

*Burrowing Owls in the Altamont Pass Wind Resource Area
Problem Statement and a Hypotheses Testing Framework*

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Problem Statement – Estimates of the number of burrowing owls killed at old generation turbines are high. Reasons/mechanisms/causes are largely unknown. Actions to reduce fatalities are unclear.

1. Estimates are biased
 - a. Adjustment factors are biased
 - i. Burrowing Owl detection probability is higher than it is for other birds, resulting in estimates that are over-adjusted and thus biased high
 1. BUOW carcasses are removed less often than other birds because they are too large to be carried off but not too large to be consumed in one sitting and consequently feather spots are commonly created
 2. BUOW are killed by nocturnal predators more often than other birds and nocturnal predators are more likely to leave a feather pile than other predators because they consume the prey on the spot rather than carrying the carcass away
 3. BUOW are killed more often by predators than other birds because they are ground nesters
 4. Burrowing Owl feather piles are more visible to searchers than other carcasses or feather piles of other birds
 5. Burrowing owl carcasses/feather piles are more likely to be double-counted than other birds
 6. Burrowing Owl carcasses/feather piles disappear at a slower rate than other birds
 7. BUOW feather piles persist and are detectable longer than other carcasses or feather piles of other birds
 8. 30-day search interval is too large to accurately adjust fatalities
 - ii. Estimates of the number of BUOW killed are biased due to the non-representative sampling scheme
 - iii. Estimates are biased low
 - b. Placeholder
2. Estimates are correct
 - a. BUOW deaths are directly turbine-related (turbine strikes)
 - i. BUOW engage in behavior that brings them into the rotor swept area during turbine operations
 1. Lights attract them to the top of turbines
 2. BUOW forage along ridges
 3. Prey items (insects) are attracted to turbines and BUOW are attracted to prey

4. Prey items (bats) are attracted to turbines and BUOW are attracted to prey
5. BUOW fly to top of turbines for mating or territorial defense
6. BUOW like to forage from tops of turbines
7. BUOW use turbines for perching during seasonal shutdown and become acclimated, then get killed after turbine operations resume
8. Recently fledged BUOW fly into the rotor swept area
9. BUOW engage in behavior at night that brings them into the rotor swept area
- ii. Non-resident and/or otherwise inexperienced BUOW are killed at a disproportionately higher rate than resident breeding birds
 1. Majority of carcasses are from migrants or floaters
 2. Majority of carcasses are from first-year birds or fledglings
- b. BUOW mortality is related to proximity of burrows to turbines
 - i. Mortality increases with decreasing distance to turbines
 - ii. Mortality increases with increasing density of BUOW
 - iii. Mortality is influenced by topography
- c. BUOW deaths are indirectly turbine-related
 - i. Predators use turbines to hunt for burrowing owls
 1. Perch-hunting predators hunt from turbines and kill BUOW at their burrows
 2. Predators flush BUOW into the rotor swept area
 - ii. BUOW mortality is associated with specific positions of active turbines relative to occupied burrows (i.e. distance, directions, and/or slope)
 - iii. Turbine-related mortality attracts coyotes, badgers and other predators that increase predation rates on ground-nesting birds
- d. BUOW deaths are not turbine-related
 - i. BUOW mortality in the APWRA is within the normal range for populations not located in or near wind farms