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Post-Construction Monitoring at the

Genesis Solar Energy Project

Riverside County, California

2015 Fall Quarterly Interim Report

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EXECUTIVE SUMMARY

Avian and bat monitoring surveys were conducted from August 31 to October 31, 2015 (the fall season; for logistical reasons, fall monitoring started on Monday, August 31, 2015) at Genesis Solar Energy Project (Project) in accordance with the Project's Bird and Bat Conservation Strategy (BBCS). Specifically, standardized carcass searches, searcher efficiency trials, and carcass persistence trials were conducted. This report represents the third seasonal report for the first year of monitoring, and summarizes monitoring methods and results for those surveys based on the procedures and requirements specified in the BBCS. This report and the other interim quarterly reports are considered preliminary summaries of data and information. Data and final information from all four quarterly monitoring periods will be included in a comprehensive final annual report.

Standardized carcass searches were conducted 1) in the solar field, consisting of a random stratified 30% sample of solar troughs of both Project units, 2) at each evaporation pond, 3) along the perimeter of each power block and beneath each air condensed cooling (ACC) unit, 4) along inner and outer portions of the "fenceline", resulting in 100% of the length of the perimeter fence surveyed, and 5) along 25% of the total length of generation-tie (gen-tie) and distribution lines (collectively, overhead lines) from the southernmost Project fence to Wiley's Well reststop, which co-occur with the Project access road. Searches were conducted within the fall season at intervals of approximately 7 days, and all components were searched nine times.

All bird and bat fatalities and injuries that were discovered by observers, referred to as "detections" in this report, including those found incidentally and during standardized carcass searches, were documented. During the reporting period, 219 avian detections and seven bat detections were made. Composition of fall detections included avian species from 18 guilds (excluding unidentified birds). Waterbirds and waterfowl comprised the largest number of detections (n = 81): the most common waterfowl species detected was eared grebe (31 detections or 14% of all avian detections). Blackbirds and orioles were the second most common guild (n = 23): the most common blackbird species was western meadowlark (n = 11 detections). A summary of all avian guilds and migration behavior represented in the fall can be found in Appendix D. Fall was the second season in which bats were detected.

According to specifications of the BBCS, avian detections were categorized by likely diurnal or nocturnal migration behavior, ecological guild (e.g., raptors, songbirds, etc.), facility component, and suspected cause of death. These standardized carcass search results, along with searcher efficiency and carcass persistence rates from bias trials conducted on site, were input into a fatality estimator model (Huso 2010) to provide a preliminary estimate of the number of fatalities that occurred at the Project during the reporting period adjusted for sources of bias. The estimate is considered preliminary because the annual report may pool information from bias trials and other data across seasons which could affect seasonal estimates.

Carcass persistence was influenced by Project component, carcass size, and season. Thus, carcass persistence trials from the fall only inform the following estimates. In the solar field, small carcasses (0-100 g) had a 59% (90% confidence interval [CI]: 45 – 74%; n = 15) chance of persisting through the 7-day search interval, medium carcasses (101 – 999 g) had a 77% (CI: 61 – 89%) chance(n = 10), and large carcasses (1000+ g) had a 100% chance (CI: 97 – 100%; n = 5). Mean (median) removal time for small carcasses in the SCAs was 4.3 (1.5) days, 11.4 (19.8) days for medium carcasses, and was not estimated for large carcasses given the nearly perfect persistence rate (no removal was observed). Along overhead lines, the model predicted that 21% (CI: 12 – 31%) of small carcasses (n = 15), 37% (CI: 23 – 50%) of medium carcasses (n = 10), and 97% (CI: 83 – 100%) of large carcasses (n = 5) persisted for a standard 7-day search interval. Mean (median) removal time along overhead lines for small carcasses was 0.5 (0.5) days, for medium carcasses was 1.4 (1.0) days, and for large carcasses was 138.6 (31.0) days.

Searcher efficiency was influenced by carcass size and Project component, but not season. Thus, searcher efficiency trials from spring, summer, and fall, and all observers, were pooled for the following estimates. In the solar field, searcher efficiency was 85% (CI: 76 – 93%) for small birds and bats (n = 39), 96% (CI: 92 – 99%) for medium birds (n = 23), and 99% (CI: 95 – 100%) for large birds (n = 14). Along overhead lines, searcher efficiency was 59% (CI: 45 – 70%) for small birds and bats (n = 41), 86% (CI: 75 – 95%) for medium birds (n = 29), and 95% (CI: 84 – 100%) for large birds (n = 15).

Using the Huso (2010) fatality estimator model, during the fall period 2015, there were an estimated total 811 carcasses (birds and bats; CI: 560 – 1036) at the Project (all components combined). There were an estimated 574 (387 – 709) carcasses (192/1000 acres, 2.30/nameplate MW) for all components associated with both solar units (SCAs, power block, evaporation ponds, and along the perimeter fence, combined). Of these, 354 carcasses were estimated for the SCAs, 23 carcasses were estimated for the fence, 125 carcasses were estimated for evaporation ponds, and 72 carcasses were estimated for power blocks.

Estimates of fatalities along the overhead lines and road are heavily influenced by the high rates of scavenging observed during the limited trials at the gen-tie (ie. large correction factors) and are likely very unreliable. The estimate along overhead lines/road was 237 carcasses (90% CI: 37 – 413). A complete list of estimates for each Project component and carcass size class with confidence intervals is presented in Appendix B.

STUDY PARTICIPANTS

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REPORT REFERENCE

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1.0 INTRODUCTION

1.1 Project Background

The Genesis Solar Energy Project (referred to in this report as "Project") consists of two solar power electrical generating facilities (Units 1 and 2) with a combined net capacity of 250 megawatts. The Project facility consists collectively of two power blocks, power generating equipment (solar collector assemblies [SCAs] of mirrored parabolic troughs [solar troughs or troughs]), support facilities, and evaporation ponds. Linear facilities include a transmission line, distribution line, natural gas pipeline, and a main access road that are mostly co-located for approximately 10.5 km (6.5 miles). The Project comprises approximately 1,800 acres (728 hectares [ha]). The solar field and associated structures comprise 1,727 acres (699 ha) and linear facilities comprise 93 acres (38 ha). The Project is located on land managed by the Bureau of Land Management (BLM) 25 miles (40 kilometers [km]) west of Blythe, in Riverside County, California (Figure 1).

1.2 Monitoring Plan Overview and Goals

A Bird and Bat Conservation Strategy (2015; “BBCS”) was prepared by the Project proponent in collaboration with the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), California Energy Commission (CEC), and Bureau of Land Management (BLM) to guide comprehensive monitoring of impacts to birds and bats associated with operation of the Project. Final agency acceptance of the BBCS occurred in March 2015.

The BBCS details post-construction monitoring to be conducted and the data analysis and reporting processes that will be implemented by Genesis Solar in collaboration with the USFWS, CDFW, CEC, and BLM. As identified in the BBCS, they are:

1. Estimate overall annual avian fatality rate and species composition associated with the Project infrastructure. This estimate will include mortality associated with SCAs, overhead lines including the generation (gen-tie) line, perimeter fence and other features of the Project that may result in injury and fatality.
2. Determine whether there are spatial and temporal/seasonal patterns of mortality associated with project infrastructure (e.g., different fatality rates near SCAs on the edge of the solar field versus the interior area of the solar field).

3. Provide information that will assist the CEC and BLM, in consultation with the USFWS and the CDFW, in understanding which species and potentially which regional populations are at risk.
4. Collect data in such a way that the CEC and BLM, in consultation with the USFWS and CDFW, may make comparisons with other solar sites.

1.3 Purpose of This Report

This report represents the third seasonal report for the first year of monitoring summarizing monitoring methods and results for avian and bat fatalities and injuries based on the procedures and requirements specified in the approved BBCS and as required by CEC Condition of Certification BIO-16. This and the other interim quarterly reports are considered preliminary summaries of data and information. Data and final information from all four quarterly monitoring periods will be included in a comprehensive final annual report.

This report covers the 2015 fall season, which includes the period from August 31 to October 31, 2015. For logistical reasons, fall monitoring started on Monday, August 31, 2015. As stated in the approved BBCS, this seasonal report includes the observed fatality rates broken out by likely diurnal, and likely nocturnal species, and for ecological guilds of interest (e.g., raptors, water-associated birds, passerines), for each of the facility types and suspected causes of death. Species composition of carcasses and the results of the bias trials are also reported. This report presents information related to the spatial distribution of carcasses, but no formal statistical analysis will be conducted until the end of the monitoring year, given the limited data presently available.

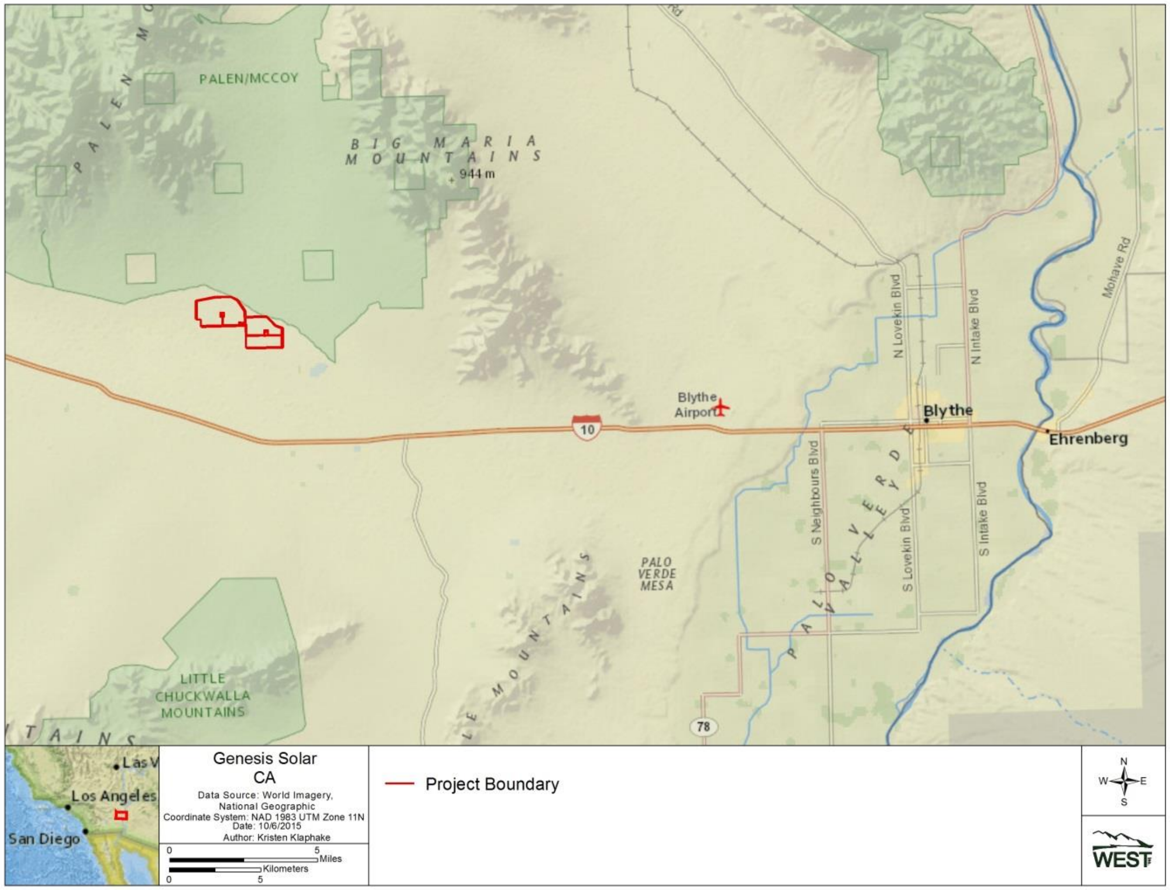

Figure 1. Genesis Solar Energy Project vicinity map, Riverside County, California.

2.0 METHODS

The BBCS describes the methods by which monitoring and certain analyses, including compilation of the overall fatality estimate, will occur. Below is an abridged description (see BBCS for detailed methods).

2.1 Standardized Carcass Searches

This section describes areas surveyed, the timing and frequency of searches, and the methods by which standardized searches were conducted to identify dead/injured birds and bats at the Project. This section also describes the methods for conducting carcass removal and searcher efficiency trials; how data were reported and analyzed; and the methods for producing fatality estimates for the Project.

2.1.1 Areas Surveyed

Standardized carcass searches were conducted at a sample of the solar collector assemblies in each unit; the perimeter of each power block (including the area below each air condensed cooling [ACC] unit; Figures 2 and 4); the evaporation ponds (Figure 3); the "fenceline" defined as the perimeter fences for each unit (100% of the total length of fence; Figures 2 and 4); and the gen-tie and distribution lines (25% of the total length of each line from the Project fence to Wiley's Well rest stop; Figure 5). Table 1 provides the total area of each component as well as the percent of each component that was searched.

To ensure a balanced distribution of plots in solar collector assemblies, each unit was divided into blocks, and each block was sampled using a systematic sample of 30% of pairs of rows with a random starting point. This sampling design ensures that survey plots were not spatially clumped.

2.1.2 Search Frequency and Timing

The fall survey season includes the period from August 31 through October 31, 2015. Standardized searches occurred at 7-day intervals beginning August 31, 2015. All project components included in standardized searches were surveyed nine times. All searches took place during daylight hours between approximately 6:30 am and 5:00 pm.

The average fall search interval was 7.0 days (median 7.0 days) for all Project components included in standardized carcass searches. Slight variation in search interval was anticipated due to weather and logistical delays.

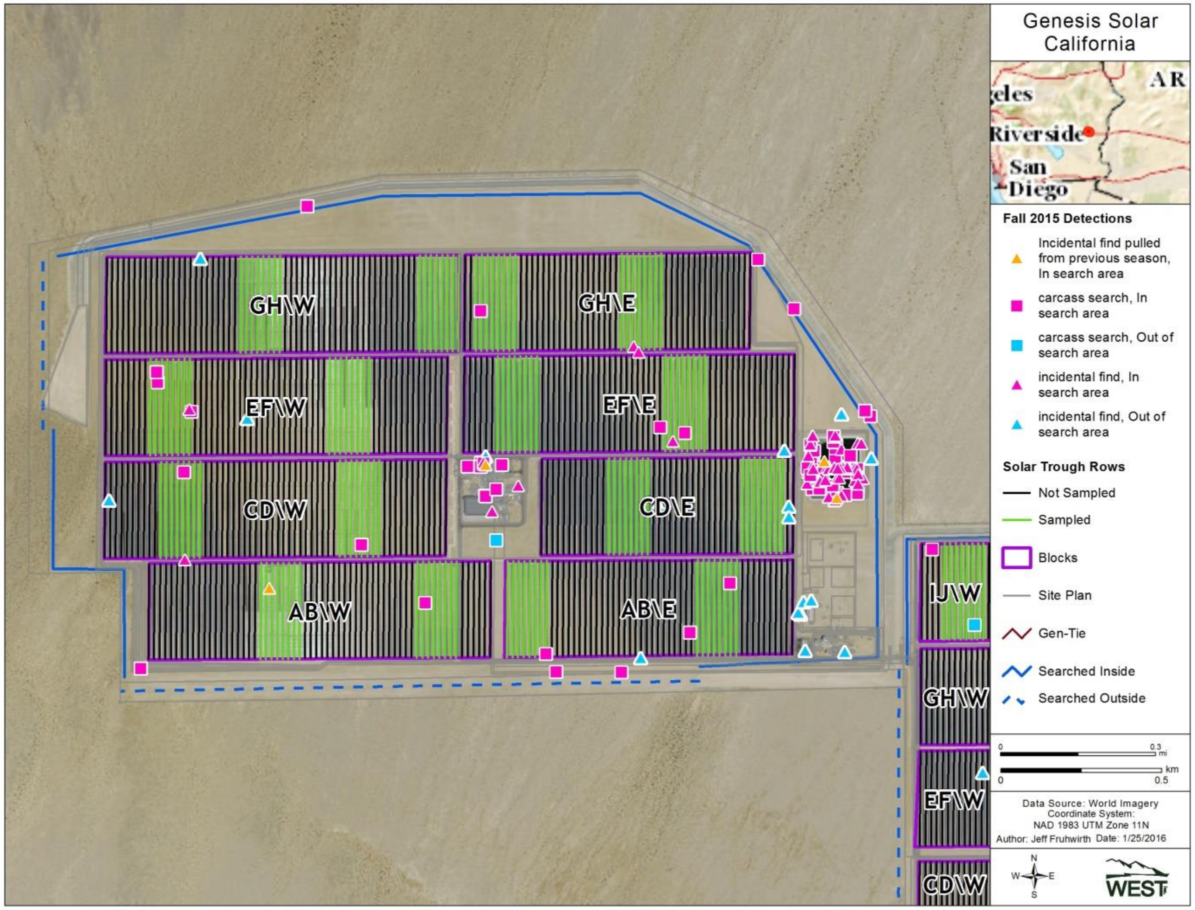

Figure 2. Areas of standardized searches and detections (those made during searches and those made incidental to operations and maintenance) at Unit 1 of the Genesis Solar Energy Project fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

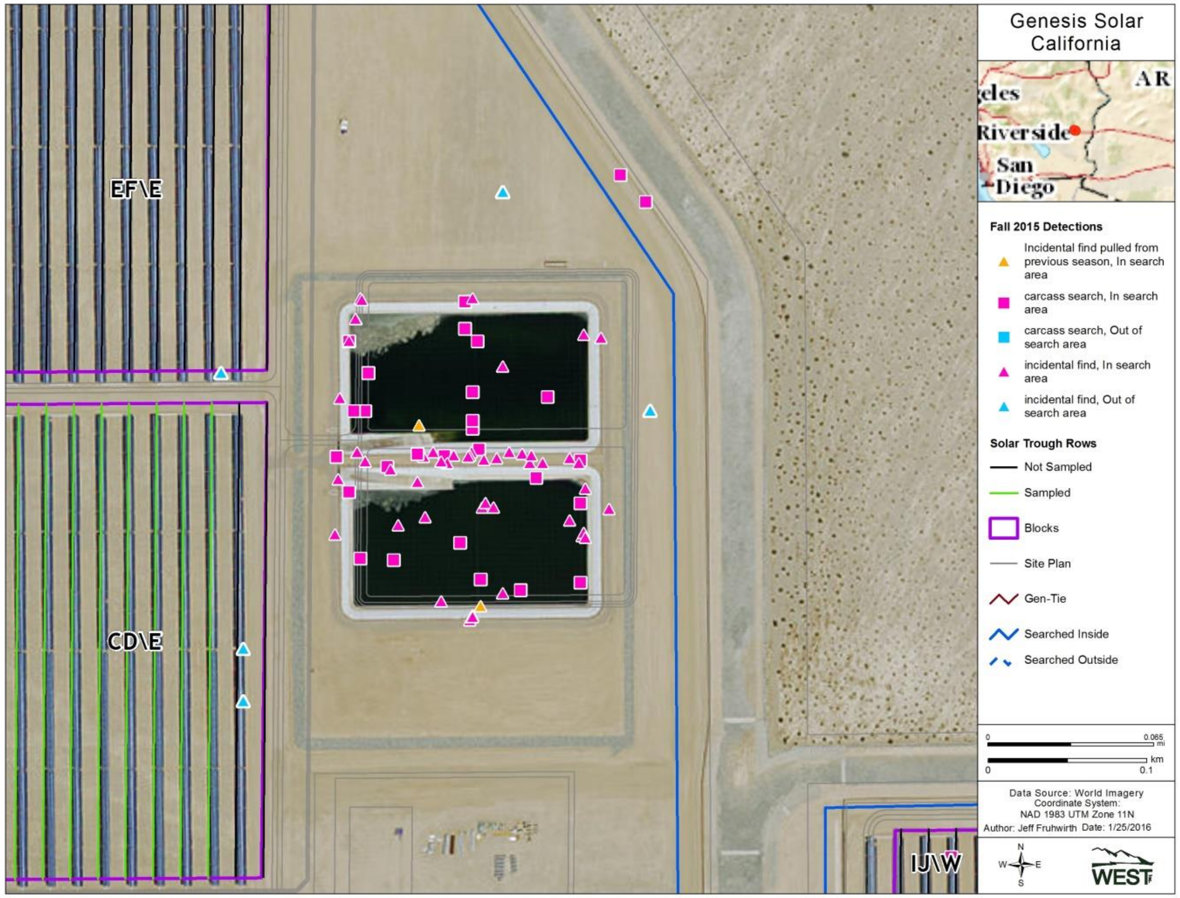

Figure 3. Close-up of area at evaporation ponds and detections (those made during searches and those made incidental to operations and maintenance) within Unit 1 of the Genesis Solar Energy Project during fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

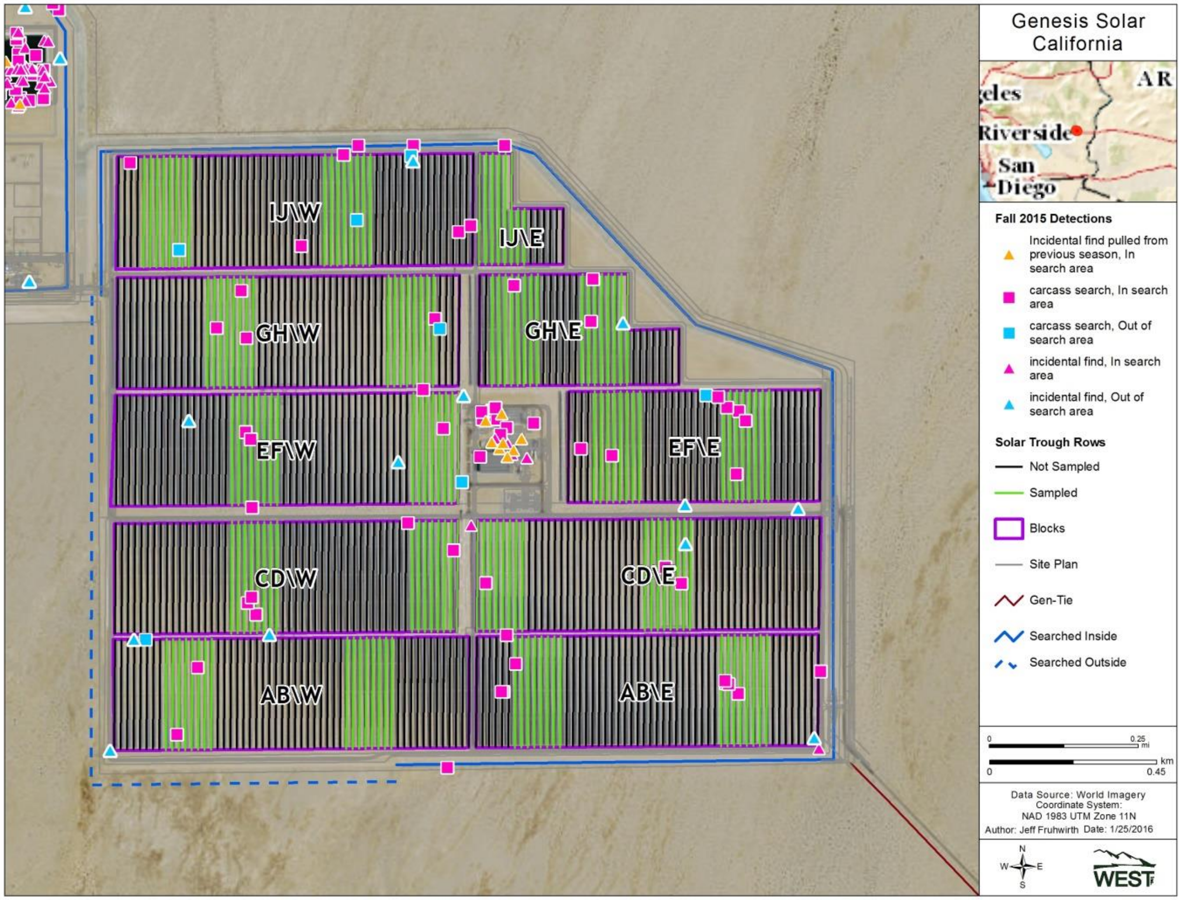

Figure 4. Areas of standardized searches and detections (those made during searches and those made incidental to operations and maintenance) at Unit 2 of the Genesis Solar Energy Project fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

Table 1. Areas included in standardized carcass searches at the Genesis Solar Energy Project during fall (August 31 – October 31) 2015.

Project Component	Total Size	Units	Percent of Component Searched
SCAs	920	rows of solar troughs	30.4
Unit 1	460	rows of solar troughs	27.8
Unit 2	460	rows of solar troughs	33.0
ACC units	0.9	hectares	100
Power block (perimeter)	0.8	kilometers	100
Evaporation ponds	3.1	hectares	100
Distribution line	8.4	kilometers	25.0
Generation Tie line	8.4	kilometers	25.0
Fence	14.5	kilometers	100

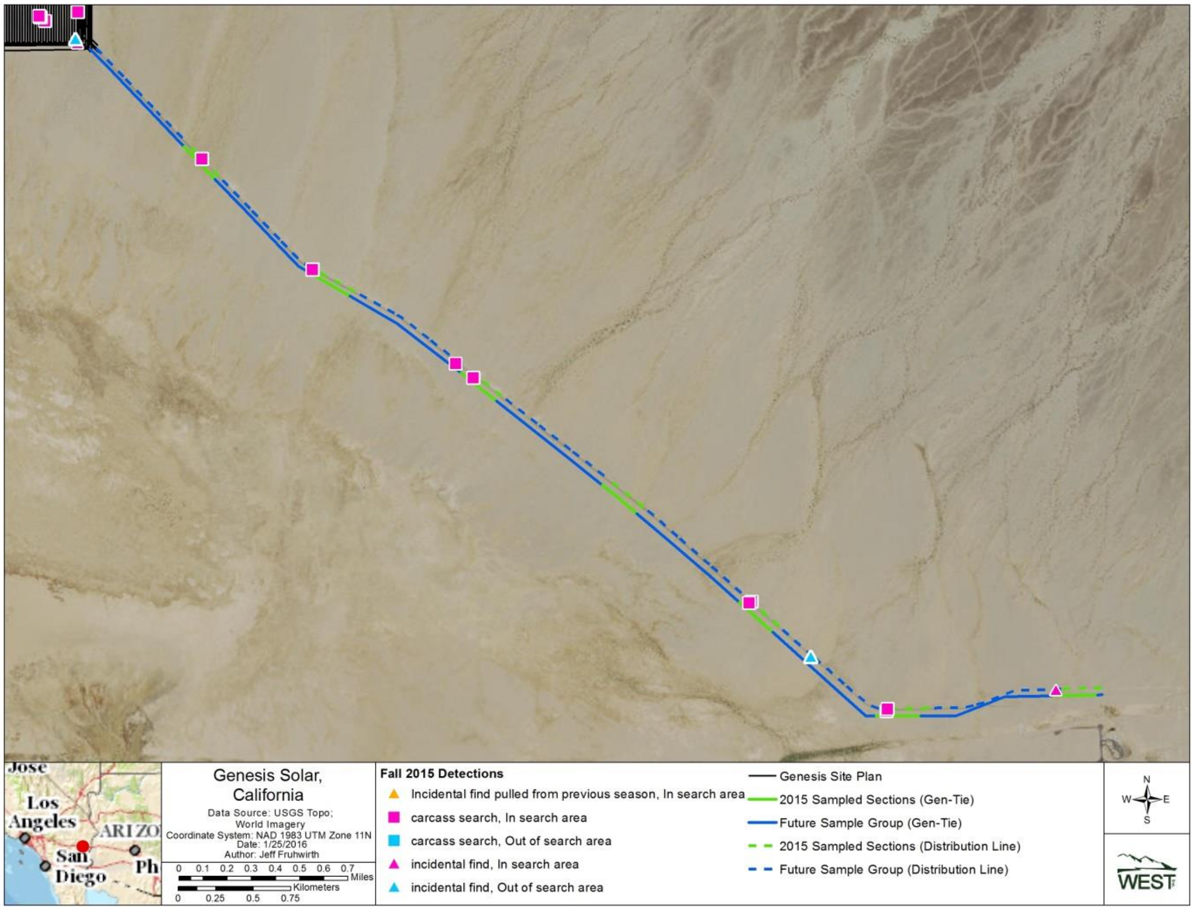

Figure 5. Areas of standardized searches and detections (those made during searches and those made incidental to operations and maintenance activities) along the distribution and generation tie lines and Project access road at the Genesis Solar Energy Project during fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

2.1.3 Search Methods

Standardized carcass searches were performed by CEC- and BLM-approved biologists, in accordance with methods outlined in the BBCS.

Within the solar collector assemblies, 280 solar troughs (30.4% of the total number of troughs) were surveyed by vehicle. Biologists slowly drove (≤5 mph) parallel to troughs and centered between rows, searching ahead and to the driver's side of the vehicle for bird and bat carcasses. Biologists scanned out to a perpendicular distance of approximately 30 m, or the ground area encompassing two rows of solar troughs.

At each power block, biologists slowly walked around the entire perimeter looking for dead and injured birds and bats, and used binoculars to scan interior portions of the powerblock. Beneath ACC units, biologists walked four evenly-spaced transects (approx. 15-m apart) through the gravel. The search area for the power block is defined as the 0.8-km perimeter of each power block, and the area of the interior power block that was available for visual inspection from the periphery.

At each evaporation pond, biologists walked the entire perimeter looking for dead and injured birds and bats on the ground, in the netting, and in the pond below the netting. Binoculars or a spotting scope were used to scan across the top of the netting and the surface of each pond.

The entire length of fenceline (approximately 12 miles) was searched by vehicle. Biologists searched an approximately 1.5 to 2.5 miles (2.4 km) along drivable sections of the outside of the fence, and the remaining 9.5 to 10.5 miles (16.9 km) were surveyed from the inside of the fence (Figures 2 and 3). Travel speed was below five mph while searching.

The gen-tie and distribution lines were each surveyed using a 30-m wide strip transect (i.e., 15 m of ground on either side of the overhead line). A 25% sample of both lines from the Project fence to the Project outer gate located near the Wiley's Well Road rest stop were searched for carcasses. Biologists slowly walked every fourth 300-ft segment of each line, scanning for dead or injured birds or bats within 15 m (49.2 ft) of the transect line. Given the location of the lines relative to the road, detections found in the strip transects below overhead lines could be caused by collision with an overhead line, vehicles along the road, predation, or some combination thereof.

Once a carcass was detected, it was immediately photographed, and data were recorded according to specifications outlined in section 6.7 of the approved Genesis BBCS. Carcasses were immediately retrieved from their location on the ground, labeled, and placed in a freezer on site.

Suspected cause of death was assigned based on evidence available on the detection, evidence available on the Project infrastructure, and proximity of a detection to Project infrastructure. Detections that had evidence of scavenging and lacked evidence on Project infrastructure were assigned as "unknown" because it can't be determined whether the event was caused by predation or interaction with project infrastructure. Detections that were intact (i.e., no evidence of scavenging), located in close proximity to Project infrastructure (e.g., found directly beneath overhead lines), and had evidence of injury had a suspected cause of death attributed to the respective Project component. Detections that were suspected to have been caused by something other than predation, collision, drowning, or entanglement were designated as "other". During the fall, those detections assigned to the "other" category were suspected to have been stranded (most of them at the evaporation ponds). It should be noted that there is uncertainty associated with cause of death assignments because no events were directly observed.

2.2 Carcass Persistence Trials

Carcass persistence trials were conducted throughout the fall period. Carcasses from three size classes (small [0-100 g], medium [101-999], and large [1000+ g]) were used for trials. Carcass persistence results from small birds were used as a proxy for bat carcass persistence. The small size class comprised house sparrows (*Passer domesticus*) and 2-3 week old coturnix quail (*Coturnix coturnix*), the medium size class comprised rock pigeons (*Columba livia*), chukar (*Alectoris chukar*) and older coturnix quail, and the large size class comprised hen mallard (*Anas platyrhynchos*) and hen ring-necked pheasant (*Phasianus colchicus*).

2.2.1 Carcass Persistence Data Collection

To quantify carcass persistence rates, 15 small, 10 medium, and five large carcasses were randomly placed and monitored within the solar field (SCA's and the fence line), and the same number of each size class were placed along the gen-tie and distribution lines, for a total of 60 carcass persistence trials at Genesis during the fall 2015 season, as specified in section 6.5 of the approved Genesis BBCS. Fifteen carcasses within the Project fence (within SCAs and along the fence and perimeter of power blocks) and four carcasses along the gen-tie and distribution lines were monitored using motion-triggered digital trail cameras, while the remaining carcasses were visited on foot, for 30 days or until the carcass had deteriorated to a condition at which it would no longer qualify as a documentable fatality (i.e., a feather spot). Fewer carcasses along the gen-tie and distribution lines were monitored with cameras because of theft and vandalism concerns. Carcasses without trail cameras were visited and photographed once per day for the first four days, and then every three to five days until the end of the monitoring period. To avoid training scavengers to recognize cameras as "feeding stations", trail cameras were installed five days before specimens were placed, and fake cameras without bias trial carcasses were also placed (eight within the Project fence, and four along the gen-tie and distribution lines). Periodic ground-based checking of carcasses with trail cameras also occured to guard against misleading indicators of carcass removal, such as wind blowing the carcass out of the camera's field of view. To minimize potential bias caused by scavenger swamping (Smallwood 2007, Smallwood et al. 2010), carcass-persistence specimens were distributed across the entire

Project, not just in areas subject to standard searches, and trials were initiated on two different dates throughout the fall season.

2.2.2 Estimating Carcass Persistence Times

Measurements of carcass persistence rates were subject to censoring. In this context, censoring refers to the instance when a value (e.g. days a carcass is present before being removed) may not be known exactly, but is known to be within a finite range. For example, suppose a carcass was checked on day 7 and was present, and was checked again on day 10, but was found to be missing. The exact time until removal is unknown; however, it is known that the carcass became unavailable at some point between 7 and 10 days. This carcass would be considered “interval censored”. Similarly, if a carcass lasts the entire 30-day trial period, that carcass is “right censored”— it is known that the carcass lasted at least 30 days, but it may have persisted longer. Because carcass persistence data were censored, persistence was analyzed using methods that can accommodate censored data and still produce unbiased estimates of the probability of persistence (Therneau 2015, Thernaur and Grambsch 2000). It is beyond the scope of this document to provide statistical foundations of censored-data survival models but functions identical to those provided with the USGS-developed fatality estimator software (Huso et al 2012) were used to fit survival models to the censored carcass persistence data, and some background is available in the documentation provided with that software.

USGS-developed fatality estimator software (Huso et al. 2012) was used to fit survival models to the censored carcass persistence data. There were four distributions implemented in survival models used to estimate the probability a carcass is unscavenged and available to be found at the end of the search interval (*r*): exponential, Weibull, loglogistic, and lognormal. These four distributions exhibit varying degrees of flexibility in order to model a wide variety of distributions of persistence time. Akaike’s Information Criterion adjusted for sample size (AICc; Akaike 1973) was used to rank the fit of each survival model to censored carcass persistence data.

2.3 Searcher Efficiency Trials

Searcher efficiency trials were conducted throughout the fall period. Carcasses from three size classes (small, medium, and large) were used for trials. Searcher efficiency results from small birds were used as a proxy for bat detection. The small size class comprised house sparrows and 2-3 week old coturnix quail, the medium size class comprised rock pigeons, chukar, and older coturnix quail, and the large size class comprised hen mallards and hen ring-necked pheasants.

2.3.1 Searcher Efficiency Data Collection

A total of 60 searcher efficiency trials (15 small birds, 10 medium birds, and five large birds within SCAs, power blocks, and along the perimeter fence, and the same number of each size class along the gen-tie and distribution lines) were placed at the Project during the 2015 fall season, as specified in section 6.4 of the approved Genesis BBCS. Locations for trials were chosen by taking a randomized sample of all locations included in standardized carcass searches. Trials were placed in various vegetation heights and in areas that had different soil and vegetation colors and values to represent the range of conditions under which searches occur. They were placed in all areas where standardized searches occur except the evaporation ponds. Trial carcasses were placed early the same day that a search was scheduled to occur, and trial carcasses were collected either as they were detected by a searcher, or shortly after the search occurred (always within a few hours of the completion of a search).

2.3.2 Estimating Searcher Efficiency

The nearly complete lack of vegetation cover in the solar field suggests that searcher efficiency may be higher in the solar field than along the overhead lines where vegetation cover is greater. If this hypothesis is true, accounting for this difference in searcher efficiency across Project components will be important for producing accurate fatality estimates at the end of the monitoring year.

To evaluate hypotheses regarding differences in carcass detectability among carcass size and visibility classes, logistic regression models were fit to searcher efficiency data and AICc was used to compare models. Models including effects of Project component, carcass size (3 classes), season (spring, summer, fall) and visibility index (2 classes) were compared to each other and a null model. The two visibility classes present at the Project site are: easy (defined as ≥ 90% bare ground [BG]; vegetation <6” tall) and moderate (defined as 26-89% BG; vegetation <6” tall). However, within the solar field the moderate visibility class has a very limited spatial extent (approximately 10%) due to management aimed at minimizing vegetation cover and thus, was represented by only four trial carcasses during the reporting period. Rather than eliminating the four carcasses in the moderate class from the analysis of searcher efficiency, we assumed there were no differences in searcher efficiency between the two visibility classes in the solar field this fall, and the set of candidate models for searcher efficiency (within the solar field only) did not include tests of the hypothesis that searcher efficiency varied between visibility classes. The spatial extent of the moderate visibility class in the solar field is roughly equal to its representation in the fall sample of searcher efficiency carcasses (4 of 60 or 6.7%). Because the moderate visibility class has a greater spatial extent along the overhead lines, we included a test of visibility class when modeling searcher efficiency along overhead lines.

Once the best model was chosen and appropriate classes identified, searcher efficiency, or the proportion of carcasses detected, *p,* was calculated for each class using the following equation:

$$p = \frac{Number\ of\ Carcasses\ Observed}{Number\ of\ Carcasses\ Available}$$

2.4 Fatality Estimator

Fatality rate estimation is a complex task due to several variables inherent to every fatality monitoring study. Carcasses may persist for variable amounts of time due to local scavenger activity or environmental conditions leading to carcass degradation over time. Carcasses and feather spots are also detected with varying levels of success based on carcass characteristics and ground cover (e.g., vegetated areas underneath the gen-tie and distribution lines versus cleared areas beneath SCAs). For these reasons, it is generally inappropriate to draw conclusions based on the raw number of fatalities alone. The desire to estimate fatalities given these variables has driven the development of several statistical methods for estimating fatalities (e.g., Smallwood 2007, Huso 2010, Korner-Nievergelt 2011). All of these fatality estimation methods share a similar underlying model. Generally, the fatality estimation for a given site may be written as:

$$F=C/rp,$$

where F is the total number of fatalities, C is the number fatalities detected and included in fatality estimation, r is the probability a carcass is unscavenged and available to be found at the end of the search interval, and p is the probability of detecting a carcass (Huso 2010).

All fatality estimates were calculated using the Huso estimator, as well as 90% confidence using bootstrapping (Manly 1997). Bootstrapping is a computer simulation technique that is useful for calculating point estimates, variances, and confidence intervals for complicated test statistics. A total of 1,000 bootstrap replicates was used for each variable including searcher efficiency (p), probability of a carcass persisting to the next search ($\hat{r}$), adjusted search interval and observed fatalities. From these bootstraps, the probability of available and detected was calculated and applied to the bootstrapped observed fatalities. The lower 5th and upper 95th percentiles of the 1,000 bootstrap estimates provide estimates of the lower limit and upper limit of an approximate 90% confidence interval on all estimates.

2.5 Incidental Reporting

Some detections were outside standardized search areas, or were within search areas but not observed during standardized searches. Such detections were found by WEST avian biologists and operational personnel and were considered "incidental" detections. When found by operational personnel, these detections were reported to WEST avian biologists for documentation. Data on incidental detections are reported here, as well as in the SPUT Avian Injury and Mortality Report Forms August – October 2015. All detections made in search areas that were estimated to have occurred within the 7-day search interval were included in fatality estimates, regardless of whether they were detected incidentally or during searches.

3.0 MONITORING RESULTS

3.1 Summary of Avian Detections

During fall 2015, a total of 226 detections (including all stranded and injured birds, incidental detections, and bats) of 43 identified avian species and five identified species of bat were recorded (Table 2). The most numerous detection of an identified species was of eared grebe (*Podiceps nigricollis*; n = 31), followed by ruddy duck (*Oxyura jamaicensis*; n = 22), and mourning dove (*Zenaida macroura*; n = 17). Most detections (n = 85, or 37.6% of total detections) occurred at SCAs (Figures 2, 3; Tables 2, 3, and 4). One hundred twenty-seven detections (56.2%) were made during standardized carcass searches and 99 (43.8%) were documented as incidentals with most (n = 54) at the evaporation ponds. Notable occurrences of species outside their typical geographic distribution included brown thrasher (*Toxostoma rufum*), rusty blackbird (*Euphagus carolinus*), and ruddy ground-dove (*Columbina talpacoti*).

Table 2. Number of individual detections (those made during standardized carcass searches and incidentally), by species and component, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = solar collector assembly; OH lines = overhead lines (gen-tie and distribution lines)

Common Name	Scientific Name	Size	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Total Count
Avian									
great blue heron	*Ardea herodias*	LB	0	0	1	0	0	0	1
great egret	*Ardea alba*	LB	0	0	1	0	0	0	1
redhead	*Aythya americana*	LB	1	0	2	0	0	0	3
western grebe	*Aechmophorus occidentalis*	LB	3	1	0	0	0	0	4
American coot	*Fulica americana*	MB	3	1	2	1	0	1	8
American kestrel	*Falco sparverius*	MB	2	2	0	0	0	0	4
blue-winged teal	*Anas discors*	MB	2	0	0	0	0	0	2
cinnamon teal	*Anas cyanoptera*	MB	2	1	2	0	0	0	5
eared grebe	*Podiceps nigricollis*	MB	2	0	27	1	1	0	31
greater roadrunner	*Geococcyx californianus*	MB	2	1	0	1	0	0	4
green-winged teal	*Anas crecca*	MB	2	0	0	0	0	0	2
killdeer	*Charadrius vociferus*	MB	2	0	0	0	0	0	2
lesser nighthawk	*Chordeiles acutipennis*	MB	0	1	0	0	0	0	1
mourning dove	*Zenaida macroura*	MB	9	2	1	1	3	1	17
northern flicker	*Colaptes auratus*	MB	0	0	0	1	0	0	1
northern shoveler	*Anas clypeata*	MB	1	0	0	0	0	0	1
rock pigeon	*Columba livia*	MB	1	0	0	0	0	0	1
ruddy duck	*Oxyura jamaicensis*	MB	3	0	19	0	0	0	22
unidentified bird (medium)	*na*	MB	5	2	3	0	0	0	10
unidentified duck	*na*	MB	0	0	0	1	0	0	1
unidentified grebe	*na*	MB	2	0	1	0	0	0	3
unidentified teal	*Anas spp*	MB	2	1	1	0	0	1	5
western meadowlark	*Sturnella neglecta*	MB	11	0	0	0	0	0	11
white-winged dove	*Zenaida asiatica*	MB	1	1	0	0	0	0	2

Table 2. Number of individual detections (those made during standardized carcass searches and incidentally), by species and component, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = solar collector assembly; OH lines = overhead lines (gen-tie and distribution lines)

Common Name	Scientific Name	Size	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Total Count
black phoebe	*Sayornis nigricans*	SB	0	1	0	0	0	0	1
Brewer's blackbird	*Euphagus cyanocephalus*	SB	1	0	1	0	0	0	2
brown-headed cowbird	*Molothrus ater*	SB	0	1	0	1	0	0	2
brown thrasher	*Toxostoma rufum*	SB	0	1	0	0	0	0	1
European starling	*Sturnus vulgaris*	SB	0	0	0	1	0	0	1
house wren	*Troglodytes aedon*	SB	1	0	0	0	0	0	1
lesser goldfinch	*Spinus psaltria*	SB	3	1	0	0	0	0	4
Lincoln's sparrow	*Melospiza lincolnii*	SB	0	1	0	0	0	1	2
loggerhead shrike	*Lanius ludovicianus*	SB	0	1	0	0	0	0	1
red-necked phalarope	*Phalaropus lobatus*	SB	0	0	1	0	0	0	1
red-winged blackbird	*Agelaius phoeniceus*	SB	0	0	2	0	0	0	2
rock wren	*Salpinctes obsoletus*	SB	0	0	0	0	1	0	1
ruby-crowned kinglet	*Regulus calendula*	SB	0	0	0	0	1	0	1
ruddy ground-dove	*Columbina talpacoti*	SB	1	0	0	0	0	0	1
rusty blackbird	*Euphagus carolinus*	SB	0	0	1	0	0	0	1
Sagebrush sparrow	*Artemisiospiza nevadensis*	SB	0	0	0	0	1	0	1
Savannah sparrow	*Passerculus sandwichensis*	SB	0	0	1	0	0	0	1
sora	*Porzana carolina*	SB	3	0	0	0	0	0	3
spotted sandpiper	*Actitis macularia*	SB	0	0	1	0	0	0	1
unidentified bird (small)	na	SB	9	1	3	1	0	1	15
unidentified blackbird	na	SB	0	0	0	2	0	0	2
unidentified goldfinch	na	SB	0	0	1	0	0	0	1
unidentified shorebird	na	SB	0	0	3	0	0	0	3
unidentified sparrow	na	SB	2	3	3	0	1	0	9
unidentified tern	na	SB	0	0	0	1	0	0	1

Table 2. Number of individual detections (those made during standardized carcass searches and incidentally), by species and component, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = solar collector assembly; OH lines = overhead lines (gen-tie and distribution lines)

Common Name	Scientific Name	Size	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Total Count
unidentified warbler	na	SB	1	1	0	0	0	0	2
western tanager	*Piranga ludoviciana*	SB	1	0	0	0	0	0	1
white-crowned sparrow	*Zonotrichia leucophrys*	SB	0	0	0	0	1	0	1
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	SB	0	2	0	0	0	0	2
yellow warbler	*Setophaga petechia*	SB	0	0	0	0	1	0	1
unidentified bird (unknown size)	na	Unk	6	0	1	3	1	0	11
Bats									
big brown bat	*Eptesicus fuscus*	BAT	1	0	0	0	0	0	1
canyon bat	*Parastrellus hesperus*	BAT	0	1	0	0	0	0	1
Mexican free-tailed bat	*Tadarida brasiliensis*	BAT	0	1	0	0	0	0	1
unidentified bat	na	BAT	0	0	2	0	0	0	2
long-legged bat	*Myotis volans*	SB	0	0	0	0	0	1	1
pallid bat	*Antrozous pallidus*	SB	0	0	0	1	0	0	1
Total			85	28	80	16	11	6	226

3.2 Temporal Patterns of Avian Detections

The number of detections recorded daily during fall 2015 ranged from zero to 34 (Figure 6). The period from August 31 to October 31 was characterized by a peak in detections on October 1, halfway through the fall season. The number of detections per day represents those discovered during standardized carcass searches and incidentally. All days on which there were 6 or more detections made were reported via the Avian Injury & Mortality Report form (in accordance with Special Utilities Permit MB44900B-0 Condition H.1(c) within 24 hours to the USFWS, BLM, CDFW, and CEC. On October 8, 2015, 10 detections were reported and it was subsequently discovered that one of those detections had been previously counted and reported on October 1, 2015. Because the detection was near the middle of an evaporation pond it could not be collected. Thus, there is a difference of one detection reported in Figure 6 on October 8 than was originally reported to the agencies.

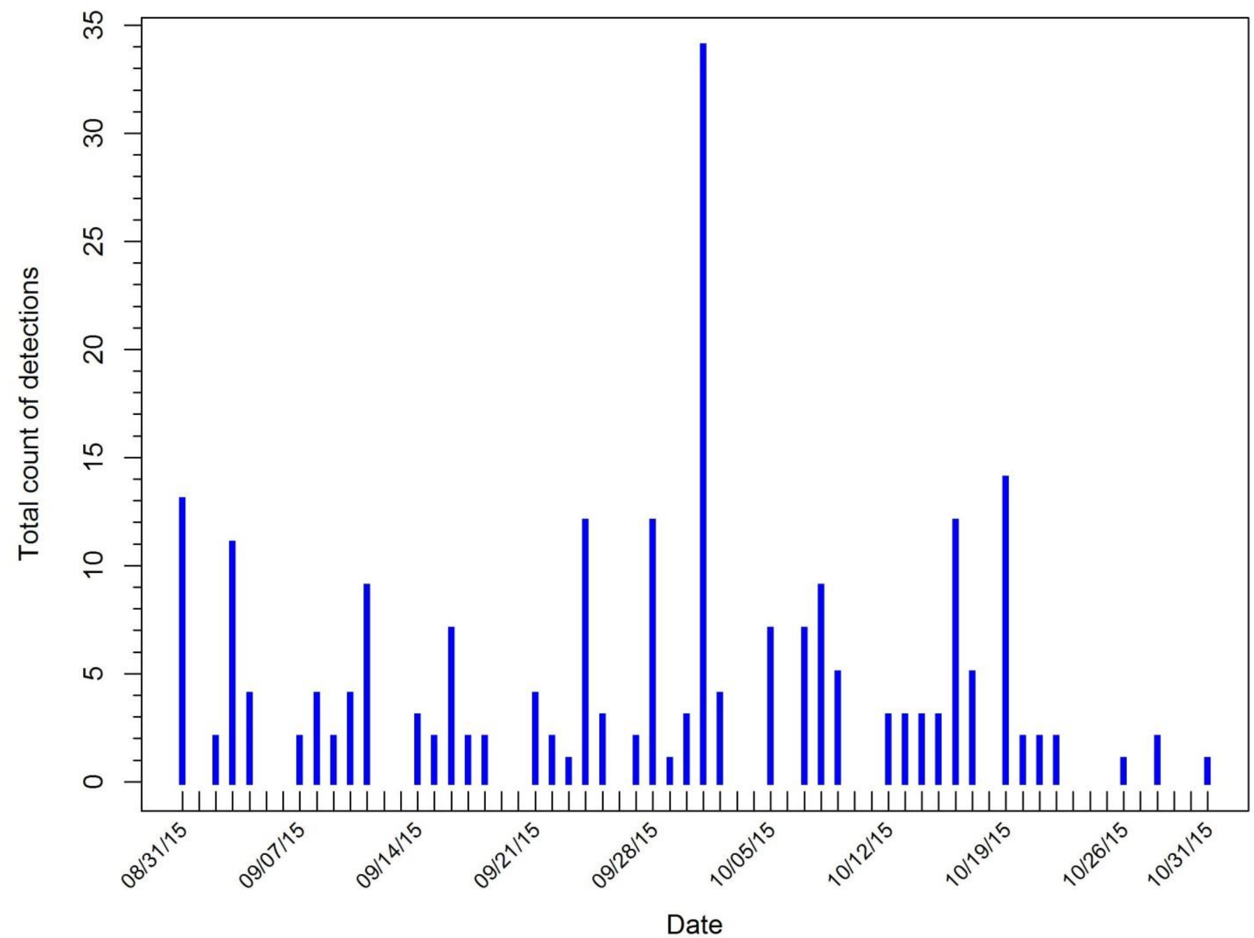

Figure 6. Total number of detections by date during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California.

3.3 Spatial Distribution of Avian Detections

3.3.1 Detections by Project Component

During fall 2015, detections were documented from Project buildings, the perimeter fence, gen-tie and distribution lines (overhead lines), evaporation ponds, the power block, and SCA's (Tables 2, 3, and 4; Figures 2-5). Of the 215 detections within both Project units, 134 (62.3%) were detected at Unit 1, and 81 (37.7%) were detected at Unit 2. There were 80 detections at the evaporation ponds.

Table 3. Total avian and bat detections by Project component and detection category during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California.

	Inside carcass search area		Outside carcass search area	
Project Component	**Carcass search**	**Incidental**	**Carcass search**	**Incidental**
Buildings	0	0	0	6
Fence	12	1	1	2
Overhead lines/road	8	1	0	2
Ponds	26	52	0	2
Power Block	17	8	1	2
SCA	56	6	6	17
Total	**119**	**68**	**8**	**31**

Table 4. Total detections (including incidentals) by Project component and suspected cause of death during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California.

	Suspected Cause of Death*						
Project Component	**Collision**	**Drowned**	**Entangled**	**Other**	**Predation**	**Unknown**	**% of Total**
Buildings	0	0	0	0	0	6	2.7
Fence	0	0	0	0	0	16	7.1
Overhead lines/road	3	0	0	0	0	8	4.9
Ponds	2	1	5	13	0	59	35.4
Powerblock	0	2	0	0	0	26	12.4
SCA	3	0	0	0	0	82	37.6
% of Total	3.5	1.3	2.2	5.8	0	87.2	100.0

* Suspected cause of death was assigned based on evidence available on the detection, evidence available on Project infrastructure, and proximity of detection to Project infrastructure. Detections that had evidence of scavenging and lacked evidence on Project infrastructure were assigned as "unknown" because it can't be determined whether the event was caused by predation or interaction with project infrastructure. Detections that were intact (i.e., no evidence of scavenging) and located in close proximity to Project infrastructure (e.g., found directly beneath overhead lines) and had evidence of injury had a suspected cause of death attributed to the respective Project component. However, it should be noted

that there is substantial uncertainy associated with cause of death assignments because no events were directly observed.

3.3.2 Feather Spot Detections

Thirty-one (13%) of the 226 detections made during fall 2015 consisted only of feather spots. Along the fence, six of 16 total detections (38%) were feather spots. Three detections along the overhead lines and road and no detections at the evaporation ponds were feather spots. Six of 28 total detections (21%) at the powerblocks were feather spots. Sixteen of 85 total detections (19%) at SCA's were feather spots.

3.4 Detections of Stranded and Injured Birds

There were 21 detections of stranded or injured birds during fall (Table 5). Most of these detections (n = 17; 81.0%) were waterfowl, and most of them (n = 18; 85.7%) were found at the evaporation ponds on top of the netting.

Table 5. Detections of stranded or injured birds at the Genesis Solar Energy Project during fall (August 31 – October 31) 2015.

Project Component	Common Name	Latin Name	Outcome	Count
Ponds	Ruddy duck	*Oxyura jamaicensis*	Died	2
			Released	1
			Transported	7
	Eared grebe	*Podiceps nigricollis*	Euthanized	1
			Released	1
			Transported	1
	American coot	*Fulica americana*	Transported	1
	Savannah sparrow	*Passerculus sandwichensis*	Released	1
	Unidentified goldfinch	-	Unknown*	1
	Unidentified sparrow	-	Unknown*	2
Powerblock	Western grebe	*Aechmophorus occidentalis*	Released	1
SCA	Eared grebe	*Podiceps nigricollis*	Released	1
Building	American coot	*Fulica americana*	Released	1

* Unidenitified passerines were flying around within the area enclosed by netting. These birds could not be rescued and eventually were no longer detected by observers.

3.5 Summary of Bat Detections

Seven bats were detected during the fall season. Idenitified species included big brown bat (*Eptesicus fuscus*), canyon bat (Parastrellus*hesperus)*, long-legged bat (*Myotis volans*), Mexican free-tailed (*Tadarida brasilinesis*), and pallid bat (*Antrozous pallidus*; Table 2).

3.6 Carcass Persistence Trials

Data from carcass persistence trial carcasses were available from spring, summer, and fall at the solar field (which includes the SCAs, powerblocks, and perimeter fence) and overhead lines (n = 30 at each component for each season, or 180 total). Preliminary analysis using AICc suggested that season was an important predictor of carcass persistence. Therefore, 30 carcasses from fall were used to estimate carcass persistence along overhead lines, and 30 carcasses from fall were used to estimate carcass persistence within the solar field.

Using carcass persistence data from the 2015 fall season as outlined above, survival models were compared for relative quality using the corrected AICc score, as suggested in Huso (2010). The AICc score provides a relative measure of model fit and parsimony among a selection of candidate models. The model with lowest AICc is typically chosen as the "best" model relative to other models tested; however, any model within two AICc points of the best model is considered competitive with the best model (Burnham and Anderson 2004).

The best model included main effects of carcass size and Project component and included a loglogistic distribution. In the solar field, the model predicted that 59% (CI: 45 – 74%) of small carcasses (n = 15), 77% (CI: 61 – 89%) of medium carcasses (n = 10), and 100% (CI: 97 – 100%) of large carcasses (n = 5) persisted for a standard 7-day search interval. Mean (median) removal time for small carcasses in the SCAs was 4.3 (1.5) days, 11.4 (19.8) days for medium carcasses, and was not estimated for large carcasses given the nearly perfect persistence rate (no removal was observed; Figure 7). Fifty percent of carcasses remained between day 1 and 2 for small birds and by day 20 for medium birds. Along overhead lines, the model predicted that 21% (CI: 12 – 31%) of small carcasses (n = 15), 37% (CI: 23 – 50%) of medium carcasses (n = 10), and 97% (CI: 83 – 100%) of large carcasses (n = 5) persisted for a standard 7-day search interval. Mean (median) removal time along overhead lines for small carcasses was 0.5 (0.5) days, for medium carcasses was 1.4 (1.0) days, and for large carcasses was 138.6 (31.0) days (Figure 7). Fifty percent of carcasses remained between day 1 and 2 for small birds and by day 2 for medium birds. Large carcasses were not reduced to 50%.

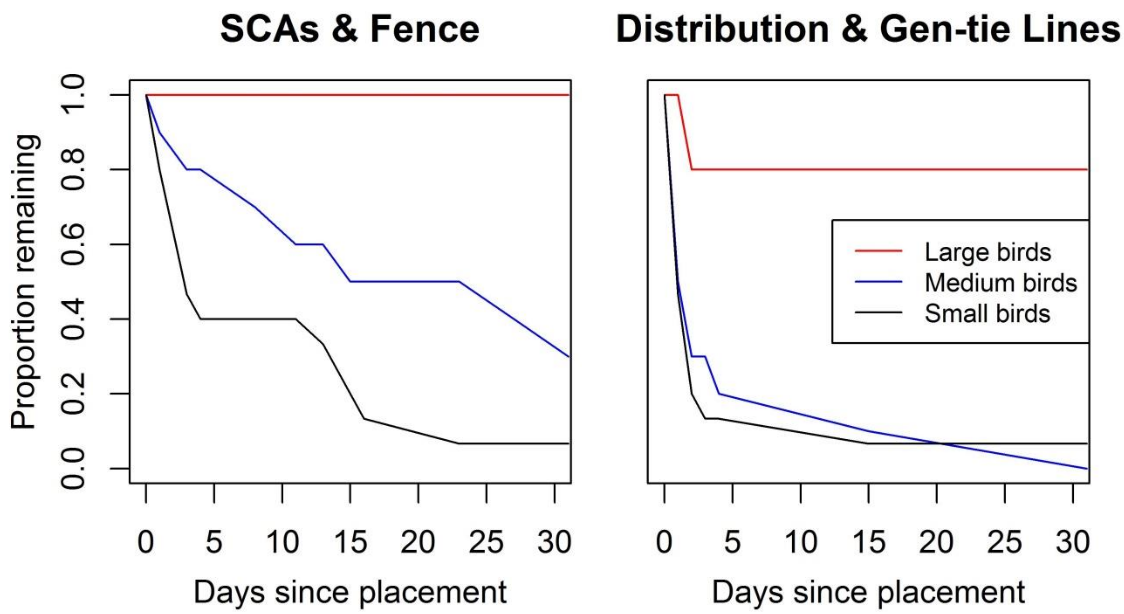

Figure 7. Proportion of trial carcasses remaining as a function of days since placement and carcass size class during the fall (August 31 – October 31) 2015 season at the Genesis Solar Energy Project, Riverside County, California. Sample size used to produce each panel of the above figure was n = 15, 10, and 5 for small, medium, and large size classes, respectively.

3.7 Searcher Efficiency Trials

During the 2015 fall season, a total of 60 searcher efficiency trials (30 small, 20 medium, and 10 large birds) were placed at the Project. Overall, 19 trials were placed in the SCAs, eight trials were placed along perimeter fences (inner and outer perimeters), and three trials were placed at power blocks (along perimeter and beneath ACC units). Fourteen trials were placed along the gen-tie and 16 were placed along the distribution line. Fifty-five trials were available to be found, and five trials disappeared (one in the SCAs, one along the fence, one at the powerblocks, one along the distribution line, and one along the gen-tie line). All carcasses removed by scavengers during searcher efficiency trials are assumed to have been removed before the observer had a chance to detect the trial carcass. Three observers conducted searches at the Project during fall. Searcher efficiency trials were conducted on each observer in approximate proportion to the number of searches they conducted at the Project, as follows: Sarah Nichols (number of trials available to be found: 18) and Wanda Bruhns (18), and Darin Blood (19). All trials were included in estimation of searcher efficiency.

The best model included main effects of carcass size and Project component, but not season or visibility class. Thus, data from spring, summer, and fall searcher efficiency trials, and both visibility classes, were pooled for the following estimates of searcher efficiency. In the solar field (SCAs + fence + powerblocks), searcher efficiency for small birds was 85% (76 – 93%), 96% (92 – 99%) for medium birds, and 99% (95 – 100%) for large birds. Along overhead lines, searcher efficiency was 59% for small birds (45 – 70%), 86% for medium birds (75 – 95%), and 95% (84 – 100%) for large birds. Although carcass size and Project component influenced searcher efficiency, searcher efficiency was relatively high over all (mean = 87%).

3.8 Fatality Estimates

Fatality estimates were calculated separately for each component (SCAs, power blocks, fence, evaporation ponds, and overhead lines/road). There were 226 detections during fall plus an additional 12 incidental detections in the summer that would have been found on the next scheduled search, which landed in the fall season. Thus, the additional 12 detections from summer were considered in the fatality analysis for fall (Table 7). Of the 238 detections, four were excluded from the analysis because they were older than the search interval, and 39 were excluded because they were outside of a standardized search area (Table 7; Appendix B). A total of 195 detections were included in the analysis and they are presented in Appendix B by size class and Project component. However, all detections from fall are reported in Table 2. Detections used in the analysis, bias corrections, summer fatality estimates, and 90% confidence intervals for summer fatality estimates are detailed in Appendix B.

Table 6. Status of detections during the fall (August 31 – October 31) 2015 season at the Genesis Solar Energy Project, Riverside County, California. All detections outside the search area were excluded from the fatality analysis, regardless of whether they occurred during a standardized carcass search or incidentally.

	Carcass search	Incidental detection	*Pushed to next season's fatality estimate	*Pulled from previous season's fatality estimate
Inside search area	119	68	0	12
Outside search area	8	31	0	0

* Incidental detections occurring after the last standardized carcass search in a season are considered for inclusion in the fatality analysis for the following season. This is consistent with the assumption we make throughout the monitoring seasons; that carcasses found incidentally would have been available to be found on the next scheduled search. This assumption may result in some carcasses found during one season but considered in the following season's fatality analysis. Once a carcass has been moved to a different season's analysis it is still subject to the same criteria for inclusion or exclusion based on location (in versus out of a searched area) and carcass age (greater than versus less than the search interval).

Using the Huso (2010) fatality estimator model, during the fall period 2015, there were an estimated total 811 carcasses (birds and bats; CI: 560 – 1036) at the Project (all components combined). There were an estimated 574 (387 – 709) carcasses (192/1000 acres, 2.30/nameplate MW) for all components associated with both solar units (SCAs, power block, evaporation ponds, and along the perimeter fence, combined). Of these, 354 carcasses were estimated for the SCAs, 23 carcasses were estimated for the fence, 125 carcasses were estimated for evaporation ponds, and 72 carcasses were estimated for power blocks.

Estimates of fatalities along the overhead lines and road are heavily influenced by the high rates of scavenging observed during the limited trials at the gen-tie (ie. large correction factors) and are likely very unreliable. The estimate along overhead lines/road was 237 carcasses (90% CI: 37 – 413). A complete list of estimates for each Project component and carcass size class with confidence intervals is presented in Appendix B.

4.0 DISCUSSION

The 2015 fall season represented the third season of standardized monitoring at Genesis per the BBCS. Searcher efficiency trials and carcass removal trials were conducted concurrently at the SCAs, power blocks, fencelines, and along the gen-tie and distribution lines. Data from these trials were used to produce fatality estimates adjusted for searcher efficiency and carcass persistence bias. Although these estimates were produced from a statistically robust sample, only limited inference may be drawn from a single season of data. These results should be considered preliminary because estimating carcass persistence, searcher efficiency, and adjusted numbers of fatalities within each season represents information based on a limited sample size. As more data are collected throughout the monitoring year (and additional quality assurance/quality control measures occur, for example characterizing feather spots to species or size class), data from all seasons may be pooled. At that time, data will be tested for seasonal differences retrospectively using an information-theoretic approach, but because seasonal estimates will be produced from the much larger annual data set, they may differ from what is reported here because they are based on a larger, more informative sample.

4.1 Carcass Persistence and Searcher Efficiency Trials

The degree to which carcasses persist on the landscape depends on a variety of factors reflecting seasonal and inter-annual variation in habitat, climate, and the scavenger community. The composition and activity patterns of the scavenger community often vary seasonally as birds migrate, new juvenile birds and mammals join the local population, and mammalian scavengers variably hibernate or estivate. The scavenger community may also vary substantially from year to year because of variation in annual reproduction and survival related to changes in landscape condition. Climatic conditions that vary seasonally and annually also may contribute to variation in carcass decay and removal rates due to variation in temperatures, solar insolation, wind patterns, and the frequency of flooding events. Thus, rates of carcass persistence reported here should be interpreted cautiously as they may change over the coming months.

Fatality estimates are influenced by the relationship between carcass removal dynamics and search intervals. In practical terms, longer search intervals reduce average probability that a carcass persists until the next search. In terms of the analysis, this can manifest as a lower probability of persistence through the effective search interval, or an effective search interval that is shorter than the nominal search interval. In either case, the adjustment to carcass counts due to carcass removal dynamics is calculated as

$$\frac{length\ of\ effective\ search\ interval}{length\ of\ nominal\ search\ interval * average\ probability\ of\ persistence\ through\ the\ effective\ search\ interval}$$

The adjustment to estimated fatality for carcass removal increases with longer search intervals, and the variance in the estimate may increase, also.

Searcher efficiency was influenced by carcass size, but it is not yet clear if there may be an effect of habitat visibility class due to limited sample sizes. The very limited spatial extent of more difficult visibility classes at the Project makes it difficult to include more trials in areas of low visibility, but the fact that there are few areas of difficult visibility classes also diminishes any measurable influence this factor may have on fatality estimates. In the SCA's, searcher efficiency was high regardless of carcass size and this is likely a function of the limited vegetation cover beneath solar troughs. Beneath overhead lines outside the Project fence vegetation cover is higher, but our analysis did not support the hypothesis that visibility class is an influential factor in searcher efficiency along the lines. Carcass size influenced searcher efficiency, but searcher efficiency was relatively high over all carcass size classes (mean = 87%).

Searcher efficiency trials for this Project will be repeated seasonally. The desert landscape in which this Project is located generally changes little with the seasons, save for brief periods following seasonal rains when floods may occur and blooming plants may flourish. A recent meta-analysis involving data from more than 70 wind-energy projects suggested that including habitat visibility class as a predictive variable generally eliminated any otherwise apparent seasonal effects on searcher efficiency (Smallwood 2013). Further, the possibility exists that searcher efficiency varies seasonally in some cover types but not others. Data from searcher efficiency trials conducted over the coming seasons will therefore continue to be tested for effects of habitat visibility class and a more complete analysis of the factors influencing searcher efficiency will be include in the annual report.

4.2 Fatality Timing, Guild/Species Composition, Fatality Estimates and Other Fatality Characteristics

A clear spike in detections occurred on October 1. It is possible that weather was a factor on this day, as winds gusted up to approximately 25 mph during the day and were predominantly out of the south or southwest. Temperatures were hot (≥ 105° F) and had been so during the preceding week. The tapering of detections toward the latter end of the season suggests the end-date of the fall season appropriately captured the latter part of the fall season. It is difficult to make the same conclusion about the beginning of the fall season, however, because the beginning of the fall coincides with the transition from a 21-day to a 7-day search interval, and may reflect the accumulation of carcasses during a longer search interval at the end of the summer.

Composition of fall detections included avian species from 18 guilds (excluding unidentified birds). Waterbirds and waterfowl comprised the largest number of detections (n = 81): the most common waterfowl species detected was eared grebe (31 detections or 14% of all avian detections). Blackbirds and orioles were the second most common guild (n = 23): the most common blackbird species was western meadowlark (n = 11 detections). A summary of all avian guilds and migration behavior represented in the fall surveys can be found in Appendix D. Fall was the second season in which bats were detected, but in small numbers again like the summer season.

Detections attributed to an unknown cause accounted for approximately 87% of all detections during the 2015 fall season, and the distribution of the unknown cause detections varied by project component with the highest percentage of unknowns (36%) occurring in association with SCA's. Of the 196 detections attributed to an unknown cause, 30 (13%) were feather spots and 99 (44%) were scavenged. Determining a cause of mortality from a feather spot or scavenged bird is challenging because there is rarely visible evidence available on which to determine a cause of death. Thus, feather spots with an unknown cause of mortality could be encountered anywhere birds occur, and an unknown cause of a sizeable proportion of the carcasses is not unique to the Project. Further, game cameras trained on carcasses for carcass persistence trials at the Project have documented the potential for multiple feather spots originating from a single trial carcass. Ravens and turkey vultures, and possibly roadrunners, dislodge feathers from their attachment to the skin of the carcass during the scavenging process. There are a very large number of potential feather spots present on a single bird carcass (because a feather spot is defined as at least two or more primary flight feathers, at least five or more tail feathers, or two primaries within five m (16.4 ft) or less of each other, or a total of 10 or more feathers of any type concentrated together in an area of three square m). Thus, the presence of feather spots among the detections for the Project may inflate the fatality estimate based on the potential for multiple feather spots resulting from one fatality to be counted separately if feathers are blown around the site or scattered by predators (e.g., plucking by ravens), feather spots resulting from predation not associated with the facility, or other causes. However, feather spots are included in the analysis here to provide a more conservative estimate of fatality.

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Appendix A. Weather Conditions and Body Weights Associated with Avian Detections Estimated to be Less Than 24 Hours Old during fall (August 31 – October 31) 2015

Table A-1. Weather conditions and body weights associated with avian detections estimated to be less than 24 hours old during fall (August 31 – October 31) 2015 at Genesis Solar Energy Project, Riverside County, California.

Carcass ID	Date	Estimated time since death (hrs)	Species	Weight (g) if intact	Weather Summary for Preceding 24 hrs
102115-SAGS-GENTIE-12-02	10/21/2015	0-8hrs	sagebrush sparrow	18	8 avg wind speed. 33 max wind speed. NNW wind direction. Waxing crescent moon phase. Rain thunderstorms.
103115-BRTH-1-POWERBLOCK-QUENCHPIT-01	10/31/2015	8-24hrs	brown thrasher	NA	33 max wind speed. 25 avg wind speed. NNW wind direction. 45 gust speed. Waning gibbous moon phase. Max temp 82 on 10/30. 6-mile visibility. Winds >20 mph from 2 am until 4 pm, then clear until bird found on 10/31.
091715-UNGR-EVAPPOND-N-01	9/17/2015	0-8hrs	eared grebe	NA	6-16 MPH NW wind, waxing crescent moon, bright and sunny w/ little cloud cover and gusts of wind
102215-EAGR-1-W-G/H-45-01	10/22/2015	0-8hrs	eared grebe	NA	5 avg wind speed. 8 max wind speed. E wind direction. First quarter moon phase. Max temp on 10/21 82F. Visibility 10 mi. Clear until 2 pm on 10/21, then partly cloudy until 3 pm
092115-UNBA-2-W-B/A-41-04	9/21/2015	8-24hrs	big brown bat	NA	MAX WIND SPEED: 15. AVG WIND SPEED: 5. WIND DIRECTION: NORTH. MOON PHASE: WAXING CRESCENT. MAX TEMP: 106. ACCORING TO WUNDERGROUND.COM, CLEAR ON 9/20 AND 9/21. HOWEVER, BY 7:45AM ON 7/21 I SAW 60% CLOUDS, AND BY 9:20 AM 85% CLOUDS WHICH REMAINED
092215-LEGO-1-W-C/D-49-01	9/22/2015	8-24hrs	lesser goldfinch	NA	MAX WIND SPEED: 18MPH. ANG WIND SPEED: 10 MPH. WIDN DIRECTION: SSE. MOON PHASE: WAXING GIBBOUS. CLOUDY AND SLIGHTLY BREEZY.
091415-AMCO-2-W-F/E-33-01	9/14/2015	8-24hrs	American coot	430	15-20MPH wind, waxing crescent moon, 108 F high, clear this morning but significant cloud cover moved in >50% winds picked up. Partly cloudy
092415-RUDU-EVAPPOND-N-01	9/24/2015	0-8hrs	ruddy duck	530	4-8 MPH SE wind, waxing gibbous moon, max temp 99 on 9.23.

					Clear until bird found
092415-EAGR-EVAPPOND-S-04	9/24/2015	8-24hrs	eared grebe	240	4-8MPH SE wind, waxing gibbous moon, max temp 99 on 9.23, clear until bird found
092415-RUDU-EVAPPOND-S-09	9/24/2015	0-8hrs	ruddy duck	NA	4-8MPH SE wind, waxing gibbous, max temp 99 on 9.23, clear until bird found
083115-BWTE-2-E-F/E-36-01	8/31/2015	8-24hrs	blue-winged teal	282	8-16 MPH SSW wind, full moon, max temp 111, clear
083115-UNBA-ASSEMBLYLINEBUILDING-02	8/31/2015	8-24hrs	long-legged bat	10	8-16 MPH SSW wind, full moon, max temp 111, clear
091015-CITE-EVAPPOND-S-01	9/10/2015	8-24hrs	cinnamon teal	NA	MAX WIND SPEED- 15. AVG WIND SPEED- 8. WIND DIRECTION- SOUTH. MOON PHASE- WANING CRESCENT. MOSTLY CLEAR.
091015-CITE-EVAPPOND-N-02	9/10/2015	8-24hrs	cinnamon teal	NA	MAX WIND SPEED- 15. AVG WIND SPEED- 8. WIND DIRECTION- SOUTH. MOON PHASE- WANING CRESCENT. MOSTLY CLEAR.
100115-AMCO-ASSEMBLYLINEBUILDING-OUTSIDE-01	10/1/2015	0-8hrs	American coot	NA	12 max wind speed. 5 avg wind speed. WSW wind direction. Waning gibbous moon phase. Clear.
100115-BRBL-1-W-C/D-48-02	10/1/2015	0-8hrs	Brewer's blackbird	55	12 max wind speed. 5 avg wind speed. WSW wind direction. Waning gibbous. Clear.
100115-AMCO-EVAPPOND-N-01	10/1/2015	8-24hrs	American coot	330	12 max wind speed. 5 avg wind speed. WSW wind direction. Waning gibbous moon phase. High temp 107 on 09/30. Clear until bird found.
100115-RWBL-EVAPPOND-N-06	10/1/2015	8-24hrs	red-winged blackbird	37	12 max wind speed. Gusts 22. 5 avg wind speed. WSW wind direction. Waning gibbous moon phase. High temp 107 on 09/30. Clear until bird found.
100115-UNSP-EVAPPOND-S-30	10/1/2015	0-8hrs	unidentified sparrow	NA	12 max wind speed. 5 avg wind speed. WSW wind direction. Waning gibbous moon phase. Clear.
100115-UNSP-EVAPPOND-S-31	10/1/2015	0-8hrs	unidentified sparrow	NA	12 max wind speed. 5 avg wind speed. WSW wind direction. Waning gibbous moon phase. Clear.
100115-RWBL-EVAPPOND-S-10	10/1/2015	8-24hrs	red-winged blackbird	NA	MAX WIND SPEED: 12. AVG WIND SPEED: 5. GUSTS: 22. WIND DIRECTION: WSW. MOON PHASE: WANING GIBBOUS. HIGH TEMP: 107 ON 09/30. CLEAR UNTIL BIRD

					FOUND
100115-UNSP-EVAPPOND-N-32	10/1/2015	0-8hrs	Savannah sparrow	NA	MAX WIND SPEED: 12. AVG WIND SPEED: 5. WIND DIRECTION: WSW. MOON PHASE: WANING GIBBOUS. CLEAR
100115-RUDU-EVAPPOND-N-13	10/1/2015	0-8hrs	ruddy duck	520	MAX WIND SPEED: 12. GUSTS: 22. AVG WIND SPEED: 5. WIND DIRECTION: WSW. MON PHASE: WANING GIBBOUS. 107 HIGH TEMP ON 09/30. CLEAR UNTIL BIRD FOUND
092415-RUDU-EVAPPOND-N-10	9/24/2015	0-8hrs	ruddy duck	NA	4-8MPH SE wind, waxing gibbous, max temp 99 on 9.23. clear until bird found
092415-BRBL-EVAPPOND-N-11	9/24/2015	0-8hrs	Brewer's blackbird	65	2-7mph wind, waxing gibbous, clear
092515-RUDU-EVAPPOND-S-01	9/25/2015	0-8hrs	ruddy duck	NA	2-7MPH ssw wind, waxing gibbous moon, clear
092515-AMCO-2-E-C/D-04-02	9/25/2015	0-8hrs	American coot	NA	2-7 MPH SSW wind, waxing gibbous, clear
090215-MODO-GENTIE-24-02	9/2/2015	0-8hrs	mourning dove	NA	MAX WIND SPEED: 14 MPH, AVG WIND SPEED: 9 MPH, WIND DIRECTION: SOUTH. MOON PHASE: WANING GIBBOUS, PARTLY CLOUDY
100115-UNBA-EVAPPOND-N-22	10/1/2015	8-24hrs	unidentified bat	NA	MAX WIND SPEED: 12. AVG WIND SPEED: 5. WIND DIRECTION: WSW. MOON PHASE: WANING GIBBOUS. CLEAR
083115-LEGO-2-POWERBLOCK-TRAIN2-EVAPORATOR2-03	8/31/2015	0-8hrs	lesser goldfinch	9	8-16 MPH SSW wind, full moon, max temp 111, clear
083115-TEAL-WATERTREATMENT-12	8/31/2015	0-8hrs	unidentified teal	NA	8-16 MPH SSW wind, full moon, max temp 111, clear
092715-LISP-2-POWERBLOCK-02	9/27/2015	8-24hrs	Lincoln's sparrow	11	6-15 MPH wind, full moon, clear
092815-EAGR-EVAPPOND-S-01	9/28/2015	0-8hrs	eared grebe	NA	6-15 mph wind, full moon, clear
092815-EAGR-EVAPPOND-S-03	9/28/2015	0-8hrs	eared grebe	209	6-15 MPH wind, full moon, clear
092815-EAGR-EVAPPOND-S-04	9/28/2015	8-24hrs	eared grebe	220	6-15mph, full moon, clear
092815-EAGR-EVAPPOND-S-05	9/28/2015	8-24hrs	eared grebe	195	6-15mph wind, full moon, clear
092815-EAGR-EVAPPOND-S-06	9/28/2015	0-8hrs	eared grebe	220	6-15mph wind, full moon, clear
093015-UNSP-ASSEMBLYLINEBUILDING-OUTSIDE-01	9/30/2015	8-24hrs	Lincoln's sparrow	12	12 max wind speed. 6 avg wind speed. SW wind direction. Waning gibbous moon phase. Hot w/ few clouds.
100515-PABA-2-W-FENCE-INSIDE-	10/5/2015	0-8hrs	Pallid bat	15	MAX WIND SPEED: 25 MPH. ANG WIND SPEED: 14. WIND

03					DIRECTION: SSW. MOON PHASE: WANING GIBBOUS. SLIGHTLY WINDY, PARTLY CLOUDY
100515-WEGR-1-POWERBLOCK-02	10/5/2015	0-8hrs	western grebe	NA	MAX WIND SPEED: 25 MPH. AVG WIND SPEED: 14. WIND DIRECTION: SSW. MOON PHASE: WANING GIBBOUS. SLIGHTLY WINDY, PARTLY CLOUDY
100815-UNGF-EVAPPOND-N-11	10/8/2015	0-8hrs	unidentified goldfinch	NA	AVG WIND SPEED: 3. MAX WIND SPEED: 13. WIND DIRECTION: N. MOON PHASE: WANING CRESCENT. CLEAR.
092815-WEME-2-W-F/E-33-03	9/28/2015	8-24hrs	western meadowlark	80	6-15mph wind, WIND DIRECTION S, full moon, clear
100915-RCKI-GENTIE-TOWER-43-01	10/9/2015	0-8hrs	ruby-crowned kinglet	NA	MAX WIND SPEED: 13 MPH. AVG WIND SPEED: 3 MPH. WIND DIRECTION: N. MOON PHASE: WANING CRESCENT. MOSTLY SUNNY, SLIGHTLY BREEZY
100915-REDH-1-E-F/E-62-02	10/9/2015	0-8hrs	redhead	NA	MAX WIND SPEED: 13 MPH. ANG WIND SPEED: 3 MPH. WIND DIRECTION: N. MOON PHASE: WANING CRESCENT. MOSTLY SUNNY AND SLIGHTLY BREEZY
101215-RUDU-EVAPPOND-N-02	10/12/2015	0-8hrs	ruddy duck	NA	MAX WIND SPEED: 9. AVG WIND SPEED: 4. WIND DIRECTION: NW. MOON PHASE: WANING CRESCENT. HIGH TEMP 99F. CLEAR UNTIL BIRD FOUND
101315-RUDU-1-E-C/D-39-01	10/13/2015	8-24hrs	ruddy duck	NA	MAX WIND SPEED: 10. ANG WIND SPEED: 4. WIND DIRECTION: ESE. MOON PHASE: WANING CRESCENT. MAX TEMP ON 10-12, 95 DEG. CLEAR UNTIL BIRD FOUND
101515-AMCO-EVAPPOND-N-01	10/15/2015	0-8hrs	American coot	NA	ANG WIND SPEED: 3. MAX WIND SPEED: 6. WIND DIRECTION: ENE. MOON PHASE: WANING CRESCENT. VISIBILITY 10 MI, NO MAJOR EVENTS
101515-WEGR-2-W-B/A-51-01	10/15/2015	0-8hrs	western grebe	NA	MAX WIND SPEED: 6 MPH. ANG WIND SPEED: 3 MPH. WIND DIRECTION: ENE. MOON PHASE: WANING CRESCENT. VISIBILITY WAS 10 MILES, NO MAJOR EVENTS
101615-RUDU-EVAPPOND-S-01	10/16/2015	0-8hrs	ruddy duck	NA	ANG WIND SPEED: 6. MAX WIND SPEED: 21. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR, BECOMING CLOUDY WITH THUNDERSTORMS
101615-RUDU-EVAPPOND-S-02	10/16/2015	0-8hrs	ruddy duck	NA	MAX WIND SPEED: 21. ANG WIND SPEED: 6. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT.

					CLEAR EARLY, BECOMING CLOUDY WITH THUNDERSTORMS
101615-RUDU-EVAPPOND-S-03	10/16/2015	0-8hrs	ruddy duck	NA	MAX WIND SPEED: 21. ANG WIND SPEED: 6. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR EARLY, BECOMING CLOUDY WITH THUNDERSTORMS
101615-RUDU-EVAPPOND-S-04	10/16/2015	0-8hrs	ruddy duck	NA	MAX WIND SPEED: 24. AVG WIND SPEED: 14. WIND DIRECTION: NE. MOON PHASE: WANING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101615-RUDU-EVAPPOND-S-06	10/16/2015	8-24hrs	ruddy duck	NA	AVG WIND SPEED: 6. MAX WIND SPEED: 21. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR EARLY, BECOMING CLOUDI WITH THUNDERSTORMS
101615-RUDU-EVAPPOND-S-07	10/16/2015	8-24hrs	ruddy duck	430	AVG WIND SPEED: 6. MAX WIND SPEED: 21. WID DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR EARLY, BECOMING CLOUDY WITH THUNDERSTORMS
101615-RUDU-EVAPPOND-S-08	10/16/2015	0-8hrs	ruddy duck	NA	AVG WIND SPEED: 6. MAX WIND SPEED: 21. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR EARLY, BECOMING CLOUDY WITH THUNDERSTORMS
101615-WEME-1-E-B/A-35-09	10/16/2015	8-24hrs	western meadowlark	NA	AVG WIND SPEED: 14 MAX WIND SPEED: 24 WIND DIRECTION: NE MOON PHASE: WAXING CRESCENT. CLEAR EARLY, BECOMING CLOUDY IN AFTERNOON.
101615-GWTE-1-E-F/E-41-10	10/16/2015	8-24hrs	green-winged teal	NA	AVG WIND SPEED: 6. MAX WIND SPEED: 21. WIND DIRECTION: NNW. MOON PHASE: WANING CRESCENT. CLEAR EARLY, BECOMING COULDY WITH THUNDERSTORMS
101715-EAGR-EVAPPOND-S-06	10/17/2015	0-8hrs	eared grebe	NA	AVG WIND SPEED: 14. MAX WIND SPEED: 24. WIND DIRECTION: NE. MOON PHASE: WAXING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101715-RUDU-EVAPPOND-S-01	10/17/2015	8-24hrs	ruddy duck	NA	AVG WIND SPEED: 14. MAX WIND SPEED: 24. WIND

					DIRECTION: NE. MOON PHASE: WAXING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101715-EAGR-EVAPPOND-S-02	10/17/2015	8-24hrs	eared grebe	NA	ANG WIND SPEED: 14. MAX WIND SPEED: 24. WIND DIRECTION: NE. MOON PHASE: WAXING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101715-RUDU-EVAPPOND-S-03	10/17/2015	8-24hrs	ruddy duck	NA	ANG WIND SPEED: 14. MAX WIND SPEED: 24. WIND DIRECTION: NE. MOON PHASE: WAXING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101715-RUDU-EVAPPOND-S-05	10/17/2015	8-24hrs	unidentified bird (medium)	NA	ANG WIND SPEED: 14. MAX WIND SPEED: 24. WIND DIRECTION: NE. MOON PHASE: WAXING CRESCENT. MOSTLY CLOUDY WITH RAIN AND THUNDERSTORMS
101915-UNGR-1-W-F/E-36-05	10/19/2015	8-24hrs	unidentified grebe	NA	AVG WIND SPEED: 8. MAX WIND SPPED: 14. WIND DIRECTION: SSW. MOON PHASE: WAXING CRESCENT. GUSTS: 32. MAX TEMP 89 DEG F. CLEAR UNTIL 3 PM, THEN CLOUDS/RAIN/THUNDERSTORMS UNTIL 5 PM, THEN CLEAR UNTIL 1 AM. SEE DATA SHEET FOR NOTES

Appendix B. Correction Factors and Bird Fatality Rates at the Genesis Solar Energy Project during fall (August 31 – October 31) 2015.

Table B-1. Correction factors and estimated numbers of carcasses at the Genesis Solar Energy Generation Facility during fall (August 31 – October 31) 2015. *Counts of fatalities on the power block and ponds have no variance because all components at the facility were searched.

	Small birds		Medium birds		Large birds		Unknown size		Bats	
Parameter	**Mean**	**CI**	**Mean**	**90% CI**	**Mean**	**90% CI**	**Mean**	**90% CI**	**Mean**	**90% CI**
Proportion of area searched by component										
Overhead lines	0.25	-	0.25	-	0.25	-	0.25	-	0.25	-
Fence	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
SCAs	0.30	-	0.30	-	0.30	-	0.30	-	0.30	-
Powerblock	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
Ponds	1.00	-	1.00	-	1.00	-	1.00	-	1.00	-
Searcher efficiency by component										
Overhead lines	0.59	0.45 - 0.70	0.86	0.75 - 0.95	0.95	0.84 - 1	0.59	0.45 - 0.70	0.59	0.45 - 0.70
All other components	0.85	0.76 - 0.93	0.96	0.92 - 0.99	0.99	0.95 - 1	0.85	0.76 - 0.93	0.85	0.76 - 0.93
Average probability of carcass persistence to the next search										
Overhead lines	0.21	0.12 - 0.31	0.37	0.23 - 0.50	0.97	0.83 – 1.00	0.21	0.12 - 0.31	0.21	0.12 - 0.31
All other components	0.59	0.45 - 0.74	0.77	0.61 - 0.89	1.00	0.97 – 1.00	0.59	0.45 - 0.74	0.59	0.45 - 0.74
Carcass counts by component										
Overhead lines	4	1 - 8	4	1 - 7	0	-	1	0 - 3	0	-
Fence	2	0 - 6	5	1 - 10	0	-	6	0 - 12	0	-
SCAs	19	11 - 27	33	22 - 44	2	0 - 6	5	1 - 10	1	0 - 3
Powerblock*	19	-	12	-	1	-	0	-	2	-
Ponds*	13	-	55	-	4	-	5	-	2	-
Average Probability of Carcass Availability and Detected (Searcher efficiency * average probability of carcass persistence)										
Overhead lines	0.13	0.07 - 0.19	0.32	0.20 - 0.43	0.92	0.76 - 1	0.13	0.07 - 0.19	0.13	0.07 - 0.19
All other components	0.50	0.37 - 0.64	0.74	0.59 - 0.85	0.98	0.94 - 1	0.50	0.37 - 0.64	0.50	0.37 - 0.64
Adjusted Fatality Estimates (Fatalities /Season; values in italics are considered unreliable due to low counts of carcasses: carcass count / (proportion of area searched * average probability of carcass availability and detected))**										
Overhead lines	*129*	*22 - 341*	*75*	*13 - 113*	0	-	*32*	*(1) - 108*	0	-
Fence	*4*	*(2) - 11*	*7*	*2 - 14*	0	-	12	3 - 24	0	-
SCAs	149	66 - 192	158	99 - 217	*7*	*(2) - 20*	33	*8 - 69*	*7*	*(1) - 20*
Powerblock	49	(19) - 101	18	(12) - 40	*1*	*(1) - 3*	0	-	*4*	*(2) - 12*
Ponds	28	(13) - 63	76	(55) - 177	*4*	*(4) - 10*	*12*	*(5) - 25*	*4*	*(2) - 11*

Table B-2. Carcasses excluded from the fall 2015 fatality analysis at the Genesis Solar Energy Project, Riverside County, California due to 1) having been detected outside of a regular search area or 2) having an estimated carcass age that is greater than the actual search interval and hence violating assumptions of the Huso estimator. .

Parameter	Small birds	Medium birds	Large birds	Unknown size	Bats
Buildings	3	3	0	0	0
Ponds	1	2	0	0	0
Fence	2	1	0	0	0
Overhead lines	2	0	0	0	0
Powerblock	0	3	0	0	0
SCA's	4	17	2	3	0

Appendix C. Detailed Areas of Standardized Searches and Carcass Locations along the Distribution and Generation Tie Lines of the Genesis Solar Energy Project during fall (August 31 – October 31) 2015.

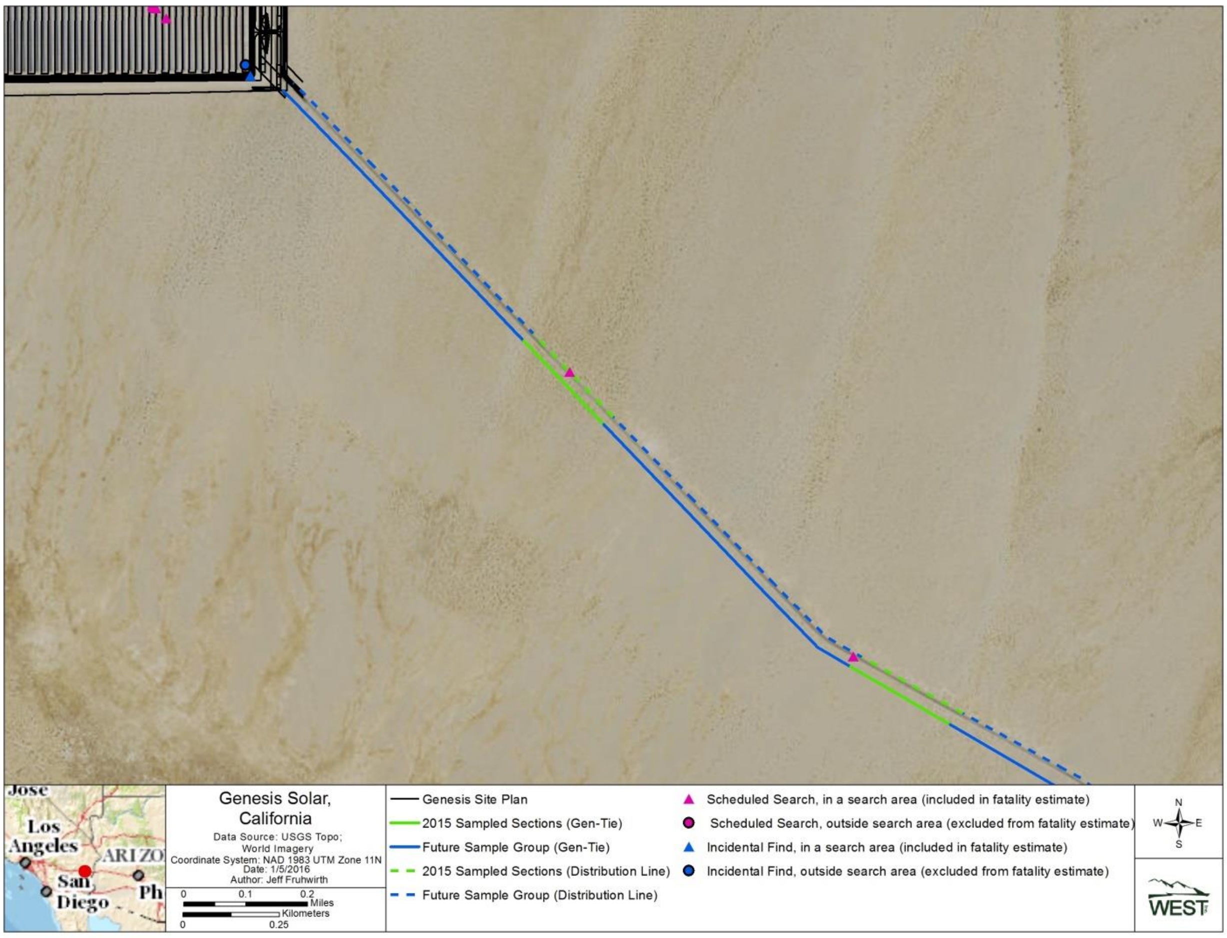

Figure C-1. Detailed map sections of detections along the distribution and generation tie lines of the Genesis Solar Energy Project during fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

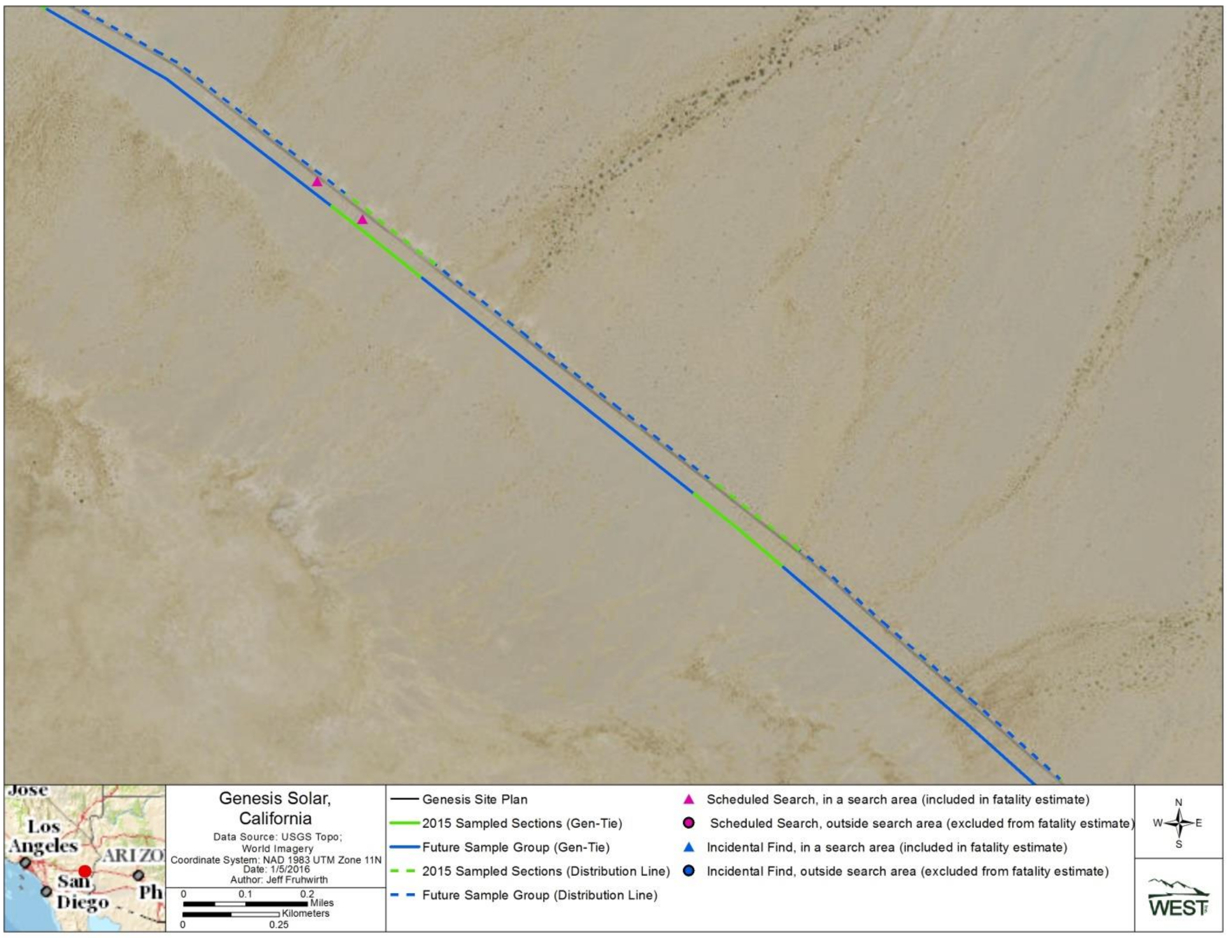

Figure C-2. Detailed map sections of detections along the distribution and generation tie lines of the Genesis Solar Energy Project during fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

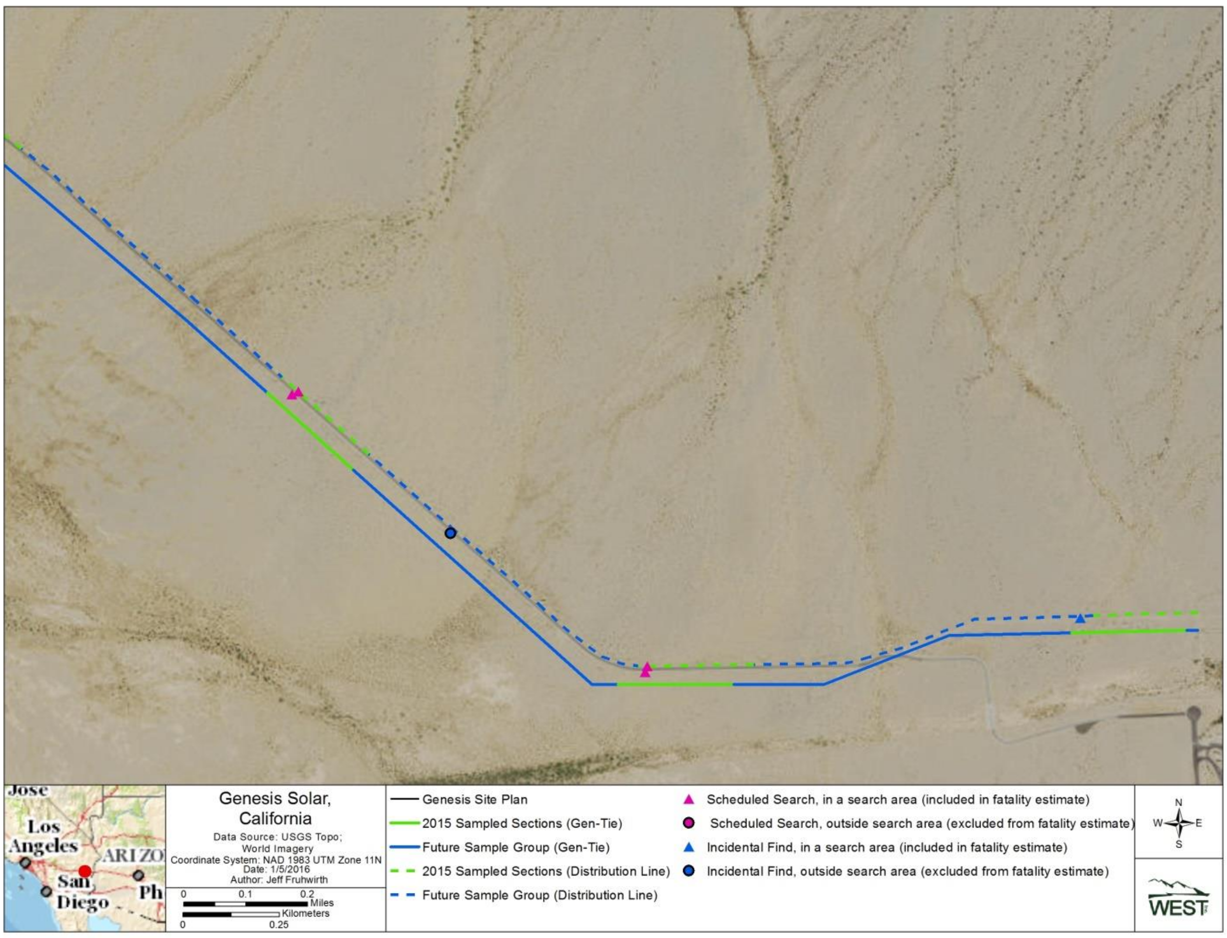

Figure C-3. Detailed map sections of detections along the distribution and generation tie lines of the Genesis Solar Energy Project during fall (August 31 – October 31) 2015. Spatial error associated with the digital imagery results in some carcasses appearing as if they were outside of carcass search areas when they were actually inside, and vice versa. Whether a carcass is inside or outside a search area is determined by the biologist in the field at the time of observation and is based on actual field measurements and not GPS.

Appendix D. Guild and migration behavior for all avian detections made during standardized carcass searches and incidentally, by species, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California.

Table D-1. Guild and migration behavior for all avian detections (those made during standardized carcass searches and incidentally), by species, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = Solar collector assembly; OH line = overhead lines (gen-tie and distribution lines).

Common Name	Scientific Name	Migration Behavior*	Guild	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Guild Total
Brewer's blackbird	*Euphagus cyanocephalus*	diurnal	Blackbirds/Orioles	1	0	1	0	0	0	
brown-headed cowbird	*Molothrus ater*	diurnal	Blackbirds/Orioles	0	1	0	1	0	0	
European starling	*Sturnus vulgaris*	variable	Blackbirds/Orioles	0	0	0	1	0	0	
red-winged blackbird	*Agelaius phoeniceus*	diurnal	Blackbirds/Orioles	0	0	2	0	0	0	
rusty blackbird	*Euphagus carolinus*	diurnal	Blackbirds/Orioles	0	0	1	0	0	0	
unidentified blackbird	-	-	Blackbirds/Orioles	0	0	0	2	0	0	
western meadowlark	*Sturnella neglecta*	diurnal	Blackbirds/Orioles	11	0	0	0	0	0	
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	diurnal	Blackbirds/Orioles	0	2	0	0	0	0	23
greater roadrunner	*Geococcyx californianus*	resident	Cuckoos	2	1	0	1	0	0	4
mourning dove	*Zenaida macroura*	variable	Doves/Pigeons	9	2	1	1	3	1	
rock pigeon	*Columba livia*	resident	Doves/Pigeons	1	0	0	0	0	0	
ruddy ground-dove	*Columbina talpacoti*	-	Doves/Pigeons	1	0	0	0	0	0	
white-winged dove	*Zenaida asiatica*	variable	Doves/Pigeons	1	1	0	0	0	0	21
American kestrel	*Falco sparverius*	resident	Falcons	2	2	0	0	0	0	4
lesser goldfinch	*Spinus psaltria*	resident	Finches/Crossbills	3	1	0	0	0	0	
unidentified goldfinch	-	-	Finches/Crossbills	0	0	1	0	0	0	5
black phoebe	*Sayornis nigricans*	variable	Flycatchers	0	1	0	0	0	0	1
ruby-crowned kinglet	*Regulus calendula*	nocturnal	Gnatcatchers/Kinglet	0	0	0	0	1	0	1
lesser nighthawk	*Chordeiles acutipennis*	diurnal	Goatsuckers	0	1	0	0	0	0	1

Table D-1. Guild and migration behavior for all avian detections (those made during standardized carcass searches and incidentally), by species, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = Solar collector assembly; OH line = overhead lines (gen-tie and distribution lines).

Common Name	Scientific Name	Migration Behavior*	Guild	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Guild Total
Lincoln's sparrow	*Melospiza lincolnii*	nocturnal	Grassland/Sparrows	0	1	0	0	0	1	
Sagebrush sparrow	*Artemisiospiza nevadensis*	-	Grassland/Sparrows	0	0	0	0	1	0	
Savannah sparrow	*Passerculus sandwichensis*	nocturnal	Grassland/Sparrows	0	0	1	0	0	0	
unidentified sparrow	-	-	Grassland/Sparrows	2	3	3	0	1	0	
white-crowned sparrow	*Zonotrichia leucophrys*	nocturnal	Grassland/Sparrows	0	0	0	0	1	0	14
brown thrasher	*Toxostoma rufum*	nocturnal	Mimids	0	1	0	0	0	0	1
American coot	*Fulica americana*	nocturnal	Rails/Coots	3	1	2	1	0	1	
sora	*Porzana carolina*	nocturnal	Rails/Coots	3	0	0	0	0	0	11
killdeer	*Charadrius vociferus*	variable	Shorebirds	2	0	0	0	0	0	
red-necked phalarope	*Phalaropus lobatus*	nocturnal	Shorebirds	0	0	1	0	0	0	
spotted sandpiper	*Actitis macularia*	both	Shorebirds	0	0	1	0	0	0	
unidentified shorebird	-	-	Shorebirds	0	0	3	0	0	0	
unidentified tern	-	-	Shorebirds	0	0	0	1	0	0	8
loggerhead shrike	*Lanius ludovicianus*	diurnal	Shrikes	0	1	0	0	0	0	1
western tanager	*Piranga ludoviciana*	nocturnal	Tanagers	1	0	0	0	0	0	1
unidentified bird (medium)	-	-	Unidentified Birds	5	2	3	0	0	0	
unidentified bird (small)	-	-	Unidentified Birds	9	1	3	1	0	1	
unidentified bird (unknown size)	-	-	Unidentified Birds	6	0	1	3	1	0	36
unidentified warbler	-	-	Warblers	1	1	0	0	0	0	
yellow warbler	*Setophaga petechia*	nocturnal	Warblers	0	0	0	0	1	0	3

Table D-1. Guild and migration behavior for all avian detections (those made during standardized carcass searches and incidentally), by species, during fall (August 31 – October 31) 2015 at the Genesis Solar Energy Project, Riverside County, California. SCA = Solar collector assembly; OH line = overhead lines (gen-tie and distribution lines).

Common Name	Scientific Name	Migration Behavior*	Guild	SCA	Powerblock	Ponds	Fence	OH lines/road	Other	Guild Total
blue-winged teal	*Anas discors*	nocturnal	Waterbirds/Waterfowl	2	0	0	0	0	0	
cinnamon teal	*Anas cyanoptera*	nocturnal	Waterbirds/Waterfowl	2	1	2	0	0	0	
eared grebe	*Podiceps nigricollis*	nocturnal	Waterbirds/Waterfowl	2	0	27	1	1	0	
great blue heron	*Ardea herodias*	-	Waterbirds/Waterfowl	0	0	1	0	0	0	
great egret	*Ardea alba*	-	Waterbirds/Waterfowl	0	0	1	0	0	0	
green-winged teal	*Anas crecca*	nocturnal	Waterbirds/Waterfowl	2	0	0	0	0	0	
northern shoveler	*Anas clypeata*	both	Waterbirds/Waterfowl	1	0	0	0	0	0	
redhead	*Aythya americana*	both	Waterbirds/Waterfowl	1	0	2	0	0	0	
ruddy duck	*Oxyura jamaicensis*	nocturnal	Waterbirds/Waterfowl	3	0	19	0	0	0	
unidentified duck	-	-	Waterbirds/Waterfowl	0	0	0	1	0	0	
unidentified grebe	-	-	Waterbirds/Waterfowl	2	0	1	0	0	0	
unidentified teal	*Anas spp*	-	Waterbirds/Waterfowl	2	1	1	0	0	1	
western grebe	*Aechmophorus occidentalis*	nocturnal	Waterbirds/Waterfowl	3	1	0	0	0	0	81
northern flicker	*Colaptes auratus*	both	Woodpeckers	0	0	0	1	0	0	1
house wren	*Troglodytes aedon*	nocturnal	Wrens	1	0	0	0	0	0	
rock wren	*Salpinctes obsoletus*	nocturnal	Wrens	0	0	0	0	1	0	2

* See literature cited for migration behavior references; information for most species was taken from the respective species accounts found in Birds of North America (BNA) Online (http://bna.birds.cornell.edu/bna/); where information on migration behavior was lacking in BNA accounts, Evans and Mellinger (1999), Newton (2008), or Murray (2004) were used.