2011

Virginia Peregrine Falcon Monitoring and Management Program: Year 2011 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
Virginia Department of Transportation
The Nature Conservancy
Dominion Power
Center for Conservation Biology

Front Cover: *Adult female breeding on Godwin Island, VA in 2011. Banded as a chick in on Watts Island in 2002 with band black over green *9/*U. Photograph by Barton Paxton.*

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.

Contents

EXECUTIVE SUMMARY

The Peregrine Falcon (*Falco peregrinus*) was believed to be extinct as a breeding species in Virginia by the mid-1960s. Intensive management efforts since the late 1970s have resulted in a known breeding population that has now exceeded 20 pairs. However, most known breeding pairs currently nests on artificial structures and reproductive performance continues to be erratic. The primary objective of this program is to continue to monitor population trends and to improve reproductive performance through active management. The ultimate goal of the program is to recover a population that is self-sustaining.

The Virginia breeding population supported 25 known pairs during the 2011 breeding season. Since 1982, the population has exhibited a steady recovery with an average doubling time of 5.4 years. Fifty-six nesting structures were surveyed for Peregrine Falcon activity during the 2011 breeding season. Occupied nesting structures included 10 peregrine towers and 2 fishing shacks on the Delmarva Peninsula; 6 bridges, 1 retired ship, 1 power plant stack, and 1 high-rise building in the coastal plain; and 4 natural cliff sites in the mountains. Nineteen falcon pairs made breeding attempts producing 59 eggs and 40 chicks that survived to banding age. Reproductive rate was 2.1 chicks/occupied territory and 2.63 chicks/active territory. Of 14 clutches that were followed completely from laying to fledging, 46 of 49 (93.8%) eggs hatched, 36 of the 44 (81.8%) chicks survived to banding age, and at least 19 fledged successfully.

Fourteen falcons representing 35% of the chicks produced in the state were translocated from the coast to the mountains during the 2011 breeding season. This included 5 females and 9 males. Three of these chicks originated on bridges that have a history of poor fledging success. The remaining chicks were from towers along the Delmarva Peninsula. Birds collected from territories were transported to Franklin Cliffs in Shenandoah National Park, and Grandview in New River Gorge National River. The management strategy initiated in 2006 to utilize productivity along the Delmarva to fuel targeted hacks in the mountains was continued in 2011. This strategy meets the objective of both repopulating the mountain range and reducing impacts to sensitive waterbirds.

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 1950s, and into the 1960s, 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 1960s.

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. Since the program began in 2000, over 200 wild-reared falcons have been translocated from coastal breeding sites in Virginia to mountain release sites in Virginia and West Virginia. 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 Virginia now exceeded 20 pairs (Figure 1). 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 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.

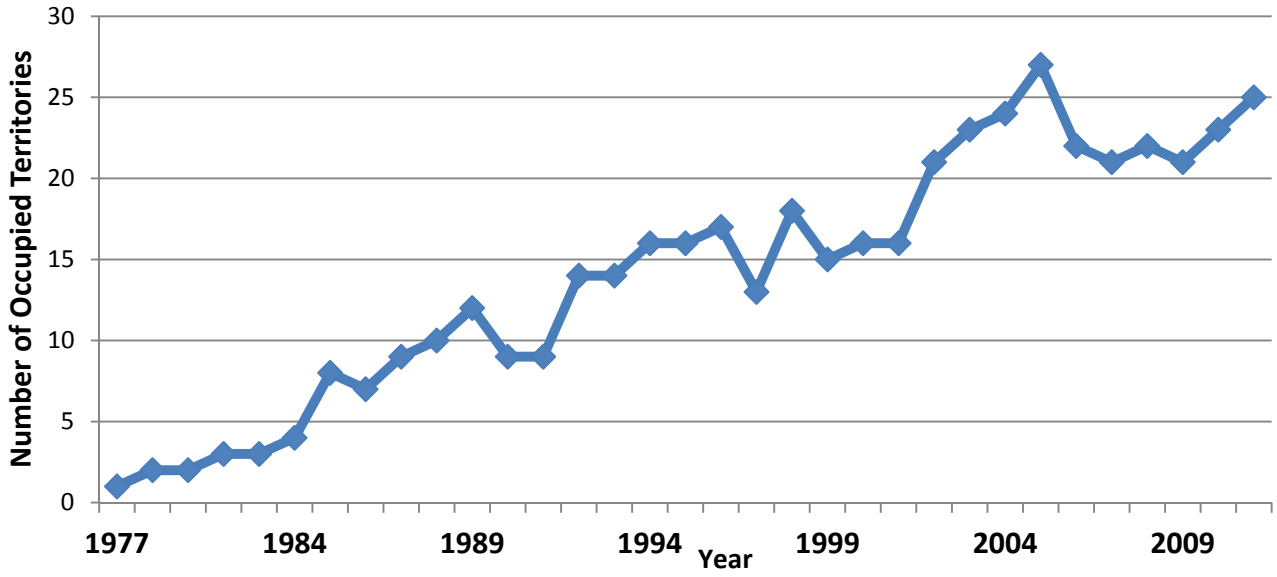

Figure 1. Breeding population of Peregrine Falcons in Virginia 1977-2011.

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

In 2011, the geographic scope of this project included 21 breeding locations within the coastal plain, 4 mountain cliff nesting sites, and 2 mountain hack sites at Franklin Rocks in Shenandoah National Park and Grandview in New River Gorge National River, WV (Figures 2 and 3). Most of the effort was focused on the coastal plain where the majority of breeding pairs occur. In addition, breeding pairs documented by project partners at VDGIF (Harding 2011) and NPS (R. Gubler pers. comm.) are included in the state wide totals.

Figure 2. Map of territories monitored during the 2011 breeding season.

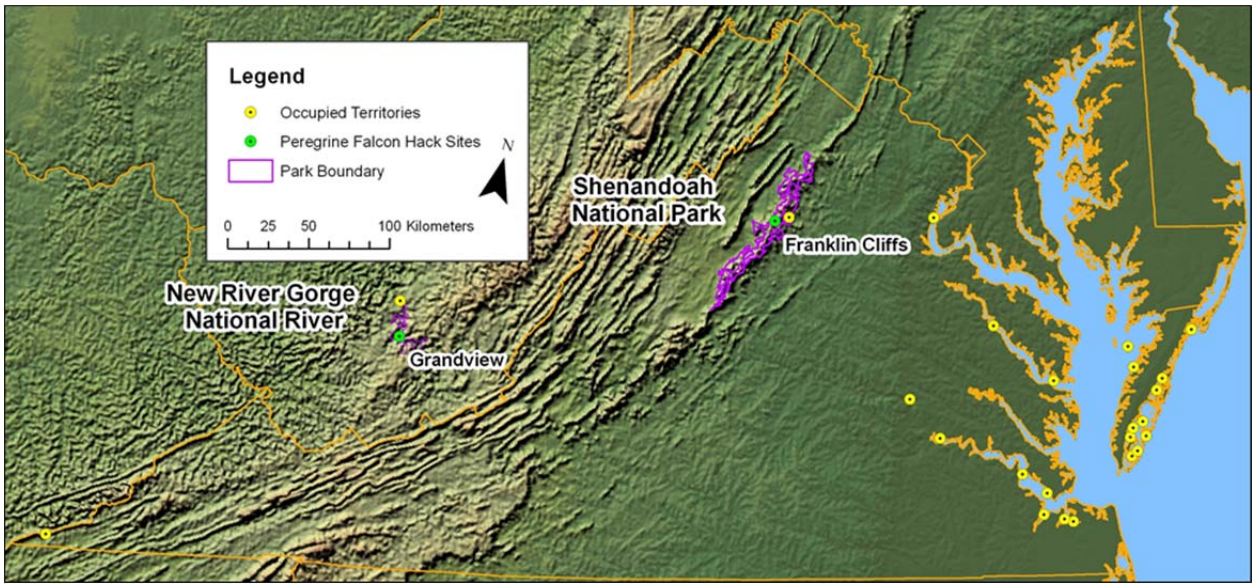

Figure 3. Hack sites where Virginia falcons were released in 2011.

Grandview hack site. (photo:TRAC)

Franklin Cliffs hack site. (photo NPS)

Nest Site Surveys

Between 1977 and 2004, more than 60 structures were established specifically for breeding Peregrine Falcons within the coastal plain of Virginia (Table 1). All of the structures on the coastal plain that survived to the 2011 breeding season were checked for evidence of resident falcons. An initial survey of breeding structures was conducted between 1 March and 30 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. Mountain sites were monitored by project partners.

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).

Banding

An attempt was made to band all chicks surviving to banding age (18-32 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. USFWS bands used in Virginia during the 2011 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.

Bill Williams and Mitchell Byrd band the chicks at Cobb Island.

Fletcher Smith accesses a peregrine tower on Elkins Marsh at high tide.

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 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 and reducing the impacts of the breeding Peregrine population on sensitive waterbirds (Long and Watts, unpublished data), chicks were taken from selected nesting sites along the seaside of the Delmarva Peninsula to be hacked from high priority mountain sites (Figure 3).

RESULTS

Site Surveys

Fifty-seven nesting structures were surveyed for Peregrine Falcon activity during the breeding season (Table 1). Of the sites with known occupation, 25 supported resident pairs. These included 10 peregrine towers, 6 bridges, 1 reserve ship, 1 power plant stack, 2 fishing shacks, 4 cliff sites, and 1 high-rise building (Table 2).

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 2011breeding season. Dashed lines indicate that the structure is no longer present.

Site Code	Location Description	Structure Type	Year Est	Checked 2011
VA-PEFA-01	Fisherman's Island Tower	Peregrine Tower	1980	------[a]
VA-PEFA-02	Cobb Island Tower	Peregrine Tower	1978	Y
VA-PEFA-03	Hog Island Tower	Peregrine Tower	1977	-----
VA-PEFA-04	Paramore Island Tower	Peregrine Tower	1982	-----
VA-PEFA-05	Metompkin Island Tower	Peregrine Tower	1982	-----[b]
VA-PEFA-06	Wallops Island Tower	Peregrine Tower	1981	Y[c]
VA-PEFA-07	Chincoteague Tower	Peregrine Tower	1979	-----
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 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-19	James River Ghost Ship 1	Moth Ball Fleet	1987	-----
VA-PEFA-20	Coleman Bridge Box	Nest Box	1989	Y
VA-PEFA-21	Norfolk Southern RR Bridge	Bridge	1992	Y
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	Little Stony Man, SNP	Natural Cliff Face	-----	Y[d]
VA-PEFA-29	Old Rag, SNP	Natural Cliff Face	-----	Y[d]
VA-PEFA-30	Back Bay Tower	Peregrine Tower	1982	-----
VA-PEFA-31	Plum Tree Island Tower	Peregrine Tower	1998	-----
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

Site Code	Location Description	Structure Type	Year Est	Checked 2011
VA-PEFA-37	Silver Beach Range Tower	Nest Box	1997	Y
VA-PEFA-38	Hawksbill Mountain	Natural Cliff Face	-----	Y[d]
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 Building	Nest Box	2002	Y[e]
VA-PEFA-57	BB&T Building	Nest Box	1984	Y
VA-PEFA-58	Russell Island Tower	Peregrine Tower	1982	Y
VA-PEFA-59	Bermuda Hundred	Nest Box	1998	Y
VA-PEFA-60	Chesapeake Bay Bridge	Nest Box	2004	-----
VA-PEFA-61	Tappahannock Bridge	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-64	James River Ghost Ship 2	Moth Ball Fleet	------	Y[f]
VA-PEFA-65	Craddock Neck	Peregrine Tower		N
VA-PEFA-66	Hoffler Building Virginia Beach	Nest Box	2009	Y
VA-PEFA-67	White Rocks	Natural Cliff Face	------	Y[d]
VA-PEFA-68	Big House Mountain	Natural Cliff Face	------	Y[e]
VA-PEFA-69	Breaks Interstate Park	Natural Cliff Face	------	Y[e]

[a] Nest box removed by USFWS in 2011. Tower used as nest platform by Ospreys.
[b] Nest tower removed by staff from The Nature Conservancy and CCB in January 2010.
[c] Nest monitored by NASA.
[d] Nest monitored by NPS.
[e] Nest monitored by VDGIF.
[f] Nest monitored by USDOT.

Table 2. Summary of productivity results for Peregrine Falcon pairs in Virginia during the 2011 breeding season.

Site Code	Location Description	Occupied Territory	Active Nest	No. Eggs	Chicks Hatched	Band Age	Fledged
VA-PEFA-02	Cobb Island Tower	Y	Y	4	4	4	≥2
VA-PEFA-06	Wallops Island Tower	Y	Y	3	3	0[a]	
VA-PEFA-09	Watts Island Tower	Y	Y	≥3	3	3	?[b]
VA-PEFA-10	Finney's Island Tower	Y	Y	4	3	3	≥1
VA-PEFA-12	Hyslop Marsh Tower	Y	Y	3	3	3[c]	≥1
VA-PEFA-16	Elkins Marsh Chimney	Y	Y	3	2	1[d]	1
VA-PEFA-17	Elkins Marsh Shack Tower	Y	Y	5	4	4	4[e]
VA-PEFA-18	Wachapreague Shack Tower	Y	Y	2	2	2	2
VA-PEFA-22	James River Bridge	Y	Y	4	3	2	0
VA-PEFA-23	Berkley Bridge	Y	N	0			
VA-PEFA-24	Benjamin Harrison Bridge	Y	Y	≥2	≥2	0	≥1
VA-PEFA-25	Mills Godwin Bridge	Y	Y	≥2	2	1[f]	1
VA-PEFA-26	West Norfolk Bridge	Y	N	0			
VA-PEFA-27	Norris Bridge	Y	Y	3	2	2[g]	2
VA-PEFA-29	Old Rag, SNP	Y	Y	3	0[h]		
VA-PEFA-34	Mockhorn Island Tower	Y	N	0[i]			
VA-PEFA-36	Upsher Bay Tower	Y	Y	3	3	3[j]	0
VA-PEFA-42	Possum Point Substation	Y	Y	≥1	≥1	1	1
VA-PEFA-56	River Front Plaza Building	Y	Y	4	4	1[n]	0[k]
VA-PEFA-62	Gull Marsh Tower	Y	Y	4	4	4[l]	4
VA-PEFA-63	Godwin Island Box	Y	Y	4	4	4[m]	3
VA-PEFA-64	James River Ghost Ship 2	Y	N				
VA-PEFA-67	White Rocks	Y	U				
VA-PEFA-68	Big House Mountain	Y	Y	≥2	≥2	2[n]	≥1
VA-PEFA-69	Breaks Interstate Park	Y	U				

[a] No evidence of egg shells remained in nest. Assumed chicks died after hatching.
[b] The nest was not rechecked to determine fledging status.
[c] Two of the three chicks were found alive on the ground under the nest tower during the banding visit. They appeared uninjured and were returned to the nest. We assumed they were blown off the tower by wind.
[d] The chick was not banded prior to fledging.
[e] 3 young translocated to New River Gorge.
[f] 1 young translocated to New River Gorge.
[g] 2 young translocated to New River Gorge.
[h] Pair abandoned eggs and moved to Stoney Man
[l] Barn Owl breeding on falcon tower.
[j] 2 young translocated to Shenandoah
[k] chick died after collision with building shortly after fledging
[l] 3 young translocated to Shenandoah
[m] 3 young translocated to New River Gorge
[n] chicks banded by VDGIF

Breeding Results

Virginia supported 25 known breeding pairs of Peregrine Falcons during 2011 (Table 2). The 19 falcon pairs that were documented making breeding attempts produced 59 eggs, at least 56 of which hatched. Only 23 were documented to survive to fledging age. The reproductive rate was 2.0 chicks/occupied territory and 2.63 chicks/active territory (Figure 4). During the 2011 breeding season, hatching rates were again at a record high while fledging rates continued to decline (Figure 5). This reduction in fledging success occurred when broods from two bridges and one building were left to fledge on site. Of 14 clutches that were followed completely from laying to fledging, 39 of 43 (90.6%) eggs hatched, 33 of the 39 (84.6%) chicks survived to banding age, and 21 of 33 chicks (63.6%) fledged successfully.

- The Tappahannock bridge (VA-PEFA-61) pair seems to have dispersed. An unbanded adult female was seen in late winter and then sporadically throughout the breeding season. A second bird or breeding attempts were not documented in 2011.
- A new adult female was documented at the nest box on the I-64 bridge (VA-PEFA-52). She was double banded but band colors or numbers were unobtainable.
- The pair using the Hoffler Building (VA-PEFA-66) continue to use the site only in winter and leave by late April.
- The pair on the Benjamin Harrison Bridge (VA-PEFA-24) moved their nest into the bridge structure on the west tower. The nest was not discovered until the chicks were 40+ days old and could not be banded.
- The two chicks on the James River Bridge (VA-PEFA-22) were left at the bridge after banding to fledge on site. Neither bird were seen after their first flight. In addition, the new adult male at JRB was the male previously at the James River Reserve Fleet (VA-PEFA-64). The male was hardly ever seen at the JRB nest and we suspect he was moving between the two territories.
- The JRRF (VA-PEFA-64) pair was not seen using either of the previous nesting sites on the ship. It is possible they nested in an unknown location on one of the ships in the ghost fleet.
- A single adult peregrine was documented perched on structures in the channel and on Metompkin. A pair has not been documented in that territory since the Metompkin tower (VA-PEFA-05) was removed by CCB.
- A new breeding pair was discovered at House Mountain (VA-PEFA-68) by VDGIF. The adult male is banded with a green USFWS band indicating it originated from a Virginia nest.
- The nest box at Mockhorn Island (VA-PEFA-34) was in use by barn owls when we checked the site in April. There was one downy owl chick in the nest and a chick carcass on the ground at the base of the tower. Both adult peregrines were present at the tower and we assumed they killed the chick.

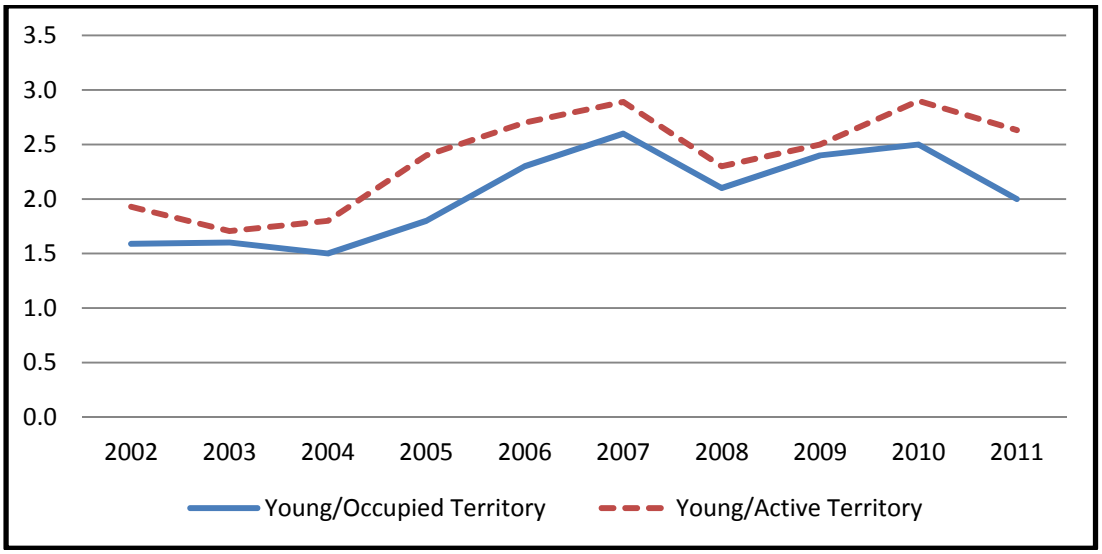

Figure 4. Productivity rates of Peregrine Falcon nests in Virginia.

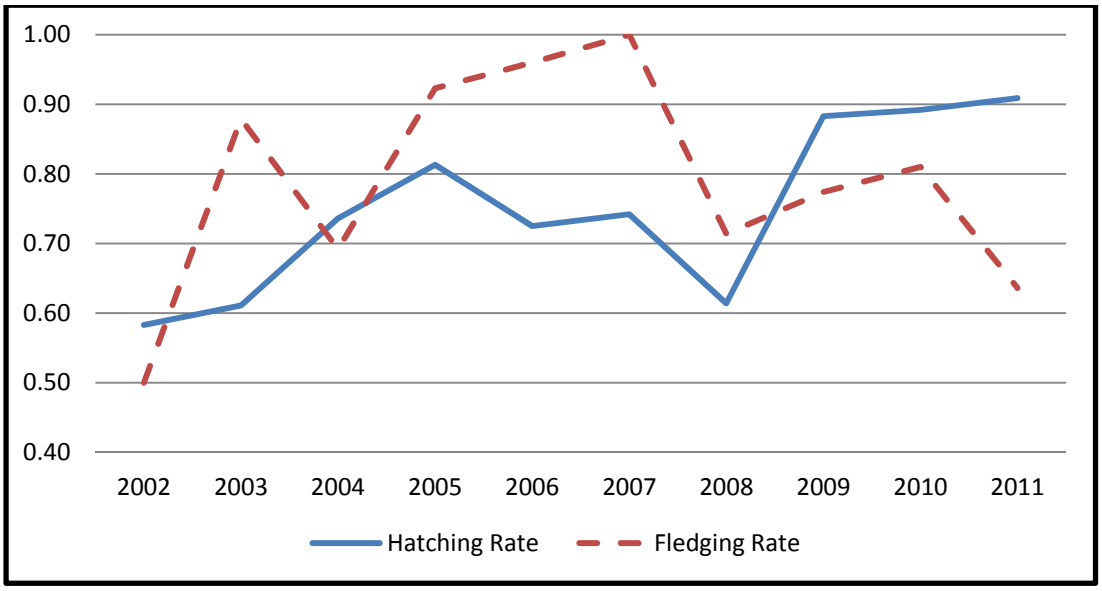

Figure 5. Hatching and fledging rates of Peregrine Falcon nests in Virginia.

Banding

All falcon chicks that survived to banding age were fitted with both USFWS and alpha-numeric bands. This included 14 females and 25 males (Tables 3a and 3b).

Table 3a. List of band codes for female peregrine falcon chicks banded in Virginia during the 2011 breeding season.

Band	Alpha-numeric Band	Nest	Date
1807-65039	00/AV	River Front Plaza Building	5/25/2011
1807-65040	01/AV	James River Bridge	5/19/2011
1807-65041	02/AV	Finney's Island Tower	5/28/2011
1807-65042	03/AV	Wachapreague Shack Tower	6/4/2011
1807-65043	04/AV	Mills Godwin Bridge	6/4/2011
1807-65044	05/AV	Godwin Island Box	6/4/2011
1807-65045	06/AV	Elkins Marsh Shack Tower	6/4/2011
1807-65046	07/AV	Elkins Marsh Shack Tower	6/4/2011
1807-65047	08/AV	Big House Mountain	6/15/2011
1807-65048	09/AV	Cobb Island Tower	6/8/2011
1807-65049	10/AV	Cobb Island Tower	6/8/2011
1807-65050	11/AV	Cobb Island Tower	6/8/2011
1807-65051	12/AV	Norris Bridge	5/23/2011
1807-65054	15/AV	Hyslop Marsh Tower	6/17/2011

Table 3b. List of band codes for male peregrine falcon chicks banded in Virginia during the 2011 breeding season.

Band	Alpha-numeric Band	Nest	Date
1126-11855	21/AS	Possum Point Substation	5/11/2011
1126-11856	22/AS	Cobb Island Tower	6/8/2011
1126-11857	23/AS	James River Bridge	5/19/2011
1126-11858	24/AS	Norris Bridge	5/23/2011
1126-11859	25/AS	Finney's Island Tower	5/28/2011
1126-11860	26/AS	Finney's Island Tower	5/28/2011
1126-11861	39/AS	Watts Island Tower	5/28/2011
1126-11862	40/AS	Watts Island Tower	5/28/2011
1126-11863	41/AS	Watts Island Tower	5/28/2011
1126-11864	42/AS	Gull Marsh Tower	6/1/2011
1126-11865	43/AS	Upsher Bay Tower	6/1/2011
1126-11866	44/AS	Upsher Bay Tower	6/1/2011
1126-11867	45/AS	Upsher Bay Tower	6/1/2011
1126-11868	46/AS	Gull Marsh Tower	6/1/2011
1126-11869	47/AS	Gull Marsh Tower	6/1/2011
1126-11870	48/AS	Gull Marsh Tower	6/1/2011
1126-11871	49/AS	Wachapreague Shack Tower	6/4/2011
1126-11872	50/AS	Big House Mountain	6/15/2011
1126-11873	51/AV	Godwin Island Box	6/4/2011
1126-11874	52/AS	Godwin Island Box	6/4/2011
1126-11875	53/AS	Godwin Island Box	6/4/2011
1126-11876	54/AS	Elkins Marsh Shack Tower	6/4/2011
1126-11877	55/AS	Elkins Marsh Shack Tower	6/4/2011
1126-11881	59/AS	Hyslop Marsh Tower	6/17/2011
1126-11882	60/AS	Hyslop Marsh Tower	6/17/2011

Band Resights

Effort was made to identify individual breeding adults at each nest by reading band codes. Fourteen adults were identified through video cameras on nests and direct observations with telescopes and digital cameras. In addition, two young falcons from Virginia were reported on the Eastern Shore; one dead from a collision and the other trapped alive during a private citizen's banding activities (Table 4).

Table 4. List of resighted banded falcons in Virginia in 2011.

Date	USFWS	USFWS color	Color band	Color code[1]	Sex	Resight Location	Origin
			Alive, recaptured				
9/29/2011	1807-65022	green	black/green	17/AD	F	Eastern Shore of VA	VA
			Alive, breeding				
5/27/2011	?	?	black/green	?	F	Gull Marsh Tower	?
5/10/2011	?	black	black/green	?	M	Watts Island	VA
5/10/2011	?	silver	black/green	*R/*9	F	Watts Island	MD
5/28/2011	?	green	black/red	V*/S	M	River Front Plaza, Richmond	VA
5/27/2011	?	?	black/red	?	M	Upsher Bay	?
5/27/2011	0987-21459	green	black/green	*9/*U	F	Godwin Island Box	VA
5/27/2011	0987-95688	black	black/green	94/Y	F	Upsher Bay	NJ
5/27/2011	1807-02731	green	black/green	25/V	F	Wachapreague	VA
5/20/2011	1807-02733	green	black/green	27/V	F	Cobb Island	VA
5/27/2011	1807-37497	black	black/red	B/*S	F	Elkins Marsh Chimney	NJ
1/12/2011	2206-43454	green	black/green	*7/*C	M	James River Bridge	VA
5/27/2011	2206-43466	green	black/green	*7/*X	M	Elkins Marsh Chimney	VA
5/20/2011	2206-81686	green	black/green	X/37	M	Cobb Island	VA
5/27/2011	?	green	?	?	M	House Mountain	VA
			Dead, collision				
1/30/2011	1126-11849	green	black/green	15/AS	M	E of Plantation Creek, Northampton Co	VA

[1] A * indicates the character is oriented horizontally on the band

Translocations

Fourteen young falcons were translocated to hacking sites during the course of the 2011 breeding season (Table 5). This included 5 females and 9 males. Three of these chicks originated on bridges that have a history of poor fledging success. The remaining 11 chicks were from towers along the Delmarva Peninsula.

The birds removed from towers were taken from one of the highest density breeding areas in Virginia where concern for the impact of peregrines on beach and colonial nesting birds is the highest. Birds collected from these territories were transported to Franklin Cliffs in Shenandoah National Park and Grandview in New River Gorge National River.

Table 5. Summary of translocation activities for Peregrine Falcons in Virginia during the 2011 breeding season.

Translocation Site	Band	Nest Site	Date Collected	Tape Color
NEW RIVER GORGE NP	1126-11858	Norris Bridge	5/23/2011	BLUE
NEW RIVER GORGE NP	1807-65051	Norris Bridge	5/23/2011	PINK
NEW RIVER GORGE NP	1126-11877	Elkins Marsh Shack Tower	6/4/2011	PINK/TURQUOISE
NEW RIVER GORGE NP	1807-65045	Elkins Marsh Shack Tower	6/4/2011	PINK/GREEN
NEW RIVER GORGE NP	1807-65046	Elkins Marsh Shack Tower	6/4/2011	PINK/PURPLE
NEW RIVER GORGE NP	1807-65043	Mills Godwin Bridge	6/4/2011	YELLOW
NEW RIVER GORGE NP	1126-11874	Godwin Island Box	6/4/2011	GREEN/PINK
NEW RIVER GORGE NP	1126-11875	Godwin Island Box	6/4/2011	GREEN/RED
NEW RIVER GORGE NP	1807-65044	Godwin Island Box	6/4/2011	GREEN/TURQUOISE
SHENAHDOAH NP	1126-11866	Upsher Bay Tower	6/1/2011	NONE
SHENAHDOAH NP	1126-11867	Upsher Bay Tower	6/1/2011	YELLOW
SHENAHDOAH NP	1126-11868	Gull Marsh Tower	6/1/2011	RED
SHENAHDOAH NP	1126-11869	Gull Marsh Tower	6/1/2011	WHITE
SHENAHDOAH NP	1126-11870	Gull Marsh Tower	6/1/2011	BLUE

Breeding pairs were documented in the mountains by the National Park Service in both parks. The nest on Old Rag was abandoned during the incubation period and the pair moved to Stoneyman in May 2011. The Old Rag pair was later seen at the Franklin Cliffs hack site in mid-June when the adult male killed or injured one of the hacked young (1126-11868) and scattered the others. The Old Rag male from previous years x/02 (2206-81658) was more tolerant of the juveniles at the hack site presumably since he was hacked there in 2007.

Addled Eggs

During the 2011 season, an addled egg was collected during banding activities at the James River Bridge. Eggs collected on this project will be analyzed as part of a long

term monitoring study of organochloride and polybrominated diphenyl ether contaminants by Da Chen and Rob Hale at the Virginia Institute of Marine Science (Chen et al 2008, Chen et al 2010).

DISCUSSION

The breeding population of Peregrine Falcons in Virginia has steadily increased since 1977. The number of breeding pairs in the state has leveled out to 23 pairs over the last 5 years.

The reproductive rate decreased in 2011 with the young per occupied territory at the lowest rate since 2002. The hatching rate during the 2011 breeding season was the highest rate recorded in the past 10 years. The fledging rate dramatically decreased from last season to match the low recorded in 2002. The 2011 productivity rates in Virginia were comparable to the average for peregrines in the Northeast US (2.1 young/active territory and 2.6/occupied territory; data collected by state wildlife agencies, USFWS *in litt.* 2009).

The use of coastal productivity to fuel targeted hacks in priority sites is consistent with the objective of re-establishing a viable breeding population within the historic mountain range of Virginia. Fledging rates from the 7 bridge sites in the coastal plain has been very low. The translocation of these birds to the mountains is a good use of this production. Over the past decade, pairs along the lower Delmarva Peninsula have increased to a very high breeding density. This population exists completely on artificial structures and has been highly productive. Diet within this system is dominated by migrant shorebirds and nesting waterbirds that are themselves of conservation concern (Long 2009). In recent years, concern about the impact of this breeding population on the management of waterbirds has increased. Three peregrine nest boxes were removed from key shorebird breeding areas (Chincoteague, Fisherman's, and Metompkin Islands) in 2009-2010 in an attempt to reduce peregrine predation and disturbance on these sensitive populations. The management strategy initiated in 2006 to utilize productivity along the Delmarva to fuel targeted hacks in the mountains was continued in 2011. This strategy meets the objective of both repopulating the mountain range and reducing impacts to sensitive waterbirds.

The hacking efforts will decrease in 2012 as a result of NPS participation. The 2012 hack site in Shenandoah NP will be moved to Hogback Mountain (located over 10 miles north of Stoneyman and Old Rag) to reduce interactions with the territorial adults. Shenandoah is committeed to continuing the hacking program as long as safe and suitable sites can be found in the park. This becomes increasingly difficult as the breeding pair move within the park. The hack site at New River Gorge continues to have subadult and adult visitors in the Grandview area. The NPS has decided to suspend the hacking program after 2011 because of conflicts with older falcons the past few years. A pair has set up a territory on one of the bridges in the park meeting the main goal of the reintroduction project.

Nesting on natural cliff sites continues to be precarious. These nests have a history of problems from exposure, drainage, and depredation. Only one mountain nest was documented fledging young this year. The intensive management of the mountain falcon population through translocation and hacking should continue in the future until the mountain population is self-sustaining. The newly discovered pairs at White Rocks Breaks, and House Mountain are encouraging and future surveys of historic eyries should be considered to document additional breeding pairs.

During the 2011 season, addled eggs were collected and analyzed at the Virginia Institute of Marine Science. This transfer represents a continuing effort to monitor contaminant levels in Virginia peregrines and to continue to explore the potential for this species to accumulate brominated fire retardants that remain on the market. These contaminants have been found in high level in falcon populations in the northeastern US and have the potential to affect avian productivity rates (Chen et al 2008, Chen et al. 2010, Potter 2004, Morse 1993, Weimeyer et al 1986).

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