

**U.S. Fish and Wildlife Service  
Florida Ecological Services Field Office**

**FLORIDA BONNETED BAT CONSULTATION GUIDELINES**

**2024 REVISION**

The U.S. Fish and Wildlife Service’s Florida Ecological Services Field Office (Service) developed the Florida Bonneted Bat Consultation Guidelines (Guidelines) to assist in avoiding and minimizing potential negative effects to roosting and foraging habitat and assessing effects to the Florida bonneted bat (*Eumops floridanus*; FBB) from proposed projects. The Consultation Keys within the Guidelines assist applicants in evaluating their proposed projects and identifying the appropriate consultation paths under sections 7 and 10 of the Endangered Species Act of 1973 (Act), as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The Florida Bonneted Bat Consultation Guidelines and associated Consultation Keys are designed to streamline and expedite consultations; however, use of the Consultation Keys are voluntary and may not be appropriate for some projects.

These Guidelines are a revision of the 2019 Guidelines. The Consultation Area, Consultation Key, Survey Methods, and Best Management Practices (BMPs) were revised based upon the best available scientific information. These Guidelines also include a Key for the Critical Habitat for the Florida bonneted bat. As more information is obtained, these Guidelines will be revised as appropriate. If you have comments or suggestions on any section of these Guidelines, please email [FBBguidelines@fws.gov](mailto:FBBguidelines@fws.gov). Comments will be reviewed and incorporated into future revisions.

These Guidelines do not apply to projects involving the renovation of an existing artificial structure (*e.g.*, building, house) within the urban environment with or without additional ground disturbing activities (please contact the Service for additional guidance). For communication tower projects, please confer with additional and supplemental guidance ([USFWS Comm Tower Guidance](#), [2020 Florida Comm Tower Clearance](#)).

Without other, project-specific guidance provided by the Service, the Guidelines and Determination Keys must be followed explicitly. If they are not followed properly, your project may not be in compliance with the Act. If you have question regarding the Guidelines, including application of the Keys for your specific project, BMPs, designing surveys, definitions, or other questions, contact the Florida Bonneted Bat Recovery Lead ([Sandra\\_Sneckenberger@fws.gov](mailto:Sandra_Sneckenberger@fws.gov); 772-925-5510).

**HOW TO COMPLETE PROJECT REVIEWS WITHIN  
THE FLORIDA BONNETED BAT’S RANGE**

1. Refer to “[Guidance for Completing Project Reviews Under the Endangered Species Act](#)” for steps that must be completed before using the Keys below.
2. Use both FBB Consultation Key and FBB CH Consultation Key (below) and follow all instructions and steps in keys and appendices. If additional information is needed or you want personal assistance regarding application of the Consultation Keys, survey design, or BMPs, please contact the [Florida Bonneted Bat Recovery Lead](#).
3. Include detailed information on how required BMPs are incorporated into your project designs. If all required BMPs cannot be incorporated into project, further consultation with the Service is required.
4. Again, refer to “[Guidance for Completing Project Reviews Under the Endangered Species Act](#)” for information on submitting your project for review. If additional information is needed or you want assistance regarding the consultation process, please contact [FW4FLESRegs@fws.gov](mailto:FW4FLESRegs@fws.gov).

**FLORIDA BONNETED BAT CONSULTATION KEY**

- 1a. [Action area](#) is wholly or partially within the [FBB consultation area \(Figure 1\)](#) .....**Go to 2**
- 1b. [Action area](#) does not overlap with any of the [FBB consultation area \(Figure 1\)](#).....**No Effect**
  
- 2a. [Action area](#) contains potential FBB [foraging](#) or [roosting habitat](#).....**Go to 3**
- 2b. [Action area](#) does not contain potential FBB [foraging](#) or [roosting habitat](#).....**No Effect**
  
- 3a. Project entirely consists of land management, conservation, or restoration activities, such as prescribed fire, forestry practices, and invasive species removal, and the activities and effects to the FBB are addressed under a current Biological Opinion (BO)  
..... **Follow all applicable avoidance and minimization measures included in the BO. No additional consultation is required.**
- 3b. Project entirely consists of land management, conservation, or restoration activities, such as prescribed fire, forestry practices, and invasive species removal, but does not have a current BO that addresses these activities or their effects to the FBB .....**MANLAA with required BMPs**
- 3c. The project’s purpose is not solely intended for conservation/restoration or land management actions.....**Go to 4**
  
- 4a. Project proponents choose to assume presence of FBB based on potential [foraging habitat](#) and/or suitable [roosting habitat](#), historical or recent detection records (e.g., FBB capture, telemetry data, acoustic records), and/or the project location is within the [FBB assumed presence polygon \(Figure 1\)](#) .....**Go to 5**
- 4b. Project proponents choose to not assume presence of FBB.....**Go to 9**

- 5a. One or more [potential FBB roost trees](#) are present within the [action area](#) ([foraging](#) and [roosting habitat](#) exists on site), but trees are too numerous within the [action area](#) to properly inventory/visually survey.....[LAA](#)  
*Further consultation with the Service is required.*
- 5b. One or more [potential FBB roost trees](#) are present within the [action area](#) ([foraging](#) and [roosting habitat](#) exists on site) and all trees on site can be properly inventoried/visually surveyed.....**Conduct [Roost Structure Inventory/Survey](#), then Go to 6**
- 5c. No potential [FBB roosting habitat](#) is present within the [action area](#) ([foraging habitat](#) only is present on the site).....**Go to 7**
- 6a. Survey results do not show [active FBB roosting](#) is likely.....**Go to 8**
- 6b. Survey results show [active FBB roosting](#) is likely .....[LAA](#)  
*Further consultation with the Service is required.*
- 7a. [Project impact area](#) is less than 25 acres (10 hectares) of FBB [foraging habitat](#) and [outside](#) of Miami-Dade County.....[MANLAA](#) with required [BMPs](#)
- 7b. [Project impact area](#) is 25 acres (10 hectares) or greater of FBB [foraging habitat](#) or project is [within](#) Miami-Dade County..... [LAA](#)  
*Further consultation with the Service is required.*
- 8a. [Project impact area](#) is less than 25 acres (10 hectares) of FBB [roosting habitat and foraging habitat](#) and [outside](#) of Miami-Dade County.....[MANLAA](#) with required [BMPs](#)
- 8b. [Project impact area](#) is 25 acres (10 hectares) or greater of FBB [roosting habitat and foraging habitat](#) or project is [within](#) Miami-Dade County..... [LAA](#)  
*Further consultation with the Service is required.*
- 9a. [Project impact area](#) is less than or equal to 5 acres (2 hectares), trees are few enough that they can be visually surveyed/inventoried individually, and project is located [outside](#) of Miami-Dade County.....**Conduct [Roost Structure Inventory/Survey](#), then Go to 10**
- 9b. [Project impact area](#) is more than 5 acres (2 hectares), or trees are too numerous to properly survey individually, or the project is located in Miami-Dade County .....  
.....**Conduct [Acoustic Survey](#), then Go to 11**
- 10a. Results do not show [active FBB roosting](#) is likely.....[MANLAA](#) with required [BMPs](#)
- 10b. Results show [active FBB roosting](#) is likely..... [LAA](#)  
*Further consultation with the Service is required.*
- 11a. Survey results yield no detection of [FBB acoustic activity](#) .....  
.....[MANLAA](#) with required [BMPs](#)
- 11b. Survey results indicate [FBB acoustic activity](#).....**Go to 12**

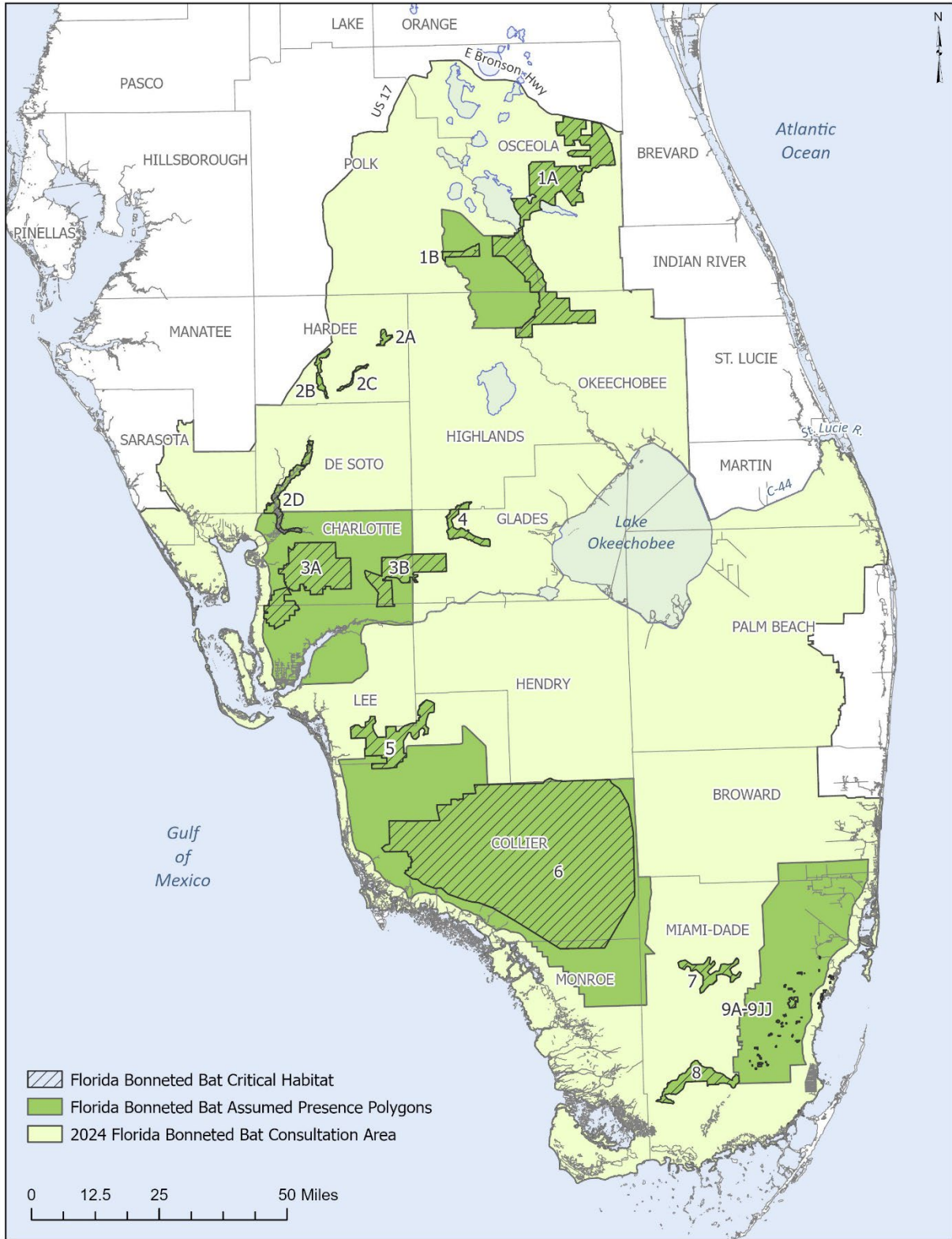
- 12a. Project impact area is less than 25 acres (10 hectares) of FBB foraging habitat or roosting habitat and outside of Miami-Dade County.....**MANLAA with required BMPs**
- 12b. Project impact area is 25 acres (10 hectares) or greater of FBB foraging habitat or roosting habitat or project is within Miami-Dade County..... **LAA**  
*Further consultation with the Service is required.*

**FLORIDA BONNETED BAT CRITICAL HABITAT CONSULTATION KEY**

- 1a. Action area does not overlap with or have indirect effects on any designated FBB critical habitat (Figure 1).....**No Effect (to CH)**
- 1b. Action area is wholly or partially within designated FBB critical habitat (Figure 1) OR may have indirect effects on designated critical habitat.....**Go to 2**  
*Indirect effects on critical habitat adjacent or near the project area may include, for example, changes in hydrology, or reduced ability to perform prescribed fire or other land management activities.*
- 2a. Project entirely consists of land management, conservation, or restoration activities, such as prescribed fire, forestry practices, and invasive species removal, and the activities and effects to the FBB CH are addressed under a current BO..... **Follow all the Reasonable and Prudent Measures, Terms and Conditions, and Monitoring and Reporting Requirements included in the current BO. No additional consultation is required.**
- 2b. Project entirely consists of land management, conservation, or restoration activities, such as prescribed fire, forestry practices, and invasive species removal, and the activities, but the effects to the FBB CH are not addressed under a current BO.....**MANLAA (CH) with required BMPs**
- 2c. The project’s purpose is not solely intended for conservation/restoration or land management actions..... **Go to 3**

- 3a. The action area overlaps with less than 0.01% of the CH unit .....**MANLAA (CH) with required BMPs**
- 3b. The action area overlaps with more than 0.01% of the CH unit ..... **Further consultation with the Service is required.**  
*Formal consultation may or may not be required. The Service will determine if adverse effects or adverse modification thresholds have been reached based on the function and context of the unit or subunit in which the action occurs.*

<b>Unit</b>	<b>Total Acreage</b>	<b>0.01%</b>
1	175,735	17.5
2	28,046	2.8
3	134,677	13.5
4	12,995	1.3
5	48,865	4.9
6	714,085	71.4
7	16,604	1.7
8	25,337	2.5
9	4,281	~ 0.5



**Figure 1.** Florida Bonneted Bat Consultation Area, Critical Habitat Units, and Assumed Presence Polygons.



## **Appendix A: Florida Bonneted Bat Potential Roost Structure Inventory/Survey Methods**

*Purpose:* The purpose of this survey is to: (1) identify potential Florida bonneted bat (FBB) roost structures within the project area; (2) qualitatively and quantitatively assess potential project impacts to FBBs and their habitat; (3) determine if FBB are likely to be actively roosting within suitable trees or artificial structures within the project area; (4) locate active roost(s) so loss or disturbance can be minimized; and, (5) avoid the take of individuals by informing the incorporation of conservation measures and best management practices into the project design. In many cases, changes in project designs or activities can avoid and minimize take.

If the applicant is unable to follow or does not want to follow the Florida Bonneted Bat Roost Structure Inventory/Survey Methods as recommended according to the Consultation Key, the Corps (or other Action Agency) will not be able to use these Guidelines and will need to provide a biologically supported rationale using the best available information for their determination in their request for consultation.

*General Description:* This survey effort is a multi-step process including a tree inventory of the project area, visual inspection of tree surfaces (as well as consideration of artificial structures or buildings on site), peeping and emergence counts for all cavities, hollows, areas of loose bark, and any other suspicious areas. Methods are dependent upon composition and configuration of project site and in most cases should be discussed with the [Florida Bonneted Bat Recovery Lead](#).

### *General Survey Expectations:*

- Approach is intended for project areas where the number and configuration of trees allow for all trees to be properly and thoroughly inventoried and individually inspected.
- Efforts should focus on assessing potential roosting structures within the project site that will be lost or modified (i.e., areas that will not be conserved), or are located on the property within 250 feet (ft) (76 meters [m]) of areas that will not be conserved. This will help avoid or minimize the loss of an active roost and individuals.
- Artificial structures and buildings on site with heights 15 ft (4.6 m) or greater should also be considered and surveyed.
- Use of provided data sheets below are preferred. If you create your own, please do not omit any information as it may not be accepted. Data requested for submission follows the data structure of the North American Bat Monitoring Program USGS Partner Portal (Loeb et al. 2015: <https://www.nabatmonitoring.org/resources>).

### GENERAL INVENTORY OF TREES AND STRUCTURES:

- All trees over 20 ft (6 m) tall should be inventoried; tree snags and artificial structures over 10 ft (3 m) tall should be inventoried. In areas with more dense growth, line

transects can be run through roosting habitat closely enough so that all trees and snags are easily inspected.

- Tree species, height, and diameter at breast height (DBH) of each tree (over 20 ft [6 m] in height) and snags (over 10 ft [3 m] in height) on the site should be listed (see [General Roost Structure Inventory Data Sheet Example](#)). Artificial structures 10 ft (3 m) in height or greater that may mimic natural roosting conditions (e.g., bat houses, utility poles, buildings over one story high with chimneys, gaps in soffits, gaps along gutters, or other structural gaps or crevices), situated in natural or semi-natural habitats should also be listed.
- Using binoculars, trees and snags (and artificial structures) must be visually inspected for evidence of its potential use as a roost/shelter, including, but not limited to openings 1 inch (in) (2.5 centimeter [cm]) in diameter or greater.
- The presence of any cavities, hollows, decay, or loose bark should be noted, including the height of the cavity or deformity. Photographs should be taken of any trees, snags, or artificial structures with cavities or other deformities where bats may emerge or find shelter.
- If no potential roost trees, snags or structures have been identified, these data do not need to be submitted into NABat.

*DATA COLLECTION FOR POTENTIAL ROOST TREES AND STRUCTURES:*

- For [potential roost trees](#) and snags, and artificial structures identified in the inventory, the following information is required for NABat data submission and must be collected for every structure regardless of presence of bats in the structure. A single roost structure may have one or more roosting features (see [Roost Structure Inventory Data Sheet Example](#) for definitions):
  - o GRTS Cell ID
  - o Location Name
  - o Latitude Decimal Degrees
  - o Longitude Decimal Degrees
  - o Observer
  - o Exit Identifier(s)
  - o Roost Location Method
  - o Broad Habitat Type
  - o Dominant plant species
  - o Roost Type
  - o Roosting Location
  - o Aspect of Exit
  - o Vegetation Obstruction
  - o Emergence Point Height
  - o Emergence Opening Width
  - o Emergence Opening Height
  - o Structure Height

- o Structure Width
  - o Building Occupancy (only required if Roost Type was a building feature)
  - o Building Type (only required if Roost Type was a building feature)
  - o Tree Species (only required if Roost Type was a tree feature)
  - o Tree Decay (only required if Roost Type was a tree feature)
  - o Diameter Breast Height (only required if Roost Type was a tree feature)
  - o Guano Amount
  - o Survey Event Comments
- If no [potential roost trees](#), snags, or structures are found in the project area or within 250 ft (76 m), survey data will still need to be submitted. Note that an area without roosting habitat, may be used for foraging. As such, if no roost structures are found, there may be a need to conduct a follow-up acoustic survey if it remains necessary to determine presence/absence of FBB.

*VISUAL INSPECTION OF POTENTIAL ROOST TREES AND STRUCTURES VIA TREE-TOP CAMERAS:*

- Contact the [FBB Recovery Lead](#) if active Red-cockaded Woodpecker (RCW) trees are expected within the survey area.
- Roost features on every identified potential roost structure should be visually inspected using a video probe (i.e., tree-top camera or “peeper”) to assess the internal contents, when possible.
- The visual inspection survey is only considered to be a valid roost survey on its own if the entire internal contents of all roosting features identified in the area of impact can be observed. However, visual inspection with a tree-top camera alone is most often not acceptable due to the potential for roosts to be too high for cameras to reach, too small for cameras to fit, or shaped in a way that contents are out of view (Braun de Torrez et al. 2016). If any roosting features are out of reach or otherwise do not allow for a full inspection, it is required to follow up with emergence surveys.
- Note other present wildlife or other pertinent information about the structure (e.g., carcasses or skeletons present, nesting materials found, etc.). If any bat species or listed species is present, contact the [FBB Recovery Lead](#) as soon as possible. If FBBs (or other bat species) are found in any features of a roost structure during the visual inspection survey, the following additional information must be collected (see [Roost Structure Inventory Data Sheet Example](#) for definitions):
  - o Seasonal Use
  - o Maternity Stage (only required if Seasonal Use was identified as maternity)
  - o Species
  - o Estimate Min



- o Estimate Max
  - o Count Confidence
  - o Pups Observed
  - o Pup Count
  - o Pup Comments
  - o Survey Event Comments
- When a visual inspection survey is conducted and no bats are found in any reachable (or all) roosting features, in the Survey Event Comments, include that no bats are present.
  - Please note that if it is not possible to identify the species of the bats in the roost, further surveys (e.g., emergence, acoustic surveys) may be necessary for species identification.

VISUAL INSPECTION OF POTENTIAL ROOST TREES AND STRUCTURES VIA EMERGENCE SURVEYS:

- Multiple observers should be stationed at potential roosts for emergence surveys. On a minimum of two nights of suitable weather, surveyors should be quietly stationed 30 minutes before sunset, so they are ready to look and listen for emerging bats from sunset to 1½ hours after sunset. When conducting emergence surveys, it is best to orient observers so that the roost is silhouetted in the remaining daylight; facing west can help maximize the ability to notice movement of animals out of a roost structure. The use of an acoustic detector with an emergence survey can greatly increase confidence in species identification. While this can be done with a passive recording device, it may be beneficial to utilize a live spectrogram device.
- Emergence surveys can be conducted any time of year as long as weather conditions meet the criteria. Although not required at this time, it has been demonstrated that conducting surveys on warm nights late in the spring can help maximize detection probabilities (Ober et al. 2016; Bailey et al. 2017). If any of the following weather conditions exist at a roost structure during an emergence survey, note the time and duration of such conditions, and repeat the emergence survey effort for that night, when necessary:
  - o temperatures fall below 60°F (15.5°C);
  - o precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the survey period; or
  - o sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale) for 30 minutes or more during the survey period (Service 2024).
- At a minimum, nightly weather conditions for survey sites should be checked using the nearest NOAA National Weather Service station and summarized in the survey reports (for the survey nights submitted).

- Note other present wildlife or other pertinent information about the structure (e.g., woodpeckers visiting structure, disturbances around structure, etc.). If Florida bonneted bats (or other bat species) are observed entering or exiting a roost structure during the emergence survey, the following additional information must be collected (see [Emergence Survey Data Sheet Example](#) for definitions):
  - o Roost Exit Points
  - o Seasonal Use
  - o Maternity Stage
  - o Species
  - o Identification Method
  - o Count Species In
  - o Count Species Out
  - o Estimate Min
  - o Estimate Max
  - o Count Confidence
  - o Observation Method
  - o Distance from Roost
  - o Reason Survey Ended
  - o Starting/Ending Temperature
  - o Starting/Ending Relative Humidity
  - o Starting/Ending Cloud Cover
  - o Starting/Ending Wind Speed
  - o Starting/Ending Weather Event
  - o Survey Event Comments
  
- When an emergence survey is conducted for a potential roost structure and no bats are observed at all, in the Survey Event Comments, include that no bats are present.

*FINAL REPORTING:*

- Much like the acoustic data submission process, the process of submitting FBB regulatory roost inventories and surveys to the Service incorporates the North American Bat Monitoring Program Partner Portal platform. Final reporting entails completed submission of the survey into the NABat Partner Portal, as well as communication with the [FBB Recovery Lead](#). Additional guidance and resources on how to correctly complete this process are available at <https://www.nabatmonitoring.org/fbb>.
  
- The report shall also be provided to the Corps project manager assigned to the project for which the survey was conducted, and to the Service along with the project submittal via [FW4FLESRegs@fws.gov](mailto:FW4FLESRegs@fws.gov). Please use a subject line for the emails: "Submittal (or Final FBB report) for [insert Project Name] FWS Project Code [insert Project Code number]" so that it can be distributed to the appropriate biologist(s).

- Reporting requirements:
  - o Summary of the project site
    - Project area acreage
    - Habitat types/land cover
    - Location (county, city, etc.), coordinates (decimal degrees latitude/longitude), site location and detailed maps
    - Project description, purpose, designs
  - o Summary of the methods used
    - Devices used (make, model, serial number, firmware version)
    - Methods used for tree inventory
    - Methods used for surveying for roost occupancy survey
    - General set-up description for surveys (e.g., distances between transects, equipment to elevate video probes, position and orientation to roost structure, etc.)
    - Photo of each/all [potential roost trees and structures](#) and its roost feature(s) (more detailed photos of each roost feature when possible)
  - o Summary of survey results
    - Inventory table/data sheets
    - Effects determination and explanation
    - BMPs to be incorporated
    - Include weather conditions for the days of emergence surveys
- Negative surveys are valid for 1 year after completion of the survey.

If you have comments, or suggestions on this survey protocols, please email your comments to [FBBguidelines@fws.gov](mailto:FBBguidelines@fws.gov). These comments will be reviewed and incorporated into future revisions.

### **Literature Cited - Appendix A**

- Bailey, A.M., H.K. Ober, A.R. Sovie, and R.A. McCleery. 2017. Impact of land use and climate on the distribution of the endangered Florida bonneted bat. *Journal of Mammalogy*. 98:1586-1593.
- Braun de Torrez, E.C., H.K. Ober, and R.A. McCleery. 2016. Use of a multi-tactic approach to locate and endangered Florida bonneted bat roost. *Southeastern Naturalist* 15: 235- 242.
- Loeb, S.C., T.J. Rodhouse, L.E. Ellison, C.L. Lausen, J.D. Reichard, K.M. Irvine, T.E. Ingersoll, J.T.H. Coleman, W.E. Thogmartin, J.R. Sauer, C.M. Francis, M.L. Bayless, T.R. Stanley, and D.H. Johnson. 2015. A plan for the North American bat monitoring program

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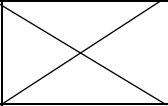
Ober, H.K., E.C. Braun de Torrez, J.A. Gore, A.M. Bailey, J.K. Myers, K.N. Smith, and R.A. McCleery. 2016. Social organization of an endangered subtropical species, *Eumops floridanus*, the Florida bonneted bat. *Mammalia* 2016:1-9.

U.S. Fish and Wildlife Service. 2004. South Florida Ecological Services Office DRAFT July 12, 2004 Species Conservation Guidelines South Florida Red-cockaded Woodpecker. Appendix A. Red-cockaded Woodpecker South Florida Survey Protocol. July 12, 2004. South Florida Ecological Service Office, Vero Beach Florida.  
<https://www.fws.gov/verobeach/BirdsPDFs/200407SlopesCompleteRedCockadedWoodpecker.pdf>

U.S. Fish and Wildlife Service. 2024. Range-wide Indiana bat and Northern long-eared bat survey guidelines. <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.

**EXAMPLE DATA SHEET FOR GENERAL ROOST STRUCTURE INVENTORY**

Document all trees over 20 ft (6 m), all snags over 10 ft (3 m), and all artificial structures over 10 ft (3 m) that are present on the project site. Using binoculars, visually inspect all structures for evidence of its potential use as a roost/shelter. Take photos when possible.

Date(s):						
Project:						
Site & GRTS ID:						
Observer(s):						
<b>TREES AND SNAGS</b>						
Structure ID	Status (Live/Dead)	Height (m)	Species	Roosting Features? (Y/N)	Photo(s) Taken? (Y/N)	Notes
<b>ARTIFICIAL STRUCTURES</b>						
Structure ID		Height (m)	Structure Type	Roosting Features? (Y/N)	Photos Taken? (Y/N)	Notes

### Data Field Definitions (General Roost Structure Inventory)

Date(s): When the survey was conducted.

Project: Descriptive and unique project titles and project numbers.

Site: Specific site of survey for listed project.

GRTS ID: GRTS ID number of the NABat grid cell where the survey was conducted.

Observer(s): First and last names of observers involved in survey. Include company name if relevant.

### TREES AND SNAGS

Structure ID: This can be as simple as consecutively identifying trees and snags as “T1, T2, T3, ...” and “S1, S2, S3, ...”.

Status: Select either “Live” or “Dead” for trees or snags, respectively.

Height (m): Estimate or measure of the height of the tree or snag in meters. Leave blank if unknown.

Species: Scientific name of the tree or snag (if identifiable – if no species ID possible for a snag, identify as pine or hardwood if possible).

Roosting Features? (Y/N): Are there any roosting features present on the tree or snag? Select Yes or No.

Photo(s) Taken? (Y/N): Were any photos taken? Select Yes or No.

Notes: Any additional notes about the tree or snag.

### ARTIFICIAL STRUCTURES

Structure ID: This can be as simple as consecutively identifying artificial structures as “A1, A2, A3, ...”.

Height (m): Estimate or measure of the height of the structure in meters.

Structure Types: Artificial roost, bridge, building, utility pole, other (include description in Notes).

Roosting Features? (Y/N): Are there any roosting features present on the tree or snag? Select Yes or No.

Photo(s) Taken? (Y/N): Were any photos taken? Select Yes or No.

Notes: Any additional notes about the structure.



## EXAMPLE DATA SHEET FOR ROOST STRUCTURE SURVEY

For potential roost trees, snags, and artificial structures identified as having features that could be used for roosts, the following information is required for every structure regardless of presence of bats in the structure. A single roost structure may have one or more roosting features.

Date:					
Project:					
Site & GRTS ID:					
Observer(s):					
POTENTIAL ROOST STRUCTURES AND FEATURES					
Structure ID					
Latitude					
Longitude					
Exit Identifier(s)					
Broad Habitat					
Dominant Plant Species					
Roost Type					
Roosting Location					
Exit Aspect(s)					
Vegetation Obstruction					
Emergence Point(s) Height (m)					
Emergence Opening(s) Width (cm)					
Emergence Opening(s) Height (cm)					
Building Occupancy					
Building Type					
Tree Species					
Tree Decay					
DBH					
Guano Amount					
Survey Event Comments					

## Data Field Definitions (Roost Structure Survey)

Date(s): When the survey was conducted.

Project: Descriptive and unique project titles and project numbers.

Site: Specific site of survey for listed project.

GRTS ID: GRTS ID number of the NABat grid cell where the survey was conducted.

Observer(s): First and last names of observers involved in survey. Include company name if relevant.

Structure ID: Provide a unique name for every roost structure surveyed within a project. Match ID with inventory.

Latitude/Longitude: Latitudinal and longitudinal coordinates in WGS84 decimal degrees.

Exit Identifier(s): Unique identifier for each notable exit/entry on the structure. Can be as simple as “C1, C2, ...” for cavities, etc.

Broad Habitat Type: Broad habitat type surrounding roost. Select from the following options: agriculture | barren land | forest-conifer | forest-deciduous | forested wetland | grassland | shrubland | urban | water | wetland

Dominant plant species: List the top 1 to 3 dominant plant species surrounding the roost structure.

Roost Type: The type of roost structure from which bats are emerging. Select from the following options: artificial roost bark mimic | artificial roost bat box | artificial roost bat bunker | artificial roost bat condo | artificial roost other | artificial roost unknown | bridge cavity | bridge crevice | bridge expansion joints | bridge other | bridge under bridge | bridge unknown | building attic | building basement | building chimney | building deck | building eaves | building interior | building other | building porch | building roof | building shingles | building under siding | building unknown | other artificial structure dam | other artificial structure utility pole | rock feature other | rock feature rocky outcrop | rock feature talus slope | rock feature unknown | tree basal hollow | tree branch | tree cavity | tree crevice | tree downed woody debris | tree exfoliating bark | tree foliage | tree on trunk | tree other | tree roots | tree unknown

Roosting Location: Provide a brief description about the exit/entries identified on the roost structure, focusing on the ones used by bats if observed. Limit description to 250 characters or less.

Exit Aspect(s): The cardinal direction the exit(s)/entry(ies) face. Select from the following options: east | multiple | north | northeast | northwest | south | southeast | southwest | unknown | west

Vegetation Obstruction: Is vegetation obstructing the roost exit? State either TRUE or FALSE.

Emergence Point Height: Height of the exit point(s) from the ground (m).

Emergence Opening Width/Height: Width/height of the exit point(s) (cm).

Emergence Opening Height If the “Exit Identifier” field was left blank, leave blank.

Building Occupancy: Leave blank if Roost Type was not a building feature. Building occupied by humans? State TRUE or FALSE.

Building Type: Leave blank if Roost Type was not a building feature. Select from the following options: barn | cabin | commercial building | house | shed | silo

Tree Species: Leave blank if Roost Type was not a tree feature. State the scientific name of the tree species if identifiable.

Tree Decay: Leave blank if Roost Type was not a tree feature. Indicate the decay stage of the tree. Select from the following options: NA | other | stage 1: live | stage 2: declining | stage 3: dead | stage 4: loose bark | stage 5: clean | stage 6: broken | stage 7: decomposed | stage 8: down material | stage 9: stump

DBH: Leave blank if Roost Type was not a tree feature. Diameter of the tree at breast height in centimeters.

Guano Amount: Guano seen in or around the roost structure. Select from the following options: abundant | large mounds | none | scattered

Survey Event Comments: Additional notes about the roost structure.

**EXAMPLE DATA SHEET FOR EMERGENCE SURVEYS**

Date:		Start/End Temperature (C):	
Project:		Start/End Relative Humidity (%) :	
Site & GRTS ID:		Start/End Cloud Cover (%):	
Observer(s):		Start/End Wind Speed (km/h):	
		Start/End Weather Event:	
<b>POTENTIAL ROOST STRUCTURES AND FEATURES</b>			
Structure ID			
Latitude			
Longitude			
Exit Identifier(s)			
# Roost Exits			
Seasonal Use			
Maternity Stage			
Species			
Identification Method			
Count In			
Count Out			
Estimate Min			
Estimate Max			
Count Confidence			
Observation Method			
Distance from Roost (m)			
Reason Survey Ended			
Survey Event Comments			

## Data Field Definitions (Emergence Surveys)

Date(s): When the survey was conducted.

Project: Descriptive and unique project titles and project numbers.

Site: Specific site of survey for listed project.

GRTS ID: GRTS ID number of the NABat grid cell where the survey was conducted.

Observer(s): First and last names of observers involved in survey. Include company name if relevant.

Starting/Ending Temperature: Temperature in Celsius at the start and end of the emergence survey.

Starting/Ending Relative Humidity: Relative humidity percentage at the start and end of the emergence survey.

Starting/Ending Cloud Cover: Cloud cover percentage at the start and end of the emergence survey.

Starting/Ending Wind Speed: Wind speed (kilometer per hour [km/h]) at the start and end of the emergence survey.

Starting/Ending Weather Event: Select from the following options for starting and ending weather event: Fair | Partly Cloudy | Mostly Cloudy | Cloudy | Fair / Windy | Mostly Cloudy / Windy | Haze | Fog | Light Rain | Rain | Heavy Rain | Thunder in the Vicinity | Thunder | T-Storm | Heavy T-Storm

Structure ID: Unique structure ID. Match ID with inventory data sheets.

Latitude/Longitude: Latitudinal and longitudinal coordinates in WGS84 decimal degrees.

# Roost Exits: The number of exits from which bats emerged.

Seasonal Use: Seasonal use of the roost. Select from the following options: fall roost | hibernacula | maternity | multi-season | spring roost | summer roost | unknown | winter roost

Maternity Stage (only required if Seasonal Use indicated as maternity): Leave blank if Seasonal Use was not identified as maternity. State whether the roost is pre-volant or post-volant.

Species: List the bat species identified. Use one column per species.

Identification Method: Method used to identify each species. Select either acoustics or visual.

Count Species In: Number of bats observed entering the roost.

Count Species Out: Number of bats observed exiting the roost.

Estimate Min: Lowest estimate of the number of bats in the roost.

Estimate Max: Highest estimate of the number of bats in the roost.

Count Confidence: Select from the following options: high (66 - 100%) | low (0 - 33%) | medium (33 - 66%)

Observation Method: Select from the following options: cavity inspection scope | night vision camera | night vision device | night vision device and bat detector | other | thermal camera and bat detector | thermal device | thermal device

Distance from Roost (m): Distance of observer from the roost (m).

Reason Survey Ended: Select from the following options: 15 min after last bat | bats finished emerging | low visibility | unknown

Survey Event Comments: Additional notes about the emergence survey.

## Appendix B: Florida Bonneted Bat Acoustic Survey Methods

*Purpose:* The purpose of this survey is to: (1) determine if Florida bonneted bats (FBBs) are likely to be present within the project area; (2) determine if Florida bonneted bat activity patterns suggest the possibility of active roosting within the project area, (3) qualitatively and quantitatively assess potential project impacts to Florida bonneted bats and their habitat, (4) avoid or minimize the take of individuals by informing the incorporation of conservation measures and best management practices into the project design. In many cases, changes in project designs or activities can avoid and minimize take.

*General Description:* When properly conducted, acoustic surveys are the most effective way to determine presence and assess habitat use. This survey is a robust acoustic effort designed to detect Florida bonneted bats on a site, when present. Methods are dependent upon composition and configuration of project site and in many cases should be designed collaboratively with the [Florida Bonneted Bat Recovery Lead](#). In some cases, further surveys (e.g., emergence surveys or tree inventories) may be helpful or desirable to properly evaluate project effects or determine how best to avoid and minimize impacts.

### *General Survey Expectations:*

- This approach is intended for larger project sites where [potential FBB roost trees](#) are too numerous to properly inventory/visually survey within the project area.
- For sites containing [roosting habitat](#), acoustic surveys should primarily focus on assessing roosting habitat within the project site that will be lost or modified (i.e., areas that will not be conserved), and locations on the property within 250 feet (76 meters) of areas that will not be conserved. This will help avoid or minimize the loss of an active roost and individuals. Secondly, since part of the purpose is to determine if Florida bonneted bats are present/using the site, acoustic devices should also be placed near open water and wetlands to maximize chances of detection and aid in assessing foraging habitat that may be lost.
- Use of provided data sheets below are preferred. If you create your own, please do not omit any information as it may not be accepted.
- Acoustic surveys should be performed by those who are trained and experienced in setting up, operating, and maintaining acoustic equipment; and retrieving, saving, analyzing, and interpreting data. Surveyors should have completed one or more of the available bat acoustic courses/workshops or be able to show similar on-the-job or academic experience (Service 2024). New surveyors may request “practice projects” where they collect, analyze, interpret, and submit up to two projects for feedback from the [FBB Recovery Lead](#).

- Due to the variation in the quality of recordings, the influence of clutter, the changing performances of software packages over time, and other factors, manual verification is recommended (Loeb et al. 2015). Files that are identified to species from automatic identification programs must be visually reviewed and manually verified by experienced personnel.

#### HABITAT ASSESSMENT:

- Start with a general assessment of habitat in the project area to identify areas with roosting habitat characteristics.
  - At minimum, conduct a general habitat assessment that records broad habitat types, dominant plant species, presence of [potential FBB roosting habitat](#).
  - Examples of areas to target during acoustic surveys include but are not limited to (if there are any questions about this consult with the [FBB Species Recovery Lead](#)):
    - a cluster of pine trees
    - a section of cypress swamp/dome
    - an area with snags
    - a water feature (e.g., canal, pond, lake)
- For sites that do not contain ANY [roosting habitat](#) but do contain [foraging habitat](#), acoustic efforts should focus on assessing foraging habitat within the project site that will be lost or modified (i.e., areas that will not be conserved).

#### ACOUSTIC SURVEY DESIGN:

- The number of acoustic survey sites and nights needed for the assessment is dependent upon the overall acreage of suitable habitat ([foraging](#) or [roosting](#)) proposed to be impacted by the action.
- For non-linear projects, a minimum of 9 valid detector nights per 20 acres of suitable habitat is required. For example, for a 145-acre project, 8 detectors should be deployed for a minimum of 9 valid nights ( $145 \div 20 = 7.25$ ; round up to 8). Do not multiply out to get total detector nights and then modify the number of detector sites or nights. Surveys should be planned with the intention of surveying for 9 consecutive valid nights. Contact the [FBB Recovery Lead](#) if it will take over 14 days to attain 9 valid nights.
- For non-linear projects, when surveying for both FBB and tricolored bats (TCB) a minimum of 14 valid detector nights per 20 acres of suitable habitat are acceptable for both species. When surveying for both FBB and TCB, TCB surveys are only valid if conducted March 1 to October 15. Surveys should be planned with the intention of surveying for 14 consecutive valid nights. Contact the [FBB Recovery Lead](#) if it will take over 21 days to attain 14 valid nights.



- For linear projects (e.g., roadways, transmission lines), a minimum of 9 detector nights per 0.6 mi (1 km) is required. When surveying for both FBB and TCB, TCB surveys are only valid if conducted March 1 to October 15. Surveys should be planned with the intention of surveying for 9 consecutive valid nights. Contact the [FBB Recovery Lead](#) if it will take over 14 days to attain 9 valid nights.
- Detectors should be placed to survey all suitable habitat. There is a 300 m minimum distance between deployed detectors.
- Please contact the [FBB Recovery Lead](#) if there is interest in diverting from these protocols (such as setting up detectors less than 300 m apart) or if there is concern about not being able to attain the minimum consecutive nights under valid weather conditions.
- *For any site, and in particular for sites > 250 acres, please feel free to contact the [FBB Recovery Lead](#) to assist in designing an appropriate approach.* Site acreage, site location (e.g., coordinates, project boundary, .kmz files), and a description of what is planned for the site is helpful information to include in correspondence.

ACOUSTIC EQUIPMENT DEPLOYMENT:

- The following acoustic detectors have been used for FBB acoustic surveys. (The Service does not endorse specific products or equipment.) Make sure the devices to be used in the field survey are updated with the most recent firmware version before deployment in the field. If interested in using a detector not listed below, please consult the [FBB Recovery Lead](#).

- o Wildlife Acoustics:

SM2 Bat +	SM2 Bat 192
SM3 Bat	SM4 Bat FS
SM Mini Bat	

- o Binary Acoustic:

AR125	AR125FG
AR180	Acrobat
IFR IV	IFR V

- o Pettersson:

D1000X	D240X
D500X	M500

- o Titley:

Anabat Swift	Anabat Walkabout
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- Microphones can be directional or omnidirectional, but make sure positioning is optimal. If using something other than a standard microphone for the device being used, ensure compatibility and functionality prior to deployment (this may even include a test deployment so recording ability can be assessed).
- It is important no matter what device you are using that you verify its functionality before every deployment. Some companies selling detectors also sell calibration devices to assess the sensitivity of the mics/devices. Devices should be calibrated while paired with the same mics they are going to be deployed in the field with. It is also required that surveyors verify functionality as soon as possible after device pick-up.
- Acoustic device program settings:
  - o Full spectrum recording
  - o Gain: 12 decibels (dB)
  - o 16k High Filter: Off
  - o Sample Rate: 256 kilohertz (kHz)
  - o Minimum Duration: 1.5 milliseconds (ms)
  - o Maximum Duration: 50 ms
  - o Minimum Trigger Frequency: 8 kHz
  - o Trigger Level: 12 dB
  - o Trigger Window: 2 seconds (s)
  - o Maximum Length: 15 s
  - o Compression: None
  - o Recorder schedule should be set to record from 30 minutes prior to sunset to 30 minutes after sunrise for multiple nights.
- Acoustic devices must be calibrated and properly placed for deployment. Microphones must be elevated to a minimum of 3 m (10 ft), situated in an area clear of vegetation 2 m in all directions, and fully free of vegetative or other clutter from ground to sky. When possible, elevating devices/device microphones higher than the minimum height requirement can improve call quality and reduce the number of noise files being recorded. Please note that it is not acceptable to attach acoustic devices to trees or other standing structures to elevate them – they should have a standalone set-up that gives them sufficient omnidirectional air space. Microphones should be directed away from surrounding vegetation, electrical wires and transmission lines, echo-producing surfaces, and external noises. Directional microphones should be aimed to sample the majority of the flight path/zone in an upward direction. Omnidirectional microphones should be deployed on a pole in the center of the flight path/zone and oriented horizontally (a slight angle might help prevent pooling on the microphone surface and therefore reduce long-term water damage). For monitoring possible roost sites, microphones should be directed to maximize likelihood of detection.

- Acoustic surveys can be conducted any time of year as long as weather conditions meet the criteria. Although not required at this time, it has been demonstrated that conducting surveys on warm nights late in the spring can help maximize detection probabilities (Ober et al. 2016; Bailey et al. 2017). If any of the following weather conditions exist at a roost structure during acoustic sampling, note the time and duration of such conditions, and repeat the acoustic sampling effort for that night, when necessary:
  - temperatures fall below 60°F (15.5°C) during the first 5 hours of the survey period;
  - precipitation, including rain and/or fog, that exceeds 30 minutes or continues intermittently during the first 5 hours of the survey period; or
  - sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale) for 30 minutes or more during the first 5 hours of the survey period (Service 2024).
  
- At a minimum, nightly weather conditions for survey sites should be checked using the nearest NOAA National Weather Service station and summarized in the survey reports (for the survey nights submitted).
  
- The following metadata is required for data submission and must be collected for every detector deployment (see [Acoustic Detector Deployment Example Data Sheet](#) for definitions):
  - GRTS Cell ID
  - Location Name
  - Latitude Decimal Degrees
  - Longitude Decimal Degrees
  - Survey Start Time/End Time
  - Detector Model
  - Detector Serial Number
  - Microphone Model
  - Microphone Orientation
  - Microphone Height
  - Distance to Nearest Clutter (meters)
  - Clutter Type
  - Broad Habitat Type
  - Land Unit Code
  - Contact

*ACOUSTIC ANALYSIS:*

- The process of analyzing and submitting FBB regulatory survey data to the Service incorporates the North American Bat Monitoring Program Partner Portal platform. Additional guidance and resources on how to correctly complete this process are available at <https://www.nabatmonitoring.org/fbb>.

### INTERPRETATION OF RESULTS:

- DO:
  - Include all FBB call types when considering potential roosting activity. Any type or number of calls is considered presence. Any call near sunrise or sunset can indicate potential roosting.
- DO NOT:
  - Interpret few FBB calls as low or no FBB activity. These methods are designed to detect presence. Discussions of level of activity or density are not appropriate.
  - Interpret a lack of echolocation recordings near sunset or sunrise as an indication that roosting nearby is unlikely. This needs to be assessed using multiple methods.
- If results of acoustic surveys show active Florida bonneted bat roosting is likely (6b or 10b), follow-up methods such as emergence surveys, visual inspection of the roosting structures, or follow-up acoustic surveys may be recommended to avoid or minimize impacts. Please contact the [FBB Recovery Lead](#) if you have any questions regarding the definitions or using the key.

### FINAL REPORTING:

- Final reporting entails completed submission of the survey into the NABat Partner Portal, as well as communication with the [FBB Recovery Lead](#).
- If there are any questions about data submission requirements, refer to the resources available at <https://www.nabatmonitoring.org/fbb>.
- The report shall also be provided to the Corps project manager assigned to the project for which the survey was conducted, and to the Service along with the project submittal via [FW4FLESRegs@fws.gov](mailto:FW4FLESRegs@fws.gov). Please use a subject line for the emails: "Submittal (or Final FBB report) for [insert Project Name] FWS Project Code [insert Project Code number]" so that it can be distributed to the appropriate biologist(s).
- Reporting requirements:
  - Summary of the project site
    - Project area acreage
    - Habitat types/land cover
    - Location (county, city, etc.), coordinates (decimal degrees latitude/longitude), site location and detailed maps
    - Project description, purpose, designs
  - Summary of the methods used
    - Devices used (make, model, serial number of detector, firmware version)
    - Calibration method/device used (both before and after device deployment)
    - Automated identification software and version

- General set-up description including height of mic, etc. (see required metadata fields in section above and in data sheet)
  - Photo of each final detector set-up, as well as 4 cardinal direction photos
- o Summary of survey results
    - Summary table of number of calls per species per detector deployment
    - Inventory table of EUMFLO recording files, recording timestamp, detector ID, and local sunrise/sunset times
    - Representative spectrograms of recordings that were automatically identified by software as EUMFLO but manually vetted and rejected as Florida bonneted bat recordings (these are often Noise files, TADBRA calls, or the social calls of other bat species)
    - Effects determination and explanation
    - BMPs to be incorporated
    - Include weather conditions for the days being included in the final survey and analysis
- Negative surveys are valid for 1 year after completion of the survey. A back-up of all acoustic data collected (raw acoustic files, spreadsheets, metadata, environmental reports, weather sheets, etc.) for each project must be maintained for a minimum of 1 year post project submission.

If you have comments, or suggestions on this survey protocols, please email your comments to [FBBguidelines@fws.gov](mailto:FBBguidelines@fws.gov). These comments will be reviewed and incorporated in future revisions.

### **Literature Cited - Appendix B**

Bailey, A.M., H.K. Ober, A.R. Sovie, and R.A. McCleery. 2017. Impact of land use and climate on the distribution of the endangered Florida bonneted bat. *Journal of Mammalogy*. 98:1586-1593.

Braun de Torrez, E.C., H.K. Ober, and R.A. McCleery. 2016. Use of a multi-tactic approach to locate and endangered Florida bonneted bat roost. *Southeastern Naturalist* 15: 235- 242.

Loeb, S.C., T.J. Rodhouse, L.E. Ellison, C.L. Lausen, J.D. Reichard, K.M. Irvine, T.E. Ingersoll, J.T.H. Coleman, W.E. Thogmartin, J.R. Sauer, C.M. Francis, M.L. Bayless, T.R. Stanley, and D.H. Johnson. 2015. A plan for the North American bat monitoring program (NABat). United States Department of Agriculture. Forest Service. Research & Development, Southern Research Station. General Technical Report SRS-208.

Ober, H.K., E.C. Braun de Torrez, J.A. Gore, A.M. Bailey, J.K. Myers, K.N. Smith, and R.A. McCleery. 2016. Social organization of an endangered subtropical species, *Eumops floridanus*, the Florida bonneted bat. *Mammalia* 2016: 1-9.

U.S. Fish and Wildlife Service. 2024. Range-wide Indiana bat and Northern long-eared bat survey guidelines. <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>.



**EXAMPLE DATA SHEET FOR ACOUSTIC DETECTOR DEPLOYMENTS**

Date(s):					
Project:					
Site & GRTS ID:					
Name(s):					
<b>ACOUSTIC DETECTOR DEPLOYMENTS</b>					
Location Name					
Latitude					
Longitude					
Survey Start Time					
Survey End Time					
Detector Type					
Detector Serial Number					
Microphone Model					
Microphone Orientation					
Microphone Height					
Distance Nearest Clutter (m)					
Clutter Type					
Broad Habitat Type					
Land Unit Code					
Contact Information					
Deployment Comments					

## Data Field Definitions (Acoustic Detector Deployment)

Date(s): When the survey was conducted.

Project: Descriptive and unique project titles and project numbers.

Site: Specific site of survey for listed project.

GRTS ID: GRTS ID number of the NABat grid cell where the survey was conducted.

Name(s): First and last names of observers involved in survey. Include company name if relevant.

Location Name: An official or unofficial name of the site. Provide a unique name for every acoustic detector deployment location within a project.

Latitude/Longitude: Latitudinal and longitudinal coordinates in WGS84 decimal degrees.

Survey Start/End Time: These reference the beginning and ending detector activation time. If a detector starts recording late, then start time should be listed as the date and time from the first file recorded. If a detector stops recording early, the end time should be listed as the date and time of the last file recorded. Note such incidents in the "Unusual Occurrences" metadata field. Adjust times as necessary for each detector/deployment (i.e., do not just use the same full survey time for all batches unless detectors were all active for that full time).

Detector Type: Select from the following options: BINARY ACOUSTIC AR125 | BINARY ACOUSTIC AR125-FG | BINARY ACOUSTIC AR180 | BINARY ACOUSTIC AcroBat | BINARY ACOUSTIC iFR-IV | BINARY ACOUSTIC iFR-V | PETERSSON D1000x | PETERSSON D240x | PETERSSON D500x | PETERSSON M500 | TITLEY AnaBat Express | TITLEY AnaBat SD1 | TITLEY AnaBat SD2 | TITLEY AnaBat Swift | TITLEY AnaBat Walkabout | WILDLIFE ACOUSTICS EM-Touch | WILDLIFE ACOUSTICS EM-Touch2 | WILDLIFE ACOUSTICS EM-TouchPRO | WILDLIFE ACOUSTICS EM3/EM3+ | WILDLIFE ACOUSTICS SM MICRO | WILDLIFE ACOUSTICS SM2 | WILDLIFE ACOUSTICS SM2Bat+ | WILDLIFE ACOUSTICS SM2Bat-192 | WILDLIFE ACOUSTICS SM3Bat | WILDLIFE ACOUSTICS SM4BAT | WILDLIFE ACOUSTICS SM4BAT-FS | WILDLIFE ACOUSTICS SM4BAT-ZC | WILDLIFE ACOUSTICS SMMINI-BAT | WILDLIFE ACOUSTICS SMZC

Detector Serial Number: Serial number of the detector/recording device.

Microphone Model: Leave blank if not applicable (i.e., no external microphone attachment). Select from the following options: Pettersson D500x | Pettersson M500 | TITLEY AnaBat Swift | Wildlife Acoustics SM3-U1 | Wildlife Acoustics SMM-U1 | Wildlife Acoustics SMM-U2 | Wildlife Acoustics SMX-U1 | Wildlife Acoustics SMX-US | Wildlife Acoustics SMX-UT | generic Directional | generic Internal | generic Omni-directional

Microphone Orientation: Direction in which the microphone was oriented. Select from the following options: e | n | ne | nw | s | se | sw | w | vert

Microphone Height: Height of the microphone above the ground (m).

Distance to Nearest Clutter (meters): Distance (m) between microphone and nearest clutter (for example: vegetation, buildings, or other structure).

Clutter Type: Select from the following options: Building | Other | Rock | Vegetation | Water

Broad Habitat Type: Broad habitat type surrounding device. Select from the following options: agriculture | barren land | forest-conifer | forest-deciduous | forested wetland | grassland | shrubland | urban | water | wetland

Land Unit Code: The first 4 letters of the county where the survey was conducted.

Contact information: person/entity that deployed and is responsible for the acoustic detector.

Deployment Comments: Additional notes about acoustic deployment.

## **Appendix C: Best Management Practices for Land Management Activities, Development Activities, and Actions within Critical Habitat**

These BMPs consist of actions intended to avoid, minimize, or offset impacts to Florida bonneted bats. BMPs required to reach a “may affect, but is not likely to adversely affect” ([MANLAA](#)) determination are listed below. If the applicant is unable or does not want to incorporate the required BMPs into the project, this Consultation Key cannot be followed and further coordination and consultation with the Service is required. In these cases, formal consultation may not be required, but further evaluation of the project and discussions with the Service are needed.

### *Best Management Practices for Land Management Activities*

The BMPs **LM1 through LM6** are required for MANLAA projects keying out to **3b** in the FBB Consultation Key (see note), no further consultation is required:

**LM1.** Conduct tree removal in areas with known or suspected roosting activity from November 15 to April 15. From April 16 to November 14, visual, peeping, and emergence surveys must be done prior to removal of trees 7.4 in (19 cm) dbh or greater with cavities (or snag height) at 15 ft or higher.

**LM2.** When feasible, roost surveys are recommended year round prior to removal of trees 7.4 inch (19 cm) dbh or greater with cavities (or snag height) at 15 ft or higher, especially for slash and longleaf pine, royal palm, and cypress.

**LM3.** Conduct prescribed burns in areas of known or suspected roosting activity from November 15 to April 15.

**LM4.** Protect known and suspected roost trees by raking and/or manually clearing vegetation around the base (150-ft (46 m) buffer) of identified trees prior to prescribed burning.

**LM5.** In areas of suitable FBB roosting habitat, plan to conduct only low intensity prescribed burns.

**LM6.** Avoid conducting frequent or sustained loud land management activities (generally above 80 decibels, such as chainsaw or heavy equipment) within 100 ft (15 m) of known or suspected roosts during the FBB breeding season (April 15 to November 15).

**LM7.** When possible, protect trees or snags 7.4 in (19 cm) dbh or greater with cavities (or snag height) at 15 ft or higher. These efforts may consist of avoiding removal of trees with these characteristics, raking and/or manually clearing vegetation around the base of known or potential roost trees to remove fuel prior to prescribed burning.

**LM8.** Forestry practices: Follow/Establish forest management efforts to maintain tree species and size class diversity to ensure long-term supply of FBB potential roost sites. Preserve large snags in open canopy when possible.

For land management activities or restoration projects that are not addressed in a current BO and cannot incorporate the BMPs above, contact the Service ([Florida Bonneted Bat Recovery Lead](#) or the Service’s Environmental Review project manager) for further guidance. Note: Many land management activities are not expected to follow these BMPs (and key out to a MANLAA), nor would it be beneficial for the FBB and many other species if all management actions followed all BMPs. However, the Service is required to evaluate the need to provide take coverage for those projects that may result in take of individuals. For example, these projects could include management actions in areas with potential roost trees during peak pup season or where fire is likely to result in significant loss of potential roost trees.

*Best Management Practices for Development, Construction, and Other Similar Activities*

Use the table below to determine which BMPs are required for projects keying out to a [MANLAA](#) with required BMPs (7a, 8a, 10a, 11a, or 12a) in the FBB Consultation Key. Information on how each BMP is each incorporated into the project must be submitted with the project for review. In cases of multiple home or multiple (future) ownership developments, how these measures will be maintained and enforced in perpetuity must also be addressed (e.g., through deed restrictions, Homeowner or Property Owner Associations (HOA/POA), Community Development Districts (CDD), planned communications to new owners and leases). If a BMP is not relevant to the project (for example, D2, if no water or water features are present or planned), please explain why it does not apply to the project.

Project keys out to:	Required BMPs
7a	D1 through D7; see specifics regarding D1 (20%) and D6 (\$4,875 per acre)
8a or 12a	D1 through D9; see specifics regarding D1 (25%) and D6 (\$7,387 per acre)
10a	D1 through D9; see specifics regarding D1 (20%) and D6 (\$7,387 per acre)
11a	D4 and D8; incorporation of additional BMPs is encouraged

**D1. Retain or restore a portion of the parcel in native contiguous vegetation.** In most cases, habitat types similar to the habitat type impacted should be retained or restored. (For example, if upland habitat is impacted, then upland habitat with native vegetation should be retained.) Projects keying out to **7a** or **10a** must retain or restore a minimum of 20% of the [project impact area](#) acreage. Projects keying out to **8a** or **12a** must retain or restore a minimum of 25% of the [project impact area](#) acreage.

**D2. Buffer all bodies of water and water features by a minimum of 50 feet (15.2 m) within which there are no impacts to substrate or vegetation.** In cases where artificial water bodies (i.e., stormwater ponds) are created, edges should be enhanced with native plantings (typically herbaceous wetland vegetation).

**D3. Maintain natural light conditions.** Avoid and minimize the use of artificial lighting and avoid permanent night-time lighting. Where lighting is necessary to meet minimum life safety requirements it must be designed to meet each of these recommendations:

- Utilize fully-shielded fixtures to restrict the amount of upward-directed light. Light sources must be downward directed and shielded so that the luminaire emits no more than

10% of its vertical output above 80 degrees from nadir. Examples of appropriate fixtures can be found in [FWC Sea Turtle Lighting Guidelines](#).

- Use the “Backlight, Uplight, Glare” (BUG) system developed by the Illuminating Engineering Society to avoid glare, excessive lighting and light trespass. The “uplight” rating should be zero, and “backlight” and “glare” ratings should be as close to zero as possible. Fixtures on edges of developed areas should have zero backlight ratings.
- Avoid broad spectrum and excessive short wavelength artificial light below 560 nanometers. Lights with less than 3000 Kelvin (K) color temperature must be used, while color temperatures of 2700 K or less are ideal. Lights with the lowest lumens possible should be used.
- Utilize shielding, louvers and baffles, dimming and other appropriate lighting controls to direct and minimize lighting when not in use.
- Implement partial-night lighting schemes to reduce the amount of artificial light used throughout the night. Motion-sensor lighting is also highly encouraged.
- Lighting must not illuminate any retained or restored vegetated areas.
- Prevent indoor artificial lighting reaching the outdoor environment. Use fixed window screens, blinds or tinting on fixed windows and skylights to contain artificial light inside buildings.

**D4. Avoid engineering designs that encourage bats from using roofs, buildings, or structures.** For example, minimize and seal any gaps, cracks, holes in roofing, siding, soffits during construction.

**D5. Avoid widespread use/application of pesticides and insecticides** (e.g., mosquito control, agricultural pest control). Chemicals should not be used or applied within and adjacent to areas where Florida bonneted bats are known or expected to forage or roost.

**D6. Use the [Florida Bonneted Bat Conservation Fund](#) to offset impacts to roosting and foraging habitat.**

Donate a recommended minimum of \$7,387 per acre (based on 2023 agricultural land values (USDA 2023)) of foraging or roosting habitat impacted (projects keying out to **8a, 10a, or 12a**), and \$4,875 per acre for projects keying out to **7a**. Donations are not required for temporary impacts to foraging habitat.

**D7. Retain trees and snags that could provide current or future roosting habitat.** This includes native potential roost trees or live royal palm, cypress, longleaf or slash pine trees of various sizes or dead or dying native trees with cavities, hollows, crevices, and loose bark. At minimum, 50% of the number of trees of these species (i.e., royal palm, cypress, longleaf or slash pine) present or 50% of the acreage of trees of these species present must be retained.

**D8. Conduct roost surveys of potential roost trees prior to removal; necessary removals should occur November 15 to April 15.** If potential roost trees or structures need to be removed, trees, snags, and structures need to be visually surveyed within 30 days prior to removal. Any cavities must be peeped with a “treetop” camera, and any cavities that cannot be reached or fully viewed by camera should be surveyed at emergence. If evidence of use by any bat species is observed, discontinue tree removal efforts in that area and coordinate with the Service on how to proceed. Tree, snag, or structure removals should not occur from April 15 to August 15; ideally removal should occur November 15 to April 15.

**D9. When using heavy equipment, establish a minimum 150 foot (46 m) buffer around retained known or potential roosts.**

Again, if the applicant is unable or does not want to incorporate the required BMPs into the project, this Consultation Key cannot be followed and further coordination and consultation with the Service is required. Formal consultation may not be required, but further evaluation of the project and discussions with the Service are needed.

*Best Management Practices for Land Management Activities within FBB CH*

BMPs **LM5**, **LM7**, and **LM8** are required for MANLAA projects keying out to **2b** in the FBB CH Consultation Key. No further consultation is required.

*Best Management Practices for development related impacts within FBB CH*

BMPs **D1 through D3, D5, D6, and D7** are required for MANLAA projects keying out to **3a** in the FBB CH Consultation Key, and information on how they are incorporated into the project must be submitted with the project for review.

**Literature Cited - Appendix C**

United States Department of Agriculture (USDA). 2023. Land Values 2023 Summary (August 2023). Released August 4, 2023, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board. Washington, D.C.

## Appendix D: Definitions

### DEFINITIONS

**Action area:** All areas affected directly or indirectly by the project/action, and not merely the immediate area involved in the action. The action area may include areas where, for example, effects of increased noise, artificial lighting, changes in hydrology or water quality, or increased traffic occur.

**Active Florida bonneted bat roosting:** The appropriate conclusion if **ANY** of the following occurs: (a) FBB calls are recorded within 1½ hours after sunset or 1½ hours before sunrise; (b) emergence and/or social calls are recorded; (c) human observers see (or hear) FBBs flying from or to potential roosts just after sunset (e.g., within 1½ hour of) or just before sunrise; (d) human observers see and identify FBBs within a natural roost or artificial roost; and/or (e) other bat sign (e.g., guano, staining, etc.) is found that is identified to be FBB through additional follow-up.

**Best Management Practices (BMPs):** Avoidance and minimization measures designed to be incorporated into the project's design such that take is not expected to occur as a result of the proposed project (i.e., not result in harassment, harm, injury, or death), after which a MANLAA determination may be possible. These recommendations for actions to conserve roosting and foraging habitat are implemented before, during, and after proposed development, land use changes, and land management activities. BMPs may also be used to offset impacts of a project with a LAA determination.

**Florida bonneted bat acoustic activity:** The appropriate conclusion if a valid acoustic survey yields at least one call file with FBB identified manually or via auto-ID with appropriate regional or species suite selected, with manual vetting from a reputable acoustic reviewer agrees that the auto-ID is correct.

**Florida bonneted bat assumed presence polygons:** The polygons indicate areas where repeated acoustic surveys have yielded detections of FBB. Project proponents may choose to assume presence of FBB if the project is within one of the polygons. Presence of FBB can also be assumed, if desired, based on potential foraging habitat and/or suitable roosting habitat, or other detection records (e.g., FBB capture, telemetry data).

**Florida Bonneted Bat Consultation Area:** The Florida Bonneted Bat Consultation Area ([Figure 1](#)) represents the general range of the species. The Consultation Area represents the area within which consideration should be given to potential effects to Florida bonneted bats from proposed projects or actions. Coordination and consultation with the Service helps to determine whether proposed actions and activities may affect listed species. This Consultation Area defines the area where proposed actions and activities may affect the Florida bonneted bat.

**Florida bonneted bat foraging habitat:** This species forages in a variety of habitats including open fresh water, permanent or seasonal freshwater wetlands, wetland and upland forests,

wetland and upland shrub, and agricultural lands. In urban and residential areas, drinking water, prey base, and suitable foraging conditions (*i.e.*, open habitat structure) can be found in relatively small patches of natural or semi-natural habitat. A project area existing within the consultation area lacking potential foraging habitat (2b) would be unlikely, therefore, please consider contacting the Service to discuss this determination if it appears to apply to your project.

**Florida bonneted bat roosting habitat:** This species roosts in live or dead trees and tree snags. Trees of any species 34 ft (10.4 m) or taller, snags 28 ft (8.5 m) or taller, with dbh 7.4 in (19 cm) or greater are potential FBB roosting habitat. Artificial structures 15 ft (4.5 m) in height and greater that may mimic natural roosting conditions (*e.g.*, bat houses, utility poles, buildings over one story high), situated in natural or semi-natural habitats should also be considered potential FBB roosting habitat. Such buildings with chimneys, gaps in soffits, gaps along gutters, or other structural gaps or crevices (outward entrance approximately 1 inch (2.5 centimeters) in size or greater can be potential roosting habitat. Bridges and culverts 15 ft and higher are also expected to provide roosting habitat, based upon the species' morphology and behavior (Keeley and Tuttle 1999).

**LAA/LAA CH:** May Affect, and is Likely to Adversely Affect. The appropriate conclusion if any adverse effect to listed species (/on designated critical habitat units) may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species (/on designated critical habitat units), but also is likely to cause some adverse effects, then the proposed action is "likely to adversely affect" the listed species (/on designated critical habitat units). If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation.

In some scenarios, applicants may be able to design projects that would not result in LAA. For example, if appropriate avoidance measures (*e.g.*, BMPs) could be incorporated into the project's design such that take is not expected to occur as a result of the proposed project (*i.e.*, not result in harassment leading to harm, harm, injury, or death), then a MANLAA determination may be possible. When take cannot be avoided, Applicants and Action Agencies are encouraged to incorporate compensation to offset adverse effects. The Service can assist the Applicant in identifying appropriate compensation (*e.g.*, conservation on site, conservation off-site, contributions to the Service's FBB conservation fund).

**MANLAA/ MANLAA CH:** May Affect, but is Not Likely to Adversely Affect. The appropriate conclusion when effects on listed species (/on designated critical habitat units) are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species (/on designated critical habitat units). Insignificant effects relate to the size of the impact and should never reach the scale where take occurs in a MANLAA. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. To use these



Guidelines and Consultation Key applicants must incorporate the required BMPs to reach a MANLAA determination.

Detailed information regarding how required BMPs are incorporated into your project designs must be included in your project submittal. If all required BMPs cannot be incorporated into project, further coordination and consultation with the Service is required.

**No Effect/No Effect to CH:** The appropriate conclusion when the action agency determines its proposed action will not affect listed species or designated critical habitat. The FESFO defines No Effect as projects with no impacts, positive or negative, to federally-listed species or designated critical habitat from the proposed action. This determination is usually not appropriate if suitable habitat, designated critical habitat, or species are present in the action area.

**Potential roost tree:** Trees of any species 34 ft (10.4 m) or taller, snags 28 ft (8.5 m) or taller, with dbh 7.4 in (19 cm) dbh or greater are potential FBB roost trees.

**Project impact area:** This is the area within the project area where any temporary or permanent impacts to foraging or roosting habitat are planned or will occur.

**Take:** to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. **Harm** is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. **Harass** is defined by FWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering.