2002

Virginia bald eagle nest and productivity survey: Year 2002 report

B. D. Watts
The Center for Conservation Biology, bdwatt@wm.edu

M A. Byrd
The Center for Conservation Biology

VIRGINIA BALD EAGLE NEST AND PRODUCTIVITY SURVEY: YEAR 2002 REPORT

CENTER FOR CONSERVATION BIOLOGY
COLLEGE OF WILLIAM AND MARY

VIRGINIA BALD EAGLE NEST AND PRODUCTIVITY SURVEY: YEAR 2002 REPORT

Bryan D. Watts, PhD
Mitchell A. Byrd, PhD
Center for Conservation Biology
College of William and Mary
Williamsburg, VA 23187-8795

Recommended Citation:

Watts, B. D. and M. A. Byrd 2002. Virginia bald eagle nest and productivity survey: Year 2002 report. Center for Conservation Biology Technical Report Series, CCBTR-02-03. College of William and Mary, Williamsburg, VA.

Project Funded By:
The Virginia Department of Game and Inland Fisheries
(Wildlife Diversity Program)
United States Department of Defense
Army Corps of Engineers
Center for Conservation Biology

Front Cover: *Three-week old eagle chicks in nest. Photo by Keith Cline. Aerial view of Tomahund Creek. 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 todays 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.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

By the late 1960's, the Virginia bald eagle breeding population had been decimated by eggshell thinning and associated low productivity. In 1977, the U. S. Fish and Wildlife Service formed the Chesapeake Bay Bald Eagle Recovery Team. This team was tasked with developing a plan for the recovery of the Bay population. As part of this process, state wildlife agencies assumed the responsibility for population monitoring. The Virginia Department of Game & Inland Fisheries along with the College of William & Mary initiated a systematic survey in the spring of 1977. Since that time, the annual bald eagle survey has become the most essential element of a successful conservation strategy. Our objectives in continuing the survey are 1) to monitor the recovery of the bald eagle in Virginia, 2) to document the status, distribution, and productivity of breeding bald eagles in Virginia, 3) to provide information to the government agencies charged with the management and protection of the Virginia bald eagle population, 4) to provide information to land holders about the status of bald eagles on their properties, and 5) to increase our understanding of bald eagle natural history in Virginia.

The Virginia Bald Eagle survey measures breeding activity and productivity via a standard 2-flight approach. The first flight is conducted between late February and mid-March to locate active nests. A high-wing Cessna 172 aircraft is used to systematically overfly the land surface at an altitude of approximately 100 m to detect eagle nests. All Bald Eagle nests detected are plotted on 7.5 min topographic maps and given a unique alpha-numeric code. Each nest is examined to determine its condition and activity status. The second survey flight is conducted from late April through mid-May to check active nests for productivity.

During the 2002 breeding season, 363 occupied Bald Eagle territories were documented in Virginia. This represents a 9.7% increase over that observed in 2001. The Virginia population continues to follow a steep growth trajectory with an average doubling time of 7.5 years. Occupied territories were documented in 41 counties and 7 independent cities. A total of 501 chicks were counted during the productivity flight. The population continues to have tremendous reproductive momentum. Of 4,340 chicks documented in the past 26 years, more than 46% have been produced in the past 5 years. This momentum is the combined result of an overall increase in both the breeding success rate and the average brood size. The percentage of active nests documented to produce chicks has risen from below 45% in the late 1970's to more than 75% throughout the late 1990's. Over this same time period, the average brood size has increased from below 1.4 chcks/nest to more than 1.9 chicks/nest.

BACKGROUND

Context

No specific estimates of the Virginia Bald Eagle (*Haliaeetus leucocephalus*) population are available prior to the early 1900's. The first known survey of eagles in Virginia was a ground survey conducted by Tyrell in 1936 (Tyrell 1936). His survey covered a small portion of Virginia around the Potomac River and documented 17 active nests. With the realization that Bald Eagle numbers and reproductive success had declined throughout the early 1950's, the National Audubon Society requested information from several areas throughout North America. As part of this effort, Abbott coordinated a volunteer-based survey beginning in 1956 that included portions of Virginia (Abbott 1957). This effort was greatly expanded in 1962 when several government agencies provided support toward a continent-wide investigation of breeding status and success (Sprunt 1962, Abbott 1963). That year marked the first time that Bald Eagles were surveyed from the air throughout most tidal areas of Virginia. The aerial survey was conducted by Abbott and Scott until the 1977 breeding season (Abbott 1976).

In 1977, the U. S. Fish and Wildlife Service formed the Chesapeake Bay Bald Eagle Recovery Team (Abbott 1977). This team was tasked with developing a plan for the recovery of the Bay population. As part of this process, state wildlife agencies assumed the responsibility for population monitoring. As the state agency responsible for wildlife management, The Virginia Game Commission (currently, The Virginia Department of Game & Inland Fisheries) is responsible for Bald Eagle monitoring and management in Virginia. Under contract to the state M. A. Byrd took over responsibility for the survey in 1977. The 2002 breeding season represents the 26th year of the comprehensive Bald Eagle breeding survey.

Objectives

Our objectives in continuing the Virginia bald eagle nest survey are:

1) to monitor the recovery of the bald eagle in Virginia
2) to document the status, distribution, and productivity of breeding bald eagles in Virginia
3) to provide information to the government agencies charged with the management and protection of the Virginia bald eagle population
4) to provide information to land holders about the status of bald eagles on their properties
5) to increase our understanding of bald eagle natural history in Virginia

METHODS

Study Area

The primary focus area for the Virginia Bald Eagle breeding survey includes the tidal reaches of Chesapeake Bay tributaries and the lower Delmarva Peninsula. All Chesapeake Bay tributaries in Virginia are systematically surveyed to the extent of tidal influence. These drainages encompass nearly all historic records of breeding eagles in Virginia and continue to support the vast majority of the population. Throughout the 1990's, several areas have been added to the core survey area including Back Bay/North Landing River area, Lake Drummond, Kerr Reservoir, Lake Chesdin, Swift Creek Reservoir, Diascund Reservoir, and Lake Manassas. No attempts have been made to systematically survey the piedmont and mountain regions of Virginia. With the dramatic increase in inland reservoirs over the past few decades, it seems likely that breeding pairs remain undiscovered within these physiographic provinces. Nesting pairs known to occur within these regions have generally been discovered by agency biologists and the general public.

A stretch of the Pamunkey River in New Kent county. This type of undisturbed habitat is ideal for breeding eagles. Photo by Bryan Watts.

Survey

The Virginia Bald Eagle survey measures breeding activity and productivity via a standard 2-flight approach (Fraser et al. 1983). The first flight is conducted between late February and mid-March to locate active nests. A high-wing Cessna 172 aircraft is used to systematically overfly the land surface at an altitude of approximately 100 m to detect eagle nests. The aircraft is maneuvered systematically between the shoreline and a distance of approximately 1 km to cover the most probable breeding locations. All Bald Eagle nests detected are plotted on 7.5 min topographic maps and given a unique alpha-numeric code. Each nest is examined to determine its condition and activity status. A breeding territory

is considered to be “occupied” if a pair of birds is observed in association with the nest and there is evidence of recent nest maintenance (e.g. well-formed cup, fresh lining, structural maintenance). Nests are considered to be “active” if a bird is observed in an incubating posture or if eggs or young are detected in the nest (Postupalsky 1974). The second survey flight is conducted from late April through mid-May to check active nests for productivity. A high-wing Cessna 172 is flown low over the nest allowing observers to examine nest contents. The number of eaglets present is recorded along with their approximate ages.

Survey plane over Hog Island Wildlife Management Area. Photo by Bryan Watts.

Typical nesting situation in cluster of pines on Lake Chesdin. Photo by Bryan Watts.

Typical nesting situation in isolated pine over marsh (Rappahannock River). Photo by Bryan Watts.

Single 6-wk old chick in nest. Photo by Keith Cline.

RESULTS

Breeding Population

A total of 363 Bald Eagle territories were determined to be occupied in Virginia during the 2002 breeding season (Table 1, see Appendices I – VIII for nesting details by geographic area). When compared to 2001, this represents a 9.7% increase in the breeding population (Table 2). Although this annual increase is lower than that observed in 2001, it falls exactly on the average observed over the 26-year survey (Figure 1). The Virginia population continues to follow a very steep growth trajectory with an average doubling time of 7.5 years (Figure 2).

Table 1. Summary of 2002 Bald Eagle survey results by geographic area. See methods for definitions of "occupied territory" and "active nest". Chicks/active nests and chicks/productive nests are mean values.

GEOGRAPHIC AREA	OCCUP TERRS	ACTIVE NESTS	CHICKS PROD	CHICKS/ ACT NESTS[1]	CHICKS/ PROD NESTS[1]
POTOMAC RIVER	80	69	103	1.60	1.84
RAPPAHAN. RIVER	91	86	130	1.59	2.00
YORK RIVER	45	41	65	1.59	1.76
JAMES RIVER	81	74	117	1.58	1.95
WESTERN SHORE	18	18	26	1.44	2.00
EASTERN SHORE	23	20	28	1.40	1.65
LOWER TIDEWATER	6	5	8	1.60	1.60
INLAND AREAS	19	16	24	1.62	1.75
TOTAL	**363**	**329**	**501**	**1.57**	**1.88**

[1]Calculated based on nests with known outcome. Success of 8 nests known to be active was not determined. The number of chicks within 5 nests known to be successful was not determined.

Table 2. Summary of 2001 Bald Eagle survey results by geographic area. See methods for definitions of "occupied territory" and "active nest". Chicks/active nests and chicks/productive nests are mean values.

GEOGRAPHIC AREA	OCCUP TERRS	ACTIVE NESTS	CHICKS PROD	CHICKS/ ACT NESTS[1]	CHICKS/ PROD NESTS[1]
POTOMAC RIVER	71	71	106	1.49	1.96
RAPPAHAN. RIVER	84	80	109	1.38	1.85
YORK RIVER	47	43	63	1.47	1.91
JAMES RIVER	75	71	115	1.62	1.95
WESTERN SHORE	14	13	25	1.92	2.27
EASTERN SHORE	20	20	26	1.30	1.63
LOWER TIDEWATER	4	4	11	2.75	2.75
INLAND AREAS	16	11	11	1.00	2.20
TOTAL	**331**	**313**	**466**	**1.49**	**1.93**

[1]Calculated based on nests with known outcome. Success of 4 nests known to be active was not determined. The number of chicks within 4 nests known to be successful was not determined.

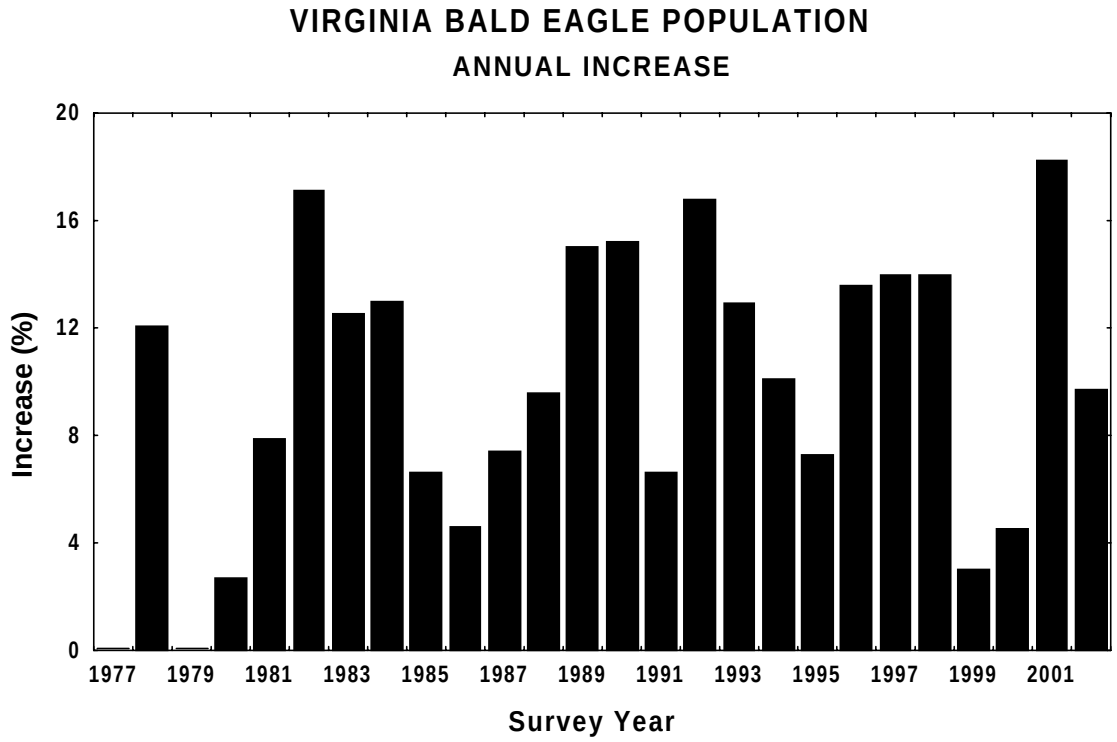

Figure 1. Annual increase values for the 26-year survey period (1977-2002). Values calculated as ($Pairs_t$ - $Pairs_{t-1}$)/$Pairs_{t-1}$ X 100.

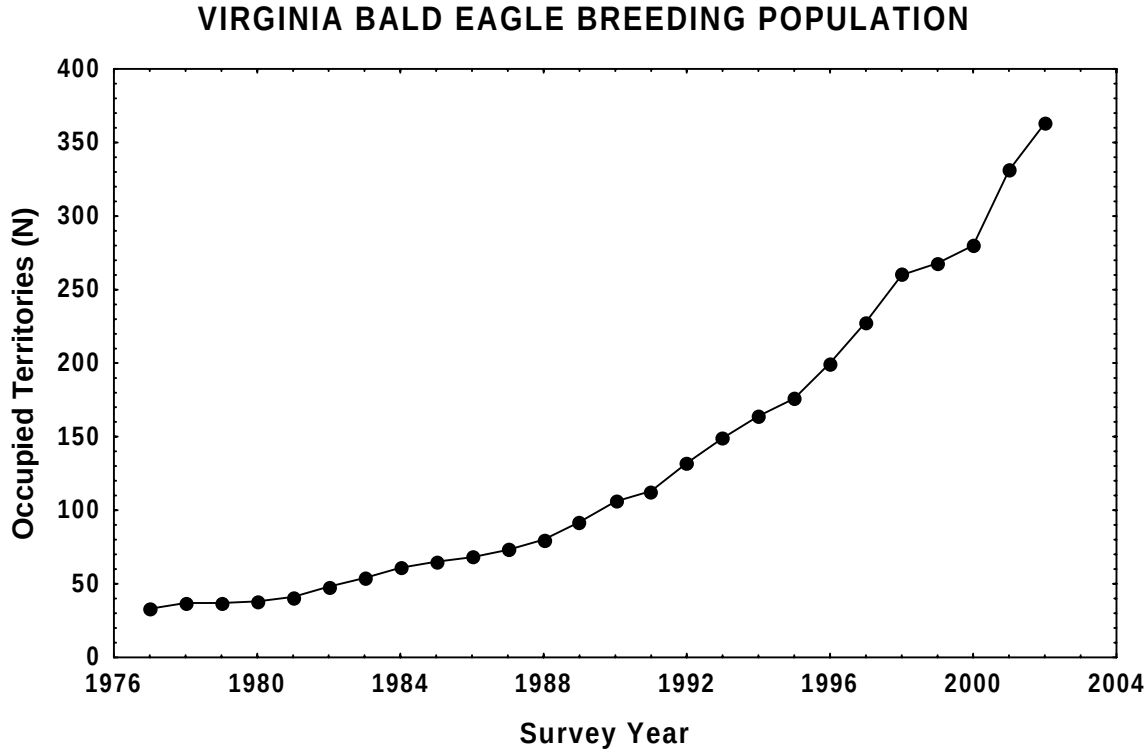

Figure 2. Number of known Bald Eagle territories in Virginia (1977-2002).

Growth in the breeding population was geographically widespread (Tables 1 and 2). All of the broad geographic areas examined had gains in the number of documented territories occupied and the majority had gains in the number of active nests. As in recent years, the number of nests located within inland areas continued to increase. Even so, these pairs account for only 5% of the overall population (it should be noted that the systematic survey is focused primarily on coastal tributaries). Occupied territories were located within 41 counties and 7 independent cities (Table 3). Nests were located for the first time in Shenandoah and South Hampton counties. Westmoreland, King George, Richmond, Essex, and Charles City counties continue to support the highest number of pairs in the state. These 5 counties alone account for 38% of the state population.

Table 3. Summary of 2002 Bald Eagle survey results by jurisdiction. See methods for definitions of "occupied territory" and "active nest". Chicks/active nests and chicks/productive nests are mean values.

COUNTY	OCCUP TERRS	ACTIVE NESTS	CHICKS PROD	CHICKS/ ACT NESTS	CHICKS/ PROD NESTS
Counties					
Accomac	13	13	18	1.38	1.64
Albemarle	1	0	-----	-----	-----
Amherst	1	1	2	2.00	2.00
Bath	1	1	2	2.00	2.00
Caroline	12	10	16	1.60	1.78
Charles City	22	17	25	1.47	2.08
Chesterfield	7	6	10	1.43	2.50
Culpepper	1	1	1	-----	-----
Essex	22	21	33	1.65	2.06
Fairfax	9	7	9	1.50	1.50
Faquier	1	1	1	-----	-----
Gloucester	6	6	10	1.67	2.00
Halifax	1	1	0	0.00	0.00
Hanover	1	1	1	1.00	1.00
Henrico	4	3	4	1.33	1.33
Isle of White	6	6	9	1.50	1.80
James City	14	13	18	1.38	1.80
King George	32	30	57	1.90	2.11
King & Queen	4	4	3	0.75	1.50
King William	13	11	20	1.82	1.82
Lancaster	6	6	11	1.83	1.83
Mathews	5	5	4	0.80	1.33
Mecklenburg	4	4	8	2.00	2.00
Middlesex	12	12	14	1.27	1.75
New Kent	11	10	17	1.70	1.89
Northampton	10	7	10	1.43	1.67
Northumberland	10	10	17	1.70	1.89

Table 3. Continued

COUNTY	OCCUP TERRS	ACTIVE NESTS	CHICKS PROD	CHICKS/ ACT NESTS	CHICKS/ PROD NESTS
Nottoway	1	1	1	-----	-----
Powhatan	1	1	2	2.00	2.00
Prince Edward	1	1	2	2.00	2.00
Prince George	12	12	25	2.08	2.50
Prince William	5	5	4	0.75	1.50
Richmond	23	22	34	1.62	2.13
Shenandoah	1	1	1	-----	-----
South Hampton	1	1	1	1.00	1.00
Stafford	10	7	8	1.40	1.75
Surry	9	9	13	1.44	1.44
Sussex	3	2	2	1.00	1.00
Westmoreland	39	34	47	1.52	1.81
York	10	9	15	1.67	1.88
Independent Cities					
Hampton City	2	2	4	2.00	2.00
Hopewell City	1	1	1	1.00	1.00
Newport News City	2	2	3	1.50	1.50
Portsmouth City	1	1	0	0.00	0.00
Richmond City	1	1	2	2.00	2.00
Suffolk City	5	5	9	1.80	2.25
Virginia Beach City	5	4	7	1.75	1.75

Productivity

A total of 501 chicks were counted during the productivity flight (Table 1, see Appendices I – VIII for nesting details by geographic area). This is the highest number of chicks produced during any year of the 26-year survey. The Virginia population continues to have tremendous reproductive momentum. Of 4,340 chicks documented in the past 26 years, more than 46% have been produced in the past 5 years (Figure 3). This momentum is the combined result of an overall increase in both the breeding success rate and the average brood size. The percentage of active nests documented to produce chicks has risen from below 45% in the late 1970's to more than 75% throughout the late 1990's (Figure 4). Over this same time period, the average brood size for productive nests has increased from below 1.4 chicks/nest to more than 1.9 chicks/nest (Figure 5).

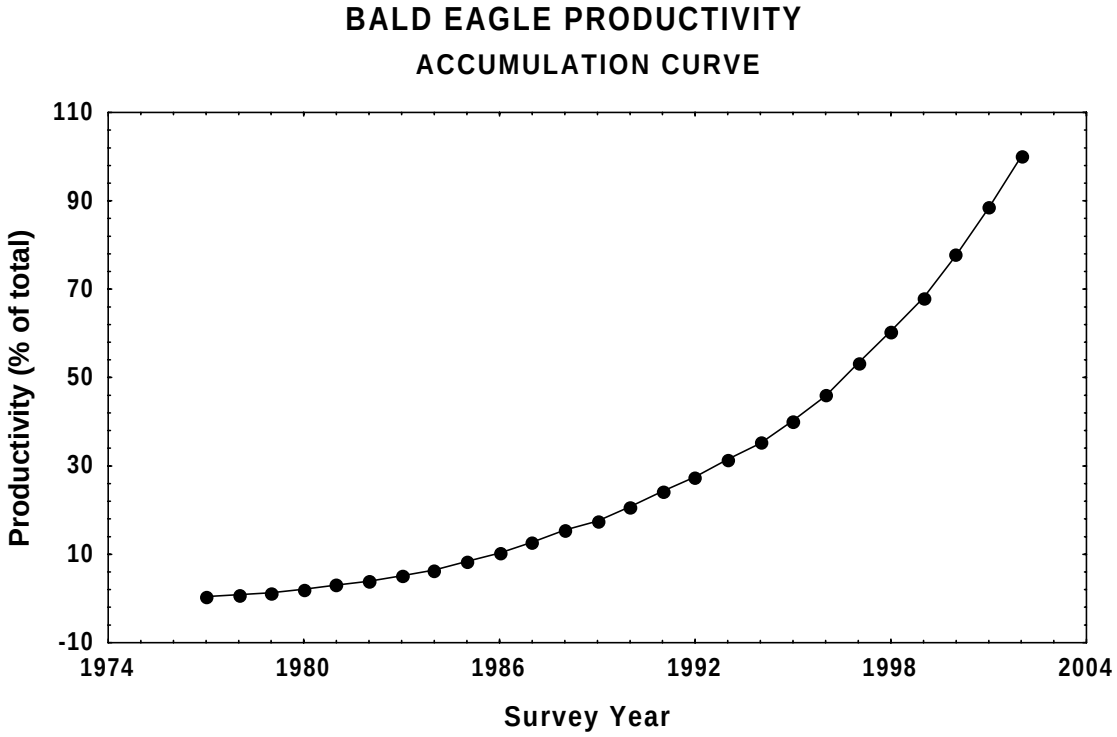

Figure 3. Productivity accumulation curve for Bald Eagles in Virginia (1977-2002). Total chicks produced over the 26-year study was 4,340.

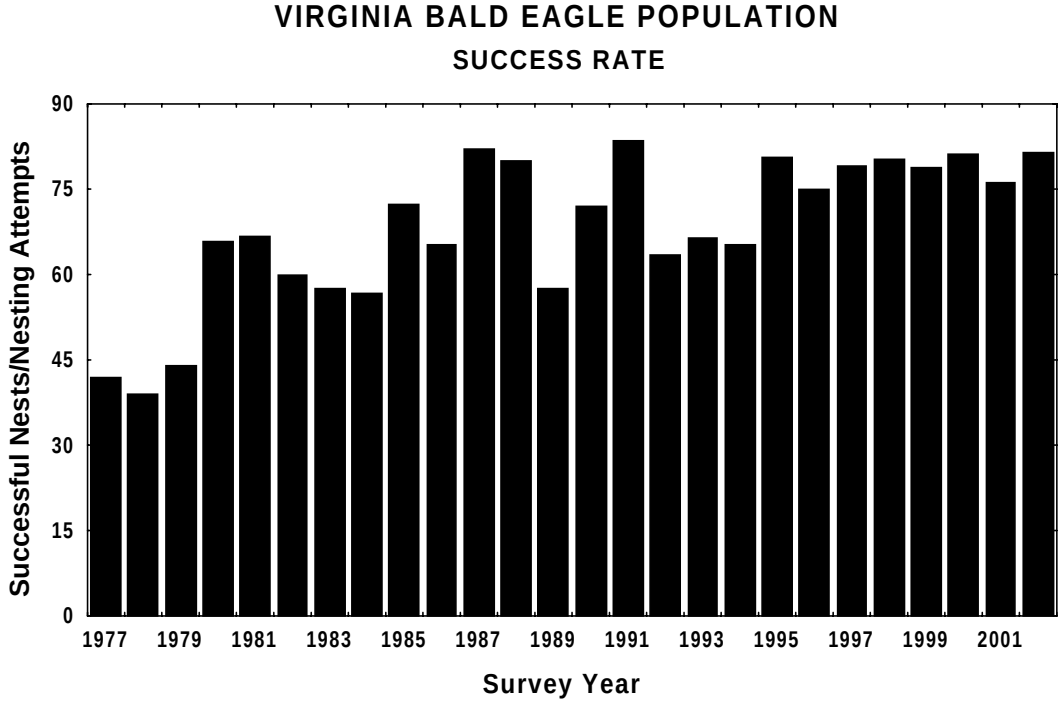

Figure 4. General trend in success rate for Bald Eagles in Virginia (1977-2002). Success rate calculated as successful nests/active nests.

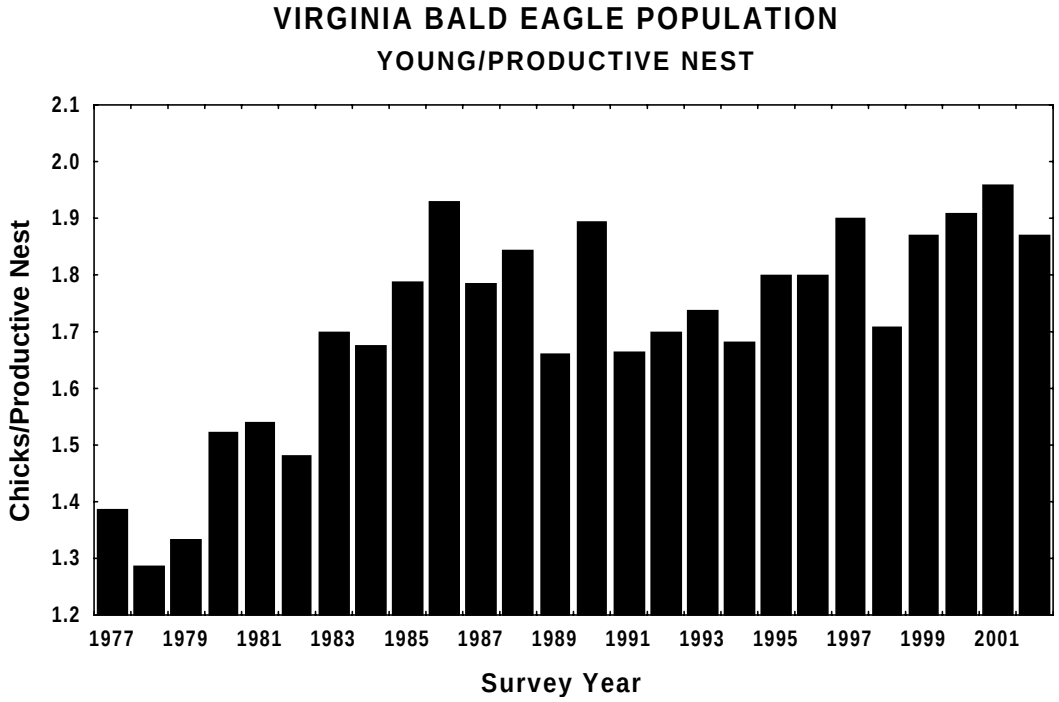

Figure 5. Temporal trend in average brood size for Bald Eagles in Virginia (1977-2002).

DISCUSSION

Since the elevation of the Bald Eagle to the federal list of endangered species in 1967 (first under The Endangered Species Protection Act of 1966 and subsequently under The Endangered Species Act of 1973) and a ban on the general use of DDT and like compounds in the United States in 1972, Bald Eagles in Virginia have experienced a dramatic recovery. As illustrated by the results presented here, this recovery includes (1) an increase in the number of breeding territories, (2) an increase in reproductive rate, and (3) an expansion in geographic distribution. The population recovery observed here in Virginia is consistent with that documented throughout the conterminous United States. Bald Eagles in the lower 48 states have increased from an estimated low in 1963 of 417 pairs (Sprunt 1963) to an estimated 5,748 pairs by 1998 (Millar 1999).

Based on the annual rate of territory formation, the Virginia breeding population shows no obvious signs of slowed growth. However, the rapid rate of growth observed throughout the 1990's will clearly not be sustained indefinitely. Breeding density along selected stretched of the James, Rappahannock, and Potomac Rivers has already reached very high levels. Further research on prey delivery rates, chick growth, and fledging success may help to predict when the population may begin to reach some form of equilibrium with the available resources. Such research may help to refine estimates of how many eagles Virginia is capable of sustaining in the long term.

The annual breeding survey has played an important role in the recovery of Bald Eagles in Virginia. In addition to tracking the progress of the population, the survey has been used to guide management actions. Without information on the distribution and activity status of breeding pairs, layers of protection provided by federal laws would not be effective. The program has proven to be one of the most important elements of a successful conservation strategy (Byrd et al. 1990). As the Virginia population enters a new phase of the recovery process, maintaining the long-term monitoring program is essential.

ACKNOWLEDGEMENTS

Many individuals and organizations contributed to the success of the 2002 Bald Eagle survey in Virginia. Ray Fernald and Jeff Cooper from the Virginia Department of Game & Inland Fisheries provided logistical support. Heather Mansfield and Thomas Wray provided assistance in accessing DOD airspace. Captain Fuzzzo and Matt Crabbe provided expert flying services. Keith Cline and Catherine Markham assisted on one or more productivity flights. Numerous individuals including Randy Burcham, Jeff Cooper, Thelma Dalmas, Eric Davis, Scott Florence, Walt Hampton, Jollie Harrison, Teta Kain, Reese Lukei, Jeff Marcell, Rick Reynolds, Tim Stamps, Jeff Trollinger, Tom Wilcox, and Mary Ann Willis provided information toward the survey. Carlton Adams, Renee Peace, Lydia Whitaker, Mark Roberts, Cheryl Pope, Anne Womack, Gloria Sciole, and Laura Sherman from the College of William and Mary provided logistical support. Financial support was provided by the Virginia Department of Game & Inland Fisheries, the U.S. Fish and Wildlife Service, the U.S. Department of Defense, the U.S. Army Corps of Engineers and the Center for Conservation Biology.

LITERATURE CITED

Abbott, J. M. 1957. Bald Eagle survey: First annual report. Atlantic Naturalist 12:118-119.

Abbott, J. M. 1963. Bald Eagle survey for Chesapeake Bay, 1962. Atlantic Naturalist 18:22-27.

Abbott, J. M. 1976. Bald Eagle nest survey 1976. Atlantic Naturalist 31:162-163.

Abbott, J. M. 1977. Chesapeake Bay Bald Eagle Survey: 1977. Unpublished report.

Byrd, M. A., G. D. Therres, S. N. Wiemeyer, and M. Parkin. 1990. Chesapeake Bay region Bald Eagle recovery plan: First Revision. U.S. Department of the Interior, Fish and Wildlife Service. Newton Corner, MA. 49pp.

Fraser, J. D., L. D. Frenzel, J. E. Mathisen, F. Martin, and M. E. Shough. 1983. Schedulting bald eagle reproduction surveys. Wildlife Society Bulletin 11:13-16.

Millar, J. G. 1999. Endangered and threatened wildlife and plants; proposed rule to remove the Bald Eagle in the lower 48 states from the list of endangered and threatened wildlife. Federal Register 64: 36454-36464.

Postupalsky, S. 1974. Raptor reproductive success: some problems with methods, criteria and terminology. Raptor Research Report 2:21-31.

Sprunt, A., IV. 1962. Continental Bald Eagle Project: Progress report no. II. Proceedings of the National Audubon Society's Convention. Corpus Christi, TX.

Sprunt, A., IV. 1963. Continental Bald Eagle Project: Progress report no. III. Proceedings of the National Audubon Society's Convention. Miami, FL.

APPENDIX I: Summary of 2002 Bald Eagle survey results for the Potomac River drainage. See methods for definitions of "occupied territory" and "active nest".

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
FF-92-01	Fairfax	Mount Vernon	Y	Y	?[1]
FF-94-01	Fairfax	Fort Belvoir	Y	N	-----
FF-96-01	Fairfax	Fort Belvoir	Y	Y	1
FF-96-02	Fairfax	Fort Belvoir	Y	Y	1
FF-97-01	Fairfax	Fort Belvoir	Y	Y	2
FF-00-02	Fairfax	Fort Belvoir	Y	Y	1
FF-01-01	Fairfax	Occoquan	Y	Y	2
FF-01-02	Fairfax	Indian Head	Y	Y	2
FF-02-01	Fairfax	Indian Head	Y	N	-----
FQ-92-01	Faquier	Rectortown	Y	Y	1[2]
KG-82-02	King George	Rollins Fork	Y	Y	2
KG-87-03	King George	King George	Y	Y	3
KG-87-04	King George	Dahlgren	Y	Y	1
KG-87-05	King George	Mathias Point	Y	Y	2
KG-90-02	King George	King George	Y	Y	2
KG-96-05	King George	Dahlgren	Y	Y	1
KG-97-01	King George	Passapatanzy	Y	Y	2
KG-97-02	King George	King George	Y	Y	2
KG-97-03	King George	Mathias Point	Y	Y	2
KG-97-05	King George	Dahlgren	Y	Y	2
KG-98-08	King George	Mathias Point	Y	Y	2
KG-99-04	King George	King George	Y	Y	1
KG-99-05	King George	Dahlgren	Y	Y	3
KG-99-07	King George	Mathias Point	Y	Y	2
KG-99-08	King George	Dahlgren	Y	Y	2
KG-00-01	King George	Widewater	Y	Y	3
KG-00-02	King George	Dahlgren	Y	Y	1
KG-01-03	King George	King George	Y	Y	2
KG-01-04	King George	Dahlgren	Y	Y	3
KG-02-04	King George	King George	Y	N	-----
KG-02-05	King George	Mathias Point	Y	Y	2
ND-96-01	Northumberland	St. George Island	Y	Y	2
ND-00-02	Northumberland	Burgess	Y	Y	2
ND-02-01	Northumberland	St. George Isl.	Y	Y	2
ND-02-02	Northumberland	Lottsburg	Y	Y	2
ND-02-03	Northumberland	Heathsville	Y	Y	1
ND-02-04	Northumberland	Heathsville	Y	Y	0
PW-98-01	Prince William	Quantico	Y	Y	1
PW-99-01	Prince William	Quantico	Y	Y	0
PW-99-02	Prince William	Quantico	Y	Y	0

APPENDIX I: --Continued--

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
ST-96-02	Stafford	Widewater	Y	N	-----
ST-96-03	Stafford	Passapatanzy	Y	Y	0
ST-98-03	Stafford	Quantico	Y	Y	0
ST-99-01	Stafford	Widewater	Y	Y	2
ST-00-01	Stafford	Widewater	Y	Y	1
ST-00-02	Stafford	Joplin	Y	N	**-----**
ST-01-03	Stafford	Widewater	Y	Y	3
ST-02-01	Stafford	Widewater	Y	Y	?[3]
ST-02-02	Stafford	Passapatanzy	Y	N	-----
WE-83-04	Westmoreland	Machodac	Y	Y	3
WE-84-04	Westmoreland	Colonial Beach S.	Y	N	-----
WE-91-02	Westmoreland	Stratford Hall	Y	Y	3
WE-94-02	Westmoreland	Colonial Beach S.	Y	Y	1
WE-95-03	Westmoreland	Rollins Fork	Y	Y	2
WE-95-06	Westmoreland	Kinsale	Y	Y	2
WE-96-02	Westmoreland	Stratford Hall	Y	Y	?[3]
WE-96-05	Westmoreland	Stratford Hall	Y	Y	2
WE-97-01	Westmoreland	Colonial Beach N.	Y	Y	0
WE-97-11	Westmoreland	St. Clements Isl.	Y	Y	0
WE-98-02	Westmoreland	Colonial Beach S.	Y	Y	2
WE-98-03	Westmoreland	Colonial Beach S.	Y	Y	2
WE-98-04	Westmoreland	Machodac	Y	N	-----
WE-98-05	Westmoreland	Machodac	Y	Y	2
WE-98-07	Westmoreland	Kinsale	Y	Y	2
WE-00-02	Westmoreland	Colonial Beach N.	Y	N	-----
WE-00-05	Westmoreland	St. Clements Isl.	Y	Y	2
WE-00-07	Westmoreland	Kinsale	Y	Y	1
WE-00-08	Westmoreland	Kinsale	Y	Y	1
WE-01-04	Westmoreland	Colonial Beach S.	Y	N	-----
WE-01-05	Westmoreland	Stratford Hall	Y	Y	1
WE-01-08	Westmoreland	Machodac	Y	Y	0
WE-01-10	Westmoreland	Piney Point	Y	Y	2
WE-01-11	Westmoreland	Rollins Fork	Y	Y	2
WE-01-12	Westmoreland	Machodoc	Y	Y	2
WE-02-03	Westmoreland	Stratford Hall	Y	Y	?[3]
WE-02-04	Westmoreland	Machodoc	Y	Y	1
WE-02-05	Westmoreland	St. Clements Isl.	Y	Y	2
WE-02-06	Westmoreland	Colonial Beach S.	Y	Y	1
WE-02-07	Westmoreland	Kinsale	Y	N	-----

[1]Nesting results unknown.
[2]Nest successful with at least 1 chick.
[3]Bird still in incubation posture during productivity flight.

APPENDIX II: Summary of 2002 Bald Eagle survey results for the Rappahannock River drainage. See methods for definitions of "occupied territory" and "active nest".

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
CA-90-01	Caroline	Supply	Y	Y	1
CA-90-02	Caroline	Port Royal	Y	Y	2
CA-90-03	Caroline	Rapp Academy	Y	N	-----
CA-95-02	Caroline	Rapp Academy	Y	Y	2
CA-96-02	Caroline	Port Royal	Y	Y	2
CA-96-03	Caroline	Supply	Y	N	-----
CA-96-05	Caroline	Port Royal	Y	Y	2
CA-99-02	Caroline	Supply	Y	Y	0
CA-00-02	Caroline	Rapp Academy	Y	Y	2
CA-01-01	Caroline	Rapp Academy	Y	Y	2
CA-02-01	Caroline	Port Royal	Y	Y	2
ES-79-01	Essex	Morattico	Y	Y	2
ES-93-03	Essex	Dunnsville	Y	Y	2
ES-95-05	Essex	Tappahannock	Y	Y	2
ES-97-03	Essex	Mount Landing	Y	Y	2
ES-97-06	Essex	Loretto	Y	Y	2
ES-99-03	Essex	Champlain	Y	Y	3
ES-00-02	Essex	Mount Landing	Y	Y	3
ES-00-03	Essex	Champlain	Y	Y	3
ES-00-04	Essex	Champlain	Y	Y	2
ES-01-01	Essex	Dunnsville	Y	Y	0
ES-01-02	Essex	Dunnsville	Y	Y	?[3]
ES-01-03	Essex	Mount Landing	Y	Y	2
ES-01-04	Essex	Champlain	Y	Y	1
ES-01-06	Essex	Champlain	Y	Y	2
ES-01-07	Essex	Champlain	Y	Y	0
ES-02-01	Essex	Dunnsville	Y	Y	0
ES-02-02	Essex	Mount Landing	Y	Y	0
ES-02-03	Essex	Champlain	Y	Y	3
ES-02-04	Essex	Loretto	Y	N	-----
ES-02-05	Essex	Loretto	Y	Y	1
ES-02-06	Essex	Rollins Fork	Y	Y	1
ES-02-07	Essex	Tappahannock	Y	Y	2
KG-95-01	King George	Port Royal	Y	Y	3
KG-95-03	King George	Rollins Fork	Y	Y	0
KG-96-01	King George	Port Royal	Y	N	-----
KG-97-08	King George	Rollins Fork	Y	Y	2
KG-98-01	King George	Port Royal	Y	Y	2
KG-98-03	King George	Rollins Fork	Y	Y	3
KG-99-01	King George	Port Royal	Y	Y	3

APPENDIX II: --Continued--

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
KG-01-01	King George	Port Royal	Y	Y	0
KG-02-01	King George	Port Royal	Y	Y	3
KG-02-02	King George	Port Royal	Y	Y	0
KG-02-03	King Geoge	Rollins Fork	Y	Y	1
LA-98-03	Lancaster	Urbanna	Y	Y	2
LA-01-02	Lancaster	Irvington	Y	Y	2
LA-02-01	Lancaster	Lively	Y	Y	1
LA-02-02	Lancaster	Lively	Y	Y	2
LA-02-03	Lancaster	Urbanna	Y	Y	1
MI-77-01	Middlesex	Church View	Y	Y	0
MI-96-01	Middlesex	Urbanna	Y	Y	3
MI-99-01	Middlesex	Church View	Y	Y	1
MI-01-03	Middlesex	Morattico	Y	Y	0
MI-02-01	Middlesex	Wilton	Y	Y	?[3]
MI-02-03	Middlesex	Church View	Y	Y	1
MI-02-04	Middlesex	Church View	Y	Y	1
MI-02-05	Middlesex	Church View	Y	Y	2
MI-02-07	Middlesex	Saluda	Y	Y	2
RI-85-03	Richmond	Morattico	Y	Y	0
RI-87-03	Richmond	Tappahannock	Y	Y	1
RI-89-02	Richmond	Tappahannock	Y	Y	3
RI-90-03	Richmond	Champlain	Y	Y	0
RI-90-04	Richmond	Tappahannock	Y	Y	0
RI-95-02	Richmond	Mount Landing	Y	Y	2
RI-95-03	Richmond	Tappahannock	Y	Y	3
RI-97-01	Richmond	Montross	Y	Y	0
RI-98-01	Richmond	Champlain	Y	Y	2
RI-98-03	Richmond	Montross	Y	Y	2
RI-98-05	Richmond	Tappahannock	Y	Y	2
RI-99-02	Richmond	Morattico	Y	Y	2
RI-99-03	Richmond	Lively	Y	Y	2
RI-00-03	Richmond	Tappahannock	Y	Y	0
RI-01-02	Richmond	Tappahannock	Y	Y	2
RI-02-01	Richmond	Champlain	Y	Y	2
RI-02-02	Richmond	Montross	Y	Y	2
RI-02-03	Richmond	Tappahannock	Y	Y	2
RI-02-04	Richmond	Tappahannock	Y	Y	2
RI-02-05	Richmond	Tappahannock	Y	Y	?[3]
RI-02-06	Richmond	Tappahannock	Y	N	-----
RI-02-07	Richmond	Tappahannock	Y	Y	3

APPENDIX II: --Continued--

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
RI-02-09	Richmond	Tappahannock	Y	Y	2
ST-01-01	Stafford	Salem Church	Y	Y	2
WE-84-01	Westmoreland	Champlain	Y	Y	1
WE-88-01	Westmoreland	Champlain	Y	Y	2
WE-99-03	Westmoreland	Rollins Fork	Y	Y	?[1]
WE-00-09	Westmoreland	Rollins Fork	Y	Y	0
WE-00-10	Westmoreland	Champlain	Y	Y	0
WE-00-11	Westmoreland	Champlain	Y	Y	2
WE-01-01	Westmoreland	Rollins Fork	Y	Y	3
WE-01-02	Westmoreland	Loretto	Y	Y	2
WE-02-01	Westmoreland	Champlain	Y	Y	1

[1]Nesting results unknown.
[2]Nest successful with at least 1 chick.
[3]Bird still in incubation posture during productivity flight.

APPENDIX III: Summary of 2002 Bald Eagle survey results for the York River drainage. See methods for definitions of "occupied territory" and "active nest".

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
CA-99-01	Caroline	Ashland	Y	Y	1
GL-97-01	Gloucester	Gressitt	Y	Y	2
GL-98-02	Gloucester	Gloucester	Y	Y	2
GL-01-04	Gloucester	Clay Bank	Y	Y	1
GL-02-02	Gloucester	Gressitt	Y	Y	2
HN-95-01	Hanover	Hanover	Y	Y	1
JC-95-01	James City	Toano	Y	Y	2
JC-98-03	James City	Gressitt	Y	Y	0
JC-00-01	James City	Gressitt	Y	Y	2
KQ-96-01	King & Queen	K&Q Courthouse	Y	Y	0
KQ-00-01	King & Queen	West Point	Y	Y	2
KQ-02-01	King & Queen	King William	Y	Y	1
KW-80-01	King William	West Point	Y	N	-----
KW-88-01	King William	New Kent	Y	Y	2
KW-91-02	King William	New Kent	Y	Y	2
KW-92-01	King William	New Kent	Y	Y	2
KW-93-01	King William	West Point	Y	Y	1
KW-97-03	King William	West Point	Y	Y	2
KW-98-01	King William	Tunstall	Y	N	-----
KW-98-02	King William	K&Q Courthouse	Y	Y	2
KW-99-01	King William	K&Q Courthouse	Y	Y	1
KW-00-01	King William	K&Q Courthouse	Y	Y	2
KW-01-01	King William	Tunstall	Y	Y	2
KW-01-02	King William	Tunstall	Y	Y	2
KW-02-01	King William	K&Q Courthouse	Y	Y	2
NK-86-01	New Kent	Tunstall	Y	Y	2
NK-94-02	New Kent	New Kent	Y	Y	2
NK-97-01	New Kent	New Kent	Y	Y	0
NK-97-03	New Kent	West Point	Y	Y	1
NK-98-04	New Kent	New Kent	Y	Y	2
NK-99-01	New Kent	Toano	Y	N	-----
NK-00-04	New Kent	New Kent	Y	Y	2
NK-01-01	New Kent	West Point	Y	Y	2
NK-01-03	New Kent	Tunstall	Y	Y	1
NK-02-01	New Kent	New Kent	Y	Y	2
YK-94-01	York	Clay Bank	Y	Y	1
YK-99-02	York	Williamsburg	Y	Y	1
YK-01-01	York	Yorktown	Y	Y	3
YK-02-01	York	Poquoson W.	Y	Y	2

APPENDIX III: --Continued--

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
YK-02-01	York	Poquoson W.	Y	Y	2
YK-02-02	York	Yorktown	Y	Y	3
YK-02-03	York	Clay Bank	Y	N	-----
YK-02-04	York	Williamsburg	Y	Y	2
YK-02-05	York	Williamsburg	Y	Y	1
YK-02-06	York	Williamsburg	Y	Y	2
YK-02-07	York	Williamsburg	Y	Y	0

APPENDIX IV: Summary of 2002 Bald Eagle survey results for the James River drainage. See methods for definitions of “occupied territory” and “active nest”.

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
CC-90-02	Charles City	Westover	Y	Y	0
CC-94-01	Charles City	Hopewell	Y	Y	0
CC-96-02	Charles City	Brandon	Y	Y	2
CC-98-03	Charles City	Brandon	Y	N	-----
CC-99-01	Charles City	Westover	Y	Y	3
CC-99-02	Charles City	Westover	Y	N	-----
CC-99-04	Charles City	Charles City	Y	Y	1
CC-99-05	Charles City	Brandon	Y	Y	2
CC-99-06	Charles City	Providence Forge	Y	Y	0
CC-00-01	Charles City	Charles City	Y	Y	3
CC-00-03	Charles City	Brandon	Y	Y	2
CC-01-02	Charles City	Charles City	Y	Y	0
CC-01-05	Charles City	Walkers	Y	Y	2
CC-01-06	Charles City	Westover	Y	Y	0
CC-02-01	Charles City	Westover	Y	Y	2
CC-02-02	Charles City	Westover	Y	Y	2
CC-02-03	Charles City	Charles City	Y	N	-----
CC-02-04	Charles City	Brandon	Y	N	-----
CC-02-05	Charles City	Brandon	Y	N	-----
CC-02-06	Charles City	Brandon	Y	Y	2
CC-02-07	Charles City	Westover	Y	Y	2
CC-02-08	Charles City	Walkers	Y	Y	2
CD-98-01	Chesterfield	Hopewell	Y	Y	2
CD-98-02	Chesterfield	Hopewell	Y	Y	3
CD-99-01	Chesterfield	Hopewell	Y	Y	0
CD-02-01	Chesterfield	Hopewell	Y	Y	0
CD-02-02	Chesterfield	Hopewell	Y	Y	3
HE-94-01	Henrico	Dutch Gap	Y	N	-----
HE-95-01	Henrico	Roxbury	Y	Y	1
HE-99-01	Henrico	Hopewell	Y	Y	1
HE-99-02	Henrico	Drewrys Bluff	Y	Y	2
HO-00-01	Hopewell City	Hopewell	Y	Y	1
IW-86-01	Isle of White	Bacons Castle	Y	Y	1
IW-96-01	Isle of White	Benns Church	Y	Y	3
IW-99-01	Isle of White	Benns Church	Y	Y	1
IW-01-01	Isle of White	Benns Church	Y	Y	2
IW-01-02	Isle of White	Mulberry Island	Y	Y	2
IW-02-01	Isle of White	Bacons Castle	Y	Y	0
JC-87-01	James City	Surry	Y	Y	2
JC-94-01	James City	Norge	Y	Y	0

APPENDIX IV: --Continued--

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
JC-96-01	James City	Norge	Y	Y	2
JC-96-02	James City	Norge	Y	Y	2
JC-98-02	James City	Hog Island	Y	Y	2
JC-01-01	James City	Surry	Y	Y	1
JC-01-02	James City	Hog Island	Y	Y	2
JC-01-03	James City	Norge	Y	Y	1
JC-01-05	James City	Surry	Y	Y	2
JC-01-06	James City	Yorktown	Y	Y	0
JC-02-01	James City	Norge	Y	N	-----
NK-01-04	New Kent	Walkers	Y	Y	3
NN-87-01	Newport News	Mulberry Island	Y	Y	1
NN-02-02	Newport News	Newport News N.	Y	Y	2
PG-89-01	Prince George	Charles City	Y	Y	3
PG-91-01	Prince George	Charles City	Y	Y	2
PG-94-01	Prince George	Westover	Y	Y	3
PG-94-02	Prince George	Westover	Y	Y	3
PG-96-04	Prince George	Prince George	Y	Y	3
PG-97-02	Prince George	Charles City	Y	Y	0
PG-00-02	Prince George	Savedge	Y	Y	2
PG-00-03	Prince George	Charles City	Y	Y	1
PG-00-04	Prince George	Westover	Y	Y	2
PG-00-05	Prince George	Westover	Y	Y	2
PG-01-01	Prince George	Savedge	Y	Y	2
PG-01-02	Prince George	Savedge	Y	Y	2
PG-02-01	Prince George	Hopewell	Y	Y	0
PM-00-01	Portsmouth	Newport News S.	Y	Y	0
PO-98-01	Powhatan	Midlothian	Y	Y	2
RM-01-01	Richmond City	Bonair	Y	Y	2
SK-91-01	Suffolk City	Chuckatuck	Y	Y	0
SK-00-01	Suffolk City	Suffolk	Y	Y	2
SK-02-01	Suffolk City	Newport News S.	Y	Y	3
SK-02-02	Suffolk City	Chuckatuck	Y	Y	3
SU-96-01	Surry	Hog Island	Y	Y	1
SU-96-04	Surry	Hog Island	Y	Y	1
SU-97-04	Surry	Surry	Y	Y	3
SU-99-03	Surry	Claremont	Y	Y	1
SU-00-01	Surry	Surry	Y	Y	1
SU-00-02	Surry	Surry	Y	Y	2
SU-01-02	Surry	Surry	Y	Y	2
SU-02-01	Surry	Hog Island	Y	Y	1
SU-02-03	Surry	Hog Island	Y	Y	1

APPENDIX V: Summary of 2002 Bald Eagle survey results for the western shore fringe of the Chesapeake Bay. See methods for definitions of “occupied territory” and “active nest”.

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
GL-96-01	Gloucester	Achilles	Y	Y	3
GL-02-01	Gloucester	Saluda	Y	Y	0
HM-97-01	Hampton City	Newport News N.	Y	Y	2
HM-00-01	Hampton City	Newport News N.	Y	Y	2
KQ-02-02	King&Queen	Church View	Y	Y	0
LA-01-03	Lancaster	Deltaville	Y	Y	3
MI-85-01	Middlesex	Wilton	Y	Y	2
MI-01-01	Middlesex	Deltaville	Y	Y	2
MI-02-06	Middlesex	Shackleford	Y	Y	0
MT-97-01	Mathews	Ware Neck	Y	Y	1
MT-00-01	Mathews	Mathews	Y	Y	0
MT-01-01	Mathews	Ware Neck	Y	Y	2
MT-01-02	Mathews	Mathews	Y	Y	1
MT-02-01	Mathews	Newpoint Comfort	Y	Y	0
ND-86-01	Northumberland	Lancaster	Y	Y	2
ND-92-01	Northumberland	Reedville	Y	Y	2
ND-01-01	Northumberland	Fleets Bay	Y	Y	1
ND-02-05	Northumberland	Reedville	Y	Y	3

APPENDIX VI: Summary of 2002 Bald Eagle survey results for the Eastern Shore of Virginia. See methods for definitions of “occupied territory” and “active nest”.

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
AC-88-02	Accomac	Exmore	Y	Y	2
AC-93-01	Accomac	Pungoteague	Y	Y	2
AC-94-01	Accomac	Chincoteague W.	Y	Y	2
AC-94-02	Accomac	Chincoteague E.	Y	Y	0
AC-94-03	Accomac	Jamesville	Y	Y	1
AC-97-03	Accomac	Chincoteague W.	Y	Y	3
AC-99-02	Accomac	Accomac	Y	Y	0
AC-99-03	Accomac	Chesconnessex	Y	Y	2
AC-00-01	Accomac	Chincoteague W.	Y	Y	1
AC-01-01	Accomac	Saxis	Y	Y	1
AC-02-01	Accomac	Nassawaddox	Y	Y	1
AC-02-02	Accomac	Hallwood	Y	Y	2
AC-02-03	Accomac	Parksley	Y	Y	1
NT-94-03	Northampton	Townsend	Y	Y	3
NT-96-01	Northampton	Cheriton	Y	Y	0
NT-96-03	Northampton	Cheriton	Y	N	-----
NT-97-01	Northampton	Townsend	Y	Y	2
NT-00-01	Northampton	Jamesville	Y	Y	1
NT-00-02	Northampton	Franktown	Y	Y	1
NT-01-01	Northampton	Cheriton	Y	Y	2
NT-01-02	Northampton	Cheriton	Y	Y	1
NT-02-01	Northampton	Cheriton	Y	N	-----
NT-02-02	Northampton	Cheriton	Y	N	-----

APPENDIX VII: Summary of 2002 Bald Eagle survey results for the Lower Tidewater portion of Virginia. See methods for definitions of “occupied territory” and “active nest”.

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
SK-99-01	Suffolk City	Lake Drummond	Y	Y	1
VB-97-01	Virginia Beach	Kempsville	Y	Y	1
VB-99-01	Virginia Beach	Creeds	Y	Y	3
VB-00-01	Virginia Beach	North Bay	Y	Y	2
VB-02-01	Virginia Beach	Cape Henry	Y	Y	1
VB-02-02	Virginia Beach	Pleasant Ridge	Y	N	-----

APPENDIX VIII: Summary of 2002 Bald Eagle survey results for the inland impoundments and rivers of Virginia. See methods for definitions of "occupied territory" and "active nest".

NEST CODE	COUNTY	TOPO QUAD	OCCUP TERR	ACTIVE NEST	CHICK PROD
AL-98-01	Albemarle	Simeon	Y	N	**-----**
AM-01-01	Amherst	Lynchburg	Y	Y	2
BT-93-01	Bath	Mount Grove	Y	Y	2
CD-96-01	Chesterfield	Winterpock	Y	N	-----
CD-96-02	Chesterfield	Hallsboro	Y	Y	2
CU-97-01	Culpepper	Rapidan	Y	Y	1[2]
HF-01-01	Halifax	Buffalo Springs	Y	Y	0
ME-97-01	Mecklenburg	Clarkesville North	Y	Y	2
ME-00-02	Mecklenburg	John H. Kerr	Y	Y	3
ME-01-01	Mecklenburg	Boydton	Y	Y	2
ME-02-01	Mecklenburg	Bracey	Y	Y	1
NO-99-01	Nottoway	Danieltown	Y	Y	1[2]
PE-96-01	Prince Edward	Green Bay	Y	Y	2
PW-98-03	Prince William	Thorofare Gap	Y	Y	2
SH-02-01	Shenandoah	Strasburg	Y	Y	1[2]
SO-01-01	South Hampton	Riverdale	Y	Y	1
SS-97-01	Sussex	Disputana South	Y	N	-----
SS-02-01	Sussex	Waverly	Y	Y	1
SS-02-02	Sussex	Yale	Y	Y	1

[1]Nesting results unknown.
[2]Nest successful with at least 1 chick.
[3]Bird still in incubation posture during productivity flight.