

## **Smallwood's Answers to Audubon's Queries About the SRC's Recommended Four Month Winter Shutdown of Wind Turbines in the Altamont Pass**

Shawn Smallwood

6 October 2007

After reading the queries from Audubon (S22) it became clear to me that written responses from the SRC are needed. However, the time given to the SRC to respond was unrealistic for a written response to be prepared before the meeting planned for 10 October 2007. I decided to prepare my own responses, representing the SRC where I thought I could, but otherwise providing my own perspective. My responses are briefer than otherwise would have been prepared, because I have to balance my time on this project with having not been paid for my work on the SRC since April (I've only been paid once since the SRC began meeting).

Written responses are needed because the three hours planned for the 10 October 2007 meeting will be insufficient time for the SRC to respond to each and every question. No doubt during the meeting the Parties will have additional follow-up questions to SRC answers, so I think three hours will not be time enough to address all the queries. Therefore, I provided brief responses so that the Parties have at least minimal responses to all the queries that may not be addressed during the planned three hour meeting.

I will note at the outset that answers to the queries were for the most part already given during the SRC meetings. Some time may have been saved had all the Parties attended the SRC meetings, where these issues were discussed. I'll also note that I cannot tell which questions were formulated by Audubon and which by the wind companies, the County of Alameda, and Californians for Renewable Energy. Were all these questions from Audubon? Or were some questions from other Parties? It might have helped to know to whom to direct the answers.

### **Question set 1**

First Question: The SRC made its recommendation based on the weight of the evidence, which included analyses provided by Julie Yee and Shawn Smallwood, and including a data summary from Brian Karas and Brian Latta. Also, Sue Orloff and Ann Flannery had produced a report in 1992, also showing higher mortality over the winter months. Smallwood and Thelander (2004, 2005) found mortality to be higher for raptors over the winter. Smallwood and Spiegel quantitatively assessed the effectiveness of a winter shutdown after the wind companies proposed this measure in 2005. Smallwood also took another look at the data from the 1998-2003 study after he learned that the Enertech turbines are routinely shut down and locked during winter, and he found no turbine-caused fatalities at these turbines during winter.

It is correct to say the SRC believes there will be a substantial reduction in avian mortality of at least three of the four focal raptor species due to the four month seasonal shutdown, which is why the SRC recommended this measure. As a point of clarification, however, the SRC also recommended that the shutdown begin October 15, 2007, and not November 1, 2007, as written in Audubon's query, because the shutdowns will need to be synchronized with the fatality searches, so that the first fatality search of the four month period corresponds with the date of the shutdown of each turbine.

Second Question: I do not believe the companies are currently on track to reach a 50% reduction in raptor mortality as defined by the settlement agreement. I believe the other SRC members agree with me, for the most part, which is why the SRC issued its statement of concern on August 22, 2007. The companies have taken no substantial measures to reduce mortality, other than the half winter shutdown in a crossover experiment. The evidence indicates the crossover experiment has contributed little if any reduction to raptor mortality, perhaps because derelict towers were left at ends of rows, or perhaps because birds habituated to shutdown turbines, but got killed more often after those turbines were turned back on. Also, the recent mortality data indicates no change in mortality since 1998-2003.

## **Question set 2**

Question 1: A P-value of 0.0001 meant there was a one in 10,000 chance a Type I error was committed in the hypothesis test. A Type I error is the rejection of the null hypothesis when the null hypothesis is in fact true. There was only a one in ten thousand chance that there was actually no change in mortality and Julie's test resulted in the wrong conclusion that there was a reduction in mortality. The odds of a Type I error are long, so we refer to the test result as highly significant.

Question 2: Julie Yee should answer this question.

Question 3: I do not believe other tools or models would change the SRC's conclusion about the effectiveness of the winter shutdown because the SRC used a weight of the evidence approach. There was no single model or tool that founded the SRC's conclusion.

Question 4: The fit statistics suggested to Julie Yee that the number of fatalities per turbine was the superior unit of measure. However, I've come to the opposite conclusion using another data set. This is an example of where biologists and statisticians can complement each other. Just because the fit statistics are superior for the per-turbine metric does not mean that metric should be used – it depends on the comparison being made. The old-generation turbines in the Altamont vary 10-fold in size, making the per-MW metric the superior one for comparing different groups of turbines to each other. However, if the same turbines are being compared between different times of year, then it does not matter which unit of measure to use. If the fit

statistics are superior for the per-turbine metric, then it makes more sense to use that one. Julie conferred with me on this issue, and we both agreed the best unit to use was the one she used.

Question 5: The overall percent reduction in focal raptor species mortality due to the seasonal shutdown will be about 32%, according to my estimate. However, if the County exempts AWI from the seasonal shutdown, then I estimated the reduction will be about 26%. Julie Yee's estimates varied from mine, and varied according to the unit used in the mortality metric, but the SRC recognizes there is uncertainty in the exact reduction that can be achieved from a 4 month winter shutdown. The exact reduction will not be known until the shutdown is implemented and fatalities monitored appropriately.

Question 6: The standard error is so high for golden eagle because the sample size of eagles in Julie's analysis was relatively small. Many zero values along with only a few positive values will produce large standard errors. This is especially the case when the metric is number of fatalities per turbine, rather than fatalities per MW in the turbine string.

### **Question set 3**

Question 1: I disregarded what Wally Erickson had to say about any of the results of the seasonal shutdown experiment, because he did not backdate fatalities from the date they were found to the date the fatality would have happened. He also included old remains along with fresh remains, and all causes of death. The study design was flawed from the outset, and any conclusion that could be drawn from it had to be from a small subset of the data that were filtered for cause of death and time since death. Also, Erickson's assumptions were questionable from a biological point of view, including the assumption that any fatality found up to 9 days into the next period was caused during the previous period. The SRC rejected Wally Erickson's analysis.

### **Question set 4**

Question 1: Again, the SRC rejected Wally Erickson's conclusions in his seasonal shutdown reports for the reasons stated above.

Question 2: See above. Erickson analyzed all the data initially, then he analyzed a subset of the initial data the second time, but not after filtering the data to the extent requested by the SRC. The SRC abandoned Wally Erickson's analysis and 4 members asked Julie to look at data that were filtered by Brian Karas and Brian Latta. Even these data, however, need to be processed further by backdating the fatalities from the date they were found to the date the fatality was estimated to have occurred. In the meantime, the SRC agreed Julie's analysis was much more reliable than Wally Erickson's analysis. But also keep in mind that Julie's analysis contributed to the weight of evidence the SRC considered, including a more carefully processed data set from the past.

Question 3: Brian Karas and Brian Latta processed the data per the request of the SRC, then Julie Yee produced the M16-series of documents. I also re-analyzed the 1998-2003 data after learning the EnerTech turbines had been shut down and locked each winter.

Question 4: The factors that led to the SRC's winter shutdown recommendation were the following:

1. The companies proposed the measure in 2005;
2. The companies agreed to a 50% mortality reduction goal, and the SRC was directed to help achieve this goal following the settlement agreement of 7 November 2006;
3. Multiple lines of evidence indicated the 4 month shutdown would substantially reduce raptor mortality.
4. The SRC was also asked to consider balancing costs to the companies against mortality reduction, so the SRC ultimately agreed that the companies' 2005 suggestion to shut down the turbines during winter made sense because the winter contributes only about 16% of the annual power generation from the APWRA.

The SRC has not recommended any other measures that would be as or more effective than the 4 month winter shutdown. It has recommended removal or relocation of all Tier 1 and Tier 2 turbines, though the SRC's confidence in the effectiveness of this measure is probably lower than it is in the winter shutdown. The SRC also recommended the rock piles be removed, but the SRC remains uncertain over the effectiveness of this measure. The SRC recommended all derelict turbines and towers be removed, but the total contribution to mortality reduction from this measure remains unknown, largely because it has yet to be implemented.

Question 5: I will not speak for the SRC on whether it can recommend any other measures with similar confidence in their effectiveness. However, I will say that I have no doubt at all that mortality could be reduced by more than 50% if the companies and the County would truly commit to the goal. Three SRC members have direct experience with the bird collision research in the APWRA and could point out turbines and groups of turbines that are more dangerous to raptors than other turbines. The turbines in Tiers 1 through 3 provide a quantitatively founded starting point, but adding other factors to the turbine selection process could improve the effectiveness of selective turbine shutdown and relocation. Removing turbines from gullies, steep slopes and ravines would help, as would relocating or removing isolated turbines. Grouping turbines together would help, since wind walls have been found to kill many fewer raptors. The SRC could spend several days in the field selecting a percentage of the APWRA's turbines to achieve the goal, but then the companies would have to cooperate or the County would need to insist that those turbines be relocated or removed. There remains no easy, painless measure that will come anywhere close to achieving the mortality reduction goal to which the companies, the County, and the plaintiffs in two CEQA challenges have agreed.

Question 6: The fatality monitoring needs to be synchronized with the 4 month winter shutdown so that the first search at each turbine during the shutdown period corresponds with the date of the shutdown. This is why the SRC recommended the winter shutdown begin by about 15 October 2007.

Question 7: See answer to the previous query.

Question 8: The turbines would be monitored once per month during the 4 month winter shutdown.

Question 9: There is no reason to suspect the monitoring team would be unable to continue monitoring the turbines on a monthly basis during the 4 month shutdown. The monitoring team will need, however, the full cooperation of the wind companies to synchronize the shutdowns to enable first fatality searches on the dates of shutdown, and the last fatality searches on the day prior to restarting the turbines.

Question 10: In my opinion, there would be no reason to compare the monitoring data from the 4 month shutdown to those from the half winter shutdown implemented in the crossover design. Such a comparison would not contribute to the goal, and it would be confounded by poor experimental design of the half winter shutdown.

### **Queries under Settlement Background**

Question 1: The answer is a conditioned “yes.” However, note that the question uses the word “determined” where it should be “estimated.” WEST, Inc. did not provide mortality estimates for any period, other than point estimates for select groups of turbines based on general turbine size. I used the reported numbers of fatalities and the number of searches to compare mortality among studies expressed as the fatalities per search, including from 1988-1989, 1989-1991, 1998-2003, and 2005-2006. Julie Yee estimated mortality, though I do not recall seeing it expressed for a year time period. A more rigorous estimate can be made, which adopts similar assumptions used to make the baseline estimate, or the baseline needs to be reconsidered. However, there has been no reason yet for the SRC or the monitoring team to generate a more rigorous estimate that is comparable to past estimates. The SRC has seen enough evidence to conclude mortality has not decreased.

Question 2: There has been no reason to approve scavenger removal adjustments yet. Doing so would be premature, partly because the intensive searches are being performed for small raptors.

Question 3: It is premature for the SRC to provide the requested data summaries, and it does not have the requested data for the year 2004. The data need to be examined first by the monitoring team, then by SRC members. Decisions need to be made about the assumptions used to determine cause of death, and other issues. The scavenger removal and searcher detection

adjustment factors have not been decided upon. But none of this information was needed for the SRC to conclude a four month winter shutdown was justified and mortality has not lessened since the study of 1998-2003.

Question 4: This question is premature (see above).

Question 5: This question is premature (see above).

Question 6: This question is premature (see above).

Question 7: The answer is “yes.” But recall that the Parties to the settlement agreement informed the SRC of their desire to achieve an Altamont-wide mortality reduction of 50%. The SRC asked for clarification on this point, and was given the impression that the intent of the language in the settlement agreement was that all companies be included, including non-settling parties. The SRC pointed out to the Parties that it could not confidently conclude mortality was reduced or increased among turbines owned by non-cooperating companies such as Northwind Energy and Buena Vista. I’ll also point out that the monitoring team has been searching for fatalities at more than 400 AWI turbines, but the monitoring of AWI turbines is also required under the 2005 CUP. So the answer is yes – fatalities have been found at turbines operated by a non-settling party.

Question 8: The question is unclear. Which analysis is the question referring to? To that of Smallwood and Spiegel and more recently by Smallwood? Or to that of Julie Yee?

Question 9: The filters were not weighted in the analysis. The filters resulted in fatalities being removed from further analysis of the half winter shutdown experiment. The SRC concluded that serious management action is needed now to achieve the 50% mortality reduction goal. This goal was deemed more important than attempting to repeat a flawed study; at least this is the way I viewed the decision.

Question 10: See my responses to previous queries about the Wally Erickson analysis. Erickson did not follow the SRC’s recommendations for filtering the data. In fact the SRC requested of the monitoring team that it start from scratch in preparing the draft report of monitoring results to date. Documentation of the SRC’s conclusions will be available in the meeting notes of the meetings in which the M13 document was regarded as unreliable.

Question 11: The SRC remains unaware of inter-annual fluctuations in bird numbers or use in the APWRA, but is aware suitable data might be available to draw inferences about these multi-annual trends. Suitable data would include data drawn carefully from existing data sets.

Such fluctuations have not been taken into account, at least not yet. The settlement agreement does not address this issue. Instead, the settlement agreement identifies the average annual estimate of 1300 raptor fatalities as the baseline, to which the SRC is to compare the average

annual estimate of raptor fatalities counted during the 3-year monitoring program ending November 2009. The goal of the settlement agreement does not account for inter-annual variation in raptor numbers or use, but the SRC has agreed to consider recommending incorporation of this information into the metric.

However, the SRC still needs the companies to provide power output data from individual turbines so that it can also incorporate inter-turbine variation in operations. Without the data on power output or percent operating time, the SRC will be less able to conclude mortality changed than if it incorporated inter-annual variation in abundance of raptors. The SRC requested data on turbine operations a year or more ago, and still has received no such data.