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IVANPAH SOLAR ELECTRIC GENERATING SYSTEM
AVIAN & BAT MONITORING PLAN

2014 FALL REPORT
(18 AUGUST – 20 OCTOBER 2014)

Project # 2802-07

Prepared for:
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March 2015

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Executive Summary

Avian and bat monitoring surveys were conducted from 18 August to 20 October 2014 (the fall season) at the Ivanpah Solar Electric Generating System facility (referred to in this report as "Ivanpah" or "Project") in accordance with the Project's Avian & Bat Monitoring and Management Plan (Plan). Specifically, avian point count surveys, raptor/large bird surveys, facility monitoring for avian detections, searcher efficiency trials, and carcass removal trials were conducted. This report represents the fourth "quarterly" (i.e., seasonal) report summarizing monitoring methods and results for those surveys based on the procedures and requirements specified in the Plan.

During avian point count surveys, a total of 38 bird species were recorded. Species richness was highest on the upper desert bajada grid (26 species), slightly lower on the lower desert bajada grid (23 species), and lowest in the heliostat grids (19 species). Avian abundance was highest on the two desert bajada grids, with 350 observations on the lower bajada grids and 277 on the upper bajada grids. Abundance was substantially lower in the three heliostat grids, with 37 observations in Unit 1, 29 observations in Unit 2, and 15 observations in Unit 3.

During the surveys for raptors and other large birds, four surveys were conducted at eight points, with the exception of one point that was surveyed only three times. During these surveys, six raptor species and three other large bird species, common raven (*Corvus corax*), white-faced ibis (*Plegadis chihi*), and an unidentified duck species, were observed. Common ravens comprised 58.5% of all large bird detections.

Avian and bat fatality monitoring searches were conducted in 1) the "tower area", consisting of the power block and inner high-density (HD) heliostats surrounding each power block on approximately 154 acres, which was surveyed with 100% coverage; 2) the "heliostat area", consisting of the inner and outer heliostat segments outside of the inner HD heliostats on approximately 720 acres, which was surveyed with 24.1% coverage in randomly selected arc-shaped plots; 3) the "fenceline", consisting of the perimeter fences, which was 100% surveyed; 4) the "collector line", consisting of the Unit 3 electrical transmission line, which was also 100% surveyed; and 5) offsite transects. Overall, approximately 29.2% of the facility was searched (not including the offsite transects, which are outside the facility). Searches were conducted within the fall season at intervals averaging 7.7 days (range 5 to 15 days, median = 7 days).

All bird and bat fatalities and injuries, referred to as "detections" in this report, including those found incidentally and during standardized facility searches, were documented and categorized as singed, collision, other project causes or unknown based on examination with a binocular microscope and evidence collected from the location of the detection. During the period 18 August – 20 October 2014, a total of 11 bat fatalities, and 289 avian detections (including 11 injured birds that died shortly after being collected and two injured birds still alive), were found.

According to the specifications of the Plan, the number of avian detections were categorized by facility structure and cause. These avian fatality search results, along with searcher efficiency carcass removal rates from trials conducted onsite, were input into a fatality estimator model (Huso 2010) to provide an estimate of the fatalities for the facility.

Using the fatality estimator model, during the period 18 August – 20 October, there were an estimated 820 fatalities (60.1%) from known causes and 543 fatalities (39.9%) from unknown causes. Of the known causes, 455 fatalities (55. 5%) were estimated for the 2,991-acre inner and outer heliostat segment areas and 363 fatalities (44.3%) were estimated for the 154 acre tower area. No detections with direct evidence of singeing, collision, or entrapment were found along the fencelines. There were two collision-related detections found along the Unit 3 collector line which were added to the overall fatality estimate unadjusted due to low sample size for this Project element.

During this same time period, there were an estimated 543 fatalities (90% confidence interval estimates 340-959) based on detections for which cause of death could not be determined. Of these, 95 fatalities (17.5%) were estimated for the tower area, 419 fatalities (77.2%) were estimated for the heliostat areas, and 29 fatalities (5.3%) were estimated along the fencelines. Driving this estimate was a large number of feather spots comprising approximately half (45.7%) of all detections, which may lead to an over-estimation of the unknowns.

According to Section 5.3 of the Plan, quarterly reports are required to categorize potential migratory bird mortality issues at Ivanpah as high, medium, or low to provide an appropriate biological basis for TAC review and decision making. Results from the 2014 fall season indicate that the migratory bird mortality during this season would be categorized as low. Total detections of any one species or group represent a small proportion of local, regional, or national populations. The 289 avian detections included 58 different bird species. Of these 58 species, 36 were represented by three or fewer detections, and the 22 species with more than three detections are relatively common, widespread birds. All of these 58 species have populations that are great enough locally (either as breeders, wintering birds, or migrants), regionally, and nationally that the loss of the individuals recorded in fall 2014 would have no substantive impact on populations at any of these geographic scales. The cause of injury or mortality for 94 of the 289 detections (32.5%) is not known with certainty. Further discussion of the specific species is found in the body of the report.

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Section 1.0 Introduction

1.1 Project Background

The Ivanpah Solar Electric Generating System (referred to in this report as "Ivanpah" or "Project") is composed of three solar units consisting of power electrical generating facilities (Units 1, 2, and 3) with a combined net capacity of 377 megawatts. Each unit includes a central power tower with an air cooled condenser (ACC) and associated electrical generating equipment, surrounded by a heliostat array that reflects sunlight to a boiler at the top of the tower. Ivanpah is located on approximately 1,457 hectares (3,600 acres) of Bureau of Land Management (BLM) land west of Interstate 15 near Nipton in San Bernardino County, California (Figure 1). Construction was initiated in 2010 and completed in late 2013.

1.2 Monitoring Plan Overview and Goals

An Avian & Bat Monitoring and Management Plan (2013; "Plan") 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 the operation of the facility. Final agency acceptance of the Plan occurred in November 2013. The Plan is also intended to: 1) satisfy the BLM Right-of-Way (ROW) Permit requirement that the Ivanpah team develop an avian plan as well as a Migratory Bird Treaty Act (MBTA) Conservation Agreement; 2) satisfy the requirements for the Avian & Bat Monitoring and Management Plan approved by the CEC for Ivanpah per CEC Condition of Certification BIO-21; and 3) achieve the avian and bat protection objectives of the USFWS in relation to the MBTA, Bald and Golden Eagle Protection Act (Eagle Act), and Federal Endangered Species Act (FESA), including preparing written records of the actions that have been taken to avoid, minimize, and compensate for potential adverse impacts to avian and bat species. By developing a proactive management plan in close consultation with the USFWS and other relevant state and federal agencies, Project proponents can effectively comply with the intent of the federal MBTA, Eagle Act, FESA, and relevant state regulations (USFWS 2012).

The Plan details the onsite and offsite surveys to be conducted and the data analysis and reporting processes that will be implemented by Ivanpah in collaboration with the USFWS, CDFW, CEC, and BLM and supports four main goals and associated objectives. As identified in the Plan, they are:

Goal 1. Identify Collision Risks: Risks will be identified by monitoring and identifying avian mortality and injury associated with facility structure collisions.

- Objective 1. Estimate collision-related avian mortality and injury with the following facility structures, using empirical data to calculate facility-wide mortality and injury rates:

- Power towers
- Perimeter fences
- Heliostats
- Project transmission line (Unit 3 collector line)

Goal 2. Identify Solar Flux Risks: Risks from flux will be assessed by monitoring and identifying avian mortality and injury associated with solar flux generated by the facility.

- Objective 2. Estimate flux-related avian mortality and injury using empirical data to calculate facility-wide mortality and injury rates.

Goal 3. Identify Patterns of Avian Use at the Facility: Patterns of avian use will be assessed by conducting onsite and offsite surveys to document avian species composition onsite and offsite, compare abundance in representative habitats onsite and offsite, and document changes in avian use in these areas over time.

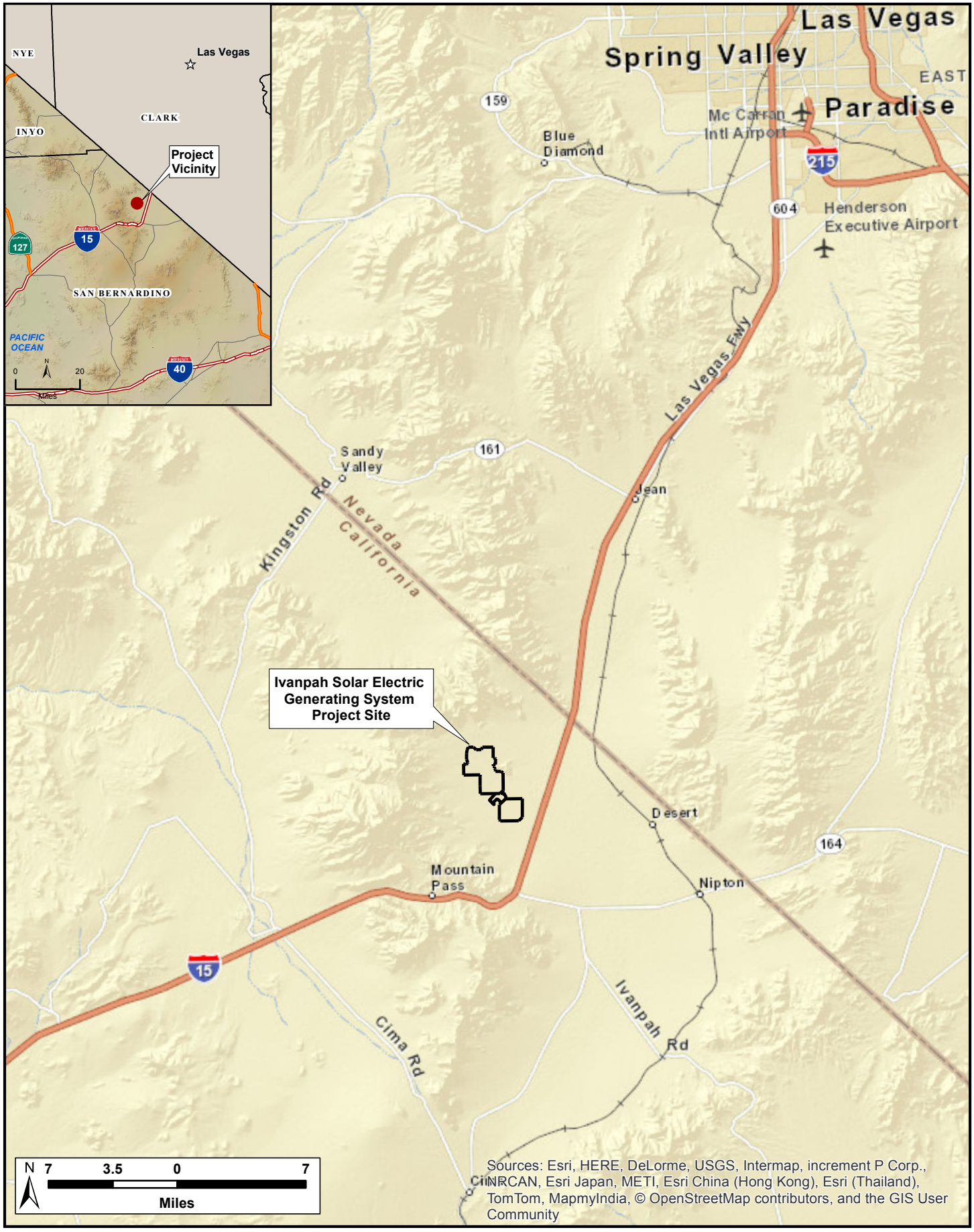
- Objective 3. Document patterns of collision- or flux-related mortality and injury associated with species, age/sex, season, weather, and visibility.
- Objective 4. Document spatial patterns associated with collision- or flux-related mortality and injury.
- Objective 7. Document use patterns of various avian species, including migratory birds, raptors, and golden eagles, particularly the seasonal variation of bird communities through breeding, migratory, and overwintering periods.

Goal 4. Provide a Framework for Management and Response to Risks: The designation and description of the functioning of the Technical Advisory Committee (TAC) provides a management and decision framework for the identification and implementation of potential adaptive management measures.

- Objective 5. Provide quantitative information for developing and implementing adaptive management responses commensurate with identified impacts.
- Objective 6. Provide a framework for the TAC to jointly review, characterize, and recommend responses, based on monitoring results, to the appropriate lead agency representatives.

1.3 Purpose of This Report

This report represents the fourth "quarterly" (i.e., seasonal) report summarizing monitoring methods and results for avian and bat injuries and fatalities based on the procedures and requirements specified in the USFWS-accepted Plan and as required by CEC Condition of Certification BIO-21. This report covers the 2014 fall season, which includes the period from 18 August through 20 October 2014.



N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 1 Ivanpah Vicinity Map.mxd

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Figure 1: Ivanpah Vicinity Map
Ivanpah Fall 2014 Avian and Bat Monitoring Report (2802-07)
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Section 2.0 Methods

The Plan describes the methods by which monitoring and certain analyses, such as compiling the overall fatality estimate, will occur. Below, these methods are described only briefly (because they are included in the Plan), with more detailed descriptions of any refinements that were necessary as the Plan was implemented in the field.

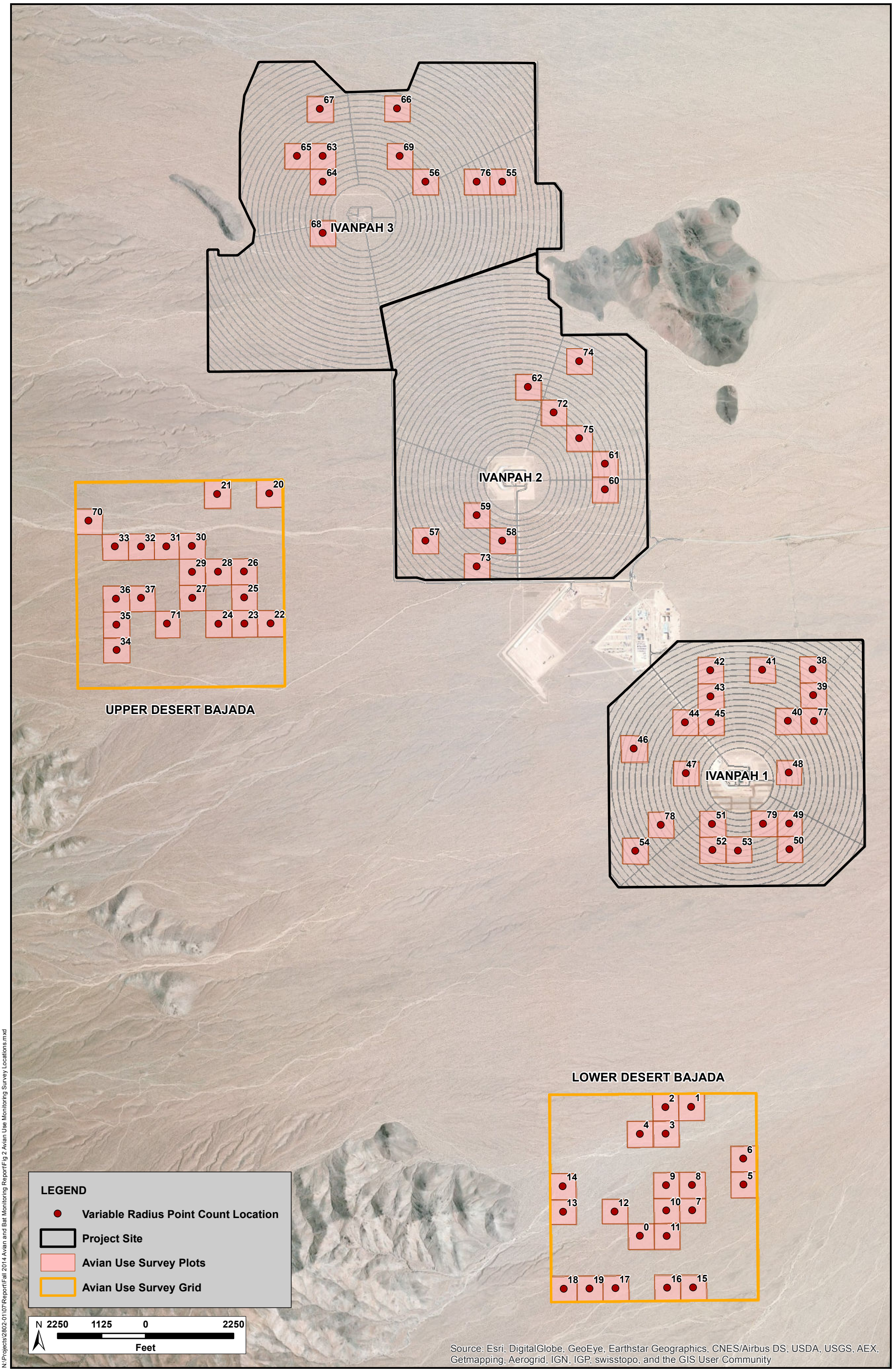
2.1 Avian Use Monitoring

This section describes the methods for monitoring avian use of the solar plant and nearby desert areas, as well as the methods for monitoring the occurrence of raptors and other large birds on and around the facility. Approximately 99 hours of field observation time conducting avian use surveys and 117 hours of field observation time conducting raptor/large bird surveys were performed during the 2014 fall season.

2.1.1 Avian Monitoring Surveys

Avian use surveys were conducted using standard, variable-radius point counts to assess bird use of the vegetated areas within the heliostat fields and nearby offsite areas within desert habitats. Eighty survey points (Figure 2) were surveyed a total of four times each during the fall period by a CEC- and BLM-approved avian ecologist. In accordance with the Plan, these 80 points were randomly selected from within the following five study areas:

1. 20 points within an approximately 2.59 square-kilometer (1-square-mile) study area located in Unit 1, within the lower bajada environment of the facility.
2. 20 points within an approximately 2.59 square-kilometer offsite study area located in comparable lower bajada environment as far as practicable from (and south of) the Unit 1 fenceline.
3. 10 points within an approximately 1.29 square-kilometer (0.5-square-mile) study area located in Unit 2, within the upper bajada environment.
4. 10 points within an approximately 1.29 square-kilometer located in Unit 3, in the upper bajada portion of the facility.
5. 20 points within an approximately 2.59 square-kilometer offsite study area located in comparable upper bajada environment and as far as practicable from (and southwest of) the Unit 3 fenceline.



N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 2 Avian Use Monitoring Survey Locations.mxd

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Figure 2: Avian Use Monitoring Survey Locations
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Each of the survey areas described above was divided into 200-m by 200-m square areas to define distinct sample plots. Within each study area, either 10 or 20 (as indicated above) avian use survey points were randomly selected from the sample plots, resulting in 20 point counts per 2.59 square kilometer for each habitat type in the facility and off-site areas, with each count location affording a minimum, non-overlapping survey radius of 100 m. Our 2014 winter and spring season surveys were conducted according to Figure 8 on Page 25 of the Plan, which is inconsistent with the text on Page 23 of the Plan because Figure 8 depicts 20 points in Unit 3 and zero in Unit 2. Starting in the summer of 2014, we adjusted our approach for avian surveys to reflect the text on Page 23 of the Plan by randomly selecting 10 of the 20 points in Unit 3 that we surveyed in the 2014 winter and spring seasons, excluding those from future surveys, and randomly selecting 10 points to survey within a grid in Unit 2. Thus, the 2014 fall surveys were consistent with the text of the Plan and with the summer survey locations.

The Plan specifies that avian use surveys are to be conducted twice per month during September through October. In accordance with this schedule, we conducted a total of four surveys (two each in September and October) for the 2014 fall season.

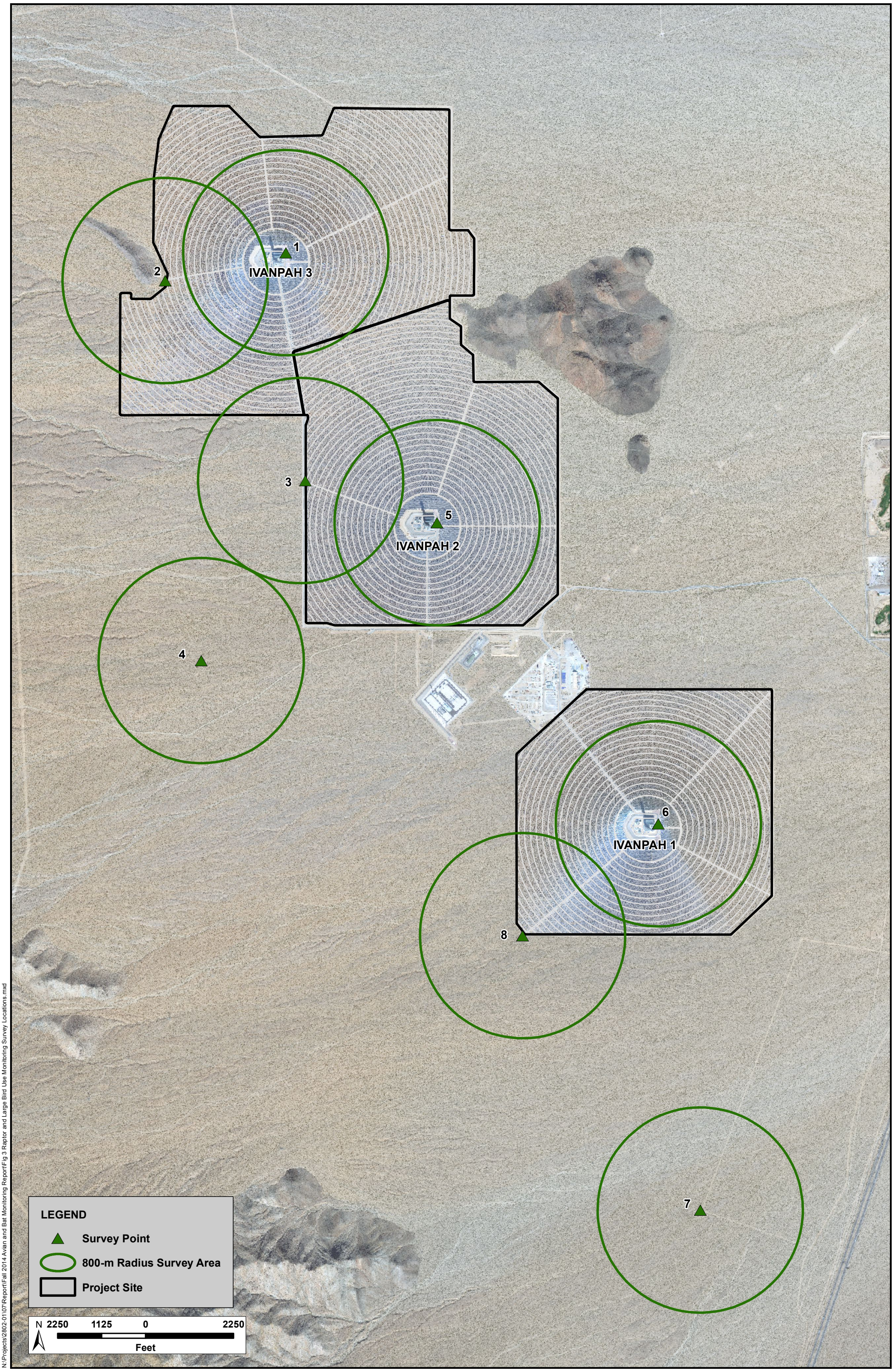
Using distance-sampling techniques such as variable-radius point count methods, determination of bird densities is not as straightforward as simply calculating the mean number of individuals observed in each survey area (Buckland et al. 1993). Rather, the density distributions of the survey data (i.e., assessing density as a function of distance from each point) have to be considered in determining densities. Determining such density distributions typically requires a fairly large amount of data, especially when using programs such as Distance 6.0 (Thomas et al. 2010) to estimate bird densities. Due to the low number of individuals of any given species recorded during these surveys (owing to the naturally low abundance of birds during the fall in the habitats surveyed), it was not possible to obtain reliable density estimates on a species-by-species basis for the 2014 fall season. Even when data were pooled within a 20-point grid, sample sizes were insufficient to allow for determination of reliable density estimates within a grid (e.g., to allow for comparisons between one 20-point heliostat grid and the other, or between one 20-point desert habitat grid and the other). However, when data from the 40 heliostat points were pooled, and data from the 40 desert points were pooled, overall sample sizes for the heliostat arrays versus the offsite desert habitats were large enough to provide reliable density estimates in each of these two categories (onsite and offsite) using the program Distance 6.0. These comparisons are appropriate per the Plan, which states that avian use studies will concentrate on species composition and abundance, with a focus on comparison between the on- and offsite areas.

2.1.2 Raptor/Large Bird Monitoring Surveys

Surveys for raptors and other large birds were conducted from each of eight points. During previous seasons, these survey points were located as shown on Figure 9 of the Plan. With TAC approval, three of the survey points were moved from the eastern perimeter of each unit to the berm of that unit's power block beginning in the fall period. This change was made to facilitate observations of raptors and large birds utilizing the heliostat arrays, and because previous quarterly reports indicated that birds observed from the three eastern

unit points were generally not associated with the facility, but with nearby anthropogenic development (e.g., Primm Valley Golf Course). The resulting fall survey locations are indicated on Figure 3.

Raptor/large bird surveys were conducted using unlimited-distance point counts to assess use of the facility and offsite study areas. CEC and BLM-approved avian ecologists performed these surveys using binoculars and spotting scopes to identify raptors and other large birds, such as common ravens (*Corvus corax*), observed during a 4-hour survey period. The Plan specifies that surveys for raptors and other large birds be conducted twice per month during fall; thus, four surveys were conducted at each point, with two each in September and October, with the exception of point 1 which was surveyed three times.



N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 3 Raptor and Large Bird Use Monitoring Survey Locations.mxd

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Figure 3: Raptor and Large Bird Use Monitoring Survey Locations
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2.2 Facility Monitoring

This section describes areas surveyed, the timing and frequency of the searches, and the methods by which standardized searches were conducted to identify dead and injured birds and bats at the facility. This section also describes the methods for conducting carcass removal and searcher efficiency trials; how data were reported and analyzed for incidental detections; and the methods for producing fatality estimates for the facility. Not including any data management or analysis, more than 2100 person-hours were spent conducting standardized monitoring searches and performing carcass removal and human searcher efficiency trials during the 2014 fall season. In addition, standardized surveys by scent detection dog teams occurred during the fall, with approximately 501 person-hours and 154 canine-hours spent conducting standardized monitoring searches and performing canine searcher efficiency trials.

2.2.1 Standardized Searches

2.2.1.1 Areas Surveyed

Per the Plan, monitoring searches were conducted in the "tower area", defined as the power block (the area consisting of the tower, the ACC unit, the associated control building, and immediately adjacent areas defined by the ring road and berm/slopes surrounding these facilities) and inner high-density (HD) heliostats surrounding each power block (100% survey coverage); the "heliostat area", defined as the inner and outer heliostat segments outside of the inner HD heliostats (24.1% survey coverage in randomly selected arc-shaped plots); the "fenceline" defined as the unit perimeter fences and CLA fence (100% survey coverage); the "collector line", defined as the Unit 3 electrical transmission line (100% survey coverage); and offsite transects. Table 1 provides the acreage searched within each of these areas, as well as the percent of the facility comprised by these search areas. Overall, approximately 29.2% of the facility (not including the offsite transects, which are outside the facility) was searched. All these areas are depicted on Figure 4.

To ensure a balanced distribution of heliostat field survey plots, we divided each unit into inner and outer heliostat fields, and randomly selected approximately 20% of each sub-area. This stratified random sampling design ensures that survey plots will not be clustered or biased in any distance or direction from the towers.

Table 1. Monitoring Areas, 18 August – 20 October 2014.

Area	Acreage Searched (ac)	Percent of Facility
Tower Area	154	4.8%
Heliostat Area	720	22.4%
Fenceline	39	1.2%
Collector Line	26	0.8%
Offsite Transects	7	NA*
Total Search Area	**939**	**29.2%**

* NA = Not applicable, because the offsite transects are located outside the facility

2.2.1.2 Search Frequency and Timing

The fall survey season began 18 August for all units (i.e., any detections reported 18 August or later would have counted as "fall" detections). Weekly standardized searches were conducted at each unit through 2 October. After this time, one additional survey each was conducted for Units 1 and 2 in order to stagger their start dates for the winter season. Thus, a total of eight surveys were conducted in Units 1 and 2. The Unit 3 heliostat area (inner and outer segments) was surveyed seven times. Due to the Labor Day holiday, the Unit 3 tower area, fence, and offsite transects were surveyed six times. According to the Plan, fall searches of each area were to be conducted at intervals of 7 days. The average 2014 fall search interval was 7.7 days (range 5 to 15, median 7 days) for the three solar units. The longer search interval was due to the longer interval between additional searches conducted after 2 October. This variation is expected to occur, and as indicated in Section 3.1.1 of the Plan, the fatality estimator (Huso 2010) is designed to accommodate slight variability in the search interval by incorporating the exact interval for each search to develop an average interval between standardized removal surveys, in days.

2.2.1.3 Search Methods

Methods Used by Human Searchers. Human searchers performed surveys in the tower area, fencelines, offsite transects, Unit 3 collector line, inner segment arc plots, and those outer segment arc plots that were not surveyed by dogs (as described below). Standardized searches for fatalities were performed by CEC and BLM-approved biologists conducting walking surveys in accordance with the methods outlined in the Plan. A pair of searchers walked a total of four transects oriented longitudinally along the complete length of each arc-plot, with the ring roads serving as the outer boundaries of each arc plot (Figure 5). While walking each transect, searchers walked a narrow search section approximately 10 meters (m) wide.

Within the heliostat area, 24.1% of each heliostat field was surveyed using randomly distributed 2.02-hectare (5-acre) arc plots. Within the power block, biologists walked through and around the tower and ACC unit looking for dead and injured birds and bats, and walked transects through the gravel surrounding the structures to achieve 100% coverage within physically accessible areas. Within the inner HD heliostats surrounding each power block, biologists walked transects to ensure 100% coverage. Thus, the tower area,

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Figure 4: Ivanpah Search Areas
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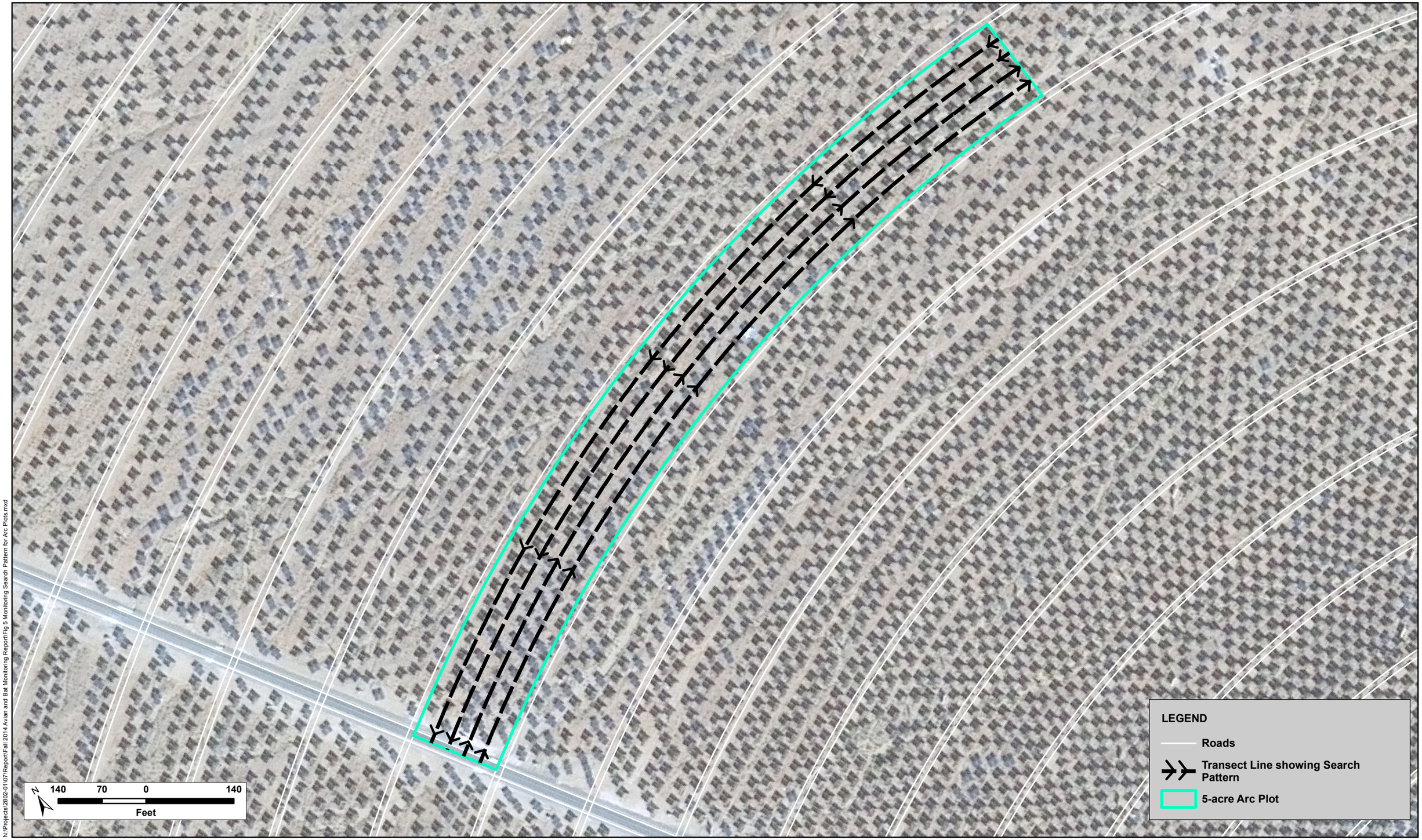

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Figure 5: Monitoring Search Pattern for Arc Plots
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comprising the area within 260 m of each tower, was completely covered during each survey. Along the fenceline, a 6-m wide transect was surveyed, centered on the fence itself (i.e., 3 m on either side of the fence). The Unit 3 collector line was surveyed using a 30-m wide transect (i.e., 15 m on either side of the center line). Offsite surveys were conducted along two randomly selected 152-m long transects, separated by approximately 10 m extending outward from the perimeter fence and back to the facility at nine locations, including the north, east, south, and west borders of the facility.

Methods Used by Detection Dog Teams. Detection dog surveys were performed using canines extensively trained to detect, and passively alert their handlers to, the presence of feathers (including avian carcasses). Search patterns differed from the visual-only patterns used by qualified human searchers. Handlers used body movements and verbal signals to direct the dog's movements relative to wind speed and direction to ensure full coverage of the survey area. As a result, the dog started its search downwind of the intended survey area at a distance appropriate for the wind speed/direction at the discretion of the handler and worked in an upwind direction. Transect spacing employed depended on wind speed, with closer spacing in light wind and wider spacing in relatively strong wind. Handlers directed detection dogs to increase their search intensity in areas of high habitat complexity (e.g., uneven ground, washes, and thick vegetation) where scents can pool and become "trapped." As each team moved through the survey area, the dog ranged and quartered (i.e., moved ahead and side to side) ahead of the handler, searching for avian detections. Once the target was confirmed, the dog received a reward. Avian fatalities were marked and collected by CEC and BLM-approved biologists.

During the fall period, detection dogs surveyed a subset of the outer segment arc plots of Unit 2. Additional Unit 2 outer segment arc plots were surveyed by detection dog teams over time. Once an arc plot had been surveyed by a dog team, that plot continued to be surveyed by detection dogs for the remainder of the fall period. At no time was an arc plot that had been surveyed by detection dogs subsequently surveyed by humans during the fall.

Carcass and Feather Spot Examination. Every carcass and feather spot was examined visually by a CEC and BLM-approved biologist for any signs of singeing or collision. When no obvious signs of singeing or collision were evident, the carcass or feather spot was then examined using an AmScope SE306R-AZ-E2 20X-40X-80X Digital Binocular Stereo Microscope. When singed detections involving carcasses (as opposed to only feather spots) were found, the singeing was assigned a grade based on Kagan et al. (2014), as follows.

- Grade 1 – curling of less than 50% of the flight feathers
- Grade 2 – curling of 50% or more of the flight feathers
- Grade 3 – curling and visible charring of contour feathers

Kagan et al. (2014) originally found no singeing of contour feathers in the absence of curling of 50% or more of the flight feathers. In contrast, we have found singeing of contour feathers with curling of less than 50% of

flight feathers, and in the absence of curling or singeing of any flight feathers. We therefore assigned grade 3 independent of grades 1 and 2.

Surveyors also looked for evidence of collision, including obvious physical trauma or detection adjacent to a heliostat with a bird-strike imprint, smudge mark, and/or feathers on or near the surface of the mirror. If there was no evidence of collision or singeing (e.g., charring, curling, or melting of feathers), as confirmed through microscopic examination, the cause of injury or fatality was listed as "unknown".

For the purpose of these surveys, feather spots were considered detections when they consisted of at least two or more primary flight feathers, five or more tail feathers, or 10 or more feathers of any type concentrated together in an area 1 m^2 or smaller (Smallwood 2007), without any bone, beak, or significant amounts of flesh or skin. In some cases, an individual detection was broken up into aggregations of feathers that would meet the criteria for a feather spot, but with pieces of the carcass that contained bone or significant amounts of flesh or skin also present. In these cases, the detection is categorized as a partial carcass (rather than a feather spot), per the "feather spot" definition above. However, to correctly account for searcher efficiency in the model, when partial carcasses are initially identified as feather spots by the observer in the field, they are modeled (in the fatality estimates) as a feather spot. In other words, the primary means of identification of the detection (feather spot or carcass) is the appropriate classification to utilize in the modeled estimates. The primary identification approach is appropriate since different searcher efficiency rates are estimated for feather spots as opposed to carcasses. Such rates differ due to differences in detectability of carcasses versus feather spots, and because searcher efficiency is an important component of the fatality estimator, what the surveyors detect first (i.e., feathers meeting the definition of a feather spot or an obvious complete or partial carcass) influences how that detection should be included in the model. Such detections are noted in Appendix A as "partial carcass + feather spot" in the "Description of Carcass/Injury" column.

2.2.2 Carcass Removal Trials

In accordance with the Plan, we set out carcasses approximately weekly for carcass removal trials. We were authorized to use only non-native species for both carcass removal trials and searcher efficiency trials (discussed below), as per the terms of the USFWS Special Purpose Utility (SPUT) permit. Therefore, we used four species of non-native birds: European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), rock pigeons (*Columbia livia*), and ring-necked pheasants (*Phasianus colchicus*). We classified bird size as follows: $\leq$100 grams (g) were classified as small, and >100 g were classified as large. As a result, European starlings and house sparrows, which average <100 g, were used to represent small birds, while rock pigeons and ring-necked pheasants, which are >100 g, were used to represent large birds. We conducted 23 carcass removal trials during the 2014 fall season (including two carcasses placed on 21 October), using a total of 10 large carcasses and 13 small carcasses. Twenty-one carcasses were placed in the power block, inner HD area, inner and outer segment heliostats, fencelines, and the Unit 3 collector line. The remaining two small carcasses were placed along the offsite transects.

We conducted carcass removal trials in accordance with the Plan and applicable permits. Consistent with all the prior monitoring periods, monitoring for carcasses included looking for any feather spots resulting from those placed carcasses that were left behind after scavenging. Because feather spots often persist for searchers to find long after scavenging, monitoring both feather spots and carcasses provides a more accurate measure of persistence.

2.2.3 Searcher Efficiency Trials

Human Searcher Efficiency Trials. In accordance with the searcher efficiency trials described in the Plan, we placed a total of 18 carcasses (eight large and 10 small) during the fall season for human searcher efficiency trials. Because a number of the detections found during searches have been feather spots, and these detections may differ from carcasses in detectability, we also placed 18 feather spots. Carcasses and feather spots 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 fatality monitoring occurs except the ACC building (i.e., the tower area, fencelines, offsite transects, Unit 3 collector line, and inner and outer segment arc plots).

One of the large carcasses disappeared (e.g., it may have been scavenged) before the searcher efficiency trial began, leaving a sample size of seven large and 10 small carcasses and 18 feather spots included in the human searcher efficiency trials.

Detection Dog Searcher Efficiency Trials. During the fall period, carcasses and feather spots were placed throughout arc plots surveyed by canines to determine the searcher efficiency of detection dog teams. As with the human searcher efficiency trials, only blind searches (i.e., those in which handlers did not know the carcass locations) were used to determine canine searcher efficiency.

During the 2014 fall season, one carcass and 117 feather spots were used in detection dog searcher efficiency trials. The carcass and feather spots were placed in locations with various vegetation heights and in areas that had different soil and vegetation colors and values to represent the various conditions under which searches occur. These subjects used for canine searcher efficiency trials were placed one week prior to the survey to avoid leaving human scent trails that dogs could follow to carcasses and feather spots.

2.2.4 Incidental Reporting

Some detections (defined as a dead or injured bat or bird) were outside standardized search areas, or were within search areas but not during standardized searches. Such detections were found by H. T. Harvey & Associates staff, the Project's designated biologists, or operational personnel. These detections, which were reported in accordance with the facility's Wildlife Incident Reporting System described in Section 3.4 of the Plan, were considered "incidental" detections. Thus, an "incidental detection" is a bird or bat found dead or injured in a time or place other than the standardized searches that are conducted according to the Plan. Data on such birds and bats were collected separately and reported in the SPUT permit database. As described in

Section 2.2.5, incidental data were included in the fatality estimates when they were found in areas covered during standardized surveys (e.g., in the tower area and along the fenceline) during time periods in which those areas were being searched. Incidental detections from outside the survey areas or during time periods in which areas are not being searched are not included in the fatality estimates.

2.2.5 Fatality Estimator

Animals die at an unknown rate which must be inferred from regular searches of a site. Carcasses also persist for varying amounts of time and are imperfectly detected by searchers. For these reasons, it is often inappropriate to draw conclusions based on the raw number of fatalities in an open system. The desire to estimate fatalities given these variables has driven the development of several statistical methods for estimating fatalities (e.g., see Johnson et al. 2003, Smallwood 2007, and Huso 2010). 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 the number of fatalities, F, is the quotient of the number of carcasses detected, C, over the product of carcasses left unscavenged, r, and the proportion that an observer sees, p (Huso 2010).

The inputs for r and p are estimated in subgroups of covariates that will influence the detectability and persistence of each carcass, such as carcass size, vegetation height, and stage of decay or scavenging (i.e., feather spot versus carcass). Given the tendency for many fatality models to underestimate site-wide fatalities, we chose to use a fatality estimator written by M. Huso (2010), which was shown to outperform previous fatality estimation models by more accurately accounting for imperfect detectability. This model, *The Fatality Estimator*, was developed to estimate fatalities primarily for wind energy Projects; however, it can be applied to other sources of fatalities including power lines and solar Projects (Huso 2010). The estimator uses this conceptual framework of fatalities, combined with bootstrapping from models of r and p to calculate variances and confidence intervals for the estimates of fatalities. Bootstrapping is a statistical method used to create a distribution to assign measures of variance to estimates for data where the underlying distribution is either unknown or cannot be represented algebraically (Efron and Tibshirani 1986). Bootstrapping resamples the data with replacement, several thousand times, to create a distribution that may be used to infer information about the sample mean.

Estimating Carcass Removal Times. Measurements of carcass removal rates typically include one or more censoring values. A censoring value is used in statistics when a value is only partially known. For example, if a carcass was checked on day 7 and was present, and was checked again on day 10, but was found to be missing, then the date of scavenging is unknown, and an interval censor would be used. Because we used camera traps, the majority of scavenging times were known precisely, and the data were not censored. However, when cameras failed to record the moment of scavenging, we applied interval censoring.

There are four commonly used distributions of survival models that can be used in the fatality estimator for a value of *r:* exponential, Weibull, loglogistic, and lognormal. These four distributions have different rates and shapes of decay curves that attempt to model the survival of carcasses over a given search interval. We used Akaike's Information Criterion adjusted for sample size (AICc; Akaike 1973) to rank the fit of each survival model to our carcass removal trial data. Because the exact time of death for detected fatalities is usually unknown, the probability of persistence cannot be calculated exactly for each carcass, but it can be estimated from the selected survival model and bootstrapped to obtain a range of estimates of *r* for each carcass.

Estimating Searcher Efficiency. Searcher efficiency, or the proportion of fatalities that an observer sees, p, is represented most simply by the following equation:

$$p = \frac{NumberObserved}{NumberAvailable}$$

Fatality Estimates. Per Section 3.1 of the Plan, we report estimates for the tower area components (i.e., the power block and inner HD heliostats) together, because 100% of this area was searched; however, these estimates were calculated separately for the power block and inner HD heliostats due to the inclusion of many more incidental observations from the power block. We ran a separate estimate for the heliostat area (the inner and outer heliostat segments combined), in which 24.1% of the total area was searched.

The ACC buildings are only marginally accessible to scavengers from the outside; therefore, they act primarily as a closed system with a scavenging rate that approaches zero. Because of this, we did not use the fatality estimator equation to determine the numbers of fatalities at the ACC buildings; rather, we added the raw numbers from the ACC buildings, which we believe are representative of the fatality population within the ACC buildings, to the results of the fatality estimator to produce the overall fatality estimates for the tower area. All detections within the ACC buildings were assigned as having a known cause of fatality, whether or not they showed evidence of singeing or collision.

Within the power block, a large percentage of the detections were found incidentally. On Projects requiring fatality estimation, incidentals are typically not included in fatality estimates due to the sporadic, unpredictable nature of such reports and unaccounted-for search effort. However, because these detections accounted for 22.5% of the detections recorded during the 2014 fall season, we included them in our estimates for the power block. We adjusted the search interval for incidental detections on the power block to one day to reflect the high human use in these areas and thus the high probability that monitoring or operational personnel would see and report any highly visible fatality in these areas. There were also five incidental detections outside of the power block, but within the standardized search areas, which were included in the fatality estimates. For these detections, the survey interval was defined as the number of days between the date of detection and the date of the previous regular standardized survey (i.e., the same approach used for detections found during standardized surveys).

Owing to low carcass removal trial sample sizes in any single component of the Project site (e.g., the power block, or the inner/outer heliostat segments), carcass removal trials for all Project areas were pooled to construct a carcass persistence model that accounted for carcass size only (small or large).

Because the fatality estimator is not appropriate for estimating rare events, we only present estimates for Project elements or groupings of more than five detections. The fatality estimator accounts for imperfect searcher efficiency, so fatalities that are not detected during a given search are still represented statistically. Because of this, if a previously missed fatality is detected on a subsequent search, it will essentially be double-counted, and cause the overall fatality estimate to be falsely inflated. Therefore, any detections determined to be significantly older than the search interval were removed from the estimator (Huso 2010). Because of uncertainty in estimating the ages of detections (i.e., the length of time between a bird's death and when the detection was discovered), all detections that were entered into the SPUT database as being <1 week old were considered to be within the search interval for 2014 fall surveys. We took both the previous search interval (averaging 7.7 days) and the estimated age of individual carcasses into account in determining which detections to exclude on the basis of being older than the search interval; for example, detections that were estimated to be <1 month old when found were included in fatality estimates if the search interval was greater than 1 week. In addition, we excluded detections found outside of the standardized survey plots, as the fatality estimates focus on areas that are covered during standardized surveys.

Section 3.0 Avian Use and Raptor/Large Bird Monitoring Survey Results

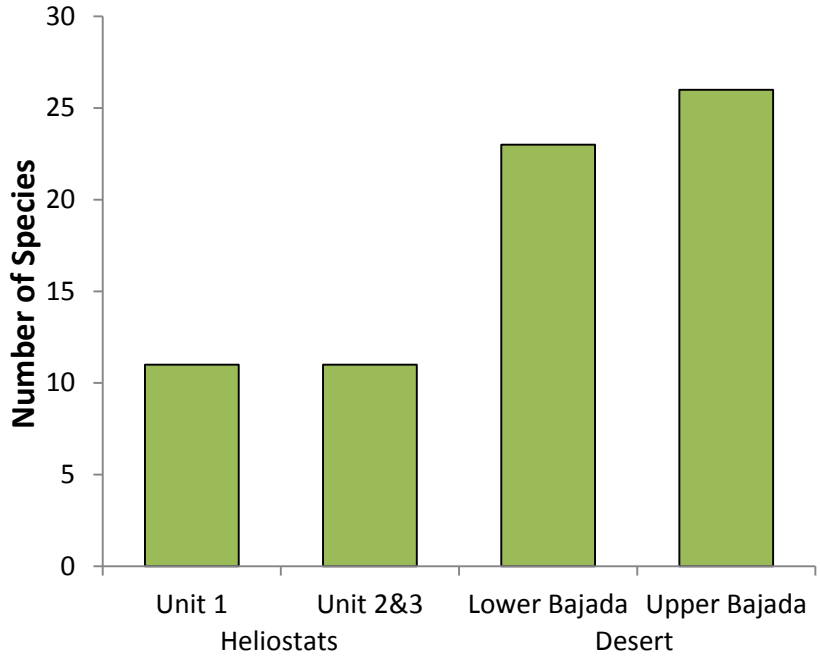
3.1 Avian Use Monitoring

This section provides the results of monitoring of avian use of the heliostat arrays and offsite desert bajada plots, including species composition and abundance. Species composition is compared between these avian use survey results and detections during standardized monitoring surveys. Approximately 99 hours of field observation time were spent conducting avian use surveys during the 2014 fall season.

3.1.1 Species Composition

A total of 38 bird species were recorded during avian use surveys during the 2014 fall season. Table 2 lists these species and the frequency of occurrences (i.e., number of individuals detected) within the five survey grids. As indicated by Figure 6, species richness was highest in the upper bajada desert (26 species), followed closely by the lower bajada desert (23 species). Species richness was much lower in the heliostat grids, with 11 species observed in Unit 1, seven in Unit 2, and six in Unit 3 (with 11 unique species in Units 2 and 3 combined). In Figure 6, overall species richness is pooled for the 20 survey points in Units 2 and 3 so that each bar represents a total of 20 survey points (for the purpose of visual comparison of results). Statistical tests for differences in species richness among the five survey grids would not be appropriate because of the high number of zero values in the samples.

Figure 6. Number of Bird Species Recorded at Avian Survey Points on Five Survey Areas.



Although all birds observed during surveys were recorded, only individual birds using the survey plots were included in these analyses. These included birds that were perched on a plot or aerial foragers (such as raptors) that appeared to be foraging on the plot. Birds that were only observed flying over or through the plot were not included in the analysis, both because these birds' occurrence did not signify use of a particular area and because inclusion of birds transiting over a plot would result in substantial problems associated with spatial autocorrelation of results (e.g., as birds are observed flying through multiple plots).

3.1.2 Avian Abundance

As with species richness, avian abundance was highest on the two desert bajada grids (350 observations on the lower bajada and 277 observations on the upper bajada). The three heliostat arrays had substantially lower avian abundance, with only 37 observations in Unit 1, 29 observations in Unit 2, and 15 observations in Unit 3 during the fall period (Figure 7). As in Figure 6, data for the 20 plots in Units 2 and 3 were pooled for Figure 7.

Figure 7. Number of Bird Observations Recorded at Avian Survey Points on Five Survey Areas.

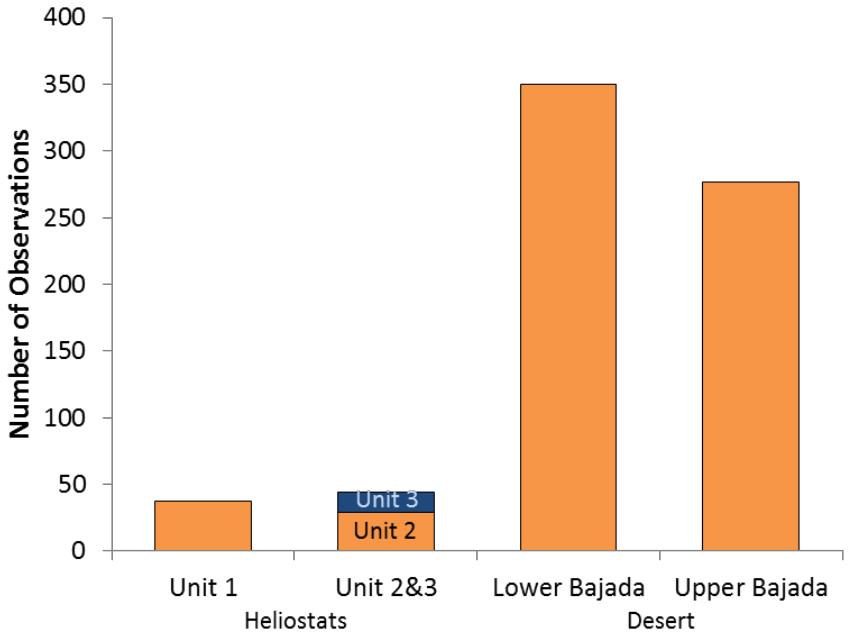


Table 2. Avian Use Survey Results - Frequency of Occurrence by Species and Survey Grid.

Common Name	Scientific Name	Unit 1	Unit 2	Unit 3	Lower Bajada	Upper Bajada	Total
Black-throated Sparrow	*Amphispiza bilineata*	2	0	0	183	83	**268**
Cactus Wren	*Campylorhynchus brunneicapillus*	0	0	0	23	34	**57**
Bewick's Wren	*Thryomanes bewickii*	0	0	0	29	17	**46**
Blue-gray Gnatcatcher	*Polioptila caerulea*	0	0	0	27	13	**40**
Gambel's Quail	*Callipepla gambelii*	0	0	0	0	32	**32**
Brewer's Sparrow	*Spizella breweri*	3	0	2	4	19	**28**
Unknown Sparrow		2	3	1	10	9	**25**
Horned Lark	*Eremophila alpestris*	13	4	5	0	1	**23**
Sagebrush/Bell's Sparrow	*Artemisiospiza nevadensis/belli*	0	0	0	13	5	**18**
House Finch	*Haemorhous mexicanus*	1	5	0	9	2	**17**
Yellow-rumped Warbler	*Setophaga coronata*	0	9	1	5	1	**16**
Le Conte's Thrasher	*Toxostoma lecontei*	0	0	0	4	9	**13**
Unknown Passerine		2	0	2	4	4	**12**
Chipping Sparrow	*Spizella passerina*	0	0	0	0	10	**10**
Loggerhead Shrike	*Lanius ludovicianus*	1	0	0	4	5	**10**
Rock Wren	*Salpinctes obsoletus*	0	0	0	7	2	**9**
Unknown		0	0	0	0	9	**9**
Verdin	*Auriparus flaviceps*	0	0	0	6	1	**7**
Western Meadowlark	*Sturnella neglecta*	3	1	0	1	2	**7**
Unknown Gnatcatcher	*Polioptila sp.*	0	0	0	2	4	**6**
Brewer's Blackbird	*Euphagus cyanocephalus*	6	0	0	0	0	**6**
Red-tailed Hawk	*Buteo jamaicensis*	0	0	0	5	0	**5**
White-crowned Sparrow	*Zonotrichia leucophrys*	0	0	1	3	1	**5**
American Kestrel	*Falco sparverius*	1	0	2	0	1	**4**
Barn Swallow	*Hirundo rustica*	0	0	0	0	3	**3**
Common Raven	*Corvus corax*	0	2	0	0	1	**3**
Orange-crowned Warbler	*Oreothlypis celata*	1	0	1	0	1	**3**
Savannah Sparrow	*Passerculus sandwichensis*	0	3	0	0	0	**3**
Black-tailed Gnatcatcher	*Polioptila melanura*	0	0	0	2	0	**2**
Crissal Thrasher	*Toxostoma crissale*	0	0	0	2	0	**2**
Ladder-backed Woodpecker	*Picoides scalaris*	0	0	0	1	1	**2**
Phainopepla	*Phainopepla nitens*	0	0	0	2	0	**2**
Sage Thrasher	*Oreoscoptes montanus*	0	0	0	1	1	**2**
Unknown Wren		0	0	0	0	2	**2**
Unknown Hummingbird		0	1	0	0	1	**2**
Anna's Hummingbird	*Calypte anna*	0	0	0	0	1	**1**

Common Name	Scientific Name	Unit 1	Unit 2	Unit 3	Lower Bajada	Upper Bajada	Total
Cooper's Hawk	*Accipiter cooperii*	0	0	0	0	1	**1**
Mourning Dove	*Zenaida macroura*	0	0	0	1	0	**1**
Northern Harrier	*Circus cyaneus*	0	0	0	1	0	**1**
Say's Phoebe	*Sayornis saya*	0	0	0	1	0	**1**
Yellow Warbler	*Setophaga petechia*	0	0	0	0	1	**1**
Brown-headed Cowbird	*Molothrus ater*	0	1	0	0	0	**1**
Greater Yellowlegs	*Tringa melanoleuca*	1	0	0	0	0	**1**
Lesser Goldfinch	*Spinus psaltria*	1	0	0	0	0	**1**
Total		**37**	**29**	**15**	**350**	**277**	**708**

Survey areas were identical for three of the four grids (20 points in each grid). Two grids, those in Units 2 and 3, contained only 10 points each. To allow comparison among areas, and because these two grids contained similar habitats, we present observations from Units 2 and 3 together. Thus, comparison of general avian abundance metrics such as total observations, as was done above, is appropriate for elucidating relative abundance, both overall and by species. However, because the relative abundance of various species differed among grids, and bird detectability may vary among species, assessing relative abundance using raw numbers may result in inaccurate conclusions. As a result, we used the program Distance 6.0 (Thomas et al. 2010) to evaluate avian densities. As discussed in Section 2.1.1, distance sampling analysis requires a fairly large amount of data, and due to the low number of individuals of most species recorded during these surveys (owing to the naturally low abundance of birds in the habitat surveyed), it was not possible to obtain reliable density estimates on a species-by-species basis. Even when data were pooled within a 20-point grid, sample sizes were insufficient to allow for determination of reliable density estimates within a grid (e.g., to allow for comparisons between the two 20-point heliostat grids or the two 20-point desert habitat grids). However, under the assumption that the two heliostat grids were more similar to each other (in terms of habitat and fall bird communities) than to either of the desert bajada grids, and making the same assumption with respect to the two desert bajada grids, we pooled data from the 40 heliostat points and compared bird densities to data from the 40 pooled desert bajada points. The 95% confidence intervals around density estimates for each habitat type did not overlap, thus providing statistical evidence that bird density in the desert bajada grids was significantly higher than bird density in the heliostat grids (Table 3).

Table 3. Avian Density Estimates for Heliostat vs. Desert Bajada Grids (Derived Using DISTANCE).

		95% Confidence Interval		
Habitat Type	**Density Estimate (Birds/Hectare)**	**Low Estimate (Birds/Hectare)**	**High Estimate (Birds/Hectare)**	**Percent Coefficient Of Variation**
Heliostat Units	1.2	0.8	1.8	22.8
Desert Bajada	7.4	5.2	10.6	18.3

3.1.3 Comparison of Avian Use Survey Results to Fatality Detections

Whereas 38 bird species were recorded during avian use surveys, 58 species were recorded as detections during fatality monitoring (described in Section 4). Comparison of the most abundant bird species that were recorded on the avian use surveys to the species most frequently recorded as detections reveals little similarity between detections and birds using either the heliostat grids (as identified during avian use surveys) or the desert bajada habitats (Table 4). Of the 10 identified species most frequently recorded as detections, only two species (yellow-rumped warbler and orange-crowned warbler) were among the most abundant species on the heliostat survey grids, while none were among the most abundant species on the desert bajada survey grids. Mourning doves, which were the most frequent fatality detection (14.2%), were recorded only once during avian use surveys in fall but were occasionally observed in heliostat areas during fatality and raptor surveys. It is also important to note that birds that were only observed flying over or through the grid plots were not included in the analysis to avoid spatial autocorrelation.

Table 4. Comparison of the Most Abundant Bird Species Recorded as Detections and Recorded on Heliostat and Desert Bajada Survey Grids[2].

Detections[1]	**Heliostat Survey Grids**	**Desert Bajada Survey Grids**
Mourning Dove	Horned Lark	Black-throated Sparrow
Yellow-rumped Warbler	Yellow-rumped Warbler	Cactus Wren
Yellow Warbler	Brewer's Blackbird	Bewick's Wren
Brown-headed Cowbird	House Finch	Blue-gray Gnatcatcher
Vaux's Swift	Brewer's Sparrow	Gambel's Quail
White-crowned Sparrow	Western Meadowlark	Brewer's Sparrow
Tree Swallow	American Kestrel	Sagebrush Sparrow
Barn Swallow	Savannah Sparrow	Le Conte's Thrasher
Lazuli Bunting	Black-throated Sparrow	House Finch
Lesser Goldfinch	Common Raven	Chipping Sparrow
Orange-crowned warbler	Orange-crowned warbler	

[1] Bird and bat fatalities and injuries found during fatality searches are called detections.
[2] Species are listed in descending order of abundance and in alphabetical order where equal numbers of individuals were observed.

3.2 Raptor and Large Bird Use Monitoring

This section discusses the results of surveys for use of the site and surrounding areas by raptors and other large birds, including a summary of species composition, abundance, and habitat use, as observed from points within, around the edges of, and outside the facility. In addition, this section provides information on the number of individuals of these species observed perched versus those in flight, as well as the heights at which flying birds were recorded. A total of 112 hours of field observation time was spent conducting raptor/large bird surveys during the 2014 fall season.

3.2.1 General Species Composition, Abundance, and Habitat Use

In general, four 4-hour surveys for raptors and other large birds were conducted from each of eight points as shown on Figure 3. One point was only surveyed three times due to logistical constraints. During the surveys, six raptor species and three other large bird species were observed and identifiable. Table 5 summarizes the total number of observations of each of these species during all surveys combined and indicates the locations in which the birds were observed. Due to the long duration of each survey and the mobility of these birds, it was not always possible to track individuals throughout a survey to avoid counting the same individuals multiple times. Consequently, results of large bird use monitoring surveys are reported as the number of observations rather than individuals.

Table 5. Raptor/Large Bird Point Count Results Summary (Number of Observations).

Common Name	Scientific Name	Ivanpah Facilities	Desert	Mountains	Total
Common Raven	*Corvus corax*	55	24	0	**79**
American Kestrel	*Falco sparverius*	15	7	0	**22**
Red-tailed Hawk	*Buteo jamaicensis*	5	10	0	**15**
Unknown Duck		8	0	0	**8**
Cooper's Hawk	*Accipiter cooperii*	0	3	0	**3**
Golden Eagle	*Aquila chrysaetos*	0	0	2	**2**
Prairie Falcon	*Falco mexicanus*	2	0	0	**2**
Sharp-shinned Hawk	*Accipiter striatus*	0	2	0	**2**
White-faced Ibis	*Plegadis chihi*	1	0	0	**1**
Unknown Falcon	*Falco sp.*	1	0	0	**1**
Total		**87**	**46**	**2**	**135**

Common ravens comprised 58.5% of all large bird observations detected during raptor/large bird surveys. The preponderance of raven observations resulted less from the abundance of ravens on the site (observed only as singles or pairs) than from the persistent nature (frequently present) and widespread occurrence of the species. Ravens were observed much more frequently at Ivanpah facilities than in the nearby desert, but none were observed toward the mountains. American kestrels (*Falco sparverius*) were more commonly observed in or over the heliostat arrays and Project buildings than in the desert. None were observed in the mountains although this falcon's small size makes very distant observations difficult. Two golden eagles (*Aquila chrysaetos*)

were observed, both in the mountains. None were observed at the Ivanpah facilities, either during formal surveys or incidentally, in fall 2014. During the 2014 fall season, there were 10 incidental observations of raptors or large birds over the desert and 16 incidental observations of other raptors or large birds at, or over Ivanpah facilities, for a total of 67 birds. One observation of a flock of twenty-nine Canada geese (*Branta canadensis*) accounted for 43.3% of this total. Other raptor/large bird species observed incidentally included a peregrine falcon (*Falco peregrinus*), two northern harriers (*Circus cyaneus*), two ospreys (*Pandion haliaetus*), two Cooper's hawks (*Accipiter cooperii*), two common ravens, nine red-tailed hawks (*Buteo jamaicensis*), nine American kestrels, and eleven unknown ducks.

As shown by Table 6, the frequency of occurrence of large birds, in terms of the number/survey hour, was relatively low. An average of 1.21 birds/ hour was recorded during the 112 hours of raptor/large bird surveys.

Table 6. Raptor/Large Bird Point Count Results Summary (Number of Observations/Survey Hour).

Common Name	Scientific Name	Ivanpah Facilities	Desert	Mountains	Total
Common Raven	*Corvus corax*	0.49	0.21	0.00	0.71
American Kestrel	*Falco sparverius*	0.13	0.06	0.00	0.20
Red-tailed Hawk	*Buteo jamaicensis*	0.04	0.09	0.00	0.13
Unknown Duck		0.07	0.00	0.00	0.07
Cooper's Hawk	*Accipiter cooperii*	0.00	0.03	0.00	0.03
Golden Eagle	*Aquila chrysaetos*	0.00	0.00	0.02	0.02
Prairie Falcon	*Falco mexicanus*	0.02	0.00	0.00	0.02
Sharp-shinned Hawk	*Accipiter striatus*	0.00	0.02	0.00	0.02
White-faced Ibis	*Plegadis chihi*	0.01	0.00	0.00	0.01
Unknown Falcon	*Falco sp.*	0.01	0.00	0.00	0.01
Total		**0.78**	**0.41**	**0.02**	**1.21**

Common ravens, red-tailed hawks, American kestrels, and a golden eagle were observed perched during raptor surveys. The golden eagle was observed perched offsite in the mountains on Sentinel Peak. Other species perched in the desert outside Ivanpah facilities typically used power poles or vegetation. Birds were observed perched within Ivanpah facilities in the heliostat fields, either on the heliostats or adjacent power poles. On one occasion, an American kestrel was observed perched on a Project building in the power block of Unit 2. On another occasion, two ravens were observed leaving a perch on the Unit 1 tower, below the boiler. Birds

Per Section 2.3 of the Plan, the height of flight above ground level (agl) was recorded in one of the following categories:

- 0 = < 10 m agl, (within the heliostat collision-risk zone)
- 1 = 10–100 m agl, (between the height of the heliostat collision-risk zone and the height of the elevated solar flux risk zone in areas closer to the power towers)
- 2 = 100–200 m agl (within the elevated solar flux risk zone (primary boiler area at 120–140 m agl))
- 3 = > 200 m agl (above the elevated solar flux risk zone)

Table 7 provides the number of observations of each species perched or flying in each height category; this information is provided separately for birds seen over Ivanpah facilities and over other habitats such as desert and mountains.

Both within the Ivanpah facility and in the desert, birds were seen in nearly equal numbers perched and flying at various altitudes. Within the Ivanpah facility, fewer birds were observed flying below 10 m above ground level. Slightly more birds were observed flying 100 – 200 m above ground level than at other heights within the Ivanpah facilities. In other habitats, birds were also slightly more likely to be observed flying above 10 m above ground level. Relatively fewer birds were observed perched in the desert (10.4%) than within the Ivanpah facilities (16.1%).

With the exception of two ravens, no raptors or large birds were observed perched on the power towers.

Table 7. Flight Heights of Raptors and Other Large Birds Over Ivanpah Facilities and Other Habitats/Areas (Data are the Number of Observations at Each Flight Height).

	Above Ivanpah Facilities					Above Other Habitats/Areas					
Species	**Perched**	**0**	**1**	**2**	**3**	**Perched**	**0**	**1**	**2**	**3**	**Total**
Common Raven	8	7	7	24	9	2	1	5	9	7	**79**
American Kestrel	4	3	2	6	0	1	1	4	1	0	**22**
Red-tailed Hawk	2	0	0	1	2	3	0	1	3	3	**15**
Unknown Duck	0	0	8	0	0	0	0	0	0	0	**8**
Cooper's Hawk	0	0	0	0	0	0	0	3	0	0	**3**
Golden Eagle	0	0	0	0	0	1	0	1	0	0	**2**
Prairie Falcon	0	0	0	2	0	0	0	0	0	0	**2**
Sharp-shinned Hawk	0	0	0	0	0	0	0	1	0	1	**2**
White-faced Ibis	0	0	1	0	0	0	0	0	0	0	**1**
Unknown Falcon	0	0	0	0	1	0	0	0	0	0	**1**
Total	**14**	**10**	**18**	**33**	**12**	**7**	**2**	**15**	**13**	**11**	**135**

3.2.2 Raptor and Large Bird Distribution

Table 8 provides the number of observations of each raptor and large bird species from each of the eight survey points (Figures 8-15).

Table 8. Raptor/Large Bird Point Count Results By Survey Point.

	Survey Point								
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Common Raven	9	3	21	8	5	8	4	21	**79**
American Kestrel	3	4	1	0	7	4	1	2	**22**
Red-tailed Hawk	2	1	4	2	1	1	4	0	**15**
Unknown Duck	8	0	0	0	0	0	0	0	**8**
Cooper's Hawk	0	0	0	1	0	0	1	1	**3**
Sharp-shinned Hawk	0	0	0	0	0	0	2	0	**2**
Golden Eagle	0	1	1	0	0	0	0	0	**2**
Prairie Falcon	0	0	0	0	1	0	0	1	**2**
White-faced Ibis	0	0	0	0	0	1	0	0	**1**
Unknown Falcon	0	0	0	0	1	0	0	0	**1**
Total	**22**	**9**	**27**	**11**	**15**	**14**	**12**	**25**	**135**

Common ravens comprised the majority of detections at Points 3, 4, 6 and 8. Two other species, red-tailed hawk and American kestrel, were detected at all but one point. The remaining raptors/large birds were encountered relatively infrequently, and were not recorded at most points.

Figures 8 through 15 depict the results of raptor surveys in terms of the locations of birds observed; number of individuals; whether the birds were flying or perched; and flight direction (for flying birds). All observations for the entire season are shown on a single figure for each of the eight survey points to document locations and concentrations, if any, of raptor and other large bird activity.

INSET

LEGEND

Number of Birds

Flight Direction

Survey Point

800-m Radius Survey Area

Project Site

Raptor/Large Bird Survey Observations

American Kestrel, Flying

Common Raven, Flying

Common Raven, Perched

Red-tailed Hawk, Flying

Unknown Duck, Flying

N 2200 1100 0 2200 Feet

N 800 Feet

IVANPAH 3

IVANPAH 2

IVANPAH 1

OVERVIEW

Fig 8

Fig 9

Fig 10

Fig 11

Fig 12

Fig 13

Fig 14

Fig 15

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 8 Raptor Large Bird Survey Observations from Survey Point 1 Fall 2014.mxd

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Figure 8: Raptor/Large Bird Survey Observations from Survey Point 1, Fall 2014

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INSET

LEGEND

Number of Birds

Flight Direction

Survey Point

800-m Radius Survey Area

Project Site

Raptor/Large Bird Survey Observations

American Kestrel, Flying

Common Raven, Flying

Golden Eagle, Perched

Red-tailed Hawk, Flying

Note: Pair of AMKE adults circling

N 1,200 Feet

N 1500 750 0 1500 Feet

IVANPAH 3

Fig 8
Fig 9
Fig 10
Fig 11
Fig 12
Fig 13
Fig 14
Fig 15
IVANPAH 1
IVANPAH 2

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 9 Raptor Large Bird Survey Observations from Survey Point 2 Fall 2014.mxd

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Figure 9: Raptor/Large Bird Survey Observations from Survey Point 2, Fall 2014

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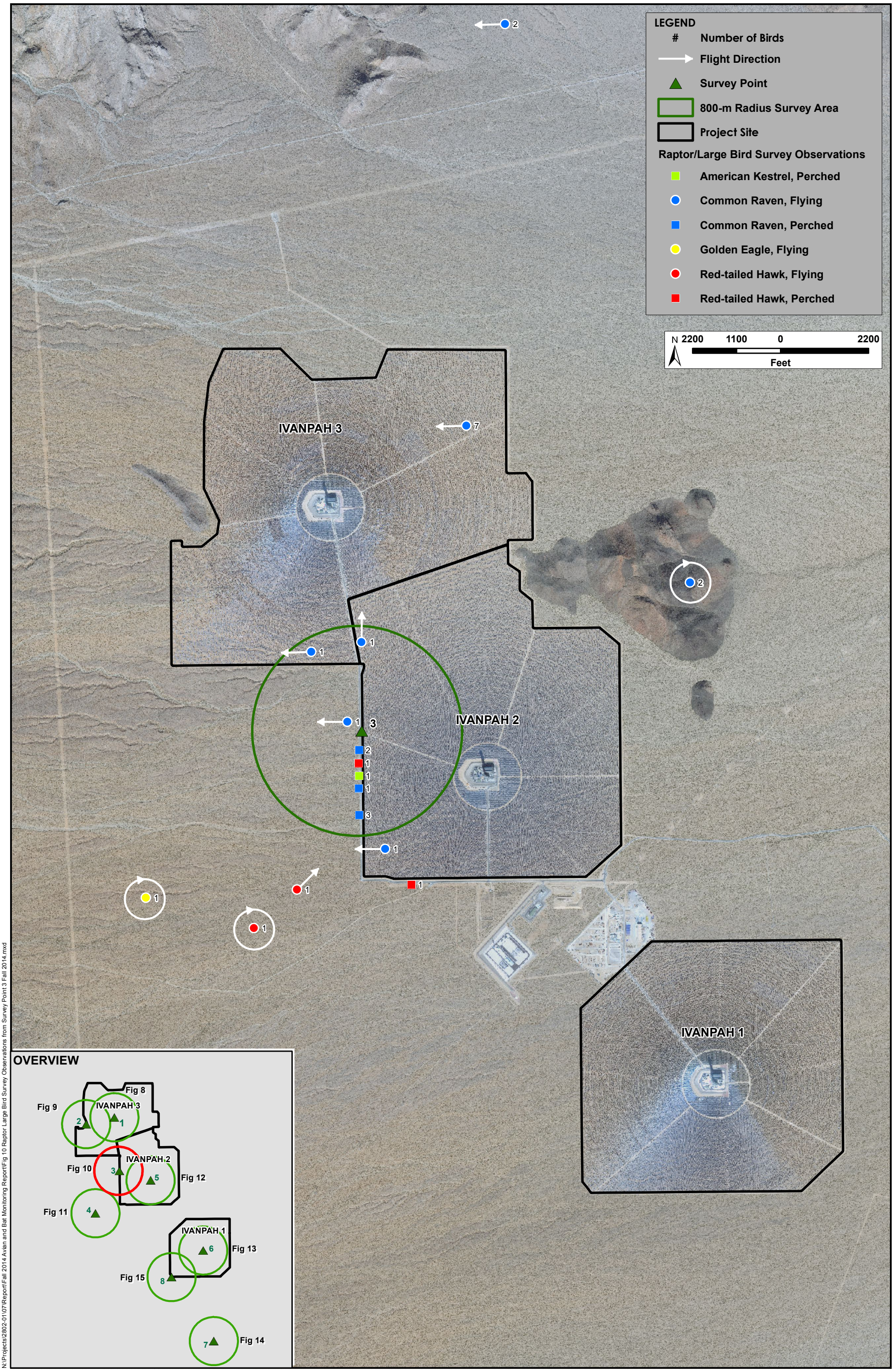

N:\Projects\2802-01107\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 10 Raptor Large Bird Survey Observations from Survey Point 3 Fall 2014.mxd

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Figure 10: Raptor/Large Bird Survey Observations from Survey Point 3, Fall 2014
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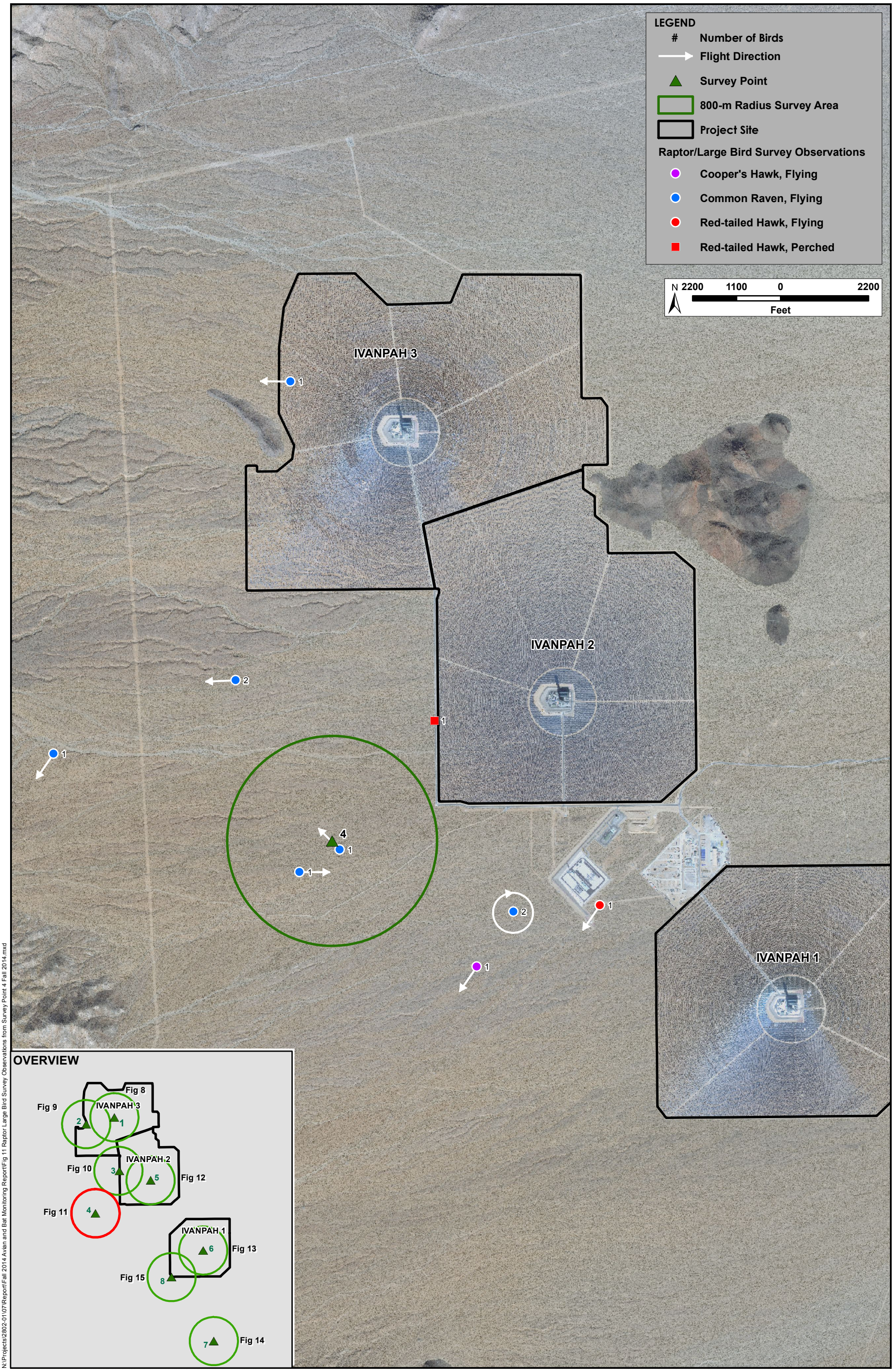

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Figure 11: Raptor/Large Bird Survey Observations from Survey Point 4, Fall 2014

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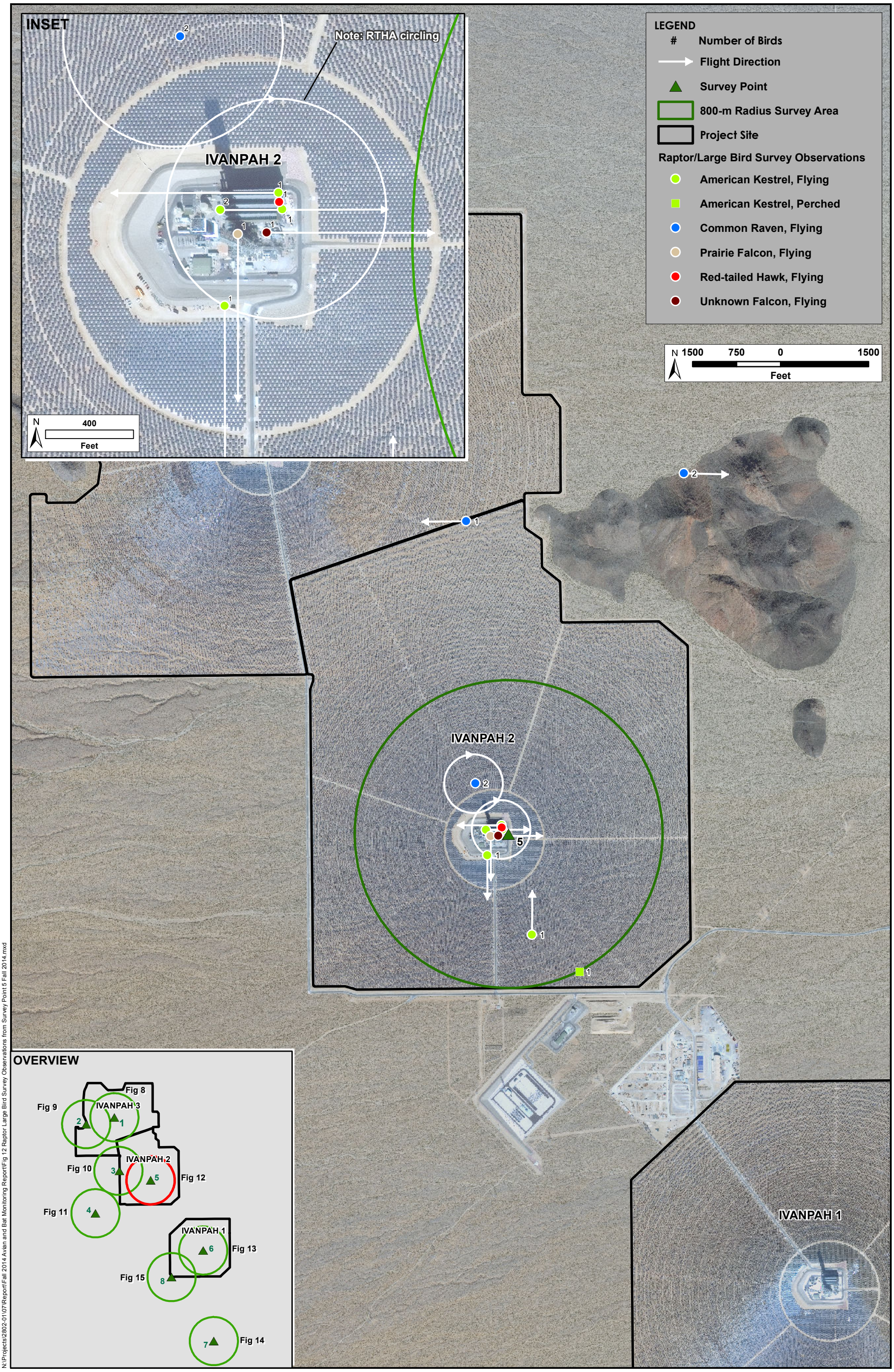

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Figure 12: Raptor/Large Bird Survey Observations from Survey Point 5, Fall 2014

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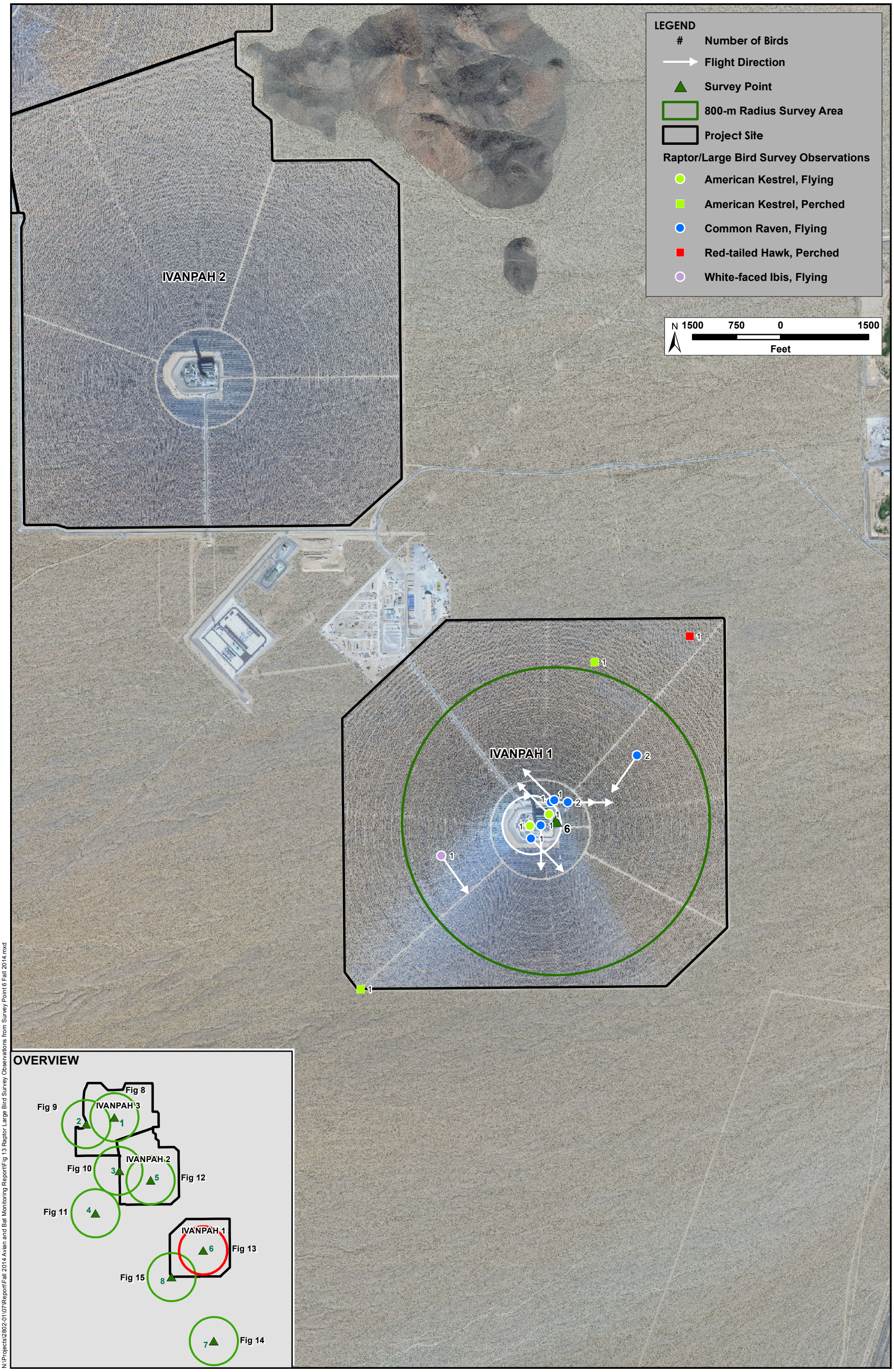

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 13 Raptor Large Bird Survey Observations from Survey Point 6 Fall 2014.mxd

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Figure 13: Raptor/Large Bird Survey Observations from Survey Point 6, Fall 2014

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IVANPAH 2

IVANPAH 1

LEGEND

#	Number of Birds
→	Flight Direction
▲	Survey Point
▭	800-m Radius Survey Area
▭	Project Site

Raptor/Large Bird Survey Observations

■	American Kestrel, Perched
●	Cooper's Hawk, Flying
●	Common Raven, Flying
■	Common Raven, Perched
●	Red-tailed Hawk, Flying
■	Red-tailed Hawk, Perched
●	Sharp-shinned Hawk, Flying

N 2200 1100 0 2200

Feet

1 1 1 2 7 2 1 1 1 1

OVERVIEW

Fig 8
Fig 9
IVANPAH 3
2
1
IVANPAH 2
Fig 10
3
5
Fig 12
Fig 11
4
IVANPAH 1
6
Fig 13
Fig 15
8
7
Fig 14

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 14 Raptor Large Bird Survey Observations from Survey Point 7 Fall 2014.mxd

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Figure 14: Raptor/Large Bird Survey Observations from Survey Point 7, Fall 2014

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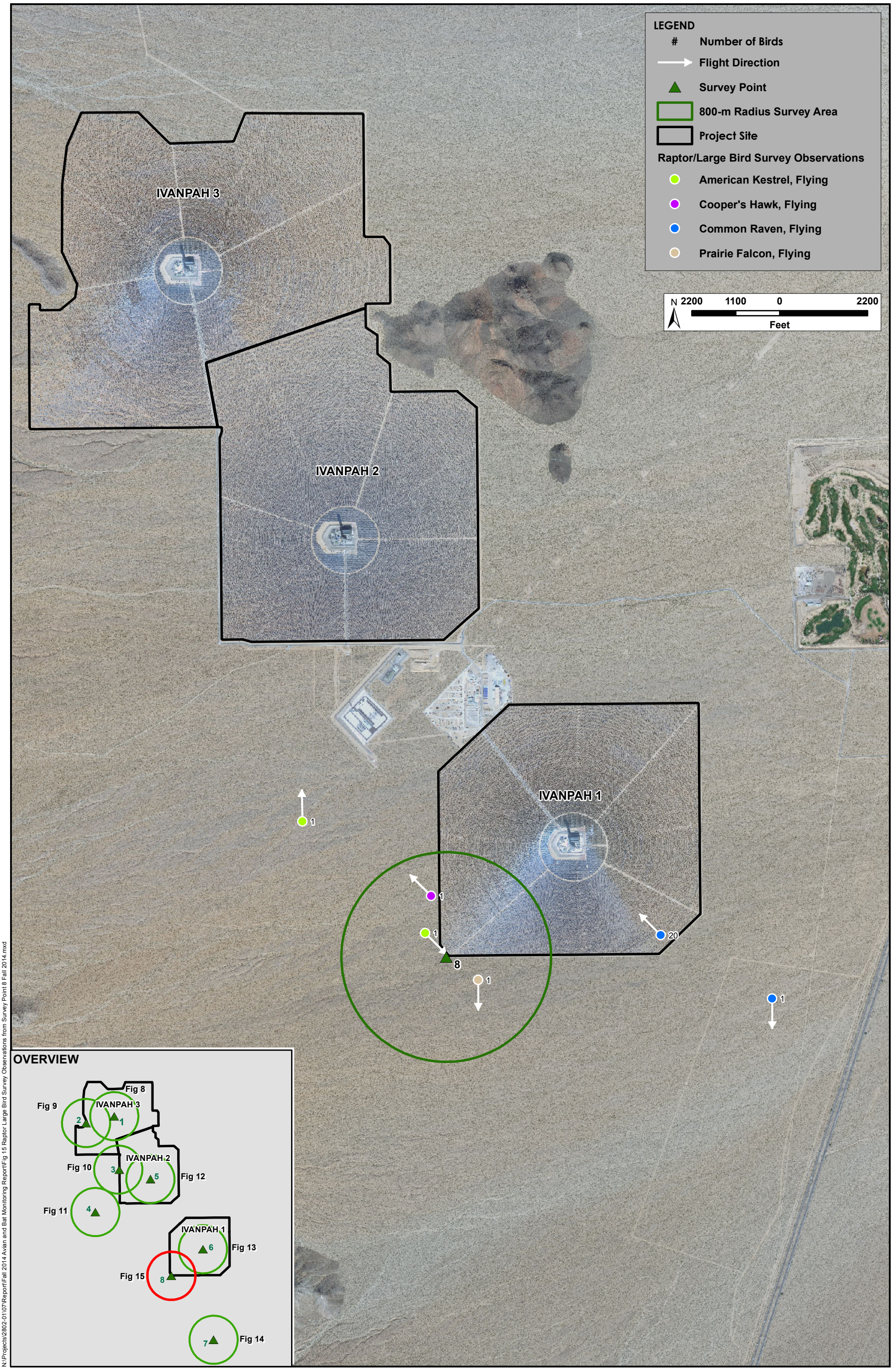

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 15 Raptor Large Bird Survey Observations from Survey Point 8 Fall 2014.mxd

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Figure 15: Raptor/Large Bird Survey Observations from Survey Point 8, Fall 2014

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Section 4.0 Monitoring Results

4.1 Avian and Bat Detections

The following section describes the basic summary statistics and distributions of the detection data. The summary provides the numbers and species comprising the detections.

4.1.1 Summary of Avian and Bat Detections

During the period 18 August – 20 October 2014, a total of 11 bat and 289 avian detections (including 11 injured birds that died shortly after detection and two injured birds still alive), were found. In total, fall detections included 58 avian species and four bat species. The total number of avian and bat detections is listed by species in Table 9 below. Appendix A includes additional data on these birds and bats. Figures 16, 17, 18 and 19 depict the locations of all bird and bat detections in Units 1, 2, and 3, and outside the units, respectively.

Table 9. Number of Individual Bird and Bat Detections, by Species, 18 August - 20 October 2014.

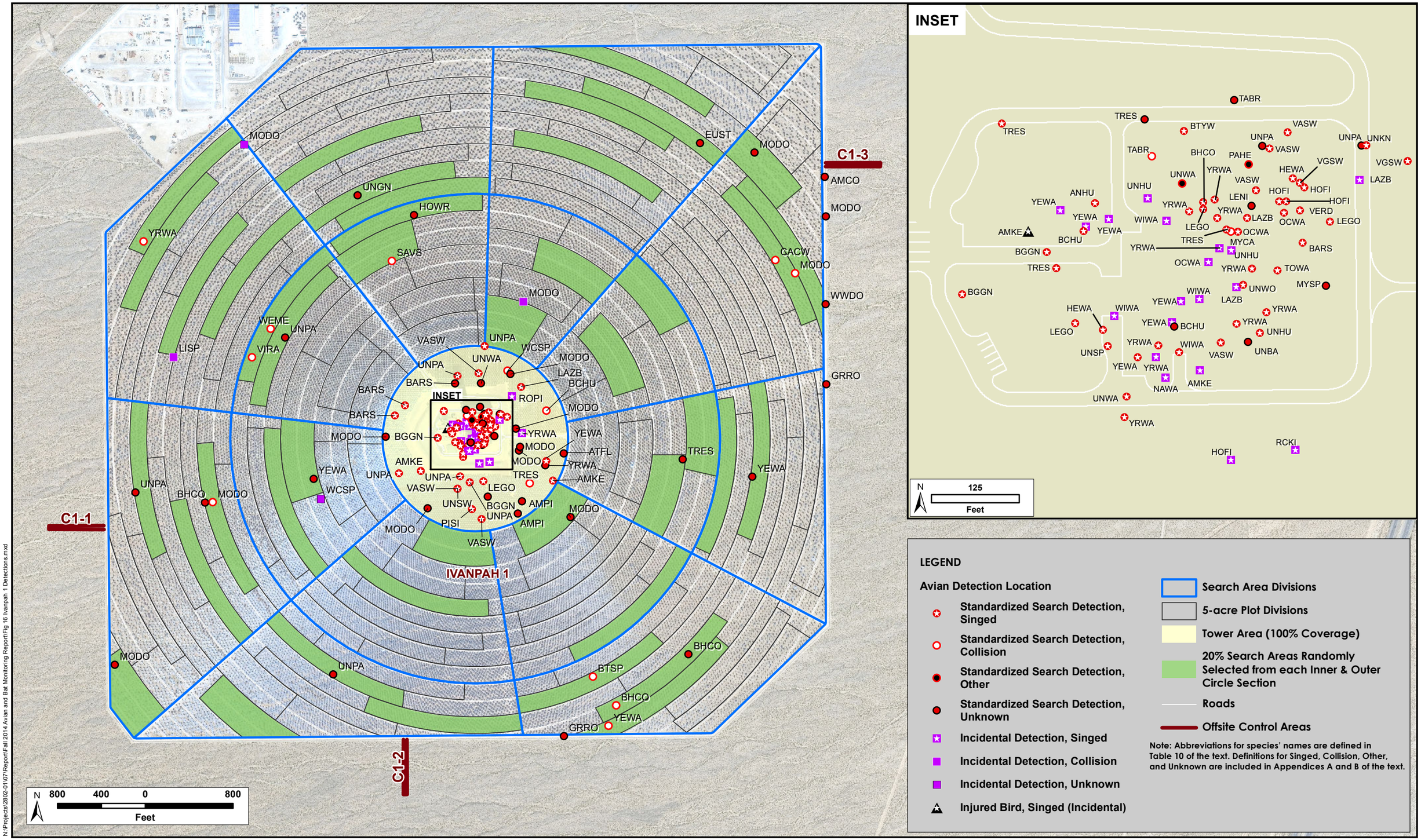
Common Name*	Scientific Name	Species Code**	Injuries	Fatalities
Mourning Dove[2]	*Zenaida macroura*	MODO		41
Yellow-rumped Warbler[1]	*Setophaga coronata*	YRWA		23
Unknown Passerine[4]		UNPA		17
Yellow Warbler[1]	*Setophaga petechia*	YEWA		16
Brown-headed Cowbird[1]	*Molothrus ater*	BHCO		10
Vaux's Swift[1]	*Chaetura vauxi*	VASW		10
White-crowned Sparrow[1]	*Zonotrichia leucophrys*	WCSP		10
Tree Swallow[1]	*Tachycineta bicolor*	TRES		9
Barn Swallow[1]	*Hirundo rustica*	BARS		8
Lazuli Bunting[1]	*Passerina amoena*	LAZB		7
Lesser Goldfinch[1]	*Spinus psaltria*	LEGO		7
Orange-crowned Warbler[1]	*Vermivora celata*	OCWA		7
Blue-gray Gnatcatcher[1]	*Polioptila caerula*	BGGN		6
Savannah Sparrow[1]	*Passerculus sandwichensis*	SAVS	1	5
Wilson's Warbler[1]	*Wilsonia pusilla*	WIWA		6
Black-throated Sparrow[1]	*Amphispiza bilineata*	BTSP		5
House Finch[1]	*Haemorhous mexicanus*	HOFI		5
Rufous Hummingbird[1]	*Selasphorus rufus*	RUHU		5
American Kestrel[2,3]	*Falco sparverius*	AMKE	1	3
Black-chinned Hummingbird[1]	*Archilochus alexandri*	BCHU		4

Common Name*	Scientific Name	Species Code**	Injuries	Fatalities
Gambel's Quail[2]	*Callipepla gambelii*	GAQU		4
Nashville Warbler[1]	*Vermivora ruficapilla*	NAWA		4
Townsend's Warbler[1]	*Setophaga townsendi*	TOWA		4
Black-throated Gray Warbler[1]	*Setophaga nigrescens*	BTYW		3
Greater Roadrunner[2]	*Geococcyx californianus*	GRRO		3
Hermit Warbler[1]	*Setophaga occidentalis*	HEWA		3
Lesser Nighthawk[1]	*Chordeiles acutipennis*	LENI		3
Unknown Gnatcatcher[1]		UNGN		3
Unknown Hummingbird[1]		UNHU		3
Unknown Warbler[1]		UNWA		3
Verdin[1]	*Auriparus flaviceps*	VERD		3
Violet-green Swallow[1]	*Tachycineta thalassina*	VGSW		3
American Coot[2]	*Fulica americana*	AMCO		2
American Pipit[1]	*Anthus rubescens*	AMPI		2
Brewer's Sparrow[1]	*Spizella breweri*	BRSP		2
Lark Sparrow[1]	*Chondestes grammacus*	LASP		2
Ladder-backed Woodpecker[1]	*Picoides scalaris*	LBWO		2
Lincoln's Sparrow[1]	*Melospiza lincolnii*	LISP		2
Pine Siskin[1]	*Spinus pinus*	PISI		2
Unknown Bird[4]		UNKN		2
Unknown Sparrow[1]		UNSP		2
Unknown Swallow[1]		UNSW		2
Anna's Hummingbird[1]	*Calypte anna*	ANHU		1
Ash-throated Flycatcher[1]	*Myiarchus cinerascens*	ATFL		1
Bank Swallow[1]	*Riparia riparia*	BANS		1
Brewer's Blackbird	*Euphagus cyanocephalus*	BRBL		1
Cactus Wren[1]	*Campylorhynchus brunneicapillus*	CACW		1
Chipping Sparrow[1]	*Spizella passerina*	CHSP		1
Cooper's Hawk[2,3]	*Accipiter cooperii*	COHA		1
European Starling[1]	*Sturnus vulgaris*	EUST		1
Green-tailed Towhee[1]	*Pipilo chlorurus*	GTTO		1
Hermit Thrush[1]	*Catharus guttatus*	HETH		1
House Wren[1]	*Troglodytes aedon*	HOWR		1
Loggerhead Shrike[1]	*Lanius ludovicianus*	LOSH		1
Lucy's Warbler[1]	*Vermivora luciae*	LUWA		1
Northern Rough-winged Swallow[1]	*Stelgidopteryx serripennis*	NRWS		1
Olive-sided Flycatcher[1]	*Contopus cooperi*	OSFL		1

Common Name*	Scientific Name	Species Code**	Injuries	Fatalities
Ruby-crowned Kinglet[1]	*Regulus calendula*	RCKI		1
Rock Pigeon[2]	*Columba livia*	ROPI		1
Spotted Sandpiper[1]	*Actitis macularia*	SPSA		1
Swainson's Thrush[1]	*Catharus ustulatus*	SWTH		1
Unknown Woodpecker[2]		UNWO		1
Virginia Rail[1]	*Rallus limicola*	VIRA		1
Western Meadowlark[1]	*Sturnella neglecta*	WEME		1
Western Tanager[1]	*Piranga ludoviciana*	WETA		1
White-winged Dove[2]	*Zenaida asiatica*	WWDO		1
Bats				
California Myotis	*Myotis californicus*	MYCA		3
Canyon Bat	*Parastrellus hesperus*	PAHE		3
Mexican Free-tailed Bat	*Tadarida brasiliensis*	TABR		2
Big Brown Bat	*Eptesicus fuscus*	EPFU		1
Unknown Myotis	*Myotis* sp.	MYSP		1
Unknown Bat		UNBA		1

* For each avian species, the size of the detection, as well as a notation if it is a raptor, is provided to indicate how each species was considered in the fatality estimates (i.e., as a small bird, large bird, and/or raptor), as follows: [1] Small bird; [2] Large bird; [3] Raptor; [4] For the purpose of fatality estimation, each detection of unknown species is given a size based on an assessment of feather size where possible.

** Species code refers to the four-letter code by which the species are referred on Figures 16 - 19.



LEGEND

Avian Detection Location

- Standardized Search Detection, Singed
- Standardized Search Detection, Collision
- Standardized Search Detection, Other
- Standardized Search Detection, Unknown
- Incidental Detection, Singed
- Incidental Detection, Collision
- Incidental Detection, Unknown
- Injured Bird, Singed (Incidental)

- Search Area Divisions
- 5-acre Plot Divisions
- Tower Area (100% Coverage)
- 20% Search Areas Randomly Selected from each Inner & Outer Circle Section
- Roads
- Offsite Control Areas

Note: Abbreviations for species' names are defined in Table 10 of the text. Definitions for Singed, Collision, Other, and Unknown are included in Appendices A and B of the text.

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 16 Ivanpah 1 Detections.mxd

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Figure 16: Ivanpah 1 Detections
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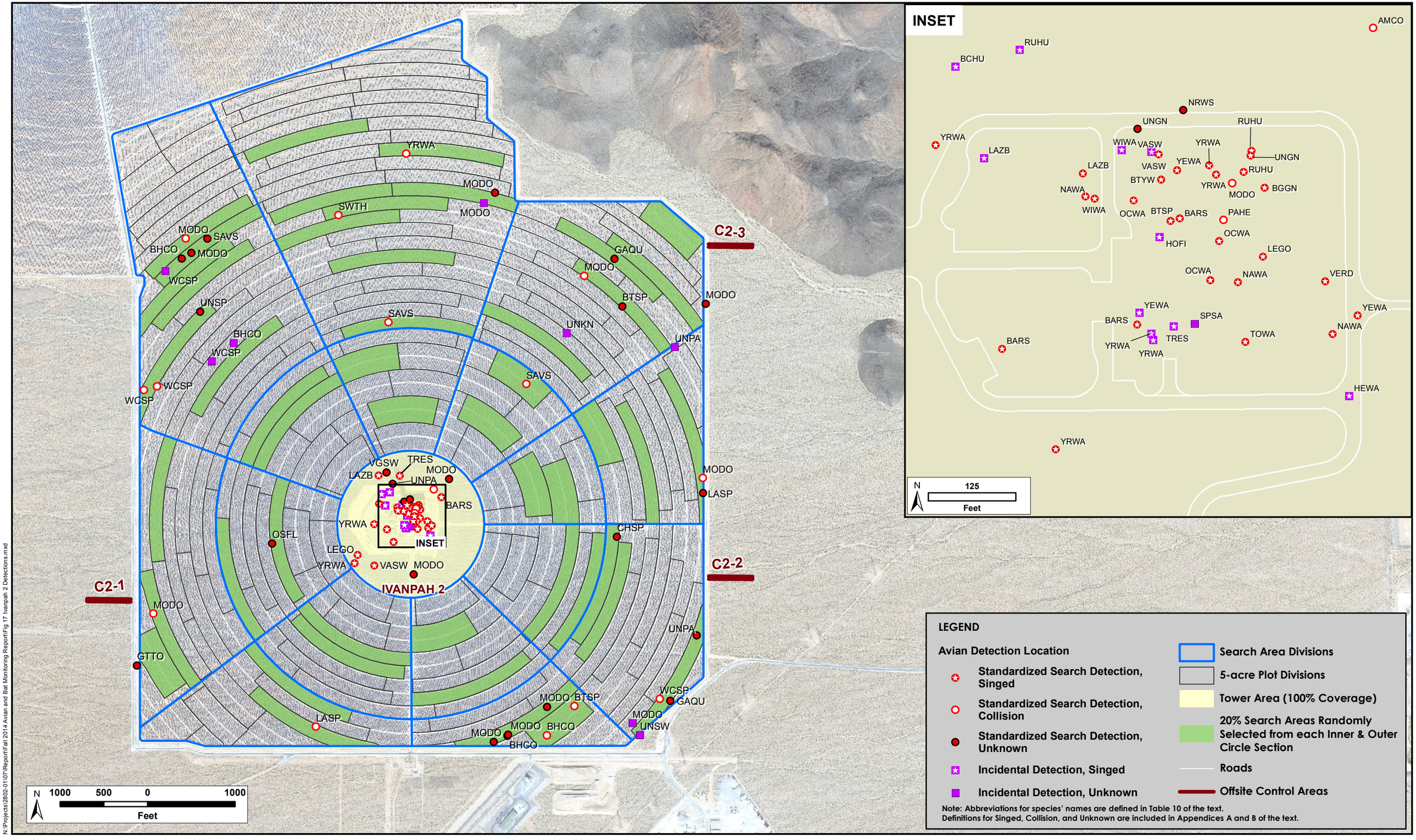

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Figure 17: Ivanpah 2 Detections
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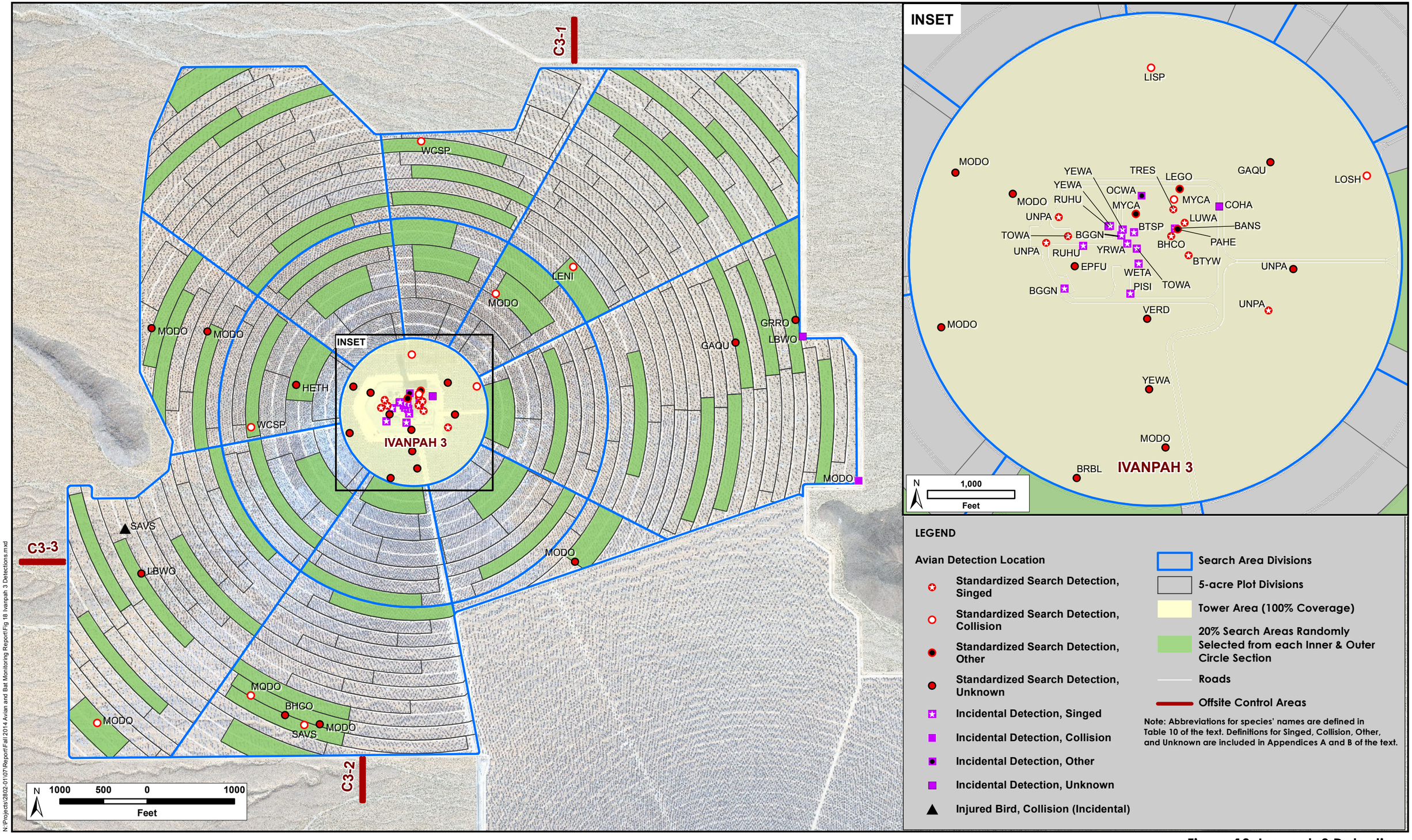

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Figure 18: Ivanpah 3 Detections
Ivanpah Fall 2014 Avian and Bat Monitoring Report (2802-07)
March 2015

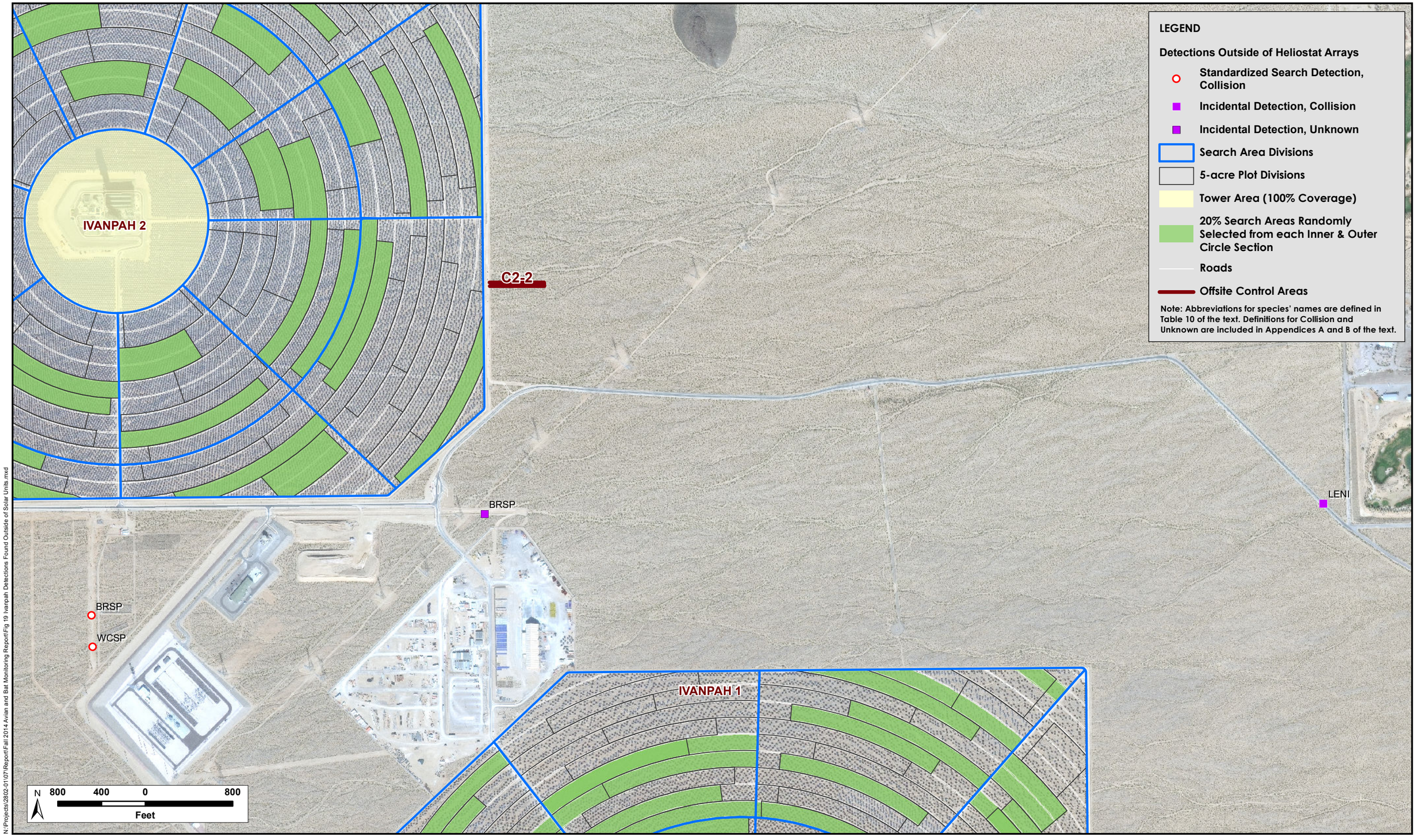

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Figure 19: Ivanpah Detections Found Outside of Solar Units
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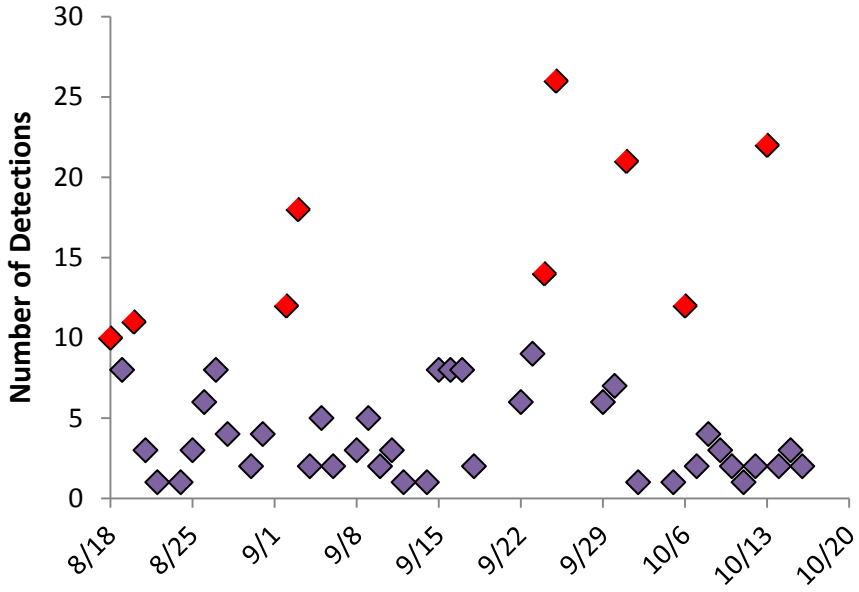
There was no obvious temporal clumping of detections recorded during the fall season, although nine survey days resulted in 10 or more detections (Figure 20). The majority of detections on these days were in the tower area (power block and inner HD heliostats). Unlike spring, fall surges in fatalities were not consistently preceded by, or did not coincide with, heavier migratory movements (as analyzed by the Cornell Lab of Ornithology's "BirdCast" website[1]). Fall migration tends to be more protracted and steady than spring migration due to variation in the cessation of breeding activity and onset of juvenile migration among individuals, populations and species. Thus, we anticipated that surges in detections would not necessarily reflect fall migratory pulses reported by BirdCast, though higher numbers of detections likely do reflect overall higher numbers of migratory birds present in the Ivanpah region.

Figure 20. Number of Detections on Each Survey Date, 18 August – 20 October 2014.



*The red points denote surveys where >10 detections were found.
Excludes bats (N=11) and detections for which time since death is >1 month or unknown.

4.1.2 Injured Birds

Thirteen injured birds were detected during this reporting period (Table 10). A singed American kestrel was still alive and recovering at the Big Bear Zoo wildlife rehabilitation facility on 24 November 2014. A savannah sparrow temporarily unable to fly was collected, recovered, and released the same day. The other 11 injured birds succumbed to their injuries. Two singed, injured birds and one bird with unknown injuries died onsite soon after capture, and the other eight (seven that were singed and one with collision injuries) died after being transported to the Big Bear Zoo rehabilitation center or the Animal Kingdom Veterinary Hospital. All of these birds are included in this report as detections.

[1] http://birdcast.info/forecasts

Table 10. Avian Injuries Detected 18 August – 20 October 2014.

Date	Species	Age	Sex	Cause of Injury	Burn Grade	Fate
8/18/14	YEWA	U	U	Singed	1, 3	Died at rehab facility
8/26/14	LAZB	J	U	Singed	2, 3	Died at rehab facility
8/31/14	AMKE	U	M	Singed	2, 3	Alive at rehab facility
9/12/14	TRES	J	U	Singed	2, 3	Died on site
9/16/14	MODO	J	U	Unknown	NA	Died on site
9/23/14	BARS	J	U	Singed	2, 3	Died at rehab facility
9/23/14	BARS	J	U	Singed	2, 3	Died at rehab facility
9/24/14	MODO	J	U	Collision	NA	Died at rehab facility
9/24/14	WETA	J	U	Singed	1, 3	Died at rehab facility
9/25/14	ROPI	A	U	Singed	2, 3	Died at rehab facility
9/25/14	VASW	U	U	Singed	2, 3	Died on site
9/30/14	SAVS	J	U	Collision	NA	Released alive
10/1/14	RCKI	U	F	Singed	2, 3	Died at rehab facility

4.1.3 Summary of Bat Detections

Eleven bats representing four species were detected during this reporting period (Table 11). Nine bat detections were within or immediately adjacent to the ACC buildings within the respective units. Two were found near other buildings or machinery on the power block.

Table 11. Summary of Bat Detections, 18 August – 20 October 2014.

Species	Scientific Name	Date	Location
Big brown bat	*Eptesicus fuscus*	8/25/2014	Unit 3 Power block
California myotis	*Myotis californicus*	8/18/2014	Unit 3 ACC
California myotis	*Myotis californicus*	8/25/2014	Unit 3 ACC
California myotis	*Myotis californicus*	9/3/2014	Unit 1 Power block*
Canyon bat	*Parastrellus hesperus*	8/18/2014	Unit 3 ACC
Canyon bat	*Parastrellus hesperus*	9/9/2014	Unit 2 ACC
Canyon bat	*Parastrellus hesperus*	10/1/2014	Unit 1 ACC
Mexican free-tailed bat	*Tadarida brasiliensis*	9/3/2014	Unit 1 Power block*
Mexican free-tailed bat	*Tadarida brasiliensis*	10/13/2014	Unit 1 Power block*
Unidentifiable myotis species	*Myotis sp.*	8/20/2014	Unit 1 Power block
Unidentifiable bat		8/20/2014	Unit 1 Power block

* Near ACC Building.

4.1.4 Incidental Detections

A total of 65 incidental avian detections were recorded during this quarter. Sixty-three of these avian detections were within the solar units (Figures 16, 17, and 18). The other two incidental avian detections were outside of the solar units, one along Colosseum Road and the other under power lines between Commons East and Unit 2 (Figure 19).

4.1.5 Fatalities Found During Standardized Searches

During the course of 2014 fall season standardized searches, searchers found 224 bird detections and 11 bat detections (Figures 16, 17, and 18).

4.2 Locations of Avian Detections

As indicated in Table 12, 193 detections (66.8%) were within 260 m of the tower, an area that was searched with 100% coverage. Eighty-three detections (28.7%) were detected over the much larger area composed of the inner and outer heliostats. Otherwise, nine detections were along the unit fencelines (3.1%), two were on Project lands outside the standardized search areas (0.7%), and two were along the Unit 3 collector line (0.7%) (Figure 19). No detections were noted within the survey areas associated with the offsite transects. Of the 285 avian detections within the solar units (i.e., excluding the Unit 3 collector line and other Project lands), 138 (48.4%) were detected in Unit 1, 94 (33.0%) in Unit 2, and 53 (18.3%) in Unit 3. The three units operated with similar numbers of days in flux during the fall period. Unit 1 operated with 59 days in flux, Unit 2 operated with 52 days in flux, and Unit 3 operated with 50 days in flux.

Table 12. Locations of Bird Detections, 18 August – 20 October 2014.

Location	Injuries	Fatalities
Power Block	1	135
Inner HD Heliostats	0	57
Inner Segment Heliostats	0	15
Outer Segment Heliostats	1	67
Unit Perimeter Fences	0	9
CLA Fence	0	0
Unit 3 Collector Line	0	2
Offsite Transects	0	0
Other Project Lands	0	2
Total	2	287

4.3 Cause of Injury or Fatality

The following section describes the number of detections with evidence of singeing or collision effects; the number from other known causes, which in fall 2014 included three avian detections apparently trapped in

the ACC buildings without signs of singeing or collision effects; the number for which cause of injury or fatality is unknown; and the spatial distributions of detections with these causes relative to the towers. Methods for identifying the cause of injury or fatality were provided in Section 2.2.1.3. Table 13 indicates the total number of detections with evidence of singeing or collision effects, from other known causes (i.e., entrapment), or for which cause of injury or fatality is unknown. Detections with an "unknown" cause of injury or death refer to those for which there was no evidence of singeing (e.g., charring, curling, or melting of feathers) or collision (e.g., obvious physical trauma or detection adjacent to a heliostat with a bird-strike imprint and/or feathers on the heliostat), as confirmed through microscopic examination. See Section 5.2 for fatality estimates for each cause of injury or fatality, which account for variation in search effort.

Table 13. Number of Avian Detections from Singeing, Collision, Other Known Causes, and Unknown Causes, 18 August – 20 October 2014.

Cause	Number of Detections
Singeing	147
Collision	45
Other Known Cause	3
Unknown	94
Total	289

4.3.1 Singeing Effects

Of the 289 avian detections during the 2014 fall season, 147 detections (50.9%) showed signs of singed feather damage. Four were raptors, 141 were small birds (≤ 100 g), and two were large birds. Table 14 indicates the number of detections in various parts of the Project site with and without evidence of singeing as confirmed through microscopic examination.

Table 14. Locations of Singed and Non-singed Bird Detections,18 August – 20 October 2014.

Location	Singed	Non-Singed
Power Block	120	16
Inner HD Heliostats	27	30
Inner Segment Heliostats	0	15
Outer Segment Heliostats	0	68
Unit Perimeter Fences	0	9
CLA Fence	0	0
Unit 3 Collector Line	0	2
Offsite Transects	0	0
Other Project Lands	0	2
Total	**147**	**142**

Figure 21 depicts the total number of detections involving evidence of singeing, evidence of confirmed collision, from other known causes (i.e., entrapment), and with unknown cause of injury or death by distance from the power towers. The two incidental detections outside the solar units and two survey detections along the Unit 3 collector line (none of which were singed) are not shown so that Figure 21 focuses on the 285 detections in the solar units themselves. Figure 22 provides an overview of the spatial location of each detection showing effects indicated by singeing, collision effects, other known causes (i.e., entrapment), and unknown causes within the solar units. All 147 detections showing effects indicated by singeing were discovered within 260 m of the towers.

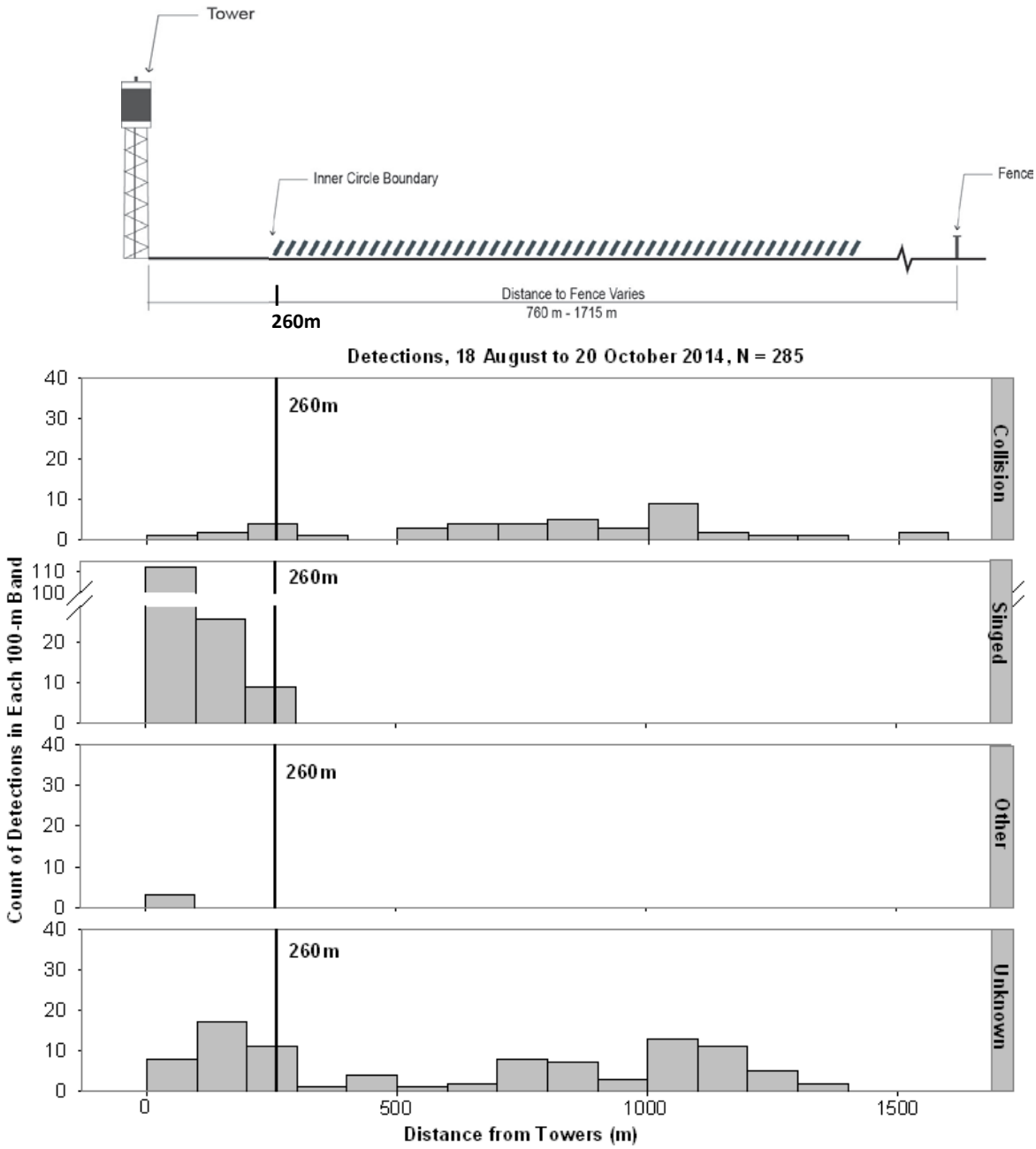
4.3.2 Collisions

Of the 289 avian detections, evidence of collision was observed in the case of 45 (15.6%). As described in Section 2.2.1.3, the evidence that was used to classify these detections as collisions was obvious physical trauma, proximity to heliostats that had smudge marks, body imprints, and/or feathers on or near the surface of the mirror (although birds that collide with structures do not always leave visible evidence). Forty-one of the collisions were with heliostats. Of the remaining four collisions, two appeared to be with the Unit 3 collector line, one with the ACC fan, and one with either a vehicle or transmission line along Colosseum Road. Evidence of collision with the ACC fans was observed in the case of four bats.

4.3.3 Other Known Causes

Three avian detections (1.0% of all detections) without evidence of singeing or collision effects were found in the external alleys of the ACC buildings. Although the cause of death for these three birds was unknown, these were considered as providing direct evidence of the cause of death because they were found entrapped or within an enclosed space, the ACC buildings.

Figure 21. Number of Avian Detections[1] Associated with Singeing, Collisions, Other Known Causes, and Unknown Injury/Fatality Causes by Distance from Towers.



[1] Only raw data are presented, so this graph does not take into account the increase in survey area as distance away from the tower increases. The detections in the "Other" category were detections found in the ACC buildings without evidence of singeing or collision effects. This figure excludes four avian detections (none of which were singed) found outside the unit fencelines.

IVANPAH 3

IVANPAH 2

IVANPAH 1

LEGEND

Detections (18 August to 20 October)

- Singed
- Collision
- Other
- Unknown
- Roads
- Project Site
- Search Area Divisions
- Tower Area (100% Coverage)

N 2000 1000 0 2000

Feet

N:\Projects\2802-01\07\Report\Fall 2014 Avian and Bat Monitoring Report\Fig 22 Locations of Singed and Unsinged Detections within Solar Units.mxd

H.T. HARVEY & ASSOCIATES
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Figure 22: Locations of Singed and Unsinged Detections within Solar Units

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Similarly, three bats were found in ACC buildings without evidence of singeing or collision effects. Although the cause of death for these bats remains unknown, their association with the ACC building provides direct evidence of the cause of death.

4.3.4 Detections of Unknown Cause

Aside from the 45 detections where evidence of collision was noted, the 147 detections with evidence of singeing, and the three detections of other known causes (i.e., entrapment), the cause of injury or mortality for the remaining 94 avian detections (32.5%) is not known with certainty. Three showed strong evidence of predation; however, no obvious evidence of the cause of mortality was observed for the other 91 detections. These 94 detections showed no evidence of collision effects, and microscopic analysis did not indicate signs of singeing. Of these unknown detections, 42 were feather spots.

No detections occurred along the CLA fence or offsite transects. None of the bat detections showed evidence of singeing; this result is expected because bats have a low exposure rate to flux due to their crepuscular and nocturnal foraging habits.

4.4 Feather Spot Detections

The following section describes the number of detections that consisted only of feather spots and spatial patterns in the ratio of feather spots to carcass-based detections. Feather spots were considered detections when they consisted of at least two or more primary flight feathers, five or more tail feathers, or 10 or more feathers of any type concentrated together in an area 1 m^2 or smaller (Smallwood 2007); feathers with significant skin or flesh, or any bone, attached were considered detections but were not considered feather spots.

Seventy (24.2%) of the 289 detections consisted only of feather spots. Evidence of singeing was noted through direct and microscopic examination on 18 of these 70 feather spots; evidence of collision (i.e., an impact imprint on a nearby mirror) was noted in the case of eight other feather spots; strong evidence of predation was noted in one case (whitewash from a raptor on heliostat and plucked clump of feathers stuck to heliostat); and one feather spot detection was considered another Project impact because it was in an ACC building. Otherwise, the causes of the feather spots for the other 42 detections are unknown. The proportions of these 42 feather spots representing fatalities (e.g., collision) that had been scavenged or representing natural predation events associated with kit foxes (*Vulpes macrotis*), common ravens, or raptors are not known. Furthermore, in some cases, multiple feather spots may result from one fatality, over-representing the number of fatalities. Nevertheless, all feather spots meeting minimum criteria (i.e., ≥ 10 feathers of any type, ≥ two primary feathers, or five or more tail feathers within an area 1 m^2 or smaller [Smallwood 2007]) were recorded as detections.

As indicated in Table 15, the ratio of feather spots to carcasses varied considerably across the Project site. It was lowest in the power block (1:14.1) and highest along the unit perimeter fences (1:0.8) and in the inner

HD (1:0.9), with the inner segments (1:4.0) and outer segments (1:2.0) intermediate. Two carcasses and no feather spots were found along the Unit 3 transmission line and on other Project lands (0:2). The change in ratio between the power block and heliostats could result from the rapidity with which carcasses around the tower are detected by people, so that there is less time for scavenging that would result in feather spots. Feather spots around the relatively open power block may also be removed by the wind more easily than in the rest of the solar field and deposited in the inner HD heliostats.

Table 15. Ratios of Feather Spots to Carcasses Relative to Site Locations.

Location	Total	Feather Spots	Carcasses	Feather Spot: Carcass Ratio
Power Block	136	9	127	1:14.1
Inner HD Heliostats	57	30	27	1:0.9
Inner Segments	15	3	12	1:4.0
Outer Segments	68	23	45	1:2.0
Unit Perimeter Fence	9	5	4	1:0.8
CLA Fence	0	0	0	NA
Unit 3 Collector Line	2	0	2	0:2
Offsite Transects	0	0	0	NA
Other Project Lands	2	0	2	0:2
Total	**289**	**70**	**219**	**1:3.1**

Section 5.0 Fatality Estimation

This section utilizes the detection data as described in Section 4 to develop an overall fatality estimate in accordance with the Plan. The estimates of carcass removal rates and searcher efficiencies are derived and subsequently utilized in the model with the detection data to provide estimates for the facility areas as required in the Plan. The total estimate for the entire facility is presented separately for fatalities with evidence of singeing or collision effects, or for detections in the ACC buildings, and fatalities of unknown cause. Following presentation of the total fatality estimates, estimates are provided separately for the tower area, heliostats, and fenceline.

5.1 Estimating Model Parameters

5.1.1 Carcass Removal Trials

We conducted 23 carcass removal trials during the 2014 fall season. These trials included 10 large carcasses and 13 small carcasses. Carcasses were placed in the power block, inner HD heliostats, inner and outer heliostat segments, along the fenceline, and on offsite transects. A camera was placed at each carcass to record the time of scavenging and the scavenging species. Scavenger species included common ravens (N=5), kit fox (*Vulpes macrotis*; N=6), and white-tailed antelope squirrels (*Ammospermophilus leucurus*; N=3). For the remaining four scavenged carcasses (five carcasses were not scavenged), the scavenger species was not captured on camera. Six feather spots or partial carcasses were created by scavengers consuming carcasses that we placed for carcass removal trials. Five of these feather spots/partial carcasses were present through a full six-week trial period; these remains, which resulted from one small and four large carcasses, were collected at the end of the period. Five of the 10 large carcasses were detected and at least partially eaten by scavengers. In four of these instances, the scavengers left enough of the carcass that the remains would have been detectable by fatality searchers and considered a fatality if detected during the standardized searches. In one case, the large carcass was relocated more than 1 km by a desert kit fox. In contrast, small carcasses tended to be completely removed, with only one of 13 small carcasses persisting for the entire six-week trial.

Carcass persistence rates for the fall season ranged from less than one day, in the case of three small carcasses, to a full six-week trial period in the case of the 10 carcasses whose remains persisted throughout the trial (one small and nine large). Figures 23 and 24 show the persistence durations for small and large carcasses throughout the facility. Carcasses placed on the power block are shown in red, while those placed elsewhere are shown in blue. The power block differs from the inner HD heliostats and the heliostat fields both in physical structure and human activity. Scavenging rates in the power block may therefore be different from those within the heliostat area. However, carcass persistence trial sample sizes for the fall season were too low to utilize separate estimates for the power block and non-power block areas in the fatality estimator.

Because 10 of the carcasses persisted for the full six-week trial before being removed by the carcass removal trial team, it is unknown how long they might have persisted if not removed. We therefore conservatively assumed that carcasses would not have persisted beyond the time the trial ended and carcasses were retrieved (about 6 weeks). Because the data were not normally distributed, we report the median carcass persistence times. Mean persistence times are also provided to reflect comparison with the Plan, which discusses the mean. Median carcass persistence was 2.9 days (mean 7.1 days) for small carcasses and 41.9 days (mean 38.8 days) for large carcasses. In comparison, the assumptions used in the power analysis in the Plan were 7.4 days for small birds and 21.8 days for large birds.

Figure 23. Persistence Durations for Small Carcasses Placed for Carcass Removal Trials (N = 13).

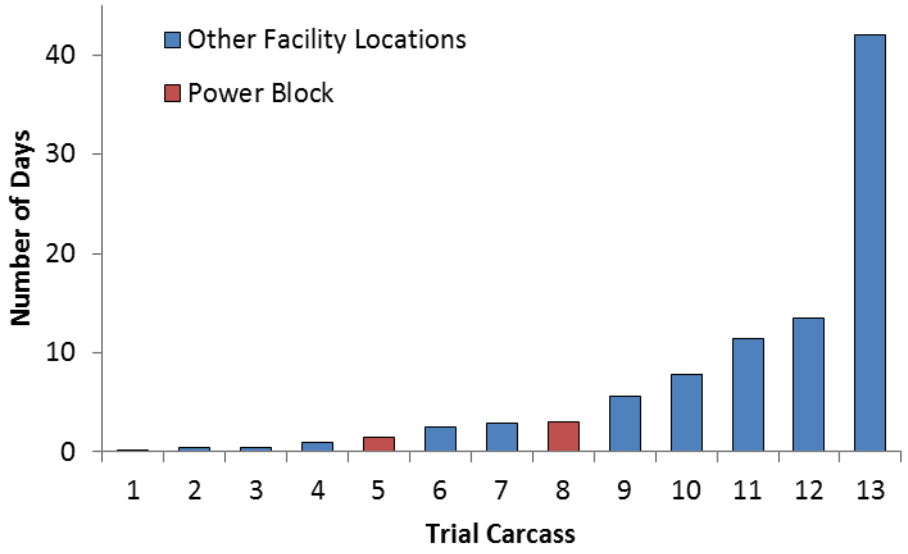
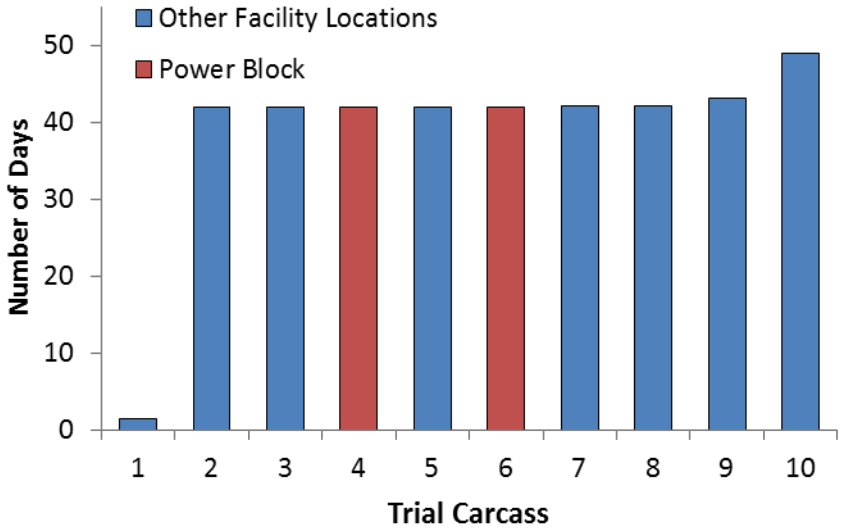


Figure 24. Persistence Durations for Large Carcasses Placed for Carcass Removal Trials (N = 10).



5.1.2 Model Selection for Carcass Removal Decay Curve

Based on the carcass removal data, eight selected survival models were compared for relative quality using the Akaike information criterion (AICc) score as suggested in Huso (2010). As a part of the fatality estimator process, Huso (2010) recommends measuring the relative quality of the estimator model for each set of data to determine which model to use. Thus, AICc provides a means for model selection. In other words, although the absolute value of AICc may vary, the difference in AICc values among models provides information about which model is most statistically supported.

There are four survival distributions that can be selected for modeling carcass persistence: Weibull, Exponential, Loglog, and Lognormal. AICc is used to select the most supported distribution, as well as select covariates (carcass size, habitat characteristics, etc.) to include in the carcass persistence distribution. Carcass size is a potentially important variable, as larger carcasses tend to persist longer and may be more likely to leave feather spots which persist for long durations, whereas smaller carcasses may be more likely to be completely removed. We ranked the eight carcass persistence models with and without size using AICc (Table 16).

Table 16. AICc Values for Each of Four Distribution Models of Carcass Persistence, and Four Additional Models in Which Carcass Size Was Also Included.

Model	AICc	Shape	Proportion Persisting* (combined, or large / small)
Weibull	118.03	2.4	0.74
Exponential	133.29	1.0	0.91
Loglog	115.99	1.8	0.72
Lognormal	115.02	3.0	0.73
Weibull/Size	99.27	1.7	0.98/0.51
Exponential/Size	103.36	1.0	0.99/0.65
Loglog/Size	98.71	1.1	0.99/0.49
Lognormal/Size	99.91	2.0	0.99/0.50

* Indicates the proportion of carcasses expected to persist through the intended survey interval (7 days).

Although the model with the lowest AICc value is typically held to be the most supported, any model with a change in AICc values of less than two from the "best model" is considered to have strong evidence supporting it (Burnham and Anderson 2004). The loglogistic, lognormal, and Weibull models that included size had ΔAICc values <2, and we chose to use the Weibull model (a continuous distribution model) because it was equivalent to or better than the other model options and was the same model selected for the 2013-2014 winter and 2014 spring and summer quarter fatality estimates. The Weibull distribution estimated that 51% of small and 98% of large carcasses were expected to persist through a 7-day search interval.

5.1.3 Searcher Efficiency Trials

Human Searcher Efficiency Trials. During the 2014 fall season, a total of 10 small carcasses, eight large carcasses, and 18 feather spots were placed in locations with various vegetation heights and with a range of contrast between the soil and vegetation to represent the various conditions under which searches occur. Carcasses were placed in all areas where searches occurred (i.e., the power block, inner HD area, inner and outer heliostats, fencelines, the Unit 3 collector line, and offsite transects). One of the large carcasses disappeared (e.g., it may have been scavenged) before the searcher efficiency trial, leaving a sample size of 10 small carcasses, seven large carcasses, and 18 feather spots included in the trials.

Human searcher efficiency rates were generally higher on the power block than in other locations, but sample sizes of searcher efficiency trials on the power block were too small for differences to be analyzed statistically. As a result, all searcher efficiency trials were pooled. When all fall searcher efficiency trials were combined, 85.7% of all large carcasses, 40.0% of all small carcasses, and 44.4% of all feather spots were successfully discovered by searchers, for a mean searcher efficiency of 51.4%. In comparison, target rates assumed in the Plan were 69% for large birds and 55% for small birds.

Canine Searcher Efficiency Trials. During the 2014 fall season, one carcass and 117 feather spots were placed in locations in the heliostat field with various vegetation heights and with a range of contrast between

the soil and vegetation to represent the various conditions under which searches occur. Twelve of the feather spot trials disappeared before the searcher efficiency trial, leaving a total of 105 feather spots included in the trials. The single carcass and 57 of the feather spots were detected. Overall detection dog searcher efficiency for feather spots during the fall period was 54.7%.

Model Selection for Searcher Efficiency Trials. The Plan states that searcher efficiency trials will be conducted during each season in which vegetation differs from the prior season, because changes in vegetative cover may affect carcass detectability. We did not make *a priori* decisions regarding whether vegetative cover would differ between seasons, but rather, we conducted searcher efficiency trials in the fall as we did in previous seasons. Following the completion of fall searcher efficiency trials, we had sufficient cumulative data for the year to assess whether searcher efficiency differed significantly by Project area (e.g. tower area versus heliostat fields), season, and/or carcass size. The nearly complete lack of vegetation cover in the tower area led us to believe that searcher efficiency may be much higher in the tower area than in other Project areas. If this hypothesis were true, accounting for this difference in searcher efficiency across Project areas would be important for producing accurate fatality estimates.

To evaluate various hypotheses regarding differences in carcass detectability among Project areas, seasons, and/or carcass size, we constructed logistic regression models and used Akaike's Information Criteria, corrected for low sample size (AICc). We defined Project area using two categories to reflect the suspected differences in searcher efficiency due to differences in vegetation cover: the tower area, which consists of the power block and the inner HD heliostats, and other areas, which consists of all other Project areas not included in the tower area. We constructed models for season, carcass size, Project area, and Project area plus carcass size, and compared them to the null model (Table 17). There were too few trials of some carcass sizes in some seasons to consider a model with season and carcass size combined. The data for this analysis included all human searcher efficiency trials of carcasses from the beginning of trials in winter 2013-2014 through the fall 2014 season. No feather spot trials were conducted in winter of 2013/2014, so feather spots could not be included in this analysis.

Table 17. AICc Values, ΔAICc values, and Number of Fitted Parameters for Searcher Efficiency Models of Carcasses. Data consist of all searcher efficiency trials for carcasses from the initiation of trials to 20 October 2014.

Model	Parameters	AICc	ΔAICc
Project area+Size	3	114.92	0
Season	4	116.39	1.47
Size	2	117.09	2.17
Project area	2	117.39	2.47
Null	1	119.31	4.40

The best model included Project area and carcass size with an AICc value 1.47 lower than the second best model that included only season. The model with the lowest AICc value is considered to best represent the data (Burnham and Anderson 2002). Thus, the results of this analysis indicated that the most supported

searcher efficiency model includes a combination of Project area and carcass size, but not Project area or size alone, and not season. In other words, human searcher efficiency should be partitioned by Project area and size, but not season. As a result, human searcher efficiency rates were pooled for all seasons (using all carcass and feather spot trials conducted from 10 February 2014 through the end of the fall season) but were separated by Project area (tower area versus heliostat fields) and carcass size. Feather spots were also separated by Project area to be consistent with the treatment of carcasses. Table 18 provides the human searcher efficiency rates used in the fall fatality estimates.

Table 18. Human Searcher Efficiency Values for Detection-Type Categories.

Project Area	Size	Found	Placed	Searcher Efficiency (90% CI)
Tower Area	Large Carcass	9	11	0.82 (0.64 – 1)
Tower Area	Small Carcass	10	14	0.71 (0.50 – 0.93)
Tower Area	Feather Spots	8	15	0.53 (0.33 – 0.73)
Other Areas	Large Carcass	19	28	0.68 (0.54 – 0.82)
Other Areas	Small Carcass	14	34	0.41 (0.26 – 0.56)
Other Areas	Feather Spots	15	42	0.36 (0.24 – 0.48)

Data from canine searcher efficiency trials for fall (105 feather spot trials and one carcass trial) were combined with canine searcher efficiency data from summer. Canine searcher efficiency was separated between carcasses and feather spots, as was done in summer. The canine searcher efficiency rates used in the fall fatality estimates are summarized in Table 19.

Table 19. Canine Searcher Efficiency Values for Detection-Type Categories.

Project Area	Category	Found	Placed	Searcher Efficiency (90%CI)
Other Areas	Carcass	16	21	0.76 (0.62 – 0.90)
Other Areas	Feather Spot	140	235	0.60 (0.54 – 0.65)

5.2 Fatality Estimates for Fall Monitoring

Fatality estimates for known and unknown causes were calculated in accordance with the Plan; specifically estimates were derived by project elements and fatality source for the first four seasons of monitoring. Tables 20 and 21 summarize fatality estimates for the fall season of monitoring by project element and cause, respectively.

Table 20. Fall Season Avian Fatality Estimates by Project Element (with Lower and Upper 90% Confidence Intervals) Based on Detections.

Project Element	Number of Estimated Fatalities[1]	
	Known Cause	Unknown Cause
Power Block	248 (158 – 405)	29 (16 – 56)
Inner HD	115 (40 – 287)	66 (33 – 138)
Heliostat Segments	455 (304 – 802)	419 (275 – 718)
Fenceline	n<5	29 (16 – 47)
Unit 3 Collector Line	n<5	n<5
Total	820 (504 – 1496)	543 (340 – 959)

[1] n<5 = No estimate provided because there were fewer than five detections for the given group. Totals do not reflect the sum of fatality estimates from the power blocks, inner HD areas, and heliostat segments because they also includes fatalities from the fenceline and Unit 3 collector line. See individual fatality estimates below for estimation details.

Table 21. Site-wide Fatality Estimates by Causes in Fall 2014 (18 August – 20 October)

Cause of Death	Detections	Site-wide Fatality Estimate	90% Confidence Interval
Singed	147	342[1]	(180 – 656)
Collision	45	475[2]	(311 – 836)
Entrapment	3	N<5[3]	N<5
Total (Known Cause)	195	820[4]	(504 – 1496)
Total (Unknown Cause)	94	543	(340 – 959)

[1] Includes estimates from the power block and inner HD, but not from the inner and outer heliostat areas or fence lines because no singed detections occurred in those areas.
[2] Includes estimates from the inner HD, inner and outer heliostat areas, but not from the power block or fencelines, because sample sizes for collisions were insufficient for modelling in those areas. One fatality from the ACC building and two from the transmission lines were added to the fatality estimator output unadjusted.
[3] Sample size insufficient for modelling.
[4] Includes 3 fatalities from entrapment, which were added unadjusted to the fatality estimator output.

5.3 Fatality Estimates for Known Causes

As per the Plan, facility-wide estimates of potential avian impacts are to be estimated based on the following:

1. Observed number of detections found during standardized searches in the monitoring season for which the cause of death can be determined and is facility-related
2. Non-removal rates, expressed as the estimated average probability that a potential detection is expected to remain in the study area and be available for detection by the observers, based on removal trials
3. Searcher efficiency, expressed as the proportion of placed trial carcasses found by observers during the searcher efficiency trials.

After determining the proper model structure for both searcher efficiency and carcass persistence trials, we ran a series of fatality estimates. We report fatality estimates as per the requirements of the Plan and only for areas and categories with more than five detections because using the fatality estimator with five or fewer detections will produce highly biased values due to the small sample size.

Fatality estimates were calculated separately for the tower area (power block and inner HD heliostats), heliostat area, and fenceline (unit perimeter and CLA fences). Estimates are first provided for fatalities where the cause of death is based upon direct evidence of singeing, collision, or other (entrapped or found within an enclosed space). Following the estimates where the cause of death is based upon these categories of direct evidence, an estimate is provided of fatalities where the cause could not be determined.

Note that the bootstrap methods used to produce the fatality estimate produce estimates for the entire dataset that differ slightly from the sum of estimates for constituent subgroups of the data.

5.3.1 Total Fatality Estimates for Known Causes

Of the 195 detections where the cause of death or injury could be determined, 147 were included in the fatality estimate models, and 33 detections from the ACC buildings and two from the Unit 3 collector line were added unadjusted to the estimator output, to produce the total fatality estimate for known causes (Table 22). There were 12 detections showing evidence of singeing or collision outside the ACC buildings that were not included in the fatality estimates; five were excluded because they were outside the standardized survey area and seven were excluded because they were older than the search interval.

Table 22. Number of Detections Based on Known Causes in Each Project Element, and Number Included in Fatality Estimates.

Element	Number Included	Number Excluded	Total Found
Power Block	87	37[1]	124
Inner HD	33	0	33
Inner and Outer Heliostats	27	8[2]	35
Fences	0	0	0
Transmission Line	0	2[3]	2
Other Project Areas	0	1[4]	1
Offsite Transects	0	0	0
Total	147	48	195

[1] Four were excluded because they were older than the search interval, and 33 were excluded because they were in the ACC buildings; these 33 were added unadjusted to the estimator output.
[2] Four of these detections were excluded because they were outside the standardized survey area, and four were excluded because they were determined to be older than the search interval.
[3] No estimate was provided for this element because of the low sample size; these detections were added unadjusted to the overall estimator output.
[4] Found outside of the standardized survey areas.

Using the estimation modeling, during the period 18 August – 20 October, there were an estimated 820 fatalities (90% confidence interval estimates 504-1496) based on detections from known causes (i.e., singeing, collision, or entrapment within Project facilities) (Table 20). Of these, 455 fatalities (55. 5%) were estimated for the 2,991-acre inner and outer heliostat segment areas and 363 fatalities (44.3%) were estimated for the 154 acre tower area (Table 20). No detections with direct evidence of singeing, collision, or entrapment were found along the fencelines. There were two collision-related detections found along the Unit 3 collector line which were added to the overall fatality estimate unadjusted due to low sample size for this Project element.

5.3.2 Fatality Estimate for Tower Area

Tables 23 and 24 provide fatality estimates for known causes within the power block and inner HD heliostats for the 2014 fall monitoring period 18 August – 20 October 2014; when added, they comprise the total fatality estimates for known causes within the tower area as a whole. We included incidental detections when they were found in areas covered during standardized surveys, during time periods in which they were being searched. Because of the high amount of unaccounted-for searching (i.e., resulting in incidental detections) in the power block, we are providing fatality estimates separately for the power block versus inner HD heliostats in Tables 23 and 24 below. Estimates from the power block should be interpreted with caution. Because detections were observed more frequently in the power block (a sub-area of the tower area) than otherwise expected if detections were made only through the fatality monitoring (and not with the addition of incidental detections made by other personnel), the total fatality estimates for the power blocks currently may be biased towards a larger number.

Table 23. Estimates by Cause (a.) and Size Class (b.) of Total Detections with Known Causes Based on Fatality Searches in Power Blocks, 18 August – 20 October 2014.

23a. Estimates by Cause

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Singeing	87[1]	244 (154 – 401)[1]
Collision	0[2]	n<5[3]
Other	0[4]	n<5[3]
Total	**87[5]**	**248** (158 – 405)[6]

[1] The 29 singed detections in the ACC buildings are not included in the number of detections included in the model, but they were added to the fatality estimator output unadjusted.
[2] One collision-related detection in an ACC building was not included in the number of detections included in the model, but it was added to the fatality estimator output unadjusted.
[3] n<5 = No estimate given because there were fewer than five detections within that group.
[4] Three detections found in the ACC buildings without evidence of singeing or collision effects are considered detections from "other known causes"; they were not included in the model, but they were added unadjusted to the fatality estimator results.
[5] The 33 detections in the ACC buildings are not included in the number of detections included in the model, but they were added to the fatality estimator output unadjusted.
[6] Totals do not reflect the sum of individual estimates because of "NA" values less than five. The fatality estimate includes the 33 detections in the ACC buildings, which were added unadjusted to the fatality estimator results.

23b. Estimates by Size Class

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	1[1]	n<5[1,2]
Raptor[3]	2	n<5[2]
Small Bird	84[4]	244 (157 – 396)[4]
Total	**87[5]**	**248** (158 – 405)[6]

[1] One large bird detection in the ACC buildings was not included in the number of detections included in the model, but it was added to the fatality estimator output unadjusted.
[2] n<5 = No estimate given because there were fewer than five detections within that group.
[3] All raptors are also considered large birds, but they were considered separately to avoid having redundant data in this table.
[4] The 32 small bird detections in the ACC buildings are not included in the number of detections included in the model, but they were added to the fatality estimator output unadjusted.
[5] The 33 detections in the ACC buildings are not included in the number of detections included in the model, but they were added to the fatality estimator output unadjusted.
[6] Totals do not reflect the sum of individual estimates because of "NA" values less than five. The fatality estimate includes the 33 detections in the ACC buildings, which were added unadjusted to the fatality estimator results.

Table 24. Estimates by Cause (a.) and Size Class (b.) of Total Detections with Known Causes Based on Fatality Searches in Inner HD Heliostats, 18 August – 20 October 2014.

24a. Estimates by Cause

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Singeing	27	98 (26 – 255)
Collision	6	17 (7 – 34)
Total Singeing + Collision	**33**	**115** (40 – 287)

24b. Estimates by Size Class

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	2	n<5[1]
Raptor[2]	2	n<5[1]
Small Bird	29	108 (38 – 274)
All Detections	**33**	**115** (40 – 287)[3]

[1] n<5 = No estimate given because there were fewer than five detections within that group.
[2] All raptors are also considered large birds, but they were considered separately to avoid having redundant data in this table.
[3] Totals do not reflect the sum of individual estimates because of "NA" values less than five.

5.3.3 Fatality Estimate for Heliostat Area

Table 25 provides fatality estimates for known causes within the heliostat area for the 2014 fall season, 18 August – 20 October 2014.

Table 25. Estimates by Cause (a.) and Size Class (b.) of Detections with Known Causes within the Heliostat Area, 18 August – 20 October 2014.

25a. Estimates by Cause

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Collision	27	455 (304 – 802)
Total Collision	**27**	**455** (304 – 802)

25b. Estimates by Size Class

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	9	78 (41 – 138)
Raptor	0	n<5
Small Bird	18	371 (221 – 724)
All Detections	**27**	**455** (304 – 802)

5.3.4 Fatality Estimate for Fenceline

The perimeter fencelines for all units, as well as the CLA fence, were surveyed throughout the full fall period. No detections found along fences provided direct evidence of singeing, collision, or other (i.e., cause of death was unknown), so we do not provide a fatality estimate for known causes based on fenceline surveys here.

5.3.5 Fatality Estimate for Unit 3 Collector Line

The Unit 3 collector line was searched for the full fall period. Two detections with evidence of collision effects were found in this area. Because fewer than five detections were found in this area, we added these unadjusted to the estimates and confidence intervals for the facility as a whole.

5.4 Fatality Estimates from Unknown Causes

Per Section 3.1 of the Plan, fatality estimates are also to be provided based on detections of birds that were injured or that died of unknown causes. Because no observable evidence of singeing or collision effects was noted in the case of these unknown detections, they cannot be clearly included in an estimate attributed to a specific cause (i.e., singeing, collision, or entrapment). The methods for determining fatality estimates for these unknown detections are the same as those described in Section 5.2 for detections with direct evidence of the cause of the fatality (i.e., singeing, collision, or other).

There were 94 detections where the cause of death could not be determined. Of these 94, 71 were included in the estimates; in addition, one detection (of unknown size) from the power block was added unadjusted to the output of the fatality estimator to produce the total fatality estimate from unknown causes (Table 26). The 22 unknown detections that were excluded from the estimates altogether included 13 that were estimated to be older than the search interval, eight that were within solar units but outside survey plots, and one that was on "other Project lands" outside the solar units.

Table 26. Number of Detections from Unknown Causes in Each Project Element, and Number Included in Fatality Estimates.

Element	Number Included	Number Excluded	Total Found
Power Block	10	2[1]	12
Inner HD	24	0	24
Inner and Outer Heliostats	28	20[2]	48
Fences	9	0	9
Other Project Areas	0	1[3]	1
Transmission Line	0	0	0
Offsite Transects	0	0	0
Total	**71**	**23**	**94**

[1] One detection was excluded because it was estimated to be older than the search interval, and one could not be placed in a size category and was added unadjusted to the estimator output.
[2] Twelve detections were excluded because they were estimated to be older than the search interval, and eight were excluded because they were found outside of survey areas.
[3] No estimate was provided for "other Project areas".

5.4.1 Total Fatality Estimates from Unknown Causes

Total fatality estimates from unknown causes were calculated as described in Section 5.2.1 above. During the period of 18 August – 20 October, the total estimate of fatalities from unknown causes was 543 (90% confidence interval estimates 340-959). Of this estimate, 95 (90% confidence interval estimates 49-194) were in the tower area, 419 (90% confidence interval estimates 275-718) in the heliostat area, and 29 in the fenceline area (90% confidence interval estimates 16-47; Table 27). Note that one detection discovered in the power block that could not be identified to size class was added unadjusted to the tower area and total fatality estimates. This detection could not be included in the estimation because size class is a required attribute if either the searcher efficiency or carcass persistence sub-models include size as a variable.

Table 27. Site-Wide Fatality Estimates from Unknown Causes, 18 August – 20 October 2014.

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Tower Area	34[1]	95 (49 – 194)[1,2]
Heliostat Area	28	419 (275 – 718)
Fences	9	29 (16 – 47)
Total Detections, Unknown Cause	**71**[1]	**543** (340 – 959)[1]

[1] The number of detections does not include a feather spot of unknown size that was discovered in the power block, but it was added unadjusted to the fatality estimator results.

[2] Note that the tower area estimate includes estimates for the power block, which should be interpreted with caution as they may be inaccurate due to the large amount of unaccounted for search effort.

5.4.2 Fatality Estimate for Tower Area

Table 28 provides fatality estimates from unknown causes for the power block for the 2014 fall period. Table 29 provides fatality estimates from unknown causes for the inner HD area. When added, the estimates in Tables 28 and 29 comprise the total fatality estimates from unknown causes for the tower area as a whole.

Table 28. Power Block Fatality Estimates from Unknown Causes, 18 August – 20 October 2014.

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	1	n<5[1]
Raptor[2]	1	n<5[1]
Small Bird	8	25 (12 – 52)
Total Detections, Unknown Cause	**10**[3]	**29** (16 – 56)[4]

[1] n<5 = No estimate given because there were fewer than five detections within that group.

[2] All raptors are also considered large birds, but they were considered separately to avoid having redundant data in this table.

[3] The number of detections does not include a feather spot of unknown size.

[4] Totals do not reflect the sum of individual estimates because of "NA" values less than five. Estimate includes one detection that could not be assigned to a size class, which was added unadjusted to the fatality estimator output.

Table 29. Inner HD Heliostats Fatality Estimates from Unknown Causes, 18 August – 20 October 2014.

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	12	22 (12 – 36)
Raptor	0	n<5[1]
Small Bird	12	45 (19 – 105)
Total Detections, Unknown Cause	**24**	**66** (33 – 138)

[1] n<5 = No estimate given because there were fewer than five detections within that group.

5.4.3 Fatality Estimate for Heliostat Area

Table 30 provides fatality estimates from unknown causes for the heliostat area for the 2014 fall period.

Table 30. Heliostat Area Fatality Estimates from Unknown Causes, 18 August – 20 October 2014.

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	12	102 (47 – 168)
Raptor	0	n<5[1]
Small Bird	16	323 (179 – 598)
Total Detections, Unknown Cause	**28**	**419** (275 – 718)

[1] n<5 = No estimate given because there were fewer than five detections within that group.

5.4.4 Fatality Estimate for Fenceline

Table 31 provides fenceline fatality estimates from unknown causes for the 2014 fall monitoring period

Table 31. Fenceline Area Fatality Estimates from Unknown Causes, 18 August – 20 October 2014.

Type of Estimate	Number of Detections Included in Model	Estimate of Site-Wide Detections (with Lower and Upper C.I.)
Large Bird	6	16 (6 – 38)
Raptor	0	n<5[1]
Small Bird	3	n<5[1]
Total Detections, Unknown Cause	**9**	**29** (16 – 47)[2]

[1] n<5 = No estimate given because there were fewer than five detections within that group.
[2] Totals do not reflect the sum of individual estimates because of "NA" values less than five.

5.5 Regional Awareness Monitoring

According to the Plan, a communication protocol was implemented to monitor local veterinarians, game wardens, and wildlife rehabilitation facilities during facility operations to determine if significant new incidences of avian injury or fatality are reported to occur in the facility vicinity and region.

The Animal Kingdom Veterinary Hospital is located in the Las Vegas area about 35 miles northeast of Ivanpah. This clinic also serves as a wildlife rehabilitation facility, so it was contacted and interviewed as a part of the protocol. Likewise, the local district game warden for the BLM and a field supervisor for CDFW were contacted to determine if they had noticed an increase in avian fatalities in the area or if they had noticed any singed or scorched injured or dead birds. Further, a designated biologist and veterinarian, Dr. Craig Himmelwright, working in the Ivanpah Valley was also interviewed for the same purpose. The following is a summary of results of interviewing these contacts for the purpose of the Regional Awareness Monitoring effort.

Joanne Stefanatos representing Animal Kingdom Veterinary Hospital; Ryan Regnell representing the BLM; Craig Himmelwright, D.V.M. in Ivanpah Valley representing the Designated Biologists for the Project; and Magdalena Rodriquez from CDFW were contacted on 21 November 2014. Each reported that they were not aware of any increase in avian fatalities for the region or any birds, injured or dead, which had been found with singed or scorched feathers since monitoring according to the Plan began at Ivanpah in early winter 2013-2014.

Section 6.0 Discussion

The 2014 fall season represented the continuation of standardized monitoring of avian and bat detections and avian use of the Ivanpah site per the Avian & Bat Monitoring and Management Plan. Searcher efficiency trials and carcass removal trials were conducted concurrently on the power block, heliostat fields, and fencelines.

6.1 Fatality Estimates

During the period 18 August – 20 October, there were an estimated 820 fatalities (90% confidence interval estimates 504-1496) based upon detections with direct evidence of singeing, collision, or entrapment. Of these, a total of 455 fatalities (90% confidence interval estimates 304-802) were estimated to be in the heliostat areas, and a total of 363 fatalities (90% confidence interval estimates 198-692) were estimated to be in the tower area. No detections found along the fencelines showed direct evidence of singeing, collision, or other Project effects. There were two collision-related detections found along the Unit 3 collector line which were added unadjusted to the total estimate.

The large amount of uncontrolled search effort in the power block complicates fatality estimation in this area. Nevertheless, the relative magnitude of the fatality estimates among the three search areas (tower area, heliostat area, and fenceline) matches the pattern of detections observed. In proportion to unit area, fatality estimates suggest the highest densities of detections in the tower area, where heliostat density is highest and all singed detections were recorded.

6.2 Carcass Removal and Searcher Efficiency Trials

For the fall season, overall human searcher efficiency rates were 85.7% for large carcasses, 40.0% for small carcasses, and 44.4% for feather spots. Because cumulative sample sizes for the year were sufficient to examine Project area effects, we used cumulative estimates of human searcher efficiency from all previous seasons. Searcher efficiency was thus estimated separately for the tower area and other Project areas (inner segments, outer segments and fencelines). For the tower area, searcher efficiency rates were 82% for large carcasses, 71% for small carcasses, and 53% for feather spots. For other Project areas, searcher efficiency rates were 68% for large carcasses, 41% for small carcasses and 36% for feather spots. The rates within the tower area were higher than target rates of 55% for small birds and 69% for large birds outlined in the plan, but rates were slightly lower in the arc plots. The observed differences in searcher efficiency between the two Project areas was expected due to the differences in habitat complexity, which make it somewhat more difficult to detect carcasses and feather spots in the vegetation and uneven ground of the arc plots.

Canine detection rates were tested only for feather spots (plus one carcass) in fall 2014. Canine feather spot detection rate was 54.7%. Canine searcher efficiency in fall 2014 may have been negatively affected by repeated weekly surveys of the same arc plots. Accumulation of scents from detections, SET feather spots,

and reward targets created odor competition over time within arc plots. This problem was compounded by having the same dog survey the same plots multiple times. The schedule has subsequently been altered to allow a 3-6 week interval between surveys of an arc plot by the same dog.

Mean carcass persistence times for the fall were 7.1 days for small carcasses and 38.8 days for large carcasses. In comparison, the assumptions used in the power analysis in the Plan were 7.4 days for small birds and 21.8 days for large birds. We estimated carcass persistence rates using a Weibull distribution, which estimated that 51% of small and 98% of large carcasses were expected to persist through a 7-day search interval.

6.3 Cause and Distribution of Fatalities

The cause of death for 50.9% of the 289 avian detections during the 2014 fall season was attributed to singeing, with 15.6% attributed to collision and 1.0% to other known causes (i.e., entrapment); 1.0% showed strong signs of predation, and the remaining 32.5% could not be confirmed (i.e., the carcass or feather spot displayed no signs of singeing and no direct collision effects as determined by microscopic examination by CEC and BLM approved biologists). A total of 48.9% of the unknown detections (42 out of 94) were feather spots.

All detections showing evidence of singeing were detected in the relatively limited tower area. This 260-m radius area consisted of the area that was searched with 100% coverage due to proximity to the towers and is coincidental with the areas with the highest concentrations of solar flux. In addition, these towers were the focus of considerable activity by Ivanpah personnel, who found and reported detections, resulting in moderate numbers of incidental fatality reports.

6.4 Feather Spots

Seventy (24.2%) of the 289 detections consisted only of feather spots. Evidence of singeing was noted through direct and microscopic examination on 18 of these 70 feather spots; evidence of collision (i.e., an impact imprint on a nearby mirror) was noted in the case of eight other feather spots; strong evidence of predation was noted in one case (whitewash from a raptor on heliostat and plucked clump of feathers stuck to heliostat); and one feather spot detection was considered another Project impact because it was in an ACC building. Otherwise, the causes of the feather spots for the other 42 detections are unknown. Based upon evidence provided by the carcass removal trials, some of these feather spots may represent detections resulting from collisions or singeing that had been scavenged, leaving no direct evidence of the cause of the fatality. However, feather spots may represent natural predation events and multiple feather spots may be generated by these events. The large proportion of feather spots among the detections for the site as a whole may inflate the fatality estimate as a result of the potential for multiple feather spots resulting from one fatality, feather spots resulting from predation not associated with the facility, or other causes. The ratio of feather spots to carcasses varied across the site, being lowest in the power block (1:14.1) and highest along the

unit perimeter fences (1:0.8) and in the inner HD (1:0.9), with the inner segments (1:4.0) and outer segments (1:2.0) intermediate.

6.5 Incidental Detections

A total of 65 incidental avian detections and no incidental bat detection were found during this quarter. Thus, incidental detections represented a moderate percentage (22.5%) of the detections. This demonstrates that the Ivanpah Wildlife Incident Reporting System, described in Section 3.4 of the Plan, is functioning well. However, a number of these incidental detections were retrieved from the power block, and the retrieval of incidental detections from the power block can confound accurate fatality estimates for this area because the search effort involved in the detection of incidental detections is not quantifiable and is subject to considerable spatial and temporal variability. Because incidental detections are retrieved at random intervals, we cannot properly assess the search interval of detected carcasses, or searcher efficiency of personnel finding detections in these areas, which are both critical model parameters when estimating fatalities. Nevertheless, incidental detections from the power block were included with an assumed one day search interval in the fatality estimates because such a large proportion of detections in this area were incidental.

Because a high proportion of detections on the site are found in and around the power block, and the current estimation protocol relies on a lower searcher efficiency than is likely reflected in the power block, we proposed a possible change in the protocol for estimating searcher efficiency and accounting for detections in the power block area. This change was approved by the TAC during the September meeting, should the revised protocol be determined to be necessary.

Section 7.0 Framework for Management and Risk Response

According to the Plan, quarterly reports are expected to categorize potential migratory bird mortality issues at Ivanpah as high, medium, or low to provide an appropriate biological basis for TAC review and decision making, based on the following definitions in Section 5.3 of the Plan:

1. "High: Estimated avian mortality or injury levels are facility-caused and likely to seriously and negatively affect local, regional, or national avian populations within a particular species or group of species."
2. "Medium: Estimated avian mortality or injury levels are facility-caused and have the potential to negatively affect local, regional, or national populations within a particular avian species or group of species."
3. "Low: Estimated avian mortality or injury levels that have minimal or no potential to negatively affect local, regional, or national populations within a particular species or group of species."

Only limited conclusions can be drawn from the fall 2014 season fatality data owing to the low numbers of detections within "a particular species or group of species"; however, the results indicate that the potential migratory bird mortality by species or groups of species would be categorized as low. The 289 avian detections included 58 different bird species. Of these 58 species, 36 were represented by three or fewer detections (injury or fatality; see Table 9). While special-status species are discussed further below, all of the species represented by three or fewer detections have populations that are great enough locally (either as breeders, wintering birds, or migrants), regionally, and nationally that the loss of individuals indicated by the detected fatalities would have no substantive impact on populations at these geographic scales.

None of the 22 species represented by more than three detections is particularly rare locally, regionally, or nationally. Rather, all 22 species are relatively abundant and widespread. Thus, the magnitude of detections of these species at Ivanpah during the 2014 fall season does not rise above the "low" category. Special-status species recorded as detections were one bank swallow (a state-listed species), 10 Vaux's swifts (a California species of special concern), 16 yellow warblers (a California species of special concern) and single individuals of loggerhead shrike, olive-sided flycatcher, and Lucy's warbler, which are also California species of special concern. Loggerhead shrikes breed in the vicinity of the site, but all the other special-status species recorded as detections were transients that breed elsewhere.

Of the special-status species recorded, the bank swallow, Lucy's warbler, all 10 Vaux's swifts, and 12 of the yellow warblers showed signs of singeing. The loggerhead shrike and one yellow warbler showed signs of collision, but the cause of death of the three remaining yellow warblers and the olive-sided flycatcher were unknown.

Bank swallows are widespread breeders throughout the middle and northern latitudes of North America (Garrison 1999). These birds completely vacate North America in winter, and as a result, large numbers migrate through southern North America (including southeastern California) in spring and fall en route between breeding and wintering areas. The bank swallow detection in fall 2014 represented a very small proportion of the bank swallows expected to migrate through the Ivanpah area, heading to and from breeding sites as far north as Alaska and Canada. The North American population of this species is estimated at 13,800,000 birds (http://birds.audubon.org/species/banswa), and the species is found throughout most of Europe and Asia as well, with a global population estimate of 46,000,000 individuals (http://birds.audubon.org/species/banswa). The most recent estimate available of the California breeding population numbered approximately 9,590 pairs in 2003 (bird species accounts at http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/); numbers of burrows, which can be used to identify trends in abundance when monitored over time but which over-represent the actual numbers of breeding pairs, were estimated at 15,000 along the Sacramento River in 2012 (Bank Swallow Technical Advisory Committee 2013). Thus, at scales from local/regional (i.e., migrants moving through the Ivanpah area and the surrounding region) to national to global, the single bank swallow detection at Ivanpah during the 2014 fall season does not rise above the "low" category, as loss at this magnitude would have a minimal effect on populations at any of these geographic scales.

The loggerhead shrike is declining over much of its range (Sauer et al. 2014), primarily due to habitat loss, but it remains a common and widespread bird throughout much of the western and southeastern United States where habitat remains. In California, this species is common in desert habitats. The southeastern deserts represent one of the areas of highest abundance in the state (Humple 2008), and Breeding Bird Survey data indicate no significant population trends, or perhaps even a slight increase, in the Mojave Desert since the mid-1960s (Sauer et al. 2014). The North American population of this species is estimated at 2,900,000 birds (http://birds.audubon.org/species/logshr). The single detection recorded on the site indicates a low number of impacted individuals that would not substantially affect local, regional, or national populations of the species; thus the fall 2014 detection does not rise above the "low" category.

Yellow warblers are one of most abundant warblers in North American and occur as both migrants and summer residents in California (Shuford and Gardali 2008). Local abundance and population trends are highly variable by region, and show broad scale declines in the Pacific Northwest and within California (Shuford and Gardali 2008). Despite these declines, the yellow warbler remains common and widespread throughout much of North American. Yellow warblers occur in the Mojave Desert as common migrants, but they typically do not breed there. The 16 yellow warblers detected in fall 2014 represented a very small proportion of the yellow warblers expected to migrate through the Ivanpah area, heading to and from breeding sites throughout the Northwest, Alaska, and Canada. The North American population of this species is estimated at 90,000,000 birds, with a U.S. population estimated at 34,000,000 (Partners in Flight Science Committee 2013). An estimated 600,000 yellow warblers occur within California (Partners in Flight Science Committee 2013). Thus, the yellow warbler detections at Ivanpah during the 2014 fall season do not

rise above the "low" category, as loss at this magnitude would have a minimal effect on populations at all geographic scales (local, regional, national or global).

Vaux's swift is declining throughout its breeding rage, primarily due to loss of their old growth coniferous forest habitat (Bull and Collins 2007). Vaux's swifts occurring in the Ivanpah region are migrants en route between their breeding grounds in the Pacific Northwest, and their wintering grounds in Mexico, Central and South America. Population size for the Vaux's swift in California is estimated at 30,000 birds. An estimated 340,000 occur in North America and 600,000 are estimated to occur worldwide (Partners in Flight Science Committee 2013). The 10 Vaux's swift detections at Ivanpah during the 2014 fall season would have a minimal effect on populations at local regional (i.e. migrants moving through the Ivanpah Valley and surrounding region) to national or global levels. Thus, these detections do not rise above the "low" category.

Olive-sided flycatcher and Lucy's warbler are sufficiently abundant at all geographic scales that the loss indicated by the single detections of these species would have a minimal impact on local, regional, and national populations. Thus, the detections of these two species also do not rise above the "low" category.

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Appendix A. Individual Avian Detections.

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
2014-374-ISEGS	Unknown Swallow	UNSW	1	Incidental	8/18/14	Broken up	< 24 hours	2 wings; partial rump and tail; no singeing (checked under scope)	Unknown	NA	2	11S 639452 3935114	Fence	
2014-375-ISEGS	Tree Swallow	TRES	1	Carcass Survey	8/18/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass; curling and singeing on flight feathers, singeing on breast, bill and left flank. Singeing grade 2, 3.	Singed	2, 3	3	11S 637494 3937964	ACC Building°	Added singeing grade to description; B. Sousa; 11/12/14.
2014-376-ISEGS	Lucy's Warbler	LUWA	1	Carcass Survey	8/18/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 month	Whole carcass; singeing and curling on wing and retrices; flux effect grade 2	Singed	2	3	11S 637506 3937950	ACC Building°	
2014-377-ISEGS	Black-Throated Sparrow	BTSP	1	Carcass Survey	8/18/14	Broken up	< 1 week	18 flight feathers; 50 + body feathers; head; no singeing evident (checked under scope)	Unknown		2	11S 639391 3936607	Heliostat	
2014-378-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/18/14	Feather spot	< 1 week	5 flight, 10 body feathers. Singed. Flux effect grade unknown	Singed	Unk	3	11S 637594 3937858	Heliostat	
2014-379-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/18/14	Feather spot	< 1 week	~60 body feathers, 34 flight feathers; all flight feathers have curling or singeing; 1/2 of body feathers singed or curled; flux effect grade unknown	Singed	Unk	3	11S 637361 3937929	Project Building	
2014-380-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	8/18/14	Dead, fresh (eyes moist)	< 24 hours	Singeing and curling on 90% of flight and body feathers. Flux effect grade 2 and 3.	Singed	2, 3	3	11S 637492 3937936	Project Building	
2014-381-ISEGS	Black-throated Gray Warbler	BTYW	1	Carcass Survey	8/18/14	Dead, fresh (eyes moist)	< 24 hours	Curling and singeing on retrices and primaries, singeing on chin and breast; flux effect grade 2 and 3	Singed	2, 3	3	11S 637510 3937916	Project Building	
2014-382-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/18/14	Broken up	< 1 week	Whole carcass, minus head. No singeing evident (checked under scope).	Collision	NA	2	11S 637870 3936844	Heliostat	
2014-383-ISEGS¥	Yellow Warbler	YEWA	1	Incidental	8/18/14	Alive, injured	< 24 hours	Warbler was found foraging on insects on the ground in the pump pit on the power block; it could not gain altitude and fly, but could run/hop, and was alert and active; singed on nape of neck and top of wings; flux effect grade 1 and 3	Singed	1, 3	2	11S 638631 3935847	Solar Concentrating Tower	
2014-384-ISEGS	Nashville Warbler	NAWA	1	Carcass Survey	8/19/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass; singed primaries, retrices, most of head; flux effect grade 2 and 3	Singed	2, 3	2	11S 638715 3935837	Solar Concentrating Tower	
2014-385-ISEGS	Rufous Hummingbird	RUHU	1	Carcass Survey	8/19/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass; singed on tips of primaries, left flank of body and left side of head. Flux effect grade 1 and 3.	Singed	1, 3	2	11S 638677 3935908	ACC Building°	
2014-386-ISEGS	Black-Throated Sparrow	BTSP	1	Carcass Survey	8/19/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass; all flight feathers singed, entire body singed; flux effect grade 2 and 3	Singed	2, 3	2	11S 638645 3935887	ACC Building°	
2014-387-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/19/14	Feather spot	< 1 week	13 flight feathers; ~80 body feathers	Unknown	NA	3	11S 637137 3936824	Heliostat	

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
2014-388-ISEGS	Nashville Warbler	NAWA	1	Carcass Survey	8/19/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass; most of primary feathers singed; retrices missing; top of head singed; flux effect grade 2 and 3	Singed	2, 3	2	11S 638674 3935860	Solar Concentrating Tower	Corrected distance to Project feature typo from 45; B. Sousa; 11/12/14.
2014-389-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	8/19/14	Mummified	< 1 month	Whole carcass singed; missing bottom half; flux effect grade 2 and 3	Singed	2, 3	2	11S 638685 3935871	Project Building	Corrected azimuth to Project feature typo from SW; B. Sousa; 11/12/14.
2014-390-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/19/14	Feather spot	< 1 week	primaries and covert feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638787 3936006	Heliostat	
2014-391-ISEGS	Lesser Nighthawk	LENI	1	Incidental	8/19/14	Broken up	< 24 hours	smashed carcass on road; wings intact; collision with vehicle	Collision	NA		11S 642009 3935029	Other	
2014-392-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/20/14	Feather spot	< 1 week	7 flight feathers; ~25 body feathers; 3 flight and 1 covert feather slightly singed. Flux effect grade unknown.	Singed	Unk	1	11S 640160 3933397	Heliostat	
2014-393-ISEGS	Lesser Nighthawk	LENI	1	Carcass Survey	8/20/14	Dead, fresh (eyes moist)	< 1 week	rigor set in; carcass still moist; ants present on carcass; no evidence of singeing (checked under scope); found at base of heliostat	Collision	NA	3	11S 638038 3938413	Heliostat	
2014-394-ISEGS	Unknown Warbler	UNWA	1	Carcass Survey	8/20/14	Feather spot	< 1 month	4 flight feathers; no evidence of singeing (checked under scope)	Other-Facility	NA	1	11S 640364 3933542	ACC Building°	Corrected Project feature to ACC Building; B. Sousa; 11/12/14.
2014-395-ISEGS	Tree Swallow	TRES	1	Carcass Survey	8/20/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; eyes present; in rigor; no evidence of singeing (checked under scope); found under heliostat mirror.	Collision	Unk	1	11S 640523 3933365	Heliostat	
2014-396-ISEGS	American Kestrel	AMKE	1	Carcass Survey	8/20/14	Feather spot	< 1 week	3 primary flight feathers, all singed; flux effect grade unknown	Singed	Unk	1	11S 640587 3933373	Heliostat	
2014-397-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Carcass Survey	8/20/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; singeing and curling of retrices, contour and primaries; flux effect grade 2 and 3	Singed	2, 3	1	11S 640305 3933513	Project Building	
2014-398-ISEGS	Black-chinned Hummingbird	BCHU	1	Carcass Survey	8/20/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass; decayed; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 640360 3933480	Solar Concentrating Tower	
2014-399-ISEGS	Greater Roadrunner	GRRO	1	Carcass Survey	8/20/14	Broken up	< 1 week	Partial carcass; head and neck, 1 flight feather, part of torso; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 638812 3938220	Heliostat	
2014-400-ISEGS	Black-chinned Hummingbird	BCHU	1	Carcass Survey	8/20/14	Dead, fresh (eyes moist)	< 24 hours	fresh carcass; eyes present but sunken, rigor mortis set in; no evidence of singeing (checked under scope); found just below heliostat	Collision	NA	1	11S 640571 3933566	Heliostat	
2014-401-ISEGS	Lazuli Bunting	LAZB	1	Carcass Survey	8/20/14	Feather spot	< 1 week	intact wing; 1 flight feather singed; flux effect grade unknown	Singed	Unk	1	11S 640501 3933634	Heliostat	
2014-402-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/20/14	Feather spot	< 1 week	8 flight feathers; ~15 body feathers; flight feathers slightly	Singed	Unk	1	11S 640401 3933748	Heliostat	

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								singed; flux effect grade unknown						
2014-403-ISEGS	Black-Throated Sparrow	BTSP	1	Carcass Survey	8/21/14	Broken up	< 1 month	Partial carcass: both wings attached to torso and legs present; no evidence of singeing (checked under scope); appropriate size imprint found on heliostat above where carcass was found	Collision	NA	2	11S 639224 3935215	Heliostat	
2014-404-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	8/21/14	Broken up	< 1 month	2 wings, skull; 100+ body feathers	Unknown	NA	1	11S 641141 3933377	Heliostat	
2014-405-ISEGS	Cactus Wren	CACW	1	Carcass Survey	8/21/14	Mummified	< 1 month	Whole carcass; no evidence of singeing (checked under scope); found underneath heliostat mirror, neck looked to be bent unnaturally indicating a possible collision with mirror	Collision	NA	1	11S 641211 3933978	Heliostat	
2014-406-ISEGS	Lazuli Bunting	LAZB	1	Incidental	8/22/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singeing and curling on dorsal side, wings, and tail feathers, top of head; Flux effect grade 2 and 3	Singed	2, 3	1	11S 640441 3933543	ACC Building°	
2014-407-ISEGS	Ladder-backed Woodpecker	LBWO	1	Incidental	8/24/14	Broken up	< 1 week	Carcass, minus head; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 638836 3938163	Heliostat	
2014-408-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/25/14	Articulated skeletal	< 1 month	partial skeleton with ~10 body feathers. Torso with legs attached.	Unknown	NA	2	11S 639650 3935461	Heliostat	
2014-409-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/25/14	Broken up	< 1 week	Partial wing; 10 body feathers; 5 flight feathers; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637251 3937840	Heliostat	
2014-410-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	8/25/14	Feather spot	< 1 week	30+ flight feathers; 80 body feathers; all tail feathers curled and singed, several body feathers singed; flux effect grade unknown	Singed	Unk	3	11S 637374 3937956	Other	
2014-411-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Carcass Survey	8/26/14	Dead, fresh (eyes moist)	< 1 week	whole carcass; singed on head, back and all of flight feathers; also singed on ventral neck and breast. Singeing grade 2, 3.	Singed	2, 3	2	11S 638686 3935901	ACC Building°	Added singeing grade; B Sousa; 11/12/14.
2014-412-ISEGS	Lazuli Bunting	LAZB	1	Carcass Survey	8/26/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; singed feathers on right breast. Singeing grade 3.	Singed	3	2	11S 638541 3936020	Heliostat	Added singeing grade; B Sousa; 11/12/14.
2014-413-ISEGS¥	Lazuli Bunting	LAZB	1	Incidental	8/26/14	Alive, injured	< 24 hours	Both wings, tail feathers, and crown of head singed. Flux effect grade 2 and 3. Found hopping on ground on West side of Unit 2 power block.	Singed	2, 3	2	11S 638564 3935915	Other	Corrected how found (from carcass survey); B. Sousa; 11/12/14.
2014-414-ISEGS	Lazuli Bunting	LAZB	1	Carcass Survey	8/26/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; primary flight feathers singed; contour back feathers singed slightly. Singeing grade 2, 3.	Singed	2, 3	2	11S 638607 3935908	Other	Added direction and azimuth to Project feature and singeing grade; B. Sousa; 11/12/14.

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2014-415-ISEGS	Olive-Sided Flycatcher	OSFL	1	Carcass Survey	8/26/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; no evidence of singeing (checked under scope);	Unknown	NA	2	11S 638171 3935781	Heliostat	
2014-416-ISEGS	Unknown Gnatcatcher	UNGN	1	Carcass Survey	8/26/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass, but missing eyes and brain; only has 2 tail feathers - 1 tail feather looks chewed; scavenged by ants	Unknown	NA	2	11S 638631 3935927	ACC Building°	
2014-417-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/27/14	Feather spot	< 1 week	2 flight feathers, 1 left wing, 100+ body feathers; keel bone; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 638034 3937383	Heliostat	
2014-418-ISEGS	Black-chinned Hummingbird	BCHU	1	Carcass Survey	8/27/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: retrices, right wing coverts, right flank, right side of head singed; flux effect grade 1 and 3	Singed	1, 3	1	11S 640321 3933522	Steam Pipe	
2014-419-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	8/27/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass singed; entire tips of both wings and tail missing; singed and curled feathers on back and back of head; flux effect grade 2 and 3	Singed	2, 3	1	11S 640344 3933467	Project Building	
2014-420-ISEGS	Tree Swallow	TRES	1	Carcass Survey	8/27/14	Mummified	< 1 week	Whole carcass; brain and muscle eaten by ants; found covered in red ants; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 640948 3933427	Heliostat	
2014-421-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/27/14	Feather spot	< 1 week	4 primaries; 4 secondaries; 5 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 640472 3933669	Heliostat	
2014-422-ISEGS	Greater Roadrunner	GRRO	1	Carcass Survey	8/27/14	Feather spot	< 1 week	28 flight feathers, ~80 body feathers, leg, beak (upper mandible); no evidence of singeing (checked under scope)	Unknown	NA	1	11S 640611 3932662	Fence	
2014-423-ISEGS	White-winged Dove	WWDO	1	Carcass Survey	8/27/14	Feather spot	< 1 week	38 flight, 100+ body feathers spread out over 4 m; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 641349 3933854	Fence	
2014-424-ISEGS	Mourning Dove	MODO	1	Carcass Survey	8/27/14	Feather spot	< 1 week	16 flight feathers; ~150 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 641352 3934098	Fence	
2014-425-ISEGS	Yellow Warbler	YEWA	1	Incidental	8/28/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; all flight feathers missing; singed over entire dorsal area and nape of neck and crown. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640359 3933482	Solar Concentrating Tower	Corrected distance and azimuth to Project feature typo (from 30, N); B. Sousa; 11/12/14.
2014-426-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	8/28/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass; no evidence of singeing (checked under scope); ants present and scavenging.	Unknown	NA	1	11S 640959 3932886	Heliostat	
2014-427-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	8/28/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; no evidence of singeing (checked under scope); evidence of collision due to trauma on right side of	Collision	NA	1	11S 640735 3932689	Heliostat	

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								head.						
2014-428-ISEGS	Black-Throated Sparrow	BTSP	1	Carcass Survey	8/28/14	Broken up	< 1 month	Whole carcass; no evidence of singeing (checked under scope); lower mandible broken, evidence of collision	Collision	NA	1	11S 640693 3932826	Heliostat	
2014-429-ISEGS	Bank Swallow	BANS	1	Incidental	8/30/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; remiges, retrices, coverts have curling and melting; possible singeing on breast contour feathers; flux effect grade 2	Singed	2	3	11S 637496 3937944	ACC Building°	
2014-430-ISEGS	Orange-crowned Warbler	OCWA	1	Incidental	8/30/14	Dead, fresh (eyes moist)	< 1 month	Whole carcass: no evidence of singeing, but did not handle carcass; left in place per protocol	Other-Facility	NA	3	11S 637461 3937978	ACC Building°	Corrected time since death from Unknown to 3 weeks; B. Sousa; 11/12/14.
2014-431-ISEGS[§]	American Kestrel	AMKE	1	Incidental	8/31/14	Alive, injured	< 24 hours	Injured AMKE with singeing on both wings, tail and crown of head; flux effect grade 2 and 3.	Singed	2, 3	1	11S 640297 3933522	Project Building	
2014-432-ISEGS	Wilson's Warbler	WIWA	1	Incidental	8/31/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: remiges and contour feathers have curling, melting, charring; flux effect grade 2, 3	Singed	2, 3	2	11S 638624 3935918	Powerblock road pavement	Updated singeing grade; B. Sousa; 11/12/14.
2014-433-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Incidental	8/31/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 24 hours	Whole carcass: Melting and charring of flight and contour feathers	Singed	2, 3	3	11S 637380 3937881	Powerblock road pavement	
2014-434-ISEGS	Rufous Hummingbird	RUHU	1	Incidental	8/31/14	Mummified	< 1 month	Whole carcass: charring of feathers, dried body. Singeing grade 1, 3.	Singed	1, 3	3	11S 637400 3937926	Ground	Added singeing grade and updated age (from Unknown); B. Sousa; 11/12/14. Corrected time since death from Unknown to 3 weeks.
2014-435-ISEGS	Black-throated Gray Warbler	BTYW	1	Carcass Survey	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: head singed; throat and breast singed, coverts and flight feathers singed; tail feathers singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638641 3935905	ACC Building°	
2014-436-ISEGS	Northern Rough-winged Swallow	NRWS	1	Carcass Survey	9/2/14	Mummified	< 1 month	Carcass minus head. No evidence of singeing (checked under scope)	Unknown	NA	2	11S 638651 3935935	Project Building	
2014-437-ISEGS	Nashville Warbler	NAWA	1	Carcass Survey	9/2/14	Mummified	< 1 week	Whole carcass: curling and singeing of wing and tail feathers; rump, breast, belly , throat singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638608 3935898	Water tanks	
2014-438-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singed wings, breast and head singed; Flux effect grade 2 and 3.	Singed	2, 3	3	11S 637441 3937943	Steam Pipe	
2014-439-ISEGS	Rufous Hummingbird	RUHU	1	Incidental	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637426 3937946	ACC condenser	
2014-440-ISEGS	Tree Swallow	TRES	1	Carcass Survey	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Singed on underwing coverts of the left wing; no other evidence of	Singed	1	2	11S 638615 3936019	Heliostat	

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								singeing. Flux effect grade 1.						
2014-441-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/2/14	Broken up	< 1 week	Parts of bird: flight and body feathers; scapula. No evidence of singeing (checked under scope)	Unknown	NA	3	11S 636563 3938213	Heliostat	
2014-442-ISEGS	Orange-crowned Warbler	OCWA	1	Carcass Survey	9/2/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: singed flight feathers, both wings and tail; singed head. Flux effect grade 2	Singed	2, 3	2	11S 638629 3935896	ACC condenser	
2014-443-ISEGS	Wilson's Warbler	WIWA	1	Carcass Survey	9/2/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: crown of head, dorsal body feathers charred; tail and wing feathers burnt off completely. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638612 3935897	Project Building	Corrected distance to Project feature typo (from 15); B. Sousa; 11/12/14.
2014-444-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: right wing greater primary coverts curled; top of head singed; 2 tail feathers curled. Flux effect grade1.	Singed	1, 3	2	11S 638726 3935845	Cement street barrier	
2014-445-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	9/2/14	Broken up	< 1 month	dull gray/ brown contour feathers, feathered tarsi. No evidence of singeing (checked under scope).	Unknown	NA	3	11S 637016 3936857	Heliostat	Corrected time since death from Unknown to 3 weeks; B. Sousa; 11/12/14.
2014-446-ISEGS	Black-chinned Hummingbird	BCHU	1	Incidental	9/2/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Singed tail feathers; singed left side of head, singed on tips of primaries. Flux effect grade 1.	Singed	1	2	11S 638552 3935955	Other	Added distance and direction to Project feature; B. Sousa; 11/12/14.
2014-447-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singed left side of neck; curling of tail feathers; singeing on breast. Flux effect grade 1.	Singed	1	3	11S 637428 3937947	Light Pole	
2014-448-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Carcass Survey	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: no evidence of singeing (checked under scope). Unknown cause of death.	Unknown	NA	1	11S 640406 3933329	Heliostat	
2014-449-ISEGS	Black-Throated Sparrow	BTSP	1	Incidental	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: both wings and tail feathers curled; singeing on crown, breast, head, and back. Flux effect grade 2, 3.	Singed	2, 3	3	11S 637453 3937940	ACC boiler	Updated singeing grade; B. Sousa; 11/12/14.
2014-450-ISEGS	Ash-Throated Flycatcher	ATFL	1	Carcass Survey	9/3/14	Feather spot	< 1 week	14 flight feathers, ~40 body feathers. No evidence of singeing (checked under scope). Unknown cause of death.	Unknown	NA	1	11S 640618 3933447	Heliostat	
2014-451-ISEGS	Townsend's Warbler	TOWA	1	Carcass Survey	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Tail burnt off; secondaries curled and singed. Flux effect grade 2.	Singed	2	1	11S 640405 3933504	Auxiliary Boiler	
2014-452-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	9/3/14	Mummified	< 1 week	Whole carcass: singeing on wings; tail feathers curled; singeing on rump. Flux effect grade 1.	Singed	1, 3	1	11S 640373 3933531	ACC Building°	
2014-453-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/3/14	Feather spot	< 1 week	16 flight, ~50 body feathers; keel bone. No evidence of singeing (checked under scope).	Unknown	NA	1	11S 640486 3933517	Heliostat	

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2014-454-ISEGS	House Finch	HOFI	1	Carcass Survey	9/3/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: entire body singed. Flux effect grade 3	Singed	3	1	11S 640409 3933534	ACC Building°	
2014-455-ISEGS	Black-throated Gray Warbler	BTYW	1	Carcass Survey	9/3/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: singed on right flank and tail feathers. Flux effect grade 1.	Singed	1	1	11S 640365 3933565	ACC	
2014-456-ISEGS	Tree Swallow	TRES	1	Carcass Survey	9/3/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: both wings, tail, crown, rump, and back singed. Flux effect grade 3.	Singed	3	1	11S 640286 3933569	Dry Coolers	
2014-457-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Carcass Survey	9/3/14	Mummified	< 1 week	Whole carcass: Desiccated; singed on tail and outer primaries of right wing. Flux effect grade 1.	Singed	1	1	11S 640268 3933495	Transformer fence	
2014-458-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	9/3/14	Mummified	< 1 week	Whole carcass: singed on both wings, tail, head. Flux effect grade 3.	Singed	3	1	11S 640317 3933482	Leech field	
2014-459-ISEGS	Unknown Sparrow	UNSP	1	Carcass Survey	9/3/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: singed wings (both), tail, side of neck, crown, nape singed. Flux effect grade 3.	Singed	3	1	11S 640331 3933472	Plant Services Building	
2014-460-ISEGS	Blue-Gray Gnatcatcher	BGGN	1	Incidental	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singed on back and primaries. Flux effect grade 1, 3.	Singed	1, 3	3	11S 637440 3937937	ACC condenser	Updated singeing grade; B. Sousa; 11/12/14.
2014-461-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/3/14	Feather spot	< 1 week	3 flight, ~50 body feathers. No evidence of singeing (checked under scope).	Collision	NA	2	11S 639671 3936010	Heliostat	
2014-462-ISEGS	Townsend's Warbler	TOWA	1	Incidental	9/3/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: singed wings, tail, breast, back and throat. Flux effect grade 2, 3.	Singed	2, 3	3	11S 637456 3937923	ADP pit pump	Corrected latitude typo (from 637466), updated singeing grade; B. Sousa; 11/12/14.
2014-463-ISEGS	Unknown Hummingbird	UNHU	1	Carcass Survey	9/3/14	Mummified	< 1 month	Whole carcass: entire body singed. All feathers burnt. Not enough plumage to ID to species. Flux effect grade 3.	Singed	3	1	11S 640397 3933477	Project Building	Corrected time since death from Unknown to 3 weeks; B. Sousa; 11/12/14.
2014-464-ISEGS	Rufous Hummingbird	RUHU	1	Incidental	9/3/14	Mummified	< 1 week	Whole carcass: both wings, tail, dorsal feathers, crown singed. Flux effect grade 3.	Singed	3	2	11S 638580 3935962	Light Pole	
2014-465-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	9/4/14	Broken up	< 1 week	headless carcass; some contour feathers scattered in area; no evidence of singeing (checked under scope); no evidence of collision.	Unknown	NA	1	11S 639621 3933320	Heliostat	
2014-466-ISEGS	European Starling	EUST	1	Carcass Survey	9/4/14	Feather spot	< 24 hours	~20 primary and secondary, ~30 body feathers	Unknown	NA	1	11S 641005 3934305	Heliostat	
2014-467-ISEGS	Wilson's Warbler	WIWA	1	Incidental	9/5/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Both wings singed; tail singed; singed chest and right side of face. Flux effect grade 3.	Singed	3	1	11S 640334 3933485	Heater bay	
2014-468-ISEGS	Unknown hummingbird sp.	UNHU	1	Incidental	9/5/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: entire body singed; Flux effect grade 2, 3.	Singed	2, 3	1	11S 640385 3933513	ACC	Updated singeing grade; B Sousa; 11/12/14.

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2014-469-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/5/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: singed left wing and tip of tail feathers; Flux effect grade 1.	Singed	1	1	11S 640322 3933524	Air tank	Updated singeing grade; B Sousa; 11/12/14.
2014-470-ISEGS	Wilson's Warbler	WIWA	1	Incidental	9/5/14	Mummified	< 1 week	Whole carcass: both wings singed; tail burnt off and gone; head singed. Flux effect grade 2, 3.	Singed	2, 3	1	11S 640357 3933526	Cable support beam	
2014-471-ISEGS	Unknown hummingbird sp.	UNHU	1	Incidental	9/5/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: entire body singed; dorsal feathers burnt down to exposed skin; tail gone. Flux effect grade 2, 3.	Singed	2, 3	1	11S 640349 3933536	ACC	Updated singeing grade; B Sousa; 11/12/14.
2014-472-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/6/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; both wings and tail singed; head and left shoulder singed. Flux effect grade 3.	Singed	2, 3	1	11S 640311 3933531	Air tank	Corrected GPS (from 640332 3933527); B. Sousa; 11/12/14.
2014-473-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/6/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: both wings and tail singed; back singed, right eye gone. Flux effect grade 3.	Singed	2, 3	1	11S 640332 3933527	ACC	Corrected GPS (from 640311 3933531); B. Sousa; 11/12/14.
2014-474-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/8/14	Broken up	< 1 week	Partial wings connected by tissue, keel, wing bones; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637486 3937714	Heliostat	Corrected distance to Project feature typo (from 15); B. Sousa; 11/12/14.
2014-475-ISEGS	Spotted sandpiper	SPSA	1	Incidental	9/8/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: Decaying and rotting, found in a puddle of water; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638655 3935842	Solar Concentrating Tower	
2014-476-ISEGS	Verdin	VERD	1	Carcass Survey	9/8/14	Mummified	< 1 week	Whole carcass: feathers weathered; brain and eyes missing; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637467 3937849	Project Building	
2014-477-ISEGS	Rufous Hummingbird	RUHU	1	Carcass Survey	9/9/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: tail burnt off; singed rump, wing feathers; singed on throat, both flanks; singed on forehead; flux effect grade 2, 3.	Singed	2, 3	2	11S 638680 3935915	ACC Building°	Updated singeing grade; B. Sousa; 11/12/14.
2014-478-ISEGS	Townsend's Warbler	TOWA	1	Carcass Survey	9/9/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: tail feathers singed off; left wing flight feathers singed and curled; flux effect grade 2	Singed	2, Unk	3	11S 637384 3937936	Mirror wash water storage area	
2014-479-ISEGS	Unknown Gnatcatcher	UNGN	1	Carcass Survey	9/9/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: all flight feathers charred off to stubs; all body feathers except eye ring and white throat singed. Flux effect grade 2, 3.	Singed	2, 3	2	11S 638680 3935915	Solar Concentrating Tower	Updated singeing grade; B. Sousa; 11/12/14.
2014-480-ISEGS	Ladder-backed Woodpecker	LBWO	1	Carcass Survey	9/9/14	Feather spot	< 1 month	8 tail feathers, 14 flight and 1 body feather; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 636519 3937356	Heliostat	
2014-481-ISEGS	Lazuli Bunting	LAZB	1	Incidental	9/9/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Both wings singed; tail singed and mostly missing; left side of breast singed. Flux effect grade 2, 3.	Singed	2, 3	1	11S 640387 3933497	Solar Concentrating Tower	Updated SPITS code (from LABU) and singeing grade; B. Sousa; 11/12/14.
2014-482-ISEGS	Tree Swallow	TRES	1	Carcass Survey	9/10/14	Mummified	< 1 week	Carcass with left wing detached; singeing in flight	Singed	2	1	11S 640309 3933506	Plant Services Building	

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								feathers; flux effect grade 2.						
2014-483-ISEGS	Unknown	UNKN	1	Incidental	9/10/14	Broken up	> 1 month	bones, leg and foot; clumps of decaying body feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 639196 3936515	Heliostat	Corrected time since death from Unknown to 1 month+; B. Sousa; 11/12/14.
2014-484-ISEGS	Wilson's Warbler	WIWA	1	Carcass Survey	9/10/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: all primaries, secondaries of wings singed, left and right side of breast singed, top of head singed. Flux effect grade 3.	Singed	3	1	11S 640362 3933469	Solar Concentrating Tower	
2014-485-ISEGS	Yellow Warbler	YEWA	1	Incidental	9/11/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Crown, flanks, dorsal surface singed; tail & nearly all remiges singed off (missing). Flux effect grade 2, 3.	Singed	2, 3	1	11S 640363 3933491	Solar Concentrating Tower	Updated singeing grade; B. Sousa; 11/12/14.
2014-486-ISEGS	Wilson's Warbler	WIWA	1	Incidental	9/11/14	Mummified	< 1 month	Whole carcass: decayed; all remiges singed, tail missing, several body feathers singed. Flux effect grade 2, 3.	Singed	2, 3	1	11S 640371 3933492	Solar Concentrating Tower	Updated singeing grade; B. Sousa; 11/12/14.
2014-487-ISEGS	House Finch	HOFI	1	Incidental	9/11/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singed on both wings, tail, crown of head and back. Flux effect grade 2, 3.	Singed	2, 3	1	11S 640384 3933422	Parking Area	Updated singeing and added distance and direction to Project feature; B. Sousa; 11/12/14.
2014-488-ISEGS†	Tree Swallow	TRES	1	Incidental	9/12/14	Alive, injured	< 24 hours	Both wings and tail singed; upper left chest and flank singed; left side of face singed; left eye closed and singed; singeing on upper back.	Singed	2, 3	2	11S 638646 3935841	Solar Concentrating Tower	
2014-489-ISEGS	Brewer's Sparrow	BRSP	1	Incidental	9/14/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: no evidence of external trauma; fresh feathers	Unknown	NA		11S 639671 3935023	Power lines	
2014-490-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/15/14	Feather spot	< 1 week	8 flight feathers; 10 body feathers. No evidence of singeing (checked under scope). Well defined heliostat imprint	Collision	NA	3	11S 637766 3938322	Heliostat	
2014-491-ISEGS	Loggerhead Shrike	LOSH	1	Carcass Survey	9/15/14	Broken up	< 1 week	Feather spot and partial carcass. 2 partial wings, tail feathers, ~50 body feathers; no evidence of singeing (checked under scope).	Collision	NA	3	11S 637697 3937999	Heliostat	Corrected carcass condition to "broken up" and added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-492-ISEGS	Mourning Dove	MODO	1	Incidental	9/15/14	Feather spot	< 1 week	partial wing, wing attached to bone. Foot with partial leg. No evidence of singeing (checked under scope).	Unknown	NA	2	11S 639426 3935156	Heliostat	
2014-493-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/15/14	Feather spot	< 24 hours	10+ wing coverts; 25+ contour body feathers. No evidence of singeing (checked under scope); heliostat imprint present	Collision	NA	2	11S 639258 3936714	Heliostat	
2014-494-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	9/15/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: observed singeing in mid-air and drop to ground; wings, tail and back singed; Flux effect grade 2 and	Singed	2, 3	1	11S 640352 3933467	Porta potties	

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								3.						
2014-495-ISEGS	American Kestrel	AMKE	1	Incidental	9/15/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: observed bird singe in mid-air, hawking insects; wings, tail, left side of head, chest, and belly singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640371 3933461	Power transfer unit	
2014-496-ISEGS	Nashville Warbler	NAWA	1	Incidental	9/15/14	Mummified	< 1 week	Whole carcass: tail singed off; wing feathers curled, singed; breast singed; crown singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640356 3933458	Solar Concentrating Tower	
2014-497-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/15/14	Broken up	< 1 week	2 partial wings; 150+ body feathers; 2 feet; no evidence of singeing (checked under scope).	Unknown	NA	2	11S 637890 3936794	Heliostat	
2014-498-ISEGS†	Mourning Dove	MODO	1	Carcass Survey	9/16/14	Alive, injured	< 24 hours	No evidence of collision or singeing. Juvenile bird was sitting quietly in spoke road; could not fly well; easily caught; no external trauma evident.	Unknown	NA	3	11S 636758 3938200	Spoke Road	Updated time since injury/mortality (from Unknown); B. Sousa; 11/12/14. Corrected Unit to Unit 3.
2014-499-ISEGS	American Coot	AMCO	1	Carcass Survey	9/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: large wound on side and chest, flesh missing from side; covered in maggots; possible imprint on closest heliostat	Collision	NA	2	11S 638734 3935970	Heliostat	Corrected level of certainty (from Probable); B. Sousa; 11/12/14.
2014-500-ISEGS	Brown-headed cowbird	BHCO	1	Incidental	9/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass minus head. No evidence of singeing, checked under scope.	Predated	NA	2	11S 638036 3936481	Heliostat	
2014-501-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	9/16/14	Feather spot	< 24 hours	20+ body feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638591 3935989	Heliostat	Corrected time since death (from 2 days); B. Sousa; 11/12/14.
2014-502-ISEGS	Savannah Sparrow	SAVS	1	Carcass Survey	9/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: in good condition; eye missing; no evidence of singeing (checked under scope); visibile imprint of collision on heliostat mirror.	Collision	NA	3	11S 637083 3936822	Heliostat	Updated age (from Unknown); B. Sousa; 11/12/14.
2014-503-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/16/14	Broken up	< 1 week	Feather spot and partial carcass. Partial left and right wing, singeing in both primaries and secondaries; flux effect grade 2	Singed	2	2	11S 638527 3935706	Heliostat	Added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-504-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/16/14	Feather spot	< 1 week	40+ flight and 100+ body feathers. No evidence of singeing, checked under scope.	Unknown	NA	2	11S 639681 3936616	Fence	
2014-505-ISEGS	Green-Tailed Towhee	GTTO	1	Carcass Survey	9/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole specimen; underside eaten by maggots. No evidence of singeing, checked under scope.	Unknown	NA	2	11S 637700 3935356	Fence	
2014-506-ISEGS	Barn Swallow	BARS	1	Carcass Survey	9/17/14	Feather spot	< 1 week	8 flight and 30 body feathers. Metallic blue body feathers and most flight feathers singed and curled.	Singed	Unk	1	11S 640178 3933586	Heliostat	Corrected Unit to Unit 1; B. Sousa; 11/12/14.
2014-507-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/17/14	Broken up	< 1 week	partial carcass with 1 leg, both wings, keel, torso, and neck, plus	Unknown	NA	1	11S 640124 3933498	Heliostat	

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								18 flight and 50+ body feathers. No evidence of singeing, checked under scope.						
2014-508-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/17/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole specimen; entire body singed (head, back, wings, tail, rump)	Singed	2, 3	1	11S 640396 3933539	ACC Building°	
2014-509-ISEGS	Lazuli Bunting	LAZB	1	Carcass Survey	9/17/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole specimen; dorsal surface, back, head, and wings singed; tail siinged off	Singed	2, 3	1	11S 640392 3933527	ACC Building°	
2014-510-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/17/14	Feather spot	< 1 week	~20 flight and 50 body feathers. No evidence of singeing, checked with scope.	Unknown	NA	1	11S 640494 3933456	Heliostat	
2014-511-ISEGS	Unknown Warbler	UNWA	1	Carcass Survey	9/17/14	Feather spot	< 1 week	8 flight and ~24 body feathers. No evidence of singeing, checked with scope.	Unknown	NA	1	11S 640390 3933644	Heliostat	
2014-512-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/17/14	Feather spot	< 1 week	35 body feathers plus one tuft stuck to mirror by body fluids	Predated	NA	1	11S 640635 3933270	Heliostat	
2014-513-ISEGS	Hermit Warbler	HEWA	1	Incidental	9/17/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; secondaries of right wing singed; singeing on right breast	Singed	1, 3	2	11S 638722 3935810	Light Pole	
2014-514-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/18/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: no evidence of singeing (checked under scope); broken neck; ants inside neck	Collision	NA	1	11S 639642 3933321	Heliostat	
2014-515-ISEGS	Mourning Dove	MODO	1	Incidental	9/18/14	Feather spot	< 1 week	~30 flight feathers; 200+ body feathers; 1 foot; 1 wing, breast/keel bone; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638908 3936968	Heliostat	
2014-516-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	9/22/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass. No external signs of trauma. No evidence of singeing (checked under scope)	Other-Facility	NA	3	11S 637501 3937985	ACC Building°	
2014-517-ISEGS	Gambel's Quail	GAQU	1	Carcass Survey	9/22/14	Feather spot	< 1 week	~40 body feathers and 10 flight feathers. No evidence of singeing (checked under scope)	Unknown	NA	3	11S 637596 3938013	Heliostat	
2014-518-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	9/22/14	Feather spot	< 1 week	10 flight and 25 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 637856 3936774	Heliostat	
2014-519-ISEGS	Savannah Sparrow	SAVS	1	Carcass Survey	9/22/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass. No evidence of collision or singeing (checked under scope)	Unknown	NA	2	11S 637945 3936843	Heliostat	
2014-520-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/22/14	Broken up	< 1 week	Partial carcass and feather spot. ~30 body and 6 flight feathers; two partial wings; leg bones	Unknown	NA	3	11S 637326 3937980	Light Pole	Added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-521-ISEGS	Hermit Thrush	HETH	1	Carcass Survey	9/22/14	Broken up	< 1 week	1 wing; ~10 flight, <50 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637066 3938010	Heliostat	

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2014-522-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	9/23/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: singed tail feathers, primaries and coverts on right wing, right flank, neck and top of head singed; some singeing on left wing; Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638648 3935909	ACC Building°	Corrected GPS point so it is in the ACC Building; B. Sousa; 11/12/14.
2014-523-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	9/23/14	Broken up	< 1 week	feather spot and partial carcass; 2 legs, 30 flight, 15 body feathers; most flight feathers singed and/or curled. Flux effect grade unknown	Singed	Unk	2	11S 638457 3935714	Heliostat	Changed carcass condition (from feather spot) and added detail to description; B. Sousa; 11/12/14.
2014-524-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	9/23/14	Dead, fresh (eyes moist)	< 1 week	Singeing on greater coverts and rump feathers. Flux effect grade 1 and 3.	Singed	1, 3	2	11S 638468 3935743	Heliostat	
2014-525-ISEGS	Gambel's Quail	GAQU	1	Carcass Survey	9/23/14	Broken up	> 1 month	pelvic girdle, 5 body feathers. No evidence of singeing (checked under scope).	Unknown	NA	2	11S 639363 3936773	Heliostat	
2014-526-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/23/14	Feather spot	< 1 week	30 + body feathers. No evidence of singeing (checked under scope).	Collision	NA	3	11S 636897 3936927	Heliostat	Changed certainty from possible to valid; typo; B. Sousa 10/27/14.
2014-527-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/23/14	Feather spot	< 1 week	~10 flight, 8 body feathers; flight feathers singed; dried blood on quills; flux effect grade unknown	Singed	Unk	2	11S 638640 3935916	ACC stairs	
2014-528-ISEGS[¥]	Barn Swallow	BARS	1	Carcass Survey	9/23/14	Alive, injured	< 24 hours	Singed on both wings, tail, right side of head; right eye partially shut. Singeing grade 2, 3.	Singed	2, 3	2	11S 638630 3935842	Solar Concentrating Tower	Added singeing grade; B. Sousa; 11/12/14.
2014-529-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/23/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: open laceration in breast area.	Collision	NA	2	11S 638672 3935903	ACC Building°	Corrected GPS point so it is in the ACC Building; B. Sousa; 11/12/14.
2014-530-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/23/14	Feather spot	< 1 week	5 retrices, body feathers; no evidence of singeing (checked under scope); clear imprint on mirror above feather spot	Collision	NA	3	11S 636360 3936836	Heliostat	
2014-531-ISEGS[¥]	Barn Swallow	BARS	1	Carcass Survey	9/23/14	Alive, injured	< 24 hours	Singeing and curling of primaries and coverts; tail feathers; singed upper back/lower neck; right metatarsus is injured (skin torn). Singeing grade 2, 3.	Singed	2, 3	2	11S 638571 3935832	Unit Control room	Added singeing grade; B. Sousa; 11/12/14.
2014-532-ISEGS[¥]	Western Tanager	WETA	1	Incidental	9/24/14	Alive, injured	< 24 hours	Singed on secondaries of left wing; singed on majority of right wing; head singed on right side; tail feathers singed. Singeing grade 1, 3.	Singed	1, 3	3	11S 637458 3937907	Solar Concentrating Tower	Added singeing grade; B. Sousa; 11/12/14.
2014-533-ISEGS	American Kestrel	AMKE	1	Carcass Survey	9/24/14	Broken up	< 1 week	Feather spot and partial carcass. 8 flight (7 tail, 1 primary); 100+ body feathers; 2 wings; bits of bone; tail feathers singed, both wings singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640220 3933403	Heliostat	Added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-534-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	9/24/14	Broken up	< 1 week	Feather spot and partial carcass. 18 flight feathers; 50 body feathers; lower mandible,	Unknown	Unk	1	11S 639923 3933383	Heliostat	Added carcass description "feather spot and partial

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								part of right wing; no evidence of singeing (checked under scope).						carcass"; B. Sousa; 11/12/14.
2014-535-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/24/14	Broken up	< 1 week	Feather spot and partial carcass. 7 flight, 3 body feathers; all feathers singed (except 1). Flux effect grade unknown.	Singed	Unk	1	11S 640388 3933268	Heliostat	Added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-536-ISEGS[¥]	Mourning Dove	MODO	1	Incidental	9/24/14	Alive, injured	< 24 hours	No external trauma evident; no evidence of singeing; bird could not fly; imprint on near heliostat mirror	Collision		3	11S 639027 3937657	Fence	
2014-537-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	9/24/14	Feather spot	< 1 week	~45 body feathers (scavenged / depredated)	Unknown	NA	1	11S 639848 3933776	Heliostat	
2014-538-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	9/24/14	Feather spot	< 1 week	6 flight feathers, 3 body feathers; partial wing (4 flight feathers stuck together); singed on flight feathers. Flux effect grade unknown.	Singed	Unk	1	11S 640325 3933666	Heliostat	
2014-539-ISEGS	Barn Swallow	BARS	1	Carcass Survey	9/24/14	Feather spot	< 1 week	~50 body, 8 flight feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 640318 3933644	Heliostat	
2014-540-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	9/24/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: no evidence of singeing (checked under scope); been scavenged by ants	Collision		3	11S 637511 3938857	Heliostat	
2014-541-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	9/24/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: no evidence of singeing (checked under scope); upper mandible broken, pushed against head, front of head deformed.	Collision	NA		11S 638575 3934662	Transmission Line	
2014-542-ISEGS	Brewer's Sparrow	BRSP	1	Carcass Survey	9/24/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: no evidence of singeing (checked under scope); full rigor; body fluids leaking, eyes, breast not fully dried	Collision	NA		11S 638573 3934750	Transmission Line	
2014-543-ISEGS	House Wren	HOWR	1	Carcass Survey	9/24/14	Broken up	< 1 week	Partial carcass: tail, foot & leg, partial ribcage, right wing and sternum; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640209 3934113	Heliostat	
2014-544-ISEGS	Greater Roadrunner	GRRO	1	Carcass Survey	9/24/14	Feather spot	< 1 week	~50 body, ~30 flight feathers; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 641349 3933632	Fence	
2014-545-ISEGS	Mourning Dove	MODO	1	Incidental	9/24/14	Broken up	< 1 week	Partial carcass: partial torso, right wing, 100+ body feathers, head	Collision	NA	1	11S 640510 3933870	Heliostat	
2014-546-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: all remiges and most retrices singed; right back, nape and side singed; right face singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640380 3933473	Tower support beam	
2014-547-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: slightly curled wing and tail feathers; wound on left side of neck and eye is	Singed	1, 3	1	11S 640428 3933525	ACC stairs	

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
								missing; singeing on crown, back, rump. Left flank, greater coverts on both wings singed. Flux effect grade 1 and 3.						
2014-548-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/25/14	Mummified	< 1 week	Whole carcass with associated loose feathers (~35 body feathers); no evidence of singeing (checked under scope).	Unknown	NA	1	11S 641156 3934277	Heliostat	
2014-549-ISEGS	Unknown	UNKN	1	Carcass Survey	9/25/14	Feather spot	< 1 week	Clump of <15 feathers attached.The feathers were orange-red in color, the color rubbed off, indicative of being chemically dyed; No evidence of singeing (checked under scope)	Unknown	NA	1	11S 640444 3933558	K-rail	Corrected latitude typo (from 6404444); B. Sousa; 11/12/14.
2014-550-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	9/25/14	Mummified	< 1 month	Carcass with missing head; feathers falling out. No evidence of singeing (checked under scope).	Collision	NA	2	11S 639128 3935113	Heliostat	
2014-551-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/25/14	Mummified	< 1 week	Both wings, tail, left flank, ventral side of rump, crown singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640410 3933564	ACC Building°	
2014-552-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	9/25/14	Mummified	< 1 week	Both wings, tail, ventral right-side flank, top of head singed; flux effect grade 2 and 3.	Singed	2, 3	1	11S 640402 3933557	ACC Building°	
2014-553-ISEGS	Verdin	VERD	1	Carcass Survey	9/25/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: singeing on top of head; rump, undertail coverts; some curling on both wing flight feathers; tail very curled. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640415 3933530	ACC Building°	
2014-554-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	9/25/14	Broken up	< 1 month	2 partial wings/10 flight feathers. No evidence of singeing (checked under scope).	Unknown	NA	2	11S 638991 3935111	Heliostat	
2014-555-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/25/14	Feather spot	< 1 week	10 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638993 3935115	Heliostat	
2014-556-ISEGS	Hermit Warbler	HEWA	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: singed on wings, tail, breast, throat, top of head, back and rump. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640412 3933544	ACC Building°	Entered time since death; B. Sousa; 11/12/14.
2014-557-ISEGS	Orange-crowned Warbler	OCWA	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: Both wings, tail, right side flank and face singed; right breast singed down to skin. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640408 3933529	ACC Building°	
2014-558-ISEGS	Orange-crowned Warbler	OCWA	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: Both wings singed; tail burnt off; belly and left flank, top of head and back singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640388 3933521	ACC Building°	
2014-559-ISEGS†	Vaux's Swift	VASW	1	Incidental	9/25/14	Alive, injured	< 24 hours	Entire dorsal surface singed and curled, right flank and underwing coverts curled; undertail coverts curled. Flux	Singed	2, 3	2	11S 638637 3935917	ACC building	

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								effect grade 2 and 3.						
2014-560-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: fresh looking feathers; in rigor mortis; well-define imprint on mirror above carcass; no evidence of singeing (checked under scope).	Collision	NA	1	11S 641265 3933941	Heliostat	
2014-561-ISEGS¥	Rock Pigeon	ROPI	1	Incidental	9/25/14	Alive, injured	< 24 hours	All flight feathers charred/burnt; all dorsal surface singed; all overtail coverts singed to skin; tail burned down to quills; Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640476 3933607	Heliostat	Corrected how found from carcass survey to incidental; B. Sousa; 11/12/14.
2014-562-ISEGS	Unknown Gnatcatcher	UNGN	1	Carcass Survey	9/25/14	Feather spot	< 1 month	20+ body feathers, 4 secondaries, 5 tail feathers; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640053 3934169	Heliostat	
2014-563-ISEGS	Violet-green Swallow	VGSW	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: Both wings, tail, rump, back, nape, side of head singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640462 3933551	Culvert drainage pipe	
2014-564-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	9/25/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: body stiff and partly scavenged, desiccated. No evidence of singeing (checked under scope).	Collision	NA	2	11S 638638 3937140	Heliostat	
2014-565-ISEGS	Tree Swallow	TRES	1	Carcass Survey	9/25/14	Broken up	< 1 week	Partial carcass: missing torso (scavenged); head intact with spine, and feet; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640348 3933570	ACC support beam	
2014-566-ISEGS	Lark Sparrow	LASP	1	Carcass Survey	9/25/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: intact, fluids leaking out; no evident external trauma; no evidence of singeing (checked under scope).	Collision	NA	2	11S 638323 3935143	Heliostat	Added species code; B. Sousa; 11/12/14.
2014-567-ISEGS	Lesser Nighthawk	LENI	1	Carcass Survey	9/25/14	Feather spot	< 1 week	Tail feathers (6) with piece of rump and undertail coverts and uppertail coverts; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640394 3933532	Power unit building	
2014-568-ISEGS	Mourning Dove	MODO	1	Incidental	9/25/14	Feather spot	< 1 week	4 primaries, 1 secondary, 1 body feather. No evidence of singeing (checked under scope).	Unknown	NA	1	11S 639739 3934314	Heliostat	
2014-569-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	9/25/14	Feather spot	< 1 week	10 body feathers. All feathers singed. Flux effect grade 3.	Singed	3, Unk	1	11S 640444 3933558	K-rail	
2014-570-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	9/25/14	Feather spot	< 1 week	~20 flight and ~60 body feathers; no evidence of singeing (checked under scope); collision imprint on mirror above feather spot	Collision	NA	1	11S 639457 3934047	Heliostat	
2014-571-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/25/14	Feather spot	< 1 week	4 retrices, undertail coverts, body feathers present; no evidence of singeing (checked under scope). Imprint on mirror	Collision	NA	2	11S 637757 3935537	Heliostat	

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								matched MODO size and shape.						
2014-572-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	9/29/14	Feather spot	< 1 week	~25 body and ~18 flight feathers; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637469 3937775	Heliostat	
2014-573-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	9/29/14	Mummified	< 1 week	Whole carcass: feathers falling out, eyes eaten by ants; tip of lower mandible broken; no evidence of singeing (checked under scope).	Collision	NA	3	11S 636907 3937864	Heliostat	
2014-574-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/29/14	Feather spot	< 1 week	~10 flight, ~20 body feathers; no evidence of singeing (checked under scope).	Unknown	NA	3	11S 637266 3938002	Heliostat	
2014-575-ISEGS	Lincoln's Sparrow	LISP	1	Carcass Survey	9/29/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: very fresh plumage, eyes present, no rigor.	Collision	NA	3	11S 637471 3938112	Heliostat	
2014-576-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	9/29/14	Mummified	< 1 month	Whole carcass: desiccated; eyes missing, dry sockets; ant scavenged; no evidence of singeing (checked under scope).	Collision	NA	2	11S 639521 3935240	Heliostat	
2014-577-ISEGS	Unknown passerine	UNPA	1	Carcass Survey	9/29/14	Feather spot	< 1 week	14 flight, 22 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	3	11S 637620 3937901	Heliostat	
2014-578-ISEGS	Barn Swallow	BARS	1	Carcass Survey	9/30/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed and curled; entire dorsal surface and under wings singed. Singeing grade 2, 3.	Singed	2, 3	2	11S 638649 3935888	ACC Building°	Added singeing grade; B. Sousa; 11/12/14.
2014-579-ISEGS	Mourning Dove	MODO	1	Carcass Survey	9/30/14	Broken up	< 1 week	2 partial wings connected with bones; rump with tail and legs; some rib cage; plus 5 flight and ~50 body feathers; no sign singeing (checked with scope)	Unknown	NA	2	11S 638664 3935674	Heliostat	
2014-580-ISEGS	Barn Swallow	BARS	1	Carcass Survey	9/30/14	Broken up	< 1 week	rump (under and over tail coverts) with tail, retrices and coverts singed. Flux effect grade unknown.	Singed	Unk	2	11S 638760 3935944	Heliostat	
2014-581-ISEGS	Orange-crowned Warbler	OCWA	1	Carcass Survey	9/30/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; entire dorsal surface singed; all flight feathers singed and curled; breast, sides, and face singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638662 3935861	Project Building	
2014-582-ISEGS	Verdin	VERD	1	Carcass Survey	9/30/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed and curled; face singed. Singeing grade 2, 3.	Singed	2, 3	2	11S 638712 3935860	Auxiliary Boiler	Added singeing grade; B. Sousa; 11/12/14.
2014-583-ISEGS	Gambel's Quail	GAQU	1	Carcass Survey	9/30/14	Mummified	< 1 month	whole carcass; no sign of collision or singeing (checked with scope); scavenged by ants	Unknown	NA	3	11S 638602 3938143	Heliostat	
2014-584-ISEGS*	Savannah Sparrow	SAVS	1	Incidental	9/30/14	Alive, injured	< 24 hours	No obvious evidence of external injuries, but bird would not fly and appeared off balance	Collision	NA	3	11S 636463 3937515	Gate	Corrected "how found" (from carcass survey); B. Sousa; 11/12/14.
2014-585-ISEGS	Savannah Sparrow	SAVS	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: bill deformed, no other sign of external trauma;	Collision		1	11S 640146 3933986	Heliostat	

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								no evidence of singeing (checked under scope).						
2014-586-ISEGS	Savannah Sparrow	SAVS	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: scavenged by ants, feathers in good condition, eyes dried out, but present. No evidence of singeing (checked under scope).	Collision	NA	2	11S 638576 3936552	Heliostat	
2014-587-ISEGS	Barn Swallow	BARS	1	Carcass Survey	10/1/14	Broken up	< 1 week	Feather spot and partial carcass. 4 tail feathers, 3 body feathers; 2 wings devoid of feathers; all retrices and few remiges singed. Flux effect grade unknown.	Singed	Unk	1	11S 640150 3933558	Heliostat	Added carcass description "feather spot and partial carcass"; B. Sousa; 11/12/14.
2014-588-ISEGS	Violet-green Swallow	VGSW	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass minus lower right wing. Singed on top of head and primaries of Left wing. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640415 3933542	ACC Building°	
2014-589-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/1/14	Broken up	< 1 month	2 full separate wings; partial carcass; ~100 body feathers. No evidence of singeing (checked under scope).	Unknown	NA	2	11S 638947 3937003	Heliostat	
2014-590-ISEGS	Virginia Rail	VIRA	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: body scavenged on by ants, desiccated; no evidence of singeing (checked under scope).	Collision	NA	1	11S 639755 3933722	Heliostat	Corrected age (from adult) after review by AKW; B. Sousa; 11/12/14.
2014-591-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/1/14	Broken up	< 1 week	Partial carcass: 1 whole wing, 1 partial wing, tail, body feathers; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640239 3933298	Heliostat	
2014-592-ISEGS	Swainson's Thrush	SWTH	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: eyes sunken, feathers in good condition; no external trauma or singeing evident (checked under scope).	Collision	NA	2	11S 638402 3936926	Heliostat	
2014-593-ISEGS[¥]	Ruby-crowned Kinglet	RCKI	1	Incidental	10/1/14	Alive, injured	< 24 hours	Worker saw bird fall from flux. Entire dorsal surface singed. Wings curled, all rump feathers singed off. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640412 3933426	Ground	
2014-594-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: wings and back singed and curled; entire dorsal and ventral surface singed; Flux effect grade 2 and 3.	Singed	2, 3	3	11S 637446 3937928	Support beam	
2014-595-ISEGS	Unknown Woodpecker	UNWO	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: entire bird burned down to skin. All feathers burned off, all flight feathers burned down to shortened quills, feathers melted. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640390 3933498	Other Machinery	
2014-596-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: all flight feathers singed; tail burned off; entire dorsal surface singed; entire ventral surface singed; flux effect grade 2 and 3.	Singed	2, 3	1	11S 640353 3933472	Parking Area	

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2014-597-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/1/14	Feather spot	< 1 week	~15 body feathers; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640497 3933466	Heliostat	
2014-598-ISEGS	Tree Swallow	TRES	1	Carcass Survey	10/1/14	Feather spot	< 1 week	13 flight, ~10 body feathers; singed/curled flight feathers, most body feathers singed; flux effect grade unknown	Singed	Unk	1	11S 640383 3933522	Cement platform	
2014-599-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; all flight feathers and dorsal surface singed. Singeing grade 2, 3.	Singed	2, 3	1	11S 640338 3933441	Other	Added singeing grade; B. Sousa; 11/12/14.
2014-600-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	10/1/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: bill damaged (keratin whitish and stressed, indicative of bending from impact); no evidence of singeing (checked under scope).	Collision	NA	1	11S 640464 3933678	Heliostat	
2014-601-ISEGS	Anna's Hummingbird	ANHU	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass: all feathers singed; flux effect grade 2 and 3.	Singed	2, 3	1	11S 640326 3933534	Support structure for water pipes	Added distance and azimuth to Project feature; B. Sousa; 11/12/14.
2014-602-ISEGS	Hermit Warbler	HEWA	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 month	Whole carcass, all flesh consumed by ants; tail singed to rump; both wings curled and singed; singeing evident on some body feathers. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640329 3933479	Project Building	
2014-603-ISEGS	Unknown Warbler	UNWA	1	Carcass Survey	10/1/14	Broken up	< 1 week	L wing with coverts and some body feathers attached; all wing feathers, including flights and coverts, singed and curled. Flux effect grade 2 and 3.	Singed	3, Unk	1	11S 640339 3933450	Project Building	
2014-604-ISEGS	White-Crowned Sparrow	WCSP	1	Incidental	10/1/14	Feather spot	< 1 week	35 flight feathers, ~40 body feathers; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 637798 3936731	Heliostat	
2014-605-ISEGS	American Coot	AMCO	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass minus one leg; no obvious signs of collision or singeing (checked with scope)	Unknown		1	11S 641350 3934208	Fence	
2014-606-ISEGS	Lincoln's Sparrow	LISP	1	Incidental	10/2/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; no obvious signs of singeing (checked with scope), smudge and feather on heliostat	Collision	NA	1	11S 639537 3933725	Heliostat	
2014-607-ISEGS	Pine Siskin	PISI	1	Incidental	10/5/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feather singed; entire dorsal surface singed; crown, breast, sides, and undertail coverts singed. Flux effect grade 2 and 3.	Singed	2, 3	3	11S 637449 3937876	Light Pole	
2014-608-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/6/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; primaries and secondaries singed; breast, flank, top of head, face, ventral neck, coverts of both wings, and right side of neck singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638662 3935911	ACC Building°	

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2014-609-ISEGS	Brewer's Blackbird	BRBL	1	Carcass Survey	10/6/14	Feather spot	< 1 week	25 flight and 40 body feathers; no sign of singeing (checked under scope)	Unknown	NA	3	11S 637393 3937682	Heliostat	
2014-610-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/6/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; all flight feathers and coverts singed; entire dorsal surface, flanks, sides, undertail coverts, and leg feathers singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638665 3935907	ACC Building°	
2014-611-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/6/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; singed retrices and remiges; crown and upper breast singed. Flux effect grade 2 and 3	Singed	2, 3	2	11S 638543 3935921	Other	
2014-612-ISEGS	Violet-green Swallow	VGSW	1	Carcass Survey	10/6/14	Broken up	< 1 week	tail with rump and 1 leg attached; partial wing; 25 flight feathers; No evidence of singeing (checked under scope)	Unknown	NA	2	11S 638569 3936029	Heliostat	
2014-613-ISEGS	Gambel's Quail	GAQU	1	Carcass Survey	10/6/14	Feather spot	< 1 month	partial L wing and 12 additional wing feathers; no sign of singeing (checked under scope)	Unknown	NA	2	11S 639558 3935233	Heliostat	Corrected species code from CAQU to GAQU; B. Sousa; 11/12/14.
2014-614-ISEGS	Unknown	UNPA	1	Incidental	10/6/14	Broken up	< 1 week	two legs, pelvic girdle, and one body feather. No sign of singeing (checked under scope).	Unknown	NA	2	11S 639573 3936467	Heliostat	Corrected how found (from carcass survey); B. Sousa; 11/12/14.
2014-615-ISEGS	Orange-crowned Warbler	OCWA	1	Carcass Survey	10/6/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; flight feathers of both wings singed; retrices singed; head, back, L belly, L side, and L flank singed; Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638666 3935878	Project Building	
2014-616-ISEGS	Orange-crowned Warbler	OCWA	1	Incidental	10/6/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; Entire body singed except throat and middle of the belly; tail singed off. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640375 3933508	Solar Concentrating Tower	
2014-617-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; all flight feathers singed and curled; all body feathers except throat and rump singed. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640394 3933505	Project Building	
2014-618-ISEGS	Townsend's Warbler	TOWA	1	Carcass Survey	10/6/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers and coverts singed; rump, crown, and most of back singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638677 3935834	Project Building	
2014-619-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/6/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed; crown, face, breast, L flank, rump, and back singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638594 3935788	Other	
2014-620-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/6/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; singed on tail feathers; both eyes white and opaque - possibly ocular damage. Flux effect grade 1.	Singed	1	2	11S 638526 3935850	Other	
2014-621-ISEGS	Savannah Sparrow	SAVS	1	Carcass Survey	10/7/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: very fresh feathers; eyes moist. No	Collision	NA	2	11S 639056 3936337	Heliostat	

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
								evidence of singeing (checked under scope).						
2014-622-ISEGS	White-Crowned Sparrow	WCSP	1	Incidental	10/7/14	Broken up	< 1 week	Body parts found: wings, head, body feathers. No evidence of singeing (checked under scope).	Unknown	NA	2	11S 637960 3936417	Heliostat	Corrected how found from carcass survey to incidental; B. Sousa; 11/12/14.
2014-623-ISEGS	Lark Sparrow	LASP	1	Carcass Survey	10/8/14	Feather spot	< 1 week	2 retrices, partial wing, ~10 body feathers; No imprint found. No evidence of singeing (checked under scope)	Unknown	NA	2	11S 639672 3935957	Heliostat	
2014-624-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	10/8/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; imprint on closest heliostat, no obvious external injuries	Collision	NA	2	11S 637724 3936316	Heliostat	
2014-625-ISEGS	White-Crowned Sparrow	WCSP	1	Carcass Survey	10/8/14	Feather spot	< 1 week	Partial body with retrices, part of wing, foot, and 100+ body feathers. Imprint on mirror	Collision	NA	2	11S 637770 3936329	Heliostat	
2014-626-ISEGS	Unknown Sparrow	UNSP	1	Carcass Survey	10/8/14	Feather spot	< 1 month	1 flight feather; ~40 breast and body feathers, including a clump of breast feathers; no imprint found; No evidence of singeing (checked under scope).	Unknown	NA	2	11S 637920 3936589	Heliostat	Corrected GPS point so it is in the ACC Building; B. Sousa; 11/12/14.
2014-627-ISEGS	Chipping Sparrow	CHSP	1	Carcass Survey	10/9/14	Broken up	< 1 month	Scalp and bill; no imprint found; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 639372 3935805	Heliostat	
2014-628-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/9/14	Broken up	< 1 week	partial wing; no imprint found; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 638943 3935090	Heliostat	
2014-629-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/9/14	Broken up	< 1 week	most of entire carcass, broken up and ant scavenged; no imprint found; no evidence of singeing (checked under scope)	Unknown	NA	2	11S 639129 3935212	Heliostat	
2014-630-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	10/10/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 24 hours	Whole carcass; all feathers singed, some down to skin. Flux effect grade 2 and 3.	Singed	2, 3	1	11S 640380 3933514	Solar Concentrating Tower	
2014-631-ISEGS	Cooper's Hawk	COHA	1	Incidental	10/10/14	Dead, fresh (eyes moist)	< 1 week	whole carcass missing head (see notes)	Unknown	NA	3	11S 637542 3937967	ACC Building	Corrected time since death to 2 days on 10/14/14 - subsequent examination found maggots in cloaca, making the carcass older than 24 hours; B. Sousa; 11/12/14.
2014-632-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	10/11/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; entire dorsal surface singed; all flight feathers singed and curled; breast and axillaries singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638637 3935835	Solar Concentrating Tower	
2014-633-ISEGS	House Finch	HOFI	1	Incidental	10/12/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; all flight feathers singed and curled; entire dorsal surface, head, and left ventral side singed. Flux effect grade 2	Singed	2, 3	2	11S 638640 3935880	ACC Building	

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
								and 3.						
2014-634-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	10/12/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed and curled; L ventral side singed; face and rump singed. Flux effect grade 2 and 3.	Singed	2, 3	2	11S 638636 3935838	Solar Concentrating Tower	
2014-635-ISEGS	Unknown	UNPA	1	Carcass Survey	10/13/14	Feather spot	< 1 month	13 body and 8 flight feathers, partial tail; singed flight feathers on partial tail and some singed body feathers; flux effect grade unknown	Singed	2, 3	1	11S 640330 3933387	Heliostat	
2014-636-ISEGS	Lesser Goldfinch	LEGO	1	Carcass Survey	10/13/14	Broken up	< 1 week	L wing and clump of ~25 body feathers; flight feathers and coverts singed; flux effect grade unknown	Singed	Unk	1	11S 640394 3933373	Heliostat	
2014-637-ISEGS	House Finch	HOFI	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; L side of face, L flank, L retrices singed; tips of R primaries and secondaries singed; 2 greater coverts singed. Flux effect grade 1 and 3.	Singed	1, 3	1	11S 640417 3933540	ACC Building°	
2014-638-ISEGS	House Finch	HOFI	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; entire body singed including all flight feathers. Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640406 3933534	ACC Building°	
2014-639-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; top of head and upper breast singed; all retrices, primaries, secondaries, and most coverts singed. Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640379 3933527	ACC Building°	
2014-640-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; entire body singed except throat and right flank, including all flight feathers. Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640367 3933530	ACC Building°	
2014-641-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed; entire dorsal surface, breast, and L flank singed. Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640373 3933534	ACC Building°	
2014-642-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; entire body singed, all flight feathers singed down to pins. Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640378 3933535	ACC Building°	
2014-643-ISEGS	Barn Swallow	BARS	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 month	whole carcass; bill damaged with broken tip; remiges singed and curled; tail feathers singed off; body feathers too weathered to determine singeing; back of neck singed; Flux effect grades 2 and 3.	Singed	2, 3	1	11S 640416 3933516	Transform Box	
2014-644-ISEGS	Unknown	UNPA	1	Carcass Survey	10/13/14	Feather spot	< 1 week	4 flight and 25+ body feathers; all 4 flight feathers singed and curled; clump of 12+ body feathers singed; Flux effect grade unknown, 3.	Singed	3, Unk	1	11S 640356 3933370	Heliostat	
2014-645-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	10/13/14	Feather spot	< 1 week	6 primaries and 1 retrix; 4 retrices, 2 remiges, 6 body	Singed	Unk	1	11S 640322 3933353	Heliostat	Added additional parts found in

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
								feathers; 1 body feather and 3 primaries singed. Flux effect grade unknown.						subsequent survey to description; B. Sousa; 11/12/14.
2014-646-ISEGS	American Pipit	AMPI	1	Carcass Survey	10/13/14	Feather spot	< 1 week	2 partial wings, clump of tail feathers, 2 feet, and 15+ body feathers; no evidence of singeing (checked under scope).	Unknown	NA	1	11S 640501 3933315	Heliostat	
2014-647-ISEGS	Pine Siskin	PISI	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; L side of head and neck, L wing tertials and greater coverts, R wing secondaries, R greater coverts, and R primary coverts singed. Some singeing on back and rump. Flux effect grades 1 and 3.	Singed	1, 3	1	11S 640361 3933296	Heliostat	
2014-648-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Feather spot	< 1 month	2 partial wings, 12 flight, and 12+ body feathers. No evidence of singeing (checked under scope).	Unknown	NA	1	11S 640569 3933427	Heliostat	
2014-649-ISEGS	Unknown	UNPA	1	Carcass Survey	10/13/14	Feather spot	< 1 week	2 primaries; No evidence of singeing (checked under scope).	Unknown	Unk	1	11S 640399 3933558	ACC Building	
2014-650-ISEGS	Unknown Swallow	UNSW	1	Carcass Survey	10/13/14	Feather spot	< 1 week	3 primaries; all feathers found singed and curled; Flux effect grade unknown	Singed	Unk	1	11S 640322 3933353	Heliostat	
2014-651-ISEGS	Vaux's Swift	VASW	1	Carcass Survey	10/13/14	Feather spot	< 1 month	partial right wing; primaries singed. Flux effect grade unknown	Singed	NA	1	11S 640384 3933673	Heliostat	
2014-652-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; all flight feathers singed; head, upper breast, and back singed	Singed	2, 3	1	11S 640387 3933481	Project Building	
2014-653-ISEGS	Yellow-rumped Warbler	YRWA	1	Carcass Survey	10/13/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all retrices and most remiges singed; crown, L side of face, and breast singed	Singed	2, 3	1	11S 640400 3933486	Project Building	
2014-654-ISEGS	American Pipit	AMPI	1	Carcass Survey	10/13/14	Feather spot	< 1 week	~12 flight and 50+ body feathers; no evidence of singeing found (checked under scope)	Unknown	NA	1	11S 640489 3933281	Heliostat	
2014-655-ISEGS	Yellow Warbler	YEWA	1	Carcass Survey	10/13/14	Feather spot	< 1 week	4 primaries, 1 contour feather, 1 retrix, and 1 undertail covert; 2 primaries singed and curled, 1 contour and 1 tail feather singed. Flux effect grade unknown, 3.	Singed	3, Unk	1	11S 640569 3933427	Heliostat	
2014-656-ISEGS	White-Crowned Sparrow	WCSP	1	Incidental	10/14/14	Broken up	< 24 hours	Partial carcass with lower body and wings, most of guts and feathers removed. Broken L leg, puncture wounds to body consistent with predator talons. No evidence of singeing (checked under scope)	Predated	NA	1	11S 639942 3933327	Heliostat	
2014-657-ISEGS	Western Meadowlark	WEME	1	Carcass Survey	10/14/14	Dead, semi-fresh (eyes	< 1 week	whole carcass; no obvious external injuries; imprint on	Collision	NA	1	11S 639808 3933801	Heliostat	

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
						desiccated, rigor mortis)		mirror; no evidence of singeing (checked under scope)						
2014-658-ISEGS	Unknown	UNPA	1	Carcass Survey	10/15/14	Feather spot	< 1 week	4 flight feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 639972 3932839	Heliostat	
2014-659-ISEGS	Mourning Dove	MODO	1	Carcass Survey	10/15/14	Mummified	< 1 month	headless and largely fleshless body + ~50 scattered body feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 639366 3932872	Heliostat	
2014-660-ISEGS	Unknown	UNPA	1	Carcass Survey	10/15/14	Feather spot	< 1 month	11 primaries/secondaries, 6 retrices, 50+ body feathers; no evidence of singeing (checked under scope)	Unknown	NA	1	11S 639428 3933350	Heliostat	
2014-661-ISEGS	Yellow-rumped Warbler	YRWA	1	Incidental	10/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	whole carcass; all flight feathers singed and curled; R side and L rump singed; breast, face, crown, upper back and both axillaries singed	Singed	2, 3	1	11S 640502 3933505	Heliostat	
2014-662-ISEGS	Brown-headed cowbird	BHCO	1	Carcass Survey	10/16/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 24 hours	whole carcass; blood on bill, imprint found on heliostat	Collision	NA	1	11S 640757 3932746	Heliostat	
2014-B21-ISEGS	California Myotis	MYCA	1	Carcass Survey	8/18/14	Mummified	< 1 month	Whole carcass, desiccated; appears damaged on ventral side; no evidence of singeing (checked under scope)	Other-Facility	NA	3	11S 637455 3937959	ACC building	
2014-B22-ISEGS	Canyon Bat	PAHE	1	Carcass Survey	8/18/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass; no singeing (checked under scope); unknown cause of death	Other-Facility	NA	3	11S 637499 3937943	ACC building	
2014-B23-ISEGS	Myotis sp.	MYSP	1	Carcass Survey	8/20/14	Mummified	> 1 month	Whole carcass; no evidence of singeing (checked under scope); decayed, desiccated	Unknown	NA	1	11S 640426 3933497	Auxiliary Boiler	
2014-B24-ISEGS	Unknown	UNBA	1	Carcass Survey	8/20/14	Broken up	< 1 month	partial carcass; no evidence of singeing (checked under scope); uropatagium and bones found	Unknown	Unk	1	11S 640392 3933473	Other	Updated time since death from Unknown to 3 weeks; B. Sousa; 11/12/14.
2014-B25-ISEGS	California Myotis	MYCA	1	Carcass Survey	8/25/14	Dead, semi-fresh (eyes desiccated, rigor mortis)	< 1 week	Whole carcass. Somewhat decayed; body fluids dripping out; lacerations on ventral torso	Collision	NA	3	11S 637495 3937974	ACC fan deck	Corrected GPS point so it is in the ACC Building; B. Sousa; 11/12/14.
2014-B26-ISEGS	Big Brown Bat	EPFU	1	Carcass Survey	8/25/14	Mummified	> 1 month	mummified and hollow whole carcass	Unknown	NA	3	11S 637391 3937904	Other	
2014-B27-ISEGS	Mexican Free-tailed Bat	TABR	1	Carcass Survey	9/3/14	Dead, fresh (eyes moist)	< 1 week	Whole carcass: aspirations around mouth, appears to have hatched parasite on dorsal side	Unknown		1	11S 640387 3933578	ACC building	
2014-B28-ISEGS	California Myotis	MYCA	1	Carcass Survey	9/3/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: trauma to right ventral part of body and humerus.	Collision	NA	1	11S 640385 3933521	Project building	
2014-B29-ISEGS	Canyon Bat	PAHE	1	Carcass Survey	9/9/14	Dead, fresh (eyes moist)	< 24 hours	Whole carcass: possible lacerations; skin torn on dorsal side; no evidence of singeing (checked under scope)	Collision	NA	2	11S 638668 3935887	ACC building	
2014-B30-ISEGS	Canyon Bat	PAHE	1	Carcass Survey	10/1/14	Dead, semi-fresh (eyes	< 1 week	Whole carcass; no evidence of singeing (checked under	Other-Facility	NA	1	11S 640393 3933550	ACC building	Reexamined carcass and changed ID

USFWS #	Common Name	Species Code[1]	Number Individuals	How found	Collection Date	Bird/Carcass Condition	Time Since Death/Injury	Description of Carcass/Injury	Cause of Injury /Mortality[2]	Burn Grade	Unit	UTM Coordinates[3]	Nearest Project Feature	SPUT Revisions[4]
						desiccated, rigor mortis)		scope); decayed, desiccated						from Unknown to Canyon Bat; B. Sousa 10/15/14.
2014-B31-ISEGS	Mexican Free-tailed Bat	TABR	1	Carcass Survey	10/13/14	Dead, fresh (eyes moist)	< 24 hours	whole carcass; no evidence of singeing (checked under scope); broken finger on R wing; both wing membranes torn; trauma to L leg and bruising on L uropatagium; L ear torn	Collision	NA	1	11S 640351 3933554	Other Machinery	

[1] Alpha codes are defined in Table 9.

[2] "Unknown" cause of death = no evidence of singeing and no clear evidence of what caused the fatality; "Singed" = evidence of singeing on the carcass or feather spot; "Collision" = evidence of collision was observed, such as a bird-strike imprint and/or feathers on a heliostat above the detection; "Other" = a detection with a known cause without signs of collision or singeing (in fall 2014, all "other" detections were of birds found in the ACC units).

Where sufficient information was available for earlier detections, singed carcass detections were assigned a singeing grade based on Kagan et al. (2014), as follows:

- Grade 1 – curling of less than 50% of the flight feathers
- Grade 2 – curling of 50% or more of the flight feathers
- Grade 3 – curling and visible charring of contour feathers

Grades were not applied in the case of feather spots or partial carcasses.

[3] UTM = Universal Transverse Mercator coordinate system

§ Alive and recovering at rehabilitation facility.
* Released alive.
¥ Died at rehabilitation facility.
† Died on site.
° Found inside ACC building.

Appendix B. Additional Detection Data for Fatality Estimates and Documentation of Fatality Estimates in Which Each Detection Was Included.

		Variables for Fatality Estimator							Fatality Estimates in Which Each Detection was Included							
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-374-ISEGS	Unit Fence	1008	Small		Carcass	Unknown	Yes	14	Yes						X	
2014-375-ISEGS	Power Block*	60	Small		Carcass	Singeing	No	20	No				X			
2014-376-ISEGS	Power Block*	66	Small		Carcass	Singeing	No	20	No				X			
2014-377-ISEGS	Outer Segment	1067	Small		Carcass	Unknown	No	12	Yes		X					
2014-378-ISEGS	Inner HD	130	Small	Small	Feather Spot	Singeing	No	20	Yes	X				X		
2014-379-ISEGS	Power Block	110	Small	Large	Feather Spot	Singeing	No	20	Yes	X		X				
2014-380-ISEGS	Power Block	35	Small		Carcass	Singeing	No	20	Yes	X		X				
2014-381-ISEGS	Power Block	38	Small		Carcass	Singeing	No	20	Yes	X		X				
2014-382-ISEGS	Outer Segment	1273	Large		Carcass	Collision	No	12	Yes		X					
2014-383-ISEGS	Power Block	35	Small		Carcass	Singeing	Yes	14	Yes	X		X				
2014-384-ISEGS	Power Block	20	Small		Carcass	Singeing	No	15	Yes	X		X				
2014-385-ISEGS	Power Block*	82	Small		Carcass	Singeing	No	15	No				X			
2014-386-ISEGS	Power Block*	57	Small		Carcass	Singeing	No	15	No				X			
2014-387-ISEGS	Outer Segment	1130	Large	Large	Feather Spot	Unknown	No	21	Yes		X					
2014-388-ISEGS	Power Block	15	Small		Carcass	Singeing	No	15	Yes	X		X				
2014-389-ISEGS	Power Block	70	Small		Carcass	Singeing	No	15	Yes	X		X				
2014-390-ISEGS	Inner HD	230	Large	Small	Feather Spot	Unknown	No	15	Yes	X				X		
2014-391-ISEGS	Other Project Lands‡		Small		Carcass	Collision	Yes		No							Outside of survey area
2014-392-ISEGS	Inner HD	220	Small	Small	Feather Spot	Singeing	No	9	Yes	X				X		
2014-393-ISEGS	Outer Segment	775	Small		Carcass	Collision	No	19	Yes		X					
2014-394-ISEGS	Power Block*	65	Small	Small	Feather Spot	Unknown	No	9	No				X			
2014-395-ISEGS	Inner HD	170	Small		Carcass	Collision	No	9	Yes	X				X		
2014-396-ISEGS	Inner HD	230	Raptor	Small	Feather Spot	Singeing	No	9	Yes	X				X		
2014-397-ISEGS	Power Block	86	Small		Carcass	Singeing	No	9	Yes	X		X				
2014-398-ISEGS	Power Block	18	Small		Carcass	Unknown	No	9	Yes	X		X				
2014-399-ISEGS	Outer Segment	1394	Large		Carcass	Unknown	No	19	Yes		X					
2014-400-ISEGS	Inner HD	220	Small		Carcass	Collision	No	9	Yes	X				X		
2014-401-ISEGS	Inner HD	210	Small	Small	Feather Spot	Singeing	No	9	Yes	X				X		
2014-402-ISEGS	Inner HD	280	Small	Small	Feather Spot	Singeing	No	9	Yes	X				X		
2014-403-ISEGS	Outer Segment	840	Small		Carcass	Collision	No	15	Yes		X					
2014-404-ISEGS	Outer Segment	770	Small		Carcass	Unknown	No	7	No							Older than interval
2014-405-ISEGS	Outer Segment	990	Small		Carcass	Collision	No	7	No							Older than interval
2014-406-ISEGS	Power Block	80	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-407-ISEGS	Unit Fence	1400	Small		Carcass	Unknown	Yes	6	Yes						X	
2014-408-ISEGS	Outer Segment	1070	Small		Carcass	Unknown	No	7	No							Older than interval

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included								
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-409-ISEGS	Inner HD	230	Large	Large	Feather Spot	Unknown	No	7	Yes	X				X		
2014-410-ISEGS	Power Block	92	Small	Large	Feather Spot	Singeing	No	7	Yes	X		X				
2014-411-ISEGS	Power Block*	62	Small		Carcass	Singeing	No	7	No				X			
2014-412-ISEGS	Inner HD	210	Small		Carcass	Singeing	No	7	Yes	X				X		
2014-413-ISEGS	Power Block	108	Small		Carcass	Singeing	Yes	7	Yes	X		X				
2014-414-ISEGS	Power Block	80	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-415-ISEGS	Inner Segment	470	Small		Carcass	Unknown	No	7	Yes		X					
2014-416-ISEGS	Power Block	88	Small		Carcass	Unknown	No	7	Yes	X		X				
2014-417-ISEGS	Outer Segment	770	Large	Large	Feather Spot	Unknown	No	7	Yes		X					
2014-418-ISEGS	Power Block	120	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-419-ISEGS	Power Block	35	Small		Carcass	Singeing	No	0	Yes	X		X				
2014-420-ISEGS	Inner Segment	570	Small		Carcass	Unknown	No	7	Yes		X					
2014-421-ISEGS	Inner HD	230	Large	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-422-ISEGS	Unit Fence	861	Large	Large	Feather Spot	Unknown	No	7	Yes						X	
2014-423-ISEGS	Unit Fence	1050	Large	Large	Feather Spot	Unknown	No	7	Yes						X	
2014-424-ISEGS	Unit Fence	1166	Large	Large	Feather Spot	Unknown	No	7	Yes						X	
2014-425-ISEGS	Power Block	10	Small		Carcass	Singeing	Yes	1	Yes	X		X				
2014-426-ISEGS	Outer Segment	820	Small		Carcass	Unknown	No	7	Yes		X					
2014-427-ISEGS	Outer Segment	850	Small		Carcass	Collision	No	7	Yes		X					
2014-428-ISEGS	Outer Segment	710	Small		Carcass	Collision	No	7	No							Older than interval
2014-429-ISEGS	Power Block*	70	Small		Carcass	Singeing	Yes	5	No				X			
2014-430-ISEGS	Power Block*	67	Small		Carcass	Unknown	Yes	5	No				X			
2014-431-ISEGS	Power Block	76	Raptor		Carcass	Singeing	Yes	4	Yes	X		X				
2014-432-ISEGS	Power Block	75	Small		Carcass	Singeing	Yes	5	Yes	X		X				
2014-433-ISEGS	Power Block	100	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-434-ISEGS	Power Block	100	Small		Carcass	Singeing	Yes	6	No							Older than interval
2014-435-ISEGS	Power Block*	75	Small		Carcass	Singeing	No	7	No				X			
2014-436-ISEGS	Power Block	85	Small		Carcass	Unknown	No	7	No							Older than interval
2014-437-ISEGS	Power Block	46	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-438-ISEGS	Power Block	48	Small		Carcass	Singeing	Yes	8	Yes	X		X				
2014-439-ISEGS	Power Block	60	Small		Carcass	Unknown	Yes	7	Yes	X		X				
2014-440-ISEGS	Inner HD	171	Small		Carcass	Singeing	No	7	Yes	X				X		
2014-441-ISEGS	Outer Segment	950	Large		Carcass	Unknown	No	7	Yes		X					
2014-442-ISEGS	Power Block	60	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-443-ISEGS	Power Block	65	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-444-ISEGS	Power Block	84	Small		Carcass	Singeing	No	7	Yes	X		X				

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included								
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-445-ISEGS	Outer Segment	1140	Small		Carcass	Unknown	No	7	No							Older than interval
2014-446-ISEGS	Power Block	120	Small		Carcass	Singeing	Yes	7	Yes	X		X				
2014-447-ISEGS	Power Block	53	Small		Carcass	Singeing	Yes	9	Yes	X		X				
2014-448-ISEGS	Inner HD	130	Small		Carcass	Unknown	No	7	Yes	X				X		
2014-449-ISEGS	Power Block	45	Small		Carcass	Singeing	Yes	9	Yes	X		X				
2014-450-ISEGS	Inner HD	240	Small	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-451-ISEGS	Power Block	64	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-452-ISEGS	Power Block*	72	Small		Carcass	Singeing	No	7	No				X			
2014-453-ISEGS	Inner HD	110	Large	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-454-ISEGS	Power Block*	65	Small		Carcass	Singeing	No	7	No				X			
2014-455-ISEGS	Power Block	100	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-456-ISEGS	Power Block	140	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-457-ISEGS	Power Block	110	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-458-ISEGS	Power Block	53	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-459-ISEGS	Power Block	47	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-460-ISEGS	Power Block	50	Small		Carcass	Singeing	Yes	9	Yes	X		X				
2014-461-ISEGS	Outer Segment	1045	Large	Large	Feather Spot	Collision	No	7	Yes		X					
2014-462-ISEGS	Power Block	24	Small		Carcass	Singeing	Yes	9	Yes	X		X				
2014-463-ISEGS	Power Block	32	Small		Carcass	Singeing	No	7	No							Older than interval
2014-464-ISEGS	Power Block	120	Small		Carcass	Singeing	Yes	1	Yes	X		X				
2014-465-ISEGS	Outer Segment	725	Small		Carcass	Unknown	No	14	Yes		X					
2014-466-ISEGS	Outer Segment	1060	Small	Small	Feather Spot	Unknown	No	14	Yes		X					
2014-467-ISEGS	Power Block	30	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-468-ISEGS	Power Block	30	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-469-ISEGS	Power Block	40	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-470-ISEGS	Power Block	10	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-471-ISEGS	Power Block	50	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-472-ISEGS	Power Block	40	Small		Carcass	Singeing	Yes	4	Yes	X		X				
2014-473-ISEGS	Power Block	40	Small		Carcass	Singeing	Yes	4	Yes	X		X				
2014-474-ISEGS	Inner HD	190	Large		Carcass	Unknown	No	14	Yes	X				X		
2014-475-ISEGS	Power Block	0	Small		Carcass	Unknown	Yes	6	Yes	X		X				
2014-476-ISEGS	Power Block	57	Small		Carcass	Unknown	No	14	Yes	X		X				
2014-477-ISEGS	Power Block*	95	Small		Carcass	Singeing	No	7	No				X			
2014-478-ISEGS	Power Block	96	Small		Carcass	Singeing	No	15	Yes	X		X				
2014-479-ISEGS	Power Block	0	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-480-ISEGS	Outer Segment	1076	Small	Small	Feather Spot	Unknown	No	7	No							Older than interval

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included								
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-481-ISEGS	Power Block	10	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-482-ISEGS	Power Block	89	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-483-ISEGS	Outer Segment‡	890	Unknown		Carcass	Unknown	Yes		No							Outside of survey area
2014-484-ISEGS	Power Block	0	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-485-ISEGS	Power Block‡	0	Small		Carcass	Singeing	Yes	1	Yes	X		X				
2014-486-ISEGS	Power Block‡	0	Small		Carcass	Singeing	Yes	1	No							Older than interval
2014-487-ISEGS	Power Block‡	50	Small		Carcass	Singeing	Yes	8	Yes	X		X				
2014-488-ISEGS	Power Block	0	Small		Carcass	Singeing	Yes	3	Yes	X		X				
2014-489-ISEGS	Other Project Lands‡		Small		Carcass	Unknown	Yes		No							
2014-490-ISEGS	Inner Segment	522	Large	Small	Feather Spot	Collision	No	7	Yes		X					
2014-491-ISEGS	Inner HD	240	Small	Small	Feather Spot	Collision	No	7	Yes	X				X		
2014-492-ISEGS	Outer Segment‡	1040	Large	Large	Feather Spot	Unknown	Yes		No							Outside of survey area
2014-493-ISEGS	Outer Segment	1070	Large	Large	Feather Spot	Collision	No	7	Yes		X					
2014-494-ISEGS	Power Block	25	Small		Carcass	Singeing	Yes	5	Yes	X		X				
2014-495-ISEGS	Power Block	25	Raptor		Carcass	Singeing	Yes	5	Yes	X		X				
2014-496-ISEGS	Power Block	24	Small		Carcass	Singeing	Yes	5	Yes	X		X				
2014-497-ISEGS	Outer Segment	1230	Large	Large	Feather Spot	Unknown	No	7	Yes		X					
2014-498-ISEGS	Outer Segment	774	Large		Carcass	Unknown	No	7	Yes		X					
2014-499-ISEGS	Inner HD	170	Large		Carcass	Collision	No	7	Yes	X				X		
2014-500-ISEGS	Outer Segment‡	840	Small		Carcass	Predated	Yes		No							Outside of survey area
2014-501-ISEGS	Inner HD	170	Small	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-502-ISEGS	Outer Segment	1150	Small		Carcass	Collision	No	7	Yes		X					
2014-503-ISEGS	Inner HD	170	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-504-ISEGS	Unit Fence	1300	Large	Large	Feather Spot	Unknown	No	7	Yes						X	
2014-505-ISEGS	Unit Fence	1055	Small		Carcass	Unknown	No	7	Yes						X	
2014-506-ISEGS	Inner HD	240	Small	Large	Feather Spot	Singeing	No	7	Yes	X				X		
2014-507-ISEGS	Inner HD	250	Large		Carcass	Unknown	No	7	Yes	X				X		
2014-508-ISEGS	Power Block*	72	Small		Carcass	Singeing	No	7	No				X			
2014-509-ISEGS	Power Block*	70	Small		Carcass	Singeing	No	7	No				X			
2014-510-ISEGS	Inner HD	120	Large	Large	Feather Spot	Unknown	No	7	Yes	X				X		
2014-511-ISEGS	Inner HD	190	Small	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-512-ISEGS	Inner Segment	360	Large	Small	Feather Spot	Predated	No	7	Yes		X					
2014-513-ISEGS	Power Block	74	Small		Carcass	Singeing	Yes	1	Yes	X		X				
2014-514-ISEGS	Outer Segment	750	Large		Carcass	Collision	No	7	Yes		X					
2014-515-ISEGS	Outer Segment‡	1170	Large	Large	Feather Spot	Unknown	Yes		No							Outside of survey area

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included								
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-516-ISEGS	Power Block*	68	Small		Carcass	Unknown	No	7	No				X			
2014-517-ISEGS	Inner HD	170	Large	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-518-ISEGS	Outer Segment	1240	Small	Small	Feather Spot	Unknown	No	7	Yes		X					
2014-519-ISEGS	Outer Segment	1230	Small		Carcass	Unknown	No	7	Yes		X					
2014-520-ISEGS	Power Block	160	Large	Small	Feather Spot	Unknown	No	7	Yes	X		X				
2014-521-ISEGS	Inner Segment	411	Small		Carcass	Unknown	No	7	Yes		X					
2014-522-ISEGS	Power Block*	35	Small		Carcass	Singeing	No	7	No				X			
2014-523-ISEGS	Inner HD	225	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-524-ISEGS	Inner HD	190	Small		Carcass	Singeing	No	7	Yes	X				X		
2014-525-ISEGS	Outer Segment	1190	Large		Carcass	Unknown	No	7	No							Older than interval
2014-526-ISEGS	Outer Segment	1130	Large	Small	Feather Spot	Collision	No	7	Yes		X					
2014-527-ISEGS	Power Block	100	Small	Small	Feather Spot	Singeing	No	7	Yes	X		X				
2014-528-ISEGS	Power Block	19	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-529-ISEGS	Power Block*	85	Large		Carcass	Collision	No	7	No				X			
2014-530-ISEGS	Outer Segment	1540	Large	Small	Feather Spot	Collision	No	7	Yes		X					
2014-531-ISEGS	Power Block	81	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-532-ISEGS	Power Block	0	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-533-ISEGS	Inner HD	170	Raptor	Large	Feather Spot	Singeing	No	7	Yes	X				X		
2014-534-ISEGS	Inner Segment	460	Small	Large	Feather Spot	Unknown	No	7	Yes		X					
2014-535-ISEGS	Inner HD	190	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-536-ISEGS	Outer Segment‡	1570	Large		Carcass	Collision	Yes		No							Outside of survey area
2014-537-ISEGS	Inner Segment	610	Small	Small	Feather Spot	Unknown	No	7	Yes		X					
2014-538-ISEGS	Inner HD	210	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-539-ISEGS	Inner HD	200	Small	Large	Feather Spot	Unknown	No	7	Yes	X				X		
2014-540-ISEGS	Outer Segment	960	Small		Carcass	Collision	No	7	Yes		X					
2014-541-ISEGS	Unit 3 Collector Line		Small		Carcass	Collision	No	8	No							Added unadjusted
2014-542-ISEGS	Unit 3 Collector Line		Small		Carcass	Collision	No	8	No							Added unadjusted
2014-543-ISEGS	Inner Segment	680	Small		Carcass	Unknown	No	7	Yes		X					
2014-544-ISEGS	Unit Fence	1020	Large	Large	Feather Spot	Unknown	No	7	Yes						X	
2014-545-ISEGS	Inner Segment‡	389	Large		Carcass	Collision	Yes	7	No							Outside of survey area
2014-546-ISEGS	Power Block	17	Small		Carcass	Singeing	No	8	Yes	X		X				
2014-547-ISEGS	Power Block	65	Small		Carcass	Singeing	No	8	Yes	X		X				
2014-548-ISEGS	Outer Segment	1140	Large		Carcass	Unknown	No	7	Yes		X					
2014-549-ISEGS	Power Block	120	Unknown	Small	Feather Spot	Unknown	No	8	No							Unknown size
2014-550-ISEGS	Outer Segment	870	Small		Carcass	Collision	No	7	No							Older than interval

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included								
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-551-ISEGS	Power Block*	110	Small		Carcass	Singeing	No	8	No				X			
2014-552-ISEGS	Power Block*	100	Small		Carcass	Singeing	No	8	No				X			
2014-553-ISEGS	Power Block*	79	Small		Carcass	Singeing	No	8	No				X			
2014-554-ISEGS	Outer Segment	800	Small		Carcass	Unknown	No	7	No							Older than interval
2014-555-ISEGS	Outer Segment	838	Large	Small	Feather Spot	Unknown	No	7	Yes		X					
2014-556-ISEGS	Power Block*	90	Small		Carcass	Singeing	No	8	No				X			
2014-557-ISEGS	Power Block*	80	Small		Carcass	Singeing	No	8	No				X			
2014-558-ISEGS	Power Block*	63	Small		Carcass	Singeing	No	8	No				X			
2014-559-ISEGS	Power Block	88	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-560-ISEGS	Outer Segment	1040	Large		Carcass	Collision	No	7	Yes		X					
2014-561-ISEGS	Inner HD	154	Large		Carcass	Singeing	Yes	8	Yes	X				X		
2014-562-ISEGS	Outer Segment	732	Small	Small	Feather Spot	Unknown	No	7	No							Older than interval
2014-563-ISEGS	Inner HD	130	Small		Carcass	Singeing	No	8	Yes	X				X		
2014-564-ISEGS	Outer Segment	1320	Small		Carcass	Collision	No	7	Yes		X					
2014-565-ISEGS	Power Block	110	Small		Carcass	Unknown	No	8	Yes	X		X				
2014-566-ISEGS	Outer Segment	750	Small		Carcass	Collision	No	7	Yes		X					
2014-567-ISEGS	Power Block	46	Small	Small	Feather Spot	Unknown	No	8	Yes	X		X				
2014-568-ISEGS	Outer Segment‡	1029	Large	Small	Feather Spot	Unknown	Yes		No							Outside of survey area
2014-569-ISEGS	Power Block	120	Small	Small	Feather Spot	Singeing	No	8	Yes	X		X				
2014-570-ISEGS	Outer Segment	1040	Small	Large	Feather Spot	Collision	No	7	Yes		X					
2014-571-ISEGS	Outer Segment	930	Large	Small	Feather Spot	Collision	No	7	Yes		X					
2014-572-ISEGS	Inner HD	130	Small	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-573-ISEGS	Inner Segment	530	Small		Carcass	Collision	No	7	Yes		X					
2014-574-ISEGS	Inner HD	230	Large	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-575-ISEGS	Inner HD	210	Small		Carcass	Collision	No	7	Yes	X				X		
2014-576-ISEGS	Outer Segment	1060	Small		Carcass	Collision	No	7	No							Older than interval
2014-577-ISEGS	Inner HD	150	Small	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-578-ISEGS	Power Block*	58	Small		Carcass	Singeing	No	7	No				X			
2014-579-ISEGS	Inner HD	210	Large	Large	Feather Spot	Unknown	No	7	Yes	X				X		
2014-580-ISEGS	Inner HD	160	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-581-ISEGS	Power Block	36	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-582-ISEGS	Power Block	76	Small		Carcass	Singeing	No	7	Yes	X		X				
2014-583-ISEGS	Outer Segment	1130	Large		Carcass	Unknown	No	6	No							Older than interval
2014-584-ISEGS	Outer Segment‡	1040	Small		Carcass	Collision	Yes		No							Outside of survey area
2014-585-ISEGS	Inner Segment	580	Small		Carcass	Collision	No	7	Yes		X					

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USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-586-ISEGS	Outer Segment	665	Small		Carcass	Collision	No	6	Yes		X					
2014-587-ISEGS	Inner HD	250	Small	Small	Feather Spot	Singeing	No	7	Yes	X				X		
2014-588-ISEGS	Power Block*	74	Small		Carcass	Singeing	No	6	No				X			
2014-589-ISEGS	Outer Segment	1138	Large	Large	Feather Spot	Unknown	No	6	No							Older than interval
2014-590-ISEGS	Inner Segment	680	Small		Carcass	Collision	No	7	Yes		X					
2014-591-ISEGS	Inner HD	210	Large		Carcass	Unknown	No	7	Yes	X				X		
2014-592-ISEGS	Outer Segment	1057	Small		Carcass	Collision	No	6	Yes		X					
2014-593-ISEGS	Power Block	75	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-594-ISEGS	Power Block	34	Small		Carcass	Singeing	Yes	2	Yes	X		X				
2014-595-ISEGS	Power Block	0	Large		Carcass	Singeing	No	6	Yes	X		X				
2014-596-ISEGS	Power Block	25	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-597-ISEGS	Inner HD	130	Large	Small	Feather Spot	Unknown	No	7	Yes	X				X		
2014-598-ISEGS	Power Block	52	Small	Small	Feather Spot	Singeing	No	6	Yes	X		X				
2014-599-ISEGS	Power Block	42	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-600-ISEGS	Inner HD	230	Small		Carcass	Collision	No	7	Yes	X				X		
2014-601-ISEGS	Power Block	85	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-602-ISEGS	Power Block	38	Small		Carcass	Singeing	No	6	No							Older than interval
2014-603-ISEGS	Power Block	36	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-604-ISEGS	Outer Segment	1200	Small	Large	Feather Spot	Unknown	Yes	1	Yes		X					
2014-605-ISEGS	Unit Fence	1230	Large		Carcass	Unknown	No	7	Yes						X	
2014-606-ISEGS	Outer Segment‡	870	Small		Carcass	Collision	Yes		No							Outside of survey area
2014-607-ISEGS	Power Block	40	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-608-ISEGS	Power Block*	76	Small		Carcass	Singeing	No	6	No				X			
2014-609-ISEGS	Inner HD	250	Small	Large	Feather Spot	Unknown	No	7	Yes	X				X		
2014-610-ISEGS	Power Block*	82	Small		Carcass	Singeing	No	6	No				X			
2014-611-ISEGS	Power Block	136	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-612-ISEGS	Inner HD	201	Small		Carcass	Unknown	No	6	Yes	X				X		
2014-613-ISEGS	Outer Segment	1100	Large	Small	Feather Spot	Unknown	No	7	No							Older than interval
2014-614-ISEGS	Outer Segment‡	1130	Small		Carcass	Unknown	Yes		No							Outside of survey area
2014-615-ISEGS	Power Block	56	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-616-ISEGS	Power Block	50	Small		Carcass	Singeing	Yes	5	Yes	X		X				
2014-617-ISEGS	Power Block	44	Small		Carcass	Singeing	No	12	Yes	X		X				
2014-618-ISEGS	Power Block	35	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-619-ISEGS	Power Block	85	Small		Carcass	Singeing	No	6	Yes	X		X				
2014-620-ISEGS	Power Block	120	Small		Carcass	Singeing	No	6	Yes	X		X				

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USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-621-ISEGS	Inner Segment	660	Small		Carcass	Collision	No	6	Yes		X					
2014-622-ISEGS	Outer Segment‡	910	Small	Large	Feather Spot	Unknown	Yes	7	No							Outside of survey area
2014-623-ISEGS	Outer Segment	1030	Small	Small	Feather Spot	Unknown	No	7	Yes		X					
2014-624-ISEGS	Outer Segment	1040	Small		Carcass	Collision	No	7	Yes		X					
2014-625-ISEGS	Outer Segment	1030	Small	Large	Feather Spot	Collision	No	7	Yes		X					
2014-626-ISEGS	Outer Segment	1060	Small	Small	Feather Spot	Unknown	No	7	No							Older than interval
2014-627-ISEGS	Outer Segment	730	Small		Carcass	Unknown	No	7	No							Older than interval
2014-628-ISEGS	Outer Segment	845	Large		Carcass	Unknown	No	7	Yes		X					
2014-629-ISEGS	Outer Segment	830	Large		Carcass	Unknown	No	7	Yes		X					
2014-630-ISEGS	Power Block	1	Small		Carcass	Singeing	Yes	9	Yes	X		X				
2014-631-ISEGS	Power Block	100	Raptor		Carcass	Unknown	Yes	11	Yes	X		X				
2014-632-ISEGS	Power Block	0	Small		Carcass	Singeing	Yes	5	Yes	X		X				
2014-633-ISEGS	Power Block	30	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-634-ISEGS	Power Block	10	Small		Carcass	Singeing	Yes	6	Yes	X		X				
2014-635-ISEGS	Inner HD	82	Small	Large	Feather Spot	Singeing	No	12	Yes	X				X		
2014-636-ISEGS	Inner HD	91	Small	Large	Feather Spot	Singeing	No	12	Yes	X				X		
2014-637-ISEGS	Power Block*	66	Small		Carcass	Singeing	No	12	No				X			
2014-638-ISEGS	Power Block*	74	Small		Carcass	Singeing	No	12	No				X			
2014-639-ISEGS	Power Block*	38	Small		Carcass	Singeing	No	12	No				X			
2014-640-ISEGS	Power Block*	40	Small		Carcass	Singeing	No	12	No				X			
2014-641-ISEGS	Power Block*	58	Small		Carcass	Singeing	No	12	No				X			
2014-642-ISEGS	Power Block*	45	Small		Carcass	Singeing	No	12	No				X			
2014-643-ISEGS	Power Block	36	Small		Carcass	Singeing	No	12	Yes	X		X				
2014-644-ISEGS	Inner HD	94	Small	Large	Feather Spot	Singeing	No	12	Yes	X				X		
2014-645-ISEGS	Inner HD	120	Small	Small	Feather Spot	Singeing	No	12	Yes	X				X		
2014-646-ISEGS	Inner HD	190	Small	Large	Feather Spot	Unknown	No	12	Yes	X				X		
2014-647-ISEGS	Inner HD	170	Small		Carcass	Singeing	No	12	Yes	X				X		
2014-648-ISEGS	Inner HD	180	Small	Small	Feather Spot	Unknown	No	12	Yes	X				X		
2014-649-ISEGS	Power Block	110	Small	Small	Feather Spot	Unknown	No	12	Yes	X		X				
2014-650-ISEGS	Inner HD	120	Small	Small	Feather Spot	Singeing	No	12	Yes	X				X		
2014-651-ISEGS	Inner HD	200	Small	Small	Feather Spot	Singeing	No	12	Yes	X				X		
2014-652-ISEGS	Power Block	20	Small		Carcass	Singeing	No	12	Yes	X		X				
2014-653-ISEGS	Power Block	27	Small		Carcass	Singeing	No	12	Yes	X		X				
2014-654-ISEGS	Inner HD	240	Small	Large	Feather Spot	Unknown	No	12	Yes	X				X		
2014-655-ISEGS	Inner HD	180	Small	Small	Feather Spot	Singeing	No	12	Yes	X				X		

		Variables for Fatality Estimator						Fatality Estimates in Which Each Detection was Included							
USFWS #[1]	Location	Distance from Tower (m)	Carcass Size	Feather Spot Size	Model Category	Cause of Death[2]	Incidental	Time Since Last Survey (days)[3]	Used in Estimator[4]	Tower Area	Heliostat Area	Power Block	ACC Bldg	Inner HD	Unit Fence	Estimator Notes[5]
2014-656-ISEGS	Inner Segment‡	450	Small		Carcass	Predated	Yes	13	No							Outside of survey area
2014-657-ISEGS	Inner Segment	661	Small		Carcass	Collision	No	13	Yes		X					
2014-658-ISEGS	Outer Segment	740	Small	Large	Feather Spot	Unknown	No	13	Yes		X					
2014-659-ISEGS	Outer Segment	1170	Large		Carcass	Unknown	No	13	Yes		X					
2014-660-ISEGS	Outer Segment	950	Small	Large	Feather Spot	Unknown	No	13	Yes		X					
2014-661-ISEGS	Inner HD	140	Small		Carcass	Singeing	Yes	3	Yes	X				X		
2014-662-ISEGS	Outer Segment	820	Small		Carcass	Collision	No	14	Yes		X					

[1] The USFWS # can be used to match each detection in Appendix B with additional information provided in Appendix A.
[2] "Unknown" cause of death = no evidence of singeing and no clear evidence of what caused the fatality; "Singeing" = evidence of singeing on the carcass or feather spot; "Collision" = evidence of collision was observed, such as a bird-strike imprint and/or feathers on a heliostat above the detection; "Other" = a detection with known cause without signs of collision or singeing (in fall 2014, all "other" detections were of birds found in the ACC units).
[3] "Time Since Last Survey" indicates the number of days between when the detection was found and the previous standardized survey of the area in which it was found.
[4] "Used in Estimator" indicates whether the detection was used in the fatality estimates. If it was not, the "Estimator Notes" column indicates why not. If it was, an "X" appears under one or more of the subsequent five columns to indicate whether the detection was used in the fatality estimate for the "Tower Area" (consisting of the power block plus inner HD heliostats combined), "Heliostat Area" (consisting of the inner and outer heliostat segments), "Power Block", "ACC", or , "Inner HD" areas. Note that because the ACC building (which is located within the Power Block) is a closed system, being only marginally accessible to scavengers, no fatality estimate per se was made for the ACC buildings; rather, the detections in the ACC buildings were added to the estimates for the Power Block and Tower Area after the fatality estimator was used to produce estimates for those areas.
[5] "Outside of survey area" indicates that the detection was not within the standardized survey areas and thus were not appropriate for inclusion in the fatality estimator. Similarly, detections that were "older than search interval", indicating that the carcasses were deemed to have been present longer than the "time since last survey", are not included in the fatality estimator.
* Found in ACC building.
‡ Found outside of surveyed areas.

Note: Fatalities in ACC building were not used in the fatality estimator, but were added in to fatality estimates post hoc.
Fence fatalities not included due to insufficient numbers of fatalities for modeling.