

By Jesse Schwartz

3/22/08

Monitoring Team's Response to Julie Yee comments:

In general we agree with the criticisms and recommendations presented by Julie Yee. Our proposed approach for addressing these issues is as follows:

1. Keep equation 1.

Agreed

2. Incorporate uncertainty about  $R$  and  $p$ .

We will associate scavenger loss at the observation-specific level to be more explicit about the impacts of this detection probability. In addition we will provide a range of mortality estimates for the four focal species by varying  $R$  and  $p$ . We will use the hierarchical approach proposed by Yee, and will vary  $R$  and  $p$  across a normally distributed curve, thereby developing a mean and standard deviation for the mortality estimates.

3. Clarify  $R_c$ .

Our report will be more explicit in terms of  $R_c$ , and will include variance in  $R_c$  as described above and below.

4. Account for different  $R$ 's for different lengths of survey periods.

Same as #2. We will use estimates of  $R$ s that are specific to each observation to account for different lengths of survey periods.

5. Reconsider the unit of analysis.

We will conduct a hierarchical analysis that will present results at all levels of aggregation – turbines, strings, and plots by month, quarter and year.

6. Make special considerations for WRRS data.

Same as #2. By connecting  $R$  and  $p$  to each individual observation we will be able to make special considerations for WRRS data. We will generate an estimate of  $q$  for each WRRS

observation, and will be explicit about the detection probability associated with each WRRS observation.

7. Refine confidence intervals and report standard errors.

Agreed. We will use a Poisson distribution for the analysis and will revise the confidence intervals and standard errors.

8. Refine the fatality count model.

We agree that the SRC should be involved, and that the calculations need to be detailed using equations and/or visual displays of the statistical model structure. There is some concern that the proposed approach is over-parameterized for the given problem. The unit of data collection is mortalities per survey, which operate on a daily time step. These observations are relatively rare on a species basis (much less than 1 mort of some species for a given survey of a given string), and it may be difficult to develop a reliable estimate of  $\mu$  as proposed. A simpler approach would be to develop estimates of overall detection efficiencies using a mark-recapture approach. We will work with the SRC to attempt to develop the model as proposed, but recommend the development and implementation of a production-level (i.e. non-experimental) monitoring of detection efficiencies. As proposed this approach involve pre-surveys of randomly selected strings and marking carcasses which are observed. The recovery of these carcasses, as with the burrowing owl study, would be used to develop an estimate of the detection probability of each species, and would eliminate the need for independent estimates of scavenger rates and surveyor efficiencies. This more parsimonious model would allow for a more transparent estimation of the standard errors associated with detection efficiencies as described in:

Cormack, R.M. 1964. Estimates of survival from the sightings of marked animals. *Biometrika* 51:429-438.

We propose that the SRC work with the MT to develop a mark-recovery program for monitoring detection efficiencies, and providing a more robust and transparent expansion of observations into mortality/survival estimates.

9. Decide on assumptions about mean fatality rates.

Agreed. Future analyses will include estimates based on the original assumptions associated with the development of the settlement agreement, along with additional expansions based on revised estimates of detection probabilities.

10. Sort out the reasons for estimation inconsistencies.

Agreed. The MT would appreciate being presented with the code and algorithms for developing the estimates presented in your recommendations. Future reports will be comparably explicit.