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Virginia peregrine falcon monitoring and management program: Year 2019 report

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VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2019 REPORT

THE CENTER FOR CONSERVATION BIOLOGY

WILLIAM & MARY

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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: Adult female on Godwin Bridge peaks under beam to watch chick inspection. Photo by Bryan Watts.

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 2019, Virginia supported a known falcon population of 30 breeding pairs including 25 within the Coastal Plain, 2 in the Piedmont and 3 in the mountains. This is the third highest population ever recorded in the state and represents the seventh consecutive year that the population has exceeded 25 breeding pairs. A new breeding territory was documented on a high wall within an active quarry. A single adult male was observed exploring the nest box on the Birchwood Power Station stack early in the season.

The 2019 breeding season was the most productive in the state's history producing 61 young. A minimum of 80 eggs were laid with at least 66 hatching. Only 5 (7.6%) of the 66 hatchlings did not survive to banding age. The reproductive rate was 2.03 young/occupied territory. Of 20 clutches that were followed completely from laying to fledging, 63 of 76 (82.9%) of eggs hatched and 59 of 63 (93.7%) of young survived to banding age. Four young were known to have problems after fledging. One bird was picked up by bridge operators on Ben Harrison Bridge and treated for a keel fracture. One bird was recovered from a 19th floor apartment balcony and treated for respiratory problems. One bird was found washed up dead along the shoreline in Westover, Maryland. One bird was picked up dead near Dulles Airport after apparently being struck by an aircraft.

Efforts continued in 2019 to identify breeding adults via field-readable bands to better understand dispersal and demography throughout the mid-Atlantic region. The banding status of 52 (87%) of the 60 adult peregrines known within the breeding population was determined. Fourteen (27%) of the 52 birds were unbanded. The alpha-numerics were read for 32 adults and of these the USGS bands have been recorded for 28. Of the banded birds where state of origin could be determined, 20 were from VA, 5 were from MD, 2 were from NJ, 1 was from PA and 1 was from DE. The natal territories were determined for 29 adults. Birds ranged in age from 2 to 18 years old.

During the 2019 season, 6 young falcons (including 2 females and 4 males) were translocated to Shenandoah National Park and hacked. Birds were released on 7 June, 2019 and were fine on release and during subsequent monitoring. Six addled falcon eggs were recovered during the 2019 season from 4 eyries.

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. 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 2019 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 2019 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) 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 (1977-2019). 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 2019 breeding season.

Site Code	Location Description	Structure Type	Year Est	2019
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
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

Site Code	Location Description	Structure Type	Year Est	2019
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
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

Site Code	Location Description	Structure Type	Year Est	2019
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 [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	Nest Box	2017	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
VA-PEFA-78	Dresser Bridge Rt 5	Pier Cap	2017	Y
VA-PEFA-79	Norfolk Naval Shipyard	Unknown	-----	Y
VA-PEFA-80	Ashburn Quarry	Quarry High Wall	-----	Y

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

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 2019 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 sites supported occupied territories. Breeding sites were found across the state (Figure 1). Occupied territories were distributed within the Coastal Plain (n = 25), Piedmont (n = 2) and mountains (n = 3).

Structures supporting occupied territories included 11 peregrine towers, 8 bridges, 4 cliffs, 3 buildings, 2 marsh shacks, and 2 power plant stacks (Table 2). For the third year, no pairs were detected in association with the Norris Bridge and the I-64 High-rise Bridge. A pair was detected early in the season on Stony Man

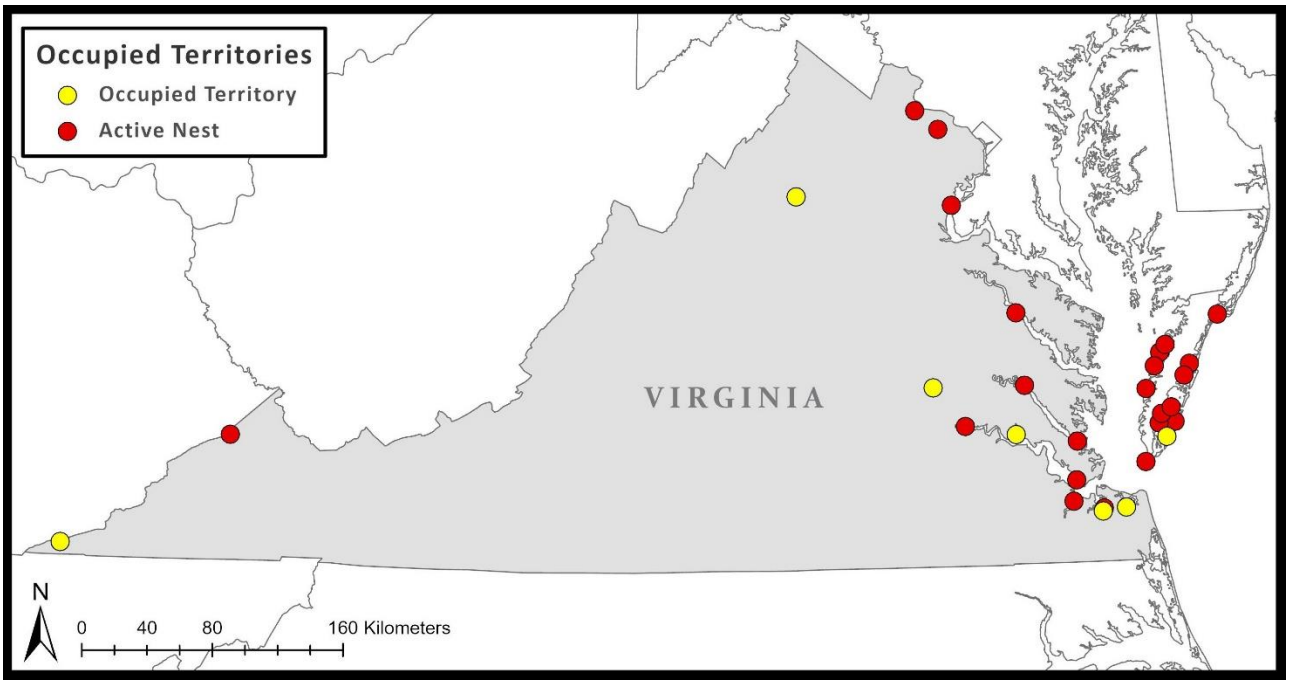
in Shenandoah National Park. A new pair nested for the first time on a high wall in the Ashburn quarry. A single adult was observed exploring the box on the stack of the Birchwood Power Plant.

Table 2. Summary of breeding activity for peregrine falcon pairs in Virginia during the 2019 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	3	2	2
VA-PEFA-10	Finney's Island Tower	Y	Y	4	4	4
VA-PEFA-12	Hyslop Marsh Tower	Y	Y	3	3	3
VA-PEFA-15	Parker's Marsh Tower	Y	Y	3	3	3
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	4	4	3
VA-PEFA-22	James River Bridge Rt 17	Y	Y	3	2	2
VA-PEFA-23	Berkley Bridge I-264	Y	Y	>1	0	0
VA-PEFA-24	Benjamin Harrison Bridge	Y	Y	4	3	3
VA-PEFA-25	Mills Godwin Bridge Rt 17	Y	Y	5	5	4
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	4	0	0
VA-PEFA-49	Yorktown Substation	Y	Y	4	3	3
VA-PEFA-56	River Front Plaza Building	Y	N	-----	-----	-----
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	Y	Y	≥2	≥2	2
VA-PEFA-61	Tappahannock Bridge Rt 360	Y	Y	4	4	4

Site Code	Nest name	Occ Terr	Active Nest	Eggs	Young Hatched	Band Age
VA-PEFA-62	Gull Marsh Tower	Y	Y	4	3	3
VA-PEFA-63	Godwin Island Box	Y	N	-----	-----	-----
VA-PEFA-66	Armada Hoffler Building	Y	N	-----	-----	-----
VA-PEFA-67	White Rocks	Y	U	-----	-----	-----
VA-PEFA-69	Breaks Interstate Park	Y	Y	≥1	≥1	0
VA-PEFA-70	Pamunkey Eltham Bridge Rt 33	Y	Y	5	4	2
VA-PEFA-72	Stony Man, SNP	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	-----	-----	-----
VA-PEFA-80	Ashburn Quarry	Y	Y	4	4	4

Figure 1. Distribution of Peregrine Falcon occupied territories and single individuals for the 2019 breeding season in Virginia.

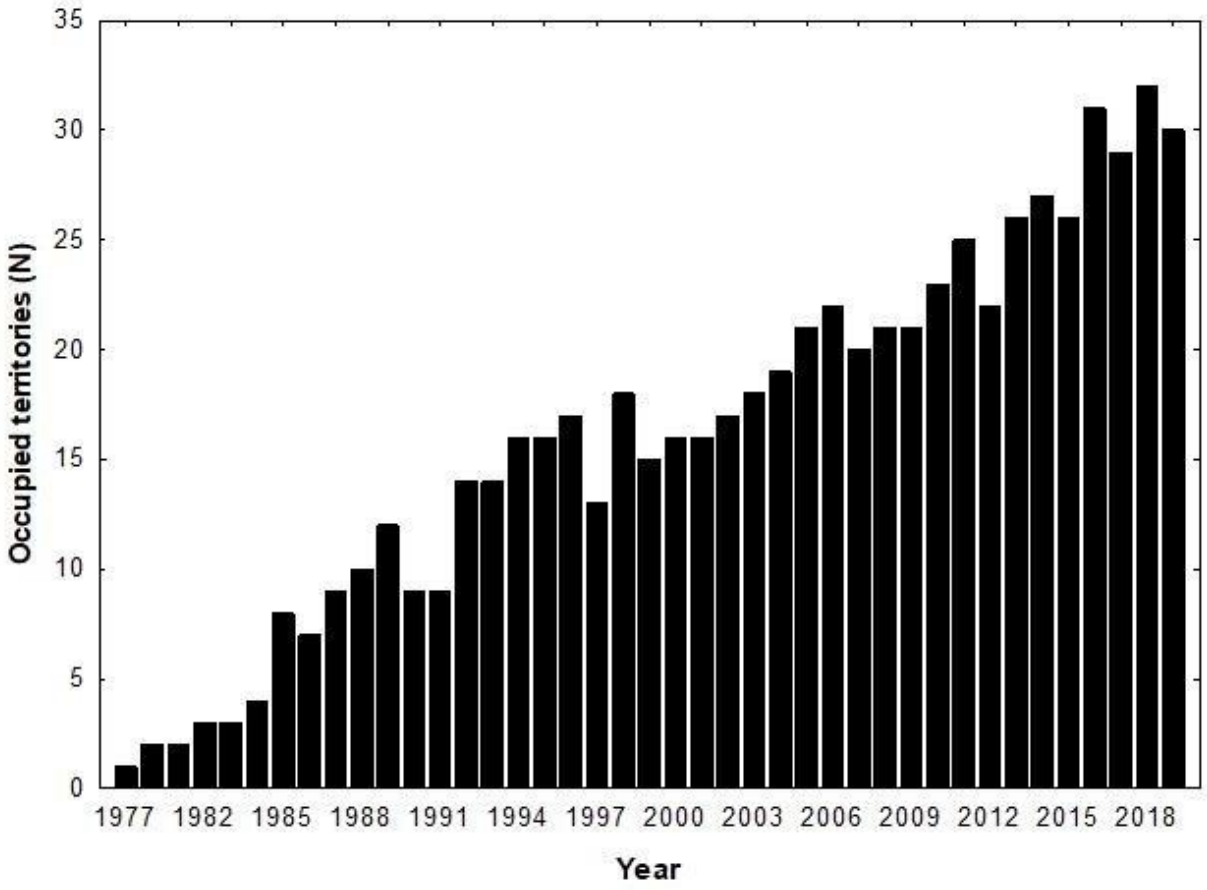


Breeding Results

Virginia supported 30 known breeding pairs of peregrine falcons during the 2019 breeding season. This is the third largest breeding population ever recorded in the state and seventh consecutive year that the state has supported more than 25 known breeding pairs (Figure 2). The 23 falcon pairs that were documented making breeding attempts produced at least 80 eggs (Table 2). At least 66 of the 80 eggs hatched. Only 5 (7.6%) of the 66 hatchlings did not survive to banding age. All of these young disappeared between the last hatching check and the scheduled day of banding (26 to 28 days old). Cause of the loss is not known. The reproductive rate was 2.03 young/occupied territory and 2.61 young/active territory. Of 20 clutches that were followed completely from laying to fledging, 63 of 76 (82.9%) eggs hatched, and 59 of 63 (93.7%) young survived to banding age.

Four young were known to have problems after fledging. One bird was picked up by bridge operators on Ben Harrisoin Bridge walking down the roadway and taken to the Wildlife Center of Virginia to be treated for a keel fracture. One bird was recovered on 25 June from a 19th floor apartment balcony in Reston and taken to the Blue Ridge Wildlife Center and treated for respiratory problems and later released on 7 July at the Reston Town Center. One bird was found by a resident in Westover, Maryland. The bird was dead and partially decomposed. One bird was picked up dead on 7 July near Dulles Airport after apparently being struck by an aircraft.

Figure 2. Virginia Peregrine Falcon breeding population (1977-2019).



Selected Site and Breeding Observations

- A second-year female laid 3 eggs and produced 2 young with an 18-year old male on the James River Bridge. She showed up at the site as a hatch-year after being banded on Assateague Island.
- The old female that has nested on the Berkley Bridge was lost late in the season and the male was observed repeatedly courting with a new female through the late summer and early fall on the Marriott Waterside Hotel.
- The igloo placed on the Norris Bridge had a board blocking the entrance and was inaccessible. The board will be removed to make the site available in 2020.
- The unbanded pair was observed on the Dressler Bridge (Chickahominy) for the third year late in the winter but the female was lost early and was not replaced during the breeding season.
- The Silver Beach Range Tower was visited in late May and all 4 young were on the wing. Based on the age of the young the female would have laid during the first week of March.
- The Godwin Island box was used by barn owls. The pair of peregrines was resident through the season but no breeding attempt was documented.
- The new pair within the Ashburn Quarry nested within an small overhang on a high wall and successfully produced 4 young.
- The adult female that nested on Wallops Island tower has maintained a territory on Chincoteague, NWR during the winters of 2017 and 2018.
- A second-year female took over the territory in Richmond but did not lay a clutch in 2019.
- The three oldest birds in the population during 2018 including the Richmond male (18), the Gull Marsh female (17) and the Elkins Chimney female (16) were lost and replaced before the 2019 breeding season.
- A pair was reported in association with the Route 123 bridge across the Occoquan River during the early fall. This location is close to previous observations of adults during the summer months and will be investigated in 2020.

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 27 males and 27 females (Tables 3a and 3b). Birds known to be unbanded were 4 young (including 2 males and 2 females) on the Silver Beach Range Tower, 2 young (including 2 females) on the Chesapeake Bay Bridge and 1 young (male) on the Wallops tower.

Table 3a. List of band codes for female peregrine falcon chicks banded in Virginia during the 2019 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
1807-46811	48/BH	Benjamin Harrison Bridge	4/29/2019
1807-46812	49/BH	Benjamin Harrison Bridge	4/29/2019
1807-46813	50/BH	Yorktown Power Station	5/8/2019
1807-46814	51/BH	Downing Bridge	5/10/2019
1807-46815	52/BH	Downing Bridge	5/10/2019
1807-46816	53/BH	Reston Town Center	5/18/2019
1807-46817	54/BH	Reston Town Center	5/18/2019
1807-46818	55/BH	Mills Godwin Bridge	5/22/2019
1807-46819	56/BH	Mills Godwin Bridge	5/22/2019
1807-46820	57/BH	Luckstone Quarry	5/28/2019
1807-46821	58/BH	Upshurs Neck	6/3/2019
1807-46822	59/BH	Upshurs Neck	6/3/2019
1807-46823	60/BH	Upshurs Neck	6/3/2019
1807-46824	61/BH	Wachapreague Shack	6/3/2019
1807-46825	62/BH	Wachapreague Shack	6/3/2019
1807-46826	63/BH	Wachapreague Shack	6/3/2019
1807-46827	64/BH	Finney's Marsh	6/4/2019
1807-46828	65/BH	Finney's Marsh	6/4/2019
1807-46829	66/BH	Finney's Marsh	6/4/2019
1807-46830	67/BH	Finney's Marsh	6/4/2019
1807-46831	68/BH	Elkins Shack	6/5/2019
1807-46832	69/BH	Elkins Chimney	6/14/2019

USGS Band	Alpha-numeric Band	Nest	Date
1807-46833	70/BH	Parkers Marsh	6/14/2019
1807-46834	71/BH	James River Bridge	6/19/2019
1807-46835	72/BH	Wallops Island	6/20/2019
1807-46836	73/BH	Gull Marsh	7/10/2019
1807-46837	74/BH	Cobb Island	7/10/2019

Table 3b. List of band codes for male peregrine falcon chicks banded in Virginia during the 2019 breeding season.

USGS Band	Alpha-numeric Band	Nest	Date
2206-54832	58/BM	Benjamin Harrison Bridge	4/29/2019
2206-54833	59/BM	Yorktown Power Station	5/8/2019
2206-54834	60/BM	Yorktown Power Station	5/8/2019
2206-54835	61/BM	Downing Bridge	5/10/2019
2206-54836	62/BM	Downing Bridge	5/10/2019
2206-54837	63/BM	Reston Town Center	5/18/2019
2206-54838	64/BM	Reston Town Center	5/18/2019
2206-54839	65/BM	Eltham Bridge	5/22/2019
2206-54840	66/BM	Eltham Bridge	5/22/2019
2206-54841	67/BM	Mills Godwin Bridge	5/22/2019
2206-54842	68/BM	Mills Godwin Bridge	5/22/2019
2206-54843	69/BM	Luckstone Quarry	5/28/2019
2206-54844	70/BM	Luckstone Quarry	5/28/2019
2206-54845	71/BM	Luckstone Quarry	5/28/2019
2206-54846	72/BM	Upshurs Neck	6/3/2019

USGS Band	Alpha-numeric Band	Nest	Date
2206-54847	73/BM	Turner's Marsh	6/4/2019
2206-54848	74/BM	Elkins Shack	6/5/2019
2206-54849	75/BM	Elkins Shack	6/5/2019
2206-54850	76/BM	Elkins Shack	6/5/2019
2206-54851	77/BM	Parkers Marsh	6/14/2019
2206-54852	78/BM	Parkers Marsh	6/14/2019
2206-54853	79/BM	Turner's Marsh	6/16/2019
2206-54854	80/BM	Turner's Marsh	6/16/2019
2206-54855	81/BM	James River Bridge	6/19/2019
2206-54856	82/BM	Gull Marsh	7/10/2019
2206-54857	83/BM	Gull Marsh	7/10/2019
2206-54858	84/BM	Cobb Island	7/10/2019

Band Resights

The banding status of 52 (86.7%) of the 60 adult peregrines known within the breeding population was determined during the 2019 season (Table 4). Fourteen (26.9%) of the 52 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, 5 from MD, 2 from NJ, 1 from DE and 1 from PA. The alpha-numerics were read for 32 adults and of these the USGS bands have been recorded for 28. All three of the unknown birds had silver USGS and were likely from MD. The natal territories were determined for 29 adults. Birds ranged in age from 2 to 18 years old.

Twenty-three Virginia falcon encounters outside of banding activities were reported since the 2018 report (Table 5). Six of these birds (4 females, 1 male) originated in Virginia and were found breeding in other states (Table 6). A second-year female from Finney's tower was photographed near Slaughter Beach in Delaware during the winter. A hatch-year female from the Yorktown Substation was photographed by three different observers during the fall near Holgate, New Jersey. A hatch-year female from Wachapreague Tower was trapped by the banding crew on Assateague Island during the fall. A 13-year old male hatched on the Ben Harrison Bridge was photographed in Dyke Marsh. This bird is likely a breeder in Washington D.C. or somewhere nearby.

Table 4. Banding status and identification of Virginia breeding peregrine falcons during the 2019 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	Green	Unknown	B/G	Unknown	VA	
	Wallops Island Tower	F	Green	1907-01947	B/G	73/AU	Watts Island, VA	4
VA-PEFA-10	Finney's Island Tower	M	Green	1126-11939	B/G	15/AU	Watts Island, VA	5
	Finney's Island Tower	F	Black	1687-02832	B/G	A/15	Dividing Creek, NJ	10
VA-PEFA-12	Hyslop Marsh Tower	M	Green	1126-11824	B/G	15/AB	Godwin Island, VA	11
	Hyslop Marsh Tower	F	Green	1807-65006	B/G	01/AD	Upsher Bay Tower, VA	11
VA-PEFA-15	Parker Marsh Tower	M	-----	Unbanded	-----	-----	Uknown	
	Parker Marsh Tower	F	Green	Unknown	B/G	7?/A?	Unknown, VA	
VA-PEFA-16	Elkins Marsh Chimney	M	Green	1126-11939	B/G	15/AU	Watts Island, VA	5
	Elkins Marsh Chimney	F	Green	1907-01491	B/G	67/AU	Finneys Tower, VA	4
VA-PEFA-17	Elkins Marsh Shack Tower	M	Green	2206-81637	B/G	09/W	Upsher Bay Tower, VA	11
	Elkins Marsh Shack Tower	F	Silver	1907-03507	B/G	65/AD	Smith Island Tower 2, MD	9
VA-PEFA-18	Wachapreague Shack Tower	M	Silver	?????	-----	-----	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Wachapreague Shack Tower	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-22	James River Bridge Rt 17	M	Green	2206-43454	B/G	*7/*C	James River Bridge, VA	18
	James River Bridge Rt 17	F	Silver	?????	-----	-----	Unknown	2
VA-PEFA-23	Berkley Bridge I-264	M	Green	1126-11953	B/G	29/AU	Yorktown, VA	5
	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	14
	Benjamin Harrison Bridge Rt 106	F	Green	1807-02775	B/G	70/Z	Benjamin Harrison, VA	11
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	6
VA-PEFA-36	Upsher Bay Tower	M	-----	Unbanded	-----	-----	Unknown	
	Upsher Bay Tower	F	Green	1907-01967	B/G	05/BH	Elkins Chimney, VA	5
VA-PEFA-37	Silver Beach Range Tower	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	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	10
	Possum Point Substation	F	Black	987-95657	B/G	*Y/*4	Betsy Ross Bridge, NJ	12
VA-PEFA-49	Yorktown Substation	M	-----	Unbanded	-----	-----	Unknown	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	Yorktown Substation	F	Green	1907-01914	B/G	70/AV	Silver Beach Tower, VA	6
VA-PEFA-56	River Front Plaza Building	M	Green	1126-11948	B/G	24/AU	Possum Point, VA	5
	River Front Plaza Building	F	Silver	1907-03426	B/G	95/AK	St. George's Bridge, DE	2
VA-PEFA-60	Chesapeake Bay Bridge Tunnel	M	Silver	?????	B/G	16/AK	Clay Island WMA, MD	7
	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	Green	Unknown	B/G	Unknown	VA	
	Gull Marsh Tower	F	Green	Unknown	B/G	Unknown	VA	
VA-PEFA-63	Godwin Island Box	M	Green	1126-11848	B/G	14/AS	Mockhorn Island, VA	9
	Godwin Island Box	F	Green	1807-02726	B/G	20/V	Upsher Bay Tower, VA	13
VA-PEFA-66	Hoffler Building Virginia Beach	M	Green	1126-11943	B/G	19/AU	Elkins Shack Tower, VA	5
	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	

Territory Code	Territory	Sex	USGS Band Color	USGS Band	ACRAFT Color	ACRAFT Code	Origin	Age
	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	5
	Pamunkey Eltham Bridge Rt 33	F	Green	1807-65016	B/G	11/AD	Elkins Shack Tower, VA	8
VA-PEFA-72	Stony Man, SNP	M	Unknown	Unknown	Unknown	Unknown	Unknown	
	Stony Man, SNP	F	Unknown	Unknown	Unknown	Unknown	Unknown	
VA-PEFA-75	Reston Town Center	M	Silver	1126-15168	B/G	29/AH	Chalk Point Plant, MD	8
	Reston Town Center	F	Silver	1687-00582	B/G	61/AR	Philadelphia, PA	8
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	
	Norfolk Naval Shipyard	F	-----	Unbanded	-----	-----	Unknown	
VA-PEFA-80	Ashburn Quarry	M	Green	2206-54805	B/G	31/BM	James River Bridge, VA	3
	Ashburn Quarry	F	Silver	Unknown	B/G	87/AK	MD	

Table 5. Encounter reports of Virginia peregrine falcons received since the 2018 report.

Resight Location	Resight Date	Sex	USGS Band	Origin	Age
Dumfries, VA	6/1/2017	F	1907-01980	Possum Point Substation	HY
Bergen County, NJ	8/20/2017	M	1126-11971	Riverfront Plaza	HY
Rockingham County, VA	10/22/2017	F	1907-01977	Mills Godwin Bridge	HY
Yorktown, VA	6/26/2018	M	2206-54812	Yorktown Substation	HY
Alexandria, VA	9/2/2018	M	2206-54815	Reston Town Center	HY
Sussex County, DE	12/18/2018	F	1807-46808	Finney's Island Tower	HY
Sussex County, DE	1/27/2019	F	1807-46808	Finney's Island Tower	2
Page County, VA	6/22/2019	M	2206-54841	Mills Godwin Bridge	HY
Reston, VA	6/25/2019	F	1807-46817	Reston Town Center	HY
Newport News, VA	6/28/2019	F	1807-46834	James River Bridge	HY
Norfolk, VA	7/1/2019	M	1126-11953	Yorktown Substation	5
Loudon County, VA	7/7/2019	M	2206-54838	Reston Town Center	HY
Westover, MD	8/24/2019	M	2206-54851	Parkers Marsh Tower	HY
Ocean County, NJ	8/29/2019	F	1807-46813	Yorktown Substation	HY
Ocean County, NJ	9/11/2019	F	1807-46813	Yorktown Substation	HY
Assateague Island, MD	10/15/2019	F	1807-46826	Wachapreague Shack Tower	HY
Loudon County, VA	10/17/2019	M	2206-54843	Ashburn Quarry	HY
Holgate, NJ	11/6/2019	F	1807-46813	Yorktown Substation	HY
Dyke Marsh, VA	1/4/2019	M	2206-81631	Ben Harrison Bridge, VA	13

Table 6. Identification of Virginia-hatched birds known to breed in other states during 2019.

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	11
Columbia, PA Rt. 462 Bridge	F	1807-65014	B/G	09/AD	James River Br, VA	9
Safe Harbor RR Bridge, PA	F	1807-65083	B/G	45/AV	Mills Godwin Br, VA	6
Pittsburgh, PA Westinghouse	M	2206-81647	B/G	19/W	Cobb Island, VA	13
Dividing Creek WMA, NJ	F	1807-02735	B/G	29/V	Wachapreague Tower, VA	13
Burlington-Bristol Bridge, NJ	F	1807-65079	B/G	14/AV	Possum Point, VA	7

Translocations

During the 2019 season, 6 young falcons (including 2 females and 4 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 a single hack box situated on Franklin Cliffs on 22 May, 2019. Birds were released on 7 June, 2019 and were fine on release and during subsequent monitoring.

Table 7. Summary of translocation activities for peregrine falcons in Virginia during the 2019 breeding season. Electrical tape was applied to the USFWS band.

USGS Band	Location	Sex	Tape Color	Date Collected	Translocation Site
1807-46818	Mills Godwin Bridge	F	Blue	5/22/2019	Shenandoah National Park
1807-46819	Mills Godwin Bridge	F	No Tape	5/22/2019	Shenandoah National Park
2206-54839	Eltham Bridge	M	Yellow	5/22/2019	Shenandoah National Park
2206-54840	Eltham Bridge	M	Red	5/22/2019	Shenandoah National Park
2206-54841	Mills Godwin Bridge	M	Orange	5/22/2019	Shenandoah National Park
2206-54842	Mills Godwin Bridge	M	White	5/22/2019	Shenandoah National Park

Addled Eggs

Six addled falcon eggs were recovered during the 2019 breeding season (Table 8). Eggs were recovered from 4 sites including 2 bridge, 1 smoke stack and 1 tower.

Table 8. Addled eggs collected during the 2019 breeding season.

Site	Date	Eggs
Possum Point	5/30/2019	3
Ben Harrison Bridge	4/29/2019	1
Eltham Bridge	4/29/2019	1
Elkins Chimney	6/4/2019	1

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 (2000-2019) 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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