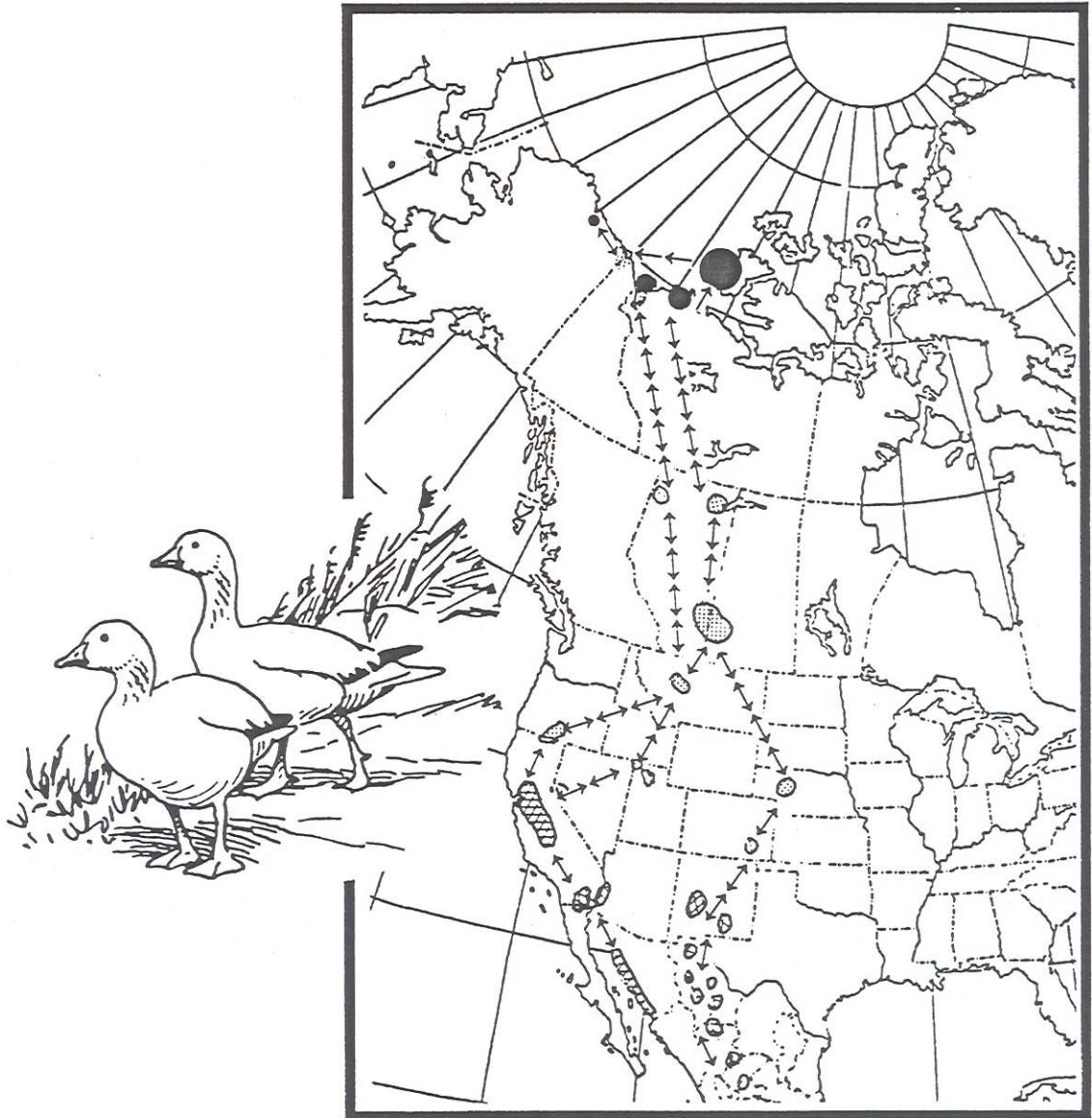


# Western Arctic Population of Lesser Snow Geese



This management plan is one of a series of cooperatively developed plans for managing the various species of migratory birds of the Pacific Flyway. Inquiries about this plan may be directed to member states of the Pacific Flyway Council or to the Pacific Flyway Representative, U.S. Fish and Wildlife Service, 911 N.E. 11th Ave., Portland, OR 97232.

PACIFIC FLYWAY MANAGEMENT PLAN  
FOR THE  
WESTERN ARCTIC POPULATION OF LESSER SNOW GEESE

Prepared for the:

Pacific Flyway Council  
Dirección General de Conservación Ecológica de Recursos Naturales  
U.S. Fish and Wildlife Service  
Canadian Wildlife Service

Prepared by:

Subcommittee on White Geese  
Pacific Flyway Study Committee

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Approved by:

  
Chairman, Pacific Flyway Council

7-31-92  
Date

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TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION .....	1
II. GOALS AND OBJECTIVES .....	1
III. STATUS	
A. Nesting Areas .....	3
B. Migration Routes .....	3
C. Chronology .....	5
D. Production and Mortality .....	6
IV. HARVEST .....	6
V. NONCONSUMPTIVE USE .....	8
VI. CURRENT MANAGEMENT PRACTICES .....	8
VII. PROBLEMS .....	8
VIII. RECOMMENDED MANAGEMENT ACTIONS	
A. Habitat .....	10
B. Harvest Regulations .....	11
C. Population Monitoring .....	12
D. Research .....	13
IX. PLAN IMPLEMENTATION AND REVIEW .....	15
X. LITERATURE CITED .....	16

LIST OF FIGURES

	<u>Page</u>
1. Distribution of lesser snow geese (Wrangel Island and Western Arctic populations) and Ross' geese as related to the Pacific Flyway .....	2

LIST OF APPENDICES

A.	Description of habitats used by Western Arctic lesser snow geese of the Pacific Flyway.....	18
B.	Estimated white geese in the Pacific Flyway from midwinter counts and special November-December white goose surveys.....	20
C.	Photographic inventories of lesser snow goose colonies in the Western Canadian Arctic.....	21
D.	Indirect band recoveries from lesser snow geese banded at Tule Lake NWR, California, 1951-81.....	22
E.	Indirect band recoveries from lesser snow geese banded in Imperial Valley, California, 1966-72.....	23
F.	Winter inventories and productivity of snow and Ross' geese in the Central Flyway.....	24
G.	Winter populations of white geese on Bosque del Apache NWR, New Mexico, 1951-89.....	25
H.	Estimated lesser snow/blue goose harvests (X1,000) in the Pacific Flyway, Alaska, the Central, Mississippi, and Atlantic Flyways and U.S.....	26
I.	Snow goose harvest on Summer Lake Wildlife Area, Oregon, 1952-1991.....	27
J.	Snow goose harvest on California-operated waterfowl hunting areas.....	28
K.	Light goose harvest on Bosque del Apache NWR, New Mexico, 1966-1992.....	29

## I. INTRODUCTION

This plan provides guidelines for management of the Western Canadian Arctic Population (WAP) of lesser snow geese (*Chen c. caerulescens*) in the Pacific Flyway. This population breeds primarily in the western Canadian Arctic and winters mainly in California (Pacific Flyway), with smaller segments wintering in southeastern Colorado, New Mexico, and northern Mexico (Western Central Flyway or WCF). There are important migration staging areas known from the Alaska and Yukon Arctic Coastal Plain, the Mackenzie River Valley, southeastern Alberta, southwestern Saskatchewan, western Montana, southern Oregon, western Utah, southeastern Colorado, and northeastern California (Appendix A). The WAP mixes in migration and on the wintering grounds with the Wrangel Island Population (WIP) and Central Arctic Population (CAP) of lesser snow geese, and Ross' geese (*C. rossii*) (Figure 1). These other populations are addressed in separate management plans, but must be treated in an integrated way with the WAP.

Lesser snow geese in North America include blue and white color phases (Cooch 1961). Blue phase geese are rare in the WAP, averaging approximately one blue per 10,000 white geese (McLandress and McLandress 1979). A sample of birds neckbanded 1987-1989 indicated one per 2,000 white phase.

Traditional midwinter surveys indicate a long-term average of 443,695 white geese wintered in the Pacific Flyway in the period 1955-1991. In 1979, the operational survey for Pacific Flyway white geese was changed to an early December count which has averaged 520,000 geese (Appendix B). These counts do not distinguish the proportions of white geese which originate from the WAP, the WIP, or the CAP, nor do they distinguish between snow and Ross' geese. The proportions of these populations in the Pacific Flyway are known to have changed dramatically since initiation of population surveys. Additional WAP snow geese winter in the WCF, including north central Mexico, where they mix with CAP snows and Ross' geese. The WCF wintering population complex is growing and changing in composition; there were an estimated 172,700 birds in the 1989-90 winter, of which 12.6% were Ross' geese (Benning 1990).

## II. GOALS AND OBJECTIVES

The goal of this management plan is to conserve populations and optimize distribution of snow geese in all parts of their range for all their benefits to society. It is recognized that the distribution of WAP lesser snow geese between the Pacific and Central Flyways is currently dynamic. Cooperative management planning between all jurisdictions needs to be integrated, as soon as possible, on the basis of best available information on breeding population units.

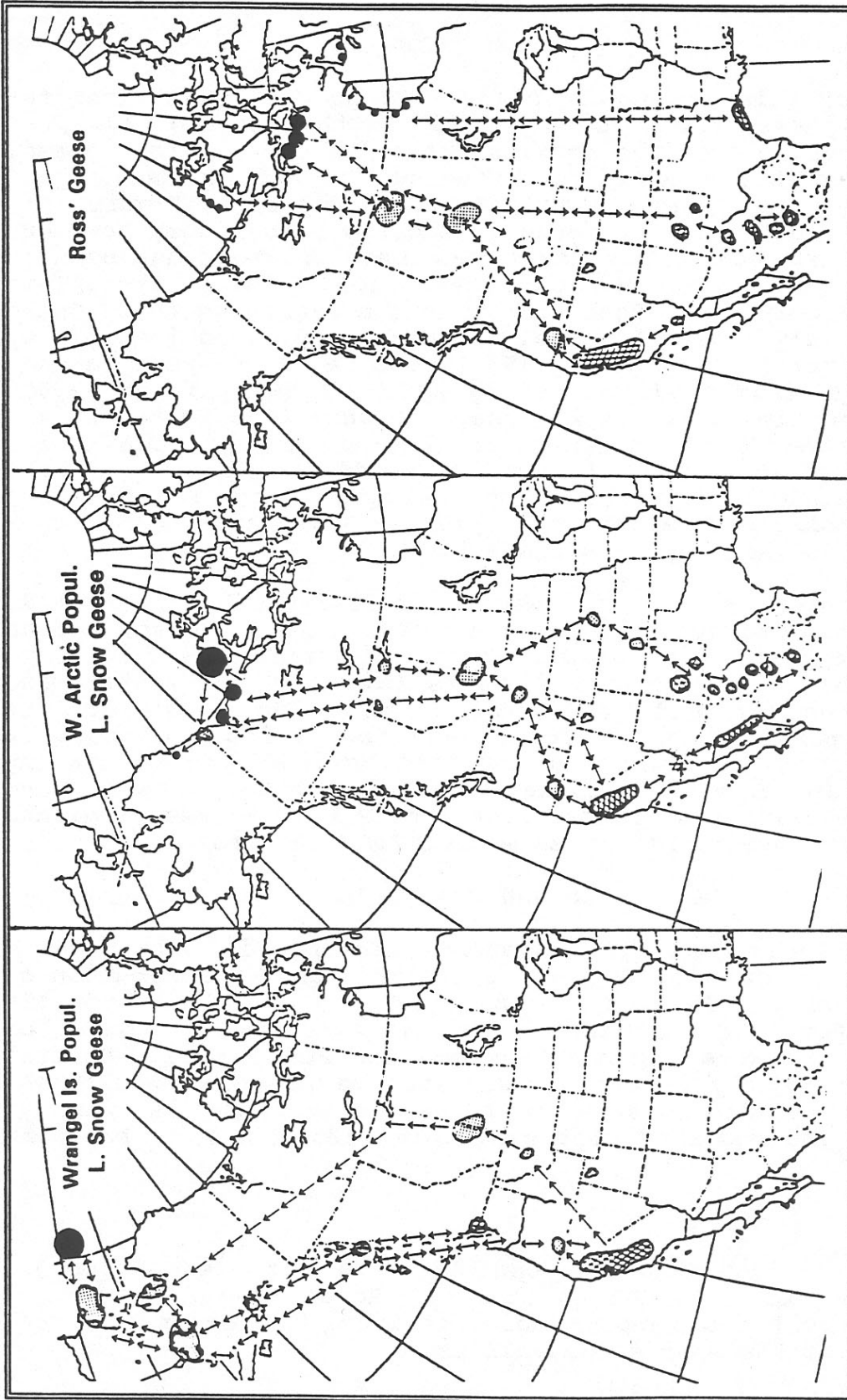


Figure 1. Distribution of lesser snow geese (Wrangel Island and Western Arctic populations) and Ross' geese as related to the Pacific Flyway.

## Objectives

- A. Maintain a breeding population of 200,000 adult snow geese on the three traditional breeding area (Banks Island, Anderson River Delta, and Kendall Island), based on a 5-year photographic inventory.
- B. Determine existing seasonal snow goose distribution and relate to breeding populations.
- C. Protect and or manage adequate year-round habitat to meet population and distribution objectives for snow geese.
- D. Provide for aesthetic, educational, scientific, and consumptive uses of these snow geese.
- E. Manage harvest to obtain population and distribution objectives.

## III. STATUS

### A. Nesting Areas

Most (95% of the total) WAP snow geese nest in the Egg River colony on Banks Island, with smaller colonies on the delta of the Anderson River and at Kendall Island in the Mackenzie River delta. In 1987, those three colonies had 98,300; 3,600; and 700 nesting pairs of snow geese, respectively (Kerbes 1988a, Appendix C). A small colony of approximately 200 nesting pairs is found on the Sagavanirtok River delta in Alaska. Occasionally, a few small colonies or broods are seen elsewhere in northern Alaska and the western Canadian Arctic.

All main breeding colonies are located on flat, paleozoic coastal areas, drained by braided deltas, and are within five miles of salt water, with the exception of those along the Egg and Kellet Rivers, which are about 16 miles inland (McEwen 1958).

### B. Migration Routes

The Arctic Coastal Plain of northeastern Alaska and the Yukon Territory is an important fall staging area for up to 700,000 WAP snow geese (Koski 1977). Up to 325,760 snow geese were estimated in the Arctic National Wildlife Refuge in 1978, but the average is 136,000 (Spindler 1978). In most years, the Mackenzie River Delta is the major coastal staging area for WAP lesser snow geese (Barry 1967, Koski 1977). From there, they move up the Mackenzie River to additional staging areas, first in southern NWT, then in southeastern Alberta and southwestern Saskatchewan.

Eventually, WAP snow geese continue south by two main routes (Figure 1). One route passes through Freezeout Lake, Montana, then southwest to Summer Lake, Oregon and the Klamath Basin on the Oregon-California border (a small portion of these birds moves through the Bear River Marshes of Utah and the Carson Sink of Nevada). These geese move on to winter in the Central Valley (especially the Sacramento Valley) of California, while the Utah birds winter in the Imperial Valley (Rienecker 1965; Appendices D, E).

The other migration route used by WAP geese leaving the Canadian prairies passes east of the Rocky Mountains to wintering grounds in the Panhandle of Texas, the Rio Grande and Pecos River valleys of New Mexico, and the Central Highlands of Mexico. Since the winter of 1984-85, significant numbers of snow geese have wintered in southeastern Colorado (J. Voelzer, pers. comm.). Much of the fall migration occurs non-stop between Prairie Canada and wintering areas. Conventional leg banding done through the early 1980's indicated little or no interchange between Pacific and Central Flyways (Appendices D, E). However, recent neck collaring studies have shown that some WAP snow geese move between the California and WCF wintering areas, sometimes moving in both directions the same winter (Kerbes 1988b, 1989, 1990).

The 1980-1989 average midwinter survey and December counts of white geese in the Pacific Flyway, excluding Mexico, were 447,827 and 483,380, respectively (Appendix B). Over 90% of the birds recorded on both of these surveys wintered in California. Within that state, approximately 4% were counted in the Imperial Valley, 2.4% in the San Joaquin Valley, 10% in the Klamath Basin, and 82% in the Sacramento Valley. These include both WAP and WIP snow geese, and Ross' geese. The latter may make up as much as 40% of the California wintering white goose population (Silveira 1989). Other than the Skagit River/Fraser River birds, which are WIP, only small numbers of white geese winter anywhere else in the Pacific Flyway.

The WCF snow geese wintering in the Pecos and Rio Grande river valleys of New Mexico and in north central Mexico belong to both WAP and CAP breeding segments, as emphasized by recent neck collar observations (Kerbes 1990). The proportions of each breeding segment comprising this wintering population are not yet known, but neck collar studies should help to clarify this in the near future. The midwinter survey estimate of this population has increased from about 104,000 in the early 1980's to about 134,000 in the late 1980's (Appendix F). A 1989-1990 productivity survey estimated the wintering population at 141,000 (Benning 1990). Peak fall populations at Bosque Del Apache and Bitter Lake NWR's show similar trends (Appendix G). In spring, these WCF snow geese first swing northeast to southeastern Colorado, then north through Nebraska and on to Saskatchewan.

Using dyed geese in spring, Kozlik et al. (1959) found that some geese migrate north by way of western Oregon, along the Washington coast, through British Columbia and into Alaska. These birds probably continued

on to Wrangel Island. The remainder of the geese passed through eastern Oregon, across Montana, through Alberta, and into the Northwest Territories to Canadian breeding grounds. Some birds banded in Montana during spring were recovered on Wrangel Island. A surprising number of recently marked WIP birds are now being recorded using an interior prairie route north in spring (Kerbes 1989). Neck collar observations are confirming migration routes for all snow goose populations, but analyses of these data are not complete.

### C. Chronology

Non-breeding snow geese leave Banks Island about mid-August on their southern migration. They first stage on the northwest edge of the Mackenzie Delta, where in early September they are joined by adults with young (Barry 1967). The main departure from the Western Arctic occurs normally between 15-20 September. On the staging areas of southeastern Alberta and southwestern Saskatchewan, snow geese peak in mid- to late October. Peak numbers are usually reached at Freezeout Lake, Montana about the first week in November, and most have departed by the latter part of the month. From there, snow geese move both southwest to California and southeast to New Mexico, but the timing of the easterly migration is not well documented.

A few white geese start to arrive in the Klamath Basin during mid-September, but large numbers usually do not arrive until late October or early November. Until recently, the early arriving birds were assumed to be from the WIP, based on results of the 1976-1977 color marking. In 1988, however, when marked samples from both populations were available, the main flight of the WAP arrived more than two weeks earlier than that of the WIP (Silveira 1989). The chronology was similar in 1989 (J. Silveira, pers. comm.). Surveys suggest that while most of the geese wintering in the Central Valley stage first in the Klamath Basin, in recent years increasing numbers of snow geese come into the Central Valley at about the same time that geese arrive in the Klamath Basin.

From neck banding studies there is evidence of interchange between some WAP geese wintering in California and those in New Mexico or Mexico. These movements appear to occur between early December and February, and take place in both directions, with some geese going both ways in the same winter (Kerbes 1988b, 1989, 1990).

Spring migration begins during February as geese leave the Central Valley for the Klamath Basin and southern Oregon, where they remain until mid-April. Birds then move northward, stopping in eastern Oregon and eastern Idaho before moving to western Montana, southeastern Alberta, and southwestern Saskatchewan. Geese then travel north with the snow melt, particularly along the Mackenzie River Valley, staging on islands in the river in mid-May (R. Bromley, pers. comm.). Beyond the zone of agriculture, the migration passes the snow melt line to arrive on the

nesting grounds 15 May-15 June, peaking at the end of May (Porsild 1943, Manning et al. 1956, McEwen 1958, Barry 1967). When the geese arrive on the nesting area, flocks break up into small groups and then into pairs as soon as snow-free ground is available (Barry 1967).

#### D. Production and Mortality

Barry (1967) concluded that most snow geese nest for the first time in their third summer, but in particularly favorable seasons, some 2-year-olds may breed. When snow conditions permit, nesting commences a few days after arrival on the breeding grounds. Most nest construction occurs within a ten-day period, regardless of the phenology of the season. Generally, 12 days after the first nest has been completed, all laying is terminated (Cooch 1961). In a delayed season when snow melt is late, the last bird to start laying has only about 83 days before freeze up. Each pair occupies and defends a small area around the nest. Nests can be as close as 6 feet apart in the dense centers of colonies. Average clutch size varies according to chronology of snow melt. For example, early snow melts result in larger clutches than when snow melt is late (Cooch 1961). Number of eggs per clutch varies from 2 to 10, but rarely exceeds 5. Average clutch size is 4.42, but the number of eggs surviving to hatch is dependent upon the phenology of the season and nest predation (Cooch 1961).

Lesser snow geese are usually successful nesters, except during years of extremely severe weather. Barry (1967) found that only 11.3% of over 14,000 nests failed completely on the Anderson River Delta. The Arctic fox (*Alopex lagopus*) is the most serious predator of snow goose eggs on Banks Island, but adverse weather is the most important factor controlling production (McEwen 1958; Lynch and Voelzer 1974).

During the period 1973-1981, Pacific Flyway snow geese averaged 31% young in the fall population, ranging from 1% in 1974 to 47% in 1975 (J. Voelzer, pers. comm.). Productivity surveys have not been conducted on these geese in the Pacific Flyway since 1981. In the WCF, productivity surveys recorded an average of 24% young during the period 1979-1989 (Benning 1990). Annual mortality rates of snow geese range from 50-55% for immatures, 25% for subadults and other nonbreeders, and 25-30% for adults (Cooch 1958; Reinecker 1965).

#### IV. HARVEST

Currently, no method exists for estimating the proportions of harvest among the various snow goose breeding segments which winter in the Pacific and Central Flyways. Total snow goose harvest is measured by the Federal Waterfowl Parts Collection and Mail Questionnaire Surveys. About

33,000 snow geese were harvested in the Pacific Flyway in 1991, slightly below the 1986-90 average, but 29% below the most recent 10-year mean (Appendix H). Most of the flyway harvest occurs in California (85% in 1991; 77% during 1980-89). Important WAP snow goose harvest areas in other Pacific Flyway states included Teton County, Montana; Lake County, Oregon; Churchill County, Nevada; and Mojave County, Arizona. Harvest at Summer Lake Wildlife Area in Oregon is shown in Appendix I. Snow geese taken near Puget Sound, Washington are probably all WIP geese.

In 1991, snow geese comprised 44% of California's total goose harvest. The important snow goose harvest counties within California in 1988, expressed as a percentage of the state total, were: Siskiyou (13%), Butte (12%), Colusa (19%), Glenn (21%), Merced (4%), Inyo (12%), and Imperial (12%). The adjacent counties of Glenn and Colusa in California are the most important snow goose harvest areas in the flyway.

Records are available for goose harvest on state-operated public hunting areas in California. The average number of snow geese taken on these areas was 4,363 during 1981-90, down 42% from the 1971-80 average; the 1990 harvest was 4,594 (Appendix J). Sacramento and Delevan NWRs on the west side of the Sacramento Valley accounted for 43% of the public area take during this period. Annual hunter use-day totals on these areas are declining. Use of public areas is closely related to number and size of management areas, types of hunt programs, available waterfowl, and hunter success.

In the WCF, snow goose harvest averaged 4,695 during 1981-1989, with 80% of this harvest occurring in New Mexico. Bosque del Apache NWR is one of the few major harvest areas in this region for which harvest records are available (Appendix K). Snow goose take is increasing on and near this refuge, though changes in the hunt program after 1985 obscure the data. No harvest figures are available from Mexico, but take is believed to be light there.

Snow goose harvest in western Canada appears to be declining overall, but increasing in southwestern Saskatchewan. Average take in western Canada dropped from 27,296 (1969-1978) to 19,082 (1979-1988). During the same period in southwestern Saskatchewan, average harvest increased from 8,725 to 10,308, while southern Alberta harvest declined from an average of 14,848 to 5,866.

Subsistence hunting on the WAP lesser snow goose populations occurs in breeding areas, but it is unmeasured and its significance is not known.

## V. NONCONSUMPTIVE USE

Snow geese are impressive in areas of concentration and are of special interest to the general public. Non-consumptive use on California State waterfowl areas tripled between 1973-74 (53,966 visits) and 1981-82 (149,753 visits) (Calliga 1983). Visits on federal waterfowl areas are presumed to be comparable. With increased interest in wildlife, nonconsumptive use is growing.

## VI. CURRENT MANAGEMENT PRACTICES

- A. Establishment and enforcement of recreational hunting seasons, bag and possession limits.
- B. Annual fall white goose survey and mid-winter waterfowl inventory to determine aggregate population size, with ground sampling to estimate proportion of Ross' geese.
- C. Federal and state/provincial harvest and hunter participation surveys, Federal Waterfowl Parts Collection Survey, and bag checks on public hunting areas to monitor production and harvest in the U.S. and Canada.
- D. Monitoring losses from avian cholera and investigation of ways to reduce losses.
- E. Managing federal, state, and provincial refuges, management areas and sanctuaries as protected areas for breeding and/or feeding and resting.
- F. Providing the general public opportunities to view snow geese on federal, provincial, and state lands.

## VII. PROBLEMS

- A. Better communications and cooperative involvement are needed among biologists representing the U.S., Canada, Mexico, and the Russian Commonwealth.

- B. The relative proportion of WIP, WAP, and CAP snow geese, and Ross' geese in the Pacific Flyway and WCF should be established. Ongoing neck collaring data should be fully analyzed as soon as possible, to address these vital needs.
- C. There is no measure of annual WAP production, other than indirectly through aerial surveys for population size on southern wintering/staging grounds.
- D. The critical autumn premigration staging areas of the NWT, Yukon, and Alaska's North Slope need protection for geese from human disturbance and habitat degradation.
- E. There is a threat of industrial and residential encroachment on goose habitats, and deleterious changes in agricultural land uses on wintering areas in California.
- F. Acreage of rice fields, prime feeding habitat for snow geese, is fluctuating from year to year. Minimum acreage to support goose population objectives is unknown.
- G. While physiological and nutritional studies have been conducted in the Mississippi Flyway, requirements of wintering snow geese in the PF are not well known.
- H. Disease losses in wintering snow geese have been severe, and fowl cholera is a potential threat on the breeding grounds.
- I. Middle Rio Grande Valley (New Mexico) wintering areas should be assessed to determine management strategies necessary to decrease crop depredations and risk of avian disease.
- J. There is no measure of the size and significance of the subsistence harvest of birds and eggs from the WAP.

VIII. RECOMMENDED MANAGEMENT ACTIONS

A. Habitat

1. Develop a cooperative management plan with Canadian Natives (e.g. related to the Inuvialuit Final Agreement) that will give priority to breeding and staging habitat protection in the north.

Lead Agencies: CWS, NWT, Yukon, Cooperative Wildlife Management Boards

Priority: 1

Schedule: Ongoing

2. Support establishment of wildlife/wilderness parks to protect staging areas in the NWT and Yukon. Support development restrictions and stringent habitat protection measures in the Arctic National Wildlife Refuge to maintain quality and use of staging areas.

Lead Agencies: USFWS, CWS, NWT, Yukon, Alaska, local governments

Priority: 1

Schedule: Ongoing

3. Maintain and/or enhance adequate staging and wintering habitat or state, provincial, territorial, and Federal areas.

- a. Promote agricultural practices and incentive programs in California's Central Valley that will maintain adequate acreage of rice stubble through the fall and winter for goose feeding areas.

Lead Agencies: USFWS, California

Priority: 1

Schedule: Ongoing

- b. Maintain management of Rio Grande Valley state and federal areas to improve local distribution of snow geese.

Lead Agencies: New Mexico, USFWS

Priority: 2

Schedule: Ongoing

- c. Continue the lure crop program in southeastern New Mexico to avoid depredation problems.

Lead Agencies: New Mexico, USFWS  
Priority: 2  
Schedule: Ongoing

- d. Proceed with winter habitat development and management efforts along the lower Colorado River on the Cibola NWR and Bill Williams Waterfowl Area to improve local goose distribution in the Imperial Valley.

Lead Agencies: USFWS, Arizona  
Priority: 3  
Schedule: Ongoing

- 4. Determine if winter habitat changes in Mexico are affecting populations of snow geese. Areas which should be monitored include Laguna de Bavicora, Laguna Salada, Ascension, Casas Grandes, Minsca Mexicanos, Gertrudis Delicias Santiaguillo, south Durango, Laguna de Guzman, and Laguna de Santa Maria.

Lead Agencies: Mexico, USFWS, CWS, DU  
Priority: 3  
Schedule: Ongoing

B. Harvest Regulations

- 1. Establish, adjust, and enforce hunting regulations to meet the objectives of this plan.

Lead Agencies: USFWS, CWS, states, provinces, territories  
Priority: 1  
Schedule: Ongoing

- 2. Continue to monitor regulation compliance and harvest of WAP snow geese to determine effectiveness of harvest strategies.

Lead Agencies: USFWS, CWS, states, provinces, territories  
Priority: 1  
Schedule: Ongoing

3. Initiate a subsistence harvest survey program in Canada involving the subsistence users as data gatherers.

Lead Agency: CWS, NWT, Yukon  
Priority: 1  
Schedule: Ongoing

4. Develop an administrative process to permit and regulate subsistence hunting in Alaska and Canada, pending renegotiation of treaty amendments and protocols.

Lead Agencies: USFWS, CWS, NWT, Yukon, Alaska  
Priority: 1  
Schedule: 1993

C. Population Monitoring

1. Perform photo census of breeding colonies every 3-5 years.

Lead Agency: CWS  
Priority: 1  
Schedule: 1993

2. Continue annual spring surveys of habitat conditions production prospects on major breeding colonies.

Lead Agencies: USFWS, CWS, NWT  
Priority: 1  
Schedule: Ongoing

3. Continue annual determination of age ratios on fall staging areas, such as the North Slope of Alaska and Yukon, Mackenzie Delta, and western prairie provinces.

Lead Agencies: CWS, USFWS, NWT, Yukon, provinces  
Priority: 1  
Schedule: Ongoing

4. Continue annual midwinter population surveys in the Central Flyway (December) and Pacific Flyway (January). Also, continue the special December winter survey initiated in 1979.

Conduct ground surveys to estimate proportion of Ross' geese every third year (1992, etc.), and photographic counts every fifth year (1992, etc.).

Lead Agencies: USFWS, states  
Priority: 1  
Schedule: Ongoing

5. Neck banding and/or color marking of snow geese has been conducted in the western and central Arctic, and on Wrangel Island to determine the migration and distribution of snow goose population units in fall and on the wintering grounds. Comprehensive analysis of band recoveries and resighting data needs to be completed as soon as possible to evaluate population-level management strategies.

Lead Agencies: CWS, USFWS, Russia, Mexico, states,  
provinces, and territories

Priority: 1

Schedule: Ongoing

6. Initiate surveys to determine distribution of snow geese in the Central Highlands of Mexico and the effects of management practices in the middle of Rio Grande Valley on goose movements and distribution.

Lead Agency: USFWS, Mexico, CWS

Priority: 1

Schedule: Ongoing

#### D. Research

1. Improve accuracy of methods of separating tail fans of Ross' geese and snow geese in the Parts Collection Survey.

Lead Agencies: USFWS and CWS

Priority: 1

Schedule: Ongoing

2. Determine the effects of spring-summer subsistence harvest in northern areas on goose populations to facilitate management of future legalized harvest

Lead Agencies: NWT, CWS, USFWS

Priority: 1

Schedule: Ongoing

3. Accelerate fowl cholera investigations and development of management procedures to minimize incidence of disease in snow geese throughout their range.

Lead Agencies: USFWS, CWS, states

Priority: 1

Schedule: Ongoing

4. Initiate a monitoring program to determine toxic contaminant levels in snow geese, examining both juveniles and adults.

Lead Agencies: USFWS, CWS  
Priority: 2  
Schedule: Undetermined

5. Initiate research efforts on Banks Island, a key WAP snow goose breeding area, to determine breeding biology parameters and potential productivity of established colony sites, ecology and micronutrient requirements of geese, competition with ungulates, and requirements for molting areas.

Lead Agencies: CWS, NWT  
Priority: 2  
Schedule: Undetermined

6. Determine the carrying capacity of premigration staging areas in NWT, Yukon, and Alaska's North Slope. These determinations should be made to assess potential effects of: significant increase in goose populations, concentrated use of restricted staging habitat from oil and gas development, and climatic conditions that limit habitat use patterns during staging.

Lead Agency: USFWS, CWS  
Priority: 2  
Schedule: Ongoing

7. Identify and determine the importance of fall and spring staging areas between the breeding grounds and agricultural areas of Alberta and Saskatchewan. Assess availability of food and water, and levels of use by geese.

Lead Agencies: CWS, NWT, Yukon, provinces  
Priority: 2  
Schedule: Undetermined

8. Determine the physiological and nutritional requirements of wintering snow geese.

Lead Agencies: USFWS, states  
Priority: 2  
Schedule: Undetermined

9. Evaluate current population survey methods and investigate new approaches to obtaining more accurate information.

Lead Agencies: CWS, USFWS, states, provinces, territories  
Priority: 2  
Schedule: Ongoing

## IX. PLAN IMPLEMENTATION AND REVIEW

A Lesser Snow/Ross' Goose Subcommittee shall investigate both lesser snow and Ross' geese. The subcommittee shall meet twice annually or as needed to review progress toward achieving the goal and objectives of this plan and to recommend actions and revisions. The Subcommittee shall report, through the Pacific Flyway Study Committee, accomplishments and shortcomings of management efforts to the Pacific Flyway Council, Canadian Waterfowl Advisory Councils, state and federal agencies having relevant management responsibilities, and organizations interested in the management of geese.

The Subcommittee shall, through the Pacific Flyway Study Committee and Council, be responsible for integrating the provisions of this plan with plans and programs for management of snow geese in the Central Flyway and maintain an active, cooperative dialogue with the Central Flyway Technical Committee. In addition, the subcommittee will ensure that snow goose management and research guidelines are related to the Arctic Goose Joint Venture (North American Waterfowl Management Plan). It shall be the responsibility of the members to assure that the objectives and procedures of this plan are integrated and coordinated with those plans and activities of the various wildlife and land management agencies and local planning systems within their agency's venue.

The Subcommittee shall be comprised of a representative from each federal, provincial and state agency having management responsibility for this goose population. Chairmanship shall be appointed biannually and rotated among members agencies. The subcommittee will exercise its prerogative to invite participation (ex officio) at meetings by any individuals, group, agency or representative whose expertise, counsel or managerial capacity is required for the coordination and implementation of management programs.

Lead Agency/Group: Subcommittee

Priority: 1

Schedule: Twice annually at the March and July meetings of the Pacific Flyway Study Committee

Rotation of the chair, beginning October 1:

1991 - Alaska  
1993 - CWS Western and Northern  
1995 - Oregon  
1997 - Montana  
1999 - Washington  
2001 - USFWS (Reg. 1)  
2003 - Arizona  
2005 - California

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Appendix A. Description of habitats used by Western Arctic Lesser Snow Geese of the Pacific Flyway

<u>AREA</u>	<u>USE</u>	<u>NUMBER</u>	<u>SEASON</u>	<u>REMARKS</u>	<u>THREATS/SAFEGUARDS</u>
<u>ALASKA</u>					
Sagavanirktok River	breeding	200+ pairs	spring-summer	major brood-rearing and banding site	Adjacent to Prudhoe and Endicott oilfields
Arctic NWR coastal plain	migration	100-325,000	late summer	portions used for molting and staging	federal refuge oil & gas prospect
<u>CANADA</u>					
Banks Island	breeding	98,300	spring-summer		
Anderson River Delta	breeding	3,600	spring-summer		
Kendall Island Mackenzie River Delta	breeding	700	spring-summer	also major staging	
Yukon North Slope	migration	100-600,000	late summer		
Hay Lake, Grande Prairie NW Alberta	migration		fall, spring		
SE Alberta, SW Saskatchewan	migration		fall, spring		
<u>MONTANA</u>					
Freezeout Lake	migration	10-50,000 100-300,000	fall, spring spring	migration splits to OR, UT, NV, CA	
<u>UTAH</u>					
Bear River Marshes	migration	12,000+	fall		
<u>NEVADA</u>					
Carson Sink	migration		fall		

APPENDIX A. (Continued)

<u>AREA</u>	<u>USE</u>	<u>NUMBER</u>	<u>SEASON</u>	<u>REMARKS</u>	<u>THREATS/SAFEGUARDS</u>
<u>OREGON</u>					
Summer Lake (WA)	migration	10,000	fall, spring	mixed white geese	state wildlife area
<u>CALIFORNIA</u>					
Klamath Basin	migration	300,000+	fall, spring	mixed white geese	mostly on federal refuges
Central Valley	wintering	400,000+	winter	mixed white geese	State and federal areas, managed private lands (duck clubs) stable. Rice acreage subject to market fluctuations. Fowl cholera and botulism.
Imperial Valley	wintering	14,000	winter	some WIP geese	One state wildlife area and one federal refuge.
<u>NEW MEXICO</u>					
Bosque del Apache National Wildlife Refuge	migration/ wintering	57,000	fall, winter	population increasing since the 1950s	federal refuge
Bitter Lake National Wildlife Refuge	migration/ wintering	75,000	fall, winter	population increasing since the 1950s	federal refuge
<u>COLORADO</u>					
Southeast Colorado	migration	37,000	fall, winter	wintering since 1984-85 increasing since the 1950s	
<u>MEXICO</u>					
Central Highlands	wintering	90,000	winter		

APPENDIX B. Estimated white geese in the Pacific Flyway from midwinter counts and special November-December white goose surveys by U.S. Fish and Wildlife Service and state personnel.

YEAR	MID-WINTER SURVEY	NOVEMBER-DECEMBER SURVEY
1955	317,284	
1956	416,185	
1957	356,601	
1958	324,145	
1959	388,143	
5-Year Mean	360,472	
1960	367,332	
1961	463,523	
1962	568,938	
1963	482,916	
1964	484,806	
1965	533,493	
1966	338,774	
1967	746,610	
1968	505,825	
1969	432,809	
10-Year Mean	492,503	
1970	461,676	
1971	513,221	
1972	436,716	
1973	343,445	
1974	443,138	
1975	446,540	
1976	487,078	
1977	507,347	
1978	236,681	
1979	247,001	528,100
10-Year Mean	412,284	
1980	378,252	204,200
1981	448,094	759,900
1982	660,549	354,100
1983	445,064	547,600
1984	525,945	466,300
1985	371,046	549,800
1986	557,223	521,700
1987	335,586	525,300
1988	345,101	441,000
1989	411,411	463,900
10-Year Mean	447,827	483,380
1990	572,118	708,500
1991	564,480	690,100
1992	428,648	
Long-Term Mean	432,745	520,000

APPENDIX C. Photographic inventories of lesser snow goose colonies in the Western Canadian Arctic, 1976, 1981, and 1987.

Colony	No. nesting pairs	Total nesting area (km <sup>2</sup> )	% analyzed on photos	Density nests per ha	% Non-breeding	Sample size	Total Geese
Banks Is. (Egg R.)							
June 1976 (a)	82,511	605.3	16%	1.4	6%	42,007	175,555
June 1981 (b)	99,063	169.2	33%	5.9	8%	93,591	215,354
June 1987 (c)	98,253	109.4	16%	9.0			
Anderson River							
June 1976 (a)	1,913	15.5	100%	1.2	21%	4,843	4,843
June 1981 (b)	4,180	16.9	100%	2.5	10%	9,238	9,238
June 1987 (c)	3,593	15.9	100%	2.3			
Kendall Island							
June 1976 (a)	416	6.2	100%	0.7	41%	1,577	1,577
June 1981 (b)	521	2.6	100%	2.0	10%	1,153	1,153
June 1987 (c)	690	3.2	100%	2.2			
Total (or weighted by colony size)							
June 1976 (a)	84,840	627		1.4	7%		181,975
June 1981 (b)	103,764	188.7		5.5	8%		225,745
June 1987 (c)	102,536	128.5		8.0			

(a) Kerbes, R.H. 1983. Lesser snow goose colonies in the western Canadian Arctic. *J. Wildl. Mgt.* 47:523-526.

(b) Kerbes, R.H. 1986. Lesser snow geese, *Anser c. caerulescens*, nesting in the western Canadian Arctic in 1981. *Can. Field-Nat.* 100:212-217.

(c) Kerbes, R.H. 1988. Inventory of lesser snow geese nesting in the western Canadian Arctic, June 1987. CWS, Saskatoon. Unpubl. rept.

APPENDIX D. Indirect band recoveries from 25,847 lesser snow geese banded at Tule Lake NWR, California, 1951-81.

Recovery Areas	Number Bands Recovered	Percent Bands Recovered	Total Percent Bands Recovered In California	Total Percent Bands Recovered In Pacific Flyway
Calif. (Northeast)	470	11.08		
Calif. (North Coast)	1	0.02		
Calif. (Sacramento V.)	2,073	48.87		
Calif. (San Francisco Bay)	138	3.25	65.91	
Calif. (South Coast)	5	0.12		
Calif. (San Joaquin V.)	61	1.44		
Calif. (Inyo-Mono)	1	0.02		
Calif. (Imperial V.)	6	0.14		
Washington (Coast)	38	0.90		
Washington (Central)	3	0.07		
Washington (East)	5	0.12		
Oregon (Coast)	6	0.14		
Oregon (East)	7	0.17		73.96
Oregon (South)	309	7.28		
Idaho (North)	1	0.02		
Idaho (South)	4	0.09		
Idaho (East)	2	0.05		
Nevada (West)	5	0.12		
Utah (South)	1	0.02		
Arizona (West)	1	0.02		
Arizona (South)	1	0.02		
Alaska	100	2.36		
Northwest Territories	141	3.32		
Br. Columbia (Coast)	12	0.28		
Br. Columbia (Interior)	2	0.05		
Alberta	556	13.11		
Saskatchewan	126	2.97		
Canada (Other)	2	0.05		
Central Flyway (North)	58	1.37		
Central Flyway (South)	1	0.02		
Mississippi Flyway	2	0.05		
Atlantic Flyway	1	0.02		
Russia	103	2.43		
TOTAL RECOVERED	4, 242			
PERCENT RECOVERED		99. 99		

APPENDIX E. Indirect band recoveries from 1,307 lesser snow geese banded in Imperial Valley, California, 1966-72.

Recovery Areas	Number Bands Recovered	Percent Bands Recovered	Total Percent Bands Recovered In California	Total Percent Bands Recovered In Pacific Flyway
Calif. (Northeast)	2	0.5		
Calif. (Sacramento V.)	11	2.7		
Calif. (San Francisco Bay)	2	0.5	71.0	
Calif. (South Coast)	2	0.5		
Calif. (San Joaquin V.)	5	1.2		
Calif. (Inyo-Mono)	1	0.2		
Calif. (Imperial V.)	268	65.4		
Oregon (South)	2	0.5		
Idaho (East)	2	0.5		
Nevada (West)	5	1.2		
Utah (North)	15	3.7		77.8
Utah (South)	1	0.2		
Arizona (West)	2	0.5		
Arizona (North)	1	0.2		
Northwest Territories	18	4.4		
Alberta	35	8.5		
Saskatchewan	31	7.6		
Central Flyway (North)	6	1.5		
TOTAL RECOVERED	410			
PERCENT RECOVERED		100.0		

APPENDIX F. Historical wintering population and productivity data, Western Central Flyway white goose population (U.S. and Mexico, combined), 1979-91.

Year	Winter Popul.	Sample Size	% Composition			% Juveniles		Juv. per Family	
			Snow	(Blue)	Ross'	Snow	Ross'	Snow	Sample Size
1979	84,596	6,776	86.6	1.8	13.4	20.6	21.5	--	--
1980	94,215	8,833	86.4	2.2	13.6	35.2	30.7	--	--
1981	133,396	5,705	84.9	2.2	15.1	25.1	22.1	--	--
1982	--	2,515	--	--	--	12.7	--	--	--
1983	--	8,988	76.7	2.1	23.3	39.9	19.2	--	--
1984	147,793	15,224	91.5	1.5	8.5	25.6	22.1	--	--
1985	--	25,217	87.5	1.1	12.5	30.1	22.9	--	--
1986	--	23,721	84.1	0.9	15.9	3.7	12.2	1.99	378
1987	119,855	28,060	87.8	3.8	12.2	20.1	7.9	2.07	1,785
1988	--	31,222	88.5	1.0	11.5	27.5	15.9	2.41	983
1989	--	34,336	87.4	1.3	12.6	23.3	27.7	2.18	869
1990	182,800	28,321	86.9	1.4	13.1	21.1	9.4	1.92	1,297
1991	--	20,004	85.3	2.1	14.6	11.7	11.4	1.93	688
1992	--	21629	81.1	0.9	18.9	15.1	8.2	1.93	850

<sup>1</sup>Data for 1979-1991 from Benning (1991) and for 1992 from D.S. Benning (pers. comm.)

APPENDIX G. Peak winter populations of white geese, species composition, and percentage young on Bosque del Apache NWR and State Management Areas, New Mexico.<sup>1</sup>

Winter	Winter Popul.		% Composition		% Young	
	Snow & Ross'	Combined	Blue	Ross'	Snow	Ross'
1951	300		-	-	-	-
1952	250		-	-	-	-
1953	302		-	-	-	-
1954	351		-	-	-	-
1955	370		-	-	-	-
1956	391		-	-	-	-
1957	920		-	-	-	-
1958	327		-	-	-	-
1959	500		-	-	-	-
1960	757		2.6	-	-	-
1961	1,043		3.1	-	-	-
1962	1,228		2.4	-	17	-
1963	1,425		1.8	-	12	-
1964	1,800		0.0	-	-	-
1965	1,850		0.0	-	-	-
1966	2,600		1.3	-	50	-
1967	3,500		1.0	-	-	-
1968	3,800		0.9	-	-	-
1969	4,000		0.8	-	-	-
1970	7,900		1.3	-	47	-
1971	8,600		2.2	-	40	-
1972	8,020		1.2	-	13	-
1973	16,000		2.5	-	52	-
1974	13,000		1.1	-	9	-
1975	18,500		0.9	-	47	-
1976	21,250		2.5	-	42	-
1977	21,550		2.1	-	28	-
1978	26,875		1.3	-	7	-
1979	28,500		1.1	-	3	22
1980	30,040		2.0	-	28	31
1981	28,000		2.0	-	19	22
1982	28,650		2.2	-	11	-
1983	34,000		1.7	-	37	19
1984	39,300		4.7	7.4	29	22
1985	56,740		2.6	10.5	30	23
1986	36,900		1.9	12.8	6	12
1987	35,500		1.7	11.1	17	5
1988	41,610		1.9	9.7	26	12
1989	37,000		1.9	14.7	22	32
1990	36,700		1.3	17.2	19	13
1991	33,400		1.5	12.8	12	17
1992	29,000		1.1	16.2	12	12

<sup>1</sup>Data for 1950-59 from Bosque del Apache NWR files; for 1960-88 from Benning (1988); for 1989-91 Benning (1989-91); for 1992 from D. S. Benning (pers. comm.); for Ross' goose ratios and production from Drewein and Brown (1991).

APPENDIX H. Estimated lesser snow/blue goose harvests in the Pacific Flyway, Alaska, the Central Flyway portions of four States, the Central, Mississippi, and Atlantic Flyways, and U.S.

Year	WA	OR	ID	MT(PF) <sup>1</sup>	WY(PF) <sup>2</sup>	CA	NV	UT	CO(PF) <sup>2</sup>	AZ	NM(PF) <sup>2</sup>	PF Tot.	AK	MT(CF)	WY(CF) <sup>2</sup>	CO(CF) <sup>2</sup>	NM(CF) <sup>2</sup>	CF Tot.	MF Tot.	AF Tot.	U.S. Tot.	
1961																						
1962	2,199	3,144	57	355	0	28,826	0	211	0	269	0	35,061		1,920	0	0	4	87,404	37,254	87	159,805	
1963	2,269	1,766	321	168	0	66,810	147	138	0	0	0	71,619		2,579	0	89	263	120,426	60,963	0	253,009	
1964	4,246	5,860	602	0	0	55,900	393	164	0	0	0	67,164		790	0	98	6	111,698	89,634	57	268,554	
1965	1,332	2,136	993	269	0	34,367	282	164	0	149	0	39,692		0	0	0	175	108,294	94,415	73	242,475	
1966	368	16,633	161	1,360	0	155,543	2,149	417	0	190	38	176,859	75	0	0	0	96	193,734	153,112	39	523,818	
1967	452	1,142	204	1,161	0	72,413	991	84	0	271	0	76,718	140	0	0	0	358	149,893	113,704	101	340,555	
1968	4,823	1,861	225	475	0	54,062	2,176	73	0	101	0	63,796	1,046	0	0	0	535	90,857	66,027	0	221,726	
1969	3,294	8,129	0	154	0	72,545	334	0	0	1,507	0	85,963	657	0	0	253	282	210,029	204,845	615	502,109	
1970	11,699	11,951	429	2,090	0	112,614	2,888	142	0	2,090	0	141,813	1,000	0	0	251	860	314,301	258,380	602	716,096	
1971	6,431	6,045	163	0	0	94,123	893	0	0	105	0	107,758	587	0	0	0	1,498	180,713	159,676	120	448,854	
1972	405	869	0	0	0	41,998	208	537	0	1,191	0	45,208	239	0	0	0	96	151,065	109,189	0	305,702	
1973	0	2,728	323	1,889	0	106,721	1,874	2,134	0	309	0	115,978	302	0	27	282	1,207	254,824	152,970	0	524,073	
1974	642	502	0	512	0	50,764	389	0	0	351	0	53,160	225	0	0	0	94	241,321	173,209	0	467,914	
1975	729	5,453	1,902	0	0	81,993	852	291	0	256	0	92,871	0	80	0	198	2,130	350,059	167,624	9,171	619,724	
1976	1,076	12,545	0	677	42	127,678	1,583	139	0	273	0	144,011	92	0	0	409	3,668	256,490	102,337	12,276	515,206	
1977	289	1,093	0	664	0	77,771	632	1,091	301	0	0	81,841	596	0	0	0	7,981	306,304	126,778	22,464	537,982	
1978	823	0	0	811	0	28,578	601	0	0	112	0	30,925	84	0	0	525	2,153	189,014	133,930	20,051	374,003	
1979	2,663	2,502	78	734	0	26,179	472	0	0	0	0	32,628	0	43	348	1,445	338,391	165,584	29,370	565,973		
1980	2,338	2,390	0	1,431	0	28,459	833	139	0	176	0	35,766	146	87	61	405	2,613	251,764	144,439	27,486	459,600	
1981	15,698	12,908	58	2,063	0	28,591	610	58	131	942	50	61,109	0	0	0	268	2,358	289,868	110,764	13,647	475,390	
1982	1,486	2,248	0	2,130	0	26,263	68	101	0	778	0	33,074	0	341	0	815	2,174	241,741	124,366	21,726	420,908	
1983	346	667	0	1,944	0	43,223	587	0	0	62	0	46,829	0	0	0	0	5,049	245,749	187,153	41,187	520,918	
1984	4,814	4,677	1,202	1,695	0	49,826	1,687	0	0	526	0	64,426	522	125	0	1,294	4,400	292,799	101,545	38,737	498,030	
1985	7,151	5,817	669	2,553	0	65,085	625	208	0	114	0	82,223	69	62	122	963	5,508	216,869	98,971	14,776	412,906	
1986	2,986	1,350	439	692	0	31,839	78	0	0	0	0	37,384	108	110	180	3,069	2,605	149,890	69,738	9,035	266,154	
1987	3,518	3,843	256	592	0	28,601	1,426	0	0	0	0	38,236	0	34	34	0	2,173	182,585	56,464	28,613	305,898	
1988	3,572	2,878	113	3,498	0	31,235	441	0	0	160	0	41,896	121	122	0	254	2,763	250,788	51,392	25,978	370,176	
1989	996	611	0	623	0	30,260	164	76	27	198	0	32,955	133	116	50	572	65,500	286,272	97,277	17,568	434,204	
1990	430	899	0	911	0	23,835	112	0	88	528	0	26,802	0	202	0	1,226	4,777	250,381	91,705	21,165	390,054	
1991	1,066	3,746	0	252	0	25,838	56	0	41	0	0	30,999	0	119	56	811	7,099	248,067	110,743	26,899	416,707	
1992 <sup>3</sup>	639	1,161	98	501	0	25,777	0	151	0	182	0	28,508	114	0	0	744	399	145,072	58,497	10,498	242,690	
Averages:																						
1962-70	3,409	5,847	332	670	0	72,564	1,040	155	0	276	4	84,298	584	588	0	77	287	154,071	119,815	175	358,683	
1971-80	1,540	3,413	247	672	4	66,426	834	433	30	277	0	74,015	227	17	13	217	2,289	251,995	143,574	12,094	481,903	
1981-90	4,100	3,590	274	1,670	0	35,876	580	44	25	331	5	46,493	95	111	39	846	9,731	240,694	98,938	23,243	409,464	
1991-91	1,066	3,746	0	252	0	25,838	56	0	41	0	0	30,999	0	119	56	811	7,099	248,067	110,743	26,899	416,707	
1962-date	2,864	4,115	268	974	1	55,733	760	204	19	282	3	65,267	232	216	18	415	4,202	216,344	118,474	12,656	412,942	
% change from:																						
1962-70	-81%	-80%	-71%	-25%	-	-64%	-	-2%	-	-34%	-	-66%	-80%	-	-	-	-	-6%	-51%	5903%	-32%	
1971-80	-58%	-66%	-60%	-25%	-	-61%	-	-65%	-	-34%	-	-61%	-50%	-	-	-	-	-42%	-59%	-13%	-50%	
1981-90	-84%	-68%	-64%	-70%	-	-28%	-	241%	-	-45%	-	-39%	20%	-	-	-	-	-40%	-41%	-55%	-41%	
1991-91	-40%	-69%	-	99%	-	-0%	-	-	-	-	-	-8%	-	-	-	-	-	-42%	-47%	-61%	-42%	
1991	-40%	-69%	-	99%	-	-0%	-	-	-	-	-	-8%	-	-	-	-	-	-42%	-47%	-61%	-42%	
% Composition of Bag:																						
1962-70	10%	15%	2%	16%	0%	34%	17%	2%	0%	11%	100%	26%	5%	-	-	-	-	50%	41%	0%	32%	
1971-80	3%	8%	1%	8%	0%	38%	14%	3%	5%	10%	0%	23%	2%	-	-	-	-	54%	31%	3%	30%	
1981-90	9%	10%	1%	16%	0%	40%	8%	0%	1%	6%	1%	19%	1%	-	-	-	-	45%	19%	6%	24%	
1991-91	2%	11%	0%	3%	0%	44%	2%	0%	1%	0%	0%	14%	0%	-	-	-	-	42%	15%	8%	22%	
1992	1%	3%	0%	5%	0%	37%	0%	1%	0%	7%	0%	12%	2%	-	-	-	-	35%	10%	4%	16%	
% Flyway Hvst:																						
1962-70	4%	7%	0%	1%	0%	86%	1%	0%	0%	0%	0%	24%	0.2%	0.2%	0.0%	0.0%	0.1%	43%	33%	0%	100%	
1971-80	2%	5%	0%	1%	0%	90%	1%	1%	0%	0%	0%	15%	0.0%	0.0%	0.0%	0.0%	0.5%	52%	30%	3%	100%	
1981-90	9%	8%	1%	4%	0%	77%	1%	0%	0%	1%	0%	11%	0.0%	0.0%	0.0%	0.2%	2.4%	59%	24%	6%	100%	
1991-91	4%	6%	0%	1%	0%	85%	1%	0%	0%	0%	0%	7%	0.0%	0.0%	0.0%	0.2%	1.7%	60%	27%	6%	100%	
1992	2%	4%	0%	2%	0%	90%	0%	1%	0%	1%	0%	12%	0.0%	0.0%	0.0%	0.3%	0.2%	60%	24%	4%	100%	

<sup>1</sup>In 1965, the Pacific Flyway portion of Montana was expanded.

<sup>2</sup>In 1962, the state was divided into Pacific and Central Flyway portions.

<sup>3</sup>Preliminary data.

APPENDIX I. Snow goose harvest on Summer Lake Wildlife Area, Oregon,  
1952-1991.

Year	Harvest	Year	Harvest
1952	4,534	1980	968
1953	5,968	1981	5,614
1954	8,204	1982	1,072
1955	8,952	1983	615
1956	6,125	1984	1,867
1957	2,643	1985	1,975
1958	3,076	1986	1,343
1959	6,226	1987	2,324
		1988	940
1960	4,903	1989	274
1961	7,716		
1962	767	1990	481
1963	6,687	1991	1,522
1964	4,795		
1965	836		
1966	8,323		
1967	1,714		
1968	1,536		
1969	6,131		
1970	13,077		
1971	1,497		
1972	390		
1973	1,480		
1974	371		
1975	3,504		
1976	3,723		
1977	598		
1978	365		
1979	2,399		

APPENDIX J. Snow goose harvest on California-operated waterfowl hunting areas (does not include harvest from Federal areas in Klamath Basin, California).

Year	Lesser Snow Geese	Percent of Total Goose Harvest	Total Geese
1971	13,763	70.3	19,567
1972	3,752	39.2	9,575
1973	11,738	73.6	15,929
1974	4,930	52.0	9,466
1975	11,512	76.4	15,070
1976	14,710	77.5	18,983
1977	7,227	81.0	8,927
1978	3,345	56.0	5,970
1979	1,417	18.4	7,696
1980	3,144	69.9	4,501
Mean 1971-80	7,554	65.3	11,569
1981	3,703	66.9	5,539
1982	3,210	56.5	5,684
1983	4,928	68.2	7,231
1984	6,882	78.2	8,800
1985	6,784	70.8	9,582
1986	2,640	69.5	3,798
1987	3,785	67.3	5,625
1988	3,832	69.2	5,541
1989	3,270	55.5	5,894
1990	4,594	66.9	6,863
Mean 1981-90	4,363	67.6	6,456

APPENDIX K. Light goose harvest on Bosque del Apache NWR, New Mexico, 1966-1992.

Year	Ross' Goose	Blue Goose	Snow Goose	Total Harvest	Percent Ross'
1966	0	0	38	38	0.0
1967	8	0	63	71	11.3
1968	5	1	69	75	6.6
1969	3	4	73	80	3.7
1970	11	0	257	268	4.1
1971	1	1	150	152	0.6
1972	3	0	47	50	6.0
1973	49	4	385	438	11.1
1974	22	2	303	327	2.1
1975	18	5	691	714	2.5
1976	10	8	328	346	2.9
1977	10	8	346	364	2.8
1978	14	2	424	440	3.2
1979	111	17	578	706	15.7
1980	208	7	589	804	26.0
1981	130	9	820	959	13.6
1982	41	10	411	462	8.9
1983	58	8	998	1,064	5.5
1984	26	6	246	278	9.4
1985	39	7	522	568	6.9
1986	7	3	101	111	6.3
1987	2	0	79	81	2.5
1988	3	2	200	205	1.5
1989	24	6	352	382	6.3
1990	6	2	280	288	2.1
1991	14	4	264	282	5.0