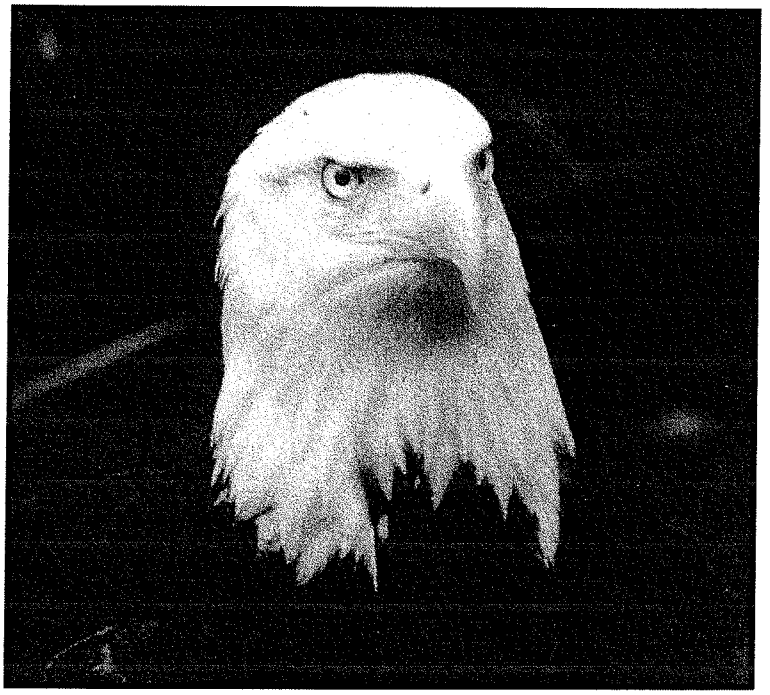
HA File Number 97.25

Status and Trends in Wintering Raptors and Waterfowl on the Maurice River: A Ten Year Study



Bald Eagle *Photo by R.T. Zappalorti*

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to

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INTRODUCTION

The Maurice River

The ornithological significance of the Maurice River, in Cumberland County, New Jersey, has long been recognized. The Maurice River rivals the Great Egg Harbor River and the Mullica River for being one of New Jersey's largest river systems (excluding the Hudson and Delaware Rivers). Flowing southward for over 35 miles from near Williamstown, past Vineland, through Millville and emptying into Delaware Bay near Port Norris, the Maurice River is by far the largest river on the Delaware Bay.

The river is freshwater to below Millville, brackish until near Dorchester, and salt water through the remainder of its length. The low salinity section from near Millville to Bricksboro is characterized by extensive acreage of wild rice, in fact one of the largest stands in New Jersey. The lower river below Maurice town is extensive salt marsh. Maurice River Cove, near East Point, is extensive tidal shallow open water, an integral part of the Delaware Estuary. Hence, a variety of habitats are available to wildlife along the length of the Maurice River.

While the birds of the Maurice River have been fairly extensively reported over the years *in: Records of New Jersey Birds, American Bird,* and *Audubon Field Notes,* most reports have been anecdotal rather than representing systematic studies. Herpetological Associates, Inc. (HA) was commissioned by Citizens United to Protect the Maurice River and Its Tributaries in 1987 to conduct intensive winter monitoring program of the raptors and waterfowl using the Maurice River. In 1988, in *Records of New Jersey Birds,* HA reported on "Wintering Raptors and Waterfowl on the Maurice

A pair of Osprey building a stick-nest on a platform along the west side of the Maurice River, Maurice River Township, Cumberland County, New Jersey. Photo by Jane Galetto.

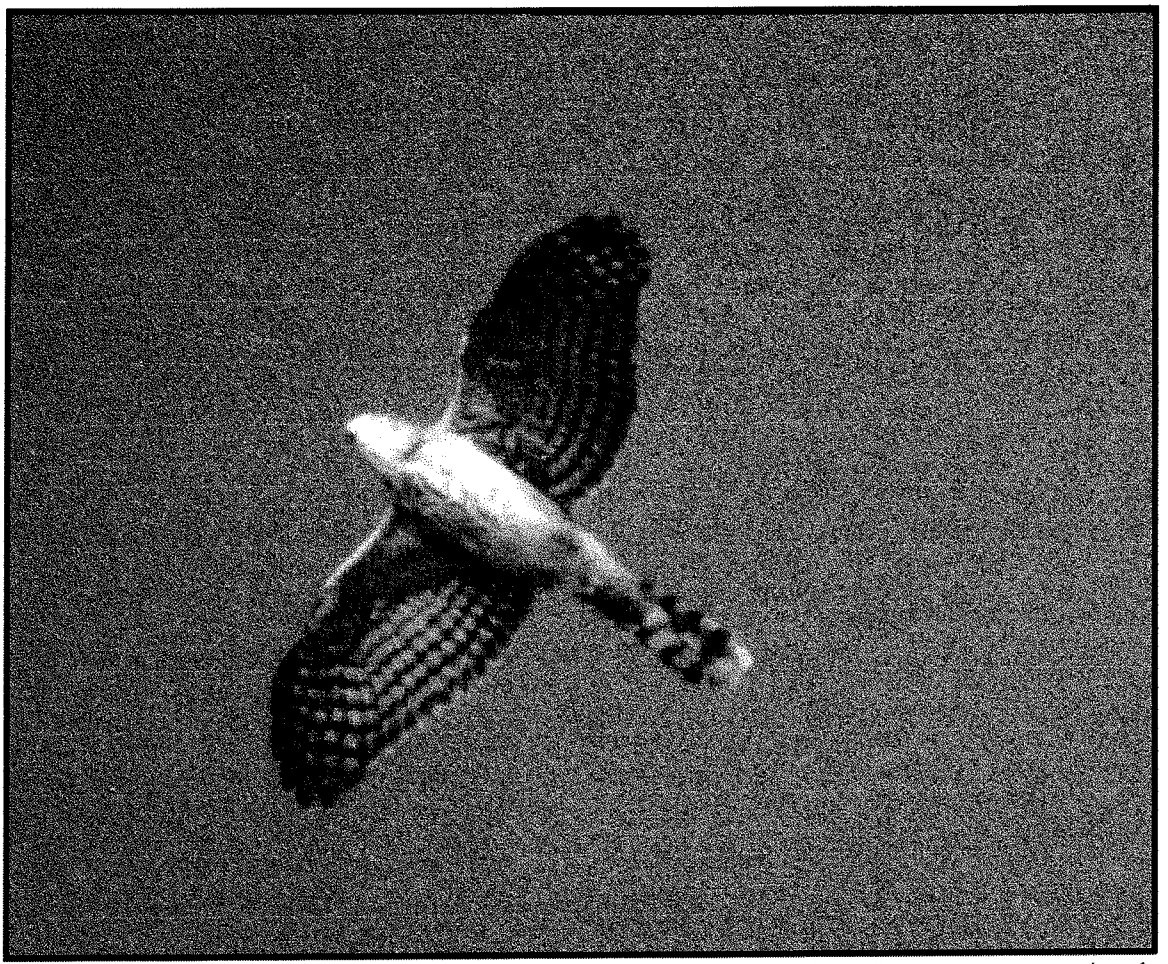
River." That study reported on the results of an extensive season-long survey of the remarkable avian resources found on the Maurice River (Sutton, 1988).

Responding to the conservation need for consistent census data, Citizens United to Protect the Maurice River and Its Tributaries has funded that pilot study and continued annual surveys over nine subsequent winter seasons. Here HA reports upon the results of ten years monitoring of winter raptor and waterfowl populations on the Maurice River. Observed status and trends in wintering hawks, eagles, ducks and geese are reported and discussed. This long-term study represents one of very few systematic ornithological surveys being conducted on New Jersey's Delaware Bayshore.

METHODS

Wintering raptors and waterfowl were sampled along the tidal portions of the Maurice River during ten winters, 1987-1988 through 1996-1997. Surveys were done between 22 November and 22 March, between 08:00 and 16:00 EST. A total of 92 surveys were done on the Maurice River for an average of 9.2 per year (range 7 - 14). The Maurice River survey route consisted of seven observation stations beginning at a location downstream of Millville, and continuing 22.4 km (14 miles) downstream to the river mouth at East Point. At each location site, all flying and perched raptors and waterfowl within view were counted for 50 minutes. If specific birds were observed to fly into the adjacent sampling area, care was taken not to re-count if sighted again in that area. Raptors seen perched along the route between sampling sites were included in the nearest sampling site if an individual of that species was not sighted from the adjacent stations. Ten power binoculars and a 20 power spotting scope were used. During about 95% of the surveys, two observers were present and on the remaining surveys only one observer. The same observer (*C. Sutton*) was present for 88 of the 92 Maurice River surveys, ensuring continuity of the sampling technique used.

In as much as possible, counts were conducted in good weather, primarily during sunny conditions with northwest winds. Over 90% of the counts were carried out under these conditions beneficial to raptor soaring and hunting (which in turn made waterfowl more visible due to frequent flushes). Most winters the river was sampled on an average of about every 10 days. For a more in depth discussion of survey methods (as well as background) see *Records of New Jersey Birds,* Vol. XIV, No. 13, Autumn 1988, which details the first season of the ten year study.



The underside of a Cooper's Hawk in flight as it soars over East Point along the Maurice River. These raptors were consistently observed during HA's 10 year winter monitoring program. Photo by Clay C. Sutton, 1995.

RESULTS

A total of 92 surveys of raptors and waterfowl were conducted on the Maurice River over 10 winter seasons beginning in 1987 and ending in 1997. A ten year summary of wintering raptors is shown in **Table 1.** Shown are both peaks (high counts) and average numbers seen for each of the 10 winter seasons. Fourteen species of raptors (vultures, hawks and eagles) normally winter on the Maurice River. One other, the Osprey, an early arrival, spring migrant from the south, was often tallied during the final two weeks of the season. Thirty species of waterfowl were recorded along the Maurice River during the ten winters of the study. Peak numbers (high counts) for each species for each winter season are shown in **Table 2.** Average numbers for each winter are shown for key species (Snow Goose, Canada Goose, American Black Duck, Mallard, and Northern Pintail) in **Table 3.** High counts are shown in the Tables and Figures for comparison.

SPECIES ACCOUNTS

RAPTORS

Black Vulture: The trend in Black Vulture populations over 10 winters of surveys on the Maurice River is shown in **Figure 1.** The peak number recorded (high count), as well as the average number recorded each season, are shown. As expected, Maurice River Black Vulture numbers have risen dramatically over the ten year study period, reflecting a region-wide trend. None-the-less, a marked decline has characterized the final three years of these winter surveys.

Turkey Vulture: Numbers of Turkey Vultures have fluctuated widely over the study period, possibly reflecting migratory numbers moving through the bayshore region in Autumn. It is known that many late season migrants through New Jersey terminate their migration along the bayshore (Sutton and Kerlinger, 1997). While no clear trends are seen, the Maurice River vulture numbers are significant, and represent a consistent population near the northern limit of their normal winter range in eastern North America.

Bald Eagle: Trends in Bald Eagle populations are shown in **Figure 2.** Numbers vary largely due to the weather conditions of a particular winter, but the upward trend in eagle numbers clearly reflects the species recovery in eastern North America in general, and New Jersey in particular. The larger numbers seen on the Maurice River clearly occur during harsh winters, and are linked to freeze-ups both on the bayshore and to the north of New Jersey - the "sending district" for winter eagles.

Northern Harrier: "Marsh Hawk" trends are shown in **Figure 3.** Both peak and average numbers have remained remarkably consistent over these ten years of study, with no clear or predictable trend seen. Some nesting occurs in the Delaware Bay marshes near the Maurice River. Winter harrier numbers appear stable along the shores and marshes of the Maurice River.

Sharp-shinned Hawk: Sharp-shinned Hawk populations are shown in **Figure 4**. These data illustrate that winter populations appear stable in the Maurice River area. While peak numbers fluctuate greatly, the average per season appears consistent. The fluctuations in peak numbers are linked to migration. In some years, some late November or early December surveys have picked up a many late season migrants - particularly on the lower river near East Point, a known raptor migratory concentration site (Sutton *et al.*, 1991).

Cooper's Hawk: As shown in **Figure 5**, Cooper's Hawk winter numbers appear stable. A slight upward trend probably reflects the known, but poorly understood Cooper's Hawk recovery and population increases both in New Jersey and throughout the East.

Red-tailed Hawk: This key species high numbers are depicted in **Figure 6** which shows a stable wintering population for the Maurice area. Always numerous on the Maurice River, peak numbers are usually recorded in late November or late March - numbers which reflect some migrants as well as local resident and wintering individuals. Average numbers on the river are remarkably consistent over the ten year study.

American Kestrel: Although only a small number of kestrel are usually seen on the Maurice River (reflecting a lack of preferred open field habitat), both peak and average numbers have clearly declined over the ten years of study **(Figure 7).** This fact adds to a growing concern over kestrel status in New Jersey, where it appears to be declining as a breeder, migrant, and wintering bird.

Other Raptor Species

Other raptor species occur in small numbers along the Maurice River in winter. Northern Goshawk appear every other winter or so; Red-shouldered Hawks winter in small numbers, but being very secretive they are usually only recorded every 2 or 3 surveys. Usually 2 or 3 Rough-legged Hawks winter on the lower river. One or two Golden Eagles are seen most winters, usually associated with upper river waterfowl concentrations. One or two Merlins usually winter, as do one or two Peregrine Falcons - often seen on the teal and dunlin-rich mudflats near the Delaware Bay, at the mouth of the river (Author's personal observations).

WATERFOWL

Of the 30 species of waterfowl recorded, Snow Goose, Canada Goose, American Black Duck, Mallard, and Northern Pintail are the key species found along the Maurice River. However, peaks our data review, do not represent absolute numbers using the river because they do not in any way factor in seasonal turnover. Averages, in part, factor out the effects of "survey day," weather, and tides (high tides always lead to higher counts due to ducks being more visible), and better show the effects of seasonal weather patterns.

Snow Goose: Peak and average Snow Goose numbers found on the Maurice River over ten years of study are detailed in **Figure 8**. Numbers vary greatly from winter to winter - clearly in response to weather conditions. In mild winters, expected numbers apparently do not arrive from coastal marshes (from Forsythe NWR, for example). In harsh winters, freeze-ups send the birds farther south. During every winter, numbers have fluctuated greatly - from week to week and even from day to day. No clear trends are seen, curious in light of a well publicized Snow Goose population explosion. It is possible that greatly expanded hunting seasons and pressures have masked an increase due to hunting efforts driving Snow Geese to more remote areas (such as nearby Egg Island Point, for example).

Canada Goose: Canada Goose numbers fluctuate greatly as well, probably for all the same reasons as the Snow Geese **Figure 9**. Peak numbers probably underestimate the true population in winter; most Canada Goose leave the river at dawn to feed in nearby fields (primarily at Bayside State Prison) and don't return until dusk, thereby eluding surveyors. No clear trends are seen. It is not known if Maurice River Canada Geese are "local" geese or "tundra" Canada Geese, whose populations are known to be dangerously low; they are probably a mix of both groups.

American Black Duck: Trends for this hallmark species of the Maurice River are illustrated in **Figure 10**. Factors similar to those for Snow Goose dictate puddle duck populations on the river: mild winters may mean ducks never arrive from farther north, harsh winters with freeze-ups may drive waterfowl farther south. Hence, Black Duck numbers can vary considerably from year to year. None-the-less, there appears to be a clear trend of declining Black Duck numbers over ten years of study.

Mallard: Mallard populations are shown in **Figure 11**, and seem to mirror the same trends seen in Black Ducks, with a general decline over time. Where Black Ducks are found throughout the length of the study area, Mallards (and Pintails) are clearly concentrated on the upper, brackish portions of the Maurice River.

Northern Pintail: The highly variable Northern Pintail populations on the Maurice River are shown in **Figure 12.** There are clearly good years and bad years on the river, thought to be largely attributable to weather patterns. In a good year, the river holds a significant population of Pintails, one of the largest in New Jersey.

As **Table 2** indicates, numerous other species of waterfowl are also found on the Maurice River in winter. Green-winged Teal are a key species, but peak populations on the river occur earlier in the fall and later in the spring than the period covered by this intensive winter survey. Significant numbers of Green-winged Teal do winter however. A variety of diving ducks are found along the lower river and adjacent bay waters. In some winters, scaup are numerous in Maurice River Cove, and, in 1990-1991 and 1991-1992, scoter were abundant near East Point, no doubt in response to a local "set" of shellfish in the area. The 900 Common Golden eyes seen on 23 January, 1994 concentrated in open water at East Point, in an otherwise frozen bay, were an impressive number to see for the region.

DISCUSSION

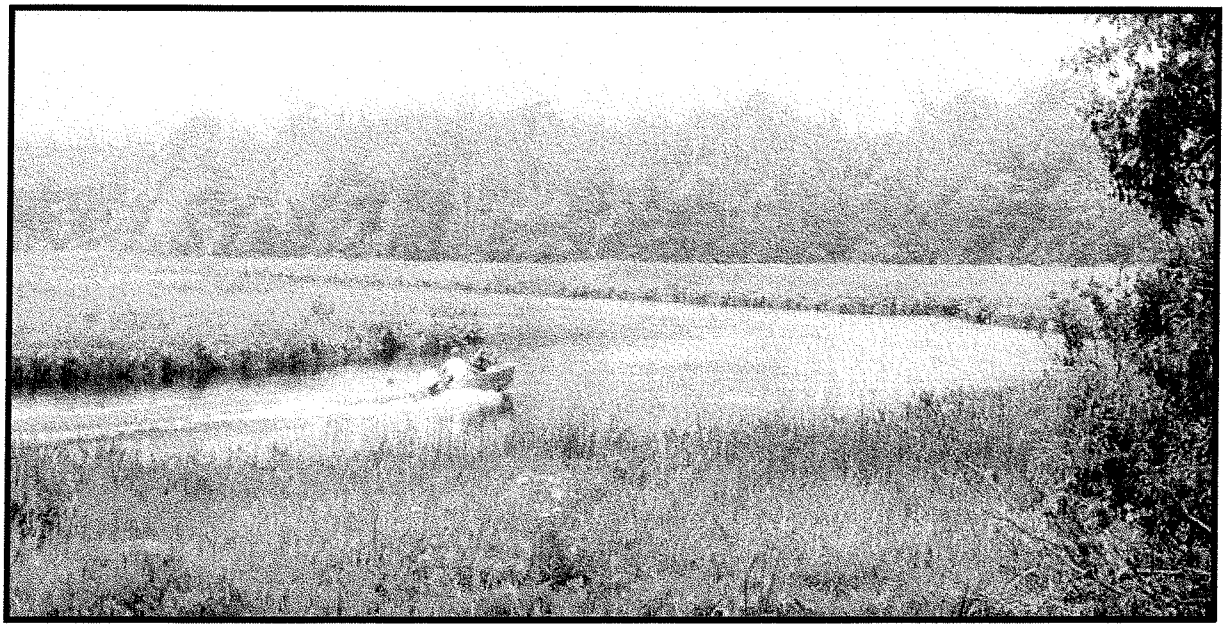
While Black Vulture increases are significant and mirror region-wide observations as this southern species expands its range, it is feared that sharp decreases in the final three winters may be linked to widely publicized (and controversial) depredation permits issued to pig farmers in the nearby Belleplain area. Press reports have stated that numerous Black Vultures may be being killed in this area to stop alleged depredation on young pigs.

A highly significant increase in wintering eagle numbers corroborates both migratory counts and winter eagle census numbers in New Jersey and helps chart the recovery of this species as both a resident and migrant in the Delaware estuary region.

While only small numbers of American Kestrels are recorded on the Maurice River in winter, a sharp decline has been documented over the past ten years, declines which can easily be corroborated with dropping migratory numbers (Liguori, 1996) and documented Christmas Bird Count declines (Sutton, unpublished. 1976 - 1996). American Kestrel may be in serious trouble in southern New Jersey, for reasons currently unknown.

While trends show a significant decline for American Black Duck, Mallard, and Northern Pintail, the decline of Black Ducks appears to be much more precipitous. The effects of the severity of winter weather should be factored out when ten years of data is reviewed, but the decline for Black Ducks remains significant. It is notable that Mallard and Pintail numbers have remained low in recent winters despite a much publicized "recovery" of these species as a result of waterfowl management efforts and an end to drought conditions in the major production areas for these species. Also notable is that Mallard and Pintail almost exclusively use the upper Maurice River - areas which are brackish to fresh (and where extensive wild rice marshes are located). Black Ducks, on the other hand, are far more evenly distributed along the river (Sutton and Williams, unpublished. 1992), as shown by a comparison of site specific data for the seven survey sites.

Of note is that while Black Ducks still are abundant on the northern portion of the study area (upper river) as well as in the salt marshes and mudflats of the lower river, they appear to have largely disappeared from the middle segment. Where in the first five years of the study, Black Ducks were abundant in the area north of Maurice River causeway, that area has been virtually devoid of ducks during the most recent years. This is for reasons unknown, although perhaps it is possible that the well-known fact of increasing salinity in estuary tributaries may be changing habitat and food resources in this transition area (Sutton *et al.*, 1996). It appears significant that the major drop in Black Duck numbers has been in the middle river region, not the upper or lower reaches.



Fishermen on the way out to the Maurice River near the junction of the Manumuskin River. Various recreational activities and commercial boating along the river may be among the many causes of fish and wildlife declines in past years. Photo by R.T. Zappalorti, 1993.

Another factor in regional duck distribution may be the emergence of nearby Thompson's Beach mudflats as key waterfowl habitat. As dikes have either broken or been removed in the past five years, converting salt hay farms to tidal mudflats, duck (and shorebird) use of the Thompson's Beach area has skyrocketed. It is possible that many former Maurice River ducks are being attracted/diverted to this adjacent area, impacting Maurice River counts (Pintails and Mallards using freshwater areas should be far less affected than Black Ducks, however). If this is correct, Maurice River populations should gradually rebound as salt marsh restoration efforts at Thompson's Beach slowly eliminate current mudflats.

A final question in the apparent decline in waterfowl may be increasing recreational use of the river. Without any data to support this, it none-the-less appears to the authors that boating traffic, fishing, and waterfowl hunting on the Maurice River has significantly increased since the early days of this 10 year study. These activities might have an impact on waterfowl by constantly moving them around (increased flushing) and possibly moving them farther up tributaries - or out into Delaware Bay - away from HA's count stations on the mainstream river.

In 1995, Maurice River waterfowl data were compared and contrasted to that being gathered by the U.S. Fish and Wildlife Service in cooperation with the Atlantic Flyway Council. In this review our ground-based counts were compared to federal/state aerial survey results (Sutton *et al.*, unpublished data, 1995). The comparisons were favorable, and aerial survey data corroborated the ground surveys summarized here. Our counts were 80% of state counts for total waterfowl. We consistently

undercounted Snow Geese (56%), which can be highly variable from day to day (,,aerial surveys were not the same day as ground surveys, but usually about a week apart), but we found 89% of the Black Ducks and 84% of the Mallards seen by aircraft. As expected, diversity of species was much greater on the ground. Important though, is that both survey methods obtained similar and corroborating data for Maurice River waterfowl.

COMPARISON TO THE COHANSEY RIVER

The Cohansey River

As an adjunct to this study and as part of other research, the Cohansey River in Cumberland County was compared and contrasted to the Maurice River for winter raptor and waterfowl populations. The Cohansey River is the New Jersey Delaware bayshore's second-largest tributary to the Delaware Estuary, running generally southwest below Bridgeton. Raptors and waterfowl were counted at five stations along the Cohansey River, from Bridgeton downstream to within two kilometers of the mouth of the river, a distance of 17.6 km (11 miles). The exact same methodology as used on the Maurice River was employed for the Cohansey River surveys in an attempt to compare the two rivers.- "The Cohansey River was sampled 20 times over seven winters, beginning in 1990-1991.

A comparison of these two river systems for key species of winter raptors and waterfowl is shown in **Table 4.** While no exact comparison can be made because available habitat acreage was not estimated or factored, it can nonetheless be seen that the Cohansey River shows similar wildlife values to the Maurice River.

Habitat along both the Maurice and Cohansey Rivers includes tidal marsh and swamp forest, as well as adjoining upland forest and farms. Wetlands in these areas range from marshes typical of tidally inundated areas to tidally influenced freshwater marshes farther upstream. *Spartina altemiflora* dominates the marshes at the mouth of the rivers, with patches of *S. patens* present. Farther upstream, although tidally influenced, the marshes are comprised of freshwater and brackish wetland plants such as wild rice, *Phragmites,* pickerel weed, arrowhead, spatter-dock, water-lily, and cattails. *Phragmites* is far more prevalent on the Cohansey River. The banks along portions of the Maurice River are quite steep and often heavily wooded, although cropland is in close proximity to the river in places. A far greater percentage of cropland is found adjacent to the Cohansey. Developed areas are minimal, comprised primarily of single family homes and a few recreational boat yards. Both rivers are similar in that at the upper sampling stations, the river and associated marshes are less than one-half mile wide, and both are about one mile wide near the lower sampling stations near the mouth. For these reasons, a rough comparison can be made between the 14 mile long study area on the Maurice River and the 11 mile study zone on the Cohansey River. Higher vulture numbers on the Maurice River may be attributable to the known two large roosts which occur every winter near Laurel Lake; the Cohansey survey route does not intersect regional roosts as it does on the Maurice. Bald Eagle numbers consistently test lower on the Cohansey, no doubt due to the fewer regional nests, fewer adjacent deep woods roosting areas, and fewer puddle ducks as prey items.

Kestrels are far more common along the Cohansey, attributable to vastly greater acreage of agricultural fields adjacent to the river there. This may explain larger Sharp-shinned and Cooper's Hawk averages as well. Even though these species are commonly referred to as birds of the forest, they frequent farmlands and hedgerows in winter. The Cohansey has a far larger population of accipiter prey items (sparrows, grackles, blackbirds and cowbirds) than does the Maurice. Also, greater open areas may simply make accipiters more visible to survey efforts than along the wooded Maurice River banks. Of note is that both Retailed Hawks and Northern Harriers show remarkably similar populations on the two rivers over time. Both species may be at their maximum winter density on both rivers.

An immature Bald Eagle roosting on a dead tree at the edge of the Maurice River. Photo by Jane Galetto, 1993.

Because of far less wild rice brackish water habitat, puddle ducks number far fewer on the Cohansey, where in many areas *Phragmites* has replaced healthy marsh. On the lower Cohansey, Black Ducks appear to be numerous, but not concentrated on mudflats as they are on the lower Maurice. Probably because of vastly greater regional farmland on the Cohansey River, both Snow Geese and Canada Geese are far more abundant along the Cohansey. While there are interesting comparisons and contrasts, both rivers play a major, and perhaps crucial, role in supporting regional winter raptors and- waterfowl.

SUMMARY

Ten Year Trends

Ten years of monitoring winter raptor and waterfowl numbers on the Maurice River have indeed confirmed and corroborated the first season's findings reported in *Records of New Jersey Birds* in 1988. The wintering populations of raptors are regionally significant, and the annual numbers of eagles are among the highest in the state (rivaled only by the upper Delaware River and the Mullica River complex). The wintering populations and early spring staging of waterfowl on the Maurice River and its tributaries are significant both in New Jersey and on the so-called eastern flyway. (It is important to remember that numbers reported here are not absolute totals, for they do not include those ducks found on the tributaries to the Maurice-Manantico Creek, the Manumuskin River and Muskee Creek. These vast tributaries were not on the survey route, and untold thousands of ducks in these branches were not counted or reported here). Collectively, the Maurice River and its tributaries represent some of the most important waterfowl habitat in our state.

The extraordinary abundance of waterfowl and raptors together make the Maurice River one of New Jersey's most important natural areas, and every effort must be made to keep these habitats from being fragmented and degraded by those forms of change which have reduced the wildlife values of so many of the state's once important natural wetlands and upland buffers. The high species diversity and large numbers of winter raptors and waterfowl documented here make the Maurice River area exceptional in the Delaware estuary and the mid-Atlantic region. The Maurice River and three of its tributaries (Manumuskin River, Manantico Creek and Muskee Creek) are now included in the U.S. National Park Service Wild and Scenic River Program. The diversity and abundance of wintering raptors and waterfowl, at minimum, confirms and affirms that designation and supports the need for increased and long-term open space protection for the remarkable Maurice River region.

Acknowledgments

Financial support for this long-term survey came from Citizens United to Protect the Maurice River and its Tributaries. The comparison to the Cohansey River was made possible through assistance provided by Cohansey Area River Protection, the Cumberland County Department of Planning and Economic Development, and New Jersey Audubon Society's Cape May Bird Observatory. We particularly thank Jane Galetto, Glenn Ewan and Donald Fauerbach for their interest and support of this project. We thank Dave Sibley, Fred Mears, Frank Nicoletti, Jim Watson and Jerry Ligouri for assisting with the field work for this study, and sincerely thank Joan Walsh, NJAS Research Director, for help with the data review and analysis. We thank Paul Kerlinger for his long-term interest in and advocacy for this project, and Robert T. Zappalorti, Executive Director and President of HA for his enthusiastic support of this project - support which went beyond contractual requirements.

Respectfully Submitted,
HERPETOLOGICAL ASSOCIATES, INC.

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Table 1. Wintering Raptors on the Maurice River, Cumberland County, N.J.
Ten Year Summary

SPECIES	1987	-1988	1988	-1989	1989	-1990	1990	-1991	1991	-1992	1992	-1993	1993	-1994	1994	-1995	1995	-1996	1996	-1997
	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg
Black Vulture	6	0.5	3	0.7	9	2.4	35	9.0	45	12.0	22	9.0	58	25.0	45	21.0	30	14.0	21	8.0
Turkey Vulture	82	44.0	209	116.0	123	58.0	105	61.0	160	79.0	77	59.0	266	107.0	99	59.0	120	84.0	93	55.0
Osprey	10						1						10				10		15	
Bald Eagle	6	2.7	4	2.6	15	5.7	10	5.4	10	5.9	11	8.4	16	9.5	6	3.9	20	10.1	14	7.0
Northern Harrier	32	20.5	32	21.0	22	18.0	23	17.0	31	24.0	30	16.0	33	19.0	28	24.0	29	20.0	23	15.0
Sharp-shinned Hawk	12	3.0	8	2.0	5	2.3	5	2.7	13	3.7	11	2.5	8	2.0	6	2.8	16	3.5	5	1.6
Cooper's Hawk	3	1.1	2	0.7	5	1.3	3	1.4	3	1.1	5	1.5	4	1.7	3	1.4	4	1.5	7	2.2
Northern Goshawk			1		1						1						1			
Red-shouldered Hawk	1		1		2				1		3		1		2		2		2	
Red-tailed Hawk	40	33.0	44	33.0	59	38.0	53	37.0	58	41.0	57	41.0	47	36.0	52	42.0	52	41.0	59	41.0
Rough-legged Hawk	3	1.0	2	1.0	4	2.0	4	2.0	3	2.0	1	0.25	1	0.22	1	0.44	3	1.2	1	0.3
Golden Eagle	1		1		2				1		1				1		1		1	
American Kestrel	6	2.5	4	2.9	8	2.3	4	2.0	5	2.6	4	1.9	5	1.7	3	1.1	3	1.5	3	0.7
Merlin					1						1		2				1		1	
Peregrine Falcon	1		1				1						1		1		1		2	
All surveys conducted between the 4th week of Novmber and the 3rd week of March.																				

Table 2. Peak Numbers of Wintering Waterfowl on the Maurice River, Cumberland County, N.J.
Ten Year Summary

SPECIES	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97
Tundra Swan	19	12	14		3	7			13	4
Mute Swan	8	9	21	25	21	25	19	40	14	17
Snow Goose	5000	1550	14000	3500	3500	6500	9200	2355	13100	5150
Ross' Goose					1		1			
Brant			2	2	25				5	20
Canada Goose	899	110	450	37	1000	187	880	290	475	660
Wood Duck	1	1	4	6	3	4	5	2	12	4
Green-winged Teal	1378	330	625	1045	562	765	355	544	229	1170
Am. Black Duck	8120	4470	4867	5448	4290	4877	1488	1509	1149	1495
Mallard	3250	2660	2179	3758	2180	3896	547	671	356	1320
Northern Pintail	3020	547	1227	1503	850	3293	347	680	240	1712
Blue-winged Teal	3	1		1		1	1		1	2
Northern Shoveler	6		2	1		1	3	4		3
Gadwall	60	39	20	40	11	3	7	8	6	25
American Wigeon	38	32	8	30	10	6		7	1	4
Canvasback	5	51	6	9		23	32	9	50	32
Redhead							1			
Ring-necked Duck	7	3	79		4	1	1	31	60	1
Greater Scaup	18	12	226	930	40	83	67	4	10	19
Lesser Scaup	26	3		12	1	10	19	68	21	19
Scaup species		690	20	400		50	40	1000	100	50
Oldsquaw	1	3			4	1	2	5	1	1
Black Scoter	1	1		2				3	1	1
Surf Scoter				2160			1	6	2	
White-winged Scoter				200			1	2		1
Scoter species					1000	5		15	15	8
Common Goldeneye	20	24	36	48	305	55	900	22	65	51
Bufflehead	55	154	125	60	108	108	150	125	181	177
Hooded Merganser	3	3		12	3	20	19	8	20	10
Common Merganser	9	74	51	5	1	4	4	33	34	32
Red-breasted Merganser	25	20	150	28	62	32	85	82	144	47
Ruddy Duck		1				1	34	3	2	6
Unid diving duck							4000			
All surveys conducted between the 4th week of Novmber and the 3rd week of March.										

Table 3. Average Number of Wintering Waterfowl on the Maurice River, Cumberland County, N.J.
Ten Year Summary for Key Species

SPECIES	1987	-1988	1988	-1989	1989	-1990	1990	-1991	1991	-1992	1992	-1993	1993	-1994	1994	-1995	1995	-1996	1996	-1997
	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg	Peak	Avg
Snow Goose	5000	1333	1550	299	14000	3898	3500	1352	3500	2356	6500	2724	9200	3796	2355	779	13100	3422	5150	1288
Canada Goose	899	112	110	30	450	110	37	21	1000	249	187	96	880	144	290	96	475	134	660	193
Am. Black Duck	8120	2611	4470	2343	4867	2411	5448	3804	4290	1983	4877	2916	1488	953	1509	810	1149	595	1495	893
Mallard	3250	1247	2660	1010	2179	825	3758	2585	2180	846	3896	2048	547	318	671	375	356	185	1320	687
Northern Pintail	3020	968	547	261	1227	348	1503	852	850	266	3293	1630	347	131	680	360	240	72	1712	532
All surveys conducted between the 4th week of Novmber and the 3rd week of March.																				

Table 4. Comparison of River Systems for Key Species
Winter Raptors and Waterfowl found on the Maurice and Cohansey Rivers

	Maurice R.	Cohansey R.
Black Vulture	10.1	6.5
Turkey Vulture	72.2	53.4
Bald Eagle	6.1	2.5
Northern Harrier	19.5	19.4
Sharp-shinned Hawk	2.6	4.3
Cooper's Hawk	1.4	2.0
Red-tailed Hawk	38.3	37.5
American Kestrel	1.9	6.2
Snow Goose	2125	8728
Canada Goose	119	595
Am. Black Duck	1932	138
Mallard	1013	104
Northern Pintail	542	3

Maurice River - number of surveys = 92 over 10 winter seasons.
Cohansey River - number of surveys = 20 over 7 winter seasons.

The Maurice River figure repesents the average of each of the ten winter seasons, while the Cohansey River figure represents all 20 individual surveys averaged together.

Figure 1. Trend in Black Vulture Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

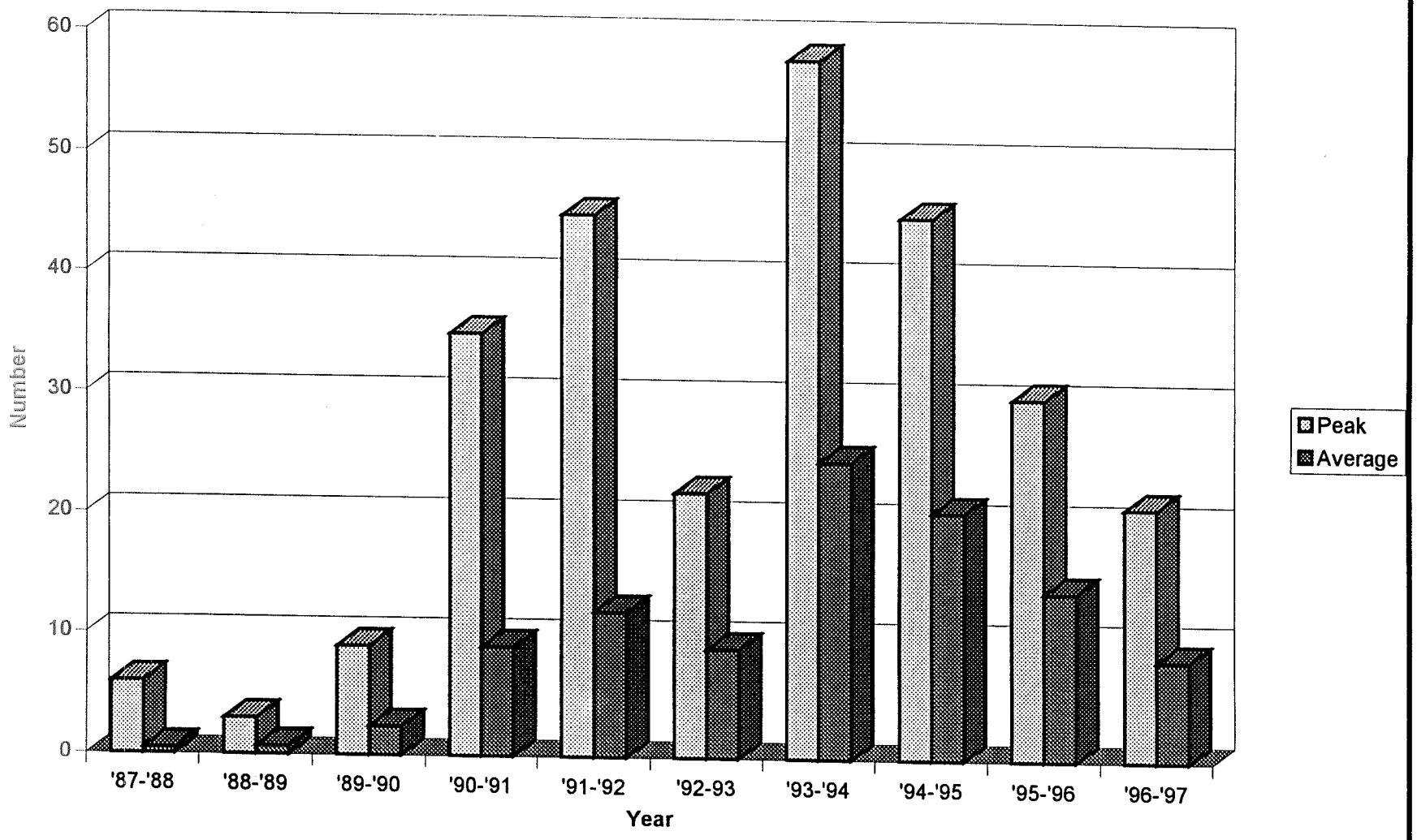


Figure 2. Trend in Bald Eagle Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

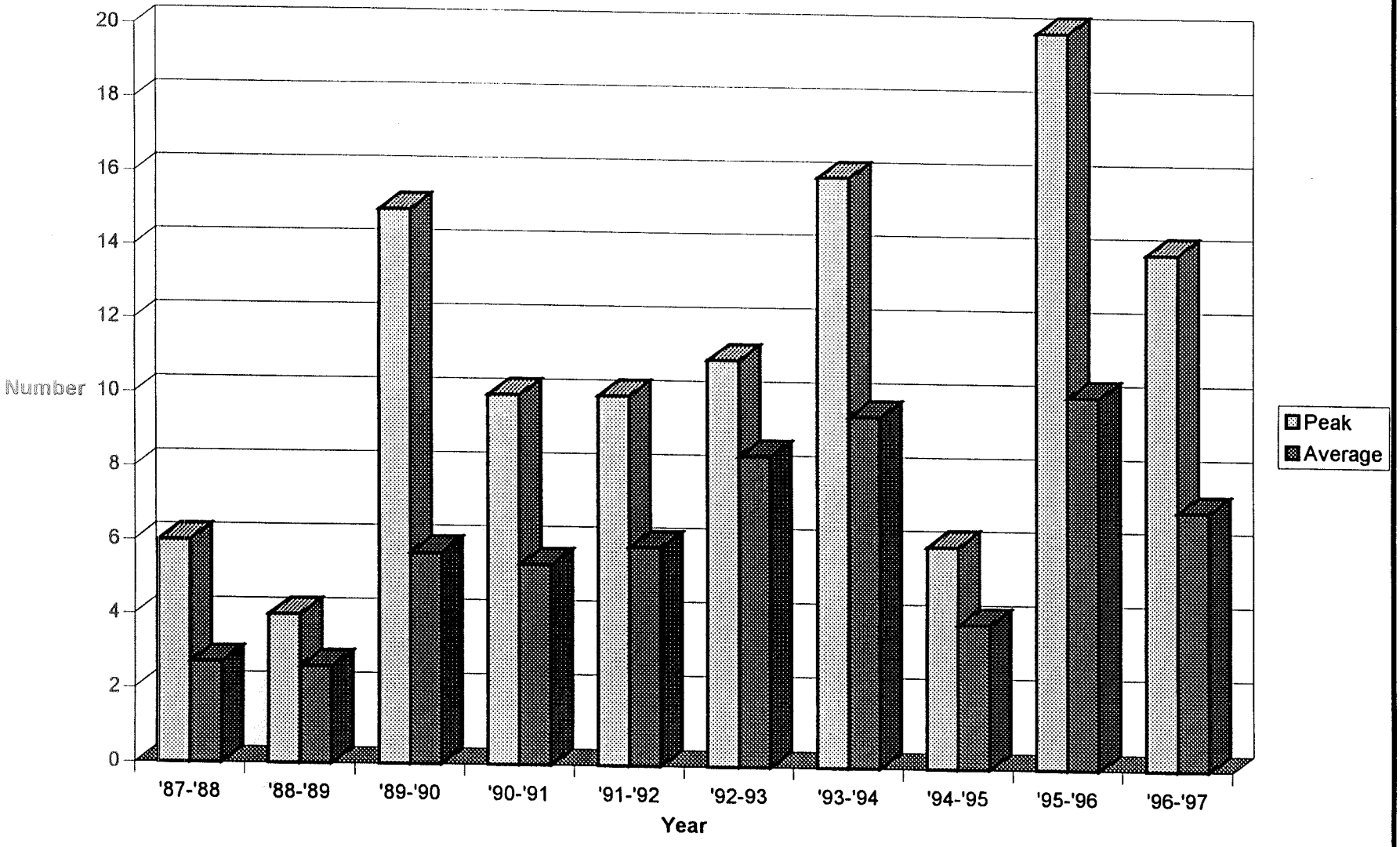


Figure 3. Trend in Northern Harrier Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

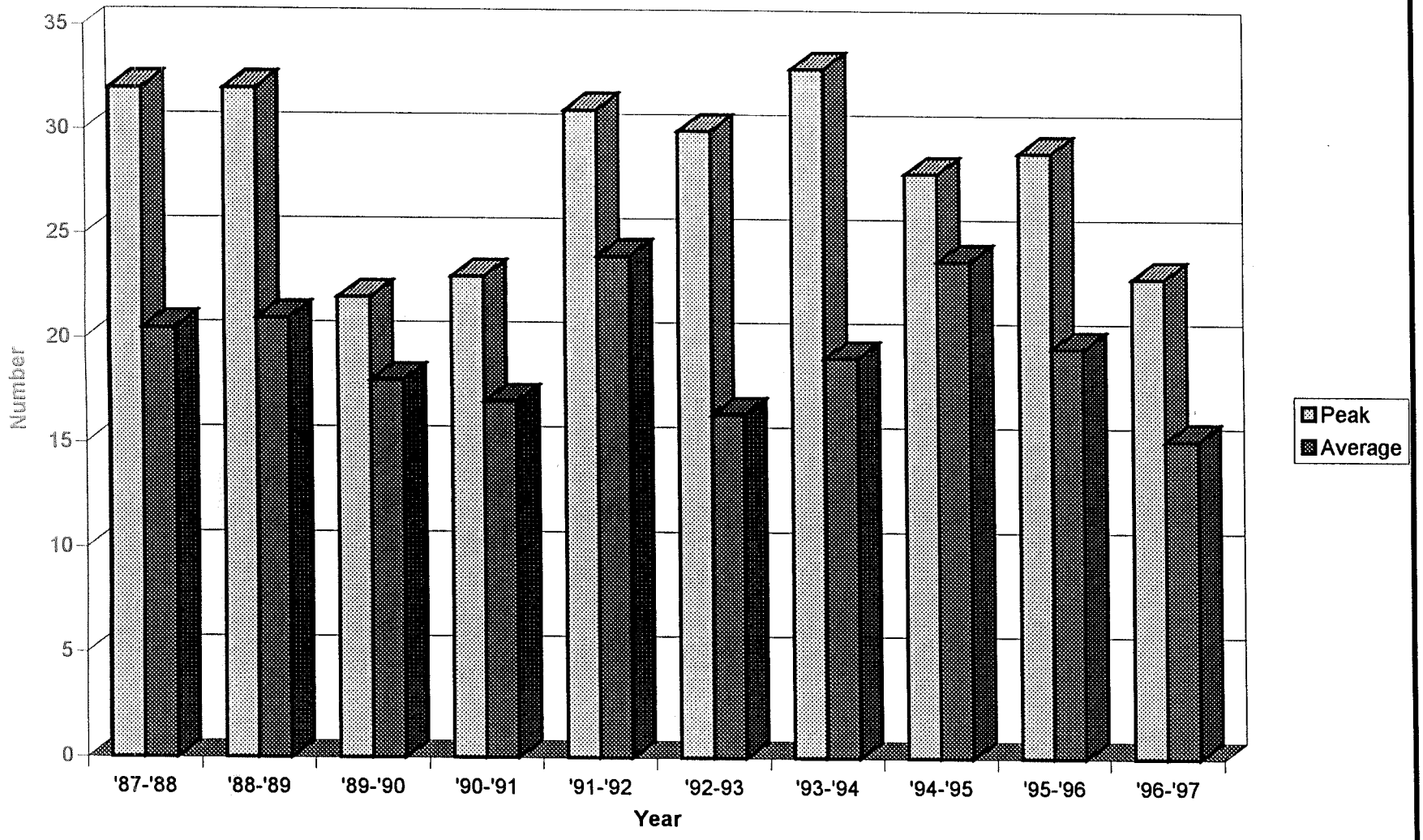


Figure 4. Trend in Sharp-shinned Hawk Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

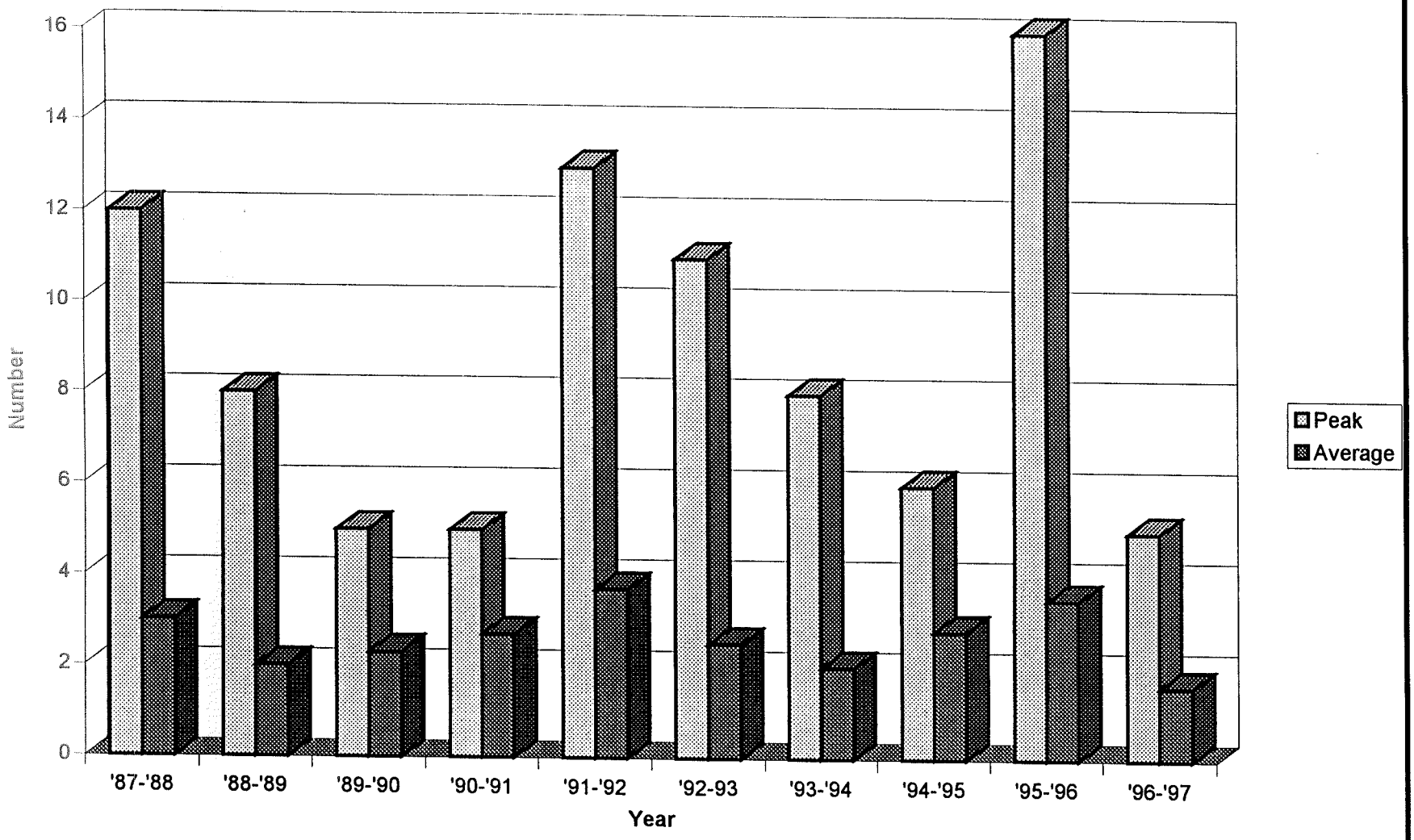


Figure 5. Trend in Cooper's Hawk Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

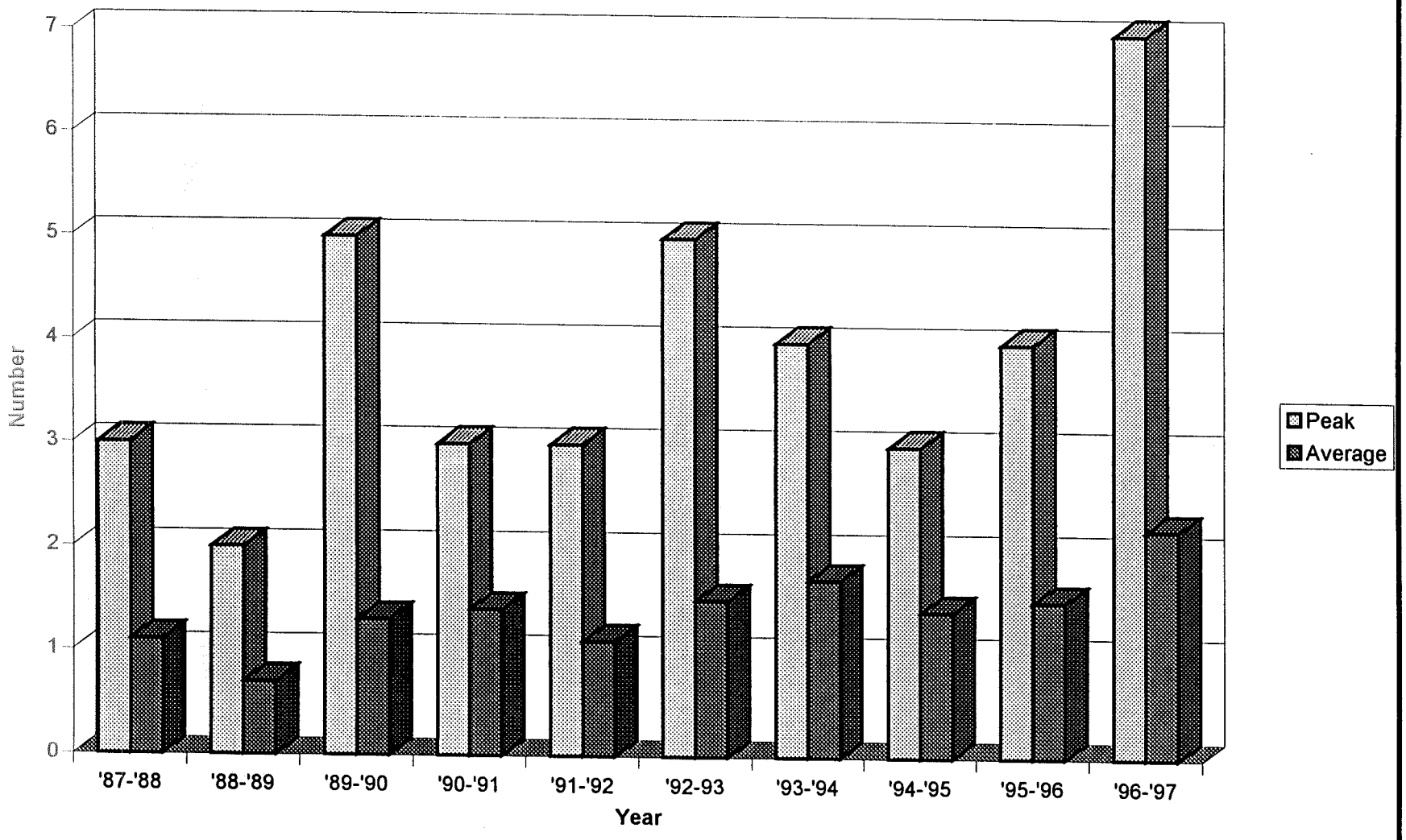


Figure 6. Trend in Red-tailed Hawk Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

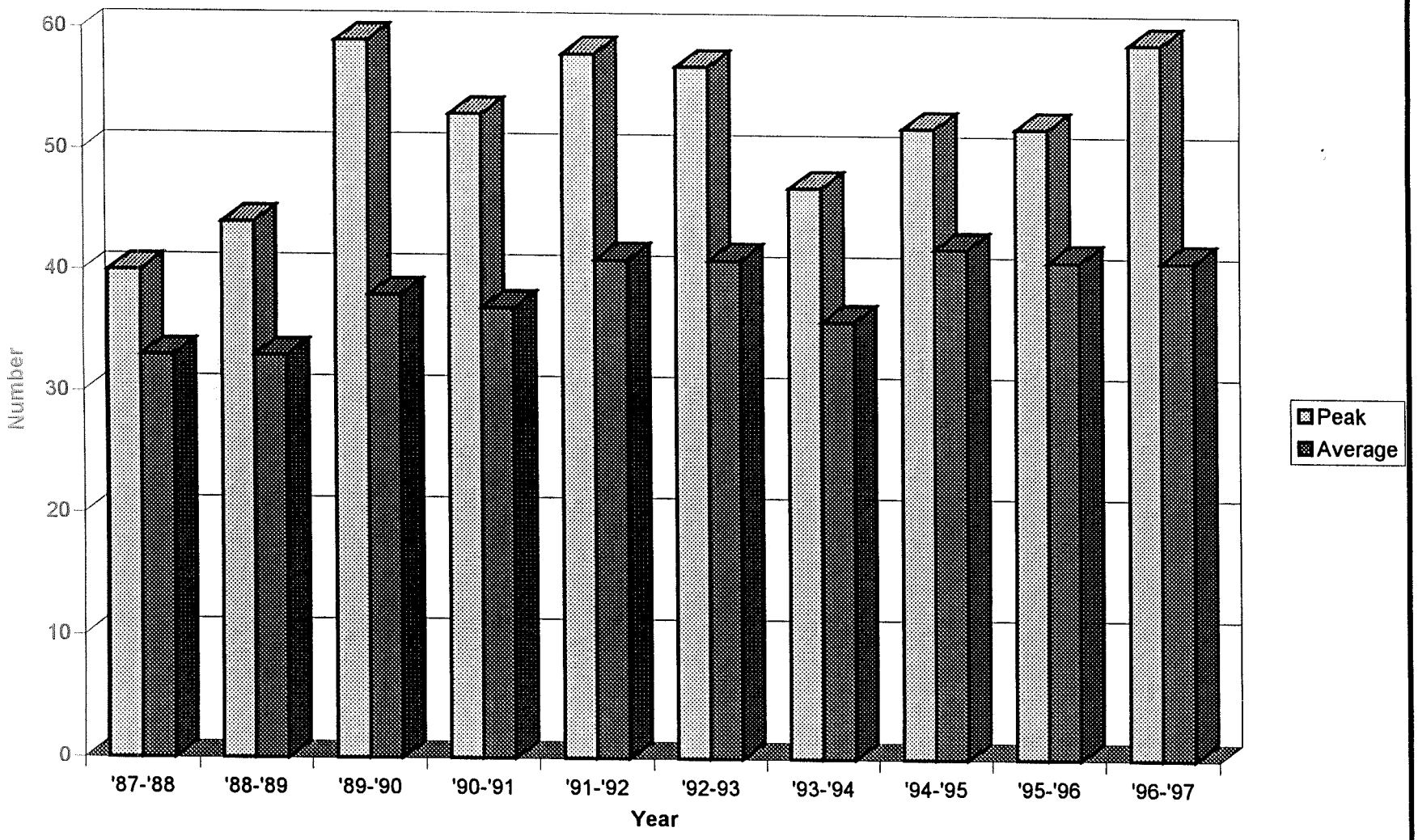


Figure 7. Trend in American Kestrel Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

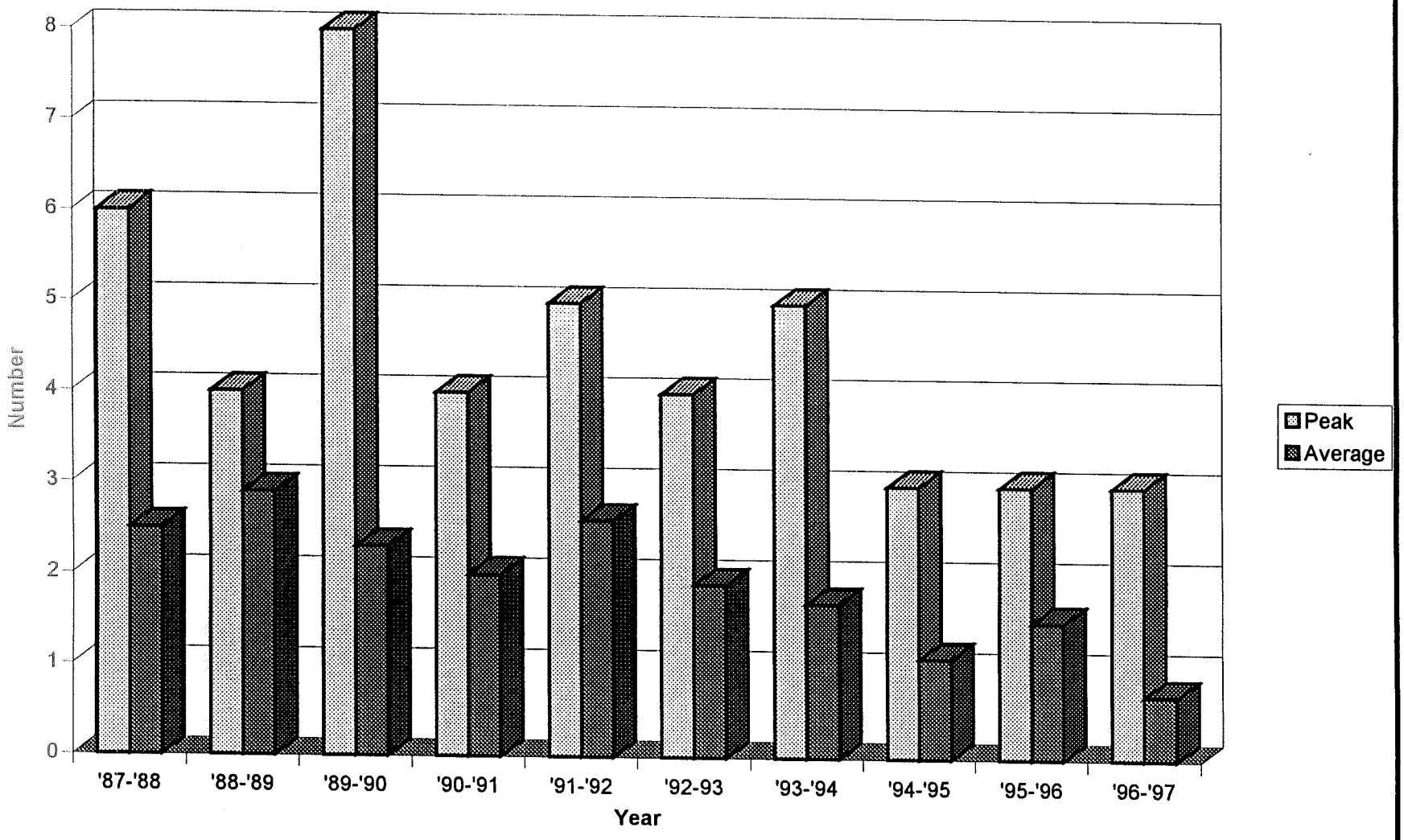


Figure 8. Trend in Snow Goose Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

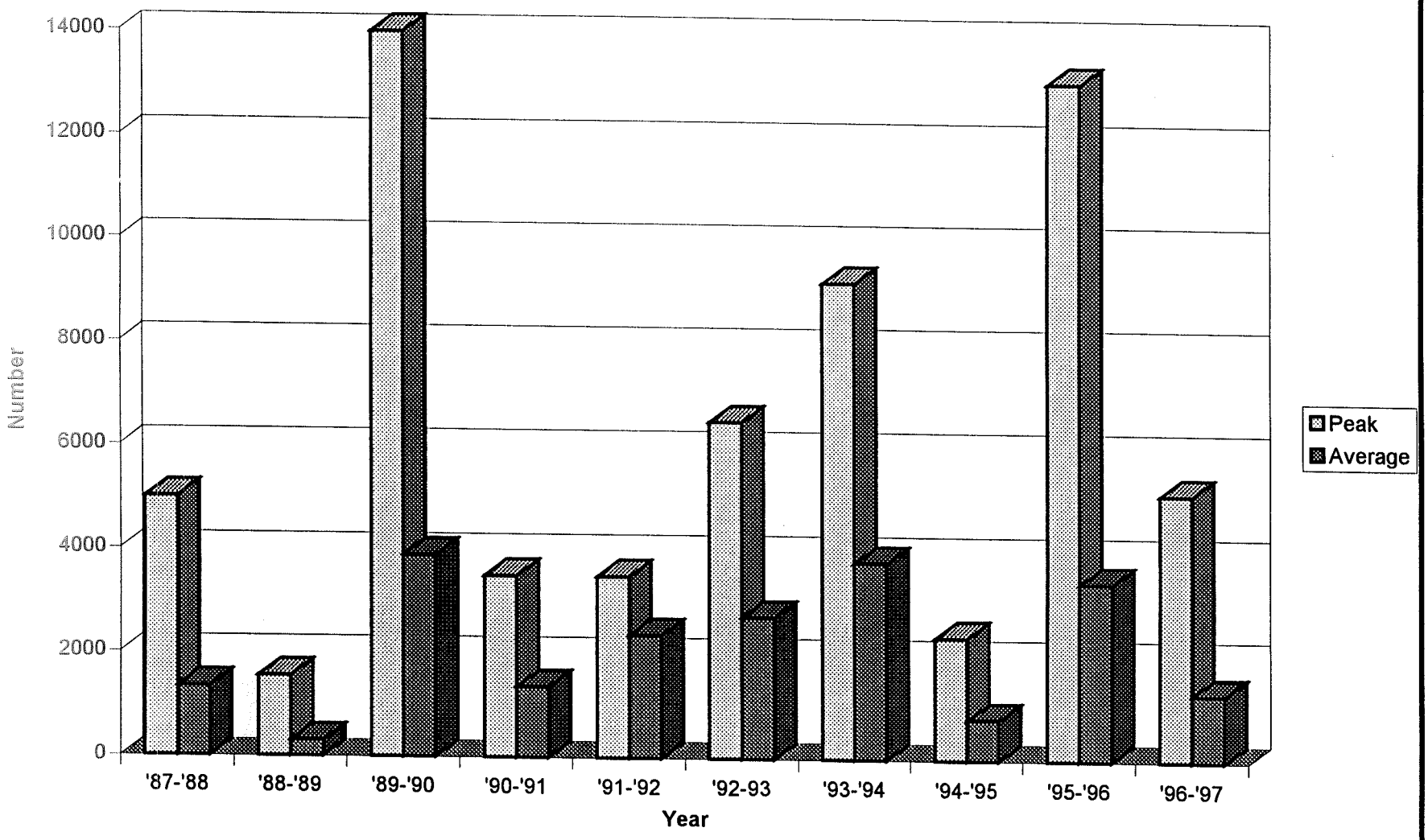


Figure 9. Trend in Canada Goose Populatios over 10 Winters on the Maurice River, Cumberland County, N.J.

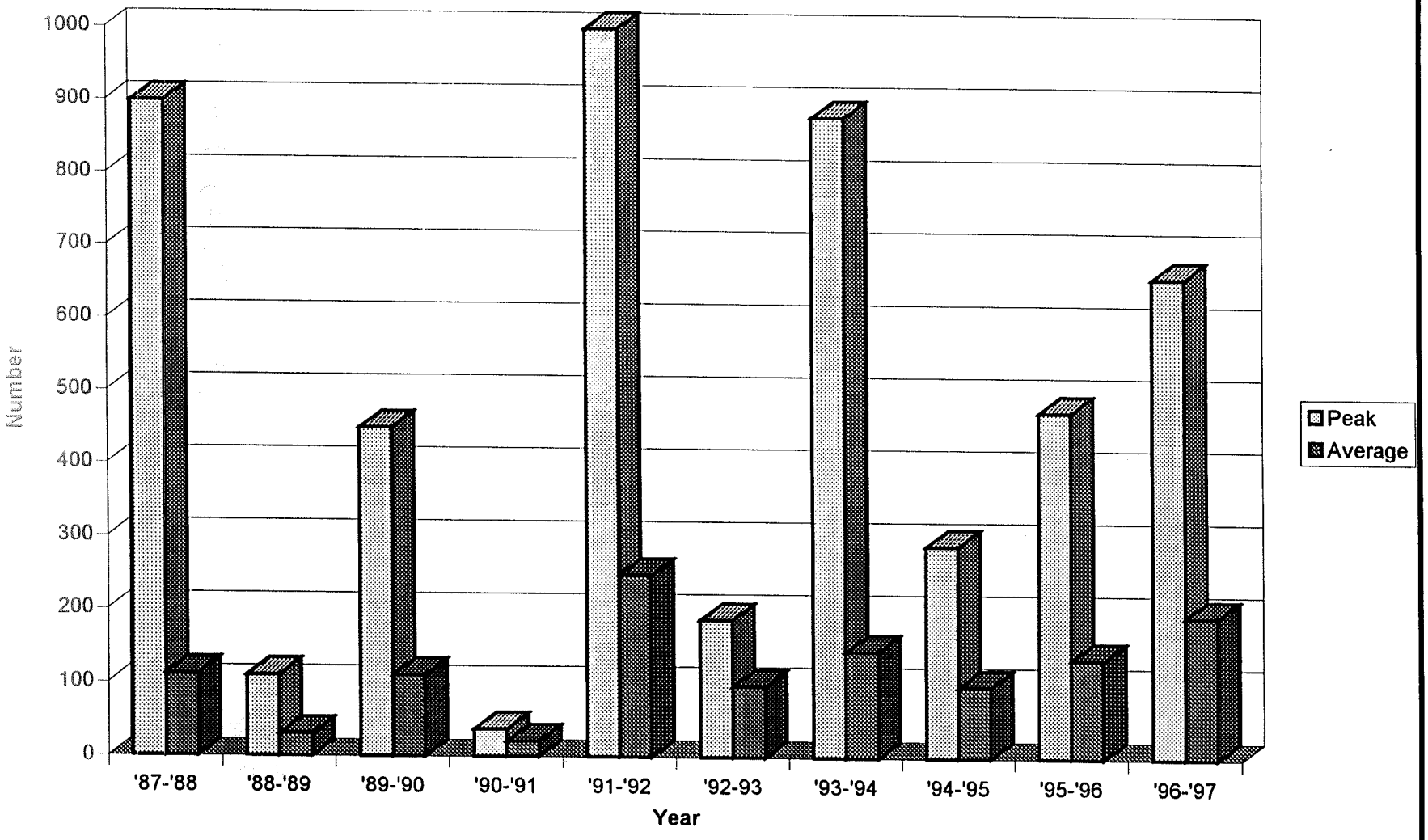


Figure 10. Trend in Black Duck Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

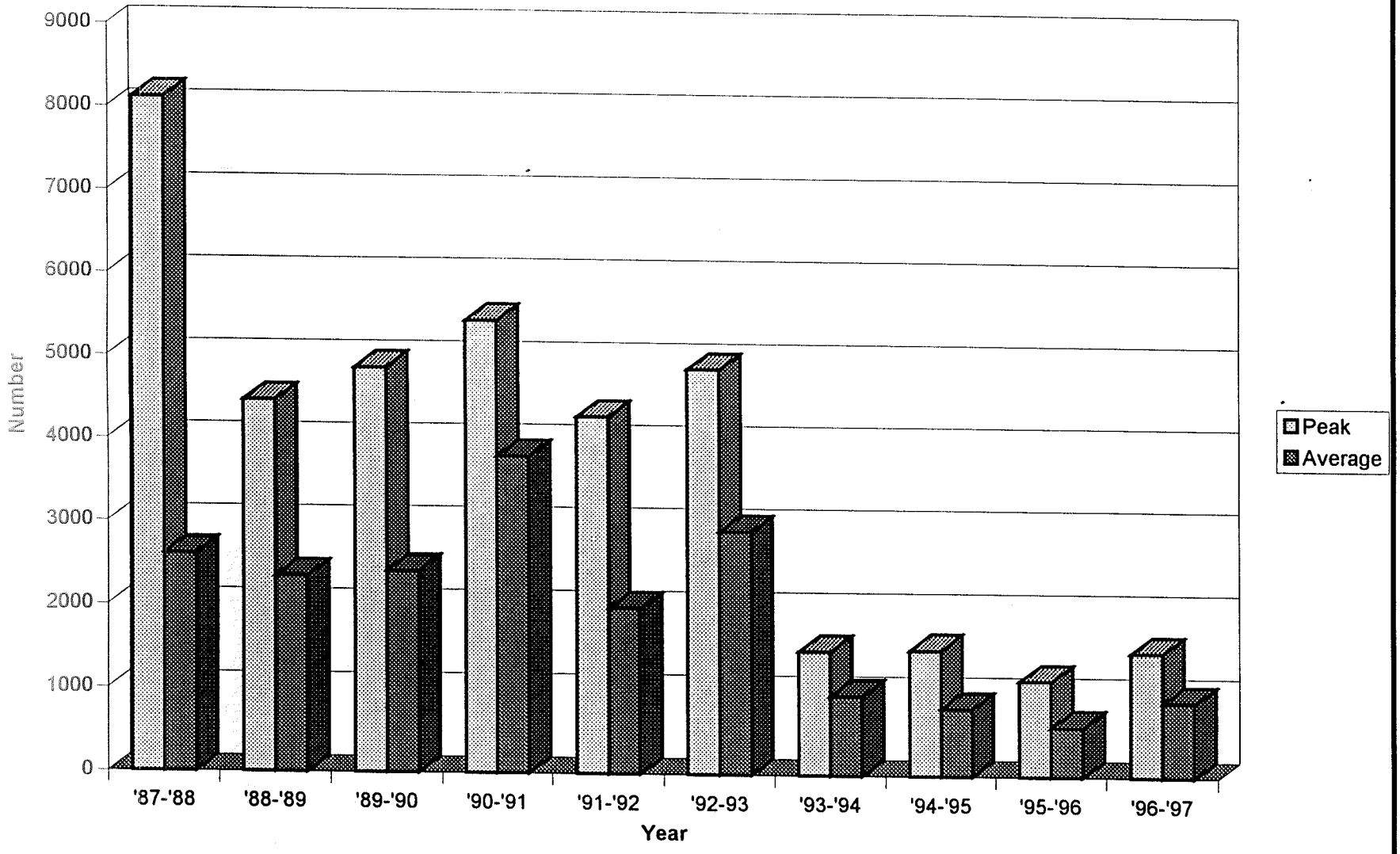


Figure 11. Trend in Mallard Populations over 10 Winters on the Maurice River, Cumberland County, N.J.

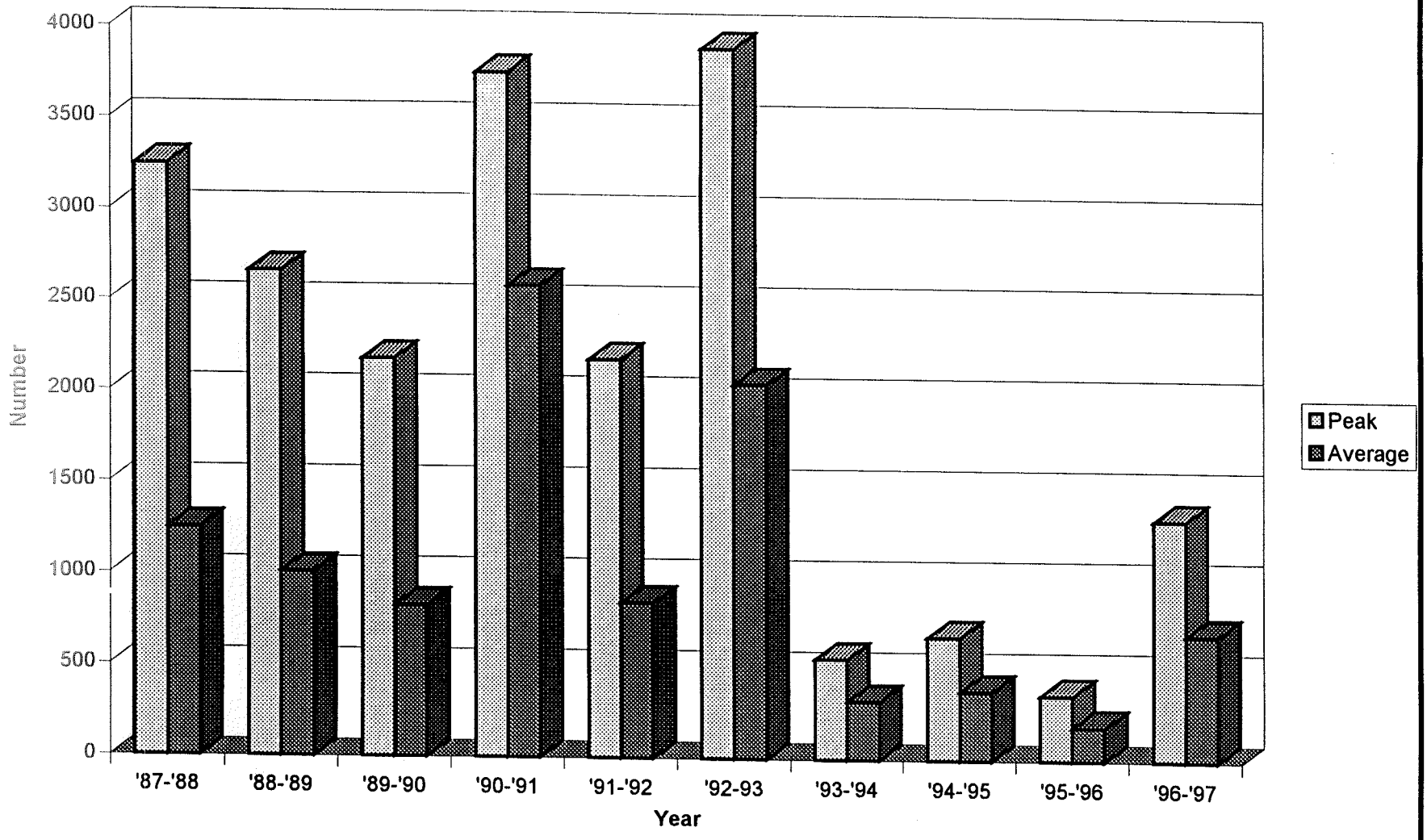
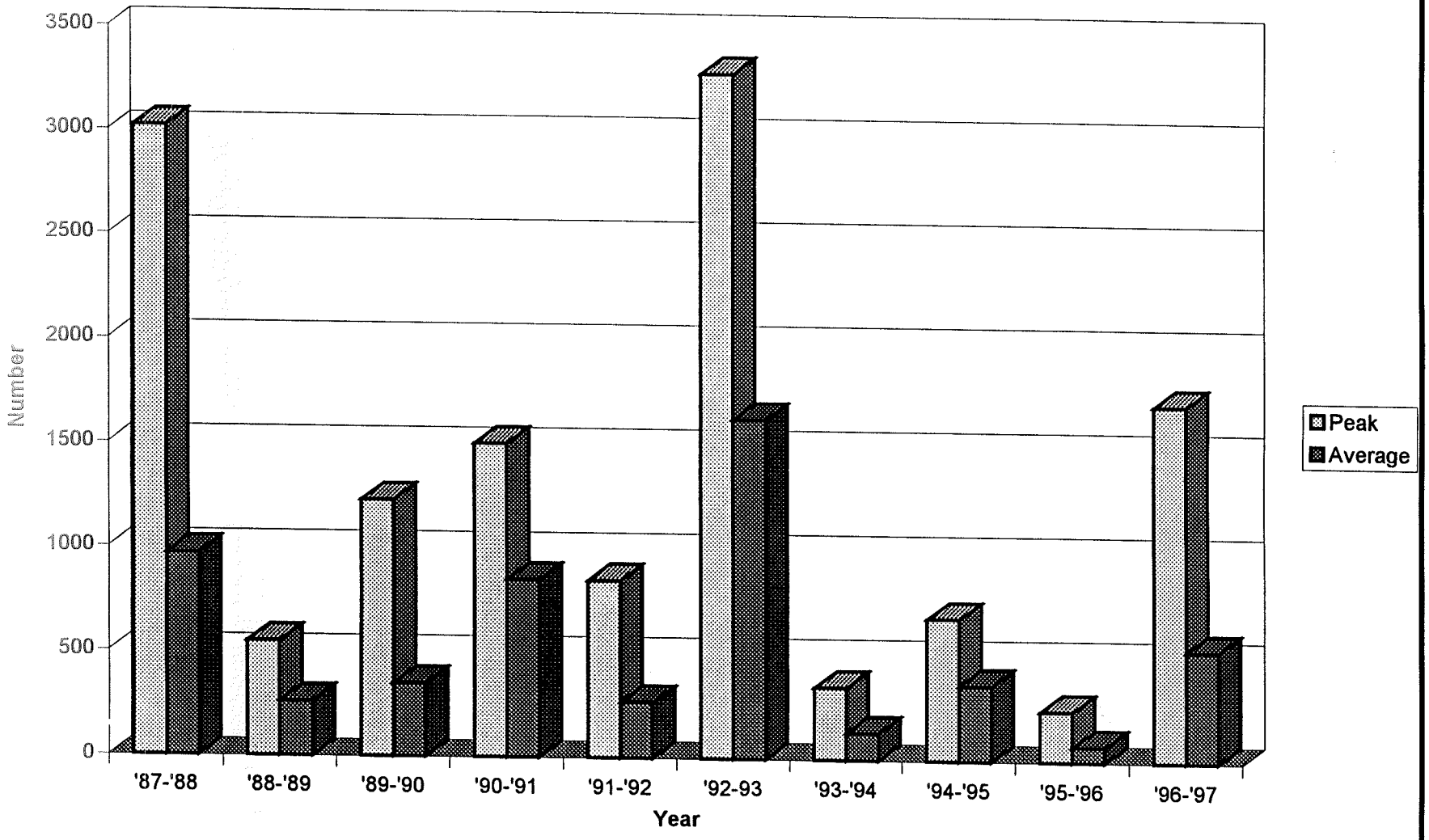


Figure 12. Trend in Northern Pintail Populations over 10 Winters on the Maurice River, Cumberland County, N.J.



Winter Raptor and Waterfowl Surveys on the Maurice River: A 10 Year Study.

Canvasbacks on the lower Maurice River at Heislerville, Winter 1995 - 1996.
Photo by Clay C. Sutton

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Citizens United to Protect the Maurice River and its Tributaries

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