VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2016 REPORT

THE CENTER FOR CONSERVATION BIOLOGY

COLLEGE OF WILLIAM AND MARY

VIRGINIA COMMONWEALTH UNIVERSITY

VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2016 REPORT

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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 Power
United States Coast Guard
Center for Conservation Biology

Front Cover: Female peregrine falcon resighted on Chincoteague National Wildlife Refuge in September of 2016. The bird was banded as a nestling on Watts Island in 2015. Photo by John McNamara.

The Center for Conservation Biology is an organization dedicated to discovering innovative solutions to environmental problems that are both scientifically sound and practical within today's social context. Our philosophy has been to use a general systems approach to locate critical information needs and to plot a deliberate course of action to reach what we believe are essential information endpoints.

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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 2016, Virginia supported a known falcon population of 31 breeding pairs including 28 within the Coastal Plain, 1 in the Piedmont and 2 in the mountains. This represents the largest population ever recorded in the state and the fourth consecutive year that the population has exceeded 25 breeding pairs. New breeding territories were documented on a building in Virginia Beach and a bridge in Norfolk. 2016 was a difficult breeding year with only 49 (57%) of 85 eggs hatching and several late breeding attempts. The reproductive rate (1.58 young/occupied territory) was considerably lower than in recent years. The population continues to benefit from the efforts of a large community of agencies, corporations and individuals.

Efforts continued in 2016 to identify breeding adults via field-readable bands to better understand dispersal and demography throughout the mid-Atlantic region. The banding status of 45 (71%) of the 63 adult peregrines known within the breeding population was determined. Twelve (26%) of the 45 birds were unbanded. 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, 20 were from VA, 6 from NJ and 2 from MD. The alpha-numerics were read for 29 adults and of these the USGS bands have been recorded for 27. The natal territories were determined for 24 adults. Birds ranged in age from 1 to 16 years old. Efforts to identify marked peregrines should continue since these birds are contributing to our understanding of effective population size and regional management.

Bands for 12 additional falcons were read and reported over the past year. Six of these birds originated in Virginia and were found breeding in other states including a male and female in Pennsylvania and 4 females in New Jersey. Three birds were captured during fall trapping operations on Assateague and Cape May Point. A first-year bird male was found dead and a first-year female was photographed multiple times on Chincoteague National Wildlife Refuge. A first-year female was found injured near Topton, PA and rehabbed over several months and released.

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 25 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 2016 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 2016 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 or boat. 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), Conservation Management Institute (CMI), 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, fledging rate was determined for all active sites when possible. Nest sites were visited approximately 2 weeks after projected fledging date to determine fledging success. This time threshold was developed from satellite tracking data (2001-2002) that indicates a pulse of mortality just

prior to fledging and in the 2 weeks following fledging (Watts et al. 2011). Reproductive rates were calculated using number of chicks reaching banding age.

Banding

An attempt was made to band all chicks surviving to banding age (18-32 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 2016 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. 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

Nest Site Surveys

Fifty-eight structures were surveyed for peregrine falcon activity within the Coastal Plain (Table 1) and several additional sites were surveyed by VDGIF in the mountains during the breeding season. Thirty-one 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 = 2).

Structures supporting occupied territories included 11 peregrine towers, 9 bridges, 2 cliffs, 3 buildings, 2 marsh shacks, 2 power plant stacks and 2 other miscellaneous structures (Table 2). One pair is believed to have nested on two bridges including a failed attempt on the Hazelwood Bridge and a subsequent successful attempt on the Mills Godwin Bridge. Birds were reported from 2 sources around the international terminal cranes along the Elizabeth River but no direct evidence was found.

Table 1. Catalog of nesting structures established for Peregrine Falcons in Virginia (1977-2009). 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 2016 breeding season.

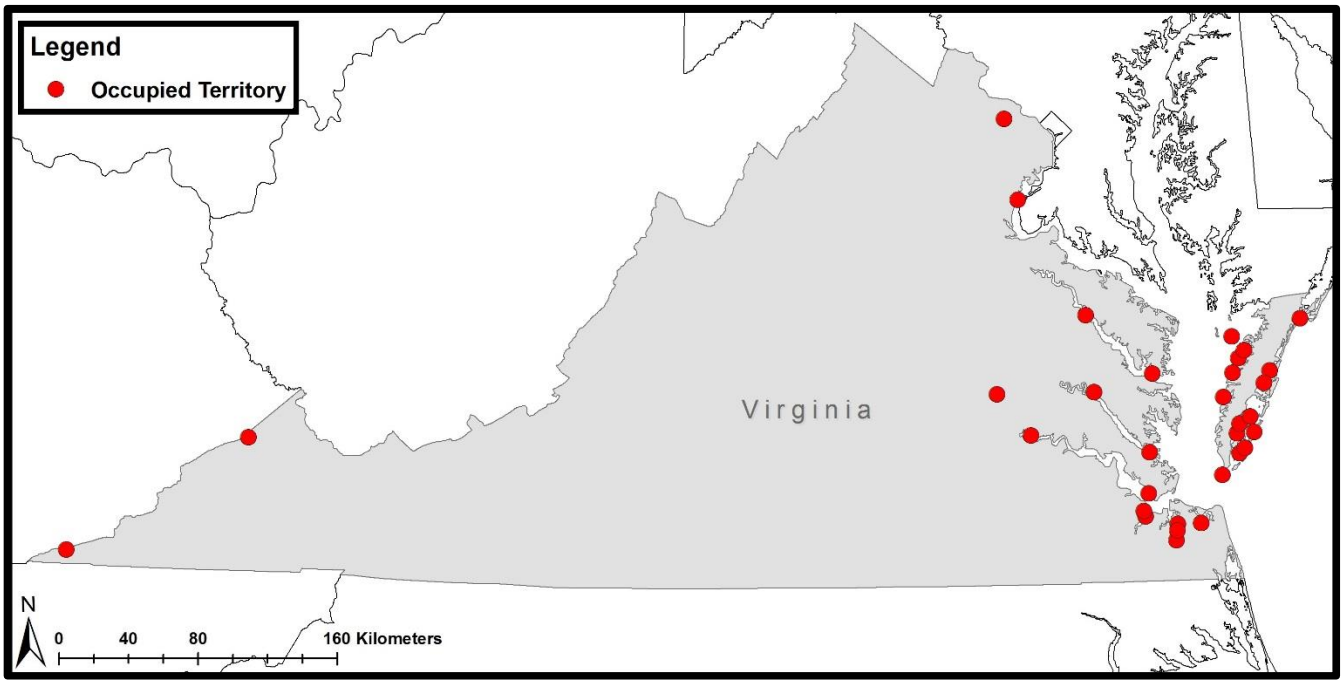
Site Code	Location Description	Structure Type	Year Est	2016
VA-PEFA-02	Cobb Island Tower	Peregrine Tower	1978	Y
VA-PEFA-06	Wallops Island Tower	Peregrine Tower	1981	Y [a]
VA-PEFA-09	Watts Island Tower	Peregrine Tower	1997	Y
VA-PEFA-10	Finney's Island Tower	Peregrine Tower	1997	Y
VA-PEFA-12	Hyslop Marsh 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

Site Code	Location Description	Structure Type	Year Est	2016
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 [b]
VA-PEFA-29	Old Rag, SNP	Natural Cliff Face	-----	Y [b]
VA-PEFA-34	Mockhorn Island Tower	Peregrine Tower	1997	Y
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 [b]
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

Site Code	Location Description	Structure Type	Year Est	2016
VA-PEFA-54	I-295 Bridge	Nest Box	2001	Y
VA-PEFA-55	Dominion Building	Nest Box	2000	Y [c]
VA-PEFA-56	River Front Plaza Building	Nest Box	2002	Y [c]
VA-PEFA-57	BB&T Building	Nest Box	1984	Y [c]
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
VA-PEFA-65	Craddock Neck	Peregrine Tower		Y
VA-PEFA-66	Hoffler Building Virginia Beach	Nest Box	2009	Y
VA-PEFA-67	White Rocks	Natural Cliff Face	-----	Y [c]
VA-PEFA-68	Big House Mountain	Natural Cliff Face	-----	Y [c]
VA-PEFA-69	Breaks Interstate Park	Natural Cliff Face	-----	Y [c]
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	Compartment Floor	-----	Y
VA-PEFA-71	Cedar Island	Ground Nest	-----	Y [c]
VA-PEFA-72	Stony Man, SNP	Natural Cliff Face	-----	Y [b]
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

[a] Nest monitored by NASA.
[b] Nest monitored by NPS.
[c] Nest monitored by VDGIF.

Figure 1. Distribution of Peregrine Falcon occupied territories and single individuals for the 2016 breeding season in Virginia.



Breeding Results

Virginia supported 31 known breeding pairs of peregrine falcons during the 2016 breeding season. This is the largest breeding population ever recorded in the state and fourth consecutive year that the state has supported more than 25 known breeding pairs (Figure 2). The 28 falcon pairs that were documented making breeding attempts produced at least 85 eggs (Table 2). At least 49 of the 85 eggs hatched. All 49 hatchlings were documented to survive to banding age. Two young were documented to be lost during or shortly after fledging. The reproductive rate was 1.58 young/occupied territory and 1.75 young/active territory.

Of 21 clutches that were followed completely from laying to fledging, 40 of 72 (55.5%) eggs hatched, and 40 of 40 (100%) young survived to banding age. Overall success rate was 55.5%.

Figure 2. Virginia Peregrine Falcon breeding population (1980-2016).

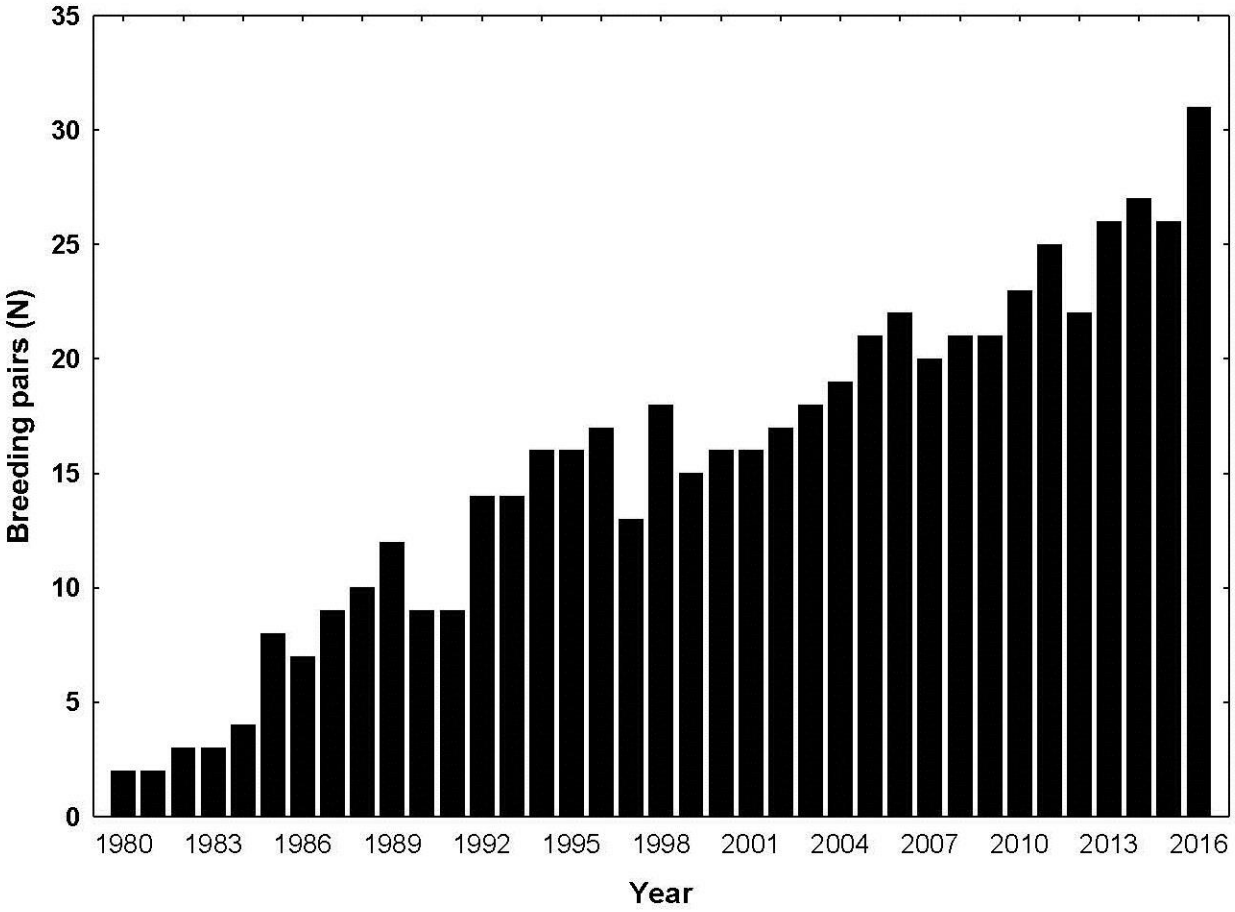


Table 2. Summary of breeding activity for peregrine falcon pairs in Virginia during the 2016 breeding season.

Site Code	Nest name	Occ Terr	Active Nest	Eggs	Young Hatched	Band Age
VA-PEFA-02	Cobb Island Tower	Y	Y	3	3	3
VA-PEFA-06	Wallops Island Tower	Y	Y	4	0	0
VA-PEFA-09	Watts Island Tower	Y	Y	>=1	U	0
VA-PEFA-10	Finney's Island Tower	Y	Y	3	2	2
VA-PEFA-12	Hyslop Marsh Tower	Y	Y	3	0	0[a]
VA-PEFA-15	Parker's Marsh Tower	Y	Y	>=1	0	0[a]
VA-PEFA-16	Elkins Marsh Chimney	Y	Y	3	1	1
VA-PEFA-17	Elkins Marsh Shack Tower	Y	Y	3	3	3
VA-PEFA-18	Wachapreague Shack Tower	Y	Y	4	2	2
VA-PEFA-22	James River Bridge Rt 17	Y	Y	4	3	3[b]
VA-PEFA-23	Berkley Bridge I-264	Y	Y	>=3	>=3	3
VA-PEFA-24	Benjamin Harrison Bridge	Y	Y	3	1	1
VA-PEFA-25	Mills Godwin Bridge Rt 17	Y	Y	2	1	1
VA-PEFA-27	Norris Bridge Rt 3	Y	Y	2	0	0[c]
VA-PEFA-34	Mockhorn Island Tower	Y	U	?	0	0[d]
VA-PEFA-36	Upsher Bay Tower	Y	Y	4	4	4
VA-PEFA-37	Silver Beach Range Tower	Y	Y	4	4	4
VA-PEFA-42	Possum Point Substation	Y	Y	5	4	4
VA-PEFA-49	Yorktown Substation	Y	Y	4	4	4
VA-PEFA-52	Highrise I-64	Y	N	-----	-----	-----
VA-PEFA-56	River Front Plaza Building	Y	Y	4	0	0
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	Y	Y	>=1	U	0

VA-PEFA-61	Tappahannock Bridge Rt 360	Y	Y	4	3	3
VA-PEFA-62	Gull Marsh Tower	Y	Y	3	1	1
VA-PEFA-63	Godwin Island Box	Y	Y	4	3	3
VA-PEFA-66	Armada Hoffler Building	Y	Y	2	1	1[e]
VA-PEFA-67	White Rocks	Y	Y	>=1	>=1	>=1
VA-PEFA-69	Breaks Interstate Park	Y	Y	>=1	>=1	>=1
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	Y	Y	4	0	0
VA-PEFA-75	Reston Town Center	Y	Y	>=4	>=4	4
VA-PEFA-76	New Jordan Bridge	Y	U	-----	-----	-----
VA-PEFA-77	Hazelwood Bridge	-----	-----	>=1	0	0[f]

[a]Nest depredated by raccoons.
[b]All young translocated to Shenandoah National Park and hacked.
[c]Adult male lost early in season but later replaced.
[d]Barn owl used box later in season and produced young.
[e]Young later flew into window and was killed.
[f]Same pair that later nested on Mills Godwin Bridge.

Selected Site and Breeding Observations

- The Cobb Island tower was occupied by great horned owls early in 2016. The pair waited and produced 3 young after the owls had dispersed. The clutch had an unusual 10-12 day gap between the second and third eggs that resulted in very disparate fledging times.
- The Mockhorn Island pair appears to have failed early and were replaced in the box by barn owls.
- The Watts Island pair was active early in the season but was not present and the tower was unstable due to shoreline erosion by May. The tower had fallen by July.
- The Norris Bridge male was picked up dead on the roadbed by Robert Pickett apparently after the female had laid 2 eggs. The eggs were not hatched and the male was replaced very late in the season.
- A pair was present on the Hazelwood Bridge across Chuckatuck Creek early in the season and was incubating a clutch on the pier cap. This attempt failed and the pair apparently moved back to the Mills Godwin Bridge and produced 1 young late in the season. The young did not fledge until August, one of the latest breeding attempts recorded in Virginia.

- The Parker and Hyslop Marsh Towers were both accessed by raccoons after laying eggs. Predator guards had failed and will be replaced.
- The eyrie on the Eltham Bridge was located within a counterweight compartment on a moveable section of the bridge. The clutch did not hatch. Because the site is not conducive to bridge operations a box will be installed on the stationary portion of the bridge.
- The eyrie within the Reston Town Center was located within an air intake vent on the Leidos Building. The building management company (Boston Properties) would not grant access to the site. Four falcons fledged from the site.
- Two of the 4 young falcons on the Possum Point stack were blown near fledging age. One was found dead under the stack and the second was found alive and taken to the Wildlife Center of Virginia. It was later hacked within Shenandoah National Park.

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 20 males and 20 females (Tables 3a and 3b). Birds known to be unbanded were both fledged young observed in the mountains, 4 young (including 2 males and 2 females) on the Leidos Building in Reston, 2 females fledged from Cobb Island Tower and 1 male fledged from Berkley Bridge.

Table 3a. List of band codes for female peregrine falcon chicks banded in Virginia during the 2016 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
1907-01954	80/AU	Possum Point Substation	5/9/2016
1907-01955	81/AU	Possum Point Substation	5/9/2016
1907-01956	82/AU	Possum Point Substation	5/9/2016
1907-01957	83/AU	Yorktown Substation	5/12/2016
1907-01958	84/AU	James River Bridge	5/13/2016
1907-01959	85/AU	Upsher Neck	5/24/2016
1907-01960	86/AU	Wachapreague Shack	5/24/2016
1907-01961	87/AU	Wachapreague Shack	5/24/2016

1907-01962	00/BH	Silver Beach Range Tower	5/24/2016
1907-01963	01/BH	Silver Beach Range Tower	5/24/2016
1907-01964	02/BH	Armada Hoffler	5/27/2016
1907-01965	03/BH	Berkley Bridge	5/31/2016
1907-01966	04/BH	Finney's Island Tower	6/2/2016
1907-01967	05/BH	Elkins Marsh Shack Tower	6/2/2016
1907-01968	06/BH	Elkins Marsh Shack Tower	6/2/2016
1907-01981	19/BH	Elkins Marsh Shack Tower	6/2/2016
1907-01969	07/BH	Godwin Island Box	6/14/2016
1907-01970	08/BH	Godwin Island Box	6/14/2016
1907-01971	09/BH	Cobb Island Tower	7/11/2016
1907-01972	10/BH	Gull Marsh Tower	7/11/2016

Table 3b. List of band codes for male peregrine falcon chicks banded in Virginia during the 2016 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
1126-11974	00/BM	Benjamin Harrison Bridge	5/2/2016
1126-11975	01/BM	Possum Point Substation	5/9/2016
1126-11976	02/BM	Yorktown Substation	5/12/2016
1126-11977	03/BM	Yorktown Substation	5/12/2016
1126-11978	04/BM	Yorktown Substation	5/12/2016
1126-11979	05/BM	James River Bridge	5/13/2016
1126-11980	06/BM	James River Bridge	5/13/2016
1126-11981	07/BM	Elkins Chimney	5/15/2016
1126-11982	08/BM	Downing Bridge	5/23/2016
1126-11983	09/BM	Downing Bridge	5/23/2016
1126-11984	10/BM	Downing Bridge	5/23/2016
1126-11985	11/BM	Upsher Neck	5/24/2016
1126-11986	12/BM	Upsher Neck	5/24/2016
1126-11987	13/BM	Upsher Neck	5/24/2016
1126-11988	14/BM	Silver Beach Range Tower	5/24/2016
1126-11989	15/BM	Silver Beach Range Tower	5/24/2016
1126-11990	16/BM	Berkley Bridge	5/31/2016
1126-11991	17/BM	Finney's Island Tower	6/2/2016
1126-11992	18/BM	Godwin Island Box	6/14/2016
1126-11993	19/BM	Mills Godwin Bridge Rt 17	7/25/2016

Band Resights

The banding status of 45 (71%) of the 63 adult peregrines known within the breeding population was determined during the 2016 season (Table 4). Twelve (26%) of the 45 birds were unbanded. The unbanded birds were nearly evenly split (7 males vs 5 females) between genders. 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, 20 were from VA, 6 from NJ and 2 from MD. The alpha-numerics were read for 29 adults and of these the USGS bands have been recorded for 27. Both of the unknown birds had silver USGS and were likely from MD. The natal territories were determined for 24 adults. Birds ranged in age from 1 to 16 years old.

Bands for 12 additional falcons were read and reported over the past year. Six of these birds originated in Virginia and were found breeding in other states (Table 5). This included a male and female in Pennsylvania and 4 females in New Jersey. The old female from Wachapreague that has nested in Atlantic City for years was resident but produced no eggs for the fourth consecutive year but did raise a young fostered to it by the state. Three birds were captured during fall trapping operations on Assateague and Cape May Point (Table 6). A first-year bird male was found dead and a first-year female was photographed multiple times on Chincoteague National Wildlife Refuge. A first-year female was found injured near Topton, PA and rehabbed over several months and released. The bird weighed only 750 g when found but was 1,335 g when released.

Table 4. Banding status and identification of Virginia breeding peregrine falcons during the 2016 season.

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
VA-PEFA-02	Cobb Island Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-02	Cobb Island Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-06	Wallops Island Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-06	Wallops Island Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-09	Watts Island Tower	M	Green	2206-81622	B/G	22/Y	Wallops Island,VA	11
	Watts Island Tower	F	Silver	0987-76950	B/G	*R/*9	Clay Island,VA	13
VA-PEFA-10	Finney's Island Tower	M	Green	1126-11939	B/G	15/AU	Watts Island, VA	2
	Finney's Island Tower	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-12	Hyslop Marsh Tower	M	Green	1126-11860	B/G	26/AS	Finney's Marsh, VA	5
	Hyslop Marsh Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-15	Parker Marsh Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Parker Marsh Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-16	Elkins Marsh Chimney	M	-----	Unbanded	-----	-----	Unknown	
	Elkins Marsh Chimney	F	Black	1807-37497	B/R	B/*S	Heislerville Tower, NJ	14
VA-PEFA-17	Elkins Marsh Shack Tower	M	Green	2206-81637	B/G	09/W	Upsher Bay Tower, VA	9
	Elkins Marsh Shack Tower	F	Silver	1907-03507	B/G	65/AD	Smith Island Tower 2, MD	6
VA-PEFA-18	Wachapreague Shack Tower	M	Green	???	B/G	???	VA	
	Wachapreague Shack Tower	F	Green	1807-02732	B/G	25/V	Gull Marsh Tower,VA	10
VA-PEFA-22	James River Bridge Rt 17	M	Green	2206-43454	B/G	*7/*C	James River Bridge, VA	15
	James River Bridge Rt 17	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-23	Berkley Bridge I-264	M	Uknown	Uknown	Uknown	Uknown	Uknown	
	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	11

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Benjamin Harrison Bridge Rt 106	F	Green	1807-02775	B/G	70/Z	Benjamin Harrison, VA	8
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	3
VA-PEFA-27	Norris Bridge Rt 3	M1	Green	2206-43455	B/R	*7/*D	Benjamin Harrison, VA	14
	Norris Bridge Rt 3	M2	Green	???	B/G	???	VA	
	Norris Bridge Rt 3	F	Black	1687-02823	B/G	A/06	Ocean Gate, NJ	9
VA-PEFA-34	Mockhorn Island Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Mockhorn Island Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-36	Upsher Bay Tower	M	-----	Unbanded	-----	-----	Unknown	
	Upsher Bay Tower	F	Silver	0987-95688	B/G	94/Y	Unknown	
VA-PEFA-37	Silver Beach Range Tower	M	Green	1126-11841	B/G	07/AS	Gull Marsh Tower,VA	6
	Silver Beach Range Tower	F	Black	987-95669	B/G	56/Y	Sea Isle City,NJ	10
VA-PEFA-42	Possum Point Substation	M	Silver	816-69379	B/G	X/78	Chalk Point Plant, MD	8
	Possum Point Substation	F	Black	987-95657	B/G	*Y/*4	Betsy Ross Bridge, NJ	10
VA-PEFA-49	Yorktown Substation	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Yorktown Substation	F	Black	1687-02889	B/G	32/AN	Tuckahoe River, NJ	4
VA-PEFA-52	Highrise Bridge I-64	M	Green	???	B/G	???	VA	1
	Highrise Bridge I-64	F	Black	1687-02880	B/G	22/AN	Tacony-Palmyra Bridge, NJ	4
VA-PEFA-56	River Front Plaza Building	M	Silver	2206-07444	B/R	*V/S	VA, Unknown	16
	River Front Plaza Building	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	M	-----	Unbanded	-----	-----	Unknown	
	Chesapeake Bay Bridge Tunnel	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-61	Tappahannock Bridge Rt 360	M	Silver	1126-15169	B/G	30/AH	Unknown	
	Tappahannock Bridge Rt 360	F	Silver	???	B/G	26/AK	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
VA-PEFA-62	Gull Marsh Tower	M	-----	Unbanded	-----	-----	Unknown	
	Gull Marsh Tower	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-63	Godwin Island Box	M	Green	1126-11848	B/G	14/AS	Mockhorn Island, VA	6
	Godwin Island Box	F	Green	1807-65090	B/G	60/AV	Finney's Island, VA	3
VA-PEFA-66	Hoffler Building Virginia Beach	M	Green	1126-11943	B/G	19/AU	Elkins Shack Tower, VA	2
	Hoffler Building Virginia Beach	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-67	White Rocks	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	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	-----	Unbanded	-----	-----	Unknown	
	Pamunkey Eltham Bridge Rt 33	F	Green	1807-65016	B/G	11/AD	Elkins Shack Tower, VA	5
VA-PEFA-75	Reston Town Center	M	Silver	???	B/G	29/AH	Unknown	
	Reston Town Center	F	Red Tape	???	B/G	Unknown	Unknown	
VA-PEFA-76	New Jordan Bridge	M	-----	Unbanded	-----	-----	Unknown	
	New Jordan Bridge	F	Unknown	Unknown	Unknown	Unknown	Unknown	

Table 5. Identification of Virginia-hatched birds known to breed in other states during 2016.

Breeding Territory	Sex	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
Westinghouse Bridge, PA	M	2206-81647	B/G	19/W	Cobb Island Tower, VA	10
Safe Harbor Dam, PA	F	1807-65083	B/G	45/AV	Mills Godwin Br, VA	3
Atlantic City Hilton, NJ	F	0987-76814	B/R	*P/*G	Wachapreague Tower, VA	18
Dividing Creek WMA, NJ	F	1807-02735	B/G	29/V	Wachapreague Tower, VA	10
Heislerville water tower, NJ	F	1807-65062	B/G	23/AV	Elkins Marsh Shack, VA	4
Burlington-Bristol Bridge, NJ	F	1807-65079	B/G	41/AV	Berkley Bridge, VA	3

Table 6. Resights of Virginia peregrine falcons made since the 2015 report.

Resight Location	Resight Date	Sex	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
Chincoteague NWR, VA	5/13/2016	M	1126-11958	B/G	34/AU	Finneys Island, VA	1
Chincoteague NWR, VA	9/17/2016	F	1907-01947	B/G	73/AU	Watts Island, VA	1
Assateague Island, MD	10/13/2015	M	1126-11956	B/G	32/AU	Upsher Bay Tower, VA	HY
Assateague Island, MD	9/29/2015	M	1126-11964	B/G	40/AU	Watts Island, VA	HY
Cape May Point, NJ	9/13/2015	M	1126-11953	B/G	29/AU	Watts Island, VA	HY
Topton, PA	3/13/2016	F	1907-01934	B/G	96/AV	James River Bridge, VA	1

Translocations

During the 2016 season, 9 young falcons including 3 females and 6 males were translocated to Shenandoah National Park and hacked (Table 7). All birds were from bridges that have experienced poor fledging success except 1 bird that was found on the ground under the Possum Point stack around the time of fledging. This bird was taken to the Wildlife Center of Virginia for examination and later transported to the park to be released with the cohort. All birds fledged successfully.

Table 7. Summary of translocation activities for peregrine falcons in Virginia during the 2016 breeding season. Electrical tape was applied to the USFWS band.

USGS Band	Nest Site	Sex	Tape Color	Date Collected	Translocation Site
1907-01954	Possum Point Substation	F	-----	5/9/2016	Shenandoah National Park
1907-01958	James River Bridge	F	Red	5/13/2016	Shenandoah National Park
1907-01965	Berkley Bridge	F	Orange	5/31/2016	Shenandoah National Park
1126-11979	James River Bridge	M	White	5/13/2016	Shenandoah National Park
1126-11980	James River Bridge	M	Blue	5/13/2016	Shenandoah National Park
1126-11982	Downing Bridge	M	Dark Green	5/23/2016	Shenandoah National Park
1126-11983	Downing Bridge	M	Yellow	5/23/2016	Shenandoah National Park
1126-11984	Downing Bridge	M	Pink	5/23/2016	Shenandoah National Park
1126-11990	Berkley Bridge	M	Black	5/31/2016	Shenandoah National Park

Addled Eggs

Fifteen addled falcon eggs were recovered during the 2016 breeding season (Table 8). Eggs were recovered from 9 sites including 4 bridges, 2 buildings, 1 smoke stack and 2 towers.

Table 8. Addled eggs collected during the 2016 breeding season.

Site	Date	Eggs
Pamunkey Bridge	7/14/2016	2
Wachapreague Tower	5/24/2016	2
Ben Harrison Bridge	5/2/2016	2
Elkins Chimney	5/4/2016	2
James River Bridge	5/13/2016	1
Tappahannock Bridge	5/23/2016	1
Armada Hoffler Building	5/27/2016	1
Possum Point	5/9/2016	1
Riverfront Plaza	5/3/2016	3
Elkins Chimney	6/5/2015	1
Possum Point	5/14/2015	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, PA) 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 (2000-2015) 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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