

Broad Incidental Take Permit/Authorization for Common Activities

Wind Energy and Cave Bats

Background

The Broad Incidental Take Permit/Authorization for Common Activities, as provided for under s. 29.604 Wis. Stats., allows for the incidental taking (mortality) of certain endangered and threatened species that may occur as a result of activities occurring regularly across the landscape. The Department recognizes that these common activities are issued or could be issued individual incidental take permits/authorizations with identical minimization and mitigation measures, and therefore has issued this broad incidental take permit (used by non-state agencies and individuals) and broad incidental take authorization (used by state agencies) to cover these regularly occurring activities if the associated conservation measures are implemented.

An incidental take permit or authorization is typically issued on a project-by-project basis, however a broad incidental take permit/authorization (BITP/A) was created for this situation so that an application, permit fee and public notice period is not required for each individual project. An individual, organization or agency is automatically covered by this permit or authorization if all conditions listed below (process, reporting, conservation measures) are met.

The proposed Broad Incidental Take Permit/Authorization for Wind Energy and Cave Bats recognizes the importance of wind energy in Wisconsin but also acknowledges the detrimental impact wind turbines may have on the state's cave bats (tricolored bat, northern long-eared bat, little brown bat, big brown bat). This broad incidental take permit/authorization creates conservation measures for wind energy that are shown to be an effective strategy in minimizing impacts on cave bats.

Species Covered

The following cave bat species are covered under this Broad Incidental Take Permit/Authorization:

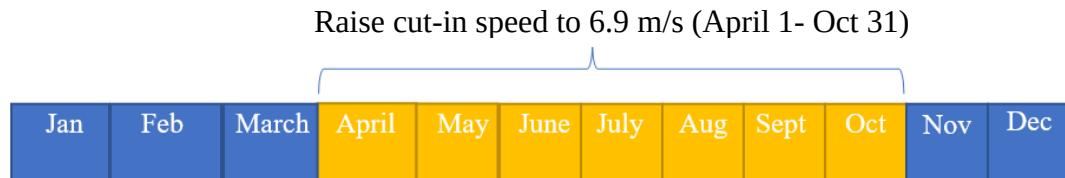
- Tricolored Bat (*Perimyotis subflavus*)
- Northern Long-eared Bat (*Myotis septentrionalis*)
- Little Brown Bat (*Myotis lucifugus*)
- Big Brown Bat (*Eptesicus fuscus*)

Conservation Measures

Land-based Wind Turbines¹ will fall under one of two categories – contact the [ER Energy Liaison](#) to determine which category your wind turbines fall under or if you are unable to meet these requirements.

1. **Within Bat Priority Area (BPA)** - Wind turbines occurring within any one of the below BPAs must implement and maintain a 6.9 m/s cut-in speed² at night³ from April 1 – October 31. This is considered avoidance, and no further monitoring is required.
 - a. Located within 10 miles of an entrance to a **Priority 1 Cave Bat Hibernaculum** (houses >10,000 little brown bats, tricolored bats, or northern long-eared bats).
 - b. Located within 1 mile of an entrance to a **Priority 2 Cave Bat Hibernaculum** (houses <10,000 little brown bats, tricolored bats, or northern long-eared bats).
 - c. Located with 3 miles of a **Priority 1 Cave Bat Maternity Roost** (any tricolored or northern long-eared bat maternity roost or a maternity roost housing >500 little brown bats).
 - d. Located within 1 mile of a **Priority 2 Cave Bat Maternity Roost** (houses <500 little brown bats).

General Curtailment Schedule Within Priority BPAs



¹ Wind turbines used for personal energy production and are 150ft or less in total height have no actions that are required at this time.

² Whitby, M. D., O'Mara, M. T., Hein, C. D., Huso, M., & Frick, W. F. (2024). A decade of curtailment studies demonstrates a consistent and effective strategy to reduce bat fatalities at wind turbines in North America. *Ecological Solutions and Evidence*, 5, e12371. <https://doi.org/10.1002/2688-8319.12371>.

³ Night is defined as 15 mins before local sunset and 15 mins after sunrise (Loeb, S.C.; Rodhouse, T.J.; Ellison, L.E.; Lausen, C.L. [and others]. 2015. A plan for the North American Bat Monitoring Program (NABat). Gen. Tech. Rep. SRS-208. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 100 p).

2. **Outside Bat Priority Area (BPA)** – Land-based wind turbines occurring outside of a cave bat maternity roost or hibernacula BPA must implement one of the following two technology options (a.) and reporting (b.):

a. Technology options (choose one)

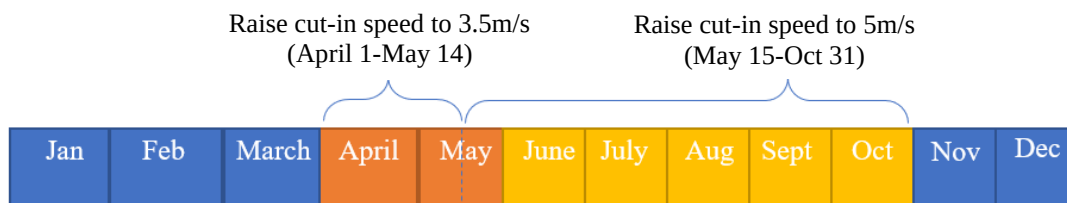
i. Option 1 - Implement year-round sensor-based technology⁴.

- At least one sensor-based technology must be implemented for every 10 turbines at a facility. The [ER Utility Liaison](#) must approve of technology used prior to implementation.

ii. Option 2 - Implement blanket curtailment based on seasonal time frames.

- Raise the cut-in speed to 3.5 m/s at night³ during the spring migration season (April 1 to May 14) at all turbines.
- Raise the cut-in speed from 3.5 to 5.0 m/s at night³ when temperatures are above 40° F⁵ (4.4° C) during the summer maternity and fall migration seasons (May 15 to October 31).

General Curtailment Schedule Outside Priority BPAs



⁴ Sensor-based technology is technology that may incorporate bat activity in addition to relevant weather variables (temperature, wind speed) to curtail turbines within a ¼ mile radius of the initial detection for up to 30 minutes and may extend at 10 minute intervals should bat activity persist. Projects may also use an algorithm-based informed curtailment (ABIC) approach or a real-time acoustic-activated smart curtailment approach.

⁵ Temperatures should be measured at the nacelle and can be specific to individual turbines on a project. For example, if the temperature at the turbine's nacelle falls below 40°F then the turbine does not need to be curtailed as long as the temperature at the nacelle is below 40°F. We based this temperature threshold on data collected at a wind project in Missouri. Jordan, G.W. 2020. Status of an anomalous population of northern long-eared bats in coastal North Carolina. Journal of Fish and Wildlife Management, 11(2): 665-678

- b. Bat fatality monitoring must also occur to estimate take of listed species because of covered activities. See Appendix A for approved monitoring methods.
 - i. Option 1 - Two years of post-construction monitoring.
 - Year 1 – intense sampling that includes 25% of the total number of turbines.
 - Year 2 – Road and Pad surveys at all turbines.
 - ii. Option 2 - Four years of Road and Pad monitoring at all turbines which includes two years of summer monitoring.

Once fatalities of covered species exceed 5 bats/year at any given turbine, then the operator must implement more stringent sensor-based curtailment options or adopt 6.9m/s blanket curtailment from April 1st through October 31st on the offending turbines. The operator must contact the [ER Utility Liaison](#) within 5 days of this occurring to discuss which curtailment option will be implemented moving forward.

Appendix A: Post-construction Bat Fatality Monitoring
Appendix B: Bat Fatality Survey Report
Appendix C: Fatality Report Guidelines

Appendix A: Post-construction Bat Fatality Monitoring

Bat Survey Protocols for Land-based Wind Energy have been developed by the Wisconsin Department of Natural Resources (DNR) as a technical tool which will ensure that valid and consistent methods are used to collect data for wind turbines located in Wisconsin. The document should be used in conjunction with the Wisconsin DNR Best Management Practices (BMPs) for Land-based Wind Energy and Telecommunication Projects, an [Endangered Resources Review](#), and the [United States Fish and Wildlife Service Land-Based Wind Energy Guidelines](#) (USFWS Guidelines).

The wildlife survey protocols in this document are used to assess potential or verified wildlife impacts from wind projects. The protocol is specific to conditions found within Broad Incidental Take Permit/Authorization for Wisconsin Cave Bats and adds detail to the framework established by USFWS Guidelines.

Fatalities to bats from collisions with wind turbines, or barotrauma, are well documented in the literature. Fatality monitoring is needed in Wisconsin in order to improve our understanding of wind energy project impacts. Fatality data can be used to verify pre-construction risk estimates, improve project micro-siting, inform future wind project locations, and determine the need for fatality minimization measures during project operation. Using standardized fatality protocols allows for the scientific collection of data that can be used to determine reliable fatality estimates and can be compared to data from other wind energy sites in Wisconsin.

In addition, turbine design (height, rotor diameter, and cut in/out speeds) and fatality protocol have evolved with the potential to influence actual fatalities and fatality estimates. Therefore, fatality studies need to be conducted on new projects, with modern technology, in differing ecological landscapes (e.g., prairie/agricultural, deciduous, coniferous) of Wisconsin in order to understand project impacts and to establish valid bat fatality estimates. In addition, understanding which species are being killed is important for understanding how to avoid and minimize fatalities.

Fatality Protocol

Wisconsin endangered species law (Wisconsin State Statute 29.604) and associated rules (Administrative Rule Chapter NR 27) prohibit the taking of endangered or threatened species without a permit. These protocols are approved for use when conducting post-construction monitoring for wind turbines.

Fatality Monitoring

Duration and Frequency of Monitoring

All fatality monitoring should be conducted three days per week, during a field season from March 15 to November 15. The number of field seasons will be based on which post-construction monitoring option is being followed. Agencies may recommend additional monitoring if a high number of fatalities are occurring or if large numbers of state-listed species are killed.

Searches are conducted three days per week in order to increase the positive identification of species killed and improve the fatality estimates, therefore decreasing potential bias associated with fewer search days. Increasing the number of search days increases the number of carcasses collected and positively identified prior to scavenger removal and decay. Increasing the positive species identification is essential to understanding the impacts to listed species, SGCN, and other bat fatalities. Without positively identifying which species are being killed, one is unable to assess impacts to listed or rare species; migratory species; understand cumulative impacts; determine the need for curtailment; or understand habitat to turbine relationships. Without positively identifying the species killed, it is difficult to identify mechanisms to avoid and minimize impacts because the species behavior and habitat use is crucial to this endeavor.

A Wisconsin DNR [Regulatory Removals Broad Incidental Take Permit/Authorization \(BITP/A\)](#) is needed to handle and possess carcasses of listed species.

Number of Turbines to Monitor

Project developers should identify turbines to monitor based on the post-construction monitoring option listed above. A random starting point should be used in most cases. However, in some instances the higher risk turbines that are in close proximity to high value resources should be selected over lower risk turbines. High risk locations may include proposed turbines in proximity to habitat supporting listed species, large blocks of grassland or forest, stream corridors, large lakes or wetland complexes, and known bat concentration areas. The first year's survey results and agency correspondence should be utilized to determine which turbines should be searched in the second year, if applicable.

Fatality Monitoring Procedures

The search area should be cleared of all carcasses prior to March 15 and the initiation of data collection. These carcasses should be identified and reported separately from the data collected from March 15 - November 15, and should not be used in the fatality estimates.

A rectangular plot that is a minimum of 60 meters from the base of each monitored turbine, in each cardinal direction, will be established (120 meters per rectangular side based on the center of the turbine). Evidence suggests that > 80% of bat fatalities fall within ½ the maximum distance of turbine height to ground (Erickson 2003a,b⁶). The intent of using 60 meters from the base of the turbine is to locate a high percentage of bat fatalities and a reasonable percentage of avian species. Vegetation removal within the plots should be considered if dense vegetation (grass/crops) will persist during the peak bat fatality months of July-September. The searchable area underneath turbines will be delineated and mapped. Maps should be constructed illustrating all turbine locations, a designated numbering system for turbines, boundaries of survey areas, and searchable areas. Searchable areas should be broken down into visibility classes and transect numbering for standard transect surveys.

- 1) Transects will be 6 meters apart and marked every 10 meters. Surveyors search for carcasses within 3 meters of each side of each transect.

⁶ Erickson, W.P., J. Jeffrey, K. Kronner, K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Final Report, July 2001-December 2003. Technical report peer-reviewed by and submitted to FPL Energy, the Oregon Energy Facility Siting Council, and the Stateline Technical Advisory Committee.

- 2) Searches should start on transects running past the base of the turbine and working outward. Turbines with no vegetation, or sparse vegetation, should be searched for a minimum of 1 person hour (1 person - 1 hour, 2 people - ½ hour). Search times for vegetated search areas will vary, but should be slow enough to thoroughly search the area and result in high searcher efficiency. Times spent surveying each turbine should be recorded daily.
- 3) Fatality monitoring should commence at sunrise, with surveys being completed for all turbines within 8 hours.
- 4) All information gathered (i.e. specimen location-visibility class, species, transect, etc.) should be entered on standardized data sheets.
- 5) Separate data sheets will be used for each survey date. All carcasses are to be picked up and bagged upon discovery. They are to be identified, handled, and labeled properly with the date, turbine number, transect number, and unique specimen number. The specimen should be frozen or used fresh for the scavenger removal and searcher efficiency trials. Injured/crippled bats are considered a fatality for data purposes.
- 6) All specimens located should have an azimuth from, and distance to, the turbine that is recorded on the data sheet. A numbered flag can be used for each specimen, and the distance and azimuth can be recorded upon completion of transect searches, so long as flags are removed after each search.
- 7) Each carcass should have a digital photograph taken and time of death estimated.

Visibility Classes

The intent of using visibility classes is to test for scavenger removal and searcher efficiency in a manner that is representative of the vegetative cover at the turbines searched. Vegetative cover can influence the detectability of carcasses by searchers and rates of scavenger removal. Each turbine search area should be mapped and labeled into 1 of 4 visibility classes. Each visibility class will be tested for scavenger removal and searcher efficiency. The visibility classes change during the growing season and they should be periodically adjusted to take this into account during data collection.

Visibility Classes: Each turbine will have the vegetation in the searchable area defined into one of the following 4 visibility classes, and mapped for submission with a description of how the visibility classes change during the monitoring period.

- Class 1 (easy): Bare ground 90% or greater; all ground cover sparse and 6 inches or less in height (i.e. gravel pad or dirt road).
- Class 2 (moderate): Bare ground 25% or greater; all ground cover 6 inches or less in height and mostly sparse.
- Class 3 (difficult): Bare ground 25% or less; 25% or less of ground cover over 12 inches in height.
- Class 4 (very difficult): Little or no bare ground; more than 25% of ground cover over 12 inches in height.

Validation Guidelines

Scavenger removal and searcher efficiency trials are the standard methods used to correct for bias in data collection. Below are accepted techniques to perform this correction.

Scavenger Removal Trials

To test for scavenger removal, carcasses are placed at each turbine with all visibility classes being tested. A random bearing and distance from the turbine should be selected to determine placement of the carcass. For these trials, carcasses should be placed within the surveyed area underneath turbines after sunset and under darkness and monitored for removal every 24 hours. If possible, fresh carcasses or ones frozen for a limited amount of time should be used. The use of old and dried out carcasses may bias the results because they might not be scavenged at the same rate as fresh carcasses. The carcasses should be left in place for 14 days with checks occurring on days 1, 2, 3, 4, 7, and 14. Ideally, the total number of bat carcasses used should be representative of the actual size and species of killed animals, with no less than 50 specimens monitored per field season. If possible, scavenger removal rates should be determined separately for bats due to potential differences. The number of specimens used for scavenger removal trials should be increased, when visibility classes are considerably different in vegetation height and density, by using 50 per major visibility class. These trials should be performed periodically throughout the season to account for varying conditions. Before placement, each carcass must be uniquely marked in a manner that does not cause additional attraction and its location recorded. Records shall include the turbine number, a brief description of immediate vegetation that may impede visibility, classification using one of the 4 visibility classes described above, and length of time before removal.

Searcher Efficiency Trials

To produce the best estimates of fatality, a high number of searcher efficiency trials will be performed. A minimum of 100 individual trials per field season will be performed to test searchers. If possible, searcher efficiency should be determined separately for bats as detection rates of bats may be lower than birds. The carcasses will be numbered and toe clipped for identification, with no more than 2 placed at any one turbine per trial. Carcasses missed by searchers will be picked up after the efficiency trial ends. The use of new fatality estimators may require that the carcasses remain in place for several searches, in order to replicate how searchers find carcasses. The habitat surrounding turbines may vary considerably and searcher efficiency appears highly correlated to visibility and habitat types. Therefore, the search area defined for each turbine surveyed will be divided into the 4 visibility classes. The carcasses are distributed among the visibility classes and will be placed at a random azimuth and distance. Each turbine monitored by searchers should be examined, with an equal number of carcasses placed at each turbine.

Testing should occur sporadically throughout the field season and searchers must not be aware they are being tested. An effort should be made to test searchers during both inclement and good weather, with weather conditions recorded. Carcasses placed should be representative of the percentage and number of species found during the fatality monitoring and should replicate the manner in which the majority are found in that visibility class (i.e. crawled under vegetation). Surrogate species for searcher efficiency or scavenger removal trials should only be used when project collected carcasses are not available. The use of surrogate species may alter the results due to them being a different size, color, or emitting different odor than the actual species killed. An effort to maximize the number of carcasses placed is best, with no less than 100 per field season. If searcher efficiency is low (<30%) based on initial trials, then the search time should be increased, distance between transects reduced, vegetation cleared, or additional staff training should be conducted.

Fatality Estimators

Fatality estimators are known to produce different fatality estimates due to varying bias associated with each method. For valid fatality estimates, only the most contemporary equations should be used as some of the original versions may be more biased than modern ones. The equations used in various estimators are currently being tested and refined and will change over time. The agencies recommend using a minimum of two modern estimators in order to compare the fatality results. Coordination on the estimators used should occur with the agencies. When the fatality estimates are relatively close you can be more confident that the results are realistic. If the results are substantially different, then the estimators may not be performing well or issues may exist with the data. When the fatality estimates are substantially different, an attempt should be made to determine the cause of the difference. The agencies will strive to achieve consistency in the estimators being used from project to project. Using the same estimators is essential when comparing the fatality estimates from multiple projects.

Summary of Fatality Protocol

- 1) Minimum of 3 search days per week.
- 2) Field season is March 15 to November 15.
- 3) Twenty percent of turbines are searched (minimum 10 and maximum 25).
- 4) Minimum search area of 60 m (120 m per rectangular side) in all cardinal directions from the base of the turbine.
- 5) Vegetation should be cleared from plots if it will significantly affect searcher efficiency.
- 6) Searcher efficiency trials use a minimum of 100 carcasses placed.
- 7) Scavenger removal trials use a minimum of 50 carcasses placed.
- 8) Search time per turbine is 1-2 hours.
- 9) Minimum of 2 agreed upon fatality estimators used.

Road and Pad Protocol

Summary of Road and Pad Protocols

- 1) Minimum of 5 full plot searches, as described above, are necessary. For road and pad protocols, full plots must be cleared of vegetation.
- 2) Full plot searches consist of 60 m (120 m per rectangular side) in all cardinal directions from the base of the turbine.
- 3) Full plots are searched 3 days per week.
- 4) Minimum of 40 road and pad search areas.
- 5) All road and pads that fall within a theoretical square plot centered on the turbine (120m per rectangular side) are searched one time per week.
- 6) Field season is March 15 to November 15.
- 7) Searcher efficiency trials use a minimum of 100 carcasses placed.
- 8) Scavenger removal trials use a minimum of 50 carcasses placed.
- 9) Searcher and scavenger removal trials are conducted in a manner to differentiate between full search plots and road and pads.
- 10) Minimum of 2 agreed upon fatality estimators used.

Data Collection and Reports

The example data collection forms, which provide for consistent data collection, are provided in Appendix B. Likewise, the Fatality Report Guidelines (Appendix C) will enable the results and data to be collected in a consistent manner. The data can then be used to assess known impacts and refine future projects.

Reporting

A summary report of this monitoring, including all data sheets and maps should be submitted by January 15 of each year to the to the [ER Energy Liaison](#). Large fatality events of 5 or more bats (per search/turbine) and any single fatality of any eagle, or federal or state-listed species, need to be reported to the [ER Energy Liaison](#) within 5 days.

Please review this template before any field surveys are conducted to become familiar with the type of information that should be collected. Please include any associated GIS shapefiles and copies of datasheets.

Appendix B. Bat Fatality Survey Report

Project Name: _____

Project Location: _____

Company/Organization/Name: _____

Address: _____

Phone: (____) _____ - _____ Fax: (____) _____ - _____

E-Mail: _____

Project Supervisor Name: _____

Supervisor Contact: Phone: (____) _____

E-Mail: _____

If this is contracted work, provide the name & address of the individual/organization work is
being performed for:

GPS Turbine Locations

(Provide Lat/Lon coordinates in UTM Zone 15N NAD83)

Project Name: _____ Page: ____ of ____

Total No. of Turbines: _____

Lat/Lon GPS Location Information for All Turbines.

DATUM used:

[illegible]

Description of Wind Turbine Searched for Carcasses

Project Name: _____ Turbine Number: _____

1. Diameter of Blade Span: _____m
2. Blade Height Above Ground- Max.: _____m; Min.: _____m
3. Surface Area of Search Plot: _____m²
4. Attach a map of each turbine with 60 meter plot (120 m per rectangular side), search boundaries, location and numbering of transects, and vegetation classification on a separate sheet.
5. Attach a spread sheet with weather data collected at 10-minute intervals. Data should include wind speed, temperature, precipitation, cloud ceiling height, etc.
6. General Habitat Description and Topography within 120 m of Turbine:
7. General Habitat Description and Topography >100m to 500m from Turbine:
8. Distance of Turbine to High Value Habitat(s) (see DNR Wind Guidance document):

Daily Search Summary

Page: _____ of _____

Project Name: _____ (complete each day of search)

Weather: F= fog, D= drizzle, R= steady rain, W=wind over 10mp

[illegible]

Carcass Data Sheet

Observer Name: _____

Date: _____

Project Name:_____

% Cloud Cover: _____ % Temperature: _____ °C Precipitation: _____ (fog, drizzle, rain, wind)

[illegible]

^aCarcass Number= Turbine # - Date - Transect No. - Sequential Specimen No.; ^c Age= A (adult), J (juvenile) Unk (unknown); ^d Sex= M (male), F (female), Unk (unknown); ^e Condition: E= excellent, F= fair, P= poor; Visibility Class 1-4.

Appendix C. Fatality Report Guidelines

FATALITY REPORT GUIDELINES

- Below is an outlined guide of what should be reported in the annual and final post-construction reports.
 - Some general guidelines include:
 - Explain all methods used in detail.
 - If species codes are used, the American Ornithologist Union 4-letter codes are recommended (Alpha Codes Link - <http://www.birdpop.org/AlphaCodes.htm>).
 - Provide all equations and methods used for all calculations.
 - Provide average, range, confidence intervals, p values, and other statistics where applicable.
 - For final reports, include all years of study reporting on each individual year, as well as overall results and trends, detailing any similarities and/or differences between years of study.
 - All reports should be submitted by January 15 following that year's data collection. Reports need to be sent electronically to the DNR ER Energy Liaison.
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1) Executive Summary

2) Introduction

a. Description of project area

- i. Map of area including turbine locations, roads, transmission lines, substation, etc.
- ii. Distribution, number and size of turbines (height, MW, rotor swept zone, etc.)
- iii. Location of project (state, county, township, etc.)
- iv. Any other general information

b. Habitat/landcover

- i. Landcover types – map and percentages of each
- ii. High Value Resources identified as per DNR Wind Guidance Document.

c. Wind speed

- i. Overall wind speed and direction (wind rose)
- ii. Prevailing winds from which direction and what times of the year

3) Methods

a. Carcass searches

i. Turbines & search area

1. No. turbines searched
2. How turbines selected
3. Dates of survey
4. Time of day searched
5. Maps of each turbine's search plot delineating visibility classes and habitat with a description of how the visibility classes changed over the field season.
6. Table showing searchable area in each vegetation class for each turbine

ii. Search methods

- iii. Incidental kills – how documented
 - b. Fatality Patterns
 - i. Temporal patterns – seasonal
 - ii. Spatial patterns - distance from turbine
 - iii. Weather and generation associations - how collected and analyzed
 - 1. Temperature
 - 2. Wind speed
 - 3. Other variables (MW, rotor sweep zone, etc.)
 - iv. Species, age, and gender
 - c. Fatality estimates and adjustment– estimators used showing all equations
 - i. Searcher efficiency trials & scavenger removal trials
 - 1. Searcher efficiency methods
 - 2. Scavenger removal methods
 - 3. Searcher efficiency and scavenging removal corrections – methods and equations used
 - ii. Searchable area corrections
 - d. Fatality and habitat (landcover) correlations
- 4) Results
 - a. Carcass searches
 - i. Overall data
 - 1. Summary of search effort
 - a. Average time each turbine searched
 - b. # survey days
 - c. Explanation why any days and/or turbines were not surveyed
 - 2. Bird carcasses
 - a. Total No. found
 - b. Breakdown by turbine
 - c. Breakdown by species
 - d. Breakdown by date, month, etc.
 - e. Alive, injured, sent to rehab, etc.
 - 3. Bat carcasses
 - a. Total No. found
 - b. Breakdown by turbine
 - c. Breakdown by species/group of species
 - d. Breakdown by date, month, etc
 - e. Alive, injured, sent to rehab, etc.
 - 4. Maps showing carcass location at each search turbine, broken down in 10 m increments; any trends?
 - ii. Temporal patterns - Seasonal distribution of fatalities
 - 1. Day
 - 2. Week
 - 3. Month
 - iii. Spatial patterns
 - 1. Distance from turbines

2. Direction from turbine (showing N, S, E, W)
- iv. Weather and generation associations
 1. Temperature
 2. Wind speed
 3. Other variables (MW, rotor sweep zone, etc.)
- v. Age, species, and gender
 1. Males vs. females
 2. Species
 3. Adults vs. juveniles
- b. Fatality estimates and adjustments
 - i. Searcher efficiency trials & scavenger removal trials
 1. Searcher efficiency
 - a. Overall searcher efficiency average and range
 - b. Individual searcher average and range
 - c. No. trials and searcher efficiency broken down by bat carcasses, bird carcasses, vegetation class, and date of trial
 - d. Fresh vs. frozen, intact vs. broken, colored vs. dull (birds), etc. and effects on searcher efficiency (if any)
 2. Scavenger removal
 - a. Overall average No. days before scavenger removal and range
 - b. Average and range of all bat and bird scavenger removal trials
 - c. No. trials broken down by bat species and bird species
 - d. No. trials and mean scavenger removal broken down by bats & birds, vegetation class, and date of trial
 - e. Fresh vs. frozen, intact vs. broken, colored vs. dull (birds), etc. and effects on scavenger removal time if any
 - f. Scavenger removal by vegetation class
 - ii. Searchable area corrections
 - iii. Fatality estimates and adjustments
 1. Bats
 - a. Total estimated No. of bats killed at site
 - b. Bats/turbine/year, include confidence interval
 - c. Bats/MW/year, include confidence interval
 2. Birds
 - a. Total estimated No. of birds killed at site
 - b. Birds/turbine/year, include confidence interval
 - c. Birds/MW/year, include confidence interval
 3. Turbines with greatest/least kills
 4. Other trends?
- c. Correlation of fatalities and Weather data
 - i. Temperature
 - ii. Wind speed
 - iii. Other variables

- d. Note any other trends observed
- 5) Discussion
 - a. Avian fatality
 - b. Bat fatality (include an analysis on correlation between the acoustic data from the RSZ and estimated fatalities)
 - c. Implications of results
 - d. Suggestions for improvements to protocol
 - e. Any recommended adjustments for this site for next year's surveys
 - f. If final report, discuss all years of study
- 6) Data sheets
 - a. Fatality datasheets
 - i. Cover
 - ii. GPS location of all wind turbines
 - iii. Description of wind turbine searched for carcass
 - iv. Daily Search Summary
 - v. Carcass Data Sheet
 - b. Searcher efficiency data
 - c. Scavenger removal data