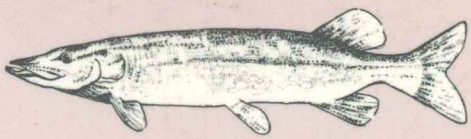

2020 VISION

MEETING THE FISH & WILDLIFE CONSERVATION CHALLENGES OF THE 21ST CENTURY

Edited by Tony J. P

2020 Vision

Meeting the Fish and Wildlife Conservation Challenges of the 21st Century

Tony J. Peterle, Editor
David J. Case, Symposium Chair

Sponsored by
The North Central Section of The Wildlife Society
and Co-Sponsored by the
Organization of Wildlife Planners
North Central Division of the American Fisheries Society

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PREFACE

The collection of papers presented herein were part of a symposium presented at the 53rd Midwest Fish and Wildlife Conference held in Des Moines, Iowa. The symposium, with the same title as this volume, was presented on Tuesday, December 3, 1991. The North Central Section of The Wildlife Society sponsored this symposium as a part of its continuing education program. Past symposia have considered topics such as the wood duck, white-tailed deer, Canada goose, and furbearers.

As we move into the last decade of the 20th century, we thought it might be appropriate to look ahead to consider what fish and wildlife conservation might be like in the year 2020. Appropriate authors were selected and contacted by Dave Case, the program chairperson. We are grateful for their thoughtful contributions. We also appreciate the efforts of the referees who kindly read these manuscripts and made cogent comments on how they might be improved.

The symposia was part of the conference program hosted by the state of Iowa and we are appreciative of their willingness to include this as a part of the formal program. The officers and members of the North Central Section of The Wildlife Society have continued to support this effort with a revolving publication fund. We look forward to seeing other symposia and publications as a result of this effort.

Perhaps in the year 2020, someone might review this publication to determine just how prophetic our authors have been.

FOREWORD

"These are bizarre times. If you thought it yesterday, if you're thinking it today, you won't think it tomorrow."

Those are the first two lines of a recent book by a widely respected business futurist (Popcorn 1991). Although most of us don't believe we change that fast, we do live in a rapidly, and most would say, radically changing world.

This book contains the proceedings of a symposium sponsored by the North Central Section of the Wildlife Society on December 3, 1991 at the Midwest Fish and Wildlife Conference in Des Moines, Iowa. The symposium was co-sponsored by the Organization of Wildlife Planners and the North Central Division of the American Fisheries Society. The purpose of the symposium, and this book, was to take a systematic, insightful look at what fish and wildlife managers will have to deal with in the year 2020 so they can begin preparing today.

Can anyone predict with certainty what the future is going to be? It's doubtful. But in the process of giving it our best thought, we may be able to prepare ourselves for some of the options.

It is said that there are four levels of competency:

1. Unconsciously incompetent–we're incompetent and don't have any idea why.
2. Consciously incompetent–we're incompetent and choose to remain that way.
3. Unconsciously competent–we're good at what we do, but don't have any idea why.
4. Consciously competent–we're good at what we do, and are conscious of why and how.

Although number two is easy, and in fact seems to be quite widespread, the intent of this symposium and this book is to strive for number four–to take the most conscious, well thought-out look we can at the future to help us be competent at the job of conserving fish and wildlife resources.

As difficult as it might be to "predict" the future, it's critical that those of us managing fish and wildlife resources try. On one hand, we must be responsive to the public (we live in a democracy) and its changing whims. On the other hand, we are dealing with professions and landscapes that in most cases do not

change or respond to change very quickly: it takes nine years or more of college to get a Ph.D. in fish and wildlife conservation, and seventy or more years to regenerate spotted owl habitat.

The authors of this book were asked to be thought-provoking. Based on the comments received by reviewers and the symposium attendees, the future of wildlife and the wildlife profession is a topic on which there are many strong opinions.

The symposium and resulting publication were made possible through the hard work of the North Central Section of The Wildlife Society Symposium Steering Committee: Erik Fritzell, Diana Hallett, Brian Miller, Joe O'Leary, Tony Peterle, Phil Seng, Dan Svedarsky, and Dan Witter. Special thanks are extended to Dennis Schenborn, Bruce Hawkinson, and Brian Stenquist for their help in planning and facilitating the "futuring" workshop.

We wish you well on your journey to the future.

David J. Case
Chairman
Symposium Steering Committee
North Central Section, TWS

LITERATURE CITED

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Wetland Habitats and Waterfowl in 2020: An International Conservation Challenge

By David E. Sharp and Robert I. Smith

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Abstract: *North America's rich diversity and abundance of migratory waterfowl, including ducks, geese, and swans, depend in varying degrees upon wetland habitats. Although the use of wetland habitats by waterfowl varies temporally and according to wetland type, the population status of some species can be used as indicators of the condition of wetlands. Historical patterns of regional loss or the degradation of wetlands have impacted those species or populations that during a portion of their annual cycle utilize wetland habitats for nesting, brood rearing, feeding, protection from predation, or resting. It is not known how many wetlands or waterfowl were present at the time of settlement of North America; however, we used recent estimates of wetland conversions and systematic waterfowl population surveys to determine trends and project status of these natural resources into the 21st century. Because human population growth, accompanied by more intensive agricultural and industrial use of land and water, will likely occur between the present and 2020, highly divergent scenarios of the continental status of wetlands and waterfowl can be developed. The conservation community will not be able to promote preservation and management of these natural resources without strong ecological awareness that transcends international boundaries and is fostered by all sectors of the general public. The future of wetland habitats and waterfowl will be determined by the value that society places on their importance. Proper design and successful implementation of cooperative international programs will result in informed economic, political, and social decisions that allow for protection and wise management of these types of shared natural resources.*

In Colonial times, North America contained a vast array of wetland types which supported a rich diversity and abundance of waterfowl. Although these bountiful flocks proved to be valuable staples for the early settlers, wetlands were soon regarded as a hinderance to productive land use. The earliest govern-

ment programs simply gave wetlands away on the condition that they be drained or converted to other uses. Accelerated human population growth stimulated well-intentioned public and private efforts to provide flood protection, greater agricultural production, better highways, and other potential benefits, but these efforts unfortunately have resulted in a 200-year history of wetland conversion and degradation. Collectively, these wetland losses diminished the quality of the continent's natural resource base to the point where it has now become obvious that we must carefully balance our economic, social, and environmental goals.

Beginning in the early 1900s, segments of the conservation community encouraged preservation of wetland resources for the maintenance of continental waterfowl populations. Since the 1930s, wetland protection efforts by natural resource agencies have been ongoing. In the U.S., the Migratory Bird Conservation Act, Migratory Bird Hunting and Conservation Act, the Land and Water Conservation Fund Act, and the recent North American Wetland Conservation Act have provided the Federal authority and/or funds to purchase wetlands. Although these continuing efforts have been useful in preserving key high-priority wetlands, the future of the vast majority of privately owned wetlands remains questionable as competing demands for other uses of these lands and waters increase.

Strong wetland laws and regulations are necessary to complement preservation efforts in order to maintain a functional wetland base. The foundation of current U.S. Federal wetland regulations is contained in Section 10 of the River and Harbor Act of 1889, Section 404 of the Clean Water Act of 1977, and the swamp-buster provision of the 1990 Farm Bill. Additionally, 24 states have also passed laws to regulate wetland uses. In total, these regulations have generally been ineffective in reversing long-term trends in the destruction of wetlands, but they indicate a gradual shift in the public's attitude toward the protection of wetlands. Current proposed legislation would further deplete the remaining wetlands.

By the late 1980s, dramatic changes began to occur in society's appreciation of the many values wetlands provide as integral elements of our environment. In 1986, Canada and the U.S. signed the North American Waterfowl Management Plan. This document reflected an international response to the precipitous decline of the continent's wetland and waterfowl resources. Its innovative approach advocated the establishment of federal, state, provincial, and private partnerships to restore, enhance, manage, and protect wetlands for waterfowl and other species of wetland-dependent wildlife.

In 1988, the National Wetlands Policy Forum established a U.S. goal to achieve no overall net loss of the Nation's remaining wetland base. In 1989, President Bush made a pledge for implementation of this national goal for wetlands and set up an interagency task force under the Domestic Policy Council to stop destruction of wetland habitats (Anonymous 1990). In 1991, Environment Canada established Canadian policy to maintain and enhance the health and diversity of Canada's wildlife by requiring integration of economic decisions with wildlife conservation.

Realizing that accurately predicting the future of North America's wetland and waterfowl resources would be an extremely difficult and complex task, we used available wetland and waterfowl status information and simple linear regression techniques to attempt projections into the 21st century. We recognize that trends may not be linear, but without added knowledge, this seems to be the most sensible approach.

WETLAND HABITAT STATUS AND TRENDS

The designation of wetlands can be difficult and perhaps confusing for many individuals because all wetlands do not fit the commonly shared stereotype of a permanently flooded, cattail (*Typha* spp.)-ringed depression. Wetland habitats include a wide variety of shapes and sizes and some wetland types are found in areas of transition between dry uplands and open water. Also, wetlands undergo wet/dry cycles that are essential to their productivity.

The scientific community, including hydrologists, botanists, soil scientists, and biologists, has agreed upon the identification criteria for a wetland (Federal Interagency Committee for Wetland Delineation 1989). This document classifies wetlands as having wetland vegetation, hydric soils, and wetland hydrology. Certain aspects of wetland hydrology, specifically the classification of areas that contain surface water for relatively brief periods, allow various nonscientific interpretations of these criteria.

Complete historical information of wetland status in North America is not available. However, substantial efforts are underway to improve inventory data bases. Current status information is most complete for the U.S., but rapidly improving for other regions of North America, especially Canada.

In the U.S., a National Wetland Inventory was initiated in 1974, and in 1979 studies to assimilate statistics on the current status and trends of wetlands were initiated by the U.S. Fish and Wildlife Service. Utilizing this extensive data base and incorporating supplemental sampling procedures, efforts have been made to

estimate the present acreage of wetlands and describe changes in acreage for specific time intervals. Tiner (1984) estimated wetland acreage changes between the 1950s and 1970s, while Dahl (1990) compared the status of wetlands from the 1780s to the 1980s.

Dahl (1990) estimated that as many as 221 million acres of wetlands were present in the conterminous U.S. during the 1780s. During 1850-1930, the U.S. was being rapidly settled and initial advances in technology allowed the conversion of natural environments into highly developed agricultural, industrial, and urban areas (Frayer et al. 1983). At that time, wetland habitats were widely regarded as wastelands and, with the aid of massive government programs, wetlands were lost at an alarming rate. During the 1930-80s, drainage projects became logistically and legally more difficult; however, losses continued, but at a slower pace (Tiner 1984). Tiner (1984) estimated that between the mid-1950s and mid-1970s, 9 million acres of wetlands were lost with average annual losses estimated at 458,000 acres. By the end of the 1980s, Dahl (1990) estimated that in the conterminous U.S., 53% of the original wetland acreage had been lost and that only 104 million acres remained.

The trend of losses from the mid-1950s to the 1970s was used to project the changes in wetland acreage through the year 2020 (Figure 1, page 5). If these loss rates continue, only slightly more than 80 million acres of wetlands would remain in the U.S.. In contrast, the goal established by the National Wetlands Policy Forum (1988) advocates no future loss of wetlands. Although we recognize the potential for increased loss rates, we believe these diverging trend lines represent a realistic range of wetland acreage status for the year 2020. We utilized this information to construct a theoretical long-term trend of wetland acreage for the conterminous U.S. (Figure 2, page 5).

These estimates indicate a disturbing downward trend for wetlands in the U.S.; however, significant variation occurs in regional loss rates. In Alaska, less than 1% of the original wetland acreage has been lost and 170 million acres remained in the 1980s. In the lower 48 states, California has lost the most (91%) and New Hampshire the least (9%). In total, 10 states have lost 70% or more of their original acreage and 22 states have lost 50% or more. With the exceptions of Alaska, New Hampshire, and Hawaii, no state has lost less than 20% of its original wetland acreage (Dahl 1990).

In Canada, about 14.3% of the wetlands have been lost. However, regional impacts in some southern areas have been severe. For example, it is estimated that over 40% of the wetland base has been destroyed in Prairie Canada (Canada/United States 1986). Of a total of 343 million acres in Canada, 49 million have

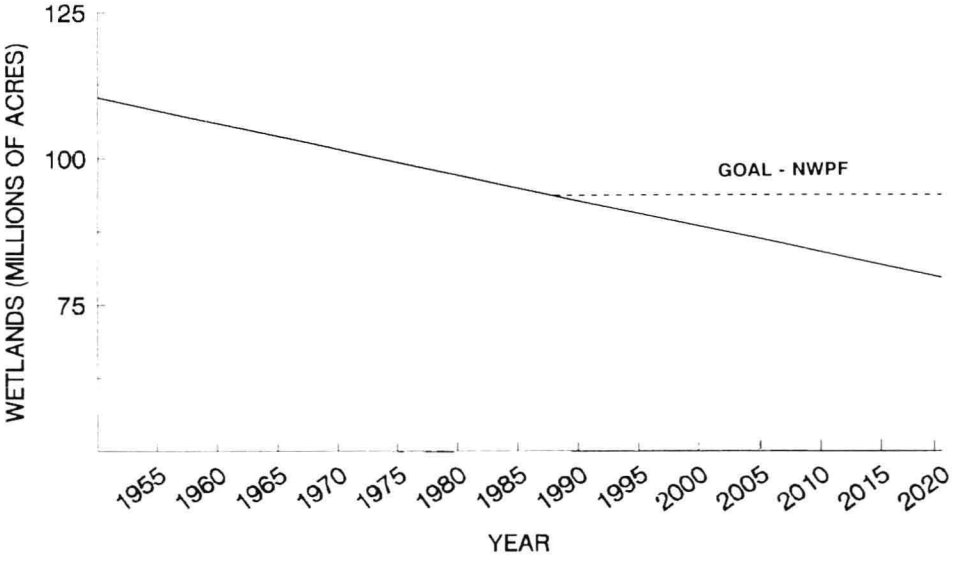

Figure 1. *Wetland trend based on acres of wetlands in the mid-1950s and mid-1970s in the conterminous U.S. (Tiner 1984) and the National Wetlands Policy Forum (NWPF) goal.*

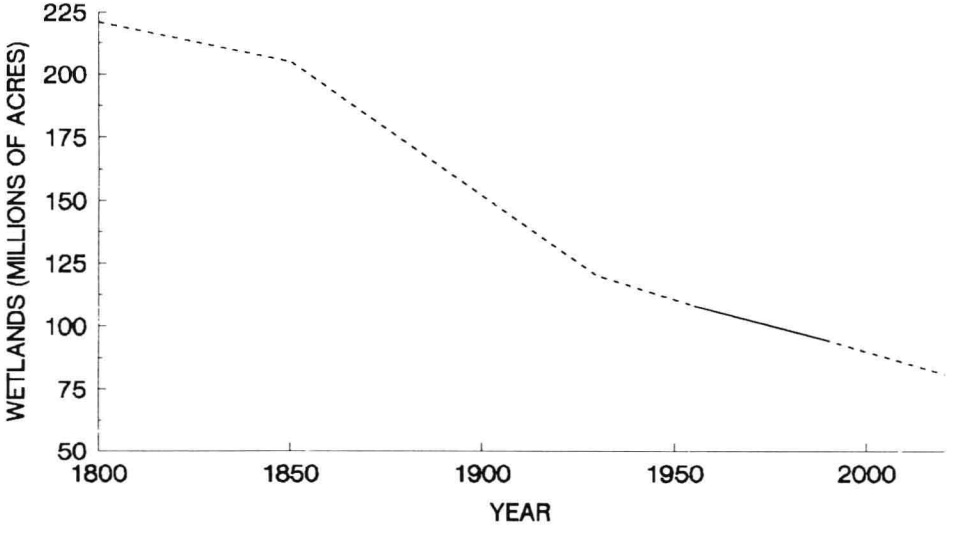

Figure 2. *Theoretical trend in wetland acreage in the conterminous U.S., 1800-2020 (Dahl 1990).*

been lost, of which 85% can be attributed to agricultural practices. Annual loss rates are currently estimated to be about 350,000 acres (C. Rubec pers. commun.).

In other portions of North America, wetland conversions have been at a much lower magnitude. In Mexico, wetland losses have not been estimated, but are believed to be substantially lower than in the conterminous U.S.. However, the recent loss rates in all other countries are believed to be increasing.

WATERFOWL POPULATION STATUS AND TRENDS

Because waterfowl are viewed as the most economically important group of migratory birds in North America, an extensive data base has been assimilated for their management. The quality and quantity of information depicting population status and long-term trends varies among species. The exact number of birds present for any given species or population is not known, but we used the best information available to determine long-term trends and to project relative changes into the 21st century.

Ducks

"More Game Birds in America" (Anonymous 1935) estimated that about 65 million ducks may have been present in North America during 1935. At that time, continental duck populations were depressed because of the widespread drought that occurred during the early 1930s. From 1935-54, efforts to assess duck abundance were mostly composed of noncoordinated regional surveys of general abundance and could not be used in any systematic way to depict trends on a continental basis. Since 1955, annual breeding population surveys encompassing more than 1.3 million square miles (3.3 million km^2) have been conducted in principal duck breeding areas in North America (Canadian Wildlife Service and U.S. Fish and Wildlife Service 1977).

Information from these operational surveys is most reliable for the more abundant species and widely distributed species, and less so for species that have nesting ranges outside the surveyed area. For our assessment of duck population trends, we used information from the surveyed area for 10 principal duck species as an index to continental trends, 1955-91 (Bortner et al. 1991)(Table 1, page 8). The resulting trend and the North American Waterfowl Management Plan population goal for these species were extended through the year 2020 (Figure 3, page 7). Although the cyclic occurrence of drought in important prairie nesting areas is particularly evident, we believe the long-term trend represents a realistic projection for duck populations.

To depict duck population trends prior to and after the 1955-90 period, we

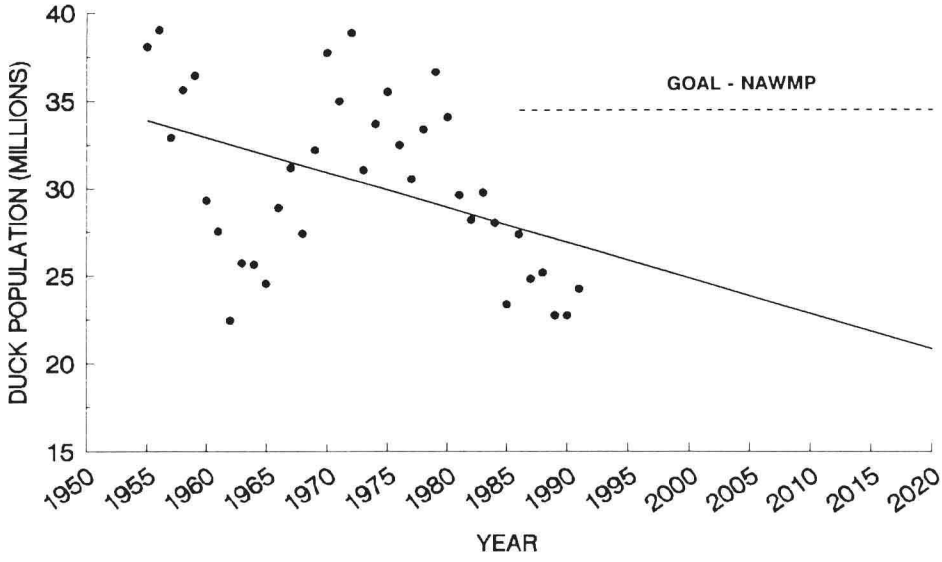

Figure 3. *Breeding population trend for the 10 principal duck species in the area annually surveyed during 1955-91 (Bortner et al. 1991) and the North American Waterfowl Management Plan (NAWMP) goal (Canada/United States 1986).*

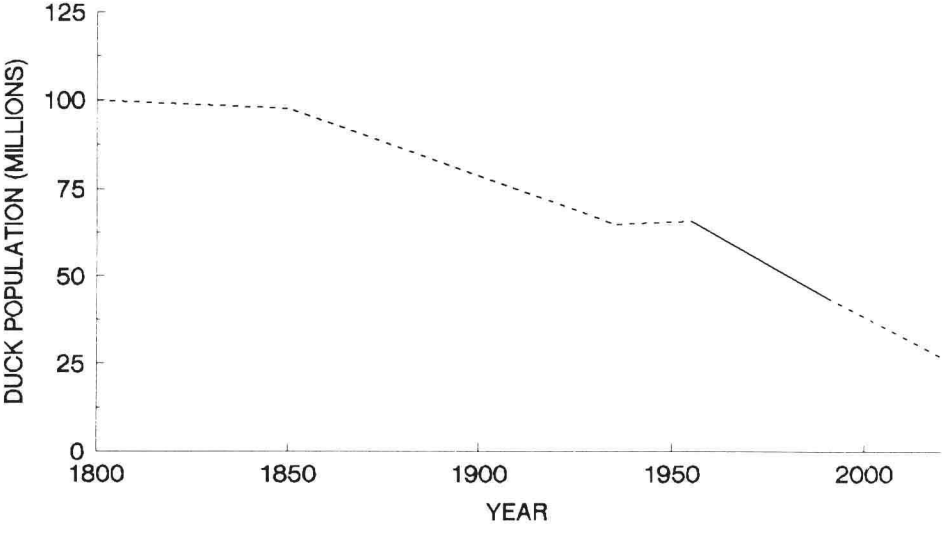

Figure 4. *Theoretical trend of North American duck breeding populations, 1800-2020.*

TABLE 1. *Breeding population estimates (thousands) for the 10 principal duck species in the area annually surveyed, 1955-91 (Bortner et al. 1991). Species abbreviations include: MAL = Mallard (*Anas platyrhynchos*), GAD = Gadwall (*A. strepera*), WIG = American Wigeon (*A. americana*), GWT = Green-winged Teal (*A. crecca*), BWT = Blue-winged Teal (*A. discors*), SHO = Shoveler (*A. clypeata*), PIN = Northern Pintail (*A. acuta*), RED = Redhead (*Athya americana*), CVB = Canvasback (*A. valisineria*), and LSC = Lesser Scaup (*A. affinis*).*

Year	MAL	GAD	WIG	GWT	BWT	SHO	PIN	RED	CVB	LSC	TOTAL
1955	8,708	692	3,142	1,795	5,547	1,665	9,520	592	599	5,816	38,076
1956	9,927	810	3,008	1,411	4,903	1,712	9,967	780	703	5,801	39,022
1957	9,226	692	2,950	1,015	4,362	1,462	6,356	544	625	5,677	32,909
1958	11,452	462	3,371	1,320	5,387	1,277	5,862	449	755	5,285	35,620
1959	9,231	529	3,780	2,582	5,148	1,507	6,610	524	499	7,018	36,428
1960	7,171	721	2,921	1,383	4,177	1,715	5,400	484	598	4,735	29,305
1961	7,237	597	3,068	1,692	3,654	1,280	3,856	318	440	5,396	27,538
1962	5,309	846	1,929	639	2,985	1,228	3,397	507	364	5,256	22,460
1963	6,683	1,094	1,783	1,135	3,747	1,311	3,616	415	523	5,415	25,722
1964	5,822	830	2,438	1,441	4,045	1,615	3,026	519	701	5,205	25,642
1965	5,261	1,273	2,332	1,235	3,646	1,406	3,677	599	522	4,609	24,560
1966	6,723	1,672	2,330	1,555	3,800	2,116	4,778	712	690	4,505	28,881
1967	7,533	1,384	2,346	1,570	4,533	2,319	5,288	737	505	4,954	31,169
1968	7,152	1,965	2,407	1,449	3,492	1,674	3,506	518	578	4,669	27,410
1969	7,590	1,579	2,955	1,508	4,145	2,177	5,915	635	508	5,170	32,182
1970	10,026	1,607	3,473	2,178	4,866	2,238	6,396	624	582	5,707	37,697
1971	9,464	1,604	3,321	1,916	4,620	2,027	5,901	540	451	5,112	34,956
1972	9,326	1,623	3,196	1,915	4,294	2,470	7,045	554	427	7,971	38,821
1973	8,152	1,251	2,887	1,970	3,350	1,629	4,355	503	627	6,312	31,036
1974	6,849	1,598	2,717	1,877	5,005	2,029	6,639	629	513	5,813	33,669
1975	7,631	1,644	2,746	1,689	5,907	1,974	5,900	833	616	6,543	35,483
1976	8,053	1,247	2,493	1,542	4,763	1,759	5,481	672	620	5,835	32,465
1977	7,561	1,319	2,583	1,328	4,628	1,508	3,948	641	690	6,303	30,509
1978	7,538	1,566	3,295	2,231	4,506	1,979	5,113	743	380	6,002	33,353
1979	8,060	1,753	3,097	2,080	4,867	2,398	5,393	696	576	7,676	36,596
1980	7,790	1,400	3,593	2,075	4,909	1,906	4,520	760	760	6,350	34,063
1981	6,569	1,412	2,934	1,865	3,757	2,333	3,483	602	627	6,014	29,596
1982	6,377	1,641	2,460	1,544	3,673	2,142	3,709	618	512	5,495	28,171
1983	6,455	1,518	2,635	1,835	3,378	1,874	3,515	713	527	7,286	29,736
1984	5,333	1,536	3,004	1,375	3,986	1,622	2,980	675	532	6,968	28,011
1985	4,839	1,308	2,045	1,441	3,470	1,700	2,513	581	385	5,083	23,365
1986	6,874	1,543	1,740	1,659	4,450	2,118	2,736	560	438	5,231	27,349
1987	5,630	1,318	1,978	1,983	3,533	1,948	2,629	502	454	4,847	24,822
1988	6,348	1,357	2,194	2,045	3,979	1,677	2,014	441	437	4,683	25,175
1989	5,503	1,382	2,009	1,846	3,192	1,483	2,098	504	455	4,281	22,753
1990	5,305	1,616	2,089	1,767	2,828	1,719	2,243	466	511	4,193	22,737
1991	5,353	1,573	2,328	1,601	3,779	1,663	1,798	437	463	5,247	24,242
Avg	7,353	1,288	2,701	1,664	4,209	1,805	4,677	587	548	5,645	30,480
NAWMP Goal	8,300	1,500	3,000	1,900	4,700	2,000	5,600	643	548	6,300	34,500

assumed that about a third of the North American duck population breeds outside the surveyed area (Canada/United States 1986). The relationship of the slope of wetland losses and duck population declines was probably similar for the 1850-1970 period, but the downward trend in duck populations is greater than the trend in wetlands for the decade of the 1980s (Figure 4, page 7). This change is probably due to the widespread drought and increases in other impacts on duck recruitment that have occurred in nesting areas. Currently,

TABLE 2. *Population indices (thousands) for Canada goose (*Branta canadensis*) populations based on surveys conducted during the fall and winter period 1969/70 - 89/90 (Bortner et al. 1991) Population abbreviations include: AFP=Atlantic Flyway Population, SJBP=Southern James Bay Population, MVP=Mississippi Valley Population, EPP=Eastern Prairie Population, WP/GP=Western Prairie/Great Plains Population, TGPP=Tall Grass Prairie Population, SGPP=Short Grass Prairie Population, H-LP=Hi-Line Population, RMP=Rocky Mountain Population, DSKY=Dusky Population, CCG=Cackling Population.*

Year	AFP	SJBP	MVP	EPP	WP/GP	TGPP	SGPP	H-LP	RMP	DSKY	CCG
1969/70	775.2	106.9	324.7	106.6			151.2	44.2		22.5	
1970/71	675.0	127.3	292.3	126.3		133.2	148.5	40.5		19.8	
1971/72	700.2	117.6	293.9	157.4		160.9	160.9	31.4		17.9	
1972/73	712.0	101.3	295.9	181.4		148.4	259.4	35.6		15.8	
1973/74	760.2	136.0	277.9	205.8		160.5	153.6	24.4		18.6	
1974/75	819.3	101.0	304.4	197.1		133.5	123.7	41.2		26.5	
1975/76	784.5	115.5	304.9	204.4		203.7	242.5	55.6		23.0	
1976/77	923.6	129.8	478.5	254.2		171.3	210.0	67.6		24.1	
1977/78	833.2	180.4	575.5	270.2		215.5	134.0	65.1	60.0	24.0	
1978/79	823.6	142.7	434.5	207.2		187.6	163.7	33.8	62.5	25.5	
1979/80	780.1	127.0	394.9	171.8		165.9	213.0	67.2	66.2	22.0	64.1
1980/81	955.0	120.3	367.4	150.9		257.7	168.2	94.3	91.0	23.0	127.4
1981/82	702.6	118.5	250.9	145.3	175.0	284.7	156.0	81.9	71.1	17.7	87.1
1982/83	888.7	129.9	303.7	210.4	242.0	171.8	173.2	75.9	73.1	17.0	54.1
1983/84	822.4	129.9	352.8	162.7	150.0	279.9	143.5	39.5	61.6	10.1	26.2
1984/85	814.2	129.3	477.2	167.6	230.0	207.0	179.1	76.4	88.4	7.5	25.8
1985/86	905.4	158.0	618.9	169.0	115.0	198.2	181.0	69.8	66.3	12.2	32.1
1986/87	754.8	129.8	514.6	182.7	324.0	163.2	190.9	98.1	66.2		51.4
1987/88	737.9	158.8	564.6	228.4	272.1	315.8	139.1	66.8	71.4	12.2	54.8
1988/89	660.7	170.2	734.6	184.5	330.3	224.2	284.8	100.1	73.9	11.8	69.9
1989/90	733.8	159.4	1098.2	324.9	271.0	159.0	378.1	105.9	102.4	11.7	76.8

many duck populations are substantially below established goals, and it is unlikely that a return to average precipitation patterns in important prairie nesting areas will bring about recovery for several of these species.

Geese, Brant, and Swans

In contrast to ducks, the main source of population information for goose, brant, and swan populations in North America is the annual Mid-winter Survey. This survey has been conducted since the mid-1930s (Martin et al. 1979, Smith et al. 1989). Because methodologies do not allow point estimates of population size, results from these surveys can best be used to determine long-term trends for various population management units.

For our assessment, we utilized trend information presented by Trost et al. (1990) and the Mid-winter Survey results to examine long-term trends for 12 Canada goose *(Branta canadensis)* populations (Table 2, above), 3 snow goose *(Chen caerulescens)* populations, 3 white-fronted goose *(Anser albifrons)* populations, 2 brant *(Branta bernicla)* populations, and 2 tundra swan *(Cygnus columbianus)* populations (Table 3, page 10).

TABLE 3. *Population indices (thousands) for snow geese (*Chen caerulescens*), greater white-fronted geese (*Anser albifrons*), brant (*Branta bernicia*), and tundra swans (*Cygnus columbianus*) based on surveys conducted during the fall and winter 1969/70-90/91 (Bortner et al. 1991). Population abbreviations include: GSG=Great Snow Goose, MCP=Mid-Continent Lesser Snow Goose Population, WMC=Western Greater White-fronted Goose Population, PF=Pacific Flyway Greater White-fronted Goose Population, ATL=Atlantic Brant Population, PAC=Pacific Brant Population, ETS=Eastern Tundra Swan Population, and the WTS=Western Tundra Swan Population.*

Year	GSG	MCP	WCF	EMC	WMC	PF	ATL	PAC	ETS	WTS
1969/70		818.7		50.6	85.4			141.7	55.0	31.0
1970/71	49.0	1067.3		39.3	128.5		151.0	149.2	58.2	98.9
1971/72	81.0	1331.8		45.8	38.6		73.0	124.8	62.8	82.9
1972/73	59.0	1025.3		43.0	131.0		41.0	125.0	57.1	33.9
1973/74	95.0	1189.7		43.2	157.5		88.0	130.7	64.2	69.8
1974/75	70.0	1096.9		40.4	133.2		88.0	123.5	66.6	54.3
1975/76	117.0	1562.4		53.4	127.0		127.0	122.1	78.6	51.4
1976/77	127.0	1150.3	34.0	50.4	204.4		74.0	147.0	76.2	46.7
1977/78	74.0	1967.0	31.0	53.1	283.6		46.0	162.9	70.2	45.6
1978/79	100.0	1285.5	29.0	49.3	250.6		44.0	129.4	78.6	53.5
1979/80	107.0	1387.7	30.0	59.0	245.0	73.1	69.0	146.4	60.4	65.2
1980/81	81.0	1406.3	37.0	67.5	71.4	93.5	97.0	194.2	92.8	83.6
1981/82	72.0	1794.0	50.0	65.6	233.9	116.5	106.0	121.0	72.9	91.3
1982/83	82.0	1755.5	76.0	62.0	201.3	91.7	124.0	109.3	86.5	67.3
1983/84	99.0	1494.4		70.3	6.6	112.9	127.0	133.4	81.1	61.9
1984/85	187.0	1973.1	63.0	81.3	72.7	100.2	146.0	144.8	93.9	48.7
1985/86	100.0	1449.3	97.0	78.6	100.4	93.8	110.0	128.5	90.9	66.2
1986/87	102.0	1913.8	64.0	71.5	144.3	107.1	111.0	128.5	94.4	52.8
1987/88	198.0	1750.5	46.2	76.7	95.4	130.6	131.0	138.6	76.2	59.2
1988/89	192.0	1956.1	74.3	116.5	99.4	161.5	138.0	128.1	90.6	78.7
1989/90	231.2	1724.2	38.7	103.3	152.5	218.8	135.4	146.0	89.6	40.1
1990/91	199.0	2135.9	104.6	135.7	115.9	240.8	147.7	127.4	95.9	47.6

To project trends for geese and brant, we combined population information for the above populations and for comparative purposes included the combined North American Waterfowl Management Plan goals (Figure 5, page 11). We conducted a similar assessment for two populations of tundra swans (Figure 6, page 12). The resulting trends project status for these populations through the year 2020.

In contrast to duck populations, current population levels are above established goals and an upward trend is evident. Although the causal factors for these trends have not been isolated, these species nest primarily in arctic and subarctic regions that have been relatively unaffected by wetland conversion. Water regimes in these northern nesting habitats are typically more stable than prairie areas and weather has been favorable for reproduction in recent years. Many populations have taken advantage of enhanced food resources in agricultural areas of migration and wintering areas. Improved interspersion of refuge areas among hunting zones has also likely increased goose survival in recent decades.