

**PENNSYLVANIA GAME COMMISSION  
BUREAU OF WILDLIFE MANAGEMENT  
PROJECT ANNUAL JOB REPORT**

**PROJECT CODE NO:** 06510

**TITLE:** Waterfowl Research/Management

**JOB CODE NO.:** 51004

**TITLE:** Waterfowl Population Monitoring

**PERIOD COVERED:** 1 July 2011 to 30 June 2012

**COOPERATING AGENCIES:** U. S. Fish & Wildlife Service, Division of Migratory Bird Management; Cooperating Atlantic Flyway States; Pennsylvania Department of Transportation, Bureau of Aviation

**WORK LOCATION(S):** Statewide

**PREPARED BY:** Kevin J. Jacobs and Ian D. Gregg

**DATE:** 2 November 2012

**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. During the Pennsylvania portion of the 2011 AF Mid-Summer Mute Swan Survey (MSMSS), conducted mid-July through late August, 167 mute swans (41% lower than the 2008 survey), including 45 feral swans (15% fewer than in 2008), were observed statewide. AF MSMSS results for 2011 indicated 9,202 mute swans which was a 13% decline from 2008 and the third consecutive decline between survey years following a steady increase from 1986 through 2002. Pennsylvania duck hunting seasons for 2011-12 were 60 days with a daily bag limit of 6 birds, similar to those offered in 2010-11. U.S. Fish and Wildlife Service (USFWS) Harvest Information Program estimated active duck and goose hunters in Pennsylvania during 2011-12 were 24,200 and 27,900, down 15% and 25% respectively from the 1999 to 2010 averages. Pennsylvania's total duck harvest estimate was 81,500, down 49% from average. Pennsylvania's 2011-12 estimated Canada goose harvest was 75,100, down 59% from average. Canada goose harvest timing was 20% during September and 80% during the regular season. Pennsylvania's estimated regular season snow goose harvest of 21,700 in 2011-12 was up 215% from average. There were an additional 3,420 snow geese harvested during the conservation season. During the Pennsylvania portion of the 2012 AF Midwinter Waterfowl Survey conducted in January, we observed 52,139 waterfowl, which was 10% higher than the 2011 total but 28% below the 2002-2011 average. Among major wintering species, mergansers were above their 10-year average but totals for mallards, black ducks, Canada geese, snow geese, and tundra swans were below average. At the flyway level, mallards,

black ducks, Canada geese, and snow geese increased from 2011 while tundra swans decreased; all 5 of these species were within 15% of their respective 10-year flyway averages. In the Pennsylvania portion of the 2012 AF Breeding Waterfowl Survey, mallard pairs (60,496) were down 35% from the 1993-2011 average. There were 67,927 wood duck breeding pairs estimated in 2012, 31% above average. Estimates of total hooded mergansers (5,695) and common merganser (24,386) were above average. The Canada goose breeding pair (83,897) and total spring population (219,609) were near average. For the Northeast U.S. survey area, total population estimates for mallards (612,587) and black ducks (28,619) were significantly below average, while the wood duck estimate (418,910) was similar to last year and the average. The spring breeding population estimate for resident population Canada geese (879,793) was similar to 2011 and the average. Habitat conditions in the Northeast U.S. were generally favorable for nesting. Waterfowl populations in the Eastern survey area of Canada were near average and habitat conditions were generally rated as good, which should favor production. Breeding duck populations on the traditional survey area in the mid-continent of North America were significantly above 2011, and 43% above the long-term average. Habitat conditions in the U.S. and Canadian prairies were near average. Recruitment from this important production region is expected to be above average in 2012. Spring 2012 breeding population estimates for Atlantic Population and Southern James Bay Population Canada geese were similar to average. Production is expected to be near average for both populations. For greater snow geese, good production and an average fall flight are expected.

## **OBJECTIVE**

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

## **METHODS**

Atlantic Flyway states and provinces conduct a Mid-Summer Mute Swan Survey (MSMSS) approximately every 3 years to monitor population trends of this exotic, invasive waterfowl species. In Pennsylvania, the MSMSS consists of a compilation of mute swan observations by Wildlife Conservation Officers (WCOs) within their districts during the survey period, which usually has target dates in early August. WCOs are requested to record any mute swans encountered during their routine travels, and if possible to specifically check locations where mute swans have been observed or reported in the past. Flyway-level MSMSS data was obtained from the Snow Goose, Brant, and Swan Committee of the Atlantic Flyway Migratory Game Bird Technical Section.

Hunter activity and total waterfowl harvest were estimated from the U.S. Fish and Wildlife Service (USFWS) Harvest Information Program (HIP) (Raftovich et al. 2012). 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.

To estimate harvest and hunter participation during the 2012 snow goose conservation season, hunters were required to obtain a free Snow Goose Conservation Permit either online or by mail. Along with the permit, hunters were required to possess a general hunting license, migratory game bird license and a federal duck stamp (for those 16 or older). Mandatory reporting of harvest and hunter activity was required of all hunters even if they did not hunt, and harvest reports were due within 30 days of the close of the snow goose conservation season. Due to the high reporting rate observed in 2009 (88.5%), we have not used reminder mailings to individuals that failed to send in their harvest reports, or additional surveys of non-respondents to estimate their harvest, from 2010-2012. Flyway-level conservation season data was obtained from the Snow Goose, Brant, and Swan Committee of the Atlantic Flyway Migratory Game Bird Technical Section.

Estimates of numbers of wintering waterfowl are obtained from the Midwinter Waterfowl Survey (MWS). States in the Atlantic Flyway (AF) conduct this survey, primarily from aircraft, each January on major coastal and inland waterfowl wintering areas. These results guide harvest management for select species (e.g. tundra swans and Atlantic brant) and provide information on population status, distribution, and habitats of all waterfowl species during this portion of the annual cycle. The current (2002-present) Pennsylvania “MWS-Lite” consists of 11 survey segments covered by the Pennsylvania Game Commission (PGC) plus 1 segment in the middle Delaware River Valley (river proper plus some inland areas on both Pennsylvania and New Jersey sides) covered by the New Jersey Division of Fish and Wildlife (NJDFW). For the purposes of state-level summary reports, one-half of each species total from the NJDFW survey is used as an estimate for the Pennsylvania portion of this segment. These procedures have now been in place for the full 10-year period typically used for long-term comparisons, and they also appear to provide data comparable with the pre-2002 methodology, in which both the PGC and NJDFW surveyed portions of the Delaware River proper (with some overlap), and inland areas only within their respective states. Current procedures result in superficial discrepancies between state- and flyway-level reports in some species totals for Pennsylvania because, while both contain identical data from the 11 PGC segments, the Delaware Valley data included in state-level reports is recorded under New Jersey at the flyway level. Data for all aerially surveyed MWS segments in Pennsylvania is recorded using a USFWS voice/Global Positioning System (GPS) software program. This program links voice recordings of waterfowl observations to the GPS position of the aircraft. Transcribed species totals from this program can be input into the USFWS database and the geo-referenced data on waterfowl concentrations provides important information for habitat conservation programs. In the 2011 MWS, some data was lost due to computer problems during the aerial portions. This data loss makes individual year comparisons between 2012 and 2011 suspect for some species, and produces a slight negative bias in the calculation of some 10-year species averages.

Information on breeding population size of mallards, black ducks, wood ducks, Canada geese, and other waterfowl was obtained from the AF Breeding Waterfowl Plot Survey. This survey has been conducted annually since 1989 in Pennsylvania and other AF states from Virginia to New Hampshire. Survey participants included Biologists from the Game Management and Wildlife Diversity Divisions of the Bureau of Wildlife Management and PGC Region Biologists and Wildlife Management Supervisors. A total of 346 1-km<sup>2</sup> plots were part of

this survey across six physiographic regions (Fig. 1) of Pennsylvania using a stratified random design. Of these, 118 plots were not field checked because they did not contain habitat for breeding waterfowl. Surveys were conducted from 9 to 30 April 2012. Breeding pair units are determined from the presence of pairs, lone drakes, and groups of drakes. Total population estimates presented for Canada geese utilize an equation initiated in 2003 that accounts for geese observed as singles, but assumed to be part of a breeding pair. These estimates averaged 8% higher each year from 2003 to 2010 than the old method of calculating total population. 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. Breeding population and breeding pair estimates for this year were compared with estimates from the long-term (1993-2011) averages. Additional breeding survey data for areas not covered by the AF Breeding Waterfowl Plot Survey was provided by the USFWS (2012).

## **RESULTS**

### **Mid-Summer Mute Swan Survey**

The Pennsylvania portion of the 2011 AF MSMSS was conducted by WCOs statewide from mid-July through late August, with the majority of surveys completed during the target dates of 1-14 August. During the 2011 survey, 167 mute swans were observed in Pennsylvania (Table 1). This was 41% below the total from the 2008 survey and 52% below the peak (2002) total for this survey. The numbers of broods (10) and cygnets (17) observed both decreased from 2008, and both totals were the lowest since 1993. The number of mute swans classified as feral declined to 45 (15% fewer than the 2008 survey and the lowest on record for this survey in Pennsylvania). Feral swans are also accounting for a declining percentage of observed broods (10% in 2011, compared to 13% in 2008, 26% in 2005, and 38% in 2002). The 2011 survey also documented a continued range contraction in the state, with the 30 WCO districts where mute swans were observed being the lowest total since 1999. Mute swan numbers continue to be highest in southeastern Pennsylvania (94). For the entire AF, 9,202 mute swans (13% below the 2008 total) were observed (Table 1). As in Pennsylvania, flyway-level mute swan numbers trended upward from survey inception in 1986 to a peak in the 2002 MSMSS, but have decreased since then. Declining trends are due mainly to active control efforts throughout the flyway (aided by the removal of legal obstacles by the Migratory Bird Treaty Reform Act of 2004); these efforts will continue as managers seek to reduce mute swan populations to levels identified in the AF Mute Swan Management Plan: <3,000 flyway-wide, zero feral/maximum 250 captive in Pennsylvania.

### **Hunter Activity and Harvest**

As in 2010-11, duck season length in 2011-12 was 60 days with outside framework dates of the Saturday nearest to 24 September and the last Sunday in January. Similar to previous years, duck seasons selected for Pennsylvania included split seasons in 3 of 4 zones with the first split opening in October and the second split closing between late December and mid-January (Appendix 1). The aggregate daily duck bag limit remained at 6 birds. The daily bag limit for individual species regulations remained the same as 2010-11.

Boundaries of Pennsylvania's 3 Canada goose harvest zones (Resident Canada Goose (RP), Southern James Bay Population (SJBP), and Atlantic Population (AP)) are presented in Appendix 1. An early Canada goose season (1-24 September) was again held statewide (except for SGL 214 (Pymatuning Wildlife Management Area (WMA) and State Game Lands (SGL) 46, the Middle Creek WMA in Lebanon and Lancaster counties). The daily bag limit was again 8 birds, 16 in possession statewide except the SJBP zone (3 per day) and the areas surrounding Pymatuning WMA and Middle Creek WMA (see Appendix 1; daily bag limit of 1 bird in these areas to limit harvest on the resident flocks at each WMA). Regular Canada goose season lengths and bag limits in the AP, RP and SJBP zones remained the same as in 2010-11.

The estimates (Raftovich et al. 2012) of active duck and goose hunters in Pennsylvania from HIP were 24,200 and 27,900 respectively and were second highest and highest, respectively in the AF (Table 2). These estimates were 15% and 25% below the 1999-2011 average. The HIP estimate of days hunted for ducks in 2011-12 was down 28% from average while the number of goose hunter days was down 36% from average and are related to the decline in hunter numbers noted above. The HIP estimate of total Pennsylvania duck harvest (81,500) was down 49% from average. HIP Canada goose harvest estimate in Pennsylvania for 2011-12 was 75,100 and was 59% below average. Pennsylvania ranked 3<sup>rd</sup> in the AF for total Canada goose harvest. State-level HIP harvest estimates provided to date have shown higher year-to-year variability than comparable previous federal survey or Game Take Survey (GTS) 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. The September season continues to account for a substantial, but recently declining proportion (20%) of the Canada goose harvest while the regular season (late-October to late-February) harvest accounted for 80% of the total. Estimated snow goose harvest during the regular season in Pennsylvania was 21,700 birds, up 215% from average. This increase was unexpected based upon field reports during the regular season. This may be related to an average number of juveniles in the fall flight as well as the mild fall and winter weather allowing a higher proportion of the AF wintering snow goose population to remain in the commonwealth through hunting seasons than occurred the past 2 years as noted in the MWS results below.

Season dates for the snow goose conservation season varied by goose hunting zone: 26 January-27 April 2012 in the AP and SJBP Zones, and 27 February-27 April in the RP Zone, with a daily bag limit of 25 geese and no possession limit in all zones. Additional hunting methods allowed included the use of electronic calls and decoys, and expanded hunting hours (1/2 hour after sunset). We issued 2,649 permits to hunters to participate in the 2012 Snow Goose Conservation Season. This included 69 nonresident hunters. Data is not available on the percentage of the permits issued to hunters using the online permit registration method. We received 915 reports (34.5% reporting rate) by 28 May. Online reporting was very popular, but exact data is not available on the percentage of reports received via this reporting method.

Of the 915 reports received, 347 (37.9%) indicated they did not hunt at all during the conservation season. Of the 568 individuals that indicated they hunted during the conservation season, their total retrieved harvest was 3,420 (Table 3). Total hunter days were 2,123 and the number of geese killed per hunter day was 1.61. Among additional hunting methods, electronic calls were used for 38% of the snow geese taken (2009-11 average was 30%) and electronic

decoys were used for 31% of geese taken, while extended hunting hours had less effect, with 15% of the total geese taken after sunset (2009-11 average was 10%). (It should be noted that these expanded methods categories are not mutually exclusive; for example, a goose taken after sunset while using both electronic calls and electronic decoys would be recorded as harvested under all 3 methods).

Compared with the 3 previous conservation seasons, both participation and harvest were below average. At least in part, these reductions likely reflect relatively limited availability of snow geese due to the early spring causing birds to pass through Pennsylvania quickly (or bypass the state completely) en route to more northerly staging and breeding areas.

At the flyway level, the estimated harvest for the 7 states (Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia and Vermont) participating in the 2012 Conservation Season was 36,853, with an additional 2,468 birds shot and lost. The retrieved harvest was 6% below the 2009-2011 average, even though the estimated number of days spent hunting (14,860) was about 11% higher than the previous 3 years. The conservation season in the U.S. has been reasonably successful in providing additional harvest of greater snow geese, although this is mitigated by a recent reduction in regular season harvest as hunter effort appears to have shifted somewhat from the regular season to the conservation season. This overabundant population appears to be stabilizing, but overall harvest rate may be insufficient to achieve reductions needed to reach management plan goals.

The five most commonly harvested duck and merganser species in Pennsylvania were mallard, wood duck, American black duck, American green-winged teal, and bufflehead (Table 4). The 2011-12 harvests of all major duck and merganser species (except American wigeon was similar to average) were below the 1999-2010 average: mallard (-49%), wood duck (-57%), American black duck (-46%), American green-winged teal (-48%), bufflehead (-16%), lesser scaup (-36%), greater scaup (-37%), ring-necked duck (-41%), gadwall (-16%), common merganser (-63%) and hooded merganser (-38%). The below average harvest was most likely related to estimated declines in hunter participation, but also the very mild weather conditions experienced during the fall and winter 2011-12.

The number of juveniles per adult in the 2011-12 AF harvest (Table 5) was near the 1996-2010 average for mallard (3%), black duck (7%), green-winged teal (10%) and snow goose (-3%), above average for bufflehead (24%), lesser scaup (75%), ring-necked duck (18%), gadwall (133%), American wigeon (42%) and below average for wood duck (-25%), greater scaup (-25%), and Canada goose (-28%). Below average age ratios may also partially explain the below average harvest for wood duck and Canada goose.

### **Midwinter Waterfowl Survey**

The Pennsylvania portion of the 2012 MWS was conducted between 4 January and 19 January. Survey methods were similar to those used in past years, with fixed-wing aerial surveys (in cooperation with the Pennsylvania Department of Transportation, Bureau of Aviation) supplemented by ground surveys at Middle Creek WMA, and a few lakes in northwestern Pennsylvania. Although most inland lakes were partially frozen during the survey period, they maintained greater amounts of open water than usual, and Lake Erie and major rivers were

essentially ice-free. Also, most terrestrial habitats lacked extensive snow cover. Under these conditions, waterfowl were more widely dispersed and difficult to observe than usual, which likely reduced survey totals somewhat.

We observed 52,139 waterfowl in Pennsylvania (Table 6). This included 1,875 dabbling ducks (mostly mallards and black ducks), 1,690 diving ducks, 1,390 mergansers, 44,164 geese (79% Canada geese and 21% snow geese), and 742 swans (93% tundra swans and 7% mute swans). The overall total was 10% higher than the 2011 total (although as noted above, 2011 totals were reduced by data loss), but 28% below the 2002-11 average. Canada geese, mallards, and black ducks decreased from 2011 while tundra swans and snow geese both increased dramatically. Mergansers were slightly above their 2002-2011 average, but the other 5 major species were all well below their respective 10-year averages. In all 3 geographic zones, totals increased from 2011 [Zone 1 (northwestern Pennsylvania) up 19%, Zone 2 (Susquehanna River) up 121%, and Zone 3 (southeastern Pennsylvania) up 5%], but were below the previous 10-year average (by 5% in Zone 1, 33% in Zone 2, and 34% in Zone 3).

For the entire AF, 2,838,360 waterfowl (including coots) were observed in the MWS (Appendix 2). Recent flyway grand totals are not directly comparable to results from earlier years, primarily because the MWS has not been conducted in Florida since 2004. However, many of the individual species numbers remain relatively comparable because only negligible proportions of their flyway totals have historically been observed in Florida. Flyway mallard and black duck numbers increased 10% and 33%, respectively, from 2011 and were 5% and 9%, respectively, above their 2002-2011 averages. Canada geese and snow geese were both up from 2011 (by 5% and 20%, respectively), but remained 11% and 15%, respectively, below their 10-year averages. Tundra swans decreased 7% from 2011 and were 4% below the 2002-2011 average. Flyway MWS trends for these 5 major species are as follows: mallards, relatively stable from 1950's through 1980's with a slow but steady decline ongoing since the early 1990's; black ducks, substantial decline from 1950's to 1980's, but relatively stable since that time; Canada geese, generally increasing from 1950's to a peak in the early 2000's, with a slight decrease since; snow geese, steady increase from 1950's to early 2000's with possible stabilization recently; and tundra swans, steady increase from 1950's through 1980's and relatively stable since. We will continue to monitor these trends in conjunction with results from breeding ground surveys. In addition to population trend information provided by the MWS, this survey has documented a general northward shift in the wintering distribution of many waterfowl species over recent decades.

### **Breeding Waterfowl Surveys**

Habitat and weather conditions were dryer than average across most of Pennsylvania in early spring. Statewide temperatures and resulting vegetation growth from March through May were significantly above average. Based upon field observations of the mallard pairs to lone drake index in late March, we advanced the statewide survey period by one full week according to survey protocol. First hatches of Canada goose and mallard broods appeared 1-2 weeks earlier than average. Precipitation continued below average through May except northeastern Pennsylvania was near average. We expected at least average production in 2012 from the birds that attempted to nest due to the early onset of nesting and extended period for re-nesting attempts. One caveat may be reduced nest and/or gosling and duckling survival rates across the

Allegheny Mountain region in central and northern Pennsylvania (primarily stratum 242) due to a significant snow event (Figure 2) overlapping the late incubation and early hatch period.

Results from the Pennsylvania portion of the AF Breeding Waterfowl Plot Survey are presented in Tables 7 and 8. Breeding pair estimates presented have large confidence intervals on the strata and state level; the survey is designed to yield  $\leq 20\%$  coefficient of variation on the mean over the entire Northeast United States region. In most instances, breeding pair trends over several years are more useful to follow than individual year estimates. Table 8 summarizes complete 2012 survey results with comparison to the 1993 to 2011 average for ducks, mergansers and Canada goose pairs.

The number of indicated mallard breeding pairs (60,496) was statistically below the average of 92,806 pairs and numerically 35% below average and the lowest estimate recorded since 1993 (Table 8). We've observed some evidence of declining trends in other indices of statewide mallard abundance (Pennsylvania Breeding Bird Atlas, North American Breeding Bird Survey and the number of preseason-banded mallards). A decline in mallard abundance was expected following liberalized hunting frameworks adopted in 1996 through Adaptive Harvest Management (Atlantic Flyway Migratory Game Bird Technical Section Mallard Committee, personal communication). Stratum 10 in southeastern Pennsylvania had the highest density of breeding mallards (0.88 pairs/km<sup>2</sup>), while stratum 243 in northeastern Pennsylvania had the next highest density of breeding mallards (0.79 pairs/km<sup>2</sup>). American black ducks were not observed during the survey and resulted in a statewide estimate of zero pairs. Breeding black ducks have been observed at very low densities since the survey was initiated in 1989 although there is evidence of declining statewide abundance and distribution over the past 15 years. Numbers of black ducks banded pre-season in Pennsylvania has been declining since the mid-1990's and results from the Pennsylvania Breeding Bird Atlas have confirmed the declining occurrence of statewide breeding black ducks. There were a record high 67,927 wood duck breeding pairs estimated in 2012, which was significantly above the average of 51,674 pairs. This marks the first time in the 24-year history of this survey that statewide wood duck estimates have exceeded mallard estimates. Trends in wood duck abundance have indicated stable to slightly increasing populations across all years of the survey and are confirmed by Pennsylvania Breeding Bird Atlas results. Wood duck densities were highest in southwestern, northwestern and northeastern Pennsylvania with 1.10, 0.94 and 0.89 pairs/km<sup>2</sup>, respectively. The estimate of total blue-winged teal (3,027) was 58% below average in 2012, while American green-winged teal numbers (7,526) were 71% above average. Teal abundance in this survey can vary dramatically from year to year due to weather related impacts on teal migration. Teal migration was earlier than average in 2012. We don't believe these estimates are indicative of true breeding populations of teal in Pennsylvania as many migrating teal are encountered during the survey period. Estimates of total hooded mergansers (5,695) and common mergansers (24,386) were above average. Population trends for both breeding merganser species are increasing since 1993 and are confirmed by Breeding Bird Atlas results.

The 2012 Pennsylvania Canada goose indicated breeding pairs was estimated at 83,897 which is statistically similar to the average of 92,057. Pair densities were highest in the southeast (1.37 pairs/km<sup>2</sup>) and southwest (1.15 pairs/km<sup>2</sup>) portions of the Commonwealth. The 2012 total population estimate of 219,609 was statistically similar to the recent 9-year average of 271,049

geese (Table 8). As expected, the highest densities of total geese were observed in southeastern (4.12 geese/km<sup>2</sup>) and northwestern (2.83 geese/km<sup>2</sup>) portions of Pennsylvania. The statewide Canada goose spring breeding population estimate has a declining trend over the past 7 years since peaking at over 338,000 total birds in 2004 following the rapid growth observed the prior 15-year period. This is a result of significant expansion of hunting seasons and other lethal and non-lethal programs implemented to control Canada goose numbers. This population remains well above the Atlantic Flyway Resident Population management plan goal of 150,000 spring birds in the Commonwealth (Atlantic Flyway Council 2011). We continue efforts to achieve the management plan goal through reduced densities in southeastern and southwestern Pennsylvania, while maintaining stable populations in other portions of the Commonwealth.

Survey results for the entire AF Breeding Waterfowl Plot Survey for 2012 (Klimstra 2012, Appendix 3) included a mallard total population estimate of 612,587, which was 19% below average (statistically significant). The American black duck estimate (28,619) was down 55% from average and the lowest estimate observed since 1993. There has been a declining trend in mallard and black duck abundance over the last 13 years of this survey. Wood duck numbers (418,910) were similar to last year and the average. Wood duck trends appear stable to slightly increasing. Nesting ducks in the northeast U.S. should have at least average production in 2012 due to favorable weather and habitat conditions. In the eastern surveyed areas of Canada and Maine (USFWS 2012), estimates for mallards, American black duck, green-winged teal, ring-necked ducks, goldeneyes, buffleheads and mergansers were similar to last year and to their 1990-2011 averages. Habitat conditions were favorable overall.

The number of ducks counted in the traditional mid-continent survey area in May 2012 (USFWS 2012) was 48.6 million. This was 7% above last year's estimate of 45.6 million birds, and 43% above the 1955-2011 long-term average (LTA). Mallard abundance was 10.6 million birds, 15% above last year's estimate and 40% above the LTA. Blue-winged teal (9.2 million birds, 94% above LTA), green-winged teal (3.5 million, 74% above LTA), gadwall (3.6 million, 96% above LTA), northern shovelers (5 million, 111% above LTA), redheads (1.3 million, 89% above LTA), and canvasbacks (0.8 million, 33% above LTA), were all above their LTA in 2011. Estimated abundance of combined greater and lesser scaup (5.2 million) was similar to the LTA and the highest estimate since 1991. The estimates for northern pintails (3.5 million, 14% below LTA) and American wigeon (2.1 million, 17% below LTA) remained below their LTA. Habitat conditions during the 2012 survey were characterized by average to below average moisture across large portions of the traditional survey area and good habitat overall in the eastern survey area. An early spring was noted across most breeding areas which tends to favor production outlook. The total pond estimate (prairie Canada and U.S. combined) was 5.5 million. This was 32% below last year and 9% above the LTA of 5.1 million ponds.

AP Canada geese nest across a broad area of Northern Québec with highest densities occurring in the Ungava Peninsula, and along the Hudson Bay coast. Spring temperatures in 2012 were normal and snow melt was near average. The estimated number of breeding pairs (190,000) was near the previous 10-year average (Harvey and Rodrigue 2012). The total population estimate (breeding pairs and grouped birds) of 871,198 individuals was similar to 2011. The forecast based upon weather modeling, as well as nesting and banding studies along Ungava Bay, predicted average productivity, which was observed during August leg-banding

surveys. SJBP Canada geese nest on Akimiski Island, Nunavut, and the James Bay lowlands of Ontario. The SJBP is the predominant migratory goose population in northwest Pennsylvania, contributing approximately 5-10% of the overall harvest in the SJBP zone (the balance being resident geese). The spring population estimate of 95,300 SJBP Canada geese was statistically unchanged from 2011 and the average (Brook and Hughes 2012). Nesting studies on Akimiski Island indicated good nesting conditions and breeding effort in James Bay. An average fall flight is expected. The Atlantic Flyway Resident Population (AFRP) breeds locally throughout the AF extending into southern Ontario and Québec. The AFRP overlaps both SJBP and AP geese during the fall and winter periods. The spring breeding population estimate was 879,793, similar to the LTA (Klimstra 2012). Field reports from the AFRP range indicate average gosling production. Another large fall flight, with many juveniles, is expected for the 2012-13 hunting season. Greater snow geese nest principally on Bylot, Axel Heiberg, Ellesmere, and Baffin Islands in the Canadian Arctic. Spring estimates on the size of this population, which are obtained during staging in southern Québec, were not available at the time of this report. Breeding conditions for greater snow geese were rated average on Bylot Island (USFWS 2012). Nesting phenology was near normal, clutch sizes were above normal, and nesting success was above average. Therefore, good production and an average fall flight are expected for greater snow geese.

## **RECOMMENDATION**

Continue waterfowl breeding and wintering survey efforts during Fiscal Year 2012-13 to provide annual information on waterfowl population status.

## **LITERATURE CITED**

- Atlantic Flyway Council 2011. Atlantic Flyway Resident Canada Goose Management Plan. Atlantic Flyway Technical Section, Canada Goose Committee. Atlantic Flyway Council 2011.
- Brook, R., and J. Hughes. 2012. 2012 Spring population estimates for Southern James Bay Population Canada geese. Canadian Wildlife Service.
- Harvey, W. F., and J. Rodrigue. 2012. A breeding pair survey of Canada geese in Northern Quebec. Report to Atlantic Flyway Council.
- Klimstra, J. 2012. Atlantic Flyway Breeding Waterfowl Plot Survey Draft Report. United States Fish and Wildlife Service, Laurel, Maryland, USA.
- Raftovich, R. V., K. A. Wilkins, S. S. Williams, and H. L. Spriggs. 2012. Migratory bird hunting activity and harvest during the 2010 and 2011 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.
- U.S. Fish and Wildlife Service. 2012. Waterfowl population status, 2012. U.S. Department of the Interior, Washington, D.C., USA.

Table 1. Mid-Summer Mute Swan Survey results for Pennsylvania and the Atlantic Flyway, 1986-2011.

	2011	2008	2005	2002	1999	1996	1993	1989	1986
<b>PA Feral</b>	45	53	95	94	97	61	93	NR <sup>a</sup>	74
<b>PA Total</b>	167	282	307	348	242	253	139	122	137
<b>AF Total</b>	9,202	10,541	13,649	14,344	12,742	11,033	10,491	8,020	6,309

<sup>a</sup> Not separately recorded

Table 2. 2011-12 waterfowl hunting season activity and harvest in Pennsylvania and percentage change as estimated by USFWS Harvest Information Program Survey (HIP).

	2011-12 <sup>a</sup>	2010-11	% Change from 2010	99-11 Average	% Change from Avg.
<b>Ducks</b>					
HIP Hunters	24,200	23,200	4	28,617	-15
HIP Hunter Days	109,400	104,800	4	150,967	-28
HIP Harvest	81,500	114,200	-29	159,558	-49
<b>Canada goose</b>					
HIP Hunters	27,900	28,100	-1	36,958	-25
HIP Hunter Days	130,500	127,100	3	202,983	-36
HIP Harvest	75,100	155,700	-52	183,162	-59
<b>Snow goose</b>					
HIP Harvest	21,738	2,045	963	6,905	215

Table 3. Number of permits issued, reports received, hunter days and number of geese taken by hunting method during the 2009 to 2012 Snow Goose Conservation Season in Pennsylvania.

Year	Permits Issued	No. Hunted	% Hunted	Days Hunted	Geese Bagged	Geese Lost	After Sunset	W/ e calls	W/ e decoys
2009 <sup>a</sup>	3,276	1,724	53	3,840	5,903	317	736	1,522	- <sup>b</sup>
2010	3,107	668	21	2,409	2,985	141	330	1,101	- <sup>b</sup>
2011	3,401	900	26	2,959	5,197	259	475	1,845	Unknown <sup>c</sup>
2012	2,649	568	21	2,123	3,420	134	542	1,356	1,091

<sup>a</sup> Results from 2009 (89% reporting rate by permit holders due to use of reporting reminder postcard) may not be fully comparable to 2010-12 (no reminders used, reporting rates by permit holders 35-43%).

<sup>b</sup> Method prohibited by state regulation.

<sup>c</sup> No data collected on this method during 2011 conservation season.

Table 4. USFWS HIP harvest estimates for major duck and merganser species in Pennsylvania, 1999-2011.

<b>Species</b>	<b>2011-12<sup>a</sup></b>	<b>2010-11</b>	<b>% Change from 2010</b>	<b>99-11 Average</b>	<b>% Change from Avg.</b>
Mallard	40,900	50,700	-19	79,714	-49
Wood duck	16,400	31,800	-48	38,374	-57
Black duck	4,700	7,400	-36	8,756	-46
Green-winged teal	4,000	5,100	-22	7,637	-48
Bufflehead	3,700	3,100	19	4,381	-16
Lesser scaup	1,400	1,200	17	2,182	-36
Greater scaup	600	200	200	946	-37
Ring-necked duck	1,000	1,500	-33	1,705	-41
Gadwall	1,500	1,900	-21	1,790	-16
American wigeon	1,100	700	57	1,103	0
Mallard/black Hybrid	300	1,100	-73	1,109	-73
Common merganser	1,600	4,100	-61	3,507	-63
Hooded merganser	1,800	1,500	20	2,913	-38

<sup>a</sup>Preliminary.

Table 5. Age ratios (Immature/Adult) of the 10 most commonly harvested duck species, Canada geese and snow geese (as determined from wing and tail collections) during the 1996-2011 hunting seasons in the Atlantic Flyway.

<b>Species</b>	<b>2011-12<sup>a</sup></b>	<b>2010-11</b>	<b>% Change from 2010</b>	<b>96-11 Average</b>	<b>% Change from Avg.</b>
Mallard	1.24	1.30	-5	1.21	3
Wood duck	0.90	1.20	-25	1.19	-25
Green-winged teal	1.97	1.95	1	1.78	10
Black duck	1.23	1.43	-14	1.15	7
Ring-necked duck	1.54	1.45	6	1.31	18
Lesser scaup	1.18	0.80	48	0.67	75
Greater scaup	0.86	0.57	51	1.16	-26
Bufflehead	0.97	0.62	56	0.78	24
Gadwall	2.61	1.82	43	1.12	133
American wigeon	1.43	1.79	-20	1.01	42
Greater snow goose <sup>b</sup>	0.77	0.44	75	0.80	-3
Canada goose	0.34	0.63	-46	0.47	-28

<sup>a</sup> Preliminary.

<sup>b</sup> Average from 2001 to 2011.

Table 6. Number of waterfowl recorded in zones 1-3 during Pennsylvania's Midwinter Waterfowl Survey, 2002-2012.

Species	2012	2011 <sup>a</sup>	2010	2009	2008	2007	2006	2005	2004	2003	2002	2002-2011
												Avg.
Canada goose	34,863	41,495	51,321	54,267	38,602	42,456	51,844	41,839	48,454	77,224	78,828	52,633
Mallard	1,054	2,131	1,098	2,544	2,992	2,613	2,676	2,453	4,460	3,082	4,124	2,817
Black duck	798	1,452	1,131	1,448	1,770	906	1,865	2,763	2,079	1,775	2,904	1,809
Gadwall	18	11	3	0	2	29	5	13	18	0	0	8
Wigeon	0	0	1	0	1	0	1	0	0	0	11	1
Green-winged teal	0	0	0	3	2	13	12	13	0	2	1	5
Blue-winged teal	0	0	0	0	0	0	0	0	0	0	0	0
Shoveler	3	30	0	12	5	32	1	0	25	0	119	22
Pintail	2	21	0	5	6	0	10	1	24	0	6	7
Wood duck	0	0	1	0	0	0	0	0	0	0	0	0
Redhead	25	11	69	0	0	0	0	0	10	0	20	11
Canvasback	655	153	5	0	1	0	0	91	10	0	0	26
Scaup	410	634	9	0	290	80	302	2,379	260	0	0	395
Ring-necked duck	60	6	4	0	32	0	0	0	0	11	12	7
Goldeneye	293	42	21	0	26	29	159	16	116	70	41	52
Bufflehead	217	24	10	25	67	252	66	13	204	237	1,841	274
Ruddy duck	25	6	0	0	0	9	0	0	6	1	8	3
Long-tailed duck	0	0	0	0	0	0	0	0	0	0	0	0
Scoters	5	0	0	0	0	0	0	0	0	0	0	0
Mergansers	1,390	229	453	704	2,360	1,988	1,009	3,993	759	992	564	1,305
Unidentified ducks	8	160	21	9	29	219	31	12	0	25	27	53
Brant	0	0	0	0	0	0	0	0	0	0	0	0
Snow goose	9,301	361	411	12,899	13,902	32,096	10,314	25,909	11,100	9,602	4,347	12,094
White-fronted goose	0	0	0	0	0	0	0	0	0	0	0	0
Tundra swan	691	316	89	783	1,178	363	2,464	786	1,261	548	1,098	889
Mute swan	51	21	48	36	23	23	23	22	33	27	13	27
Unidentified swans	0	0	9	0	0	0	0	2	0	0	0	1
Coot	2,270	222	105	0	100	552	200	75	25	50	250	158
Totals	52,139	47,325	54,809	72,735	61,388	81,660	70,982	80,380	68,844	93,646	94,214	72,598

<sup>a</sup> 2011 totals reduced due to data loss from aerial surveys, with effects varying in significance by species.

Table 7. Estimates of waterfowl breeding pairs and standard error by physiographic strata in Pennsylvania, 2012.

Strata	Mallard		Black duck		Wood duck		Canada goose		Canada goose	
	Pairs	SE	Pairs	SE	Pairs	SE	Pairs	SE	Total	SE
10	11,546	3,173	0	0	5,102	1,705	17,990	4,119	54,239	11,714
13	16,719	6,105	0	0	16,023	5,599	15,326	6,187	44,585	17,172
22	6,659	3,676	0	0	14,650	5,453	15,316	6,424	30,631	12,848
241	5,796	1,766	0	0	9,331	2,513	10,461	2,858	27,992	9,337
242	9,557	3,888	0	0	11,327	4,575	14,159	5,967	32,566	13,528
243	10,221	2,349	0	0	11,498	2,608	10,647	2,866	29,598	8,595
2012 PA Total	60,496	9,198	0	0	67,927	9,901	83,897	12,187	219,609	30,680
1993 –2011 avg.	92,806	2,037	889	164	51,674	2,037	92,057	3,584	271,049 <sup>a</sup>	8,187
% Change	- 35 %		-		+31 %		-9 %		- 19 %	

<sup>a</sup> 2003 to 2011, 9-year average.

Table 8. Pennsylvania waterfowl population estimates from 2003 to 2012 and the 1993-2011 averages.

Species Estimate	2012	93-11 average	2011	2010	2009	2008	2007	2006	2005	2004	2003
Mallard pairs	60,496	92,806	61,790	78,677	92,509	65,739	90,237	80,667	95,685	84,806	82,302
Mallard total	127,633	191,720	132,903	161,675	187,697	131,477	181,504	174,374	197,975	177,715	170,067
Black duck pairs	-	889	426	269	639	269	1,716	-	-	-	622
Black duck total	-	1,778	852	537	1,278	537	3,433	-	-	-	1,245
Wood duck pairs	67,927	51,674	51,787	56,265	63,118	42,791	56,671	61,014	60,536	47,368	46,855
Wood duck total	141,258	109,391	107,045	114,797	128,060	87,924	127,847	128,009	132,552	94,736	93,711
Canada goose pairs	83,897	92,057	100,802	88,845	88,617	100,174	100,741	88,478	115,291	122,857	101,564
Canada goose total	219,609 <sup>a</sup>	271,049 <sup>b</sup>	245,061 <sup>a</sup>	231,780 <sup>a</sup>	289,879 <sup>a</sup>	246,499 <sup>a</sup>	255,924 <sup>a</sup>	245,689 <sup>a</sup>	311,171 <sup>a</sup>	338,230 <sup>a</sup>	275,207 <sup>a</sup>
Bl-wing teal total	3,027	7,199	2,970	4,186	7,814	1,840	12,650	1,979	2,746	8,041	1,273
Gr-wing teal total	7,526	4,402	3,869	2,063	5,569	1,979	5,064	7,172	7,089	9,138	5,266
Hooded merg. total	5,695	3,591	4,646	2,620	2,975	3,031	2,972	7,646	9,625	1,272	4,318
Common merg. total	24,386	15,515	25,100	14,053	12,377	18,773	17,429	15,167	12,916	14,671	14,335
Mute swan total	707	1,369	1,417	2,268	1,276	3,921	6,064	2,102	2,245	2,528	709

- No black ducks observed.

<sup>a</sup> Total estimate calculated using new formula 2x(pairs + singles) + groups.

<sup>b</sup> Average from 2003 to 2011 using new formula for total.

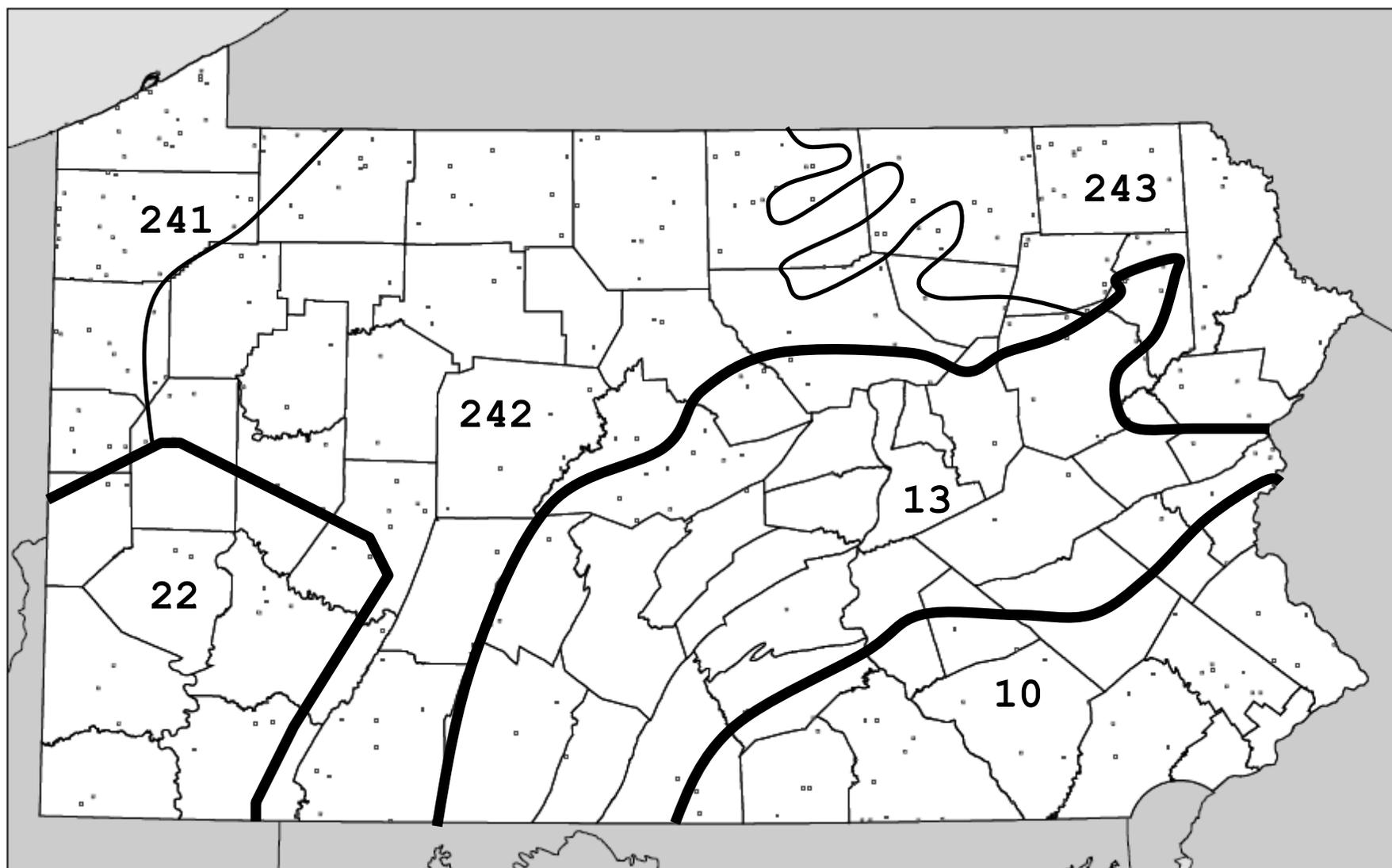


Figure 1. Location of Atlantic Flyway breeding waterfowl survey plots within major physiographic provinces in Pennsylvania. Physiographic Provinces are Piedmont (10), Ridge and Valley (13), Pittsburgh Plateau (22), Glaciated NW (241), Allegheny Mountain/Plateau (242), and Pocono/Low Plateau (243).

COOP 2-Day Total Snowfall (inches)  
ending 7:00 AM Tue Apr 24 2012

Updated 11:30 AM 04/24/12

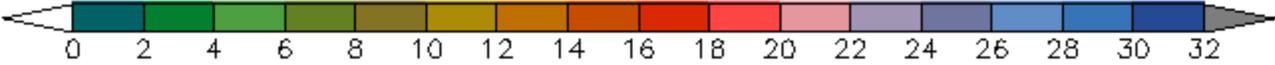
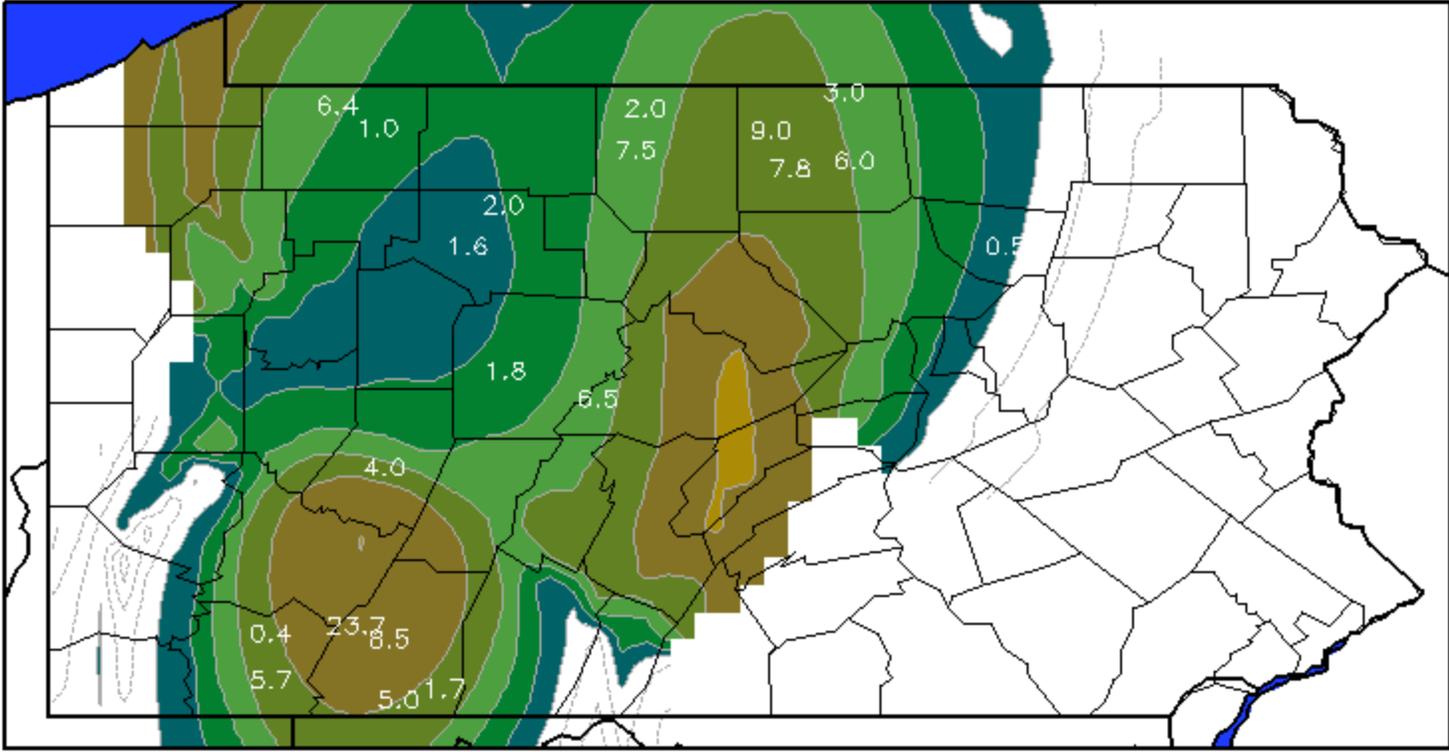


Figure 2. April 22 to 24, 2012 snowfall event total accumulations in Pennsylvania.



Appendix 1. Proposed 2011/2012 waterfowl hunting season recommendations.

### **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, 2 pintails, 1 mottled duck, 1 fulvous tree duck, 3 wood ducks, 2 redheads, 1 canvasback, 4 scoters and 2 scaup. Possession limit may not include more than 8 mallards including 4 hens, 2 black ducks, 4 pintails, 2 mottled ducks, 2 fulvous tree ducks, 6 wood ducks, 4 redheads, 2 canvasbacks, 8 scoters and 4 scaup.

**MERGANSERS:** 5 daily not more than 2 hooded mergansers, 4 in possession.

**COOTS:** 15 daily, 30 in possession.

**Youth Waterfowl Hunting Days (Ducks, Mergansers, Canada Geese, Coots and Moorhens):** September 17 and 24.

#### **SEASON DATES**

##### **Lake Erie Zone**

Ducks, sea ducks, coots and mergansers – Oct. 24 – Dec. 31

##### **North Zone**

Ducks, sea ducks, coots and mergansers – Oct. 8 – 22 & Nov. 11 – Jan. 4, 2012

##### **Northwest Zone**

Ducks, sea ducks, coots and mergansers – Oct. 8 – Dec. 16

##### **South Zone**

Ducks, sea ducks, coots and mergansers – Oct. 15 – 22 & Nov. 15 – Jan. 14, 2012

#### **ATLANTIC BRANT**

Oct. 8 – Dec. 5 (2 brant daily bag limit, 4 in possession).

#### **SNOW GEESE**

##### **Atlantic Population & Southern James Bay Population Goose Hunting Zones**

Regular Season – Oct. 25 – Jan. 25, 2012 (25 daily bag limit, no possession limit).

Conservation Season – Jan. 26, 2012 – Apr. 27, 2012 (25 daily bag limit, no possession limit. Permit required).

## **Resident Population Goose Hunting Zone**

Regular Season – Oct. 25 – Feb. 25, 2012 (25 daily bag limit, no possession limit).

Conservation Season – Feb. 27, 2012 – Apr. 27, 2012 (25 daily bag limit, no possession limit. Permit required).

## **CANADA GEESE**

### **Atlantic Population Goose Hunting Zone**

Nov. 15 – 26 & Dec. 17 – Jan. 25, 2012 (3 goose daily limit)

### **Southern James Bay Population Goose Hunting Zone**

Oct. 22 – Nov. 26 & Dec. 12 – Jan. 25, 2012 (3 goose daily limit)

### **Resident Population Goose Hunting Zone**

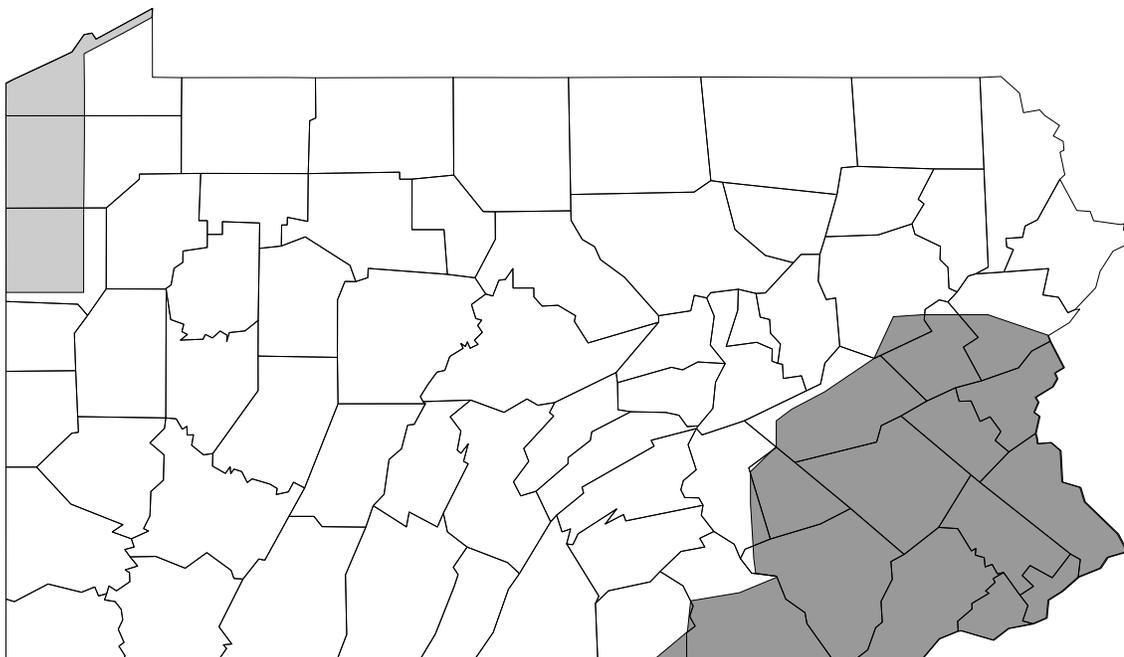
Oct. 22 – 29, Nov. 11 – 26 & Dec. 20 – Feb. 25, 2012 (5 goose daily limit)

## **September Canada Goose Season - Statewide**

September 1 – September 24 (8 goose daily bag limit, 16 in possession) **except:**

- (1) In the SJBZ zone the daily limit is 3 Canada geese, possession limit 6.
- (2) In the area south of SR 198 from the Ohio state line to intersection of SR 18, SR 18 south to SR 618, SR 618 south to US Route 6, US Route 6 east to US Route 322/SR 18, US Route 322/SR 18 west to intersection of SR 3013, SR 3013 south to the Crawford/Mercer County line. The daily bag limit is one goose; **except** on State Game Lands 214 where the season is closed to September goose hunting. Note: this restriction does not apply to youth participation on youth waterfowl hunting days September 17 & September 24, 2011 when regular season regulations apply.
- (3) Canada geese may be taken on Pymatuning State Park Reservoir and an area to extend 100 yards inland from the shoreline of the reservoir, excluding the area east of SR 3011 (Hartstown Road). The daily bag limit is 3 geese, possession limit of six geese.
- (4) In the area of Lancaster and Lebanon counties north of the Pennsylvania Turnpike I-76, east of SR 501 to SR 419, south of SR 419 to Lebanon-Berks county line, west of Lebanon-Berks county line and the Lancaster-Berks county line to SR 1053 (also known as Peartown Road and Greenville Road), west of SR 1053 to Pennsylvania Turnpike I-76, the daily bag limit is one goose, possession limit two geese; **except** on State Game Lands No. 46 (Middle Creek Wildlife Management Area) where the season is closed. Note: this restriction does not apply to youth participation on youth waterfowl hunting days September 17 & September 24, 2011 when regular season regulations apply.

Canada, Snow and White-Fronted Goose hunting zones for 2011-12 season in Pennsylvania



## Pennsylvania

### **Resident Population Goose (RP) Zone**

All of Pennsylvania **except** for the Southern James Bay Population (SJBP) zone **and** the Atlantic Population (AP) zone.

### **Southern James Bay Population (SJBP) Zone**

The area north of I-80 and west of I-79 including in the city of Erie west of Bay Front Parkway to and including the Lake Erie Duck zone (Lake Erie, Presque Isle and the area within 150 yds of Lake Erie Shoreline).

### **Atlantic Population (AP) Zone**

The area east of route SR 97 from Maryland State Line to the intersection of SR 194, east of SR 194 to intersection of US Route 30, south of US Route 30 to SR 441, east of SR 441 to SR 743, east of SR 743 to intersection of I-81, east of I-81 to intersection of I-80, south of I-80 to New Jersey state line.

Appendix 2. 2012 Atlantic Flyway Midwinter Waterfowl Survey results.

Species	ME	VT	NH	MA	CT	RI	NY <sup>a</sup>	PA	WV	NJ	DE	MD	VA	NC	SC	GA	FL	Flyway Total <sup>b</sup>
Mallard	2,249	1,220	680	3,153	1,959	2,776	3,080	604	2,971	28,570	8,068	57,386	12,878	6,837	3,186	552	.	136,169
Black duck	18,977	235	839	30,591	2,092	1,937	9,738	713	293	96,345	6,507	27,678	16,407	9,591	1,601	7	.	223,551
Mexican duck	0	0	0	0	0	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	0	0	60	40	.	100
Gadwall	0	0	0	0	177	40	20	8	0	735	1,132	4,998	14,335	42,257	23,117	885	.	87,704
American wigeon	0	0	0	2	321	160	225	0	1	1,075	120	1,421	6,788	28,867	6,134	461	.	45,575
G.W. Teal	20	0	0	170	14	0	50	0	0	5,020	1,199	3,724	5,858	60,395	37,895	2,737	.	117,082
B.W. Teal	0	0	0	0	0	0	0	0	0	0	0	0	12	2,644	474	.	3,130	
N. Shoveler	0	0	0	0	0	0	0	3	0	100	1,219	158	1,725	2,271	12,616	156	.	18,248
N. Pintail	0	0	0	41	4	0	540	2	0	3,505	1,106	1,174	2,572	106,431	15,837	0	.	131,212
Wood duck	0	0	0	0	0	0	0	0	0	14	6	10	59	1,016	267	.	1,372	
Whistling duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	.	14	
<b>Total Dabblers</b>	<b>21,246</b>	<b>1,455</b>	<b>1,519</b>	<b>33,957</b>	<b>4,567</b>	<b>4,913</b>	<b>13,653</b>	<b>1,330</b>	<b>3,265</b>	<b>135,350</b>	<b>19,365</b>	<b>96,545</b>	<b>60,573</b>	<b>256,720</b>	<b>104,106</b>	<b>5,593</b>	.	<b>733,474</b>
Redhead	0	0	0	0	0	0	0	25	2	0	0	4,475	410	13,379	0	12	.	18,303
Canvasback	0	0	0	25	37	0	0	655	0	630	700	14,335	6,712	2,040	1	2,515	.	27,650
Scaup	129	2,500	1,595	4,534	985	6,825	10,655	410	10	20,805	24	69,226	9,066	11,997	1,495	12,235	.	152,491
Ringneck	0	0	0	0	163	0	0	50	26	815	1,620	1,296	13,805	20,028	15,663	8,120	.	61,586
Goldeneye	3,323	5,800	240	5,587	790	1,215	2,144	293	0	345	42	901	5	20	0	0	.	20,705
Bufflehead	5,490	0	84	3,860	1,152	5,750	5,250	157	131	27,180	688	19,830	15,146	7,849	492	240	.	93,299
Ruddy duck	0	0	0	6	78	200	1,620	0	6	3,785	365	15,270	31,347	23,480	239	8	.	76,404
<b>Total Divers</b>	<b>8,942</b>	<b>8,300</b>	<b>1,919</b>	<b>14,012</b>	<b>3,205</b>	<b>13,990</b>	<b>19,669</b>	<b>1,590</b>	<b>175</b>	<b>53,560</b>	<b>3,439</b>	<b>125,333</b>	<b>76,491</b>	<b>178,793</b>	<b>17,890</b>	<b>23,130</b>	.	<b>444,978</b>
Eider	9,763	0	1,371	41,076	6	8,580	0	0	0	0	0	0	0	0	0	0	.	60,796
Scoter	1,344	0	157	12,021	448	1,950	0	5	6	305	0	5,069	1,115	1,482	471	1,500	.	25,873
Long-tailed Duck	2,383	0	75	698	278	9	20	0	0	780	10	825	151	0	0	0	.	5,229
Harlequin	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	10
<b>Total Seaducks</b>	<b>13,500</b>	<b>0</b>	<b>1,603</b>	<b>53,795</b>	<b>732</b>	<b>10,539</b>	<b>20</b>	<b>5</b>	<b>6</b>	<b>1,085</b>	<b>10</b>	<b>5,894</b>	<b>1,266</b>	<b>1,482</b>	<b>471</b>	<b>1,500</b>	.	<b>91,908</b>
Merganser	4,774	3,524	0	15,158	879	799	1,771	1,235	271	15,415	239	2,770	1,541	18,283	2,296	643	.	69,598
Unidentified Duck	0	0	0	10	0	0	0	8	5	0	0	15	254	818	392	10	.	1,512
<b>Total Ducks</b>	<b>48,462</b>	<b>13,279</b>	<b>5,041</b>	<b>116,932</b>	<b>9,383</b>	<b>30,241</b>	<b>35,113</b>	<b>4,168</b>	<b>3,722</b>	<b>205,410</b>	<b>23,053</b>	<b>230,557</b>	<b>140,125</b>	<b>356,096</b>	<b>125,155</b>	<b>30,876</b>	.	<b>1,340,072</b>
Brant	0	0	0	1,550	1,664	2,115	66,250	0	0	69,560	750	548	6,720	0	0	0	.	149,157
Snow goose	0	0	0	0	0	3	857	801	1	75,400	160,252	43,379	13,654	36,855	401	0	.	331,603
Canada Goose	4,806	861	2,465	16,579	4,126	17,572	3,912	26,793	3,904	187,685	38,952	342,610	124,568	14,698	527	855	.	790,913
W.F. Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	0
<b>Total Geese</b>	<b>4,806</b>	<b>861</b>	<b>2,465</b>	<b>18,129</b>	<b>5,790</b>	<b>19,690</b>	<b>71,019</b>	<b>27,594</b>	<b>3,905</b>	<b>332,645</b>	<b>199,954</b>	<b>386,537</b>	<b>144,942</b>	<b>51,553</b>	<b>928</b>	<b>855</b>	.	<b>1,271,631</b>
Tundra swan	0	0	0	0	0	0	0	691	0	425	178	16,599	8,884	59,716	300	0	.	86,793
Trumpeter swan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.	0
Mute Swan	2	0	12	421	720	691	164	48	0	1,412	39	40	56	0	0	0	.	3,605
Unidentified Swan	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	.	4
<b>Total Swans</b>	<b>2</b>	<b>0</b>	<b>12</b>	<b>421</b>	<b>720</b>	<b>691</b>	<b>164</b>	<b>739</b>	<b>0</b>	<b>1,837</b>	<b>217</b>	<b>16,643</b>	<b>8,940</b>	<b>59,716</b>	<b>300</b>	<b>0</b>	.	<b>90,402</b>
<b>Total Waterfowl</b>	<b>53,270</b>	<b>14,140</b>	<b>7,518</b>	<b>135,482</b>	<b>15,893</b>	<b>50,622</b>	<b>106,296</b>	<b>32,501</b>	<b>7,627</b>	<b>539,892</b>	<b>223,224</b>	<b>633,737</b>	<b>294,007</b>	<b>467,365</b>	<b>126,383</b>	<b>31,731</b>	.	<b>2,701,850</b>
Coot	0	0	0	0	85	100	0	2,270	0	220	1,655	815	36,745	22,234	54,490	17,896	.	136,510
Sandhill crane	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	.	1

<sup>a</sup> New York survey data from Long Island only. Counts for black ducks and brant are probably reasonable, but are likely too small for other species, especially mallards, canvasbacks, Canada geese and, mute swans.

<sup>b</sup> Flyway totals are not comparable with totals from previous years because of lack of survey in Florida. Totals for mottled ducks, whistling ducks, blue-winged teal, redheads, scaup, ringnecked ducks, and to a lesser extent, wigeon and shovellers are especially suspect.

## Appendix 3. 2012 Atlantic Flyway Breeding Waterfowl Plot Survey results.

ATLANTIC FLYWAY  
BREEDING WATERFOWL PLOT SURVEYBreeding Pair  
and  
Population Size Estimates  
Report

2012

Jon D. Klimstra

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

5 July, 2012

Across the entire survey area winter was extremely mild with little to no snow fall which resulted in dryer than normal conditions. This was a marked difference compared to last year where most of the area received above average precipitation into spring. Because of the mild winter, spring phenology was advanced by about one to two weeks across much of the area. Nesting chronology was advanced by about two weeks but because of the dry winter and early spring, nesting habitat was lacking. This resulted in states starting their surveys about seven to ten days earlier than normal. April temperatures were above normal and some states reported wood ducks incubating nests the first week in April. Temperatures and precipitation returned to average levels during the first part of May in many survey states. However because of early nest initiation this had the potential to impact any broods that were hatched. Overall most states felt that the timing of the survey was good given the early spring. Across most of the survey area production is expected to be about average.

In 2012, 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  $2 \times (\text{pairs} + \text{singles}) + \text{grouped birds}$ .

As in years past stratum-within-state-, state-, stratum-, and survey-area specific estimates (formerly printed as "Appendix A") will be distributed in an Excel file. This will again make these estimates more accessible to cooperators. Note that these estimates will also be uploaded to the USFWS Migratory Bird Data Center (<http://mbdcapps.fws.gov/>).

Breeding population and breeding pair estimates for this year are compared with estimates from 2011 and long-term (1993-2011) averages. Statistical comparisons were made with a 2-tailed  $z$ -test. The statistic was compared with the normal distribution in SAS. The  $z$  test statistic was calculated as:

$$z = \frac{Estimate_i - Estimate_{i-1}}{\sqrt{Var_i + Var_{i-1}}} \quad \text{or} \quad z = \frac{Estimate_i - Estimate_{LTA}}{\sqrt{Var_i + Var_{LTA}}}$$

The variance of the long-term average was calculated as;

$$Var_{LTA} = \frac{\sum_{i=1}^n Var_i}{n^2}$$

Where:

$i$  = survey year

$Var_i$  = estimated variance for year  $i$

$n$  = number of years used in the long-term average

This was the tenth year that social 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 2011 were made with mallards, black ducks, wood ducks, and Canada geese. This is the fifth year that the current years estimates will be compared with the long-term average (LTA).

## Results

For the Mallard, both the population and breeding pair estimates increased from 2011 with a percent change of approximately 4.5 and 5.5 percent respectively (Tables 1 and 2; Figures 1 and 2). Neither estimate was significantly different ( $P=0.66$  and  $P=0.58$ ) however both still remain well below the long term average. When compared to the LTA both the populations and pairs estimate were approximately 18 percent below the LTA and were significantly different ( $P=0.002$  and  $P=0.002$ , Table 1 and 2). Both the black duck population and pairs estimate declined from the 2011 estimate by approximately 26 percent (but were not significant) and also

the LTA. Both the population and pairs estimate were 55 and 52 percent below the LTA with both being significantly different ( $P=0.000019$  and  $P=4.40^{-10}$ ) from the LTA (Tables 1 and 2; Figures 1 and 2). Wood ducks showed an increase for the population and breeding pairs estimate compared to 2011 and the LTA. However for population and pairs, neither increase was significant (Tables 1 and 2; Figures 1 and 2). For the Canada goose both the old and new population estimate showed a non-significant decline from the 2011 estimates (Table 1). In addition both the old and new estimates showed a decline from the LTA however the decline for the new estimate was slightly significant ( $P=0.047$ ). Like the population estimate for geese the pairs estimate was down compared to both the 2011 estimate and LTA but neither were significant (Table 2).

The population estimate for Gadwall declined from 2011 and the LTA however this decline was not significant in either case (Table 3). The number of estimated pairs dramatically declined from last year and the long term average. This decline was significantly different from the LTA ( $P=0.011$ ). Caution should be used though in interpreting the estimates for Gadwall as there are large confidence errors associated with the estimates and the estimates themselves fluctuate from year to year. The Green-winged teal estimate was down slightly from 2011 but still above the LTA by about 5 percent (Table 3). The pairs estimate for green-wings increased for the second straight year and also was also above the LTA for second year in a row. For both the green-wing population and pair estimate none were significant changes from 2011 and the LTA (Table 3 and 4). The Blue-winged teal population and pair estimate were both above the 2011 estimate but still below the LTA with none of these being significant changes. Both the population and pairs estimate for the Common merganser decreased slightly from 2011 but was not significant and was still above the LTA (Table 3). Both the population and pair estimate for the Hooded merganser increased compared to 2011 and the LTA but were not significant changes (Table 3 and 4). Both of these estimates were above the LTA for the first time since 2007. The mute swan population estimate did increase (22 and 54 percent respectively) from 2011 and the LTA but were not significant (Table 3). However the breeding pair population remained relatively stable from 2011 with a slight decrease for the second straight year compared to the LTA (Table 4). However this increase compared to the LTA was not significant.

AF Breeding Waterfowl Plot Survey  
Final Report, 7/5/2012

Table 1. Population estimates and standard errors for mallards, black ducks, wood ducks, and Canada geese from the Atlantic Flyway Breeding Waterfowl Plot Survey, 1993-2011, and percent change from 2010 to 2011 and from the long-term average to 2011.

Year	N	Mallards		Black ducks		Wood ducks		Canada geese			
		Estimate	SE	Estimate	SE	Estimate	SE	Estimate <sup>a</sup>	SE	Estimate <sup>b</sup>	SE
1993	1,475	686,562	49,870	80,158	11,033	311,924	32,660	647,509	111,770		
1994	1,468	856,313	62,774	60,930	8,667	323,285	34,730	648,684	72,971		
1995	1,465	864,120	70,395	72,507	13,169	367,019	35,473	780,027	98,816		
1996	1,469	848,645	61,074	77,316	17,521	344,659	32,139	932,656	107,423		
1997	1,472	795,176	49,596	65,578	9,050	385,644	33,863	1,013,324	132,539		
1998	1,474	775,213	49,718	81,689	20,458	382,778	28,585	970,092	115,663		
1999	1,491	879,953	60,173	82,421	14,392	402,170	34,542	999,517	120,811		
2000	1,480	762,555	48,701	87,009	15,421	376,212	35,008	1,022,299	101,930		
2001	1,485	809,438	51,572	69,627	11,263	388,204	37,891	1,016,629	89,337		
2002	1,487	833,514	56,235	68,637	12,211	420,000	37,804	965,657	86,932		
2003	1,495	731,907	47,025	64,898	11,357	341,945	29,497	1,040,474	89,820	1,126,731	94,540
2004	1,485	806,554	51,747	53,891	7,713	360,185	36,035	978,554	89,813	1,073,096	93,828
2005	1,488	753,622	53,619	49,745	8,469	413,558	38,981	1,064,696	96,415	1,167,075	102,279
2006	1,455	721,402	47,639	51,924	8,880	400,967	34,124	1,057,251	103,397	1,143,951	106,242
2007	1,485	687,578	46,724	62,355	11,608	420,574	36,086	1,046,067	90,513	1,127,987	94,528
2008	1,476	619,095	40,682	65,121	16,838	386,127	34,468	951,501	79,003	1,024,914	82,157
2009	1,445	666,752	45,695	39,523	6,228	367,998	34,312	943,274	72,554	1,006,133	75,112
2010	1,463	651,709	49,122	38,155	8,495	409,599	35,018	896,254	87,327	977,085	92,408
2011	1,471	586,089	41,561	38,717	6,919	382,736	32,978	941,359	82,828	1,015,076	86,473
2012	1,474	612,587	45,776	28,619	4,370	418,910	33,177	823,257	69,346	879,793	71,582
Long-term average (1993-2011)											
		754,537	11,997	63,695	2,792	378,189	7,920	942,938	22,385	1,075,918	30,799
Percent change											
from:											
	%	P	%	P	%	P	%	P	%	P	
2011	4.52	0.6682	-26.08	0.2172	9.45	0.4393	-12.55	0.2743	-13.33	0.2282	
LTA	-18.81	0.0027	-55.07	0.0000	10.77	0.2697	-12.69	0.1960	-18.23	0.0470	

<sup>a</sup> Estimates based on the 1993-2002 method of calculating total indicated birds [TIB = 2\*(pairs) + singles + groups].<sup>b</sup> Estimates based on the post-2002 method of calculating total indicated birds [TIB = 2\*(pairs + singles) + groups].

AF Breeding Waterfowl Plot Survey  
Final Report, 7/5/2012

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, 1993-2011, and percent change from 2010 to 2011 and from the long-term average to 2011.

Year	N	Mallards		Black ducks		Wood ducks		Canada geese	
		Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
1993	1,475	324,020	23,075	39,464	5,485	140,506	14,229		
1994	1,468	427,254	31,354	29,472	4,255	148,298	14,448	202,281	19,827
1995	1,465	404,837	30,111	32,670	5,919	172,944	16,949	245,233	23,023
1996	1,469	403,919	28,367	31,674	5,042	156,201	14,023	277,608	25,468
1997	1,472	383,296	23,653	29,792	4,079	186,127	16,610	326,982	40,080
1998	1,474	374,612	24,079	31,833	4,885	184,725	13,938	324,648	29,188
1999	1,491	421,492	28,771	38,693	6,620	195,197	16,512	379,479	38,088
2000	1,480	359,398	22,288	36,006	4,902	174,417	15,066	339,936	26,316
2001	1,485	385,824	23,400	31,942	4,544	187,322	18,336	392,055	27,777
2002	1,487	400,730	26,599	29,026	3,645	202,090	18,298	405,898	32,094
2003	1,495	347,309	22,299	28,863	4,186	167,135	14,664	389,793	28,280
2004	1,485	387,141	25,135	25,028	3,499	173,292	16,971	394,626	28,065
2005	1,488	358,214	25,213	21,471	3,127	195,916	17,690	410,544	30,402
2006	1,455	345,742	22,568	24,907	4,225	194,578	16,713	384,715	27,397
2007	1,485	332,549	22,778	24,714	4,253	196,717	15,616	390,630	27,454
2008	1,476	301,700	19,728	24,204	4,360	185,867	16,642	377,762	26,780
2009	1,445	321,830	22,256	17,823	2,933	173,898	15,767	329,638	22,291
2010	1,463	300,558	22,346	15,431	2,736	198,490	17,247	359,627	26,875
2011	1,471	277,354	18,157	18,146	3,348	184,559	15,817	363,841	25,776
2012	1,474	292,799	21,529	13,407	2,093	200,618	15,832	312,766	21,763
Long-term average (1993-2011)									
		360,936	5,632	27,956	1,016	179,909	3,702	349,739	6,711
Percent change									
from:		%	P	%	P	%	P	%	P
2011		5.57	0.5834	-26.11	0.2301	8.70	0.4730	-14.04	0.1300
LTA		-18.88	0.0022003	-52.04	0.0000	11.51	0.2028	-10.57	0.1045

AF Breeding Waterfowl Plot Survey  
Final Report, 7/5/2012

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, 2003-2011, and percent change from 2010 to 2011 and from the long-term average to 2011.

Year	N	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	1,495	8,933	3,494	60,173	13,237	33,948	11,397	45,653	8,306	28,878	5,518	14,368	2,999
2004	1,485	11,247	5,272	55,016	13,356	39,344	11,862	49,163	14,923	44,143	11,366	22,706	8,653
2005	1,488	16,062	14,012	36,321	9,097	19,066	6,467	40,420	7,027	43,035	8,921	12,614	3,051
2006	1,455	7,199	3,320	64,402	17,330	8,988	5,556	43,214	12,409	34,355	9,931	24,902	6,825
2007	1,485	6,230	2,321	55,108	11,019	42,505	19,342	49,230	9,710	43,121	9,356	17,064	3,591
2008	1,476	8,438	6,540	43,995	12,720	15,116	8,203	39,515	7,084	31,197	6,878	21,251	7,893
2009	1,445	14,551	6,165	67,003	12,629	23,143	8,881	40,615	7,704	25,019	5,671	21,859	5,816
2010	1,463	3,821	2,681	70,763	22,638	35,834	25,829	43,340	12,490	20,187	4,979	18,243	3,517
2011	1,472	6,078	2,650	61,412	20,495	8,761	3,364	52,232	9,302	28,078	6,185	24,972	8,588
2012	1,474	5,557	3,726	60,028	13,751	13,224	4,325	50,128	9,106	34,092	7,544	30,606	9,728
Long-term average (2003-2011)													
		9,173	2,072	57,133	5,106	25,189	4,363	44,820	3,409	33,113	2,648	19,775	2,033
Percent change from:													
		%	p	%	p	%	p	%	p	%	p	%	p
	2011	-8.57	0.9093	-2.25	0.9553	50.94	0.4153	-4.03	0.8716	21.42	0.5375	22.56	0.6642
	LTA	-39.42	0.3964	5.07	0.8435	-47.50	0.0515	11.84	0.5852	2.96	0.9025	54.77	0.2758

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, 2003-2011, and percent change from 2010 to 2011 and from the long-term average to 2011.

Year	N	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	1,495	4,466	1,747	12,622	3,510	7,445	2,891	19,561	3,432	12,783	2,555	7,184	1,499
2004	1,485	3,259	1,265	8,690	2,743	16,342	5,024	19,544	6,891	20,158	5,514	9,267	2,538
2005	1,488	1,071	897	7,389	2,106	7,251	2,110	17,369	2,961	20,051	4,130	6,031	1,508
2006	1,455	1,754	839	13,665	4,194	4,494	2,778	17,233	5,117	11,563	2,463	10,184	2,938
2007	1,485	3,115	1,160	13,155	3,851	13,444	6,211	17,620	3,119	18,673	4,069	8,023	1,649
2008	1,476	971	430	12,172	4,315	7,041	4,070	18,520	3,329	14,361	3,322	10,001	3,898
2009	1,445	3,108	1,231	17,022	4,232	11,494	4,439	16,619	3,189	10,804	2,717	9,562	2,487
2010	1,463	630	404	10,308	3,624	5,032	2,271	16,088	5,514	8,081	2,245	9,514	1,846
2011	1,472	2,880	1,320	15,207	7,153	3,637	1,509	23,169	4,062	13,323	3,024	8,524	1,752
2012	1,474	934	430	16,631	4,670	6,496	2,158	20,620	3,528	15,998	3,624	8,481	1,834
Long-term average (2003-2011)													
		2,362	370	12,248	1,395	8,464	1,257	18,414	1,458	14,422	1,161	8,699	787
Percent change from:													
		%	p	%	p	%	p	%	p	%	p	%	p
	2011	-67.57	0.1610	9.37	0.8676	78.62	0.2775	-11.01	0.6356	20.08	0.5709	-0.50	0.9866
	LTA	-60.45	0.0119	35.79	0.3684	-23.26	0.4306	11.98	0.5634	10.93	0.6788	-2.51	0.9130

AF Breeding Waterfowl Plot Survey  
Final Report, 7/5/2012

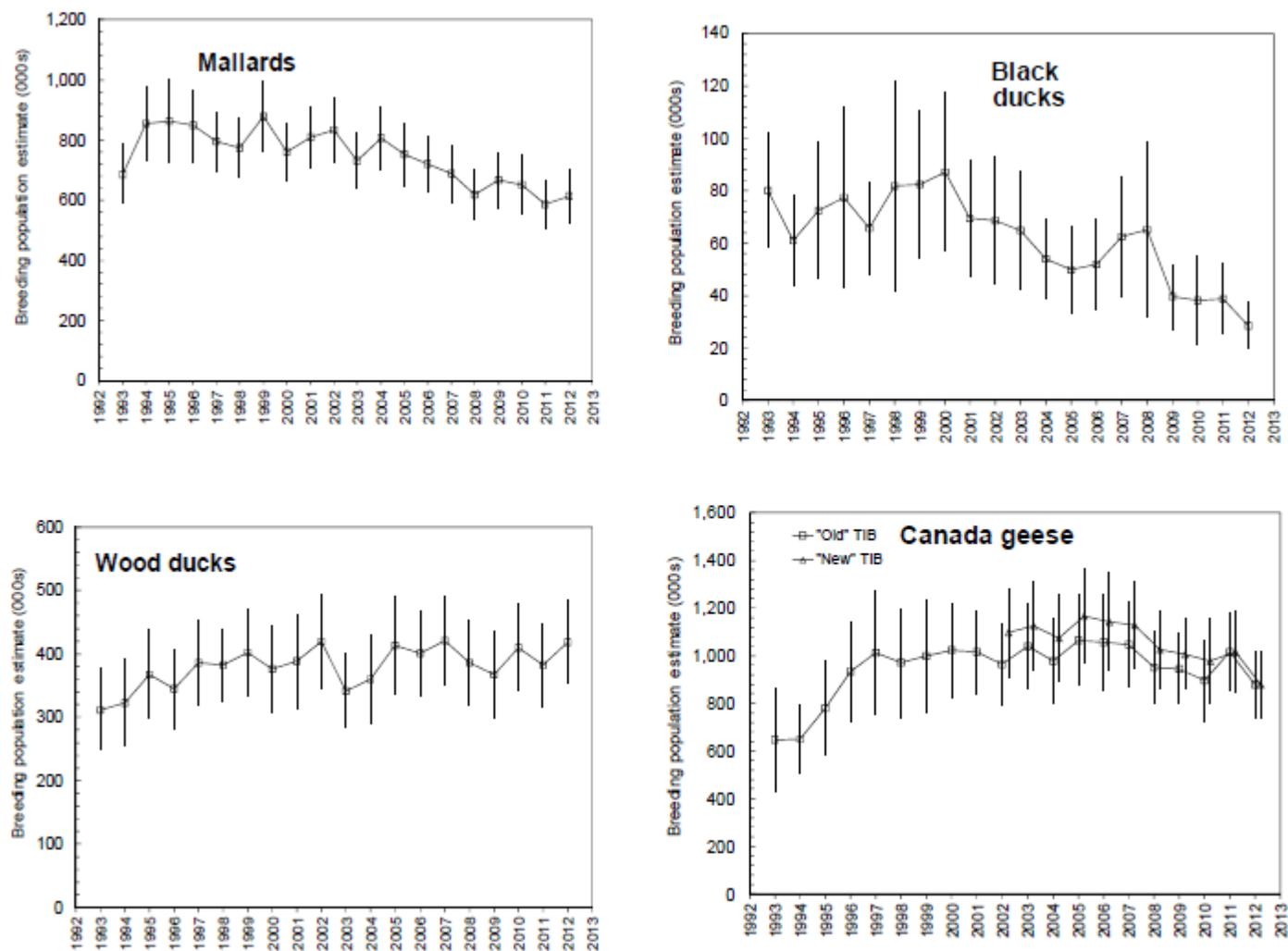


Figure 2. Population estimates and 95 % confidence intervals for mallards, black ducks wood ducks and Canada geese, 1993-2012.

AF Breeding Waterfowl Plot Survey  
Final Report, 7/5/2012

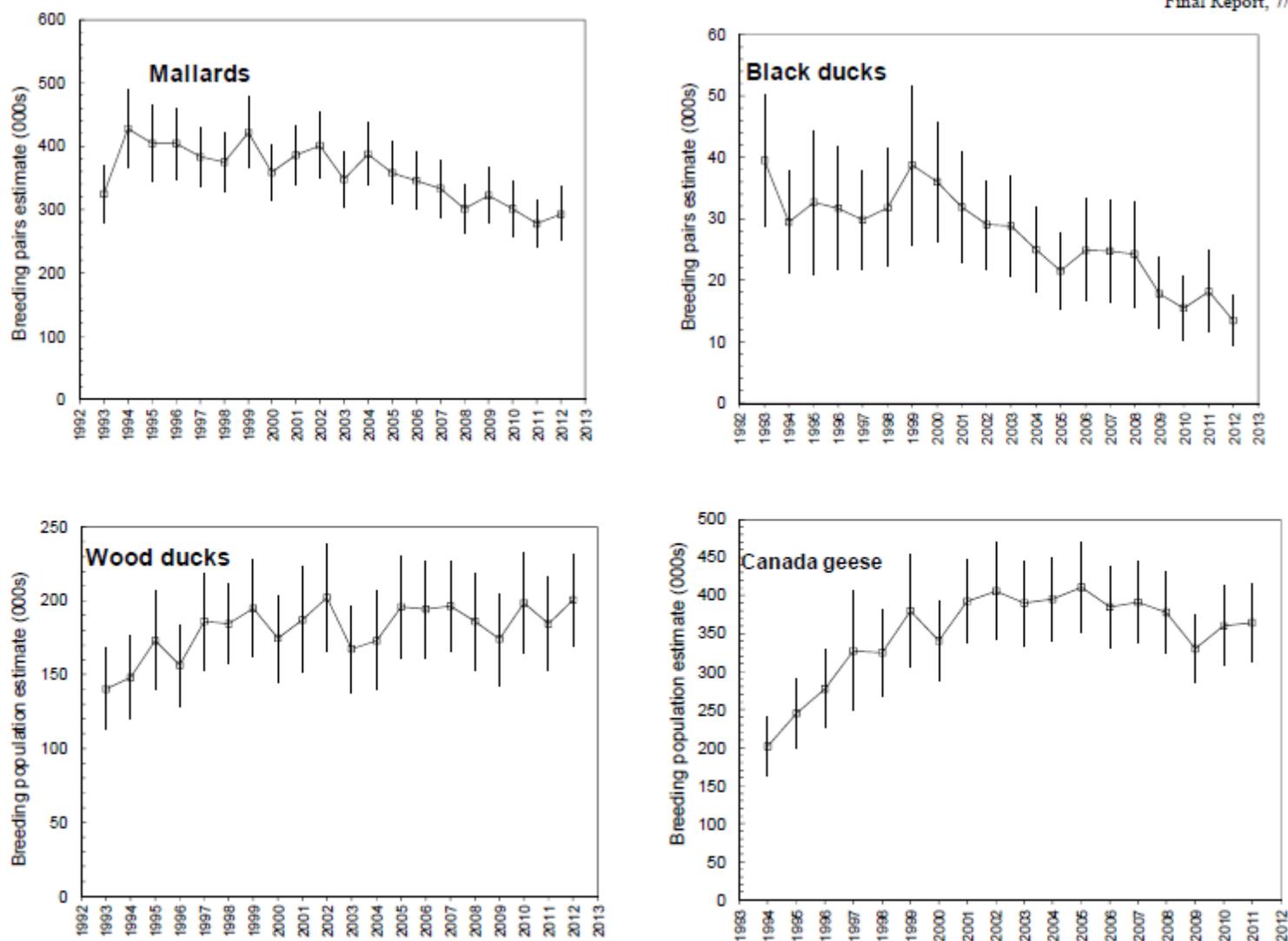


Figure 2. Breeding pair estimates and 95% confidence intervals for black ducks, wood ducks, and Canada geese, 1993-2012.