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Virginia Peregrine Falcon monitoring and management program: Year 2002 report

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**VIRGINIA PEREGRINE FALCON
MONITORING AND MANAGEMENT PROGRAM:
YEAR 2002 REPORT**



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

VIRGINIA PEREGRINE FALCON MONITORING AND MANAGEMENT PROGRAM: YEAR 2002 REPORT

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

Front Cover: *Chick with satellite transmitter on tower at Chincoteague, NWR. 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 increased to more than 15 pairs. However, all 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.

Forty-nine nesting structures were surveyed for falcons during the 2002 breeding season. Surveys resulted in the documentation of 17 occupied territories. Fourteen breeding attempts were documented that resulted in the production of 27 young that survived to banding age. As in previous years, hatching rate continued to be poor. Of 9 clutches that were followed completely from laying to banding age, only 21 of 36 (58.3%) eggs hatched. Eighteen of these chicks survived to banding age. Of 16 chicks monitored through the fledging period, 8 (50%) were lost during or near fledging. Documented losses of chicks resulted in an estimated reproductive rate of 1.1 chicks/occupied territory or 1.3 chicks/active territory. However, these are optimistic values calculated under the assumption that all translocated chicks survived. Actual fledging rates even with the hacking program were lower.

Several management recommendations follow from observations made during the 2002 breeding season. Addled eggs analyzed for contaminants in the early 1990's suggest that contaminant levels may be high enough to impact reproductive success. Future monitoring efforts should continue to collect addled eggs whenever possible to help clarify the role of contaminants in hatching rates. The 3 chicks that died during the nestling period were overcome with wingless hippoboscids. Since these parasites overwinter in nest material, disinfecting and changing pea gravel within boxes during the winter months would likely improve chick survival. Of 7 birds left on bridge sites, 4 did not survive the fledging period. For the foreseeable future, attempts should be made to translocate chicks from bridge sites where fledging rates are low to mountain hack sites. These moves serve to preserve productivity and may help to recolonize the historic breeding range. Historically, systematic monitoring of falcon broods in Virginia has ended at the point of banding. Given the large number of chicks documented to be lost at fledging over the past 2 years, it is important to continue monitoring through the fledging period. Quantification of mortality during the fledging period would help to refine reproductive rates.

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 is highly likely that breeding pairs do exist on natural cliff sites within Virginia. However, none are currently known. No attempts to systematically survey these areas have been made since 1992.

Nest Site Surveys

Between 1977 and 2002 approximately 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 2002 breeding season were checked for evidence of resident falcons. An initial survey of breeding structures was conducted between 15 February and 30 March. 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 and to band young. 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.



Access to some bridge nesting sites is not possible without specialized equipment. Boom truck used to access West Norfolk Bridge (lft) and Norris Bridge (rt). Photos by Bryan Watts and Bart Paxton.

Table 1. Catalog of nesting structures established for Peregrine Falcons in Virginia (1977-2002). Table gives year of establishment and whether or not the site was checked for Peregrine Falcon activity during the 2002 breeding season. Dashed lines indicate that the structure is no longer present.

Site Code	Location Description	Structure Type	Year Est.	Checked 2002
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	Parramore 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	1997	Y
VA-PEFA-18	Wachapreague Shack	Peregrine Tower	1994/2000	Y
VA-PEFA-19	James River Ghost Ship	Moth Ball Fleet	1987	N
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	Y
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	N
VA-PEFA-35	Tangier Island tower	Peregrine Tower	2000	-----
VA-PEFA-36	Upsher Bay tower	Peregrine Tower	2000	Y
VA-PEFA-37	Silver Beach Range Tower	Nest Box	1997	Y

Table 1. Continued

Site Code	Location Description	Structure Type	Year Est.	Checked 2002
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	Bank of America Building	Nest Box	1984	N
VA-PEFA-58	Russell Island	Peregrine Tower	1982	-----
VA-PEFA-59	Bermuda Hundred	Nest Box	1998	N



Nest box on chimney remnant on Elkins Marsh. This is one of the most unusual breeding territories in Virginia. Photo by Bryan Watts.

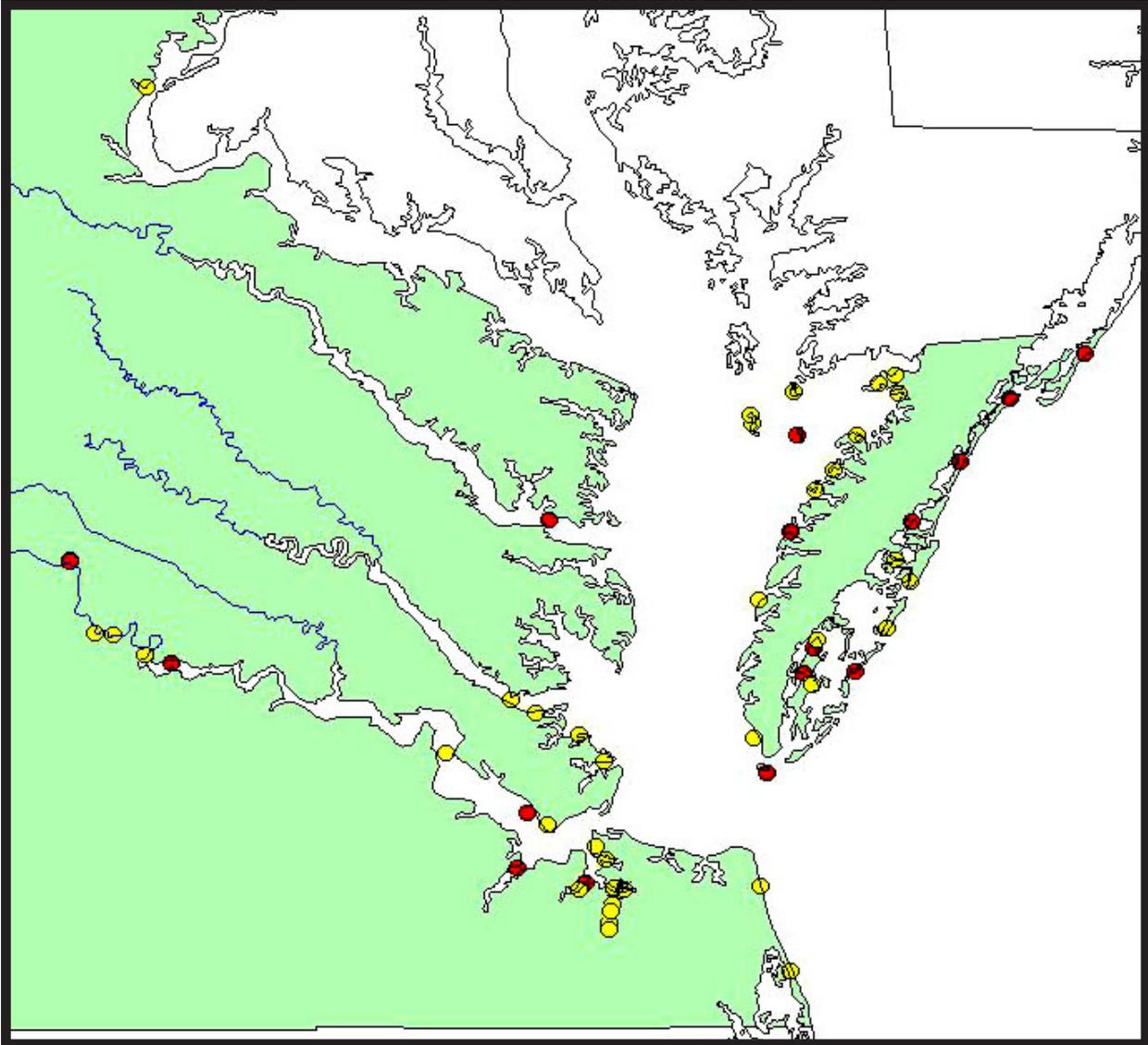


Figure 1. Map of coastal Virginia indicating the location of nesting structures established for Peregrine Falcons. Red circles indicate the location of structures occupied by resident pairs during the 2002 breeding season.

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 2002 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.



Chicks after banding on the Benjamin Harrison Bridge showing green anodized FWS band on right leg and black/green alpha-numeric band on left leg. Photo by Catherine Markham.

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).

RESULTS

Site Surveys

Forty-nine nesting structures were surveyed for Peregrine Falcon activity during the breeding season (Table 1). Nearly all of the structures not surveyed were alternate sites within territories known to be occupied (i.e. assumed not to be used due to proximity to breeding pair). Three exceptions to this rule were the historic breeding site within the James River ghost fleet, the tower on Mockhorn Island, and a box established on an industrial building at Bermuda Hundred near the city of Hopewell. Of the sites with known occupation, 17 supported resident pairs. These included 8 peregrine towers, 6 bridges, 2 shack remnants on the seaside of the Delmarva, and 1 high-rise building (Table 2).

Table 2. Summary of productivity results for Peregrine Falcon pairs in Virginia during the 2002 breeding season.

Location Description	Site Code	Occ Terr	Active Terr	Eggs	Chicks Hatched	Band Age
Fisherman's Island Tower	PEFA-01	Y	Y	4	0	-----
Cobb Island Tower	PEFA-02	Y	Y	4	?	1
Metomkin Island Tower	PEFA-05	Y	Y	4	?	2
Wallops Island Tower	PEFA-06	Y	Y	4	2	2
Chincoteague Tower	PEFA-07	Y	Y	?	?	3
Watts Island Tower	PEFA-09	Y	Y	4	3	3
Hyslop Marsh Tower	PEFA-12	Y	Y	2	1	1
Elkins Marsh Chimney Box	PEFA-16	Y	N	-----	-----	-----
Elkins Marsh Shack Box	PEFA-17	Y	Y	4	3	3
Wachapreague Shack/Tower	PEFA-18	Y	N	-----	-----	-----
James River Bridge Box	PEFA-22	Y	Y	5	3	3
Berkley Bridge Box	PEFA-23	Y	Y	5	1	1
Ben Harrison Bridge Box	PEFA-24	Y	Y	4	4	4
Mills Godwin Bridge Box	PEFA-25	Y	Y	4	4	1
West Norfolk Bridge Box	PEFA-26	Y	Y	1?	1?	1
Norris Bridge	PEFA-27	Y	Y	2?	2?	2
Richmond City	PEFA-56	Y	N	-----	-----	-----
Total	-----	17	14	≥50	≥30	27

Breeding Results

Coastal Virginia supported 17 known breeding pairs of Peregrine Falcons during the 2002 breeding season. Three of these pairs were not documented to produce eggs such that there were only 14 active territories (Table 2). Pairs produced at least 50 eggs and at least 30 chicks hatched. However, only 27 chicks (1.6/occ terr, 1.9/act terr) survived to banding age.

As in recent years, hatching rate within the Virginia population continued to be relatively low. Of 9 clutches that were followed completely from laying to banding age, only 21 of 36 (58.3%) eggs hatched. Of these 21 chicks, 18 (85.7%) survived to banding age. All 3 of the chicks that died post hatching were from the Mills Godwin Bridge. This site has had a recent history of infestation with a species of wingless *Hippoboscid* fly. All of these chicks were overcome with the parasites and died. Two of these chicks died on site and the remaining 2 were moved to the James River Bridge. One of these chicks recovered.

Several chicks were lost around the time of fledging. Of 16 chicks monitored through the fledging period, 8 (50%) were lost during or near fledging. Four of these chicks were lost during summer storms. This included 2 chicks that were blown off the James River Bridge and 2 chicks that were believed to have been blown from towers. The 2 chicks remaining on the tower at Chincoteague NWR were believed to have been killed by Great Horned Owls. The remaining 2 chicks were lost from bridges. This included the single chick on the West Norfolk Bridge that was recovered from the water and subsequently died and 1 of 2 chicks left on the Benjamin Harrison Bridge that was found dead in the roadbed. Documented losses of chicks at or near the time of fledging reduced estimated reproductive rates to 1.1 chicks/occupied territory and 1.3 chicks/active territory. However, these calculations are problematic since several of the chicks were translocated for hacking. Values presented are optimistic values calculated under the assumption that all translocated chicks survived the fledging period (an assumption known to be false). Actual fledging rates even with the hacking program were lower.



Remains of chick found near Hyslop Marsh tower. Based on telemetry information and remains, chick appears to have been blown off tower in storm and eaten by mammalian predator. Photo by Bryan Watts.

Banding

Twenty-five of 27 falcon chicks that survived to banding age were fitted with both FWS and alpha-numeric bands. This included 17 females and 8 males (Table 3). The only chicks that were not banded included a male and female produced on the Metompkin tower. These birds were not banded because when the banding team arrived, the male was too mature. Rather than taking a risk that the male would jump prematurely, the two chicks were left unbanded.

Table 3. List of band codes for peregrine falcon chicks banded in Virginia during 2002 breeding season.

FWS Band	A-N Band	Trans	Location	Date
Females				
987-51248	*9/*A	27408	James River Bridge	5/17/02
987-51249	*9/*B	36485	Benjamin Harrison Bridge	5/20/02
987-51250	*9/*C	-----	Benjamin Harrison Bridge	5/20/02
987-51251	*9/*D	-----	Benjamin Harrison Bridge	5/20/02
987-51252	*9/*E	27400	Norris Bridge	5/20/02
987-51253	*9/*H	27404	Norris Bridge	5/20/02
987-51254	*9/*K	-----	Elkins Shack	5/21/02
987-51255	*9/*M	-----	Elkins Shack	5/21/02
987-51256	*9/*P	-----	Elkins Shack	5/21/02
987-51257	*9/*R	8172	Turners Marsh	5/24/02
987-51258	*9/*S	8248	Watts Island	5/24/02
987-51259	*9/*U	8175	Watts Island	5/24/02
987-51260	*9/*V	24090	Watts Island	5/24/02
987-51261	*9/*W	36493	Wallops Island	6/12/02
987-51262	*9/*X	36492	Wallops Island	6/12/02
987-51263	*9/*Y	36487	Chincoteague NWR	6/19/02
987-51264	*A/*C	8147	Chincoteague NWR	6/19/02
Males				
2206-43452	*7/*A	-----	James River Bridge	5/17/02
2206-43453	*7/*B	-----	James River Bridge	5/17/02
2206-43454	*7/*C	-----	James River Bridge	5/17/02
2206-43455	*7/*D	-----	Benjamin Harrison Bridge	5/20/02
2206-43457	*7/*H	-----	Berkley Bridge	5/29/02
2206-43458	*7/*K	8145	Chincoteague NWR	6/19/02
2206-43459	*7/*M	36491	Cobb Island	6/26/02
2206-43460	*7/*P	8172	West Norfolk Bridge	7/02/02

Translocations

Eight young falcons were moved during the course of the 2002 breeding season (Table 4). This included 5 young that were translocated and released at the Hawksbill hacksite within Shenandoah National Park, 1 young that was collected for hacking but was taken to the Wildlife Center for Virginia for treatment of an infection, and 2 chicks that were transported and fostered to a wild pair. The single young taken to the Wildlife Center did not recover from a respiratory infection. The 2 chicks removed from a nest site infested with parasites were treated and introduced into a nearby nest site. One of these chicks did not recover from the infestation. The second chick recovered and survived to banding age.

Table 4. Summary of translocation activities for Peregrine Falcons in Virginia during the 2002 breeding season.

FWS Band#	Hatch Site	Date Moved	Release Site	Date Released
987-51248	James River Bridge	5/20/02	Shenandoah National Park	5/28/02
987-51249	Ben Harrison Bridge	5/20/02	Shenandoah National Park	6/03/02
987-51251	Ben Harrison Bridge	5/20/02	Shenandoah National Park	----- ¹
987-51252	Norris Bridge	5/20/02	Shenandoah National Park	5/28/02
987-51253	Norris Bridge	5/20/02	Shenandoah National Park	5/28/02
987-51263	Chincoteague NWR	6/20/02	Shenandoah National Park	6/25/02
? ²	Mills Godwin Bridge	4/22/02	James River Bridge	-----
Unbanded	Mills Godwin Bridge	4/22/02	James River Bridge	-----

¹Taken to wildlife center due to respiratory infection and ultimately euthanized.

²Because this chick was very young when moved and mixed in with existing brood its identity at banding was not known.

Adult Mortality

Five adult falcons were documented to be lost during the 2002 season.

Chincoteague Pair - Both resident adults from the nest tower on Chincoteague NWR were believed to be lost during the breeding season. The male of this pair disappeared in mid spring leaving the female to provide for 3 chicks. When these chicks were banded on 6/20/02, all were very thin. One of these chicks was translocated to Shenandoah National Park. The remaining 2 chicks were left on the tower with the female and supplemental food was provided by refuge staff. Near the expected fledging date, both chicks and the attending female were believed to have been killed by a Great Horned Owl.

Hyslop Marsh Female – On 15 May, 2002 while visiting the nest tower on Hyslop Marsh an adult female (FWS 987-76811) was found at the base of the tower. The cause of death was not clear due to the condition of the carcass but the bird may have been killed in a confrontation with other birds. An adult pair was resident at the time. This bird was determined to have been banded at South Marsh in Maryland as a nestling on 5/21/98.

Norris Bridge Female – On 22 September, 2002 a citizen fishing on the Rappahannock River recovered an injured adult female (FWS 1807-37437) from the base (over water) of the Norris Bridge. This bird had a back injury and was ultimately taken to the Wildlife Center of Virginia for treatment. The bird never recovered and was euthanized. This bird was originally banded in Atlantic City, NJ as a nestling on 13 June, 1997.

Northern Virginia Female – On 11 June, 2002 an adult female was found in the Potomac River along the George Washington Parkway. The female was alive but died shortly after recovery from the river. The bird showed signs of trauma to its head and breast indicating

that it may have been struck by a car. Upon internal examination the bird showed signs of having recently laid eggs (3-4 spent follicles). This bird was likely the breeding female of a pair discovered in the area earlier in the spring. The exact nesting site was not known.

DISCUSSION

The breeding population of Peregrine Falcons in coastal Virginia has remained stable with 17 occupied territories since 1998. It remains unclear if local reproductive rates are sufficient to sustain the population. In 2002, even an optimistic estimate of fledging success was below the 1.25 young/pair suggested to be required to sustain a stable population. Continued problems with both hatching and fledging appear to be the largest contributors to the poor reproductive performance.

As in past years, hatching rates were relatively poor during the 2002 breeding season. The underlying causes of low rates are not clear. 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). Many of these coastal breeding pairs rely heavily on migrant shorebirds in the spring and may encounter contaminants within this prey base. Sixteen eggs collected during the 2001 and 2002 breeding seasons await chemical analysis. Future monitoring efforts should continue to collect addled eggs whenever possible to help clarify the role of contaminants in hatching rates.

A second factor that may be reducing overall hatching rate is the age of some breeding females within the population. Two breeding females are known to be greater than 15 years old, an age threshold beyond which reproductive success has been suggested to decline. The resident female on the Berkley Bridge in Norfolk is known to be 18 years old. This female has laid 13 eggs in the past 2 years only 1 of which has hatched. The resident female on the James River Bridge is now 16 years old. In 2002, this female produced 5 eggs only 3 of which hatched. Although the age distribution of females is not completely known these two individuals alone are having an impact on overall hatching rate.

Nearly all of the young known to have hatched survived to banding age. This general pattern is consistent with previous years. The nestling period appears to be one of the least vulnerable periods for the young. The only 3 chicks that died during the nestling period were overcome with parasites on the Mills Godwin Bridge. The *Hippoboscids* flies observed over the past 2 years at this nest site are a small wingless form. These flies feed on blood from the chicks. Large numbers of these insects on individual chicks can cause anemia. These parasites are also known to transmit blood parasites to their hosts. Chicks within the nest box on the Mills Godwin Bridge had heavy infestations of parasites. Chicks that were treated and replaced were recolonized with flies in a short period. Although the

Mills Godwin Bridge was the worst location for this problem, these parasites were observed within 2 other broods during the 2002 season. Relatively light infestations were observed within both the James River Bridge brood and the Elkins Marsh shack brood. Mortality caused by these parasites is preventable. These insects overwinter within the nest box as pupae within prey remains and other materials that have built up through the years. Disinfecting and changing pea gravel within boxes during the winter months would likely improve survival of chicks.

A large number of young were lost at fledging. Birds appear to have been lost to summer storms, Great Horned Owls, and bridges. For the second year in a row, young birds were lost as severe summer storms passed through coastal Virginia. Birds that are near fledging and spending large amounts of time outside of nest boxes exercising have been blown off towers and bridges. These birds are vulnerable to ground predators or drowning. The population of Great Horned Owls appears to have been increasing in recent years, particularly along the Delmarva Peninsula where many of the Peregrine Falcons are concentrated. Over the past 5 years, owls have taken over nest towers several times. Based on the examination of remains it seems likely that horned owls took the birds remaining on the Chincoteague tower. Peregrines are vulnerable to the owls in several locations. The long-term solution to this problem is not clear. Lastly, of 7 birds left on bridge sites, 4 did not survive. Wind conditions around these structures may be particularly difficult for birds to negotiate on their early flight attempts. There is no simple solution to this problem. For as long as possible, attempts should be made to translocate chicks from bridge sites where fledging rates are low to mountain hawk sites. These moves serve to preserve productivity and may help to recolonize the historic breeding range.

Historically, systematic monitoring of falcon broods in Virginia has ended at the point of banding. Satellite tracking of young falcons within this population over the past two years has clearly defined a significant period of vulnerability within the first 10 weeks after fledging (Watts et al. 2002). A significant portion of mortality occurs during the fledging process. Given the large number of chicks documented to be lost at fledging over the past 2 years, it is important to continue monitoring through the fledging period. Fledge checks should be scheduled two weeks after anticipated fledging dates. This time frame is well within the residency phase prior to dispersal. Quantification of mortality during the fledging period would help to refine reproductive rates.

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