



VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2018 REPORT



**THE CENTER FOR CONSERVATION BIOLOGY
COLLEGE OF WILLIAM AND MARY
VIRGINIA COMMONWEALTH UNIVERSITY**

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Project Partners:

The Virginia Department of Game and Inland Fisheries
National Aeronautics and Space Administration
National Park Service
United States Fish and Wildlife Service
United States Forest Service
Virginia Department of Transportation
The Nature Conservancy
Dominion Energy
United States Coast Guard
The Center for Conservation Biology

Front Cover: Female from the James River Bridge (2007-2018) was lost early in the season. Photo by Bryan Watts.



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EXECUTIVE SUMMARY

The peregrine falcon (*Falco peregrinus*) was believed to be extirpated as a breeding species in Virginia by the early 1960s. An aggressive restoration program was initiated in 1978 that included the release of 115 captive-reared birds on the Coastal Plain (1978-1985) and 127 birds in the mountains (1985-1993). This program resulted in the first breeding of the modern era in 1982. Since this time, the population has proceeded through a rapid establishment phase followed by a consolidation phase. However, more than 95% of all breeding activity over the past 30 years has occurred on the Coastal Plain with very limited breeding within the historic mountain range. Since 2000 a dedicated translocation program has moved more than 250 birds from eyries on the coast to hack sites in the mountains in an effort to restore the mountain breeding population. Restoration of the breeding population in the mountains continues to be a management priority for the state.

In 2018, Virginia supported a known falcon population of 32 breeding pairs including 28 within the Coastal Plain, 1 in the Piedmont and 3 in the mountains. This is the highest population ever recorded in the state and represents the sixth consecutive year that the population has exceeded 25 breeding pairs. A new breeding territory was documented on a crane within the Norfolk Naval Shipyard. Long-time territories including the Norris Bridge and the Highrise Bridge (I-64) were vacant in 2018. A single adult male was observed on the I-295 bridge across the James River.

2018 was a mixed breeding year with a relatively low hatching rate (67%, 45 of 67 eggs hatched) and no losses before banding. Three young were known to be lost after fledging. Of 17 clutches that were followed completely from laying to fledging, 36 of 57 (63%) eggs hatched and 36 of 36 (100%) young survived to banding age. The reproductive rate (1.25 young/occupied territory) was considerably lower than in recent years.

Efforts continued in 2018 to identify breeding adults via field-readable bands to better understand dispersal and demography throughout the mid-Atlantic region. The banding status of 46 (73%) of the 64 adult peregrines known within the breeding population was determined. Thirteen (28%) of the 46 birds were unbanded. The alpha-numeric bands were read for 29 adults and of these the USGS bands have been recorded for 27. Of the banded birds where state of origin could be determined, 22 were from VA, 3 were from NJ, 4 were from MD and 1 was from PA. The natal territories were determined for 27 adults. Birds ranged in age from 3 to 18 years old.

Bands for 9 additional falcons were read and reported over the past year. Six of these birds (1 male, 5 females) originated in Virginia and were found breeding in other states (Table 5). This included 4 birds in Pennsylvania and 2 birds in New Jersey. A 10-year male banded on Watts Island was resighted in Talbot County, MD on 14 December, 2017. A hatch-year male banded in Reston Town Center was resighted on 27 June, 2018 in Loudon County, VA. A 13-year male banded on Benjamin Harrison Bridge and later hacked on Little Stony Man within Shenandoah National Park was photographed at Dyke Marsh in Alexandria, VA on 4 January, 2019.

BACKGROUND

Context

The historical population of peregrine falcons (*Falco peregrinus*) in the eastern United States was estimated to contain approximately 350 breeding pairs, relied on open cliff faces and cut-banks for nesting, and was mostly confined to the Appalachian Mountains (Hickey 1942). The population experienced a precipitous decline throughout the 1950s (Hickey 1969) due to contaminant-induced reproductive suppression (Anderson and Hickey 1972) and was believed to have been extirpated by the early 1960s (Berger et al. 1969). The peregrine falcon was listed as endangered on the U.S. Federal List of Endangered and Threatened Wildlife (50 CFR 17.11-17.12) in June 1970. In 1975, the U.S. Fish and Wildlife Service appointed an Eastern Peregrine Falcon Recovery Team to develop and implement a recovery plan (Bollengier et al. 1979). A retrospective assessment of the historic peregrine falcon population in Virginia identified 24 historical eyries in the Appalachian Mountains (Gabler 1983). Two additional nesting sites were documented on old osprey nests along the Virginia portion of the Delmarva Peninsula (Jones 1946).

As part of a national effort to restore the eastern peregrine population, the Virginia Department of Game and Inland Fisheries, Cornell University, and the College of William and Mary initiated a hacking program for Virginia in 1978. The program involved the release of captive-reared peregrines with the hope that these birds would re-colonize the historic breeding range. Between 1978 and 1993, approximately 250 young falcons were released in Virginia. Since the close of this program, captive-reared peregrines have been released on a limited basis within the state. Such releases have involved more targeted projects. Beginning in 2000, Virginia initiated a translocation program that has moved birds from coastal territories to be hacked from mountain release sites. The program has taken advantage of young produced from sites where fledging success has been poor. More than 250 birds have been moved since the inception of the program.

The first successful nesting of peregrines falcons in Virginia after the DDT era occurred in 1982 on Assateague Island. Since that time, the breeding population has continued a slow but steady increase. The size of the known breeding population within Virginia now exceeds 30 pairs. However, both hatching rate and chick survival remain somewhat erratic in both the coastal and mountain breeding populations. An analysis by the U.S. Fish and Wildlife Service in the early 1990s of addled eggs collected in Virginia, showed levels of DDE, Dieldrin, and egg-shell thinning that have been shown previously to have an adverse impact on reproduction. An additional problem that has been suspected but not fully quantified is that the turnover rate of breeding adults appears to be high. At present, the long-term viability of the Virginia population in the absence of continued immigration from surrounding populations remains questionable. Continued monitoring and management of this population is needed to ensure that the population will continue to recover.

OBJECTIVES

The objectives of this project were:

- 1) to track the recovery of the breeding population of peregrine falcons in Virginia (both in terms of the size and distribution of the breeding population and the number of young produced),
- 2) to evaluate the success of past and present management techniques used with the breeding population,
- 3) to improve productivity of nesting pairs through active management, and
- 4) to increase our understanding of peregrine falcon natural history in the mid-Atlantic region.

METHODS

Geographic Focus

As in previous years, monitoring in 2018 was focused on the Coastal Plain where most breeding activity has been known. Additional efforts focused on mountain sites (Harding 2015) and those efforts are summarized in this report to provide a state-wide overview.

Nest Site Surveys

Between 1977 and 2009, more than 60 structures were established specifically for breeding peregrine falcons within the Coastal Plain of Virginia (Table 1). An effort was made to check all of the existing structures on the Coastal Plain that survived to the 2018 breeding season for evidence of resident falcons. An initial survey of breeding structures on the Coastal Plain was conducted between 1 March and 30 April by foot, boat or aircraft. The number of adults attending sites and/or activity within the nest box was recorded. Remaining sites on bridges or within urban areas were surveyed on the ground for occupation and activity. Sites were surveyed in the mountains by the Virginia Department of Game & Inland Fisheries (DGIF), U.S. Forest Service (USFS) and the National Park Service (NPS).

Coastal sites that were confirmed to have peregrine activity were monitored with 2-5 additional ground visits to document breeding activity, to band young and to document fledging success. A breeding territory was considered to be “occupied” if a pair of adult peregrines was resident during the breeding season. Nests were considered to be “active” if eggs or young were detected (Postupalsky 1974). Complete breeding information (e.g. clutch size, hatching rate) could not be obtained for a small portion of active sites due to poor access. However, the number of birds surviving to banding age was determined for all active sites when possible. Reproductive rates were calculated using number of chicks reaching banding age.

Table 1. Catalog of nesting structures established for Peregrine Falcons in Virginia (1977-2018). Table gives the type of structure, year of establishment where appropriate and whether or not the site was checked for Peregrine Falcon activity during the 2018 breeding season.

Site Code	Location Description	Structure Type	Year Est	2018
VA-PEFA-02	Cobb Island Tower	Peregrine Tower	1978	Y
VA-PEFA-06	Wallops Island Tower	Peregrine Tower	1981	Y ^a
VA-PEFA-09	Watts Island Tower	Peregrine Tower	1997	Y ^b
VA-PEFA-10	Finney's Island Tower	Peregrine Tower	1997	Y
VA-PEFA-12	Hyslop Marsh Tower	Peregrine Tower	1995	Y
VA-PEFA-13	Saxis Marsh N. Tower	Peregrine Tower	1996	Y
VA-PEFA-14	Saxis Marsh S. Tower	Peregrine Tower	1998	Y
VA-PEFA-15	Parker Marsh Tower	Peregrine Tower	1997	Y
VA-PEFA-16	Elkins Marsh Chimney	Nest Box	1995	Y
VA-PEFA-17	Elkins Marsh Shack Tower	Nest Box/Tower	1997/2004	Y
VA-PEFA-18	Wachapreague Shack Tower	Peregrine Tower	1994/2000	Y
VA-PEFA-20	Coleman Bridge Box Rt 17	Nest Box	1989	Y
VA-PEFA-21	Norfolk Southern RxR Bridge	Bridge	1992	Y
VA-PEFA-22	James River Bridge Rt 17	Nest Box	1991	Y
VA-PEFA-23	Berkley Bridge I-264	Nest Box	1996	Y
VA-PEFA-24	Benjamin Harrison Bridge Rt 106	Nest Box	1996	Y
VA-PEFA-25	Mills Godwin Bridge Rt 17	Nest Box	1996	Y
VA-PEFA-26	West Norfolk Bridge Rt 164	Nest Box	1996	Y
VA-PEFA-27	Norris Bridge Rt 3	Nest Box	1989	Y
VA-PEFA-28	Little Stony Man, SNP	Natural Cliff Face	-----	Y ^c
VA-PEFA-29	Old Rag, SNP	Natural Cliff Face	-----	Y ^c
VA-PEFA-34	Mockhorn Island Tower	Peregrine Tower	1997	Y

Site Code	Location Description	Structure Type	Year Est	2018
VA-PEFA-36	Upsher Bay Tower	Peregrine Tower	2000	Y
VA-PEFA-37	Silver Beach Range Tower	Nest Box	1997	Y
VA-PEFA-38	Hawksbill Mountain, SNP	Natural Cliff Face	-----	Y ^c
VA-PEFA-39	Concrete Ships	Nest Box	1995	Y
VA-PEFA-40	Chesterfield Substation	Nest Box	1998	Y
VA-PEFA-41	Holiday Inn VA Beach	Nest Box	1997	Y
VA-PEFA-42	Possum Point Substation	Nest Box	1998	Y
VA-PEFA-43	Newport News City Hall	Nest Box	1993	Y
VA-PEFA-45	Cargill Grain Elevator	Nest Box	1993	Y
VA-PEFA-46	Lafayette Bridge Rt 337	Nest Box	1998	Y
VA-PEFA-48	Churchland Bridge US 17	Nest Box	1999	Y
VA-PEFA-49	Yorktown Substation	Nest Box	1998	Y
VA-PEFA-51	Campostella Bridge Rt 168	Nest Box	1998	Y
VA-PEFA-52	Highrise Bridge I-64	Nest Box	1999	Y
VA-PEFA-53	ALCOA RxR Bridge	Nest Box	1999	Y
VA-PEFA-54	I-295 Bridge	Nest Box	2001	Y
VA-PEFA-55	Dominion Building	Nest Box	2000	Y ^b
VA-PEFA-56	River Front Plaza Building	Nest Box	2002	Y ^b
VA-PEFA-57	BB&T Building	Nest Box	1984	Y ^b
VA-PEFA-59	Bermuda Hundred	Nest Box	1998	Y
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	Pier Cap	2004	Y
VA-PEFA-61	Tappahannock Bridge Rt 360	Nest Box	2004	Y
VA-PEFA-62	Gull Marsh Tower	Peregrine Tower	2004	Y
VA-PEFA-63	Godwin Island Box	Nest Box	2004	Y

Site Code	Location Description	Structure Type	Year Est	2018
VA-PEFA-65	Craddock Neck	Peregrine Tower	1995	Y
VA-PEFA-66	Hoffler Building Virginia Beach	Nest Box	2009	Y
VA-PEFA-67	White Rocks	Natural Cliff Face	-----	Y ^{b, c}
VA-PEFA-68	Big House Mountain	Natural Cliff Face	-----	Y ^b
VA-PEFA-69	Breaks Interstate Park	Natural Cliff Face	-----	Y ^b
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	Nest Box	2017	Y
VA-PEFA-71	Cedar Island	Ground Nest	-----	Y ^b
VA-PEFA-72	Stony Man, SNP	Natural Cliff Face	-----	Y ^c
VA-PEFA-74	Birchwood Power Plant	Nest Box	2014	Y
VA-PEFA-75	Reston Town Center	Air Intake Vent	2015	Y
VA-PEFA-76	New Jordan Bridge	Pier Cap	2016	Y
VA-PEFA-77	Hazelwood Bridge	Pier Cap	2016	Y
VA-PEFA-78	Dresser Bridge Rt 5	Pier Cap	2017	Y
VA-PEFA-79	Norfolk Naval Shipyard	Crane	2018	Y

^a Nest monitored by NASA.

^b Nest monitored by VDGIF.

^c Nest monitored by NPS.

Banding

An attempt was made to band all chicks surviving to banding age (18-35 d). Chicks were banded with a USGS lock-on, aluminum tarsal band on the right leg and a bi-colored, green and black, alpha-numeric auxiliary band on the left leg. USGS bands used in Virginia during the 2018 breeding season were anodized green. Band size 6 and 7a were used for male and female chicks respectively. Auxiliary bands were applied with two pop rivets. Hacked falcons were also identified with colored electrical tape applied to the USGS band for temporary identification at the hack site. Accessing nests required coordination and assistance from state, federal, NGO, and corporate partners.

Band Resights

Effort was made to identify individual breeding adults at each nest by reading band codes. Bands were identified through a Bushnell Natureview Cam HD max game camera mounted on the nest box platform, live webcams broadcast online, and by digital photos taken during visits to the nest.

Translocations

Since the early 1990s, many young have been lost at fledging age on coastal bridges. Numerous chicks have been lost in the water during early flights when they are unable to fly back up to nest structures. Other chicks have flown down to the roadbed and been killed by automobiles.

In order to improve survivorship for high-risk sites, a program was initiated to translocate chicks to mountain release sites. Chicks are typically removed from nest sites, transported to mountain sites, and released using standard hacking techniques (Sherrod et al. 1981). In keeping with the objectives of facilitating the re-colonization of the historic mountain range chicks were hacked from a high priority mountain site in Shenandoah National Park (SNP). Only chicks from bridge nests were removed for the hacking program because of limited space in the hack box. Chicks that were found on the ground during fledging or taken to rehabilitation facilities were also included for release from hack sites. SNP has two hack boxes and the hacking program takes up to 10 birds aged for synchronous release. SNP staff led by Rolf Gubler open the door to the hack box at 45-50 days old. Food is provided at the hack site for 6 weeks. Survival is confirmed when the falcons return to the hack site to feed each day (Sherrod et al 1981).

Addled Eggs

Unhatched eggs were collected from nests if eggs were no longer being incubated. Eggs were washed, air dried, covered with aluminum foil and frozen.

RESULTS

Site Surveys

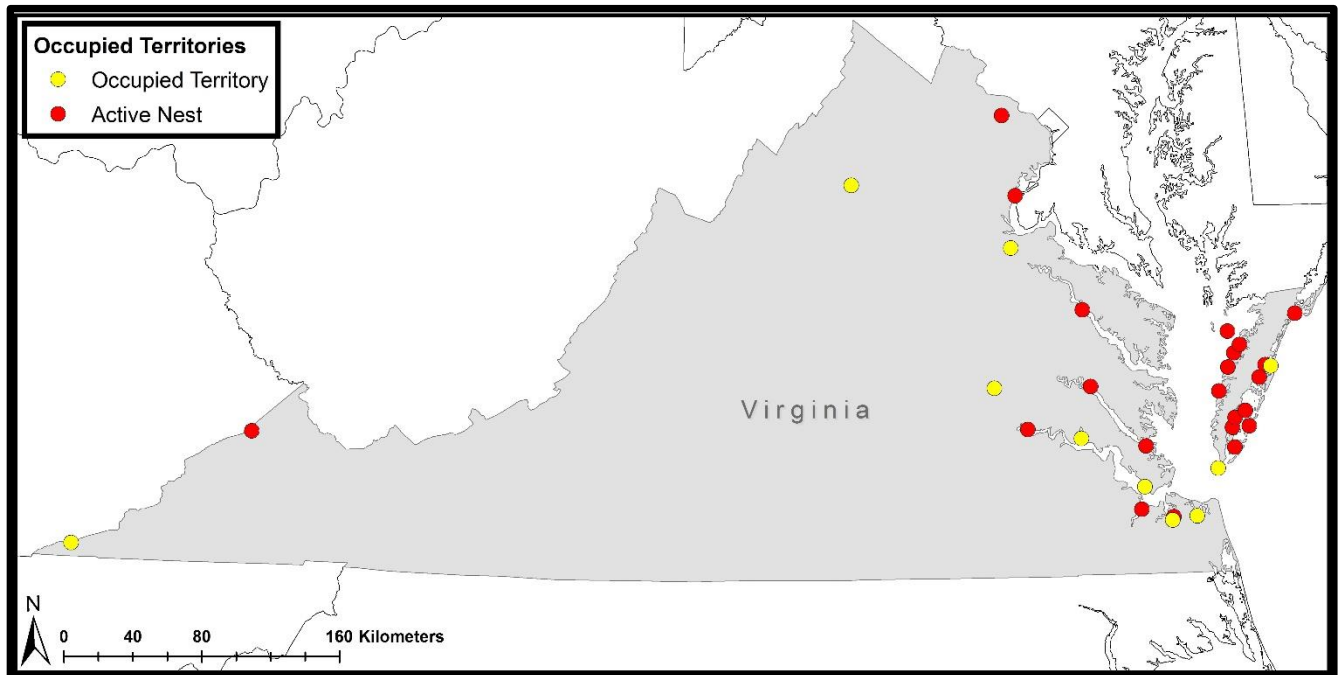
Fifty-one structures were surveyed for peregrine falcon activity within the Coastal Plain (Table 1) and several additional sites were surveyed by VDGIF and NPS in the mountains during the breeding season. Thirty-two sites supported occupied territories. Breeding sites were found across the state (Figure 1). Occupied territories were distributed within the Coastal Plain (n = 28), Piedmont (n = 1) and mountains (n = 3). Structures supporting occupied territories included 11 peregrine towers, 8 bridges, 3 cliffs, 3 buildings, 2 marsh shacks, and 3 power plant stacks (Table 2). Although the Watts Island tower was washed away during the summer of 2016 the nest box remained upright on the ground and was positioned behind the dunes. Two addled eggs were discovered in the box during the summer. Barn owls used the Godwin Island Box in 2018 and the peregrine pair that has occupied the site in recent years nested in the Mockhorn Island tower. For the second year, no pair was detected in association with the Norris Bridge as maintenance activity continued. Pairs were detected early in the season on Stony Man in Shenandoah National Park and associated with the Birchwood stack. A single adult male was recorded on multiple occasions on the I-295 bridge across the James River.

Table 2. Summary of breeding activity for peregrine falcon pairs in Virginia during the 2018 breeding season.

Site Code	Nest name	Occ Terr	Active Nest	Eggs	Young Hatched	Band Age
VA-PEFA-02	Cobb Island Tower	Y	Y	3	2	2
VA-PEFA-06	Wallops Island Tower	Y	Y	>1	0	0
VA-PEFA-09	Watts Island Tower	Y	Y	2	0	0
VA-PEFA-10	Finney's Island Tower	Y	Y	4	4	4
VA-PEFA-12	Hyslop Marsh Tower	Y	Y	3	1	1
VA-PEFA-15	Parker's Marsh Tower	Y	Y	3	0	0
VA-PEFA-16	Elkins Marsh Chimney	Y	Y	3	1	1
VA-PEFA-17	Elkins Marsh Shack Tower	Y	Y	4	4	4
VA-PEFA-18	Wachapreague Shack Tower	Y	Y	3	3	3
VA-PEFA-22	James River Bridge Rt 17	Y	N	-----	-----	-----
VA-PEFA-23	Berkley Bridge I-264	Y	Y	>1	0	0

Site Code	Nest name	Occ Terr	Active Nest	Eggs	Young Hatched	Band Age
VA-PEFA-24	Benjamin Harrison Bridge	Y	Y	3	3	3
VA-PEFA-25	Mills Godwin Bridge Rt 17	Y	Y	4	0	0
VA-PEFA-34	Mockhorn Island Tower	Y	Y	2	1	1
VA-PEFA-36	Upsher Bay Tower	Y	Y	3	3	3
VA-PEFA-37	Silver Beach Range Tower	Y	Y	4	1	1
VA-PEFA-42	Possum Point Substation	Y	Y	4	1	1
VA-PEFA-49	Yorktown Substation	Y	Y	4	4	4
VA-PEFA-56	River Front Plaza Building	Y	N	-----	-----	-----
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	Y	U	-----	-----	-----
VA-PEFA-61	Tappahannock Bridge Rt 360	Y	Y	4	4	4
VA-PEFA-62	Gull Marsh Tower	Y	Y	3	U	0
VA-PEFA-66	Armada Hoffler Building	Y	N	-----	-----	-----
VA-PEFA-67	White Rocks	Y	U	-----	-----	-----
VA-PEFA-69	Breaks Interstate Park	Y	Y	≥1	U	U
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	Y	Y	4	4	4
VA-PEFA-71	Cedar Island	Y	U	-----	-----	-----
VA-PEFA-72	Stony Man, SNP	Y	N	-----	-----	-----
VA-PEFA-74	Birchwood Power Plant	Y	N	-----	-----	-----
VA-PEFA-75	Reston Town Center	Y	Y	≥4	4	4
VA-PEFA-78	Dresser Bridge Rt 5	Y	N	-----	-----	-----
VA-PEFA-79	Norfolk Naval Shipyard	Y	N	-----	-----	-----

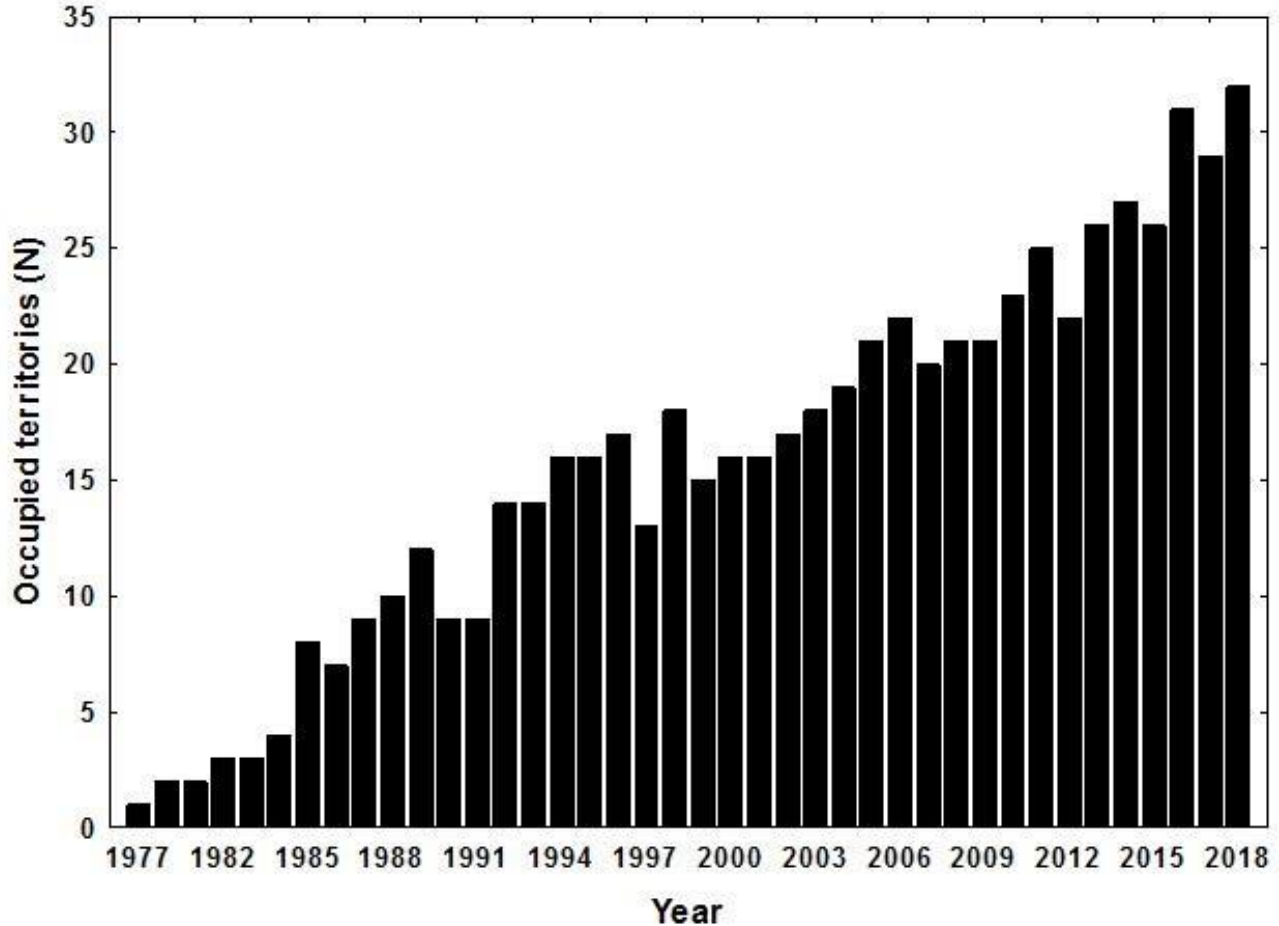
Figure 1. Distribution of Peregrine Falcon occupied territories and single individuals for the 2018 breeding season in Virginia.



Breeding Results

Virginia supported 32 known breeding pairs of peregrine falcons during the 2018 breeding season. This is the highest breeding population ever recorded in the state and sixth consecutive year that the state has supported more than 25 known breeding pairs (Figure 2). The 22 falcon pairs that were documented making breeding attempts produced at least 67 eggs (Table 2). At least 45 of the 67 eggs hatched. All of the young known to have hatched survived to banding age. One female was lost before release during the hack in Shenandoah National Park. Two birds were believed to have been lost shortly after fledging including a female that was lost during a storm after release during the hack in Shenandoah National Park and one male that was trapped in a space on one of the stacks at Possum Point and found in October. The reproductive rate was 1.25 young/occupied territory and 1.82 young/active territory. Of 17 clutches that were followed completely from laying to fledging, 36 of 57 (63.2%) eggs hatched, and 36 of 36 (100%) young survived to banding age.

Figure 2. Virginia Peregrine Falcon breeding population (1980-2018).



Selected Site and Breeding Observations

- The female that had occupied the James River Bridge (2007-2017) was observed on territory in February but was lost before the breeding season and was replaced by an unbanded third-year female. No eggs were laid.
- The nest box from the Watts Island tower that was lost in 2016 was found upright behind the dunes and two addled eggs were collected in June.
- The Dressler Bridge was occupied by a pair for the second year but the site has no good nest sites and the pair was not documented to lay.
- The I-64 Highrise bridge had a significant maintenance project for the second year and no birds were observed.
- The pair on the Benjamin Harrison Bridge nested on the north tower on a steel beam. The nest location was not accessible. The pair produced 1 male and 2 females.

- The female that has occupied the Berkley Bridge for many years has spent most of her time over the past 2 years laying in the nest tray and has produced no young.
- The nest box on Godwin Island was used by barn owls that produced 4 young and the peregrine pair nested on the Mockhorn Island tower.
- The female that had occupied the Yorktown stack since 2015 was replaced by a 5th-year female that was observed in 2017 competing for the Richmond territory.
- A pair was detected on the north end of Cedar Island during an early season survey flight and later in early summer. No nesting site was discovered.
- The pair on the Armada Hoffer building in Virginia Beach was resident but appeared to be disturbed by a window-washing crew and equipment and did not lay.
- A new pair was detected on the crane within the Norfolk Naval Shipyard along the southern branch of the Elizabeth River. Both birds were adults and were observed courting but no nest site was located.

Banding

All young falcons that survived to banding age and that could be accessed were fitted with both USGS and alpha-numeric bands. This included 21 males and 16 females (Tables 3a and 3b). Birds known to be unbanded were 3 young (including 1 male and 2 females) on the Benjamin Harrison Bridge.

Table 3a. List of band codes for female peregrine falcon chicks banded in Virginia during the 2018 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
1807-46801	38/BH	Eltham Bridge Box	5/14/2018
1807-46802	39/BH	Downing Bridge	5/14/2018
1807-46803	40/BH	Elkins Marsh Chimney	5/24/2018
1807-46804	41/BH	Elkins Marsh Shack Tower	5/24/2018
1807-46805	42/BH	Upsher Neck Tower	6/6/2018
1807-46806	43/BH	Wachapreague Shack	6/6/2018
1807-46807	44/BH	Wachapreague Shack	6/6/2018
1807-46808	45/BH	Finney's Island Tower	6/6/2018
1807-46809	46/BH	Finney's Island Tower	6/6/2018
1807-46810	47/BH	Cobb Island Tower	6/28/2018
1907-01994	32/BH	Yorktown Substation	5/7/2018
1907-01995	33/BH	Yorktown Substation	5/7/2018
1907-01996	34/BH	Silver Beach Range Tower	5/9/2018
1907-01997	35/BH	Reston Town Center	5/12/2018
1907-01998	36/BH	Reston Town Center	5/12/2018
1907-01999	37/BH	Eltham Bridge Box	5/14/2018

Table 3b. List of band codes for male peregrine falcon chicks banded in Virginia during the 2018 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
2206-54811	37/BM	Yorktown Substation	5/7/2018
2206-54812	38/BM	Yorktown Substation	5/7/2018
2206-54813	39/BM	Possum Point Substation	5/10/2018
2206-54814	40/BM	Reston Town Center	5/12/2018
2206-54815	41/BM	Reston Town Center	5/12/2018
2206-54816	42/BM	Eltham Bridge Box	5/14/2018
2206-54817	43/BM	Eltham Bridge Box	5/14/2018
2206-54818	44/BM	Downing Bridge	5/14/2018
2206-54819	45/BM	Downing Bridge	5/14/2018
2206-54820	46/BM	Downing Bridge	5/14/2018
2206-54821	47/BM	Elkins Marsh Shack Tower	5/24/2018
2206-54822	48/BM	Elkins Marsh Shack Tower	5/24/2018
2206-54823	49/BM	Elkins Marsh Shack Tower	5/24/2018
2206-54824	50/BM	Upsher Neck Tower	6/6/2018
2206-54825	51/BM	Upsher Neck Tower	6/6/2018
2206-54826	52/BM	Wachapreague Shack	6/6/2018
2206-54827	53/BM	Hyslop Marsh Tower	6/6/2018
2206-54828	54/BM	Finney's Island Tower	6/6/2018
2206-54829	55/BM	Finney's Island Tower	6/6/2018
2206-54830	56/BM	Mockhorn Island Tower	6/7/2018
2206-54831	57/BM	Cobb Island Tower	6/28/2018

Band Resights

The banding status of 46 (73%) of the 64 adult peregrines known within the breeding population was determined during the 2018 season (Table 4). Thirteen (28%) of the 46 birds were unbanded. The unbanded birds were skewed to females (4 males vs 9 females). The level of unbanded birds suggests the possibility of unknown eyries within Virginia or surrounding states. Of the banded birds where state of origin could be determined, 22 were from VA, 3 from NJ, 4 from MD and 1 from PA. The alpha-numeric were read for 29 adults and of these the USGS bands have been recorded for 27. All of the unknown birds had silver USGS and were likely from MD. The natal territories were determined for 27 adults. Birds ranged in age from 3 to 18 years old.

Bands for 9 additional falcons were read and reported over the past year. Six of these birds (1 male, 5 females) originated in Virginia and were found breeding in other states (Table 5). This included 4 birds in Pennsylvania and 2 birds in New Jersey. The old (19 years) female from Wachapreague that has nested in Atlantic City for years did not survive to the breeding season.

A 10-year male banded on Watts Island was resighted in Talbot County, MD on 14 December, 2017. A hatch-year male banded in Reston Town Center was resighted on 27 June, 2018 in Loudon County, VA. A 13-year male banded on Benjamin Harrison Bridge and later hacked on Little Stony Man within Shenandoah National Park was photographed at Dyke Marsh in Alexandria, VA on 4 January, 2019.

Table 4. Banding status and identification of Virginia breeding peregrine falcons during the 2018 season.

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
VA-PEFA-02	Cobb Island Tower	M	-----	Unbanded	-----	-----	Unknown	
	Cobb Island Tower	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-06	Wallops Island Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Wallops Island Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-09	Watts Island	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Watts Island	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-10	Finney's Island Tower	M	Green	1126-11939	B/G	15/AU	Watts Island, VA	4
	Finney's Island Tower	F	Black	1687-02832	B/G	A/15	Dividing Creek, NJ	9
VA-PEFA-12	Hyslop Marsh Tower	M	Green	1126-11824	B/G	15/AB	Godwin Island, VA	10
	Hyslop Marsh Tower	F	Green	1807-65006	B/G	01/AD	Upsher Bay Tower, VA	10
VA-PEFA-15	Parker Marsh Tower	M	Green	1126-11955	B/G	31/AU	Upsher Bay Tower, VA	3
	Parker Marsh Tower	F	Green	Unknown	B/G	7?/A?	Unknown, VA	
VA-PEFA-16	Elkins Marsh Chimney	M	Green	Unknown	B/G	Unknown	Unknown, VA	
	Elkins Marsh Chimney	F	Black	1807-37497	B/R	B/*S	Heislerville Tower, NJ	16
VA-PEFA-17	Elkins Marsh Shack Tower	M	Green	2206-81637	B/G	09/W	Upsher Bay Tower, VA	10

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Elkins Marsh Shack Tower	F	Silver	1907-03507	B/G	65/AD	Smith Island Tower 2, MD	8
VA-PEFA-18	Wachapreague Shack Tower	M	Green	1126-11964	B/G	40/AU	Watts Island Tower, VA	4
	Wachapreague Shack Tower	F	Silver	1807-	None	-----	Unknown	
VA-PEFA-22	James River Bridge Rt 17	M	Green	2206-43454	B/G	*7/*C	James River Bridge, VA	17
	James River Bridge Rt 17	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-23	Berkley Bridge I-264	M	Green	Unknown	B/G	Unknown	Unknown, VA	
	Berkley Bridge I-264	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-24	Benjamin Harrison Bridge Rt 106	M	Green	2206-81605	B/G	05/Y	BB&T Richmond, VA	13
	Benjamin Harrison Bridge Rt 106	F	Green	1807-02775	B/G	70/Z	Benjamin Harrison, VA	10
VA-PEFA-25	Mills Godwin Bridge Rt 17	M	-----	Unbanded	-----	-----	Unknown	
	Mills Godwin Bridge Rt 17	F	Green	1807-65098	B/G	57/AV	Mockhorn Island, VA	5
VA-PEFA-34	Mockhorn Island Tower	M	Green	1126-11848	B/G	14/AS	Mockhorn Island, VA	8
	Mockhorn Island Tower	F	Green	1807-02726	B/G	20/V	Upsher Bay Tower, VA	12
VA-PEFA-36	Upsher Bay Tower	M	Green	1126-11861	B/G	39/AS	Watts Island Tower, VA	7
	Upsher Bay Tower	F	Green	1907-01967	B/G	05/BH	Elkins Chimney, VA	3
VA-PEFA-37	Silver Beach Range Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Silver Beach Range Tower	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-42	Possum Point Substation	M	Silver	816-69379	B/G	X/78	Chalk Point Plant, MD	9
	Possum Point Substation	F	Black	987-95657	B/G	*Y/*4	Betsy Ross Bridge, NJ	11
VA-PEFA-49	Yorktown Substation	M	-----	Unbanded	-----	-----	Unknown	
	Yorktown Substation	F	Green	1907-01914	B/G	70/AV	Silver Beach Tower, VA	5
VA-PEFA-56	River Front Plaza Building	M	Silver	2206-07444	B/R	*V/S	Hacked, VA	18
	River Front Plaza Building	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	M	Silver	Unknown	B/G	16/AK	Clay Island WMA, MD	6
	Chesapeake Bay Bridge Tunnel	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-61	Tappahannock Bridge Rt 360	M	Silver	1126-15169	B/G	30/AH	Unknown	
	Tappahannock Bridge Rt 360	F	Silver	Unknown	B/G	26/AK	Unknown	
VA-PEFA-62	Gull Marsh Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Gull Marsh Tower	F	Silver	Unknown	None	-----	Unknown	
VA-PEFA-66	Hoffler Building Virginia Beach	M	Green	1126-11943	B/G	19/AU	Elkins Shack Tower, VA	4
	Hoffler Building Virginia Beach	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-67	White Rocks	M	Unknown	Unknown	Unknown	Unknown	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	White Rocks	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-69	Breaks Interstate Park	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Breaks Interstate Park	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	M	Green	1126-11954	B/G	30/AU	Yorktown Plant, VA	4
	Pamunkey Eltham Bridge Rt 33	F	Green	1807-65016	B/G	11/AD	Elkins Shack Tower, VA	7
VA-PEFA-71	Cedar Island	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Cedar Island	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-72	Stony Man, SNP	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Stony Man, SNP	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-74	Birchwood Power Plant	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Birchwood Power Plant	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-75	Reston Town Center	M	Silver	1126-15168	B/G	29/AH	Chalk Point Plant, MD	7
	Reston Town Center	F	Silver	1687-00582	B/G	61/AR	Philadelphia, PA	7
VA-PEFA-78	Dresser Bridge Rt 5	M	-----	Unbanded	-----	-----	Unknown	
	Dresser Bridge Rt 5	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-79	Norfolk Naval Shipyard	M	Unknown	Unknown	Unknown	Unknown	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Norfolk Naval Shipyard	F	-----	Unbanded	-----	-----	Unknown	

Table 5. Identification of Virginia-hatched birds known to breed in other states during 2018.

Breeding Territory	Sex	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
Pittsburgh, PA Cathedral	F	1807-02774	B/G	69/Z	Benjamin Harrison Br, VA	10
Columbia, PA Rt 462 Bridge	F	1807-65014	B/G	09/AD	James River Br, VA	8
Safe Harbor RR Bridge, PA	F	1807-65083	B/G	45/AV	Mills Godwin Br, VA	5
Pittsburgh, PA Westinghouse	M	2206-81647	B/G	19/W	Cobb Island, VA	12
Dividing Creek WMA, NJ	F	1807-02735	B/G	29/V	Wachapreague Tower, VA	12
Burlington-Bristol Bridge, NJ	F	1807-65079	B/G	14/AV	Possum Point, VA	6

Table 6. Resights of Virginia peregrine falcons made since the 2017 report.

Resight Location	Resight Date	Sex	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
Talbot County, MD	12/14/2017	M	1126-11814	B/G	05/AB	Watts Island, VA	10
Loudon County, VA	6/27/2018	M	2206-54814	B/G	40/BM	Reston, VA	HY
Dyke Marsh, VA	1/4/2019	M	2206-81631	B/G	04/W	Ben Harrison Bridge, VA	13

Translocations

During the 2018 season, 7 young falcons (including 2 females and 5 males) were translocated to Shenandoah National Park and hacked (Table 7). All birds were from bridges that have experienced poor fledging success. Birds were placed in two hack boxes situated on Franklin Cliffs on 14 May, 2018. During the evening a violent storm with high wind gusts blew one of the boxes off the cliff. All of the birds but one were found the next day in good condition. A female (39/BH) from the Downing Bridge was injured and taken to The Wildlife Center for examination. The bird was found to have broken bones and nerve damage and was not a candidate for rehabilitation. The bird was euthanized. Remaining birds were released on 1 June, 2018 and were fine on release. A heavy rain event occurred on 2 and 3 June and the Eltham Bridge female (38/BH) was not observed afterwards and presumed lost. All remaining birds (5 males) fledged and dispersed successfully.

Table 7. Summary of translocation activities for peregrine falcons in Virginia during the 2018 breeding season. Electrical tape was applied to the USFWS band.

USGS Band	Nest Site	Sex	Tape Color	Date Collected	Translocation Site
1807-46801	Eltham Bridge Box	F	Yellow	5/14/2018	Shenandoah National Park
1807-46802	Downing Bridge	F	White	5/14/2018	Shenandoah National Park
2206-44819	Downing Bridge	M	Orange	5/14/2018	Shenandoah National Park
2206-44820	Downing Bridge	M	Light Green	5/14/2018	Shenandoah National Park
2206-54816	Eltham Bridge Box	M	Blue	5/14/2018	Shenandoah National Park
2206-54817	Eltham Bridge Box	M	Red	5/14/2018	Shenandoah National Park
2206-54818	Downing Bridge	M	Dark Green	5/14/2018	Shenandoah National Park

Added Eggs

Eleven added falcon eggs were recovered during the 2018 breeding season (Table 8). Eggs were recovered from 5 sites including 1 bridge, 1 smoke stack and 3 towers.

Table 8. Added eggs collected during the 2018 breeding season.

Site	Date	Eggs
Possum Point	5/2/18	3
Silver Beach Range Tower	5/9/18	3
Mockhorn Island Tower	5/24/18	1
Watts Island	5/28/18	2
Mills Godwin Bridge	6/24/18	2

DISCUSSION

Between 1975 and 1993 more than 430 captive-reared falcons were released into the mid-Atlantic region as part of an effort to restore the eastern peregrine falcon population. The regional breeding population proceeded through an establishment phase (1979-1985) driven by releases with an average doubling time of 1.3 years to a consolidation phase (1986-) with an average doubling time of 23.4 years (Watts et al. 2015). Reproductive rates have increased significantly over this period from 1.18 young/occupied territory during establishment to 1.87 young/occupied territory as the population has become more stable.

Since the first breeding attempt was documented on Assateague Island in 1982, the Virginia population has exhibited steady growth. To date, growth has been driven by established pairs on the Coastal Plain. Pairs along the coast have accounted for more than 95% of all breeding attempts in the modern era and young produced are responsible for the ongoing formation of new territories. Currently, coastal pairs nesting on artificial substrates represent the demographic engine that is maintaining the state population.

Recent efforts to identify marked adults in both Virginia and New Jersey are providing significant information on dispersal, adult turnover rates, and the age structure of the breeding population. Capitalizing on efforts to mark all young in the region should be a priority for the foreseeable future. Expanding the effort to other neighboring states (e.g. MD, DE, NC, WV) would expand our understanding of movement patterns.

With few exceptions, establishment of breeding territories within the historic mountain range have been the result of the earlier hacking program (1985-1993) and the more recent translocation project (2000-2018) focused on the mountains. Since 2000, the latter has made use of young produced on bridge and building eyries that have experienced poor fledging success. This is a win-win situation and should continue as long as partners are willing and able to operate the hacks. If possible, new hack sites should be developed and operated in southwestern Virginia around historic breeding sites.

Recent efforts to survey a larger portion of the mountain range are exciting. Although effort-intensive, there is no way of assessing success of the ongoing management program except to continue survey work. Once breeding pairs have been located, increasing the frequency of monitoring may help to improve information on reproductive success.

Peregrine Falcons have contended with a wide array of contaminants since the re-establishment of the breeding population (Morse 1993, Chen et al 2008, 2010, Potter et al. 2009). Continuing the long-term collection and analysis of addled eggs provides a historical record of contaminant exposure within this breeding population.

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