Florida Bonneted Bat Biological Status Review Report

March 31, 2011

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
620 South Meridian Street
Tallahassee, Florida 32399-1600

Biological Status Review Report
for the
Florida bonneted bat
(*Eumops floridanus*)
March 31, 2011

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of November 8, 2010 that had not undergone a status review in the past decade. Public information on the status of the Florida bonneted bat was sought from September 17 to November 1, 2010. The members of the Biological Review Group (BRG) met on November 3-4, 2010. Group members were Jeff Gore (FWC lead), Cyndi Marks (Florida Bat Conservancy), and Holly Ober (University of Florida) (Appendix 1). In accordance with rule 68A-27.0012, Florida Administrative Code (F.A.C.), the BRG was charged with evaluating the biological status of the Florida bonneted bat using criteria included in definitions in 68A-27.001, F.A.C., and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels (Version 3.0)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://myfwc.com/wildlifehabitats/imperiled/listing-action-petitions/ to view the listing process rule and the criteria found in the definitions.

In late 2010, staff developed the initial draft of this report which included BRG findings and a preliminary listing recommendation from staff. The draft was sent out for peer review and the reviewers' input has been incorporated to create this final report. The draft report, peer reviews, and information received from the public are available as supplemental materials at http://myfwc.com/wildlifehabitats/imperiled/biological-status/.

The Florida bonneted bat BRG concluded from the biological assessment that the Florida bonneted bat meets at least one listing criterion. Based on the literature review and the BRG findings, staff recommends the Florida bonneted bat be listed as a Threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida. FWC staff gratefully acknowledges the assistance of the biological review group members and peer reviewers. Staff would also like to thank Karen Nutt who served as a data compiler on the species and prepared the initial draft of this report.

BIOLOGICAL INFORMATION

Taxonomic Classification – The Florida bonneted bat previously was considered to be a subspecies (*Eumops glaucinus floridanus*), but recent scientific research indicates that it is distinct from other *Eumops* outside Florida and should be classified as a full species (*E. floridanus*; Best 1997; Timm and Genoways 2004; McDonough *et al*. 2008). Alternative common names that have been used for the Florida bonneted bat include mastiff bat, Florida mastiff bat, and Wagner's mastiff bat (Belwood 1992; US Fish and Wildlife Service 2008).

Life History – The Florida bonneted bat is of medium size compared to other species in the genus *Eumops* (Best 1997; Timm and Genoways 2004). Both sexes are similar in size (forearm 61-66 mm) and adults weigh 34-47 g (Timm and Genoways 2004). Pelage color varies from black to brown to grayish or cinnamon brown (Belwood 1992; Best 1997; Timm and Genoways 2004).

The Florida bonneted bat inhabits semitropical forests, particularly pineland, tropical hardwood, and mangrove habitat (Robson 1989). It can be found roosting in a variety of natural and man-made substrates including chimneys, limestone outcroppings, tree cavities, bat houses, and under tiles of Spanish-style roofs (Best 1997; Timm and Genoways 2004; Marks and Marks 2008; US Fish and Wildlife Service 2008).

The Florida bonneted bat typically forages for flying insects in open, uncluttered areas and often flies >10 m above the ground (Belwood 1992; Best 1997). Humans can hear the loud, low-frequency echolocation calls of bonneted bats and thus can recognize the bats as they fly past (Belwood 1992; Best 1997).

The Florida bonneted bat roosts singly or in harem-like colonies composed of a male and several females (Belwood 1981; Belwood 1992; Best 1997). It has low fecundity, gives birth to only one offspring, and is thought to be polyestrous with an extensive summer breeding season and perhaps additional offspring born in January/February (Best 1997; Timm and Genoways 2004). Pregnant females have been found from June through September and a single juvenile was captured in mid-December (Belwood 1992; Robson *et al*. 1989; Marks and Marks 2008; K.N. Smith, FWC, personal communication). The Florida bonneted bat is not migratory, but there may be seasonal shifts in roosting sites (Best 1997; Timm and Genoways 2004).

Geographic Range and Distribution – The Florida bonneted bat may have the smallest range of any bat species in the New World and therefore is believed to be one of the most critically endangered mammals in North America (Timm and Genoways 2004). A survey in 2006-2007 found the Florida bonneted bat at only nine locations in Florida: Coral Gables (Granada Golf Course), Homestead, Naples, North Fort Myers, Babcock Ranch, Fred C. Babcock/Cecil M. Webb Wildlife Management Area (125.5 square miles.), Fakahatchee Strand Preserve State Park (117 square miles), Big Cypress National Preserve (1125 square miles), and Everglades City (Marks and Marks 2008). The Florida bonneted bat's range is restricted to 4 southern Florida counties: Charlotte (860 square miles), Lee (1,212 square miles), Collier (2,306 square miles), and Miami-Dade (2,430 square miles) (Belwood 1981; Robson 1989; Robson *et al*. 1989; Marks and Marks 2008; Timm and Genoways 2004). These 4 counties encompass 6,808 square miles, which is the maximum extent of occurrence for the bonneted bat. The area occupied within the 4 counties is unknown, but it is undoubtedly much smaller than the total area (Marks and Marks 2008; US Fish and Wildlife Service 2008).

Population Status and Trend – The population of Florida bonneted bats in Miami-Dade County apparently declined greatly in the 1950s-60s, presumably due to a period of rapid urbanization, destruction of native habitat, and heavy pesticide spraying for mosquitoes (Belwood 1992; Robson 1989). Bonneted bats often roost in buildings and one indication of their decline on the east coast is that requests to pest control companies to remove bats from

human structures all but ceased by 1982 (Belwood 1992). Furthermore, recent surveys failed to record vocalizations in Fort Lauderdale where bonneted bats have been recorded in the past (Marks and Marks 2008). Bonneted bats were first recorded on the west coast in 1979 (Belwood 1981). This single observation was the only record from southwest Florida until a small colony was confirmed in a bat house in North Fort Myers in 2003 (Timm and Genoways 2004; Marks and Marks 2008). Subsequently, bonneted bats have been found or their unique echolocation calls detected at several locations including Babcock-Webb Wildlife Management Area, Naples, Fakahatchee Strand Preserve State Park, and Everglades City (Marks and Marks 2008, US Fish and Wildlife Service 2008). Trends in population or range in southwest Florida cannot be identified due to the lack of surveys in previous years. East coast populations have declined and apparently are restricted to the area of Coral Gables (US Fish and Wildlife Service 2008). Florida bonneted bat populations on both coasts may decline in the future due to increased urbanization, destruction of habitat and continued pesticide use (Timm and Arroyo-Cabrales 2008; US Fish and Wildlife Service 2008).

The size and status of the colonies at each of the Florida bonneted bat's reported locations are unknown except for Lee County where a colony occupying two bat houses contains approximately 20 to 24 individuals (Belwood 1992; Marks and Marks 2008; US Fish and Wildlife Service 2008). Marks and Marks (2008) estimated that the entire population of Florida bonneted bats may be less than a few hundred individuals "based on the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies." Timm and Arroyo-Cabrales (2008) estimated there to be fewer than "250 mature individuals, with no subpopulation greater than 50 individuals."

The IUCN currently lists the Florida bonneted bat as Critically Endangered due to its small population size, very small subpopulations, and an apparent continuing decline in the population (Timm and Arroyo-Cabrales 2008).

Quantitative Analyses – No population viability analysis for Florida bonneted bats has been published.

BIOLOGICAL STATUS ASSESSMENT

Threats – The most serious concern for the Florida bonneted bat may be the small population size and restricted extent of occurrence that makes the species highly vulnerable to a number of potential impacts, including inbreeding depression, genetic drift, disease, hurricanes, and other chance events (US Fish and Wildlife Service 2008). The Florida bonneted bat is known to roost in trees, and continued loss of forest habitat is likely a threat to this species. The bats also roost in buildings, but little is known about the relative importance of trees versus buildings as roost sites or about the relative availability of different roost types. Based on the observed use of bat houses (Marks and Marks 2008), availability of suitable roosts may be a limiting factor for populations of bonneted bats. Hurricanes could kill roosting bats across local areas of south Florida as well as cause extensive loss of roosting sites in trees and buildings (US Fish and Wildlife Service 2008). The potential impact of pesticides from mosquito control operations is unknown, but may also be significant (US Fish and Wildlife Service 2008).

Population Assessment – The Florida bonneted bat BRG concluded that the Florida bonneted bat meets criteria for listing as described in 68A-27.001, F.A.C. Findings from the BRG are included in the Biological Status Review information findings table.

LISTING RECOMMENDATION

Based on the literature review and the BRG findings, staff recommends the Florida bonneted bat be listed as a Threatened species.

SUMMARY OF THE INDEPENDENT REVIEW

Comments were received from 3 reviewers: Dr. Eric Britzke (U.S. Army Corps of Engineers), Dr. Ted Fleming (University of Miami, emeritus), and Dr. Robert McCleery (University of Florida). Staff incorporated appropriate editorial changes recommended by the reviewers. One reviewer asked about the status and strength of the referenced data that purport a decline in bat numbers in southeast Florida. Staff agrees that supporting data for past declines are largely anecdotal and based on opinions of investigators. Unfortunately, no systematic surveys are available for assessing past trends. One reviewer suggested that discussion of the detectability of the species would be useful. Staff agrees, but no quantitative assessment of detectability has been conducted. One reviewer noted that tree loss was likely a minor threat. The report listed all potential threats and did not attempt to rank them. One reviewer felt use of bat boxes did not indicate shortage of suitable roosts. Staff agrees roost status is unknown, but the report only states that shortage of roosts may be a limiting factor. The revisions did not change the findings or the staff recommendation and all reviewers concurred with the staff recommendation. Peer reviews are available at MyFWC.com.

LITERATURE CITED

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Biological Status Review Information
Findings

Species/taxon:	Florida bonneted bat (*Eumops floridanus*)
Date:	3 Nov 2010
Assessors:	Jeff Gore, Cyndi Marks, and Holly Ober
Generation length:	Assuming a lifespan of 10 to 20 years for bats of this size (Wilkinson and South 2002), the average generation time is estimated to be 5 to 10 years. Inference only, no direct data available.

Criterion/Listing Measure	Data/Information	Data Type*	Sub-Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Sub-Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	Unknown but suspect overall population decline; evidence of decline in some portions of range. Extent of suspected decline is unknown.	S	N	US Fish and Wildlife Service 2008
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	Unknown but suspect overall population decline; evidence of decline in some portions of range. Extent of suspected decline is unknown.	S	N	US Fish and Wildlife Service 2008
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	Unknown but suspect overall population decline; evidence of decline in some portions of range. Extent of suspected decline is unknown.	S	N	US Fish and Wildlife Service 2008
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	Unknown but suspect overall population decline; evidence of decline in some portions of range. Extent of suspected decline is unknown.	S	N	US Fish and Wildlife Service 2008
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	~6,808 mi^2 = combined area of Miami-Dade, Charlotte, Collier, and Lee counties where the bat	E	Y	Marks and Marks 2008; Robson *et al*. 1989

	has been found. Likely an overestimate because bat not known throughout each county			
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Unknown. Sampling effort has been insufficient to reliably detect occupancy.		N	
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Potentially in 3 subpopulations and all in coastal locations susceptible to hurricanes.	I	Y	Marks and Marks 2008
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals	Continuing decline inferred in (i) extent of occurrence and (iii) area, extent, and/or quality of habitat. Extent of occurrence has declined in east coast but trends cannot be inferred in the west coast because there is no information on past extent of occurrence beyond a single record in 1979.	I	Y	US Fish and Wildlife Service 2008
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals	No		N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	< 100 individuals known in roosts; assumption is total population of mature individuals is well under 10,000	I	Y	US Fish and Wildlife Service 2008
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR	Unknown, but east coast population has likely declined.	S	N	Marks and Marks 2008; Robson *et al*. 1989
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	Unknown, but east coast population has likely declined.	S	N	Marks and Marks 2008; Robson *et al*. 1989
a. Population structure in the form of EITHER				
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation				
b. Extreme fluctuations in number of mature individuals				
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	< 100 individuals of all ages known in roost counts, so total population of mature individuals may be <1,000	I	Y	Marks and Marks 2008

(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	Potentially separated into 3 subpopulations and all are in coastal locations susceptible to hurricanes.	I	Y	Marks and Marks 2008; Robson *et al*. 1989
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	No PVA.		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Meets at least one of the criteria.	B1(a) and (b)(i) (iii); D1; D2
Is species/taxon endemic to Florida? (Y/N)	Y
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Meets at least one of the criteria.	B1(a) and (b)(i) (iii); D1; D2

APPENDIX 1: Brief biographies of the Florida bonneted bat Biological Review Group members

Jeff Gore has a Ph.D. in Wildlife Biology from the University of Massachusetts. He has worked for FWC since 1986 and since 2004 has been the leader of the Terrestrial Mammal Research Subsection. Dr. Gore has over 25 years of experience working on conservation of wildlife species in Florida, particularly small mammals such as bats and beach mice.

Cyndi Marks is currently earning a B.S. from St. Petersburg College. Ms. Marks has over 20 years experience conserving bat populations in Florida and has been Executive Director of the Florida Bat Conservancy since 1994.

Holly Ober has a Ph.D. in Forest Science and Wildlife Science from the Oregon State University. Dr. Ober has 16 years of experience in wildlife research and conservation, with primary emphasis on bats during the past 12 years. She has worked as an assistant professor for the University of Florida since 2007.

APPENDIX 2. **Summary of letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010.**

No information about this species was received during the public information request period.