APWRA Conservation Plan

DRAFT

Response of Independent Advisors
To Questions Submitted
Regarding Independent Science Advisor Workshop 1 Memo dated 12/23/09

March 11, 2010

The Independent Science Advisors (ISA) for the Altamont Pass Wind Resource Area (APWRA) Conservation Plan submitted a memo (12/23/09) with preliminary recommendations emerging from discussions at our November 16-17, 2009, workshop. We subsequently received a number of questions and requests to clarify some recommendations. This memo attempts to answer these questions.

General Questions for Advisors

1. On page 3, you note that a longer permit term may be needed to implement appropriate adaptive management. How many years of adaptive management are recommended after the last of the repowering projects is completed?

The advisors were simply cautioning that 35 years may be a short time for all the biological effects of repowering and other actions, including adaptive changes to management or operations over time, to be clearly revealed. Ideally, adaptive management and monitoring would continue for the permit duration. Monitoring to date has revealed large inter-annual variation in mortality due to numerous factors. This variability suggests that monitoring must continue for at least a few years (perhaps 5-10) following an action (e.g., repowering or other changes to turbine locations or operations) to observe effects. The actual sampling duration should be based on a power analysis to determine what sample sizes and durations are necessary to reveal trends of, for example, 20% or 50% change in the dependent variable (e.g., mortality rates or population changes).

2. On page 5 you recommend covering sensitive ecological communities in the Plan. The NCCP Act does not contain language that provides coverage for a natural community and no take permit is available for natural communities. We do intend to develop (and did develop in our first draft) biological goals and objectives for affected land covers in the Plan. What do you mean by "covering" natural communities and how might that be implemented if different than what the draft BGOs indicate? For reference, we expect that the vast majority of impacts will occur in the grassland land cover and that very few impacts will occur in the identified sensitive land-cover types.

We disagree that the Natural Community Conservation Planning Act does not address coverage of natural communities. See for example Sections 2810 and 2820 (emphasis added):

> **2810**. (b) The agreement shall meet all of the following conditions:
> (3) The agreement shall identify a preliminary <u>list of those natural communities</u>, and the endangered, threatened, candidate, or other species known, or reasonably expected to be found, in those communities, <u>that are intended to be the initial focus of the plan</u>.

(5) The agreement shall establish a process for the inclusion of independent scientific input to assist the department and plan participants, and to do all of the following:
(A) Recommend scientifically sound conservation strategies for species and natural communities proposed to be covered by the plan.
(B) Recommend a set of reserve design principles that addresses the needs of species, landscapes, ecosystems, and ecological processes in the planning area proposed to be addressed by the plan.

2820. (a) The department shall approve a natural community conservation plan for implementation after making the following findings, based upon substantial evidence in the record:
(2) The plan integrates adaptive management strategies that are periodically evaluated and modified based on the information from the monitoring program and other sources, which will assist in providing for the conservation of covered species and ecosystems within the plan area.
(3) The plan provides for the protection of habitat, natural communities, and species diversity on a landscape or ecosystem level through the creation and long-term management of habitat reserves or other measures that provide equivalent conservation of covered species appropriate for land, aquatic, and marine habitats within the plan area.

The advisors were fulfilling their charge under Section 2810 to help identify those natural communities to be covered by and addressed in the plan. We pointed out that there are a number of sensitive natural communities in or near the plan area that could be directly or indirectly affected by permitted activities—including road widening, ground clearing, runoff from disturbed areas—or that could benefit from the plan's conservation, mitigation, or management actions.

3. On pages 8 and 9, you recommend using "a hierarchically structured and incremental spatial approach to siting repowered turbines that treats each phase of repowering and each potential mitigation action, as an adaptive management experiment." Effective adaptive management requires thorough monitoring to be able to understand the efficacy of each management action. Complete repowering in the APWRA is expected to take 5-7 years. Is the approach recommended by the Science Advisors feasible within this timeframe and, if not, what alternative approaches would you recommend that would facilitate rapid repowering of APWRA while still incorporating an adaptive management framework? What kind of adaptive management practices are the ISAs considering?

The advisors were unaware of the 5-7 year estimate to complete repowering. Although this may be a short time during which to incrementally test different approaches for siting and operating new turbines, we still recommend that effects of early actions should be monitored and used to inform later actions in an adaptive management framework. For instance, if a large proportion of fatalities occur at certain times of year or day, or in association with certain meteorological conditions, operational curtailment of turbines could be attempted, and monitored, to determine if they reduce fatalities. Although we are aware that seasonal shutdowns were previously attempted with uncertain results, they were not performed in a sufficiently systematic or experimental manner, with appropriate monitoring, to quantify and interpret their effects on mortality.

In addition, a variety of resource management activities could be implemented as adaptive management experiments, including but not limited to livestock management (e.g., stocking rates, timing of grazing, fencing of sensitive habitats, placement of water infrastructure and supplements), water management/restoration for covered species (e.g., seasonal drying or other treatment of ponds to control invasive species), and vegetation management to support conservation of covered species (e.g., fire or other treatment of scrub to maintain open grassland foraging habitat).

4. The ISAs recommends several studies including:
    - Interactions between date, meteorological conditions, and fatality risk of both bats and birds
    - The SRC BUOW study
    - The SRC QA/QC study on scavenging and observer correction factors

   Given limited time and research budget, what is the recommended prioritization of these studies? What is the intended outcome of the recommended studies as they relate to repowering?

Prioritization depends on scientific as well as non-scientific considerations, such as the time course for repowering or the costs of different studies. These studies are relevant for both existing and re-powered turbines. If repowering will be completed quickly (within 5-7 years as mentioned above), studies to improve understanding of how existing turbines affect covered species become less important than studies informing how best to site repowered turbines or how best to manage areas (e.g., using grazing management or squirrel control) to benefit covered species.

Studying the interactions between date, meteorological conditions, and fatality risk to bats and birds can help to suggest mitigations in turbine placement and operations. Such mitigations could then be attempted and evaluated in an adaptive management context. Such studies could be completed within a 1-3 year period depending on scope.

Accounting for scavenger removal and searcher efficiency to produce bias-corrected estimates of fatality are currently standard practice at wind energy facilities (e.g., Kerlinger et al. 2006, 2008, West Inc. 2006). However these biases have never been adequately accounted for in APWRA estimates, especially as they may apply to the diverse assemblage of impacted taxa, ranging from bats and songbirds to eagles. The ISA's recommend a comprehensive study, using short search intervals, that quantifies these biases by species group within the APWRA. The SRC QA/QC study on scavenging and observer correction factors was designed to resolve the problems associated with developing adjustment factors (searcher detection and scavenger removal). Currently there is still considerable uncertainty regarding these factors, and fatality estimates can vary widely depending on which factors are used. Without accurate adjustment factors one cannot confidently estimate fatality numbers or make mortality comparisons between areas, years, or turbine characteristics.

A burrowing owl study is important to understand why burrowing owls are being killed in such high numbers at existing turbines, and whether the fatalities result directly from turbines or indirectly from predators. Without this information, accurate estimates of turbine-caused mortality cannot be used to inform mitigation measures. The SRC originally proposed the burrowing owl study in two parts: (a) abundance and distribution, and (b) behavior. The ISA agree with a recent SRC recommendation to decouple the two parts, with higher priority given the behavior study.

5. The ISAs did not recommend dropping any of the Plan species. Did the science advisors consider this issue? In particular, we are interested to know if the science advisors believe it is appropriate to cover the sandhill crane.

The advisors agree with dropping sandhill crane as a covered species, due to low potential for effects. We have not carefully assessed each and every species to determine if others should be dropped. We recommended maintaining a relatively inclusive list until it is clear that a species will not be affected by the Plan.

6. The ISAs did not comment on any of the species accounts. Was this due to lack of time to review or lack of comments/feedback?

The ISA's did not have time to fully review and comment on the accounts during the first workshop. Advisors have since reviewed most of the species accounts and found them generally well researched, accurate, and well written. The advisors appreciate that, at least for some species, the authors appeared to have done due diligence in seeking out grey literature sources and interviewing experts to augment published information or existing data sources (e.g., CNDDB). However, some accounts could be improved with additional research and information sources; and accounts could be tailored to better address local Plan issues. For example, the account for the hoary bat could be improved by adding locality information to the CNDDB data, including locations of hoary bat fatalities recorded in the APWRA, and by consulting recent publications that provide more information on the role the APWRA plays in the species' ecology. Please see Attachment A for detailed comments on the hoary bat, and consider modifying other species accounts accordingly. Also see Attachment B for some recommended revisions to the golden eagle account.

7. The ISAs did not addressed mitigation (HCP) or conservation (NCCP) needs for the Plan. Did you consider this aspect of the Plan during the workshop? Do the ISAs have any recommendations for appropriate mitigation or conservation? What might an appropriate off-site mitigation/conservation program be? E.g., how do we improve the source population of golden eagles in APWRA?

The advisors did describe some preliminary conservation and mitigation options, including designating turbine-free zones, siting repowered turbines to minimize fatalities, considering off-site habitat purchases or easements, and various land management and operational changes performed as adaptive management experiments. We did not feel it was appropriate to offer more detail about possible conservation/mitigation programs at this point--such as the nature or amount of habitat to conserve--because this should be determined based on additional analyses and discussions.

We do not necessarily believe that improving the "source population of golden eagles in APWRA" should be a conservation goal. There is abundant nesting habitat outside the APWRA in the region (in the Diablo Mountains). The resource lost to eagles in the APWRA is safe foraging habitat, primarily for subadults and floaters. Mortality in the APWRA therefore reduces survivorship of subadults and floaters, but does not necessarily reduce the regions' resident breeding population. The reduction in non-breeding adults is nevertheless detrimental, because it reduces the reservoir of individuals available to replace breeders that die from all causes. This reduces the resiliency of the regional population. Offsite conservation to benefit golden eagles should therefore center on the protection and possible enhancement of safe foraging habitat, which should be devoid of potential nest trees from which breeders can exclude floaters. Changes in grazing management could be used as a conservation measure to increase prey populations in safe areas away from turbines.

Avian Risk Modeling

1. The ISA recommends adding the prairie falcon, California condor, ferruginous hawk, western meadowlark, horned lark, and grasshopper sparrow to the Plan species list. These species would therefore require risk modeling. We do not have sufficient monitoring data to support risk analysis of these species. Do the ISAs have suggestions for surrogate/indicator species we could model instead that may be representative of impacts anticipated for these species? Do the ISAs have suggestions for grouping these or other Plan species for the purpose of the risk analysis?

Not all Plan species can or should be analyzed the same way, and we did not suggest that risk modeling with existing monitoring data is necessary for these species. Adding them as planning species recognizes that they have potential to be affected by plan actions, whether positively or negatively. Risk analysis is appropriate for species for which there is sufficient data. Mortality should be estimated as best as possible for each affected species and appropriately mitigated.

There is a possibility that ferruginous hawk fatalities are undercounted due to misidentifications. Photographs of remains could be examined by an independent expert to determine if ferruginous hawks have been misidentified, particularly among fatalities recorded prior to the current program of winter shutdowns.

Doug Bell presented data on regional prairie falcon numbers and use, which information should be integrated into Plan analyses.

2. The ISA recommends using rock pigeons and European starlings as planning species to support the risk modeling. Given feedback from the monitoring team field crew, we are concerned that including European starlings would skew the analysis because these birds nest in the turbines and therefore we would expect a much higher mortality rate than other species. Based on this information, does the ISA agree that it is not appropriate to use European starlings in the analysis?

We agree that including starlings may bias the analyses and they could be excluded.

3. Is our understanding correct that the ISAs recommend moving from a turbine-based modeling framework to a to a carcass based modeling framework? Whereas we initially proposed to associate a carcass with a turbine and then look at the characteristics of the turbine, the ISAs are suggesting that we look at the location around a carcass and try to model common features of carcass locations? And that we would be moving from a Poisson-based model that provides a rate of mortality per turbine, to a logistic model that tries to characterize dangerous locations on the landscape?

   If we switch to the proposed approach, it seems to us that we can identify places in the landscape that are dangerous but we can no longer estimate relative risk for different turbine locations and configurations. I.e., we would not be able to provide guidance to the wind companies about the relative riskiness of different proposed turbine layouts. Do the ISAs agree with this assessment? If not, why?

We do recommend turbine-based modeling; we do not recommend pooling to model at the string level, unless this is in addition to turbine-based modeling. Based on the presentation at the workshop, we understood that the data were being compiled to only represent string-associated variables (by associating each carcass with the centroid of the string). We think that approach will obscure how turbine-specific characteristics (such as height and topographic position) influence risk. We disagree that our suggested approach will make it more difficult to assess the risk associated with turbines.

The analysis should start with the location of the carcass and analyze what environmental factors best predict risk. The variables that enter alternative statistical models should include measures at the carcass proper, as well as at the turbine associated with the mortality by the field crew. Those variables should include characteristics of the associated turbine (e.g., turbine height and type, topographic position, and position of the turbine in a string) as well as “neighborhood” characteristics, such as the string’s configuration or location. Comparing alternative statistical models can then sort out what combinations of variables, at what scales, best predict risk. Comparing statistical models using both carcass-centric and turbine-centric variables (or a mix) should not be much more labor intensive than doing one or the other.

4. A key use of the modeling data is to refine the existing siting criteria and site new turbines in the least risky locations of the landscape. Given this need, which approach (ZIP or logistic presence/absence model) better supports future turbine siting?

The exact error structure used to model the data does not concern us as much as using the most powerful use of the existing data. Our collective sense is that the most direct and clear use of carcass data will use carcass locations and their surrounding landscape features to determine the relative probabilities of strikes in areas with different turbine placements relative to key landscape features. As noted above, the ZIP modeling proposed did not seem to us to make the best use of the data, since it aggregated information in a way that seemed as likely to obscure landscape features that determined risk as to inform them. This is especially true as the current “string” arrangements of turbines will not be maintained with repowering.

Additional Risk Modeling Comments

> Regarding the modeling technique, the ISAs indicated that the filtering criteria were applied to obtain a constant survey interval. This is not the case. The filtering is used to obtain a high quality dataset. We are concerned that the data collected for date of death and cause of death is less accurate the older the carcass becomes (i.e., the chance that a date or cause of death is incorrect become greater the older the carcass). Using only “fresh” carcasses reduces the chance that cause or time of death is incorrectly attributed.

This aspect of the choice to winnow the data wasn’t clear from the presentations we heard. Given this problem, this choice represents a trade-off between data quantity and quality. In a case like this, where quality is of concern, but the quantity of data is clearly limiting, we suggest doing the analysis both ways to see if the choice matters. We think that using all possible data will be more effective in this case, but only doing both analyses will definitively answer that question.

> We are concerned that a logistic presence/absence model would not be any better than a Poisson model in determining total number of fatalities. We would still need an estimate of overall bird numbers in the Altamont to be able to predict for new scenarios with a logistic. In addition we would not be able to predict a rate with a logistic equation. The proposed approach would help to identify

places in the landscape that are more or less likely to have fatalities but it would not provide a number for how many fatalities we would expect. The Poisson, on the other hand, provides numbers of bird mortalities per sample period under a given set of conditions/turbine configuration.

It seems to us that a logistic would face the problem of pseudo-absences in creating "absence locations." Due to the high scavenging rates, or just scavenging in general, we could randomly pick locations that are absent due to searcher inefficiency or scavenging removal. The ZIP would have the advantage of putting an estimate on excess 0 counts, which could be caused by removal due to scavenging and searcher inefficiency.

We are not sure we agree with the concerns expressed here. First, the two goals of estimating the most dangerous locations for turbines and also estimating total mortality rates do not need to be tied together – that is, separate analyses could address each question. Second, it is not entirely clear what the utility of a retrospective estimate of total deaths is, given that repowering will completely change the type and distribution pattern of turbines and hence future mortalities. Finally, a probability model that estimates the spatial distribution of probability of strikes (and makes this an explicit estimate by modeling the probability of carcasses being found after death) will allow creation of a spatially averaged expected number of carcasses generated in any area as a function of landscape features and turbine proximity. This general approach is the way that spatial Poisson processes are often derived (from aggregation of small binomial probabilities). However, all this said, the major concern we raised with the ZIP approach was its perceived inefficiency at estimating risk factors, which seems the primary goal of this analysis.

As the monitoring team and SRC are investigating the issue of searcher efficiency and scavenging rates, we plan to use the outcome of that research for either modeling method used. For the ZIP model, the scavenging/searcher model would simply acts as a multiplier to the number of carcasses predicted to occur through the ZIP model.

The advisors do not recommend relying on any single model or approach as a basis for analysis. We recommend using several models--for example, using filtered and unfiltered data sets or logistic as well as Poisson models--to determine which approach offers the most reliable and useful results. Applying several model approaches can inform the analyst about model efficacy, reduce uncertainties of relying on any single model, and can reveal more information about the underlying data.

Using just fresh carcasses will not eliminate the uncertainty in estimating time or cause of death. Smaller raptors and bats are typically scavenged very quickly (most BUOW fatalities are found as feather piles within less than 48 hr of death). So using 2 to 3 weeks as a cutoff to reduce errors in estimating time and cause of death will not work for these species; and we still don't know what percentage of the fatalities is the result of turbine strikes or predation. The advisors don't think smaller raptors should be eliminated from the model, but we need better data to inform them, such as data about mortality causes from the SRC's proposed burrowing owl study.

General Questions for Advisors from Next Era Energy Resources, LLC

1. On page 3, you first introduce the idea of "geographic scope" and redefining the "region" covered in the plan. You suggest using well studied species to aid in this determination. Which species do you suggest and what is known about these species that would enable us to understand the population level impacts

wind is having? How should the "region" be defined in relationship to populations? E.g., only California, western U.S., western North America? If different by species, please provide guidance by species.

We recommend that the consultants evaluate which covered species may be affected by Plan actions beyond APWRA boundaries, and for which species sufficient information exists to at least roughly assess the geographic effect area (e.g., using population source-sink assessment or tissue samples of mortalities). This assessment would be one consideration for planning the conservation and mitigation strategies. The geographic scope will change with the species or group of species being considered—for example, migrating versus resident species. An evaluation of BBS trend analyses may be a way to look at species that may be of concern because their local or regional populations appear to be declining. Although migratory species may be affected beyond California's borders, such affects may be so diluted as not to significantly affect regional population sizes or trends. However, for resident species like golden eagle and prairie falcon, the plan could have significant population effects over roughly the west-central region of California.

We recommended evaluating the geographic area over which at least populations of golden eagles and prairie falcons (two relatively well-studied species) may be affected by turbine mortality. Turbine mortalities of golden eagles affect mostly non-territorial subadults and floaters that are presumably produced by breeding territories in the region surrounding APWRA, which may make the golden eagle population of west-central California more vulnerable to declines. Likewise, Doug Bell presented data suggesting that the population of prairie falcons in west-central California may be significantly affected by even modest numbers of turbine mortalities, due to small regional population size and low recruitment. Although precise quantification of the region over which such effects may be occurring would be difficult, and probably unnecessary, even a rough approximation of the area over which a population may be affected could be useful in evaluating alternative conservation and mitigation actions, such as whether conservation actions outside APWRA boundaries might be beneficial.

2. On page 5 (then page 7) surrogate or "analysis" species are suggested for use as extra carcasses for monitoring purposes (testing searchers and being left for scavenging studies, presumably), and to lend results of analyses on these species to protected species (surrogate). The birds (often predated species) are commonly found in the Altamont mortality searches while the species of bat is not. And although these may be appropriate for field tests, we lack understanding regarding the behavior that makes one species more at-risk than another with regard to wind turbines. We recommend more discussion on this topic.

The idea of surrogate species is to build a better sample size to evaluate biases where appropriate, such as with scavenging rates for different size birds or bats. This is not a question of at-risk behavior. This is about estimating biases in sampling procedure of dead things on the ground. For example, you could use dead pigeons as a surrogate for burrowing owls, or house finches for less common song birds, in scavenging trials. Bats are more difficult, but all fresh bats found on site could be re-placed to estimate these biases for bats – they don't have to be hoary bats. Mice have been suggested as surrogates for bats in scavenging trials, although we don't know of any analyses that evaluate how faithfully they represent bats

3. On page 6, an approach for fatality risk modeling at the turbine level is suggested. Knowing that a fatality at an individual turbine is a very rare event, and that the turbines are located quite close to one

another (~80 to 100 feet), do you believe that there will be enough variation in turbine characteristics and data points to fit a model? Also, if we are using historical survey data in this model to generate estimates of actual kills, wouldn't the historical population numbers be necessary to determine population level effects?

It seems that there is very likely to be enough variation across the study area to fit models for risk. Although individual mortality events are rare, there seems to be sufficient cumulative mortality data to detect meaningful statistical patterns, such as what sorts of locations are riskiest. While ideally there would be historical density data to tie relative risk estimates to population-wide average mortality rates, this could be done reasonably well if there are current total population estimates in this region, using indirect data (e.g., BBS and Christmas Bird Count data) to suggest differences between current and past numbers.

4. On page 12 you recommend more frequent fatality searches at turbines to establish scavenging rates. The kestrel/burrowing owl study implemented by the current Monitoring Team in the Altamont performed 48 hour searches on 500 turbines with insufficient data for meaningful analyses. The cost per data point on a study such as this may be something to consider. Placement with monitoring of removal by scavengers may be an alternative option.

The 48-hour search study detected many more carcasses than monitoring with longer intervals, and documented that a large proportion of carcasses, especially smaller species, are scavenged very soon (<48 hours) after death. The results suggest that even the 48-hour effort failed to detect some mortalities due to imperfect searcher efficiency and rapid scavenging of carcasses. We recommend a single, well-designed, intensive study that addresses scavenging and searcher efficiency on a representative sample of turbines in the APWRA at daily intervals to establish better correction factors. Comparisons need to be made between annual or seasonal estimates of total fatalities, not on total number of fatalities. Power analyses of the results should be used to determine sampling size and intervals sufficient to detect trends of pertinent magnitude. Over time, we believe this approach may save money, because if done properly the correction factors would not need to be estimated for each set of turbines or other factors.

In addition, carcass placement experiments (to determine scavenging rates) could be used to better quantify the means and variances in removal rates and how they vary with species, time of year, etc. This will help make the more intensive survey data more powerful.

Literature Cited:

Kerlinger, P., Curry, R., Culp, L., Jain, A., Wilkerson, C., Fischer, B., Hasch, A. 2006. Post-construction avian and bat fatality monitoring study for the high winds wind power project Solano County, California: two year report. McLean, Virginia: Curry and Kerlinger, L.L.C. 135 p

Kerlinger, P., Curry, R., Culp, L., Fischer, B. Hasch, A., Jain, A., Wilkerson, C. 2008. Post-construction avian monitoring study for the Shiloh I Wind Power Project Solano County, California: two year report. McLean, Virginia: Curry and Kerlinger, L.L.C. 120 pp

WEST Inc. 2006. Diablo Winds Wildlife Monitoring Progress Report. Cheyenne, Wyoming: Western EcoSystems Technology, Inc. 29 pp.

Attachment A

Comments on Hoary Bat Species Account

Submitted by Ted Weller

March 10, 2010

I found the information therein to be generally accurate, though I would have liked to see more interpretation and thought about how it might apply to the situation at hand. Below I provide my comments relevant to specific subsections of the document.

Distribution

The authors should review and interpret Cryan (2003) to better understand species distribution relative to the APWRA. This paper summarizes contemporary thinking on the distribution and migration of Hoary Bat in North America. In particular, it suggests that California is a migratory destination and wintering area for a large proportion of the Hoary Bat populations in North America. It further suggests that spring and autumn are seasons when densities of Hoary Bats may be high in north-central California. These are also times when Hoary Bats have been killed at nearby wind energy facilities (Kerlinger et al. 2006, 2008). Taken together, these findings have clear implications for the APWRA that should be addressed.

Occurrences within the Planning Area

It appears that review of CNDD was the sole source of information in this subsection and, not surprisingly, it did not contain records for the APWRA area. While review of the CNDD may be standard practice for such efforts, in this case, several other relevant information sources exist. Smallwood and Karas (2009) reported 11 Hoary Bat fatalities from 1989-2007 and WEST Inc. (2006) reported 2 Hoary Bat fatalities during from 2005-2006 in the APWRA. These are not only occurrences, but fatalities caused by wind turbine operations. To exclude these as records of occurrence provides a misleading impression of the potential threats to Hoary Bats

Further, at nearby wind energy facilities in Solano County which employ modern-design wind turbines, Hoary Bats are among the most frequently killed species of bat or bird (Kerlinger et al. 2006, Kerlinger et al 2008). Given the close proximity of the Solano County wind facilities to APWRA, and against the backdrop of a very limited understanding of seasonal occurrence and distribution of Hoary Bats, these occurrences (fatalities) are relevant to the situation and should be included in this section.

Reproduction

Additional review of Cryan (2003) is warranted, especially with respect to characterization of migratory movements as “southward”. Cryan (2003) suggests “coastward” movement during autumn and identifies California as an important wintering area for Hoary Bats. Spring migratory movements are toward the east and the north (Cryan 2003).

I suggest clarifying “hibernation (north)” in Table 2. Relative to most bat species, Hoary Bats are not considered “hibernators” and few winter records exist north of northern California.

Movements

Paragraph 2 could benefit from review of Cryan (2003)

Threats

The last sentence is very understated and deserves an upgrade. Across North America, Hoary Bats are the most frequently killed species at wind energy facilities (Arnett et al. 2008). I believe that they have been found dead at every wind energy facility where bats have been the target of fatality searches; a point supported by the data in

Arnett et al. (2008). Impacts of habitat loss are difficult to quantify for most bat species (Weller et al 2009) but impacts of wind energy development on Hoary Bats are relatively easy to quantify and rising rapidly with the expansion of wind energy development. Relative to habitat loss and wind energy development,threats from jays are likely insignificant.

Conservation and Management

Curtailment of turbine operations that aim to reduce bat fatalities (Baerwald et al. 2009) are a very relevant existing conservation measure for this species and should be mentioned here.

Literature Cited:

Arnett, E. B., K. Brown, W. P. Erickson, J. Fiedler, T. H. Henry, G. D. Johnson, J. Kerns, R. R. Kolford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of fatality of bats at wind energy facilities in North America. Journal of Wildlife Management 72: 61–78.

Baerwald, E. F., J. Edworthy, M. Holder, and R. M. R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management 73: 107-1081.

Cryan, P. M. 2003. Seasonal distribution of migratory tree bats (Lasiurus and Lasionycteris) in North America. Journal of Mammalogy 84: 579–593.

Kerlinger, P., Curry, R., Culp, L., Jain, A., Wilkerson, C., Fischer, B., Hasch, A. 2006. Post-construction avian and bat fatality monitoring study for the high winds wind power project Solano County, California: two year report. McLean, Virginia: Curry and Kerlinger, L.L.C. 135 p

Kerlinger, P., Curry, R., Culp, L., Fischer, B. Hasch, A., Jain, A., Wilkerson, C. 2008. Post-construction avian monitoring study for the Shiloh I Wind Power Project Solano County, California: two year report. McLean, Virginia: Curry and Kerlinger, L.L.C. 120 pp

Smallwood, K. S., and B. Karas. 2009. Avian and bat fatality rates at old-generation and repowered wind turbines in California. Journal of Wildlife Management 73:1062-1071.

Weller, T. J., P.M. Cryan, and T. J. O'Shea. 2009. Broadening the focus of bat conservation and research in the USA for the 21st century. Endangered Species Research 8: 129-145.

WEST Inc. 2006. Diablo Winds Wildlife Monitoring Progress Report. Cheyenne, Wyoming: Western EcoSystems Technology, Inc. 29 pp.

Sincerely,

Ted J. Weller
Independent Science Advisor &
Ecologist, USDA Forest Service
Pacific Southwest Research Station

Attachment B

Comments on the Golden Eagle species account

Submitted by Grainger Hunt

Historical, page 2, first line. An interesting account of breeding-season food habits of the historical population is in Carnie, S.K. 1954. Food habits of nesting golden eagles in the coast ranges of California. Condor 56(1):3-12.

Recent, page 2, 2nd paragraph, 5th line. Should read “Nine of the territories….”

Habitat Requirements, page 2,

> Line 2. Should read “…except extensive areas of dense forest…”
>
> line 5. Omit “…with overhanging ledges.” Also omit “overhanging ledges” from Table 1.
>
> Line 11. Substitute “…all but a few” with “…most”

Reproduction, page 3, 2nd sentence (and in Table 3). More recent information does not support Smith and Murphy’s 1973 territory size estimate of 50 square miles. Tracking data from Hunt et al. (1998) show that breeding territories in the Diablo Range tend to be quite small, most in the neighborhood of 5-9 square miles.

> Lines 6-8. Consider changing to: “The reproductive season in west-central California extends from January through August, with peak activity from February through June; eggs are laid from late January to early April.”
>
> Also, consider adding to the end of the paragraph a sentence to the effect that “Five annual surveys of 59-69 territories around Livermore showed an average of 0.64 fledglings per territorial pair (Hunt 2002).”

Threats, page 5, line 6. “A study in the region surrounding the planning area…”

<u>Model Description</u>, page 6, Assumptions. Nesting Habitat. Consider changing to: “Traditional nest sites include large trees adjacent to suitable foraging habitat. Land cover types that might contain suitable nesting trees (or cliffs) include all savanna, natural woodlands, and ornamental woodlands (eucalyptus).”