WATERFOWL BREEDING POPULATION SURVEY FOR WISCONSIN, 1973-2015

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TITLE: WATERFOWL BREEDING POPULATION SURVEY FOR WISCONSIN, 1973-2015.

STRATA SURVEYED: Southeast Central (SEC), Northern High Density (NHI), Northern Low Density (NLO), and Southwest Driftless (SWD).

DATES: April 27 - May 8, 2015.

Air Survey: Completed in 8 days, spanning 11 days: April 27 – May 7.

Ground Survey: 8 days, spanning 11 days: Apr 28– May 8.

DATA SUPPLIED BY: Wisconsin Department of Natural Resources (WDNR) and U.S. Fish and Wildlife Service (USFWS).

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ABSTRACT: The 2015 Waterfowl Breeding Population Survey for Wisconsin was conducted April 27- May 8, following methods of the North American waterfowl population survey. The information from the survey is used as part of the overall survey of breeding waterfowl in North America as well as in making state level waterfowl management decisions. This was the 43rd consecutive year we have conducted the survey. These data on Wisconsin waterfowl breeding populations are best interpreted as trends viewed over several years rather than as year to year changes in waterfowl populations. Fall and winter precipitation (Oct-Feb) was down throughout the state by 13% compared to the same time period in 2013-14. Spring (March-May) precipitation ranged from 5-10% above average in the central and west-central to 3-7% below normal in the south and northwest. Overall, average statewide spring precipitation was 1% below normal resulting in relatively dry conditions when considered in combination with the 13% below average winter precipitation. Total non-linear wetland basins were: down 33% from 2014 in the SEC and 36% below the long-term mean, down 44% from 2014 in the NHI and 16% below the long-term mean, and down 63% from 2014 in the NLO and 44% below the long-term. In the SWD, non-linear basins were down 49% from 2014 and 24% below the 18-year (1997-2014) mean. The total breeding duck population estimate of 372,840 is down 6% from the 2014 estimate of 395,099 and 16% below the long-term mean. Overall, the total duck population estimate for 2015 is in the range of variation for total duck numbers experienced in the last 10 years. The 2015 total mallard population estimate of 176,200 is up 11% from the 2014 estimate of 158,747 but is 3% below the long-term mean (42 years). The 2015 blue-winged teal breeding population estimate of 59,083 is up 72% from 2014, but is still 46% below the long-term mean. In 2015, the population estimate for wood ducks is 68,142 which is down 35% from 2014 and 15% below the long-term mean. We should always consider the continental perspective for migratory birds when interpreting local surveys. Fortunately, in recent years the continental duck populations have been at all-time high estimates. However, it is clear that our continued commitment to protecting wetland and grassland habitat and regulating harvest impacts are both important to the future of Wisconsin breeding ducks. The statewide breeding Canada goose population estimate of 119,212 is down 6% which is statistically unchanged from 2014 and 26% above the long-term (29-year) mean. While the water conditions were drier than average during the time of the survey, considerable precipitation for the month of May following the survey has improved wetland conditions for the brood-rearing period. It appears that the Wisconsin landscape will provide good duck production in 2015, although we expect renesting and late broods as a result of spring flooding in some areas. The good water conditions on the landscape should provide good brood habitat for all duck species in 2015. Average Canada goose breeding numbers should provide quality Canada goose hunting opportunities this fall.

INTRODUCTION: Decisions regarding hunting season structure and harvest limits in waterfowl management have a long history of being based in part upon spring breeding pair surveys. The US Fish and Wildlife Service's (USFWS) Waterfowl Breeding Population and Habitat Survey has been conducted for 60 years across the traditional survey area of north-central United States, Canada and Alaska. The Wisconsin Waterfowl Breeding Population Survey, which is modeled after the continental survey, has been conducted for 43 years and provides a long-term measure of waterfowl breeding trends in Wisconsin. These data are used at the national and state level for monitoring waterfowl populations and making management decisions. Wisconsin's breeding waterfowl survey data are included in the Waterfowl Population Status Report published annually by the USFWS on continental waterfowl populations. In addition, mallard data from Wisconsin, Minnesota, and Michigan are combined with data from the traditional survey areas as a basis for the Adaptive Harvest Management Report that is used to establish federal waterfowl season frameworks. At the state level, waterfowl breeding survey data are used to establish annual hunting seasons, to identify long term changes in species populations, and to evaluate the impact of habitat changes and management. This report provides a summary and analysis of the 2015 survey data in support of these efforts.

METHODS: The breeding waterfowl survey in Wisconsin is a stratified double sampling scheme patterned after the North American Waterfowl Breeding Population Survey developed by the USFWS (Anon. 1977), but modified for local conditions (March *et al*. 1973). Fifty-five east-west aerial transects, each 30 miles long and 1/4 mile wide, were randomly selected in 1973 within 3 strata of Wisconsin: SEC, NHI, and NLO, based on duck densities and habitat (Figure 1). These strata total 43,359 square miles. In 1997, we added eleven aerial transects within the unglaciated SWD stratum (12,311 square miles) and included this stratum in our statewide population estimates. This area was not surveyed prior to 1997 because of its low wetland density.

The 2015 aerial survey was conducted in 8 days, spanning 11 days (April 27-May 7) using a Cessna 182 aircraft, flying 80-85 mph at a maximum altitude of 200 feet. An observer recorded waterfowl data from each side of the plane, with the observer on the north side of the plane recording the number and type of wetland basins within a transect. Visibility correction factors (R) for waterfowl not seen by the aerial crew were determined by counting waterfowl from the ground on segments (10-15 miles long) of 26 transects. The aerial surveys are generally initiated in the southern part of Wisconsin with the crews progressing to the northern transects. The ground surveys were done on 8 days that spanned

April 28-May 8. All ground counts were completed within 3 days of the air survey. Forty-one people from 2 agencies were involved in the planning and implementation of the survey.

Survey results separate mallards, blue-winged teal, wood ducks, and Canada geese. All other ducks are pooled into a category of “other ducks”. By 2004, wood duck populations had increased to the point where we were able to estimate them as a separate group rather than as part of "other ducks". This is significant because it allows us to provide independent breeding population estimates for three of the four duck species that constitute the majority of Wisconsin’s fall harvest. Visibility correction factors (R) were calculated separately for each stratum-species group, but when the coefficient of variation (CV) of R exceeded 20%, the estimate of R was considered unreliable and the data for R were pooled for all strata (Bartelt and Gatti 1987). When the CV of R still exceeded 20% for the pooled strata, data from prior years were iteratively added until the CV of R was below 20%.

This survey was not originally designed for surveying Wisconsin's resident Canada goose population. If a survey were specifically designed for breeding Canada geese in Wisconsin, it would be conducted earlier in the spring because of their earlier nesting chronology. Canada goose counts and population estimates were not included in this report prior to 1986 because of the small sample size. However, aerial counts of geese have increased steadily since the mid-1980s, making survey estimates useful indices to population trends of breeding Canada geese. Human-goose conflicts resulting from a growing goose population increase the importance of tracking the population status of breeding geese in Wisconsin.

The survey was designed to detect a 20% change in total ducks observed. The population estimates of individual species groups have wider confidence intervals because of lower sample sizes and added variability of R. Population estimates for waterfowl species in individual strata should be treated with caution due to low sample sizes. Population estimates are most valuable when viewed over several years as an indicator of population trends rather than viewing them as exact measures of population on a year-to-year basis. Lesser scaup and bufflehead are not included in the state duck population estimates because they rarely breed in Wisconsin and when counted are assumed to be in migration to more northern breeding areas.

The determination of wetland type from the air is difficult to standardize when observers change over

the years. Pooling data into linear (streams and ditches) and nonlinear (types I-VIII) wetland groups resolves some of the typing problems. The same aerial observers are used for a minimum 5-year period to limit problems with observer bias.

RESULTS AND DISCUSSION:

Survey Timing/Weather:

In 2015, spring weather came much earlier than the previous two years. We initiated the breeding waterfowl survey on April 27 which appeared to be well timed to slightly late with regard to mallards which is the priority species in this survey. As in the past, the survey was initiated in the southern part of Wisconsin, progressing northward to account for the differences in phenology from south to north. The timing of the breeding waterfowl survey is always a challenge because variables such as weather, bird species phenology, and tree leaf-out all impact the timing, visibility, and accuracy of the survey. During the first half of spring across the state, temperatures and precipitation were right at normal. Weather was generally conducive to completing the survey on time and there was little leaf-out so visibility issues from that variable were not a concern.

The crews encountered few problems with waterfowl in groups (of over 4) in 2015, except for blue-winged teal and "other ducks" in the SEC, confirming that some of these birds were still on migration. Groups made up 7% of the wood ducks (compared to 3% in 2014 and 0% in 2013), 7% of mallards (10% in 2014), 35% of the "other ducks" (15% in 2014), but 45% of the blue-winged teal observed (24% in 2014). Groups comprised 10% of the Canada geese observed, compared to 8% last year. Canada geese were well along with their nesting phenology, mallards were at the stage of being paired to just breaking pair bonds, while wood duck and blue-winged teal pairs in northern Wisconsin did not appear to have fully settled into nesting areas yet.

Precipitation: Fall and winter precipitation (Oct-Feb) was down throughout the state. The largest deviation from normal occurred in the south (-19% to -30%), and the statewide average was 13% below normal (Figure 2, Table 1). Spring (March-May) precipitation ranged from 5-10% above average in the central and west-central to 3-7% below normal in the south and northwest. Overall, average statewide spring precipitation was 1% below normal. When migrating ducks arrived in

Wisconsin this spring, the typical high density duck nesting areas in southern and eastern Wisconsin were drier than normal which may have caused some ducks to overfly these potential breeding area.

Wetlands: The relatively mild winter of 2014-15, combined with below normal rainfall in March and April 2015 caused wetland conditions to be dry across the state during the time of the survey. However, we observed considerable rainfall in May following the survey which has put us right at average wetland conditions for the year during the important brood-rearing period. During the 2015 survey we observed fewer wetlands than in 2014 for all regions, with most below the mean for the last 10 years (Table 2). Total non-linear wetland basins were: down 33% from 2014 in the SEC and 36% below the long-term (42-year) mean, down 44% from 2014 in the NHI and 16% below the long-term mean, and down 63% from 2014 in the NLO and 44% below the long-term mean. In the SWD, which has less suitable waterfowl breeding habitat, non-linear basins were down 49% from 2014 and 24% below the 18 year (1997-2014) mean. Total linear basins (streams and ditches) were: down 7% from 2014 and 1% above the long-term mean in the SEC, down 24% from 2014 in the NHI and at the long-term mean, down 38% in the NLO from 2014 and 8% below the long-term mean, and in the SWD were down 26% from 2014, and 8% below the 18-year mean. With the increased precipitation in May putting us near average conditions breeding and brood-rearing habitat in Wisconsin is expected to be good across the state.

Mallards: The 2015 total mallard population estimate of 176,200 (+/- 23,589) is similar (up 11%) to the 2014 level of 158,747 ($Z=0.55$ $p=0.58$) but is down somewhat when compared to the last 10 years (191,871; Tables 3 and 4; Figure 3). Among duck species, mallards are highly adaptable to annual weather variation and often begin nesting when conditions are not yet ideal. The 2015 mallard breeding pair survey numbers combined with improving wetland conditions in the key breeding areas suggest that we will have mallard production similar to the last 10 year period for 2015. Heavy spring rains, however, may have flooded out some nests, but a strong renesting effort is expected with the good wet conditions. As in previous years, the SEC still represented the largest portion of the breeding mallard population (41%) and was similar to 2014, but still remained below the long-term average proportion of the statewide mallard population (48%) in this region (Tables 3 and 4, Figure 3). Because of the importance of the SEC region to mallard production and the increasing land use pressures, a focus on land acquisition, habitat restoration and management as well as private land management incentives such as those available through the federal farm bill programs continue to be a

priority for the SEC. Waterfowl breeding population estimates are best interpreted from long term trends rather than year to year variation. For the last few years, we have been cautious to avoid drawing broad conclusions because of this annual variation; however, it now appears that there has clearly been a change in Wisconsin's mallard breeding population over the last 20 years. From 1995-2005, the average spring mallard breeding population estimate in Wisconsin was 272,417 while from 2006-2015 we observed a lower population averaging 191,871. During the period leading up to the mid-1990's there was clearly an increasing trend in mallard numbers in Wisconsin while there has been a decrease since the early 2000's. There are several potential reasons for this observed decline but given the lengths of the trends, it does appear to be a real decline and not related to survey effect. Good wetland and grassland nesting habitat are generally the key factors in driving mallard numbers. Declining habitat conditions cause secondary impacts of increased mortality to hens and broods from factors such as nest destruction from haying or predation. Fall mortality from hunting can also be a factor although when habitat conditions are good this impact is relatively minor. Over the last 50 years across the Wisconsin landscape, we have experienced a decline in grassland habitat and an increase in developed and forested lands resulting from a variety of land use changes. However, in the last 30 years we initially observed an increase in grassland habitat in agricultural areas of Wisconsin primarily through the federal farm bill program known as CRP with a peak of over 700,000 acres in 1994 and over 600,000 acres remaining on the landscape through 2007. Since that peak we have seen a steady decline to less than 250,000 acres of CRP grassland habitat in 2015. During the same period, we went from 30 day duck seasons, to 40 and 50 day seasons and then 60 day duck hunting seasons since 1997. In 2002, we shifted to opening our duck hunting seasons 1 week earlier. Several studies conducted since the 1970's have shown that about 70% of Wisconsin's mallard harvest is derived from mallards hatched in Wisconsin. As a result, maintaining and increasing nesting habitat in Wisconsin while reducing sources of mortality on hen mallards are all important to a recovery of our mallard breeding population and fall harvest opportunities.

Blue-winged Teal: The 2015 blue-winged teal survey results in Wisconsin are always difficult to interpret because of often challenging survey conditions, high variation in survey results, the propensity of teal to shift breeding locations at the continental level and the sometimes opposite population trends experienced in Wisconsin versus the prairie region of the US and Canada. The 2015 blue-winged teal breeding population estimate is 59,083 (+/- 23,094) which is up 73% from 2014 but 46% below the long-term mean (109,825) which excludes the migrant years of 1981, 2004 and 2005.

While this change seems large it is statistically not significant as a result of the high variation in teal survey counts (Z=0.97, p=0.33). The best approach when evaluating the blue-winged teal survey data is to look at long term trends and continental context. In the late 1970's and 1980's there was a clear decline in Wisconsin breeding blue-winged teal numbers concurrent with declines at the continental level. However, since then Wisconsin blue-winged teal breeding numbers have remained low compared to historic levels while continental numbers have shown dramatic increases during the late 1990's and in the last 10 years. We remain concerned about long term decreases in secure grassland and nesting cover, particularly with less Conservation Reserve Program lands enrolled in Wisconsin. However, blue-winged teal are also known for shifting breeding locations around the continent in response to wetland habitat conditions. Continental blue-winged teal breeding populations have reached record highs in 3 of the last 4 surveys with estimates of 8-9 million breeding blue-winged teal reflecting good wetland conditions and good production in the prairies of Canada and the US. The abundant blue-winged teal populations in the prairies provide large fall flights of teal, which compensate for declines in Wisconsin. During the regular duck hunting season in Wisconsin, about 2/3 of our blue-winged teal harvest is supported by teal that breed outside of Wisconsin.

Wood Ducks: The breeding population of wood ducks in Wisconsin continues to be an important and relatively stable part of our total breeding duck population. The 2015 breeding population estimate for wood ducks of 68,142 (+/- 13,033) is down 35% from 2014, but still was not a statistically significant drop (Z=1.61, p = 0.11), though it is 15% below the long-term mean of 80,109 (1973-2014). The majority of the estimated decrease in wood duck numbers from last year was observed in the northern half of the state. The significant decline in observed seasonal and temporary wetlands in the northern regions may have impacted wood duck habits or visibility accounting for some of this apparent decline. Nevertheless, little can be concluded from a 1 year drop in an otherwise stable population over the last few years. With improved wetland conditions following the survey period, we are more optimistic about wood duck numbers than the survey estimates might reflect. While the 2014 wood duck breeding population estimate is down from 2014 and below the recent 10 year mean (107,015), these differences are within the range of normal annual variation and we do not believe represent change in our stable population. The breeding wood duck population showed significant gains in 1980's and early 1990's, and appears to be leveling off around 100,000 after peaking about 10 years ago. Based on improved water conditions and our best interpretation of the survey results, we expect wood duck production in 2015 to be good and similar to recent years.

Other Ducks: The 2015 population estimate for the "other duck" group of 69,415 (+/- 17,614) is down 29% from 2014, but this is within annual variation (Z=0.99, p=0.32), and is 10% above the long-term mean. Observed duck species within the other duck group were typical of prior years with goldeneye, common merganser, hooded merganser and canvasback in the SEC, ring-necked ducks, hooded and common mergansers, gadwall, goldeneye and green-winged teal found in the NHI; ring-necked ducks, hooded and common mergansers, green-winged teal and wigeon in the NLO. Black ducks and pintail were again absent from the survey.

Total Ducks: The total state breeding duck population estimate of 372,840 (+/- 39,622) is similar to the 2014 estimate of 395,099 (Z=0.41, p=0.68) but 16% below the long-term mean (Tables 3 and 4; Figure 6).

As wetland and migratory wildlife species, ducks readily adjust behavior to weather and water conditions. As a result, variations in population estimates and breeding behavior from year to year are expected. While these annual variations draw considerable interest, particularly from duck hunters, looking at the long range trends is most important for conservation purposes. Wisconsin is fortunate to have a substantial breeding population of ducks supported by mallards, wood ducks, blue-winged teal, and others which each take advantage of a unique composition of wetland and nesting habitats. Overall, wood duck numbers appear stable, blue-winged teal numbers in Wisconsin are highly variable and should be interpreted in the context of high continental populations while mallard numbers have shown declines as described above. Current Wisconsin landscape conditions combined with a good rain/snowfall year appear capable of supporting total breeding duck numbers near 500,000. It appears that the Wisconsin landscape will provide good duck production in 2015, although we expect renesting and late broods as a result of spring flooding in some areas. Continentally, habitat conditions have been good and duck breeding populations high for several years. In fact, the 2014 continental breeding duck estimate was the highest ever recorded at 49.2 million ducks. The thousands of lakes and abundant permanent water in Wisconsin help to moderate the impact of drier wetland years by providing stable duck habitat here. The most significant change in current habitat conditions is the ongoing loss of grassland nesting cover in Wisconsin and across the US prairies as a result of changes in federal farm policy. Continued efforts to protect wetland and grassland habitat will be needed to sustain current duck population levels.

Canada Geese: Based on the most recent harvest derivations, the proportion of the Wisconsin Canada goose harvest that comes from giant Canada geese is about 40%, with most of those birds representing Canada geese that breed in Wisconsin (T. Moser, 2010 USFWS memo). This proportion indicates the continued importance of in-state breeding Canada geese in our overall fall harvest. The statewide breeding Canada goose population estimate of 119,212 (+/- 18,547) is similar to the 2014 estimate of 126,299 (Z=0.27, p=0.78). It is below the most recent 10 year average of 138,843 but 26% above the long-term (29-year) mean. The long-term trend in goose numbers suggests an end to their population increase, and that the population has leveled off at ~140,000. Indications from field staff are that Canada goose nesting was early and brood production good for 2015, so we expect numbers similar to recent years going into the fall hunting season.

While the spring breeding waterfowl survey is designed primarily for ducks, it serves as a fairly reliable index of change in the Canada goose population. Giant Canada geese represent a positive resource for some Wisconsin residents but they also represent a problem for other residents in cities and on farms where increasing populations have caused conflicts. Fortunately, there are solutions to the problems that resident geese cause. In Wisconsin, the management strategy for these geese is two-fold: 1) Manage the overall population through hunter harvest and 2) Address property or community specific problems with professionally guided integrated management. The early goose hunting season, with a harvest of over 90% local birds during a two week period, continues to be an important part of our management strategy. The early season now comprises roughly 1/3 of the Canada geese harvested statewide each fall. In addition, site specific Canada goose control measures are implemented in urban and agricultural areas to mitigate nuisance goose problems. We continue to adapt harvest strategies, banding plans, nuisance goose programs, and survey strategies as the breeding population of giant Canada geese increases and expands across Wisconsin (Tables 3, and 4; Figure 7). A continued interest in the Early September Canada goose hunting season is important to the overall management of this population.

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Table 1. Wisconsin Precipitation

Prepared by Wisconsin State Climatology Office June 2015
Precipitation Data

	Oct. 1, 2014-February 28, 2015			March 1, 2015- May 31, 2015		
Division	**Total (inches)**	**Departure from Normal* (inches)**	**Percent Change from Normal***	**Total (inches)**	**Departure from Normal* (inches)**	**Percent Change from Normal***
1 (NW)	6.29	-1.75	-21.75%	7.14	-0.51	-6.64%
2 (NC)	8.71	0.12	1.42%	7.79	0.09	1.19%
3 (NE)	8.82	0.15	1.75%	7.61	0.09	1.20%
4 (WC)	6.28	-1.40	-18.25%	9.11	0.39	4.53%
5 (C)	7.30	-0.71	-8.81%	9.18	0.81	9.68%
6 (EC)	7.86	-1.02	-11.49%	7.38	-0.52	-6.54%
7 (SW)	7.05	-1.62	-18.66%	9.32	-0.26	-2.70%
8 (SC)	7.10	-2.26	-24.16%	8.55	-0.56	-6.11%
9 (SE)	7.05	-2.98	-29.70%	8.41	-0.60	-6.62%
Statewide Average	**7.40**	**-1.10**	**12.90%**	**8.16**	**-0.08**	**-1.02%**

* 1981-2010 normals

Table 2. Numbers of wetlands per square mile observed, 1973-2015, **SEC**

Tot.Linear	2.4	2.7	3.1	3.2	2.3	3.7	4.2	3.6	4.6	4.2	4.8	6.3	5.9	4.0	4.9
Wetland Type	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
I,II,VI	2.4	3.8	2.7	6.1	6.9	10.5	4.6	4.4	4.9	6.6	3.5	3.5	1.6	3.2	4.9
III	0.8	1.2	1.1	1.1	1.2	1.5	1.9	1.3	1.0	1.5	0.8	0.8	0.1	1.0	0.6
IV,V	2.9	2.8	3.2	3.2	2.5	3.5	3.0	3.5	3.5	3.9	3.1	3.6	3.5	3.4	3.9
VII,VIII	0.9	1.4	1.1	2.2	1.3	2.0	1.1	0.8	1.5	0.9	0.9	0.8	0.6	0.8	1.0
Tot.Nonlin.	7.1	9.2	8.1	12.7	11.9	17.5	10.5	10.0	10.9	12.9	8.4	8.6	5.8	8.4	10.4
Stream	2.2	1.8	1.7	2.1	2.1	1.9	2.0	2.1	1.8	1.9	1.8	1.8	1.6	1.7	1.7
Ditch	2.4	3.3	2.3	3.5	2.8	3.2	2.8	2.7	2.5	3.1	2.5	1.3	1.5	2.0	2.4
Tot.Linear	4.7	5.1	4.0	5.6	4.9	5.1	4.8	4.8	4.3	5.0	4.2	3.0	3.1	3.7	4.1

Wetland Type	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**% Change from 2014**	**Long-term mean**
I,II,VI	1.9	1.9	1.1	2.5	3.7	3.3	3.8	2.0	2.6	2.1	2.5	3.0	1.3	-55%	3.7
III	0.3	0.8	0.4	0.4	0.5	1.0	0.7	0.5	0.7	0.6	1.0	1.0	0.8	-25%	0.9
IV,V	3.5	3.2	3.6	3.6	3.1	3..5	3.3	3.8	3.8	3.1	3.2	3.1	2.7	-12%	2.9
VII,VIII	0.6	1.1	1.1	1.2	1.4	1.5	1.0	0.6	1.0	0.7	0.6	1.2	0.7	-36%	1.1
Tot.Nonlin.	6.4	7.0	6.2	7.7	8.6	9.2	8.8	6.5	8.1	6.4	7.3	8.3	5.6	-33%	8.6
Stream	1.6	1.8	1.8	1.8	1.8	1.9	1.9	1.7	2.0	1.6	1.8	1.7	1.8	3%	1.7
Ditch	1.8	2.4	2.1	2.2	2.1	2.5	2.8	2.2	2.2	2.6	2.5	2.8	2.4	-14%	2.4
Tot.Linear	3.4	4.2	3.9	4.0	3.9	4.4	4.8	3.9	4.2	4.1	4.2	4.5	4.2	-7%	4.2

1973.

** Wetland classification system from March et al. 1973.*

Table 2. Continued, **NHI**

Wetland Type	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I,II,VI	1.1	1.3	2.6	2.4	0.9	3.6	4.3	1.4	4.9	3.4	4.2	5.5	3.2	9.1	3.4
III	0.7	0.8	0.9	0.7	0.8	0.6	0.6	0.8	0.7	1.8	0.7	1.0	1.1	0.4	1.4
IV,V	2.8	2.9	3.1	3.0	2.5	2.8	3.4	3.3	3.1	4.6	3.5	3.9	3.9	3.8	3.1
VII,VIII	0.7	0.5	0.7	0.8	0.3	2.1	4.6	1.3	3.2	2.0	1.3	3.4	1.6	2.9	1.6
Tot.Nonlin.	5.3	5.5	7.3	7.0	4.5	9.1	13.0	6.7	11.8	11.8	9.7	13.9	9.8	16.2	9.5
Stream	1.9	1.4	1.3	1.5	1.1	2.1	2.5	1.7	2.4	2.4	2.2	3.2	2.4	2.0	2.0
Ditch	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.4	0.5	0.5	0.8	0.4	0.6	0.5
Tot.Linear	2.0	1.5	1.5	1.6	1.2	2.5	2.8	1.9	2.7	2.9	2.7	3.9	2.8	2.6	2.5

Wetland Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
I,II,VI	2.9	4.0	3.4	8.2	6.8	5.7	2.9	3.3	2.8	3.7	2.4	4.2	2.4	6.2	4.4
III	1.2	2.2	1.3	1.8	0.7	1.3	2.5	2.8	1.2	2.6	1.3	1.7	1.5	2.8	2.0
IV,V	5.1	5.1	4.2	5.0	3.2	4.4	4.5	5.1	6.0	3.7	3.6	4.0	4.5	3.7	4.9
VII,VIII	2.1	4.3	3.4	5.8	1.8	1.7	1.1	2.1	3.6	2.2	2.6	2.0	2.6	4.1	3.9
Tot.Nonlin.	11.3	15.6	12.3	20.8	12.4	13.1	10.9	13.2	13.5	12.2	9.9	11.9	11.0	16.8	15.1
Stream	2.0	2.5	2.7	3.1	2.3	2.4	2.5	2.3	2.5	2.2	2.0	2.3	2.4	2.5	2.1
Ditch	0.4	0.8	0.5	1.0	0.4	0.3	0.4	0.6	0.4	0.4	0.2	0.6	0.3	0.5	0.4
Tot.Linear	2.4	3.3	3.3	4.1	2.7	2.7	2.9	2.8	3.0	2.6	2.2	2.8	2.6	2.9	2.5

Wetland Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% Change from 2014	Long-term mean
I,II,VI	2.4	1.6	1.0	2.6	0.6	3.1	1.2	0.6	6.2	3.4	2.9	6.4	2.6	-60%	3.5
III	1.2	1.6	0.7	1.2	0.7	1.6	1.2	0.5	2.0	1.0	2.1	1.8	1.3	-27%	1.3
IV,V	5.0	4.2	4.3	4.9	3.3	3.3	3.8	3.1	4.4	3.8	4.0	5.7	3.5	-38%	3.9
VII,VIII	2.5	2.5	1.6	1.6	0.2	1.1	0.6	0.3	1.8	1.0	0.6	2.4	1.7	-29%	2.1
Tot.Nonlin.	11.0	9.8	7.7	10.3	4.9	9.1	6.7	4.5	14.4	9.3	9.6	16.3	9.1	-44%	10.9
Stream	2.2	2.7	2.1	2.6	2.4	2.6	2.3	2.3	2.5	2.3	2.8	2.9	2.1	-30%	2.3
Ditch	0.3	0.2	0.3	0.7	0.6	0.6	0.4	0.3	0.6	0.3	0.6	0.6	0.6	7%	0.4
Tot.Linear	2.6	2.9	2.4	3.3	3.1	3.2	2.7	2.6	3.1	2.6	3.3	3.5	2.7	-24%	2.7

Table 2. Continued, **NLO**

Wetland Type	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
I,II,VI	2.1	1.0	1.0	1.6	0.5	2.1	3.5	0.9	3.9	1.8	2.3	5.7	2.8	6.1	4.0
III	0.7	0.5	0.6	0.4	0.4	0.5	0.4	0.6	0.5	1.0	0.3	0.5	0.4	0.3	0.7
IV,V	1.7	0.9	1.1	1.1	1.1	1.5	1.8	2.1	1.5	2.3	1.7	1.6	2.1	2.0	2.0
VII,VIII	1.0	0.5	0.7	0.8	0.1	2.0	4.6	1.1	3.0	3.7	1.5	2.8	1.3	2.3	1.1
Tot.Nonlin.	5.5	2.9	3.4	3.8	2.2	6.1	10.2	4.6	9.0	8.7	5.8	10.6	6.5	10.7	7.8
Stream	3.1	2.1	2.1	2.3	1.6	3.3	3.6	3.1	3.6	3.6	3.7	4.4	3.4	3.0	2.9
Ditch	0.3	0.4	0.4	0.4	0.2	0.6	0.6	0.4	0.5	0.5	0.6	1.1	0.8	0.6	0.5
Tot.Linear	3.3	2.5	2.5	2.7	1.8	3.9	4.2	3.5	4.2	4.1	4.3	5.5	4.2	3.6	3.3

Wetland Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
I,II,VI	3.8	6.5	4.0	9.7	4.1	10.6	3.8	5.0	3.0	10.6	2.9	5.2	4.4	6.9	6.2
III	0.5	1.1	0.6	0.9	0.7	0.9	1.6	1.5	0.2	1.6	0.7	1.3	1.3	1.3	1.5
IV,V	2.8	3.0	2.7	3.0	1.9	2.8	2.5	3.1	2.3	3.1	2.1	2.2	2.1	2.1	3.0
VII,VIII	2.6	2.8	3.0	5.9	1.6	2.5	1.3	1.4	2.5	3.3	1.5	1.7	2.8	3.2	3.7
Tot.Nonlin.	9.6	13.5	10.3	19.6	8.3	16.8	9.3	11.0	8.0	18.6	7.1	10.5	10.7	13.5	14.4
Stream	2.9	3.4	4.1	3.9	3.6	3.2	3.6	3.8	3.2	3.5	3.6	3.9	3.5	3.4	2.9
Ditch	0.7	1.0	0.9	1.7	0.8	0.9	1.0	1.0	0.8	1.4	0.6	0.5	0.6	0.6	0.7
Tot.Linear	3.6	4.4	5.0	5.5	4.4	4.1	4.6	4.7	4.0	4.9	4.3	4.4	4.1	4.0	3.6

Wetland Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	% Change from 2014	Long-term mean
I,II,VI	3.8	2.3	2.7	6.4	1.3	6.0	0.8	2.3	3.4	5.0	3.4	8.8	1.7	-81%	4.2
III	0.8	1.3	0.5	0.8	0.5	1.2	1.2	0.3	0.6	0.5	1.0	0.5	0.6	16%	0.8
IV,V	2.6	2.3	2.8	2.9	2.0	2.1	2.4	2.0	3.3	2.4	2.5	2.0	1.8	-10%	2.2
VII,VIII	2.8	2.5	1.5	1.7	0.6	1.4	1.5	0.3	1.9	1.7	0.7	2.7	1.1	-62%	2.1
Tot.Nonlin.	10.0	8.4	7.5	11.8	4.4	10.7	7.8	4.9	9.2	9.5	7.6	14.1	5.2	-63%	9.3
Stream	3.0	4.1	3.6	3.9	3.4	3.9	4.8	3.3	4.4	4.8	3.8	4.6	3.0	-34%	3.5
Ditch	0.7	0.7	0.8	1.2	0.7	1.3	0.9	0.9	0.6	0.8	0.8	1.7	0.9	-48%	0.8
Tot.Linear	3.7	4.8	4.4	5.1	4.0	5.1	5.7	4.2	5.0	5.7	4.6	6.2	3.9	-38%	4.2

Table 2. Continued, **SWD**

Wetland Type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
I,II, VI	2.3	0.7	2.0	1.2	1.2	1.7	0.6	0.7	0.8	0.9
III	0.5	0.4	0.4	0.2	0.2	0.2	0.3	0.1	0.3	0.3
IV, V	2.0	1.2	1.8	1.4	1.4	2.0	1.2	1.3	1.9	1.7
VII, VIII	0.4	0.0	0.1	0.1	0.1	0.3	0.1	0.1	0.3	0.2
Tot. Nonlin.	5.1	2.3	4.2	2.9	2.9	4.2	2.2	2.2	3.3	3.1
Stream	3.7	2.9	4.0	3.4	3.4	2.7	2.7	2.7	3.4	2.7
Ditch	0.8	0.3	0.7	0.4	0.4	0.3	0.4	0.4	0.4	0.5
Tot. Linear	4.5	3.2	4.7	3.8	3.8	3.0	3.1	3.1	3.8	3.2

Wetland Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	% Change from 2014	Long-term mean
I,II, VI	0.5	2.0	1.6	0.4	1.1	1.0	1.4	2.3	0.7	-68%	1.3
III	0.3	0.2	0.2	0.1	0.2	0.2	0.5	0.6	0.2	-58%	0.3
IV, V	1.7	1.3	1.6	1.5	1.8	1.9	1.3	1.7	1.3	-25%	1.6
VII, VIII	0.1	0.2	0.2	0.0	0.6	0.0	0.4	0.5	0.3	-37%	0.2
Tot. Nonlin.	2.5	3.7	3.6	2.1	3.7	3.1	3.6	5.1	2.6	-49%	3.4
Stream	3.1	3.7	3.6	3.4	3.1	3.6	3.6	3.4	2.8	-17%	3.2
Ditch	0.4	0.7	0.5	0.4	0.5	1.0	0.8	1.3	0.7	-47%	0.6
Tot. Linear	3.5	4.4	4.1	3.9	3.6	4.5	4.4	4.7	3.5	-26%	3.8

Table 3. Breeding waterfowl population estimates in Wisconsin, 1973-2015.

Stratum: South-East Central (SEC)

Year	Mallard	BW Teal	Wood Ducks	Other Ducks	Total Ducks	Canada Geese
1973	56,632	147,748	807	105,245	310,432	
1974	61,042	217,734	4,841	65,024	348,641	
1975	67,247	193,932	11,297	36,199	308,675	
1976	58,814	152,089	9,683	29,831	250,417	
1977	41,816	126,116	15,331	9,385	192,648	
1978	30,977	75,132	9,683	42,232	158,024	
1979	35,125	71,549	12,104	19,440	138,218	
1980	44,175	34,425	10,490	14,748	103,838	
1981	65,784	131,567	12,910	40,891	251,152	
1982	45,758	66,732	6,455	18,099	137,044	
1983	56,863	48,414	6,455	6,033	117,765	
1984	43,240	45,589	8,069	5,028	101,926	
1985	38,906	43,985	12,910	4,357	100,158	
1986	53,938	26,360	34,697	3,352	118,347	7,640
1987	66,657	75,001	20,771	16,759	179,188	9,277
1988	53,091	29,033	8,851	4,357	95,332	9,095
1989	63,795	60,409	27,799	25,808	177,811	39,109
1990	57,853	34,980	21,307	6,033	120,173	12,551
1991	69,114	36,814	24,009	34,523	164,460	16,917
1992	115,344	116,706	61,856	66,604	360,510	26,921
1993	90,471	62,642	33,271	9,152	195,536	21,101
1994	174,488	103,386	32,805	36,500	347,179	27,649
1995	137,757	90,305	80,564	28,223	336,849	45,475
1996	152,951	56,096	31,393	27,077	267,517	39,377
1997	90,397	48,711	66,816	5,952	211,876	56,116
1998	105,733	49,757	49,758	7,843	213,091	54,172
1999	110,406	57,220	45,931	8,975	222,532	54,502
2000	207,191	71,240	64,061	7,853	350,345	83,314
2001	83,621	35,675	51,034	3,875	174,205	56,241
2002	193,365	40,077	50,284	28,069	311,795	79,264
2003	140,726	28,042	48,643	39,703	257,114	165,303
2004	124,980	162,121	61,526	17,691	366,318	103,119
2005	158,797	151,774	50,286	27,371	388,228	82,849
2006	115,872	60,473	39,612	8,234	224,191	72,393
2007	102,568	86,772	33,684	16,108	239,132	63,445
2008	104,291	113,037	35,568	27,587	280,483	65,854
2009	94,490	45,270	44,893	7,818	192,471	77,590
2010	84,583	17,082	41,422	4,414	147,501	81,301
2011	101,288	37,061	58,680	21,333	218,362	93,005
2012	91,716	49,754	42,392	12,094	195,956	68,014
2013	61,916	42,117	36,666	23,724	164,423	74,478
2014	60,773	14,467	38,141	12,207	125,588	59,753
2015	73,096	47,131	35,983	27,670	183,880	55,439
MEAN (73-2014):	88,442	69,537	32,328	22,280	218,225	56,753

Table 3. Continued.

Stratum: Northern High (NHI)

Year	Mallard	BW Teal	Wood Ducks	Other Ducks	Total Ducks	Canada Geese
1973	13,602	9,594	0	3,929	27,125	
1974	13,058	9,594	6,621	1,179	30,452	
1975	26,376	19,346	4,729	3,143	53,594	
1976	25,645	18,331	2,837	5,893	52,706	
1977	19,138	29,483	2,837	3,536	54,994	
1978	13,640	31,958	3,783	5,500	54,881	
1979	20,942	21,412	1,892	11,393	55,639	
1980	37,872	19,852	9,458	9,822	77,004	
1981	34,822	43,776	10,404	5,107	94,109	
1982	20,355	15,781	0	2,750	38,886	
1983	27,950	3,547	946	1,571	34,014	
1984	22,730	7,634	9,458	5,500	45,322	
1985	15,391	23,795	5,675	3,143	48,004	
1986	23,876	11,235	16,078	9,036	60,225	1,492
1987	32,271	15,552	36,032	9,429	93,284	4,051
1988	46,752	18,994	26,800	3,143	95,689	4,264
1989	47,015	31,428	7,965	52,251	138,659	5,970
1990	42,916	15,033	29,238	14,929	102,116	6,610
1991	41,472	9,530	13,727	55,787	120,516	4,691
1992	52,293	14,450	22,608	28,315	117,666	4,904
1993	32,308	9,607	6,658	10,727	59,300	9,381
1994	48,830	13,058	4,272	18,691	84,851	2,985
1995	43,596	4,975	35,910	31,825	116,306	7,462
1996	50,294	1,566	13,957	30,533	96,350	8,528
1997	27,716	7,664	17,762	15,115	68,257	14,713
1998	36,194	18,417	40,377	11,031	106,019	8,627
1999	60,939	9,863	23,927	13,353	108,082	21,844
2000	89,946	29,896	45,214	20,502	185,558	25,567
2001	44,191	21,722	46,359	21,349	133,621	16,183
2002	69,938	12,918	25,836	83,469	192,161	16,992
2003	40,188	5,716	20,608	13,815	80,327	35,596
2004	42,530	17,927	17,046	48,137	125,640	25,554
2005	56,253	19,471	47,440	12,222	135,386	17,415
2006	40,198	23,198	39,287	38,603	141,286	25,221
2007	30,056	10,485	18,049	18,881	77,471	31,185
2008	31,727	29,785	38,216	65,423	165,151	21,365
2009	39,900	28,189	24,022	35,824	127,935	30,487
2010	47,210	15,670	31,973	18,107	112,960	26,562
2011	29,163	21,720	32,611	48,285	131,779	20,651
2012	41,657	13,121	28,157	57,588	140,523	29,293
2013	56,209	12,342	29,010	102,235	199,796	25,653
2014	35,448	6,056	28,362	31,796	101,662	14,116
2015	49,031	2,351	8,652	14,270	74,304	19,363
MEAN (73-14):	37,492	15,962	19,670	23,402	97,269	16,116

Table 3. Continued.

Stratum: Northern Low (NLO)

Year	Mallard	BW Teal	Wood Ducks	Other Ducks	Total Ducks	Canada Geese
1973	25,812	13,005	4,807	3,328	46,952	
1974	10,601	6,502	1,602	3,994	22,699	
1975	14,550	4,917	6,410	2,663	28,540	
1976	14,197	13,976	9,615	6,656	44,444	
1977	21,354	24,283	0	1,331	46,968	
1978	10,741	16,244	1,602	9,319	37,906	
1979	14,516	18,139	12,820	3,328	48,803	
1980	22,559	9,505	4,807	7,988	44,859	
1981	27,656	61,809	11,217	16,641	117,323	
1982	14,233	8,138	1,602	0	23,973	
1983	22,464	3,606	1,602	3,994	31,666	
1984	28,104	6,467	6,410	1,331	42,312	
1985	12,073	9,599	3,205	1,331	26,208	
1986	21,651	9,518	19,229	4,659	55,057	1,084
1987	24,050	23,422	26,400	3,994	77,866	0
1988	33,870	14,079	10,253	8,653	66,855	722
1989	51,437	23,095	14,722	17,972	107,226	3,612
1990	35,149	14,472	6,192	18,638	74,451	1,806
1991	44,250	15,250	20,933	35,279	115,712	361
1992	56,618	33,460	38,306	13,707	142,091	0
1993	33,950	18,602	22,562	11,883	86,997	1,084
1994	31,175	15,930	16,287	24,631	88,023	2,529
1995	36,112	13,111	13,521	17,737	80,481	1,445
1996	79,098	6,631	19,348	17,017	122,094	3,400
1997	38,910	2,597	27,359	17,073	85,939	4,399
1998	34,495	7,801	17,736	9,345	69,377	8,186
1999	55,975	6,684	15,202	7,541	85,402	14,664
2000	101,746	12,226	16,415	2,836	133,223	8,468
2001	35,757	16,562	15,202	23,088	90,609	12,096
2002	73,910	3,979	19,151	49,549	146,589	12,073
2003	49,759	38,741	30,261	17,248	136,009	19,190
2004	37,364	21,262	17,773	21,331	97,730	6,927
2005	57,933	23,993	26,793	31,061	139,780	15,395
2006	36,270	13,101	26,222	25,889	101,482	19,876
2007	44,184	10,659	34,402	10,663	99,908	17,612
2008	38,735	20,882	29,431	39,497	128,545	16,737
2009	46,708	39,333	25,196	26,819	138,056	6,265
2010	44,946	14,750	26,083	8,765	94,544	34,333
2011	38,254	20,853	44,203	18,992	122,302	49,904
2012	41,958	27,172	22,450	42,031	133,611	35,495
2013	42,494	9,957	10,922	52,658	116,031	27,571
2014	41,274	8,205	22,805	53,872	126,156	36,795
2015	33,919	5,974	10,994	27,475	78,362	26,690
MEAN (73-2014):	36,831	14,755	16,692	16,532	86,305	12,484

Table 3. Continued.

Stratum: Southwest (SWD)

Year	Mallard	BW Teal	Wood Ducks	Other Ducks	Total Ducks	Canada Geese
1973	10,910	15,014	1,022	1,251	28,197	
1974	9,621	20,610	2,378	781	33,390	
1975	12,287	19,231	4,084	467	36,069	
1976	11,206	16,253	4,029	471	31,959	
1977	9,349	15,855	3,307	159	28,670	
1978	6,288	10,871	2,743	635	20,537	
1979	8,017	9,792	4,881	380	23,070	
1980	11,882	5,622	4,506	362	22,372	
1981	14,569	20,902	6,286	697	42,454	
1982	9,126	7,990	1,467	232	18,815	
1983	12,185	4,898	1,639	129	18,851	
1984	10,685	5,261	4,357	132	20,435	
1985	7,539	6,820	3,967	98	18,424	
1986	11,298	4,153	12,743	190	28,384	913
1987	13,969	10,046	15,146	336	39,497	1,191
1988	15,188	5,474	8,356	180	29,198	1,258
1989	18,429	10,130	9,190	1,068	38,817	4,349
1990	15,438	5,684	10,328	440	31,890	1,873
1991	17,587	5,429	10,680	1,397	35,093	1,962
1992	25,472	14,509	22,348	1,208	63,537	2,843
1993	17,802	8,008	11,375	353	37,538	2,820
1994	28,907	11,667	9,714	888	51,176	2,962
1995	24,701	9,554	23,663	865	58,783	4,858
1996	32,070	5,667	11,777	830	50,344	4,583
1997	23,945	11,823	7,473	0	43,241	3,338
1998	10,469	0	13,842	0	24,311	3,727
1999	21,126	10,651	28,838	0	60,615	10,173
2000	55,096	3,976	16,192	0	75,264	12,159
2001	19,884	3,351	18,456	0	41,691	9,546
2002	41,329	9,059	39,858	0	90,246	10,147
2003	30,659	17,637	10,597	1,122	60,015	21,841
2004	24,301	12,445	18,205	6,855	61,806	13,403
2005	44,242	0	16,633	0	60,875	8,177
2006	27,154	11,929	16,529	0	55,612	17,193
2007	33,412	16,176	1,740	2,774	54,102	12,953
2008	13,676	15,845	23,225	0	52,746	12,759
2009	19,399	0	19,412	5,141	43,952	13,951
2010	21,503	2,686	7,307	0	31,496	23,657
2011	12,535	0	10,977	0	23,512	12,535
2012	21,619	15,744	13,628	0	50,991	12,585
2013	20,581	9,067	14,918	2,524	47,090	11,223
2014	21,253	5,606	14,832	0	41,691	15,635
2015	20,154	3,627	12,513	0	36,294	17,720
MEAN (73-2014):	19,445	9,284	11,492	761	41,113	8,780

Table 3. Continued,

All Stratum

Year	Mallard	BW Teal	Wood Ducks	Other Ducks	Total Ducks	Canada Geese
1973	106,956	185,361	6,636	113,753	412,706	
1974	94,322	254,440	15,442	70,978	435,182	
1975	120,460	237,426	26,520	42,472	426,878	
1976	109,862	200,649	26,164	42,851	379,526	
1977	91,657	195,737	21,475	14,411	323,280	
1978	61,646	134,205	17,811	57,686	271,348	
1979	78,600	120,892	31,697	34,541	265,730	
1980	116,488	69,404	29,261	32,920	248,073	
1981	142,831	258,054	40,817	63,336	505,038	
1982	89,472	98,641	9,524	21,081	218,718	
1983	119,462	60,465	10,642	11,727	202,296	
1984	104,759	64,951	28,294	11,991	209,995	
1985	73,909	84,199	25,757	8,929	192,794	
1986	110,763	51,266	82,747	17,237	262,013	11,129
1987	136,947	124,021	98,349	30,518	389,835	14,519
1988	148,901	67,580	54,260	16,333	287,074	15,339
1989	180,676	125,062	59,676	97,099	462,513	53,040
1990	151,356	70,169	67,065	40,040	328,630	22,840
1991	172,423	67,023	69,349	126,986	435,781	23,931
1992	249,727	179,125	145,118	109,834	683,804	34,668
1993	174,531	98,859	73,866	32,115	379,371	34,386
1994	283,400	144,041	63,078	80,710	571,229	36,125
1995	242,166	117,945	153,658	78,650	592,419	59,240
1996	314,413	69,960	76,475	75,457	536,305	55,888
1997	180,968	70,795	119,410	38,140	409,313	78,566
1998	186,891	75,975	121,713	28,219	412,798	74,712
1999	248,446	84,418	113,898	29,869	476,631	101,183
2000	453,979	117,338	141,882	31,191	744,390	129,508
2001	183,453	77,310	131,051	48,312	440,126	94,066
2002	378,542	66,033	135,129	161,087	740,791	118,476
2003	261,332	90,136	110,109	71,888	533,465	241,930
2004	229,175	213,755	114,550	94,014	651,494	149,003
2005	317,224	195,239	141,152	70,655	724,270	123,836
2006	219,494	108,701	121,650	72,726	522,571	134,683
2007	210,219	124,093	87,875	48,427	470,614	125,195
2008	188,429	179,549	126,440	132,506	626,924	116,715
2009	200,497	112,793	113,523	75,602	502,416	148,293
2010	199,107	50,188	103,769	32,757	385,821	157,622
2011	187,862	90,803	146,471	88,610	513,746	176,095
2012	196,950	105,791	106,626	111,712	521,079	145,386
2013	181,200	73,483	91,516	181,141	527,340	138,925
2014	158,747	34,337	104,140	97,875	395,099	126,299
2015	176,200	59,083	68,142	69,415	372,840	119,212
MEAN (73-14):	182,339	109,825	80,109	63,009	443,320	94,538
MEAN (06-15):	191,871	93,882	107,015	91,077	483,845	138,843
Change from 2014	11%	72%	-35%	-29%	-6%	-6%
Change from 73-2014 Mean	-3%	-46%	-15%	10%	-16%	26%

* Long term and 10-year means for Blue-winged Teal excludes migrant years (1981, 2004 and 2005)

Table 4. 2015 Wisconsin breeding waterfowl data.

Species	Area of stratum (mi^2)	Bird density seen from the air ($birds/mi^2$)	Aerial visibility correction factor[1]	Population estimate	Standard error of the population estimate	Test for differences from 2014-2015 Z-statistic	Probability for type 1 error
Mallard							
Stratum[2]							
SEC	17,949	2.322	1.754	73,096	16,718		
NHI	9,431	2.964	1.754	49,031	10,827		
NLO	15,979	1.210	1.754	33,919	10,827		
SWD	12,311	0.933	1.754	20,154	6,520		
Subtotal	55,670			176,200	23,589	0.55	=0.58
Blue-winged teal							
Stratum							
SEC	17,949	0.432	6.076	47,131	22,259		
NHI	9,431	0.041	6.076	2,351	2,351		
NLO	15,979	0.062	6.076	5,974	4,379		
SWD	12,311	0.048	6.076	3,627	3,627		
Subtotal	55,670			59,083	23,094	0.97	=0.33
Wood duck							
Stratum							
SEC	17,949	0.359	5.590	35,983	10,429		
NHI	9,431	0.164	5.590	8,652	4,605		
NLO	15,979	0.123	5.590	10,994	3,984		
SWD	12,311	0.182	5.590	12,513	4,898		
Subtotal	55,670			68,142	13,033	1.61	=0.11

Table 4. Continued

Species	Area of stratum (mi^2)	Bird density seen from the air ($birds/mi^2$)	Aerial visibility correction factor[1]	Population estimate	Standard error of the population estimate	Test for differences from 2014-2015 Z-statistic	Probability for type 1 error
Other duck species[3]							
Stratum							
SEC	17,949	0.230	6.706	27,670	11,978		
NHI	9,431	0.226	6.706	14,270	8,171		
NLO	15,979	0.256	6.706	27,475	10,001		
SWD	12,311	0.00	0	0	0		
Subtotal	55,670			69,415	17,614	0.99	=0.32
Canada Geese							
Stratum							
SEC	17,949	1.821	1.696	55,439	12,702		
NHI	9,431	1.210	1.696	19,363	5,921		
NLO	15,979	0.985	1.696	26,690	10,267		
SWD	12,311	0.845	1.696	17,720	6,498		
Subtotal	55,670			119,212	18,548	0.27	=0.78

[1] Aerial Visibility Correction Factor (R) = number of birds seen from the ground divided by the number seen from the air on air-ground segments. The Coefficient of Variation (CV) of R (the visibility correction factor) was not precise enough (i.e., CV[R] > 20%) to use for individual species-strata in 2015. When air-ground data from all strata were pooled by species in 2015 the R was still not precise enough for any species-group (CV=20%) except for geese. Air-ground data from past years were used to achieve the desired precision for mallards, blue-winged teal, wood ducks, and "other ducks" by using 2, 10, 6, and 17 years of air-ground data, respectively. SEC = Southeast Central, NHI = Northern High, NLO = Northern Low, SWD = Southwest Driftless Strata.

[3] As in other years lesser scaup, buffleheads, and all non-duck/goose waterbirds were excluded in the summaries. The duck species included in the "other ducks" (in decreasing abundance) were: SEC – Common Goldeneye, Common Merganser, Hooded Merganser, and Canvasback, ; NHI – Ring-necked Duck, Hooded Merganser, Common Merganser, Gadwall, Common Goldeneye, and Green-winged Teal; NLO – Green-winged Teal, Common Merganser, Hooded Merganser , Ring-necked Duck, and American Wigeon; SWD – none. Mallards, BWT, Wood Ducks, and Canada Geese were seen in all 4 strata.

Figure 1. Transect Lines and Regions Surveyed

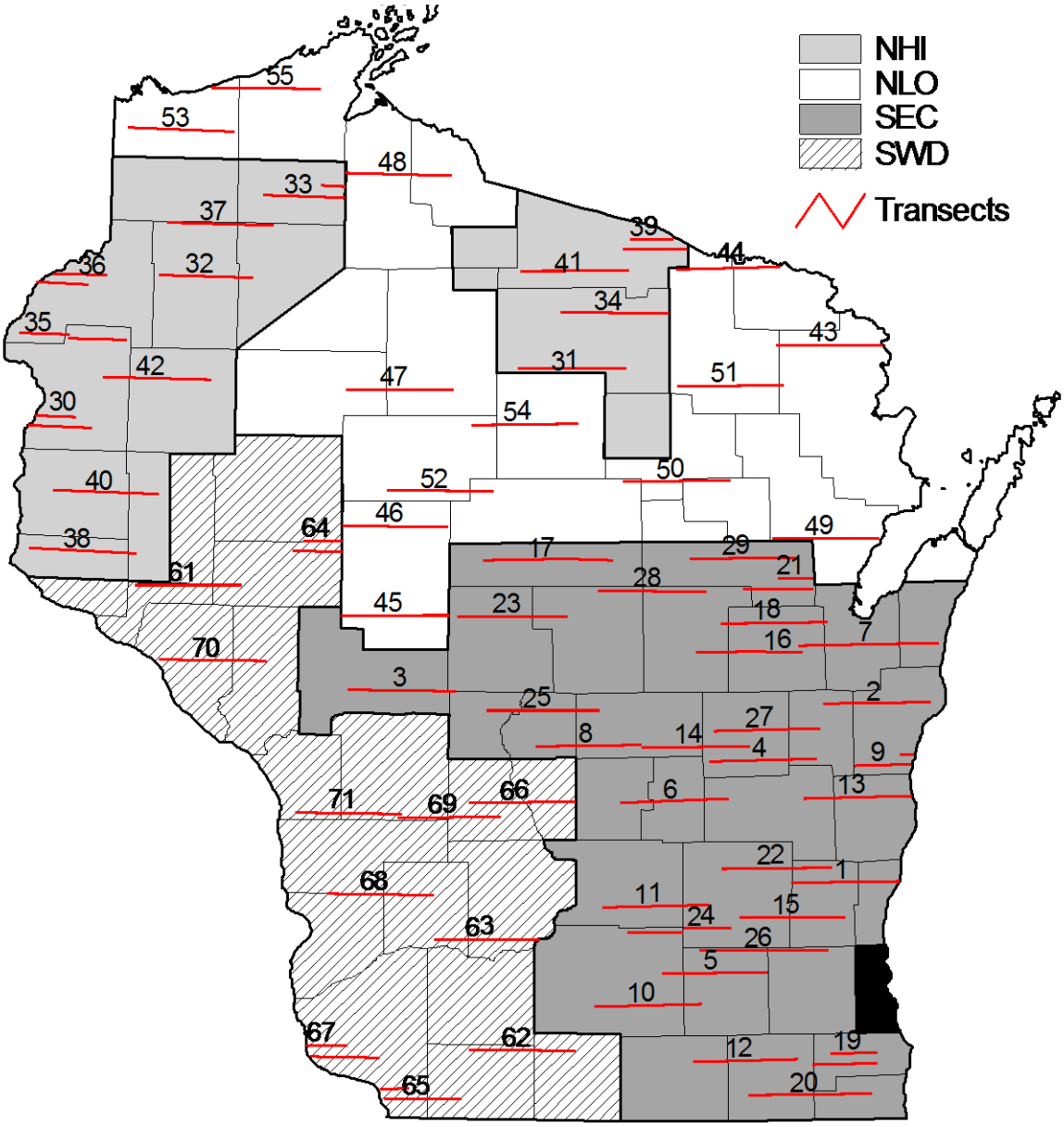


Figure 2. Climatology Divisions

1. Northwest
2. North Central
3. Northeast
4. West Central
5. Central
6. East Central
7. Southwest
8. South Central
9. Southeast

Figure 3.

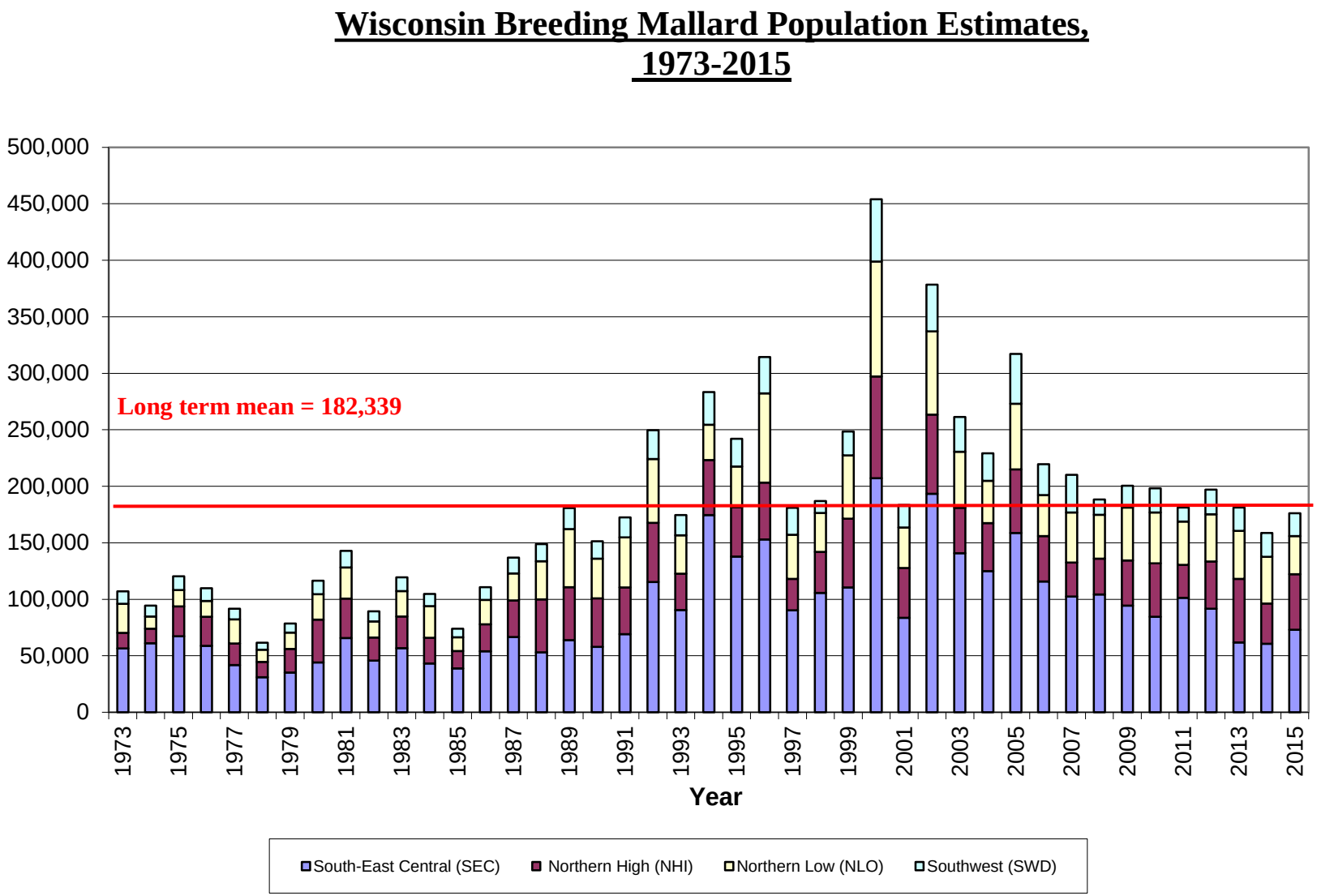


Figure 4.

Wisconsin Breeding Blue-winged Teal Population Estimates, 1973-2015 (*excludes migrant years of 1981, 2004, and 2005)

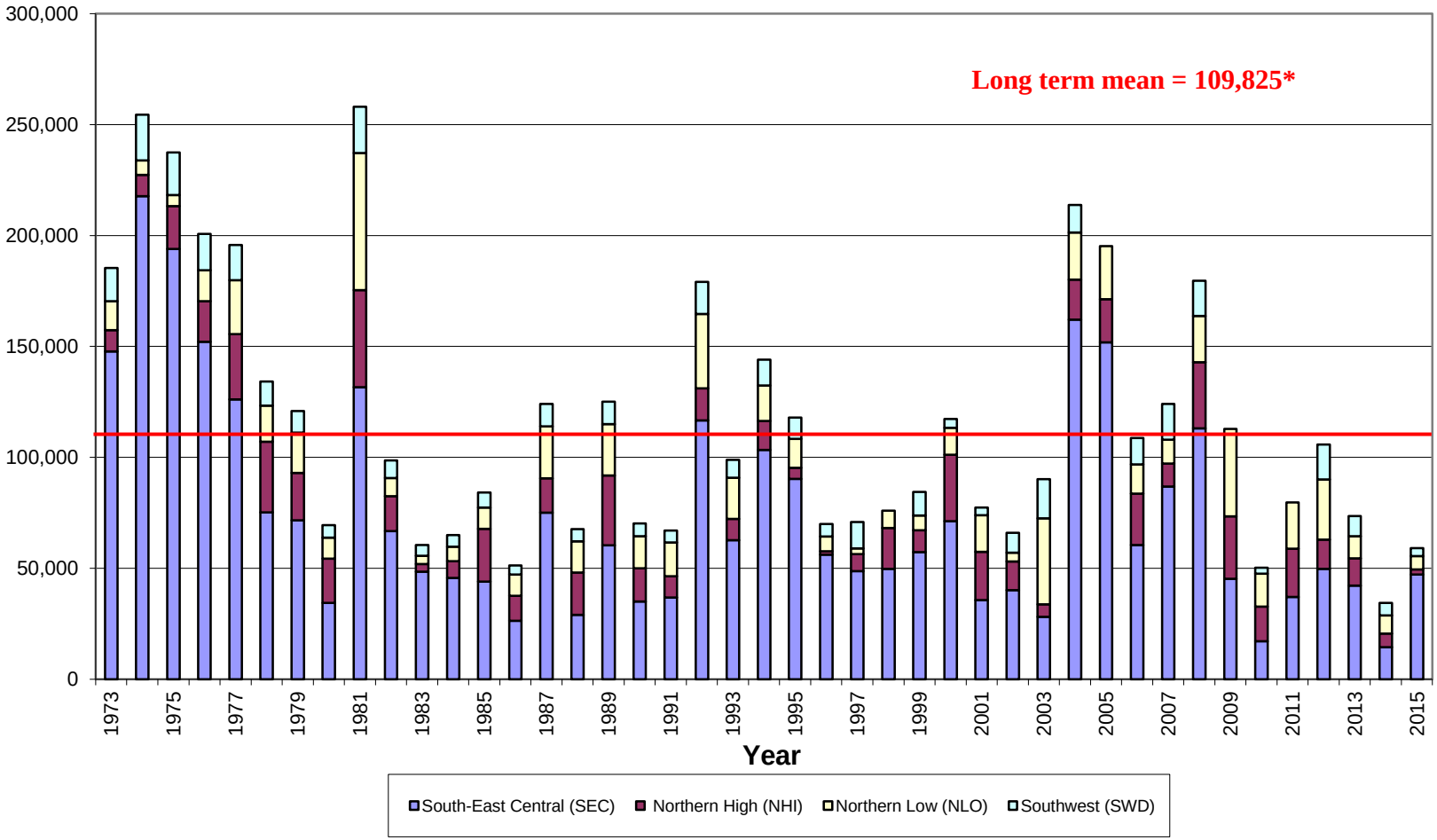


Figure 5.

Wisconsin Breeding Wood Duck Population Estimates, 1973-2015

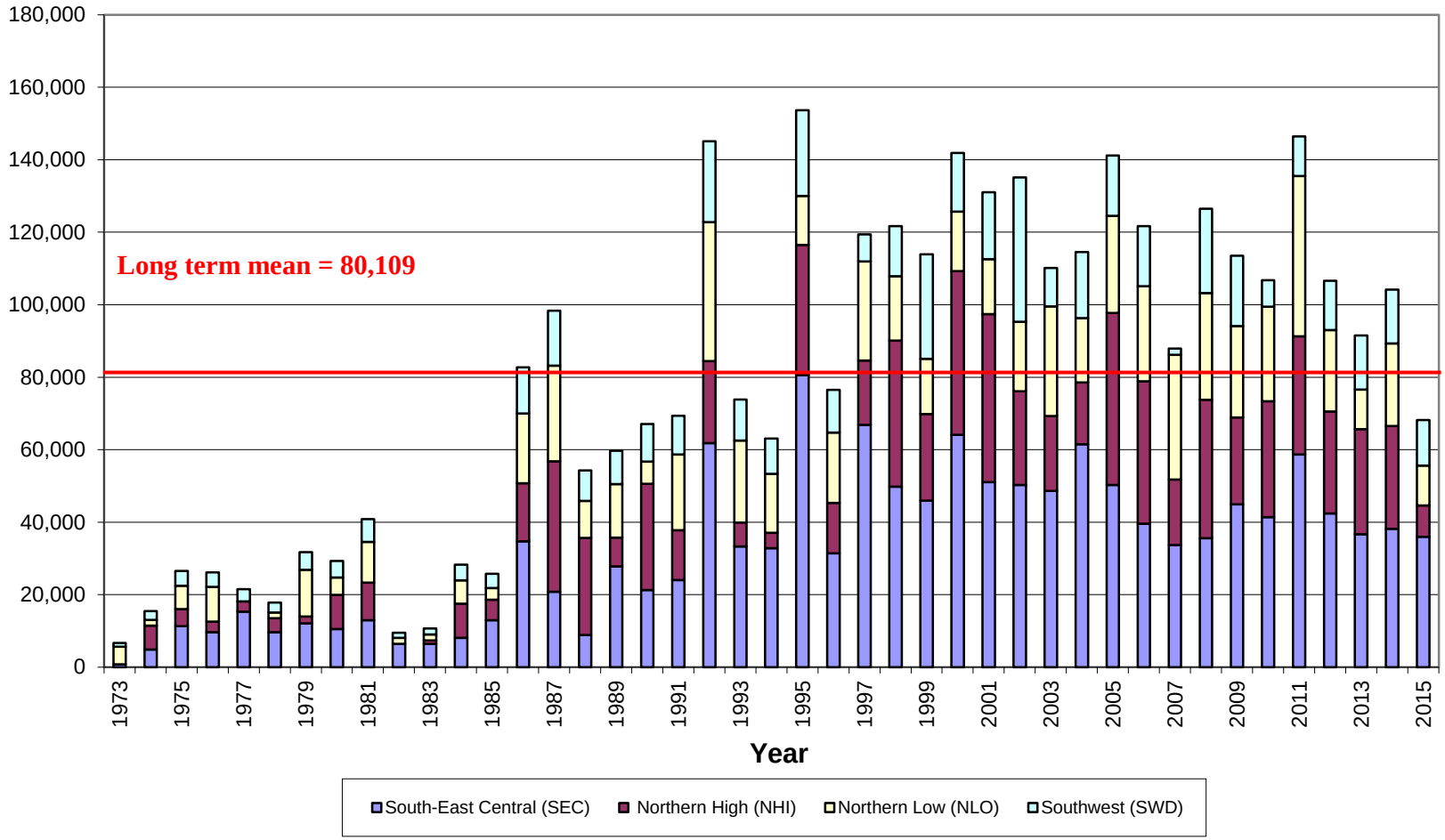


Figure 6.

Wisconsin Total Breeding Duck Population Estimates, 1973-2015

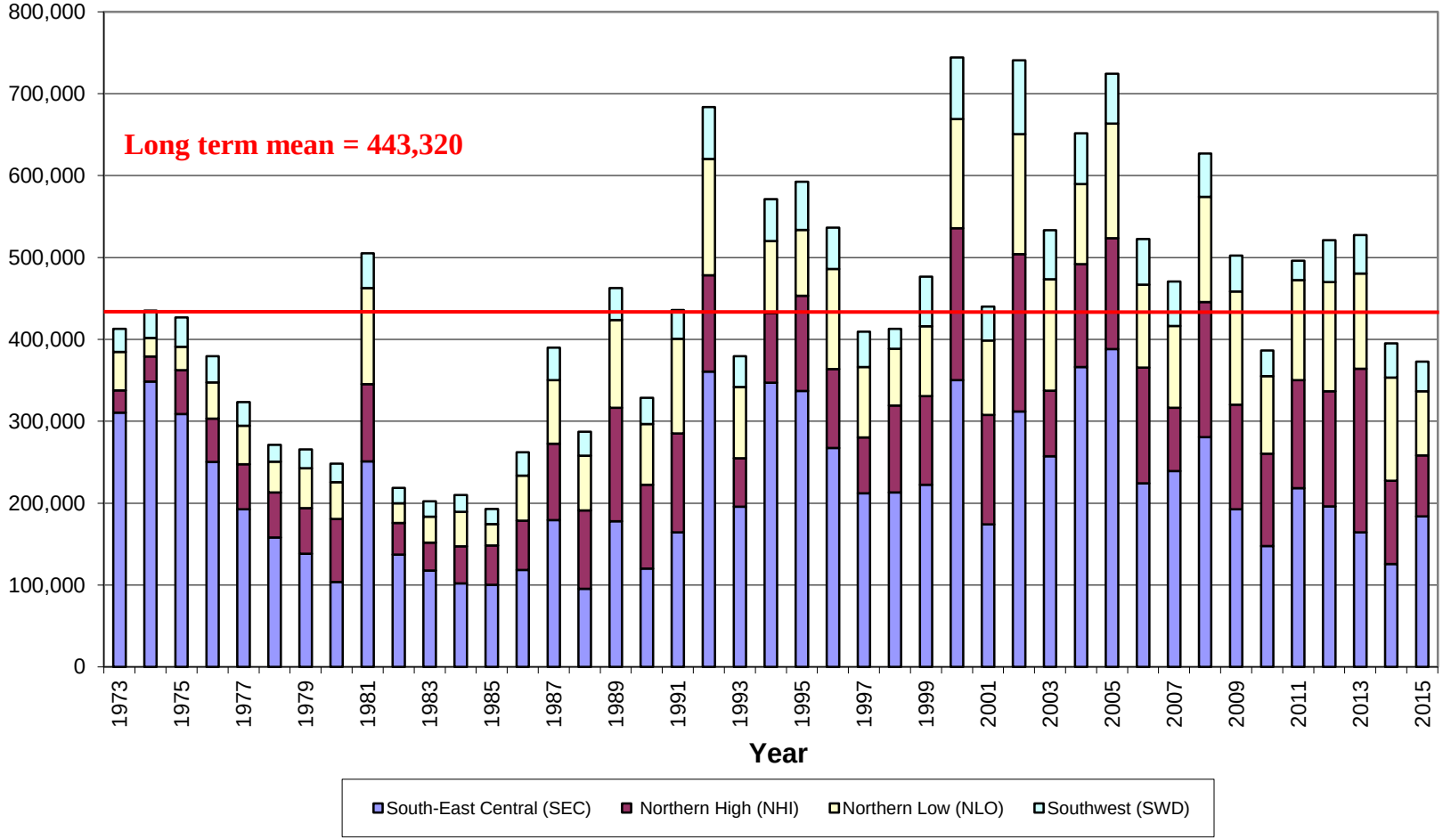
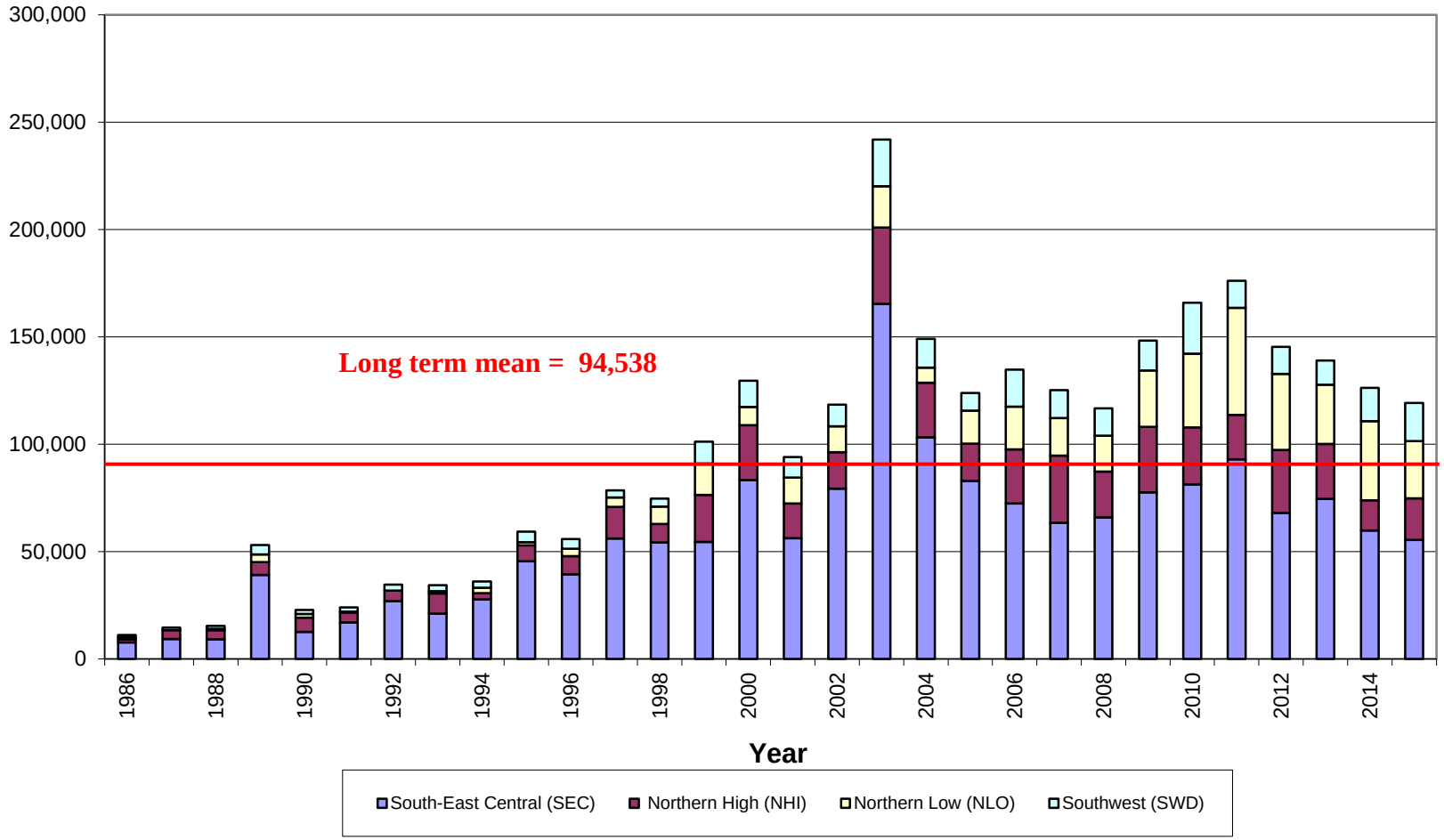


Figure 7.

Wisconsin Canada Goose Breeding Population Estimates, 1986 - 2015



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