



Indiana Bat, FW3 <indiana\_bat@fws.gov>

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## Response to Draft Revised Indiana Bat Summer Survey Guidelines

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Ian Agranat <ian@wildlifeacoustics.com>

Mon, Mar 4, 2013 at 1:25 PM

To: indiana\_bat@fws.gov

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To whom it may concern,

Please find attached my public comments in response to the Draft Revised Indiana Bat Summer Survey Guidelines.

I am available should you have any questions.

Best regards,

Ian Agranat

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March 4, 2013

Indiana Bat Summer Survey Guidelines  
U.S. Fish and Wildlife Service  
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Bloomington, IN 47403-2121

indiana\_bat@fws.gov

To whom it may concern,

Please find herein my public comments regarding the Draft Revised Indiana Bat Summer Survey Guidelines.

I am the president and chief executive officer of Wildlife Acoustics, Inc., a supplier of bat detector hardware and analysis software worldwide with over 10,000 recorders deployed by our customers in over 60 countries. I am writing with comments on the “Draft Revised Rangewide Indiana Bat Summer Survey Guidelines January 2013” and the “Acoustic Bat Identification Software Testing Criteria – Draft January 2013” documents.

I. Comments on “Draft Revised Rangewide Indiana Bat Summer Survey Guidelines January 2013”

a. Appendix B: Phase 2 Acoustic Surveys

- i. Page 12 Verification of Deployment Location: “It is recommended to temporarily attach GPS units to each detector”.

COMMENTS:

Is this “recommended” or “required”? While our detectors have a GPS option, it is designed for time synchronization and is expensive for the simple purpose of logging a static location. It should be sufficient for the surveyor to obtain a fix with any off-the-shelf GPS receiver to determine the approximate location of the detector. This will provide equivalent accuracy but at a much lower cost.

- ii. Page 12 Verification of Proper Functioning: “It is also recommended to ensure equipment is working during set-up in the field. This can be done simply by producing ultrasound (e.g., finger rubs)”

COMMENTS:

This methodology would not be consistent with our recommendations for our equipment. Our detectors when used as recommended have an integrated filter that can tell the difference between “finger rubs” and bat echolocation calls. Thus, finger rubs without bats would not be recorded and the function of equipment cannot be confirmed with this technique. Instead, we offer a calibrator capable of producing ultrasonic pulses that would be recorded. In addition it allows verification that the ultrasonic sensor is within specification. I recommend that the methodology require following the equipment manufacturer’s testing recommendations.

- iii. Page 12 Verification of Proper Functioning: “Thus, at least 10 bat calls (i.e. greater than or equal to 3 high-quality pulses in a call) must be recorded AND a minimum of 40% of all recorded bat calls must be identified to the species level”

COMMENTS:

Is classification to the species level to be done by human experts or by software? The 40% identification to species may be impossible in some cases or unhelpful in others. For example, suppose 40% of the bat passes are attributable to an easily identified species such as the tricolored bat. You might achieve 40% identifiable calls but not have any identifiable calls among 60% of the population that could include uncertain but possible Indiana bat passes. Conversely, depending on the species mix and clutter conditions at the site, 40% identifiable calls may be unattainable. What if only 1% of the calls were identified to species, but these calls included almost certain Indiana bat calls thus confirming presence? Wouldn't that be sufficient to conclude presence of Indiana bats? Perhaps a better metric would be a minimum number of identifiable calls collected at the site.

II. Comments on "Acoustic Bat Identification Software Testing Criteria – Draft January 2013"

- a. Section 2 "Program developers must provide the Service with a copy of their call library, which must indicate the number of calls per species, call recording location and the method of collection"

COMMENTS:

Wildlife Acoustics' call library was collected from numerous trusted third parties (eleven different sources to date and growing). We do not have ownership rights to the call library and thus it is not ours to provide to the Service. In some cases, we are under non-disclosure agreements and thus cannot provide the calls nor other information to the Service. In other cases, we don't have all of the information such as recording location and methods for every call in our library as that sometimes was considered sensitive data from the contributor. It is unclear what exactly the Service would intend to do with these calls and information. Asking software developers for their call libraries isn't that different from asking for source code, algorithms, trade secrets or other intellectual property which seems like an unreasonable requirement for the government to impose on a commercial private sector entity.

As methods and algorithms for software vary, it would be incorrect to suggest that the inputs necessarily strongly correlate with the software's ability to determine the presence or absence of Indiana bats. This requirement could limit the Services ability to approve highly effective software.

Furthermore, providing this information does not offer any guarantee that the software would accurately determine the presence or absence of Indiana bats.

In general, the software test criteria should only specify requirements that ensure that the objectives are met, that is, the accurate determination of presence or probable absence of Indiana bats, and not set out extraneous requirements that might only serve to limit choices to specific implementations.

- b. Section 4 "The program must include filtering to remove extraneous noise and non-bat files, as well as feeding buzzes, files with multiple bats, poor-quality passes that are recognizable as a bat but not to species, and medium-quality passes that are only recognizable to genus"

COMMENTS:

This requirement assumes limitations of methods and algorithms that may not exist. Suppose an algorithm could successfully identify bat species by characteristics in their feeding buzzes. Suppose an algorithm could successfully handle files with multiple bats and identify the two individual bats accurately, Again, this requirement could limit the Services ability to approve highly effective software..

Furthermore, these requirements fail to guarantee that the software would accurately determine the presence or absence of Indiana bats.

Again, software test criteria should only specify requirements that ensure that the objectives are met, that is, the accurate determination of presence or probable absence of Indiana bats, and not specify extraneous requirements that might only serve to limit choices to specific implementations.

- c. Section 6 “Accuracy rates of the program must be derived through cross-validation... Minimum correct classification rate on the software’s training data must be 90% or better for all *Myotis* species...”

COMMENTS:

Software optimized to meet the requirement of 90% correct classification rates could very well suffer from “overfitting” (See <http://en.wikipedia.org/wiki/Overfitting>) which will then result in a loss of generalization to previously unobserved data as would be collected under the guidelines. This means that while you may see impressive results from cross validation, biases inherent in the data will result in worse results in the field, not better.

Once again, this is a requirement that might exclude software that would actually perform better while at the same time offer no guarantee that the software would meet the objectives of the protocol.

The argument that cross validation on a statistically significant call library would overcome the problem of overfitting is flawed. The nature of a call library may include what would seem to be a statistically significant set of calls, yet these calls would likely have been collected from a small number of field sites. Bats will adapt their echolocation calls as received by the microphones to specific conditions and will therefore present a bias in the data at each site. Cross validation removing calls at random will fail to remove these biases and overfitting remains a significant risk.

- d. Section 7 “all analysis programs must utilize a maximum-likelihood estimator approach”

COMMENTS:

Yet again, this requirement forces a particular implementation that might exclude software that would actually perform better while at the same time offers no guarantee that the software would meet the objectives of the protocol.

A maximum-likelihood estimator, if based on expected error rates, will only produce meaningful P-values if the error rates are consistent in a variety of field conditions. Unfortunately, this assumption may not be valid. Different sites with different species composition and clutter conditions may result in significantly varied error rates and thus result in unreliable P-values for determination of the presence or probable absence of Indiana bats.

- e. Section 8 “and the maximum-likelihood estimator value assignments”

COMMENTS:

Same comment as above in “d”.

In conclusion, I would summarize my comments as follows: First, the draft software testing criteria specifies numerous requirements that have little to do with the ultimate objective of accurately determining the presence or probable absence of Indiana bats at a site. The requirements as written would serve only to restrict the possible

solutions that would be accepted, potentially eliminating solutions that might offer superior performance. And second, there is no actual test that would determine the efficacy of software to meeting the stated objectives of the guidance. It seems to me that the entire software test criteria should be scrapped and rewritten as follows:

1. The Service will collect full spectrum and zero crossing recordings from a statistically significant number of sites both known to have Indiana bats present and known not to have Indiana bats present following the guidance laid out in Appendix B “Phase 2 Acoustic Surveys”. These recordings must not be made available to any software developer as doing so would taint any results (it is easy to optimize to fit training data as discussed above to the detriment of classifying previously unknown data, so it is imperative that the data collected for testing software was never seen by the software under test).
2. The Service will run the data sets through candidate software programs. If the software reliably determines which data came from sites known to have Indiana bats present and which came from sites known to have Indiana bats absent to some acceptable degree, then the software is accepted.

Implementation of the above standard not only tests the efficacy of the software for its intended application, but also tests the entire guidance as effective in meeting its stated objectives.

I am available to answer any questions.

Respectfully submitted,



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