Pilot Study to Investigate Burrowing owl Mortality Mechanisms in the Altamont Pass Wind Resource Area
Revised – February 9, 2011

Introduction

Mortality monitoring results in the Altamont Pass Wind Resource Area (APWRA) have indicated an unusually high level of burrowing owl mortality in some years (M-21). Understanding the causes of high burrowing owl mortality has been a high priority of the Scientific Review Committee (SRC) for several years. At an in-person SRC meeting in December 2010, the SRC recommended that a pilot study on burrowing owl mortality mechanisms be implemented. This study would be funded by a portion of the money remaining in the monitoring budget allocated for "other studies". The savings realized by reducing the monitoring effort, while maintaining the historic funding level, allowed some money to be available for "other studies" to benefit avian species in the APWRA.

The SRC originally proposed a study to investigate burrowing owl mortality in 2008 (P70); however, this study was never funded. The original burrowing owl study proposal was divided into three main aspects: abundance and distribution, behavior and predation, and scavenger removal. Due to funding and time constraints, the currently proposed pilot study focuses only on the behavior and predation portion. The use of thermal imaging equipment to detect and follow burrowing owl movements at night is an integral component of this behavior/predation study. A preliminary investigation conducted in 2008 to test the feasibility of using this equipment to follow burrowing owl movements determined it worked reasonably well (M28). However, the SRC believes another pilot study is necessary because there is still uncertainty about the effectiveness of gathering behavioral data using thermal imaging equipment, and the appropriate duration and timing for this type of survey. If this pilot study proves to be informative and the technique promising, then a larger scale study would be recommended in the winter of 2011-12. Mortality levels for burrowing owls appear to be high during the winter period, when the turbines are shutdown.

Issues and Concerns

After five years of monitoring surveys, the causes of burrowing owl mortality are still unclear. The extent to which mortality is influenced by the presence of turbines and/or turbine operation has not yet been determined. Mortality could be a function of 1) collision with operating or non-operating turbines; 2) predation by other raptors (some of which may use turbines as hunting perches near burrowing owl colonies) or mammals; 3) seasonal timing of turbine operation; or 4) other non-turbine-related causes.

Several data gaps and issues have hindered the understanding of mortality mechanisms. The following is a summary of data gaps and issues taken from the original burrowing owl proposal (P70).

- Uncertainty regarding causes of death due to relatively few whole carcasses (most found fatalities are feather spots) suggesting that other mortality mechanisms (e.g., predation) may contribute.
- Uncertainty of scavenging and searcher detection rates, especially for smaller raptors such as burrowing owls, which could have resulted in high estimates of mortality.
- Uncertainty regarding burrowing owl behavior around turbines, especially at night, and the extent to which burrowing owls are at risk of direct collision mortality.
- Lack of adequate information on predatory behavior of raptors that might prey on burrowing owls.
- Lack of adequate information on how predation may be facilitated around turbine rows.
- Lack of understanding why there is burrowing owl mortality occurring at non-operational turbines.

The uncertainty regarding the causes and circumstances of high burrowing owl mortality in the APWRA makes understand the mechanisms of that mortality a primary concern. Understanding burrowing owl mortality mechanisms is important not only for existing turbines, some of which might be in operation for at least the next five years (Settlement Agreement 2010; S30), but could also provide guidance for future repowering. Siting repowered turbines to minimize mortality could benefit from information on the following potential risk factors: 1) proximity of burrowing owl colonies and flights around turbine rows could be associated with mortality, 2) specific topographic features around turbines may contribute to risky foraging and flight patterns, 3) certain turbine features or transmission lines used for perching by burrowing owls or their potential predators could increase risk of mortality, 4) some turbine types or turbine layouts may make burrowing owls more susceptible to predation, and 5) turbine configurations could be critical in relation to topography.

A focused observational study should provide data on burrowing owl foraging behavior and flight patterns (i.e., height and proximity) around turbines, and data on predation and the influence of turbines (i.e., perch sites for predators near burrowing owl colonies). Although Smallwood et al. (2007) examined burrowing owl behavior patterns around turbines in the APWRA, these surveys were not conducted at night.

Study Plan

The primary purpose of this pilot study is to observe burrowing owl behavior in the vicinity of turbines during dusk and nighttime hours as it relates to potential turbine collision mortality. Secondarily, and to the extent possible, the study will investigate the mechanisms of burrowing owl predation. The study has been designed to assess if an observational survey using thermal imaging equipment will be effective at collecting this type of behavioral data. A night vision scope will also be used to augment visibility at night. A more detailed discussion of the purposes of the behavior/predation study can be found in P70.

In addition, prior to the field work an analysis of existing historical burrowing owl fatality data will be conducted to identify burrowing owl fatality patterns, hot spots, clusters of fatalities, and potential related environmental attributes. The results will be used to help select the optimal locations for study sites (high mortality areas). This historical analysis will also be funded by a portion of the money for “other studies”.

The following procedures are suggested:

- Select four survey areas.
  Three areas with turbines that have the following characteristics:
    - Vicinity of active burrowing owl colonies (i.e., areas of high burrowing density).
    - High historical burrowing owl mortality.
    - Variety of turbine types including lattice and tubular towers.
    - Variety of topographical characteristics (e.g., steep or rolling).
    - At least one with transmission lines in close proximity.

  One area without turbines that is comparable to the other three sites as much as possible.

- Identify observation sites and conduct pre-field visits.
    - Within each of the survey areas, select a slope (side of prevailing wind) with an associated ridgeline (with or without turbines).
    - Divide each of the four slopes into two elevations (high and mid to low) for a total of two observation stations on each slope. This equates to a total of 8 observation stations. A recent analysis of burrowing owl carcass distribution around turbines should be reviewed to evaluate the appropriate distances from turbine rows for the mid to low slope positions (Smallwood 2008).
    - Select observation sites on the high slopes that are in line with the turbine rows so that the observer would be looking down the row.
    - If possible, select sites that face west for the best visibility after the sun sets.
    - Select sites at some distance away from the turbine rows or colonies as to minimize disruption of burrowing owl (or their predators) behavioral patterns. If necessary setup a blind.
    - If necessary, install thermally contrasting markers on the ground (e.g., pin flags) to better estimate distances.
    - Mark burrowing owl colonies on the ground in each area (e.g., with rocks).
    - Conduct a nighttime field trail at each of the sites (≈1hr/site) to become familiar with the areas at night and to determine the parameters of observable distances.

- Conduct survey.
  - At the beginning of the surveys, randomly choose a slope position to start (high or mid to low) and then systematically alternate the survey between the two positions.
  - Each slope position is surveyed for a 2-hour period using the thermal imaging camera and night scope for a total of 4 nighttime survey hours per night.
  - Prior to the 4 hours of nighttime observation, conduct one hour of daytime/dusk observation using binoculars from the first selected slope location for a total of 5 hours of observation per night.
  - Conduct survey for 32 nights (each site surveyed eight times).
  - One thermal imaging camera, one night vision scope, and two-person field crew are required per site.
  - Using two crew members at each site, one operates the thermal camera and the other operates the night vision scope and records owl behavior and related data on field forms.
  - Record the nightly activities on digital video for reviewing the data.
  - Consider and possibly test the use of lights with red filters placed on the slopes to enhance visibility.

- Field staff will record data (to the extent possible) on flight behavior, foraging behavior, prey species and prey captures, other local movements, perching behavior, inter- and intra-specific interactions, proximity to wind turbines and blades, flight height and flight type near wind turbines, presence and proximity of avian and mammal predators, predator behavior (e.g., den excavation, stooping from perch, coursing flight through colony, etc.), prey captures, and dispensation of prey (e.g., carried off whole, dismembered and eaten onsite, partially eaten onsite, etc.), and interactions between potential predators and burrowing owls. Additional data recorded includes turbine type, wind speed and direction, percent cloud cover, precipitation, temperature, time of observations.

- Survey period: Half of the surveys would be conducted during March/April and other half in June/July.

- Conduct fatality searches only if a potential predation event on any avian species is detected. Conduct searches using standardized methods currently in use by the Monitoring Team. The associated turbine string should be searched in its entirety from the ridgeline to the toe of each slope (both sides). Fatality searches at the turbine sites would allow actual mortalities during the survey period to be correlated with observational data.

- After 4 surveys have been completed (one at each site), the results of the effectiveness of the technique will be reported to the SRC (or subcommittee) in a conference call format. This will give the SRC the options of providing input or altering the surveys. If after 8 surveys, the techniques or equipment are thought to be infeasible or ineffective at gathering useful information, the remaining of the surveys should be cancelled.

Estimated Costs

Cost Assumptions:

- Two observers are required for a total of 7 hours each per night (5 hours for surveys plus two additional hours for travel time and set-up). The surveys are conducted for 32 nights (16 in March/April and 16 in June/July) for a total of 448 hours.
- Four complete fatality searches (for each search a two-person crew conducts a four-hour fatality search) for a total of 32 hours.
- Thermal camera training (16 hours). Use the same trained people in the summer and winter.
- Presurvey investigation and mobilization will require 60 hours.
- Data compilation, analysis, and report preparation will require 100 hours.
- Total labor hours = 656 hours
- Field staff rate = $50 per hour; management rate = $140.
- Per diem = $23/day for 64 person-days = $1472.
- Reimbursable expenses (vehicle use, gasoline) = $2,000.
- Thermal camera rental (two months at $5,000/month = $10,000.
- Night vision scope rental (two months) = $2500 (this is approximate – still need Doug's input).

Total estimated cost based on the above assumptions = $55,072 for spring and summer seasons.

References Cited

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