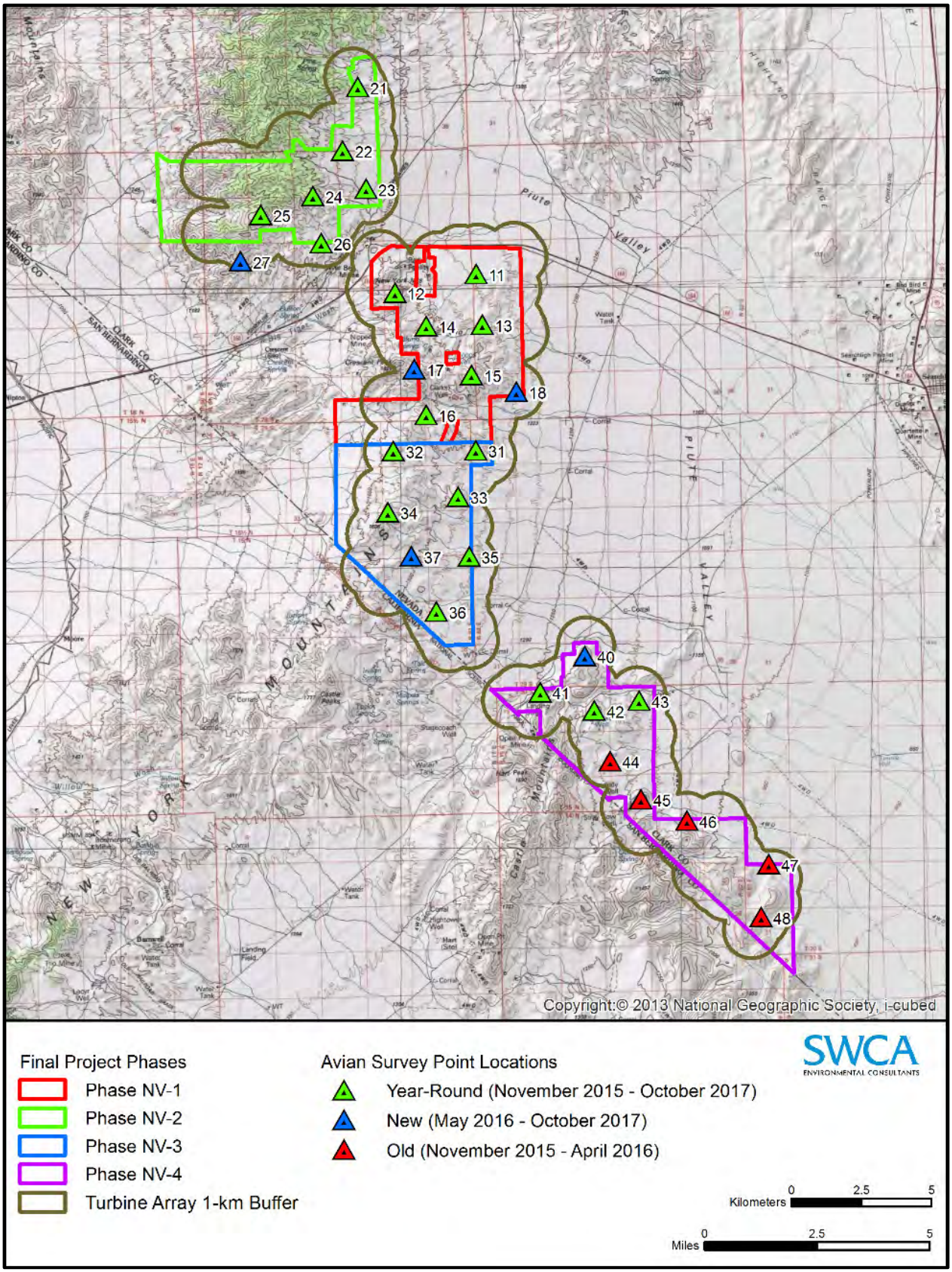


**Figure 2.** Avian use survey plots.

equals 1 exposure minute; two eagles in flight in the cylinder in a given minute [or the same eagle in flight continuing into a second 1-minute interval] equals 2 exposure minutes, and so on). Flight information for eagles observed outside the survey cylinder were recorded, but these observations were not included in the eagle-minute calculations. All eagle flight paths, those inside and outside of the cylinder, were mapped to better understand eagle spatial use of the Project area.

During each observation, behavior was recorded as either soaring, flapping/gliding, kiting-hovering, stooping or diving at prey, stooping or diving in an agonistic context with other eagles or other bird species, undulating/territorial flight, or perched (USFWS 2013). Bearing and flight direction were recorded for the duration of eagle observations, and eagle flight paths were mapped in the field. A compilation of eagle flight paths is presented in this report.

In accordance with the ECPG and Eagle Rule, perched eagles were excluded from the summary of eagle-minutes (USFWS 2013, 2016). The age of each eagle was categorized as juvenile (first year), subadult (second to fourth year), adult, or unknown. Weather data were also recorded, including wind direction and speed, cloud cover, precipitation, and temperature. Surveys were conducted under all weather conditions, except when visibility was less than 800 m horizontally or 200 m vertically (e.g., heavy rain, blinding snow, or fog).

In addition to eagle-minutes data, eagle use was defined as the number of instances eagles were recorded in a specified time period. The mean frequency of eagle observation (i.e., the mean number of eagle observations per 20-minute survey [1-hr survey broken down into three independent 20-minute surveys to match industry standard]) was calculated and presented as tabular data to illustrate use relative to other large-bird assemblages (see Section 3.2).

## 2.2 Avian Use Point Counts—Large and Small Birds

Large-bird use counts (LBUCs) and small-bird use counts (SBUCs) were conducted at each of the plots established for eagle use point-count surveys over the same time period. LBUCs were conducted twice monthly within the same 800-m search radius used for the eagle use point-count surveys. SBUCs were conducted once per month within an 80-m search radius. Surveys were conducted evenly across all seasons. For LBUCs, seasons followed those defined for eagle use counts. However, because SBUCs were only conducted once per month, seasons were defined differently than for eagles and LBUCs: winter was December through February, spring was March through May, summer was June through August, and fall was September through November. Delineating the seasons in this manner allowed for an even survey effort across all seasons.

LBUCs were conducted during the first 20 minutes of each eagle use survey. Large-bird species included diurnal raptors (including eagles), vultures, ravens, water birds (e.g., pelicans, cranes, etc.), and nighthawks. To assess the potential that the Project area provides a migratory corridor for eagles, during the spring and fall migration periods of the second year of LBUCs (mid-March through mid-May 2017, and September through October 2017, respectively), raptor migration counts were conducted for the entire 1-hour eagle use count. During migration counts, migratory raptor species moving through the survey cylinder in a northerly (spring) or southerly (fall) direction were recorded. Raptor migration data were compiled and presented as raptor/turkey vulture passage rates (number of raptors/turkey vultures migrating past a given point in a specified time) for the Project area. Variation in survey start times ensured that surveys were conducted across all daylight hours for each survey location. At each SBUC plot, observers recorded all small birds detected by sight or sound during a 10-minute survey period immediately prior to LBUCs and eagle use surveys.

Large- and small-bird use was defined as the number of instances a bird species was recorded in a specified time period. Raptor/turkey vulture passage rates were reported as migrants per hour of

observation. Survey data collected at each LBUC and SBUC point also included the following: species, distance, flight direction, AGH, and behavior. Weather data were recorded, including wind direction and speed, cloud cover, precipitation, and temperature.

The mean frequency of species observation (i.e., the mean number of times a species is observed per 20-minute [LBUC] and 10-minute [SBUC] survey) was calculated and presented as tabular data to illustrate relative use within large- and small-bird assemblages. The frequency of species observation per survey and across seasons was summarized (i.e., N surveys, mean number of observations per survey) for large birds and small birds.

## 2.3 Golden Eagle and Other Raptor Nest Surveys

In accordance with the ECPG, SWCA identified eagle and other raptor nests within 10 miles of the project. The guidance for eagle nest surveys described in the ECPG recommends at least 2 surveys be completed in a season, with the first survey completed during courtship (December–February) and the second during the mid-incubation period (March) (USFWS 2013). Due to desert bighorn sheep (*Ovis canadensis nelsoni*) lambing concerns, the BLM, through coordination with NDOW, provided new guidance in southern Nevada, which included a combination of aerial and ground-based surveys. As directed by the BLM, the first of these surveys is an early nesting season aerial occupancy survey conducted in late December, prior to the bighorn sheep lambing season (early January–mid-April). The second survey is a follow-up ground-based occupancy survey conducted from February through March.

### *2.3.1 Early Nesting Season Aerial Occupancy Survey*

Prior to the aerial survey, an SWCA eagle ecologist reviewed aerial imagery and topographic backgrounds in ArcGIS and identified 213,695 acres (865 $km^2$) of potential golden eagle (*Aquila chrysaetos*) nesting habitat (e.g., rugged terrain, rock faces, and transmission towers) within the 10-mile buffer survey area (Figure 3). This included 32,044 acres (130-$km^2$) within the four Project sites, 114,513 acres (463 $km^2$) within the Nevada side of the 10-mile buffer survey, and 67,138 acres (272 $km^2$) within the California side of the 10-mile survey.

The aerial survey was conducted from December 22, 2016, to January 3, 2017 and covered the entire 10-mile buffer survey area. Every attempt was made to complete the survey in December to avoid the bighorn sheep lambing season, but multiple weather days precluded survey completion before January 1, 2017. To avoid disturbance to bighorn sheep, only low elevation areas deemed least likely to provide habitat for bighorn sheep were flown during the only survey day in January; no bighorn sheep were observed during this day of survey. Helicopter surveys were led by an avian ecologist with more than 3 years of flight experience surveying for eagle nests (as recommended by USFWS). An AS350 (A-Star) helicopter allowed for close approach to accurately locate nests and determine nest contents. While in the air, surveyors identified and surveyed raptor nesting habitat, focusing on habitat identified during the ArcGIS desktop evaluation. Areas identified as suitable habitat in the desktop analysis that did not exhibit appropriate characteristics once observed from the air were avoided or not surveyed intensively. In addition to the habitat layer, surveyors were also guided by previously known nest locations recorded during 2011 raptor nest surveys. Surveys were sensitive to disturbance at nests and conducted during favorable weather conditions (in accordance with the methods of Pagel et al. [2010] and Driscoll [2010]).

Surveyors revisited eagle and possible eagle nests found during 2011 raptor nest surveys and recorded all newly found eagle and possible eagle nests. Non-eagle raptor nests were recorded opportunistically during the survey. For each nest, surveyors recorded the date and time of observation, a nest identification number, species (or "undetermined species" if unknown), nest substrate (e.g., cliff, transmission tower), and nest condition/contents. Undetermined species nests included any nests that were too deteriorated to confidently identify to species or exhibited qualities characteristic of more than one species; for these nests,

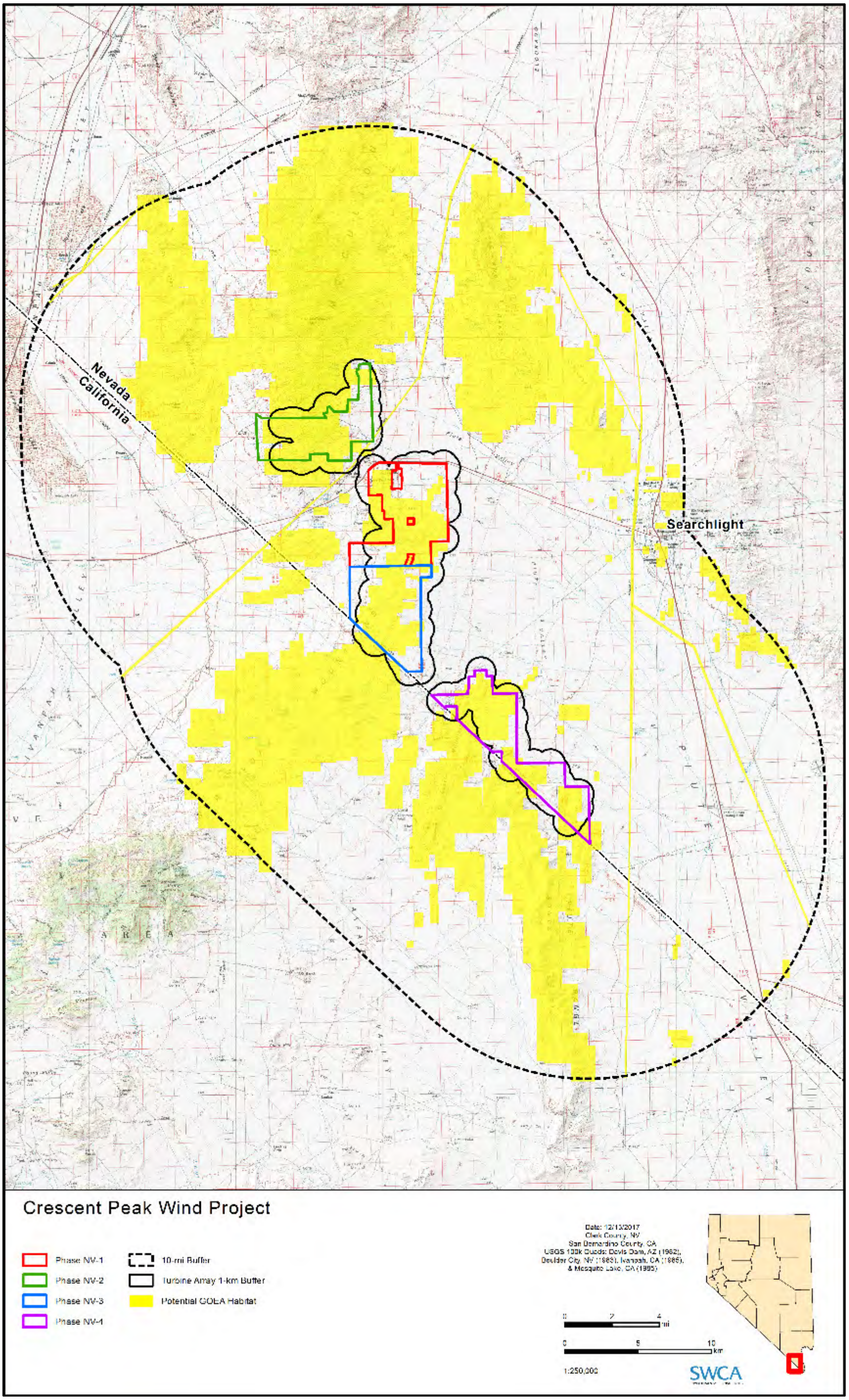


**Figure 3.** Potential golden eagle (GOEA) habitat surveyed during 2016/2017 golden eagle nest surveys.

surveyors recorded an informed opinion regarding the species or species group most likely to use the nest based on nest structure and placement. The following nest conditions/contents will be recorded: 1) sticks-intact, 2) sticks-deteriorating, 3) greenery/ornamentation, 4) adult in incubation/brooding posture, or 5) number of egg(s)/nestling(s). All nests were photo-documented with a digital single-lens reflex (SLR) camera with high-zoom (150–500 millimeter) lens and lens stabilizer to effectively document nest condition and contents.

Surveyors focused on determination of golden eagle nest occupancy, which was defined as a nest in which one or more of the following occurred: 1) young were raised, 2) eggs were laid, 3) an adult was observed sitting, presumably in incubation or brooding posture, in the nest, 4) two adults were observed perched on or near the nest, 5) an adult and a bird in immature plumage were observed at or near the nest, if mating behavior was observed (e.g., display flight, copulation), and/or 6) recent repairs (e.g., fresh greenery, sticks with fresh breaks), mute, or feathers were visible at or near the nest (Driscoll 2010; Postupalsky 1974; Steenhof and Newton 2007; USFWS 2013). An "active" nest is one in which an egg or eggs were laid and/or young were raised (Driscoll 2010; Postupalsky 1974; USFWS 2013).

### *2.3.2 Follow-up Ground-based Occupancy Surveys*

On January 23, 2017, the Crescent Peak Renewables team (Bullen Law LLC, Eolus North America, Inc., Crescent Peak Development LLC, Platt Environmental, and SWCA) met with representatives from BLM and NDOW to discuss survey results and the protocol for follow-up ground-based occupancy surveys. From these discussions, the following key points to the protocol were agreed upon:

- Identifying the number of occupied territories when describing the local area eagle population should be a high priority.
- This included nests designated as golden eagle and potential golden eagle (undetermined: resembles *Buteo* spp. or golden eagle).
- Nests that were categorized as deteriorating did not need to be revisited during follow-up ground-based surveys.
- Nests within 1.2 miles (2.0 km) and on the same cliff or within the same topographic feature (i.e., canyon, valley, etc.) as an occupied nest did not need to be revisited during follow-up ground-based surveys.
- Nests within 0.5 mile (0.8 km) of an occupied nest, independent of location and topographic feature, did not need to be revisited during the follow-up ground-based survey.
- Biologists would revisit cliff walls where golden eagles were observed (but no occupied nest was observed) to search for newly-built nests and determine occupancy status, where possible.

The goal of the follow-up ground-based surveys was to identify golden eagle territories that were not occupied during the early season occupancy survey and to identify possible golden eagle territories where the species designation could not be determined during that early-season occupancy survey. Furthermore, it was reiterated that the point of the follow-up ground-based survey was not to revisit golden eagle territories where territory occupancy was already verified during the initial aerial survey.

The follow-up ground-based golden eagle nest occupancy surveys were conducted from February 10, 2017, to March 20, 2017, targeting all nests of likely or possible golden eagle origin for which occupancy was not confirmed in that territory during the December aerial survey. The ground-based survey protocol, as described by Pagel et al. (2010), requires a 4-hour survey at each targeted nest or nest cluster; survey time may have been reduced if observations yielded eagle presence and evidence of nest occupancy/activity prior to completing the 4-hour recommended survey period. Of the 183 golden eagle or possible golden eagle nests observed, eight were recorded as occupied and 24 were designated as deteriorating. Additionally, 54 golden eagle and possible golden eagle nests were within 1.2 miles (2.0 km) of occupied nests and on the same cliff

or within the same topographic feature as an occupied nest or were within 0.5 mile (0.8 km) of an occupied nest, independent of location or aspect. After eliminating deteriorating nests and nests within already occupied territories, approximately 97 nests required a follow-up ground-based survey. Additionally, two areas with golden eagle observations but no nests present required a revisit under this protocol, and two nests that contained greenery and were identified as "undetermined: resembles *Buteo* spp." during the December 2016 survey were monitored, for a total of 101 nest or golden eagle observation locations.

When possible, multiple nests or nest clusters were monitored from a single observation point, and some nests were confirmed occupied or unoccupied prior to the end of the 4-hour survey period. Additionally, nests that were confirmed active negated the need to monitor other nests within that same active territory.

### *2.3.3 Golden Eagle Half-Mean Inter-Nest Distance*

One-half the inter-nest distance has been commonly used in raptor studies as a coarse approximation for the radius of a territory (Soutullo et al. 2006; Thorstrom 2001; Wichmann et al. 2003). USFWS (2013) recommends calculating this metric for the study area nesting population to delineate specific golden eagle territories and associated breeding and juvenile eagles that may be affected by a specific project. To calculate the study area nesting population half-mean inter-nest distance, we measured the distance from one territory's occupied nest to the nearest neighboring territory's occupied nest.

This method requires careful definition of an "occupied nesting territory." Distinguishing occupied nesting territories within a study area nesting population can be problematic, especially when relying on observation of recent nest repairs alone. For example, within the same golden eagle territory, alternate nests can be spaced >3 miles (4.8 km) apart (McGahan 1968), whereas nearest neighbors can be spaced 0.5 to 10.0 miles (0.8–16.0 km) apart (Kochert 1972). Golden eagle nesting density varies widely and is influenced by prey availability, nesting substrate, and other features of the landscape (Kochert et al. 2002; Watson 2010). In the western United States, nearest-neighbor distances between pairs are rarely <0.6 mile (1.0 km), ranging between 0.5 to 9.9 miles (0.8–16.0 km) (Kochert 1972; Kochert et al. 2002); distances between adjacent occupied nests in one study in Wyoming ranged from 1.9 to 5.1 miles (3.1–8.2 km) (Phillips et al. 1984). Based on a minimum separation of 1.6 miles between adjacent active nests in the local breeding population (see Section 3.3), we distinguished territories by ensuring that occupied nests were generally separated by at least 1.5 miles (2.4 km).

## 2.4 Golden Eagle Prey Surveys

To determine relative abundance and seasonal variability in potential prey available for eagles, all medium-sized mammals (e.g., black-tailed jackrabbit [*Lepus californicus*], desert cottontail [*Sylvilagus audubonii*], etc.) and birds (e.g., chukar [*Alectoris chukar*], Gambel's quail [*Callipepla gambelii*], etc.) were counted within an 80-m survey radius at all avian use survey locations. Each 10-minute count was completed immediately upon arrival at a survey location, prior to conducting SBUCs and LBUC/eagle use surveys. The index of abundance for eagle prey at each survey plot (mean number of individuals observed per plot) was compared across seasons to determine potential seasonal use patterns and identify relatively high-use areas, if any.

# 3.0 RESULTS

## 3.1 Eagle Use Surveys

From November 3, 2015, to October 26, 2017, 1,248 eagle use counts (48 survey sessions) were conducted (312 in winter, 312 in spring, 312 in summer, and 312 in fall), for a total of 74,880 observer-minutes. Forty-eight surveys were conducted at the majority of survey plots. Only 12 surveys were conducted at

Plots 44–48 (prior to an update to the proposed WTG locations, labeled “Old” in Figure 4), and 36 surveys were conducted at Plots 17, 18, 27, 37, and 40 (following the update, labeled “New” in Figure 4).

Two bald eagles (*Haliaeetus leucocephalus*) were recorded incidentally while traveling to or between survey points; one juvenile bald eagle was observed migrating south over Site NV-3 and one adult bald eagle was observed migrating north over Site NV-3. However, no bald eagles were recorded during eagle use counts. Golden eagles were observed within the sampling point-count cylinders for a total of 115 eagle-minutes (see Figure 4, Table 1), or 0.15% of the total observation time. Additionally, on three occasions, golden eagles were observed perched within the eagle use survey cylinders for a total of 14 minutes.

Additional observations were recorded outside the cylinder, but are not disclosed here for consistency within this project analysis and for comparing these numbers with other projects’ data. Golden eagle use was highest during the winter (fifteen target birds observed for a total of 58 eagle-minutes) and lowest during the spring (five target birds observed for 11 eagle-minutes). The majority of the eagle-minutes were recorded at Plot 41 (37 minutes; 32.2% of total eagle-minutes). Plot 41 is approximately 2.9 km (1.8 miles) north-northeast of the Hart Peak golden eagle territory core nesting area, and two of the birds recorded at Plot 41 were adults performing undulating/territorial flights (see Table 1), presumably members of the Hart Peak breeding pair. Just over half of the total eagle-minutes were recorded in Site NV-4 (66 minutes; 57.4% of total eagle-minutes). Fourteen eagle-minutes were recorded each at Site NV-1 and Site NV-2 (12.2%), and twenty-one eagle-minutes were recorded at Site NV-3 (18.3%). To illustrate possible areas of concentration, eagle flight paths are displayed in Figures 5–9.

## 3.2 Avian Use Point-Counts—Large and Small Birds

From November 3, 2015, to October 26, 2017, 26 point-count plots established for large- and small-bird use studies (see Figure 2) were sampled bi-monthly for LBUCs (48 survey sessions) and monthly for SBUCs (24 survey sessions), resulting in a total of 1,248 LBUCs and 624 SBUCs.

Fifteen large-bird species (Table 2) and 49 small-bird species (Table 3) were recorded over the entire sampling period. Raptor/turkey vulture use by season (for species with use greater than 0.05 observations /20-minute survey) is depicted in Figure 10; small-bird use by season (for species with use greater than 0.05 observations/10-minute survey) is depicted in Figure 11.

Although golden eagles were recorded during eagle use surveys, the main objective of those surveys is to record eagle-minutes (see Section 3.1), as described in the ECPG (USFWS 2013). To compare golden eagle use with other species use at the Project and with golden eagle use at other wind energy facilities, only observations recorded during the LBUCs (first 20 minutes of eagle use counts) were included in the use calculations presented below.

When golden eagle use is calculated across the entire 1-hour eagle use count (separating the hour into three distinct and independent 20-minute survey periods), eagle use equals 0.014 observations/20-minute survey, almost identical to use calculated during the first 20-minute LBUC (0.015 observations/20-minute survey) (see Table 3).

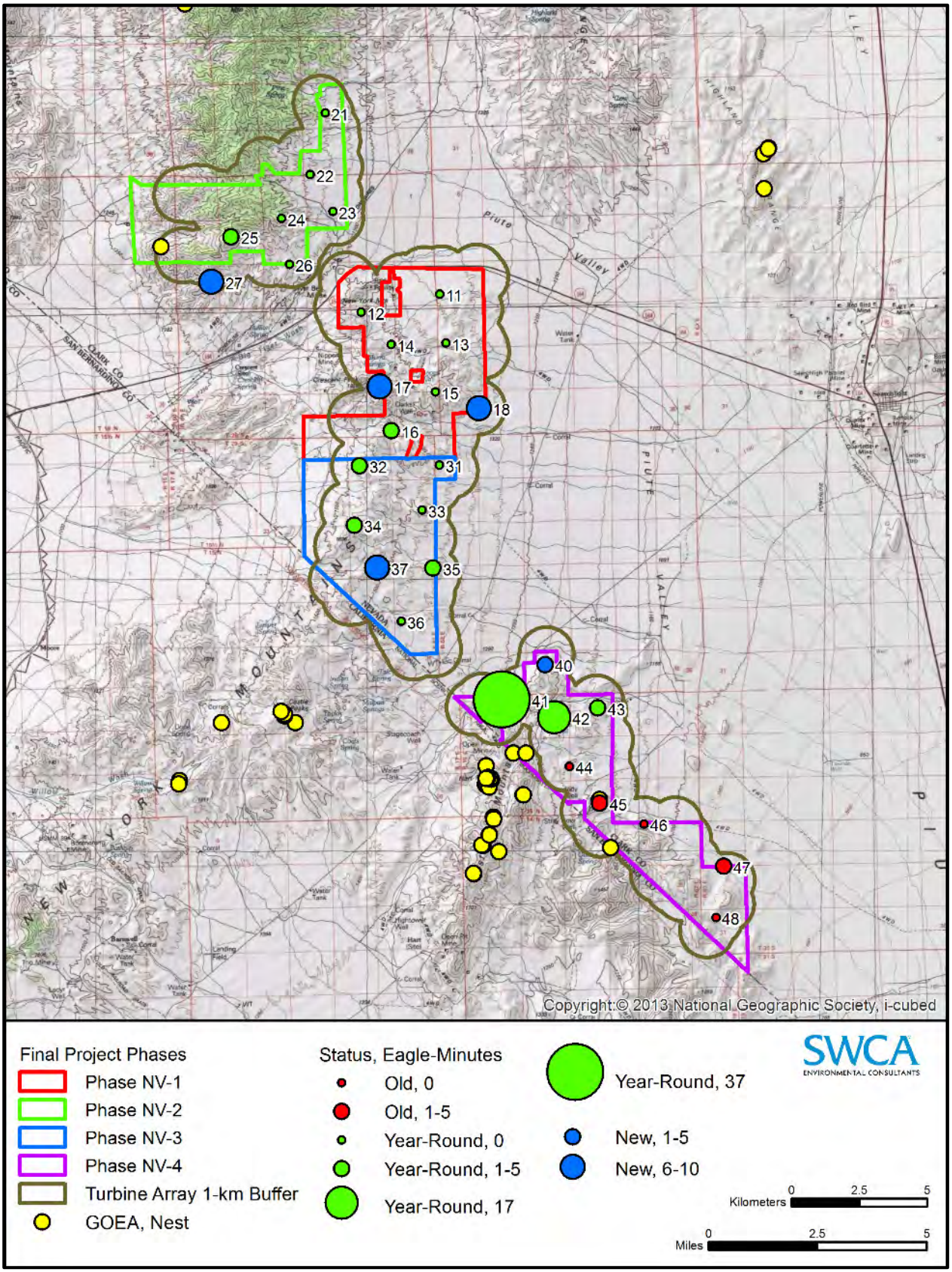


**Figure 4.** Golden eagle-minutes recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for the proposed Crescent Peak Wind Project.

**Table 1.** Details of Golden Eagle-Minutes Recorded at the Proposed Crescent Peak Wind Project, November 3, 2015, to October 26, 2017

| Eagle Use Survey Plot | Site | Date | Season | Total Number of Eagle-Minutes | Number and Age of Individuals Observed | Eagle Behavior(s) |
|---|---|---|---|---|---|---|
| 32 | NV-3 | November 25, 2015 | Fall | 1 | One adult | Flying between 10 and 20 m AGH |
| 47 | NV-4 | January 19, 2016 | Winter | 4 | One individual of unknown age | Soaring between 50 and 75 m AGH |
| 41 | NV-4 | February 3, 2016 | Winter | 14 | One adult (second adult observed outside the cylinder at the same time) | Soaring and performing undulating flight (territorial defense) between 20 and 200 m AGH |
| 45 | NV-4 | February 16, 2016 | Winter | 1 | One adult | Soaring between 175 and 200 m AGH |
| 41 | NV-4 | February 17, 2016 | Winter | 7 | Two adults | Soaring/flying/kiting between 10 and 90 m AGH (6 minutes for one adult and 1 minute for the other) |
| 41 | NV-4 | March 6, 2016 | Winter | 3 | One adult | Soaring and performing undulating flight (territorial defense) between 50 and 125 m AGH |
| 43 | NV-4 | April 28, 2016 | Spring | 4 | One adult | Soaring between 120 and 160 m AGH |
| 45 | NV-4 | April 28, 2016 | Spring | 1 | One subadult | Flying between 20 and 125 m AGH |
| 41 | NV-4 | June 8, 2016 | Spring | 4 | One adult | Soaring and kiting between 25 and 40 m AGH (also perched for 3 minutes [not counted in eagle-minutes]) |
| 34 | NV-3 | June 21, 2016 | Summer | 3 | One adult | Soaring and kiting between 70 and 160 m AGH |
| 37 | NV-3 | August 12, 2016 | Summer | 5 | Two adults | Soaring and flying between 50 and 75 m AGH (4 minutes for one adult and 1 minute for the other) |
| 18 | NV-1 | August 24, 2016 | Summer | 6 | One adult | Soaring between 75 and 150 m AGH |
| 17 | NV-1 | October 12, 2016 | Fall | 4 | One juvenile | Soaring/flying/kiting between 10 and 100 m AGH |
| 27 | NV-2 | November 28, 2016 | Fall | 5 | One adult | Soaring between 100 and 125 m AGH |
| 40 | NV-4 | November 29, 2016 | Fall | 1 | One individual of unknown age | Flying between 75 and 100 m AGH |
| 43 | NV-4 | December 18, 2016 | Winter | 1 | One adult female (adult male observed outside the cylinder at the same time) | Flying at 50 m AGH |
| 42 | NV-4 | January 11, 2017 | Winter | 3 | One adult | Flying and soaring between 20 and 120 m AGH (also perched for 3 minutes [not counted in eagle-minutes]) |
| 42 | NV-4 | February 9, 2017 | Winter | 13 | Three adults | Flying/kiting/soaring between 20 and 130 m AGH (10 minutes for one adult, 2 minutes for the second adult, and 1 minute for the third adult) |

| Eagle Use Survey Plot | Site | Date | Season | Total Number of Eagle-Minutes | Number and Age of Individuals Observed | Eagle Behavior(s) |
|---|---|---|---|---|---|---|
| 41 | NV-4 | February 23, 2017 | Winter | 9 | Three adults | Flying/kiting/soaring between 10 and 100 m AGH (4 minutes for one adult, 4 minutes for the second adult, and 1 minute for the third adult) |
| 35 | NV-3 | March 7, 2017 | Winter | 3 | One adult | Soaring between 80 and 200 m AGH |
| 42 | NV-4 | May 25, 2017 | Spring | 1 | One adult | Flying between 60 and 90 m AGH |
| 34 | NV-3 | June 7, 2017 | Spring | 1 | One adult | Flying and soaring between 50 and 120 m AGH |
| 27 | NV-2 | July 6, 2017 | Summer | 5 | One adult | Flying and soaring between 75 and 200 m AGH |
| 17 | NV-1 | August 17, 2017 | Summer | 2 | One adult | Flying and soaring between 5 and 27 m AGH (also perched for 5 minutes [not counted in eagle-minutes]) |
| 37 | NV-3 | September 8, 2017 | Summer | 5 | Two adults | Flying and soaring between 20 and 100 m AGH (3 minutes for one adult and 2 minutes for the other) |
| 17 | NV-1 | September 9, 2017 | Summer | 1 | One adult | Flying and soaring between 45 and 150 m AGH |
| 25 | NV-2 | October 4, 2017 | Fall | 4 | One juvenile | Soaring and flying between 10 and 70 m AGH (also perched for 3 minutes [not counted in eagle-minutes]) |
| 32 | NV-3 | October 25, 2017 | Fall | 3 | One adult | Soaring and flying between 150 and 190 m AGH |
| 16 | NV-1 | October 25, 2017 | Fall | 1 | One juvenile | Flying between 60 and 80 m AGH |

American white pelicans (*Pelecanus erythrorhynchos*) exhibited the highest overall use within the project area (950 individuals, 0.761 observations/20-minute survey; see Table 2). However, this species was only observed from one survey point, on August 12, 2016, during the entire LBUC survey period. The 950 individual pelicans were observed flying over the Project area in two large flocks, representing only 0.4% of all targets recorded by observers. The event was isolated, localized, and not representative of large bird use throughout the year at the project area but does highlight that this and other water bird species (e.g., sandhill crane [*Antigone canadensis*], snow goose [*Chen caerulescens*], etc.) can migrate over the Project area in large numbers during limited periods of time. American white pelicans aside, common ravens (*Corvus corax*) exhibited the highest year-round use (275 individuals; 0.220 observations/20-minute survey), followed by red-tailed hawks (*Buteo jamaicensis*) (165 individuals; 0.132 observations/20-minute survey) and turkey vultures (*Cathartes aura*) (94 individuals; 0.075 observations/20-minute survey).

When both years of survey are combined, use for all large birds (excluding pelicans) was highest in fall (0.692 observations/20-minute survey) and summer (0.558 observations/20-minute survey), followed by spring (0.420 observations/20-minute survey) and winter (0.215 observations/20-minute survey). Common ravens were the most frequently observed large-bird species in the fall and constituted 76.9% of fall large-bird observations. Red-tailed hawk were also frequently observed in the fall, constituting 16.2% of fall large-bird observations. Overall raptor/turkey vulture (excludes common ravens, which are non-migratory and tend to avoid turbine collision) numbers dropped by 55% from summer to fall, indicating that, for this group of birds, the project area is likely more important to summer residents than to fall migrants. When both years of survey are combined, raptor/turkey vulture numbers were highest in summer (0.359 observations/20-minute survey) and spring (0.346 observations/20-minute survey), followed by fall (0.160 observations/20-minute survey) and winter (0.135 observations/20-minute survey).

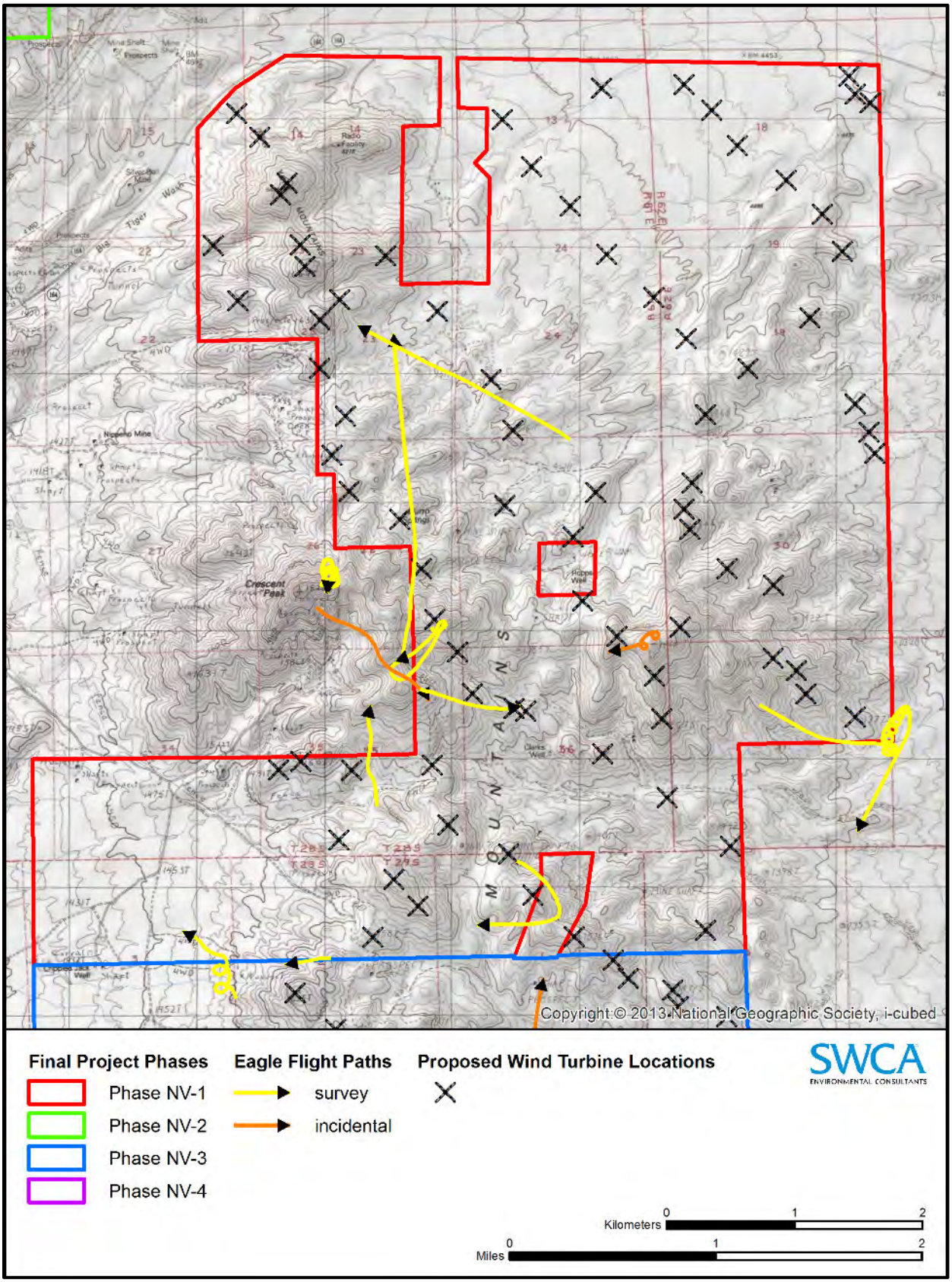


**Figure 5.** Golden eagle flight paths recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for Site NV-1 at the proposed Crescent Peak Wind Project.

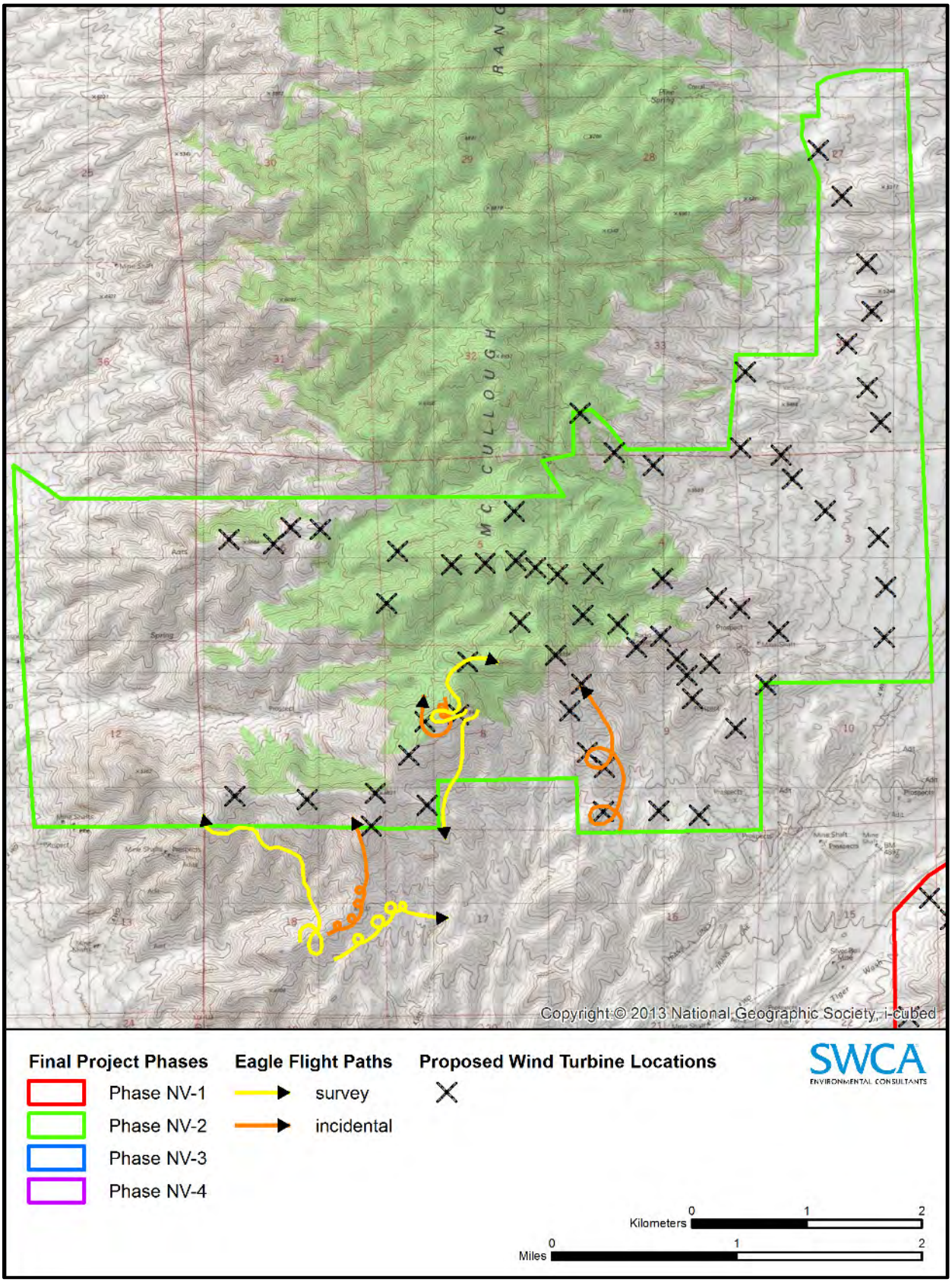


**Figure 6.** Golden eagle flight paths recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for Site NV-2 at the proposed Crescent Peak Wind Project.

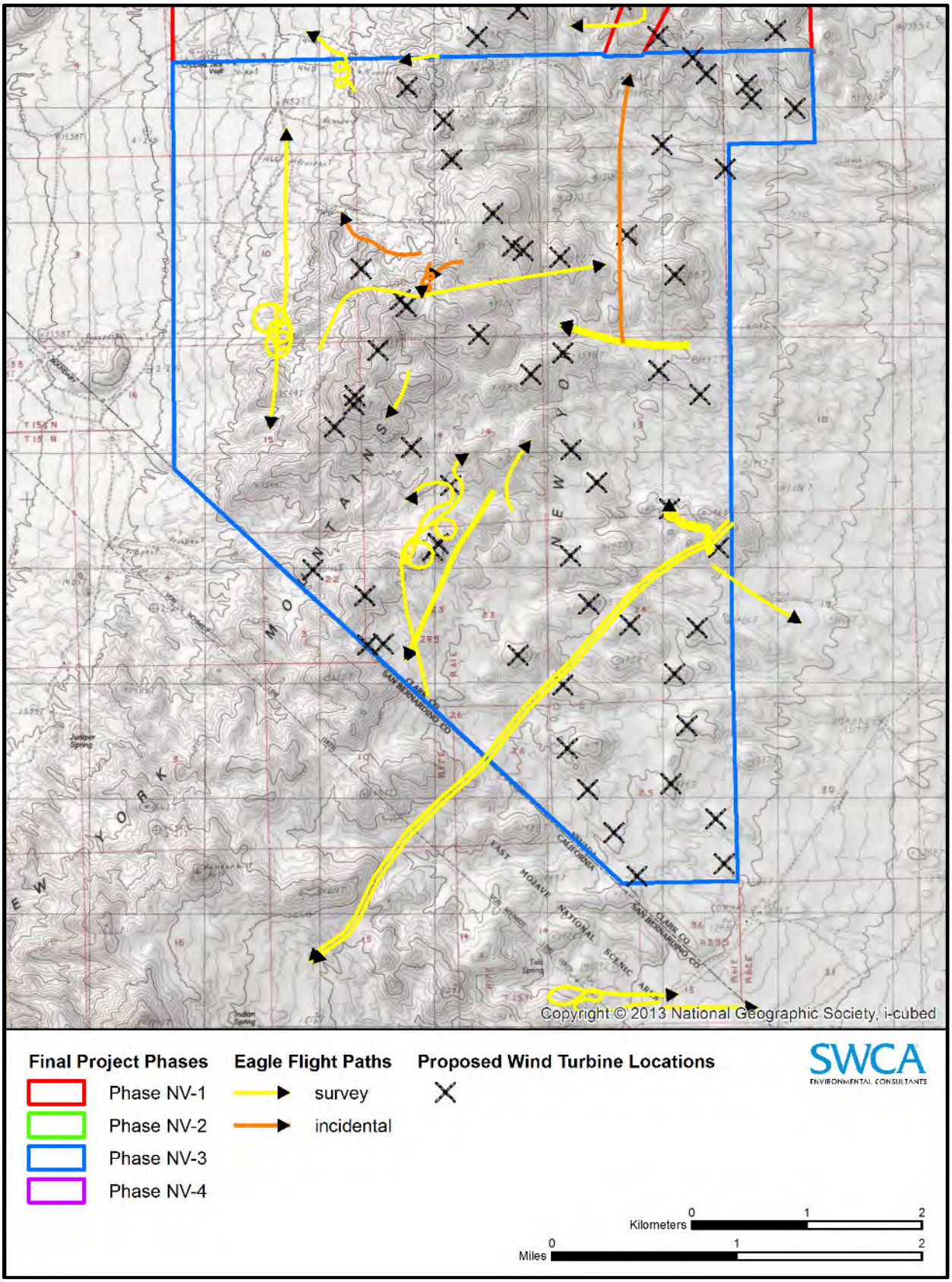


**Figure 7.** Golden eagle flight paths recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for Site NV-3 at the proposed Crescent Peak Wind Project.

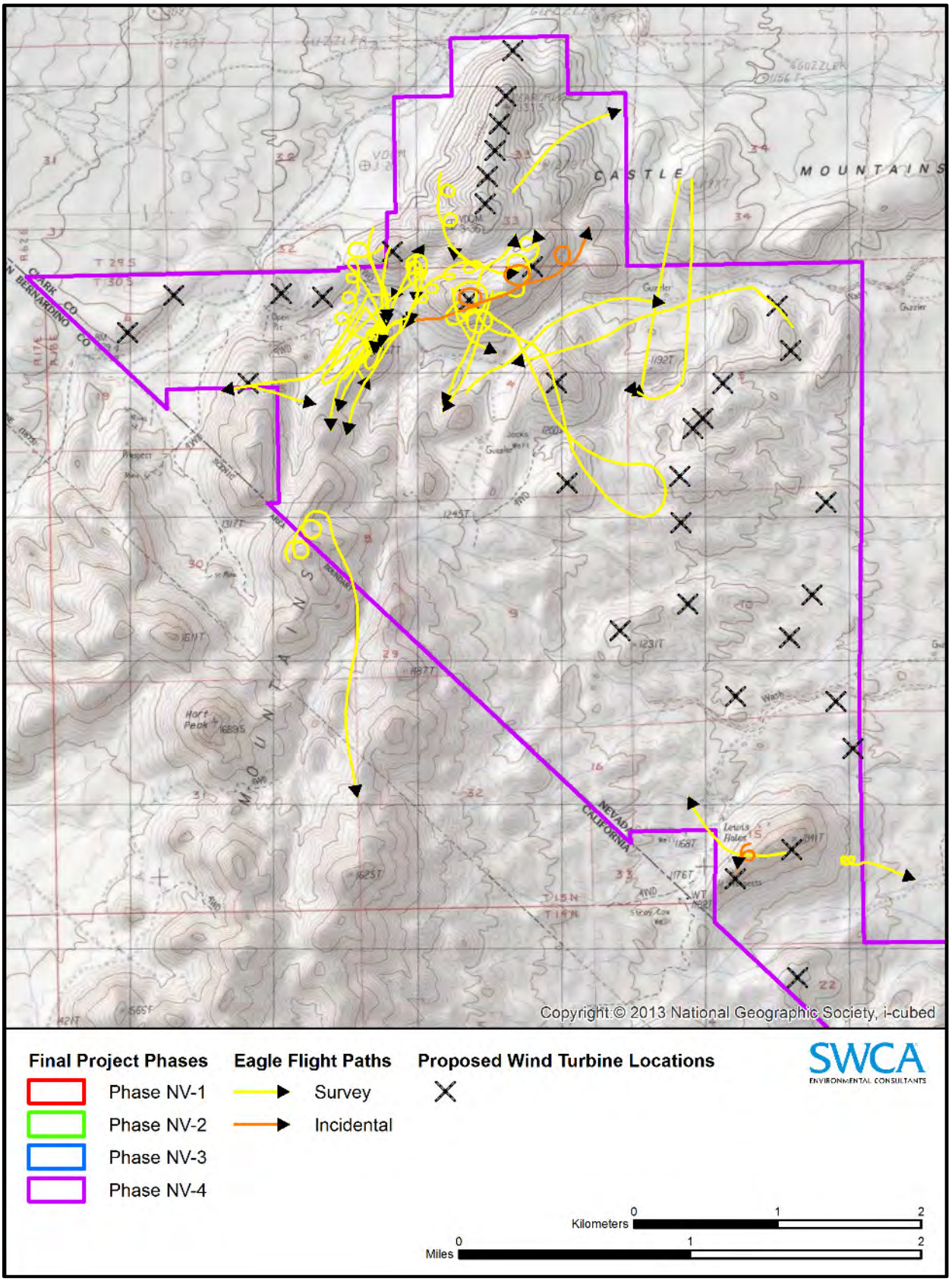


**Figure 8.** Golden eagle flight paths recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for the northern half of Site NV-4 at the proposed Crescent Peak Wind Project.

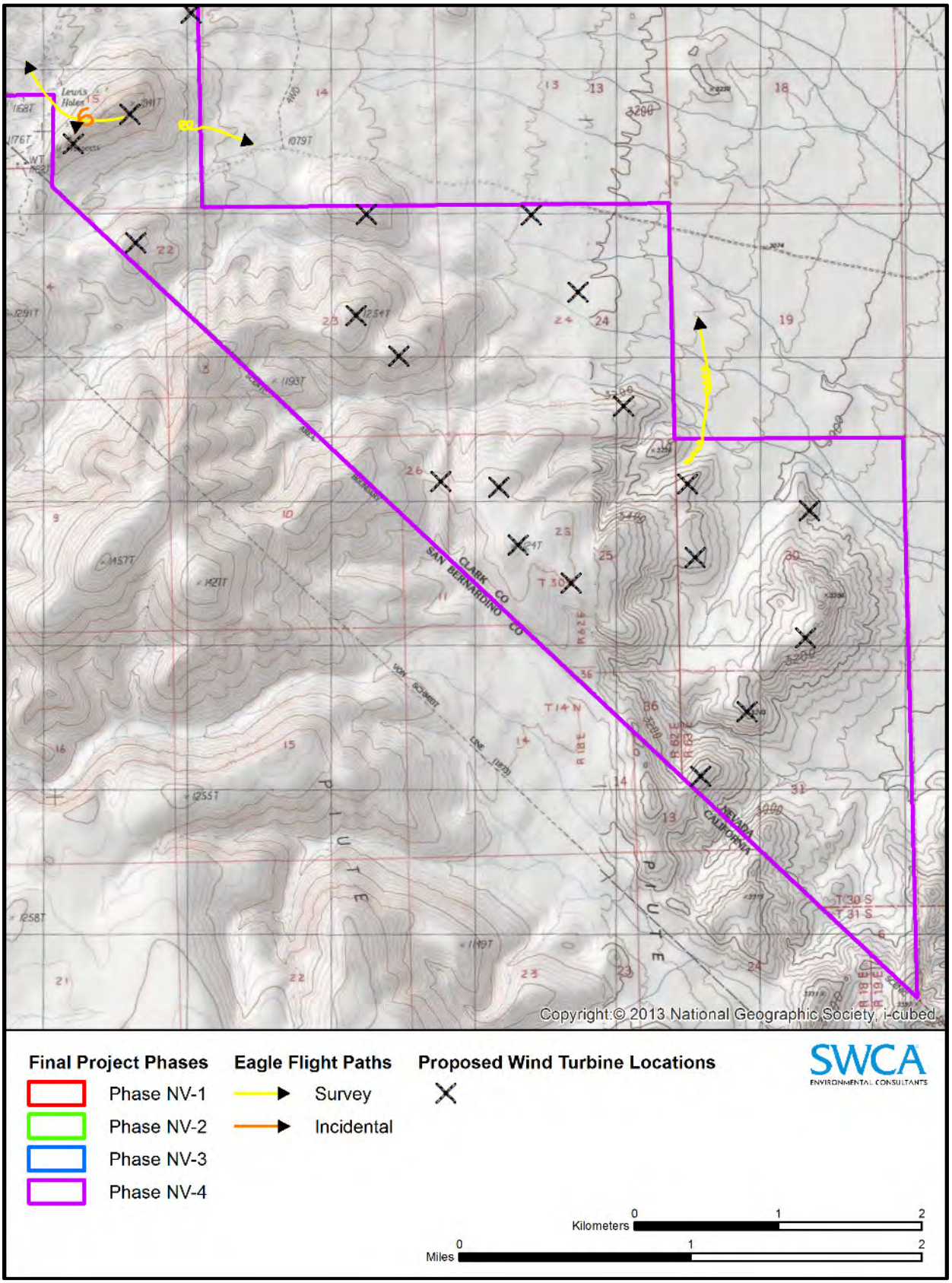


**Figure 9.** Golden eagle flight paths recorded during eagle use surveys from November 3, 2015, to October 26, 2017, for the southern half of Site NV-4 at the proposed Crescent Peak Wind Project.

**Table 2.** Large-Bird Species Use Recorded during LBUCs for the Proposed Crescent Peak Wind Project, November 3, 2015, to October 26, 2017

| Species | Scientific Name | Species Use* (observations/20-minute survey) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter 1 156 20-Minute Counts | Spring 1 156 20-Minute Counts | Summer 1 156 20-Minute Counts | Fall 1 156 20-Minute Counts | Year 1 Total | Winter 2 156 20-Minute Counts | Spring 2 156 20-Minute Counts | Summer 2 156 20-Minute Counts | Fall 2 156 20-Minute Counts | Year 2 Total | Overall Total |
| American kestrel | *Falco sparverius* | 0.006 (1) | 0.013 (2) | 0.013 (2) | 0.006 (1) | **0.010 (6)** | 0.000 (0) | 0.006 (1) | 0.019 (3) | 0.019 (3) | **0.011 (7)** | **0.010 (13)** |
| American white pelican | *Pelecanus erythrorhynchos* | 0.000 (0) | 0.000 (0) | **6.090 (950)** | 0.000 (0) | **1.522 (950)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.761 (950)** |
| Cooper's hawk | *Accipiter cooperii* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.006 (1) | **0.002 (1)** | 0.000 (0) | 0.019 (3) | 0.000 (0) | 0.006 (1) | **0.006 (4)** | **0.004 (5)** |
| Common raven | *Corvus corax* | 0.071 (11) | 0.071 (11) | 0.192 (30) | **0.423 (66)** | **0.189 (118)** | 0.090 (14) | 0.071 (11) | **0.205 (32)** | **0.641 (100)** | **0.252 (157)** | **0.220 (275)** |
| Great horned owl | *Bubo virginianus* | 0.006 (1) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.001 (1)** |
| Golden eagle | *Aquila chrysaetos* | 0.032 (5) | 0.026 (4) | 0.013 (2) | 0.000 (0) | **0.018 (11)** | 0.013 (2) | 0.013 (2) | 0.019 (3) | 0.006 (1) | **0.013 (8)** | **0.015 (19)** |
| *Golden eagle (1-hr)‡* | | *0.030 (14)* | *0.013 (6)* | *0.013 (6)* | *0.004 (2)* | ***0.015 (28)*** | *0.019 (9)* | *0.004 (2)* | *0.017 (8)* | *0.011 (5)* | ***0.013 (24)*** | ***0.014 (52)*** |
| Lesser nighthawk | *Chordeiles acutipennis* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.006 (1) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | **0.001 (1)** |
| Northern harrier | *Circus hudsonius* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.006 (1) | **0.002 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.006 (1) | **0.002 (1)** | **0.002 (2)** |
| Osprey | *Pandion haliaetus* | 0.000 (0) | 0.006 (1) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | 0.000 (0) | 0.006 (1) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | **0.002 (2)** |
| Prairie falcon | *Falco mexicanus* | 0.000 (0) | 0.006 (1) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.001 (1)** |
| Red-tailed hawk | *Buteo jamaicensis* | **0.103 (16)** | **0.205 (32)** | 0.147 (23) | 0.141 (22) | **0.149 (93)** | **0.103 (16)** | **0.128 (20)** | 0.147 (23) | 0.083 (13) | **0.115 (72)** | **0.132 (165)** |
| Sharp-shinned hawk | *Accipiter striatus* | 0.000 (0) | 0.026 (4) | 0.000 (0) | 0.013 (2) | **0.010 (6)** | 0.006 (1) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | **0.006 (7)** |
| Swainson's hawk | *Buteo swainsoni* | 0.000 (0) | 0.006 (1) | 0.000 (0) | 0.000 (0) | **0.002 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.001 (1)** |
| Turkey vulture | *Cathartes aura* | 0.000 (0) | 0.115 (18) | **0.212 (33)** | 0.006 (1) | **0.083 (52)** | 0.000 (0) | 0.115 (18) | 0.135 (21) | 0.019 (3) | **0.067 (42)** | **0.075 (94)** |
| Zone-tailed hawk | *Buteo albonotatus* | 0.000 (0) | 0.000 (0) | 0.013 (2) | 0.000 (0) | **0.003 (2)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (2)** |
| **Total – Large-Bird Use** | | **0.218 (34)** | **0.474 (74)** | **6.679 (1042)** | **0.603 (94)** | **1.994 (1244)** | **0.212 (33)** | **0.365 (57)** | **0.526 (82)** | **0.782 (122)** | **0.471 (294)** | **1.232 (1538)** |
| **Total – Raptors/Turkey Vultures** | | **0.147 (23)** | **0.404 (63)** | **0.397 (62)** | **0.179 (28)** | **0.282 (176)** | **0.122 (19)** | **0.288 (45)** | **0.321 (50)** | **0.141 (22)** | **0.218 (136)** | **0.250 (312)** |

Note: Blue text represents species with the highest use for a given time period.

* Number in parentheses is the total number of observations.

‡ Golden eagle 1-hr count data is not included in total calculations; use equals number of observations divided by 468 20-minute counts for comparison with other large bird data by season.

**Table 3.** Small-Bird Species Use Recorded during SBUCs for the Proposed Crescent Peak Wind Project, November 3, 2015, to October 26, 2017

| Species | Scientific Name | Species Use* (observations/10-minute survey) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter 1 78 10-Minute Counts | Spring 1 78 10-Minute Counts | Summer 1 78 10-Minute Counts | Fall 1 78 10-Minute Counts | Year 1 Total | Winter 2 78 10-Minute Counts | Spring 2 78 10-Minute Counts | Summer 2 78 10-Minute Counts | Fall 2 78 10-Minute Counts | Year 2 Total | Overall Total |
| Anna's hummingbird | *Calypte anna* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | **0.002 (1)** |
| Ash-throated flycatcher | *Myiarchus cinerascens* | 0.000 (0) | 0.051 (4) | 0.103 (8) | 0.000 (0) | **0.038 (12)** | 0.000 (0) | 0.128 (10) | 0.167 (13) | 0.000 (0) | **0.074 (23)** | **0.056 (35)** |
| Barn swallow | *Hirundo rustica* | 0.000 (0) | 0.038 (3) | 0.000 (0) | 0.000 (0) | **0.010 (3)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.005 (3)** |
| Bewick's wren | *Thryomanes bewickii* | 0.000 (0) | 0.115 (9) | 0.090 (7) | 0.038 (3) | **0.061 (19)** | 0.000 (0) | 0.026 (2) | 0.077 (6) | 0.064 (5) | **0.042 (13)** | **0.051 (32)** |
| Black-tailed gnatcatcher | *Polioptila melanura* | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.026 (2) | 0.013 (1) | **0.010 (3)** | **0.006 (4)** |
| Black-throated sparrow | *Amphispiza bilineata* | 0.026 (2) | **0.321 (25)** | **0.269 (21)** | 0.038 (3) | **0.163 (51)** | **0.410 (32)** | **0.179 (14)** | **0.962 (75)** | 0.103 (8) | **0.413 (129)** | **0.288 (180)** |
| Blue-gray gnatcatcher | *Polioptila caerulea* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.003 (1) | 0.026 (2) | 0.038 (3) | **0.019 (6)** | **0.010 (6)** |
| Brewer's sparrow | *Spizella breweri* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.013 (1) | **0.006 (2)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.003 (2)** |
| Brown-headed cowbird | *Molothrus ater* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.000 (0) | 0.077 (6) | 0.000 (0) | **0.019 (6)** | **0.010 (6)** |
| Bushtit | *Psaltriparus minimus* | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | 0.077 (6) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.022 (7)** | **0.014 (9)** |
| Cactus wren | *Campylorhynchus brunneicapillus* | 0.026 (2) | 0.051 (4) | 0.141 (11) | 0.038 (3) | **0.064 (20)** | 0.038 (3) | 0.051 (4) | 0.051(4) | 0.013 (1) | **0.038 (12)** | **0.051 (32)** |
| Chipping sparrow | *Spizella passerina* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.051 (4) | **0.013 (4)** | **0.006 (4)** |
| Crissal thrasher | *Toxostoma crissale* | **0.038 (3)** | 0.026 (2) | 0.026 (2) | 0.051 (4) | **0.035 (11)** | 0.013 (1) | 0.013 (1) | 0.077 (6) | 0.038 (3) | **0.035 (11)** | **0.035 (22)** |
| Dark-eyed junco | *Junco hyemalis* | 0.013 (1) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.179 (14) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.045 (14)** | **0.024 (15)** |
| Dusky flycatcher | *Empidonax oberholseri* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.013 (1) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Gambel's quail | *Callipepla gambelii* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Gilded flicker | *Colaptes chrysoides* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.013 (1) | **0.003 (1)** | 0.000 (0) | 0.013 (1) | 0.013 (1) | 0.000 (0) | **0.006 (2)** | **0.005 (3)** |
| Gray flycatcher | *Empidonax wrightii* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Green-tailed towhee | *Pipilo chlorurus* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | **0.002 (1)** |
| House finch | *Haemorhous mexicanus* | 0.000 (0) | 0.064 (5) | 0.167 (13) | **0.115 (9)** | **0.087 (27)** | 0.038 (3) | 0.090 (7) | 0.590 (46) | **0.192 (15)** | **0.228 (71)** | **0.157 (98)** |
| **T**Horned lark | *Eremophila alpestris* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.013 (1) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | **0.002 (1)** |
| House wren | *Troglodytes aedon* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Juniper titmouse | *Baeolophus ridgwayi* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.026 (2) | 0.000 (0) | **0.006 (2)** | **0.005 (3)** |
| Ladder-backed woodpecker | *Picoides scalaris* | 0.026 (2) | 0.013 (1) | 0.038 (3) | 0.038 (3) | **0.029 (9)** | 0.051 (4) | 0.038 (3) | 0.064 (5) | 0.064 (5) | **0.054 (17)** | **0.042 (26)** |
| Lesser goldfinch | *Spinus psaltria* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Loggerhead shrike | *Lanius ludovicianus* | 0.000 (0) | 0.000 (0) | 0.038 (3) | 0.013 (1) | **0.013 (4)** | 0.013 (1) | 0.000 (0) | 0.090 (7) | 0.026 (2) | **0.032 (10)** | **0.022 (14)** |
| MacGillivray's warbler | *Geothlypis tolmiei* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.0013 (1) | **0.003 (1)** | **0.002 (1)** |
| Mountain chickadee | *Poecile gambeli* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Mourning dove | *Zenaida macroura* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | **0.003 (2)** |
| Northern flicker | *Colaptes auratus* | 0.013 (1) | 0.013 (1) | 0.000 (0) | 0.038 (3) | **0.016 (5)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.008 (5)** |
| Northern mockingbird | *Mimus polyglottos* | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | **0.005 (3)** |
| Phainopepla | *Phainopepla nitens* | 0.000 (0) | 0.064 (5) | 0.026 (2) | 0.000 (0) | **0.022 (7)** | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.013 (1) | **0.010 (3)** | **0.016 (10)** |
| Red-naped sapsucker | *Sphyrapicus nuchalis* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.013 (1) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Rock wren | *Salpinctes obsoletus* | 0.000 (0) | 0.077 (6) | 0.090 (7) | 0.103 (8) | **0.067 (21)** | 0.064 (5) | 0.077 (6) | 0.218 (17) | 0.090 (7) | **0.112 (35)** | **0.090 (56)** |
| Ruby-crowned kinglet | *Regulus calendula* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.026 (2) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | **0.003 (2)** |

| Species | Scientific Name | Species Use* (observations/10-minute survey) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Winter 1 78 10-Minute Counts | Spring 1 78 10-Minute Counts | Summer 1 78 10-Minute Counts | Fall 1 78 10-Minute Counts | Year 1 Total | Winter 2 78 10-Minute Counts | Spring 2 78 10-Minute Counts | Summer 2 78 10-Minute Counts | Fall 2 78 10-Minute Counts | Year 2 Total | Overall Total |
| **Species** | **Scientific Name** | **Species Use* (observations/10-minute survey)** | | | | | | | | | | |
| | | **Winter 1 78 10-Minute Counts** | **Spring 1 78 10-Minute Counts** | **Summer 1 78 10-Minute Counts** | **Fall 1 78 10-Minute Counts** | **Year 1 Total** | **Winter 2 78 10-Minute Counts** | **Spring 2 78 10-Minute Counts** | **Summer 2 78 10-Minute Counts** | **Fall 2 78 10-Minute Counts** | **Year 2 Total** | **Overall Total** |
| Rufous-crowned sparrow | *Aimophila ruficeps* | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | 0.013 (1) | 0.000 (0) | 0.038 (3) | 0.026 (2) | **0.019 (6)** | **0.013 (8)** |
| Sagebrush sparrow | *Artemisiospiza nevadensis* | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | 0.026 (2) | 0.000 (0) | 0.000 (0) | 0.026 (2) | **0.013 (4)** | **0.008 (5)** |
| Say's phoebe | *Sayornis saya* | 0.000 (0) | 0.000 (0) | 0.064 (5) | 0.000 (0) | **0.016 (5)** | 0.000 (0) | 0.000 (0) | 0.026 (2) | 0.000 (0) | **0.006 (2)** | **0.011 (7)** |
| Scott's oriole | *Icterus parisorum* | 0.000 (0) | 0.013 (1) | 0.038 (3) | 0.000 (0) | **0.013 (4)** | 0.000 (0) | 0.051 (4) | 0.013 (1) | 0.000 (0) | **0.016 (5)** | **0.014 (9)** |
| Spotted towhee | *Pipilo maculatus* | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.002 (1)** |
| Tree swallow | *Tachycineta bicolor* | 0.000 (0) | 0.038 (3) | 0.000 (0) | 0.000 (0) | **0.010 (3)** | 0.000 (0) | 0.000 (0) | 0.013 (1) | 0.000 (0) | **0.003 (1)** | **0.006 (4)** |
| Violet-green swallow | *Tachycineta thalassina* | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.000 (0) | **0.006 (2)** | **0.006 (4)** |
| Verdin | *Auriparus flaviceps* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.013 (1) | **0.003 (1)** | **0.002 (1)** |
| Warbling vireo | *Vireo gilvus* | 0.000 (0) | 0.013 (1) | 0.000 (0) | 0.000 (0) | **0.003 (1)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.013 (1) | **0.003 (1)** | **0.003 (2)** |
| Western tanager | *Piranga ludoviciana* | 0.000 (0) | 0.013 (1) | 0.013 (1) | 0.000 (0) | **0.006 (2)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.003 (2)** |
| Wilson's warbler | *Cardellina pusilla* | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | 0.000 (0) | 0.038 (3) | 0.000 (0) | 0.000 (0) | **0.010 (3)** | **0.005 (3)** |
| Woodhouse's scrub-jay | *Aphelocoma woodhouseii* | 0.013 (1) | 0.013 (1) | 0.038 (3) | 0.000 (0) | **0.016 (5)** | 0.013 (1) | 0.000 (0) | 0.026 (2) | 0.000 (0) | **0.010 (3)** | **0.013 (8)** |
| White-throated swift | *Aeronautes saxatalis* | 0.000 (0) | 0.064 (5) | 0.077 (6) | 0.000 (0) | **0.035 (11)** | 0.000 (0) | 0.026 (2) | 0.077 (6) | 0.000 (0) | **0.026 (8)** | **0.030 (19)** |
| Yellow-rumped warbler | *Setophaga coronata* | 0.000 (0) | 0.026 (2) | 0.000 (0) | 0.013 (1) | **0.010 (3)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.026 (2) | **0.006 (2)** | **0.008 (5)** |
| Unidentified hummingbird | | 0.000 (0) | 0.000 (0) | 0.051 (4) | 0.000 (0) | **0.013 (4)** | 0.000 (0) | 0.038 (3) | 0.000 (0) | 0.000 (0) | **0.010 (3)** | **0.011 (7)** |
| Unidentified sparrow | | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.026 (2) | **0.006 (2)** | 0.000 (0) | 0.000 (0) | 0.000 (0) | 0.000 (0) | **0.000 (0)** | **0.003 (2)** |
| Unidentified bird | | 0.000 (0) | 0.013 (1) | 0.026 (2) | 0.064 (5) | **0.026 (8)** | 0.000 (0) | 0.013 (1) | 0.026 (2) | 0.051 (4) | **0.022 (7)** | **0.024 (15)** |
| **Total** | | **0.154 (12)** | **1.205 (94)** | **1.346 (105)** | **0.628 (49)** | **0.833 (260)** | **0.974 (76)** | **0.885 (69)** | **2.718 (212)** | **0.872 (68)** | **1.362 (425)** | **1.098 (685)** |

Note: Blue text represents species with the highest use for a given time period.

* Number in parentheses is the total number of observations.

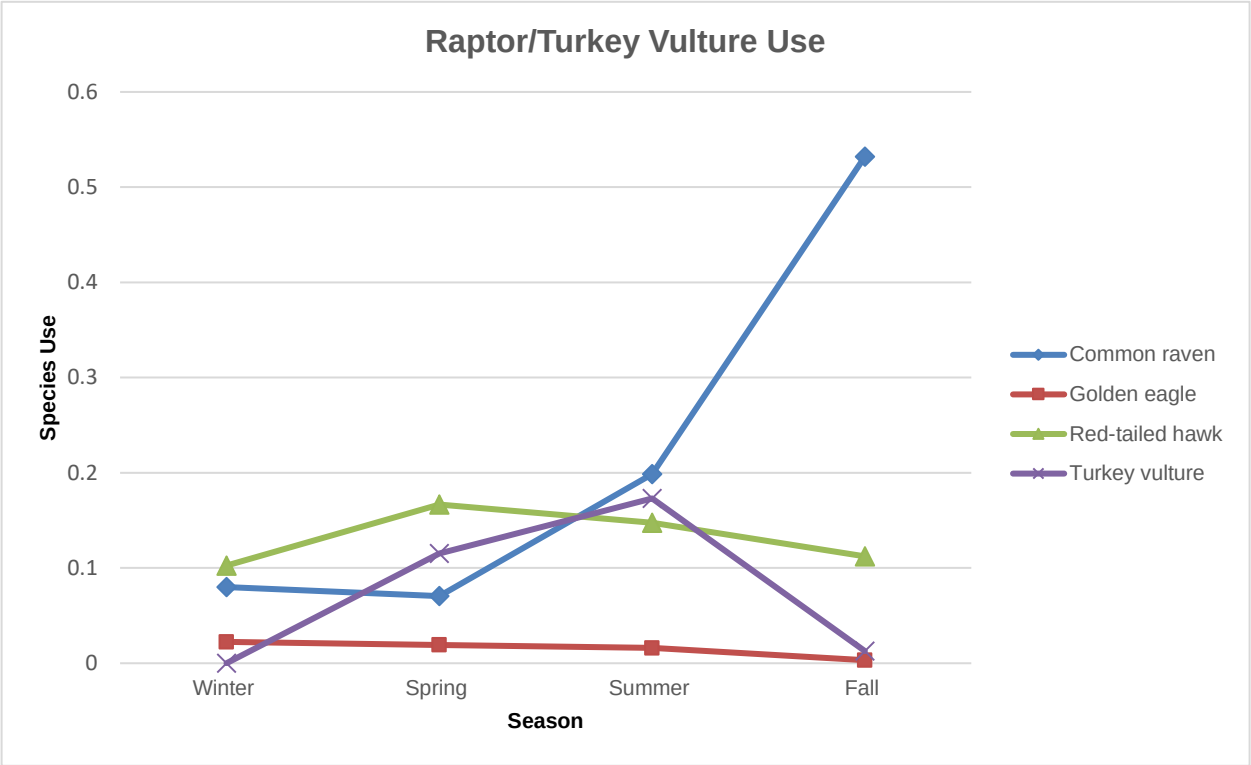


**Figure 10.** Raptor/turkey vulture use for the most abundant species from November 3, 2015, to October 26, 2017, proposed Crescent Peak Wind Project.

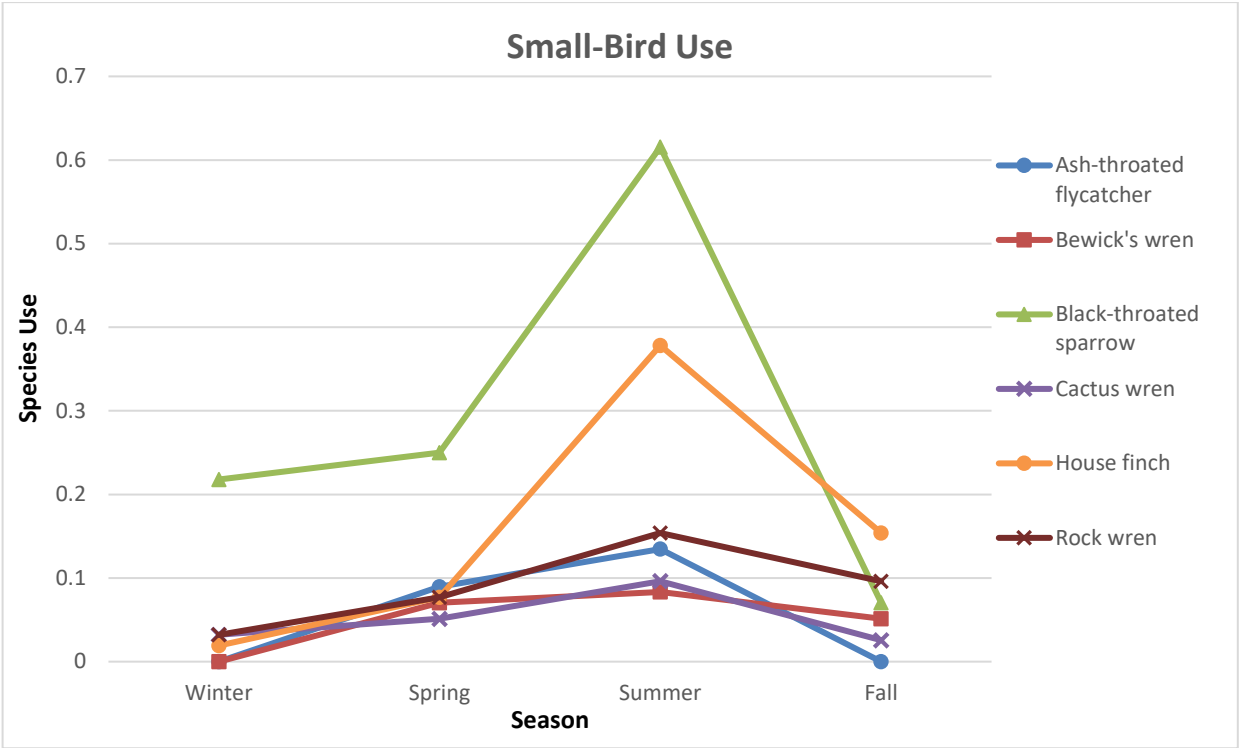


**Figure 11.** Raptor/turkey vulture use for the most abundant species from November 3, 2015, to October 26, 2017, proposed Crescent Peak Wind Project.

A total of 58 migrating raptor/turkey vultures (29 in spring and 28 in fall) were recorded during 208 hours of raptor migration surveys in 2017 (Table 4). This correlates to raptor/turkey vulture passage rates of 0.274 migrants/hour for both spring and fall. The most frequently observed migrant during both periods was turkey vulture (0.106 migrants/hour and 0.096 migrant/hour during spring and fall, respectively) followed by red-tailed hawk (0.087 migrants/hour and 0.067 migrants/hour for spring and fall, respectively). Red-tailed hawk and turkey vulture were the two most frequently observed species during spring LBUCs (0.167 observations/20-minute survey and 0.115 observations/20-minute survey, respectively).

**Table 4.** Raptor/Turkey Vulture Species Migration Passage Rates Recorded during Raptor Migration Surveys for the Proposed Crescent Peak Wind Project, Spring and Fall 2017

| Species | Scientific Name | Raptor Passage Rates* (observations/1-hour survey) | | |
|---|---|---|---|---|
| | | Spring 52 1-Hour Counts | Fall 52 1-Hour Counts | Total |
| American kestrel | *Falco sparverius* | 0.010 (1) | **0.038 (4)** | 0.024 (5) |
| Cooper's hawk | *Accipiter cooperii* | **0.048 (5)** | 0.010 (1) | **0.029 (6)** |
| Golden eagle | *Aquila chrysaetos* | 0.000 (0) | 0.019 (2) | 0.010 (2) |
| Northern harrier | *Circus cyaneus* | 0.010 (1) | 0.000 (0) | 0.005 (1) |
| Osprey | *Pandion haliaetus* | 0.019 (2) | 0.000 (0) | 0.010 (2) |
| Red-tailed hawk | *Buteo jamaicensis* | **0.087 (9)** | **0.067 (7)** | **0.077 (16)** |
| Sharp-shinned hawk | *Accipiter striatus* | 0.000 (0) | **0.038 (4)** | 0.019 (4) |
| Turkey vulture | *Cathartes aura* | **0.106 (11)** | **0.096 (10)** | **0.101 (21)** |
| **Total** | | **0.279 (29)** | **0.269 (28)** | **0.274 (57)** |

Note: Blue text represents species with the highest use for a given time period.

* Number in parentheses is the number of observations

Large-bird species exhibiting the greatest use in summer (when American white pelican is excluded) were common raven, turkey vulture, and red-tailed hawk (see Table 2). Large-bird species exhibiting the greatest use in winter were red-tailed hawk, common raven, and golden eagle (see Table 2). Turkey vultures, while common throughout all other seasons, are completely absent from the Project area in the winter (see Figure 10).

Small-bird use was greatest in summer (2.032 observations/10-minute survey) and spring (1.045 observations/10-minute survey), followed by fall (0.750 observations/10-minute survey) and winter (0.564 observations/10-minute survey; see Table 3). The increase in small-bird use in summer vs. winter was due mostly to the arrival of one short-distance migrant, the black-throated sparrow (*Amphispiza bilineata*), and increased use by one year-round resident, the house finch (*Haemorhous mexicanus*) (see Figure 11).

The most abundant small-bird species across all seasons were black-throated sparrow, house finch, and rock wren (*Salpinctes obsoletus*) (see Table 3). Small-bird species with the greatest use by season included black-throated sparrow, house finch, and rock wren in summer; black-throated sparrow, ash-throated flycatcher (*Myiarchus cinerascens*), house finch, and rock wren in spring; house finch, rock wren, and black-throated sparrow in fall; and black-throated sparrow, dark-eyed junco (*Junco hyemalis*), bushtit (*Psaltriparus minimus*), and ladder-backed woodpecker (*Picoides scalaris*) in winter.

## 3.3 Special-Status Species

Special-status wildlife species are subject to regulations under the authority of federal and state agencies. Federal special-status species include Threatened and Endangered species protected pursuant to the Endangered Species Act of 1973 (ESA), Section 4, as amended. Additional USFWS designations include Proposed, Candidate, Species of Concern, Nonessential Experimental Population, Partial Status, and Delisted Monitoring. The Nevada BLM has designated some species as Sensitive Species (BLM 2014), and the State of Nevada has created state status designations under Nevada Revised Statutes (NRS) Chapter 501.

Eight species designated as protected by the BLM or State of Nevada were observed during pre-construction surveys (Table 5). These species are listed by common name, and the table also provides the scientific name, protection status, and means of detection. No avian species federally listed as either Threatened, Endangered, or Candidate for listing under the ESA were observed within the Project sites.

**Table 5.** Special-Status Species Observed at the Proposed Crescent Peak Wind Project, November 3, 2015, to October 26, 2017

| Common Name | Scientific Name | Federal Status[1] | State Status[2] | Preferred Habitat | Means of Detection in Project Area[†] |
|---|---|---|---|---|---|
| Bald eagle | *Haliaeetus leucocephalus* | SS BGEPA | EB | Sierra Coniferous Forests and Woodlands, Intermountain Riparian | Incidental |
| Brewer's sparrow | *Spizella breweri* | SS | SB | Sagebrush, Mojave Warm Desert and Mixed Desert Scrub, Intermountain Cold Desert Scrub, Lower Montane Chaparral. | SBUC |
| Burrowing owl | *Athene cunicularia* | SS | - | Intermountain Cold Desert Scrub, Sagebrush, Mojave Warm Desert and Mixed Desert Scrub, Grasslands and Meadows, Sand Dunes and Badlands, Developed Landscapes | Incidental |
| Golden eagle | *Aquila chrysaetos* | SS, BGEPA | - | Cliffs and Canyons, Sagebrush, Intermountain Cold Desert Scrub, Mojave Warm Desert and Mixed Desert Scrub, Warm Desert Riparian, Wet Meadows, Lower Montane Woodlands and Chaparral, Alpine and Tundra. | LBUC |
| Loggerhead shrike | *Lanius ludovicianus* | SS | SB | Intermountain Cold Desert Scrub, Sagebrush, Mojave Warm Desert and Mixed Desert Scrub, Lower Montane Woodlands and Chaparral, Grassland and Meadows | SBUC |
| Pinyon jay | *Gymnorhinus cyanocephalus* | SS | - | Lower Montane Woodlands and Chaparral | Incidental |
| Sage thrasher | *Oreoscoptes montanus* | SS | SB | Sagebrush, Intermountain Cold Desert Scrub | Incidental |
| Swainson's hawk | *Buteo swainsoni* | SS | - | Lower Montane Woodlands and Chaparral, Sagebrush, Inter-Mountain (Cold Desert) Scrub, Mojave (Warm Desert) and Mixed Desert Scrub, Grasslands and Meadows | LBUC |

[1] Federal designations: BGEPA = Bald and Golden Eagle Protection Act (federal), SS = Nevada BLM Sensitive Species. (NNHP 2017)
[2] State Designations: EB = Endangered Bird, SB = Sensitive Bird (NNHP 2017)
[†] Incidental = Observed outside of designated survey periods, LBUC = Observed during Large Bird Use Count(s), SBUC = Observed during Small Bird Use Count(s)
++ Habitat information was obtained from species descriptions from NatureServe Explorer (NatureServe 2016).

## 3.4 Golden Eagle and Other Raptor Nest Surveys

### *3.4.1 Early Nesting Season Aerial Occupancy Survey*

The ArcGIS desktop evaluation identified 213,695 acres (865 $km^2$) of possible golden eagle nesting habitat within the 10-mile buffer of the Project. In total, 497 raptor/raven nests were recorded during the early season occupancy survey (Figures 12 and 13). Due to the early timing of surveys and subsequent lack of

nesting activity, most of the nests observed during the aerial survey were assigned to an "undetermined" species category.

In total, biologists recorded five different species designations:

- 118 golden eagle,
- 65 undetermined: resembles *Buteo* spp. or golden eagle,
- 53 undetermined: resembles *Buteo* spp.,
- 224 undetermined: resembles *Buteo* spp. or common raven,
- 37 undetermined: resembles common raven.

Because the survey was conducted at the onset of the breeding season, there were very few occupied (i.e., containing greenery/fresh sticks or an adult[s]) nests found within the survey area. Of the 497 nests observed within the survey area, 17 were considered occupied:

- 8 golden eagle (distributed among six territories),
- 7 undetermined: resembles *Buteo* spp. or golden eagle,
- 2 undetermined: resembles *Buteo* spp.

Additionally, 21 golden eagles were observed perched or flying during the survey. One of these individuals was an adult that was perched in the core nesting area within the Hart Peak territory. All other individuals (19 adults and 1 subadult) were observed away from any nests.

### *3.4.2 Follow-up Ground-based Occupancy Surveys*

SWCA surveyors monitored 99 golden eagle or possible golden eagle nests within 13 golden eagle territories, as well as two areas where adult golden eagles were observed but no intact nests were documented during the aerial survey. Additionally, two nests that contained greenery during the December 2016 survey and were identified as "undetermined: resembles *Buteo* spp." were monitored, for a total of 101 nests. In the two areas where golden eagles were observed without documented nest(s), no new nests were discovered during ground-based visits.

The majority of the species and occupancy designations stayed the same from the early season aerial occupancy survey to the follow-up ground-based occupancy survey; however, some designations changed following the ground-based occupancy survey because: 1) the nest was active or 2) the species designation could be changed due to a better view of the nest from the ground. In addition, two active, previously undocumented golden eagle nests were found during the follow-up ground-based surveys.

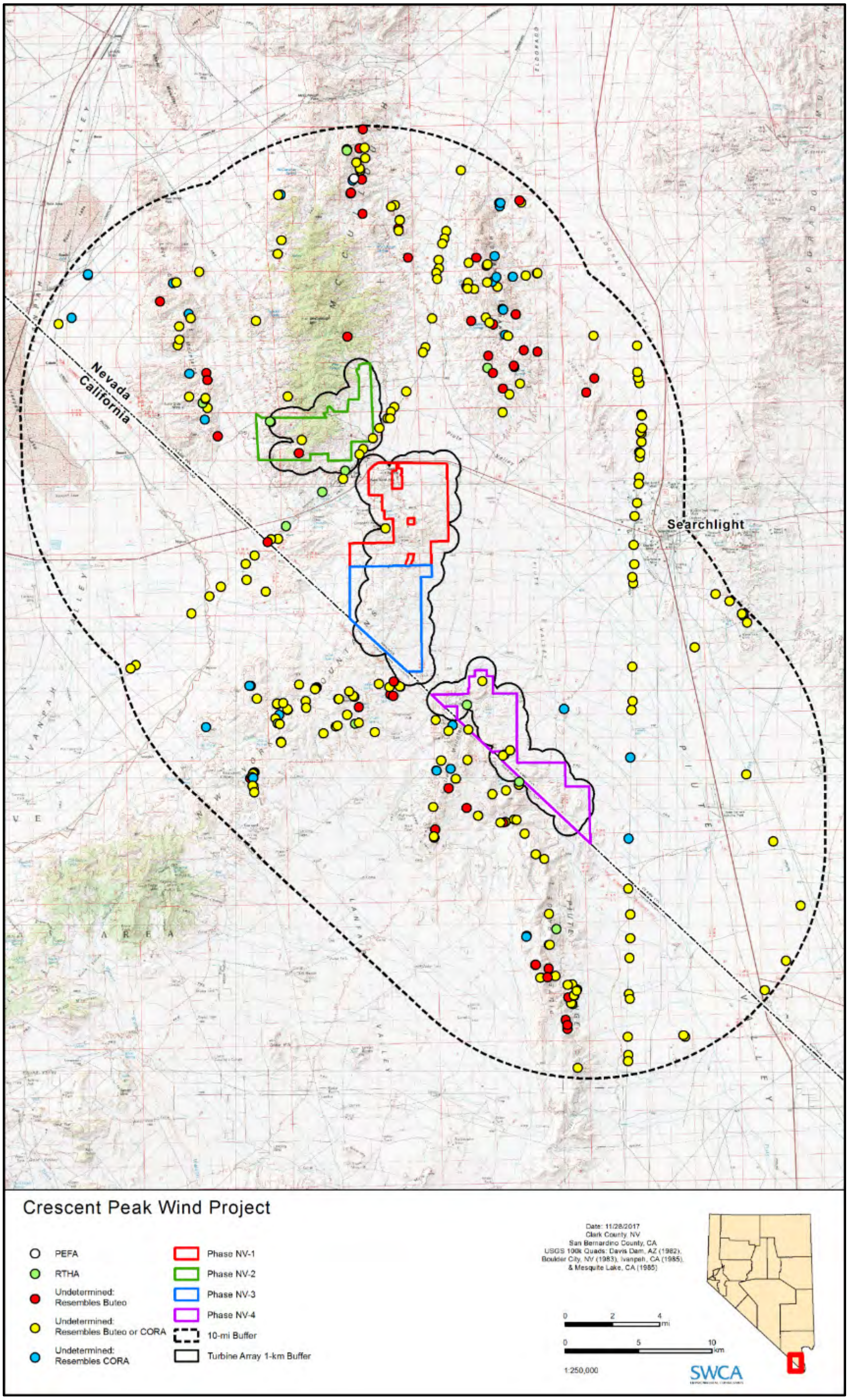


**Figure 12.** Location and occupancy status of all non-eagle nests in the 10-mile buffer survey area (CORA = common raven, Buteo = *Buteo* spp., PEFA = peregrine falcon, RTHA = red-tailed hawk).

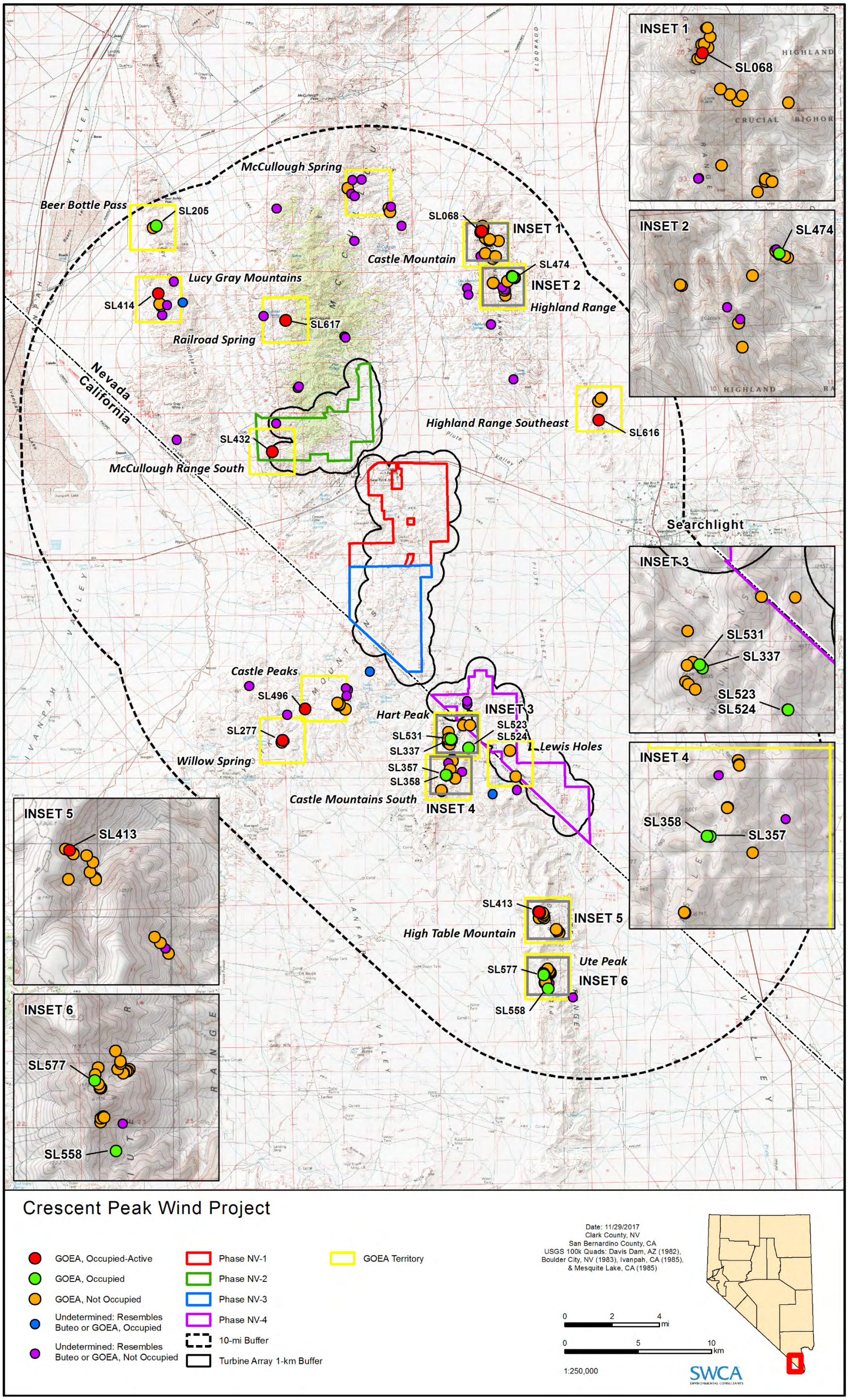


**Figure 13.** Location and occupancy status of all golden eagle (GOEA) nests in the 10-mile buffer survey area.

After the ground-based nest surveys and the addition of the two newly-found nests, the number of nests within the 10-mile survey totaled 499; the final species and occupancy status designations for 2017 were as follows:

**ACTIVE**

- 8 golden eagle,
- 12 red-tailed hawk,

**OCCUPIED**

- 10 golden eagle,
- 3 undetermined: resembles *Buteo* spp. or golden eagle,
- 4 red-tailed hawk,
- 1 peregrine falcon (*Falco peregrinus*),

**NOT OCCUPIED**

- 103 golden eagle,
- 49 undetermined: resembles *Buteo* spp. or golden eagle,
- 52 undetermined: resembles *Buteo* spp.,
- 220 undetermined: resembles *Buteo* spp. or common raven,
- 37 undetermined: resembles common raven.

Seventeen of the 499 nests were located within the Project site boundaries; three of these were occupied or active during the 2017 breeding season: an occupied red-tailed hawk nest in Site NV-4 and active red-tailed hawk and golden eagle (McCullough Range South territory; SL432) nests in Site NV-2 (see Figure 13). Two unoccupied golden eagle nests (Hart Peak and Lewis Holes territories) and three unoccupied possible golden eagle nests were found within Site NV-4 (see Figure 13). One unoccupied possible golden eagle nest was located in Site NV-2 (see Figure 13). No golden eagle or possible golden eagle nests were recorded in Sites NV-1 or NV-3. In addition to the three golden eagle nests found within the Project site boundaries, there were 16 golden eagle nests located within 1 mile (1.61 km) of the Project; all of these nests were southwest of Site NV-4 (14 in the Hart Peak territory and 2 in the Lewis Holes territory).

Figures 12 and 13 depict the most up-to-date occupancy statuses for all non-eagle raptor nests and all golden eagle and possible golden eagle nests, respectively. In total, fifteen golden eagle territories were identified within the survey area (Table 6 and see Figure 13). Eight of these territories were recorded as active (Castle Mountain, Castle Peaks, Highland Range Southeast, High Table Mountain, Lucy Gray Mountains, McCullough Range South, Railroad Spring, and Willow Spring) and five were recorded as occupied but not active (Beer Bottle Pass, Castle Mountains South, Hart Peak, Highland Range, and Ute Peak). Two territories appear to be historical golden eagle territories, with no signs of occupancy in 2011 or 2017 (Lewis Holes and McCullough Spring).

**Table 6.** Nesting Status of Golden Eagle Nests within 10 Miles of the Proposed Crescent Peak Wind Project, December 2016 to March 2017

| SWCA Territory Name | Nest ID | Nest Occupancy/Activity Status |
|---|---|---|
| Beer Bottle Pass | **SL205**<br>SL203 | **Occupied**<br>Not Occupied |
| Castle Mountain | **SL068**<br>SL057, SL058, SL061, SL063, SL065, SL066, SL067, SL069, SL071, SL074, SL076, SL077, SL078, SL079, SL080, SL476, SL477, SL479, SL480, SL481, SL482, SL483, SL484 | **Active**<br>Not Occupied |

| SWCA Territory Name | Nest ID | Nest Occupancy/Activity Status |
|---|---|---|
| Castle Mountains South | **SL357, SL358**<br>SL346, SL347, SL348, SL354, SL355, SL360, SL361, SL534 | **Occupied**<br>Not Occupied |
| Castle Peaks | **SL496**<br>SL320, SL321, SL322, SL493 | **Active**<br>Not Occupied |
| Hart Peak | **SL337, SL523, SL524, SL531**<br>SL109, SL335, SL338, SL339, SL340, SL342, SL343, SL344, SL345, SL525, SL530 | **Occupied**<br>Not Occupied |
| Highland Range | **SL474**<br>SL041, SL042, SL044, SL050, SL051, SL463, SL464, SL467, SL469, SL470 | **Occupied**<br>Not Occupied |
| Highland Range Southeast | **SL616**<br>SL240, SL242, SL487 | **Active**<br>Not Occupied |
| High Table Mountain | **SL413**<br>SL411, SL412, SL543, SL544, SL545, SL546, SL547, SL548, SL549, SL552, SL555, SL557 | **Active**<br>Not Occupied |
| Lewis Holes | SL104, SL107, SL108 | Not Occupied |
| Lucy Gray Mountains | **SL414**<br>SL195, SL197 | **Active**<br>Not Occupied |
| McCullough Range South | **SL432** | **Active** |
| McCullough Spring | SL152, SL153, SL160 | Not Occupied |
| Railroad Spring | **SL617** | **Active** |
| Ute Peak | **SL558, SL577**<br>SL404, SL409, SL561, SL562, SL563, SL564, SL565, SL566, SL567, SL568, SL569, SL572, SL573, SL574, SL575, SL576, SL578, SL583, SL584, SL585, SL586, SL588 | **Occupied**<br>Not Occupied |
| Willow Spring | **SL277**<br>SL511 | **Active**<br>Not Occupied |

### *3.4.3 Golden Eagle Half-Mean Inter-Nest Distance*

The mean inter-nest distance within the Project's 10-mile buffer was 3.08 miles (4.96 km) (range: 1.48–7.07 miles [2.38–11.38 km]) for occupied territories (Figure 14). The mean territory radius centered on the nest (i.e., the half-mean inter-nest distance) was 1.54 miles (2.48 km) (Figure 15) (USFWS 2013). Using this method, two golden eagle territories would overlap with the final Turbine Area: McCullough Range South and Hart Peak (see Figure 15). There was some uncertainty as to the separation of the Hart Peak and Castle Mountains South territories. When these two territories were considered one territory, the mean inter-nest distance increased to 3.62 miles (5.83 km) (range: 1.63–7.07 miles [2.62–11.38 km]), and the half-mean inter-nest distance increased to 1.81 miles (2.91 km). No additional territories would overlap with the final Turbine Area using this approach.

## 3.5 Golden Eagle Prey Surveys

Thirty-four potential golden eagle prey items were recorded during the 1,248 golden eagle prey surveys: 17 desert cottontails, nine juvenile mule deer (*Odocoileus hemionus*), six coyote (*Canis latrans*), and two black-tailed jackrabbits. More potential golden eagle prey items were recorded in Site NV-3 (15 potential prey items) than in any other Project site, followed by Site NV-1, with 10 potential prey items.
As mentioned in Section 3.1, approximately 30.4% of all eagle-minutes were recorded in Sites NV-1 and NV-3 combined (12.2% and 18.3%, respectively). Conversely, only one golden eagle prey item (2.9% of prey items) was observed during prey surveys in Site NV-4, but 57.4% of eagle-minutes were recorded at that site.

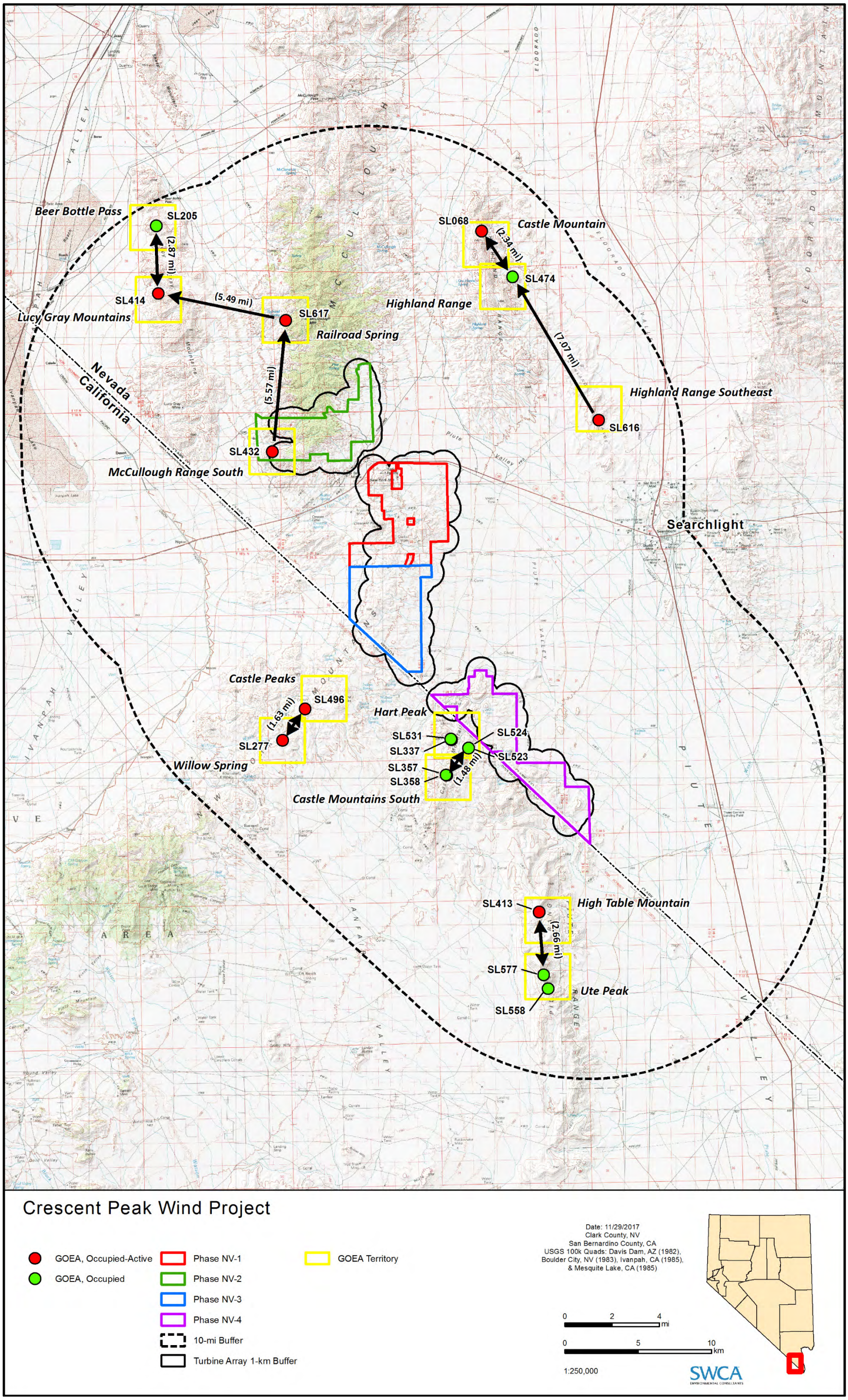


**Figure 14.** Illustration of calculating nearest-neighbor distances for the 13 occupied golden eagle (GOEA) nesting territories.

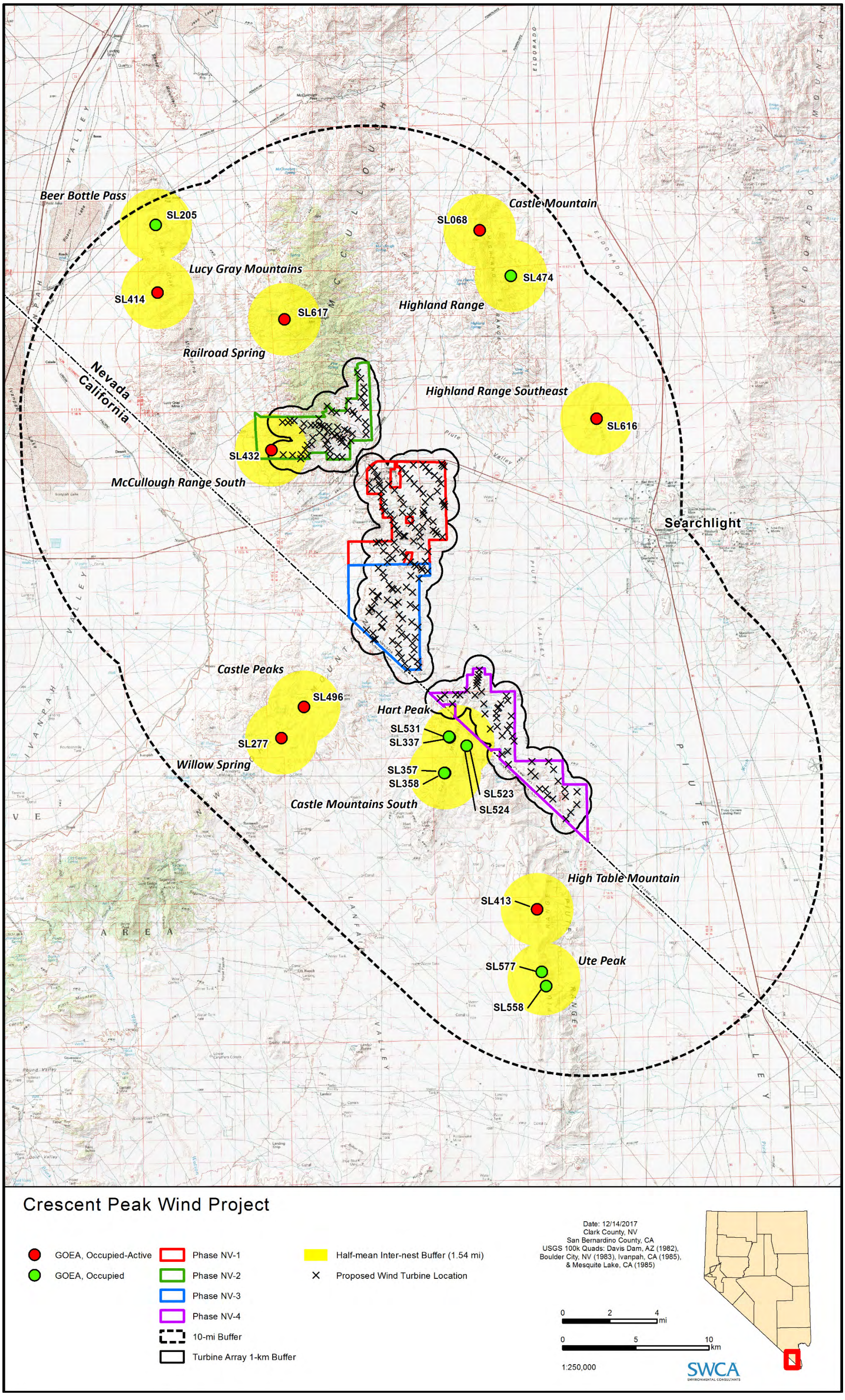


**Figure 15.** Approximation of golden eagle (GOEA) territories using half-mean inter-nest distance buffers.

Black-tailed jackrabbits, the most common prey item for golden eagles throughout the western United States (Driscoll 2010; Ehrlich et al. 1988), were only observed once during prey base surveys (two individuals), though biologists frequently observed jackrabbits incidentally while traveling to survey locations or performing other work in or around the Project.

# 4.0 CONCLUSION SUMMMARY

## 4.1 Eagle Use Surveys

Based on use counts and associated flight path mapping, there appear to be few golden eagle use concentration areas within the Project site boundaries (see Figures 5–9), with the exception of the northern portions of Site NV-4 (see Figure 8). Plots 41–43 comprised 9.7% of the 31 use count locations (includes "New" and "Old") but accounted for 51.4% (59 eagle-minutes) of all eagle-minutes (see Figure 4).

## 4.2 Avian Use Point-Counts—Large and Small Birds

### *4.2.1 Large- and Small-Bird Use*

Average raptor/turkey vulture use across all seasons at the Project (0.250 observations/20-minute survey) was 42% lower than the average of 17 studies at operating wind energy sites in the western United States (0.426 observations/20-minute survey) (Table 7) (from Erickson et al. 2002). Specifically, for golden eagles, large and small falcons, and northern harriers, average use was much lower across all seasons compared with that reported by Erickson et al. (2002) (see Table 7). Both *Buteo* spp. and *Accipiter* spp., however, exhibited use comparable to the results presented by Erickson et al. (2002) (see Table 7).

**Table 7.** Comparisons of Raptor Group Use of the Proposed Crescent Peak Wind Project (November 3, 2015, to October 26, 2017) with 17 Studies at Operating Wind-Energy Sites in the Western United States

| Raptor Group | Winter | | Spring | | Summer | | Fall | | Average | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Crescent Peak | Erickson et al. (2002) | Crescent Peak | Erickson et al. (2002) | Crescent Peak | Erickson et al. (2002) | Crescent Peak | Erickson et al. (2002) | Crescent Peak | Erickson et al. (2002) |
| Raptors/ vultures | 0.135 | 0.316 | 0.346 | 0.434 | 0.359 | 0.429 | 0.160 | 0.613 | 0.250 | 0.426 |
| Buteos | 0.103 | 0.107 | 0.170 | 0.148 | 0.154 | 0.148 | 0.112 | 0.167 | 0.135 | 0.137 |
| Golden eagle | 0.022 | 0.075 | 0.019 | 0.085 | 0.016 | 0.043 | 0.003 | 0.085 | 0.015 | 0.071 |
| Large falcons | 0.000 | 0.009 | 0.003 | 0.010 | 0.000 | 0.016 | 0.000 | 0.020 | 0.001 | 0.014 |
| Small falcons | 0.003 | 0.046 | 0.010 | 0.064 | 0.016 | 0.072 | 0.013 | 0.060 | 0.010 | 0.058 |
| Northern harrier | 0.000 | 0.011 | 0.000 | 0.013 | 0.000 | 0.020 | 0.006 | 0.036 | 0.002 | 0.019 |
| Accipiters | 0.003 | 0.002 | 0.022 | 0.007 | 0.000 | 0.009 | 0.013 | 0.021 | 0.010 | 0.008 |

Source: Erickson et al. (2002).

Note: Use is recorded as number of observations per 20-minute survey; blue text represents use at Crescent Peak Wind same or lower than Erickson et al. (2002); red text represents use at Crescent Peak Wind higher than Erickson et al. (2002).

Despite the presence of north-south trending ridgelines at the Project, there appears to be very little evidence of raptor migration through the Project sites.

Concentrations of migrating raptors typically occur during fall migration. Though no spatial analysis was completed to assess potential areas of raptors concentration, it appears that use was fairly evenly

distributed across the four Project sites, and there appears to be no evidence that migrating raptors/turkey vultures concentrate in the Project sites during fall migration. Additionally, raptor passage rates during the fall migration season were extremely low compared with known raptor migration concentration points. HawkWatch International conducted migration surveys at eight locations in the western United States during the 2016 fall migration period and recorded an average of 160.301 migrants/hour (Oleyar and Watson 2017); in contrast, the passage rate for migrating raptors in the project area during the fall was 0.274 migrants/hour. Of the eight locations surveyed by HawkWatch International, Yaki Point in Grand Canyon National Park is the most comparable to the Project in terms of climate and latitude. At this location, recorded passage rates (9.802 migrants/hour) were 34 times greater than those recorded in the project area (Oleyar and Watson 2017). Raptors do not typically concentrate during spring migration (personal communication, M. Neal, HawkWatch International, 2010); similarly, there is no indication that the Project area concentrates raptors or turkey vultures during spring migration. Pre-construction data suggest that the Project area does not serve as an important migratory pathway for migrating raptors or turkey vultures.

Forty-nine small bird species typical of the Mojave Desert were observed during SBUCs. Habitat loss associated with development and maintenance of the Project is likely to have some effect on localized use by small bird species; however, habitat within the proposed project area is not unique relative to the surrounding landscape, and development and maintenance of the Project would not preclude birds from using the habitat surrounding the Project and between Project facilities.

### *4.2.2 Golden Eagle Use*

Golden eagles exhibited low use across seasons in the Project area (0.015 observations/20-minute survey) (see Table 2). For general comparative purposes, golden eagle use at the Project (0.022 observations/ 20-minute survey in winter, 0.019 observations/20-minute survey in spring, 0.016 observations/20-minute survey in summer, and 0.003 observations/20-minute survey in fall) (see Table 2) was below average, compared with 17 studies at operating wind-energy sites in the western United States (Erickson et al. 2002) (see Table 7). Analyzing use data for the entire 1-hour eagle use count period yielded similar results (see Table 2).

In comparison with data from Erickson et al. (2002), year-round golden eagle use at the Project (0.015 golden eagles/20-minute survey) is most similar to that of the Maiden Wind Farm in Washington (Table 8), which places the Project just below the median use of the other 17 wind facility study areas. However, golden eagle use in the Project is well below the mean golden eagle use for all of these sites due, in large part, to the relatively high use at Altamont Pass and several sites at Foote Creek Rim. It is also important to note that Table 8 includes five projects for which golden eagles were never recorded. Of the sites provided in Erickson's (2002) synthesis where golden eagles are known to occur, the Project would rank near the bottom for golden eagle use.

**Table 8.** Golden Eagle Use at 17 Study Areas in the Western United States and at the Crescent Peak Wind Project

| Wind Resource Area | Study Area | Winter | Spring | Summer | Fall | Average |
|---|---|---|---|---|---|---|
| Altamont Pass | Altamont Pass | 0.375 | 0.438 | 0.063 | 0.500 | 0.333 |
| Foote Creek Rim | Foote Creek Rim | 0.187 | 0.301 | 0.194 | 0.311 | 0.234 |
| Foote Creek Rim | Foote Creek Rim UV | 0.189 | 0.214 | 0.122 | 0.287 | 0.197 |
| Foote Creek Rim | Morton's Pass Reference | 0.123 | 0.141 | 0.073 | 0.121 | 0.113 |
| Columbia Hills | Columbia Hills | 0.101 | 0.040 | 0.142 | 0.050 | 0.091 |
| Foote Creek Rim | Simpson's Ridge | 0.104 | 0.122 | 0.036 | 0.067 | 0.082 |
| Cares | Cares | 0.101 | 0.128 | 0.031 | 0.035 | 0.075 |
| San Gorgonio Pass | Phase I Water Area | 0.067 | 0.042 | 0.000 | 0.000 | 0.032 |
| San Gorgonio Pass | Phase I High Elevation | 0.000 | 0.000 | 0.048 | 0.075 | 0.028 |

| Wind Resource Area | Study Area | Winter | Spring | Summer | Fall | Average |
|---|---|---|---|---|---|---|
| Crescent Peak* | Crescent Peak | 0.022 | 0.019 | 0.016 | 0.003 | 0.015 |
| Maiden | Maiden | 0.031 | 0.000 | 0.000 | 0.000 | 0.012 |
| San Gorgonio Pass | Phase I Medium Elevation | 0.000 | 0.024 | 0.000 | 0.000 | 0.004 |
| Tehachapi Pass | West Ridge | 0.000 | 0.000 | 0.018 | 0.000 | 0.004 |
| San Gorgonio Pass | Phase I Low Elevation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| San Gorgonio Pass | Phase II Low Elevation | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| San Gorgonio Pass | Phase II Water Area | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Tehachapi Pass | East Slope | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Tehachapi Pass | Middle Ridge | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **Average** | | **0.072** | **0.082** | **0.041** | **0.081** | **0.068** |
| **Average without Crescent Peak** | | **0.075** | **0.085** | **0.043** | **0.085** | **0.071** |

Source: Erickson et al. (2002).

Note: Some biases may exist in comparisons of study areas due to differences in quality of viewsheds out to 800 m and durations of surveys. Overall four-season average is weighted by the length of each season.

* Crescent Peak Wind Project data not included in Erickson et al. (2002).

## 4.3 Special-Status Species

Of the eight special-status species recorded at the Project, four were recorded or seen on multiple occasions and at multiple sites: Brewer's sparrow (*Spizella breweri*), golden eagle, loggerhead shrike (*Lanius ludovicianus*), and pinyon jay (*Gymnorhinus cyanocephalus*). While none of these species are abundant, they at not uncommon at the Project. The four other species were recorded incidentally or during a single survey. Bald eagle was incidentally observed migrating over Site NV-3 on two occasions. Burrowing owl (*Athene cunicularia*) and sage thrasher (*Oreoscoptes montanus*) were each incidentally observed once in Site NV-3 near Plot 37 and Plot 32, respectively (see Figure 2). One Swainson's hawk (*Buteo swainsoni*) was recorded migrating north over Plot 36, also in Site NV-3.

## 4.4 Golden Eagle and Other Raptor Nest Surveys

Short vegetation and relatively flat topography limits available nesting habitat for eagles throughout most of the Project sites. The lack of large trees in Mojave Desert scrub habitat limits natural nesting sites to suitable cliffs; there are small cliffs scattered throughout the Project, but there are several large cliffs suitable for golden eagle nesting in Site NV-4. Multiple golden eagle nests are located within the Project site boundaries, one in Site NV-2 that was active in 2017 and two in Site NV-4 that were not occupied in 2011 or in 2017. Additionally, active and occupied red-tailed hawk nests were located within the site boundaries at Site NV-2 and Site NV-4, respectively. Two golden eagle territories (Hart Peak and McCullough Range South) (see Figure 15) recorded as occupied in 2017 (estimated by using the half-mean inter-nest distance) overlap with Sites NV-2 and NV-4. Furthermore, a third territory, Lewis Holes, was not occupied in 2011 or 2017, but is located within Site NV-4 and could later become occupied. The ECPG identifies that eagles occupying these territories may be highly susceptible to collisions with operating WTGs and calls for careful evaluation of such projects (USFWS 2013). It should be noted that the calculation of eagle territories using the USFWS (2013) method may underestimate, sometimes quite significantly, the actual home range of breeding eagles, and that golden eagle territories do not extend uniformly in all directions from the occupied nest(s) within a given territory.

## 4.5 Golden Eagle Prey Surveys

Prey base surveys were conducted to help describe relative prey availability for golden eagles within the Project area. Prey base surveys are typically conducted by driving and spotlighting transects at night (Driscoll 2010; Longshore et al. 2015). Results of stationary, daytime surveys should be considered limited

in their ability to accurately describe prey populations for the Project. Additionally, prey populations are cyclical, and determining local population cycles would require additional surveys outside the scope of work for the Project.

Based on two years of prey base survey data, the Project area does not provide an abundance of prey for golden eagles, and there are no colonial prey species (e.g., prairie dogs [*Cynomys* spp.], California ground squirrels, etc.), or species that otherwise congregate, in this region of the Mojave Desert. Furthermore, no colonial prey species or other potential golden eagle-concentrating prey sources were observed on-site during any of the numerous pre-construction surveys. Although eagle foraging habitat does exist within the Project area, no concentrations of prey were observed during the prey base surveys.

# 5.0 LITERATURE CITED


American Wind Energy Association. 2011. Comments of the American Wind Energy Association on the Draft Eagle Conservation Plan Guidance. Available at: http://www.fws.gov/windenergy/eagle_comments/john_anderson.pdf. Accessed January 2017.

American Wind Wildlife Institute (AWWI). 2017. Wind Turbine Interactions with Wildlife and Their Habitats: A Summary of Research Results and Priority Questions. Washington, DC. Available at: https://awwi.org/wp-content/uploads/2017/07/AWWI-Wind-Wildlife-Interactions-Summary-June-2017.pdf. Accessed November 2017.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, and R.D. Tankersley. 2008. Patterns of bat fatalities at wind energy facilities in North America. *Journal of Wildlife Management* 72:61–78.

Barrios, L., and A. Rodríguez. 2004. Behavioural and environmental correlates of soaring-bird mortality at on-shore wind turbines. *Journal of Applied Ecology* 41:72–81.

Bay, K., K. Nasman, W. Erickson, K. Taylor, and K. Kosciuch. 2016. Predicting eagle fatalities at wind facilities. *The Journal of Wildlife Management* 80(6):1000–1010.

Bureau of Land Management (BLM). 2005. *Final Wind Energy Programmatic Environmental Impact Statement*. Washington, D.C.: U.S. Department of the Interior, Bureau of Land Management.

Carrete, M., J.A. Sanchez-Zapata, J.R. Benitez, M. Lobón, F. Montoya, and J.A. Donázar. 2012. Mortality at wind farms is positively related to large-scale distribution and aggregation in griffon vultures. *Biological Conservation* 145:102–108.

Collopy, M.W. 1983. Foraging behavior and success of golden eagles. *Auk* 100: 747–749.

Dahl, E., K. Bevanger, T. Nygard, E. Roskaft, and B.G. Stokke. 2012. Reduced breeding success in white-tailed eagles at Smola windfarm, western Norway, is caused by mortality and displacement. *Biological Conservation* 145:79–85.

de Lucas, M., M. Ferrer, M. Bechard, and M.J. Munoz. 2012. Griffon vulture mortality at wind farms in southern Spain: Distribution of fatalities and active mitigation measures. *Biological Conservation* 147:184–189.

Driscoll, D.E. 2010. *Protocol for Golden Eagle Occupancy, Reproduction, and Prey Population Assessment*. Apache Junction, Arizona: American Eagle Research Institute.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds.* New York: Simon and Schuster Inc.

Erickson, W.P. 2003. Updated information regarding bird and bat mortality and risk at new generation wind projects in the West and Midwest. Presented at the National Wind Coordinating Collaborative Biological Significance Meeting, Washington, D.C., November 17–18, 2003.

Erickson, W.P., G. Johnson, M.D. Strickland, D.P. Young, Jr., K.J. Sernka, and R.E. Good. 2001. *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States.* National Wind Coordinating Committee Resource Document. Cheyenne, Wyoming: Western EcoSystems Technology, Inc.

Erickson, W.P., G.D. Johnson, D.P. Young, M.D. Strickland, R.E. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. *Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting, and Mortality Information from Proposed and Existing Wind Developments*. Cheyenne, Wyoming: Western EcoSystems Technology, Inc.

Erickson, W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, and J.L. Gehring. 2014. A comprehensive analysis of small-passerine fatalities from collision with turbines at wind energy facilities. *PLoS ONE* 9:1–18.

Ferrer, M., M. de Lucas, G.F.E. Janss, E. Casado, A.R. Munoz, M.J. Bechard, and C.P. Calabuig. 2012. Weak relationship between risk assessment studies and recorded mortality in wind farms. *Journal of Applied Ecology* 49(1):38–46.

Hoover, S.L., and M.L. Morrison. 2005. Behavior of red-tailed hawks in a wind turbine development. *Journal of Wildlife Management* 69:150–159.

Hunt, G.W. 2002. *Golden Eagles in a Perilous Landscape: Predicting the Effects of Mitigation for Wind Turbine Blade-strike Mortality*. Contract No. 500-97-4033. Prepared for PIER – Environmental Area. Santa Cruz, California: University of California.

Katzner, T., D. Brandes, T. Miller, M. Lanzone, C. Maisonneuve, J.A. Tremblay, R. Hulvihill, and G.T. Merovich. 2012. Topography drives migratory flight altitude of golden eagles: implications for on-shore wind energy development. *Journal of Applied Ecology* 49:1178–1186.

Kelly, T.A., and J.K. Fiedler. 2008. A framework for mitigation of bird and bat strike risk at wind farms using avian radar and SCADA interface. DeTect, Inc. Presented at the Wind Wildlife Research Meeting VII, Milwaukee, Wisconsin, October 27–29, 2008.

Kingsley, A., and B. Whittam. 2005. *Wind Turbines and Birds: A Background Review for Environmental Assessment.* Prepared for Environment Canada/Canadian Wildlife Service.

Kochert, M.N. 1972. Population Status and Chemical Contamination in Golden Eagles in Southwestern Idaho. Master's thesis, University of Idaho, Moscow.

Kochert, M.N., K. Steenhof, C.L. Mcintyre, and E.H. Craig. 2002. Golden eagle (*Aquila chrysaetos*). The Birds of North America Online, edited by A. Poole. Cornell Lab of Ornithology, Ithaca, New York, and American Ornithologists Union. Available at: http//bna.birds.cornell.edu/bna/species/684doi:10.2173/bna.684. Accessed January 2010.

Kuvlesky, W.P., L.A. Brennan, M.L. Morrison, K.K. Boydston, B.M. Ballard, and F.C. Bryant. 2007. Wind energy development and wildlife conservation: challenges and opportunities. *Journal of Wildlife Management* 71(8):2487–2498.

Longshore, K. M., T.C. Esque, K.E. Nussear, Diego Johnson, Matthew Simes, and R.D. Inman. U.S. Geological Survey. 2015. *An Assessment of Food Habits, Prey Availability, and Nesting Success of Golden Eagles within the Desert Renewable Energy Conservation Plan Area.* California Energy Commission. Publication number: CEC-500-2017-003.

Loss, S.R., T. Will, and P.P. Marra. 2013. Estimates of bird collision mortality at wind facilities in the contiguous United States. *Biological Conservation* 168:201–209.

McGahan, J. 1968. Ecology of the golden eagle. *Auk* 85:1–12.

National Academy of Sciences (NAS). 2007. *Environmental Impacts of Wind Energy Projects*. Washington, D.C.: National Academies Press.

National Wind Coordinating Committee (NWCC). 2010. *Wind Turbine Interactions with Birds, Bats, and Their Habitats: A Summary of Research Results and Priority Questions*. Available at: https://www.nationalwind.org/research/publications/birds-and-bats-fact-sheet/. Accessed August 2016.

NatureServe. 2016. NatureServe Explorer. Available at: http://explorer.natureserve.org/index.htm. Accessed January 11, 2016.

Nevada Natural Heritage Program (NNHP). 2017. NNHP Species for Clark County. Department of Conservation and Natural Resources. Available online at http://www.heritage.nv.gov/species/process_list.php. Accessed December 2017.

Nilsson, C. 2015. *Flight Behaviour of Passerines on Nocturnal Migration* (Doctoral dissertation). Lund University, Lund, Sweden. Available at: https://www.falsterbofagelstation.se/arkiv/pdf/cecilia_kappa.pdf. Accessed December 2017.

Oleyar, D. and J. Watson. 2017. Fall 2016 raptor migration report Yaki Point HawkWatch – Grand Canyon, Arizona. HawkWatch International, Inc. Salt Lake City, Utah. Available at: https://hawkwatch.org/images/stories/Conservation_Science/Publications_and_Reports/Technical_Reports_-_Current_Projects/2016_Yaki_Point_Annual_Report.pdf. Accessed December 2017.

Pagel, J.E., D.M. Whittington, and G.T. Allen. 2010. *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Eagle Management and Permit Issuance*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management.

Phillips, R.L., T.P. McEneaney, and A.E. Beske. 1984. Population densities of breeding golden eagles in Wyoming. *Wildlife Society Bulletin* 12:269–273.

Postupalsky, S. 1974. Raptor reproductive success: some problems with methods, criteria, and terminology. In *Management of Raptors, Raptor Research Report No. 2*, edited by F.N. Hamerstrom, Jr., B.E. Harrell, and R.R. Olendorf, pp. 21–31. Vermillion, South Dakota: Raptor Research Foundation.

Smallwood, K.S., and C.G. Thelander. 2008. Bird mortality in the Altamont Pass wind resource area, California. *Journal of Wildlife Management* 72:215–223.

Soutullo, A., V. Urios, M. Ferrer, and S.G. Penarrubia. 2006. Post-fledging behavior in golden eagles *Aquila chrysaetos*: onset of juvenile dispersal and progressive distancing from the nest. *Ibis* 148:307–312.

Steenhof, K., and I. Newton. 2007. Assessing nest success and productivity. In *Raptor Research and Management Techniques*, edited by D.M. Bird and K.L. Bildstein, pp. 181–191. British Columbia, Canada: Hancock House, Raptor Research Foundation.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L. Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions.* Prepared for the National Wind Coordinating Collaborative, Washington, D.C.

Tetra Tech, Inc. 2012. *Mohave County Wind Farm Eagle Conservation Plan and Bird Conservation Strategy*. Prepared for BP Wind Energy North America, Inc. Available at: http://www.blm.gov/pgdata/etc/medialib/blm/az/pdfs/energy/mohave/feis/pod.Par.73579.File.pdf/Attachment_12_-_ECP-BCS.pdf. Accessed August 2013.

Thorstrom, R. 2001. Nest-site characteristics and breeding density of two sympatric forest falcons in Guatemala. *Ornitologia Neotropical* 12:337–343.

U.S. Fish and Wildlife Service (USFWS). 2012. *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines*. March 23.

———. 2013. *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management. April 2013.

———. 2016. Eagle permits; revisions to regulations for incidental take and take of eagle nests. *Federal Register* 81:91494–91553.

U.S. Geological Survey (USGS). 2004. Provisional Digital Land Cover Map for the Southwestern United States. Version 1.0. Logan, Utah: RS/GIS Laboratory, College of Natural Resources, Utah State University.

Watson, J. 2010. *The Golden Eagle*. 2nd edition. New Haven, Connecticut: Yale University Press.

Wichmann, M.C., F. Jeltsch, W.R.J. Dean, K.A. Moloney, and C. Wissel. 2003. Implication of climate change for the persistence of raptors in arid savanna. *Oikos* 102:186–202.