

**VIRGINIA PEREGRINE FALCON  
MONITORING AND MANAGEMENT PROGRAM:  
YEAR 2005 REPORT**



**CENTER FOR CONSERVATION BIOLOGY  
COLLEGE OF WILLIAM AND MARY**

# VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2005 REPORT

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## Project Partners:

The Virginia Department of Game and Inland Fisheries  
(Wildlife Diversity Program)  
National Aeronautics and Space Administration  
National Park Service  
United States Fish and Wildlife Service  
Virginia Department of Transportation  
The Nature Conservancy  
Dominion  
Center for Conservation Biology

**Front Cover:** *Breeding female on BB&T building in Richmond. Photo by Bryan Watts.*



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## EXECUTIVE SUMMARY

The Peregrine Falcon (*Falco peregrinus*) was believed to be extinct as a breeding species in Virginia by the mid-1960's. Intensive management efforts since the late 1970's have resulted in a known breeding population that has now exceeded 20 pairs. However, all but 1 known breeding pairs currently nest on artificial structures and reproductive performance continues to be erratic. The primary objective of this program is to continue monitoring efforts to document population trends and to learn more about factors that may limit breeding success and survivorship. The ultimate goal is to develop management actions that will result in a population that is self-sustaining.

Fifty-seven nesting structures were surveyed for falcons during the 2005 breeding season. Surveys resulted in the documentation of 21 occupied territories. For the first time in several years, a successful breeding attempt was documented in the mountains. Sixteen breeding attempts produced 38 chicks that survived beyond fledging (reproductive rate 1.8 chicks/occupied territory and 2.4 chicks/active territory). As in previous years, hatching rate continued to be relatively low. Of 14 clutches that were followed completely, only 39 of 48 (81.3%) eggs hatched. Of these 39 chicks, 38 (92.3%) fledged. It should be noted that much of the chick production resulted from management actions taken during the breeding season. Thirteen (34.2%) of the 38 chicks known to fledge were the result of translocations. Many of these birds would most likely have been lost if left in place. Translocation of chicks from bridge sites known to have a history of poor fledging success to mountain hack sites has improved chick survivorship and increased the potential for birds to re-colonize the historic mountain breeding range. This management practice should continue for the foreseeable future.

## **BACKGROUND**

### **Context**

The original population of peregrine falcons in the eastern United States was estimated to contain approximately 350 breeding pairs (Hickey 1942). From published records and accounts, there have been 24 historical Peregrine eyries documented in the Appalachians of Virginia (Gabler 1983). Two additional nesting sites were documented on old osprey nests along the Virginia portion of the Delmarva Peninsula (Jones 1946). Throughout the 1950's, and into the 1960's Peregrine Falcon populations throughout parts of Europe and North America experienced a precipitous decline (Hickey 1969). A survey of 133 historic eyries east of the Mississippi River in 1964 failed to find any active sites (Berger et al. 1969). The Peregrine Falcon was believed to be extinct in Virginia as a breeding species by the early 1960's.

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, wild-reared falcons have been translocated from coastal breeding sites to mountain release sites. Such movements have taken advantage of young produced from sites where fledging success is known to be poor.

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 the coastal plain has now exceeded 15 pairs. However, both hatching rate and chick survival remain somewhat erratic. An analysis by the U.S. Fish and Wildlife Service in the early 1990's 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

The geographic scope of this project was limited to the coastal plain of Virginia. Given the known number of breeding pairs of Peregrine Falcons in the mountains of surrounding states, it seems likely that breeding pairs do occur in the mountains. Limited nesting activity has been recorded within Shenandoah National Park and that area continues to be the primary focus of the hacking program.

### Nest Site Surveys

Between 1977 and 2005 more than 60 structures have been established specifically for breeding Peregrine Falcons within the coastal plain of Virginia (Table 1, Figure 1). Nearly all of the structures that survived to the 2004 breeding season were checked for evidence of resident falcons. An initial survey of breeding structures was conducted between 1 March and 15 April. All surveys of towers and boxes along the Delmarva Peninsula and fringe of the western shore were surveyed from the air using a Cessna 172, high-wing aircraft. Fly bys were conducted at low altitude to flush attending adults and to view the inside of nest boxes for activity. 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 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 (i.e. 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. Nest sites were visited approximately 2 wks 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. 2002).



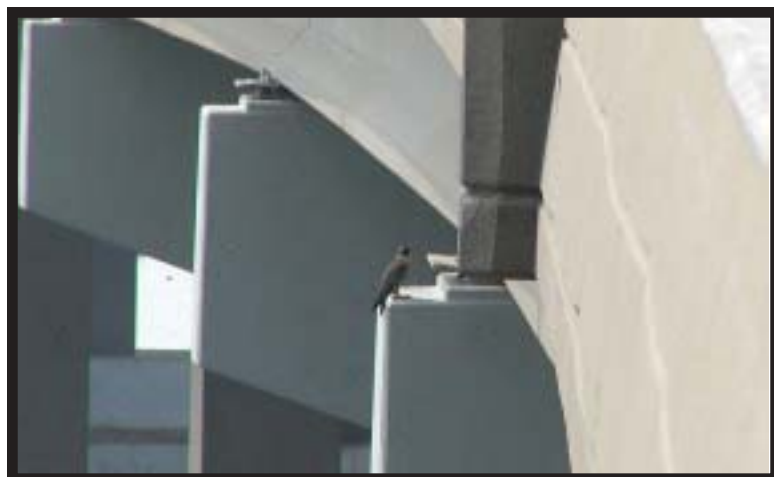
*Peregrine brood in the life tower of the Benjamin Harrison Bridge ready to be*

**Table 1.** Catalog of nesting structures established for Peregrine Falcons in Virginia (1977-2004). Table gives year of establishment and whether or not the site was checked for Peregrine Falcon activity during the 2005 breeding season. Dashed lines indicate that the structure is no longer present.

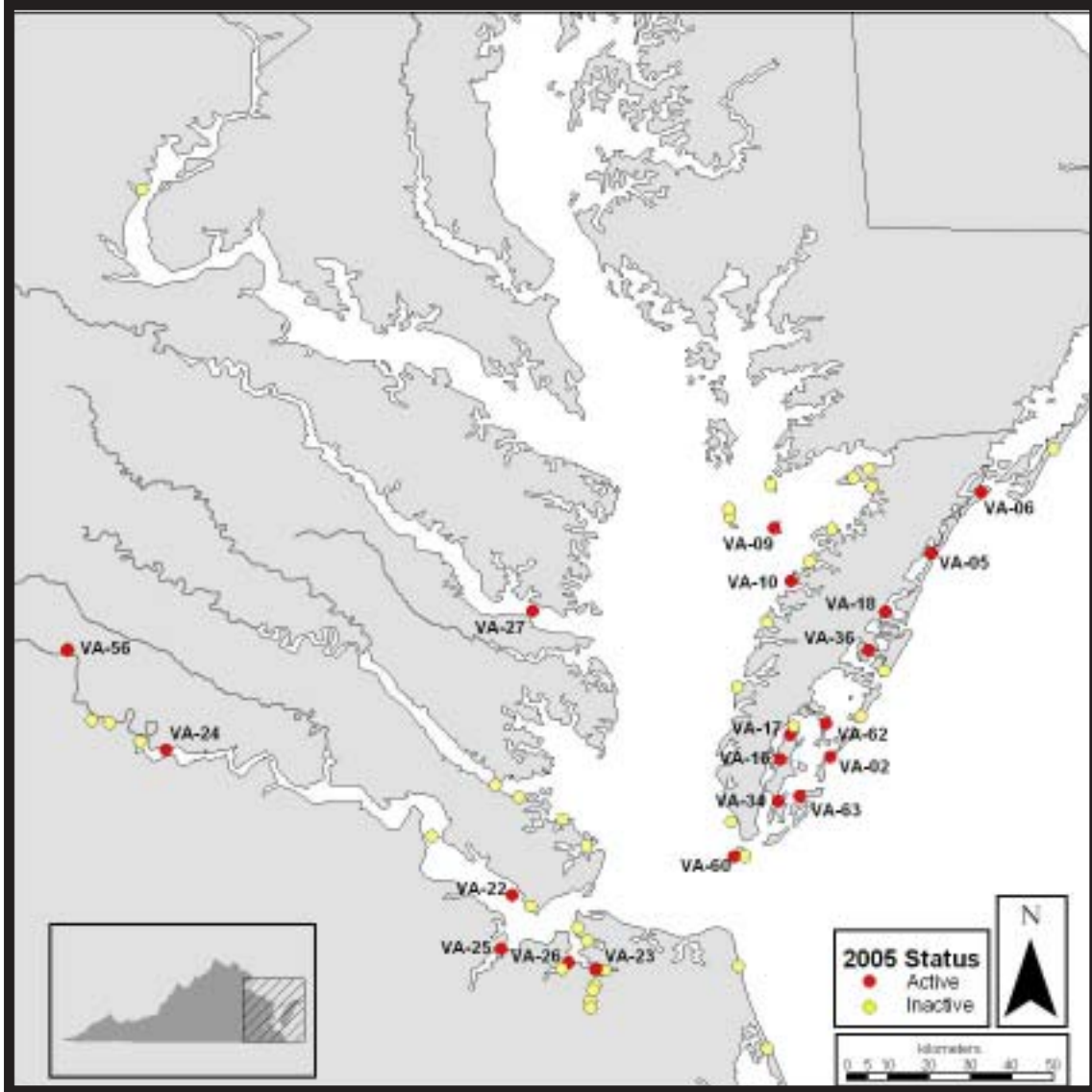
Site Code	Location Description	Structure Type	Year Est.	Checked 2005
VA-PEFA-01	Fisherman's Island Tower	Peregrine Tower	1980	Y
VA-PEFA-02	Cobb Island Tower	Peregrine Tower	1978	Y
VA-PEFA-03	Hog Island Tower	Peregrine Tower	1977	Y
VA-PEFA-04	Paramore Island Tower	Peregrine Tower	1982	-----
VA-PEFA-05	Metomkin Island Tower	Peregrine Tower	1982	Y
VA-PEFA-06	Wallops Island Tower	Peregrine Tower	1981	Y
VA-PEFA-07	Chincoteague Tower	Peregrine Tower	1979	Y
VA-PEFA-08	Great Fox Island Tower	Peregrine Tower	1981	Y
VA-PEFA-09	Watts Island Tower	Peregrine Tower	1997	Y
VA-PEFA-10	Finney's Island Tower	Peregrine Tower	1997	Y
VA-PEFA-11	Tangier Island Water Tower	Nest Box	1999	-----
VA-PEFA-12	Hyslop Marsh Tower2T	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	Nest Box/Tower	1997/2004	Y
VA-PEFA-18	Wachapreague Shack	Peregrine Tower	1994/2000	Y
VA-PEFA-19	James River Ghost Ship	Moth Ball Fleet	1987	Y
VA-PEFA-20	Coleman Bridge Box	Nest Box	1989	Y
VA-PEFA-21	Norfolk Southern RR Bridge	Bridge	1992	N
VA-PEFA-22	James River Bridge	Nest Box	1991	Y
VA-PEFA-23	Berkley Bridge	Nest Box	1996	Y
VA-PEFA-24	Benjamin Harrison Bridge	Nest Box	1996	Y
VA-PEFA-25	Mills Godwin Bridge	Nest Box	1996	Y
VA-PEFA-26	West Norfolk Bridge	Nest Box	1996	Y
VA-PEFA-27	Norris Bridge	Nest Box	1989	Y
VA-PEFA-28	Stoney Man, SNP	Natural Cliff Face	-----	Y
VA-PEFA-29	Old Rag, SNP	Natural Cliff Face	-----	Y
VA-PEFA-30	Back Bay tower	Peregrine Tower	1982	-----
VA-PEFA-31	Plum Tree Island tower	Peregrine Tower	1998	Y
VA-PEFA-32	Plum Tree Island box	Nest Box	1990	Y
VA-PEFA-33	Saxis Marsh W. tower	Peregrine Tower	1998	Y
VA-PEFA-34	Mockhorn Island tower	Peregrine Tower	1997	Y
VA-PEFA-35	Tangier Island tower	Peregrine Tower	2000	-----
VA-PEFA-36	Upsher Bay tower	Peregrine Tower	2000	Y

**Table 1.** –continued–

Site Code	Location Description	Structure Type	Year Est.	Checked 2005
VA-PEFA-37	Silver Beach Range Tower	Nest Box	1997	Y
VA-PEFA-38	Hawksbill Mountain	Natural Cliff Face	-----	Y
VA-PEFA-39	Concrete Ships	Nest Box	1995	Y
VA-PEFA-40	Chesapeake 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-44	Elizabeth River Substation	Nest Box	1998	Y
VA-PEFA-45	Cargill Grain Elevator	Nest Box	1993	Y
VA-PEFA-46	Lafayette Bridge	Nest Box	1998	Y
VA-PEFA-47	North Elkins Shack	Nest Box	1994	Y
VA-PEFA-48	Churchland Bridge	Nest Box	1999	Y
VA-PEFA-49	Yorktown Substation	Nest Box	1998	Y
VA-PEFA-50	Jordan Bridge	Nest Box	1995	Y
VA-PEFA-51	Campostella Bridge	Nest Box	1998	Y
VA-PEFA-52	I-64 Bridge	Nest Box	1999	Y
VA-PEFA-53	ALCOA Bridge	Nest Box	1999	Y
VA-PEFA-54	I-295 Bridge	Nest Box	2001	Y
VA-PEFA-55	Dominion Building	Nest Box	2000	Y
VA-PEFA-56	River Front Plaza	Nest Box	2002	Y
VA-PEFA-57	BB&T Building	Nest Box	1984	Y
VA-PEFA-58	Russell Island	Peregrine Tower	1982	-----
VA-PEFA-59	Bermuda Hundred	Nest Box	1998	Y
VA-PEFA-60	Chesapeake Bay Bridge	Nest Box	2004	Y
VA-PEFA-61	Tappahannock Bridge	Nest Box	2004	Y
VA-PEFA-62	Gull Marsh	Peregrine Tower	2004	Y
VA-PEFA-63	Godwin Island Box	Nest Box	2004	Y



*Adult male Peregrine on West Norfolk Bridge. A pair was resident at this site but no breeding attempt was recorded. Photo by Bryan Watts.*



**Figure 1.** Map of coastal Virginia indicating the location of nesting structures established for Peregrine Falcons. Red circles indicate the location of structures occupied by resident pairs during the 2005 breeding season. Yellow circles indicate locations that were not occupied.

## Banding

An attempt was made to band all chicks surviving to banding age (21-32 d). Chicks were banded with a U.S. Fish and Wildlife Service lock-on, aluminum tarsal band on the right leg and a bi-colored, green and black, alpha-numeric auxiliary band on the left leg. FWS bands used in Virginia during the 2005 breeding season were anodized green. Band size 6 and 7 were used for male and female chicks respectively. Auxiliary bands were applied with two pop rivets.



*Mitchell Byrd with young falcon just after banding.  
Photo by Bryan Watts.*

## **Translocations**

Over the past several years, some breeding sites on bridges have been known to experience low fledging rates. Observations indicate that losses occur during initial flight attempts or when chicks are near fledging age. 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 bridge 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).

## **RESULTS**

### **Site Surveys**

Fifty-seven nesting structures were surveyed for Peregrine Falcon activity during the breeding season (Table 1). Only one structure that is still standing was not surveyed and it is within the territory of a pair nesting on a nearby structure. Of the sites with known occupation, 21 supported resident pairs. These included 10 peregrine towers, 7 bridges, 2 shack remnants on the seaside of the Delmarva, 1 high-rise building, and 1 natural cliff face (Table 2).

**Table 2.** Summary of productivity results for Peregrine Falcon pairs in Virginia during the 2005 breeding season.

Site Code	Location Description	Occ Terr	Active Nest	Eggs	Chicks Hatched	Band Age	Fledg
PEFA-02	Cobb Island Tower	Y	N	-----	-----	-----	-----
PEFA-05	Metomkin Island Tower	Y	Y	4	3	3	3
PEFA-06	Wallops Island Tower	Y	Y	3	3	3	3
PEFA-09	Watts Island Tower	Y	Y	3	2	2	2
PEFA-10	Finney's Island Tower	Y	Y	3	3	2	2 <sup>1</sup>
PEFA-16	Elkins Marsh Chimney	Y	N	-----	-----	-----	-----
PEFA-17	Elkins Marsh Tower	Y	Y	3	2	2	2
PEFA-18	Wachapreague Shack	Y	N	-----	-----	-----	-----
PEFA-22	James River Bridge	Y	N	-----	-----	-----	-----
PEFA-23	Berkley Bridge	Y	Y	≥1	≥1	1	1
PEFA-24	Ben Harrison Bridge	Y	Y	4	3	3	2 <sup>2</sup>
PEFA-25	Mills Godwin Bridge	Y	Y	4	4	4	4 <sup>3</sup>
PEFA-26	West Norfolk Bridge	Y	N	-----	-----	-----	-----
PEFA-27	Norris Bridge	Y	Y	3	2	2	2 <sup>4</sup>
PEFA-28	Stoney Man, SNP	Y	Y	≥1	≥1	1	1
PEFA-34	Mockhorn Island tower	Y	Y	3	2	2	2
PEFA-36	Upsher Bay tower	Y	Y	4	4	4	4
PEFA-57	BB&T Building	Y	Y	3	3	3	3 <sup>5</sup>
PEFA-60	Chesapeake Bay Bridge	Y	Y	4	4	4	4 <sup>6</sup>
PEFA-62	Gull Marsh Tower	Y	Y	4	2	1	1
PEFA-63	Godwin Island Box	Y	Y	3	2	2	2
Total		-----	-----	≥50	≥41	39	38

<sup>1</sup>2 birds translocated to Shenandoah National Park (SNP) and successfully released.

<sup>2</sup>2 birds translocated to (SNP) and successfully released, remaining bird killed on roadway.

<sup>3</sup>All 4 birds translocated to SNP and successfully released.

<sup>4</sup>Both birds translocated to SNP and successfully released.

<sup>5</sup>two birds fledged successfully on site, remaining bird translocated to SNP and successfully released.

<sup>6</sup>two birds translocated to Dominion Clover substation and successfully released, remaining 2 birds assumed to have fledged from bridge.

## Breeding Results

Virginia supported 21 known breeding pairs of Peregrine Falcons during the 2005 breeding season including 20 on the Coastal Plain and 1 in the mountains (Figure 1). Five of these pairs were not documented to produce eggs such that there were only 16 active territories (Table 2). Pairs not making breeding attempts included Wachapreague and West Norfolk that seem to be erratic in recent years for unknown reasons, James River Bridge where the female appears to be beyond her reproductive life, Elkins Chimney

where the female has not produced eggs in many years, and Cobb Island where both adults were lost and a triad formed early in the season. The Cobb Island tower has been used consistently over the years and has been a productive territory. Over the winter season, both adults were apparently lost. Survey of this site early in the spring suggested that 2 males and 1 female was present. Contests to control the site delayed the formation of a stable pair until late in the season. This delay eliminated the possibility of a breeding attempt during the 2005 season. A young female was detected on the Chincoteague tower in March but no resident pair was ever documented.

Remaining 16 pairs produced >50 eggs, at least 41 of which hatched. Thirty-nine of these chicks survived to banding age and 38 appeared to have fledged successfully. Fledging success was 1.8 chicks/occ terr and 2.4 chicks/act terr. It should be noted that much of the chick production resulted from management actions taken during the breeding season. Thirteen (34.2%) of the 38 chicks known to fledge were the result of translocations. Many of these birds would most likely have been lost if left in place.

Compared to recent years, hatching rate within the Virginia population was higher but survival to fledging was lower. Of 14 clutches that were followed completely from laying to fledging, only 39 of 48 (81.3%) eggs hatched. Of these 39 chicks, 37 (94.9%) survived to banding age and 36 (92.3%) fledged successfully. One of the chicks on the Finney's Island tower that was observed hatching was not present during the next visit. Both remaining chicks would likely have been lost later if they had not been taken to Shenandoah to be hacked. The adult male was not observed at this site after chicks hatched and both chicks were in poor condition. One of the 2 chicks on the tower on Gull Marsh disappeared prior to banding age. The single chick left on the Benjamin Harrison Bridge was hit by a car in the road bed shortly after fledging.

## **Banding**

All of the falcon chicks (N = 39) that survived to banding age were fitted with both FWS and alpha-numeric bands. This included 11 females and 28 males (Table 3).

## **Translocations**

Thirteen young falcons were moved to hack sites during the course of the 2005 breeding season (Table 4). This included 3 females and 10 males. Ten of these chicks originated on bridges that have a history of poor fledging success. The remaining 3 chicks were from an office building in Richmond (1) and from the Finney's Island tower. This 2-chick brood was not progressing due to the apparent loss of the adult male so the decision was made to release them in the mountains to give them a better chance of fledging successfully. Eleven of the translocated birds were hacked and released at Hawksbill in Shenandoah National Park and were tended by park staff. The remaining 2 birds were hacked at the Clover power substation near Danville and were tended by Dominion employees.

**Table 3.** List of band codes for peregrine falcon chicks banded in Virginia during 2005 breeding season.

<b>FWS Band</b>	<b>A-N Band</b>	<b>Location</b>	<b>Date</b>
<b>Females</b>			
987-51294	8/U	Berkley Bridge	5-13-05
987-51295	8/V	Benjamin Harrison Bridge	5-19-05
987-51296	8/W	BB&T Building	5-19-05
987-51297	8/X	Norris Bridge	5-20-05
987-51298	8/Y	Elkins Marsh Tower	5-25-05
987-51299	8/Z	Upsher Bay Tower	5-31-05
987-51300	00/V	Finney's Island Tower	6-1-05
1807-02708	01/V	Chesapeake Bay Bridge	6-1-05
1807-02709	02/V	Chesapeake Bay Bridge	6-1-05
1807-02710	03/V	Godwin Island	6-13-05
1807-02711	04/V	Mockhorn Island	6-13-05
<b>Males</b>			
2206-43499	*5/*Y	Mills Godwin Bridge	5-13-05
2206-43500	00-Y	Mills Godwin Bridge	5-13-05
2206-81601	01-Y	Mills Godwin Bridge	5-13-05
2206-81602	02-Y	Mills Godwin Bridge	5-13-05
2206-81603	03-Y	Benjamin Harrison Bridge	5-19-05
2206-81604	04-Y	Benjamin Harrison Bridge	5-19-05
2206-81605	05-Y	BB&T Building	5-19-05
2206-81606	06-Y	BB&T Building	5-19-05
2206-81607	07-Y	BB&T Building	5-19-05
2206-81608	08-Y	Norris Bridge	5-20-05
2206-81609	09-Y	Elkins Marsh Tower	5-25-05
2206-81610	10-Y	Upsher Bay Tower	5-31-05
2206-81611	11-Y	Upsher Bay Tower	5-31-05
2206-81612	12-Y	Upsher Bay Tower	5-31-05
2206-81613	13-Y	Watts Island Tower	5-31-05
2206-81614	14-Y	Watts Island Tower	5-31-05
2206-81615	15-Y	Finney's Island Tower	6-1-05
2206-81616	16-Y	Chesapeake Bay Bridge	6-1-05
2206-81617	17-Y	Chesapeake Bay Bridge	6-1-05
2206-81618	18-Y	Godwin Island	6-13-05
2206-81619	19-Y	Mockhorn Island Tower	6-13-05
2206-81620	20-Y	Wallops Island Tower	6-14-05
2206-81621	21-Y	Wallops Island Tower	6-14-05
2206-81622	22-Y	Wallops Island Tower	6-14-05
2206-81623	23-Y	Metomkin Island Tower	6-14-05
2206-81624	24-Y	Metomkin Island Tower	6-14-05
2206-81625	25-Y	Metomkin Island Tower	6-14-05
2206-81626	15-V	Gull Marsh Tower	6-27-05

**Table 4.** Summary of translocation activities for Peregrine Falcons in Virginia during the 2005 breeding season.

<b>FWS Band#</b>	<b>Hatch Site</b>	<b>Date Moved</b>	<b>Translocation Site</b>
2206-43499	Mills Godwin Bridge	5-13-05	Shenandoah National Park
2206-43500	Mills Godwin Bridge	5-13-05	Shenandoah National Park
2206-81601	Mills Godwin Bridge	5-13-05	Shenandoah National Park
2206-81602	Mills Godwin Bridge	5-13-05	Shenandoah National Park
987-51295	Benjamin Harrison	5-19-05	Shenandoah National Park
2206-81604	Benjamin Harrison	5-19-05	Shenandoah National Park
2206-81607	BB&T Building	5-19-05	Shenandoah National Park
987-51297	Norris Bridge	5-20-05	Shenandoah National Park
2206-81608	Norris Bridge	5-20-05	Shenandoah National Park
2206-81616	Chesapeake Bay Bridge	6-1-05	Clover Substation
2206-81617	Chesapeake Bay Bridge	6-1-05	Clover Substation
987-51300	Finney's Island Tower	6-7-05	Shenandoah National Park
2206-81615	Finney's Island Tower	6-7-05	Shenandoah National Park

## DISCUSSION

The breeding population of Peregrine Falcons in coastal Virginia increased to 21 pairs during the 2005 breeding season. The population increased from 19 pairs in 2004, 18 pairs in 2003 and 17 pairs for the previous 5 years. Fledging rate was the highest recorded during the recent past.

In recent years, pairs nesting on bridges represent approximately 30% of the breeding population. Historically, fledging success from some of these bridges have been relatively poor. Chicks apparently have a difficult time negotiating the wind currents around these structures and frequently do not make it back to the aeries during early flight attempts. These birds often end up in the water or on the road bed below. Translocation of chicks from these locations to mountain hack sites has increased fledging success and potentially could result in some re-colonization of their historic mountain range. In 2005 more than 30% of productivity resulted from the translocation of birds from these high-risk sites to hack sites. Whenever opportunities allow, the translocation program should continue to take advantage of chick production that would otherwise be lost.

For the first time since the mid-1990s Peregrine Falcons were documented to make a breeding attempt in the mountains of Virginia. During the 2004 season, a pair seemed to be forming around Stoney Man in Shenandoah National Park. This pair was again present during the 2005 season. Park biologists investigated the aerie used by peregrines earlier but found no evidence of a breeding attempt early in the season. However, it was determined later that the pair had made a successful attempt within an

alternate site. E. Long repelled down into the site only to find that a bird had fledged a couple of days prior. It appears that a single female fledged from this site. Since the visit was post fledging, this bird was not banded.

Reproductive rate was much improved in 2005 compared to the past 5 years greatly exceeding that believed to be required for population maintenance. However, hatching rate continues to be a concern. Of 48 eggs followed through hatching, 9 (19%) did not hatch. As has been the case in previous years, some of the eggs collected were cracked and thin-shelled. A direct connection between these and other events within the population and environmental contaminants has not been established though contaminants have been detected within addled eggs.

Addled eggs collected from the population in 1992 (Morse 1993) revealed DDE concentrations within ranges that have been shown to have adverse impacts on reproduction in previous studies (Wiemeyer et al. 1986). Egg-shell thinning ranged up to 26.9%, a level above the reported 14% to 17% range that has been documented to result in egg failure (Peakall and Kiff 1988). Sixteen addled eggs were collected during the 2001 and 2002 breeding seasons and examined by Kat Potter in Rob Hale's lab at the Virginia Institute of Marine Science (Potter 2004). Analysis revealed detectable concentrations of many different compounds including DDE. A relationship between DDE concentrations and shell thickness was documented. The study identified an unusual congener pattern of polybrominated diphenyl ethers (PDBEs). This group of compounds is environmentally persistent and used widely as flame retardants. Continued monitoring of contaminant exposure within this population seems warranted. Eleven eggs collected during the 2004 breeding season and 5 eggs collected during the 2005 breeding season were transferred to Rob Hale's lab for analysis.

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