State of Hawai‘i

DEPARTMENT OF LAND AND NATURAL RESOURCES

Division of Forestry and Wildlife

Honolulu, Hawaii 96813

October 21, 2020 Meeting

Endangered Species Recovery Committee

State of Hawai‘i

Honolulu, Hawai‘i

Committee Members:

SUBJECT: DRAFT HAWAIIAN HOARY BAT GUIDANCE FOR RENEWABLE WIND ENERGY PROPONENTS: PUBLIC COMMENT MATRIX AND KEY BAT WORKSHOP FINDINGS

Presented for your consideration is a staff summary of the public comments received by the Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) prior to the Hawaiian Hoary Bat Workshop held on March 5 and 6, 2020, on the Draft Hawaiian Hoary Bat Guidance for Renewable Wind Energy Proponents update for 2020 (“guidance document”).

The first edition of the guidance document was developed by the Endangered Species Recovery Committee (ESRC) in 2015 with the goal of incorporating new research and information every five years. In January 2020, the ESRC’s bat task force provided a draft update to the 2015 guidance document, and during the March 2020 Hawaiian Hoary Bat Workshop the ESRC had the opportunity to review current and ongoing research on the species’ ecology, distribution, and interactions with wind energy projects, as well as advances in monitoring, avoidance, and minimization technology. The below matrix summarizes public comments (in white) and information presented at the workshop (in grey) as they apply to the sections of the guidance document. This matrix will be updated as additional public comments and testimony are received, and has been expanded to include the public comments and workshop findings for the remaining sections and appendices of the guidance document.

**SECTION I. INTRODUCTION:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor(s)** |
| Financial Burden of Recommendations | * Scope of recommendations impedes development of new wind energy and leads to increased power costs for state residents. | Marilyn Teague, AEP Renewables  Eric Pendegraft, Na Pua Makani, LLC |
| Perceived Rulemaking | * The ESRC treats the guidance document as a mandatory requirement which must be followed in order to recommend an ITL for approval. This approach is akin to illegal “underground rulemaking.” * Should clarify that the guidance document contains recommendations to the Department of Land and Natural Resources and is not rules under Chapter 195D, HRS. | Marilyn Teague, AEP Renewables  Matt Stelmach, on behalf of TetraTech  Whitney Wilson, TerraForm Power  Chris Clevenger, Kawailoa Wind, LLC |
| Best Available Science | * Best scientific and other reliable data is not utilized in the guidance document and should be incorporated in order to make sound recommendations. * The guidance document recommendations are in places ambiguous, inconsistent, missing context, or outdated, and provide conflicting recommendations. * Draft does not utilize the most recent science on Hawaiian Hoary Bats. | Marilyn Teague, AEP Renewables  Matt Stelmach, on behalf of Tetra Tech  Whitney Wilson, TerraForm Power  George Akau, AEP Renewables  Chris Clevenger, Kawailoa Wind, LLC |
| * More research into newer technologies to observe and monitor interactions and take of bats at wind power facilities must be enhanced for all HCPs to be approved. * Should require that any HCP’s bat take not be authorized beyond the listed population sizes for the respective HCP site and island, and stipulate that net species recovery levels should supersede any bat losses to be expected at the project. | Fern Duvall, NEPM Maui Coordinator, DOFAW |

**SECTION II. BACKGROUND:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Species Classification | * Hawaiian Hoary Bats are recognized at the species level (*Lasiurus semotus*) and there is a general consensus they are no longer considered a sub-species. | Kristin Jonasson, Bat Conservation International (BCI) |
| * American Society of Mammologists recognize Hawaiian Hoary Bat as a full species but under the genus *Aorestes* not *Lasiurus*. | Frank Bonaccorso, U.S. Geological Survey (retired) |
| Population Estimate | “Hawaiian Hoary Bat populations on each island are stable or slightly increasing (i.e., a 0 to 1 percent annual population increase as found by Gorresen et al. (2013)”   * This statement is based on acoustic data from just a single island; it might be the best data available but with all the acoustic data collected at a project, it seems possible to design in a way to adjust this to be more project specific. * It is important to caution that this trend may not be applicable to other islands which have different levels of development and human impact currently and historically. | Michael Schirmacher, Bat Conservation International  Kristin Jonasson, Bat Conservation International |
| Risk to Bats | “Bat collisions and mortality at wind facilities are well-documented throughout the U.S., mostly involving migratory tree-roosting bat species such as silver-haired, hoary, and eastern red bats …”   * A more recent book chapter (Arnett et al. 2016) shows that the most common feature shared by susceptible species is the use of open habitats.  "An emerging hypothesis is that bats that regularly move and feed in less cluttered and more open air-space are most vulnerable to collisions with wind turbines, regardless of continent, habitat, migratory patterns, and roost preferences."   “Bat foraging behavior may be influenced by the turbines themselves because of 1) an attraction of bats to the turbine for various reasons, most unknown.”   * The attraction hypothesis deserves merit and there are several papers which support this. This is also something for developers to be aware of and consider when they are conducting pre-construction surveys. | Kristin Jonasson, Bat Conservation International |
| Application of Mainland Hoary Bat Data | * This section should at least have as much information as the PEIS (USFWS 2019). There is a significant body of information about the Hawaiian Hoary Bat and relevant information about the mainland hoary bat that would benefit readers, but is not included here. Citations from recent HCP and HCP amendments, mitigation plans, recovery plan, etc. all provide sources of information that could be incorporated. | Matt Stelmach, on behalf of Tetra Tech |
| **Topic** | **Bat Workshop Finding** | **Presenter(s)** |
| Roosting | * Mean height of roosting trees is 21 meters (n = 24). * Mean bat roost height is about 14 meters (n = 24). * Mean forest stand canopy height is 24 meters. * ʻŌhiʻa is the only native tree in which bats were identified roosting. | Kristina Montoya-Aiona, U.S. Geological Survey/ Hawai‘i Cooperative Studies Unit |
| Pupping | * All pupping occurs below approximately 1,000 meters elevation as temperature is critical for pupping; higher elevations are too cold. | Frank Bonaccorso, U.S. Geological Survey (retired) |
| Diet | * Two-thirds of the Hawaiian Hoary Bat’s diet is comprised of moths, particularly *Lepidoptera*. * Hawaiian Hoary Bats eat many non-native insects. * Diet depends on where the bat is feeding and may vary by island and habitat. | Dave Johnston, H.T. Harvey & Associates  Corinna Pinzari, U.S. Geological Survey/ Hawai‘i Cooperative Studies Unit |
| Range | * “(The Hawaiian Hoary Bat has) a lot of plasticity showing a lot of behavioral flexibility. They can do a lot of different things in different situations. Prey availability is likely the driving factor in its distribution.” * From the acoustic data collected in East Maui, it was determined bats spent more time foraging in gulch, low-density developed, and grassland habitats, although differences existed between months. * The mean core use area used by the bats in East Maui for foraging was 3,700 hectares, but there was a wide range of values among individual bats. * Prey availability is likely the driving factor in the bat’s distribution. | Dave Johnston, H.T. Harvey & Associates |
| * The species is an extreme habitat generalist and has been observed flying from sea level up to volcano summits. * Hawaiian Hoary Bat data shows order of magnitude differences in foraging ranges on different islands and habitats depending on resource availability. | Frank Bonaccorso, U.S. Geological Survey (retired) |

**SECTION III. ASSESSMENT OF TAKE AND IMPACTS FOR HCPs:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Acoustic Activity Monitoring | * Acoustic monitoring cannot determine the number of bats present in any given area. * Hein et al. (2013) found that pre-construction acoustic monitoring results are not correlated to bat fatality rates. Pre-construction monitoring should be considered on a case-by-case basis. * Occurrence of bat fatalities is documented through fatality monitoring, not by acoustic monitoring; therefore, acoustic monitoring is not necessary for this purpose. * There are no existing flaws in self-monitoring of wind projects and third party monitoring would add data quality uncertainties. The proposed 20% outer area buffer for fatality monitoring is unnecessary when there is no indication current monitoring standards are inadequate. * The 20% change in activity standard does not consider baseline acoustic activity or time frame. * “Activity” should be defined (occupancy, calls per night, etc.). * Significant financial burden imposed by the number of detectors that would be required to meet recommendation. * Documentation of habitat preferences at the site through acoustic monitoring may not be possible or meaningful for all sites. Seasonal and temporal activity changes have been consistent for all wind farms with HCPs. Other sources of data may provide sufficient information to evaluate risk and bat activity patterns. * Interannual variability limits the statistical comparisons between years. | Marilyn Teague, AEP Renewables  Matt Stelmach, on behalf of Tetra Tech |
| “Activity monitoring is recommended at both nacelle and ground levels.”   * Consider comparing activity at nacelle and ground levels to determine if there is a relationship. This could identify opportunities to shift cost away from things that are not providing ‘good data’ to other techniques. | Michael Schirmacher, Bat Conservation International |
| * The stated objectives for acoustic monitoring should be more focused to attain the stated statistical significance. * The stated level of statistical power is very robust and would be difficult to achieve using acoustic monitoring because of typical variability in nightly activity rates. * Define “in the vicinity of wind facilities.” * Should state how monitoring data should be used, for example, to provide a control for trends in activity at the wind facility or to detect impacts to the population in the areas surrounding the facility. This strongly affects site placement. * Recommend a subset of turbines to monitor and the criteria for selecting these turbines, such as the turbines with the highest activity or highest mortality rates long term. * Provide more specific guidance on the specific metrics of activity to track and standardized statistical approaches to evaluating these data, particularly the incorporation of all the recommended covariates. * Specify how the infrared imaging should be used to enhance interpretation of the required acoustic monitoring. | SWCA Environmental Consultants |
| Use of Tiers | * Tiers are biologically appropriate and beneficial. Tiers enable the identification and implementation of more biologically effective mitigation based on new, best available information and research results. | Marilyn Teague, AEP Renewables |
| * The past use of tiers seems to indicate that they are consistent with State law. Suggest Attorney General review the use of tiers, or remove the speculative discussion of the legality of tiers from the guidance document. | Matt Stelmach, on behalf of Tetra Tech |
| Fall Distribution Models | * I believe there are better fall distribution models than Hull and Muir (2010). USGS is working on a module for GenEst that allows calculating fall distribution that should be complete this summer.   “There is new data showing that impacted bats fall farther from wind turbines at higher wind speeds (Hein 2017) which has implications for Hawai‘i wind energy facilities that should be evaluated.”   * This is also important if you are implementing curtailment, because blades are only spinning at higher wind speeds so bats are falling further from the turbine by default (see Manuela Huso presentation at NWCC). * Wind speed, wind direction, temperature, etc. should be provided when bats are not found to determine if there are conditions when risk is higher. | Michael Schirmacher, Bat Conservation International |
| Carcass Retrieval Protocol | “Treatment of carcasses found during fatality monitoring, or incidental to the regular monitoring, should follow the most current standardized protocol provided by the agencies.”   * Defining “incidental” is important. * If a bat is found outside a standard search and needs to be collected, then a surrogate should be placed to see if the carcass would have been found during a standard search. If not found after 20 days, then incidental but if found then count as a search fatality. | Michael Schirmacher, Bat Conservation International |
| Take Risk Relative to Turbine Size | * Zimmerling and Francis (2016) show turbine size is not correlated to bat fatality rate.   “Figure 3. (No. of fatalities/turbine relative to modified tower heights).”   * Showing Hawai‘i projects wind turbine sizes on this figure is inappropriate. This data is unrelated to Hawai‘i projects and was based on outdated turbine designs. The Hawai‘i projects are outside of the scope of inference for this data both geographically and based on turbine design. When Hawai‘i projects are used as examples in the document, treatment should be unbiased. | Matt Stelmach, on behalf of Tetra Tech |
| Evidence of Absence (EoA) | * The use of the 80% credible level is arbitrary and has not been adequately justified. Justification should be provided. The text should also read: “...the use of the 80% credible level results in overestimating take in eight out of every ten years and a high degree of certainty that estimated take is greater than actual take.” | Matt Stelmach, on behalf of Tetra Tech |
| *Rho* Value | “When using the EoA model to calculate the ongoing take, a *rho* value should not be applied unless a baseline from site-specific monitoring is first established at a site.”   * *Rho* values for assessing compliance with take authorization are different from *rho* values for projection of take. It is valuable to clarify the distinction between *rho* values for compliance and *rho* values for projections of fatalities.   “To justify the use of a *rho* factor in the EoA calculation… average wind speed at site, pre-operational monitoring of bat activity, rotor diameter, nacelle height…”   * These factors have been shown to be poor predictors of fatality rates. Post-construction monitoring results are the most appropriate means of assessing fatality rates. EoA also provides a test of bias in *rho* values for assessing unobserved take. | Matt Stelmach, on behalf of Tetra Tech |
| Third Party Monitoring | * Taking monitoring out of the control of the ITL holder implies owners and consultants are not qualified or doing a good job performing the monitoring, while the case is the opposite. The Hawai‘i wind companies have been quite innovative in their monitoring efforts as demonstrated by the use of canine search teams. * Owners will not be able to manage quality control and monitoring costs. | Matt Stelmach, on behalf of Tetra Tech |
| * The stated reason for this new demand is to “avoid conflicts of interest, perceived or real.” However, there is no indication that wind project self-monitoring – a long-standing approach under most environmental laws, and one that is always subject to agency oversight – has been flawed or compromised in any way. * Also, DOFAW lacks the organizational and staffing capacity to search for, select, retain and manage a monitoring entity. This proposed new requirement, which would add enormous cost and data quality uncertainties, appears aimed at a problem that does not exist. | Marilyn Teague, AEP Renewables |
| Application of Mainland Hoary Bat Data | * Mainland hoary bat demographics (Frick et al. 2017) are not meaningful for Hawaiian Hoary Bats because the environments that constrain the populations are dissimilar. * Frick et al. (2017) was not an empirical study but an expert elicitation that solicited results from only nine researchers and the eight primary authors are the experts solicited. The results spanned five orders of magnitude, suggesting this is not meaningful information. Suggest removing reference to this paper. * Guidance document should apply results from mainland studies consistently. Research from mainland studies are heavily incorporated into the minimization section but nearly absent from the mitigation section. | Matt Stelmach, on behalf of Tetra Tech |
| * The Draft Updated Guidance relies upon mainland studies to support recommended minimization measures, while simultaneously excluding mainland studies when discussing mitigation types and effectiveness. Bat Task Force appears to have chosen cited studies or excerpts selectively in order to support a pre-determined assumption or conclusion. | Marilyn Teague, AEP Renewables |
| Assessment of Take | * Preventing loss of genetic representation only applies to plants not animals 195D-4 (g)(9) | Marilyn Teague, AEP Renewables |
| **Topic** | **Bat Workshop Finding** | **Presenter(s)** |
| Acoustic Activity Monitoring | * Multiple studies show differences in activity from ground-based detectors versus nacelle-based detectors. * Acoustic activity is concentrated in the first six hours of the night. * Acoustic activity is negatively correlated with wind speed. We have many more detections occurring at low wind speeds. * Wind speed does not predict all bat activity. * “We know that pre-construction acoustic monitoring cannot predict bat fatality rates so I would… suggest that we assume new wind sites would have bat activity and use appropriate surrogates to estimate take, and not (make it) a requirement for mandatory baseline monitoring.” | Matt Stelmach, on behalf of Tetra Tech |
| * Bats are not always echolocating near the nacelle or the rotor-swept zone. | Marcos Gorresen, U.S. Geological Survey/ Hawai‘i Cooperative Studies Unit |
| * Bats emit micro calls which are hypothesized to:   + Save energy compared to “expensive” normal echolocation,   + Increase ability to sneak up on prey, and   + Enable sneaking up on the opposite sex during mating season. | Ted Weller, U.S. Department of Agriculture Forest Service |
| * The East Maui study showed bats were much less likely to call on nights with rainfall | Dave Johnston, H.T. Harvey & Associates |

**SECTION IV. AVOIDANCE AND MINIMIZATION MEASURES:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Low Wind Speed Curtailment | * Prior analysis and publicly available studies have not been able to translate available data into an actionable smart curtailment management strategy. * Should provide definitions for curtailment, low wind speed curtailment, and deterrents. | Matt Stelmach, on behalf of Tetra Tech |
| “…studies conducted across numerous ecosystems and facilities have consistently shown a decrease in fatalities of over 50 percent once cut-in speeds are equal to or greater than 5.0 meters per second (m/s).”   * This depends on a number of factors, like the turbine start-up speed (different from the cut-in speed) and the species. * BCI is finalizing a curtailment synthesis which should provide a better understanding of the reduction at a given cut-in speed. * The assessment of >50% decrease in fatalities at 5 m/s is high. * Recent data shows bats fall further from the turbine when curtailed so if plots are too small you likely miss fatalities that occur at curtailed turbines. | Michael Schirmacher, Bat Conservation International |
| Deterrence | * Because UV lights are insect nocturnal attractants, especially moths, there could be a risk that UV lights could accumulate prey and attract bats. | Kristin Jonasson, Bat Conservation International |
| * Deterrents need further testing before recommending them in HCPs, for which we have the ability. Some research has shown an increase in the fatality of bats when using the earlier versions of deterrents. | Michael Schirmacher, Bat Conservation International |
| Project Siting | * There might be enough baseline data from projects to examine this and determine if there are particular features that should be avoided or require higher minimization. We are pursuing something similar for continental U.S. | Michael Schirmacher, Bat Conservation International |
| * Recommend listing landscape features to avoid, and including a discussion on the increased risks of constructing facilities on certain habitat features. Forested ridgetops are where the conflict between bats and wind energy first became apparent (see Arnett et al. 2008). Additionally, the 2019 H.T. Harvey study showed gulches are a frequently used habitat. Kawailoa Wind is the wind energy facility with the highest level of take and is situated on forested ridges. Improving understanding of siting risk and avoiding high risk areas is likely the most cost-effective way to reduce fatalities. | Kristin Jonasson, Bat Conservation International |
| Other Operational Factors Affecting Bat Take | * Suggest accounting for hysteresis events (wind gusts that could inflate average wind speed causing turbines to start-up before wind speeds are actually high) should be considered.   “Young et al. (2011) found that feathering the blades to reduce the rotational speed of turbine blades at or under the manufacturer’s cut-in speed of 4.0 m/s significantly reduced bat fatalities.”   * The authors could not repeat these results in the second year. | Michael Schirmacher, Bat Conservation International |
| **Topic** | **Bat Workshop Finding** | **Presenter** |
| Occupancy | * Oʻahu:   + Occupancy rates inversely associated with population density but not with tree cover or elevation.   + 12,000 detections over entire island in 2.5 years.   + High levels of detection in North Shore and Waiʻanae Mountains areas. * Leeward Haleakalā, Maui:   + Highest activity detected at mid-upper elevations.   + 17,000 bat detections over study site in 1-3 months. * Maui bat activity much greater than on Oʻahu. | Joel Thompson, Western EcoSystems Techology (WEST) Inc. |
| * Mauna Kea, Hawai‘i Island: preliminary model estimates are 2-8 bats per square kilometer. | Marcos Gorresen, U.S. Geological Survey/ Hawai‘i Cooperative Studies Unit |
| Acoustic Deterrents | * Deterrent units have an approximately ten year lifespan. * It is assumed bats cannot become desensitized to the deterrents. * Illinois Study: deterrents and 5 m/s low wind speed curtailment:   + 68% reduction in total bat fatalities   + 57% reduction in the Eastern Red Bat fatalities, and   + 71% reduction in the mainland hoary bat fatalities. * Texas Study: deterrents only:   + 50% reduction in total bat fatalities, and   + 54% reduction in Mexican Free-tailed Bat fatalities, and   + 78% reduction in mainland hoary bat fatalities. | John Ugland, NRG Systems |

**SECTION V. MITIGATION:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Cost Analysis | * Recommendations increases bat mitigation and monitoring costs by 400% rendering future projects infeasible. * Mitigation cost of $125,000 unjustified for CUA. | Marilyn Teague, AEP Renewables |
| Community Engagement | * Community should be engaged through the use of citizen science in bat management and mitigation * Commentors have submitted sample citizen science mitigation option | Sandra Demoruelle, Kaʻū Resident  Linda Morgan, Kaʻū Resident |
| Native Reforestation | * No evidence that native forests benefitor produce more bats, and best available science has debunked these prior assumptions. | Marilyn Teague, AEP Renewables |
| * Gorresen et al. (2013) found no correlation between bat activity and native forest. There is a growing body of evidence to suggest that bats are using the open spaces rather than the forests. Jantzen (2012) found mainland hoary bats prefer open spaces. Jacobs (1999) found increased consumption of insects in open habitats, similar to activity of mainland hoary bats. Bellwood and Fullard (1984) demonstrated bats utilizing open spaces for foraging. H.T. Harvey (2019) also found increased activity in open spaces. | Matt Stelmach, on behalf of Tetra Tech |
| “... native forests represent the natural habitats to which Hawaiian Hoary Bats are adapted and should make up the core of restoration goals, in the absence of compelling information otherwise.”   * Continuing to think of Hawaiian Hoary Bats as native forest specialists is limiting. Recent studies have demonstrated that Hawaiian Hoary bats are generalists that forage extensively in open areas (H.T. Harvey 2019; Pinzari et al. 2019) and eat native and non-native insects (H.T. Harvey 2019; Pinzari et al. 2019). * While Hawaiian Hoary Bats adapted to the original Hawaiian landscape, we should ensure that native habitats still contain sufficient insects to provide appropriate prey. Hawai‘i has suffered devastating losses to its invertebrates (Asquith 1995; Dunn 2005). It is very possible some insect species that bats relied on have gone extinct or will not readily return once native trees are planted. As insectivores, bats are at least one step removed from a mitigation action; we cannot directly plant their food (i.e. the way ʻōhiʻa is planted for native forest birds). Recent genetic barcoding of bat fecal pellets has identified their insect prey to the genus and species level. Mitigation should state the specific insect prey species to be restored and link the restoration plants to act as hosts for these insects. * Hawaiian Hoary Bats feed on native and non-native moths that frequently forage on grasses so we must ensure that shrublands and pasture are not de-facto considered degraded habitat for this species. If non-native food resources are replaced by native plants that provide a lower biomass of insect prey, then restoration efforts could backfire and decrease foraging habitat quality. Non-native pine/eucalyptus forest is likely a more suitable target for restoration than pasture as these forests appear to have lower levels of insect prey. Prospective restoration sites should be surveyed for the abundance of suitable insect prey prior to selection, and suitable insect abundance before and after restoration should be quantified. * Other native habitats can provide suitable foraging habitat for Hawaiian Hoary Bats. Native shrubland, for instance, māmane at elevation,has been used by bats foraging for both native and non-native moths (H.T. Harvey 2019), | Kristin Jonasson, Bat Conservation International |
| Habitat Quality | * The document should emphasize the quality of foraging habitat at critical times of year. For example, energy demands during lactation are 30% greater than during pregnancy (Kurta et al. 1989). * Recommend use of herbicides that have minimal impacts on insects. * Should include interventions that could improve insect biomass and density. | Kristin Jonasson, Bat Conservation International |
| * The studies cited selectively support a predetermined conclusion and have several conflicting findings and/or recommendations. For example, the document recommends ungulate control yet ungulates are positively correlated with bat activity. | Marilyn Teague, AEP Renewables  Matt Stelmach, on behalf of Tetra Tech |
| * The recommendation “Restoration efforts should include controlling the impacts of ungulates (e.g. fencing), removing key invasive species” (page 31) does not explain how fencing/ungulate exclusion benefits bats, or which invasive species have been known to negatively impact bat foraging or roosting habitat. | Kristin Jonasson, Bat Conservation International |
| Core Use Area (CUA) | * No scientific justification to increase CUAs by 150% from 40 to 97 acres. This recommendation relies on unpublished data and non-peer reviewed data from H.T. Harvey. | Marilyn Teague, AEP Renewables  SWCA Environmental Consultants |
| “The typical unit of Hawaiian Hoary Bat take is one adult bat, which had a mean CUA of 48.5 acres.”   * This value is not presented by Bonaccorso et al. (2015) nor by the 2015 guidance document.Calculations need to be included for newly derived estimates especially when critical to the evaluation of mitigation. Furthermore, the mean is an inappropriate measure of central tendency for highly skewed data.   “Doubling the acreage could provide the other half of a bat’s habitat need, if it was of high quality.”   * Suggest removing the term “high quality”. Preceding statements assert that “threats and factors that limit the bat population are unknown.” Therefore, the quality of habitat cannot be assessed. * The doubling of a mean or median is a logical fallacy. Half the time spent in an area does not relate to half the area. Doubling the acreage is an arbitrary decision point. More specificity is required to understand how bats are utilizing habitat.   “Compensatory mitigation is recommended to consist of 97 acres of high quality predominantly native habitat (i.e., CUA quality).”   * A set acreage protected for perpetuity does not relate to a single bat but a bat or bats over time. Generations of bats benefiting from mitigation need to be acknowledged. | Matt Stelmach, on behalf of Tetra Tech |
| Research as Mitigation | * The mitigation value of research cannot be measured by its dollar cost, but must instead reflect its contribution to the likelihood and extent of bat recovery. | Marilyn Teague, AEP Renewables  Matt Stelmach, on behalf of Tetra Tech |
| * Guidance should acknowledge the U.S. Fish and Wildlife Service’s position on research as mitigation; unless the U.S. Fish and Wildlife Service accepts research as mitigation there is zero incentive for applicants to spend money on research. | Marilyn Teague, AEP Renewables |
| * Any land management for the benefit of Hawaiian Hoary Bats should be given some credit as research benefit, as management actions reduce the uncertainty of limiting factors and bat responses to management. | Matt Stelmach, on behalf of Tetra Tech |
| Land Acquisition | “If partnering with other entities for a larger acquisition, the prorated share of funds provided for the mitigation should be used to calculate credit at a rate of 97 acres per bat.”   * The proportion of funding is not an appropriate means of assessing the contribution to mitigation. The overall mitigation credit for the parcel should be evaluated, and the funding partners should agree on how the mitigation credit is distributed. | Matt Stelmach, on behalf of Tetra Tech |
| **Topic** | **Bat Workshop Finding** | **Presenter** |
| Foraging Habitat | * Bats forage in very patchy habitats. Although they had fairly large ranges bats selected very specific habitats. That meant that they had to fly over other areas and they were frequently flying over forest. * May be more important to enhance a given habitat as opposed to purchasing a set forest or set habitat. Bats need different habitats at different times of the year to some degree, but there are basic habitats they do need for foraging year round. CUAs and foraging range may not be as important as habitat quality. * Some evidence suggests that Hawaiian Hoary Bats select some moths over others (n=11). When restoring habitat and designing intact habitat, these insects’ host plants should go down to the species level in order to plant specific plants that will produce certain prey. | Dave Johnston, H.T. Harvey & Associates |
| * Diet studies should be done in other habitats and other islands and one study is not representative of the entire state. No diet studies have been conducted in dry forest or wetlands yet for Hawaiian Hoary Bats. | Corinna Pinzari, U.S. Geological Survey/ Hawai‘i Cooperative Studies Unit |
| * Foraging habitat can be estimated based on diet but requires knowledge of insect host plants. * Possible to characterize habitats based on composition of insects collected. | Bob Peck, U.S. Geological Survey |

**SECTION VI. ADAPTIVE MANAGEMENT:**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Exceeding Take | “When the average take rate is determined to be clearly above the permitted level, a short-term trigger is activated that can be used as a check against excessive take over the span of a few years, signaling that the long-term take limit is likely to be exceeded unless conditions change”   * Interannual variability in Hawaiian Hoary Bat take rates suggests a project is likely to trigger short term thresholds in the first five years of a project, regardless of whether the long term trigger is likely to be exceeded. Suggest modifying accordingly.   “Include a provision that if authorized take is exceeded, turbines will not operate during times when bat take is possible.”   * Suggest removing. DLNR has other options to resolve this issue that are commercially viable. | Matt Stelmach, on behalf of Tetra Tech |

**APPENDIX I. HAWAIIAN HOARY BAT RESEARCH:**

|  |  |  |
| --- | --- | --- |
| **Topic** | * **Comment** | **Commentor** |
| Research Priorities | * Suggest revising and providing an updated list for 2020. * Suggest removing priorities that have been completed. * Suggest removing priorities that do not improve the ability to manage the bat directly. | Matt Stelmach, on behalf of Tetra Tech |

**APPENDIX VI. HAWAIIAN HOARY BAT VORTEX POPULATION EXERCISE**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Comment** | **Commentor** |
| Carrrying Capacity | “Carrying capacity is a critical parameter in Vortex.”   * General ecology would suggest that a self-sustaining population, in a stable equilibrium (“stable to increasing”) is likely experiencing density dependent depression of growth rates. This high level discussion does not adequately address these problems and how they relate to the models posed below.   “Frick et al. (2017) set an upper bound on population growth at ten times the initial population size in order to strike a balance between unbounded and overly constrained population growth.”   * The ecological constraints of the mainland hoary bat are distinctly different from the Hawaiian Hoary Bat and include different seasonal influences, different prey, different geographic extent, impacts from migration, and others. Frick et al. (2017) also needs to be placed in context as not using empirical data. | Matt Stelmach, on behalf of Tetra Tech |
| Population Exercise | * Population-based test has no scientific support that cannot be satisfied limiting any future wind projects in Hawaiʻi. | Marilyn Teague, AEP Renewables |

Prepared by:  
Lauren Taylor, Protected Species Habitat Conservation Planning Coordinator

Koa Matsuoka, Protected Species Habitat Conservation Planning Associate