

Supplemental Information for the White-Crowned Pigeon

Biological Status Review Report



The following pages contain peer reviews received from selected peer reviewers, comments received during the public comment period, and the draft report that was reviewed before the final report was completed

March 31, 2011

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Peer review #1 from Dr. Jerry Lorenz

From: LORENZ, Jerry
To: Imperiled
Cc: Miller, Karl
Subject: RE: White crowned pigeon Draft BSR Report
Date: Friday, January 14, 2011 2:15:07 PM

I have reviewed the BSR for white crowned pigeons and have no additions or edits to make to the BSR. I concur with the findings of the participants that this species should be listed as threatened due to its small distribution in an hurricane prone habitat and that habitat loss continues to cause declines in breeding habitat. The participants used the most appropriate and up-to-date materials regarding the numbers and distribution of this species. The best information available indicates that the species is threatened in the state of Florida.

Jerome J. Lorenz, Ph.D.
Director of Research
Audubon of Florida

Peer review #2 from Dr. Reed Bowman

From: Bowman, Reed

To: Imperiled

Subject: BSR review

Date: Wednesday, January 19, 2011 1:45:13 PM

Attachments: Review of the Biological Status Review for the WCPI_Bowman.docx

Please find attached my review of the BSR for the White-crowned Pigeon

Review of the Biological Status Review for the White-crowned Pigeon

Reed Bowman, Ph.D.

Research Program Director, Avian Ecology and Associate Research Biologist

Archbold Biological Station

123 Main Dr.

Venus, FL 33960

First and foremost, I agree with conclusion that the White-crowned Pigeon (WCPI; *Patagioenas leucocephala*) meets the criteria for listing as State Threatened. Thus any quibbles I have with the methodology, data analysis or interpretation are just that, quibbles, because I agree with the final conclusion. However, if a category above State Threatened existed, I think the WCPI would be a candidate.

The first criterion is Population Size Reduction and the review concluded that the WCPI did not meet any of those criteria. The review admits that data on population trends are vague because of variation in the intensity, geographical scope, and timing of surveys; however, some qualitative conclusions seem evident. The review notes that nesting habitat in the lower Keys was reduced by hurricanes occurring in 2004 and 2005 and that recovery of that habitat has been slow. The estimated breeding population declined by nearly 50% between 2004 and 2005 (5351 to 2929, Table 1, Meyers and Wilmers 2006). If recovery of habitat has been slow and immigration of WCPI into Florida from other breeding areas in the Caribbean is low (Meyers and Wilmers 2006), then this decline could represent a permanent reduction in the size of the lower Keys breeding population. Furthermore, the high estimate of 12,000 breeding pairs was derived by taking the maximum number estimated over four years for the lower Keys and adding that to an estimate derived for the upper Keys in the early 1990s (Strong et al. 1994), despite the inclusion of a personal communication from Sonny Bass (ENP) that the upper Keys populations has “been declining during the last 15 years.” Together, these patterns suggest that the current, post-hurricane population is much lower than the max estimate of 12,000 and that criteria A4: 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... is likely met.

Similarly, I think that future threats to WCPI in Florida may have been underestimated. The review acknowledges that climate change might result in an increased frequency and severity of

tropical storms, which can reduce nesting habitat. However, with global patterns of climate change also comes the likelihood of sea level rise. Even modest increases in sea level could threaten nesting habitat, but it also could have a huge impact on the distribution of tropical hardwood hammocks throughout the Keys. These are essential foraging resources for the WCPI and we have little understanding of how sea level rise, increased salt water intrusion into freshwater resources, and the eventual shift in human habitat to higher ground, on which hardwood hammocks occur, will affect the extant distribution of hardwood hammocks and the fruiting trees on which WCPI depend.

However, as stated above, despite this disagreement with some of the data interpretation of the BSR, I agree with the final conclusion, that the White-crowned Pigeon merits listing as State Threatened. The subsequent required management plan for this species should address the likelihood that this population is declining and not stable and how future threats to both nesting and foraging habitat as a result of climate change might be mitigated.

Peer review #3 from Dr. John Lloyd

From: John Lloyd

To: Imperiled

Subject: Comments on White-crowned Pigeon BSR

Date: Thursday, December 30, 2010 10:39:20 AM

Attachments: WCPI_BSR_comments.pdf

Attached, please find my comments regarding the Biological Status Review of the White-crowned Pigeon.

Thank you,

John D. Lloyd, Ph. D., CWB
Senior Research Ecologist
Ecostudies Institute

December 21, 2010

Dr. Elsa Haubold
Section Leader, Species Conservation Planning
Florida Fish and Wildlife Conservation Commission
RE: Biological Status Review of the White-crowned Pigeon (*Patagioenas leucocephala*)

Dear Dr. Haubold,

Thank you for the opportunity to review and provide comment on the Biological Status Review (BSR) for the White-crowned Pigeon. Overall, I found that the conclusion reached by the Biological Review Group (BRG), that the White-crowned Pigeon should be listed as Threatened, was well supported by available data. I found no critical flaws in the assumptions, analyses, or conclusions presented in the BSR.

The BRG's finding that White-crowned Pigeon should be listed as Threatened is based on *a*) the limited distributional range of this species in Florida (<5,000 km²), *b*) the limited area within its range that is actually occupied by this species (<1,250 km²), *c*) its occurrence in <10 locations throughout the State, and *d*) ongoing declines in the extent of area occupied and the extent of available habitat. Points *a-c* are well established in the scientific literature. Point *d* is less well-supported, at least based on the literature cited in BSR. However, I would suggest that point *d* is, in fact, clearly established by at least one study not cited in the BSR. In particular, Karim and Main (2009; Urban Ecosystems 12:359-370), using remotely sensed data, estimated a 31% decline in the areal extent of tropical hardwood hammocks in the upper Florida Keys between 1991 and 2004. Given that hammocks are the primary foraging habitat for White-crowned Pigeons, these data strongly suggest an ongoing decline in the area and extent of habitat (i.e., Criterion b(iii)) for this species.

Although the BRG's findings are strongly supported, I believe that the extent of ongoing threats to White-crowned Pigeon is understated in the BSR. In the interest of fully documenting the status of this species, I would suggest considering the following points, although I note that doing so would have no bearing on the BRG's findings; I raise them only in the interest of being thorough. First, the vulnerability of Florida's White-crowned Pigeons to hunting in the Bahamas should be stated clearly in the BSR. The language of the BSR (e.g., ((the species continues to be heavily hunted in other areas of its range ...)) suggests that hunting is a problem only for populations outside of Florida, when in fact migrants from Florida are almost certainly harvested each winter in the Bahamas. Second, I think that the BSR overemphasizes the vulnerability of White-crowned Pigeons to the damage that tropical cyclones can cause in mangroves used for nesting. Indeed, tropical cyclones can cause extensive reductions in the extent of mangroves, but whether this actually has implications for population dynamics of White-crowned Pigeons is unclear. Based on my understanding of the data presented in Myers et al. (2009; Final Report to the FFWCC), pigeons readily nested on keys damaged by a tropical cyclone, albeit at higher densities as they crowded into the remaining undamaged patches. One could imagine density-dependent processes that might reduce productivity in these cases, but in general it seems that this species is fairly resistant to the effects of tropical cyclones, as would be expected given its

evolutionary history in an area prone to this kind of disturbance. Furthermore, mangroves as a forest type are almost certainly resilient, at least in the medium term, to disturbance by tropical cyclones.

Taken together, this suggests to me that, in general, the effects of tropical cyclones on White-crowned Pigeons are apt to be relatively transient. A significant exception to this generalization, not raised in the text of the BSR, is that a single, large cyclone crossing Florida Bay during the nesting season could directly kill an entire cohort of White-crowned Pigeons via the destruction of nests containing eggs and nestlings. It may be that the most dangerous aspect of tropical cyclones is not the effect that they have on habitat, but instead the direct effect that cyclones may have on survival of White-crowned Pigeons, especially nestlings and embryos. As a small, range-restricted population, Florida's White-crowned Pigeons may be especially vulnerable to stochastic, catastrophic disturbances.

Finally, I think that changes in sea-level represent a potentially important threat not raised in the BSR. The rate of sea-level rise is likely to increase as global temperatures rise in conjunction with increased emission of CO₂, CH₄, and other greenhouse gases. A rapidly rising sea level may eliminate many of the small mangrove keys that currently provide nesting habitat, and may also contribute to the ongoing decline of tropical hardwood hammocks that are used as foraging sites. Sea-level rise is expected to increase the extent of mangroves in south Florida, although whether this will mean an increase in habitat for White-crowned Pigeons is unclear. Given that they do not appear to nest in large numbers in the extensive mangrove forests along the mainland coast, I suspect that sea-level rise in the long run will eliminate most extant nesting habitat without creating significant new areas for nesting.

Again, thank you for the opportunity to comment on the BSR. I commend the BRG for providing a thorough review of available data and for providing an analysis that clearly demonstrates why White crowned Pigeons should be listed as Threatened. Should you have any further questions, please do not hesitate to contact me.

John D. Lloyd, Ph. D.

Peer review #4 from Tom Wilmers

From: Thomas_Wilmers@fws.gov [mailto:Thomas_Wilmers@fws.gov]
Sent: Wednesday, January 12, 2011 8:47 AM
To: Miller, Karl
Cc: meyer@arcinst.org
Subject: BSR White-crowned pigeon
(See attached file: BSR White-crowned pigeon.docx)

Hi Karl:

I used Track Changes in the attached BSR. Sorry for the delay. Thanks.

Tom Wilmers
Wildlife Biologist
Florida Keys National Wildlife Refuges
28950 Watson Boulevard
Big Pine Key, FL 33043

**Biological Status Review
for the
White-crowned Pigeon
(*Patagioenas leucocephala*)**

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 September 1, 2010. Public information on the status of the white-crowned pigeon was sought from September 17, 2010 to November 1, 2010. The three member biological review group (BRG) met on November 4th, 2010. Group members were Karl Miller (FWC lead), Kenneth Meyer, and Sonny Bass. In accordance with rule 68A-27.0012 F.A.C, the White-crowned Pigeon Biological Review Group (hereafter BRG) was charged with evaluating the biological status of the white-crowned pigeon using criteria included in definitions in 68A-27.001(3) 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 (2004)*. Please visit http://www.myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions.

The BRG concluded from the biological assessment that the white-crowned pigeon met criteria for listing. Based on the literature review and the BRG findings, staff recommend listing the species as State Threatened.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Life History References – Strong and Bancroft (1994), Strong et al. (1994), Bancroft (1996), Bancroft et al. (2000), Bancroft and Bowman (2001), Wells and Wells (2001), Florida Fish and Wildlife Conservation Commission (2003), BirdLife International (2008).

Taxonomic Classification – The white-crowned pigeon was previously placed in the genus *Columba* but is now included in the *Patagioenas* genus of New World pigeons. There are no recognized subspecies (Bancroft and Bowman 2001).

Geographic Range and Distribution – The white-crowned pigeon is a subtropical species occurring in low-lying forest habitats with ample fruiting trees. Breeding range for the species is centered on the Bahamas and Greater Antilles, although populations extend into southern Florida, the Lesser Antilles, and the Caribbean coast of southeastern Mexico and Central America. Its range in the United States is restricted to Florida Bay, Biscayne Bay, and the Florida Keys, although a few individuals probably nest inland in Monroe and Miami-Dade counties (Bancroft and Bowman 2001, Florida Fish and Wildlife Conservation Commission

Comment [t1]: frugivorous

Comment [t2]: In Florida, nesting occurs almost exclusively on mangrove islands. Nesting birds fly to islands having fruit-bearing trees.

2003). The BRG estimated the range in Florida, or total extent of occurrence, at <5,000 km² and noted that a large majority of this area was open water; the land area actually occupied by white-crowned pigeons in Florida is probably <1,250 km².

Some white-crowned pigeons that breed in Florida overwinter in Florida, while most migrate south or southeast for the winter (Robertson and Woolfenden 1992, Bancroft 1996). Band recoveries suggest that most white-crowned pigeons breeding in Florida winter in the Bahamas (Bancroft and Bowman 2001).

Population Status and Trend – Strong et al. (1994) estimated the population of nesting white-crowned pigeons in Florida Bay, Biscayne Bay and Barnes Sound in the upper Florida Keys at 5,055 pairs in 1991. Pairs nesting in other parts of southern Florida and the Florida Keys were not systematically surveyed during that time period, but were estimated at 2,500 pairs (Bancroft and Bowman 2001). Estimates for the statewide population range from approximately 7,500 pairs (Bancroft and Bowman 2001) to 10,000 pairs (T. Bancroft, cited in Robertson and Woolfenden 1992) to as many as 12,000 pairs (Meyer and Wilmers 2006). Larger population estimates reflect recent and more complete flight-line count data from the lower Florida Keys (3,500 – 5,600 pairs; Meyer and Wilmers 2006), although those data have a wide confidence interval.

Population trend is not well understood, primarily because of variation in the intensity and geographic coverage of surveys over different time periods. Apparent increases in population estimates over time likely reflect improved survey methods and more complete coverage of white-crowned pigeon habitat. In Florida Bay, white-crowned pigeon numbers have been declining during the last 15 years (S. Bass, *personal communication*). In the lower Florida Keys, the species appears relatively stable, i.e., a trend cannot be distinguished from annual fluctuations in flight-line counts (T. Wilmers, *unpublished data*). Trend data for the upper Florida Keys are not available.

The Bahamas are estimated to hold up to 30,000 breeding pairs, and the largest nesting population is believed to be in Cuba, although data are lacking (Bancroft and Bowman 2001; A. Kirkconnell, *personal communication* to K. Meyer).

Quantitative Analyses – We are not aware of a population viability analysis using demographic data for white-crowned pigeon in Florida.

BIOLOGICAL STATUS ASSESSMENT

Threats – The white-crowned pigeon global population is assessed as Near Threatened according to IUCN Red List Category and Criteria due to the fact that it is restricted to low-lying areas subject to intense habitat degradation and deforestation (BirdLife International 2008). Hunting of this species was a threat to populations during the late 1800s and early 1900s, but protection measures have been beneficial to reducing this threat in Florida. However, the species continues to be heavily hunted in other areas of its range (Bancroft and Bowman 2001, Wells and Wells 2001, Meyer and Wilmers 2006). Bancroft and Bowman (2001) list hunting and harvesting, pesticides and other contaminants, collisions with structures or objects, degradation

Comment [t3]: While the statement re: Florida Bay may be true, lacking substantive data, it seems inappropriate to make the declaratory statement about a decline over the past 15 years. At least use a qualifier such as “may” or “appears to have declined.”

Comment [t4]: There is a clear trend. The largest colonies (core colonies) have been censused annually for 10 years. The results show clearly that the number of WCPI nesting in Key West NWR declined markedly after Hurricane Dennis. To date, numbers have not recovered. In sharp contrast, numbers at the core islands in GWHNWR increased markedly in 2010 with new highs being set at 5 islands. Replicate counts (as many as 6) were performed at all the core islands in 2010.

of habitat, and direct human/research impacts as primary threats to white-crowned pigeons. Nest predation by raccoons and other mammals is also a documented threat (Strong et al. 1991).

The Florida white-crowned pigeon subpopulation is contained within Monroe County, where it is vulnerable to hurricane events, both because of its location and its restricted range. Historical storm records corroborate the vulnerability of these geographic locations. The hurricanes of 2004-2005 eliminated substantial areas of nesting habitat in the lower Florida Keys, including Barrocuta Key, Little Crane Key, Upper Harbor Key, Little Spanish Key Mangrove, and Joe Ingram Key (T. Wilmers, *personal communication*). Recovery of black mangrove forest has been extremely slow. Increasing frequency of severe tropical storms and hurricanes (Webster et al. 2006) are expected to degrade and reduce the available nesting habitat for the species.

Statewide Population Assessment – Please refer to the Biological Status Review Information Sheet for the findings of the BRG. The white-crowned pigeon met multiple criteria for listing under Geographic Range Size and Fragmentation and Decline (B1+2ab(iii)).

Comment [t5]: crowned

Regional Assessment of Subpopulations – Please refer to the Biological Status Review Information Sheet for the regional assessment of the BRG. There was no change from the initial finding because of a lack of evidence for significant immigration from outside of Florida.

Evidence is lacking for significant immigration into Florida from the Bahamas. Existing band recoveries suggest that white-crowned pigeons banded as nestlings in the Bahamas rarely move to Florida (Bancroft and Bowman 2001). In addition, subpopulations outside of Florida (especially in the Bahamas) are expected to continue to decline principally because of unregulated hunting pressure and habitat loss and degradation (e.g., Arendt et al. 1979, Wiley 1979, Norton and Seaman 1985, Strong and Johnson 2001, Meyer and Wilmers 2006, Hay 2008).

LISTING RECOMMENDATION

In accordance with rule 68A-27.0012 F.A.C., staff recommend listing the white-crowned pigeon on the FWC State Threatened list. The species met multiple criteria for listing under Geographic Range Size and Fragmentation and Decline (B1, B2, and Ba, Bb(iii)).

LITERATURE CITED

- Arendt, W.J., T. A. Vargas Mora, and J.W. Wiley. 1979. White-crowned pigeon: status rangewide and in the Dominican Republic. *Proceedings from the Annual Conference of Southeast Associations of Fish and Wildlife Agencies* 33: 111 – 122.
- Bancroft, G.T. 1996. White-crowned Pigeon (*Patagioenas leucocephala*). Pp. 258-266 in *Rare and endangered biota of Florida, Volume V. Birds* (J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, Eds.). University Press of Florida, Gainesville. FCREPA.
- Bancroft, G.T., and R. Bowman. 2001. White-crowned Pigeon (*Patagioenas leucocephala*). *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/683> .
- Bancroft, G.T., R. Bowman, and R.J. Sawicki. 2000. Rainfall, fruiting phenology, and the nesting season of white-crowned pigeons in the upper Florida Keys. *Auk* 117: 416 – 426.
- BirdLife International. 2008. Species factsheet: *Patagioenas leucocephala*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. Accessed online at www.iucnredlist.org on 10/04/2010.
- Florida Fish and Wildlife Conservation Commission. 2003. Florida's breeding bird atlas: A collaborative study of Florida's birdlife. <http://www.myfwc.com/bba/> (Accessed 10/04/2010).
- Hay, D.B. 2008. Report of the White-crowned Pigeon (*Patagioenas leucocephala*) Working Group. *Journal of Caribbean Ornithology* 21: 110 – 112.
- Meyer, K. D., and T. J. Wilmers. 2006. Foraging habitats, winter residency, survival, and philopatry of adult white-crowned pigeons (*Patagioenis leucocephala*) in the lower Florida Keys. Final Report NG03-013 to Florida Fish and Wildlife Conservation Commission, Tallahassee.
- Norton, R.L., and G.A. Seaman. 1985. Post-fledging distribution of white-crowned pigeons banded in St. Croix, Virgin Islands. *Journal of Field Ornithology* 56: 416 – 418.
- Robertson, W.B., Jr., and G.E. Woolfenden. 1992. Florida bird species: an annotated list. Florida Ornithological Society, Special Publication No. 6.
- Strong, A.M., and G.T. Bancroft. 1994. Postfledging dispersal of white-crowned pigeons: implications for conservation of deciduous seasonal forests in the Florida Keys. *Conservation Biology* 8: 770 – 779.
- Strong, A.M., and M.D. Johnson. 2001. Exploitation of a seasonal resource by nonbreeding plain and white-crowned pigeons: implications for conservation of tropical dry forests. *Wilson Bulletin* 113: 73 – 77.

- Strong, A.M., R.J. Sawicki, and G.T. Bancroft. 1991. Effects of predator presence on the nesting distribution of white-crowned pigeons in Florida Bay. *Wilson Bulletin* 103: 415 – 425.
- Strong, A.M., R.J. Sawicki, and G.T. Bancroft. 1994. Estimating white-crowned pigeon population size from flight-line counts. *Journal of Wildlife Management* 58: 156 – 162.
- Webster, P.J., G.J. Holland, and H.R. Chang. 2006. Changes in tropical cyclone number, duration, and intensity in a warming environment. 2006. *Science* 16: 1844- 1846.
- Wells, A.C., and J.V. Wells. 2001. Pigeons and Doves. Pages 319 - 325 in C. Elphick, J.B. Dunning, Jr., D.A. Sibley (Eds.). *The Sibley Guide to Bird Life and Behavior*. Chanticleer Press, Inc. New York.
- Wiley, J.W. 1979. The white-crowned pigeon in Puerto Rico: status, distribution, and movements. *Journal of Wildlife Management* 43: 402 – 413.

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and Wells 2001, Meyer and Wilmers 2006). Bancroft and Bowman (2001) list hunting and harvesting, pesticides and other contaminants, collisions with structures or objects, degradation of habitat, and direct human/research impacts as primary threats to white-crowned pigeons. Nest predation by raccoons and other mammals is also a documented threat (Strong et al. 1991).

The Florida white-crowned pigeon subpopulation is contained within Monroe County, where it is vulnerable to hurricane events, both because of its location and its restricted range. Historical storm records corroborate the vulnerability of these geographic locations. The hurricanes of 2004-2005 eliminated substantial areas of nesting habitat in the lower Florida Keys, including Barrocuta Key, Little Crane Key, Upper Harbor Key, Little Spanish Key Mangrove, and Joe Ingram Key (T. Wilmers, *personal communication*). Recovery of black mangrove forest has been extremely slow. Increasing frequency of severe tropical storms and hurricanes (Webster et al. 2006) are expected to degrade and reduce the available nesting habitat for the species.

Statewide Population Assessment – Please refer to the Biological Status Review Information Sheet for the findings of the BRG. The white-crownd pigeon met multiple criteria for listing under Geographic Range Size and Fragmentation and Decline (B1+2ab(iii)).

Regional Assessment of Subpopulations – Please refer to the Biological Status Review Information Sheet for the regional assessment of the BRG. There was no change from the initial finding because of a lack of evidence for significant immigration from outside of Florida.

Evidence is lacking for significant immigration into Florida from the Bahamas. Existing band recoveries suggest that white-crowned pigeons banded as nestlings in the Bahamas rarely move to Florida (Bancroft and Bowman 2001). In addition, subpopulations outside of Florida (especially in the Bahamas) are expected to continue to decline principally because of unregulated hunting pressure and habitat loss and degradation (e.g., Arendt et al. 1979, Wiley 1979, Norton and Seaman 1985, Strong and Johnson 2001, Meyer and Wilmers 2006, Hay 2008).

LISTING RECOMMENDATION

In accordance with rule 68A-27.0012 F.A.C., staff recommend listing the white-crowned pigeon as a Threatened species because the species met listing criteria. The species met multiple criteria for listing under Geographic Range Size and Fragmentation and Decline (B1+2ab(ii,iii)).

LITERATURE CITED

- Arendt, W.J., T. A. Vargas Mora, and J.W. Wiley. 1979. White-crowned pigeon: status rangewide and in the Dominican Republic. *Proceedings from the Annual Conference of Southeast Associations of Fish and Wildlife Agencies* 33: 111 – 122.
- Bancroft, G.T. 1996. White-crowned Pigeon (*Patagioenas leucocephala*). Pp. 258-266 in Rare and endangered biota of Florida, Volume V. Birds (J.A. Rodgers, Jr., H.W. Kale II, and H.T. Smith, Eds.). University Press of Florida, Gainesville. FCREPA.
- Bancroft, G.T., and R. Bowman. 2001. White-crowned Pigeon (*Patagioenas leucocephala*). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/683>.
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- Florida Fish and Wildlife Conservation Commission. 2003. Florida's breeding bird atlas: A collaborative study of Florida's birdlife. <http://www.myfwc.com/bba/> (Accessed 10/04/2010).
- Hay, D.B. 2008. Report of the White-crowned Pigeon (*Patagioenas leucocephala*) Working Group. *Journal of Caribbean Ornithology* 21: 110 – 112.
- Meyer, K. D., and T. J. Wilmers. 2006. Foraging habitats, winter residency, survival, and philopatry of adult white-crowned pigeons (*Patagioenis leucocephala*) in the lower Florida Keys. Final Report NG03-013 to Florida Fish and Wildlife Conservation Commission, Tallahassee.
- Norton, R.L., and G.A. Seaman. 1985. Post-fledging distribution of white-crowned pigeons banded in St. Croix, Virgin Islands. *Journal of Field Ornithology* 56: 416 – 418.
- Robertson, W.B., Jr., and G.E. Woolfenden. 1992. Florida bird species: an annotated list. Florida Ornithological Society, Special Publication No. 6.
- Strong, A.M., and G.T. Bancroft. 1994. Postfledging dispersal of white-crowned pigeons: implications for conservation of deciduous seasonal forests in the Florida Keys. *Conservation Biology* 8: 770 – 779.
- Strong, A.M., and M.D. Johnson. 2001. Exploitation of a seasonal resource by nonbreeding plain and white-crowned pigeons: implications for conservation of tropical dry forests. *Wilson Bulletin* 113: 73 – 77.

- Strong, A.M., R.J. Sawicki, and G.T. Bancroft. 1991. Effects of predator presence on the nesting distribution of white-crowned pigeons in Florida Bay. *Wilson Bulletin* 103: 415 – 425.
- Strong, A.M., R.J. Sawicki, and G.T. Bancroft. 1994. Estimating white-crowned pigeon population size from flight-line counts. *Journal of Wildlife Management* 58: 156 – 162.
- Webster, P.J., G.J. Holland, and H.R. Chang. 2006. Changes in tropical cyclone number, duration, and intensity in a warming environment. 2006. *Science* 16: 1844- 1846.
- Wells, A.C., and J.V. Wells. 2001. Pigeons and Doves. Pages 319 - 325 in C. Elphick, J.B. Dunning, Jr., D.A. Sibley (Eds.). *The Sibley Guide to Bird Life and Behavior*. Chanticleer Press, Inc. New York.
- Wiley, J.W. 1979. The white-crowned pigeon in Puerto Rico: status, distribution, and movements. *Journal of Wildlife Management* 43: 402 – 413.

Biological Status Review Information Findings		Species/taxon:	White-crowned Pigeon		
		Date:	11/04/10		
		Assessors:	Karl Miller, Ken Meyer, Sonny Bass		
		Generation length:	2-3 yrs		
Criterion/Listing Measure	Data/Information	Data Type*	Criterion Met?*	References	
(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			N		
(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			N		
(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			N		
(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			N		
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	Occurs only in portions of Monroe County and Miami-Dade County; total areal extent estimated <5000 km ² .	O	Y	FWC land cover map; Strong et al. (1994); Bancroft and Bowman (2001); Florida Fish & Wildlife Conservation Commission (2003); Meyer and Wilmers (2006); S. Bass and T. Wilmers, personal communications.	

(b)2. Area of occupancy < 2,000 km ² (772 mi ²)	Land area is <25% of extent of occurrence (i.e., < 1250 km ²); at any time no more than 1/3 of keys and islands (ca. 400 km ²) are occupied.	O, E, I	Y	Strong et al. (1994); Florida Fish & Wildlife Conservation Commission (2003); Meyer and Wilmers (2006); S. Bass and T. Wilmers, personal communications.
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Exist in 3-4 "locations" where tropical weather events can severely impact all breeding individuals; vulnerability of these geographic locations corroborated by historical storm records for Florida Keys, Florida Bay, and Biscayne Bay.	O	Y	See B1 and B2 above.
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	Increasing frequency of severe tropical storms and hurricanes have caused long-term habitat destruction. Black mangrove nesting substrate especially affected and does not regenerate for decades. Hurricanes during 2004-2005 resulted in partial or complete loss of nesting substrate in large portions of Lower Keys, including Barrocuta Keys, Little Crane Key, Upper Harbor Key, Little Spanish Key Mangrove, Joe Ingram Key.	O, I, P	Y (ii,iii)	Meyer and Wilmers (2006); T. Wilmers, unpublished data.
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	Annual fluctuation in number of nesting attempts can be extreme, possibly tied to variation in food abundance; however, evidence inconclusive for extreme fluctuation in area of occupancy or number of individuals.		N	Bancroft (1996), Strong and Johnson (2001).
(C)Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Statewide population likely to be 10,000 - 12,000 pairs.		N	Meyer and Wilmers (2006).
(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			N	

(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:				
a. Population structure in the form of EITHER			N	
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation			N	
b. Extreme fluctuations in number of mature individuals			N	
(D)Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR			N	
(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			N	
(E)Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years			N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Meets at least one of criteria	B1+2ab(ii,iii)
Is species/taxon endemic to Florida? (Y/N)	N
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 are met)
Meets at least one of criteria	B1+2ab(ii,iii)

1	<p align="center">Biological Status Review Information Regional Assessment</p>	Species/taxon:	White-crowned Pigeon
2		Date:	11/04/10
3		Assessors:	Karl Miller, Ken Meyer, and
4			Sonny Bass
5			
6			
7			
8	Initial finding		
9			
10	2a. Is the species/taxon a non-breeding visitor? (Y/N/DK). If 2a is YES, go to line 18. If 2a is NO or DO NOT KNOW, go to line 11.		No
11	2b. Does the Florida population experience any significant immigration of propagules capable of reproducing in Florida? (Y/N/DK). If 2b is YES, go to line 12. If 2b is NO or DO NOT KNOW, go to line 17.		Do not know (suspect No)
12	2c. Is the immigration expected to decrease? (Y/N/DK). If 2c is YES or DO NOT KNOW, go to line 13. If 2c is NO go to line 16.		
13	2d. Is the regional population a sink? (Y/N/DK). If 2d is YES, go to line 14. If 2d is NO or DO NOT KNOW, go to line 15.		
14	If 2d is YES - Upgrade from initial finding (more imperiled)		
15	If 2d is NO or DO NOT KNOW - No change from initial finding		
16	If 2c is NO or DO NOT KNOW - Downgrade from initial finding (less imperiled)		
17	If 2b is NO or DO NOT KNOW - No change from initial finding		No change
18	2e. Are the conditions outside Florida deteriorating? (Y/N/DK). If 2e is YES or DO NOT KNOW, go to line 24. If 2e is NO go to line 19.		
19	2f. Are the conditions within Florida deteriorating? (Y/N/DK). If 2f is YES or DO NOT KNOW, go to line 23. If 2f is NO, go to line 20.		
20	2g. Can the breeding population rescue the Florida population should it decline? (Y/N/DK). If 2g is YES, go to line 21. If 2g is NO or DO NOT KNOW, go to line 22.		
21	If 2g is YES - Downgrade from initial finding (less imperiled)		
22	If 2g is NO or DO NOT KNOW - No change from initial finding		
23	If 2f is YES or DO NOT KNOW - No change from initial finding		
24	If 2e is YES or DO NOT KNOW - No change from initial finding		
25			
26	Final finding		Meets at least one of criteria

Appendix 1: Biological Review Group Members' Biographies

Karl E. Miller received his Ph.D. from the University of Florida and is currently the Upland Nongame Bird Leader for FWC's Fish and Wildlife Research Institute. Miller has more than 15 years experience implementing research and monitoring projects for imperiled birds and mammals in Florida, with more than 50 articles or book chapters published in scientific journals or popular magazines. Miller's expertise is focused on the population ecology and community ecology of raptors, woodpeckers, and songbirds.

Kenneth D. Meyer received his Ph.D. from the University of North Carolina, Chapel Hill, and is Director and Research Ecologist for the Avian Research and Conservation Institute. Meyer has conducted research on the behavioral ecology, migration, and population status of some of Florida's most imperiled and area-restricted bird species, including swallow-tailed kite, short-tailed hawk, and white-crowned pigeon. Meyer also serves as adjunct faculty member in the Department of Wildlife Ecology and Conservation at the University of Florida.

Oron "Sonny" Bass is Supervisory Wildlife Biologist at the Daniel Beard Research Center in Everglades National Park, where he has led research and monitoring projects on imperiled birds and mammals for the past three decades. Bass's expertise includes the conservation biology of bald eagles, ospreys, Cape Sable seaside sparrows, and Florida panthers, especially in relation to habitat quality and water management issues in the Everglades.

Appendix 2: Summary of Public Comment

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

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APPENDIX 3. Information and comments received from independent reviewers.

To be added later.

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