

Executive Summary

San Diego Zoo Institute for Conservation Research began a long-term study in January, 2009 to investigate the spatial ecology and habitat utilization of the California condor (*Gymnogyps californianus*) reintroduced to Baja California, Mexico and the golden eagle (*Aquila chrysaetos*). Research on these two critical species is being implemented in northern Baja California, with a focus on the proposed area for the Energia Sierra Juarez Wind Project (ESJWP) prior to, during, and after development¹. The main objectives of this ongoing research are to identify the relative importance of the project area to golden eagles and California condors, to identify risks to their populations, and to support project design and operations to avoid or minimize potential impacts from wind energy development.

To date, research has included nest searches and activity monitoring; capture of eagles and application of transmitters; biotelemetry of eagle and condor movement behavior; and modeling of territories and habitats to delineate high use areas. The extremely rugged and largely unmapped terrain of the Sierra Juarez presents difficult logistical challenges for field research. Both aerial surveys and on-the-ground observations were used to identify and map golden eagle nest sites and territories throughout the study area. Condor movement data have been collected since 2002 when condors were initially released into Mexico by the Institute.

Remote meteorological stations have been installed in both the Sierra San Pedro Mártir and Sierra Juarez in 2009 and 2010 as part of the ESJWP effort. Measurements of environmental conditions using these meteorological stations will be used to validate wind flow models and determine interrelationships among habitat, topography, wind, temperature, and flight behavior; this will enable characterization and prediction of condor and eagle long-distance ranging patterns.

Our preliminary findings from this ongoing study are from more than two years of data collected during the pre-construction phase of the ESJWP. Both condor and eagle activity in the

¹ For purposes of this summary, ESJWP refers to the overall ESJ project development area, as defined in ESJ's MIA document. ESJ 1 refers to the area where the first phase of ESJ will be constructed, located in Ejido Jacume. The ESJWP encompasses a total of 294,312 hectares of land, while ESJ 1 alone encompasses 2,104 hectares of land.

ESJ 1 site have been minimal through the Fall of 2011. Biotelemetry of condor movement behavior has revealed a pattern of confined movements around communal feeding and roosting sites near the reintroduction site in the Sierra San Pedro Martir (approximately 180 km from the US – Mexico border) and home range expansion during spring and summer when temperatures and winds increase.

Since 2002, only one condor flight through what is now the ESJ 1 site has been recorded to date (in 2007). Condor flights closest to the ESJ 1 site in 2009, 2010 and 2011 were recorded at 18 km, ≥ 80 km, and 44 km respectively. There are currently no condors in the wild in San Diego County. As the condor population continues to grow, however, the number of individual condors recorded flying within the ESJWP area has been increasing, with 0 before 2005, 2 in 2006, 3 in 2007, 9 in 2008, and 11 in 2009. In 2010, condor activity in the area decreased with only 4 condors recorded within the ESJWP area. Several factors may have contributed to this, including extreme weather conditions and lead poisoning from contaminated food that necessitated bringing the birds in for treatment during part of 2010. However, condor large-scale flights north into the ESJWP area increased again in 2011, with 6 birds crossing over the southern boundary. We are currently modeling condor movement behavior to try to determine the factors driving the observed seasonal movement patterns and to enable accurate prediction of future movement patterns.

Unlike condors, golden eagles are utilizing the middle to southern ESJWP area for both foraging and breeding, but at low densities. Despite the abundance of suitable nesting sites, we found relatively few historic nests (<20) and even fewer active nests (1 in 2009, 1 in 2010, and 0 found in 2011). No golden eagle nests were found within the ESJ 1 site. Although only one nest was confirmed active in the southern Sierra Juarez by aerial nest search in 2010, the presence of an immature eagle with an adult pair in the central Sierra Juarez (approximately 61.5 km away from the ESJ 1 area, but within the ESJWP area) suggests breeding at this site as well.

Based on our observations of golden eagles in the ESJWP area, we have identified at least 2 territories and potentially a third: an adult pair and one juvenile in the central Sierra Juarez, where there was an active nest site in 2009; a breeding pair and a juvenile in the southern Sierra Juarez where there was an active nest site in 2010, and; two adult eagles in the northern Sierra Juarez where historic nest sites were found. However, eagles have large home ranges, especially in this type of habitat, and it is currently unknown from our observations whether

these represent unique territories. In the Spring of 2011, we attached GPS transmitters on an adult pair of eagles (one male and one female) captured within the ESJWP area which unfortunately died several months after tagging. However, ante-mortem, many valuable movement data were collected. In October 2011 a second adult female was GPS tagged which is currently providing data showing that this bird has crossed the US/Mexico border at least 7 times and has flown to within 29 km of the Sempra Phase-1 project site. Data from all three of these eagles will help further resolve the delineation of eagle territories.

By evaluating the movements of golden eagles and condors while identifying the conditions associated with high use, we hope to pinpoint areas of increased risk of mortality posed by wind turbines to provide a more precise risk assessment. Preliminary findings appear to suggest that the ESJ 1 site does not contain suitable nesting habitat for resident golden eagle breeding. Potential techniques to incorporate the monitoring of condor movements into the operation of wind turbines that present the highest risk are also being explored to help avoid turbine-related mortalities.

While not our focal species for this research, we have also observed peregrine falcons (*Falco peregrinus*) and bighorn sheep (*Ovis canadensis*), two species of concern, within the ESJWP project boundary, but not within the ESJ 1 area, during the 2009, 2010, and 2011 surveys. The closest peregrine falcon and bighorn sheep sightings occurred approximately 25.5 and 26.6 km southeast of the ESJ 1 area, respectively.

Future recommendations on project design, construction, and operation of the proposed ESJWP to minimize and/or eliminate mortality of golden eagles and condors will be provided based on the findings of this research. Current recommendations for the ESJ 1 site include:

1. With only one incursion in nine years by California condors into the ESJ 1 area it appears that the risk of impact to the California condors reintroduced in Mexico is relatively small, although this may change as the population continues to grow. The Institute will continue to work closely with Sempra to monitor the movement of these birds.
2. The limited sightings of golden eagles in the ESJ 1 area and lack of suitable nesting habitat appears to indicate a limited potential risk of impact, although further study of the species and their territories is necessary.

3. Sempra should consider the development of an alert system, such as MERLIN radar or VHF detection receivers, to minimize the risk to condors and/or eagles. The Institute will work with Sempra to explore and develop various options for both alerting when collision risk is high and deterring wildlife-turbine collisions.
4. Sempra is encouraged to follow the current USFWS Land-Based Wind Energy Guidelines and Eagle Conservation Plan Guidance.
5. Adaptive management should be used and risk assessments updated as more data are collected for this site.