



Colonial Nesting Birds in Biscayne National Park

2018–2019 Nesting Year Summary

Natural Resource Data Series NPS/SFCN/NRDS—2020/1286



ON THE COVER

Photograph of Double-crested Cormorants on the pilings at Soldier Key.

Photograph by: Robert Muxo, National Park Service, South Florida / Caribbean Network.

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Abstract

The habitats within Biscayne National Park consist of rocky coast lines, Biscayne Bay (a shallow water bay), over forty mangrove islands, and coral reefs. This ecosystem lies near the large metropolitan area of Miami, suburban development, a nuclear power plant, and has several canals that drain from the mainland into the park or close to park boundaries. Another result of the park's proximity to a large population is that the park endures heavy usage. The park is a popular destination for fishers and boaters. All the aforementioned factors put stressors on the park ecosystem.

The South Florida / Caribbean Network has developed a long-term monitoring program that focuses on the colonial

nesting birds that use park resources for foraging, roosting, and nesting. The South Florida / Caribbean Network uses monthly helicopter flights to survey nine nesting colonies in or near the park. The nine colonies monitored are: Kings Road, Mangrove Key, West Arsenicker Key, Arsenicker Key, Jones Lagoon, Ragged Key 5, Ragged Key 4, Soldier Key, and Kings Bay (Figure 1). We focus on six species of birds: Double-crested Cormorants (*Phalacrocorax auritus*), Great Egrets (*Ardea alba*), Great White Herons (*Ardea herodias occidentalis*), Great Blue Herons (*Ardea herodias*), White Ibises (*Eudocimus albus*), and Roseate Spoonbills (*Platalea ajaja*).

Introduction

Nesting colonies of wading birds and seabirds are important indicators of ecosystem health as they respond to changes in food abundance, food quality, contaminants, invasive species, and disturbances. The acts of selecting mates, building nests, laying eggs, and rearing chicks are energy intensive. If the habitat is insufficient to support these activities, nesting success will suffer and may indicate a problem in the ecosystem. The South Florida / Caribbean Inventory and Monitoring Network of the National Park Service is monitoring colonial nesting birds in Biscayne National Park (BISC) and this report summarizes the results for the nesting year July 2018 through June 2019.

The specific objectives of this monitoring program are to determine status and long-term trends in:

- The number and locations of active colonies of colonial nesting birds with a special focus on Double-crested Cormorants (*Phalacrocorax auritus*), Great Egrets (*Ardea alba*), Great White Herons (*Ardea herodias occidentalis*), Great Blue Herons (*Ardea herodias*), White Ibises (*Eudocimus albus*), and Roseate Spoonbills (*Platalea ajaja*; referred to as focal species).
- The annual peak active nest counts of colonial nesting birds in Biscayne National Park for the focal species.
- An annual nesting index (sum of monthly nest counts) for the focal species.
- The timing of peak nest counts for the focal species.

Methods

The monitoring process in 2018–2019 consisted of an annual park-wide survey via helicopter to locate new nesting colonies of wading birds and seabirds within Biscayne National Park, coupled with monthly surveys of located colonies that were detected in the annual survey. Two SFCN staff, a photographer and an observer, participated in each survey. As the helicopter circled each island colony, the colonies were photographed, and the observer recorded the number of visible nesting and non-nesting birds. Approximately 450 photographs were taken during each survey. The photographs were downloaded to a computer for processing and analyzed to identify active nests by species. The identified nests were circled on the photographs and then counted from the processed photographs.

Peak nest counts were identified for each colony and then summed across colonies to calculate the peak nesting year total across the park for each species. “Year” refers to nesting year defined as July through June in the subsequent year. In addition, an annual nesting index is calculated, which is the sum of monthly nest counts for the entire nesting year. The nesting estimates for months with no sampling are calculated as the average of the months before and after the missing month. The South Florida / Caribbean Network uses the annual nesting index as well as peak nest counts as some species such as Double-crested Cormorants nest

in all months and peak nest counts alone were considered insufficient to describe the nesting effort. Trying to estimate the true number of nest starts is not feasible at this time. This year’s peak nest counts and nesting index are compared to the eight previous nesting years (July through June) mean, maximum, and minimum. Complete methods are described in the protocol “Colonial Nesting Bird Monitoring Protocol in Biscayne National Park” (Muxo et al. 2015).

Colony surveys were conducted in 2018 (July–December) and 2019 (February, and April–June). Actual survey dates are 7/25/2018, 8/23/2018, 9/21/2018, 10/24/2018, 11/15/2018, 12/19/2018, 2/15/2019, 4/24/2019, 5/22/2019, and 6/13/2019. The “January” flight did not occur because of the federal government shutdown and the “March” flight did not occur because of the lack of helicopter availability. The nine colonies surveyed during the routine monthly flights are: Kings Road, Mangrove Key, West Arsenicker, Arsenicker Key, Jones Lagoon, Ragged Key 5, Ragged Key 4, Soldier Key, and Kings Bay (Figure 1). Although the Kings Bay colony is located north of the park boundary, it is being monitored because of its proximity to the park. The birds nesting at Kings Bay most likely use the park for resources and provide a more complete a picture of colonial birds using Biscayne Bay.

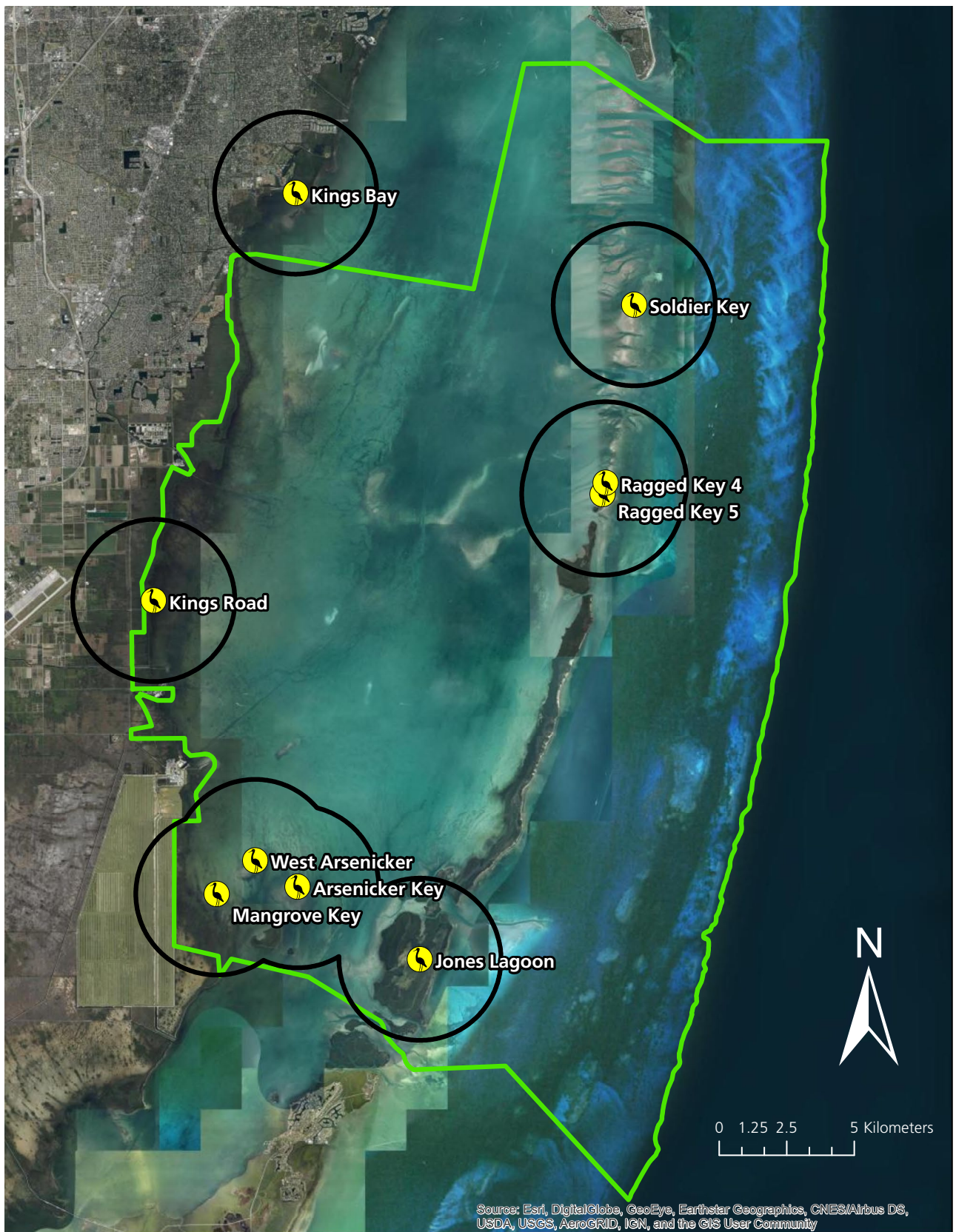


Figure 1. Locations of the nine nesting colony locations currently monitored. The black circles represent a three-kilometer radius foraging area. Studies of Double-crested Cormorants in other states have shown their average foraging distance is within 3 kilometers (1.9 miles) of their colonies (Custer and Bunck 1992; Coleman et al. 2005; Seefelt and Gillingham 2006). The park boundary is shown in green.

Results and Discussion

The standard results of the colonial nesting bird monitoring are summarized in the following tables and graphs and highlights are discussed further below:

- Table 1: Species list
- Table 2: Comparison of peak nest numbers and nesting index for 2018–2019 nesting season to previously monitored years.
- Figures 2 through 4: Graphs of nests photographed per month by focal species
- Figure 5: Number nesting colonies per species by year
- Figure 6: Number species nesting by colony and year
- Figure 7: Total of peak nest counts across colonies by focal species
- Figure 8: Annual nesting index across colonies by focal species
- Figure 9: Peak nest counts by colony by focal species
- Figure 10: Annual nesting index by colony by focal species
- Table 3: Percent nesting by month and focal species
- Table 4: Totals and percentages of nests occupied by birds, nests with eggs, nests with chicks, and empty nests

In the 2018–2019 nesting year, the South Florida / Caribbean Network completed its ninth year of monitoring colonial nesting birds in Biscayne National Park. This year's results include a new colony, Ragged Key 4, located approximately 25 meters (82 feet) north of Ragged Key 5 (Figure 1). This is the first time we are reporting results for this colony. When interpreting the data for this nesting season, it is important to consider there were two months that were not flown (January and March). These results can be seen in Figures 2, 3, and 4. Other data using cumulative results are also affected, particularly Figures 7 and 8 and Table 3.

Focal Species Results

The monitoring results have yielded valuable nesting data for documenting species-specific nesting patterns and trends. We have chosen to break down survey results by grouping bird species according to their feeding method: diver,

stalk and strike, and tactile. Species specific information is presented with a focus on Double-crested Cormorants, Great Egrets, Great White Herons, Great Blue Herons, White Ibises, and Roseate Spoonbills. A breakdown of active nests (occupied nests + active empty nests) for the focal species including counts for nests with chicks and nests with eggs is shown in Table 4. The annual seasonal nesting periods for the focal species are shown in Table 4.

Divers—Double-crested Cormorants

In the 2018–2019 nesting season, Double-crested Cormorants (DCCO) nested at every colony (Figure 6). The peak nest count for DCCO this season occurred in August of 2018 with a count of 735 (Figure 2). The entire park mean peak nest count for DCCO was down nine percent from previous years (Table 2), but within the previous data range of 792–1336 nests. The annual nesting index of 5,908.5 was within the range of the previous minimum and maximum of 4,957 and 7,552.5 respectively, but slightly below the average. Double-crested Cormorants continue to nest year-round and account for 91% percent of the nests counted. Seven of the nine previously monitored colonies showed lower peak nest counts than the mean of previous years; Ragged Key 4 and West Arsenicker were the only colonies showing an increase.

Stalk and Strike—Great Blue Heron, Great White Heron, and Great Egret

Great Blue Herons were observed nesting on six of the nine colonies (Table 2 and Figure 6). The peak nest count for the 2018–2019 nesting season was 13 compared to a mean of 11.9 of previous years and is within the previous data range of 6–16 nests (Table 2). Jones Lagoon had the highest number of Great Blue Heron nests with six nest.

The Great White Heron peak nest count of 40 was 37% above the mean of previously monitored seasons of 29.2 but is below the previous maximum peak nest count of 46 recorded in the 2010–2011 nesting season (Table 2). Great White Herons nested on all nine colonies monitored (Table 2 Figure 6).

Park wide peak nest counts for Great Egrets showed four nests, considerably lower than the mean from previous years (Table 2). During the 2018–2019 nesting season, Great Egrets nested at two colonies across the Park (Table 2 and Figure 6).

Table 1. List of species detected in 2018–2019 nesting season. Numbers in this table should not be used as true abundance estimates as nests and birds were likely observed during more than one sample period.

Common Name	Species Code	Photographed Nests	Field Observed Birds
Anhinga	ANHI	2	2
Black	BLVU	–	4
Brown Pelican	BRPE	–	155
Double-crested Cormorant	DCCO	5,148	2,469
Great Blue Heron	GBHE	35	36
Great Egret	GREG	4	95
Great White Heron	GWHE	137	192
Laridae family gull	LARI	–	49
Little Blue Heron	LBHE	2	27
Magnificent Frigatebird	MAFR	–	20
Reddish Egret	REEG	3	–
Roseate Spoonbill	ROSP	4	18
Snowy Egret	SNEG	2	5
Tricolored Heron	TRHE	–	10
Turkey Vulture	TUVU	–	29
Unidentified	UNID	62	–
Unidentified Dark Bird	UNDA	2	–
Unidentified White Bird	UNWH	17	47
White Ibis	WHIB	39	90
White-crowned Pigeon	WCPI	–	1
Wurdeemann's Heron	WUHE	1	–
Grand Total	–	5,458	3,249

Tactile Feeders—Roseate Spoonbill and White Ibis

This season there were two colonies where Roseate Spoonbills were observed nesting, one, Jones Lagoon, and the other Arsenicker Key. The peak nest count for the 2018–2019 nesting season is three which is a 40% below the previous years' mean of five, but within the previous data range of 0–12 nests (Table 2).

The White Ibis peak nest count of 33 nests was down 37% below the mean of the previous eight years of 52.3 (Table 2). This season's nest count is within the minimum and maximum range of 24 to 95 (Table 2).

Colony Results

West Arsenicker had the highest species richness of nesting species with eight species (Figure 6). Mangrove Key was the next highest with seven species nesting. This past nesting

season, for the first time, we observed Great White Herons at Kings Bay and Kings Road colonies. This year's report includes results from a new colony, Ragged Key 4. Ragged Key 4 along with Kings Bay and Kings Road, add 289 Double-crested Cormorants to the total.

Conclusion

Overall, the number of nests was slightly lower than the average of the past eight nesting years for four of the focal species. With the exception of Great Egrets, peak nest counts, and nesting indices fell within the range of variation seen in those years.

Table 2. This table shows a comparison of peak nest numbers and nesting index for the 2018–2019 nesting season to previously monitored years. Peak nest numbers in this table should not be used as true abundance estimates as nests and birds were likely observed during more than one sample period. Species codes: DCCO= Double-crested Cormorant; GBHE=Great Blue Heron; GREG=Great Egret; GWHE=Great White Heron; ROSP=Roseate Spoonbill; WHIB=White Ibis Note: Nesting seasons with zero nests counted are factored into the calculated means. See Figure 9 for individual colony counts showing zero counts for individual species.

Park	Species	2018 –2019	Mean	% Change	Max	Min	2018 –2019	Mean	% Change	Max	Min
Biscayne National Park	DCCO	940	1,038.7	-9	1336	792	5,908.5	5,979.5	-1	7,552.5	4,957.5
	GBHE	13	11.9	9	16	6	48.0	34.6	39	48.5	12.0
	GREG	4	16.1	-75	29	4	4.0	47.0	-91	84.5	4.0
	GWHE	40	29.2	37	46	18	181.0	118.7	53	192.0	68.5
	ROSP	3	5.0	-40	12	0	7.0	11.7	-40	25.0	0.0
	WHIB	33	52.3	-37	95	24	41.0	87.2	-53	206.0	27.0
Arsenicker Key	DCCO	56	146.7	-62	257	56	298.5	677.7	-56	983.5	298.5
	GBHE	1	0.4	-150	2	0	1.0	0.8	20	5.0	0.0
	GREG	0	0.6	-100	2	0	0.0	1.3	-100	5.0	0.0
	GWHE	4	5.4	-26	13	2	16.0	22.2	-28	54.5	11.5
	ROSP	1	0.5	100	1	0	1.5	0.8	100	1.5	0.0
	WHIB	0	31.5	-100	60	1	0.0	41.6	-100	87.0	0.0
Jones Lagoon	DCCO	55	103	-47	135	55	430.5	546.5	-21	905.0	298
	GBHE	6	6.2	-4	10	2	29.5	21.3	38	33.5	6.5
	GREG	1	1.0	0	2	0	1.0	1.0	0	2.0	0.0
	GWHE	10	9.2	8	14	6	56.5	40.2	40	64.0	23.0
	ROSP	2	4.9	-59	12	0	5.5	11.5	-52	25.0	0.0
	WHIB	0	0.0	0	0	0	0.0	0.0	–	0.0	0.0
Mangrove Key	DCCO	16	31.3	-49	115	0	67.0	102.1	-34	309.0	0.0
	GBHE	3	1.8	67	4	0	10.0	4.4	130	12.0	0.0
	GREG	0	0.3	-100	1	0	0.0	0.4	-100	2.0	0.0
	GWHE	8	1.9	324	8	0	37.5	7.6	396	37.5	0.0
	ROSP	0	0.0	0	0	0	0.0	0.0	–	0.0	0.0
	WHIB	0	0.0	0	0	0	.00	0.0	–	0.0	0.0

Table 2 (continued). This table shows a comparison of peak nest numbers and nesting index for the 2018-2019 nesting season to previously monitored years. Peak nest numbers in this table should not be used as true abundance estimates as nests and birds were likely observed during more than one sample period. Species codes: DCCO= Double-crested Cormorant; GBHE=Great Blue Heron; GREG=Great Egret; GWHE=Great White Heron; ROSP=Roseate Spoonbill; WHIB=White Ibis Note: Nesting seasons with zero nests counted are factored into the calculated means. See Figure 9 for individual colony counts showing zero counts for individual species.

Park	Species	2018–2019	Mean	% Change	Max	Min	2018–2019	Mean	% Change	Max	Min
Ragged Key 5	DCCO	351	410.8	-15	706	294	2,170.0	2,715.3	-20	3,568.0	2,072.5
	GBHE	1	0.4	133	1	0	2.5	0.5	400	2.5	0.0
	GREG	0	0.2	-100	1	0	0.0	0.2	-100	1.0	0.0
	GWHE	4	4.7	-14	8	2	24.0	19.1	26	36.5	10.0
	ROSP	0	0	0	0	0	0.0	0.0	–	0.0	0.0
	WHIB	0	0	0	0	0	0.0	0.0	–	0.0	0.0
Solider	DCCO	171	206.7	-17	342	140	1,286.0	1,283.8	0	1,575.5	870.5
	GBHE	1	1.1	-10	2	1	3.5	2.9	19	9.0	1.0
	GREG	0	0.5	-100	1	0	0.0	0.4	-100	1.5	0.0
	GWHE	5	4.2	18	9	2	33.0	16.3	102	36.5	5.0
	ROSP	0	0	0	0	0	0.0	0.0	–	0.0	0.0
	WHIB	0	0	0	0	0	0.0	0.0	–	0.0	0.0
West Arsenicker	DCCO	2	1.4	38	10	0	2.0	1.8	9	13.0	0.0
	GBHE	1	2.8	-64	5	1	1.5	5.6	-73	15.0	1.5
	GREG	3	14.1	-79	27	3	3.0	44.0	-93	82.5	3.0
	GWHE	5	3.2	55	6	1	8.0	12.4	-36	29.5	4.0
	ROSP	0	0	0	0	0	0.0	0.0	–	0.0	0.0
	WHIB	33	24.3	36	95	0	41.0	45.7	-10	206.0	0.0
Kings Bay	DCCO	218	275	-21	357	218	1,402.5	1,291.1	9	1,739.5	424
	GWHE	1	0.3	233	1	0	1.5	0.4	300	1.5	0.0
Kings Road Island	DCCO	33	54	-39	66	33	108	182.0	-41	222.5	108
	GWHE	1	1	0	1	1	1.0	0.5	100	1.0	0.0
Ragged Key 4	DCCO	38	25	52	38	12	144.0	80.0	80	144.0	16
	GWHE	3	1.5	100	3	1	3.5	2.8	25	3.5	2.0

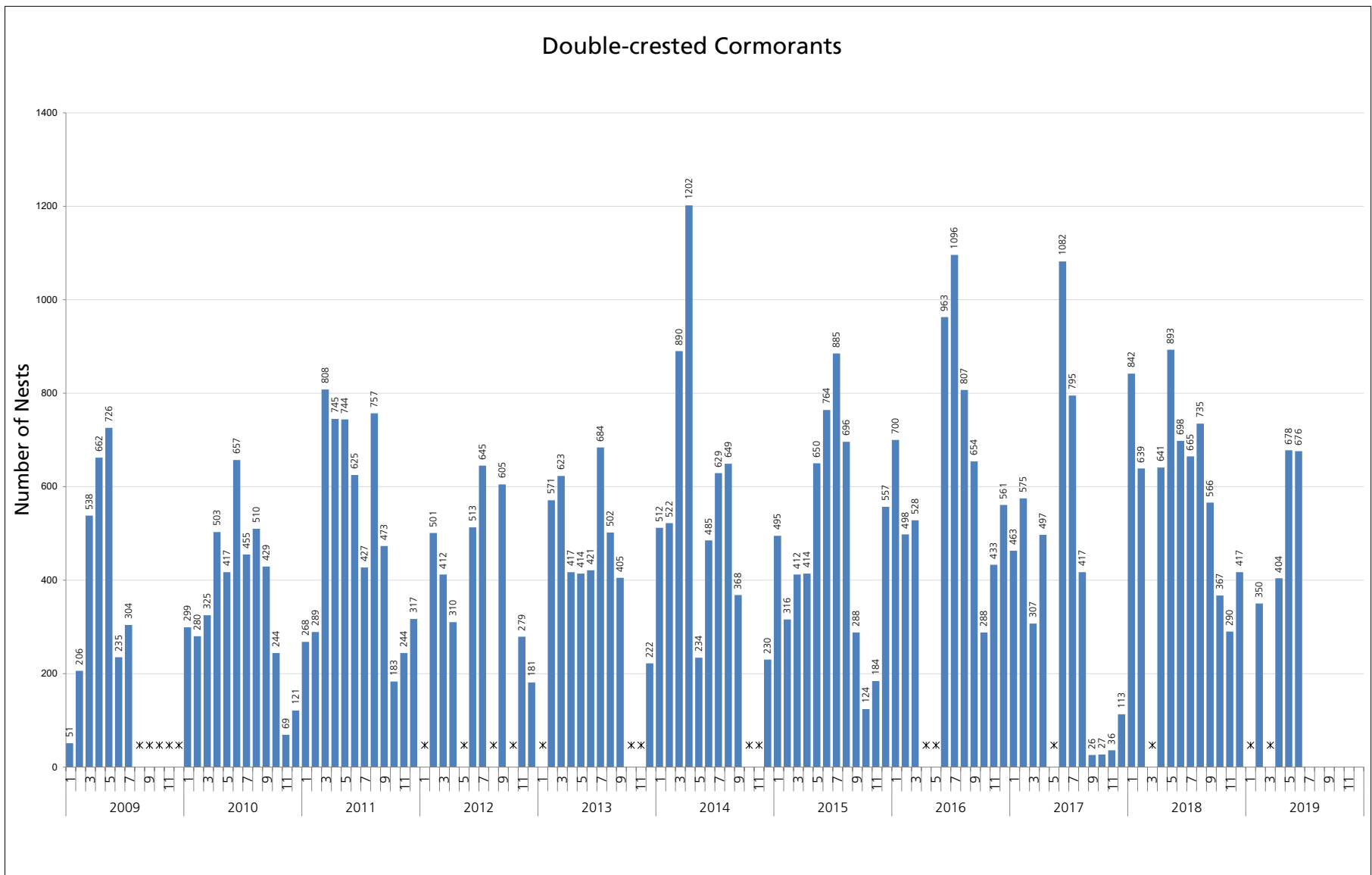


Figure 2. Number of Double-crested Cormorant nests per month. An asterisk (*) indicates months not sampled.

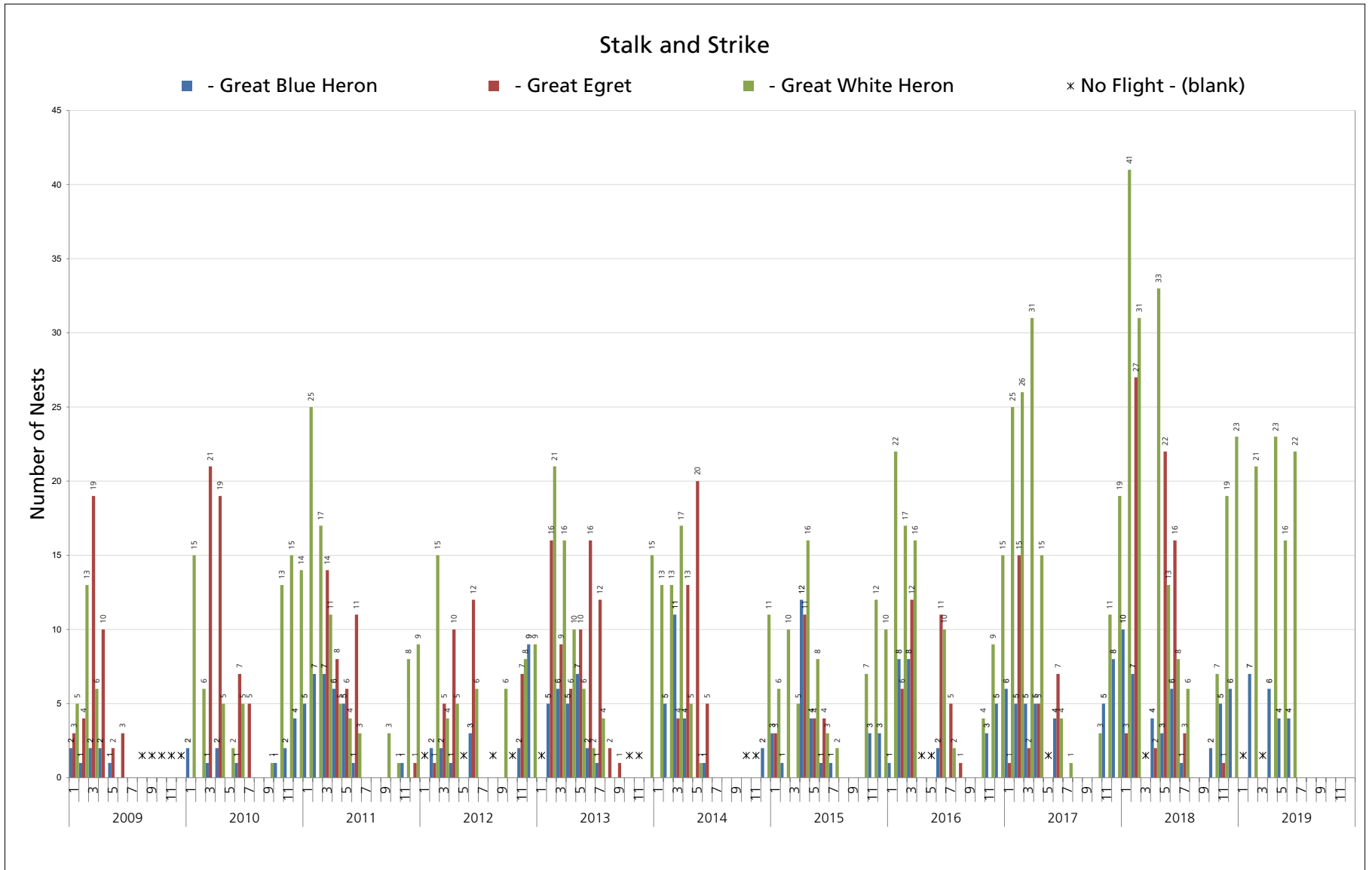


Figure 3. The number of nests by month for selected stalk and strike species: Great Blue Heron, Great Egret, and Great White Heron.

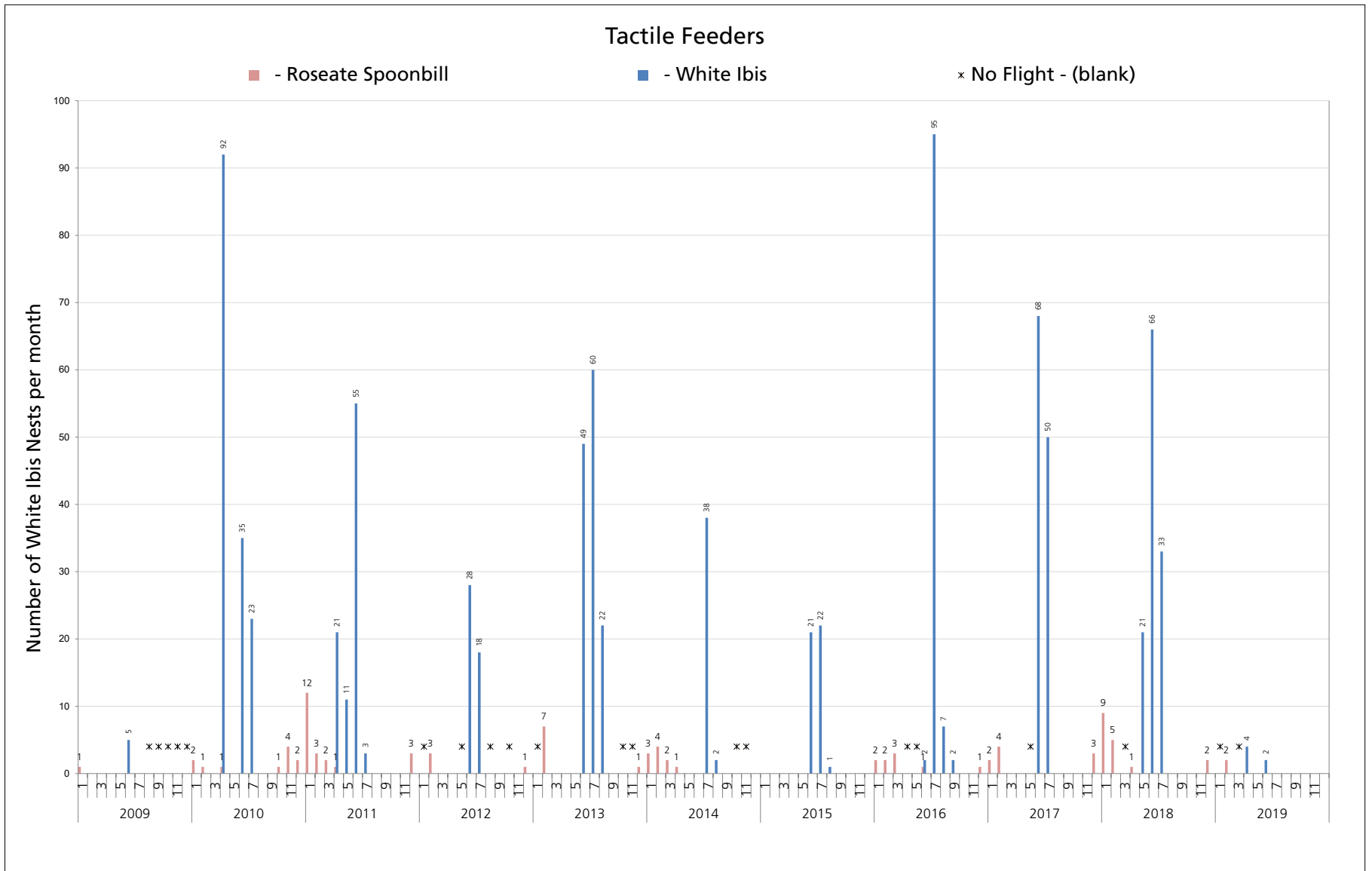


Figure 4. The number of nests by month for two tactile feeder species: Roseate Spoonbills and White Ibises. This graph shows that Roseate Spoonbills nest in the dry season and White Ibises nest in the wet season. An asterisk (*) indicates months not sampled.

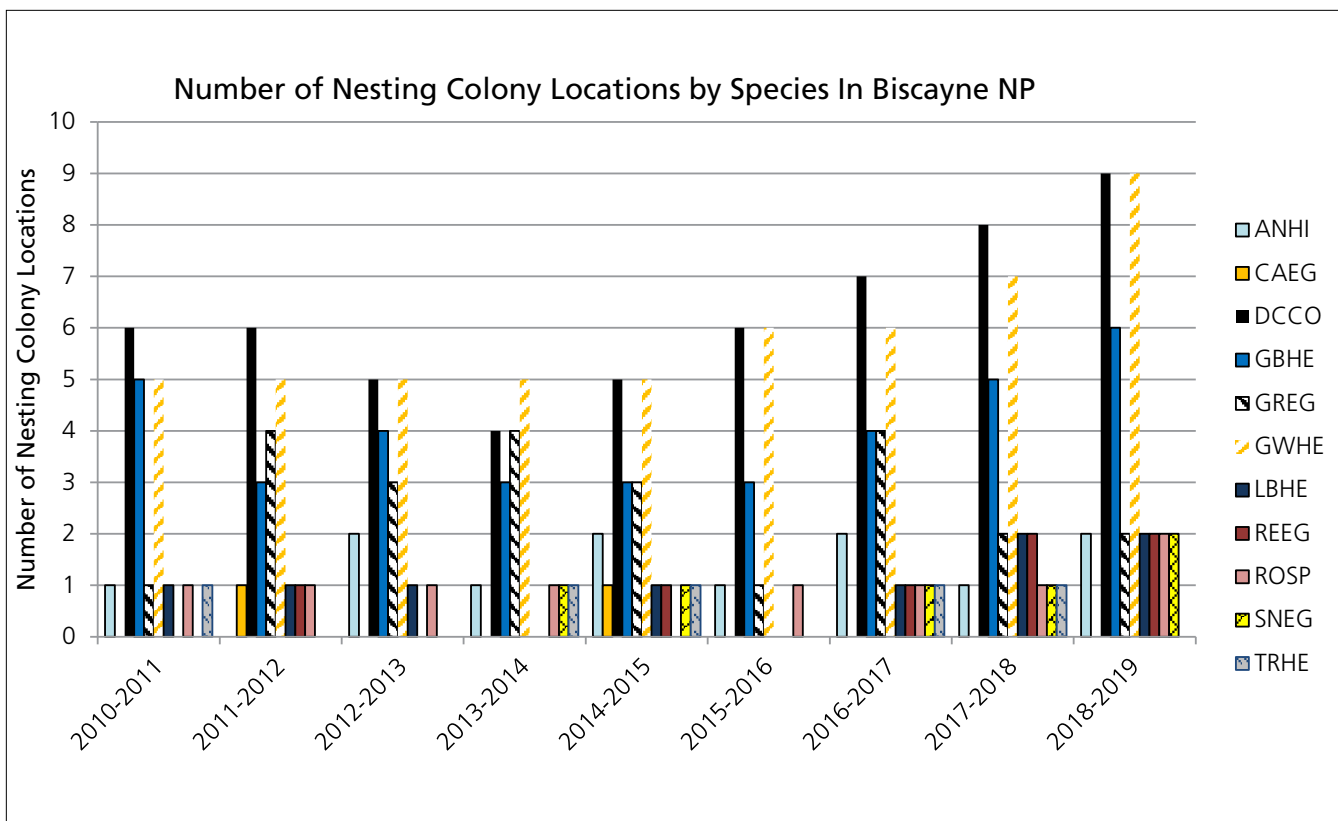


Figure 5. Number of nesting colony locations by species in Biscayne National Park. Includes all egrets, ibises, spoonbills, and herons.

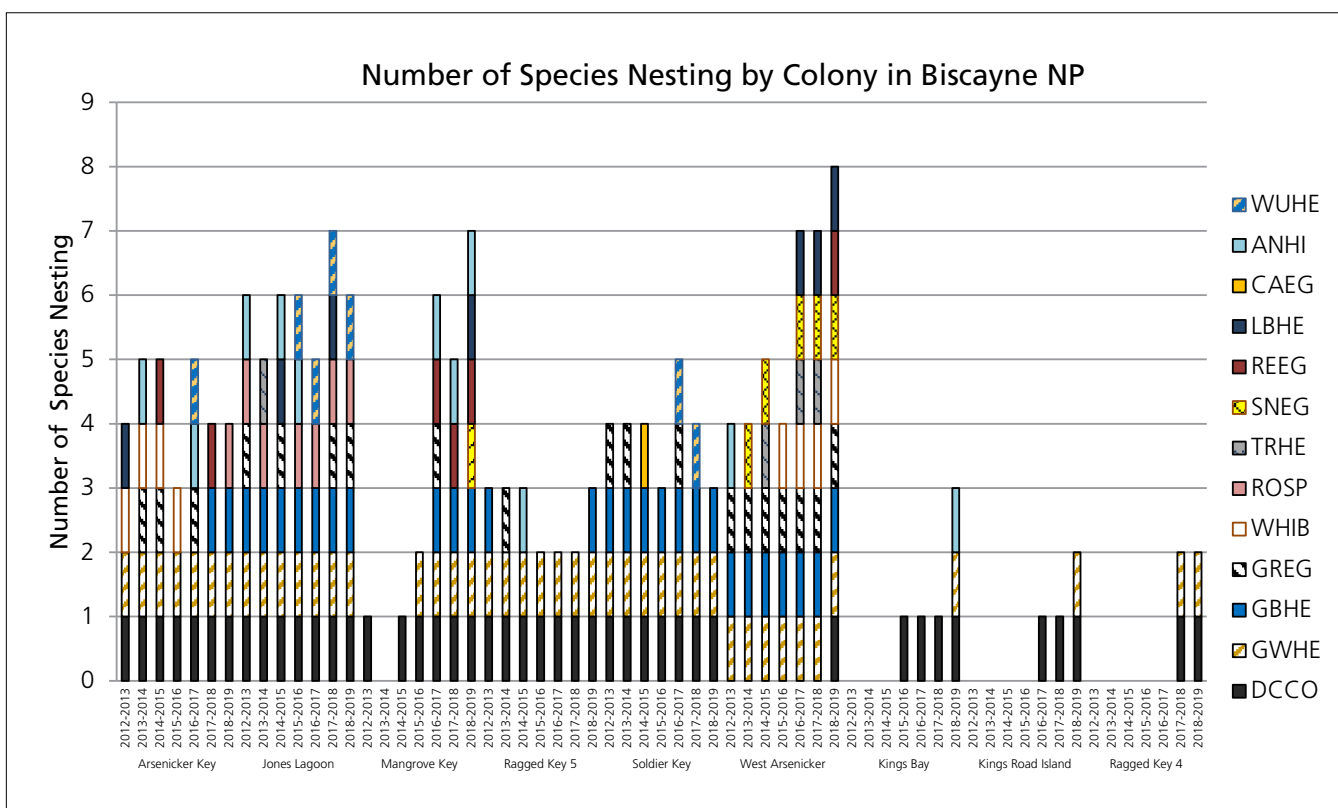


Figure 6. Number of species nesting by colony in Biscayne National Park. Includes all egrets, ibises, spoonbills, and herons.

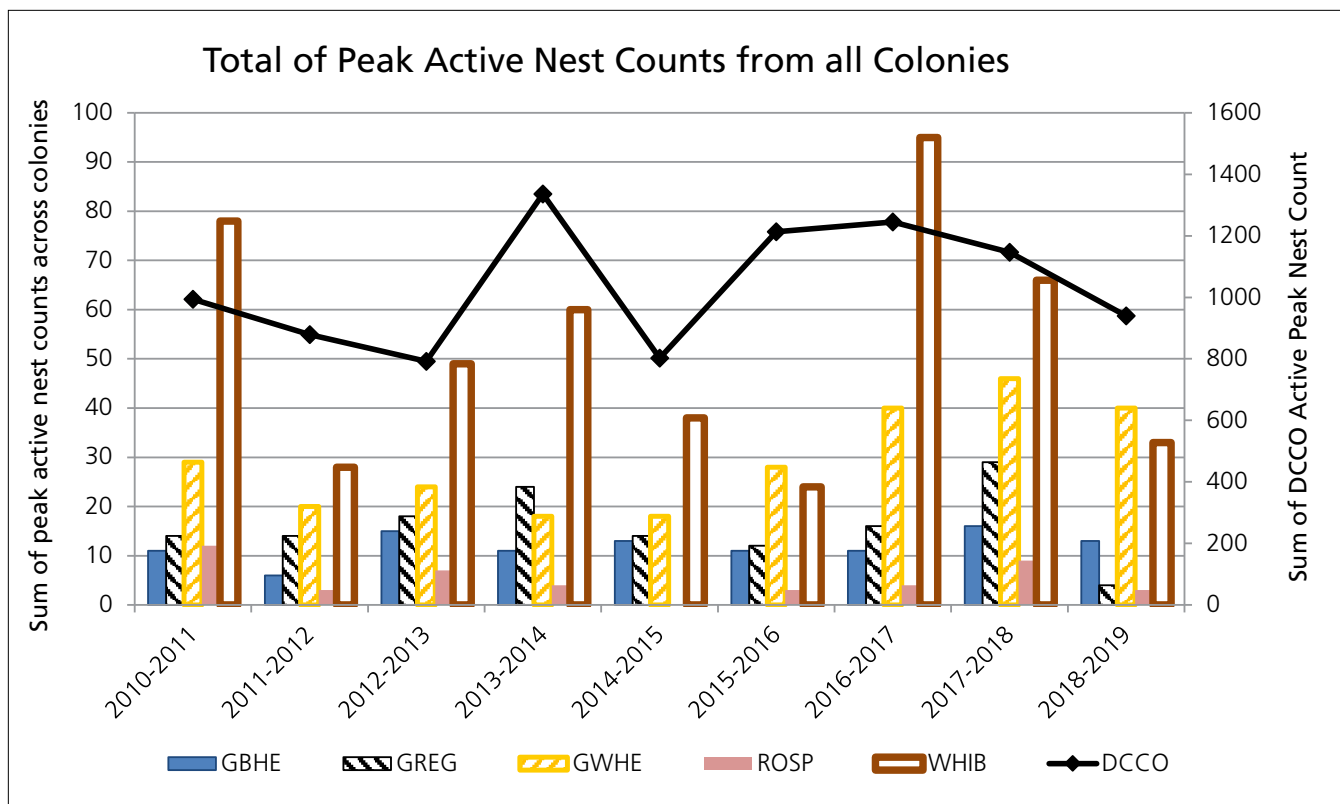


Figure 7. Total of peak nests detected per colony was summed to create a total of peak nest counts across all colonies.

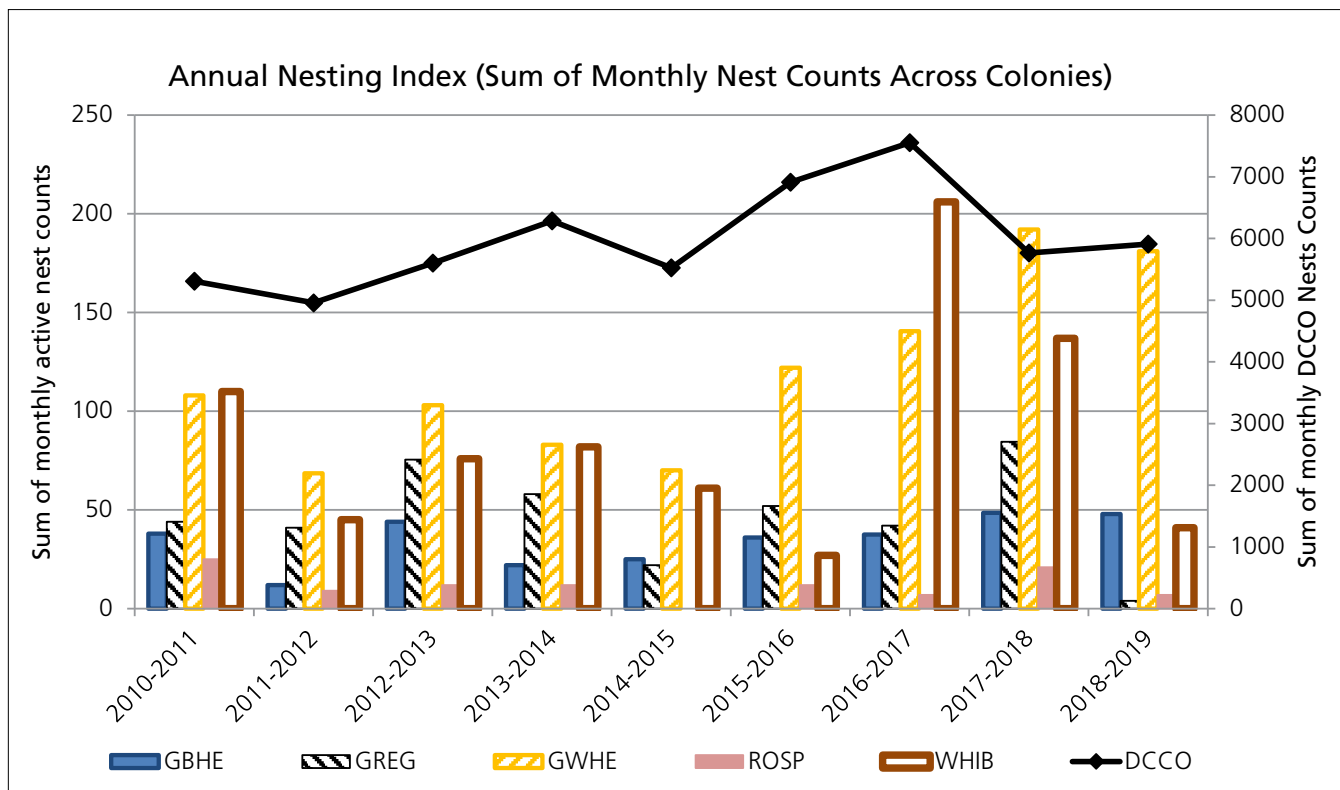


Figure 8. Annual nesting index across colonies by focal species. The number of nests counted at each colony during each month was summed to create an annual nesting index across all colonies for the six focal species. This number exceeds the actual number of nest starts as a single nest could be counted during two or more monthly visits.

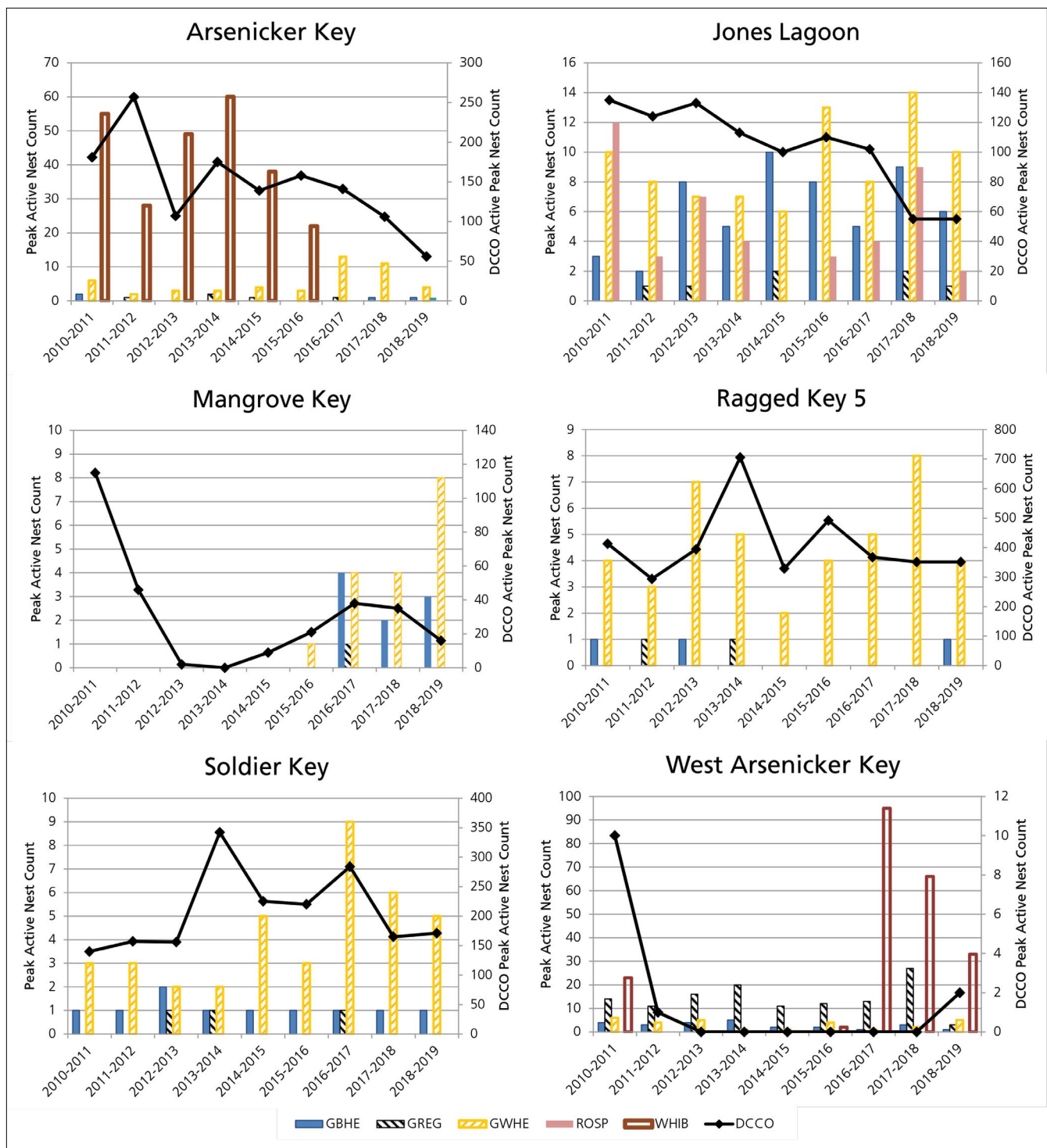


Figure 9. Peak nest counts by colony for the six focal species. Note: Kings Road, Kings Bay, and Ragged Key 4 are not included.

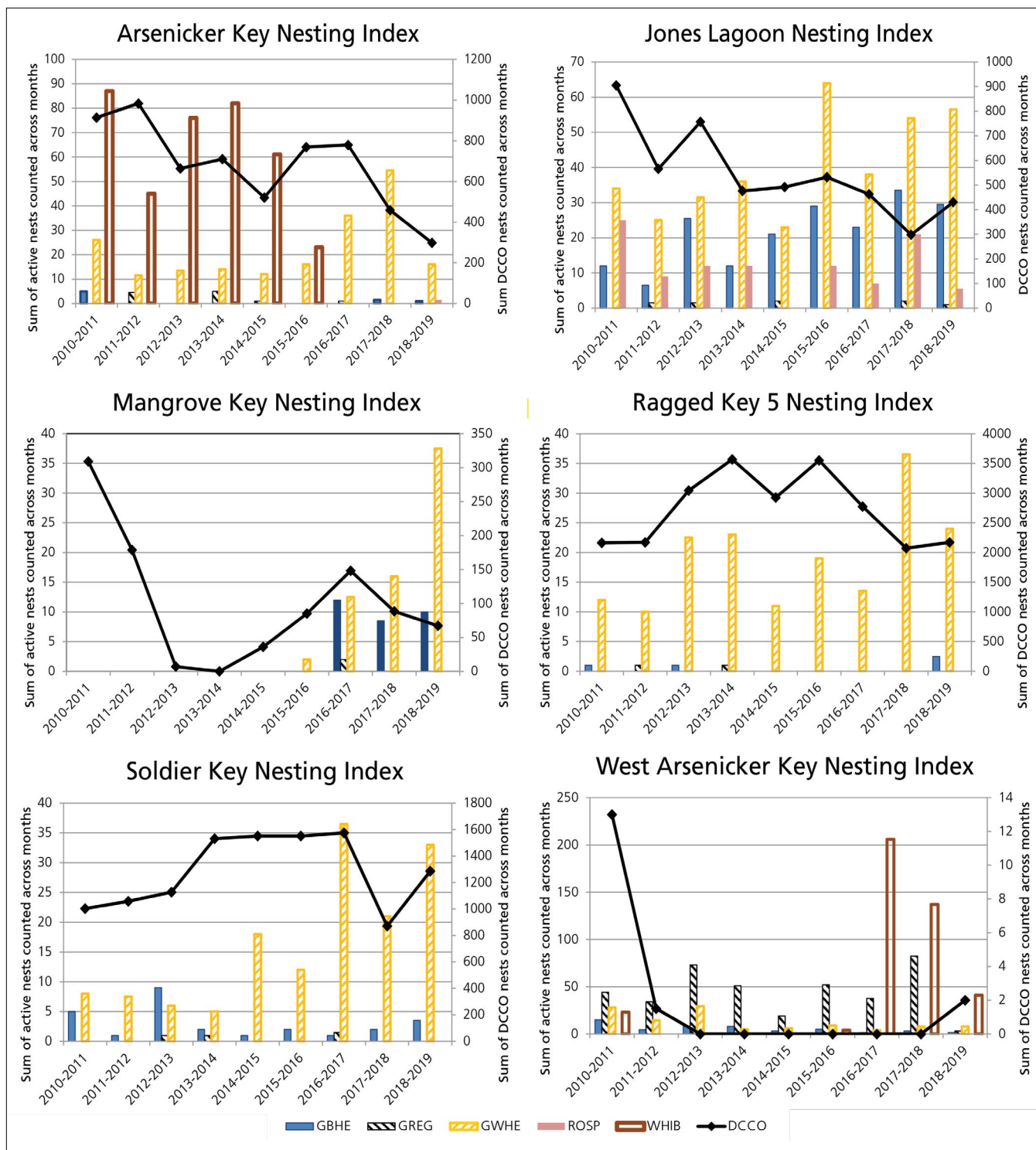


Figure 10. Annual nesting index across colonies by focal species. The annual nesting index is defined as total nests counted across all months and colonies. Note: Kings Bay, Kings Road, and Ragged Key 4 are not included.

Table 3. Percent nesting by month and species. NF = No Flight. Monthly mean = mean percent nesting across all nesting seasons.

Species	Nesting Season	July 2018	Aug. 2018	Sept. 2018	Oct. 2018	Nov. 2018	Dec. 2018	Jan. 2019	Feb. 2019	March 2019	April 2019	May 2019	June 2019	Total Active Nests
Double-Crested Cormorant	Monthly mean	13	11	8	3	3	6	7	9	9	10	8	13	46,646
	2010–2011	9	10	8	5	1	2	5	5	15	14	14	12	5,307
	2011–2012	10	18	11	4	6	8	0	12	10	7	0	12	4,137
	2012–2013	16	0	15	0	7	4	0	14	15	10	10	10	4,156
	2013–2014	12	9	7	0	0	4	9	9	16	21	4	9	5,658
	2014–2015	13	13	7	0	0	5	10	6	8	8	13	16	4,927
	2015–2016	16	13	5	2	3	10	13	9	10	0	0	18	5,423
	2016–2017	16	12	10	4	6	8	7	9	5	7	0	16	6,763
	2017–2018	16	8	1	1	1	2	16	12	NF	13	17	14	5,127
	2018–2019	13	14	11	7	6	8	NF	7	NF	8	13	13	5,148
Great Blue Heron	Monthly mean	1	0	0	1	8	14	9	18	15	16	9	9	265
	2010–2011	0	0	0	3	5	11	13	18	18	16	13	3	38
	2011–2012	0	0	0	0	11	0	NF	22	22	11	NF	33	9
	2012–2013	0	NF	0	NF	6	25	NF	14	17	14	19	6	36
	2013–2014	0	0	0	NF	NF	0	0	24	52	19	0	5	22
	2014–2015	0	0	0	NF	NF	9	13	4	0	52	17	4	23
	2015–2016	4	0	0	0	12	12	4	31	31	NF	NF	8	26
	2016–2017	0	0	0	0	9	15	18	15	15	15	NF	12	33
	2017–2018	0	0	0	0	12	19	23	16	NF	9	7%	14	43
	2018–2019	3	0	0	6	14	17	NF	20	NF	17	11	11	35
Great Egret	Monthly mean	7	1	0	0	2	0	2	18	13	15	17	23	355
	2010–2011	11	0	0	0	0	0	0	0	32	18	14	25	44
	2011–2012	0	0	0	0	0	3	NF	3	17	34	NF	41	29
	2012–2013	0	NF	0	NF	11	0	NF	25	14	9	16	25	64
	2013–2014	21	4	2	NF	NF	0	0	0	7	23	35	9	57
	2014–2015	0	0	0	NF	NF	0	14	0	0	50	18	18	22
	2015–2016	0	0	0	0	0	0	0	21	41	NF	NF	38	29
	2016–2017	14	3	0	0	0	0	3	42	6	14	NF	19	36
	2017–2018	0	0	0	0	0	0	4	39	NF	3	31	23	70
	2018–2019	75	0	0	0	25	0	NF	0	NF	0	0	0	4

Table 3 (continued). Percent nesting by month and species. NF= No Flight. Monthly mean = mean percent nesting across all nesting seasons.

Species	Nesting Season	July 2018	Aug. 2018	Sept. 2018	Oct. 2018	Nov. 2018	Dec. 2018	Jan. 2019	Feb. 2019	March 2019	April 2019	May 2019	June 2019	Total Active Nests
Great White Heron	Monthly mean	2	0	1	4	9	14	15	19	11	13	45	7	888
	2010–2011	0	0	1	12	14	13	23	16	10	5	4	3	108
	2011–2012	0	0	6	2	16	18	NF	29	8	10	NF	12	51
	2012–2013	0	NF	8	NF	10	12	NF	27	21	13	8	3	78
	2013–2014	6	0	0	NF	NF	22	19	19	25	7	1	0	68
	2014–2015	0	0	0	NF	NF	19	10	17	8	27	14	5	59
	2015–2016	2	0	0	7	13	10	23	18	17	NF	NF	10	96
	2016–2017	2	0	0	3	7	11	19	20	24	11	NF	3	131
	2017–2018	1	0	0	2	7	12	26	19	NF	21	8	5	160
	2018–2019	4	0	0	5	14	17	NF	15	NF	17	12	16	137
Roseate Spoonbill	Monthly mean	0	0	0	1	5	15	32	34	8	3	0	1	87
	2010–2011	0	0	0	4	16	8	48	12	8	4	0	0	25
	2011–2012	0	0	0	0	0	50	NF	50	0	0	NF	0	6
	2012–2013	0	NF	0	NF	0	13	NF	88	0	0	0	0	8
	2013–2014	0	0	0	NF	NF	9	27	36	18	9	0	0	11
	2014–2015	0	0	0	NF	NF	0	0	0	0	0	0	0	0
	2015–2016	0	0	0	0	0	0	25	25	38	NF	NF	13	8
	2016–2017	0	0	0	0	0	14	29	57	0	0	NF	0	7
	2017–2018	0	0	0	0	0	17	50	28	NF	6	0	0	18
	2018–2019	0	0	0	0	0	50	NF	50	NF	0	0	0	4
White Ibis	Monthly mean	44	7	0	0	0	0	0	0	0	6	3	41	724
	2010–2011	21	0	0	0	0	0	0	0	0	19	10	50	110
	2011–2012	10	0	0	0	0	0	NF	0	0	0	NF	90	31
	2012–2013	27	NF	0	NF	0	0	NF	0	0	0	0	73	67
	2013–2014	73	27	0	NF	NF	0	0	0	0	0	0	0	82
	2014–2015	62	3	0	NF	NF	0	0	0	0	0	0	34	61
	2015–2016	88	4	0	0	0	0	0	0	0	NF	NF	8	25
	2016–2017	55	4	1	0	0	0	0	0	0	0	NF	40	172
	2017–2018	36	0	0	0	0	0	NF	0	0	0	15	48	137
	2018–2019	85	0	0	0	0	0	NF	0	NF	10	0	5	39

Table 4. Totals and percentages of nests occupied by birds, nests with eggs, nests with chicks, and empty nests. Occupied nest numbers include nests with chicks and nests with eggs. Total active nest numbers are comprised of occupied nests plus empty nest. Blank cells (–) are 0. Species codes: DCCO= Double-crested Cormorant; GBHE=Great Blue Heron; GREG=Great Egret; GWHE=Great White Heron; ROSP=Roseate Spoonbill; WHIB=White Ibis.

Species Code	Nesting Season	Occupied Nests (Bird, Chick, and/or Egg Visible)	Nests With Visible Chicks	Nests With Visible Eggs	Empty Nests (No Bird, Egg, or Chick)	Total Active Nests	% Occupied Nests (Bird, Chick, and/or Egg Visible)	% Nests With Visible Chicks	% Nests With Visible Eggs	% Empty Nests (No Bird, Egg, or Chick)
DCCO	2010–2011	4,734	724	152	573	5,307	89	14	3	11
	2011–2012	3,768	220	87	369	4,137	91	5	2	9
	2012–2013	3,708	258	97	448	4,156	89	6	2	11
	2013–2014	5,123	455	133	537	5,660	91	8	2	9
	2014–2015	4,274	446	172	653	4,927	87	9	3	13
	2015–2016	4,879	593	202	544	5,423	90	11	4	10
	2016–2017	5,671	601	189	1,092	6,763	84	9	3	16
	2017–2018	4,676	574	147	451	5,127	91	11	3	9
	2018–2019	4,650	280	132	498	5,148	90	5	3	10
GBHE	2010–2011	37	5	4	1	38	97	13	11	3
	2011–2012	9	3	1	–	9	100	33	11	–
	2012–2013	35	8	3	1	36	97	22	8	3
	2013–2014	21	7	2	–	21	100	33	10	–
	2014–2015	23	10	5	–	23	100	43	22	–
	2015–2016	26	8	5	–	26	100	31	19	–
	2016–2017	33	6	4	–	33	100	18	12	–
	2017–2018	43	12	9	–	43	100	28	21	–
	2018–2019	35	9	3	–	35	100	26	9	–
GREG	2010–2011	33	3	4	11	44	75	7	9	25
	2011–2012	29	3	–	–	29	100	10	–	–
	2012–2013	64	8	7	–	64	100	13	11	–
	2013–2014	57	13	1	–	57	100	23	2	–
	2014–2015	22	5	1	–	22	100	23	5	–
	2015–2016	29	3	1	–	29	100	10	3	–
	2016–2017	36	2	4	–	36	100	6	11	–
	2017–2018	68	4	16	2	70	97	6	23	3
	2018–2019	4	3	1	–	4	100	75	25	–

Table 4 (continued). Totals and percentages of nests occupied by birds, nests with eggs, nests with chicks, and empty nests. Occupied nest numbers include nests with chicks and nests with eggs. Total active nest numbers are comprised of occupied nests plus empty nest. Blank cells (–) are 0. Species codes: DCCO= Double-crested Cormorant; GBHE=Great Blue Heron; GREG=Great Egret; GWHE=Great White Heron; ROSP=Roseate Spoonbill; WHIB=White Ibis.

Species Code	Nesting Season	Occupied Nests (Bird, Chick, and/or Egg Visible)	Nests With Visible Chicks	Nests With Visible Eggs	Empty Nests (No Bird, Egg, or Chick)	Total Active Nests	% Occupied Nests (Bird, Chick, and/or Egg Visible)	% Nests With Visible Chicks	% Nests With Visible Eggs	% Empty Nests (No Bird, Egg, or Chick)
GWHE	2010–2011	107	21	11	1	108	99	19	10	1
	2011–2012	50	10	7	1	51	98	20	14	2
	2012–2013	74	21	4	4	78	95	27	5	5
	2013–2014	68	19	7	–	68	100	28	10	–
	2014–2015	58	15	5	1	59	98	25	8	2
	2015–2016	–	–	–	–	96	–	–	–	–
	2016–2017	130	28	7	1	131	99	21	5	1
	2017–2018	160	44	13	–	160	100	28	8	–
	2018–2019	135	44	22	2	137	99	32	16	1
ROSP	2010–2011	25	5	–	–	25	100	20	–	–
	2011–2012	6	1	–	–	6	100	17	–	–
	2012–2013	8	3	–	–	8	100	38	–	–
	2013–2014	11	4	–	–	11	100	36	–	–
	2014–2015	–	–	–	–	–	–	–	–	–
	2015–2016	8	–	1	–	8	100	–	13	–
	2016–2017	7	–	1	–	7	100	–	14	–
	2017–2018	18	3	–	–	18	100	17	–	–
	2018–2019	4	1	–	–	4	100	25	–	–
WHIB	2010–2011	109	14	6	1	110	99	13	5	1
	2011–2012	31	1	1	–	31	100	3	3	–
	2012–2013	67	–	5	–	67	100	–	7	–
	2013–2014	82	11	6	–	82	100	13	7	–
	2014–2015	61	1	8	–	61	100	2	13	–
	2015–2016	24	2	3	1	25	96	8	12	4
	2016–2017	166	9	14	6	172	97	5	8	3
	2017–2018	136	12	14	1	137	99	9	10	1
	2018–2019	37	7	2	2	39	95	18	5	5

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