

PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
RESEARCH DIVISION
PROJECT ANNUAL JOB REPORT

PROJECT CODE NO: 06510

TITLE: Waterfowl Research/Management

JOB CODE NO.: 51004

TITLE: Waterfowl Population Monitoring

PERIOD COVERED: 1 July 2003 to 30 June 2004

COOPERATING AGENCIES: U.S. Fish & Wildlife Service (USFWS), Division of Migratory Bird Management; Cooperating Atlantic Flyway States

WORK LOCATION(S): Statewide

PREPARED BY: Ian D. Gregg, John P. Dunn, and Kevin J. Jacobs

DATE: 26 October 2004

Abstract: The objectives of this project are to monitor the status of breeding and wintering populations of waterfowl in Pennsylvania and the Atlantic Flyway (AF), and to assess the effects of harvest regulation changes on the waterfowl resource. Pennsylvania duck hunting seasons for 2003 were 60 days with a bag limit of 6 birds, similar to previous years, with harvest restrictions in place for pintails and canvasbacks. Canada goose zones and seasons were similar to 2002, except for a bag limit increase to 8 birds in the Atlantic Population (AP) South Zone during the September season and restrictions on harvest at SGL 46 (Middle Creek WMA). Pennsylvania's total duck harvest (USFWS Harvest Information Program (HIP) estimate) was 124,300, 50% lower than 2002. For the AF, total duck harvest and harvests of most of the major individual species decreased. Total Canada goose harvest was 188,200 in Pennsylvania (evenly divided between early and late seasons targeting the large resident population, and the regular season) and 657,900 in the AF. Snow goose harvest in 2003 increased from the previous year in Pennsylvania (5,700 birds) and declined slightly at the flyway level (36,100). During the Pennsylvania portion of the 2004 AF Midwinter Waterfowl Survey (MWS), conducted in January, we observed 68,939 waterfowl (26% below the 2003 total). Canada goose numbers declined substantially from 2003; mergansers declined slightly and mallards, black ducks, snow geese, and tundra swans showed modest increases. Canada geese, snow geese, and tundra swans were above the previous 10-year average. Compared to 2003, AF counts were up for mallards and snow geese and down for black ducks, Canada geese, and tundra swans. Mallards and black ducks were below, Canada and snow geese above, and tundra swans similar to, their respective 10-year averages. In the Pennsylvania portion of the 2004 AF Breeding Waterfowl Survey, conducted in April and May, point estimates for breeding pairs of mallards (84,806) and wood ducks (47,368) were similar to 2003, with mallards below and wood ducks similar to the 10-year average. Black ducks (0 birds recorded) decreased and were below the previous 10-year average, with Canada goose pairs (123,126) increasing from 2003 and above the 10-year average. For the Northeast U.S. survey area, there were non-significant increases from 2003 in mallard and

wood duck pair estimates and non-significant decreases in black duck and Canada goose estimates. Long-term trends for this survey are increasing for Canada geese and stable for duck species, with a short-term decrease in black duck numbers. Wetland habitat conditions across Pennsylvania and much of the northern AF region were good to excellent throughout spring and summer 2004 due to abundant precipitation. Overall waterfowl production from the region is expected to be above average in 2004. Spring 2004 breeding population estimates increased for AP Canada geese and decreased for the Southern James Bay Population (SJBPP). Production is expected to be poor for both of these migratory populations due to harsh spring weather conditions on their breeding grounds.

OBJECTIVE

To determine the status of breeding and wintering waterfowl populations in Pennsylvania and assess the effects of hunting regulation changes on the waterfowl resource.

METHODS

Hunter activity and total waterfowl harvest were estimated from the USFWS Harvest Information Program (HIP) and the PGC's Game Take Survey. The HIP survey, which became fully operational in 1999, has replaced the traditional USFWS Mail Questionnaire Survey (MQS), which used duck stamp buyers as a sampling frame and was phased out after the 2001 season. From 1999-2001 the 2 surveys were conducted concurrently. The USFWS is in the process of formally comparing the results from the 2 surveys during this period of overlap to provide a basis for continuity between estimates derived from them. Until that analysis is completed, results from the 2 surveys cannot be considered comparable, and it is difficult to place recent harvest estimates in historical context. The species, age, sex, geographical, and temporal distribution of the total harvest were obtained from the USFWS Parts Collection Survey (PCS). This survey samples a number of HIP-registered migratory bird hunters who record the date and location for each bird they harvest, and send in a wing from each duck and a tail fan and primary tips from each goose from which species, sex, and age are determined. A pilot study from 1998-2001 indicated that use of tail fans alone for age classification of geese introduces a substantial negative bias in age ratios, because many juveniles from temperate-nesting populations completely replace their juvenile rectrices with adult feathers before or during the hunting season. Consequently, the USFWS now uses the tips of primary feathers in conjunction with tail fans to assign ages, which provides more accurate age ratio estimates. Productivity data for snow geese, tundra swans, and Atlantic brant is obtained from a survey conducted on major wintering grounds (between New York and North Carolina) in early winter by Atlantic Flyway states and National Wildlife Refuges. The percentage of immatures and number of young per family group observed during this survey provide an index to production during the previous breeding season for these 3 species that are not well surveyed on their Arctic breeding grounds.

Estimates of numbers of wintering waterfowl are obtained from the MWS. All states in the AF conduct this survey in early January; it is a primarily aerial count of waterfowl on major wintering areas within the flyway. Segment coverage in the 2002-2004 surveys has followed an "MWS-Lite" approach (Gregg et al. 2002). Therefore, state results for 2002-2004 may not be completely comparable to prior years, particularly for Canada geese. For this species, comparisons based on the segments not affected by the changes in 2002 may be

more relevant. In 2004, MWS data in eastern Pennsylvania was collected using a USFWS voice/GPS software program. This program enables voice recordings of waterfowl observations to be linked to the GPS position of the aircraft. Transcribed data from this program can be input into the USFWS database and the linkage of waterfowl concentrations to geographical locations provides important information for habitat conservation programs.

Information on breeding population size of mallards, black ducks, wood ducks, Canada geese, and other waterfowl was obtained from the Atlantic Flyway Breeding Waterfowl Plot Survey. This survey has been conducted annually since 1989 in Pennsylvania and other AF states from Virginia to New Hampshire. Established 1-km² plots are surveyed for ducks and geese once each year between mid-April and early May. Breeding pair units are determined from the presence of pairs, lone drakes, and groups of drakes. Breeding pair estimates show large 95% confidence intervals on the state level; the survey is designed to yield $\leq 20\%$ coefficient of variation on the mean over the entire Northeast United States region. Therefore, breeding pair trends over several years are more useful to follow than individual year estimates for Pennsylvania. Additional breeding survey data for areas not covered by the AF Breeding Waterfowl Survey was provided by the USFWS.

RESULTS

Hunter Activity and Harvest

As in 2002, duck season length in 2003 was 60 days with outside framework dates of the Saturday nearest 24 September and the last Sunday in January. Duck seasons selected for Pennsylvania remained similar to previous years; all 4 zones had split seasons with the first segment running 1-2 weeks during October and the second segment opening in early to mid-November and running 8-9 weeks until closing between late December and mid-January (Appendix 1). The aggregate daily duck bag limit remained at 6 birds. Season length was restricted to 30 days within the general duck season for both canvasbacks (liberalization from a closed season in 2002-2003) and northern pintails (same restriction as in 2002-2003), as dictated by status of these species in relation to established national harvest strategies. All other species and sex-specific regulations remained the same as in 2002.

Boundaries of the 5 Canada goose harvest zones (RP, SJBP, Pymatuning, AP North, and AP South) were unchanged from 2002-2003 (Appendix 1). An early Canada goose season (1-25 September) was again held statewide (except for the Pymatuning Zone and SGL 46, the Middle Creek Wildlife Management Area in Lebanon/Lancaster Counties). For 2003, the USFWS authorized bag limits of up to 8 birds for the September season. However, in Pennsylvania this 8-bird bag limit was applied only in the Atlantic Population Zone South in southeastern Pennsylvania, where nuisance goose problems are the most severe and harvest opportunities are more restricted during fall and winter due to the presence of migratory AP geese. For other areas having a September season, bag limit remained at 5 birds. Population status of RP, SJBP, and AP Canada geese was similar to 2002, so season lengths and bag limits for Pennsylvania's regular and late goose seasons were essentially unchanged from 2002-2003. The RP zone had a 70-day regular season (15-29 November and 11 December-14 February) with a 5-bird daily bag limit. The SJBP Zone had a 40-day regular season (15 November-31 December) with a 2-bird bag limit, and a 30-day late season (15 January-14 February) with a 5-bird daily limit. The Pymatuning Zone had a 35-day regular season (15 November-25 December) with a daily bag limit of 1 bird. The AP Zone North had a 45-day regular season (15-29 November and 9

December-14 January) with a 2-bird bag limit, and a 30-day late season (15 January-14 February) with a 5-bird bag limit. The AP Zone South had a 45-day regular season (15-29 November and 15 December-20 January) with a 2-bird daily bag limit, except for SGL 46 where the daily limit was 1 bird.

The numbers of active duck and goose hunters in Pennsylvania were estimated at 32,100 and 41,300, respectively. Both estimates were similar to those for recent years. At present, the HIP Survey does not allow for estimation of the number of waterfowl hunters at the flyway level because there is no mechanism to prevent double-counting of individual hunters that register more than once (due to the requirement to complete a separate HIP registration for each state where a hunter wishes to pursue migratory game birds). Hunter numbers are likely relatively stable since duck stamp sales and the number of days hunted for ducks and geese at the flyway level have exhibited little annual change over the past several years.

Estimates of total Pennsylvania duck harvest for the 2003-2004 season (Table 1) were 124,300 (USFWS-HIP) and 191,132 (PGC). The HIP harvest estimate was 50% lower than the 2002 estimate. State-level HIP harvest estimates to date have shown more variability than either MQS or Game Take Survey estimates, and additional analysis and accumulation of HIP data is needed to assess the accuracy and precision of the various surveys for estimating state waterfowl harvests. Total AF regular season duck harvest was 1,607,400, an 11% decrease from 2002.

The 4 most commonly harvested duck species in Pennsylvania were mallard (49% of the total harvest), wood duck (22%), and black duck and green-winged teal (6% each). For the major duck species in the Pennsylvania harvest (the above plus blue-winged teal, bufflehead, and lesser scaup), harvest estimates declined from 2002 for all species except lesser scaup (Table 2). County-level harvest estimates were not available at the time of this report. At the flyway level, harvests declined from 2002 for most major species including mallards (427,300, down 23%), wood ducks (336,900, down 9%), green-winged teal (137,200, down 13%), and black ducks (95,100, down 26%).

Total Canada goose harvest estimates in Pennsylvania (Table 1) for 2003 were 188,200 (USFWS-HIP) and 207,632 (PGC). The HIP estimate was 6% lower than 2002. With the recent expansion of regular season harvest opportunities in the AP and RP zones, the regular season has regained the distinction of accounting for the largest proportion of the annual Pennsylvania Canada goose harvest (50% in 2003-2004). The September season continues to account for a substantial proportion (37%) of the harvest, while the late season contributed 13%. County-level harvest estimates were not available at the time of this report. AF Canada goose harvest during the 2003 season was 657,900, an 8% decrease from 2002.

Estimated snow goose harvest in Pennsylvania was 5,700 birds (USFWS-HIP), more than 3 times the 2002 estimate. Total snow goose harvest for the flyway (36,100) decreased 7% from 2002.

The trend in the number of juveniles per adult in the AF harvest (Table 3) was positive from 2002 to 2003 for most waterfowl species, with some species exhibiting their best age ratios in several years. It should be noted that Canada goose age ratios from 1998-2003 are not directly comparable to those from 1997 and prior because the latter are based on tail fan data only. (Canada goose age ratio data from 1998-2001 also differs from that presented in previous annual reports for this job because the more accurate primary tip

plus tail fan data available for those years from the pilot study has been substituted for the tail fan only data included in prior reports.) The age ratios reflect good waterfowl production due to the excellent habitat conditions present during the 2003 breeding season in most duck production areas important to the Atlantic Flyway. Compared to 2002, the 2003 production index for tundra swans and snow geese increased at the state level (Table 4). Flyway level results also showed an increase in snow goose productivity (more than a 5-fold increase over the "bust" year of 2002 although still 22% below the 1976-2002 average), but indicated a decrease in tundra swan productivity (35% below 2002, 59% below the long-term average, and the lowest since 1992). Atlantic brant productivity was near average.

Midwinter Waterfowl Survey

The Pennsylvania portion of the 2004 MWS was conducted between 7-12 January. Survey methods generally were similar to those used in past years, with fixed-wing aerial surveys supplemented by ground surveys at Middle Creek and Pymatuning Wildlife Management Areas and Conneaut Lake. Habitat and observation conditions were variable with rivers, southeastern Pennsylvania lakes, and Lake Erie having little ice cover but other lakes in northwestern Pennsylvania being 90% or more frozen. In areas without ice cover, waterfowl were more dispersed and difficult to count than usual, which may have had a minor effect on survey numbers.

We observed 68,939 waterfowl in Pennsylvania (Table 5). This included 6,616 dabbling ducks (mostly mallards and black ducks), 606 diving ducks (mostly scaup, buffleheads, and goldeneyes), 764 mergansers, 59,634 geese (81% of which were Canada geese), and 1,294 total swans (97% of which were tundra swans). The total number of waterfowl observed was 26% lower than the 2003 survey, but 6% higher than the 1994-2003 average. For the 11 segments unaffected by the 2002 procedural changes, the total was 10% higher than the previous 10-year average for those segments. Most of the decrease in overall numbers from the 2003 survey resulted from a 37% decline in the number of Canada geese observed. Among the other common wintering species, mergansers also declined, while counts increased for mallards, black ducks, snow geese, and tundra swans. Canada geese were 7% above their overall 1994-2003 average (12% above when comparing only the 11 segments unchanged in 2002). Numbers of snow geese (88% above) and tundra swans (6% above) were also higher than their respective 1994-2003 averages, while mallards, black ducks, and mergansers were below their respective 10-year averages.

For the entire AF, 3,545,149 waterfowl were observed in the Midwinter Waterfowl Survey (Appendix 2). This total represented a 4% increase from 2003 but was 5% below the 1994-2003 average. Mallards increased 5% from 2003 but were 13% below the 10-year average. Black duck numbers were about 8% below both the 2003 count and the 10-year average. Canada geese were 15% lower than in 2003 but still 7% above the 10-year average. Snow geese increased 37% from 2003 and were 64% above the 1994-2003 average, while tundra swans were down 12% but essentially equal to the 10-year average.

Breeding Waterfowl Survey

Two hundred sixteen 1-km² plots containing wetland habitats distributed across 6 physiographic regions (Fig. 1) of Pennsylvania were field checked for breeding waterfowl, with breeding pair estimates for the most common breeding waterfowl species calculated for 2004 (Table 6). These estimates

and those for other species encountered during the breeding surveys were also compared to survey results from the past 10 years (Table 7).

The number of mallard pairs in Pennsylvania in 2004 was estimated at 84,806. Stratum 22, in southwestern Pennsylvania and stratum 10 in southeastern Pennsylvania had the highest density of breeding mallards (1.45 and 1.12 pairs/km², respectively). The trend in mallard pairs appears stable since 60-day hunting seasons were initiated in 1997. There were no black ducks observed in the Commonwealth on survey plots for only the second time in 16 years. Black ducks have been observed at very low densities since the survey was initiated in 1989. There were 47,368 wood duck breeding pairs estimated during the 2004 survey. Wood duck densities were highest in northwestern and southeastern Pennsylvania with 0.80 and 0.53 pairs/km², respectively. The trend in wood duck pairs has been relatively stable since 1989. The statewide trends for teal and merganser species all appear stable since 1989. It should be noted that an unknown number of migrating teal are recorded in this survey each year, which may lead to wide fluctuations in population estimates unrelated to actual breeding numbers.

The 2004 Pennsylvania Canada goose population estimate of 299,269 was a new record high point estimate. The highest densities of total geese were observed in the southeastern (6.20 geese/km²) and northwestern (4.97 geese/km²) portions of the Commonwealth. Survey observations also indicated a new record high, 123,126 breeding pairs of Canada geese in the state. Pairs were again most abundant in southeastern (2.14 pairs/km²) and northwestern (1.91 pairs/km²) Pennsylvania. There has been an increasing trend in the number of breeding pairs and total population of Canada geese in the state since 1989, though the rate of increase has slowed somewhat since the late 1990's.

Breeding pair estimates for the most common breeding species in the Atlantic Flyway for 2004 (Appendix 3) were: mallard, 388,399 pairs; black duck, 25,052 pairs; wood duck, 172,845 pairs; and Canada goose, 395,450 pairs. The estimate for total Canada geese (factoring in non-breeding individuals) was 980,433 birds. The point estimates increased for mallard, wood duck, and Canada goose pairs and decreased for black duck pairs and total Canada geese, but all were statistically similar to 2003 ($P > 0.2$, Appendix 3). Mallard and wood duck pair estimates have remained stable in the Northeast U.S. during the 1989-2004 period; there has been a short-term (1999-2004) decline in black duck pair estimates. Canada goose pair estimates and total population have exhibited increasing trends since 1989. The Atlantic Flyway Resident Population of Canada geese is currently approximately 50% above the North American Waterfowl Management Plan (NAWMP) goal of 650,000 birds.

In the Ungava Peninsula region of northern Quebec, where most breeding AP Canada geese are concentrated, 174,793 breeding pairs were counted in spring 2004, up 11% from 2003 and above the population objective for this region (150,000 pairs). Poor production is expected due to the effects of a late spring thaw on nesting effort and success, but the status of this population remains healthy and a large fall flight, albeit with fewer juveniles, is expected in 2004. The number of breeding pairs of SJBP Canada geese on Akimiski Island, Nunavut, and the James Bay lowlands of Ontario (37,600) decreased 16% from 2003 with a record low number of pairs on Akimiski Island; total spring population (101,000) was down 5%, but still slightly above the NAWMP goal of 100,000 birds. Spring was very late in the SJBP breeding range and poor production, with a smaller fall flight than in

2003, is expected. The SJBP population trend from 1990 to 2004 has been stable despite restrictive harvest regulations since 1991. Research conducted on Akimiski Island has documented a relationship between poor gosling growth rates, survival and degraded brood-rearing habitat (Hill et al. 2003). SJBP gosling recruitment from Akimiski Island will likely remain poor in the foreseeable future due to the degraded brood rearing habitat.

The number of greater snow geese counted on spring staging areas in the St. Lawrence Valley was 957,617. This is a new record high estimate and up 41% from the 2003 estimate of 678,000 birds. At least part of the large percentage increase may be related to improvements in survey methodology (use of 5 aircraft rather than 3), which allowed for better coverage of the survey area. Liberal snow goose seasons were instituted in the U.S. and Canada in the 1990's in response to the potential for habitat degradation by overabundant greater snow goose populations. Prior to 2004, these seasons appeared to be achieving the desired result of beginning to reduce this population toward the NAWMP goal of 500,000 birds. Continued close monitoring of greater snow goose numbers will be required to determine if more drastic management measures will be needed to attain optimal population levels. Projections for 2004 are for near average greater snow goose production and a large fall flight similar in size to 2003.

The number of ducks counted in the traditional mid-continent survey area was 32.2 million, an 11% decrease from the 2003 estimate of 36.2 million. Mallard abundance was 7.4 million, similar to both the 2003 estimate and the long-term (1955-2003) average. Most other species were also similar to 2003 levels and with 3 exceptions (scaup, northern pintails, and American wigeons), were near or above their long-term averages and NAWMP goals. Pintails and scaup continue to be of particular concern. Breeding population estimates for these 2 species were statistically similar to 2003 ($P = 0.110$ and 0.810 , respectively, USFWS 2004), but remained 48% and 27%, respectively, below long-term averages, and well below NAWMP goals. Neither of these species showed a positive response to excellent habitat conditions in the mid-continent region during the late 1990s. The total May pond estimate for the U.S./Canadian prairies and Canadian parklands (3.9 million) was 24% lower than 2003 and 19% below the long-term average. In the eastern surveyed areas of Canada and Maine the total number of ducks was 3.9 million. The point estimate increased 8% from 2003 but was statistically similar to both the previous year's estimate ($P = 0.534$, USFWS 2004) and the long-term (1996-2003) average for this survey ($P = 0.102$, USFWS 2004). Ring-necked ducks increased significantly from 2003 ($P = 0.095$, USFWS 2004) but were similar to their long-term average, while American wigeon and goldeneyes were below their long-term averages. Estimates for other individual species were similar to both 2003 and long-term averages. Precipitation was above average throughout Pennsylvania and most of the northern AF region in fall and winter 2003-2004 as well as throughout the 2004 breeding season. Spring was late with below-average temperatures, and nest flooding may have had negative impacts on production in some locales, but overall wetland habitat conditions were excellent for breeding, brood-rearing, and re-nesting, and waterfowl production from areas important to Pennsylvania should again be good to excellent in 2004.

RECOMMENDATIONS

1. Continue waterfowl breeding and wintering survey efforts during FY 2004 to provide annual information on waterfowl population status.

2. Continue implementation of computer software programs to electronically link waterfowl observations with GPS coordinates: expand use of MWS voice/GPS program to all Pennsylvania MWS segments, and refine methodology for electronic data collection on Breeding Waterfowl Survey plots.

LITERATURE CITED

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Table 1. Waterfowl harvest in Pennsylvania as estimated by USFWS Harvest Information Program Survey (USFWS-HIP), USFWS Mail Questionnaire Survey (USFWS-MQS), and PGC game take survey, 1994-2003.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003 ^a
Ducks										
USFWS-HIP						148,000	140,200	248,300	248,100	124,300
USFWS-MQS	85,500	104,600	113,700	141,800	131,300	143,000	112,600	129,100		
PGC	128,164	156,511	151,142	188,034	146,050	164,328	185,185	143,907	169,828	191,132
Canada Geese										
USFWS-HIP						152,500	99,200	215,100	199,900	188,200
USFWS-MQS	61,600	54,600	80,300	104,500	91,100	94,700	81,500	125,800		
PGC	102,980	64,380	83,780	112,752	127,000	118,682	162,538	191,318	171,599	207,632

^a Preliminary.

Table 2. Harvest estimates (USFWS) for major duck species in Pennsylvania, 1994-2003.

Species	1994 ^a	1995 ^a	1996 ^a	1997 ^a	1998 ^a	1999 ^b	2000 ^b	2001 ^b	2002 ^b	2003 ^{bc}
Mallard	50,100	50,500	56,600	71,000	60,900	71,500	77,400	125,700	124,600	60,300
Black duck	4,300	6,500	7,500	8,400	5,000	7,300	8,600	13,800	15,200	7,000
Wood duck	20,300	27,000	30,400	35,700	39,200	37,200	34,700	72,500	60,900	27,400
Green-winged teal	3,400	3,300	2,900	4,800	6,600	9,500	5,300	7,400	11,800	7,100
Blue-winged teal	800	2,800	1,400	1,100	300	900	300	1,900	1,300	700
Bufflehead	800	1,200	2,700	4,800	6,000	1,900	2,000	4,600	6,400	3,000
Lesser scaup	600	4,500	2,000	1,900	600	2,500	400	2,200	3,500	4,500

^a Estimate based on Mail Questionnaire Survey.

^b Estimate based on Harvest Information Program Survey.

^c Preliminary.

Table 3. Age ratios (Immature/Adult) of the 10 most commonly harvested duck species, plus pintails and Canada geese (as determined from wing and tail collections) during the 1994-2003 hunting seasons in the Atlantic Flyway. Duck species presented in order of average percentage species composition in the 2001-2003 flyway harvests.

Species	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003 ^a
Mallard	1.20	1.09	1.15	1.25	1.03	0.91	0.95	1.14	0.95	1.26
Wood duck	1.16	1.24	1.23	1.18	1.09	1.03	1.22	1.20	1.15	1.59
Green-winged teal	2.45	1.81	1.61	2.33	2.33	2.37	1.20	1.15	1.88	1.83
Black duck	1.16	1.14	0.99	1.38	1.24	1.00	0.82	0.93	1.07	1.12
Ring-necked duck	1.16	1.44	1.03	2.05	1.33	1.11	0.73	1.19	1.11	1.17
Lesser scaup	2.31	1.07	0.64	1.05	1.69	0.27	0.34	0.63	0.46	0.77
Bufflehead	1.21	0.79	0.92	0.74	0.96	0.64	0.47	0.86	1.29	0.78
Blue-winged teal	2.06	2.30	1.98	2.00	1.03	1.39	0.73	1.34	0.83	1.29
Gadwall	1.30	1.65	1.52	1.27	0.71	1.97	0.79	0.83	0.51	0.86
American wigeon	0.91	0.87	0.58	1.01	1.23	1.08	0.50	1.01	0.92	0.90
Northern pintail	1.36	0.76	0.81	2.03	1.80	1.18	0.57	1.02	1.32	2.29
Canada goose	0.34 ^b	0.36 ^b	0.22 ^b	0.33 ^b	0.50 ^c	0.60 ^c	0.41 ^c	0.48 ^c	0.40 ^c	0.56 ^c

^a Preliminary.

^b Age ratios determined from tail fans only.

^c Age ratios determined from a combination of tail fans and primary tips.

Table 4. Productivity data (percent immatures) for Atlantic brant, greater snow geese, and tundra swans wintering in the Atlantic Flyway, 1994-2003.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Atlantic brant	10.2	21.6	15.3	17.5	24.1	1.5	25.1	24.7	6.9	17.2
Gr. snow geese										
PA	NA	NA	62.3	32.3	NA	0.0	20.9	25.0	4.9	53.2
AF	13.4	16.7	30.5	28.7	26.5	2.8	34.6	21.2	2.8	15.8
Tundra swans										
PA	NA	NA	17.5	6.4	NA	16.1	8.1	16.3	9.6	13.2
AF	19.2	8.1	10.0	7.5	15.7	10.4	10.2	9.8	8.0	5.2

^a NA = not available.

Table 5. Number of waterfowl recorded in zones 1-3 during Pennsylvania's Midwinter Waterfowl Survey, 1994-2004.

Species	2004 ^a	2003 ^a	2002 ^a	2001	2000	1999	1998	1997	1996	1995	1994	1994-2003
												Avg.
Canada goose	48,534	77,224	78,828	48,198	29,388	44,821	33,350	35,657	40,244	24,195	40,790	45,270
Mallard	4,465	3,082	4,124	4,306	7,184	6,274	5,921	6,049	3,452	5,923	3,244	4,956
Black duck	2,084	1,775	2,904	1,570	3,878	2,185	5,098	2,365	1,236	5,204	1,923	2,814
Pintail	24	0	6	0	12	2	13	12	0	0	0	5
Wigeon	0	0	11	0	1	0	0	3	0	3	0	2
G-w teal	0	2	1	0	6	0	18	0	0	0	0	3
B-w teal	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	18	0	0	2	12	1	20	23	0	33	0	9
N. shoveler	25	0	119	9	61	49	79	23	4	20	0	36
Wood duck	0	0	0	0	0	1	0	0	0	0	4	1
Ruddy duck	6	1	8	33	25	56	66	0	6	0	150	35
Bufflehead	204	237	1,841	191	335	102	238	45	4	1,559	194	475
Goldeneye	116	70	41	10	352	82	161	942	61	320	1,061	310
Ring-necked	0	11	12	44	15	1	0	35	7	11	0	14
Scaup	260	0	0	34	357	400	287	230	25	40	55	143
Canvasback	10	0	0	0	13	66	164	5	2	40	0	29
Redhead	10	0	20	1	0	60	16	1	4	1	0	10
Long-tailed	0	0	0	0	0	6	0	0	0	0	0	1
Scoters	0	0	0	0	2	0	0	0	0	0	0	0
Mergansers	764	992	564	1,070	7,968	1,949	2,886	1,816	1,773	3,146	9,383	3,155
Unident. Ducks	0	25	27	53	9	0	35	29	19	29	234	46
Brant	0	0	0	2	0	0	0	0	0	0	0	0
Snow goose	11,100	9,602	4,347	0	1,400	9,023	10,463	11,695	58	12,202	182	5,897
Wh.-fr. goose	0	0	0	0	0	1	0	0	0	0	0	0
Tundra swan	1,261	548	1,098	363	1,106	553	1,949	3,515	115	2,012	686	1,195
Mute swan	33	27	13	32	32	10	13	27	13	10	13	19
Unident. swans	0	0	0	3	0	0	0	0	0	0	0	0
Coot	25	50	250	265	1,050	339	420	685	61	1,337	16	447
Total	68,939	93,646	94,214	56,186	53,206	65,981	61,197	63,157	47,084	56,085	57,935	64,869

^a Totals for 2002-2004 may not be completely comparable to those from 2001 and prior due to procedural changes to survey in 2002.

Table 6. Number of waterfowl breeding pairs + 95% confidence interval by physiographic strata in Pennsylvania, 2004.

Stratum	Mallard		Black duck		Wood duck		Canada goose		Canada goose	
	Pairs	95% C.I.	Pairs	95% C.I.	Pairs	95% C.I.	Pairs	95% C.I.	Total	95% C.I.
10	14,768	7,604	0	-	6,981	4,186	28,194	9,929	81,627	34,754
13	20,203	12,211	0	-	13,933	15,310	20,899	12,647	33,439	22,369
22	19,311	15,544	0	-	5,993	4,815	17,313	12,848	58,599	40,911
241	9,048	5,896	0	-	7,917	3,660	18,944	12,845	49,197	40,902
242	11,681	7,760	0	-	7,434	4,856	21,593	15,788	42,124	31,715
243	9,795	3,786	0	-	5,110	2,739	16,183	7,502	34,282	17,822
2004 PA Total	84,806	23,619	0	-	47,368	17,877	123,126	29,902	299,269	79,865
1994-2003 Avg.	103,401		1,218		51,189		85,915		216,117	

Table 7. Pennsylvania waterfowl population estimates, 1995-2004.

Species Estimate	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	Avg.
Mallard pairs	84,806	82,302	84,534	89,030	88,443	121,515	92,453	109,767	108,731	123,174	98,476
Mallard total	177,715	170,067	171,752	189,711	185,318	246,359	191,082	223,017	220,148	264,480	203,965
Black duck pairs	0	622	2,010	2,026	354	1,444	1,375	1,444	649	1,760	1,168
Black duck total	0	1,245	4,020	4,052	709	2,889	2,749	2,889	1,299	3,519	2,337
Wood duck pairs	47,368	46,855	65,684	56,276	43,296	59,011	52,368	57,733	42,375	45,247	51,621
Wood duck total	94,736	93,711	132,858	116,298	92,648	122,783	112,629	123,140	87,659	102,575	107,904
Canada goose prs.	123,126	101,564	85,192	96,468	85,379	104,343	88,975	87,849	71,120	81,056	92,507
Canada goose tot.	299,269	254,194	234,754	246,859	225,472	261,965	196,661	194,607	189,860	206,192	230,983
Bl-wing teal tot.	8,041	1,273	7,842	8,373	10,293	9,305	15,492	13,697	12,235	5,864	9,242
Gr-wing teal tot.	9,138	5,803	4,131	4,664	7,015	4,338	2,633	3,977	7,856	2,362	5,192
Hooded merg. tot.	1,272	4,247	4,205	1,417	3,686	2,833	1,630	5,665	3,097	510	2,856
Common merg. tot.	14,671	17,831	14,371	14,020	12,292	33,325	11,581	16,304	2,176	8,140	14,471

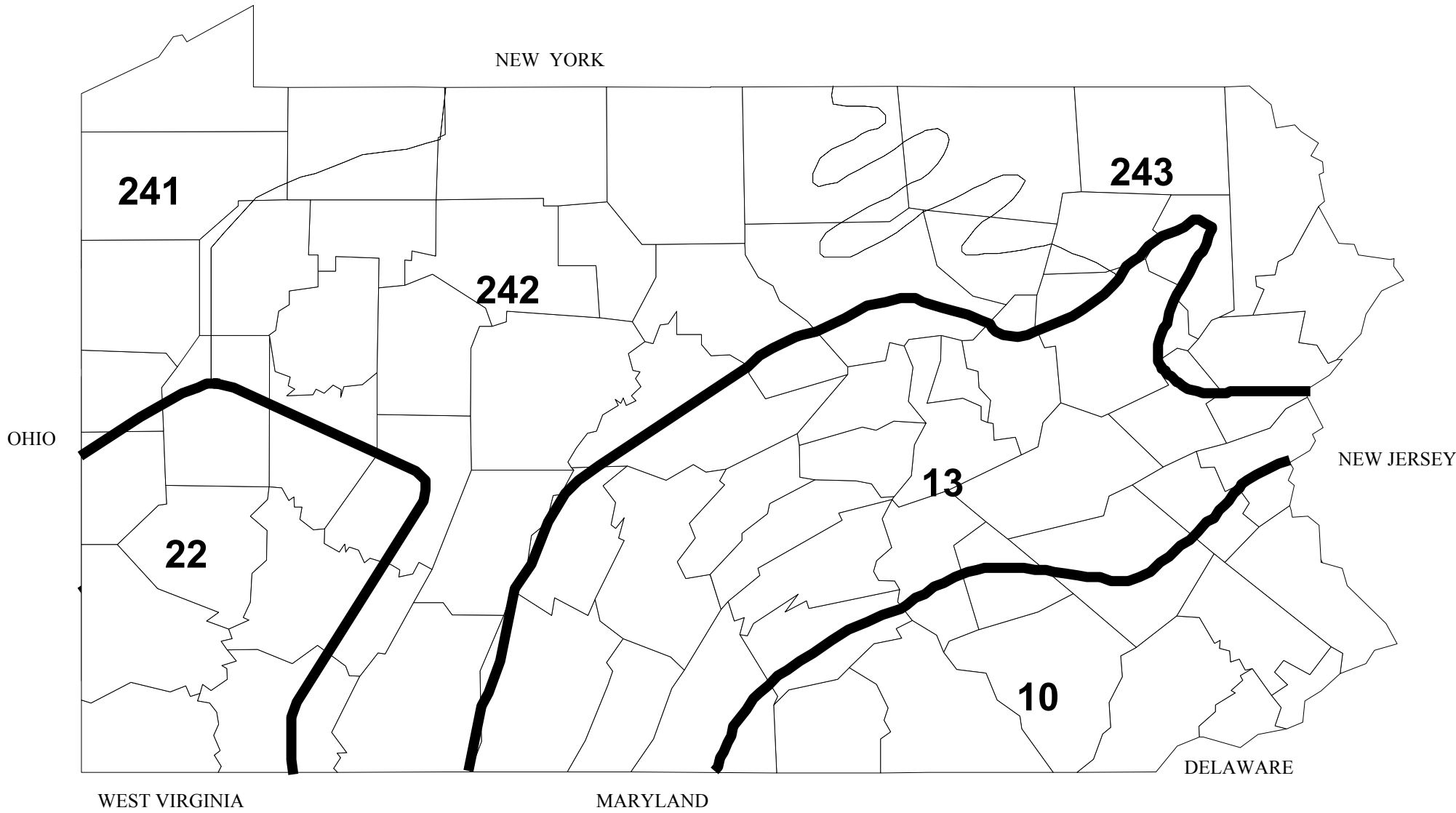


Fig. 1. Physiographic zones sampled for breeding waterfowl in Pennsylvania.

Appendix 1
2003-2004 Pennsylvania Waterfowl Seasons

**BUREAU OF WILDLIFE MANAGEMENT
MIGRATORY GAME BIRD SECTION**

2003/2004 WATERFOWL HUNTING SEASON REGULATIONS

DUCKS, SEA DUCKS, COOTS, AND MERGANSERS

BAG LIMITS

DUCKS: 6 daily, 12 in possession; daily limit may not include more than 4 mallards including 2 hen mallards, 1 black duck, 1 pintail, 1 mottled duck, 1 fulvous tree duck, 2 wood ducks, 2 redheads, 1 canvasback, 4 scoters and 3 scaup. Possession limit may not include more than 8 mallards including 4 hens, 2 black ducks, 2 pintails, 2 mottled ducks, 2 fulvous tree ducks, 4 wood ducks, 4 redheads, 2 canvasbacks, 8 scoters and 6 scaup.

MERGANSERS: 5 daily, not more than 1 hooded merganser, 2 in possession.

COOTS: 15 Daily, 30 in possession.

Youth Waterfowl Hunting Day (Ducks, Mergansers, Canada Geese, Coots and Moorhens): September 27

SEASON DATES

Lake Erie Zone

Pintails – Dec. 2 – Jan. 5.

Canvasbacks - Dec. 2 – Jan. 5.

All other ducks, sea ducks, coots and mergansers- Oct. 27 – Nov. 1 & Nov. 4 – Jan. 5.

North Zone

Pintails - Oct. 11–25 & Nov. 15 – Dec. 4.

Canvasbacks - Nov. 15 – Dec. 19.

All other ducks, sea ducks, coots and mergansers -Oct. 11-25 & Nov. 15 – Jan. 8.

Northwest Zone

Pintails - Oct. 11–25 & Nov. 1–20.

Canvasbacks - Nov. 21 – Dec. 25.

All other ducks, sea ducks, coots and mergansers-Oct. 11-25 and Nov. 1 – Dec. 25.

South Zone

Pintails - Oct. 11–18 & Nov. 15 – Dec. 11.

Canvasbacks - Nov. 15 – Dec. 19.

All other ducks, sea ducks, coots and mergansers-Oct. 11-18 and Nov. 15 - Jan. 15.

CANADA GEESE

Pymatuning Zone

Nov. 15 – Dec. 25 (1 goose daily limit).

Atlantic Population Zone North

Nov. 15 – 29 and Dec. 9 – Jan. 14 (2 goose daily limit).

Jan. 15 – Feb. 14 (5 goose daily bag limit).

Atlantic Population Zone South

Nov. 15-29 and Dec. 15-Jan. 20 (2 goose daily limit).

Southern James Bay Population Zone

Nov. 15 - Dec. 31 (2 goose daily limit).

Jan. 15 – Feb. 14 (5 goose daily bag limit).

Resident Canada Goose Zone.

Nov. 15-29 and Dec. 11- Feb. 14 (5 goose daily limit).

Early Resident Canada Goose Season – Statewide

September 1 – September 25 (5 goose daily bag limit, 10 in possession) except:

- (1) No September goose season in that portion of Crawford County south of SR 198 from the Ohio state line to intersection of SR 18, to intersection of US Route 322/SR18, to intersection of SR 3013, south to Crawford/Mercer County line.
- (2) No September Canada goose season on the Middle Creek Wildlife Management Area (SGL 46); both the controlled and public hunting areas are closed.
- (3) The daily bag and possession limits shall be 8 and 16 respectively in the southern portion of the AP zone.

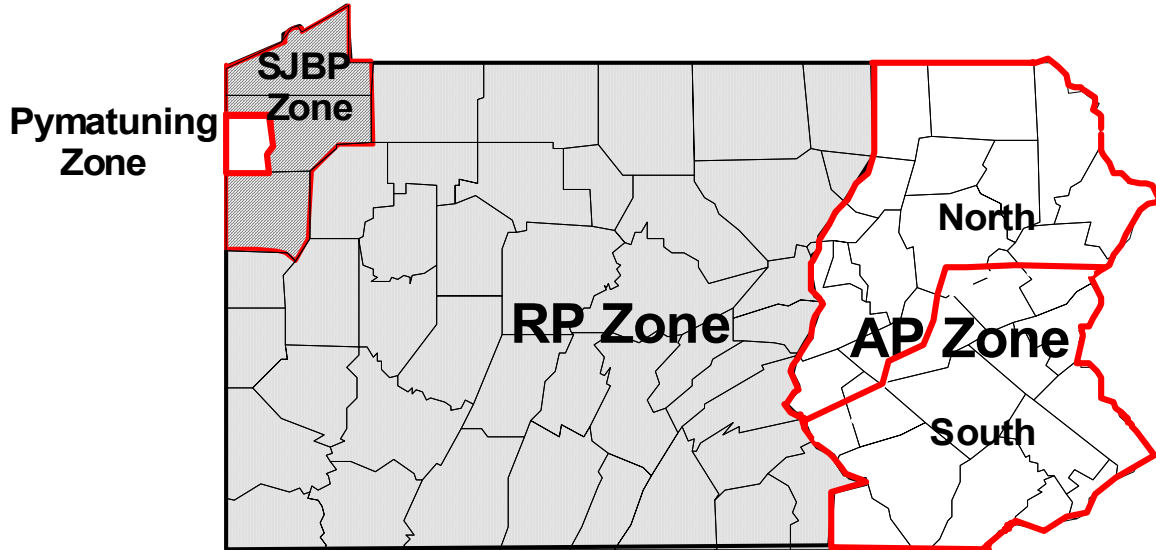
ATLANTIC BRANT

Oct. 11 – Dec. 19 (3 brant daily bag limit, 6 in possession).

SNOW GEESE

Nov. 7 - Mar. 10 (15 snow goose daily bag limit, no possession limit).

Canada goose hunting zones for 2003-2004 season in Pennsylvania.



Resident Canada Goose Zone (RP)

All of Pennsylvania **except** for Crawford, Erie, and Mercer counties **and** the area east of I-83 from the Maryland state line to the intersection of US Route 30 to the intersection of SR 441 to intersection of I-283, east of I-283 to I-83, east of I-83 to intersection of I-81, east of I-81 to the intersection of US Route 322, east of US Route 322 to intersection of SR 147, east of SR 147 to intersection of I-180, east of I-180 to intersection of US Route 220, east of US Route 220 to the New York state line.

SJBZ Zone

Erie, Mercer, and Crawford Counties **except** for the Pymatuning Zone (the area south of SR 198 from the Ohio state line to intersection of SR 18 to intersection of US Route 322/SR 18, to intersection of SR 3013, south to the Crawford/Mercer County line).

Pymatuning Zone

The area south of SR 198 from the Ohio state line to intersection of SR 18 to intersection of US Route 322/SR 18, to intersection of SR 3013, south to the Crawford/Mercer County line.

AP Zone

The area east of I-83 from the Maryland state line to the intersection of US Route 30 to the intersection of SR 441 to intersection of I-283, east of I-283 to I-83, east of I-83 to intersection of I-81, east of I-81 to the intersection of US Route 322, east of US Route 322 to intersection of SR 147, east of SR 147 to intersection of I-180, east of I-180 to intersection of US Route 220, east of US Route 220 to the New York state line.

South The area east of I-83 from the Maryland state line to the intersection of US Route 30 to the intersection of SR 441 to intersection of I-283, east of I-283 to I-83, east of I-83 to intersection of I-81, east of I-81 to the intersection of I-80, south of I-80 to New Jersey state line.

North The remainder of the AP zone.

Appendix 2
Atlantic Flyway Midwinter Waterfowl Survey, 2004 Final Report

Results of the 2004 Atlantic Flyway Midwinter Waterfowl Survey

1 of 2

	ME	VT	NH	MA	CT	RI	NY	PA	WV	NJ	DE	MD
Mallard	2,055	325	252	3,373	1,013	320	13,675	3,477	1,172	28,445	13,054	48,182
Black duck	10,799	142	829	9,954	2,150	640	16,804	1,834	393	92,775	7,974	31,682
Mexican duck	0	0	0	0	0	0	0	0	0	0	0	0
Mottled duck	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	0	0	0	0	8	204	0	18	16	330	4,411	2,471
American wigeon	0	0	0	0	8	120	48	0	3	1,065	1,889	5,982
G.W. Teal	0	0	0	0	0	0	0	0	11	1,755	2,808	1,156
B.W. Teal	0	0	0	0	0	0	0	0	2	0	0	0
N. Shoveler	0	0	0	0	0	0	0	25	0	20	1,303	50
N. Pintail	10	0	0	1	0	0	0	1	24	1,920	12,462	4,602
Wood duck	0	0	0	0	0	2	0	0	32	0	20	0
Whistling duck	0	0	0	0	0	0	0	0	0	0	0	0
Total Dabblers	12,864	467	1,081	13,328	3,179	1,286	30,527	5,355	1,653	128,310	43,901	94,125
Redhead	0	0	0	0	0	0	3,585	10	0	0	0	6,064
Canvasback	0	0	0	0	0	25	61	10	1	1,795	200	30,774
Scaup	0	130	0	1,978	1,900	3,280	37,181	280	2	26,355	100	106,288
Ringneck	0	0	0	0	0	0	0	0	2	70	860	249
Goldeneye	6,783	3,562	33	4,194	1,241	0	1,452	116	4	305	0	1,005
Bufflehead	4,012	0	0	1,312	1,664	67	690	204	21	11,400	550	9,780
Ruddy duck	0	0	0	0	0	0	0	6	0	1,135	50	33,997
Total Divers	10,795	3,692	33	7,484	4,805	3,372	42,949	606	30	41,080	1,780	188,158
Eider	17,240	0	917	19,516	0	420	52	0	0	0	0	0
Scoter	346	0	0	901	0	465	27,795	0	0	405	0	8,119
Long-tailed Duck	846	0	0	3	38	0	1,091	0	0	120	0	446
Harlequin	51	0	0	0	0	0	0	0	0	0	0	0
Total Seaducks	18,463	0	917	20,420	38	885	28,938	0	0	525	0	8,565
Merganser	1,944	754	25	3,054	463	776	14,893	631	15	7,080	454	18,663
Unidentified Duck	0	0	2	0	0	0	60	0	0	0	0	66
Total Ducks	44,086	4,913	2,058	44,286	8,483	6,319	117,367	6,592	1,698	174,985	46,115	308,577
Brant	4	0	0	1,989	1,548	401	20,748	0	0	83,850	2,271	1,295
Snow goose	0	0	35	0	0	0	1,358	11,100	23	61,340	332,890	93,895
Canada Goose	2,290	5	2,713	7,377	4,642	3,860	127,126	40,681	2,934	152,597	89,472	355,244
W.F. Goose	0	0	0	0	0	0	0	0	0	0	0	0
Total Geese	2,294	5	2,748	9,366	6,190	4,261	149,232	51,781	2,957	297,787	424,633	450,434
Tundra swan	0	0	0	0	0	0	8	1,261	0	495	667	17,891
Trumpeter swan	0	0	0	0	0	0	0	0	0	0	0	0
Mute Swan	4	0	34	714	851	556	345	19	0	2,109	65	3,181
Unidentified Swan	0	0	0	0	0	0	100	0	0	0	0	0
Total Swans	4	0	34	714	851	556	453	1,280	0	2,604	732	21,072
Coot	0	0	0	0	0	0	0	25	0	70	0	197
Grand Total	46,364	4,918	4,840	54,366	15,524	11,136	267,052	59,678	4,655	475,446	471,480	781,280
S.H. Cranes	0	0	0	0	0	0	0	0	0	0	0	0

Results of the 2004 Atlantic Flyway Midwinter Waterfowl Survey

2 of 2

	VA	NC	SC	GA	FL*	AF Total	2003 Total	% Change	1994-2003 average	% Change
Mallard	12,502	9,193	2,317	478	555	140,386	133,237	5.4	182,014	-13.3
Black duck	22,414	7,378	580	70	10	206,428	224,574	-8.1	225,909	-8.6
Mexican duck	0	0	0	0	0	0	0	N/A	2	-100.0
Mottled duck	0	0	62	11	1,143	1,216	737	65.0	1,272	-4.4
Gadwall	4,067	5,345	6,236	344	1,590	25,040	23,409	7.0	22,091	13.3
American wigeon	2,833	13,397	8,232	457	14,331	48,345	34,833	38.8	44,649	8.3
G.W. Teal	3,133	31,974	24,130	938	11,865	77,770	57,202	36.0	75,858	2.5
B.W. Teal	0	5	2,071	1,098	19,929	23,105	15,446	49.6	18,424	25.4
N. Shoveler	240	1,508	2,834	522	2,343	8,845	7,628	16.0	9,549	-7.4
N. Pintail	1,700	21,452	8,458	3	4,890	55,523	36,324	52.9	47,084	17.9
Wood duck	31	417	10,049	258	252	11,101	1,541	620.4	2,665	316.6
Whistling duck	0	0	0	0	672	672	55	1,121.8	800	-16.0
Total Dabblers	46,920	90,669	64,969	4,177	59,622	598,431	534,986	11.9	610,316	-1.9
Redhead	1,005	14,035	36	0	80,720	105,455	12,365	752.9	104,594	0.8
Canvasback	13,109	1,235	425	705	2,002	50,342	70,650	-26.7	89,031	-43.5
Scaup	19,410	34,494	5,708	1,950	160,146	399,183	336,916	18.5	524,897	-23.9
Ringneck	6,795	4,635	23,700	2,860	47,043	86,214	63,673	35.4	91,264	-5.5
Goldeneye	293	0	1	0	1	18,990	21,268	-10.7	28,017	-27.0
Bufflehead	17,039	3,578	334	259	2,484	53,394	74,009	-27.9	68,281	-21.8
Ruddy duck	46,975	6,733	278	67	5,644	94,885	79,871	18.8	85,360	11.2
Total Divers	104,626	64,710	30,482	5,841	298,041	608,443	658,752	22.7	989,242	-18.3
Eider	0	0	0	0	0	38,145	74,246	-48.6	101,042	-62.2
Scoter	8,830	4,724	1,247	27	133	52,992	16,307	225.0	45,578	16.3
Long-tailed Duck	215	0	0	0	0	2,757	7,779	-64.6	8,774	-68.6
Harlequin	0	0	0	0	0	51	11	363.6	19	171.3
Total Seaducks	9,045	4,724	1,247	27	134	93,945	98,343	-4.5	155,413	-39.6
Merganser	3,875	1,582	411	566	3,097	58,293	87,523	-13.7	86,354	-32.5
Unidentified Duck	2	0	241	52	276	699	328	113.1	2,839	-75.4
Total Ducks	164,468	161,686	97,350	10,663	361,170	1,559,811	1,359,932	14.7	1,844,164	-15.4
Brant	17,480	0	0	0	4	129,590	164,526	-21.2	149,088	-13.1
Snow goose	25,004	25,805	634	0	1	552,085	402,342	37.2	337,749	63.5
Canada Goose	108,980	12,692	1,524	830	10	912,957	1,078,144	-15.3	854,094	6.9
W.F. Goose	0	0	3	0	0	3	0	N/A	2	50.0
Total Geese	151,444	38,497	2,161	830	15	1,594,635	1,645,012	-3.1	1,340,932	18.9
Tundra swan	7,173	67,188	292	0	0	94,975	108,187	-12.2	94,985	0.0
Trumpeter swan	0	0	0	0	0	0	0	N/A	4	-100.0
Mute Swan	146	0	0	0	0	8,024	12,289	-34.7	8,398	-4.4
Unidentified Swan	0	0	0	0	0	100	151	-33.8	545	-81.6
Total Swans	7,319	67,188	292	0	0	103,099	120,627	-14.5	103,350	-0.2
Coot	160	5,955	8,294	81,596	191,307	287,604	290,210	-0.9	428,497	-32.9
Grand Total	323,391	273,325	108,097	93,089	552,491	3,545,149	3,415,781	3.8	3,716,943	-4.6
S.H. Cranes	0	0	0	30	1,452	1,482	3,787	-60.9	2,053	-27.8

* No survey conducted in Florida. These counts based on the 2000-2002 average.

Appendix 3
Atlantic Flyway Breeding Waterfowl Plot Survey, 2004 Final ReportATLANTIC FLYWAY
BREEDING WATERFOWL PLOT SURVEYBreeding Pair and Population Size Estimates
2004

Robert V. Raftovich

U.S. Fish and Wildlife Service
Division of Migratory Bird Management
11510 American Holly Drive
Laurel, Maryland 20708

28 July 2004

Habitat conditions in the 11-state survey area were good for nesting waterfowl again this year. Normal to above normal late winter and early spring rains kept wetlands full, providing ample nesting habitat. Variability in the weather seems to have translated into variable nest-initiation timing, with some areas reporting early initiation and others reporting somewhat delayed or normal phenology. Late-spring rains likely helped waterfowl broods in the southern part of the survey area, but coupled with cool temperatures in some of the northern portion may have caused lower than expected brood survival.

In 2004, 2 population estimates are again presented for Canada geese. The first is based on the method of calculating total indicated birds (TIB) that was used from 1993 to 2002 [TIB = $(2 \times \text{pairs}) + \text{singles} + \text{grouped birds}$]. The newer method, more comparable with that used for duck species in this survey and for other goose surveys, calculates TIB as $2 \times (\text{pairs} + \text{singles}) + \text{grouped birds}$.

This was also the second year that grouping information (i.e. singles, pairs, flocks, groups) was collected for gadwall, green-winged and blue-winged teal, common and hooded mergansers, and mute swans. Comparisons with estimates from 2003 were made as with mallards, black ducks, wood ducks, and Canada geese.

Population estimates for mallards increased 10.5% from 2003, but remained near the 1993-2003 average of 804,000 birds. Wood ducks increased 5.3% from 2003, and was also near the 1993-2003 average (368,000 birds). Both Canada goose estimates declined by similar amounts (5 to 6 %), and again were about 100,000 geese different (Table 1, Fig. 1). None of these changes were statistically significant ($P > 0.2$, Table 1).

Both population and pairs estimates for black ducks declined by >10% from 2003, although neither was statistically significant (Tables 1 and 2). This continues a short-term (since 2000 and 1999, respectively) decline in these estimates.

*Atlantic Flyway Breeding Waterfowl Plot Survey
Report 2004*

Population and pair estimates for gadwall, teal, the merganser species, and mute swans showed large changes (Tables 3 and 4). Although large, none of the differences were statistically significant. It is possible that some of the increases represent adjustment by field workers to collecting these data, which has not been done in the past

Table 1. Population estimates and standard errors for mallards, black ducks, wood ducks, and Canada geese from the Atlantic Flyway Breeding Waterfowl Plot Survey, 1993-2004, and percent change from 2003 to 2004.

Year	Mallards		Black ducks		Wood ducks		Canada geese			
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate ^a	SE	Estimate ^b	SE
1993	686,562	49,870	80,158	11,033	311,924	32,660	647,509	111,770		
1994	856,313	62,774	60,930	8,667	323,285	34,730	648,684	72,971		
1995	864,120	70,395	72,507	13,169	367,019	35,473	780,027	98,816		
1996	848,645	61,074	77,316	17,521	344,659	32,139	932,656	107,423		
1997	795,176	49,596	65,578	9,050	385,644	33,863	1,013,324	132,539		
1998	775,213	49,718	81,689	20,458	382,778	28,585	970,092	115,663		
1999	879,953	60,173	82,421	14,392	402,170	34,542	999,517	120,811		
2000	762,555	48,701	87,009	15,421	376,212	35,008	1,022,299	101,930		
2001	809,438	51,572	69,627	11,263	388,204	37,891	1,016,629	89,337		
2002	833,669	56,241	68,702	12,215	420,163	37,817	965,706	86,933		
2003	731,907	47,025	64,898	11,357	341,945	29,497	1,039,705	89,825	1,126,731	94,540
2004	809,139	51,825	53,938	7,718	360,100	35,927	980,433	90,019	1,075,118	94,055
Percent change, 2003-2004										
	10.55		-16.89		5.31		-5.70		-4.58	
P-value, comparison of 2003 and 2004 estimates										
	0.2698		0.4248		0.6961		0.6411		0.6987	

^a Estimates based on the 1993-2002 method of calculating total indicated birds [TIB = (2×pairs) + singles + groups].

^b Estimates based on the post-2002 method of calculating total indicated birds [TIB = 2×(pairs + singles) + groups].

*Atlantic Flyway Breeding Waterfowl Plot Survey
Report 2004*

Table 2. Breeding pair estimates and standard errors for mallards, black ducks, wood ducks, and Canada geese from the Atlantic Flyway Breeding Waterfowl Plot Survey, 1993-2004, and percent change from 2003 to 2004.

Year	Mallards		Black ducks		Wood ducks		Canada geese	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
1993	324,020	23,075	39,464	5,485	140,506	14,229		
1994	427,254	31,354	29,472	4,255	148,298	14,448	202,281	19,827
1995	404,837	30,111	32,670	5,919	172,944	16,949	245,233	23,023
1996	403,919	28,367	31,674	5,042	156,201	14,023	277,608	25,468
1997	383,296	23,653	29,792	4,079	186,127	16,610	326,982	40,080
1998	374,612	24,079	31,833	4,885	184,725	13,938	324,648	29,188
1999	421,492	28,771	38,693	6,620	195,197	16,512	379,479	38,088
2000	359,398	22,288	36,006	4,902	174,417	15,066	339,936	26,316
2001	385,824	23,400	31,942	4,544	187,322	18,336	392,055	27,777
2002	400,807	26,602	29,059	3,648	202,171	18,305	405,902	32,094
2003	347,309	22,299	28,863	4,186	167,135	14,664	389,793	28,280
2004	388,399	25,172	25,052	3,501	172,845	16,836	395,450	28,170
Percent change, 2003-2004								
	11.83		-13.20		3.42		1.45	
P-value, comparison of 2003 and 2004 estimates								
	0.2217		0.4850		0.7982		0.8873	

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Table 3. Population estimates and standard errors for gadwall, green-winged teal, blue-winged teal, common mergansers, hooded mergansers, and mute swans from the Atlantic Flyway Breeding Waterfowl Plot Survey, 1993-2004, and percent change from 2003-2004.

Year	Gadwall		Green-winged teal		Blue-winged teal		Common merganser		Hooded merganser		Mute swan	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
2003	8,933	3,494	60,173	13,237	33,948	11,397	45,653	8,306	28,878	5,518	14,381	3,000
2004	11,362	5,310	55,067	13,367	39,384	11,883	49,303	14,935	44,171	11,369	22,859	8,661
Percent change, 2003-2004												
	27.20		-8.48		16.01		8.00		52.96		58.95	
P-value, comparison of 2003 and 2004 estimates												
	0.7023		0.7861		0.7413		0.8309		0.2262		0.3550	

Table 4. Breeding pair estimates and standard errors for gadwall, green-winged teal, blue-winged teal, common mergansers, hooded mergansers, and mute swans from the Atlantic Flyway Breeding Waterfowl Plot Survey, 1993-2004, and percent change from 2003-2004.

Year	Gadwall		Green-winged teal		Blue-winged teal		Common merganser		Hooded merganser		Mute swan	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
2003	4,466	1,747	12,622	3,510	7,445	2,891	19,561	3,432	12,783	2,555	7,191	1,500
2004	3,304	1,280	8,708	2,753	16,362	5,036	19,597	6,895	20,168	5,515	9,343	2,544
Percent change, 2003-2004												
	-26.03		-31.01		119.76		0.19		57.77		29.94	
P-value, comparison of 2003 and 2004 estimates												
	0.5914		0.3804		0.1247		1.0000		0.2244		0.4661	

*Atlantic Flyway Breeding Waterfowl Plot Survey
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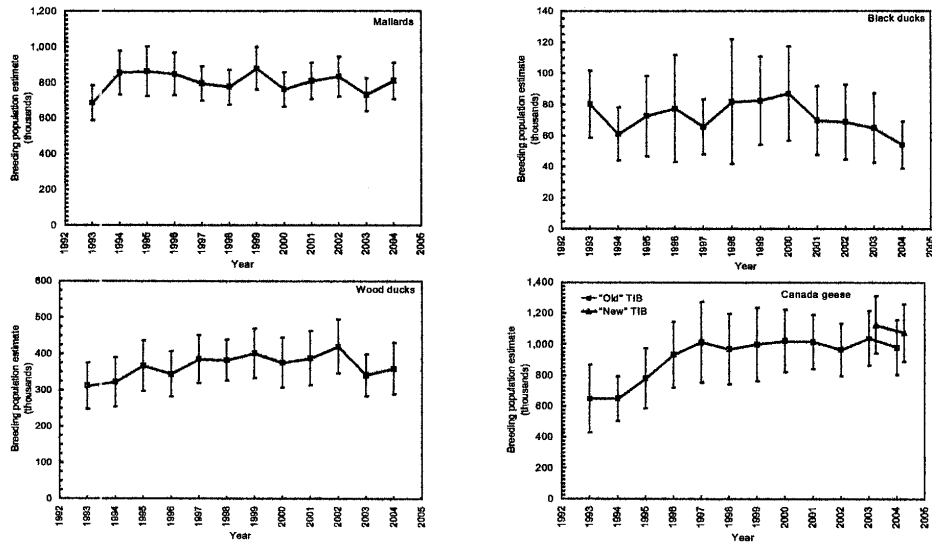


Figure 1. Population estimates and 95% confidence intervals for mallards, black ducks, wood ducks, and Canada geese, 1993-2004.

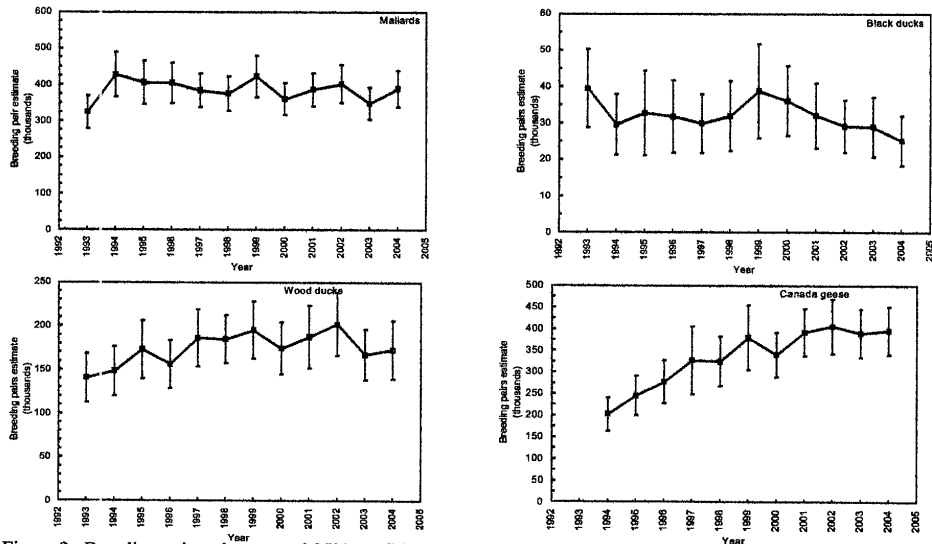


Figure 2. Breeding pair estimates and 95% confidence intervals for mallards, black ducks, wood ducks, and Canada geese, 1993-2004.