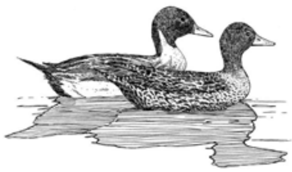

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GAME BIRD PROGRAM RECOMMENDATIONS FOR 2009-2010 GAME BIRD SEASONS – UPLAND GAME BIRDS AND WATERFOWL

SUPPLEMENTAL RECOMMENDATIONS FOR MIGRATORY GAME BIRD SEASONS

FOR CONSIDERATION BY THE OREGON FISH AND WILDLIFE COMMISSION
AUGUST 7, 2009

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The recommendations in this packet are based on public correspondence (including telephone and e-mail communications), Pacific Flyway Study Committee and Council discussions, discussions with ODFW field personnel, federal regulatory requirements and past Oregon Fish and Wildlife Commission direction concerning hunting seasons.

INTRODUCTION

This is a supplemental package provided to the Oregon Fish and Wildlife Commission (Commission), which outlines recommendations for most waterfowl seasons. The lateness of the federal regulatory process in 2009 precluded developing many season recommendations until this time. Season recommendations for upland game birds and some migratory game birds were included in an earlier Commission packet and are not repeated here. New or updated information on population status and harvest surveys is included. Detailed information on the status of waterfowl and Adaptive Harvest Management, including the western mallard model, is provided in two reports provided in the appendices.

These proposals have been communicated to various hunting interests, including members of the Oregon Hunters Association, Ducks Unlimited, and Oregon Duck Hunters Association. Final federal regulatory decisions as well as public comment between now and the August 7 Commission meeting may modify recommendations but most proposals are anticipated to have majority support from hunters, based on past public comment and seasons adopted by the Commission in recent years.

MIGRATORY GAME BIRDS POPULATION STATUS

Pacific Flyway Populations

Ducks: In general, total ducks from major breeding areas in Alaska, Canada, Montana and the Dakotas increased 13% compared to numbers from the previous year and 25% compared to the 1955-2008 average. Mallard numbers increased 10% from the previous year while pintails showed a 23% increase, although they remain 20% below the long-term average. All species reported in the survey increased from the previous year except for redheads and American wigeon which were nearly unchanged. Redheads continue to be near record high population levels. Total pond numbers in these areas increased 45% from the previous year. Although continental populations experienced increases, in general, surveyed areas which contribute significant portions of their breeding population to Pacific Flyway states either experienced declines in breeding numbers or remained similar to last year. However, these areas still maintain robust breeding populations. Oregon breeding waterfowl surveys were conducted from late April through mid-May. Statewide, the breeding mallard population was down 6% compared to last year and down 25% compared to the 1994-2008 long-term average. Total duck numbers were down 17% from last year and down 32% from the long term average. Breeding waterfowl habitat was generally reduced in southeastern Oregon, where the majority of the state's waterfowl are produced. However, above normal late-spring precipitation is expected to bolster production for the breeding birds present.

Geese and Swans: Most goose and swan populations in North America remain healthy and the size of many fall flights should be similar to or increased compared to those of last year. However, the dusky Canada goose population index continues to decline and this year the 3-year population average reached a record low, triggering more restrictive harvest management actions throughout the flyway, including Oregon. In Oregon, the breeding Canada goose population was similar to last year and the long-term average, down 1% and no difference, respectively. Habitat conditions for nesting geese were fair in Alaska with good production noted for Taverner's, cackling, and white-fronted geese. Production was excellent this spring for Wrangel Island snow geese and a large fall flight is expected, while snow goose production in the western-Canadian arctic was fair to good.

MIGRATORY GAME BIRDS
HARVEST SURVEYS

The Harvest Information Program (HIP), a cooperative harvest survey between the USFWS and states, was implemented in Oregon during 1995. Harvest is calculated by the USFWS from databases provided by the Oregon licensing system. This cooperative survey will continue to be refined annually by department and USFWS personnel.

Stamp Sales: State of Oregon waterfowl validation (stamp) sales to resident hunters in 2008 totaled 49,921, a 2% increase from 2007. Total 2008 nonresident game bird stamp (valid for both waterfowl and upland game bird hunting) sales were 6,401, down slightly from 6,415 in 2007.

Ducks: Preliminary results from the HIP suggest during the 2008/09 hunting season, 23,600 Oregon hunters spent 237,700 days hunting ducks and harvested 644,400 ducks. Mallards composed 41% of the harvest while other heavily harvested species were; wigeon (19%), green-winged teal (16%), and pintail (9%).

Geese: Preliminary results from HIP suggest during the 2008/09 hunting season, 13,800 Oregon hunters spent 90,500 days hunting geese and harvested 105,400 geese. Canada geese composed 89% of the harvest while greater white-fronted and white geese composed 8% and 3%, respectively.

American Coots: Preliminary results from the HIP suggest during the 2008/09 hunting season, 900 Oregon hunters spent 1,300 days hunting coots and they harvested 3,300 coots

Mourning Doves: Preliminary results from the HIP suggest during the 2008 hunting season, 5,800 Oregon hunters spent 14,600 days hunting mourning doves and they harvested 45,500 doves.

Band-tailed Pigeons: Preliminary results from the HIP suggest during the 2008 hunting season, 200 Oregon hunters spent 500 days hunting band-tailed pigeons and they harvested 500 pigeons.

Wilson's Snipe: Preliminary results from the HIP suggest during the 2008/09 hunting season, 700 Oregon hunters spent 3,700 days hunting snipe and they harvested 1,400 snipe.

MIGRATORY GAME BIRDS
2009-10 SEASON PROPOSALS

Please note: All seasons for migratory game birds are established under U.S. Fish and Wildlife Service (USFWS) frameworks. The Oregon Department of Fish and Wildlife works through the Pacific Flyway Council process and the USFWS regulatory process to make recommendations on these federal frameworks. All recommendations must meet established framework guidelines and all season selections by the Fish and Wildlife Commission are subject to approval by the USFWS.

➢ DUCK AND MERGANSER

Tentative Framework

A maximum season length of 107 days is allowed between the Saturday closest to September 24 and the last Sunday in January; a daily bag limit of 7 birds to include no more than 2 hen mallards, 2 pintail, 3 Scaup, 1 Canvasback, and 2 redheads. The scaup season may only be a maximum of 86 days. For all species possession limit is twice the daily bag limit. Shooting hours are from one half hour before sunrise to sunset. Zoning options approved by the USFWS may be retained. One split in season dates may occur in each zone. The extra 7 days in the Columbia Basin are not offered because of the liberal season package. Two federal youth waterfowl days are allowed for ducks, mergansers, coots and geese. The two youth days must be consecutive. Youths 15 years of age and under may participate.

Recommendation

Adoption of maximum days and bag limits as allowed by framework. Maintain traditional shooting hours. Adoption of a federal youth waterfowl weekend. The adoption of a youth waterfowl hunt weekend requires a reduction in regular waterfowl seasons by two days.

Zone 1: October 17, 2009 – October 25, 2009 and
October 28, 2009 – January 31, 2010*

Scaup: November 7, 2009 – January 31, 2010

Zone 1 is western Oregon and Columbia Basin counties.

Zone 2: October 10, 2009 – November 29, 2009 and
December 2, 2009 – January 24, 2010*

Scaup: October 10, 2009 – November 29, 2009 and
December 2, 2009 – January 5, 2010

Zone 2 is the remainder of eastern Oregon.

*** A federal waterfowl youth hunt weekend is proposed for September 26 and 27.**

Allowed frameworks were developed cooperatively with the USFWS, states and all Flyway Councils under the Adaptive Harvest Management (AHM) program. AHM is a process that increases objectivity and efficiency in the annual process of setting duck hunting regulations. AHM improves upon past approaches by using clearly defined harvest-management objectives, a limited set of regulatory options, and data assessment procedures. It is important to note the AHM process is dynamic, and as new information is obtained decision criteria will be modified. This represents the second year of implementation of the Western Mallard Model under AHM.

The proposed season framework is similar to last year and flyway biologists believe continued liberal harvest regulations are justified based on established databases. Many duck populations have remained relatively abundant throughout the state and Flyway in recent years, especially the mallard, which is the most commonly harvested species. Species bag restrictions are maintained for ducks of special concern, such as northern pintail and scaup and canvasback.

Restrictions taken during the last 4 years for scaup have generally reduced harvest in the Pacific Flyway; however last year based on a long-term population decrease the USFWS mandated further harvest restrictions. Under the national harvest strategy adopted by the USFWS last year, the Flyways will continue to evaluate harvest with fixed regulatory option packages over the next 2 years. This year the scaup population increased to a level allowing a moderate season under the new harvest strategy which allows the Pacific Flyway states to offer 3 birds in the bag for a limited 86 day season. The scaup seasons in Zone 1 and Zone 2 are proposed at times that should optimize hunting opportunities.

Adoption of a 105-day duck season will accommodate the federal youth waterfowl hunting weekend (105 + 2 = 107 day maximum) and should minimize conflicts with season date selections encountered in past years. Waterfowlers in all parts of the state will have opportunities to hunt ducks in preferred times of the year under many different types of conditions (early and late hunting). It is recommended to retain duck zones implemented in 1996, with differential season dates (season splits) proposed. Last year duck seasons opened concurrently in both of Oregon's duck hunting zones. This was done to avoid opening zone 2 duck season the same weekend as Eastern Oregon buck deer season. Because the federal framework calendar shifts back a week this year both zones will be able to open on their traditional and preferred opening dates, while avoiding the opening weekend of buck season.

Public Comment

The majority of comments received support the seasons as outlined. The department supports the adoption of the full frameworks based on the rationale provided, including the need to continue to implement the western mallard model under AHM. With an overall 107 day duck season in Oregon there will be many opportunities for public recreation.

➢ Fall Geese

Please Note: There are three separate frameworks regarding geese; general fall, NW Oregon Permit Goose, and black brant seasons.

General Fall Goose Season Framework (except NW Oregon Permit Goose Zone)

In general, a 100-day season between the Saturday closest to October 1 and the last Sunday in January (dark geese) or March 10 (white geese) is permitted. Daily bag limit: 4 dark geese and 6 white geese. Possession limit is twice the daily bag. The dark goose limit may not include more than 1 cackling or 1 Aleutian Canada goose, statewide, except in the Southwest and South Coast zones where the daily limit may include up to 4 cackling or 4 Aleutian Canada Geese. In the South Coast Zone and the Klamath County Zone the season length may be 107-days. White-fronted goose restrictions occur in Lake County. Other restrictions pertain to bag limits in portions of seasons allowed in Klamath County. Shooting hours are one half hour before sunrise to sunset. Past goose hunt zones may be retained. One split in season dates may occur in all zones except two splits may occur in the South Coast and Klamath County zones. Season date selections may extend to March 10 in the South Coast and Klamath County zones with bag limits for white and/or dark geese. Two federal youth waterfowl hunt days for ducks, mergansers, coots and geese are offered. The two youth days must be consecutive. Youths 15 years of age and younger may participate.

Recommendations

Adoption of maximum days and bag limits, plus adoption of federal waterfowl youth weekend.

PROPOSED FALL GOOSE SEASONS

Western Oregon, excluding closed and permit only areas:

Lincoln and those portions of Multnomah, Clackamas, Marion, Linn and Lane counties outside the NW Oregon Permit Goose Zone (Northwest Oregon General Zone):
October 17, 2009 – October 25, 2009 and
November 5, 2009 – January 31, 2010*

Josephine, Jackson and those portions of Coos, Curry, and Douglas counties east of Hwy 101 (Southwest Oregon General Zone):
October 17, 2009 – November 29, 2009 and
December 12, 2009 – January 31, 2010*

Those portions of Coos, Curry, and Douglas counties west of Hwy 101 (South Coast Zone):
October 3, 2009 – October 20, 2009 and
November 25, 2009 – January 31, 2010 and
February 20, 2010 – March 10, 2010* (dark goose hunting only)

Eastern Oregon, except as listed:
October 17, 2009 – October 25, 2009 and
November 7, 2009 – January 31, 2010*

Lake, Harney and Malheur Counties:
October 10, 2009 – November 29, 2009 and
December 19, 2009 – January 31, 2010*

Klamath County:
October 10, 2009 – November 29, 2009 and
December 19, 2009 – January 22, 2010 and
Feb 20, 2010 – March 10, 2010* (white-fronted and white goose hunting only)

*** A federal waterfowl youth hunt weekend is proposed for September 26 and 27. However, goose hunting by youths is not allowed within the counties encompassed by the NW Oregon Permit Goose Zone. White-fronted goose limits for Lake County also apply.**

Most goose populations, especially Canada geese, have remained robust in recent years, increasing recreational opportunity throughout the state. Other goose populations are expected to be similar to last year or increased. White and Pacific white-fronted goose populations in the Pacific Flyway are at or significantly above management goals. Numerous population and harvest surveys are in place to monitor any impacts from current season structures. In some counties, due to boundary differences between duck and goose zones and a 107-day duck season, hunting days for duck and goose hunting will not always coincide. Establishment of September seasons also influence overall dates for fall seasons. However, in order to optimize opportunity, it is critical to utilize the full frameworks allowed. Extended frameworks allow later hunting opportunity, which is a common request by hunters. In order to utilize this opportunity, split seasons will be fully utilized similar to previous years.

In 2006, the Department recommended and the Commission approved the discontinuation of the September Canada goose season in Klamath County. Resident goose populations have been declining in recent years in portions of SE Oregon and are currently slightly above flyway restriction levels. Evaluation of breeding population numbers has resulted in a recommendation to continue the bag limit reduction for Canada geese in the remainder of eastern Oregon during the special September Canada goose season. Also, the reduction in days used in the September season for Klamath County augment the continued late goose season and provide more overall hunting days in the fall season.

The late-winter white-fronted and white goose hunt in Klamath County is proposed to continue this season. This season was implemented three years ago in response to increasing agricultural depredation issues in Klamath County. Last year was the first year white geese were included in the bag limit; however the bag limit on white-fronted geese was reduced to one goose. This year, the Department proposed to the flyway a late season with an increased bag limit. During this season, hunting is allowed only on private lands since the main focus of this hunt is to provide assistance with depredation complaints. Last year’s season had mixed results. Early in the season winter conditions prevailed and few geese were present in the hunt area. During the latter portion of the season geese arrived in large numbers and hunter effort increased. With the increased hunter effort goose depredation was probably reduced during this time. The department has fielded concerns that this season needs to be extended past March 10 to have a significant affect on goose depredation; however the Migratory Bird Treaty Act restricts hunting beyond this date.

Similarly, because of increasing agricultural depredation issues in the south coast area, in 2006 a joint proposal was approved by the Flyway Council, the Commission, and the

USFWS for increasing hunting opportunities in Oregon and California with an emphasis on harvest of Aleutian Canada geese. This population is currently 33% above the population objective in the Flyway Council plan. As in the Klamath County hunt, late season hunting occurs only on private lands and coincides with California season dates. The previous three seasons during the late hunt period, Aleutian goose use of the hunt area was low and staff has not noted an increase in Aleutian goose numbers coinciding with increased hunting pressure to the south in California. Some Aleutian geese were in the area, along with numerous resident western Canada geese and both incurred varying levels of harvest. As in Klamath County, the department has fielded concerns that this season needs to be extended past March 10 to have a significant affect on goose depredation; however, the Migratory Bird Treaty Act restricts hunting beyond this date.

Similar to Klamath County, the department did not propose a September Canada goose season in the South Coast Zone. However, unlike the Klamath County late hunt, any dark goose may be taken during the South Coast Zone late hunt. Resident Canada geese are commonly taken during this hunt, and late season harvest likely compensates for harvest which previously occurred during the September season.

The department and the flyway are recommending that both of these late hunts be continued during the 2009/10 seasons to address continuing depredation issues. However, during the late Klamath hunt the department, supported by the Flyway Council and the USFWS, is recommending 1 additional white goose and white-fronted goose be added to the bag limit during the late hunt period. White geese (snow and Ross) are present in large numbers along with white-fronted geese during the late winter and spring and both contribute to the agricultural depredation complaints occurring in the hunt area. Flyway biologists recognize that populations of white geese are above management plan goals as is the Pacific population of white-fronted geese. However, the tule population of white-fronted geese remains of concern because of lower population levels. Radio telemetry observations and measurements from harvested geese have shown tule geese are present in the hunt area and are occasionally harvested by hunters. However, this harvest is minimal and the increased bag limit of white-fronted geese is expected to have little impact on tule geese while providing increased goose hunting opportunity to address depredation problems caused by both white and white-fronted geese. Research into tule goose ecology will continue in cooperation with Alaska, California and the USFWS. No September goose seasons in Klamath County and the South Coast Zone are recommended, the same as the previous seasons.

Public Comment

Most comments received have supported seasons as proposed. The increase in the bag limit in the late season Klamath hunt will likely be well received by the hunting public and landowners. But some hunters maintain that public access to private lands during this depredation hunt is not desirable and support its discontinuation. These same hunters would prefer to have Canada goose season open more in early December. Other hunters maintain there are few white geese in the Klamath basin during the hunt period and they are losing hunting opportunity. However, white and white-fronted geese do occur in the area during the hunt period and the overall increased bag limit should provide increased hunting opportunities. Also, many landowners, when this hunt began were requesting more of a focus on white goose harvest. Oregon will continue to work with California and USFWS personnel to seek options to frameworks that can utilize this season to its fullest.

The Oregon Farm Bureau and numerous landowners are very supportive of continuation of special late seasons for Klamath County and the south coast. Some hunters have expressed concerns about the loss of September seasons in these areas. Again, there have been comments that the late goose seasons do not allow hunting when the geese are most numerous. However, as stated above, the Migratory Bird Treaty Act restricts goose hunting after March 10.

For other goose zones, many hunters in eastern Oregon have requested late hunting opportunities whenever possible. However, some individuals have opposed splitting seasons in the Columbia basin during November and December. Season proposals should address these concerns.

NW Oregon Permit Goose Season

Framework

A 107-day season is allowed between the Saturday closest to October 1 and the Sunday closest to March 1. Daily bag limit: 4 dark geese (including no more than 2 Aleutian Canada geese or 2 cackling Canada geese) and 4 white geese. Possession limit is twice the daily bag. The state retains options to determine open hunt areas and allocate quotas not to exceed 90 dusky Canada geese. The hunting of geese during federal waterfowl youth days is not allowed. Mandatory hunter check stations are required in order to select this hunt.

Background

This season changed significantly 11 years ago as a result of receiving congressional funding to assist with goose depredation issues in NW Oregon. Hunting restrictions were lifted on all private lands, many of which had been closed to goose hunting for nearly 16 years, new check stations established, and additional law enforcement personnel hired to monitor the permit zone. However, last year, as during most years, no federal funding was received and Congress has again not supported funding for the upcoming hunting season. In the past, $90-100,000 was received from Congress to cost share administration of this hunt. Most of the costs related to this season are personnel costs related to check stations and law enforcement. With the loss of those funds, state waterfowl stamp funds have been used to maintain the hunt program. The department feels this season is an important management tool to assist private landowners dealing with depredation issues. The primary purpose of this season is the use of hunters to assist landowners with depredation control. Congressional funds were also used to fund Wildlife Services programs for direct assistance to landowners but those programs are now cut, emphasizing the importance of the continuation of this hunt.

Recommendations

The following summarizes proposals for the permit goose hunt in 2009-10:

- Reduce the dusky Canada goose quota from 165 to 90. The dusky Canada goose population has fallen to a level identified in the Pacific Flyway's management plan which mandates lower quotas in northwest Oregon and southwest Washington in addition to assignment of a quota to portions of Alaska where dusky geese are harvested. Allocate dusky harvest quotas throughout the permit goose zone by county groupings and period allocations. Unused quota would be transferred from period to period but not from area to area. If a quota were exceeded for one period, the following period's quota for that area would be reduced accordingly. This is no change from last year. Quotas in all zones will be adjusted significantly lower to reduce the overall quota to 90 dusky geese.

- Retention of all private lands being open for goose hunting with the exception of Tillamook County, where a small closure is in place on private lands to protect Semidi Island Aleutian geese.

- In all areas except Tillamook County, split the season in three segments to allow some earlier hunting. This is in an attempt to encourage cackling Canada geese to continue migration to traditional wintering grounds in California or at a minimum distribute goose flocks over a wider geographical range in the Willamette Valley. This early season has strong support from the Oregon Farm Bureau to assist landowners along the lower Columbia River beginning at Sauvie Island. While there are no specific ways to measure the success of redistribution, landowners perceive it as a means to assist in hazing and reducing agricultural depredation. The season structure is no change from last year. Ten to 15% of the overall harvest occurs in Period 1.

- Proposed season dates are as follows for all areas except Tillamook County:

    - Period 1: October 24-November 8, 2009;

    - Period 2: November 21, 2009-January 17, 2010;

    - Period 3: February 6-28, 2010.

    - For Tillamook County: November 28, 2009-February 28, 2010.

- Similar to last year, because Tillamook County does not contain a split season, differential shooting hours will be defined by dates instead of periods. From October 24, 2009-January 31, 2010 shooting hours will begin at 8:00 a.m. and end at 4:00 p.m. on hunt days and from February 1-28, 2010 shooting hours will begin at 7:30 a.m. and end at 4:00 p.m. on hunt days.

- Outside of Tillamook County, maintain the 3-day per week hunting schedule (Saturday, Sunday, and Wednesday schedule). This is no change from last year. Tillamook County would have a 2-day per week hunting schedule (Saturday and Sunday schedule).

- Maintain the daily bag limit of four dark geese and four white geese (two dark geese in Tillamook County). However, to assist in meeting population objectives of the Y-K Delta Goose Management Plan the bag limit for cackling Canada geese remains at no more than 2 cackling or Aleutian geese per day. After four years of population increases the cackling goose population decreased slightly this year and the 3-year average is now approximately 74,000 geese below the population goal of 250,000.

- Because of the importance of checking out all geese in the permit zone, whether dusky or non-dusky, it is also recommended the Commission maintain the rule that any hunter who fails to check out geese will not only lose their hunting privileges in the permit zone for the remainder of the season but would lose their hunting privileges for the next season also. Continued concerns by the USFWS and continued reports by hunters of non-compliance with checking geese, warrants a strong message to hunters that harvest monitoring is of utmost importance if this season is to be maintained in the future. This is particular true with current dusky Canada goose management issues and in maintaining cooperative agreements with native Alaskans regarding cackling Canada geese.

- Maintain check station locations as identified in last year's regulations.

The number of dusky Canada geese on the Copper River Delta continued to decline based on breeding ground surveys and this year reached an all time low in both the annual index and the 3-year average. Good production was observed this year which may bolster the population; however the very good production observed last year did not appear to affect this spring's population. Because geese do not breed generally until their third year of life there is still hope the goslings produced during the last two years may yet bolster breeding the population in the future. The Middleton Island segment of this population (where predation of adults, nests, and goslings is low) has remained relatively stable in recent years at approximately 1,500 adults and the island appears to have reached carrying capacity for dusky geese.

Over a decade ago the Commission supported significant changes for goose hunting in northwest Oregon to assist with agricultural depredation problems. Changes included new mandatory testing for hunters and greatly expanded hunt areas. This season worked fairly well, though hunter participation in some areas was not as high as hoped. Positive steps have been taken while still promoting conservation of dusky Canada geese.

In March 1997, under direction from the Pacific Flyway Council, the USFWS began development of a goose depredation control plan for northwest Oregon and southwest Washington. State personnel in both Oregon and Washington spent considerable time providing input into this plan. The Council adopted the plan in March 1998. The department continues to strongly encourage Flyway-wide participation because actions taken in Oregon will have impacts on populations shared by many states. Oregon and Washington Farm Bureau representatives also provided input to the development of the depredation control plan. During the 2009 session, the Oregon legislature passed, and the Governor signed into law, Senate Bill 622. This bill creates a task force to study issues raised by the increasing numbers of various species of geese in Oregon and to make recommendations regarding opportunities to control the goose population pursuant to applicable state and federal laws.

The department recommends maintaining the permit goose hunting season in NW Oregon and keeping the program as consistent as possible. The following will assist managers in achieving goals:

- ✓ The current hunter education program is proposed for continuation. This will continue to improve knowledge of goose management issues and the role hunters play in this process. After Commission approval in 2005 the hunter education program was implemented in the NW Oregon General Zone in 2006 to assist with management of cackling and dusky Canada geese. Online internet testing for the goose permit was made available to hunters for the first time in September 2006 and was very well received by permit test takers. This is the second year in which only online testing will be offered except by special appointment.

- ✓ Past law enforcement efforts have shown minimal problems with dusky Canada geese not being checked at stations. There is speculation that some duskys are being left in the field. Last year the department funded additional OSP personnel to support enforcement efforts. However, due to budget constraints the senior trooper program has been eliminated and the department will have to pay troopers overtime wages to provide law enforcement support during this season. The high cost of this enforcement may reduce the number of hours devoted to law enforcement during this season compared to when senior troopers were utilized.

- ✓ Population monitoring has indicated high winter survival rates for adult dusky Canada geese. These activities will continue this year to monitor impacts of hunting programs.

- ✓ All hunting will be by permit only and under a hunt period quota system. Dusky harvest has been minimal compared to the take of other species.

- ✓ The Pacific Flyway Dusky Canada Goose Management Plan includes various one additional threshold to cut back harvest if the population should further decrease. The plan also calls for the institution of hunter education and permit/quota hunts in Alaska where dusky geese may be harvested at the current population level. Alaska is in the process of instituting these programs for this season.

Public Comment

This season continues to be debated, especially in light of high numbers of wintering geese in northwest Oregon. Public opinion varies tremendously on how this season should be administered and whether or not the dusky Canada goose population should be maintained at any cost. With little or no assistance from federal agencies, primarily because of USDA - Wildlife Services budgetary constraints, landowner tolerance towards wintering geese is low. The Oregon Farm Bureau does not generally support the flyway depredation control plan as long as management agencies consider the dusky Canada goose a distinct subspecies.

Many hunters have expressed concerns about the reduction in the daily bag limit of cackling Canada geese that took effect in 2005 which did reduce harvest of cackling geese from prior levels. It is uncertain if the reduction has reduced overall hunter participation, however the number of individual hunters bringing geese to check stations has not declined and cackling goose harvest has increased since 2005, although not to the levels seen in 2004 when 4 cacklers were allowed in the bag.

There are also requests to classify the dusky Canada goose as a protected species, eliminate all permit goose restrictions, and cite any hunter who shoots a dusky. The department, as in past years, does not support this concept. This season is complicated, but its integrity must be maintained to ensure protection for depressed goose populations. Many hunters have been concerned with further cutbacks in the permit seasons due to lack of federal funds. The proposed season is status quo from last year, except for the reduced dusky quota. These individuals are also promoting the Commission consider an additional fee to maintain this hunting season in the future. The current estimate for operational costs this season is approximately $190,000 funded by waterfowl stamp funds. These costs include $40-50,000 of funds needed for additional law enforcement support. Costs have increased with the inclusion of hunting in Tillamook County. Landowners in Tillamook County would like to see increase season lengths and bag limits. But research is still continuing to ascertain the status of Semidi Island Aleutian Canada geese.

Some hunters oppose the continuation of online internet testing for the goose permit citing concerns of increased opportunities for cheating.

Black Brant

Framework

Oregon may select 16 consecutive days between the Saturday closest to October 1 and December 15. Bag limit is 2 per day, 4 in possession. Shooting hours are one half hour before sunrise to sunset.

Recommendation

Adoption of a 16-day season and 2 brant daily bag limit, 4 in possession. The season dates for this year have been adjusted back one week due to public request.

PROPOSED BLACK BRANT SEASON

Statewide: November 14, 2009 – November 29, 2009

The brant season in Oregon is short in duration with restrictive bag limits. Oregon coastal bays are a minor wintering site for brant in the Flyway and likely provide more migration than wintering habitat. Human disturbance has been documented to have detrimental effects on brant populations in other areas of the Flyway. Expanding acres of oyster plats, which can destroy eelgrass beds, and other non-hunting recreational activities in Oregon are of concern. Brant hunter numbers in Oregon are small with minimal harvest. The proposed one-week opening day delay is expected to have no impact on hunter opportunity but may provide hunting days when higher numbers of brant may be using Oregon's coastal bays.

The department continues to support a conservative approach to brant hunting adopted by the Commission eight years ago. Two objectives of the strategy were to overlap Oregon and California seasons whenever possible and reduce overall brant harvest in Oregon in an attempt to increase wintering numbers. The proposed one-week season delay still coincides with California's 30-day brant season. The department supports harvest limitations through regulation of days and bag limits, rather than method of take. Also, the department continues to support Flyway policies on managing populations based on breeding derivation rather than winter distribution of individual flocks.

Public Comment

Comments remained mixed on the brant season. Very few hunters participate in this season since it is somewhat specialized and requires special skills. Some hunters have complained a November hunt greatly reduces their success rate and propose moving the season back into late December and/or January which is no longer allowed under federal frameworks. One hunter has asked for at least a later start during the month of November and the Department is proposing that for this season. This change will also hunting over the Thanksgiving holiday.

➢ WILSON'S SNIPE

Framework

Oregon is allowed a 107-day season between September 1 and February 28, with a daily bag limit and possession limit of 8 and 16, respectively. A two-way or three-way season split can be selected. Hunting zones may be selected by established duck hunting zones.

Recommendation

Adoption of maximum days and bag limits.

PROPOSED WISLON'S SNIPE SEASON

Zone 1: Concurrent with proposed duck season.

Zone 2: Concurrent with proposed duck season.

Public Comment

One hunter has repeatedly requested a split season for snipe which would allow later hunting in western Oregon and last year provided a petition signed by other hunters supporting a late split season. The same request was submitted again this year. However, there are differences of opinions on this proposal and not all hunters support it. The Commission is reminded that this type of season has been adopted in past years and received little support after a three year experiment. At that time, many hunters, including the hunter who is requesting the split season now, recommended going back to the concurrent seasons with duck hunting. The department still believes the majority of hunters support a season concurrent with duck seasons for simplicity of regulations and that many snipe are hunted incidental to being in the field hunting for ducks.

➢ American Coot

Framework

Concurrent with duck season with a daily and possession limit of 25.

Recommendation

Adoption of maximum days and bag limits.

PROPOSED AMERICAN COOT SEASON

Zone 1: Concurrent with proposed duck season.

Zone 2: Concurrent with proposed duck season.

*** A federal waterfowl youth hunt weekend is proposed for September 26 and 27.**
Coot population levels remain above the long-term average. Numbers in Oregon increased substantially as recorded during spring surveys. Current harvest strategies seem to have minimal impact on coots, which are not highly sought by most hunters.

Public Comment

No comments have been received.

➢ FALCONRY

Framework

No migratory bird species can be hunted by any method (gun + falconry) for more than 107 days in a geographic area. Falconry daily bag and possession limits for all permitted migratory game birds shall not exceed three and six, respectively, singly or in the aggregate. During that time when the season for dove, pigeons, crow and/or snipe, overlaps that for waterfowl, the falconer's bag may contain not more than three of all the federally regulated species.

Recommendation

Adoption of maximum days and bag limits allowed.

PROPOSED MIGRATORY GAME BIRD FALCONRY SEASONS

Duck, Coot, Merganser, Crow and Snipe: Concurrent with all listed gun seasons. Maximum falconry bag limits allowed.

Geese: Concurrent with all listed gun seasons except that no falconry hunting is allowed in the NW Oregon Permit Goose Zone or during any September Canada goose season. Only one goose, excluding brant, is allowed per day.

Dove and Band-tailed Pigeon: September 1, 2009 **-** December 16, 2009. Pigeon limit remains at one.

There are approximately 80 licensed falconers in the state, not all of who fly their raptors after game. Their collective harvest of birds is small. Most migratory game bird season proposals are concurrent with gun seasons. Liberalization of general duck and goose seasons denies opportunities for falconers to hunt outside of normal gun seasons.

Public Comment

Comments were received regarding department rules requiring all falconers hunting any wildlife to posses state game bird validations and a federal waterfowl stamp. The department has proposed to change the wording to indicate falconers must posses all applicable permits, validations and stamps for wildlife they will be hunting.

PUBLIC HUNTING OPPORTUNITIES

Columbia Basin Regulated Hunt Area Program: Programs along the Columbia River near Boardman and other public access programs in Umatilla County are proposed to remain the same as in past years. In December of 2005 the Port of Morrow opened up approximately 500 acres of its land near Boardman to public hunting access. Access to this land will again be available to hunters this season.

APPENDIX A

ADAPTIVE HARVEST MANAGEMENT REPORT, 2009

U.S. Fish & Wildlife Service

Adaptive Harvest Management

2009 Hunting Season

U.S. Fish & Wildlife Service

Adaptive Harvest Management

2009 Hunting Season

PREFACE

The process of setting waterfowl hunting regulations is conducted annually in the United States (Blohm 1989). This process involves a number of meetings where the status of waterfowl is reviewed by the agencies responsible for setting hunting regulations. In addition, the U.S. Fish and Wildlife Service (USFWS) publishes proposed regulations in the *Federal Register* to allow public comment. This document is part of a series of reports intended to support development of harvest regulations for the 2009 hunting season. Specifically, this report is intended to provide waterfowl managers and the public with information about the use of adaptive harvest management (AHM) for setting waterfowl hunting regulations in the United States. This report provides the most current data, analyses, and decision-making protocols. However, adaptive management is a dynamic process and some information presented in this report will differ from that in previous reports.

Citation: U.S. Fish and Wildlife Service. 2009. Adaptive Harvest Management: 2009 Hunting Season. U.S. Dept. Interior, Washington, D.C. 52pp. Online: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/AHM/AHM-intro.htm

ACKNOWLEDGMENTS

A working group consisting of representatives from the USFWS, the U.S. Geological Survey (USGS), the Canadian Wildlife Service (CWS), and the four Flyway Councils (Appendix 1) was established in 1992 to review the scientific basis for managing waterfowl harvests. The working group, supported by technical experts from the waterfowl management and research communities, subsequently proposed a framework for adaptive harvest management, which was first implemented in 1995. The USFWS expresses its gratitude to the AHM Working Group and to the many other individuals, organizations, and agencies that have contributed to the development and implementation of AHM.

This report was prepared by the USFWS Division of Migratory Bird Management. G. S. Boomer and T. A. Sanders were the principal authors. Individuals that provided essential information or otherwise assisted with report preparation were G. Zimmerman, M. Koneff, K. Richkus, E. Silverman, N. Zimpfer, J. Klimstra, K. Magruder, and P. Garrettson. Comments regarding this document should be sent to the Chief, Division of Migratory Bird Management - USFWS, 4401 North Fairfax Drive, MS MSP-4107, Arlington, VA 22203.

We are grateful for the continuing technical support from F. A. Johnson, M. C. Runge, and J. A. Royle (USGS), and acknowledge that information provided by USGS in this report has not received the Director's approval and, as such, is provisional and subject to revision. This information is released on the condition that neither the USGS nor the United States Government may be held liable for any damages resulting from its authorized or unauthorized use.

Cover art: Joshua Spies's painting of a long-tailed duck (*Clangula hyemalis*) that was selected for the 2009 federal "duck stamp."

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EXECUTIVE SUMMARY

In 1995 the U.S. Fish and Wildlife Service (USFWS) implemented the Adaptive Harvest Management (AHM) program for setting duck hunting regulations in the United States. The AHM approach provides a framework for making objective decisions in the face of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts.

The AHM protocol is based on the population dynamics and status of three mallard (*Anas platyrhynchos*) stocks. Mid-continent mallards are defined as those breeding in the Waterfowl Breeding Population and Habitat Survey (WBPHS) strata 13–18, 20–50, and 75–77 plus mallards breeding in the states of Michigan, Minnesota, and Wisconsin (state surveys). The prescribed regulatory alternative for the Mississippi and Central Flyways depends exclusively on the status of these mallards. Eastern mallards are defined as those breeding in WBPHS strata 51–54 and 56 and breeding in the states of Virginia northward into New Hampshire (Atlantic Flyway Breeding Waterfowl Survey [AFBWS]). The regulatory choice for the Atlantic Flyway depends exclusively on the status of these mallards. Western mallards are defined as those birds breeding in WBPHS strata 1–12 (hereafter Alaska) and those birds breeding in the states of California and Oregon (state surveys). The regulatory choice for the Pacific Flyway depends exclusively on the status of these mallards.

Mallard population models are based on the best available information and account for uncertainty in population dynamics and the impact of harvest. Model-specific weights reflect the relative confidence in alternative hypotheses and are updated annually using comparisons of predicted and observed population sizes. For mid-continent mallards, current model weights favor the weakly density-dependent reproductive hypothesis (88%) and suggest some preference for the additive-mortality hypothesis (62%). For eastern mallards, virtually all of the weight is on models that have corrections for bias in estimates of survival or reproductive rates. Model weights do not discriminate between the strongly density-dependent (47%) and weakly density-dependent (53%) reproductive hypotheses. By consensus, hunting mortality is assumed to be additive in eastern mallards. Unlike mid-continent and eastern mallards, we consider a single functional form to predict western mallard population dynamics but consider a wide range of parameter values each weighted relative to the support from the data.

For the 2009 hunting season, the USFWS is considering the same regulatory alternatives as last year. The nature of the restrictive, moderate, and liberal alternatives has remained essentially unchanged since 1997, except that extended framework dates have been offered in the moderate and liberal alternatives since 2002. Harvest rates associated with each of the regulatory alternatives have been updated based on band-reporting rate studies conducted since 1998. The expected harvest rates of adult males under liberal hunting seasons are 0.119 (SD = 0.020), 0.149 (SD = 0.043), and 0.115 (SD = 0.032) for mid-continent, eastern, and western mallards, respectively.

Optimal regulatory strategies for the 2009 hunting season were calculated using: (1) harvest-management objectives specific to each mallard stock; (2) the 2009 regulatory alternatives; and (3) current population models. Based on this year's survey results of 8.71 million mid-continent mallards, 3.57 million ponds in Prairie Canada, 0.908 million eastern mallards, and 0.884 million western mallards in Alaska (0.503 million) and California–Oregon (0.381 million), the optimal choice for all four flyways is the liberal regulatory alternative.

AHM concepts and tools are also being applied to help improve harvest management for several other waterfowl stocks. In the last year, progress has been made in understanding the harvest potential of northern pintails (*Anas acuta*) and scaup (*Aythya affinis*, *A. marila*). While these biological assessments are on-going, they are already informing decision makers and proving valuable in helping focus debate on the social aspects of harvest policy, including management objectives and the nature of regulatory alternatives.

BACKGROUND

The annual process of setting duck-hunting regulations in the United States is based on a system of resource monitoring, data analyses, and rule-making (Blohm 1989). Each year, monitoring activities such as aerial surveys and hunter questionnaires provide information on population size, habitat conditions, and harvest levels. Data collected from this monitoring program are analyzed each year, and proposals for duck-hunting regulations are developed by the Flyway Councils, States, and USFWS. After extensive public review, the USFWS announces regulatory guidelines within which States can set their hunting seasons.

In 1995, the USFWS adopted the concept of adaptive resource management (Walters 1986) for regulating duck harvests in the United States. This approach explicitly recognizes that the consequences of hunting regulations cannot be predicted with certainty and provides a framework for making objective decisions in the face of that uncertainty (Williams and Johnson 1995). Inherent in the adaptive approach is an awareness that management performance can be maximized only if regulatory effects can be predicted reliably. Thus, adaptive management relies on an iterative cycle of monitoring, assessment, and decision-making to clarify the relationships among hunting regulations, harvests, and waterfowl abundance.

In regulating waterfowl harvests, managers face four fundamental sources of uncertainty (Nichols et al. 1995*a*, Johnson et al. 1996, Williams et al. 1996):

(1) environmental variation - the temporal and spatial variation in weather conditions and other key features of waterfowl habitat; an example is the annual change in the number of ponds in the Prairie Pothole Region, where water conditions influence duck reproductive success;

(2) partial controllability - the ability of managers to control harvest only within limits; the harvest resulting from a particular set of hunting regulations cannot be predicted with certainty because of variation in weather conditions, timing of migration, hunter effort, and other factors;

(3) partial observability - the ability to estimate key population attributes (e.g., population size, reproductive rate, harvest) only within the precision afforded by extant monitoring programs; and

(4) structural uncertainty - an incomplete understanding of biological processes; a familiar example is the long-standing debate about whether harvest is additive to other sources of mortality or whether populations compensate for hunting losses through reduced natural mortality. Structural uncertainty increases contentiousness in the decision-making process and decreases the extent to which managers can meet long-term conservation goals.

AHM was developed as a systematic process for dealing objectively with these uncertainties. The key components of AHM include (Johnson et al. 1993, Williams and Johnson 1995):

(1) a limited number of regulatory alternatives, which describe Flyway-specific season lengths, bag limits, and framework dates;

(2) a set of population models describing various hypotheses about the effects of harvest and environmental factors on waterfowl abundance;

(3) a measure of reliability (probability or "weight") for each population model; and

(4) a mathematical description of the objective(s) of harvest management (i.e., an "objective function"), by which alternative regulatory strategies can be compared.

These components are used in a stochastic optimization procedure to derive a regulatory strategy. A regulatory strategy specifies the optimal regulatory choice, with respect to the stated management objectives, for each possible combination of breeding population size, environmental conditions, and model weights (Johnson et al. 1997). The setting of annual hunting regulations then involves an iterative process:

(1) each year, an optimal regulatory choice is identified based on resource and environmental conditions, and on current model weights;

(2) after the regulatory decision is made, model-specific predictions for subsequent breeding population size are determined;
(3) when monitoring data become available, model weights are increased to the extent that observations of population size agree with predictions, and decreased to the extent that they disagree; and
(4) the new model weights are used to start another iteration of the process.

By iteratively updating model weights and optimizing regulatory choices, the process should eventually identify which model is the best overall predictor of changes in population abundance. The process is optimal in the sense that it provides the regulatory choice each year necessary to maximize management performance. It is adaptive in the sense that the harvest strategy "evolves" to account for new knowledge generated by a comparison of predicted and observed population sizes.

MALLARD STOCKS AND FLYWAY MANAGEMENT

Since its inception AHM has focused on the population dynamics and harvest potential of mallards, especially those breeding in mid-continent North America. Mallards constitute a large portion of the total U.S. duck harvest, and traditionally have been a reliable indicator of the status of many other species. As management capabilities have grown, there has been increasing interest in the ecology and management of breeding mallards that occur outside the mid-continent region. Geographic differences in the reproduction, mortality, and migrations of mallard stocks suggest that there may be corresponding differences in optimal levels of sport harvest. The ability to regulate harvests of mallards originating from various breeding areas is complicated, however, by the fact that a large degree of mixing occurs during the hunting season. The challenge for managers, then, is to vary hunting regulations among Flyways in a manner that recognizes each Flyway's unique breeding-ground derivation of mallards. Of course, no Flyway receives mallards exclusively from one breeding area; therefore, Flyway-specific harvest strategies ideally should account for multiple breeding stocks that are exposed to a common harvest.

The optimization procedures used in AHM can account for breeding populations of mallards beyond the mid-continent region, and for the manner in which these ducks distribute themselves among the Flyways during the hunting season. An optimal approach would allow for Flyway-specific regulatory strategies, which represent an average of the optimal harvest strategies for each contributing breeding stock weighted by the relative size of each stock in the fall flight. This joint optimization of multiple mallard stocks requires: (1) models of population dynamics for all recognized stocks of mallards; (2) an objective function that accounts for harvest-management goals for all mallard stocks in the aggregate; and (3) decision rules allowing Flyway-specific regulatory choices.

Currently, three stocks of mallards are officially recognized for the purposes of AHM (Fig. 1). We use a constrained approach to the optimization of these stocks' harvest, in which the Atlantic Flyway regulatory strategy is based exclusively on the status of eastern mallards, the regulatory strategy for the Mississippi and Central Flyways is based exclusively on the status of mid-continent mallards, and the Pacific Flyway regulatory strategy is based exclusively on the status of western mallards. This approach has been determined to perform nearly as well as a joint-optimization because mixing of the three stocks during the hunting season is limited and because of the constraints imposed by management objectives and regulatory alternatives.

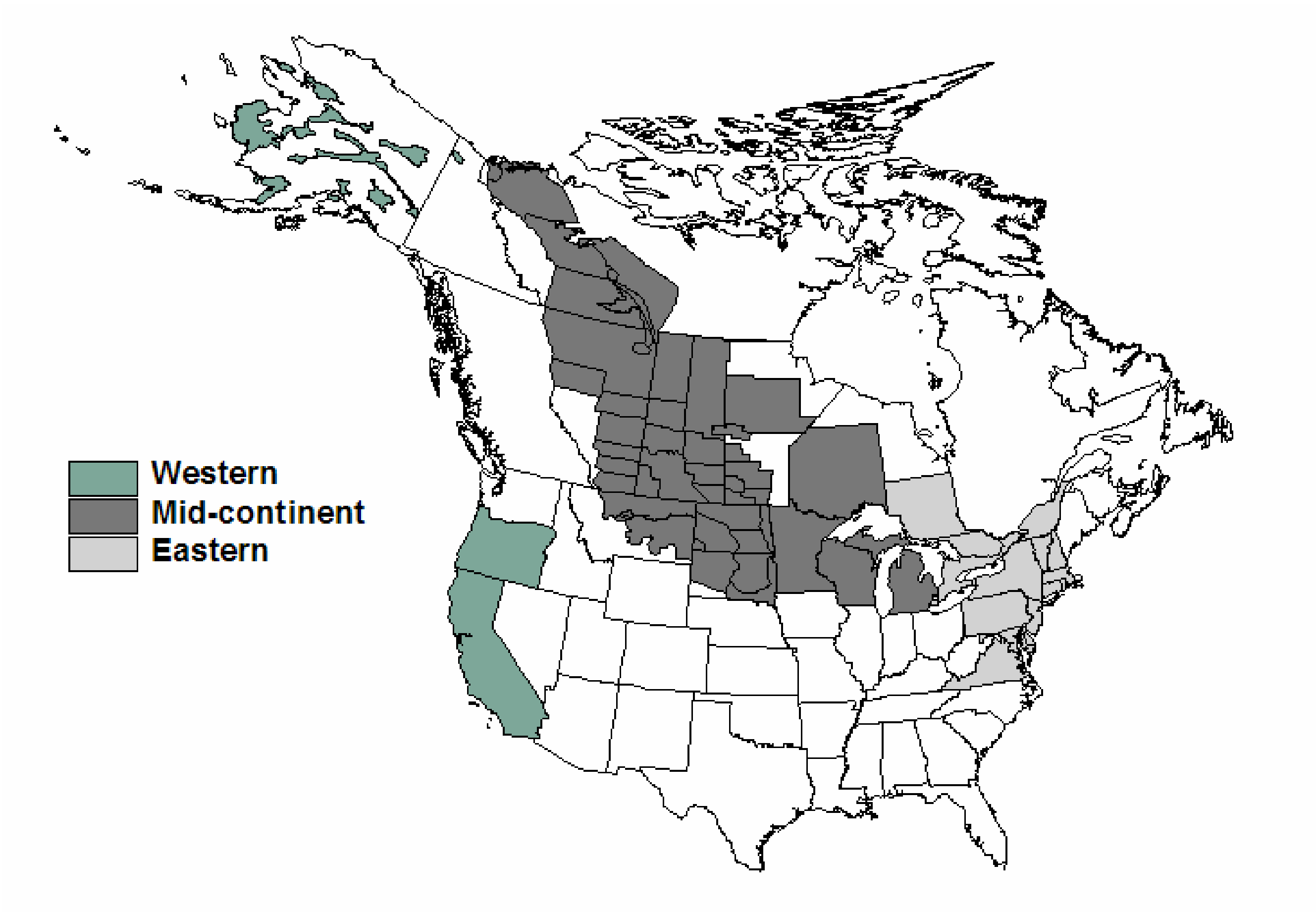

Fig. 1. Survey areas currently assigned to the mid-continent, eastern, and western stocks of mallards for the purposes of AHM.

MALLARD POPULATION DYNAMICS

Mid-Continent Stock

In 2008, mid-continent mallards were re-defined as those breeding in WBPHS strata 13–18, 20–50, and 75–77, and in the Great Lakes region (Michigan, Minnesota, and Wisconsin; see Fig. 1). Estimates of the size of this population are available since 1992, and have varied from 6.4 to 11.2 million (Table 1, Fig. 2). Estimated breeding-population size in 2009 was 8.71 million (SE = 0.25 million), including 8.01 million (SE = 0.24 million) from the WBPHS and 0.696 million (SE = 0.056 million) from the Great Lakes region.

Details describing the set of population models for mid-continent mallards are provided in Appendix 2. The set consists of four alternatives, formed by the combination of two survival hypotheses (additive vs. compensatory hunting mortality) and two reproductive hypotheses (strongly vs. weakly density dependent). Relative weights for the alternative models of mid-continent mallards changed little until all models under-predicted the change in population size from 1998 to 1999, perhaps indicating there is a significant factor affecting population dynamics that is absent from all four models (Fig. 3). Updated model weights suggest some preference for the additive-

Table 1. Estimates (N) and associated standard errors (SE) of mid-continent mallards (in millions) observed in the WBPHS (strata 13–18, 20–50, and 75–77) and the Great Lakes region (Michigan, Minnesota, and Wisconsin).

	WBPHS area		Great Lakes region		Total	
Year	**N**	**SE**	**N**	**SE**	**N**	**SE**
1992	5.6304	0.2379	0.9946	0.1597	6.6249	0.2865
1993	5.4253	0.2068	0.9347	0.1457	6.3600	0.2529
1994	6.6292	0.2803	1.1505	0.1163	7.7797	0.3035
1995	7.7452	0.2793	1.1214	0.1965	8.8666	0.3415
1996	7.4193	0.2593	1.0251	0.1443	8.4444	0.2967
1997	9.3554	0.3041	1.0777	0.1445	10.4331	0.3367
1998	8.8041	0.2940	1.1224	0.1792	9.9266	0.3443
1999	10.0926	0.3374	1.0591	0.2122	11.1518	0.3986
2000	8.6999	0.2855	1.2350	0.1761	9.9348	0.3354
2001	7.1857	0.2204	0.8622	0.1086	8.0479	0.2457
2002	6.8364	0.2412	1.0820	0.1152	7.9184	0.2673
2003	7.1062	0.2589	0.8360	0.0734	7.9422	0.2691
2004	6.6142	0.2746	0.9333	0.0748	7.5474	0.2847
2005	6.0521	0.2754	0.7862	0.0650	6.8383	0.2830
2006	6.7607	0.2187	0.5881	0.0465	7.3488	0.2236
2007	7.7258	0.2805	0.7677	0.0584	8.4935	0.2865
2008	7.1914	0.2525	0.6750	0.0478	7.8664	0.2570
2009	8.0094	0.2442	0.6958	0.0564	8.7052	0.2506

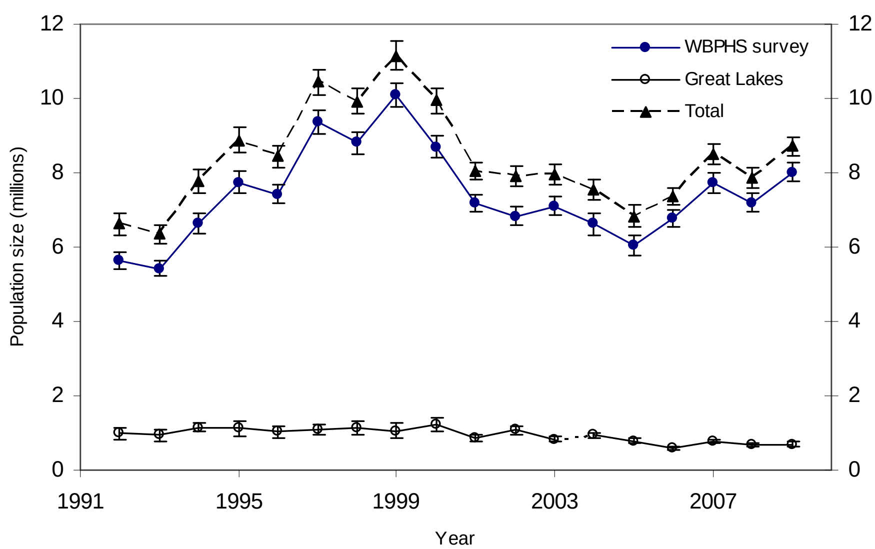

Fig. 2. Population estimates of mid-continent mallards observed in the WBPHS (strata: 13–18, 20–50, and 75–77) and the Great Lakes region (Michigan, Minnesota, and Wisconsin). Error bars represent one standard error.

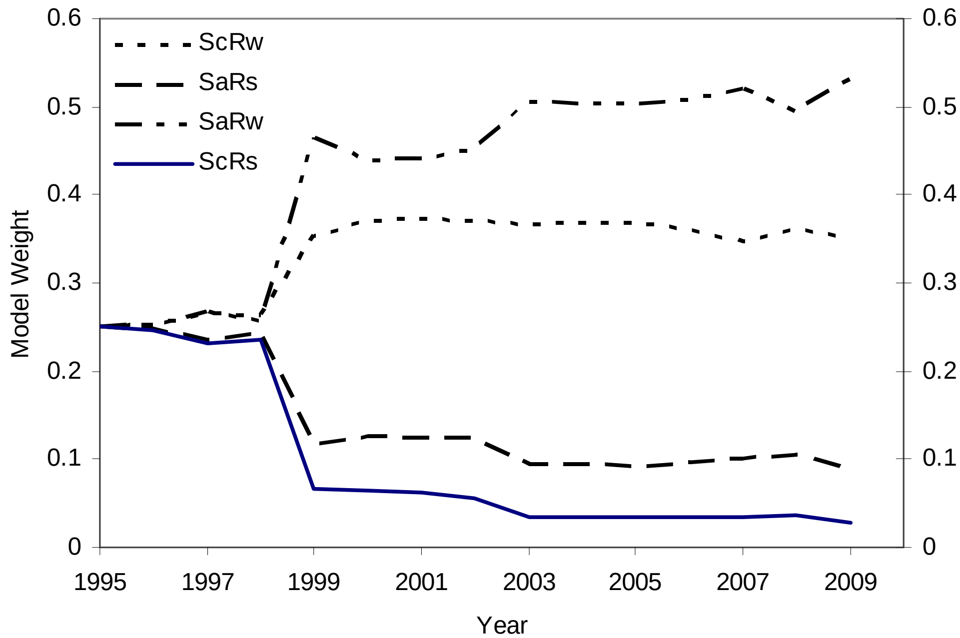

Fig. 3. Weights for models of mid-continent mallards (ScRs = compensatory mortality and strongly density-dependent reproduction, ScRw = compensatory mortality and weakly density-dependent reproduction, SaRs = additive mortality and strongly density-dependent reproduction, and SaRw = additive mortality and weakly density-dependent reproduction). Model weights were assumed to be equal in 1995.

mortality models (62%) over those describing hunting mortality as compensatory (38%). For most of the time frame, model weights have strongly favored the weakly density-dependent reproductive models over the strongly density-dependent ones, with current model weights of 88% and 12%, respectively. The reader is cautioned, however, that models can sometimes make reliable predictions of population size for reasons having little to do with the biological hypotheses expressed therein (Johnson et al. 2002*b*).

Eastern Stock

Eastern mallards are defined as those breeding in southern Ontario and Quebec (WBPHS strata 51–54 and 56) and in the northeastern U.S. (AFBWS; Heusman and Sauer 2000; see Fig. 1). Estimates of population size have varied from 0.815 to 1.1 million since 1990, with the majority of the population accounted for in the northeastern U.S. (Table 2, Fig. 4). For 2009, the estimated breeding-population size of eastern mallards was 0.908 million (SE = 0.063 million), including 0.667 million (SE = 0.046 million) from the northeastern U.S. and 0.241 million (SE = 0.043 million) from the WBPHS. The reader is cautioned that these estimates differ from those reported in the USFWS annual waterfowl trend and status reports, which include composite estimates based on more fixed-wing strata in eastern Canada and helicopter surveys conducted by the Canadian Wildlife Service (CWS).

Details concerning the set of population models for eastern mallards are provided in Appendix 3. The set consists of six alternatives, formed by the combination of two reproductive hypotheses (strongly vs. weakly density dependent) and three hypotheses concerning bias in estimates of survival and reproductive rates (no bias vs. biased survival rates vs. biased reproductive rates). With respect to model weights, there is no single model that is clearly favored over the others at the current time. Collectively, current model weights provide little discrimination between the weakly density-dependent or strongly density dependent reproductive hypotheses, with current model weights of 53% and 47%, respectively (Fig. 5). In addition, there is overwhelming evidence of bias in extant estimates of survival or reproductive rates, assuming that survey estimates are unbiased.

Table 2. Estimates (N) and associated standard errors (SE) of eastern mallards (in millions) observed in the northeastern U.S. (AFBWS) and southern Ontario and Quebec (WBPHS strata 51–54 and 56).

	Northeastern U.S.		**Canadian survey strata**		**Total**	
Year	**N**	**SE**	**N**	**SE**	**N**	**SE**
1990	0.6651	0.0783	0.1907	0.0472	0.8558	0.0914
1991	0.7792	0.0883	0.1528	0.0337	0.9320	0.0945
1992	0.5622	0.0479	0.3203	0.0530	0.8825	0.0715
1993	0.6866	0.0499	0.2921	0.0482	0.9786	0.0694
1994	0.8563	0.0628	0.2195	0.0282	1.0758	0.0688
1995	0.8641	0.0704	0.1844	0.0400	1.0486	0.0810
1996	0.8486	0.0611	0.2831	0.0557	1.1317	0.0826
1997	0.7952	0.0496	0.2121	0.0396	1.0073	0.0634
1998	0.7752	0.0497	0.2638	0.0672	1.0390	0.0836
1999	0.8800	0.0602	0.2125	0.0369	1.0924	0.0706
2000	0.7626	0.0487	0.1323	0.0264	0.8948	0.0554
2001	0.8094	0.0516	0.2002	0.0356	1.0097	0.0627
2002	0.8335	0.0562	0.1915	0.0319	1.0250	0.0647
2003	0.7319	0.0470	0.3083	0.0554	1.0402	0.0726
2004	0.8066	0.0517	0.3015	0.0533	1.1081	0.0743
2005	0.7536	0.0536	0.2934	0.0531	1.0470	0.0755
2006	0.7214	0.0476	0.1740	0.0284	0.8954	0.0555
2007	0.6876	0.0467	0.2193	0.0336	0.9069	0.0576
2008	0.6191	0.0407	0.1960	0.0300	0.8151	0.0505
2009	0.6668	0.0457	0.2411	0.0434	0.9078	0.0630

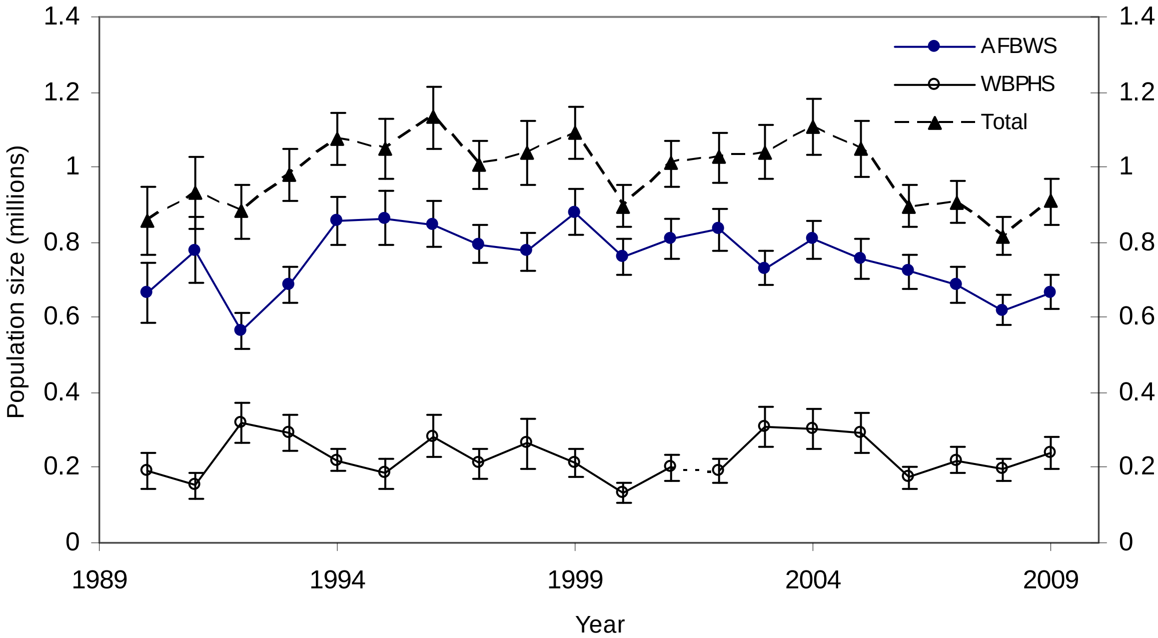

Fig. 4. Population estimates of eastern mallards observed in the northeastern states (AFBWS) and in southern Ontario and Quebec (WBPHS strata 51–54 and 56). Error bars represent one standard error.

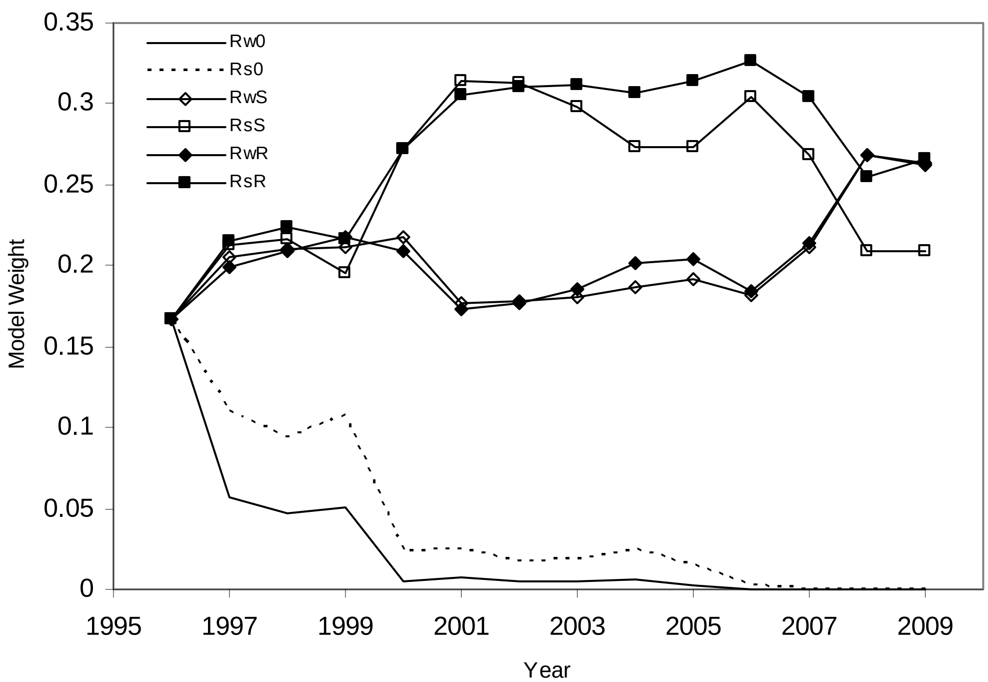

Fig. 5. Weights for models of eastern mallards (Rw0 = weak density-dependent reproduction and no model bias, Rs0 = strong -dependent reproduction and no model bias, RwS = weak density-dependent reproduction and biased survival rates, RsS = strong density-dependent reproduction and biased survival rates, RwR = weak density-dependent reproduction and biased reproductive rates, and RsR = strong density-dependent reproduction and biased reproductive rates). Model weights were assumed to be equal in 1996.

Western Stock

Western mallards consist of 2 substocks and are defined as those birds breeding in Alaska (WBPHS strata 1–12) and those birds breeding in California and Oregon (state surveys; see Fig. 1). Estimates of the size of these subpopulations have varied from 0.283 to 0.843 million in Alaska since 1990 and 0.355 to 0.694 million in California and Oregon since 1992 (Table 3, Fig. 6). The total population size of western mallards has ranged from 0.748 to 1.407 million.

Ideally, the western mallard stock assessment would account for mallards breeding in the states of the Pacific Flyway (including Alaska), British Columbia, and the Yukon Territory. However, we have had continuing concerns about our ability to determine changes in population size based on the collection of surveys conducted independently by Pacific Flyway States and the CWS in British Columbia. These surveys tend to vary in design and intensity, and in some cases lack measures of precision. We reviewed extant surveys to determine their adequacy for supporting a western-mallard AHM protocol and selected Alaska, California, and Oregon for modeling purposes. These three states likely harbor about 75% of the western-mallard breeding population. Nonetheless, this geographic delineation is considered temporary until surveys in other areas can be brought up to similar standards and an adequate record of population estimates is available for analysis.

Details concerning the set of population models for western mallards are provided in Appendix 4. To predict changes in abundance we relied on a discrete logistic model, which combines reproduction and natural mortality into a single parameter, r, the intrinsic rate of growth. This model assumes density-dependent growth, which is regulated by the ratio of population size, N, to the carrying capacity of the environment, K (i.e., equilibrium population size in the absence of harvest). In the traditional formulation of the logistic model, harvest mortality is completely additive and any compensation for hunting losses occurs as a result of density-dependent responses beginning in the subsequent breeding season. To increase the model's generality we included a scaling parameter for harvest that allows for the possibility of compensation prior to the breeding season. It is important to note, however, that this parameterization does not incorporate any hypothesized mechanism for harvest compensation and, therefore, must be interpreted cautiously. We modeled Alaska mallards independently of those in California and Oregon because of differing population trajectories (see Fig. 6) and substantial differences in the distribution of band recoveries.

We used Bayesian estimation methods in combination with a state-space model that accounts explicitly for both process and observation error in breeding population size (Meyer and Millar 1999). Breeding population estimates of mallards in Alaska are available since 1955, but we had to limit the time series to 1990–2008 because of changes in survey methodology and insufficient band-recovery data. The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time series of Alaska population estimates. The estimated mean carrying capacity was 1.1 million, the intrinsic rate of growth was 0.31, while the scaling parameter estimate suggests that harvest mortality may be additive. Breeding population and harvest-rate data were available for California–Oregon mallards for the period 1992–2008. The logistic model also provided a reasonable fit to these data, suggesting a mean carrying capacity of 0.7 million, an intrinsic rate of growth of 0.33, while the scaling parameter estimate suggests that harvest mortality may be only partially additive.

Table 3. Estimates (N) and associated standard errors (SE) of mallards (in millions) observed in Alaska (WBPHS strata 1–12) and California and Oregon (state surveys) combined.

	Alaska		**California–Oregon**		**Total**	
Year	**N**	**SE**	**N**	**SE**	**N**	**SE**
1990	0.3669	0.0370				
1991	0.3853	0.0363				
1992	0.3457	0.0387	0.4835	0.0605	0.8292	0.0718
1993	0.2830	0.0295	0.4654	0.0510	0.7484	0.0589
1994	0.3509	0.0371	0.4367	0.0426	0.7876	0.0565
1995	0.5242	0.0680	0.4541	0.0428	0.9783	0.0803
1996	0.5220	0.0436	0.6451	0.0802	1.1671	0.0912
1997	0.5842	0.0520	0.6390	0.1043	1.2232	0.1166
1998	0.8362	0.0673	0.4868	0.0489	1.3230	0.0832
1999	0.7131	0.0696	0.6937	0.1066	1.4068	0.1273
2000	0.7703	0.0522	0.4639	0.0532	1.2342	0.0745
2001	0.7183	0.0541	0.4044	0.0451	1.1227	0.0705
2002	0.6673	0.0507	0.3775	0.0327	1.0449	0.0603
2003	0.8435	0.0668	0.4340	0.0501	1.2775	0.0835
2004	0.8111	0.0639	0.3547	0.0352	1.1658	0.0729
2005	0.7031	0.0547	0.4014	0.0474	1.1045	0.0724
2006	0.5158	0.0469	0.4879	0.0576	1.0037	0.0743
2007	0.5815	0.0551	0.4900	0.0546	1.0715	0.0775
2008	0.5324	0.0468	0.3814	0.0478	0.9138	0.0669
2009	0.5030	0.0449	0.3815	0.0639	0.8844	0.0781

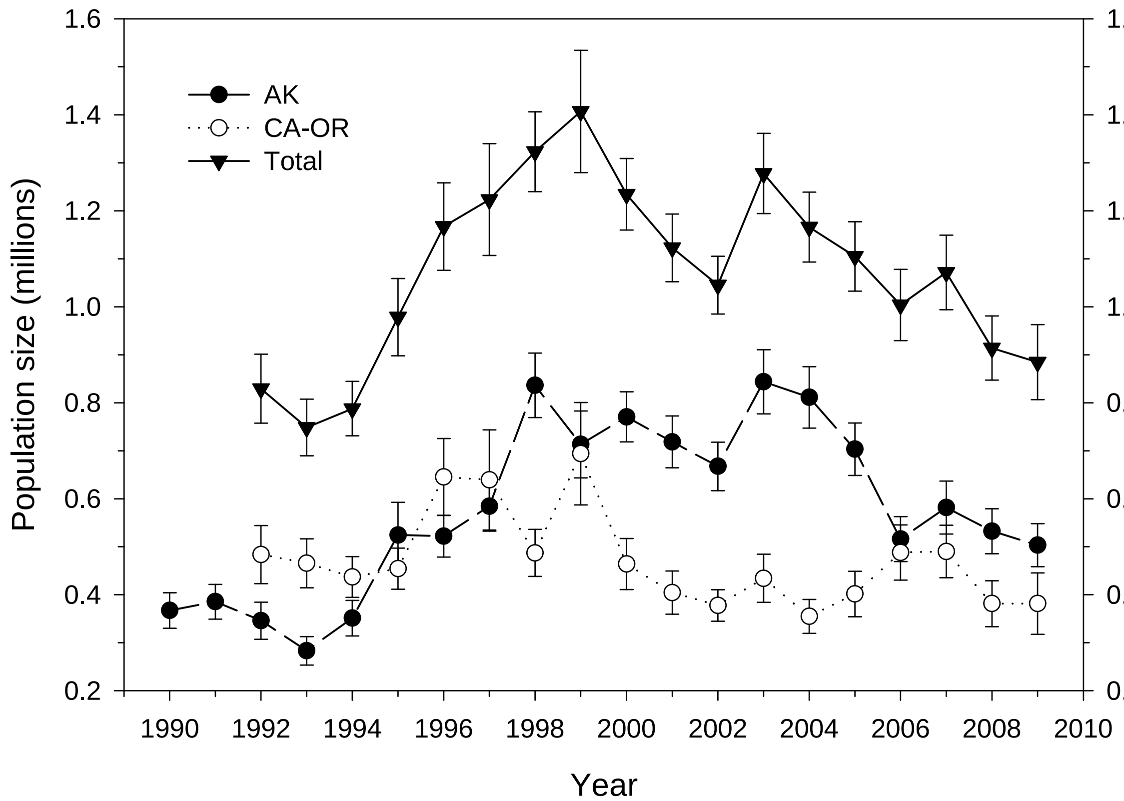

Fig. 6. Population estimates of western mallards observed in Alaska (WBPHS strata 1–12) and California and Oregon (state surveys) combined. Error bars represent one standard error.

Ideally, the development of AHM protocols for mallards would consider how different breeding stocks distribute themselves among the four Flyways so that Flyway-specific harvest strategies could account for the mixing of birds during the hunting season. At present, however, a joint optimization of western, mid-continent, and eastern stocks is not feasible due to computational hurdles. However, our preliminary analyses suggest that the lack of a joint optimization does not result in a significant decrease in performance. Therefore, the AHM protocol for western mallards is structured similarly to that used for eastern mallards, in which an optimal harvest strategy is based on the status of a single breeding stock and harvest regulations in a single flyway. Although the contribution of mid-continent mallards to the Pacific Flyway harvest is significant, we believe an independent harvest strategy for western mallards poses little risk to the mid-continent stock. Further analyses will be needed to confirm this conclusion, and to better understand the potential effect of mid-continent mallard status on sustainable hunting opportunities in the Pacific Flyway.

HARVEST-MANAGEMENT OBJECTIVES

The basic harvest-management objective for mid-continent mallards is to maximize cumulative harvest over the long term, which inherently requires perpetuation of a viable population. Moreover, this objective is constrained to avoid regulations that could be expected to result in a subsequent population size below the goal of the North American Waterfowl Management Plan (NAWMP). According to this constraint, the value of harvest decreases proportionally as the difference between the goal and expected population size increases. This balance of harvest and population objectives results in a regulatory strategy that is more conservative than that for maximizing long-term harvest, but more liberal than a strategy to attain the NAWMP goal (regardless of effects on hunting opportunity). The current objective for mid-continent mallards uses a population goal of 8.5 million birds, which consists of 7.9 million mallards from the WBPHS (strata 13–18, 20–50, and 75–77) corresponding to the mallard population goal in the 1998 update of the NAWMP (less the portion of the mallard goal comprised of birds breeding in Alaska) and a goal of 0.6 million for the combined states of Michigan, Minnesota, and Wisconsin.

For eastern and western mallards, there is no NAWMP goal or other established target for desired population size. Accordingly, the management objective for eastern and western mallards is simply to maximize long-term cumulative (i.e., sustainable) harvest. Additionally for western mallards, maximum long-term cumulative harvest is subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes.

REGULATORY ALTERNATIVES

Evolution of Alternatives

When AHM was first implemented in 1995, three regulatory alternatives characterized as liberal, moderate, and restrictive were defined based on regulations used during 1979–84, 1985–87, and 1988–93, respectively. These regulatory alternatives also were considered for the 1996 hunting season. In 1997, the regulatory alternatives were modified to include: (1) the addition of a very-restrictive alternative; (2) additional days and a higher duck bag limit in the moderate and liberal alternatives; and (3) an increase in the bag limit of hen mallards in the moderate and liberal alternatives. In 2002 the USFWS further modified the moderate and liberal alternatives to include extensions of approximately one week in both the opening and closing framework dates.

In 2003 the very-restrictive alternative was eliminated at the request of the Flyway Councils. Expected harvest rates under the very-restrictive alternative did not differ significantly from those under the restrictive alternative, and the very-restrictive alternative was expected to be prescribed for < 5% of all hunting seasons. Also in 2003, at the request of the Flyway Councils the USFWS agreed to exclude closed duck-hunting seasons from the AHM protocol when the population size of mid-continent mallards was $\geq$ 5.5 million (WBPHS strata 1–18, 20–50, and 75–77 plus the Great Lakes region). Based on our original assessment, closed hunting seasons did not appear to be necessary from the perspective of sustainable harvesting when the mid-continent mallard population exceeded this level. The impact of maintaining open seasons above this level also appeared negligible for other mid-continent duck species, as based on population models developed by Johnson (2003).

In 2008, because of the re-definition of the mid-continent mallard stock that excludes mallards breeding in Alaska, we re-scaled the closed-season constraint. Initially, we attempted to adjust the original 5.5 million closure threshold by subtracting out the 1985 Alaska breeding population estimate, which was the year upon which the original closed season constraint was based. Our initial re-scaling resulted in a new threshold equal to 5.25 million. Simulations based on optimal policies using this revised closed season constraint suggested that the Mississippi and Central Flyways would experience a 70% increase in the frequency of closed seasons. At this time, we agreed to consider alternative re-scalings in order to minimize the effects on the mid-continent mallard strategy and account for the increase in mean breeding population sizes in Alaska over the past several decades. Based on this assessment, we recommended a revised closed season constraint of 4.75 million which resulted in a strategy performance equivalent to the performance expected prior to the re-definition of the mid-continent mallard stock. Because the performance of the revised strategy is essentially unchanged from the original strategy, we believe it will have no greater impact on other duck stocks in the Mississippi and Central Flyways. However, complete- or partial-season closures for particular species or populations could still be deemed necessary in some situations regardless of the status of mid-continent mallards. Details of the regulatory alternatives for each Flyway are provided in Table 4.

Table 4. Regulatory alternatives for the 2009 duck-hunting season.

	Flyway			
Regulation	**Atlantic**[a]	**Mississippi**	**Central**[b]	**Pacific**[c]
Shooting hours	one-half hour before sunrise to sunset			
Framework dates				
Restrictive	Oct 1 – Jan 20	Saturday nearest Oct 1to the Sunday nearest Jan 20		
Moderate and Liberal	Saturday nearest September 24 to the last Sunday in January			
Season length (days)				
Restrictive	30	30	39	60
Moderate	45	45	60	86
Liberal	60	60	74	107
Bag limit (total / mallard / female mallard)				
Restrictive	3 / 3 / 1	3 / 2 / 1	3 / 3 / 1	4 / 3 / 1
Moderate	6 / 4 / 2	6 / 4 / 1	6 / 5 / 1	7 / 5 / 2
Liberal	6 / 4 / 2	6 / 4 / 2	6 / 5 / 2	7 / 7 / 2

[a] The states of Maine, Massachusetts, Connecticut, Pennsylvania, New Jersey, Maryland, Delaware, West Virginia, Virginia, and North Carolina are permitted to exclude Sundays, which are closed to hunting, from their total allotment of season days.
[b] The High Plains Mallard Management Unit is allowed 12, 23, and 23 extra days in the restrictive, moderate, and liberal alternatives, respectively.
[c] The Columbia Basin Mallard Management Unit is allowed seven extra days in the restrictive and moderate alternatives.

Regulation-Specific Harvest Rates

Harvest rates of mallards associated with each of the open-season regulatory alternatives were initially predicted using harvest-rate estimates from 1979–84, which were adjusted to reflect current hunter numbers and contemporary specifications of season lengths and bag limits. In the case of closed seasons in the U.S., we assumed rates of harvest would be similar to those observed in Canada during 1988–93, which was a period of restrictive regulations both in Canada and the U.S. All harvest-rate predictions were based only in part on band-recovery data, and relied heavily on models of hunting effort and success derived from hunter surveys (Appendix C in USFWS 2002). As such, these predictions had large sampling variances and their accuracy was uncertain.

In 2002, we began relying on Bayesian statistical methods for improving regulation-specific predictions of harvest rates, including predictions of the effects of framework-date extensions. Essentially, the idea is to use existing (prior) information to develop initial harvest-rate predictions (as above), to make regulatory decisions based on those predictions, and then to observe realized harvest rates. Those observed harvest rates, in turn, are treated as new sources of information for calculating updated (posterior) predictions. Bayesian methods are attractive because they provide a quantitative, formal, and an intuitive approach to adaptive management.

For mid-continent mallards, we have empirical estimates of harvest rate from the recent period of liberal hunting regulations (1998–2008). The Bayesian methods thus allow us to combine these estimates with our prior predictions to provide updated estimates of harvest rates expected under the liberal regulatory alternative. Moreover, in the absence of experience (so far) with the restrictive and moderate regulatory alternatives, we reasoned that our initial predictions of harvest rates associated with those alternatives should be re-scaled based on a comparison of predicted and observed harvest rates under the liberal regulatory alternative. In other words, if observed harvest rates under the liberal alternative were 10% less than predicted, then we might also expect that the mean harvest rate under the moderate alternative would be 10% less than predicted. The appropriate scaling factors currently are based exclusively on prior beliefs about differences in mean harvest rate among regulatory alternatives, but they will be updated once we have experience with something other than the liberal alternative. A detailed description of the analytical framework for modeling mallard harvest rates is provided in Appendix 5.

Our models of regulation-specific harvest rates also allow for the marginal effect of framework-date extensions in the moderate and liberal alternatives. A previous analysis by the USFWS (2001) suggested that implementation of framework-date extensions might be expected to increase the harvest rate of mid-continent mallards by about 15%, or in absolute terms by about 0.02 (SD = 0.01). Based on the observed harvest rates during the 2002–2008 hunting seasons, the updated (posterior) estimate of the marginal change in harvest rate attributable to the framework-date extension is 0.008 (SD = 0.007). The estimated effect of the framework-date extension has been to increase harvest rate of mid-continent mallards by about 7% over what would otherwise be expected in the liberal alternative. However, the reader is strongly cautioned that reliable inference about the marginal effect of framework-date extensions ultimately depends on a rigorous experimental design (including controls and random application of treatments).

Current predictions of harvest rates of adult-male mid-continent mallards associated with each of the regulatory alternatives are provided in Table 5. Predictions of harvest rates for the other age–sex cohorts are based on the historical ratios of cohort-specific harvest rates to adult-male rates (Runge et al. 2002). These ratios are considered fixed at their long-term averages and are 1.5407, 0.7191, and 1.1175 for young males, adult females, and young females, respectively. We make the simplifying assumption that the harvest rates of mid-continent mallards depend solely on the regulatory choice in the Mississippi and Central Flyways.

Table 5. Predictions of harvest rates of adult-male mid-continent mallards expected with application of the 2009 regulatory alternatives in the Mississippi and Central Flyways.

Regulatory alternative	Mean	SD
Closed (U.S.)	0.0088	0.0019
Restrictive	0.0563	0.0129
Moderate	0.1029	0.0215
Liberal	0.1188	0.0198

The predicted harvest rates of eastern mallards are updated in the same fashion as that for mid-continent mallards based on reward banding conducted in eastern Canada and the northeastern U.S. (Appendix 5). Like mid-continent mallards, harvest rates of age and sex cohorts other than adult male mallards are based on constant rates of differential vulnerability as derived from band-recovery data. For eastern mallards, these constants are 1.153, 1.331, and 1.509 for adult females, young males, and young females, respectively (Johnson et al. 2002*a*). Regulation-specific predictions of harvest rates of adult-male eastern mallards are provided in Table 6.

In contrast to mid-continent mallards, framework-date extensions were expected to increase the harvest rate of eastern mallards by only about 5% (USFWS 2001), or in absolute terms by about 0.01 (SD = 0.01). Based on the observed harvest rates during the 2002–2008 hunting seasons, the updated (posterior) estimate of the marginal change in harvest rate attributable to the framework-date extension is 0.003 (SD = 0.010). The estimated effect of the framework-date extension has been to increase harvest rate of eastern mallards by about 2% over what would otherwise be expected in the liberal alternative.

Table 6. Predictions of harvest rates of adult-male eastern mallards expected with application of the 2009 regulatory alternatives in the Atlantic Flyway.

Regulatory alternative	Mean	SD
Closed (U.S.)	0.0797	0.0233
Restrictive	0.1108	0.0393
Moderate	0.1412	0.0473
Liberal	0.1492	0.0433

Based on available estimates of harvest rates of mallards banded in California and Oregon during 1990–1995 and 2002–2007, there was no apparent relationship between harvest rate and regulatory changes in the Pacific Flyway. This is unusual given our ability to document such a relationship in other mallard stocks and in other species. We note, however, that the period 2002–2007 was comprised of both stable and liberal regulations and harvest rate estimates were based solely on reward bands. Regulations were relatively restrictive during most of the earlier period and harvest rates were estimated based on standard bands using reporting rates estimated from reward banding during 1987–1988. Additionally, 1993–1995 were transition years in which full-address and toll-free bands were being introduced and information to assess their reporting rates (and their effects on reporting rates of standard bands) is limited. Thus, the two periods in which we wish to compare harvest rates are characterized not only by changes in regulations, but also in estimation methods.

Consequently, we lack a sound empirical basis for predicting harvest rates of western mallards associated with current regulatory alternatives in the Pacific Flyway. This year, we applied Bayesian statistical methods for improving regulation-specific predictions of harvest rates (see Appendix 5). The methodology is analogous to that currently in use for mid-continent and eastern mallards except that the marginal effect of framework date extensions in moderate and liberal alternatives is inestimable because there are no data prior to implementation of extensions. We specified prior regulation-specific harvest rates of 0.01, 0.06, 0.09, and 0.11 with associated standard deviations of 0.003, 0.02, 0.03, and 0.03 for the closed, restrictive, moderate, and liberal alternatives, respectively. The harvest rates for the liberal alternative were based on empirical estimates realized under the current liberal alternative during 2002–2007 and determined from adult-male mallards banded with reward bands in California and Oregon. Harvest rates for the moderate and restrictive alternatives were based on the proportional (0.85 and 0.51) difference in harvest rates expected for mid-continent mallards under the respective alternatives. And finally, harvest rate for the closed alternative was based on what we might realize with a closed season in the U.S. (including Alaska) and a very restrictive season in Canada, similar to that for mid-continent mallards. A relatively large standard deviation (CV=0.3) was chosen to reflect greater uncertainty about the means than that for mid-continent mallards (CV=0.2). Current predictions of harvest rates of adult-male western mallards associated with each regulatory alternative are provided in Table 7.

Table 7. Predictions of harvest rates of adult-male western mallards expected with application of the 2009 regulatory alternatives in the Pacific Flyway.

Regulatory alternative	Mean	SD
Closed (U.S.)	0.010	0.018
Restrictive	0.059	0.016
Moderate	0.098	0.027
Liberal	0.115	0.032

OPTIMAL REGULATORY STRATEGIES

We calculated optimal regulatory strategies using stochastic dynamic programming (Lubow 1995, Johnson and Williams 1999). For the Mississippi and Central Flyways, we based this optimization on: (1) the 2009 regulatory alternatives, including the closed-season constraint; (2) current population models and associated weights for mid-continent mallards; and (3) the dual objectives of maximizing long-term cumulative harvest and achieving a population goal of 8.5 million mid-continent mallards. The resulting regulatory strategy (Table 8) is similar to that used last year. Note that prescriptions for closed seasons in this strategy represent resource conditions that are insufficient to support one of the current regulatory alternatives, given current harvest-management objectives and constraints. However, closed seasons under all of these conditions are not necessarily required for long-term resource protection, and simply reflect the NAWMP population goal and the nature of the current regulatory alternatives. Assuming that regulatory choices adhered to this strategy (and that current model weights accurately reflect population dynamics), breeding-population size would be expected to average 6.83 million (SD = 1.83 million). Based on an estimated population size of 8.71 million mid-continent mallards and 3.57 million ponds in Prairie Canada, the optimal choice for the Mississippi and Central Flyways in 2009 is the liberal regulatory alternative.

We calculated an optimal regulatory strategy for the Atlantic Flyway based on: (1) the 2009 regulatory alternatives; (2) current population models and associated weights for eastern mallards; and (3) an objective to maximize long-term cumulative harvest. The resulting strategy suggests liberal regulations for all population sizes of record, and is characterized by a lack of intermediate regulations (Table 9). We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that current model weights accurately reflect population dynamics), breeding-population size would be expected to average 0.911 million (SD = 0.173 million). Based on an estimated breeding population size of 0.908 million mallards, the optimal choice for the Atlantic Flyway in 2009 is the liberal regulatory alternative.

We calculated an optimal regulatory strategy for the Pacific Flyway based on: (1) the 2009 regulatory alternatives, (2) current (1990–2008) population models and parameter estimates, and (3) an objective to maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes (Table 10). We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be expected to average 1.0 million (SD = 0.22 million) in Alaska and 0.46 million (SD = 0.03 million) in California and Oregon. Based on an estimated breeding population size of 0.503 million mallards in Alaska and 0.381 million in California and Oregon, the optimal choice for the Pacific Flyway in 2009 is the liberal regulatory alternative (see Table 10).

Table 8. Optimal regulatory strategy[a] for the Mississippi and Central Flyways for the 2009 hunting season. This strategy is based on current regulatory alternatives (including the closed-season constraint), on current mid-continent mallard models and weights, and on the dual objectives of maximizing long-term cumulative harvest and achieving a population goal of 8.5 million mallards. The shaded cell indicates the regulatory prescription for 2009.

Bpop[b]	**Ponds[c]**									
	1.5	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**
≤ 4.5	C	C	C	C	C	C	C	C	C	C
4.75–5.75	R	R	R	R	R	R	R	R	R	R
6.00	R	R	R	R	R	R	R	R	M	M
6.25	R	R	R	R	R	R	M	M	M	L
6.5	R	R	R	R	M	M	M	L	L	L
6.75	R	R	R	M	L	L	L	L	L	L
7.0	R	M	M	L	L	L	L	L	L	L
7.25	M	M	L	L	L	L	L	L	L	L
7.5	M	L	L	L	L	L	L	L	L	L
≥ 7.75	L	L	L	L	L	L	L	L	L	L

[a] C = closed season, R = restrictive, M = moderate, L = liberal.
[b] Mallard breeding population size (in millions) in the WBPHS (strata 13–18, 20–50, 75–77) and Michigan, Minnesota, and Wisconsin.
[c] Ponds (in millions) in Prairie Canada in May.

Table 9. Optimal regulatory strategy[a] for the Atlantic Flyway for the 2009 hunting season. This strategy is based on current regulatory alternatives, on current eastern mallard models and weights, and on an objective to maximize long-term cumulative harvest. The shaded cell indicates the regulatory prescription for 2009.

Mallards[b]	**Regulation**
≤ 0.250	C
0.275	R
≥ 0.300	L

[a] C = closed season, R = restrictive, M = moderate, and L = liberal.
[b] Estimated number of mallards in eastern Canada (WBPHS strata 51–54, 56) and the northeastern U.S. (AFBWS), in millions.

Table 10. Optimal regulatory strategy[a] for the Pacific Flyway during the 2009 hunting season. This strategy is based on the 2009 regulatory alternatives, current (1990–2008) population models and parameter estimates, and an objective to maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes. The shaded cell indicates the regulatory prescription for 2009.

CA-OR BPOP[b]	**Alaska BPOP[b]**											
	0	**0.05**	**0.10**	**0.15**	**0.20**	**0.25**	**0.30**	**0.35**	**0.40**	**0.45**	**0.50**	**≥ 0.55**
0	C	C	M	L	L	L	L	L	L	L	L	L
0.05	C	C	R	R	R	M	M	M	L	L	L	L
0.10	C	R	R	M	M	M	L	L	L	L	L	L
0.15	R	R	M	M	L	L	L	L	L	L	L	L
0.20	M	R	L	L	L	L	L	L	L	L	L	L
0.25	M	R	L	L	L	L	L	L	L	L	L	L
0.30	M	M	L	L	L	L	L	L	L	L	L	L
0.35	M	M	L	L	L	L	L	L	L	L	L	L
0.40	M	M	L	L	L	L	L	L	L	L	L	L
≥ 0.45	L	M	L	L	L	L	L	L	L	L	L	L

[a] C = closed season, R = restrictive, M = moderate, and L = liberal.
[b] Estimated number of mallards in millions for Alaska (WBPHS strata 1–12) and in California and Oregon.

Application of AHM Concepts to Other Stocks

The USFWS is striving to apply the principles and tools of AHM to improve decision-making for several other stocks of waterfowl. Over the last year, some progress has been made to develop AHM frameworks for American black ducks (*Anas rubripes*) and the Atlantic Population of Canada geese (*Branta canadensis*), but these results are not yet finalized for inclusion in this year's report. As these frameworks are developed further, we will continue to describe this work in subsequent reports. Below, we provide the 2009 updates for two decision-making frameworks that are currently informing harvest management.

Northern Pintails

The Flyway Councils have long identified the northern pintail as a high-priority species for inclusion in the AHM process. In 1997, the USFWS adopted a pintail harvest strategy to help align harvest opportunity with population status, while providing a foundation upon which to develop a formal AHM framework. Since 1997, the harvest strategy has undergone a number of technical improvements and policy revisions. However, the strategy continues to be a set of regulatory prescriptions born out of consensus, rather than an optimal strategy derived from agreed-upon population models, management objectives, regulatory alternatives, and measures of uncertainty.

In 2007, the USFWS and Flyway Councils took a major step towards a truly adaptive approach by incorporating alternative models of population dynamics. Two models are considered: one in which harvest is additive to natural mortality, and another in which harvest losses are compensated for by reductions in natural mortality. In the additive model, winter survival rate is a constant, whereas winter survival is density-dependent in the compensatory model. We here provide a summary of these recent modeling efforts. A detailed progress report is available online (http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BySpecies/NOPI%20Harvest%20Strategy%202007.pdf).

The predicted $cBPOP_t$ in year $t + 1$ ($cBPOP_{t+1}$) for the additive harvest mortality model is calculated as

$$cBPOP_{t+1} = \left\{cBPOP_t s_s (1 + \gamma_R \hat{R}_t) - \hat{H}_t / (1-c)\right\} s_w$$

where $cBPOP_t$ is the latitude-adjusted breeding population size in year t, s_s and s_w are the summer and winter survival rates, respectively, γ_R is a bias-correction constant for the age ratio, c is the crippling loss rate, $\hat{R}_t$ is the predicted age ratio, and $\hat{H}_t$ is the predicted continental harvest. The model uses the following constants: s_s = 0.70, s_w = 0.93, γ_R = 0.80, and c = 0.20.

The compensatory harvest mortality model serves as a hypothesis that stands in contrast to the additive harvest mortality model, positing a strong but realistic degree of compensation. The compensatory model assumes that the mechanism for compensation is density-dependent post-harvest (winter) survival. The form is a logistic relationship between winter survival and post-harvest population size, with the relationship anchored around the historic mean values for each variable. For the compensatory model then, predicted winter survival rate in year t (s_t) is calculated as

$$s_t = s_0 + (s_1 - s_0)\left[1 + e^{-(a + b(P_t - \overline{P}))}\right]^{-1},$$

where s_1 (upper asymptote) is 1.0, s_0 (lower asymptote) is 0.7, b (slope term) is -1.0, P_t is the post-harvest population size in year t (expressed in millions), $\overline{P}$ is the mean post-harvest population size (4.295 million from

1974 through 2005), and

$$a = \text{logit}\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)$$

or

$$a = \log\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right) - \log\left\{1 - \left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)\right\},$$

where $\bar{s}$ is 0.93 (mean winter survival rate).

At moderate population size and latitude, the compensatory model allows for greater harvest (Fig. 7) than does the additive model (note especially that the size of the restrictive region [season-within-a-season] is smaller and is invoked when the latitude is higher). Also, 2- and 3-bird bag limits are called for under more circumstances. But, at high population sizes, the higher bag limits are called for less often, because the compensatory model predicts that growth of the population will be slower (density-dependence).

The fit to historic data was used to compare the additive and compensatory harvest models. From the $cBPOP_t$, $mLAT_t$, and observed harvest (H_t) for the period 1974–through year *t*, the subsequent year's breeding population size (on the latitude-adjusted scale) was predicted with both the additive and compensatory model, and compared to the observed breeding population size (on the latitude-adjusted scale). The mean-squared error of the predictions from the additive model (MSE_{add}) was calculated as:

$$MSE_{add} = \frac{1}{(t - 1975) + 1} \sum_{t=1975}^{t} (cBPOP_t - cBPOP_t^{add})^2$$

and the mean-squared error of the predictions from the compensatory model were calculated in a similar manner.

The model weights for the additive and compensatory models were calculated from their relative mean-squared errors. The model weight for the additive model (W_{add}) was calculated as:

$$W_{add} = \frac{\frac{1}{MSE_{add}}}{\frac{1}{MSE_{add}} + \frac{1}{MSE_{comp}}}.$$

The model weight for the compensatory model was found in a corresponding manner, or by subtracting the additive model weight from 1.0. As of 2008, the compensatory model did not fit the historic data as well as the additive model; the model weights were 0.597 for the additive model and 0.403 for the compensatory model, unchanged from 2007. The 2008 average model calls for a strategy that is intermediate between the additive and compensatory models (see Fig. 7).

The USFWS remains committed to the development of an AHM framework to inform pintail harvest management based on a formal, derived strategy and clearly articulated management objectives. We are committed to continue to work with the Flyways to finalize an AHM protocol with the intent of implementing a revised harvest strategy for pintails in the near future.

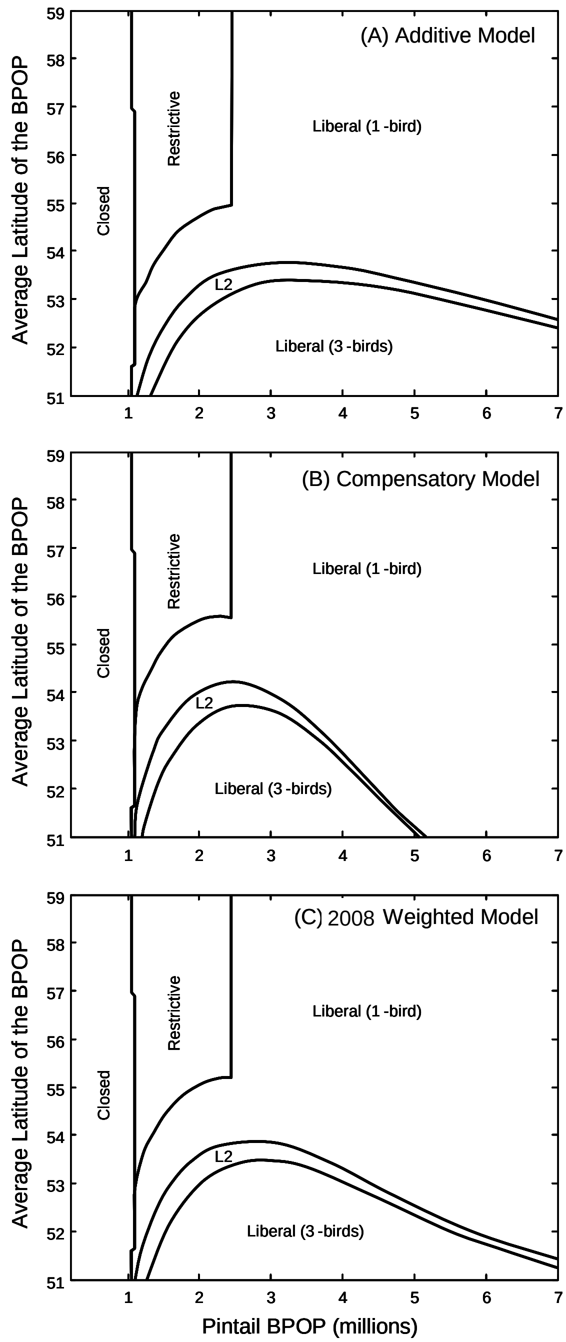

Fig. 7. State-dependent harvest policy for northern pintails with (A) additive, (B) compensatory, and (C) 2008 weighted models. In each case the strategy assumes that the general duck hunting season is that prescribed under the liberal regulatory alternative.

Scaup

In 2008, the USFWS implemented a decision-making framework for establishing scaup harvest regulations that was initially proposed in 2007 (Boomer and Johnson 2007). In addition, the USFWS committed to continue working with the Flyways to develop an alternative scaup population model for inclusion in the current decision-making framework. This model will capture the belief that the scaup population will decline to and stabilize at some lower equilibrium level in response to a declining carrying capacity and that harvest at current levels is completely compensatory. We plan to report on our efforts to develop an alternative model at the 2009 AHM Working Group meeting.

In 2007, the USFWS also outlined methods to facilitate the specification of regulatory alternatives for scaup harvest management (Boomer et al. 2007). We proposed harvest thresholds to be considered under regulatory alternatives based on a simulation of an optimal policy that was derived under an objective to achieve 95% of the long-term cumulative harvest. We used this objective because it results in a strategy less sensitive to small change in population size as compared to a strategy derived under an objective to achieve 100% of long-term cumulative harvest. In addition, the 95% objective allows for some harvest opportunity at relatively low population sizes. We have continued to work with the Flyways to determine what regulations would achieve the allowable harvest thresholds set forth in Boomer et al. (2007). In 2008 during deliberations over scaup regulatory alternatives, the USFWS also agreed to consider a “hybrid season” option that would be available to all Flyways for the restrictive and moderate alternatives. In 2008, initial Restrictive, Moderate, and Liberal scaup regulatory alternatives were defined and implemented in all four Flyways. Subsequent concerns and dialogue led the USFWS to further clarify criteria associated with the establishment of hybrid seasons and to allow additional modifications of the alternatives for each Flyway in 2009. Final scaup regulatory alternatives were adopted for each Flyway in 2009. These alternatives will remain in place for a period of three years and then revisited as the latest harvest information is evaluated.

The USFWS will continue to work with the Flyways to determine acceptable harvest-management objectives and evaluate regulatory alternatives to be used in the evolving decision-making framework for scaup harvest management. Presently, the scaup harvest strategy prescribes optimal harvest levels, not optimal regulatory alternatives. It is important to note that we currently have limited ability to predict expected scaup harvest under the newly-established, Flyway-specific scaup regulatory alternatives. The initial regulatory alternatives adopted for each Flyway were based on relatively crude predictions from harvest models developed in Boomer et al. (2007) or alternative harvest models proposed by the Flyways. As we gain experience with scaup regulatory alternatives, we will refine predicted harvest distributions associated with the Flyway-specific alternatives with the ultimate goal being to use regulatory alternatives, as opposed to harvest, as the control variable in deriving future scaup harvest policies.

The lack of scaup demographic information over a sufficient timeframe and at a continental scale precludes the use of a traditional balance equation to represent scaup population and harvest dynamics. As a result, we used a discrete-time, stochastic, logistic-growth population model to represent changes in scaup abundance, while explicitly accounting for scaling issues associated with the monitoring data. Details describing the modeling and assessment framework that has been developed for scaup can be found in Appendix 6 and in Boomer and Johnson (2007).

We updated the scaup assessment based on the current model formulation and data extending from 1974 through 2008. As in past analyses, the state space formulation and Bayesian analysis framework provided reasonable fits to the observed breeding population and total harvest estimates with realistic measures of variation. The posterior mean estimate of the intrinsic rate of increase (r) is 0.106 while the posterior mean estimate of the carrying capacity (*K*) is 8.44 million birds. The posterior mean estimate of the scaling parameter (*q*) is 0.552, ranging between 0.479 and 0.634 with 95% probability.

We calculated an optimal harvest policy for scaup based on: (1) a control variable of total harvest (U.S. and Canada combined), (2) current population model and updated parameter estimates, and (3) an objective to achieve 95% of the long-term cumulative harvest. We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be expected to average 4.64 million (SD = 0.86 million). With an estimated breeding population size of 4.2 million scaup, the optimal harvest level for scaup is 0.3 million (Table 11). Based on the harvest thresholds specified in Boomer et al. (2007), this year's optimal harvest corresponds to the moderate regulatory alternative.

Table 11. Optimal scaup harvest levels (observed scale in millions) and corresponding breeding population sizes (in millions). This strategy is based on the current scaup population model, and an objective to maximize 95% of long-term cumulative harvest. The shaded cell indicates the optimal harvest level for 2009.

BPOP	Optimal Harvest
0.0 – 1.8	0
2.0 – 2.4	0.05
2.6 – 2.8	0.1
3.0 – 3.2	0.15
3.4 – 3.6	0.2
3.8 – 4.0	0.25
4.2 – 4.4	0.3
4.6	0.35
4.8 – 5.2	0.4
5.4 – 5.6	0.5

Emerging Issues in AHM

Under the existing AHM protocol learning occurs passively as annual comparisons of model predictions to observations from monitoring programs are used to update model weights and relative beliefs about system responses to management (Johnson et al. 2002*b*) or as model parameters are updated based on an assessment of the most recent monitoring data (Boomer and Johnson 2007, Johnson et al. 2007). However, additional learning can also occur as decision-making frameworks are evaluated to determine if objectives are being achieved, if objectives are adequately specified or have changed, or if other aspects of the decision problem are adequately being addressed. Often the feedback resulting from this process results in a form of "double loop" learning (Lee 1993) that offers the opportunity to adapt decision-making frameworks in response to a shifting decision context, novel or emerging management alternatives, or to a need to revise models that may perform poorly or may need to account for new information. Adaptive management depends on this iterative process to ensure that decision-making protocols remain relevant in evolving natural and social systems.

As a byproduct of the adaptive management process, it is natural to think about when or how decision-making protocols should be revised to incorporate new information or to accommodate changes in the overall management context. Recent outcomes from the 2008 Future of Waterfowl Management Workshop and evaluations of waterfowl harvest and habitat management programs (e.g., Anderson et al. 2007, Assessment Steering Committee 2007) suggest compelling reasons for a re-evaluation of the objectives of waterfowl management as well as the technical and institutional frameworks through which harvest and habitat management decisions are made. We view such introspection as completely consistent with the principles underlying AHM, and, in fact, critical to its long-term utility as a decision framework for waterfowl harvest regulation.

The AHM Working Group has begun to consider the need to better integrate harvest and habitat management objectives (sensu Runge et al. 2005, Anderson et al. 2007). In addition, we have begun to explore the implications of large-scale system changes (e.g., related to climate change) in habitats and the environment on the decision-making frameworks used to inform harvest management. Additionally, we continue to explore questions related to the appropriate taxonomic, spatial, and temporal resolution of waterfowl harvest management. In light of all these issues, we remain committed to the continued reassessment of waterfowl harvest decision frameworks. Ultimately, we will need to prioritize the scope of work required to revisit the AHM protocol in the face of limited resources. We look forward to working with the Flyways as we continue to refine the adaptive harvest management framework.

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APPENDIX 2: Mid-continent Mallard Models

In 1995, we developed population models to predict changes in mid-continent mallards based on the traditional survey area which includes individuals from Alaska (Johnson et al. 1997). In 1997, we added mallards from the Great Lakes region (Michigan, Minnesota, and Wisconsin) to the mid-continent mallard stock, assuming their population dynamics were equivalent. In 2002, we made extensive revisions to the set of alternative models describing the population dynamics of mid-continent mallards (Runge et al. 2002, USFWS 2002). In 2008, we redefined the population of mid-continent mallards to account for the removal of Alaskan birds (WBPHS strata 1–12) that are now considered to be in the western mallard stock and have subsequently rescaled the model set appropriately.

Model Structure

Collectively, the models express uncertainty (or disagreement) about whether harvest is an additive or compensatory form of mortality (Burnham et al. 1984), and whether the reproductive process is weakly or strongly density-dependent (i.e., the degree to which reproductive rates decline with increasing population size).

All population models for mid-continent mallards share a common "balance equation" to predict changes in breeding-population size as a function of annual survival and reproductive rates:

$$N_{t+1} = N_t\left(mS_{t,AM} + (1-m)\left(S_{t,AF} + R_t\left(S_{t,JF} + S_{t,JM}\,\phi_F^{sum}/\phi_M^{sum}\right)\right)\right)$$

where:
N = breeding population size,
m = proportion of males in the breeding population,
S_{AM}, S_{AF}, S_{JF}, and S_{JM} = survival rates of adult males, adult females, young females, and young males, respectively,
R = reproductive rate, defined as the fall age ratio of females,
$\phi_F^{sum}/\phi_M^{sum}$ = the ratio of female (F) to male (M) summer survival, and
t = year.

We assumed that m and $\phi_F^{sum}/\phi_M^{sum}$ are fixed and known. We also assumed, based in part on information provided by Blohm et al. (1987), the ratio of female to male summer survival was equivalent to the ratio of annual survival rates in the absence of harvest. Based on this assumption, we estimated $\phi_F^{sum}/\phi_M^{sum}$ = 0.897. To estimate m we expressed the balance equation in matrix form:

$$\begin{bmatrix} N_{t+1,AM} \\ N_{t+1,AF} \end{bmatrix} = \begin{bmatrix} S_{AM} & RS_{JM}\,\phi_F^{sum}/\phi_M^{sum} \\ 0 & S_{AF} + RS_{JF} \end{bmatrix} \begin{bmatrix} N_{t,AM} \\ N_{t,AF} \end{bmatrix}$$

and substituted the constant ratio of summer survival and means of estimated survival and reproductive rates. The right eigenvector of the transition matrix is the stable sex structure that the breeding population eventually would attain with these constant demographic rates. This eigenvector yielded an estimate of m = 0.5246.

Using estimates of annual survival and reproductive rates, the balance equation for mid-continent mallards over-predicted observed population sizes by 11.0% on average. The source of the bias is unknown, so we modified the balance equation to eliminate the bias by adjusting both survival and reproductive rates:

$$N_{t+1} = \gamma_S N_t \left(mS_{t,AM} + (1-m)\left(S_{t,AF} + \gamma_R R_t \left(S_{t,JF} + S_{t,JM} \, \phi_F^{sum} / \phi_M^{sum} \right)\right)\right)$$

where γ denotes the bias-correction factors for survival (S) and reproduction (R). We used a least squares approach to estimate γ_S = 0.9407 and γ_R = 0.8647.

Survival Process

We considered two alternative hypotheses for the relationship between annual survival and harvest rates. For both models, we assumed that survival in the absence of harvest was the same for adults and young of the same sex. In the model where harvest mortality is additive to natural mortality:

$$S_{t,sex,age} = s_{0,sex}^{A} \left(1 - K_{t,sex,age}\right)$$

and in the model where changes in natural mortality compensate for harvest losses (up to some threshold):

$$S_{t,sex,age} = \begin{cases} s_{0,sex}^{C} & if \;\; K_{t,sex,age} \leq 1 - s_{0,sex}^{C} \\ 1 - K_{t,sex,age} & if \;\; K_{t,sex,age} > 1 - s_{0,sex}^{C} \end{cases}$$

where s_0 = survival in the absence of harvest under the additive (A) or compensatory (C) model, and K = harvest rate adjusted for crippling loss (20%, Anderson and Burnham 1976). We averaged estimates of s_0 across banding reference areas by weighting by breeding-population size. For the additive model, s_0 = 0.7896 and 0.6886 for males and females, respectively. For the compensatory model, s_0 = 0.6467 and 0.5965 for males and females, respectively. These estimates may seem counterintuitive because survival in the absence of harvest should be the same for both models. However, estimating a common (but still sex-specific) s_0 for both models leads to alternative models that do not fit available band-recovery data equally well. More importantly, it suggests that the greatest uncertainty about survival rates is when harvest rate is within the realm of experience. By allowing s_0 to differ between additive and compensatory models, we acknowledge that the greatest uncertainty about survival rate is its value in the absence of harvest (i.e., where we have no experience).

Reproductive Process

Annual reproductive rates were estimated from age ratios in the harvest of females, corrected using a constant estimate of differential vulnerability. Predictor variables were the number of ponds in May in Prairie Canada (P, in millions) and the size of the breeding population (N, in millions). We estimated the best-fitting linear model, and then calculated the 80% confidence ellipsoid for all model parameters. We chose the two points on this ellipsoid with the largest and smallest values for the effect of breeding-population size, and generated a weakly density-dependent model:

$$R_t = 0.7166 + 0.1083P_t - 0.0373N_t$$

and a strongly density-dependent model:

$$R_t = 1.1390 + 0.1376P_t - 0.1131N_t$$

Predicted recruitment was then rescaled to reflect the current definition of mid-continent mallards which now excludes birds from Alaska but includes mallards observed in the Great Lakes region.

Pond Dynamics

We modeled annual variation in Canadian pond numbers as a first-order autoregressive process. The estimated model was:

$$P_{t+1} = 2.2127 + 0.3420P_t + \varepsilon_t$$

where ponds are in millions and ε_t is normally distributed with mean = 0 and variance = 1.2567.

Variance of Prediction Errors

Using the balance equation and sub-models described above, predictions of breeding-population size in year *t+1* depend only on specification of population size, pond numbers, and harvest rate in year *t*. For the period in which comparisons were possible, we compared these predictions with observed population sizes.

We estimated the prediction-error variance by setting:

$$e_t = \ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)$$

$$\text{then assuming} \quad e_t \sim N\left(0, \sigma^2\right)$$

$$\text{and estimating} \quad \hat{\sigma}^2 = \sum_t \left[\ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)\right]^2 \Big/ (n-1)$$

where N^{obs} and N^{pre} are observed and predicted population sizes (in millions), respectively, and n = the number of years being compared. We were concerned about a variance estimate that was too small, either by chance or because the number of years in which comparisons were possible was small. Therefore, we calculated the upper 80% confidence limit for σ^2 based on a Chi-squared distribution for each combination of the alternative survival and reproductive sub-models, and then averaged them. The final estimate of σ^2 was 0.0280, equivalent to a coefficient of variation of about 18%.

Model Implications

The population model with additive hunting mortality and weakly density-dependent recruitment (SaRw) leads to the most conservative harvest strategy, whereas the model with compensatory hunting mortality and strongly density-dependent recruitment (ScRs) leads to the most liberal strategy. The other two models (SaRs and ScRw) lead to strategies that are intermediate between these extremes. Under the models with compensatory hunting mortality (ScRs and ScRw), the optimal strategy is to have a liberal regulation regardless of population size or number of ponds because at harvest rates achieved under the liberal alternative, harvest has no effect on population size. Under the strongly density-dependent model (ScRs), the density dependence regulates the population and keeps it within narrow bounds. Under the weakly density dependent model (ScRw), the density-dependence does not exert as strong a regulatory effect, and the population size fluctuates more.

Model Weights

Model weights are calculated as Bayesian probabilities, reflecting the relative ability of the individual alternative models to predict observed changes in population size. The Bayesian probability for each model is a function of the model's previous (or prior) weight and the likelihood of the observed population size under that model. We used Bayes' theorem to calculate model weights from a comparison of predicted and observed population sizes for the years 1996–2009, starting with equal model weights in 1995.

APPENDIX 3: Eastern Mallard Models

Model Structure

We also revised the population models for eastern mallards in 2002 (Johnson et al. 2002*a*, USFWS 2002). The current set of six models: (1) relies solely on federal and state waterfowl surveys (rather than the Breeding Bird Survey) to estimate abundance; (2) allows for the possibility of a positive bias in estimates of survival or reproductive rates; (3) incorporates competing hypotheses of strongly and weakly density-dependent reproduction; and (4) assumes that hunting mortality is additive to other sources of mortality.

As with mid-continent mallards, all population models for eastern mallards share a common balance equation to predict changes in breeding-population size as a function of annual survival and reproductive rates:

$$N_{t+1} = N_t \cdot \left(\left(p \cdot S_t^{am} \right) + \left((1-p) \cdot S_t^{af} \right) + \left(p \cdot \left(A_t^m / d \right) \cdot S_t^{ym} \right) + \left(p \cdot \left(A_t^m / d \right) \cdot \psi \cdot S_t^{yf} \right) \right)$$

where:
N = breeding-population size,
p = proportion of males in the breeding population,
S^{am}, S^{af}, S^{ym}, and S^{yf} = survival rates of adult males, adult females, young males, and young females, respectively,
A^m = ratio of young males to adult males in the harvest,
d = ratio of young male to adult male direct recovery rates,
ψ = the ratio of male to female summer survival, and t = year.

In this balance equation, we assume that p, d, and ψ are fixed and known. The parameter ψ is necessary to account for the difference in anniversary date between the breeding-population survey (May) and the survival and reproductive rate estimates (August). This model also assumes that the sex ratio of fledged young is 1:1; hence A^m/d appears twice in the balance equation. We estimated d = 1.043 as the median ratio of young:adult male band-recovery rates in those states from which wing receipts were obtained. We estimated ψ = 1.216 by regressing through the origin estimates of male survival against female survival in the absence of harvest, assuming that differences in natural mortality between males and females occur principally in summer. To estimate p, we used a population projection matrix of the form:

$$\begin{bmatrix} M_{t+1} \\ F_{t+1} \end{bmatrix} = \begin{bmatrix} S^{am} + \left(A^m / d \right) \cdot S^{ym} & 0 \\ \left(A^m / d \right) \cdot \psi \cdot S^{yf} & S^{af} \end{bmatrix} \cdot \begin{bmatrix} M_t \\ F_t \end{bmatrix}$$

where M and F are the relative number of males and females in the breeding populations, respectively. To parameterize the projection matrix we used average annual survival rate and age ratio estimates, and the estimates of d and ψ provided above. The right eigenvector of the projection matrix is the stable proportion of males and females the breeding population eventually would attain in the face of constant demographic rates. This eigenvector yielded an estimate of p = 0.544.

We also attempted to determine whether estimates of survival and reproductive rates were unbiased. We relied on the balance equation provided above, except that we included additional parameters to correct for any bias that might exist. Because we were unsure of the source(s) of potential bias, we alternatively assumed that any bias resided solely in survival rates:

$$N_{t+1} = N_t \cdot \Omega \cdot \left(\left(p \cdot S_t^{am} \right) + \left((1-p) \cdot S_t^{af} \right) + \left(p \cdot \left(A_t^m / d \right) \cdot S_t^{ym} \right) + \left(p \cdot \left(A_t^m / d \right) \cdot \psi \cdot S_t^{yf} \right) \right)$$

(where Ω is the bias-correction factor for survival rates), or solely in reproductive rates:

$$N_{t+1} = N_t \cdot \left(\left(p \cdot S_t^{am} \right) + \left((1-p) \cdot S_t^{af} \right) + \left(p \cdot \alpha \cdot \left(A_t^m / d \right) \cdot S_t^{ym} \right) + \left(p \cdot \alpha \cdot \left(A_t^m / d \right) \cdot \psi \cdot S_t^{yf} \right) \right)$$

(where α is the bias-correction factor for reproductive rates). We estimated Ω and α by determining the values of these parameters that minimized the sum of squared differences between observed and predicted population sizes. Based on this analysis, $\Omega = 0.836$ and $\alpha = 0.701$, suggesting a positive bias in survival or reproductive rates. However, because of the limited number of years available for comparing observed and predicted population sizes, we also retained the balance equation that assumes estimates of survival and reproductive rates are unbiased.

Survival Process

For purposes of AHM, annual survival rates must be predicted based on the specification of regulation-specific harvest rates (and perhaps on other uncontrolled factors). Annual survival for each age (*i*) and sex (*j*) class under a given regulatory alternative is:

$$S_t^{i,j} = \bar{\theta}^{\,j} \cdot \left(1 - \frac{\left(h_t^{am} \cdot v^{i,j} \right)}{(1-c)} \right)$$

where:

S = annual survival,

$\bar{\theta}^{\,j}$ = mean survival from natural causes,

h^{am} = harvest rate of adult males,

v = harvest vulnerability relative to adult males, and

c = rate of crippling (unretrieved harvest).

This model assumes that annual variation in survival is due solely to variation in harvest rates, that relative harvest vulnerability of the different age-sex classes is fixed and known, and that survival from natural causes is fixed at its sample mean. We estimated $\bar{\theta}^{\,j}$ = 0.7307 and 0.5950 for males and females, respectively.

Reproductive process

As with survival, annual reproductive rates must be predicted in advance of setting regulations. We relied on the apparent relationship between breeding-population size and reproductive rates:

$$R_t = a \cdot \exp\left(b \cdot N_t \right)$$

where R_t is the reproductive rate (i.e., A_t^m / d), N_t is breeding-population size in millions, and a and b are model parameters. The least-squares parameter estimates were a = 2.508 and b = -0.875. Because of both the importance and uncertainty of the relationship between population size and reproduction, we specified two alternative models in which the slope (b) was fixed at the least-squares estimate ± one standard error, and in which the intercepts (a) were subsequently re-estimated. This provided alternative hypotheses of strongly density-dependent (a = 4.154, b = -1.377) and weakly density-dependent reproduction (a = 1.518, b = -0.373).

Variance of Prediction Errors

Using the balance equations and sub-models provided above, predictions of breeding-population size in year *t+1* depend only on the specification of a regulatory alternative and on an estimate of population size in year *t*. For the period in which comparisons were possible (1991–96), we were interested in how well these predictions corresponded with observed population sizes. In making these comparisons, we were primarily concerned with how well the bias-corrected balance equations and reproductive and survival sub-models performed. Therefore, we relied on estimates of harvest rates rather than regulations as model inputs.

We estimated the prediction-error variance by setting:

$$e_t = \ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)$$

$$\text{then assuming} \quad e_t \sim N\left(0, \sigma^2\right)$$

$$\text{and estimating} \quad \hat{\sigma}^2 = \sum_t \left[\ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)\right]^2 \Big/ n$$

where N^{obs} and N^{pre} are observed and predicted population sizes (in millions), respectively, and $n = 6$.

Variance estimates were similar regardless of whether we assumed that the bias was in reproductive rates or in survival, or whether we assumed that reproduction was strongly or weakly density-dependent. Thus, we averaged variance estimates to provide a final estimate of $\sigma^2 = 0.006$, which is equivalent to a coefficient of variation (*CV*) of 8.0%. We were concerned, however, about the small number of years available for estimating this variance. Therefore, we estimated an 80% confidence interval for σ^2 based on a Chi-squared distribution and used the upper limit for $\sigma^2 = 0.018$ (i.e., *CV* = 14.5%) to express the additional uncertainty about the magnitude of prediction errors attributable to potentially important environmental effects not expressed by the models.

Model Implications

Model-specific regulatory strategies based on the hypothesis of weakly density-dependent reproduction are considerably more conservative than those based on the hypothesis of strongly density-dependent reproduction. The three models with weakly density-dependent reproduction suggest a carrying capacity (i.e., average population size in the absence of harvest) >2.0 million mallards, and prescribe extremely restrictive regulations for population size <1.0 million. The three models with strongly density-dependent reproduction suggest a carrying capacity of about 1.5 million mallards, and prescribe liberal regulations for population sizes >300 thousand. Optimal regulatory strategies are relatively insensitive to whether models include a bias correction or not. All model-specific regulatory strategies are "knife-edged," meaning that large differences in the optimal regulatory choice can be precipitated by only small changes in breeding-population size. This result is at least partially due to the small differences in predicted harvest rates among the current regulatory alternatives (see the section on Regulatory Alternatives later in this report).

Model Weights

We used Bayes' theorem to calculate model weights from a comparison of predicted and observed population sizes for the years 1996–2009. We calculated weights for the alternative models based on an assumption of equal model weights in 1996 (the last year data was used to develop most model components) and on estimates of year-specific harvest rates (Appendix 5).

APPENDIX 4: Western Mallard Models

In contrast to mid-continent and eastern mallards, we did not model changes in population size of western mallards as an explicit function of survival and reproductive rate estimates (which in turn may be functions of harvest and environmental covariates). We believed this so-called "balance-equation approach" was not viable for western mallards because of insufficient banding in Alaska to estimate survival rates, and because of the difficulty in estimating stock-specific fall age ratios from a sample of wings derived from a mix of breeding stocks. We therefore relied on a discrete logistic model (Schaefer 1954), which combines reproduction and natural mortality into a single parameter r, the intrinsic rate of growth. The model assumes density-dependent growth, which is regulated by the ratio of population size, N, to the carrying capacity of the environment, K (i.e., equilibrium population size in the absence of harvest). In the traditional formulation, harvest mortality is additive to other sources of mortality, but compensation for hunting losses can occur through subsequent increases in production. However, we parameterized the model in a way that also allows for compensation of harvest mortality between the hunting and breeding seasons. It is important to note that compensation modeled in this way is purely phenomenological, in the sense that there is no explicit ecological mechanism for compensation (e.g., density-dependent mortality after the hunting season).

The basic model for both the Alaska and California–Oregon stocks had the form:

$$N_{t+1} = \left[N_t + N_t r \left(1 - \frac{N_t}{K} \right) \right] (1 - \alpha_t)$$
$$where \quad \alpha_t = d \cdot h_t^{AM}$$

and where t = year, h^{AM} = the harvest rate of adult males, and d = a scaling factor. The scaling factor is used to account for a combination of unobservable effects, including un-retrieved harvest (i.e., crippling loss), differential harvest mortality of cohorts other than adult males, and for the possibility that some harvest mortality may not affect subsequent breeding-population size (i.e., the compensatory mortality hypothesis).

Estimation Framework

We used Bayesian estimation methods in combination with a state-space model that accounts explicitly for both process and observation error in breeding population size. This combination of methods is becoming widely used in natural resource modeling, in part because it facilitates the fitting of non-linear models that may have non-normal errors (Meyer and Millar 1999). The Bayesian approach also provides a natural and intuitive way to portray uncertainty, allows one to incorporate prior information about model parameters, and permits the updating of parameter estimates as further information becomes available.

We first scaled N by K as recommended by Meyer and Millar (1999), and assumed that process errors e_t were log-normally distributed with mean 0 and variance σ^2. Thus, the process model had the form:

$$P_t = N_t / K_t$$

$$\log(P_t) = \log\{[P_{t-1} + P_{t-1} r (1 - P_{t-1})](1 - d \cdot h_{t-1}^{AM})\} + e_t$$

$$where \quad e_t \sim N(0, \sigma^2)$$

The observation model related the unknown population sizes ($P_t K$) to the population sizes (N_t) estimated from the breeding-population surveys in Alaska and California-Oregon. We assumed that the observation process yielded additive, normally distributed errors, which were represented by:

$$N_t = P_t K + \varepsilon_t^{BPOP},$$

$$where \quad \varepsilon_t^{BPOP} \sim N(0, \sigma_{BPOP}^2).$$

Use of the observation model allowed us to account for the sampling error in population estimates, while permitting us to estimate the process error, which reflects the inability of the model to completely describe changes in population size. The process error reflects the combined effect of misspecification of an appropriate model form, as well as any un-modeled environmental drivers. We initially examined a number of possible environmental covariates, including the Palmer Drought Index in California and Oregon, spring temperature in Alaska, and the El Niño Southern Oscillation Index (http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html). While the estimated effects of these covariates on *r* or *K* were generally what one would expect, they were never of sufficient magnitude to have a meaningful effect on optimal harvest strategies. We therefore chose not to further pursue an investigation of environmental covariates, and posited that the process error was a sufficient surrogate for these un-modeled effects.

Parameterization of the models also required measures of harvest rate. Beginning in 2002, harvest rates of adult males were estimated directly from the recovery of reward bands. Prior to 1993, we used direct recoveries of standard bands, corrected for band-reporting rates provided by Nichols et al. (1995*b*). We also used the band-reporting rates provided by Nichols et al. (1995*b*) for estimating harvest rates in 1994 and 1995, except that we inflated the reporting rates of full-address and toll-free bands based on an unpublished analysis by Clint Moore and Jim Nichols (Patuxent Wildlife Research Center). We were unwilling to estimate harvest rates for the years 1996–2001 because of suspected, but unknown, increases in the reporting rates of all bands. For simplicity, harvest rate estimates were treated as known values in our analysis, although future analyses might benefit from an appropriate observation model for these data.

In a Bayesian analysis, one is interested in making probabilistic statements about the model parameters (θ), conditioned on the observed data. Thus, we are interested in evaluating P(θ|data), which requires the specification of prior distributions for all model parameters and unobserved system states (θ) and the sampling distribution (likelihood) of the observed data P(data| θ). Using Bayes theorem, we can represent the posterior probability distribution of model parameters, conditioned on the data, as:

$$P(\theta \mid data) \propto P(\theta) \times P(data \mid \theta).$$

Accordingly, we specified prior distributions for model parameters *r*, *K*, *d*, and P_0, which is the initial population size relative to carrying capacity. For both stocks, we specified the following prior distributions for *r*, *d*, and σ^2:

$$r \sim Log-normal(-1.0397, 1.4427)$$

$$d \sim Uniform(0, 2)$$

$$\sigma^2 \sim Inverse-gamma(0.001, 0.001)$$

The prior distribution for *r* is centered at 0.35, which we believe to be a reasonable value for mallards based on life-history characteristics and estimates for other avian species. Yet the distribution also admits considerable uncertainty as to the value of *r* within what we believe to be realistic biological bounds. As for the harvest-rate scalar, we would expect $d \geq 1$ under the additive hypothesis and $d < 1$ under the compensatory hypothesis. As we had no data to specify an informative prior distribution, we specified a vague prior in which *d* could take on a wide range of values with equal probability. We used a traditional, uninformative prior distribution for σ^2. Prior distributions for *K* and P_0 were stock-specific and are described in the following sections.

We used the public-domain software WinBUGS (http://www.mrc-bsu.cam.ac.uk/bugs/) to derive samples from the joint posterior distribution of model parameters via Markov-Chain Monte Carlo (MCMC) simulations. We obtained 510,000 samples from the joint posterior distribution, discarded the first 10,000, and then thinned the remainder by 50, resulting in a final sample of 10,000.

Alaska mallards

Data selection.--Breeding population estimates of mallards in Alaska (and the Old Crow Flats in Yukon) are available since 1955 in WBPHS strata 1–12 (Smith 1995). However, a change in survey aircraft in 1977 instantaneously increased the detectability of waterfowl, and thus population estimates (Hodges et al. 1996). Moreover, there was a rapid increase in average annual temperature in Alaska at the same time, apparently tied to changes in the frequency and intensity of El Niño events (http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html). This confounding of changes in climate and survey methods led us to truncate the years 1955–1977 from the time series of population estimates.

Modeling of the Alaska stock also depended on the availability of harvest-rate estimates derived from band-recovery data. Unfortunately, sufficient numbers of mallards were not banded in Alaska prior to 1990. A search for covariates that would have allowed us to make harvest-rate predictions for years in which band-recovery data were not available was not fruitful, and we were thus forced to further restrict the time series to 1990–2005. Even so, harvest rate estimates were not available for the years 1996–2001 because of unknown changes in band-reporting rates. Because available estimates of harvest rate showed no apparent variation over time, we simply used the mean and standard deviation of the available estimates and generated independent samples of predictions for the missing years based on a logit transformation and an assumption of normality:

$$\ln\left(\frac{h_t}{1-h_t}\right) \sim Normal(-2.3265,\, 0.0830) \quad for\ t = 1996-2001$$

Prior distributions for K and P_0.—We believed that sufficient information was available to use mildly informative priors for K and P_0. In recent years the Alaska stock has contained approximately 0.8 million mallards. If harvest rates have been comparable to that necessary to achieve maximum sustained yield (MSY) under the logistic model (i.e., $r/2$), then we would expect $K \approx 1.6$ million. On the other hand, if harvest rates have been less than those associated with MSY, then we would expect $K < 1.6$ million. Because we believed it was not likely that harvest rates were $>r/2$, we believed the likely range of K to be 0.8–1.6 million. We therefore specified a prior distribution that had a mean of 1.4 million, but had a sufficiently large variance to admit a wide range of possible values:

$$K \sim Lognormal(0.13035,\, 0.41224)$$

Extending this line of reasoning, we specified a prior distribution that assumed the estimated population size of approximately 0.4 million at the start of the time-series (i.e., 1990) was 20–60% of K. Thus on a log scale:

$$P_o \sim Uniform(-1.6094,\, -0.5108)$$

Parameter estimates.—The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time-series of population estimates. The posterior means of K and r were similar to their priors, although their variances were considerably smaller (Table 1). However, the posterior distribution of d was essentially the same as its prior, reflecting the absence of information in the data necessary to reliably estimate this parameter.

Table 1. Estimates of model parameters resulting from fitting a discrete logistic model with MCMC to a time

series of estimated population sizes and harvest rates of mallards breeding in Alaska, 1990–2008.

Parameter	Mean	SD	95% credibility interval
K	1.125	0.323	0.659–1.890
P_0	0.342	0.097	0.207–0.560
d	1.066	0.541	0.091–1.946
r	0.310	0.131	0.095–0.594
σ^2	0.024	0.013	0.008–0.057

California–Oregon mallards

Data selection.—Breeding-population estimates of mallards in California are available starting in 1992, but not until 1994 in Oregon. Also, Oregon did not conduct a survey in 2001. To avoid truncating the time series, we used the admittedly weak relationship ($P = 0.11$) between California and Oregon population estimates to predict population sizes in Oregon in 1992, 1993, and 2001. The fitted linear model was:

$$N_t^{OR} = 74486 + 0.0848\left(N_t^{CA}\right)$$

To derive realistic standard errors, we assumed that the predictions had the same mean coefficient of variation as the years when surveys were conducted ($n = 14$, CV = 0.082). The estimated sizes and variances of the California–Oregon stock were calculated by simply summing the state-specific estimates.

We pooled banding and recovery data for California and Oregon and estimated harvest rates in the same manner as that for Alaska mallards. Although banded sample sizes were sufficient in all years, harvest rates could not be estimated for the years 1996–2001 because of unknown changes in band-reporting rates. As with Alaska, available estimates of harvest rate showed no apparent trend over time, and we simply used the mean and standard deviation of the available estimates and generated independent samples of predictions for the missing years based on a logit transformation and an assumption of normality:

$$\ln\left(\frac{h_t}{1-h_t}\right) \sim Normal(-1.9633,\ 0.0335) \quad for\ t = 1996-2001$$

Prior distributions for K and P_0.— Unlike the Alaska stock, the California–Oregon population has been relatively stable with a mean of 0.48 million mallards. We believed K should be in the range 0.48 – 0.96 million, assuming the logistic model and that harvest rates were $\leq r/2$. We therefore specified a prior distribution on K that had a mean of 0.7 million, but with a variance sufficiently large to admit a wide range of possible values:

$$K \sim Lognormal(-0.5628,\ 0.41224)$$

The estimated size of the California–Oregon stock was 0.48 million at the start of the time-series (i.e., 1992). We used a similar line of reasoning as that for Alaska for specifying a prior distribution P_0, positing that initial population size was 40–100% of K. Thus on a log scale:

$$P_o \sim Uniform(-0.9163,\ 0.0)$$

Parameter estimates.—The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time series of population estimates. The posterior means of K and r were similar to their priors, although the variances were considerably smaller (Table 2). Interestingly, the posterior mean of d was <1, suggestive of a compensatory response to harvest; however the standard deviation of the estimate was large, with the upper 95% credibility limit >1.

Table 2. Estimates of model parameters resulting from fitting a discrete logistic model with MCMC to a time-series of estimated population sizes and harvest rates of mallards breeding in California and Oregon, 1992–2008.

Parameter	Mean	SD	95% credibility interval
K	0.655	0.178	0.445–1.117
P_0	0.741	0.161	0.429–0.986
d	0.599	0.410	0.038–1.588
r	0.335	0.220	0.067–0.883
σ^2	0.013	0.012	0.001–0.044

APPENDIX 5: Modeling Mallard Harvest Rates

Mid-continent
We modeled harvest rates of mid-continent mallards within a Bayesian hierarchical framework. We developed a set of models to predict harvest rates under each regulatory alternative as a function of the harvest rates observed under the liberal alternative, using historical information. We modeled the probability of regulation-specific harvest rates (h) based on normal distributions with the following parameterizations:

$$\text{Closed}: p(h_C) \sim N(\mu_C, \upsilon_C^2)$$
$$\text{Restrictive}: p(h_R) \sim N(\gamma_R \mu_L, \upsilon_R^2)$$
$$\text{Moderate}: p(h_M) \sim N(\gamma_M \mu_L + \delta_f, \upsilon_M^2)$$
$$\text{Liberal}: p(h_L) \sim N(\mu_L + \delta_f, \upsilon_L^2)$$

For the restrictive and moderate alternatives we introduced the parameter γ to represent the relative difference between the harvest rate observed under the liberal alternative and the moderate or restrictive alternatives. Based on this parameterization, we are making use of the information that has been gained (under the liberal alternative) and are modeling harvest rates for the restrictive and moderate alternatives as a function of the mean harvest rate observed under the liberal alternative. For the harvest-rate distributions assumed under the restrictive and moderate regulatory alternatives, we specified that γ_R and γ_M are equal to the prior estimates of the predicted mean harvest rates under the restrictive and moderate alternatives divided by the prior estimates of the predicted mean harvest rates observed under the liberal alternative. Thus, these parameters act to scale the mean of the restrictive and moderate distributions in relation to the mean harvest rate observed under the liberal regulatory alternative. We also considered the marginal effect of framework-date extensions under the moderate and liberal alternatives by including the parameter δ_f.

To update the probability distributions of harvest rates realized under each regulatory alternative, we first needed to specify a prior probability distribution for each of the model parameters. These distributions represent prior beliefs regarding the relationship between each regulatory alternative and the expected harvest rates. We used a normal distribution to represent the mean and a scaled inverse-chi-square distribution to represent the variance of the normal distribution of the likelihood. For the mean (μ) of each harvest-rate distribution associated with each regulatory alternative, we use the predicted mean harvest rates provided in USFWS (2000:13–14), assuming uniformity of regulatory prescriptions across flyways. We set prior values of each standard deviation (ν) equal to 20% of the mean (CV = 0.2) based on an analysis by Johnson et al. (1997). We then specified the following prior distributions and parameter values under each regulatory package:

Closed (in U.S. only):

$$p(\mu_C) \sim N(0.0088, \frac{0.0018^2}{6})$$
$$p(\nu_C^2) \sim Scaled\ Inv - \chi^2(6, 0.0018^2)$$

These closed-season parameter values are based on observed harvest rates in Canada during the 1988–93 seasons, which was a period of restrictive regulations in both Canada and the United States.

For the restrictive and moderate alternatives, we specified that the standard error of the normal distribution of the scaling parameter is based on a coefficient of variation for the mean equal to 0.3. The scale parameter of the inverse-chi-square distribution was set equal to the standard deviation of the harvest rate mean under the restrictive and moderate regulation alternatives (i.e., CV = 0.2).

Restrictive:

$$p(\gamma_R) \sim N(0.51, \frac{0.15^2}{6})$$

$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0133^2)$$

Moderate:

$$p(\gamma_M) \sim N(0.85, \frac{0.26^2}{6})$$

$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0222^2)$$

Liberal:

$$p(\mu_L) \sim N(0.1305, \frac{0.0261^2}{6})$$

$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0261^2)$$

The prior distribution for the marginal effect of the framework-date extension was specified as:

$$p(\delta_f) \sim N(0.02, 0.01^2)$$

The prior distributions were multiplied by the likelihood functions based on the last seven years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided in Table 1.

Table 1. Parameter estimates for predicting mid-continent mallard harvest rates resulting from a hierarchical, Bayesian analysis of mid-continent mallard banding and recovery information from 1998 to 2008.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0088	0.0021	h_{1998}	0.1021	0.0069
ν_C	0.0019	0.0005	h_{1999}	0.0981	0.0071
γ_R	0.5107	0.0622	h_{2000}	0.1249	0.0083
ν_R	0.0129	0.0033	h_{2001}	0.0923	0.0088
γ_M	0.8525	0.1066	h_{2002}	0.1128	0.0062
ν_M	0.0215	0.0055	h_{2003}	0.1131	0.0069
μ_L	0.1103	0.0067	h_{2004}	0.1200	0.0109
ν_L	0.0198	0.0035	h_{2005}	0.1157	0.0085
δ_f	0.0085	0.0075	h_{2006}	0.1094	0.0078
			h_{2007}	0.1034	0.0066
			h_{2008}	0.1112	0.0065

Eastern

We modeled harvest rates of eastern mallards using the same parameterizations as those for mid-continent mallards:

$$\text{Closed}: p(h_C) \sim N(\mu_C, \upsilon_C^2)$$
$$\text{Restrictive}: p(h_R) \sim N(\gamma_R \mu_L, \upsilon_R^2)$$
$$\text{Moderate}: p(h_M) \sim N(\gamma_M \mu_L + \delta_f, \upsilon_M^2)$$
$$\text{Liberal}: p(h_L) \sim N(\mu_L + \delta_f, \upsilon_L^2)$$

We set prior values of each standard deviation (ν) equal to 30% of the mean (CV = 0.3) to account for additional variation due to changes in regulations in the other Flyways and their unpredictable effects on the harvest rates of eastern mallards. We then specified the following prior distribution and parameter values for the liberal regulatory alternative:

Closed (in U.S. only):

$$p(\mu_C) \sim N(0.08, \frac{0.024^2}{6})$$
$$p(\nu_C^2) \sim Scaled\ Inv - \chi^2(6, 0.024^2)$$

Restrictive:

$$p(\gamma_R) \sim N(0.76, \frac{0.228^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0404^2)$$

Moderate:

$$p(\gamma_M) \sim N(0.92, \frac{0.28^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0488^2)$$

Liberal:

$$p(\mu_L) \sim N(0.1771, \frac{0.0531^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.0531^2)$$

A previous analysis suggested that the effect of the framework-date extension on eastern mallards would be of lower magnitude and more variable than on mid-continent mallards (USFWS 2000). Therefore, we specified the following prior distribution for the marginal effect of the framework-date extension for eastern mallards as:

$$p(\delta_f) \sim N(0.01, 0.01^2)$$

The prior distributions were multiplied by the likelihood functions based on the last four years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided in Table 2.

Table 2. Parameter estimates for predicting eastern mallard harvest rates resulting from a hierarchical, Bayesian analysis of eastern mallard banding and recovery information from 2002 to 2008.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0797	0.0257	h_{2002}	0.1617	0.0125
ν_C	0.0233	0.0061	h_{2003}	0.1456	0.0105
γ_R	0.7619	0.0919	h_{2004}	0.1360	0.0114
ν_R	0.0393	0.0100	h_{2005}	0.1308	0.0119
γ_M	0.9217	0.1145	h_{2006}	0.1034	0.0132
ν_M	0.0473	0.0118	h_{2007}	0.1209	0.0134
μ_L	0.1459	0.0153	h_{2008}	0.1206	0.0120
ν_L	0.0433	0.0087			
δ_f	0.0034	0.0096			

Western

We modeled harvest rates of western mallards using a similar parameterization as that used for mid-continent and eastern mallards. However, we did not explicitly model the effect of the framework date extension because we did not use data observed prior to when framework date extensions were available. In the western mallard parameterization, the effect of the framework date extensions are implicit in the expected mean harvest rate expected under the liberal regulatory option.

$$\text{Closed}: p(h_C) \sim N(\mu_C, \upsilon_C^2)$$
$$\text{Restrictive}: p(h_R) \sim N(\gamma_R \mu_L, \upsilon_R^2)$$
$$\text{Moderate}: p(h_M) \sim N(\gamma_M \mu_L, \upsilon_M^2)$$
$$\text{Liberal}: p(h_L) \sim N(\mu_L, \upsilon_L^2)$$

We set prior values of each standard deviation (ν) equal to 30% of the mean (CV = 0.3) to account for additional variation due to changes in regulations in the other Flyways and their unpredictable effects on the harvest rates of western mallards. We then specified the following prior distribution and parameter values for the liberal regulatory alternative:

Closed (in U.S. only):

$$p(\mu_C) \sim N(0.01, \frac{0.00264^2}{6})$$
$$p(\nu_C^2) \sim Scaled\ Inv - \chi^2(6, 0.00264^2)$$

Restrictive:

$$p(\gamma_R) \sim N(0.51, \frac{0.153^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.01683^2)$$

Moderate:

$$p(\gamma_M) \sim N(0.85, \frac{0.255^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.02805^2)$$

Liberal:

$$p(\mu_L) \sim N(0.11, \frac{0.033^2}{6})$$
$$p(\nu_R^2) \sim Scaled\ Inv - \chi^2(6, 0.033^2)$$

The prior distributions were multiplied by the likelihood functions based on the last four years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided Table 3.

Table 3. Parameter estimates for predicting western mallard harvest rates resulting from a hierarchical, Bayesian analysis of western mallard banding and recovery information from 2008.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0102	0.0187	h_{2008}	0.1435	0.0243
ν_C	0.0181	0.0045			
γ_R	0.5103	0.0636			
ν_R	0.0164	0.0042			
γ_M	0.8524	0.1025			
ν_M	0.0272	0.0069			
μ_L	0.1155	0.0124			
ν_L	0.0318	0.0076			

APPENDIX 6: Scaup Model

We use a state-space formulation of scaup population and harvest dynamics within a Bayesian estimation framework (Meyer and Millar 1999, Millar and Meyer 2000). This analytical framework allows us to represent uncertainty associated with the monitoring programs (observation error) and the ability of our model formulation to predict actual changes in the system (process error).

8.1 Process Model

Given a logistic growth population model that includes harvest (Schaefer 1954), scaup population and harvest dynamics are calculated as a function of the intrinsic rate of increase (r), carrying capacity (K), and harvest (H_t). Following Meyer and Millar (1999), we scaled population sizes by K (i.e., $P_t = N_t/K$) and assumed that process errors (ε_t) are lognormally distributed with a mean of 0 and variance $\sigma^2_{Process}$. The state dynamics can be expressed as

$$P_{1974} = P_0 \, e^{\varepsilon_{1974}}$$
$$P_t = \left(P_{t-1} + rP_{t-1}(1 - P_{t-1}) - H_{t-1} / K\right)e^{\varepsilon_t} \text{ , t} = 1975,...,2008,$$

where P_0 is the initial ratio of population size to carrying capacity. To predict total scaup harvest levels, we modeled scaup harvest rates (h_t) as a function of the pooled direct recovery rate (f_t) observed each year with

$$h_t = f_t / \lambda_t .$$

We specified reporting rate (λ_t) distributions based on estimates for mallards (*Anas platyrhynchos*) from large scale historical and existing reward banding studies (Henny and Burham 1976, Nichols *et. al*. 1995*b*, P. Garrettson *unpublished data*). We accounted for increases in reporting rate believed to be associated with changes in band type (e.g., from AVISE and new address bands to 1-800 toll free bands) by specifying year specific reporting rates according to

$$\lambda_t \sim Normal(0.38, 0.04) \quad t = 1974,...,1996$$
$$\lambda_t \sim Normal(0.70, 0.04) \quad t = 1997,...,2008 .$$

We then predicted total scaup harvest (H_t) with

$$H_t = h_t \left[P_t + rP_t(1 - P)\right]K, \text{t} = 1974,...,2008.$$

8.2 Observation Model

We compared our predictions of population and harvest numbers from our process model to the observations collected by the Waterfowl and Breeding Habitat Survey (WBPHS) and the Harvest Survey programs with the following relationships, assuming that the population and harvest observation errors were additive and normally distributed. May breeding population estimates were related to model predictions by

$$N_t^{Observed} - P_t K = \varepsilon_t^{BPOP}, \text{where}$$
$$\varepsilon_t^{BPOP} \sim N(0, \sigma^2_{t,BPOP}), t = 1974,...,2008,$$

where $\sigma^2_{t,BPOP}$ is specified for each year with the variance estimates resulting from the WBPHS.

We adjusted our harvest predictions to the observed harvest data estimates with a scaling parameter (*q*) according to

$$H_t^{Observed} - \left(h_t\left[P_t + rP_t(1-P)\right]K\right)/q = \varepsilon_t^H, \mathrm{t} = 1974,...,2008, \text{ where}$$
$$\varepsilon_t^H \sim N(0, \sigma^2_{t,Harvest}).$$

We assumed that appropriate measures of the harvest observation error $\sigma^2_{t,Harvest}$ could be approximated by assuming a coefficient of variation for each annual harvest estimate equal to 0.15 (Paul Padding *pers. comm.*). The final component of the likelihood included the year specific direct recovery rates that were represented by the rate parameter (f_t) of a Binomial distribution indexed by the total number of birds banded preseason and estimated with.

$$f_t = m_t / M_t,$$
$$m_t \sim Binomial(M_t, f_t)$$

where m_t is the total number of scaup banded preseason in year t and recovered during the hunting season in year *t* and M_t is the total number of scaup banded preseason in year *t*.

8.3 Bayesian Analysis

Following Meyer and Millar (1999), we developed a fully conditional joint probability model, by first proposing prior distributions for all model parameters and unobserved system states and secondly by developing a fully conditional likelihood for each sampling distribution.

Prior Distributions

For this analysis, a joint prior distribution is required because the unknown system states P are assumed to be conditionally independent (Meyer and Millar 1999). This leads to the following joint prior distribution for the model parameters and unobserved system states

$$P(r, K, q, f_t, \lambda_t, \sigma^2_{\text{Process}}, P_0, P_{1,...,T})$$
$$= p(r)p(K)p(q)p(f_t)p(\lambda_t)p(\sigma^2_{\text{Process}})p(P_0)p(P_1 \mid P_0, \sigma^2_{\text{Process}}) \times \prod_{t=2}^{n} p(P_t \mid P_{t-1}, r, K, f_{t-1}, \lambda_{t-1}, \sigma^2_{\text{Process}}).$$

In general, we chose non-informative priors to represent the uncertainty we have in specifying the value of the parameters used in our assessment. However, we were required to use existing information to specify informative priors for the initial ratio of population size to carrying capacity (P_0) as well as the reporting rate values (λ_t) specified above that were used to adjust the direct recovery rate estimates to harvest rates.

We specified that the value of P_0, ranged from the population size at maximum sustained yield ($P_0 = N_{MSY}/K = (K/2)/K = 0.5$) to the carrying capacity ($P_0 = N/K = 1$), using a uniform distribution on the log scale to represent this range of values. We assumed that the exploitation experienced at this population state was somewhere on the right-hand shoulder of a sustained yield curve (i.e., between MSY and *K*). Given that we have very little evidence to suggest that historical scaup harvest levels were limiting scaup population growth, this seems like a reasonable prior distribution.

We used non-informative prior distributions to represent the variance and scaling terms, while the priors for the population parameters *r* and *K* were chosen to be vague but within biological bounds. These distributions were specified according to

$$P_0 \sim \; Uniform(\ln(0.5),0),$$

$$K \sim Lognormal\ (2.17,\ 0.667),$$

$$r \sim Uniform\ (0.00001,\ 2),$$

$$f_t \sim Beta(0.5,0.5),$$

$$q \sim Uniform(0.0,\ 2),$$

$$\sigma^2_{Process} \sim Inverse\ Gamma\ (0.001,\ 0.001).$$

Likelihood

We related the observed population, total harvest estimates, and observed direct recoveries to the model parameters and unobserved system states with the following likelihood function:

$$P(N_{1,\ldots,T}, H_{1,\ldots,T}, m_{1,\ldots,T}, M_{1,\ldots,T} \mid r, K, f_t, \lambda_t, q, \sigma^2_{\text{Process}}, \sigma^2_{Harvest}, P_{1,\ldots,T})$$
$$= \prod_{t=1}^{T} p(N_t \mid P_t, K, \sigma^2_{BPOP}) \times \prod_{t=1}^{T} p(H_t \mid P_t, r, K, f_t, \lambda_t, q, \sigma^2_{Harvest}) \times \prod_{t=1}^{T} p(m_t \mid M_t, f_t).$$

Posterior Evaluation

Using Bayes theorem we then specified a posterior distribution for the fully conditional joint probability distribution of the parameters given the observed information according to

$$P(r, K, q, f_t, \lambda_t, \sigma^2_{\text{Process}}, P_0, P_{1,\ldots,T} \mid N_{1,\ldots,T}, H_{1,\ldots,T}, m_{1,\ldots,T}, M_{1,\ldots,T})$$
$$\propto p(r)p(K)p(q)p(f_t)p(\lambda_t)p(\sigma^2_{\text{Process}})p(P_0)p(P_1 \mid P_0, \sigma^2_{\text{Process}}) \times \prod_{t=2}^{n} p(P_t \mid P_{t-1}, r, K, f_{t-1}, \lambda_{t-1}, \sigma^2_{\text{Process}})$$
$$\times \prod_{t=1}^{T} p(N_t \mid P_t, K, \sigma^2_{BPOP}) \times \prod_{t=1}^{T} p(H_t \mid P_t, r, K, q, f_t, \lambda_t, \sigma^2_{Harvest}) \times \prod_{t=1}^{T} p(m_t \mid M_t, f_t,).$$

We used Markov Chain Monte Carlo (MCMC) methods to evaluate the posterior distribution using WinBUGS (Spiegelhalter et al. 2003). We randomly generated initial values and simulated 5 independent chains each with 1,000,000 iterations. We discarded the first half of the simulation and thinned each chain by 250, yielding a sample of 10,000 points. We calculated Gelman-Rubin statistics (Brooks and Gelman 1998) to monitor for lack of convergence. The state space formulation and Bayesian analysis framework provided reasonable fits to the observed breeding population and total harvest estimates with realistic measures of variation. The 2009 posterior estimates of model parameters based on data from 1974–2008 are provided in Table 1.

Table 1. Model parameter estimates resulting from a Bayesian analysis of scaup breeding population, harvest, and banding information from 1974–2008.

Parameter	Mean	2.5% CI	Median	97.5% CI
r	0.106	0.030	0.097	0.233
K	8.443	5.868	8.126	12.360
σ^2	0.007	0.002	0.006	0.016
q	0.552	0.479	0.551	0.634

APPENDIX B

USFWS WATERFOWL STATUS, 2009

U.S. Fish and Wildlife Service

Waterfowl

Population Status, 2009

Waterfowl Population Status, 2009

July 23, 2009

In North America the process of establishing hunting regulations for waterfowl is conducted annually. In the United States the process involves a number of scheduled meetings in which information regarding the status of waterfowl is presented to individuals within the agencies responsible for setting hunting regulations. In addition the proposed regulations are published in the Federal Register to allow public comment. This report includes the most current breeding population and production information available for waterfowl in North America and is a result of cooperative efforts by the U.S. Fish and Wildlife Service (FWS), the Canadian Wildlife Service (CWS), various state and provincial conservation agencies, and private conservation organizations. This report is intended to aid the development of waterfowl harvest regulations in the United States for the 2009-2010 hunting season.

Cover: 2009-2010 Duck stamp. Long-tailed duck by Joshua Spies, winner of the 2008 federal duck stamp design competition.

Acknowledgments

Waterfowl Population and Habitat Information: The information contained in this report is the result of the efforts of numerous individuals and organizations. Principal contributors include the Canadian Wildlife Service, U.S. Fish and Wildlife Service, state wildlife conservation agencies, provincial conservation agencies from Canada, and Dirección General de Conservación Ecológica de los Recursos Naturales, Mexico. In addition, several conservation organizations, other state and federal agencies, universities, and private individuals provided information or cooperated in survey activities. Appendix A.1 provides a list of individuals responsible for the collection and compilation of data for the "Status of Ducks" section of this report. Appendix A.2 provides a list of individuals who were primary contacts for information included in the "Status of Geese and Swans" section. We apologize for any omission of individuals from these lists, and thank all participants for their contributions. Without this combined effort, a comprehensive assessment of waterfowl populations and habitat would not be possible.

Authors: This report was prepared by the U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Population and Habitat Assessment Branch. The principal authors were Kathy Fleming, Timothy Moser, Pamela Garrettson, Walt Rhodes, and Nathan Zimpfer. The authors compiled information from the numerous sources to provide an assessment of the status of waterfowl populations.

Report Preparation: The preparation of this report involved substantial efforts on the part of many individuals. Support for the processing of data and publication was provided by Emily Silverman, Guthrie Zimmerman, and John Sauer. Ray Bentley, John Bidwell, Dale Caswell, Carl Ferguson, Elizabeth Huggins, Mark Koneff, Ed Mallek, Dan Nieman, Fred Roetker, John Solberg, Phil Thorpe, Jim Bredy, John Rayfield, Walt Rhodes, Terry Liddick, and James Wortham provided habitat narratives, reviewed portions of the report that addressed major breeding areas, and provided helpful comments. Rebecca Rau, Tom Cooper, and Phil Thorpe provided helpful comments on earlier drafts. Kathy Fleming provided the survey area map, and the colorized revisions to the goose and swan range maps.

This report should be cited as: U.S. Fish and Wildlife Service. 2009. Waterfowl population status, 2009. U.S. Department of the Interior, Washington, D.C. USA.

All Division of Migratory Bird Management reports are available from our Web site (http://www.fws.gov/migratorybirds/).

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1 Status of Ducks

Abstract: In the traditional survey area, which includes strata 1–18, 20–50, and 75–77, the total duck population estimate was 42.0 ± 0.7 [SE] million birds. This estimate represents a 13% increase over last year's estimate of 37.3 ± 0.6 million birds and was 25% above the long-term average (1955–2008). Estimated mallard (*Anas platyrhynchos*) abundance was 8.5 ± 0.2 million birds, which was a 10% increase over last year's estimate of 7.7 ± 0.3 million birds and 13% above the long-term average. Estimated abundance of gadwall (*A. strepera*; 3.1 ± 0.2 million) was similar to the 2008 estimate and 73% above the long-term average. Estimated American wigeon abundance (*A. americana*; 2.5 ± 0.1 million) was similar to 2008 and the long-term average. Estimated abundances of green-winged teal (*A. crecca*; 3.4 ± 0.2 million) and blue-winged teal (*A. discors*; 7.4 ± 0.4 million) were similar to last year's estimates and well above their long-term averages (+79% and +60%, respectively). Northern shovelers (*A. clypeata*; 4.4 ± 0.2 million) were 25% above the 2008 estimate and remain well above their long-term average (+92%). The estimate for northern pintails (*A. acuta*) was 3.2 ± 0.2 million, which was 23% above the 2008 estimate of 2.6 ± 0.1 million, and 20% below the long-term average. Estimated abundance of redheads (*Aythya americana*; 1.0 ± 0.1 million) was similar to last year and 62% above the long-term average. The canvasback estimate (*A. valisineria*; 0.7 ± 0.06 million) was 35% above the 2008 estimate (0.5 ± 0.05 million) and similar to the long-term average. The scaup estimate (*A. affinis* and *A. marila* combined; 4.2 ± 0.2 million) was similar to that of 2008 and 18% below the long-term average of 5.1 ± 0.05 million. Habitat conditions during the 2009 Waterfowl Breeding Population and Habitat Survey were characterized by above-average moisture across the southern portions of the traditional survey area, good habitat in the eastern survey area, and late spring conditions across northern survey areas. The total pond estimate (prairie Canada and U.S. combined) was 6.4 ± 0.2 million. This was 45% above last year's estimate of 4.4 ± 0.2 million ponds and 31% above the long-term average of 4.9 ± 0.03 million ponds. The 2009 estimate of ponds in prairie Canada was 3.6 ± 0.1 million. This was a 17% increase from last year's estimate (3.1 ± 0.1 million) and was similar to the long-term average (3.4 ± 0.03 million). The 2009 pond estimate for the northcentral U.S. of 2.9 ± 0.1 million was 108% above last year's estimate (1.4 ± 0.07 million) and 87% above the long-term average (1.5 ± 0.02 million). The projected mallard fall-flight index was 10.3 ± 0.9 million. The eastern survey area was restratified in 2005 and is now composed of strata 51–72. Estimates of mallards, scaup, scoters (black [*Melanitta nigra*], white-winged [*M. fusca*], and surf [*M. perspicillata*]), green-winged teal, American wigeon, bufflehead (*Bucephala albeola*), American black duck (*Anas rubripes*), ring-necked duck (*Aythya collaris*), mergansers (red-breasted [*Mergus serrator*], common [*M. merganser*], and hooded [*Lophodytes cucullatus*]), and goldeneye (common [*B. clangula*] and Barrow's [*B. islandica*]) were all similar to their 2008 estimates and long-term averages.

This section summarizes the most recent information about the status of North American duck populations and their habitats to facilitate the development of harvest regulations. The annual status of these populations is assessed using the databases resulting from surveys which include estimates of the size of breeding populations, production, and harvest. This report details abundance estimates; harvest survey results are discussed in separate reports. The data and analyses were the most current available when this report was written. Future analyses may yield slightly different results as databases are updated and new analytical procedures become available.

Methods

Waterfowl Breeding Population and Habitat Survey

Federal, provincial, and state agencies conduct surveys each spring to estimate the size of breeding waterfowl populations and to evaluate habitat conditions. These surveys are conducted using airplanes and helicopters, and cover over 2.0 million square miles that encompass principal breeding areas of North America. The traditional survey area (strata 1–18, 20–50, and 75–77) comprises parts of Alaska, Canada, and the northcentral U.S., and covers approximately 1.3 million square miles (Appendix B.1). The eastern survey area (strata 51–72) includes parts of Ontario, Quebec, Labrador, Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, New York, and Maine, covering an area of approximately 0.7 million square miles (Appendix B.1).

In prairie and parkland Canada and the northcentral U.S., aerial waterfowl counts are corrected annually for visibility bias by conducting ground counts along a portion of survey segments. In some northern regions of the traditional survey area, visibility corrections were derived from past helicopter surveys. In the eastern survey area, duck estimates are adjusted using visibility-correction factors derived from a comparison of airplane and helicopter counts. Annual estimates of duck abundance are available since 1955 for the traditional survey area and since 1996 for all strata (except 57–59 and 69) in the eastern survey area. However, portions of the eastern survey area have been surveyed since 1990. In the traditional survey area, estimates of pond abundance in prairie Canada are available since 1961, and in the northcentral U.S., since 1974. Several provinces and states also conduct breeding waterfowl surveys using various methods; some have survey designs that allow calculation of measures of precision for their estimates. Information about habitat conditions was supplied primarily by biologists working in the survey areas. Unless otherwise noted, z-tests were used for assessing statistical significance, with alpha level set at 0.1; P-values are given in tables along with wetland and waterfowl estimates.

Since 1990, the U.S. Fish and Wildlife Service (USFWS) has conducted aerial transect surveys using airplanes in eastern Canada and the northeast U.S., similar to those in the midcontinent, in order to estimate waterfowl abundance. Additionally, the Canadian Wildlife Service (CWS) has conducted a helicopter-based aerial plot survey in core American black duck breeding regions of Ontario, Quebec, and the Atlantic Provinces. Historically, data from these surveys were analyzed separately, despite overlap in geographic areas of inference. In 2004, the USFWS and CWS agreed to integrate the two surveys, produce composite estimates from both sets of survey data, and expand the geographic scope of the survey in eastern North America.

Consequently, as of 2005, waterfowl population sizes for eastern North America (strata 51–72) are estimated using a hierarchical-modeling approach that combines USFWS and CWS data. For strata containing both CWS and USFWS surveys (51, 52, 63, 64, 66–68, and 70), USFWS estimates were adjusted for visibility by CWS plot estimates, and then averaged to derive stratum-level estimates. In strata with only USFWS survey estimates (53, 54, 56–59, 62, 65, and 69), traditional visibility-correction factors were used. No visibility adjustments were made for strata with only CWS plots (71 and 72). In cases where the USFWS has traditionally not recorded observations to the species level (i.e., scoters, mergansers, scaup, and goldeneyes), estimates were produced for multi-species groupings from 2007 forward. While estimates were generated for all strata in the eastern survey area, survey-wide composite estimates presented in this report currently correspond only to strata 51, 52, 63, 64, 66–68, and 70–72. These strata contain either (1) both USFWS fixed-wing survey transects and CWS helicopter plots or (2) only helicopter plots (strata 71 and 72).

For widely distributed and abundant species (American black ducks, mallards, green-winged teal, ring-necked ducks, goldeneyes and mergansers), composite estimates of population size were constructed using a hierarchical model (Link and Sauer 2002). The model estimated the mean count per unit area surveyed for each stratum, year, and method (i.e., airplane or helicopter). These mean counts were then extrapolated to the area of each stratum to produce a stratum/year/method-specific population estimate. Estimates for the airplane surveys were adjusted for visibility bias by multiplying them by the total CWS helicopter survey population estimates for all years divided by the total USFWS fixed-wing survey population estimates for all years. The composite estimate was calculated as the average of the CWS estimate and adjusted USFWS estimate to provide estimated total indicated birds for each stratum and year. For two species groups, goldeneyes and mergansers, for which there are many survey units with no observations, a zero-inflated Poisson distribution (Martin et al. 2005) was used to fit the model. Using this technique, the binomial probability of encountering the species on a transect or a plot is modeled separately. Even this modified modeling approach was not adequate for species that occur at lower densities and are more patchily distributed in the eastern survey area (scaup, scoters, bufflehead, and American wigeon). Estimates for these species were the means of CWS and visibility-adjusted USFWS survey averages weighted by their precision, such that more precise estimates were given higher weights. We will continue to investigate methods that will allow us to estimate populations of these rarer species within the hierarchical-modeling framework.

To produce a consistent index for American black ducks, total indicated pairs are calculated using the CWS method of scaling observed pairs. The CWS scaling is based on sex-specific observations collected during the CWS survey in eastern Canada, which indicate that approximately 50% of black duck pair observations are actually two drakes. For this index, observed black duck pairs are scaled by 1.5 rather than the 1.0 scaling traditionally applied by the USFWS. However, in this report, estimates for American black ducks and other species are based on total indicated birds, an index estimated using the conventional scaling factor applied by the USFWS.

This model-based approach and changes in analytical procedures for some species may preclude comparisons of results from 2008-forward to those in previous reports. We anticipate additional refinements to the survey design and analysis for eastern North America during the coming years, and composite estimates are subject to change in the future.

Waterfowl Production and Habitat Survey

Since 2004, we have had no traditional Waterfowl Production and Habitat Survey (conducted in July) to verify the early predictions of our biologists in the field. The production survey was discontinued due to budget constraints within the migratory bird program and because modern analytical procedures reduced the utility of brood indices produced by the survey. In this report we present habitat conditions as recorded during the months of May and June at the time of the Waterfowl Breeding Population and Habitat Survey.

Total Duck Species Composition

In the traditional survey area, our estimate of total ducks excludes scoters, eiders (*Somateria* and *Polysticta* spp.), long-tailed ducks (*Clangula hyemalis*), mergansers, and wood ducks (*Aix sponsa*), because the traditional survey area does not include a large portion of their breeding ranges.

Mallard Fall-flight Index

The mallard fall-flight index is a prediction of the size of the fall abundance of mallards originating from the mid-continent region of North America. For management purposes, the mid-continent population has historically been composed of mallards originating from the traditional survey area, as well as Michigan, Minnesota, and Wisconsin. However, as of 2008, the status of western mallards will be considered separately in setting regulations for the Pacific Flyway, and thus Alaska–Yukon mallards (strata 1–12) have been removed from the mid-continent stock. Otherwise, the fall-flight index remains unchanged; it is based on the mallard models used for Adaptive Harvest Management and considers breeding population size, habitat conditions, adult summer survival, and the projected fall age ratio (young/adult). The projected fall age ratio is predicted from models that depict how age ratios vary with changes in spring population size and Canadian pond abundance. The fall-flight index represents a weighted average of the fall flights predicted by the four alternative models of mallard population dynamics used in Adaptive Harvest Management (U.S. Fish and Wildlife Service 2009).

Review of Estimation Procedures

Since the inception of the Waterfowl Breeding Population and Habitat Survey in 1955, there have been continual modifications to the conduct of the survey and analysis of the data, but the last comprehensive review was completed over 10 years ago (Smith 1995). During this time new analytical approaches, personnel, and equipment were put in place. In addition, environmental conditions and management needs have changed. Therefore, the USFWS has initiated a review of operational and analytical procedures. As a first step, we plan to address several estimation procedures. First, we are in the process of updating spatial coverages and recalculating stratum areas. Second, we are responding to a recent publication by Fieberg and Giudice (2008), which identified an error in the computer programs historically used to calculate standard errors for aggregate estimates. These improvements, along with results from related investigations into our methods of variance estimation, visibility correction, and population change detection, will entail some modification to the existing time series, so that new methods do not affect evaluation of long-term trends. We intend to implement improvements to our estimation procedures, and estimates presented in future reports will reflect updates made as a result of this review. In an effort to streamline and facilitate the regulations cycle and to expedite data requests from cooperators, we are also in the process of updating current data collection, storage, and access procedures.

Results and Discussion

2008 in Review

Habitat conditions during the 2008 Waterfowl Breeding Population and Habitat Survey were characterized in many areas by a delayed spring in comparison with several preceding years. Drought in parts of the traditional survey area contrasted sharply with record amounts of snow and rainfall in the eastern survey area. The total pond estimate (prairie Canada and U.S. combined) was 4.4 ± 0.2 million. This was 37% below the 2007 estimate of 7.0 ± 0.3 million ponds and 10% below the long-term average of 4.9 ± 0.03 million ponds. The 2008 estimate of ponds in prairie Canada was 3.1 ± 0.1 million. This was a 39% decrease from the 2007 estimate (5.0 ± 0.3 million), and 11% below the 1961–2007 average (3.4 ± 0.03 million). The parklands were drier in 2008 than in 2007, when excess water created much additional waterfowl habitat; still this area was classified as fair to good overall with most seasonal and semi-permanent wetlands full. A late April snowstorm recharged wetlands in some areas of the northern parklands; these were classified as excellent.

The U.S. prairies experienced drought conditions in the spring of 2008 and many semi-permanent wetlands and livestock dugouts were dry. At the time of the survey, habitat in this area was considered fair to poor; exceptions were regions with temporary and seasonal water in southeastern South Dakota, and areas of western South Dakota that received abundant rain and snowfall in early May. Habitat conditions in these locations were considered good. The 2008 pond estimate for the northcentral U.S. (1.4 ± 0.07 million) was 30% below the 2007 estimate (2.0 ± 0.1 million) and 11% below the long-term average (1974–2007; 1.5 ± 0.02 million). Following the completion of the survey the Dakotas and neighboring areas experienced several heavy rainfall events. This eased drought conditions somewhat and may have improved habitat conditions for late-nesting waterfowl and increased the success rate of renesting attempts.

In the bush regions of the traditional survey area (Alaska, Yukon, Northwest Territories, northern Manitoba, northern Saskatchewan, and western Ontario) spring breakup was later in 2008 than in previous years. Locally variable snowfall and, consequently, variable runoff, resulted in habitat conditions that ranged from fair in the east to good in the west. Most large lakes were still frozen on May 20 in the Northwest Territories; however, warmer temperatures in late

May led to habitat conditions suitable for nesting during the survey period. Good conditions were present throughout Alaska, with slightly late spring conditions in some coastal areas.

The boreal forest of the eastern survey area was generally in good condition in the spring of 2008, although in most areas spring was delayed by 1–2 weeks relative to the early springs of preceding years. Most of the eastern survey area experienced record or near-record winter snowfall and spring precipitation accompanied by average to below-average temperatures. These conditions caused extensive flooding in some parts of Maine and the Maritimes and likely disrupted normal waterfowl nesting chronology. Newfoundland and Labrador also received above-average winter precipitation, but snow melt and breakup was gradual with minimal flooding. The frost seal throughout much of southern Ontario was poor; however, winter snowfall and spring rains led to good-to-excellent habitat conditions across most of the area with the exception of extreme southwestern Ontario which was characterized as fair. Conditions in western Ontario initially pointed toward a late spring, but higher temperatures and winds provided good melting conditions so habitats were ready for the arrival of breeding pairs. In more northern sections of Ontario, ice persisted on lakes late into May and early June. Conditions in northern Quebec were slightly drier than average, and spring-like conditions came early.

In the traditional survey area, the 2008 total duck (excluding scoters, eiders, long-tailed ducks, mergansers, and wood ducks) population estimate was 37.3 $\pm$ 0.6 million birds. This was 9% lower than the 2007 estimate of 41.2 $\pm$ 0.7 million birds, but 11% above the 1955–2007 long-term average.

In the eastern Dakotas, 2008 total duck numbers were 17% lower than the 2007 estimate but 53% above the long-term average. The total duck estimate in southern Alberta was similar to 2007, and to the long-term average. The total duck estimate was 19% lower than that of 2007 in southern Saskatchewan, but remained 20% above the long-term average. The total duck count in southern Manitoba was similar to the 2007 estimate, and 21% below its long-term average. The total duck estimate in central and northern Alberta, northeastern British Columbia and the Northwest Territories was 13% higher than the 2007 estimate and similar to the long-term average. The estimate in the northern Saskatchewan–northern Manitoba–western Ontario area was similar to 2007, but 11% below the long-term average. The 2008 total duck estimate in the western Dakotas–eastern Montana area was 30% below both their 2007 estimate and long-term average. In the Alaska–Yukon Territory–Old Crow Flats region the total duck estimate was 10% below 2007, but remained 42% above its long-term average.

Several states and provinces conduct breeding waterfowl surveys in areas outside the geographic extent of the Waterfowl Breeding Population and Habitat Survey of the USFWS and CWS. In California, the northeastern U.S., Oregon, and Wisconsin, measures of precision for survey estimates are available. In Oregon, the 2008 total duck estimate was 29% lower than in 2007, and 19% below the long-term average. The 2008 total duck estimate in California was similar to the 2007 estimate and the long-term average. Wisconsin's 2008 total duck estimate was 33% higher than in 2007, and 45% above its long-term average. The 2008 total breeding duck estimate in the northeastern U.S. fell by 20% relative to 2007, and was 16% below the long-term average. Of the states without measures of precision for total duck numbers, the 2008 estimates in Michigan and Minnesota fell by more than 40% compared to those in 2007. Estimates in 2008 fell slightly in Washington and increased slightly in Nevada relative to 2007.

In the traditional survey area in 2008, estimated mallard abundance was 7.7 $\pm$ 0.3 million birds, which was similar to the 2007 estimate of 8.3 $\pm$ 0.3 million birds and the long-term average. Blue-winged teal abundance was 6.6 $\pm$ 0.3 million birds. This value was similar to the 2007 estimate of 6.7 $\pm$ 0.4 million birds and 45% above the long-term average. Estimated abundances of gadwall (2.7 $\pm$ 0.2 million) and northern shoveler (3.5 $\pm$ 0.2 million) were below 2007 estimates (-19% and -23%, respectively) but both remained 56% above their respective long-term averages. Estimated abundance of American

Table 1: Estimated number (in thousands) of May ponds in portions of prairie and parkland Canada and the northcentral U.S.

			Change from 2008			Change from LTA	
Region	2009	2008	%	P	LTA[a]	%	P
Prairie Canada							
S. Alberta	687	849	−19	0.067	741	−7	0.343
S. Saskatchewan	2,210	1,608	+37	0.001	1,993	+11	0.109
S. Manitoba	671	598	+12	0.154	676	−1	0.874
Subtotal	3,568	3,055	+17	0.014	3,410	+5	0.292
Northcentral U.S.							
Montana & Western Dakotas	1,034	531	+95	<0.001	537	+93	<0.001
Eastern Dakotas	1,832	845	+117	<0.001	997	+84	<0.001
Subtotal	2,866	1,376	+108	<0.001	1,534	+87	<0.001
Total	6,434	4,431	+45	<0.001	4,917	+31	<0.001

[a] Long-term average. Prairie and parkland Canada, 1961–2008; northcentral U.S. and Grand Total, 1974–2008.

wigeon (2.5 ± 0.2 million) was similar to the 2007 estimate and the long-term average. Estimated abundances of green-winged teal (3.0 ± 0.2 million) and redheads (1.1 ± 0.1 million) were similar to 2007 and were >50% above their long-term averages. The redhead and green-winged teal estimates were the highest and the second highest ever for this region. Estimated abundance of canvasbacks (0.5 ± 0.05 million) was 44% below the record high 2007 estimate (0.9 ± 0.09 million) and 14% below the long-term average. The estimate for northern pintails was 2.6 ± 0.1 million, which was 22% below the 2007 estimate of 3.3 ± 0.2 million, and 36% below the long-term average. The scaup estimate (3.7 ± 0.2 million) was similar to 2007, and remained 27% below the long-term average of 5.1 ± 0.2 million.

In the eastern survey area, 2008 population estimates for the 10 most abundant species surveyed were similar to 2007 and to their 1990–2007 averages. The estimate for American black ducks was 496,000, and the estimate for mallards was 450,000.

2009 Breeding Populations and Habitat Conditions

Overall Habitat and Population Status

Habitat conditions during the 2009 Waterfowl Breeding Population and Habitat Survey were characterized by above-average moisture across the southern portions of the traditional survey area, good habitat in the eastern survey area, and late spring conditions across northern survey areas. The total pond estimate (prairie Canada and U.S. combined) was 6.4 ± 0.2 million (Table 1, Figure 1). This was 45% above last year's estimate of 4.4 ± 0.2 million ponds and 31% above the long-term average of 4.9 ± 0.03 million ponds.

Conditions across the Canadian prairies improved in 2009, with the exception of southern Alberta. The 2009 estimate of ponds in prairie Canada was 3.6 ± 0.1 million. This was a 17% increase from last year's estimate (3.1 ± 0.1 million) and was similar to the 1961–2008 average (3.4 ± 0.03 million). The prairie parklands received below-normal precipitation but waterfowl habitat in this area continued to benefit from above-normal precipitation received in 2007 and was classified as fair to good.

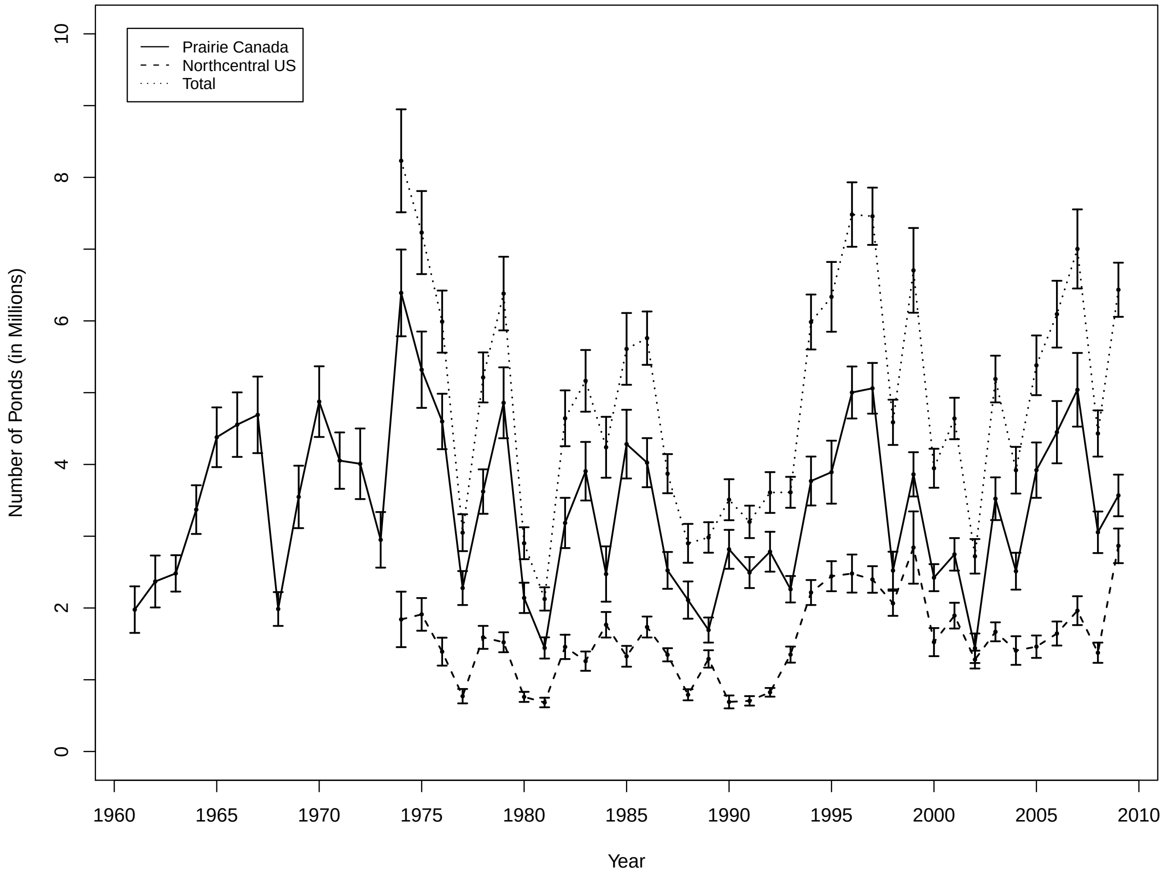

Figure 1: Number of ponds in May and 90% confidence intervals in prairie Canada and the northcentral U.S.

Significant improvements in wetland numbers occurred in the U.S. prairies during 2009. The 2009 pond estimate for the northcentral U.S. of 2.9 ± 0.1 million was 108% above last year's estimate (1.4 ± 0.07 million) and 87% above the long-term average (1974–2008; 1.5 ± 0.02 million). Considerable precipitation in late spring 2008 and above-normal precipitation over the fall and winter recharged wetlands across the Dakotas and eastern Montana. Drier conditions were noted in western Montana and southeastern South Dakota.

In the bush regions of the traditional survey area (Alaska, Yukon, Northwest Territories, northern Manitoba, northern Saskatchewan, and western Ontario), spring breakup was delayed as much as three weeks relative to normal in 2009. Most of the large lakes across the region remained frozen in early June, whereas smaller habitats, such as beaver ponds, were open. Overall habitat conditions in northern Alberta and the Northwest Territories, and most of Alaska, were rated as good. Below-average precipitation through northern Saskatchewan and portions of northern Manitoba negatively affected smaller ponds.

The boreal forest of the eastern survey area was generally in good condition this spring, although northern survey areas in Ontario, Quebec, and Labrador experienced a very late spring. Above-average snowfall was recorded from Maine to the Maritimes, but average spring temperatures prevented the flooding that occurred in 2008, resulting in good-to-excellent waterfowl habitat in 2009. Good-to-excellent waterfowl habitat existed throughout New York and much of Quebec and Ontario. Although overall habitat conditions were good in the east-

Table 2: Total duck[a] breeding population estimates (in thousands) for regions in the traditional survey area and other regions.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[b]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	4,345	5,123	−15	0.003	3,641	+19	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	6,934	6,934	+0	0.999	7,093	−2	0.610
N. Saskatchewan –N. Manitoba–W. Ontario	3,813	3,162	+21	0.014	3,528	+8	0.154
S. Alberta	3,288	4,199	−22	<0.001	4,287	−23	<0.001
S. Saskatchewan	8,053	8,949	−10	0.083	7,497	+7	0.102
S. Manitoba	1,371	1,223	+12	0.118	1,539	−11	0.022
Montana & Western Dakotas	2,468	1,139	+117	<0.001	1,610	+53	<0.001
Eastern Dakotas	11,733	6,546	+79	<0.001	4,330	+171	<0.001
Total	42,005	37,276	+13	<0.001	33,526	+25	<0.001
Other regions							
California	511	554	−8	0.639	596	−14	0.244
Northeastern U.S.[c]	1,271	1,197	+6	0.532	1,416	−10	0.136
Oregon	198	240	−17	0.067	292	−32	<0.001
Wisconsin	502	627	−20	0.165	438	+15	0.164

[a] Includes the 10 species in Appendix C.3 plus American black duck, ring-necked duck, goldeneyes, bufflehead, and ruddy duck; excludes eiders, long-tailed duck, scoters, mergansers, and wood ducks.

[b] Long-term average, 1955–2008; years for other regions vary (see Appendix C.2).

[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.

ern survey area, flooding from a series of major storms in southwestern Ontario during mid-May and persistent winter conditions in the James and Hudson Bay Lowlands may have reduced habitat quality in those areas.

In the traditional survey area, which includes strata 1–18, 20–50, and 75–77, the total duck population estimate (excluding scoters, eiders, long-tailed ducks, mergansers, and wood ducks) was 42.0 ± 0.7 million birds. This estimate represents a 13% increase over last year's estimate of 37.3 ± 0.6 million birds and was 25% above the long-term average (1955–2008; Table 2, Appendix C.4). In the eastern Dakotas, total duck numbers were 79% above the 2008 estimate and 171% above the long-term average. The total duck estimate in southern Alberta was 22% below last year's estimate, and 23% below the long-term average. The total duck estimate was 10% below 2008 in southern Saskatchewan, but was similar to the long-term average. In southern Manitoba, the total duck population estimate was similar to last year's, but was 11% below the long-term average. The total duck estimate in central and northern Alberta, northeastern British Columbia, and the Northwest Territories was unchanged from last year and the long-term average. The estimate in the northern Saskatchewan–northern Manitoba–western Ontario survey area was 21% higher than the 2008 estimate but similar to the long-term average.

Table 3: Mallard breeding population estimates (in thousands) for regions in the traditional and eastern survey areas, and other regions of the U.S.

			Change from 2008			Change from LTA	
Region	2009	2008	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	503	532	−6	0.650	368	+37	0.003
C. & N. Alberta–N.E. British Columbia–NWT	1,080	1,079	+0	0.997	1,072	+1	0.939
N. Saskatchewan –N. Manitoba–W. Ontario	930	1,046	−11	0.437	1,142	−19	0.032
S. Alberta	754	875	−14	0.099	1,086	−31	<0.001
S. Saskatchewan	1,867	1,907	−2	0.838	2,066	−10	0.088
S. Manitoba	417	381	+10	0.397	381	+10	0.227
Montana & Western Dakotas	444	354	+26	0.071	501	−11	0.166
Eastern Dakotas	2,517	1,549	+62	<0.001	895	+181	<0.001
Total	8,512	7,724	+10	0.027	7,511	+13	<0.001
Eastern survey area	463	451	+3	[b]	407	+14	[b]
Other regions							
California	302	297	+2	0.951	366	−18	0.322
Michigan	259	189	+37	0.123	382	−32	0.005
Minnesota	236	298	−21	0.182	224	+6	0.737
Northeastern U.S.[c]	667	619	+8	0.436	777	−14	0.021
Oregon	80	84	−6	0.593	106	−25	<0.001
Wisconsin	200	188	+6	0.739	181	+10	0.491

[a] Long-term average. Traditional survey area 1955–2008; eastern survey area 1990–2008; years for other regions vary (see Appendix C.2).

[b] *P*-values not appropriate because these data were analyzed with Bayesian methods.

[c] Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA.

The total duck estimate in the western Dakotas–eastern Montana area was 117% above the 2008 estimate and 53% above the long-term average. In the Alaska–Yukon Territory–Old Crow Flats region the total duck estimate was 15% lower than last year, but 19% above the long-term average.

Several states and provinces conduct breeding waterfowl surveys in areas outside the geographic extent of the Waterfowl Breeding Population and Habitat Survey of the USFWS and CWS. In California, the northeastern U.S., Oregon, and Wisconsin, measures of precision for survey estimates are available. In Oregon, the total duck estimate was 17% lower than in 2008, and 32% below the long-term average. The total duck estimate in California was similar to the 2008 estimate and the long-term average. Wisconsin's total duck estimate was 20% lower than in 2008, but 15% above its long-term average. The total breeding duck estimate in the northeastern U.S. was similar to 2008, and was 9% below the long-term average. Of the states without measures of precision for total duck numbers, the estimate in Michigan increased by 16%, and in Minnesota, fell by more than 31% compared to those in 2008. Estimates fell slightly in Washington relative to 2008.

Trends and annual breeding population estimates for 10 principal duck species from the traditional survey area are provided in this report (Tables 3–12, Figure 2, Appendix C.3). Percent change was computed prior to rounding and therefore may not match calculations that use the rounded estimates presented in the tables and text. Mallard abundance was 8.5 ± 0.2 million birds, 10% higher than last year's estimate of 7.7 ± 0.3 million birds and 13% higher than the long-term average (Table 3). The mallard estimate in southern Alberta was 14% below last year's and was 31% below the long-term average. In the eastern Montana–western Dakotas survey area, mallard counts were 26% above the 2008 estimate but similar to the long-term mean. In the central and northern Alberta–northeastern British Columbia–Northwest Territories region the mallard estimate was similar to 2008 and the long-term average. In the northern Saskatchewan–northern Manitoba–western Ontario survey area, the mallard estimate was similar to that of 2008, but 19% below the long-term average. Mallard numbers were similar to the 2008 estimate and 37% above their long-term average in the Alaska–Yukon Territory–Old Crow Flats region. In the southern Manitoba survey area, the mallard estimate was similar to last year's and to the long-term average. In southern Saskatchewan, mallards were similar to last year but 10% below the long-term average. In the eastern Dakotas, mallards were 62% above last year's count, and 181% above the long-term average. Mallard abundance with estimates of precision are also available for other areas where surveys are conducted (California, Oregon, Wisconsin, the northeast U.S., as well as Michigan and Minnesota). Mallard numbers were similar in California to last year and the long-term average. In Wisconsin, mallards were similar to last year but 10% above the long-term average. Mallards were 6% lower in Oregon than last year, and 25% lower than the long-term average. The mallard estimate was similar to the 2008 estimate in the northeast U.S., but was 14% below the long-term average. In Michigan, mallard estimates were similar to 2008 estimates, and were 32% below the long-term average. In Minnesota, the mallard estimate was 21% lower than last year. In the states without estimates of precision (Washington and Nevada), mallards decreased relative to 2008. However, due to changes in survey design Nevada's mallard estimate is not comparable to previous years.

In the traditional survey area the estimated abundance of blue-winged teal (7.4 ± 0.4 million) was similar to last year's estimate and above the long-term average (+60%). Gadwall abundance (3.1 ± 0.2 million) was similar to the 2008 estimate and 73% above the long-term average. Estimated American wigeon abundance (2.5 ± 0.1 million) was similar to 2008 and the long-term average. Estimated abundance of green-winged teal (3.4 ± 0.2 million) was similar to last year's estimate and well above the long-term average (+79%). Northern shovelers (4.4 ± 0.2 million) were 25% above the 2008 estimate of 3.5 ± 0.2 million and remain well above their long-term average (+92%). The estimate for northern pintails was 3.2 ± 0.2 million, which

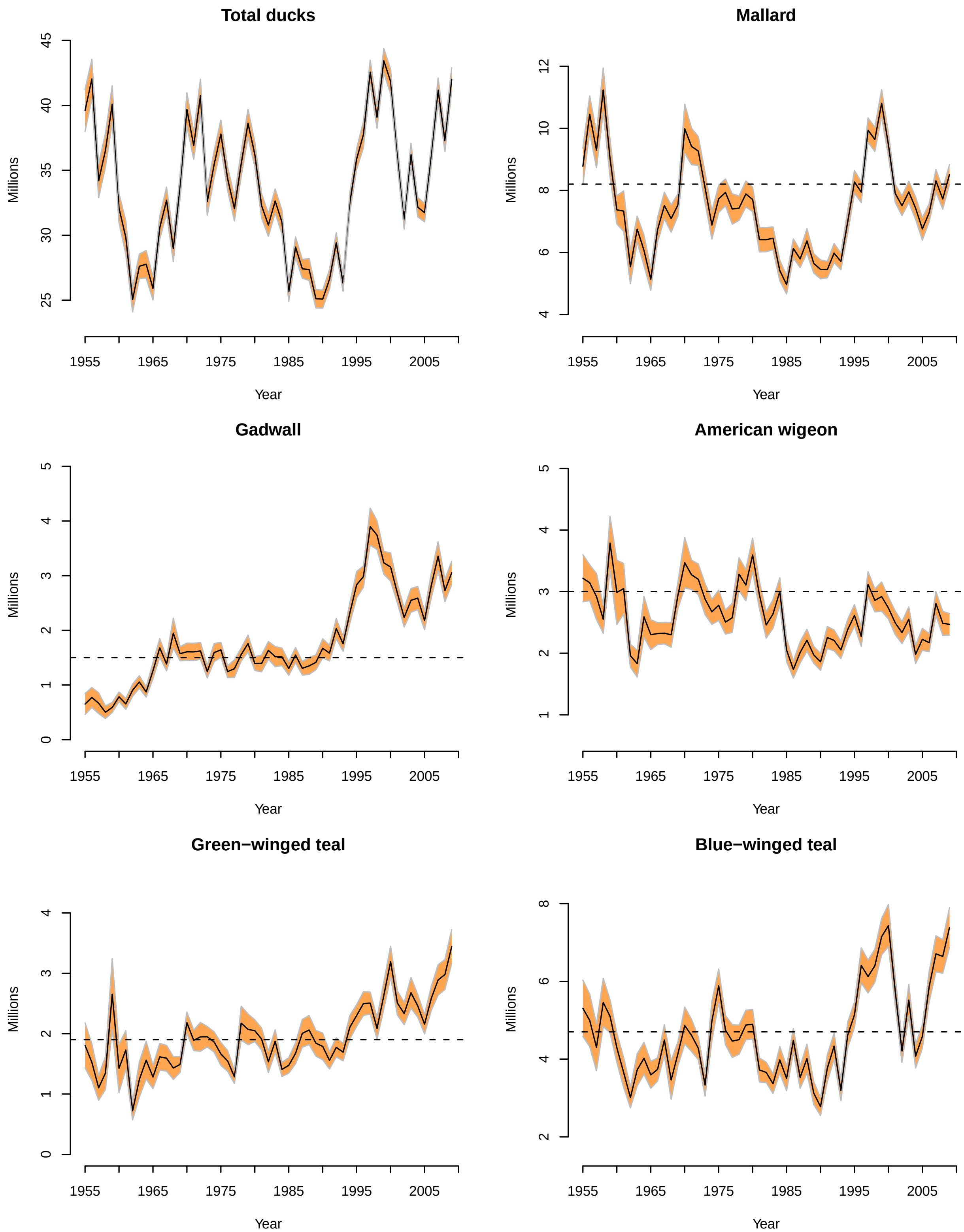

Figure 2: Breeding population estimates, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species in the traditional survey area (strata 1–18, 20–50, 75–77).

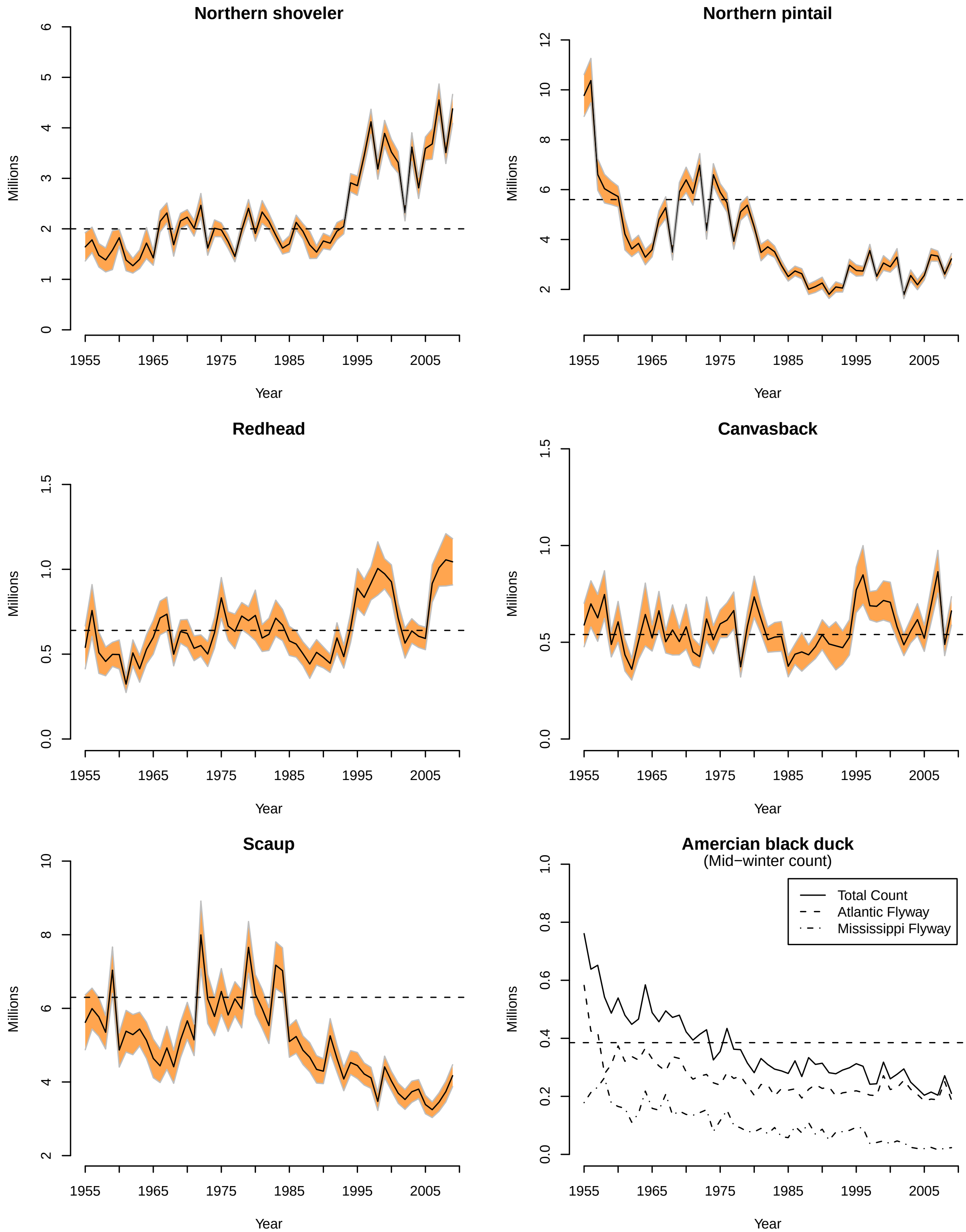

Figure 2: Continued.

Table 4: Gadwall breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 *P*	LTA[a]	Change from LTA %	Change from LTA *P*
Alaska–Yukon Territory–Old Crow Flats	2	4	−50	0.517	2	+3	0.967
C. & N. Alberta–N.E. British Columbia–NWT	67	109	−39	0.057	51	+31	0.341
N. Saskatchewan –N. Manitoba–W. Ontario	9	10	−8	0.871	27	−67	<0.001
S. Alberta	401	420	−5	0.822	314	+28	0.210
S. Saskatchewan	1,044	1,011	+3	0.840	590	+77	<0.001
S. Manitoba	118	112	+5	0.847	69	+70	0.014
Montana & Western Dakotas	319	200	+59	0.017	196	+63	0.005
Eastern Dakotas	1,094	861	+27	0.060	514	+113	<0.001
Total	3,054	2,728	+12	0.157	1,763	+73	<0.001

[a] Long-term average, 1955–2008.

Table 5: American wigeon breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 *P*	LTA[a]	Change from LTA %	Change from LTA *P*
Alaska–Yukon Territory–Old Crow Flats	805	921	−13	0.221	535	+50	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	793	819	−3	0.861	903	−12	0.272
N. Saskatchewan –N. Manitoba–W. Ontario	147	90	+64	0.102	245	−40	0.003
S. Alberta	133	180	−26	0.108	290	−54	<0.001
S. Saskatchewan	237	372	−36	0.068	420	−43	<0.001
S. Manitoba	9	12	−26	0.410	59	−85	<0.001
Montana & Western Dakotas	216	58	+270	<0.001	108	+99	0.001
Eastern Dakotas	128	34	+278	<0.001	49	+162	<0.001
Total	2,469	2,487	−1	0.929	2,609	−5	0.307

[a] Long-term average, 1955–2008.

Table 6: Green-winged teal breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	658	655	+1	0.968	380	+73	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	1,225	1,068	+15	0.474	760	+61	0.006
N. Saskatchewan –N. Manitoba–W. Ontario	399	282	+41	0.009	203	+96	<0.001
S. Alberta	175	297	−41	0.052	197	−11	0.445
S. Saskatchewan	648	561	+16	0.553	244	+166	<0.001
S. Manitoba	48	48	+0	0.999	51	−7	0.763
Montana & Western Dakotas	175	56	+210	<0.001	40	+336	<0.001
Eastern Dakotas	115	13	+766	<0.001	45	+154	0.007
Total	3,444	2,980	+16	0.114	1,920	+79	<0.001

[a] Long-term average, 1955–2008.

Table 7: Blue-winged teal breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	0	0	+0		1	−100	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	248	393	−37	0.125	275	−10	0.697
N. Saskatchewan –N. Manitoba–W. Ontario	116	87	+34	0.486	256	−55	<0.001
S. Alberta	480	818	−41	0.004	618	−22	0.026
S. Saskatchewan	1,740	2,318	−25	0.098	1,278	+36	0.036
S. Manitoba	303	265	+14	0.523	379	−20	0.120
Montana & Western Dakotas	345	235	+47	0.116	265	+30	0.214
Eastern Dakotas	4,152	2,525	+64	<0.001	1,534	+171	<0.001
Total	7,384	6,640	+11	0.153	4,607	+60	<0.001

[a] Long-term average, 1955–2008.

Table 8: Northern shoveler breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	464	466	+0	0.984	279	+66	0.015
C. & N. Alberta–N.E. British Columbia–NWT	293	322	−9	0.625	218	+34	0.110
N. Saskatchewan –N. Manitoba–W. Ontario	16	37	−57	0.065	42	−62	<0.001
S. Alberta	527	618	−15	0.355	383	+38	0.034
S. Saskatchewan	894	1,184	−25	0.056	694	+29	0.038
S. Manitoba	137	90	+53	0.061	109	+26	0.129
Montana & Western Dakotas	408	134	+203	<0.001	150	+173	<0.001
Eastern Dakotas	1,639	657	+149	<0.001	400	+309	<0.001
Total	4,376	3,508	+25	0.002	2,273	+92	<0.001

[a] Long-term average, 1955–2008.

Table 9: Northern pintail breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	930	1,250	−26	0.030	925	+0	0.966
C. & N. Alberta–N.E. British Columbia–NWT	243	331	−27	0.169	370	−34	0.001
N. Saskatchewan –N. Manitoba–W. Ontario	21	4	+425	0.006	39	−45	0.008
S. Alberta	172	240	−28	0.159	703	−76	<0.001
S. Saskatchewan	444	423	+5	0.782	1,195	−63	<0.001
S. Manitoba	48	29	+63	0.121	108	−56	<0.001
Montana & Western Dakotas	383	50	+662	<0.001	262	+46	0.090
Eastern Dakotas	984	285	+245	<0.001	453	+117	<0.001
Total	3,225	2,613	+23	0.005	4,056	−20	<0.001

[a] Long-term average, 1955–2008.

Table 10: Redhead breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	1	2	−60	0.450	2	−46	0.384
C. & N. Alberta-N.E. British Columbia–NWT	29	94	−70	0.077	40	−29	0.137
N. Saskatchewan –N. Manitoba–W. Ontario	6	12	−48	0.252	27	−77	<0.001
S. Alberta	135	333	−59	0.014	122	+10	0.726
S. Saskatchewan	285	383	−26	0.297	202	+41	0.056
S. Manitoba	69	56	+23	0.610	72	−5	0.883
Montana & Western Dakotas	33	3	+934	0.032	9	+251	0.087
Eastern Dakotas	487	173	+181	0.001	170	+187	<0.001
Total	1,044	1,056	−1	0.941	645	+62	<0.001

[a] Long-term average, 1955–2008.

Table 11: Canvasback breeding population estimates (in thousands) for regions in the traditional survey area.

Region	2009	2008	Change from 2008 %	Change from 2008 P	LTA[a]	Change from LTA %	Change from LTA P
Alaska–Yukon Territory–Old Crow Flats	41	72	−43	0.185	91	−54	<0.001
C. & N. Alberta–N.E. British Columbia–NWT	88	84	+5	0.874	75	+18	0.501
N. Saskatchewan –N. Manitoba–W. Ontario	49	23	+109	0.215	54	−9	0.758
S. Alberta	52	79	−34	0.262	65	−21	0.337
S. Saskatchewan	280	166	+69	0.027	187	+50	0.036
S. Manitoba	48	31	+59	0.052	56	−14	0.347
Montana & Western Dakotas	26	9	+198	0.003	8	+223	0.002
Eastern Dakotas	77	25	+210	0.005	33	+134	0.013
Total	662	489	+35	0.018	569	+16	0.109

[a] Long-term average, 1955–2008.

Table 12: Scaup (greater and lesser combined) breeding population estimates (in thousands) for regions in the traditional survey area.

			Change from 2008			Change from LTA	
Region	2009	2008	%	*P*	LTA[a]	%	*P*
Alaska–Yukon Territory–Old Crow Flats	821	1,071	−23	0.034	922	−11	0.158
C. & N. Alberta–N.E. British Columbia–NWT	1,685	1,627	+4	0.812	2,556	−34	<0.001
N. Saskatchewan –N. Manitoba–W. Ontario	684	406	+69	0.012	573	+19	0.211
S. Alberta	287	176	+63	0.110	344	−17	0.363
S. Saskatchewan	324	256	+26	0.436	411	−21	0.238
S. Manitoba	70	60	+17	0.604	132	−47	<0.001
Montana & Western Dakotas	34	16	+111	0.031	51	−33	0.036
Eastern Dakotas	266	127	+110	0.006	100	+166	<0.001
Total	4,172	3,738	+12	0.175	5,090	−18	<0.001

[a] Long-term average, 1955–2008.

was 23% above the 2008 estimate of 2.6 ± 0.1 million, and 20% below the long-term average. Estimated abundance of redheads (1.0 ± 0.1 million) was similar to last year and 62% above the long-term average. The canvasback estimate (0.7 ± 0.06 million) was 35% above the 2008 estimate (0.5 ± 0.05 million) and similar to the long-term average. The combined scaup estimate (4.2 ± 0.2 million) was similar to that of 2008, and 18% below the long-term average. Population estimates for the 10 most abundant species in the eastern survey area were all similar to last year's estimates and to long-term averages (Table 13, Figures 3 and 4, Appendix C.5).

The longest time series of data available to assess the status of the American black duck is provided by the midwinter surveys conducted in January in states of the Atlantic and Mississippi Flyways. Measures of precision are not available for the midwinter surveys. In 2009, the total midwinter count of American black ducks in both flyways combined was 210,100, which was 15% below the most recent 10-year average (1999–2008) of 248,100. In the Atlantic Flyway, the black duck midwinter index was 186,900, which was 16% below the flyway's 10-year average of 222,400. In the Mississippi Flyway, the black duck midwinter index in 2009 was 23,200, which was 21% below the 10-year flyway average of 29,400. A shorter time series for assessing changes in American black duck population status is provided by the breeding waterfowl surveys conducted by the USFWS and CWS in the eastern survey area (Table 13, Figure 3). In the eastern survey area, the 2009 estimate for breeding American black ducks (464,000) was statistically similar to the 2008 estimate (499,000) and to the 1990–2008 average (478,000). Black duck population estimates for northeast states from New Hampshire south to Virginia are available from the Atlantic Flyway Breeding Waterfowl Survey. The estimate from the 2009 survey (39,500) was not significantly different from the 2008 estimate (65,000) but was 42% below the 1993–2008 average (68,400).

Trends in wood duck populations are available from the North American Breeding Bird Survey (BBS). The BBS, a series of roadside routes surveyed during May and June each year, provides the only long-term range-wide breeding

Table 13: Duck breeding population estimates[a] (in thousands) for the 10 most abundant species in the eastern survey area.

Species	2009	2008	% Change from 2008[c]	Average[b]	% Change from average[c]
Mergansers (common, red-breasted, and hooded)	460	460	+0[d]	453	+2
Mallard	463	451	+3	407	+14
American black duck	464	499	−7	478	−3
American wigeon	12	8	+43	19	−37
Green-winged teal	273	270	+1	242	+13
Scaup (greater and lesser)	38	32	+18	38	+1
Ring-necked duck	551	546	+1	526	+5
Goldeneyes (common and Barrow's)	396	422	−6	407	−3
Bufflehead	27	30	−11	25	+9
Scoters (black, white-winged, and surf)	101	86	+18	82	+23

[a] Estimates for mallard, American black duck, green-winged teal, ring-necked duck, goldeneyes, and mergansers from Bayesian hierarchical analysis using FWS and CWS data from strata 51, 52, 63, 64, 66–68, 70–72. All others were computed as the variance-weighted means of FWS and CWS estimates for strata 51, 52, 63, 64, 66–68, 70–72.

[b] Average for 1990–2008.

[c] No changes were significant at ($P < 0.10$) as determined by overlap of Bayesian credibility intervals or confidence intervals.

[d] Rounded values mask change in estimates.

population indices for this species. Wood ducks are encountered with low frequency along BBS routes, which limits the amount and quality of available information (Sauer and Droege 1990). However, hierarchical analysis of these data (J. Sauer, U.S. Geological Survey/Biological Resources Division, unpublished data) incorporated adjustments for spatial and temporal variation in BBS route quality, observer skill, and other factors that may affect detectability (Link and Sauer 2002). This analysis also produces annual abundance indices and measures of variance (95% credible intervals), in addition to the trend estimates and 95% credible intervals presented here. In the Atlantic and Mississippi Flyways combined, the BBS wood duck index increased by an average of 2.3% (UCL 3.0%, LCL 1.7%) per year over the entire survey period (1966–2008), 3.0% (UCL 4.0%, LCL 2.2%) over the past 20 years (1989–2008), and 3.5% (UCL 4.9%, LCL 2.3%) over the most recent (1999-2008) 10-year period. The Atlantic Flyway wood duck index increased by an average of 1.7% (UCL 2.5%, LCL 0.9%) annually over the entire time series (1966–2008), by 2.7% (UCL 3.9%, LCL 1.6%) over the past 20 years (1989–2008), and by 3.3% (UCL 5.4%, LCL 1.4%) from 1999–2008. In the Mississippi Flyway, the corresponding BBS wood duck index trends averaged +2.6% (UCL 3.4%, LCL 1.8%, 1966–2008), 3.2% (UCL 4.4%, LCL 2.2%, 1989–2008), and 3.6% (UCL 5.4%, LCL 2.0%, 1999–2008; J. Sauer, U.S. Geological Survey/Biological Resources Division, unpublished data). An independent wood duck population estimate is available for the northeast states from New Hampshire south to Virginia, from the Atlantic Flyway Breeding Waterfowl Survey. The estimate from the 2009 survey (368,000) was similar to the 2008 estimate (386,100) and to the 1993–2008 average (376,600).

Regional Habitat and Population Status

A description of habitat conditions and duck populations for each of the major breeding areas follows. In the past this information was taken from more detailed reports of specific regions available under *Waterfowl Breeding Population Surveys, Field Crew Reports* located on the Division of Migratory Bird Management's Web site on the Publications page (http://www.fws.gov/migratorybirds/NewReportsPublications/WPS.html). Although these reports will no longer be produced, habitat and population status for each region will continue to be summarized here. More detailed information on regional waterfowl and habitat conditions during the May waterfowl survey is also available on the flyways.us website (http://www.flyways.us/status-of-waterfowl).

Southern Alberta (strata 26–29, 75–76)

The habitat conditions in this survey area have deteriorated from last year, with a portion of the Alberta prairie potholes experiencing record dry conditions due to drought. However, some western areas were still classified as good habitat, with wetter conditions than in the east. While the aspen parkland conditions were in better condition than areas to the south, they appeared drier than last year. Wetland habitats appeared more stable in the boreal forest transition; the larger and deeper wetland systems in this region are typically less affected by drought than the shallow prairie potholes.

Overall, May ponds were 19% lower than the 2008 estimate, and similar to the long-term average. The total duck estimate was 22% lower than that of 2008 and 23% lower than the long-term average. The mallard estimate was 14% below last year and 31% below the long-term average. Blue-winged teal and green-winged teal estimates were both 41% below their 2008 estimates, while blue-winged teal were 22% below, and green-winged teal similar to their long-term averages. Northern pintail numbers were similar to 2008, but remained 76% below their long-term average for this survey area. Gadwall numbers were similar to those of 2008 and the long-term average. The northern shoveler estimate was similar to 2008 but was 38% higher than its long-term average. American wigeon were also similar to their 2008 estimate, but 54% below their long-term average. The redhead estimate was 59% lower than in 2008 and similar to its

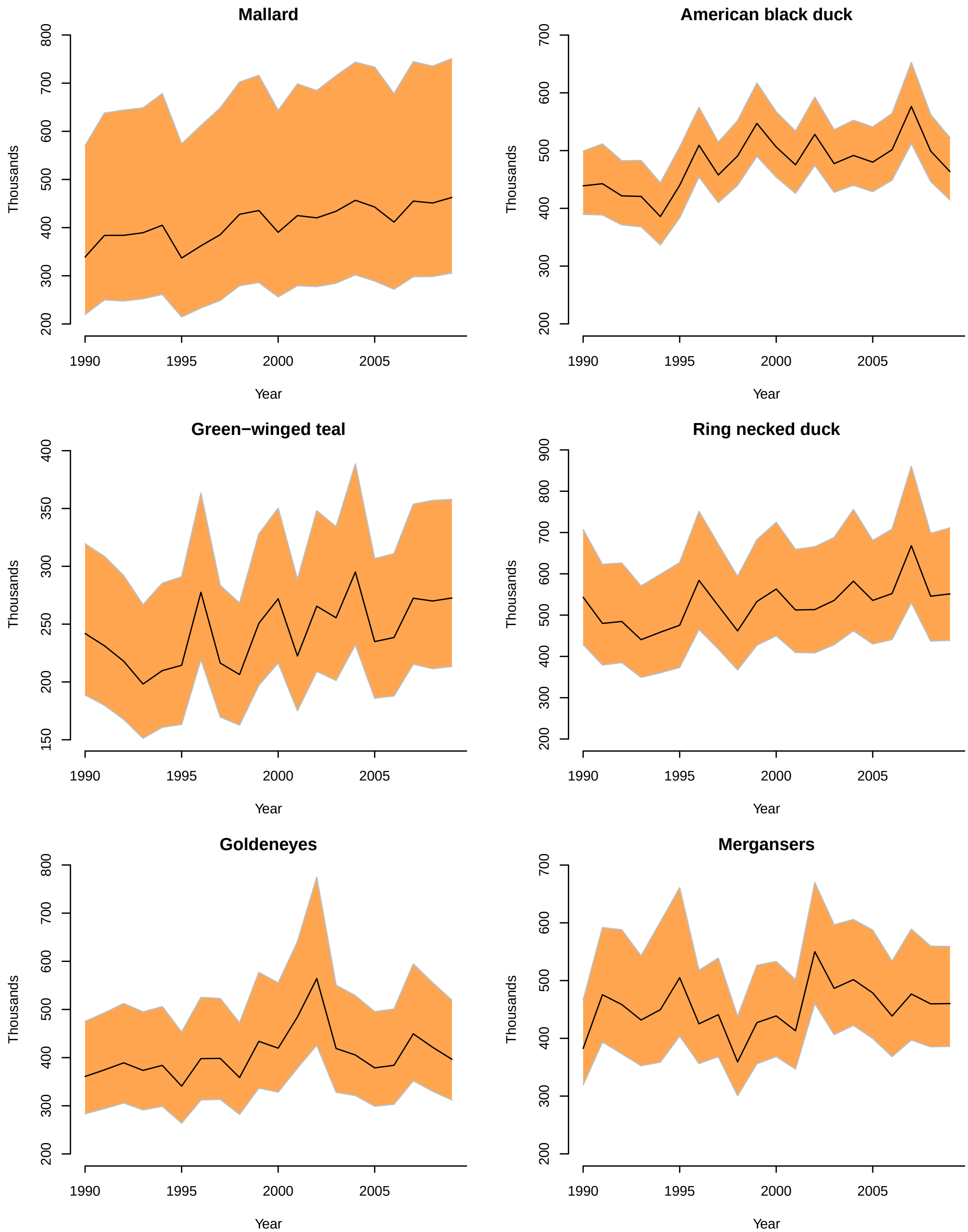

Figure 3: Breeding population estimates and 90% credibility intervals from Bayesian hierarchical models, for selected species in the eastern survey area (strata 51, 52, 63, 64, 66–68, 70–72).

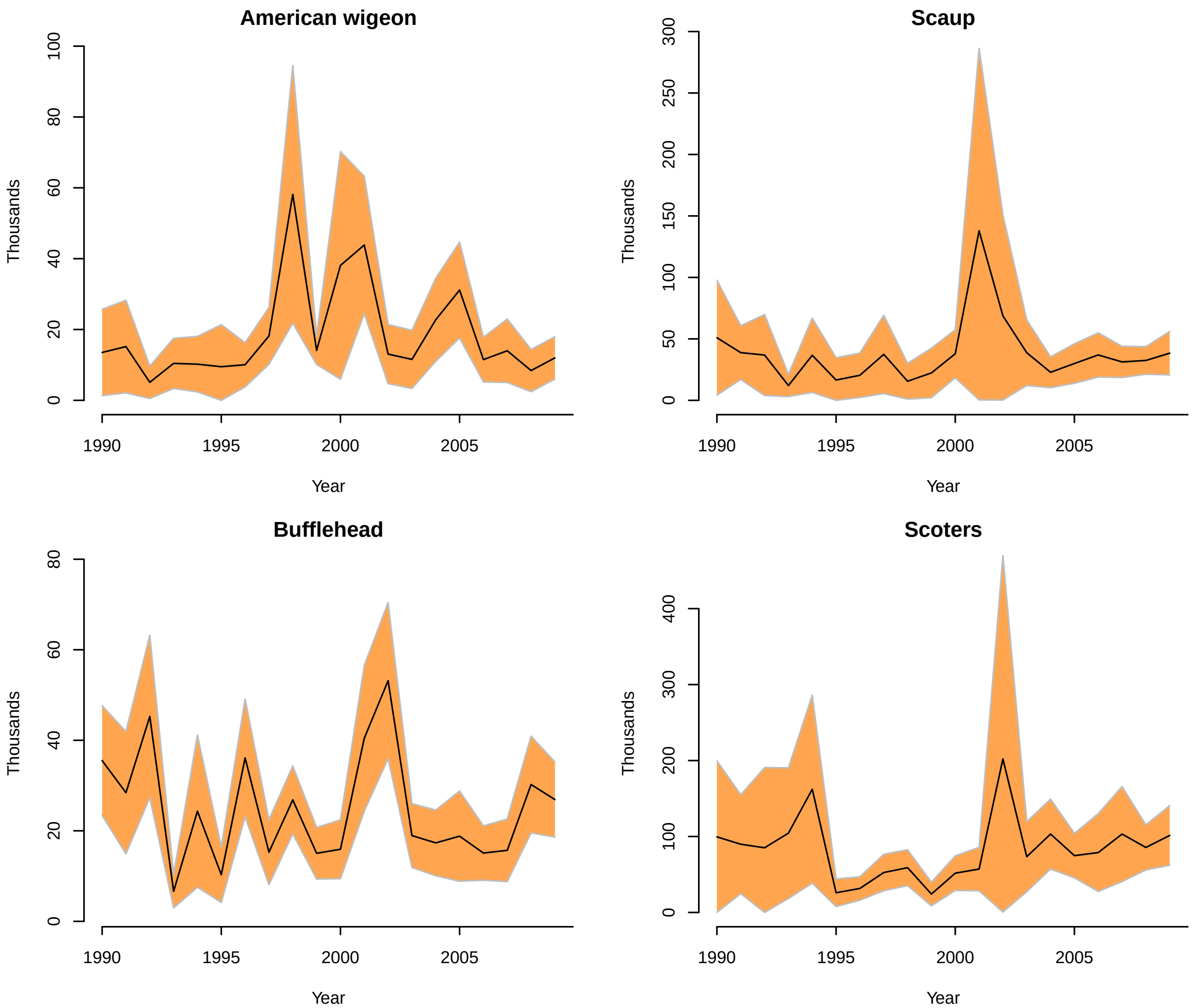

Figure 4: Breeding population estimates (precision-weighted means) and 90% confidence intervals for selected species in the eastern survey area (strata 51, 52, 63, 64, 66–68, 70–72).

long-term average for the survey area. Both canvasback and scaup were similar to 2008 and to their long-term average.

Southern Saskatchewan (strata 30–33)

Habitat conditions for nesting waterfowl improved considerably in the southern grasslands of southern Saskatchewan since last year, but deteriorated in the northern grasslands and portions of the parklands. Good-to-excellent wetland conditions were observed in the southern grasslands this year as a result of above-average precipitation that fell during the fall of 2008. The colder-than-average winter provided a good frost seal and preserved the water for spring waterfowl use. The remainder of the survey area received average to below-average precipitation over the preceding year. Fall and winter precipitation was below average across the majority of the survey area with the exception of the southeast grasslands, which had average to above-average precipitation. Spring precipitation was less than 40% of normal for the western third of the survey area. The remainder of the survey area received 60–85% of normal precipitation. Monthly average temperatures were below normal through much of the winter and all of the spring. May temperatures were 2–4°C below average for the survey area. The southwest grasslands remained dry but had fair wetland conditions for waterfowl. Wetland conditions deteriorated from the southeast to the northwest in the grasslands of this region. The northern grasslands continued to dry out and at the time of the survey were considered poor for waterfowl production. The wetlands in the eastern grasslands southeast of Saskatoon remain in good condition. The parklands continued to dry out and much of the area was considered only fair. A band of good wetland conditions stretched from Saskatoon towards the Manitoba border. These conditions remained good only because of residual water from the last two years of above-average precipitation.

The May pond estimate was 37% above last year's, but similar to the long-term average. Total ducks were 10% below the 2008 estimate, but similar to their long-term average. The mallard estimate was similar to 2008 estimate and 10% lower than the long-term average. American wigeon numbers were 36% lower than last year and 43% lower than the long-term average. Gadwall, green-winged teal, and redhead estimates were also similar to last year's, and were 77%, 166%, and 41% higher than their respective long-term averages. Blue-winged teal and northern shoveler numbers were both 25% lower than last year's estimates, but were 36% and 29% above their respective long-term averages. Canvasbacks were 69% above the 2008 estimate and 50% above their long-term average for the survey area. Scaup estimated abundance was similar to last year's estimate and the long-term average. Northern pintail estimated abundance was similar to the 2008 estimate but remained 63% below the long-term average for the survey area.

Southern Manitoba (strata 25, 34–40)

Habitat conditions in this survey area have significantly improved over 2008 conditions. The 2008–2009 winter and spring was cooler than average with increased precipitation, both as snow in winter and rain in early spring. Drought indicators showed substantial improvements over last year. At the beginning of the survey, spring phenology appeared to be slightly delayed. Significant snowfall in early May improved conditions in the northern parts of strata 34 and 37. Conditions in southwest Manitoba (strata 39 and 40) were good to excellent, while the adjacent areas to the west in Saskatchewan (strata 34 and 35) were fair. All of these areas were much improved over 2008. Prior to beginning the survey there was still significant flooding in the Red River valley; however, this area dried out substantially as flood waters receded by the time the survey was flown. In the boreal forest habitat of central Manitoba conditions were rated fair to excellent. While much of the muskeg habitat seemed drier than normal, most of the ponds and wetland basins were full. A fair amount of ice remained on the larger lakes in this area. With the wet conditions this past spring, there was little evidence of tilling or burning wetland basins for agriculture. Agricultural activities were apparently delayed, and not much activity was observed until the final days of the survey. Overall, the combination of above-average winter and spring precipitation and cool spring temperatures should provide favorable nesting and brood habitat in this survey area, and production is predicted to be good.

The May pond count was similar to the 2008 estimate and the long-term average. Estimates for most species in this survey area were similar to those of 2008. The total duck count was similar to 2008 but 11% below the long-term average. Northern shovelers and canvasbacks were the only species in this survey area with estimates higher than in 2008—the shoveler estimate was 53% higher, and the canvasback estimate was 59% higher—but both were similar to their long-term averages. Mallards, blue-winged teal, green-winged teal, and redheads were all similar to their 2008 estimates and long-term averages. The gadwall estimate was similar to last year's, but was 70% above the long-term average. American wigeon and northern pintail numbers were similar to last year, but were 85% and 56% below their respective long-term averages. The scaup estimate was similar to 2008 but 47% below its long-term average.

Montana and Western Dakotas (strata 41–44)

In May of 2008 a weather event produced significant precipitation near the Montana/South Dakota border, which initiated a recovery from the otherwise dry conditions prevalent across the entire survey area last year. While occurring late in the nesting season of 2008, the additional moisture stimulated vegetation growth which provided good residual cover in early 2009. By April of 2009 drought indicators showed marked improvement in soil moisture and precipitation. As a result of the relatively cold winter and adequate frost seal, habitat conditions in all of eastern Montana and western Dakotas were significantly improved over the previous five years. Nearly all primary and secondary river systems showed evidence of high flows in early spring. Responding to increases in precipitation, upland vegetation was advanced and robust over most of the region, particularly in the area east of Billings which is typically dry. In southwest South Dakota and western North Dakota habitat was ranked as good to excellent, with 75–100% of basins containing water, many at full capacity. In the higher elevation terrain of eastern Montana, where there are fewer ponds and stream drainages compared to the Dakotas, habitat conditions were still ranked fair to excellent. The combination of good residual vegetation, a large increase in spring precipitation, and subsequent vegetation growth in 2009 produced very favorable waterfowl nesting conditions in the western Dakotas and Eastern Montana. Brood habitat and overall waterfowl production should be good in this survey area.

Overall in Montana and the western Dakotas, May pond counts were 95% above the 2008 estimate and 93% above the long-term average. Most species were well above their 2008 estimates. Total ducks were 117% higher than their 2008 estimate, and 53% higher than their long-term average (LTA). The mallard estimate was 26% higher than 2008 but similar to its long-term average. American wigeon (+270%, +99% LTA), green-winged teal (+210%, +336% LTA), and northern shoveler (+203%, +173% LTA) estimates were higher than both their 2008 estimates and their long-term averages. Northern pintail (+662%, +46% LTA) and redhead (+934%, +251% LTA) estimates were well above their 2008 estimates and the long-term average in this survey area. The blue-winged teal estimate was similar to last year's and its long-term average. Gadwall were 59% above the 2008 estimate, and 63% higher than the long-term average. Canvasbacks were 198% above the 2008 estimate and 223% above their long-term average. The scaup estimate was 111% above last year's, but 33% below the long-term average.

Eastern Dakotas (strata 45–49)

Significant improvements in wetland numbers and condition have occurred over most of the region since 2008. South Dakota experienced above-normal precipitation and normal fall temperatures in 2008. Overall, the winter was wetter and colder than normal. In the southern third of South Dakota, wetland conditions were similar to or only slightly improved from last year. The evidence of intense agriculture and wetland drainage was most evident in the extreme southeast part of the state, where a small area was rated in poor condition. The remainder of the southern third was considered in fair condition. The northern two-thirds of east river South Dakota exhibited the most pronounced improvement in wetland conditions in the state since last year. Precipitation in much of the Leola Hills and glacial drift plain improved wetland conditions from fair to poor in 2008 to mostly good to excellent in 2009. Overall, wetland conditions in North Dakota showed more overall improvement since last year than South Dakota. North Dakota experienced a wetter and colder winter than normal, with cooler temperatures and higher to normal precipitation in the spring. Improvements in wetland condition occurred over most of north and eastern North Dakota, and this region was classified as good to excellent. Only the central Red River Valley and small parts of the coteau slope were rated fair. Dry conditions last year allowed many shallow basins to be tilled, removing wetland cover. Additionally, as much as 800,000 acres formerly enrolled in the Conservation Reserve Program has been lost in the Dakotas since 2007, and an additional 400,000 acres are due to expire in 2009, which may further reduce or fragment available nesting cover. Overall, with the strong and positive response by waterfowl to the improved habitat conditions, we expect above-average production in this survey area this year.

Overall in the eastern Dakotas, May pond counts were 117% above the 2008 estimate, and 84% above the long-term average. Total ducks were 79% higher than their 2008 estimate, and 171% above their long-term average. All the major species estimates in this survey area showed increases over their 2008 estimates and long-term averages. Mallard and gadwall counts increased 62% and 27% relative to 2008 estimates, and 181% and 113% above their long-term averages. American wigeon (+278%, +162% LTA), green-winged teal (+766%, +154% LTA), and northern pintail (+245%, +117% LTA) were well above their 2008 estimates and their long-term averages. The blue-winged teal estimate was 64% above the 2008 estimate, and 171% above its long-term average. Northern shovelers were 149% above last year's estimate, and 309% above their long-term average. Canvasbacks (+210%, +134% LTA), redheads (+181%, +187% LTA), and scaup estimates (+110%, +166% LTA) were all higher than their 2008 estimates and their long-term averages.

Northern Saskatchewan, Northern Manitoba, and Western Ontario (strata 21–24, 50)

This region generally received average to below-average precipitation. Temperatures ranged from significantly below average to slightly above average since May 2008. Precipitation trends were fairly consistent across the survey area. Precipitation ranged from 60% to 115% of average from May 2008 (Agriculture and Agri-Food Canada 2009, Saskatchewan Watershed Authority 2009). Total annual precipitation was near average over the northern portions of both Saskatchewan and Manitoba; however, near Buffalo Narrows in westcentral Saskatchewan, total annual precipitation was below average. Beginning in the fall of 2008, precipitation was only 60% to 85% of normal in the survey area, with slightly wetter pockets near Prince Albert and La Ronge, Saskatchewan, and Lynn Lake and Gillam, Manitoba. The dry trend continued into the spring, especially during May 2009 across the northern portion of Saskatchewan and Manitoba.

Spring and summer temperatures during 2008 were average over the region. Temperatures during October and November 2008 averaged 2–5°C above average but were more than 5°C below normal during December 2008. January and February 2009 were near normal. Spring in the survey area was delayed 1–3 weeks beginning in March 2009, when temperatures averaged 3–5°C below normal, and continued through May. The coldest temperatures, more than 4°C below normal, were from Key Lake, Saskatchewan, and Lynn Lake, Manitoba eastward towards Gillam and Churchill, Manitoba.

Wetland conditions were fair to good in the southern portion of the survey area west and slightly north of Prince Albert, Saskatchewan and around Thompson and Gillam, Manitoba. These smaller wetlands (e.g., beaver flowages, potholes) were thawed during the survey despite the very late spring. Through northern Saskatchewan and the remainder of northern Manitoba, those wetlands that were thawed showed reduced water levels. The waterline in some of these wetlands was as much as 30–60 m from the shore. All of the big lakes, such as Cree, Wollaston, Reindeer, Black, Athabasca, Split and Stephens, had very little, if any, open water around the margins, indicating the late spring and resulting in poor waterfowl nesting habitat. Despite the slightly dry conditions over the last year, river flow in major drainages like the Churchill and major lake levels were average.

The total duck estimate in this survey area was 21% above the 2008 estimate, but similar to the long-term average. Mallard, gadwall, and American wigeon estimates were all similar to last year's estimates, but were 19%, 67%, and 40% below their long-term averages, respectively. Blue-winged teal were similar to the 2008 estimate, but 55% lower than the long-term average. Green-winged teal were 41% above the 2008 estimate, and 96% above the long-term average. The northern shoveler estimate was 57% below last year's, and 62% below the long-term average. Northern pintails were well above the 2008 estimate (425%), but were 45% below their long-term average for this survey area. Redheads and canvasbacks were similar to their 2008 estimates, but the redhead estimate was 77% lower than their long-term average, while canvasbacks were similar to their long-term average. The scaup estimate was 69% above the 2008 estimate, but similar to the long-term average.

Central and Northern Alberta, Northeastern British Columbia, and Northwest Territories (strata 13–18, 20, 77)

Habitat conditions were generally good across the survey area. Wetland conditions differed according to variation in winter precipitation. A fairly dry spring limited the widespread flooding that often impacts early nesting waterfowl in this region, such as in the Peace–Athabasca river delta, where spring flooding was minimal. However, the Mackenzie River delta was an exception, with persisting high water. Aside from the major deltas, the important small wetlands often created by beaver dams appeared to be in ideal condition. Although 2009 was characterized by a late spring, an early warm up occurred in some regions. This allowed some early nesting waterfowl to make use of the smaller beaver flowages, ponds, and the many miles of small streams. We saw flocked mallard drakes in these habitats, suggesting that some birds initiated nests early in the survey period. However, the long-lasting, severely cold winter caused a delayed ice breakup on the larger lakes, with areas east of Yellowknife especially slow to open. Although areas further west experienced a delayed breakup as well, they were being well utilized by waterfowl during the survey.

Total duck numbers were similar to both the 2008 estimate and the long-term average for the survey area. Counts of mallards, American wigeon, blue-winged teal, northern shoveler, and canvasbacks were all similar to last year and their long-term averages. Northern pintail and scaup estimates were both similar to last year's estimates but both were 34% below their respective long-term averages. The gadwall estimate was 39% below the 2008 estimate but similar to its long-term average. Green-winged teal were similar to the 2008 estimate but 61% higher than the long-term average. Redheads were 70% below the 2008 estimate but similar to their long-term average.

Alaska, Yukon Territory, and Old Crow Flats (strata 1–12)

In this survey area, breeding conditions depend largely on the timing of spring phenology, because wetland conditions are less variable than on the prairies. Good conditions were present throughout Alaska in 2009, though spring was slightly late in some coastal areas. Spring arrived later than average on the Copper River Delta (stratum 7) and in some areas of the outer coast of the Yukon–Kuskokwim (YK) Delta (stratum 9). The southwest portion of the YK Delta had slightly more ice than normal at the time of the survey. Spring breakup in interior Alaska and southcentral Alaska (strata 1–6) started slowly but was normal during the survey. There was extensive flooding within the Innoko River drainage (stratum 5) and in parts of the Koyukuk River drainage (stratum 6). The flooding in these areas may have resulted in reduced production this year. Bristol Bay (stratum 8), Seward Peninsula (stratum 10), and Kotzebue Sound (stratum 11) seemed to have normal breakup timing and wetland conditions. Despite the late spring, lakes on the Seward Peninsula had less ice than in recent years. The Old Crow Flats (stratum 12) was average and slightly more advanced in breakup compared to more recent years. Overall, production is expected to be fair to good, with possible lower production in the flooded areas and in areas where breakup occurred later than normal.

The total duck estimate for the survey area was 15% lower than that of 2008, but 19% above the long-term average. The mallard estimate was similar to last year but 37% above its long-term average. Estimates for gadwall and redheads were similar to both 2008 estimates and their long-term averages. American wigeon, green-winged teal, and northern shoveler were all similar to their 2008 estimates but they were 50%, 73%, and 66% above their respective long-term averages. The canvasback estimate was similar to last year but 54% below the long-term average. Northern pintail and scaup estimates were 26% and 23% below their 2008 estimates, respectively, but were both similar to their long-term averages.

Eastern Survey Area (strata 51–72)

The boreal forest of the eastern survey area was generally in good condition this spring, although northern survey areas in Ontario, Quebec, and Labrador experienced a very late spring. Late winter/spring precipitation in southwest Ontario filled wetland basins to capacity by the beginning of the survey, resulting in excellent nesting conditions. The James and Hudson Bay Lowlands of far northern Ontario were in good-to-poor condition for breeding waterfowl at the time of the survey. Deep snow blanketed parts of this area, while others received below-normal accumulation. Cold spring temperatures kept wetlands and lakes in this area frozen until early June, especially in the Lowlands of Hudson Bay. These conditions, along with several late-May storms, will likely depress production in this region. Habitat conditions in southern and central Quebec were classified as good, due to the wet winter and normal spring timing; however, some lakes northeast of Chibougamau were still frozen at the time of the survey. Above-average snowfall was recorded from Maine to the Maritimes, but average spring temperatures prevented the flooding that occurred in 2008, resulting in waterfowl habitat that was rated good to excellent in 2009. An exception was the below-average snowpack in Newfoundland, even at high elevations; still, habitat in this region was classified as excellent. Spring phenology in the Atlantic region (strata 62–67) appeared to be normal, except for slightly delayed timing in Nova Scotia. Overall, although habitat conditions were good in the eastern survey area, flooding from a series of major storms in southwestern Ontario during mid-May and persistent winter conditions in the James and Hudson Bay Lowlands may have reduced habitat quality in those areas.

In the eastern survey area, estimates of mallards, scaup, scoters, green-winged teal, American wigeon, buffleheads, American black ducks, ring-necked ducks, mergansers, and goldeneyes were all similar to their 2008 estimates and long-term averages (Table 13).

Other areas

Over much of the Pacific Flyway, the outlook for waterfowl production improved relative to last year. In California, the total duck estimate in 2009 was 510,800, which was similar to last year's estimate and their long-term average of 596,400. The mallard estimate in 2009 was 302,000, also similar to the 2008 estimate and their long-term average (366,500). Late spring precipitation in the Central Valley improved nesting habitat, but also delayed rice cultivation in the Sacramento Valley. Rice fields that have been planted and then flooded provide important brood habitat for mallards. Therefore, later hatching broods tend to have higher survival, which is opposite to what is observed in prairie-nesting ducks. Overall, increased recruitment is expected in many parts of California compared to the dry spring conditions experienced in 2008.

In Nevada, the outlook for waterfowl production also improved over much of the state. In the western portion of the state, the Carson, Walker, and Truckee River flows are the highest in two years, which should improve wetland conditions along their banks and at their terminal lakes. Moreover, June rains were the third highest on record, and were accompanied by cool temperatures which likely benefited plant growth. One of the state's largest playa lakes, the Humboldt Sink, had been dry for the past two years, but snowmelt was expected to fill it this year. In addition, a series of dikes will be constructed to segment the Toulon portion of the Humboldt WMA to establish working marshes. Over the rest of the state, conditions were variable; in northeastern Nevada, spring snowmelt and flow on the east side of the Ruby Mountains were insufficient to fill the Franklin Lake WMA. Ponds on Ruby Lake NWR will be filled according to their management plan. In southern Nevada, habitats on Kirch, Key Pittman, and Overton WMAs were in adequate condition at the start of the breeding season. Several large lakes remain dry in Pahranagat NWR, with other segments there in good condition. In Nevada the total duck estimate was 105,500, and the mallard estimate was 12,700 (due to changes in Nevada's survey design the 2009 totals are not comparable to previous years).

In western Oregon, a good snow pack produced average water conditions. Southeast Oregon was generally dry during the survey period but habitat conditions improved substantially due to above-average precipitation during late May and throughout June. Wetland areas in other areas of eastern Oregon also benefited from late-spring precipitation, and were generally in above-average condition. In Oregon, the total duck estimate in 2009 was 198,300, which was 17% lower than 2008, and 32% below the long-term average. The 2009 mallard count was 79,500, which was 6% lower than last year, and 25% lower than the long-term average. In eastern Washington, the total pond count in 2009 was 6,000, up 9% from 2008, due to increased water on the landscape in Lincoln County, Douglas County, and the Far East. However, pond counts on the Okanogan and Omak transects declined, so that the overall count was 9% below the long-term average. Overall, biologists expect a fall flight similar to that of 2008, but below the long-term average for eastern Washington wetlands. The 2009 total duck estimate from Washington was 116,500, which was slightly lower than the 2008 estimate of 120,900. The 2009 mallard estimate was 47,500, which was lower than the 2008 estimate of 50,600. In British Columbia, temperatures were atypically cold throughout the winter of 2008–2009, which resulted in heavier-than-normal snow accumulation at low elevations. Precipitation was above normal in the north and below normal in the south from November 2008 to February 2009. However, in March 2009 a series of Pacific frontal storms moved across the province, which brought heavier-than-normal snowfall to most areas. Thus, snowpack conditions were quite variable across the interior of the province in late April and early May 2009: below normal in the southern interior, near-normal in the central interior, and above normal in the northern interior. Despite this precipitation, overall in May 2009 water levels were low and habitat conditions remained poor, similar to those of 2007 and 2008.

Wetland habitat conditions in the Sandhills region of Nebraska were good to excellent. Continued precipitation through May and June was conducive to renesting attempts and good brood-rearing conditions; thus, good production was anticipated in this region in 2009. In Michigan, pond numbers were up 5% compared to last year, but pond numbers were 19% below the 1992–2008 average. The total duck estimate in Michigan for 2009 was 530,500 (excluding mergansers), which was 16% higher than 2008, and 31% below the long-term average. The 2009 mallard estimate was 258,000, which was similar to 2008 estimate of 189,000, and 32% below the long-term average.

In Wisconsin, the total state breeding duck population estimate of 502,400 was down 20% relative to 2008 and 15% above the long-term mean. The 2009 total mallard population estimate of 200,500 was higher than 2008 and 10% above the long-term mean (36 years). In 2009, the population estimate for wood ducks was 113,500, which was below the 2008 estimate, and 51% above the long-term mean. Some late snows and early spring rains improved conditions in the central and northeast regions of the state but important waterfowl breeding areas in northwest Wisconsin remained dry (down 37% relative to normal). Precipitation in southcentral (48% above normal) and southeast (31% above normal) Wisconsin was up during this important spring period. Despite high precipitation in the southern areas of the state, wetland conditions were only average. Breeding and brood-rearing habitat in southern Wisconsin was considered good in 2009, but in northern Wisconsin it was considered poor. Across Minnesota, wetland habitat conditions were above average, but highly variable. Southern and eastcentral Minnesota were extremely dry, while westcentral to northwest Minnesota was extremely wet. Wetland numbers decreased 2% compared to 2008 but remained 26% above the 10-year average and 28% above the long-term average. The estimated numbers of temporary (Type 1) wetlands decreased 44% from 2008 and were 43% below the long-term average. The mallard breeding population index (236,000) in Minnesota was statistically similar to that of 2008 (298,000). Mallard numbers were 19% below the 10-year average but 6% above the long-term average of 224,000 breeding mallards. The estimate of total duck abundance (507,000, excluding scaup), decreased 31% compared to 2008 and was 32% below the 10-year average and 19% below the long-term average (626,100), and was the third lowest estimate since 1983.

In the northeast United States, good habitat conditions were generally reported for nesting waterfowl across the area covered by the northeastern plot survey, which encompasses New Hampshire to Virginia. Much of the survey area experienced a cool spring, but a few localized areas had higher-than-normal temperatures. The first three months of the year in many areas were some of the driest on record, but rainfall over much of the area during the months just before and during the survey period was well above normal. Some areas reported double their normal monthly precipitation in May and June. This record spring precipitation recharged most of the previously dry areas, which created a substantial amount of nesting and brood habitat across much of the survey area. Thus, the forecast for nesting waterfowl was average to above average. Total duck numbers from the Atlantic Flyway Breeding Waterfowl survey (1.3 million) were similar to the 2008 estimate of 1.2 million, but 9% below their 1993–2008 average (1.4 million). Mallard numbers (666,800) were similar to the 2008 estimate of 619,100 and 14% below their long-term average of 777,000.

Mallard Fall-Flight Index

The mid-continent mallard population is composed of mallards from the traditional survey area (revised in 2008 to exclude Alaska mallards), Michigan, Minnesota, and Wisconsin, and was estimated to be 10.3 ± 0.9 million in 2009 (Figure 5). This was similar to the 2008 estimate of 9.2 ± 0.8 million.

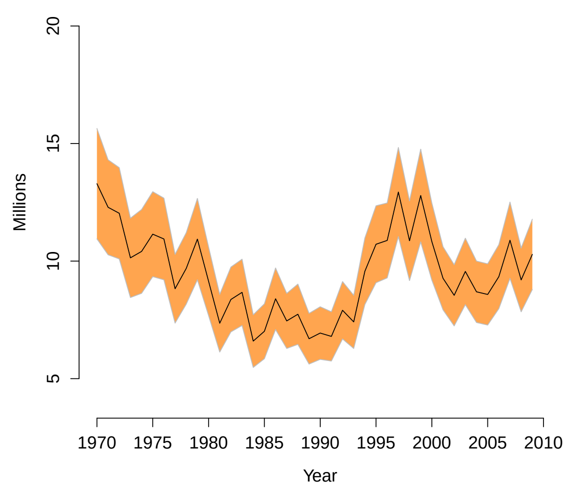

Figure 5: Estimates and 90% confidence intervals for the size of the mallard population in the fall.

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2 Status of Geese and Swans

Abstract: We provide information on the population status and productivity of North American Canada geese (*Branta canadensis*), brant (*B. bernicla*), snow geese (*Chen caerulescens*), Ross' geese (*C. rossii*), emperor geese (*C. canagica*), white-fronted geese (*Anser albifrons*), and tundra swans (*Cygnus columbianus*). In May of 2009, temperatures were 1–5°C colder than average throughout the central region of subarctic and Arctic Canada. In some locales harsh spring conditions persisted into June. In areas near Hudson Bay and the Queen Maud Gulf, goose and swan nesting activities were delayed by 1 to 3 weeks. In contrast, nesting conditions were favorable near Wrangel Island, Alaska's North Slope and eastern interior regions, parts of the Canadian high Arctic, and Newfoundland. Improved wetland abundance in the Canadian and U.S. prairies, and other temperate regions will likely improve the production of Canada geese that nest at southern latitudes. Primary abundance indices decreased for 15 goose populations and increased for ten goose populations in 2009 compared to 2008. Primary abundance indices for both populations of tundra swans increased in 2009 from 2008 levels. The following populations displayed significant positive trends during the most recent 10-year period ($P < 0.05$); Mississippi Flyway Giant, Aleutian, Atlantic, and Eastern Prairie Canada geese; Greater, Western Arctic/Wrangel Island, and Western Central Flyway light geese; and Pacific white-fronted geese. No populations showed a significant negative 10-year trend. The forecast for the production of geese and swans in North America for 2009 is regionally variable, but production for many populations will be reduced this year due to harsh spring conditions in much of central Canada.

This section summarizes information regarding the status, annual production of young, and expected fall flights of goose and tundra swan populations in North America. Information was compiled from a broad geographic area and is provided to assist managers in regulating harvest. Most populations of geese and swans in North America nest in the Arctic and subarctic regions of Alaska and northern Canada (Figure 6), but several Canada goose populations nest in temperate regions of the United States and southern Canada ("temperate-nesting" populations). The annual production of young by northern-nesting geese is influenced greatly by weather conditions on the breeding grounds, especially the timing of spring snowmelt and its impact on the initiation of nesting activity (i.e., phenology). Persistent snow cover reduces nest site availability, delays nesting activity, and often results in depressed reproductive effort and productivity. In general, goose productivity will be better than average if nesting begins by late May in western and central portions of the Arctic, and by early June in the eastern Arctic. Production usually is poor if nest initiations are delayed much beyond 15 June. For temperate-nesting Canada goose populations, recruitment rates are less variable, but productivity is influenced by localized drought and flood events.

Methods

We have used the most widely accepted nomenclature for various waterfowl populations, but they may differ from other published information. Species nomenclature follows the List of Migratory Birds in Title 50 of the Code of Federal Regulations, Section 10.13. Some of the goose populations described herein are comprised of more than one subspecies and some light goose populations contain two species (i.e., snow and Ross' geese).

Population estimates for geese (Appendices D.1, D.2, and D.3) are derived from a variety of surveys conducted by biologists from federal, state, and provincial agencies, or from universities (Appendix A.2). Surveys include the Midwinter Survey (MWS, conducted each January in wintering areas), the Waterfowl Breeding Population and Habitat Survey (WBPHS, see Status of Ducks section of this report), and surveys that are specifically designed for various

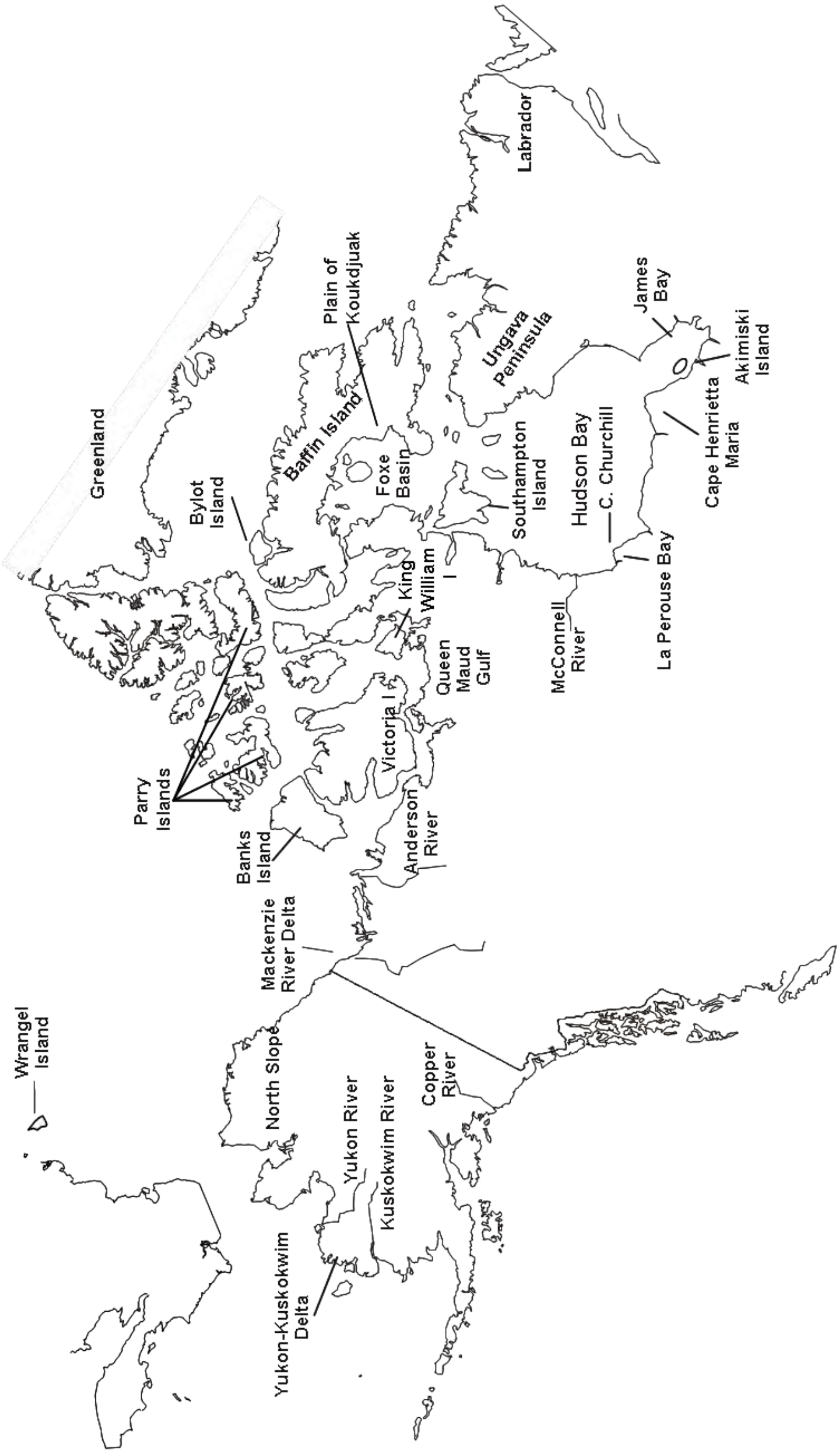


Figure 6: Important goose and swan nesting areas in Arctic and subarctic North America.

Figure 7: The extent of snow and ice cover in North America on 2 June 2009 and 2 June 2008 (data from National Oceanic and Atmospheric Administration).

goose populations. When survey methodology allowed, 95% confidence intervals were presented with population estimates. The 10-year trends of population estimates were calculated by regressing the natural logarithm of survey results on year, and slope coefficients were presented and tested for equality to zero (t-statistic). Changes in population indices between the current and previous years were calculated and, where possible, assessed with a z-test using the sum of sampling variances for the two estimates. Primary abundance indices, those related to management plan population objectives, are described first in population-specific sections and graphed when data are available.

Because this report was completed prior to the final annual assessment of goose and swan reproduction, the annual productivity of most populations is only predicted qualitatively. Information on habitat conditions and forecasts of productivity were primarily based on observations made during various waterfowl surveys and interviews with field biologists. These reports provide reliable information for specific locations, but may not provide accurate assessment for the vast geographic range of waterfowl populations.

Results and Discussion

Conditions in the Arctic and Subarctic

May 2009 was 1–5°C colder than average throughout a broad area of subarctic and Arctic central Canada. In areas near Hudson Bay and the Queen Maud Gulf, harsher than average spring conditions persisted into June. Despite near average or below average overwinter snowfall, snow cover persisted in many of these areas and delayed goose nesting activities by 1 to 3 weeks beyond average. Several Waterfowl Breeding Population and Habitat Survey crews throughout North America reported unusually high numbers of migrant geese in southerly crew areas, suggesting a delayed migration of northern-nesting geese in spring 2009. In contrast, climate records and field reports from Wrangel Island, much of Alaska, the western Canadian Arctic, and the high Arctic indicate near average or earlier than average spring breakup. Gosling production of many migrant Canada goose populations that migrate to the Atlantic, Mississippi, and Central Flyways will likely be reduced substantially in 2009. It is expected that production of snow, Ross', and white-fronted geese of the Central and Mississippi Flyways will also be below average. The snow and ice cover graphics (Figure 7, National Oceanic and Atmospheric Administration, http://www.natice.noaa.gov/ims/) illustrates the persistent snow cover in the eastern subarctic and advanced snowmelt along the north coast of western Canada on 2 June 2009 compared to the same date in 2008.

Conditions in Southern Canada and the United States

Conditions that influence the productivity of Canada geese vary less from year to year in these temperate regions than in the Arctic and subarctic. Given adequate wetland numbers and the absence of flooding, temperate-nesting Canada geese are reliably productive. Indices of wetland abundance in the Canadian and U.S. prairies in 2009 were greatly improved from 2008 and contributed to increased nesting and brood rearing success this year. Generally favorable nesting conditions were reported in most areas inhabited by temperate-nesting geese in southern Canada and the United States. In a few regions (e.g., WY, eastern AB, and western SK) drought or inclement weather during laying or hatching reduced production potential. Production of temperate-nesting Canada geese from most of their North American range is expected to be average or above average in 2009.

Status of Canada Geese

North Atlantic Population (NAP)

NAP Canada geese principally nest in Newfoundland and Labrador. They generally commingle during winter with other Atlantic Flyway Canada geese, although NAP geese have a more coastal distribution than other populations (Figure 9). Biologists are considering revising the index used to monitor this population to one that combines the WBPHS transect and the Canadian helicopter plot survey data. We continue to present interim indices until that new index has been adopted. Based on data from the 2009 WBPHS, biologists estimated 53,700 (±25,200) indicated pairs (singles plus pairs) within the NAP range (strata 66 and 67), 28% more than in 2008 ($P = 0.473$; Figure 8). Indicated pair estimates declined an average of 2% per year during 2000–2009 ($P = 0.269$). The 2009 estimate of 179,700 (±89,300) total NAP Canada geese was 66% above last year's estimate ($P = 0.174$). Preliminary information from the CWS helicopter plot surveys in Newfoundland and Labrador indicated a strong nesting effort that remained above the long-term average. Below-average winter snowfall and mild spring temperatures contributed to an early snowmelt in Newfoundland in 2009 and likely benefited NAP Canada geese. In Labrador, average winter snowfall and a colder spring contributed to less favorable nesting conditions. Preliminary data

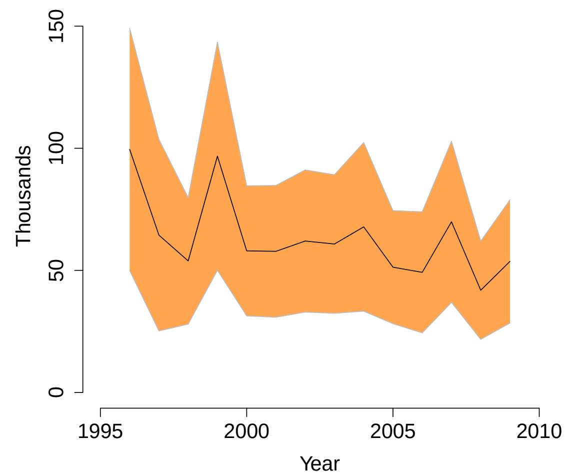


Figure 8: Estimated numbers (and 95% confidence intervals) of North Atlantic Population Canada geese (breeding pairs).

indicated that clutch sizes of NAP geese in 2009 appeared to be larger than average. A fall flight similar to that of 2008 is expected.

Atlantic Population (AP)

AP Canada geese nest throughout much of Quebec, especially along Ungava Bay, the eastern shore of Hudson Bay, and on the Ungava Peninsula. The AP winters from New England to South Carolina, but the largest concentrations occur on the Delmarva Peninsula (Figure 9). Spring surveys in 2009 yielded an estimate of 176,100 (±28,300) breeding pairs, 4% more than in 2008 ($P = 0.752$; Figure 10.1). Breeding pair estimates increased an average of 5% per year during 2000–2009 ($P = 0.025$). In 2009, 38% of indicated pairs were observed as singles. This proportion is well below the 17-year average (51%), near the lowest on record (34%), and indicates a poor nesting effort in 2009. The estimated total spring population of 1,097,700 (±171,600) in 2009 was 11% lower than in 2008 ($P = 0.362$). May temperatures in AP range in 2009 were 3–4°C colder than average and snowmelt was delayed. Nesting studies along Ungava Bay estimated a mean nest initiation date seven days later than average, and a below-average clutch size of 3.62. Production is

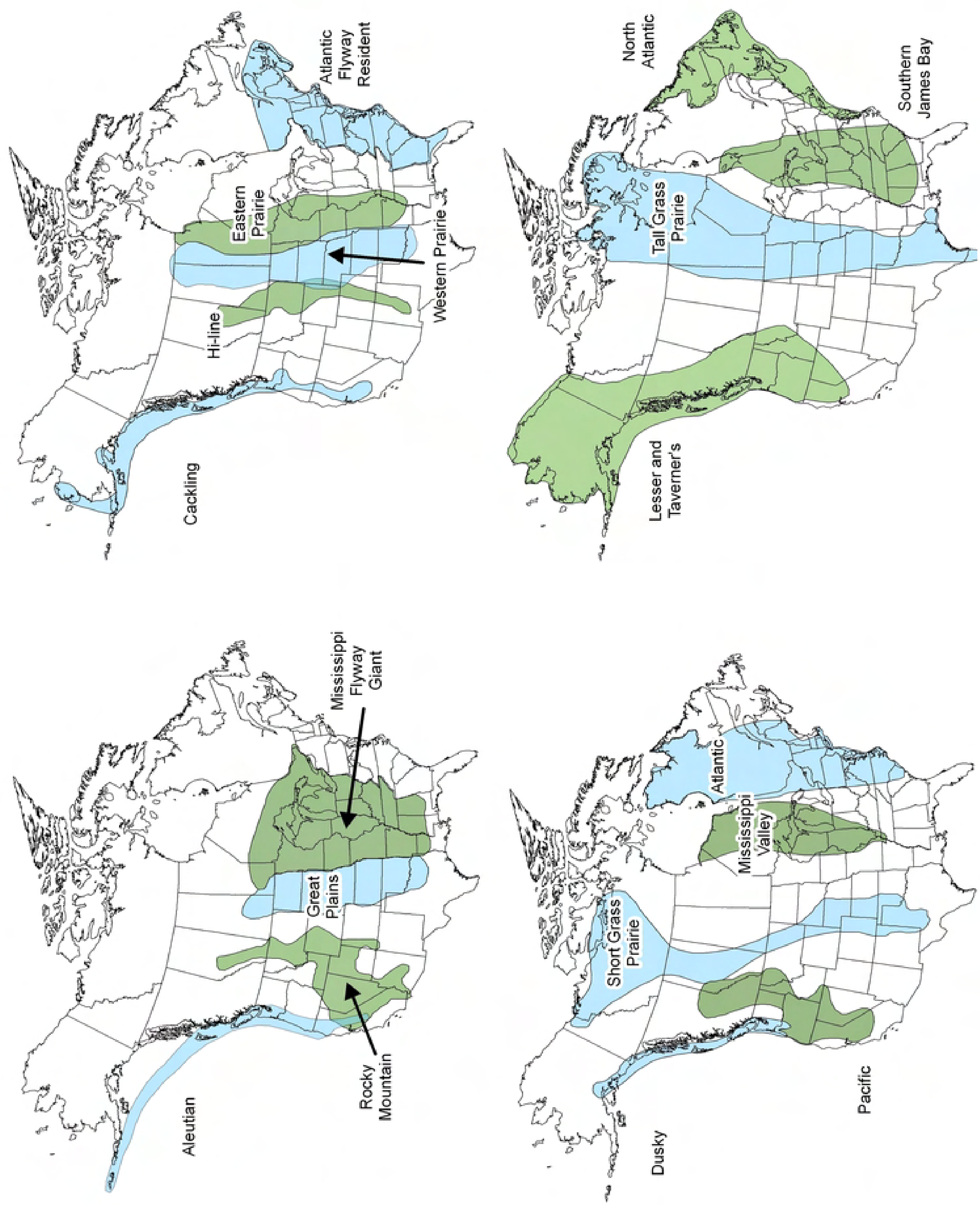
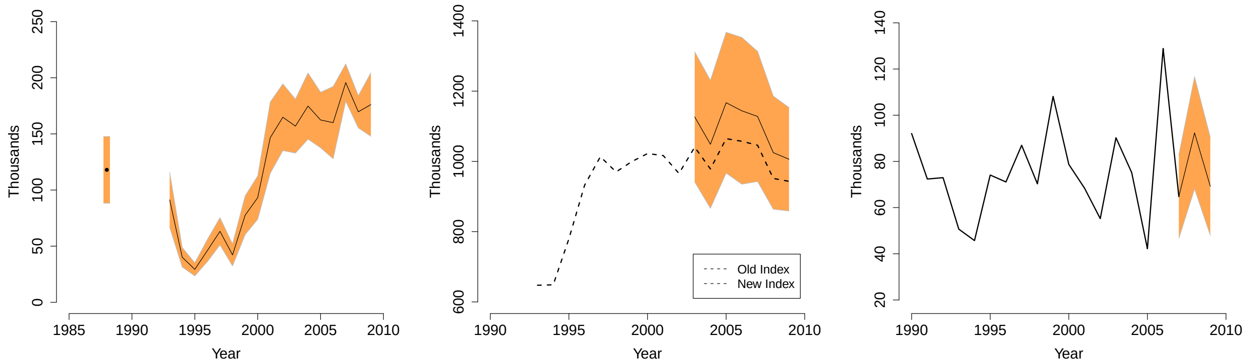


Figure 9: Approximate ranges of Canada goose populations in North America.



10.1: Atlantic Population

10.2: Atlantic Flyway Resident Population

10.3: Southern James Bay Population

Figure 10: Estimated numbers (and 95% confidence intervals) of Atlantic Population (breeding pairs), Atlantic Flyway Resident Population (breeding adults), and Southern James Bay Population (breeding adults) Canada geese.

expected to be poor to moderate in 2009 with a fall flight reduced from 2008.

Atlantic Flyway Resident Population

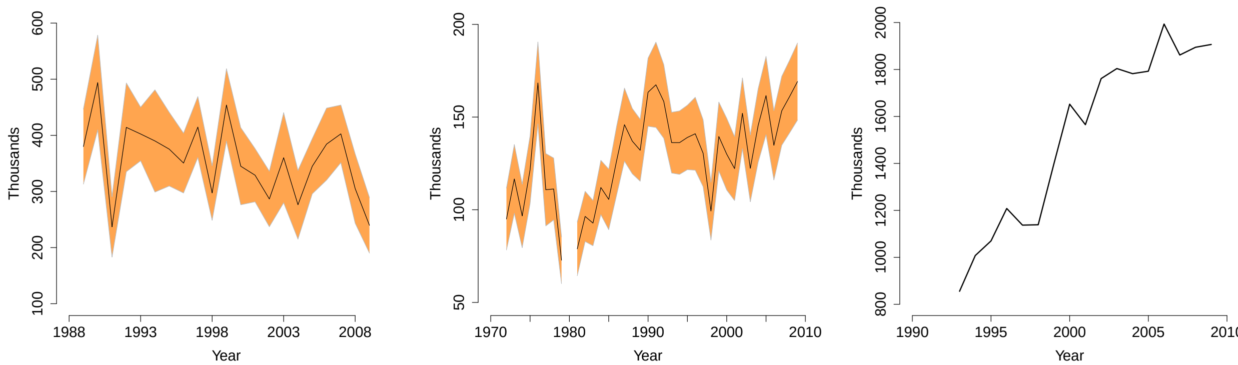
This population of large Canada geese inhabits southern Ontario and Quebec, the southern Maritime provinces, and all states of the Atlantic Flyway (Figure 9). Surveys during spring 2009 estimated 1,006,100 (±147,200) Canada geese in this population, 2% fewer than in 2008 ($P = 0.866$; Figure 10.2). The new indices decreased an average of 1% per year during the last seven years ($P = 0.203$). Nesting conditions in the northern portion of the AFRP range were reportedly good to excellent, with cool and dry weather during nesting activities. Although the southern portion of the range experienced cool and wet weather, biologists expect excellent AFRP production. The 2009 fall flight was expected to be similar to the recent average.

Southern James Bay Population (SJBP)

This population nests on Akimiski Island and in the Hudson Bay Lowlands to the west and south of James Bay. The SJBP winters from southern Ontario and Michigan to Mississippi, Alabama, Georgia, and South Carolina (Figure 9). The estimated number of breeding SJBP geese in spring 2009 was 69,200 (±21,200), 25% lower than last year's index ($P = 0.161$; Figure 10.3). These indices of SJBP geese have increased an average of 1% per year since 2000 ($P = 0.710$). Transect-level analyses of this year's breeding pair estimates appeared similar to the previous five years on Akimiski Island and the mainland. The 2009 survey indicated a total spring population of 77,500 (±23,900) Canada geese, 30% fewer than in 2008 ($P = 0.074$). Surveys in 2009 were conducted with the traditionally used aircraft and within the target survey period. Above-average snow pack and a colder than average May contributed to nesting phenology near the long-term average, but much later than the previous five-year average. Nesting studies on Akimiski Island indicated relatively low nest densities, below-average clutch sizes, and poorer nest success compared to recent years. Biologists expect gosling production and the 2009 fall flight to be below average.

Mississippi Valley Population (MVP)

The nesting range of this population is in northern Ontario, principally in the Hudson Bay Lowlands, west of Hudson and James Bays. MVP Canada geese primarily concentrate during fall and winter in Wisconsin, Illinois, and Michigan (Figure 9). Breeding ground surveys conducted in 2009 indicated the presence of 239,600 (±49,500) MVP breeding adults, 21% fewer than



11.1: Mississippi Valley Population

11.2: Eastern Prairie Population

11.3: Mississippi Flyway Giant Population

Figure 11: Estimated numbers (and 95% confidence intervals) of Mississippi Valley Population (breeding adults), Eastern Prairie Population (single and paired breeding adults), and Mississippi Flyway Giant Population (breeding adults) Canada geese.

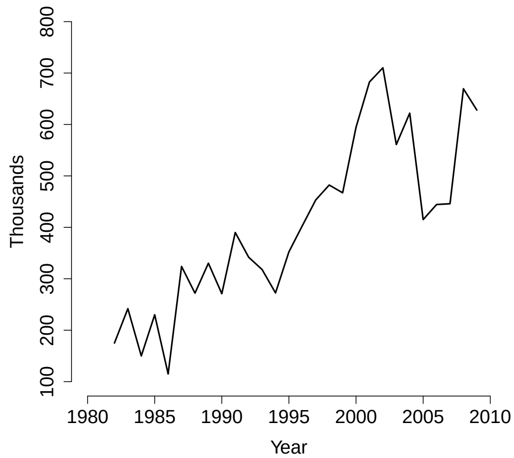
in 2008 ($P = 0.104$; Figure 11.1). Estimates of breeding adults decreased an average of 1% per year during 2000–2009 ($P = 0.592$). Transect-level analyses of MVP breeding pairs indicated the 2009 estimates were lower ($P = 0.044$) than the previous five-year mean. Surveys indicated a total population of 518,200 (±191,800) Canada geese, a 17% decrease from the revised 2008 estimate ($P = 0.392$). Spring phenology in the MVP range in 2009 was among the latest recorded since 1989. May was characterized by near-record snow cover, mean daily temperatures more than 3°C below average, and several snow storms. Nesting studies near Peawanuck, Ontario yielded nest density estimates even lower than last year's poor nesting effort, and very low nest success. Nesting conditions inland from the coast appeared to be less harsh. Biologists expect poor production again in 2009 and a fall flight lower than that of last year.

Eastern Prairie Population (EPP)

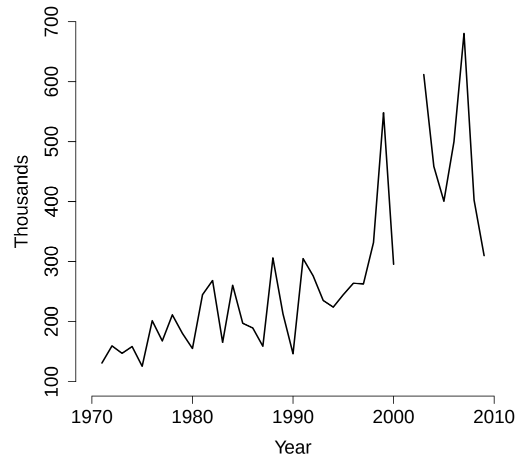
These geese nest in the Hudson Bay Lowlands of Manitoba and concentrate primarily in Manitoba, Minnesota, and Missouri during winter (Figure 9). The 2009 survey estimate of single and paired EPP geese was 169,200 (±20,800), 5% higher than last year ($P = 0.581$; Figure 11.2). Estimates of these population components have increased an average of 3% per year during 2000–2009 ($P = 0.016$). The 2009 spring estimate of total geese was 279,900 (±31,200), 9% higher than the 2008 estimate ($P = 0.317$). The estimated number of productive geese (nesting pairs and singles) was 54,100 in 2009, 20% lower than in 2008. Biologists at the Nestor One field station near Cape Churchill observed the latest median hatch date (12 July), the second lowest nest density (2.7 nests/100 ha), and the second lowest clutch size recorded during studies there during 1976–2009. Very poor production and a fall flight lower than 2008 is expected in 2009.

Mississippi Flyway Giant Population (MFGP)

Giant Canada geese have been reestablished or introduced in all Mississippi Flyway states. This subspecies now represents a large proportion of all Canada geese in the Mississippi Flyway (Figure 9). Biologists estimated the presence of 1,906,600 MFGP geese during the spring of 2009, 1% more than the revised 2008 estimate, and the second highest estimate on record (Figure 11.3). These estimates have increased an average of 2% per year since 2000 ($P = 0.003$). Iowa and Minnesota reported above-average nesting conditions in 2009, while production in other MFGP states was expected



12.1: Western Prairie/Great Plains Population



12.2: Tall Grass Prairie Population

Figure 12: Numbers of Western Prairie/Great Plains Population and Tall Grass Prairie Population Canada geese estimated during winter surveys.

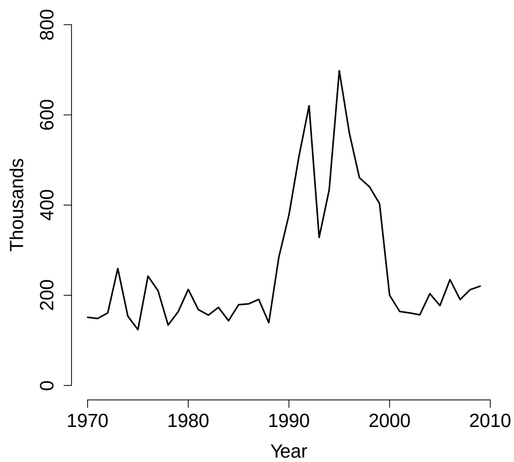
to be near average. Biologists expect a fall flight this year similar to that of 2008.

Western Prairie and Great Plains Populations (WPP/GPP)

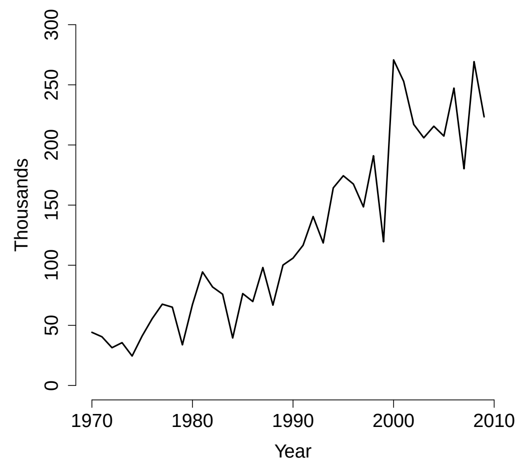
The WPP is composed of mid-sized and large Canada geese that nest in eastern Saskatchewan and western Manitoba. The GPP is composed of large Canada geese resulting from restoration efforts in Saskatchewan, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Geese from these breeding populations commingle during migration with other Canada geese along the Missouri River in the Dakotas and on reservoirs from southwestern Kansas to Texas (Figure 9). These two populations are managed jointly and surveyed during winter. During the 2009 MWS, 628,000 WPP/GPP geese were counted, 6% fewer than in 2008 (Figure 12.1). These indices decreased 2% per year since 2000 ($P = 0.422$). In 2009, the estimated spring population in the portion of WPP/GPP range included in the WBPHS was 922,900 (±128,100) geese, 11% more than last year ($P = 0.330$). The WBPHS estimates have increased an average of 5% per year since 2000 ($P = 0.004$). The northern WPP range experienced a colder-than-average May and nesting activities were likely delayed. However, wetland abundance in the southern WPP and most of GPP range was greatly improved in 2009 from that of 2008. Goose production in 2009 was reported as above average in South and North Dakota, average to above average in Nebraska, and near average in Oklahoma. A fall flight improved from that of 2008 is expected.

Tall Grass Prairie Population (TGPP)

These small Canada geese nest on Baffin (particularly on the Great Plain of the Koukdjuak), Southampton, and King William Islands; north of the Maguse and McConnell Rivers on the Hudson Bay coast; and in the eastern Queen Maud Gulf region. TGPP Canada geese winter mainly in Oklahoma, Texas, and northeastern Mexico (Figure 9). These geese mix with other Canada geese on wintering areas, making it difficult to estimate the size of the winter population. During the 2009 MWS in the Central Flyway, 309,900 TGPP geese were counted, 23% fewer than in 2008 (Figure 12.2). These estimates increased an average of 5% per year during 2000–2009 ($P = 0.334$). Most of TGP range, with the exception of Baffin Island, experienced May temperatures 1–4°C below average which likely delayed nesting activities. Nesting phenology of



13.1: Short Grass Prairie Population



13.2: Hi-line Population

Figure 13: Numbers of Short Grass Prairie and Hi-line Canada geese estimated during winter surveys.

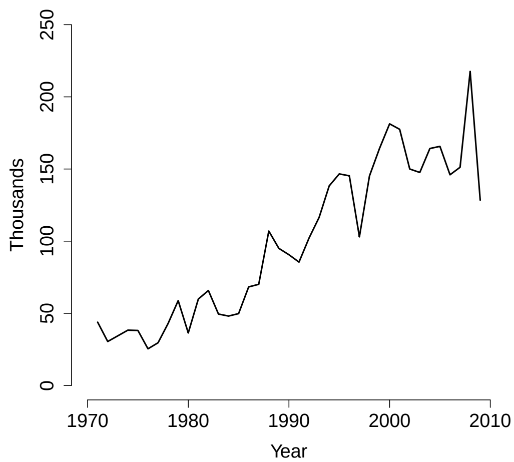
several species on Southampton Island were delayed 2–3 weeks, and production is likely to be low. Biologists working in the Queen Maud Gulf Sanctuary reported goose nesting phenology was one week later than average, and near the latest recorded since 1993. Aerial survey crews working in central Arctic TGP range observed 5–10% snow cover, similar to the last two years and reported phenology as 1–2 weeks later than average. Available information suggests that the production of TGPP Canada geese will be below average in 2009.

Short Grass Prairie Population (SGPP)

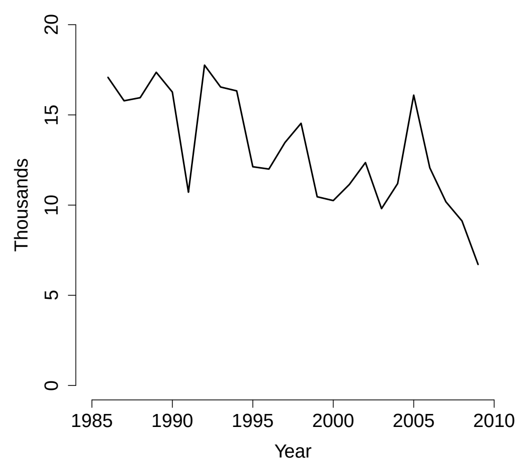
These small Canada geese nest on Victoria and Jenny Lind Islands and on the mainland from the Queen Maud Gulf west and south to the Mackenzie River and northern Alberta. These geese winter in southeastern Colorado, northeastern New Mexico, and the Oklahoma and Texas panhandles (Figure 9). The MWS index of SGPP Canada geese in 2009 was 220,300, 4% higher than in 2008 (Figure 13.1). These indices have increased an average of 3% per year since 2000 ($P = 0.067$). In 2009, the estimated spring population of SGPP geese in the Northwest Territories (WBPHS strata 13–18) was 134,100 (±47,300), a 15% increase from 2008 ($P = 0.621$). WBPHS estimates have increased an average of 6% per year since 2000 ($P = 0.108$). In the eastern half of SGP range, May and June temperatures were 1–3°C colder than average. Spring precipitation was average or below average throughout SGP range. Nesting phenology in the Queen Maud Gulf Sanctuary was one week later than average, and near the latest on record (since 1991). Aerial surveys conducted in eastern SGPP range encountered 5–10% snow cover, similar to the last 2 years, and reported phenology as 1–2 weeks later than average. In western SGPP range (i.e., West Victoria Island and near Inuvik), spring temperatures were average or warmer than average. Wetland conditions in boreal forest SGPP nesting areas were assessed as good. Production of SGPP geese in 2009 is expected to be below average.

Hi-line Population (HLP)

These large Canada geese nest in southeastern Alberta, southwestern Saskatchewan, eastern Montana and Wyoming, and in Colorado. They winter in these states and central New Mexico (Figure 9). The 2009 MWS indicated a total of 223,400 HLP Canada geese, 17% fewer than last year's estimate (Figure 13.2). The MWS estimates have decreased an average of



14.1: Rocky Mountain Population



14.2: Dusky Canada Geese

Figure 14: Estimated numbers of Rocky Mountain Population and dusky Canada geese (breeding adults).

1% per year since the record high count in 2000 ($P = 0.506$). The 2009 WBPHS estimate for Saskatchewan, Alberta, and Montana was 298,400 (±63,600), 12% lower than the 2008 estimate ($P = 0.439$). The WBPHS population estimates have decreased an average of 2% per year during 2000–2009 ($P = 0.247$). Wetland abundance and condition in 2009 were generally improved from last year throughout HLP range. Cool and wet weather during early nesting may have reduced production in Wyoming but weather was not a major negative factor in other states. The fall flight of HLP geese is expected to be similar to that of 2008.

Rocky Mountain Population (RMP)

These large Canada geese nest in southern Alberta and western Montana, and the inter-mountain regions of Utah, Idaho, Nevada, Wyoming, and Colorado. They winter mainly in central and southern California, Arizona, Nevada, Utah, Idaho, and Montana (Figure 9). Spring population estimates from RMP states and provinces in 2009 totaled 128,400 geese, 41% fewer than the revised estimate from 2008 (Figure 14.1). These estimates have decreased an average of 1% per year since 2000 ($P = 0.563$). Population indices in 2009 decreased in Alberta, Montana, Wyoming, Colorado, and Nevada, while increasing only in Utah. Slightly improved wetland conditions and gosling production was reported from most states. The fall flight of RMP geese is expected to be near average.

Pacific Population (PP)

These large Canada geese nest and winter west of the Rocky Mountains from northern Alberta and British Columbia south through the Pacific Northwest to California (Figure 9). The total of PP goose indices in 2009 was 127,000, 47% lower than last year. Most PP geese are surveyed in Alberta (WBPHS strata 76–77) where 68,100 (±28,500) were estimated in 2009, 63% fewer than the unusually high estimate in 2008 ($P = 0.039$), and similar to other recent surveys. Indices of statewide nesting effort in Washington, California, and Nevada increased from 2008 levels, and decreased slightly in Oregon. Habitat conditions varied throughout PP range in 2009 but generally wetland conditions were improved from 2008 with the exception of southwest Idaho and western Washington. In general, gosling production and the 2009 fall flight are expected to be near average.

Dusky Canada Geese (DCG)

These mid-sized Canada geese predominantly nest on the Copper River Delta of southeastern Alaska, and winter principally in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Figure 9). The official population index of DCG was changed from a wintering mark-resight method to a direct count of geese on DCG breeding areas in 2007. The 2009 spring population estimate was 6,700 DCG, 26% below 2008, and the lowest on record for this population since 1986, when comparable surveys were initiated (Figure 14.2). These estimates have decreased an average of 3% during 2000–2009 ($P = 0.222$). Spring snowmelt on the Copper River Delta breeding area was slightly delayed in 2009 due to heavy winter snowfall, and nesting phenology was a few days later than average. A moderately strong run of spawning eulachon (a common prey fish of eagles) contributed to high nest success and low eagle predation on dusky geese this year. Despite the low population level in 2009, gosling production is expected to be near average.

Cackling Canada Geese

Cackling Canada geese nest on the Yukon-Kuskokwim Delta (YKD) of western Alaska. They primarily winter in the Willamette and Lower Columbia River Valleys of Oregon and Washington (Figure 9). Since 1999, the primary index of this population has been an estimate of the fall population derived from the previous spring counts of adults on the YKD. The fall estimate for 2009 is 160,600 geese, 17% lower than that of 2008. These estimates have increased an average of 1% per year since 2000 ($P = 0.521$; Figure 15). Indices of total cackling geese in the YKD coastal zone in 2009 decreased about 20% from last year but indicated pair numbers remained near the record high level of 2008. The timing of spring snowmelt on the YKD was near average and the median hatch date of cackling geese was one day earlier than the long-term average. Yukon Delta nesting surveys conducted during 2009 indicated clutch sizes were slightly below average, fox predation was reduced from the levels of recent years, and nest success was

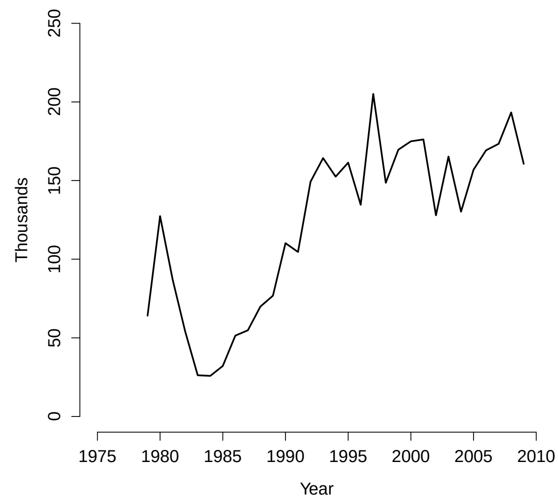


Figure 15: Estimated numbers of cackling Canada geese (fall geese).

high. Overall, good production and a fall flight similar to that of last year are expected.

Lesser and Taverner's Canada Geese

These populations nest throughout Alaska and winter in Washington, Oregon, and California (Figure 9). Taverner's geese are more strongly associated with tundra areas of the North Slope and western Alaska, while lesser Canada geese tend to nest in Alaska's interior. However, these geese mix with other Canada geese throughout the year and reliable estimates of separate populations are not presently available. The 2009 estimate of Canada geese within WBPHS strata predominantly occupied by these subspecies (strata 1–6, 8, 10–12) was 68,000, 26% lower than the 2008 estimate ($P = 0.339$). These estimates have declined an average of 3% per year since 2000 ($P = 0.239$). Timing of spring break-up and flooding extent in Alaska's interior was variable in 2009. In general, above-average goose production was reported in eastern interior areas, but flooding was reported to have reduced nest success and gosling production in western areas. Overall, production of lesser Canada geese in the interior is expected to be near average. Spring phenology was nearly a week early on the North Slope, and near average on the Yukon Delta. Production of Taverner's geese is expected to be better than average on the Yukon Delta and the North Slope.

Aleutian Canada Geese (ACG)

The Aleutian Canada goose was listed as endangered in 1967 (the population numbered approximately 800 birds in 1974) and was de-listed in 2001. These geese now nest primarily on the Aleutian Islands, although historically they nested from near Kodiak Island, Alaska to the Kuril Islands in Asia. They now winter along the Pacific Coast to central California (Figure 9). Aleutian population estimates since 1996 are based on analysis of observations of neck-banded geese in California. The preliminary population estimate during the winter of 2008–2009 was 79,500 (±26,100), 29% lower than the revised 2008 estimate ($P = 0.034$; Figure 16). These estimates have increased by an average of 10% per year during the last 10 winters ($P = 0.050$). Biologists working on Buldir Island reported that nesting phenology in 2009 was approximately three days earlier than average, the mean clutch size of 3.4 eggs was lower than the previous average (4.1), and that a strong nesting effort was observed. A fall flight similar to that of last year is expected.

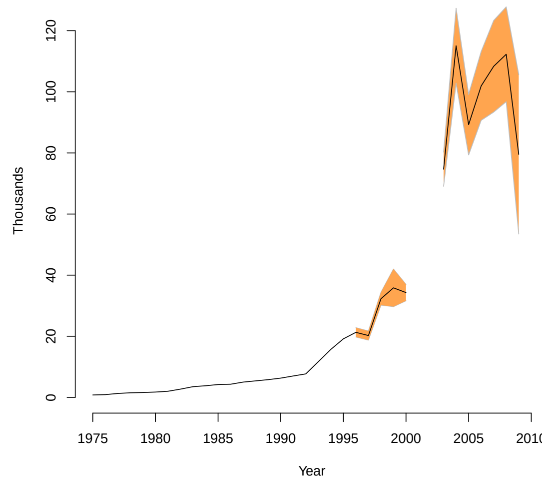


Figure 16: Estimated numbers of Aleutian Canada geese (winter geese, with 95% confidence intervals).

Status of Light Geese

The term light geese refers to both snow geese and Ross' geese (including both white and blue color phases), and the lesser (*C. c. caerulescens*) and greater (*C. c. atlantica*) snow goose subspecies. Another collective term, mid-continent light geese, includes lesser snow and Ross' geese of two populations: the Mid-continent Population and the Western Central Flyway Population.

Ross' Geese

Most Ross' geese nest in the Queen Maud Gulf region, but increasing numbers nest along the western coast of Hudson Bay, and Southampton, Baffin, and Banks Islands. Ross' geese are present in the range of three different populations of light geese and primarily winter in California, New Mexico, Texas, and Mexico, with increasing numbers in Louisiana and Arkansas (Figure 17). Ross' geese are annually surveyed at only one of their numerous nesting colonies. More comprehensive aerial photography inventories and groundwork (to identify proportions of snow and Ross' geese within colonies) are conducted periodically. The largest Ross' goose colonies are in the Queen Maud Gulf Sanctuary. Biologists at the Karrak Lake colony estimated that 726,200 adult Ross' geese nested there in 2008, a 2% decrease from the revised 2007 estimate (Figure 18.1). These estimates increased an average of 8% per year during 1999–2008 ($P < 0.001$). Colony 10, about 60 miles to the east of Karrak Lake, has grown to contain similar or higher numbers of Ross' geese. In 2009, May temperatures near the Queen Maud Gulf were 1–3°C colder than average and spring precipitation was below average. Nesting phenology at the Karrak Lake colony was 1 week later than average and near the latest on record since 1993. Biologists expect Ross' goose production in 2009 to be poor, similar to that of the last 2 years. May temperatures on Southampton Island and along the west coast of Hudson Bay were 2–4°C colder than average, likely delayed goose nesting activities 2–3 weeks, and will contribute to low Ross' goose production there.

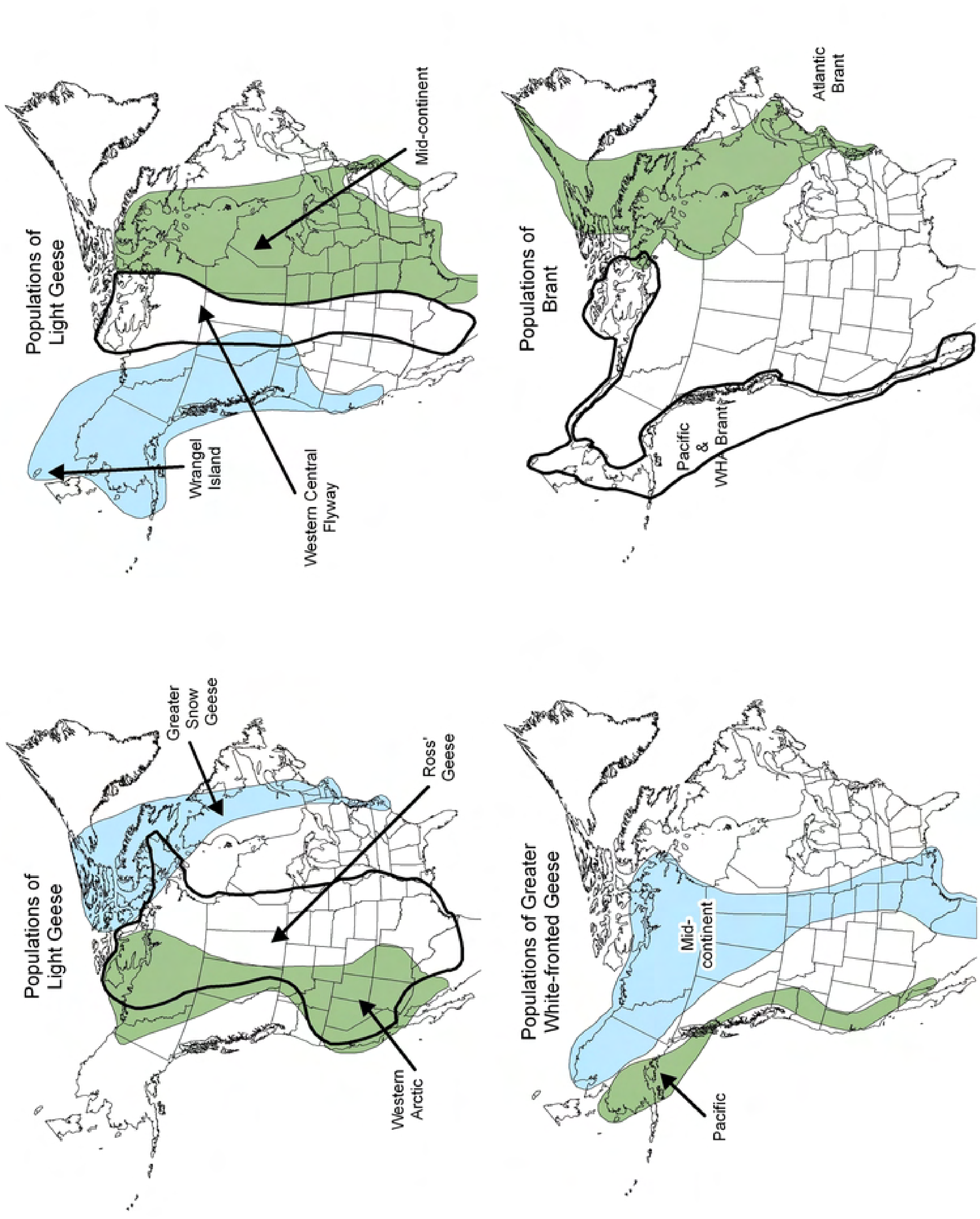
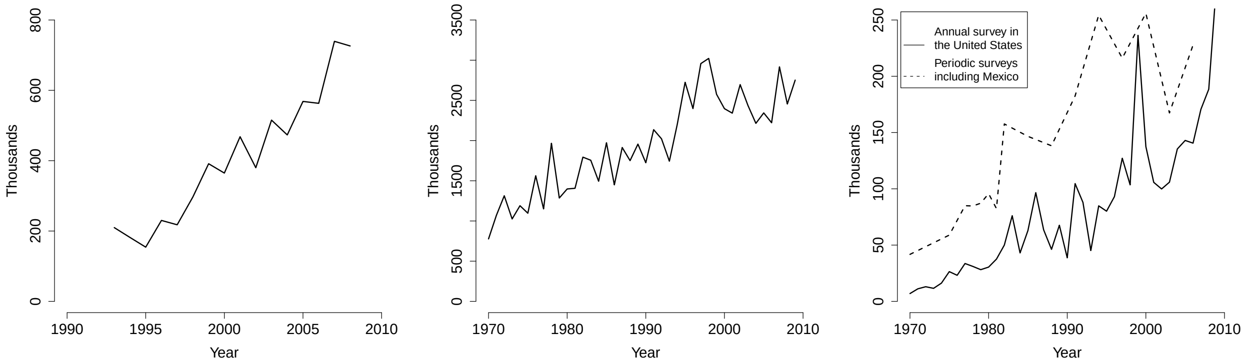


Figure 17: Approximate ranges of brant, snow, Ross', and white-fronted goose populations in North America.



18.1: Ross' Geese

18.2: Mid-continent Population Light Geese

18.3: Western Central Flyway

Figure 18: Estimated numbers of Ross' geese (nesting adults, at the Karrak Lake colony, Nunavut) and Mid-continent Population snow and Ross' geese (winter geese).

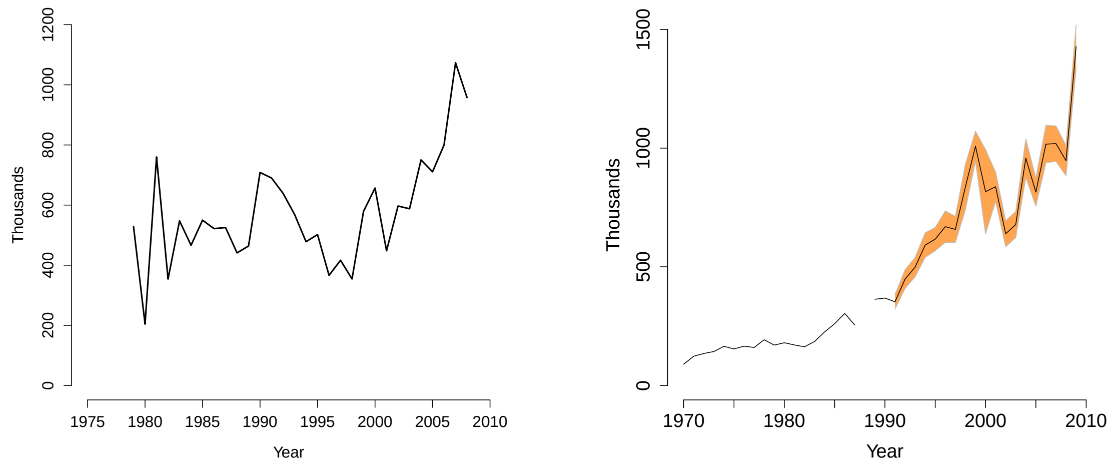
Ross' goose production in 2009 is expected to be below average.

Mid-continent Population Light Geese (MCP)

This population includes lesser snow geese and increasing numbers of Ross' geese. Geese of the MCP nest on Baffin and Southampton Islands, with smaller numbers nesting along the west coast of Hudson Bay (Figure 17). These geese winter primarily in eastern Texas, Louisiana, and Arkansas. During the 2009 MWS, biologists counted 2,753,400 light geese, 12% more than in 2008 (Figure 18.2). Winter indices during 2000–2009 have increased an average of 1% per year ($P = 0.325$). Spring temperatures on Baffin Island in 2009 were near average. In contrast, May temperatures on Southampton Island were 2–4°C colder than average in 2009 and biologists there reported spring phenology was delayed 2–3 weeks. May and June temperatures along the Hudson Bay coast in Nunavut and Manitoba were 2–5°C colder than average. Biologists at La Perouse Bay, Manitoba recorded the latest nesting phenology in 41 years in 2009, and reported a near reproductive failure at that small colony. A snowy and cold May likely also reduced snow goose productivity at goose colonies in Ontario and on Akimiski Island. Although snow goose production on Baffin Island may be near average in 2009, poor production from other nesting areas will contribute to a fall flight containing a below-average proportion of young.

Western Central Flyway Population (WCFP)

Historically, this population included predominantly snow geese, but Ross' geese continue to increase and now represent nearly one third of all WCFP geese. Geese of the WCFP nest in the central and western Canadian Arctic, with large nesting colonies near the Queen Maud Gulf and on Banks Island. These geese stage during fall in eastern Alberta and western Saskatchewan and concentrate during winter in southeastern Colorado, New Mexico, the Texas Panhandle, and the northern highlands of Mexico (Figure 17). WCFP geese wintering in the U.S. portion of their range are surveyed annually, but the entire range, including Mexico, is surveyed only once every three years. The Mexico survey that was scheduled for 2009 was not conducted this year due to sociopolitical unrest in that country. In the U.S. portion of the 2009 survey, 284,400 geese were counted, 51% more than in 2008 (Figure 18.3). These population indices have increased 9% per year during 2000–2009 ($P = 0.003$). In 2009, May temperatures near the Queen Maud Gulf were 1–3°C colder than average and spring precipitation was below average. Nesting phenology at Karrak Lake colony was one week later than average and near the latest on record since 1993. Biologists ex-



19.1: Western Arctic/Wrangel Island Population

19.2: Greater Snow Goose Population

Figure 19: Estimated numbers of Western Arctic/Wrangel Island Population snow geese (fall geese) and greater snow goose (spring staging geese, with 95% confidence intervals).

pect snow and Ross' goose production there in 2009 to be poor, similar to that of the last two years. Reports indicate that spring temperatures and snowfall on Banks Island were near average, and local contacts indicate nesting phenology was about average. Photographic survey crews reported a strong nesting effort and production was expected to be at least average there. Snow goose production from this population will be similar to that of last year.

Western Arctic/Wrangel Island Population (WAWI)

Most of the snow geese in the Pacific Flyway originate from nesting colonies in the western and central Arctic (WA: Banks Island, the Anderson and Mackenzie River Deltas, and the western Queen Maud Gulf region) or Wrangel Island (WI), located off the northern coast of Russia. The WA segment of the population winters in central and southern California, New Mexico, and Mexico; the WI segment winters in the Puget Sound area of Washington and in northern and central California (Figure 17). In winter, WA and WI segments commingle with light geese from other populations in California, complicating surveys. The fall 2008 estimate of WAWI snow geese was 957,400, 11% lower than the previous year's record-high count (Figure 19.1). Fall estimates increased 7% per year during 1999–2008 ($P = 0.003$). Reports indicate that spring conditions and nesting phenology on Banks Island was near average in 2009. Snow goose nesting efforts were below average at Kendall Island, and were extremely poor at Anderson River colonies. Nesting conditions at Wrangel Island's Tundra River colony were reported as excellent and one of the earliest nesting seasons on record. Preliminary estimates included a spring population of 135,000–140,000 adults, with 50,000–60,000 nesting pairs. Estimates of the Wrangel Island spring population have increased an average of 4% per year since 2000 ($P < 0.001$). Biologists expected excellent production from Wrangel Island with estimated nest success estimated at 80% and a mean clutch size of 4.1 eggs. A larger-than-average fall flight is expected in 2009.

Greater Snow Geese (GSG)

This subspecies principally nests on Bylot, Axel Heiberg, Ellesmere, and Baffin Islands, and on Greenland, and winters along the Atlantic coast from New Jersey to North Carolina (Figure 17). This population is monitored on their spring staging areas near the St. Lawrence Valley in Quebec. The preliminary estimate from spring surveys in 2009 was 1,428,000 (±178,400) geese, 51% more than estimated last year estimate ($P < 0.001$; Figure 19.2). Spring estimates of greater snow geese have increased an average of 6% per year since 2000 ($P = 0.013$). The number of snow geese counted during the 2009 MWS in the Atlantic Flyway was 410,300, a 1% increase from the 2008 survey. Midwinter counts have increased an average of 1% per year during 2000–2009 ($P = 0.561$). The largest known greater snow goose nesting colony is on Bylot Island. Timing of snowmelt on Bylot Island in 2009 was near average and nesting phenology was about one day earlier than the long-term average. Nest density in the colony was relatively high, mean clutch size (3.4 eggs) was slightly below average (3.7), and nest success to mid-incubation was high at 88% (average is 64%). Good production and a fall flight above average are expected.

Status of Greater White-fronted Geese

Pacific Population White-fronted Geese (PP)

These geese primarily nest on the Yukon-Kuskokwim Delta (YKD) of Alaska and winter in the Central Valley of California (Figure 17). The index for this population was a fall estimate from 1979–1998. Since 1999, the index has been a fall population estimate derived from spring surveys of adults on the YKD and Bristol Bay. The 2009 fall estimate is 536,700, 14% lower than the 2008 record-high estimate (Figure 20). These estimates have increased an average of 6% per year since 2000 ($P = 0.002$). The timing of spring snowmelt on the YKD was near average and the median hatch of white-fronted geese was two days later than the long-term average. Yukon Delta nesting surveys conducted during 2009 indicated clutch sizes were near average, fox predation was reduced from the levels of recent years, and nest success was better than average. Good production and a fall flight similar to that of 2008 are expected.

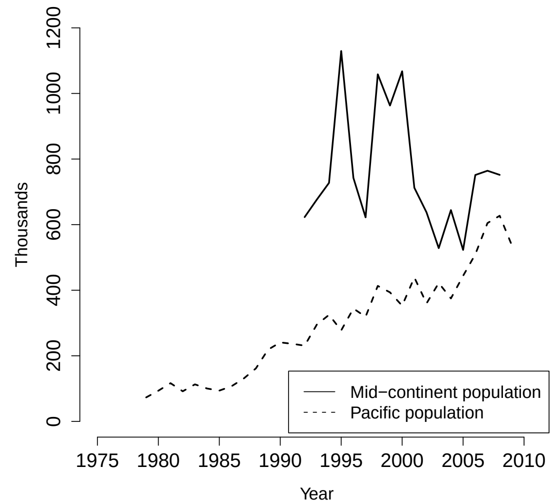


Figure 20: Estimated numbers of Mid-continent Population and Pacific Population white-fronted geese (fall geese).

Mid-continent Population White-fronted Geese (MCP)

These white-fronted geese nest across a broad region from central and northwestern Alaska to the central Arctic and the Foxe Basin. They concentrate in southern Saskatchewan during the fall and in Texas, Louisiana, Arkansas, and Mexico during winter (Figure 17). During the fall 2008 survey in Saskatchewan and Alberta, biologists counted 751,700 MCP geese, 2% fewer than during the previous survey (Figure 20). During 1999–2008, these estimates declined by an average of 3% per year ($P = 0.284$). Eastern portions (e.g., Queen Maud Gulf, Rasmussen Lowlands) of MCP white-fronted goose range experienced colder than average May temperatures and nesting activities were apparently delayed. May temperatures near the Queen Maud Gulf were 1–3°C colder than average and goose nesting phenology near Karrak Lake was one week later than average and near the latest on record since 1993. White-fronted goose production there is expected to be below average. Mild spring conditions near the Mackenzie River Delta and on Alaska's North Slope contributed to earlier-than-average spring phenology. Numbers of white-fronts observed during surveys of the North Slope were similar to recent years and above the long-term average. Production in those areas is expected to be better than average. In Alaska's interior, snowmelt progressed early and rapidly. In general, eastern interior Alaska experienced above-average goose production, but flooding in western areas reduced nest success and gosling production. Overall, production of MCP white-fronted geese in 2009 is expected to be near average.

Status of Brant

Atlantic Brant (ATLB)

Most of this population nests on islands of the eastern Canadian Arctic. These brant winter along the Atlantic Coast from Massachusetts to North Carolina (Figure 17). The 2009 MWS estimate of brant in the Atlantic Flyway was 151,300, 7% lower than the 2008 estimate (Figure 21). These estimates have shown no trend during 2000–2009 ($P = 0.676$). May temperatures along James Bay staging areas and southerly brant nesting areas (e.g., Southampton Island) were 1–4°C colder than average and nesting phenology on Southampton Island was reportedly the latest observed since 1996. At latitudes to the north of Southampton, including Baffin and Devon Islands, spring temperatures showed far less deviation from average. Considering the harsh conditions that existed in 2009 near some nesting and important staging areas, Atlantic brant production is expected to be below average.

Pacific Brant (PACB)

These brant nest across Alaska's Yukon-Kuskokwim Delta (YKD) and North Slope, Banks Island, other islands of the western and central Arctic, the Queen Maud Gulf, and Wrangel Island. They winter as far south as Baja California and the west coast of Mexico (Figure 17). Winter surveys were not conducted in Mexico in 2009 due to sociopolitical unrest, so there is no comparable population metric for 2009. The 2008 MWS estimate of brant in the Pacific Flyway and Mexico was 147,400, 10% more than the estimate in 2007 (Figure 21).

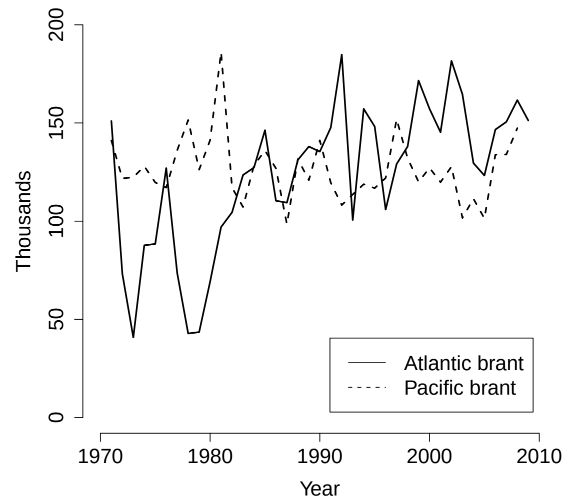


Figure 21: Numbers of Atlantic and Pacific brant estimated during winter surveys.

The estimates during 1999–2008 had increased an average of 1% per year ($P = 0.356$). The timing of spring snowmelt on the YKD was near average in 2009 and the nesting phenology of brant was three days later than the average since 1982. Brant nest densities at five primary colonies on the YKD in 2009 increased from levels in 2008, but remained below the average level since 1992. Fox predation was reduced from recent years, clutch sizes were slightly above average, and nest success measured outside the primary colonies was higher than 2008 and above the average level since 1982. Spring phenology was expected to be near average on Banks Island, and delayed near the Queen Maud Gulf. Brant production was expected to be near average on the YKD, good on Alaska's North Slope, and variable in Canadian portions of their range. The fall flight is expected to be similar to that of last year.

Western High Arctic Brant (WHA)

This population of brant nests on the Parry Islands of the Northwest Territories (Figure 17). The population stages in fall at Izembek Lagoon, Alaska. They predominantly winter in Padilla, Samish, and Fidalgo Bays of Washington and near Boundary Bay, British Columbia, although some individuals have been observed as far south as Mexico. This population is monitored during the MWS in three Washington state counties. During the 2009 MWS, 16,200 brant were counted, 76% more than in 2008. These estimates have increased an average of 7% per year during 2000–2009 ($P = 0.086$). Satellite imagery indicated moderate snowpack on the Parry Islands during the nesting period and is consistent with near-average production for WHA brant in 2009.

Status of Emperor Geese

The breeding range of emperor geese is restricted to coastal areas of the Bering Sea, with the largest concentration on the Yukon-Kuskokwim Delta (YKD) in Alaska. Emperor geese migrate relatively short distances and primarily winter in the Aleutian Islands (Figure 22). Since 1981, emperor geese have been surveyed annually on spring staging areas in southwestern Alaska. The 2009 emperor goose survey estimate was 91,900, 42% higher than in 2008 (Figure 23.1). These estimates increased an average of 2% per year during 2000–2009 ($P = 0.401$). Aerial surveys during the YKD coastal survey indicated slight decreases in the number of pairs and total birds from 2008 levels but a long-term increasing trend in both indices is still apparent. Spring phenology on the YKD was near average and emperor goose phenology was about two days later than the long-term average. Nesting surveys conducted on the YKD during 2009 indicated clutch sizes were near average and nest success was better than in 2008 and the long-term average. Good production and a fall flight similar to that of 2008 are expected.

Status of Tundra Swans

Western Population Tundra Swans

These swans nest along the coastal lowlands of western Alaska, particularly between the Yukon and Kuskokwim Rivers. They winter primarily in California, Utah, and the Pacific Northwest (Figure 22). The 2009 MWS estimate of 105,200 swans was 17% higher than the 2008 estimate (Figure 23.2). These estimates have increased by an average of 3% per year over the last 10 years ($P = 0.140$). Estimated numbers

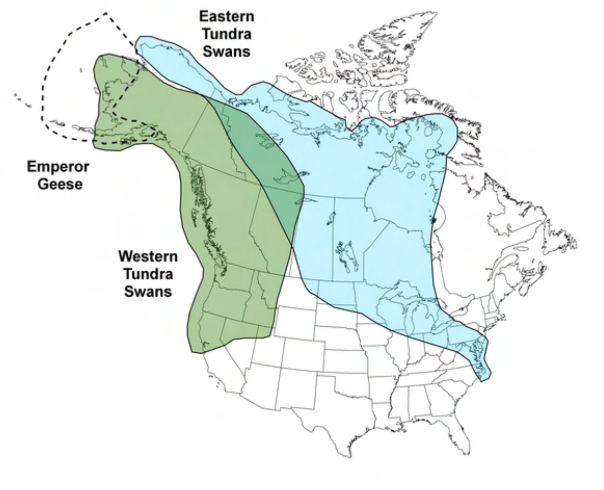
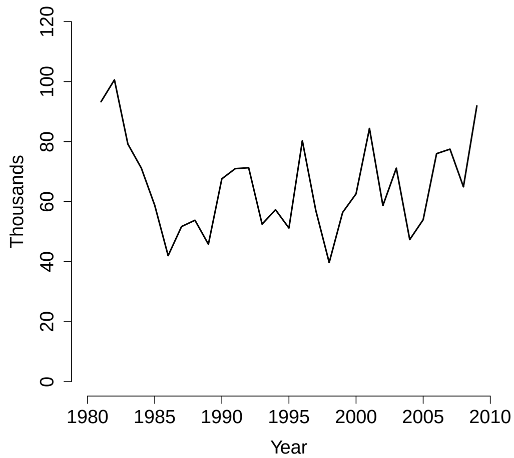


Figure 22: Approximate range of emperor geese, and Eastern and Western Populations of tundra swans in North America.

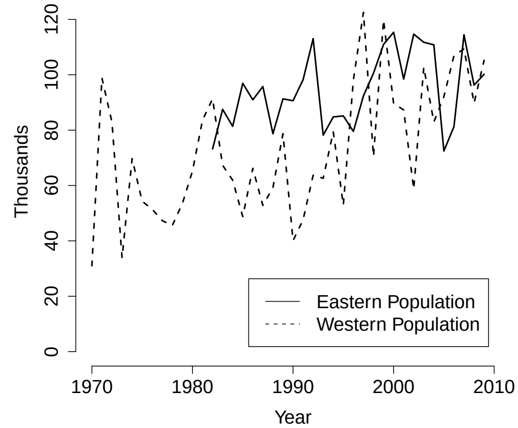
of total swans from the coastal Yukon-Kuskokwim Delta survey during spring 2009 decreased slightly, but numbers of nests and indicated pairs were up slightly compared to 2008. In 2009, the timing of spring ice breakup on the YKD was near average, swan nesting phenology was about six days later than average, clutch sizes were lower than average, and nest success was slightly lower than in 2008 and the long-term average. Swan production is expected to be fair in 2009 and contribute to a fall flight similar to that of last year.

Eastern Population Tundra Swans

Eastern Population tundra swans (EP) nest from the Seward Peninsula of Alaska to the northeast shore of Hudson Bay and Baffin Island. The Mackenzie Delta and adjacent areas are of particular importance. These birds winter in coastal areas from Maryland to North Carolina (Figure 22). The primary index for EP tundra swans includes swans counted during winter in Ontario and the Atlantic and Mississippi Flyways. During the 2009 MWS, 100,200 EP tundra swans were observed, 4% more than in 2008 (Figure 23.2). These estimates decreased by an average of 2% per year during 2000–2009 ($P = 0.361$). Spring phenology was later than average in much of the central and eastern portions of EP tundra swan range in 2009. From



23.1: Emperor geese



23.2: Tundra swans

Figure 23: Estimated numbers of emperor geese (spring staging geese), and Eastern and Western Populations of tundra swans (winter swans).

Alaska's North Slope to just east of the Mackenzie River Delta, spring conditions were more favorable for nesting swans. Spring conditions appeared to be near average on Baffin Island. Swan production in 2009 is expected to be near average.

A Individuals who supplied information for the generation of this report

A.1. Individuals who supplied information on the status of ducks.

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Air	F. Roetker and C. Ferguson[e]

Northern Saskatchewan and Northern Manitoba (Strata 21–24)

Air	W. Rhodes and J. Goldsberry[e]

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Ground	K. Fleming and J. Klimstra

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Ground	P. Garrettson, K. Kruse, R. Holbrook, D. Collins, and S. Gibbs

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Central and Eastern Ontario, Hudson and James Bay Lowlands (Strata 51, 54, 57–59)

Air	M. Koneff and G. Zimmerman

Southern Ontario and Southern Quebec (Strata 52–53, 55–56, and 68)

Air	J. Rayfield and E. Huggins

Maine and Maritimes (Strata 62–67)

Air J. Bidwell and D. Forsell

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Ontario	K. Ross[a], D. McNicol[a], D. Fillman[a], R. Russell[a], and S. Meyer[a]
New Brunswick & Nova Scotia	R. Hicks[a] and B. Pollard[a]
Labrador & Newfoundland	S. Gilliland[a], P. Ryan[a], W. Barney[b], P. Padding, and C. Dwyer

California

Air	M. Weaver[b] and S. Oldenburger[b]
Ground	D. Loughman[d] and J. Kwolek[d]

Michigan

Air	B. Barlow[b], B. Berger[b], S. Chadwick[b], K. Cleveland[b], E. Kafcas[b], A. Karr[b], T. Maples[b], T. McFadden[b], M. Mills[b], J. Niewoonder[b], and J. Robison[b]

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New Jersey	P. Castelli[b], T. Nichols[b], A. Burnett[b], J. Garris[b], B. Kirkpatrick[d], K. Korth[b], S. Petzinger[b], J. Powers[b], S. Predl[b], L. Widjeskog[b], T. Watts[b], R. Somes[b], P. Winkler[b], M. Gnoinski[b], K. Bond[b], D. Wilkinson[b], and P. Woerner[b]
New York	Staff of New York Department of Environmental Conservation
Pennslyvania	D. Brauning[b], M. Casalena[b], J. Dunn[b], J. Gilbert[b], D. Gross[b], T. Hardisky[b], K. Jacobs[b], M. Lovallo[b], J. Morgan[b], D. Mummert[b], B. Palmer[b], M. Ternent[b], C. Thoma[b], and S. Trusso[b]

Rhode Island	J. Osenkowski[b], C. Brown[b], B. Tefft[b], M. Griffin[b], and S. Wittwer[b]
Vermont	B. Crenshaw[b], J. Gobeille[b], D. Sausville[b], J. Mlcuch[b], J. Buck[b], A. Alfiere[b], K. Royar[b], F. Hammond[b], D. Blodgett[b], and J. Flewelling[b]
Virginia	G. Costanzo[b] and T. Bidrowski[b]

Nevada

Air	C. Nicolai[b], K. Neill[b], and J. Romero[d]

Oregon

Air	B. Bales[b], B. Reishus[b], N. Leonetti[b], T. Collom[b], M. St. Louis[b], E. Miguez[b], J. Journey[b], M. Kirsch[b], N. Myatt[b], J. Thompson[b], C. Sponseller[b], R. Klus[b], D. Marvin[b], J. Nelson[b], A. Larkins[b], and Brim Aviation[d]

Washington

Air	M. Moore[b], R. Finger[b], B. Hoenes[b], J. Bernatowicz[b], W. Moore[b], M. Livingston[b], P. Fowler[b], P. Wik[b], H. Ferguson[b], M. Atamian[b], D. Base[b], D. Palmer[b], S. Fitkin[b], J. Heinlen[b], D. Volsen[b], J. Gallie[b], T. Hames[b], E. Krausz[b], J. Bohannan[b], B. Bales[b], G. Schirato[b], B. Murphie[b]

Wisconsin

Air	L. Waskow[b], P. Berringer[b], C. Cold[b], C. Kopacek[b], and C. Milestone[b]
Ground	T. Carlson[b], J. Carstens[b], J. Christian[b], G. Dunsmoor[b], E. Grossman[b], J. Huff[b], D. Hutchison[b], B. Kelly[b], R. McDonough[b], C. Mogen[b], K. Morgan[b], J. Pritzl[b], M. Rasmussen[b], J. Robaidek[b], M. Schmidt[b], M. Soergel[b], K. Van Horn[b], J. Wanner[b], R. Weide[b], D. Wyman[b], P. Charland, A. Kitchen, J. Lutes, S. Otto, S. Papon, R. Sammerdyke, G. VanVreede, and T. Walters[d]

[a]Canadian Wildlife Service
[b]State, Provincial or Tribal Conservation Agency
[c]Ducks Unlimited—Canada
[d]Other Organization
[e]U.S. Fish and Wildlife Service—Retired
All others—U.S. Fish and Wildlife Service

Table A.2: Individuals that supplied information on the status of geese and swans.

Flyway-wide and Regional Survey Reports: K. Bollinger, D. Caswell[a], D. Collins, J. Fischer, D. Fronczak, J. Kelley, J. Klimstra, K. Kruse, J. Leafloor[a], R. Oates, M. Otto, P. Padding, R. Raftovich, D. Sharp, and R. Trost

Information from the Breeding Population and Habitat Survey: See Appendix A

North Atlantic Population Canada Geese: J. Bidwell, S. Gilliland[a], B. Pollard[a], and G. Zimmerman

Atlantic Population Canada Geese: J. Bidwell, P. Castelli[b], R. Cotter[a], W. Harvey[b], L. Hindman[b], J. Rodrigue[a], and P. May[d]

Atlantic Flyway Resident Population Canada Geese: P. Castelli[b], G. Costanzo[b], W. Crenshaw[b], J. Dunn[b], H. Heusmann[b], L. Hindman[b], R. Hossler[b], M. Huang[b], K. Jacobs[b], J. Osenkowski[b], and E. Robinson[b]

Southern James Bay Population Canada Geese: K. Abraham[b], R. Brook[b], J. Hughes[a], and M. Koneff

Mississippi Valley Population Canada Geese: K. Abraham[b], R. Brook[b], J. Hughes[a], and M. Koneff

Mississippi Flyway Population Giant Canada Geese: K. Abraham[b], F. Baldwin[b], D. Graber[b], J. Hughes[a], D. Luukkonen[b], R. Marshalla[b], L. Naylor[b], A. Phelps[b], R. Pritchert[b], L. Reynolds[b], D. Scott[b], K. Van Horn[b], T. White[b], and G. Zenner[b]

Eastern Prairie Population Canada Geese: D. Andersen[d], F. Baldwin[b], B. Lubinski, A. Raedeke[b], M. Reiter[d], and J. Wollenberg[b]

Western Prairie and Great Plains Populations Canada Geese: M. Johnson[b], F. McNew[b], D. Nieman[a], W. Rhodes, J. Richardson[b], J. Solberg, P. Thorpe, S. Vaa[b], M. Vritiska[b]

Tall Grass Prairie Population Canada Geese: R. Alisauskas[a] , G. Gilchrist[a], D. Groves, and E. Mallek

Short Grass Prairie Population Canada Geese: R. Alisauskas[a], D. Groves, J. Ingram[a], E. Mallek, F. Roetker

Hi-Line Population Canada Geese: R. Bentley, J. Bredy, J. Gammonley[b], J. Hansen[b], W. Rhodes, L. Roberts[b], E. Silverman, and P. Thorpe

Rocky Mountain Population Canada Geese: T. Aldrich[b], J. Bredy, J. Bohne[b], J. Gammonley[b], C. Mortimore[b], R. Northrup[b], L. Roberts[b], E. Silverman, and D. Yparraguirre[b]

Pacific Population Canada Geese: B. Bales[b], A. Breault[a], T. Hemker[b], D. Kraege[b], C. Mortimore[b], R. Northrup[b], B. Reishus[b], F. Roetker, M. Weaver[b], and D. Yparraguirre[b]

Dusky Canada Geese: J. Fode[b], B. Larned, and R. Stehn

Lesser and Taverner's Canada Geese: K. Bollinger, C. Dau, D. Groves, B. Larned, E. Mallek, and M. Spindler

Table A.2: Continued.

Cackling Canada Geese: K. Bollinger and C. Dau

Aleutian Canada Geese: V. Byrd, T. Sanders, and L. Spitler

Greater Snow Geese: J. Lefebvre[a], G. Gauthier[d], and A. Reed[d]

Mid-continent Population Light Geese: K. Abraham[b], R. Brook[b], G. Gilchrist[a], B. Lubinski, and R. Rockwell[d]

Western Central Flyway Population Light Geese: R. Alisauskas[a] and J. Ingram[a]

Western Arctic/Wrangel Island Population Snow Geese: V. Baranuk[d], S. Boyd[a] J. Ingram[a], and D. Kraege[b]

Ross' Geese: R. Alisauskas[a], D. Caswell[a], J. Leafloor[a], and P. Thorpe

Pacific Population White-Fronted Geese: C. Dau, K. Bollinger, and D. Groves

Mid-continent Population White-fronted Geese: R. Alisauskas[a], R. Bentley, S. Durhams[b], D. Groves, J. Ingram[a], K. Kraii[b], B. Larned, E. Mallek, D. Nieman[a], F. Roetker, M. Spindler, and K. Warner[a]

Pacific Brant: B. Larned and H. Wilson

Atlantic Brant: G. Gilchrist[a]

Western High Arctic Brant: D. Kraege[b]

Emperor Geese: C. Dau and E. Mallek

Western Population Tundra Swans: K. Bollinger and C. Dau

Eastern Population Tundra Swans: C. Dau, B. Larned, and E. Mallek

[a]Canadian Wildlife Service
[b]State, Provincial or Tribal Conservation Agency
[c]Ducks Unlimited—-Canada
[d]Other Organization
All others—U.S. Fish and Wildlife Service

B Waterfowl Breeding Population and Habitat Survey map

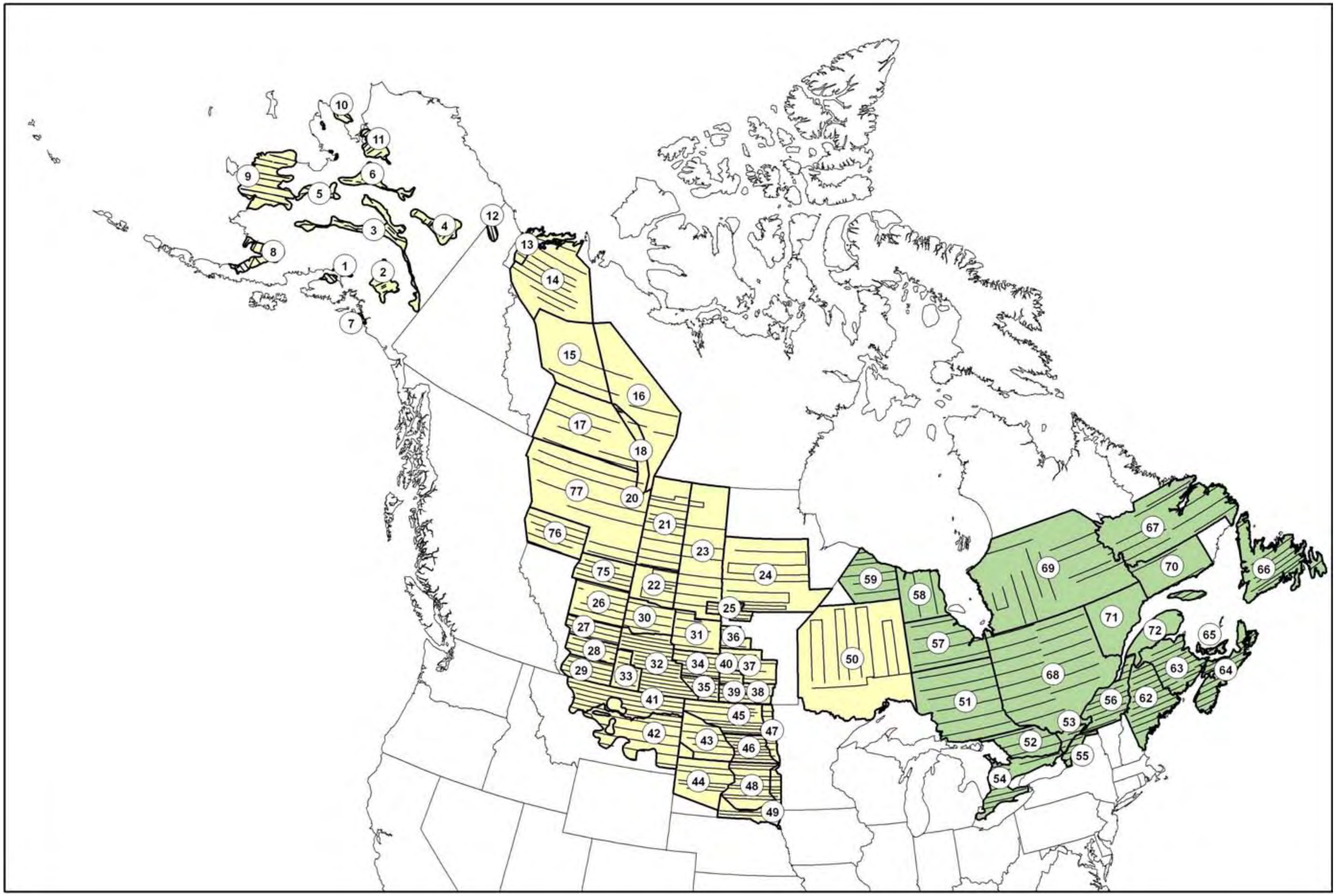

Figure B.1: Strata and transects of the of the Waterfowl Breeding Population and Habitat Survey (Yellow = traditional survey area, green = eastern survey area).

C Historical estimates of May ponds and regional waterfowl populations

Table C.1: Estimated number of May ponds and standard errors (in thousands) in portions of prairie Canada and the northcentral U.S.

	Prairie Canada		Northcentral U.S.[a]		Total	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1961	1,977.20	165.40				
1962	2,369.10	184.60				
1963	2,482.00	129.30				
1964	3,370.70	173.00				
1965	4,378.80	212.20				
1966	4,554.50	229.30				
1967	4,691.20	272.10				
1968	1,985.70	120.20				
1969	3,547.60	221.90				
1970	4,875.00	251.20				
1971	4,053.40	200.40				
1972	4,009.20	250.90				
1973	2,949.50	197.60				
1974	6,390.10	308.30	1,840.80	197.20	8,230.90	366.00
1975	5,320.10	271.30	1,910.80	116.10	7,230.90	295.10
1976	4,598.80	197.10	1,391.50	99.20	5,990.30	220.70
1977	2,277.90	120.70	771.10	51.10	3,049.10	131.10
1978	3,622.10	158.00	1,590.40	81.70	5,212.40	177.90
1979	4,858.90	252.00	1,522.20	70.90	6,381.10	261.80
1980	2,140.90	107.70	761.40	35.80	2,902.30	113.50
1981	1,443.00	75.30	682.80	34.00	2,125.80	82.60
1982	3,184.90	178.60	1,458.00	86.40	4,642.80	198.40
1983	3,905.70	208.20	1,259.20	68.70	5,164.90	219.20
1984	2,473.10	196.60	1,766.20	90.80	4,239.30	216.50
1985	4,283.10	244.10	1,326.90	74.00	5,610.00	255.10
1986	4,024.70	174.40	1,734.80	74.40	5,759.50	189.60
1987	2,523.70	131.00	1,347.80	46.80	3,871.50	139.10
1988	2,110.10	132.40	790.70	39.40	2,900.80	138.10
1989	1,692.70	89.10	1,289.90	61.70	2,982.70	108.40
1990	2,817.30	138.30	691.20	45.90	3,508.50	145.70

[a] No comparable survey data available for the north-central U.S. during 1961–73.

Table C.1: Continued.

Year	Prairie Canada $\widehat{N}$	Prairie Canada $\widehat{SE}$	Northcentral U.S. $\widehat{N}$	Northcentral U.S. $\widehat{SE}$	Total $\widehat{N}$	Total $\widehat{SE}$
1991	2,493.90	110.20	706.10	33.60	3,200.00	115.20
1992	2,783.90	141.60	825.00	30.80	3,608.90	144.90
1993	2,261.10	94.00	1,350.60	57.10	3,611.70	110.00
1994	3,769.10	173.90	2,215.60	88.80	5,984.80	195.30
1995	3,892.50	223.80	2,442.90	106.80	6,335.40	248.00
1996	5,002.60	184.90	2,479.70	135.30	7,482.20	229.10
1997	5,061.00	180.30	2,397.20	94.40	7,458.20	203.50
1998	2,521.70	133.80	2,065.30	89.20	4,586.90	160.80
1999	3,862.00	157.20	2,842.20	256.80	6,704.30	301.20
2000	2,422.50	96.10	1,524.50	99.90	3,946.90	138.60
2001	2,747.20	115.60	1,893.20	91.50	4,640.40	147.40
2002	1,439.00	105.00	1,281.00	63.40	2,720.00	122.70
2003	3,522.30	151.80	1,667.80	67.40	5,190.10	166.10
2004	2,512.60	131.00	1,407.00	101.70	3,919.60	165.80
2005	3,920.50	196.70	1,460.70	79.70	5,381.20	212.20
2006	4,449.50	221.50	1,644.40	85.40	6,093.90	237.40
2007	5,040.20	261.80	1,962.50	102.50	7,002.70	281.20
2008	3,054.80	147.60	1,376.60	71.90	4,431.40	164.20
2009	3,568.10	148.00	2,866.00	123.10	6,434.00	192.50

Table C.2: Breeding population estimates (in thousands) for total ducks[a] and mallards for states, provinces, or regions that conduct spring surveys.

	British Columbia[b]		California		Michigan		Minnesota		Nebraska	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955									101.5	32.0
1956									94.9	25.8
1957									154.8	26.8
1958									176.4	28.1
1959									99.7	12.1
1960									143.6	21.6
1961									141.8	43.3
1962									68.9	35.8
1963									114.9	37.4
1964									124.8	66.8
1965									52.9	20.8
1966									118.8	36.0
1967									96.2	27.6
1968							368.5	83.7	96.5	24.1
1969							345.3	88.8	100.6	26.7
1970							343.8	113.9	112.4	24.5
1971							286.9	78.5	96.0	22.3
1972							237.6	62.2	91.7	15.2
1973							415.6	99.8	85.5	19.0
1974							332.8	72.8	67.4	19.5
1975							503.3	175.8	62.6	14.8
1976							759.4	117.8	87.2	20.1
1977							536.6	134.2	152.4	24.1
1978							511.3	146.8	126.0	29.0
1979							901.4	158.7	143.8	33.6
1980							740.7	172.0	133.4	37.3
1981							515.2	154.8	66.2	19.4
1982							558.4	120.5	73.2	22.3
1983							394.2	155.8	141.6	32.2
1984							563.8	188.1	154.1	36.1
1985							580.3	216.9	75.4	28.4
1986							537.5	233.6	69.5	15.1
1987	2.7	0.2					614.9	192.3	120.5	41.7
1988	4.9	0.6					752.8	271.7	126.5	27.8
1989	4.6	0.5					1,021.6	273.0	136.7	18.7
1990	4.7	0.5					886.8	232.1	81.4	14.7
1991	5.9	0.6					868.2	225.0	126.3	26.0
1992	6.2	0.6	497.4	375.8	665.8	384.0	1,127.3	360.9	63.4	24.4
1993	5.7	0.5	666.7	359.0	813.5	454.3	875.9	305.8	92.8	23.8
1994	6.6	0.6	483.2	311.7	848.3	440.6	1,320.1	426.5	118.9	17.5
1995	6.5	0.8	589.7	368.5	812.6	559.8	912.2	319.4	142.9	42.0

[a] Species composition for the total duck estimate varies by region.

[b] Index to waterfowl use in prime waterfowl producing areas of the province.

Table C.2: Continued.

Year	British Columbia[b]		California		Michigan		Minnesota		Nebraska	
	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1996	6.4	0.5	843.7	536.7	790.2	395.8	1,062.4	314.8	132.3	38.9
1997	5.7	0.5	824.3	511.3	886.3	489.3	953.0	407.4	128.3	26.1
1998	7.3	0.9	706.8	353.9	1,305.2	567.1	739.6	368.5	155.7	43.4
1999	8.5	0.9	851.0	560.1	824.8	494.3	716.5	316.4	251.2	81.1
2000	8.2	0.8	562.4	347.6	1,121.7	462.8	815.3	318.1	178.8	54.3
2001	7.8	0.8	413.5	302.2	673.5	358.2	761.3	320.6	225.3	69.2
2002	9.0	0.6	392.0	265.3	997.3	336.8	1,224.1	366.6	141.8	50.6
2003	8.6	0.6	533.7	337.1	587.2	294.1	748.9	280.5	96.7	32.9
2004	6.6	0.6	412.8	262.4	701.9	328.8	1,099.3	375.3	69.9	23.2
2005	5.6	0.5	615.2	317.9	442.6	238.5	681.3	238.5	117.1	29.3
2006		103.3	649.4	399.4	353.5	207.8	529.4	160.7		
2007		99.3	627.6	388.3	723.0	315.0	495.6	242.5		
2008		73.7	554.3	297.1	457.0	189.0	740.0	297.6		
2009			510.8	302.0	530.5	258.9	507.0	236.4		

[a] Species composition for the total duck estimate varies by region.

[b] Index to waterfowl use in prime waterfowl producing areas of the province.

Table C.2: Continued.

Year	Nevada		Northeastern U.S.[c]		Oregon		Washington		Wisconsin	
	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1955										
1956										
1957										
1958										
1959	14.2	2.1								
1960	14.1	2.1								
1961	13.5	2.0								
1962	13.8	1.7								
1963	23.8	2.2								
1964	23.5	3.0								
1965	29.3	3.5								
1966	25.7	3.4								
1967	11.4	1.5								
1968	10.5	1.2								
1969	18.2	1.4								
1970	19.6	1.5								
1971	18.3	1.1								
1972	19.0	0.9								
1973	20.7	0.7							412.7	107.0
1974	17.1	0.7							435.2	94.3
1975	14.5	0.6							426.9	120.5
1976	13.6	0.6							379.5	109.9
1977	16.5	1.0							323.3	91.7
1978	11.1	0.6							271.3	61.6
1979	12.8	0.6					98.6	32.1	265.7	78.6
1980	16.6	0.9					113.7	34.1	248.1	116.5
1981	26.9	1.6					148.3	41.8	505.0	142.8
1982	21.0	1.1					146.4	49.8	218.7	89.5
1983	24.3	1.5					149.5	47.6	202.3	119.5
1984	24.0	1.4					196.3	59.3	210.0	104.8
1985	24.9	1.5					216.2	63.1	192.8	73.9
1986	26.4	1.3					203.8	60.8	262.0	110.8
1987	33.4	1.5					183.6	58.3	389.8	136.9
1988	31.7	1.3					241.8	67.2	287.1	148.9
1989	18.8	1.3					162.3	49.8	462.5	180.7
1990	22.2	1.3					168.9	56.9	328.6	151.4
1991	14.6	1.4					140.8	43.7	435.8	172.4
1992	12.4	0.9					116.3	41.0	683.8	249.7
1993	14.1	1.2	1,158.1	686.6			149.8	55.0	379.4	174.5
1994	19.2	1.4	1,297.3	856.3	336.7	125.0	123.9	52.7	571.2	283.4
1995	17.9	1.0	1,408.5	864.1	227.5	85.6	147.3	58.9	592.4	242.2

[c] Includes all or portions of Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

[d] Survey redesigned in 2009, and not comparable with previous years.

Table C.2: Continued.

	Nevada[d]		Northeastern U.S.[c]		Oregon		Washington		Wisconsin	
Year	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards	Total ducks	Mallards
1996	26.4	1.7	1,430.9	848.6	298.9	108.3	163.3	61.6	536.3	314.4
1997	25.3	2.5	1,423.5	795.2	370.9	127.7	172.8	67.0	409.3	181.0
1998	27.9	2.1	1,444.0	775.2	358.0	132.9	185.3	79.0	412.8	186.9
1999	29.9	2.3	1,522.7	880.0	334.3	133.6	200.2	86.2	476.6	248.4
2000	26.1	2.1	1,933.5	762.6	324.4	116.3	143.6	47.7	744.4	454.0
2001	22.2	2.0	1,397.4	809.4			146.4	50.5	440.1	183.5
2002	11.7	0.7	1,466.2	833.7	276.2	112.2	133.3	44.7	740.8	378.5
2003	21.1	1.7	1,266.2	731.9	258.7	96.9	127.8	39.8	533.5	261.3
2004	12.0	1.7	1,416.9	805.9	245.6	92.3	114.9	40.0	651.5	229.2
2005	10.7	0.7	1,416.2	753.6	226.1	83.5	111.5	40.8	724.3	317.2
2006	37.4	1.8	1,384.2	725.2	263.5	88.4	135.4	45.5	522.6	219.5
2007	11.4	2.1	1,500.4	687.6	336.5	101.7	128.3	46.1	470.6	210.0
2008	11.5	1.9	1,197.1	619.1	239.9	84.3	120.9	50.6	626.9	188.4
2009	105.5	1.3	1,271.1	666.8	198.3	79.5	116.5	47.5	502.4	200.5

[c] Includes all or portions of Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia.

[d] Survey redesigned in 2009, and not comparable with previous years.

Table C.3: Breeding population estimates and standard errors (in thousands) for 10 species of ducks from the traditional survey area (strata 1–18, 20–50, 75–77).

	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1955	8,777.3	457.1	651.5	149.5	3,216.8	297.8	1,807.2	291.5	5,305.2	567.6
1956	10,452.7	461.8	772.6	142.4	3,145.0	227.8	1,525.3	236.2	4,997.6	527.6
1957	9,296.9	443.5	666.8	148.2	2,919.8	291.5	1,102.9	161.2	4,299.5	467.3
1958	11,234.2	555.6	502.0	89.6	2,551.7	177.9	1,347.4	212.2	5,456.6	483.7
1959	9,024.3	466.6	590.0	72.7	3,787.7	339.2	2,653.4	459.3	5,099.3	332.7
1960	7,371.7	354.1	784.1	68.4	2,987.6	407.0	1,426.9	311.0	4,293.0	294.3
1961	7,330.0	510.5	654.8	77.5	3,048.3	319.9	1,729.3	251.5	3,655.3	298.7
1962	5,535.9	426.9	905.1	87.0	1,958.7	145.4	722.9	117.6	3,011.1	209.8
1963	6,748.8	326.8	1,055.3	89.5	1,830.8	169.9	1,242.3	226.9	3,723.6	323.0
1964	6,063.9	385.3	873.4	73.7	2,589.6	259.7	1,561.3	244.7	4,020.6	320.4
1965	5,131.7	274.8	1,260.3	114.8	2,301.1	189.4	1,282.0	151.0	3,594.5	270.4
1966	6,731.9	311.4	1,680.4	132.4	2,318.4	139.2	1,617.3	173.6	3,733.2	233.6
1967	7,509.5	338.2	1,384.6	97.8	2,325.5	136.2	1,593.7	165.7	4,491.5	305.7
1968	7,089.2	340.8	1,949.0	213.9	2,298.6	156.1	1,430.9	146.6	3,462.5	389.1
1969	7,531.6	280.2	1,573.4	100.2	2,941.4	168.6	1,491.0	103.5	4,138.6	239.5
1970	9,985.9	617.2	1,608.1	123.5	3,469.9	318.5	2,182.5	137.7	4,861.8	372.3
1971	9,416.4	459.5	1,605.6	123.0	3,272.9	186.2	1,889.3	132.9	4,610.2	322.8
1972	9,265.5	363.9	1,622.9	120.1	3,200.1	194.1	1,948.2	185.8	4,278.5	230.5
1973	8,079.2	377.5	1,245.6	90.3	2,877.9	197.4	1,949.2	131.9	3,332.5	220.3
1974	6,880.2	351.8	1,592.4	128.2	2,672.0	159.3	1,864.5	131.2	4,976.2	394.6
1975	7,726.9	344.1	1,643.9	109.0	2,778.3	192.0	1,664.8	148.1	5,885.4	337.4
1976	7,933.6	337.4	1,244.8	85.7	2,505.2	152.7	1,547.5	134.0	4,744.7	294.5
1977	7,397.1	381.8	1,299.0	126.4	2,575.1	185.9	1,285.8	87.9	4,462.8	328.4
1978	7,425.0	307.0	1,558.0	92.2	3,282.4	208.0	2,174.2	219.1	4,498.6	293.3
1979	7,883.4	327.0	1,757.9	121.0	3,106.5	198.2	2,071.7	198.5	4,875.9	297.6
1980	7,706.5	307.2	1,392.9	98.8	3,595.5	213.2	2,049.9	140.7	4,895.1	295.6
1981	6,409.7	308.4	1,395.4	120.0	2,946.0	173.0	1,910.5	141.7	3,720.6	242.1
1982	6,408.5	302.2	1,633.8	126.2	2,458.7	167.3	1,535.7	140.2	3,657.6	203.7
1983	6,456.0	286.9	1,519.2	144.3	2,636.2	181.4	1,875.0	148.0	3,366.5	197.2
1984	5,415.3	258.4	1,515.0	125.0	3,002.2	174.2	1,408.2	91.5	3,979.3	267.6
1985	4,960.9	234.7	1,303.0	98.2	2,050.7	143.7	1,475.4	100.3	3,502.4	246.3
1986	6,124.2	241.6	1,547.1	107.5	1,736.5	109.9	1,674.9	136.1	4,478.8	237.1
1987	5,789.8	217.9	1,305.6	97.1	2,012.5	134.3	2,006.2	180.4	3,528.7	220.2
1988	6,369.3	310.3	1,349.9	121.1	2,211.1	139.1	2,060.8	188.3	4,011.1	290.4
1989	5,645.4	244.1	1,414.6	106.6	1,972.9	106.0	1,841.7	166.4	3,125.3	229.8
1990	5,452.4	238.6	1,672.1	135.8	1,860.1	108.3	1,789.5	172.7	2,776.4	178.7
1991	5,444.6	205.6	1,583.7	111.8	2,254.0	139.5	1,557.8	111.3	3,763.7	270.8
1992	5,976.1	241.0	2,032.8	143.4	2,208.4	131.9	1,773.1	123.7	4,333.1	263.2

Table C.3: Continued.

	Mallard		Gadwall		American wigeon		Green-winged teal		Blue-winged teal	
Year	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1993	5,708.3	208.9	1,755.2	107.9	2,053.0	109.3	1,694.5	112.7	3,192.9	205.6
1994	6,980.1	282.8	2,318.3	145.2	2,382.2	130.3	2,108.4	152.2	4,616.2	259.2
1995	8,269.4	287.5	2,835.7	187.5	2,614.5	136.3	2,300.6	140.3	5,140.0	253.3
1996	7,941.3	262.9	2,984.0	152.5	2,271.7	125.4	2,499.5	153.4	6,407.4	353.9
1997	9,939.7	308.5	3,897.2	264.9	3,117.6	161.6	2,506.6	142.5	6,124.3	330.7
1998	9,640.4	301.6	3,742.2	205.6	2,857.7	145.3	2,087.3	138.9	6,398.8	332.3
1999	10,805.7	344.5	3,235.5	163.8	2,920.1	185.5	2,631.0	174.6	7,149.5	364.5
2000	9,470.2	290.2	3,158.4	200.7	2,733.1	138.8	3,193.5	200.1	7,431.4	425.0
2001	7,904.0	226.9	2,679.2	136.1	2,493.5	149.6	2,508.7	156.4	5,757.0	288.8
2002	7,503.7	246.5	2,235.4	135.4	2,334.4	137.9	2,333.5	143.8	4,206.5	227.9
2003	7,949.7	267.3	2,549.0	169.9	2,551.4	156.9	2,678.5	199.7	5,518.2	312.7
2004	7,425.3	282.0	2,589.6	165.6	1,981.3	114.9	2,460.8	145.2	4,073.0	238.0
2005	6,755.3	280.8	2,179.1	131.0	2,225.1	139.2	2,156.9	125.8	4,585.5	236.3
2006	7,276.5	223.7	2,824.7	174.2	2,171.2	115.7	2,587.2	155.3	5,859.6	303.5
2007	8,307.3	285.8	3,355.9	206.2	2,806.8	152.0	2,890.3	196.1	6,707.6	362.2
2008	7,723.8	256.8	2,727.7	158.9	2,486.6	151.3	2,979.7	194.4	6,640.1	337.3
2009	8,512.4	248.3	3,053.5	166.3	2,468.6	135.4	3,443.6	219.9	7,383.8	396.8

Table C.3: Continued.

Year	Northern shoveler $\widehat{N}$	Northern shoveler $\widehat{SE}$	Northern pintail $\widehat{N}$	Northern pintail $\widehat{SE}$	Redhead $\widehat{N}$	Redhead $\widehat{SE}$	Canvasback $\widehat{N}$	Canvasback $\widehat{SE}$	Scaup $\widehat{N}$	Scaup $\widehat{SE}$
1955	1,642.8	218.7	9,775.1	656.1	539.9	98.9	589.3	87.8	5,620.1	582.1
1956	1,781.4	196.4	10,372.8	694.4	757.3	119.3	698.5	93.3	5,994.1	434.0
1957	1,476.1	181.8	6,606.9	493.4	509.1	95.7	626.1	94.7	5,766.9	411.7
1958	1,383.8	185.1	6,037.9	447.9	457.1	66.2	746.8	96.1	5,350.4	355.1
1959	1,577.6	301.1	5,872.7	371.6	498.8	55.5	488.7	50.6	7,037.6	492.3
1960	1,824.5	130.1	5,722.2	323.2	497.8	67.0	605.7	82.4	4,868.6	362.5
1961	1,383.0	166.5	4,218.2	496.2	323.3	38.8	435.3	65.7	5,380.0	442.2
1962	1,269.0	113.9	3,623.5	243.1	507.5	60.0	360.2	43.8	5,286.1	426.4
1963	1,398.4	143.8	3,846.0	255.6	413.4	61.9	506.2	74.9	5,438.4	357.9
1964	1,718.3	240.3	3,291.2	239.4	528.1	67.3	643.6	126.9	5,131.8	386.1
1965	1,423.7	114.1	3,591.9	221.9	599.3	77.7	522.1	52.8	4,640.0	411.2
1966	2,147.0	163.9	4,811.9	265.6	713.1	77.6	663.1	78.0	4,439.2	356.2
1967	2,314.7	154.6	5,277.7	341.9	735.7	79.0	502.6	45.4	4,927.7	456.1
1968	1,684.5	176.8	3,489.4	244.6	499.4	53.6	563.7	101.3	4,412.7	351.8
1969	2,156.8	117.2	5,903.9	296.2	633.2	53.6	503.5	53.7	5,139.8	378.5
1970	2,230.4	117.4	6,392.0	396.7	622.3	64.3	580.1	90.4	5,662.5	391.4
1971	2,011.4	122.7	5,847.2	368.1	534.4	57.0	450.7	55.2	5,143.3	333.8
1972	2,466.5	182.8	6,979.0	364.5	550.9	49.4	425.9	46.0	7,997.0	718.0
1973	1,619.0	112.2	4,356.2	267.0	500.8	57.7	620.5	89.1	6,257.4	523.1
1974	2,011.3	129.9	6,598.2	345.8	626.3	70.8	512.8	56.8	5,780.5	409.8
1975	1,980.8	106.7	5,900.4	267.3	831.9	93.5	595.1	56.1	6,460.0	486.0
1976	1,748.1	106.9	5,475.6	299.2	665.9	66.3	614.4	70.1	5,818.7	348.7
1977	1,451.8	82.1	3,926.1	246.8	634.0	79.9	664.0	74.9	6,260.2	362.8
1978	1,975.3	115.6	5,108.2	267.8	724.6	62.2	373.2	41.5	5,984.4	403.0
1979	2,406.5	135.6	5,376.1	274.4	697.5	63.8	582.0	59.8	7,657.9	548.6
1980	1,908.2	119.9	4,508.1	228.6	728.4	116.7	734.6	83.8	6,381.7	421.2
1981	2,333.6	177.4	3,479.5	260.5	594.9	62.0	620.8	59.1	5,990.9	414.2
1982	2,147.6	121.7	3,708.8	226.6	616.9	74.2	513.3	50.9	5,532.0	380.9
1983	1,875.7	105.3	3,510.6	178.1	711.9	83.3	526.6	58.9	7,173.8	494.9
1984	1,618.2	91.9	2,964.8	166.8	671.3	72.0	530.1	60.1	7,024.3	484.7
1985	1,702.1	125.7	2,515.5	143.0	578.2	67.1	375.9	42.9	5,098.0	333.1
1986	2,128.2	112.0	2,739.7	152.1	559.6	60.5	438.3	41.5	5,235.3	355.5
1987	1,950.2	118.4	2,628.3	159.4	502.4	54.9	450.1	77.9	4,862.7	303.8
1988	1,680.9	210.4	2,005.5	164.0	441.9	66.2	435.0	40.2	4,671.4	309.5
1989	1,538.3	95.9	2,111.9	181.3	510.7	58.5	477.4	48.4	4,342.1	291.3
1990	1,759.3	118.6	2,256.6	183.3	480.9	48.2	539.3	60.3	4,293.1	264.9
1991	1,716.2	104.6	1,803.4	131.3	445.6	42.1	491.2	66.4	5,254.9	364.9
1992	1,954.4	132.1	2,098.1	161.0	595.6	69.7	481.5	97.3	4,639.2	291.9
1993	2,046.5	114.3	2,053.4	124.2	485.4	53.1	472.1	67.6	4,080.1	249.4

Table C.3: Continued.

Year	Northern shoveler		Northern pintail		Redhead		Canvasback		Scaup	
	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$	$\widehat{N}$	$\widehat{SE}$
1994	2,912.0	141.4	2,972.3	188.0	653.5	66.7	525.6	71.1	4,529.0	253.6
1995	2,854.9	150.3	2,757.9	177.6	888.5	90.6	770.6	92.2	4,446.4	277.6
1996	3,449.0	165.7	2,735.9	147.5	834.2	83.1	848.5	118.3	4,217.4	234.5
1997	4,120.4	194.0	3,558.0	194.2	918.3	77.2	688.8	57.2	4,112.3	224.2
1998	3,183.2	156.5	2,520.6	136.8	1,005.1	122.9	685.9	63.8	3,471.9	191.2
1999	3,889.5	202.1	3,057.9	230.5	973.4	69.5	716.0	79.1	4,411.7	227.9
2000	3,520.7	197.9	2,907.6	170.5	926.3	78.1	706.8	81.0	4,026.3	205.3
2001	3,313.5	166.8	3,296.0	266.6	712.0	70.2	579.8	52.7	3,694.0	214.9
2002	2,318.2	125.6	1,789.7	125.2	564.8	69.0	486.6	43.8	3,524.1	210.3
2003	3,619.6	221.4	2,558.2	174.8	636.8	56.6	557.6	48.0	3,734.4	225.5
2004	2,810.4	163.9	2,184.6	155.2	605.3	51.5	617.2	64.6	3,807.2	202.3
2005	3,591.5	178.6	2,560.5	146.8	592.3	51.7	520.6	52.9	3,386.9	196.4
2006	3,680.2	236.5	3,386.4	198.7	916.3	86.1	691.0	69.6	3,246.7	166.9
2007	4,552.8	247.5	3,335.3	160.4	1,009.0	84.7	864.9	86.2	3,452.2	195.3
2008	3,507.8	168.4	2,612.8	143.0	1,056.0	120.4	488.7	45.4	3,738.3	220.1
2009	4,376.3	224.1	3,225.0	166.9	1,044.1	106.3	662.1	57.4	4,172.1	232.3

Table C.4: Total breeding duck estimates for the traditional survey area, in thousands.

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
1955	39,603.6	1,264.0
1956	42,035.2	1,177.3
1957	34,197.1	1,016.6
1958	36,528.1	1,013.6
1959	40,089.9	1,103.6
1960	32,080.5	876.8
1961	29,829.0	1,009.0
1962	25,038.9	740.6
1963	27,609.5	736.6
1964	27,768.8	827.5
1965	25,903.1	694.4
1966	30,574.2	689.5
1967	32,688.6	796.1
1968	28,971.2	789.4
1969	33,760.9	674.6
1970	39,676.3	1,008.1
1971	36,905.1	821.8
1972	40,748.0	987.1
1973	32,573.9	805.3
1974	35,422.5	819.5
1975	37,792.8	836.2
1976	34,342.3	707.8
1977	32,049.0	743.8
1978	35,505.6	745.4
1979	38,622.0	843.4
1980	36,224.4	737.9
1981	32,267.3	734.9
1982	30,784.0	678.8
1983	32,635.2	725.8
1984	31,004.9	716.5
1985	25,638.3	574.9
1986	29,092.8	609.3
1987	27,412.1	562.1
1988	27,361.7	660.8
1989	25,112.8	555.4

Table C.4: Continued.

	Traditional Survey Area[a]	
Year	$\widehat{N}$	$\widehat{SE}$
1990	25,079.2	539.9
1991	26,605.6	588.7
1992	29,417.9	605.6
1993	26,312.4	493.9
1994	32,523.5	598.2
1995	35,869.6	629.4
1996	37,753.0	779.6
1997	42,556.3	718.9
1998	39,081.9	652.0
1999	43,435.8	733.9
2000	41,838.3	740.2
2001	36,177.5	633.1
2002	31,181.1	547.8
2003	36,225.1	664.7
2004	32,164.0	579.8
2005	31,734.9	555.2
2006	36,160.3	614.4
2007	41,172.2	724.8
2008	37,276.5	638.3
2009	42,004.8	701.9

[a] Total ducks in the traditional survey area include species in Appendix C.3 plus ring-necked duck, goldeneyes, bufflehead, and ruddy duck.

Table C.5: Breeding population estimates and 90% confidence intervals or credibility intervals (CIs; in thousands) for the 10 most abundant species of ducks in the eastern survey area, 1990–2009[a].

	Mergansers[b]		Mallard		American black duck		American wigeon		Green-winged teal	
Year	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI
1990	382.5	(319.4, 466.1)	339.0	(219.6, 570.1)	439.0	(389.6, 498.9)	13.5	(1.4, 25.7)	241.9	(188.8, 319.4)
1991	475.5	(393.7, 591.7)	383.8	(250.0, 637.8)	442.7	(388.7, 511.6)	15.2	(2.1, 28.3)	231.3	(179.9, 308.6)
1992	458.5	(373.3, 587.9)	384.0	(247.8, 643.9)	421.6	(371.5, 482.3)	5.1	(0.5, 9.7)	217.9	(167.7, 291.9)
1993	431.7	(352.6, 542.8)	389.4	(252.4, 648.6)	420.7	(368.2, 482.9)	10.4	(3.4, 17.5)	198.2	(151.3, 266.8)
1994	449.6	(358.8, 601.4)	405.0	(261.4, 678.2)	385.8	(336.8, 444.0)	10.2	(2.4, 18.1)	209.8	(160.8, 285.4)
1995	505.0	(404.0, 660.8)	336.9	(214.6, 573.9)	439.9	(383.6, 506.1)	9.5	(0.0, 21.4)	214.4	(163.3, 290.9)
1996	425.1	(356.4, 517.8)	362.2	(233.3, 611.8)	509.3	(454.5, 575.0)	10.0	(3.8, 16.3)	277.5	(219.4, 363.3)
1997	441.0	(368.4, 538.9)	385.4	(248.9, 648.5)	457.8	(410.0, 514.5)	18.2	(10.2, 26.2)	216.3	(169.7, 283.4)
1998	359.2	(300.6, 437.5)	427.7	(279.5, 702.2)	490.8	(439.9, 551.9)	58.1	(21.8, 94.5)	206.4	(162.7, 268.2)
1999	427.2	(356.0, 526.4)	435.5	(286.1, 716.1)	547.1	(490.3, 617.0)	14.1	(10.1, 18.1)	250.7	(197.1, 327.9)
2000	438.8	(368.4, 533.1)	390.3	(256.2, 643.3)	506.2	(454.1, 567.2)	38.1	(6.0, 70.2)	271.9	(216.5, 350.3)
2001	413.1	(346.9, 501.6)	425.0	(279.6, 698.4)	475.4	(426.1, 533.7)	43.9	(24.5, 63.3)	222.4	(175.1, 288.7)
2002	550.1	(460.3, 669.6)	420.3	(277.6, 684.6)	528.1	(474.5, 592.6)	13.1	(4.7, 21.4)	265.5	(209.2, 348.1)
2003	486.6	(406.4, 596.7)	434.0	(284.7, 715.4)	477.5	(427.9, 536.0)	11.6	(3.4, 19.8)	255.5	(201.3, 334.2)
2004	501.6	(422.4, 605.7)	456.8	(302.0, 743.6)	491.6	(440.0, 552.5)	22.8	(11.0, 34.5)	295.1	(232.2, 388.5)
2005	478.7	(399.9, 587.4)	442.8	(289.2, 733.2)	480.0	(428.9, 540.9)	31.1	(17.6, 44.7)	234.9	(186.0, 306.6)
2006	438.6	(368.4, 533.4)	411.4	(272.1, 678.0)	501.5	(448.8, 564.1)	11.5	(5.2, 17.8)	238.4	(187.9, 310.9)
2007	476.7	(397.1, 589.0)	455.1	(298.2, 744.5)	576.4	(512.3, 652.5)	14.0	(5.0, 23.0)	272.4	(215.4, 353.7)
2008	459.7	(385.3, 559.6)	451.1	(298.7, 735.3)	499.3	(446.6, 562.5)	8.4	(2.5, 14.4)	270.0	(211.5, 356.9)
2009	460.2	(386.2, 558.9)	462.7	(305.8, 750.7)	463.6	(414.6, 522.1)	12.0	(6.0, 18.0)	272.6	(213.4, 357.8)

[a] Estimates for mallards, American black ducks, green-winged teal, ring-necked duck, bufflehead, goldeneyes, and mergansers from Bayesian hierarchical analysis using FWS and CWS data from strata 51, 52, 63, 64, 66–68, 70–72. All others were computed as variance-weighted means of FWS and CWS estimates for strata 51, 52, 63, 64, 66–68, 70–72.

[b] Common, red-breasted, and hooded.

Table C.5: Continued

	Scaup[c]		Ring-necked duck		Goldeneyes[d]		Bufflehead		Scoters[e]	
Year	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI	$\hat{N}$	90% CI
1990	50.9	(4.2, 97.6)	543.2	(428.9, 707.1)	360.9	(283.4, 475.0)	35.5	(23.4, 47.6)	99.5	(0.1, 199.5)
1991	38.8	(17.0, 60.6)	479.9	(379.4, 622.9)	374.5	(294.1, 493.0)	28.4	(14.9, 41.9)	89.8	(24.7, 154.9)
1992	36.9	(3.9, 69.8)	484.6	(385.0, 626.0)	389.2	(305.9, 512.4)	45.3	(27.3, 63.2)	85.2	(0.1, 190.7)
1993	12.0	(3.1, 21.0)	440.5	(349.3, 570.6)	373.5	(291.4, 494.9)	6.6	(3.0, 10.3)	104.4	(18.3, 190.5)
1994	36.7	(6.4, 66.9)	458.6	(360.4, 598.6)	383.9	(299.2, 505.9)	24.3	(7.5, 41.2)	162.2	(38.6, 285.9)
1995	16.5	(0.0, 34.6)	475.5	(373.4, 627.0)	340.8	(264.0, 453.0)	10.3	(4.2, 16.4)	25.9	(7.8, 44.1)
1996	20.4	(2.4, 38.4)	584.1	(465.4, 751.2)	397.9	(312.2, 525.0)	36.1	(23.1, 49.1)	31.6	(16.2, 47.0)
1997	37.4	(5.5, 69.3)	522.7	(418.1, 671.5)	398.4	(313.3, 522.8)	15.3	(8.1, 22.5)	52.6	(28.7, 76.5)
1998	15.6	(1.0, 30.1)	461.7	(367.4, 593.6)	358.6	(282.2, 472.3)	26.8	(19.3, 34.3)	58.9	(35.3, 82.6)
1999	22.3	(2.2, 42.4)	532.9	(427.1, 682.5)	433.8	(336.7, 576.9)	15.0	(9.3, 20.7)	24.2	(8.7, 39.7)
2000	37.9	(18.4, 57.4)	563.1	(449.7, 724.7)	419.6	(328.4, 555.1)	15.9	(9.4, 22.4)	51.7	(28.9, 74.4)
2001	137.9	(0.3, 286.3)	512.4	(409.6, 659.1)	484.5	(378.3, 640.7)	40.4	(24.4, 56.5)	57.1	(28.5, 85.7)
2002	68.8	(0.3, 150.8)	513.4	(408.6, 665.5)	564.2	(425.8, 774.5)	53.2	(35.9, 70.4)	202.1	(0.6, 469.6)
2003	38.7	(12.1, 65.4)	535.6	(428.5, 687.9)	419.0	(328.1, 550.4)	18.9	(11.9, 26.0)	73.4	(27.3, 119.5)
2004	22.8	(10.3, 35.3)	582.2	(462.0, 755.9)	405.4	(321.3, 528.7)	17.3	(10.1, 24.6)	103.3	(57.3, 149.2)
2005	30.0	(14.0, 46.0)	535.6	(430.2, 680.9)	378.7	(299.2, 495.4)	18.8	(8.9, 28.8)	74.8	(45.6, 104.1)
2006	36.9	(18.9, 54.9)	552.2	(441.0, 708.1)	384.1	(303.2, 500.8)	15.1	(9.1, 21.1)	78.8	(27.6, 130.1)
2007	31.3	(18.6, 43.9)	668.1	(530.2, 860.2)	449.4	(352.0, 594.5)	15.7	(8.8, 22.6)	103.2	(40.7, 165.7)
2008	32.5	(21.3, 43.6)	545.8	(437.3, 698.0)	421.5	(330.3, 555.7)	30.2	(19.5, 40.9)	85.6	(56.0, 115.2)
2009	38.4	(20.7, 56.1)	551.4	(438.8, 711.1)	396.5	(312.0, 519.1)	26.9	(18.6, 35.2)	101.4	(62.2, 140.7)

[c] Greater and lesser.

[d] Common and Barrow's.

[e] Black, white-winged, and surf.

D Historical estimates of goose and swan populations

Table D.1: Abundance indices (in thousands) for North American Canada goose populations, 1969–2009.

Year	North Atlantic[a,b]	Atlantic[a,b]	Atlantic Flyway Resident[a]	Southern James Bay[a]	Miss. Valley[a]	Miss. Flyway Giant[a,b]	Eastern Prairie[a]
1969/70							
1970/71							
1971/72							95.0
1972/73							116.6
1973/74							96.7
1974/75							121.5
1975/76							168.4
1976/77							110.8
1977/78							111.2
1978/79							72.8
1979/80							
1980/81							78.9
1981/82							96.4
1982/83							92.8
1983/84							112.0
1984/85							105.6
1985/86							126.4
1986/87							145.9
1987/88		118.0					137.0
1988/89					380.0		132.1
1989/90				92.1	494.0		163.4
1990/91				72.4	237.0		167.4
1991/92				73.0	414.2		158.4
1992/93		91.3		50.7	402.4	855.3	136.2
1993/94		40.1		45.7	390.0	1007.6	136.2
1994/95		29.3		74.1	375.3	1069.8	139.0
1995/96	99.6	46.1		71.1	350.5	1208.0	141.0
1996/97	64.4	63.2		87.0	414.7	1137.1	130.5
1997/98	53.9	42.2		70.3	297.5	1338.7	99.3
1998/99	96.8	77.5		108.1	454.0	1398.8	139.5
1999/00	58.0	93.2		78.7	345.0	1652.3	130.0
2000/01	57.8	146.7		68.4	329.0	1564.9	122.2
2001/02	62.0	164.8		55.2	286.5	1761.2	152.0
2002/03	60.8	156.9	1126.7	90.2	360.1	1804.0	122.4
2003/04	67.8	174.8	1048.7	75.2	276.3	1782.2	145.5
2004/05	51.3	162.4	1167.1	42.2	344.9	1792.6	161.6
2005/06	49.2	160.2	1144.0	128.9	384.4	1993.5	134.8
2006/07	69.9	195.7	1128.0	64.8	402.6	1861.6	153.4
2007/08	41.9	169.7	1024.9	92.3	305.2	1894.6	161.1
2008/09	53.7	176.1	1006.1	69.2	239.6	1906.6	169.2

[a] Surveys conducted in spring.

[b] Number of breeding pairs.

Table D.1: Continued

Year	W. Prairie & Great Plains[b]	Tall Grass Prairie[b,c]	Short Grass Prairie[d]	Hi-line[d]	Rocky Mountain[a]	Dusky[e]	Cackling[f]	Aleutian[e]
1969/70			151.2	44.2				
1970/71		131.1	148.5	40.5	43.9			
1971/72		159.6	160.9	31.4	30.5			
1972/73		147.2	259.4	35.6	34.4			
1973/74		158.5	153.6	24.5	38.3			
1974/75		125.6	123.7	41.2	38.1			0.8
1975/76		201.5	242.5	55.6	25.4			0.9
1976/77		167.9	210.0	67.6	29.6			1.3
1977/78		211.3	134.0	65.1	43.0			1.5
1978/79		180.5	163.7	33.8	58.8		64.1	1.6
1979/80		155.2	213.0	67.3	36.4		127.4	1.7
1980/81		244.9	168.2	94.4	59.9		87.1	2.0
1981/82	175.0	268.6	156.0	81.9	65.8		54.1	2.7
1982/83	242.0	165.5	173.2	75.9	49.5		26.2	3.5
1983/84	150.0	260.7	143.5	39.5	48.1		25.8	3.8
1984/85	230.0	197.3	179.1	76.4	49.8		32.1	4.2
1985/86	115.0	189.4	181.0	69.8	68.3	17.1	51.4	4.3
1986/87	324.0	159.0	190.9	98.1	70.1	15.8	54.8	5.0
1987/88	272.1	306.1	139.1	66.8	107.0	16.0	69.9	5.4
1988/89	330.3	213.0	284.8	100.1	95.0	17.4	76.8	5.8
1989/90	271.0	146.5	378.1	105.9	90.6	16.3	110.2	6.3
1990/91	390.0	305.1	508.5	116.6	85.5	10.7	104.6	7.0
1991/92	341.9	276.3	620.2	140.5	102.2	17.8	149.3	7.7
1992/93	318.0	235.3	328.2	118.5	116.5	16.5	164.3	11.7
1993/94	272.5	224.2	434.1	164.3	138.3	16.3	152.5	15.7
1994/95	352.5	245.0	697.8	174.4	146.6	12.1	161.4	19.2
1995/96	403.3	264.0	561.2	167.5	145.3	12.0	134.6	21.3
1996/97	453.4	262.9	460.7	148.5	103.0	13.5	205.1	20.2
1997/98	482.3	331.8	440.6	191.0	145.2	14.5	148.6	32.3
1998/99	467.2	548.2	403.2	119.5	164.3	10.5	169.6	35.8
1999/00	594.7	295.7	200.0	270.7	181.3	10.3	175.0	34.3
2000/01	682.7	149.1	164.1	252.9	177.5	11.1	176.2	
2001/02	710.3	504.7	160.9	217.1	150.0	12.4	127.9	
2002/03	561.0	611.9	156.7	205.9	147.6	9.8	165.2	74.7
2003/04	622.1	458.7	203.6	215.6	164.2	11.2	130.2	115.1
2004/05	415.1	400.8	177.2	207.4	165.7	16.1	156.9	89.3
2005/06	444.4	499.8	234.7	247.3	146.0	12.1	169.3	101.9
2006/07	446.0	680.3	190.5	180.2	151.2	10.2	173.4	108.3
2007/08	669.5	402.7	212.4	269.3	217.6	9.1	193.3	112.3
2008/09	628.0	309.9	220.3	223.4	128.4	6.7	160.6	79.5

[a] Surveys conducted in spring.

[b] Surveys conducted in December until 1998; in 1999 a January survey replaced the December count.

[c] Only Tall Grass Prairie Population geese counted in Central Flyway range are included.

[d] Surveys conducted in January.

[e] Indirect or preliminary estimate.

[f] Surveys conducted in fall through 1998; from 1999 to present a fall index is predicted from breeding ground surveys (total indicated pairs).

Table D.2: Abundance indices for snow, Ross', white-fronted, and emperor goose populations.

	Snow and Ross' geese				White-fronted geese		Emperor geese[a]
Year	Greater snow geese[a]	Mid-continent[b]	Western Central Flyway[c]	Western Arctic & Wrangel Isl.[d]	Mid-continent[d]	Pacific[e]	
1969/70	89.6	777.0	6.9				
1970/71	123.3	1,070.2	11.1				
1971/72	134.8	1,313.4	13.0				
1972/73	143.0	1,025.3	11.6				
1973/74	165.0	1,189.8	16.2				
1974/75	153.8	1,096.6	26.4				
1975/76	165.6	1,562.4	23.2				
1976/77	160.0	1,150.3	33.6				
1977/78	192.6	1,966.4	31.1				
1978/79	170.1	1,285.7	28.2			73.1	
1979/80	180.0	1,398.1	30.4	528.1		93.5	
1980/81	170.8	1,406.7	37.6	204.2		116.5	93.3
1981/82	163.0	1,794.1	50.0	759.9		91.7	100.6
1982/83	185.0	1,755.5	76.1	354.1		112.9	79.2
1983/84	225.4	1,494.5	43.0	547.6		100.2	71.2
1984/85	260.0	1,973.0	62.9	466.3		93.8	58.8
1985/86	303.5	1,449.4	96.6	549.8		107.1	42.0
1986/87	255.0	1,913.8	63.5	521.7		130.6	51.7
1987/88		1,750.7	46.2	525.3		161.5	53.8
1988/89	363.2	1,956.2	67.6	441.0		218.8	45.8
1989/90	368.3	1,724.3	38.7	463.9		240.8	67.6
1990/91	352.6	2,135.8	104.6	708.5		236.5	71.0
1991/92	448.1	2,021.9	87.9	690.1		230.9	71.3
1992/93	498.4	1,744.1	45.1	639.3	622.9	295.1	52.5
1993/94	591.4	2,200.8	84.9	569.2	676.3	324.8	57.3
1994/95	616.6	2,725.1	80.1	478.2	727.3	277.5	51.2
1995/96	669.1	2,398.1	93.1	501.9	1,129.4	344.1	80.3
1996/97	657.5	2,957.7	127.2	366.3	742.5	319.0	57.1
1997/98	836.6	3,022.2	103.5	416.4	622.2	413.1	39.7
1998/99	803.4	2,575.7	236.4	354.3	1,058.3	393.4	54.6
1999/00	813.9	2,397.3	137.5	579.0	963.1	352.7	62.6
2000/01	837.4	2,341.3	105.8	656.8	1,067.6	438.9	84.4
2001/02	639.3	2,696.1	99.9	448.1	712.3	359.7	58.7
2002/03	678.0	2,435.0	105.9	596.9	637.2	422.0	71.2
2003/04	957.6	2,214.3	135.4	587.8	528.2	374.9	47.4
2004/05	814.6	2,344.2	143.0	750.3	644.3	443.9	54.0
2005/06	1,017.0	2,221.7	140.6	710.7	522.8	509.3	76.0
2006/07	1,019.0	2,917.1	170.6	799.7	751.3	604.7	77.5
2007/08	947.0	2,455.1	188.5	1,073.5	764.3	627.0	64.9
2008/09	1,428.0	2,753.4	284.4	957.4	751.7	536.7	91.9

[a] Surveys conducted in spring.

[b] Surveys conducted in December until 1997/98; surveys since 1998/99 were conducted in January.

[c] Surveys conducted in January.

[d] Surveys conducted in autumn.

[e] Surveys conducted in fall through 1998; from 1999 to present a fall index is predicted from breeding ground surveys (total indicated birds).

[f] Incomplete or preliminary.

Table D.3: Abundance indices of North American brant and swan populations from January surveys, 1969–2009.

Year	Brant			Tundra swans	
	Atlantic	Pacific[a]	Western High Arctic	Western	Eastern
1969/70		136.6	5.1	31.0	
1970/71	151.0	141.1	8.1	98.8	
1971/72	73.2	121.8	3.0	82.8	
1972/73	40.8	122.4	2.7	33.9	
1973/74	87.7	128.0	2.7	69.7	
1974/75	88.4	119.7	3.7	54.3	
1975/76	127.0	117.1	5.0	51.4	
1976/77	73.6	136.1	10.9	47.3	
1977/78	42.8	151.5	11.4	45.6	
1978/79	43.5	126.2	3.2	53.5	
1979/80	69.2	141.3	5.1	65.2	
1980/81	97.0	186.1	8.1	83.6	
1981/82	104.5	117.1	4.0	91.3	73.2
1982/83	123.5	107.2	2.1	67.3	87.5
1983/84	127.3	128.4	5.1	61.9	81.4
1984/85	146.3	136.0	8.8	48.8	96.9
1985/86	110.4	126.9	9.4	66.2	90.9
1986/87	109.4	98.5	10.4	52.8	95.8
1987/88	131.2	131.6	15.3	59.2	78.7
1988/89	138.0	120.9	14.3	78.7	91.3
1989/90	135.4	141.1	10.5	40.1	90.6
1990/91	147.7	119.5	12.2	47.6	98.2
1991/92	184.8	108.2	9.5	63.7	113.0
1992/93	100.6	113.6	10.8	62.6	78.2
1993/94	157.2	118.8	11.2	79.4	84.8
1994/95	148.2	116.8	16.9	52.9	85.1
1995/96	105.9	122.0	4.9	98.1	79.5
1996/97	129.1	151.9	6.0	122.5	92.4
1997/98	138.0	132.1	6.3	70.5	100.6
1998/99	171.6	120.0	9.2	119.8	111.0
1999/00	157.2	127.1	7.9	89.6	115.3
2000/01	145.3	119.9	4.9	87.3	98.4
2001/02	181.6	127.8	9.0	58.7	114.7
2002/03	164.5	101.7	4.9	102.7	111.7
2003/04	129.6	111.5	7.7	83.0	110.8
2004/05	123.2	101.4	10.0	92.1	72.5
2005/06	146.6	133.9	9.5	106.9	81.3
2006/07	150.6	133.9	6.1	109.4	114.4
2007/08	161.6	147.4	9.2	89.7	96.2
2008/09	151.3		16.2	105.2	100.2

[a] Totals exclude Western High Arctic brant. Beginning in 1986, counts of Pacific brant in Alaska were included with the remainder of the Pacific flyway.

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APPENDIX C

PUBLIC CORRESPONDENCE

Bradley Bales

From: lm51 [lmiles51@charter.net]
Sent: Sunday, April 05, 2009 1:34 PM
To: Bradley Bales
Subject: Snipe season

Dear Brad,

I haven't hunted any snipe yet but after meeting a snipe hunting enthusiast on the internet I have been considering it.

I joined a snipe bulletin board recently and a fellow from Oregon posted recently that snipe numbers in Oregon were much higher during Feb. and March and was trying to persuade you to open the season later so it can run through Feb.. This would be ideal for me as I hunt chukars mostly from Oct. through January and would add some hunting time to my season. As I'm an older hunter now I can't think of anything else I would rather do in Feb. then chase some snipe.

Of course you won't be able to please everyone as there is bound to be someone who will want to hunt in October regardless of the lower numbers available but I hope you will consider starting later so the season can run through Feb. when I would have a better chance of some success and the time to do it after chukar season closes.

I'm looking forward to giving it a try next year and will probably go out later in the season even if you don't extend the season into Feb.. But it just seems to make sense that snipe hunters would be better served if the season actually ran during the times when snipe numbers were at their peak.

Thanks for your consideration,

Larry Miles
541-784-8359

Bradley Bales

From: LONNIE ADELLE WALN [lonniewaln1@msn.com]

Sent: Monday, April 06, 2009 1:37 PM

To: Bradley Bales

Subject: FW:

I hope this goes through this time?? Thanks Lonnie

From: lonniewaln1@msn.com
To: brady.d.bales@state.or.us
Subject: FW:
Date: Sun, 29 Mar 2009 03:43:11 +0000

From: lonniewaln1@msn.com
To: bales@state.or.us
Subject:
Date: Sun, 29 Mar 2009 03:41:52 +0000

Mr. Bales,

My name is Lonnie Waln and I currently live in Omak, Washington. I grew up in Oregon, south of Salem and left Oregon in 2001. I've hunted snipe in the Willamette Valley and several Oregon coastal estuaries for over 40 years now. I currently travel to the Halsey area several times a year to hunt snipe with my son who manages a large grass seed farm in that area. Over the years I've introduced a number of hunters to the joys of the little rockets, both in the air and on the table. Although they greatly enjoy the hunts, they seem to give up snipe hunting quickly, because of the lack of bird numbers. My son and I have talked a number of times about the large number of snipe that arrive to the valley in late February and March. I would guess these are birds moving back north from their southern migration. I'm just wondering why the snipe season isn't extended to include these late birds. In many of the southern states, the seasons run until late March. I would think this could add some badly needed revenue to your wildlife dollars, attracking more hunters with the greater number of birds to hunt and for selfish reasons I could extend my bird hunting season.

Thank you for your time and consideration of this issue. Best, Lonnie

---

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Bradley Bales

From: rptuers@aol.com
Sent: Tuesday, December 30, 2008 3:45 PM
To: Bradley Bales
Subject: NW GOOSE PERMIT ZONE

Brad, I represent a group of goose hunters that would like to see the starting time for the first two NW permit goose season changed.

Question, why did the commission set an 8 AM start? Does the U.S. Fish & Wildlife Service mandate this?

We believe hunters in this permit area are a lot better at identifying targeted birds. The Dusky quota has not been met for several years now. Our request would be for the shooting tables in the bird regs, but we would settle for a 7:30 A start.

I do not believe the State Police have cited many goose hunters for shooting early, since duck hunters follow the shooting table.

At what level is the C.E.P. for the NW Permit area (high, medium, or low)?

Final question for now: when does the Fish & Wildlife Commission meet regarding the goose regs.

Have a great New Year

Roger L. Tuers

Bradley Bales

From: Eric Olson [ericolsonmd@gmail.com]
Sent: Monday, November 10, 2008 9:39 PM
To: Bradley Bales
Subject: September Goose Hunting---legal shooting hours
Follow Up Flag: Follow up
Flag Status: Red

Mr Bales,
September geese fly early, sometimes 10 or 15 minutes before sunrise. Game Bird Regulations for 2008-2009 state that shooting hours for September geese start at sunrise, not 30 minutes before sunrise as it is for all other waterfowl except the Northwest Goose Permit Season. Is there any rationale for this regulation? Identifying different subspecies of Canada geese is not an issue during this season, so the amount of light is irrelevent.
I'm hopeful that this regulation will be changed for next year.
Looking forward to hearing from you.

Eric Olson
ericolsonmd@gmail.com

Brandon Reishus

From: ODFW Info
Sent: Thursday, May 07, 2009 7:36 AM
To: Brandon Reishus
Subject: FW: Geese population control

From: OreganHunter@aol.com [mailto:OreganHunter@aol.com]
Sent: Thursday, May 07, 2009 3:41 AM
To: Odfw.Info@state.or.us
Subject: Geese population control

I have read in the paper a couple times about the geese over population. Seems to me if you just gave the geese hunters another tag for a couple more dollars that would help solve the problem...AND...Oregon would make money!!!!! and it should reduce the amount of tax money spent on meetings and surveys.
Also reducing the restrictions on hunting them, that's the complaint I here most about bird hunters is to many laws and restrictions, that's why there are less and less bird hunters.

Thk you..............Robert

Brandon Reishus

From: ODFW Info
Sent: Monday, September 08, 2008 8:43 AM
To: Bradley Bales; Brandon Reishus
Subject: FW: paying for goose cards

From: Kerri Evans [mailto:kevans@bridgeslearning.com]
Sent: Sunday, September 07, 2008 7:08 PM
To: ODFW Info
Subject: paying for goose cards

Dear Oregon department of FRAUDE AND WASTE. As a hunter of this state you people never cease to amaze me on the sole importance of money, rather than actually doing something for the people that you work for. In my time as a hunter I have hunted many other states. All other states have welcomed me with open arms. Yet as a resident of Oregon, you open one arm and reach into my pocket with the other. As for the case of the goose cards, Yes $1.50 is not a lot but once again you are asking for money for a "BS" program which in the eyes of all the real hunters is nothing but a joke for us to laugh at you about. Get real do you truly believe that a hunter hunting near a county line is going to drive to a single check station which may be 45 minutes to an hour in the wrong direction from their home to check in a whopping two cacklers. Or if someone does mistakenly shoot a dusky in the morning fog, are they going to make that drive to lose their permit? SURE. How about this the one out of hundred that decides to actually check their birds gets treated like a criminal by the frogs you employ to work these stations. Wake up and try doing something for the people for once

Aaron Evans

From: LONNIE ADELLE WALN [mailto:lonniewaln1@msn.com]
Sent: Wednesday, July 15, 2009 7:02 PM
To: odfw.commission@state.or.us; ODFW Commission
Subject:

Dear Members,

My name is Lonnie Waln and I current live in Omak, Washington. I grew up on a large farm south of Salem, Oregon when the pheasants were everywhere and the coastal bays swarmed with waterfowl and snipe. After 52 years in the Salem area I've moved to Omak, but still hunt snipe in the Halsey, Oregon area with my son Matthew and his hunting buddies. Matthew manages a 3000 acre grass seed operation near Halsey, spending a huge amount of time in the local fields. I wait each year for his call, " that the snipe are in ", load up my gun and head for Oregon to chase the little rockets.

I know a very good friend of mine and hunting partner, Worth Mathewson has been working with Brad Bales and I believe also the commission members, to extend the snipe season in the valley. I have also e-mailed Brad Bales on this subject, which he responded to my contact, which was greatly appreciated.

With the information I get from my son, the main migration of snipe into the valley doesn't really start until after the season has ended. The last week of the season can be very good, but Matthew reports very large numbers of snipe coming into his fields after season end. It is always interesting when I talk about or introduce someone to snipe hunting, there first reaction is to the joke of snipe hunting with a flashlight and gunnysack, but they are hooked after that first flush.

Thank you for your time and I would hope your consideration on this matter.
Best, Lonnie

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:44 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: NW GOOSE PERMIT ZONE

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
3406 Cherry Avenue, NE
Salem, OR 97303
Telephone 503.947.6322
Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: rptuers@aol.com [mailto:rptuers@aol.com]
Sent: Tue 12/30/2008 3:45 PM
To: Bradley Bales
Subject: NW GOOSE PERMIT ZONE

Brad, I represent a group of goose hunters that would like to see the starting time for the first two NW permit goose season changed.

Question, why did the commission set an 8 AM start? Does the U.S. Fish & Wildlife Service mandate this?

We believe hunters in this permit area are a lot better at identifying targeted birds. The Dusky quota has not been met for several years now. Our request would be for the shooting tables in the bird regs, but we would settle for a 7:30 A start.

I do not believe the State Police have cited many goose hunters for shooting early, since duck hunters follow the shooting table.

At what level is the C.E.P. for the NW Permit area (high, medium, or low)?

Final question for now: when does the Fish & Wildlife Commission meet regarding the goose regs.

Have a great New Year

Roger L. Tuers

David Budeau

From: Dale Mazar [mazar.or@gmail.com]
Sent: Thursday, July 02, 2009 3:39 PM
To: david.a.budeau@state.or.us
Subject: Proposed 2010 -2015 Upland Game Bird Framework

Mr. Budeau,

I would like to let you know that I support the proposed changes to the Upland Game Bird seasons as described the subject document Executive Summary which Mr. Brad Bales sent out today.

Keep up the good work,

Dale Mazar

David Budeau

From: Barbara and Bob Canessa [canessab@pacifier.com]

Sent: Thursday, July 02, 2009 9:23 PM

To: david.a.budeau@state.or.us

Subject: Upland Game Bird Framework

David,

My only comment would be to compliment you on recommending increased tags, bag limits and open hunting areas for future turkey seasons as the population of flocks expand. Thanks for your good work.

Bob Canessa
Seaside, OR

David Budeau

From: JOSEPH SHARON PURDY [ydrupj@q.com]

Sent: Thursday, July 02, 2009 8:41 PM

To: david.a.budeau@state.or.us

Subject: birds

Hi, David. Is it a fact that turkey populations thru-out the state are healthy enough to stand killing a lot of hens? Should not we set such a limit in only those GMU's that can support it? Just my thoughts, I'm no biologist, but I havin't gottin a Tom in 3 years. Joe Purdy, Aumsville.

David Budeau

From: Meyer, Howard - ANS [howard.h.meyer@oregonstate.edu]
Sent: Sunday, July 05, 2009 9:10 PM
To: Bradley Bales; David Budeau
Subject: RE: 2010-2015 Upland Game Bird Framework

Hello Dave,

I've raised this before but have never gotten an answer that made sense (at least to me) – Given the tenets of wildlife management listed on the front page of your executive summary, why are Morrow and Umatilla counties treated differently from the rest of eastern Oregon with regard to season length for quail, chukars and huns? If this is based on some political decision (which I assume to be the case), what is needed from the hunter/grassroots level to address the inequity.

At the risk of sounding like a broken record, what (if anything) is happening with regard to making sense of the dog training regulations?? Wheels may move slowly on certain matters, but they seem to be completely rusted solid on this topic.

Howard

Dr. Howard H. Meyer, Professor Emeritus
Dept. Animal Sciences
Oregon State University
Corvallis, OR 97330
(541) 752-2098

From: Bradley Bales [mailto:bradley.d.bales@state.or.us]
Sent: Thursday, July 02, 2009 3:12 PM
To: David Budeau
Subject: FW: 2010-2015 Upland Game Bird Framework

All

See note from Dave Budeau, upland game bird coordinator. The new upland hunting frameworks will be adopted by the Commission in early August. Please direct any comments directly to Dave. Thanks.

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
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Salem, OR 97303
Telephone 503.947.6322
Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: David Budeau

David Budeau

From: leny5853@comcast.net
Sent: Friday, July 03, 2009 3:56 PM
To: david.a.budeau@state.or.us
Subject: Pheasant season proposals 2010-2015

A copy of the draft for the 2010-1015 pheasant seasons was forwarded to me by a friend. I am not sure if you are looking for hunter input, but I would like to present my concerns.

The following is what I observed over a 10 year period (1982 - 1992) of hunting almost every hunt day of every season during the period on the McCormick unit of the Umatilla National Wildlife Refuge near Umatilla Oregon. Even though the habitat (cover) remained constant the number of birds declined after Mr. Clow retired. Norman Clow was the last employee to take a serious interest in upland bird enforcement on the refuge. With no in the field enforcement presence, I personally repeatedly saw hunters haversting hen pheasants. More than one hunter with a trained retriever explained to me that the dog needed to be rewarded for it's effort and so they felt obligated to shoot a hen for the dog. Unfortunately they did not stop with just one. In this particular situation where hunting was only allowed three days a week and the birds were present through out the season hunters did have a major impact on the population over time.
The fifty hens to a flock flushes dissappeared after hen shooting became prevalent. I believe that todays pheasant hunter,because of the scarcity of birds, is much more prone to shoot a hen out of frustration than were hunters of the past. During the time period mentioned above there was a cattle, corn and beets operation (C and B farms near Hermiston) that granted hunting access for a trespass fee. According to the farm help, they waited untill the cover was down in late December (the season be damned) and then they went around the crop circle edges in the scant cover that remained and flushed and shot everything that flew reguardless of sex. It was a lot easier then according to them.
Extending the season into the time when cover has been beaten down by the rain only makes the pheasant more vulnerable to unscupulous hunting pressure. Lumping the pheasant with the smaller quail and Hun and saying upland birds do not carry over to breed the next spring, while it may be true for the smaller birds, does a disservice to the larger pheasant. From my days hunting UNWR regularly I know those huge old dark hen birds that I flushed had been there for years.
From reading parts of the draft I get a feeling that pheasant management is being minamalized due to cost benefit concerns. Cost benefit relationships are a large part of the equation I realize. I guess my questions are: Has the pheasant been selected for relaxed protection to be reduced to insignificance in the habitat because it is not a native species? Does the department favor native upland species and manage primarily for them? There is a tone to the draft that supports the above assumptions. If that is the present direction of pheasant management in Oregon it appears misdirected to me because there are still those of us who value our wild Oregon pheasant hunting. Your response is appreciated. Thanks.

Len Yutzy

David Budeau

From: Dave Yutzy [daveyutzy@msn.com]
Sent: Friday, July 03, 2009 5:40 PM
To: david.a.budeau@state.or.us
Subject: Five Year Upland Hunting Framework Proposal

David - I'd like to comment on the above referenced proposal. The following statement is a direct quote within that proposal: "In most cases the quality and quantity of habitat has a much greater impact on long-term population numbers than does hunting. It is crucial for the long-term health of any upland game bird population that high quality habitat be maintained."

I've hunted pheasants for over twenty years. Early within the twenty year time period, the last two weeks prior to the seasons close I and my dogs would encounter large numbers of hens. Pheasants are a larger bird and given the opportunity they seem to winter over successfully year after year, as long as when they were forced to flush, there was adequate cover available to elude a hunter. Habitat density declines as the season progresses and late in the season when a bird is forced to flush generally speaking there were not as many cover escape opportunities available to them.

If ODFW surmises hunters only harvest roosters they are sadly mistaken. Yes, I have encountered hen shooters in the field. Talking with them they all feel they are owed something, be it to reward the dog, or the standard "populations can't be stock piled and pheasants only live a few years" or because of the expense of the trip they have a great and urgent need to shoot a bird. They always seem to have a ready and logical reason - at least to them to be less than ethical when harvesting a bird. However, increased hunting pressure over the past ten years in the areas that I hunt, those historic flocks of hens that were next years breeders, became a distant memory. Basically late in the season what flushed died - rooster or hen. Today there is no longer the opportunity to enjoy large flocks of birds flushing - hunting pressure has clipped those overwinter flocks of hens to being non-existent event.

If the above quoted statement from the framework proposal is actually true, then why propose extending the season closing date by an additional time of 25% when high quality habitat cover has deteriorated and weathered, and the pheasant population is being stressed and there is greater opportunity to harvest next years breeders. Extending the season with less than ideal cover to elude hunters, the brown bird shooters especially can have a field day and significantly impact the overwintering population of hens. After all the powers to be state that "populations can't be stock piled" so hunters who read such statement surmise it gives them a legal license of "everything that flies dies" mentality, the hen that just flushed in front of them might just be the one that doesn't make it through the winter better to bag it than let it go.

I strongly disagree with the two week season extension proposal, as I've seen first hand the damage that occurs to a healthy pheasant population because of hunting pressure. Late season pheasant hunters go to the field as they feel they have increased their odds in their favor of bringing a bird to hand be it a rooster, but my late season field experience show me that the most likely bird to be flushed will be a hen. You and I both know that habitat deteriorates as the season progresses, so why add an additional two weeks "for everything that files - dies mentality" to really mop up the remaining population.

My field experience indicates that lengthening the season an additional two weeks will greatly harm the available over winter population - next years breeders. The idea is bad for the pheasants!

Dave Yutzy

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:44 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: September Goose Hunting---legal shooting hours

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
3406 Cherry Avenue, NE
Salem, OR 97303
Telephone 503.947.6322
Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: Eric Olson [mailto:ericolsonmd@gmail.com]
Sent: Mon 11/10/2008 9:38 PM
To: Bradley Bales
Subject: September Goose Hunting---legal shooting hours

Mr Bales,
September geese fly early, sometimes 10 or 15 minutes before sunrise. Game Bird Regulations for 2008-2009 state that shooting hours for September geese start at sunrise, not 30 minutes before sunrise as it is for all other waterfowl except the Northwest Goose Permit Season. Is there any rationale for this regulation? Identifying different subspecies of Canada geese is not an issue during this season, so the amount of light is irrelevent.
I'm hopeful that this regulation will be changed for next year.
Looking forward to hearing from you.

Eric Olson
ericolsonmd@gmail.com

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:44 PM
To: Liz Bueffel; Michelle Tate
Subject: FW:

Brad Bales
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email bradley.d.bales@state.or.us

From: LONNIE ADELLE WALN [mailto:lonniewaln1@msn.com]
Sent: Mon 4/6/2009 1:37 PM
To: Bradley Bales
Subject: FW:

I hope this goes through this time?? Thanks Lonnie

From: lonniewaln1@msn.com
To: brady.d.bales@state.or.us
Subject: FW:
Date: Sun, 29 Mar 2009 03:43:11 +0000

From: lonniewaln1@msn.com
To: bales@state.or.us
Subject:
Date: Sun, 29 Mar 2009 03:41:52 +0000

Mr. Bales,

My name is Lonnie Waln and I currently live in Omak, Washington. I grew up in Oregon, south of Salem and left Oregon in 2001. I've hunted snipe in the Willamette Valley and several Oregon coastal estuaries for over 40 years now. I currently travel to the Halsey area several times a year to hunt snipe with my son who manages a large grass seed farm in that area. Over the years I've introduced a number of hunters to the joys of the little rockets, both in the air and on the table. Although they greatly enjoy the hunts, they seem to give up snipe hunting quickly, because of the lack of bird numbers. My son and I have talked a number of times about the large number of snipe that arrive to the valley in late February and March. I would guess these are birds moving back north from their southern migration. I'm just wondering why the snipe season isn't extended to include these late birds. In many of the southern states, the seasons run until late March. I would think this could add some badly needed revenue to your wildlife dollars, attracking more hunters with the greater number of birds to hunt and for selfish reasons I could extend my bird hunting season.

Thank you for your time and consideration of this issue. Best, Lonnie

---

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Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:44 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Snipe season

Brad Bales
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Fax 503.947.6330
email bradley.d.bales@state.or.us

From: lm51 [mailto:lmiles51@charter.net]
Sent: Sun 4/5/2009 1:34 PM
To: Bradley Bales
Subject: Snipe season

Dear Brad,

I haven't hunted any snipe yet but after meeting a snipe hunting enthusiast on the internet I have been considering it.

I joined a snipe bulletin board recently and a fellow from Oregon posted recently that snipe numbers in Oregon were much higher during Feb. and March and was trying to persuade you to open the season later so it can run through Feb.. This would be ideal for me as I hunt chukars mostly from Oct. through January and would add some hunting time to my season. As I'm an older hunter now I can't think of anything else I would rather do in Feb.. then chase some snipe.

Of course you won't be able to please everyone as there is bound to be someone who will want to hunt in October regardless of the lower numbers available but I hope you will consider starting later so the season can run through Feb. when I would have a better chance of some success and the time to do it after chukar season closes.

I'm looking forward to giving it a try next year and will probably go out later in the season even if you don't extend the season into Feb.. But it just seems to make sense that snipe hunters would be better served if the season actually ran during the times when snipe numbers were at their peak.

Thanks for your consideration,

Larry Miles
541-784-8359

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:45 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Goose hunting seasons

Brad Bales
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email bradley.d.bales@state.or.us

From: info@basinguideservice.com [mailto:info@basinguideservice.com]
Sent: Fri 6/12/2009 12:15 PM
To: Bradley Bales
Subject: Goose hunting seasons

Brad,
My name is Jason Fromm, I live in Klamath Falls. I am writing you in regards to the late season goose hunt here in Feb. and March. I would like to ask that you request a higher bag limit on specks for the upcoming season. The population is more than double the flyway goals and no tule geese were measured during last years speck/snow season. I also understand that California is going to request a bag limit of 6 specks this year if that is the case, I feel an increase in our bag limit during the late season hunt should be in order. Being able to harvest white geese was great, but they are not as widely distributed as the specks therefore it limits hunter access to them. I know this hunt was originally set up to be more of a hazing effort but as I am sure you know it has turned into a hunt that a lot of hunters look forward to each year(we get to hunt geese in Feb. and Mar.) thank you for your time.
Jason Fromm
Basin Guide Service

http://www.basinguideservice.com/

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:45 PM
To: Liz Bueffel; Michelle Tate
Subject: FW:

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
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Salem, OR 97303
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Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: info@basinguideservice.com [mailto:info@basinguideservice.com]
Sent: Thu 7/2/2009 1:46 PM
To: Bradley Bales
Subject:

Brad,
I am writing you concerning the late season(late Feb.-Mar. 10th) white front/snow goose hunt in Klamath County. I am completely in favor of this hunt and I understand that March 10 th is as late as the season may go. What I am not in favor of is the 1 speck daily limit while specks are more than double the flyway goals. I know that this was put into place because of concern over harvest of Tule geese but, there were not any Tule geese measured during last years hunt. I also understand that California is going to request a 6 bird limit for their 100 day season, with that said I feel that an increase in our limit during the 17 day season here should be in order. The hunters here in Klamath County truly enjoy the late season hunt and we look forward to it each year. If you could push for an increase in the speck limit to 3 birds a day for our late hunt it would be greatly appreciated.

Thank You,
Jason Fromm

Jason Fromm
Phone Number: (541)591-1504
e-mail: info@basinguideservice.com
web site: http://www.basinguideservice.com/

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:45 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: 2009 - 2010 Waterfowl Seasons

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
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Salem, OR 97303
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Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: Dale Mazar [mailto:mazar.or@gmail.com]
Sent: Thu 7/2/2009 3:45 PM
To: Bradley Bales
Subject: 2009 - 2010 Waterfowl Seasons

Brad,

Just saw the "Trends in Duck Breeding Populations" on the MBMO web site and would like to be the first(????) to make my comments on what I would like to see in the fall duck seasons.

My assumptions are based on the pond counts growing 45% overall and mallards increasing 10% overall, which I presume will lead to another Liberal season framework for us. If my assumptions are true, I would like to give my support for a season starting on October 17th and ending on January 31st. I know you will do your usual excellent job of choosing closed days within those days as necessary.

Good Hunting,

Dale Mazar

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:46 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: '09-'10 Goose Season

Brad Bales
Migratory Game Bird Program
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email bradley.d.bales@state.or.us

From: Don Richelderfer [mailto:nwos@gorge.net]
Sent: Tue 7/7/2009 7:20 AM
To: bradley.d.bales@state.or.us
Subject: '09-'10 Goose Season

From: Don Richelderfer Wasco, Or.

Mornin' Brad .... just a short note concerning this upcoming waterfowl season. Is it possible that we here in Mid-Columbia area not have opening day of goose not start till first Saturday in November?? Then run the season for full 100 or 107 days from that. Over last several years our migrating geese have not shown up till first week of Nov. -- making any October days a waste. Then I have to sit and watch geese in our fields through the 'break' period. I've had many locals ask me why we even have a season in October any more cuz the geese just are not here yet . BUT YES, I do appreciate being able to hunt ELK during that time !!!!??? And with the increasing elk numbers here in Sherman County it is not hard to find an elk. And I did pull one of the 5 antelope tags for Sherman County also !!!

Thank You, Don Richelderfer

Brad Bales
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email bradley.d.bales@state.or.us

From: jctrbuchanan@msn.com [mailto:jctrbuchanan@msn.com]
Sent: Mon 7/27/2009 3:38 PM
To: Brad Bales
Subject: 2009/2010 waterfowl season

Brad,

When you set the regulations for the upcoming waterfowl season, would you consider the season as late as possible in January and have the shortened Scaup season run to the end of the season? If the limit on Pintails is set at 2 birds, could you require one of them to be a drake? In Western Washington where we hunt, we don't start getting good hunting until the first or second week of December and it continues through the end of January.
I would appreciate your consideration on the above issues!
Thanks!

Jim Buchanan
Forest Grove, Oregon

I could get into this goose issue here in the county, but I'll save that for another day!

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:46 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
3406 Cherry Avenue, NE
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Telephone 503.947.6322
Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: Moe3393@aol.com [mailto:Moe3393@aol.com]
Sent: Sun 8/2/2009 6:03 PM
To: bradley.d.bales@state.or.us
Subject: Re: Proposed Migratory Game Bird Regs

Thanks for the info. I am looking forward to the increase in the pintail limit. I never could understand how we could see so many each year and have only a one bird limit. Jim Miller

---

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:46 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

Brad Bales
Migratory Game Bird Program
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Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

From: Scott Ritter [mailto:wildoregon@hotmail.com]
Sent: Sun 8/2/2009 6:04 PM
To: Bradley Bales
Subject: Re: Proposed Migratory Game Bird Regs

Thanks Brad!

Scott Ritter
"Life begins at the edge of your comfort zone."

> ----- Original Message -----
> **From:** Bradley Bales
> **To:** Bradley Bales
> **Sent:** Sunday, August 02, 2009 5:11 PM
> **Subject:** Proposed Migratory Game Bird Regs
>
> Please see attached for proposed migratory game bird regulations for this year. The Commission will meet this Friday August 7 for consideration and final adoption. Please provide email comments back to me by the previous Thursday if you want the Commission to hear your comments. Also share this information with any interested parties. Things to note:
>
> 1. The pintail limit in this flyway will be 2 this year, canvasback season will reopen and 1 more scaup will be in the bag limit. Differential seasons are once again set by duck zones.
>
> 2. Goose bag limit in the late season Klamath hunt will increase.
>
> 3. While note listed on the attachment, the permit goose zone will be very similar to last year except that the dusky quotas will be reduced close to 50 percent. This is in response to the lowest population count ever recorded on the Alaska breeding grounds.

4. A concurrent snipe season with ducks is proposed. There has been some public request for a late season snipe hunt only in western Oregon. Snipe seasons have to be set by duck zone. I have asked for comments on this type of season in the past from people on this distribution list. Based on past history and comments with this type of hunting, no changes are being proposed for the snipe season and it would remain concurrent with duck hunting within both zones.

Final frameworks were just adopted by the USFWS last Friday. Thanks for any input.

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
3406 Cherry Avenue, NE
Salem, OR 97303
Telephone 503.947.6322
Cell 503.381.7621
Fax 503.947.6330
email bradley.d.bales@state.or.us

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:47 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

Brad Bales
Migratory Game Bird Program
Oregon Department of Fish and Wildlife
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From: Dale Mazar [mailto:mazar.or@gmail.com]
Sent: Sun 8/2/2009 6:07 PM
To: Bradley Bales
Subject: Re: Proposed Migratory Game Bird Regs

Perfect!! I totally support the proposed regulations.

Dale Mazar

On Sun, Aug 2, 2009 at 5:11 PM, Bradley Bales <bradley.d.bales@state.or.us> wrote:

> Please see attached for proposed migratory game bird regulations for this year. The Commission will meet this Friday August 7 for consideration and final adoption. Please provide email comments back to me by the previous Thursday if you want the Commission to hear your comments. Also share this information with any interested parties. Things to note:
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> 2. Goose bag limit in the late season Klamath hunt will increase.
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>
> Final frameworks were just adopted by the USFWS last Friday. Thanks for any input.
>
> Brad Bales
> Migratory Game Bird Program

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From: Worth Mathewson [mailto:slpress@macnet.com]
Sent: Sun 8/2/2009 6:10 PM
To: Bradley Bales
Subject: Re: Proposed Migratory Game Bird Regs

Brad, I truly don't understand your stand on snipe. It doesn't make any common sense. You are totally mistaken. But then you have frequently taken stands based on the lack of common sense. I guess you want to keep your record intact. It is a real pity, as you have the chance to make some important decisions for our wildlife. The worst part is that you are so young that you will likely be around for years to come. But life is full of bad turns. Worth Mathewson

> ----- Original Message -----
> **From:** Bradley Bales
> **To:** Bradley Bales
> **Sent:** Sunday, August 02, 2009 5:11 PM
> **Subject:** Proposed Migratory Game Bird Regs
>
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Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:48 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

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From: mll8edw@aol.com [mailto:mll8edw@aol.com]
Sent: Sun 8/2/2009 6:23 PM
To: bradley.d.bales@state.or.us
Subject: Re: Proposed Migratory Game Bird Regs

thanks for the update

-----Original Message-----
From: Bradley Bales <bradley.d.bales@state.or.us>
To: Bradley Bales <bradley.d.bales@state.or.us>
Sent: Sun, Aug 2, 2009 5:11 pm
Subject: Proposed Migratory Game Bird Regs

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Sent: Monday, August 03, 2009 8:48 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

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From: Ed & Chris May [mailto:cemay@coho.net]
Sent: Sun 8/2/2009 9:44 PM
To: 'Bradley Bales'
Subject: Proposed Migratory Game Bird Regs

Brad,

It all looks good to me and thanks for all of your hard work. I enjoyed the two hours that I got to sit in on the Pacific Flyway Council meeting in Portland...

Ed May
State Chairman
Oregon Ducks Unlimited

Importance: High

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Sent: Monday, August 03, 2009 8:48 PM
To: Liz Bueffel; Michelle Tate
Subject: FW: Proposed Migratory Game Bird Regs

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From: 3hancocks@comcast.net [mailto:3hancocks@comcast.net]
Sent: Sun 8/2/2009 11:37 PM
To: Bradley Bales
Subject: Re: Proposed Migratory Game Bird Regs

Brad,

Season dates look good. I would like to be able to chat with you about the Permit Zone changes...Particularly Tillamook County. I am hoping that the limit will stay at 2 birds a day. I believe that I have read that the hunt was approved by the Flyway for a 3 bird a day limit. I think that given the level 2 quotas 3 birds a day would spell disaster for Tillamook County. Also would like to know the possibility of splitting the Tillamook season into 2 periods? I grew up there and spend a LOT of time hunting the area. I know that the quota has been a problem the last 2 years and am fearful of a possible early shutdown if the hunt remains a solid period hunt. Im guessing that the quota will be somewhere around 6 this year and know that there are a lot of uneducated goose "hunters" that frequent the area.

Thanks again for the info.

Justin Hancock

----- Original Message -----
From: "Bradley Bales" <bradley.d.bales@state.or.us>
To: "Bradley Bales" <bradley.d.bales@state.or.us>
Sent: Sunday, August 2, 2009 5:11:42 PM GMT -08:00 US/Canada Pacific
Subject: Proposed Migratory Game Bird Regs

Please see attached for proposed migratory game bird regulations for this year. The Commission will meet this Friday August 7 for consideration and final adoption. Please provide email comments back to me by the previous Thursday if you want the Commission to hear your comments. Also share this information with any interested parties. Things to note:

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Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:49 PM
To: Michelle Tate; Liz Bueffel
Subject: FW: Duck Seasons

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From: Joseph Koziol [mailto:smeegal@me.com]
Sent: Mon 8/3/2009 6:52 PM
To: bradley.d.bales@state.or.us
Subject: Duck Seasons

Brad, I am still an advocate for a late snipe hunt season. Let's get a waiver and try this sort of hunt out for 3 years. If a hunter is not after ducks and wants only to hunt snipe he is at a disadvantage with these season dates. Thanks for this opportunity to contribute.

Liz Bueffel

From: Bradley Bales
Sent: Monday, August 03, 2009 8:49 PM
To: Michelle Tate; Liz Bueffel
Subject: FW: Goose Hunting inTillamook County

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From: David Lubinski [mailto:dlubins@embarqmail.com]
Sent: Mon 8/3/2009 7:36 PM
To: bradley.d.bales@state.or.us
Subject: Goose Hunting inTillamook County

Bradley you know the goose season here in Tillamook county was new the year before last. It was a great success accept we didn't keep the birds moving much. The Dusky Goose quota was not met and we had an abundance of geese especially in the late part of the season. Anywhere else in the state the bird limit has been four birds a day and we have this ridiculous limit of two birds and only two days of hunting a week for geese. The vast majority of birds are harvestable birds. We even had many Speckle Bellies and Snow geese most of the season. I propose that we get a four bird per day limit like the rest of the state and open at least one more day of the week, probably Wednesdays. We have proved that we can manage our dark bird harvest and the farmers are screaming to keep the birds moving. There are not many hunters so the few of us that live here could use a little more hutting opportunity. Note that last year I saw local farmers go out and shoot geese in their fields and let them lay just to keep them from doing more damage to the grass. Please pass these thoughts along. Give consideration to raising the daily bag limit and maybe more days during the week. It sounds like the guys who do the check stations are here and on salary anyway.

David Lubinski
890 Bearberry Lane
Oceanside, OR 97134
(503)842-2342
