

COLORADO RESIDENT CANADA GOOSE MANAGEMENT PLAN

COLORADO PARKS AND WILDLIFE



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FOREWORD

Over 60 years ago, Colorado and many other states began efforts to expand local breeding populations of Canada geese. These efforts were successful, and today resident Canada geese are well established and widely distributed across Colorado. Populations of migrant Canada and cackling geese that breed outside Colorado but migrate through and winter in the state have also grown rapidly in recent decades. Similarly, the human population has grown rapidly in Colorado, and the landscapes used by both people and Canada geese continue to change. While Canada geese are a valuable resource, providing hunting and viewing opportunities, the presence of geese can also produce conflicts with people. Management of resident Canada geese involves coordination among federal and state agencies, municipal governments, landowners, and the general public. Colorado Parks and Wildlife (CPW) produced this Colorado Resident Canada Goose Management Plan to identify statewide management objectives and issues, and to facilitate communication and management actions for resident Canada geese among federal agencies, CPW, and the citizens of Colorado. This management plan is intended to compliment annual CPW work plans, annual budgets, Strategic Plans, and Director and Commission guidance. It is not intended to supersede any specific federal or state statutes and regulations, Commission Policies, or Administrative Directives regarding Canada geese or their management in Colorado.



Jeffrey M. Ver Steeg, Acting Director
Colorado Parks and Wildlife
April 5, 2019

COLORADO RESIDENT CANADA GOOSE MANAGEMENT PLAN COLORADO PARKS AND WILDLIFE

INTRODUCTION

Canada geese (*Branta canadensis*) are federally protected in the United States by the Migratory Bird Treaty Act. The U.S. Fish and Wildlife Service (USFWS) defines resident Canada geese as Canada geese that nest and/or reside predominantly within the coterminous United States (U.S. Fish and Wildlife Service 2005). Resident Canada goose populations have grown dramatically across the United States over the past several decades (Schmidt 2004). While resident Canada geese provide a valuable resource for waterfowl hunters and wildlife viewers, conflicts between people and geese occur.

Breeding resident Canada geese occur throughout Colorado (Boyle 2016). Much larger numbers of Canada geese and cackling geese (*B. hutchinsii*) that nest in states north of Colorado and in Canada also are present in Colorado from fall through spring (Central Flyway Waterfowl Technical Committee 1965, Colorado Division of Wildlife 1989, Kraft and Funk 1990). Colorado Parks and Wildlife (CPW) manages wildlife populations in Colorado, and in cooperation with the USFWS manages resident and migrant Canada and cackling goose populations in the state. Recreational hunting is the primary tool used by CPW to manage Canada and cackling goose populations, in coordination with the USFWS and other states and provinces in the Central and Pacific Flyways. However, hunting cannot effectively address some human-geese conflicts.

Under federal regulations, non-lethal control activities for Canada geese, such as hazing and harassment, habitat management, and repellants, can be used without a permit at any time. Local ordinances may prohibit some control activities. All control activities that involve direct contact with geese and can result in harm to geese, goslings, eggs, or nests require a federal permit issued by the USFWS, or must be taken under a depredation order. The USFWS issues permits to alleviate resident Canada goose depredations in coordination CPW and the Wildlife Services program of the U.S. Department of Agriculture's Animal Plant Health Inspection Service (Wildlife Services-Colorado). Wildlife Services-Colorado is the federal agency with lead responsibility for dealing with wildlife damage complaints. Where human health and safety is a concern, Wildlife Services-Colorado has primary responsibility for conducting damage management activities, and we do not address these situations in this plan. However, most conflicts between people and geese in Colorado involve nuisance and property damage issues. To address these conflicts, permitted lethal control activities for resident Canada geese are currently available from March 11 through August 31 each year.

This plan defines CPW's goal, objectives, and strategies for management of resident Canada geese in Colorado. The plan 1) provides a reference for coordination and communication on statewide activities related to resident Canada geese within CPW, 2) facilitates required state-federal coordination on management of resident Canada geese,

and 3) provides a means to communicate with the public about management goals, objectives, and actions for resident Canada geese in Colorado.

GOAL

The CPW management goal for resident Canada geese in Colorado is to maximize recreational opportunity consistent with the welfare of the population, habitat constraints, and landowner/public tolerances.

OBJECTIVE 1. Maintain a stable statewide population trend and current county-level distribution of breeding Canada geese in Colorado.

Strategy 1.1. CPW will monitor statewide breeding population trends using annually updated results from the North American Breeding Bird Survey (BBS).

Strategy 1.2. CPW will monitor the statewide distribution of breeding Canada geese using the number of counties with eBird observations of geese reported during April and May as an annual index of breeding distribution.

Rationale

Maintaining a healthy statewide population of resident Canada geese is consistent with the goal of this plan. There are no historic or current statewide population surveys conducted for resident Canada geese in Colorado, and rigorous population estimates are not available (see Background Information below). CPW currently conducts annual aerial cruise surveys to provide a rough population index for breeding Canada geese in parts of western Colorado as part of rangewide, cooperative monitoring of Rocky Mountain Population Canada geese (Pacific Flyway Subcommittee on Rocky Mountain Population Canada Geese 2000). CPW also conducts an annual Mid-winter Waterfowl Survey during the first week of January that provides an index to Canada goose numbers in eastern Colorado and the San Luis Valley, but observers cannot distinguish between resident and migrant Canada geese during this count.

A specific statewide abundance objective is not useful in relation to the management goal. The number of resident Canada geese that achieves a balance between providing recreational opportunity and meeting landowner tolerances varies locally throughout the state and is likely to change over time. However, we used results from an intensive statewide banding program to provide a benchmark of approximately 17,400-26,100 resident Canada goose statewide following the breeding season during the 2000s (see Background Information below). We caution that this is at best a crude index to the true population.

For future management decisions and communications purposes, it is useful to track indices for the overall population trend and distribution of resident Canada geese across Colorado. Although not designed well for species like Canada geese, the BBS provides a long-term, on-going source for bird population trends at a state scale. BBS results for

Colorado are imprecise, but indicate an increasing trend (7.21% average annual increase, 0.17-15.19% credible interval) in the breeding population of Canada geese from 2005 through 2015 (Sauer et al. 2017). CPW will annually monitor the updated interval BBS trend estimate. If the BBS trend credible interval indicates a declining statewide resident Canada goose breeding population, CPW will consider conducting intensive population monitoring in areas where we suspect undesirable declines have occurred, and review potential management actions.

Observations posted on eBird (<https://ebird.org/home>, The Cornell Lab of Ornithology) from March through May 2018 show that resident Canada geese occurred in every county in Colorado except Cheyenne County. This citizen science source provides a convenient, large-scale index to resident Canada goose distribution in Colorado. CPW will annually review eBird records of Canada geese during the breeding season across the state. If records are lacking from a county for at least two years, CPW will consider conducting detailed investigations to determine if habitat changes or management actions explain the change in distribution.

CPW will augment information on the statewide breeding population of resident Canada geese from BBS and eBird with local information from field personnel. Where there are concerns about changes in local populations, or the need to have more detailed demographic estimates in specific areas of the state, CPW will conduct statistically rigorous population surveys (see Strategy 4.1).

OBJECTIVE 2. Provide and promote opportunities for hunting and viewing resident Canada geese in Colorado.

Strategy 2.1. Provide annual legal hunting opportunity that promotes the harvest of resident Canada geese.

- 2.1.1 In the Pacific Flyway portion of Colorado, CPW will consider maintaining a special September Canada goose season, and early-season (late September and October) hunting opportunity during the regular Canada goose season.
- 2.1.2 In the Central Flyway portion of Colorado, CPW will consider maintaining goose hunting zones in the mountain parks (North Park, South Park, the San Luis Valley) and the Northern Front Range, where early-season hunting opportunity is provided in late September and October.
- 2.1.3 In the Northern Front Range goose hunting zone, CPW will also consider extending the hunting season as late as federal frameworks allow, to provide late-season hunting opportunity when resident Canada geese are more vulnerable to harvest in this hunting zone.
- 2.1.4 CPW will work with the Pacific and Central flyways and USFWS to maintain regulations (e.g., season length, bag limit) that maximize legal hunting opportunity for Canada geese in Colorado. This includes effective, coordinated management of migrant Canada goose and cackling goose populations.

- 2.1.5 CPW managers will work with landowners and local governments to promote the use of managed, local hunting opportunities for Canada geese in and near municipalities where permitted by local ordinances, and support changes in local ordinances that permit greater opportunity for Canada goose harvest.

Strategy 2.2. Promote legal hunting and viewing of Canada geese in Colorado.

- 2.2.1 As resources permit, CPW will use Canada goose hunting opportunities to recruit hunters by offering skills training workshop and mentored hunts for youth, women, veterans, etc.
- 2.2.2 CPW will work with partners to provide information to the public on the biology and distribution of Canada geese in Colorado.
- 2.2.3 CPW will work with partners to communicate the aesthetic values of Canada geese to the public.
- 2.2.4 CPW will develop and post natural history information about the multiple Canada goose populations living in Colorado on its website.
- 2.2.5 CPW will add information to its wildlife viewing program about locations and times of the year to view Canada geese.

Rationale

The primary motivation for establishing local breeding populations of Canada geese in Colorado was to provide additional legal hunting opportunity, as well as viewing opportunities. Hunting and viewing Canada geese adds much to the quality of life for residents living in Colorado and visitors exploring the state. CPW has a statutory responsibility to provide wildlife-related recreational opportunity:

33-1-101. Legislative declaration

(1) It is the policy of the state of Colorado that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors. It is further declared to be the policy of this state that there shall be provided a comprehensive program designed to offer the greatest possible variety of wildlife-related recreational opportunity to the people of this state and its visitors and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities.

(4) The state shall utilize hunting, trapping, and fishing as the primary methods of effecting necessary wildlife harvests.

Regulated hunting harvest is an accepted method to manage wildlife populations. Legal hunting is the most effective way to reduce the Canada goose population growth rate, by reducing survival of adult Canada geese (Balkcom 2010). Hunting activity can also influence the distribution of Canada geese at local scales.

CPW sets annual hunting regulations for Canada geese within frameworks established by the USFWS for season dates, season length, bag limits, and methods of take. Federal hunting frameworks for regular hunting seasons are based primarily on the status of migratory populations of Canada and cackling geese. In 2002, CPW established a

September Canada goose season (currently September 1-9) in the Pacific Flyway portion of Colorado. In addition to providing general recreational hunting opportunity, this season provides a mechanism for individual landowners to address site-specific conflicts (primarily crop depredation issues). In the Central Flyway portion of Colorado, CPW established special goose hunting zones in North Park, South Park, the San Luis Valley, and the northern Front Range. Hunting seasons in these zones begin in late September or early October, before resident Canada geese migrate from the mountain parks, and before large numbers of migrant Canada and cackling geese arrive along the northern Front Range. Band recovery information indicates that substantial harvest of resident Canada geese along the Front Range occurs early and late in the hunting season; thus, late season (February) hunting opportunity can also be an effective tool for managing resident Canada geese in the northern Front Range area (Gammonley 2010).

Because many resident Canada geese in Colorado live near municipalities, they can provide convenient hunting opportunities. In addition, even limited hunting activity can be effective in redistributing geese around local areas. Local governments and property owners can address some human-goose conflicts with carefully managed hunts in and near municipal areas.

Resident Canada geese provide highly accessible opportunities for the public to view and interact with this species. Because of their adaptability to human-modified habitats and living in close proximity to humans, viewing opportunities for Canada geese are abundant throughout much of Colorado without active management to provide viewing opportunities. Resident Canada geese provide a convenient means for CPW and partners to educate and inform the public about wildlife biology and management issues.

OBJECTIVE 3. Reduce and manage local-scale conflicts and damage attributed to nuisance and/or depredating resident Canada geese.

Strategy 3.1. Provide property owners and managers with information on non-lethal and lethal methods for addressing site-specific human-goose conflicts.

- 3.1.1 CPW will provide information on using non-lethal and lethal methods to address conflicts with resident Canada geese (and migrant Canada and cackling geese) on its public website, at CPW offices, in land use comments, and when requested by the public.
- 3.1.2 CPW will coordinate with USFWS and Wildlife Services-Colorado on providing information on site-specific resident Canada goose management to the public.

Strategy 3.2. Encourage the use of regulated hunting to address local resident Canada goose conflicts wherever possible (see Strategy 1.1.4).

- 3.2.1 In rural and exurban areas where regulated hunting is permitted, hunting should be used as a primary tool for addressing site-specific conflicts with geese.

- 3.2.2 CPW will support the use of managed, local hunting opportunities for Canada geese in and near municipalities, where permitted by local ordinances.

Strategy 3.3. Manage non-hunting, lethal control of resident Canada geese by property owners, primarily in municipalities.

- 3.3.1 CPW, USFWS, and Wildlife Services-Colorado will coordinate on damage management activities.
- 3.3.2 For statewide egg oiling activities, CPW will direct individual property owners to the USFWS Resident Canada Goose Nest and Egg Registration Site (<https://epermits.fws.gov/eRCGR/>).
- 3.3.3 In the Denver metropolitan area and within the incorporated boundaries of other municipalities along the I-25 Front Range corridor in Larimer, Weld, Boulder, Broomfield, Denver, Jefferson, Adams, Arapahoe, Douglas, El Paso, and Pueblo counties, property owners will coordinate culling resident Canada geese with USFWS and Wildlife Services-Colorado. Wildlife Services-Colorado will be the primary contact for assistance with lethal control in these areas.
- 3.3.4 CPW will maintain a USFWS Special Canada Goose permit that allows CPW and individual subpermittees to conduct lethal control activities for resident Canada geese. CPW will use this permit in limited situations where property owners cannot effectively use non-lethal control, hunting, and egg oiling to address site-specific human-goose conflicts with resident Canada geese.

Rationale

CPW's primary role is managing resident Canada geese at a population level, rather than managing site-specific conflicts. Most human-goose conflicts in Colorado are local in scale. Although some isolated conflicts occur outside of hunting seasons in rural and unincorporated areas, the vast majority of conflicts between humans and resident Canada geese occur in municipalities, and most of these conflicts occur in the Denver metropolitan area and other Front Range municipalities. Conflicts in Front Range municipalities primarily involve damage and costs to public and private property (e.g., the cost of cleaning up goose waste at parks and golf courses).

CPW provides individual property owners with information on methods to address conflicts, and conducts some activities to address site-specific issues with resident Canada geese. From the 1970s through the 1990s, CPW routinely trapped adult geese and goslings from Front Range municipalities and translocated them to more rural areas in Colorado and other states; USFWS granted CPW a permit to conduct these trap and transplant operations. Importantly, this activity was for many years associated with efforts to establish new local populations of resident Canada geese. However, by the mid-1990s there were no suitable areas remaining to establish new local populations. Furthermore, trap and transplant has proven to be a costly and ineffective method to address site-specific human-goose conflicts. Consequently, by the late 1990s CPW suspended routine trap and transplant efforts.

In 2001, CPW obtained a new Special Canada Goose permit from the USFWS, which permits state wildlife agencies to conduct lethal damage management activities. Although CPW personnel have directly conducted some damage management activities, subpermittees (i.e., property owners or managers) authorized by CPW have conducted the vast majority of activities under this permit. Furthermore, almost all of the lethal damage management activity conducted under this permit has been egg oiling, and virtually all of the egg oiling activity occurs in Front Range municipalities. Since 2002, CPW personnel and over 50 subpermittees have treated over 6,000 nests in Colorado. The USFWS now has an online registration system where individuals can obtain a permit for egg and nest control, and report their activities directly to the USFWS. Beginning in 2019, CPW will direct individual property owners to use the online USFWS registration system for egg and nest control.

The USFWS Special Canada Goose permit also allows CPW to cull adult resident geese and goslings. However, although CPW has allowed a few individual subpermittees in rural areas to conduct limited culling of adult geese, primarily in association with agricultural damage (<10 subpermittees have killed about 300 geese since 2008), CPW has expressly avoided implementing widespread and large-scale culling operations under its Special Canada Goose permit. Recently, there is increased interest in culling from public and private property owners in the Denver metropolitan area and other Front Range municipalities. While CPW is not opposed to this method and is not concerned about population-level impacts of these activities, we lack the financial and staff resources to conduct or oversee these activities. Individuals or coalitions of individuals in Front Range municipalities can most effectively work directly with federal agencies (USFWS and Wildlife Services-Colorado) to implement culling.

If individuals register directly for egg oiling activities, and Front Range municipalities work directly with federal agencies on culling activities, CPW expects damage management actions conducted under the Special Canada Goose permit will be very limited. Examples include 1) limited culling of geese causing crop damage in rural areas, and 2) assisting property owners with first-time, time-sensitive removal of nests where aggressive pairs of geese are regularly in contact with people (e.g., near the entrance to a business or school). CPW, USFWS, and Wildlife Services-Colorado will regularly coordinate and communicate on control activities (see Strategy 4.3).

OBJECTIVE 4. Improve monitoring of and communication about resident Canada goose populations, harvest and hunting activities, conflict-related control activities, and public attitudes toward resident Canada geese in Colorado.

Strategy 4.1. Develop and implement a periodic spring population survey for resident Canada geese along the I-25 urban corridor from Fort Collins to Pueblo (Front Range corridor).

4.1.1 CPW will design a survey to obtain reliable estimates of spring abundance and distribution of resident Canada geese along the Front Range corridor.

- 4.1.2 CPW will coordinate with partners to conduct the survey in a cost-effective way, and communicate results of the survey.

Strategy 4.2. Monitor Canada goose harvest and hunter activity in Colorado.

- 4.2.1 USFWS annually conducts waterfowl harvest surveys that include estimates of Canada goose harvest, and the temporal and spatial (county-level) distribution of harvest in Colorado. CPW will track and communicate results of this survey as related to resident Canada geese (e.g., early season goose harvest).
- 4.2.2 CPW will consider periodically conducting intensive monitoring studies of resident Canada geese (e.g., banding) to obtain and update information on survival and harvest rates, and spatial and temporal distribution of resident Canada goose harvest.

Strategy 4.3. Track statewide damage management activities for resident Canada geese in Colorado.

- 4.3.1 CPW, USFWS and Wildlife Services-Colorado will meet annually to share and review information on non-lethal and lethal control efforts.
- 4.3.2 CPW, USFWS, and Wildlife Services-Colorado will update approaches and procedures as needed.

Strategy 4.4. CPW, in coordination with partners, will periodically conduct public surveys on attitudes and perceptions toward resident Canada geese, and incorporate these results into communications efforts and goose management actions.

Strategy 4.5. CPW, in coordination with partners, will periodically (at least every five years) review and update the objectives, strategies, and background information in this plan as needed.

Rationale

As the human and resident Canada goose populations in Colorado continue to grow and interact, we expect an increased need to share information on management activities with management partners and the public.

CPW does not currently conduct extensive, rigorous population surveys for resident Canada geese along the Front Range corridor. A periodic ground-based survey conducted during spring can provide precise abundance estimates and information on distribution of resident Canada geese along the Front Range corridor, where most conflicts occur and property managers conduct most site-specific control activities. This information would be useful for communicating about changes in local populations and the effectiveness of control actions.

Similarly, tracking harvest of Canada geese and control activities conducted throughout Colorado will help facilitate communication about the status of resident Canada geese in Colorado. Perceptions and attitudes toward resident Canada geese and management activities is likely to vary among different segments of the public, geographically, and

over time. Understanding these perceptions and concerns will assist local, state, and federal managers in communicating with the public about resident Canada geese and their management.

BACKGROUND INFORMATION

Canada Goose Populations in Colorado

In North America, Canada geese are managed at a population level based on relatively distinct breeding area affinities. During migration and winter, different breeding populations of geese often mix together. Large numbers of Canada geese that breed outside Colorado migrate through and winter in Colorado. While many Canada geese that breed in Colorado also winter in the state, often moving short distances or to lower elevations, some resident breeding geese in Colorado migrate out of the state during winter (primarily to New Mexico). Thus, while resident Canada geese in Colorado are the focus of this plan, it is necessary to consider resident geese in the context of the overall Canada goose populations that occur in Colorado.

Three continental populations of Canada geese occur in Colorado:

Hi-Line Population (HLP)

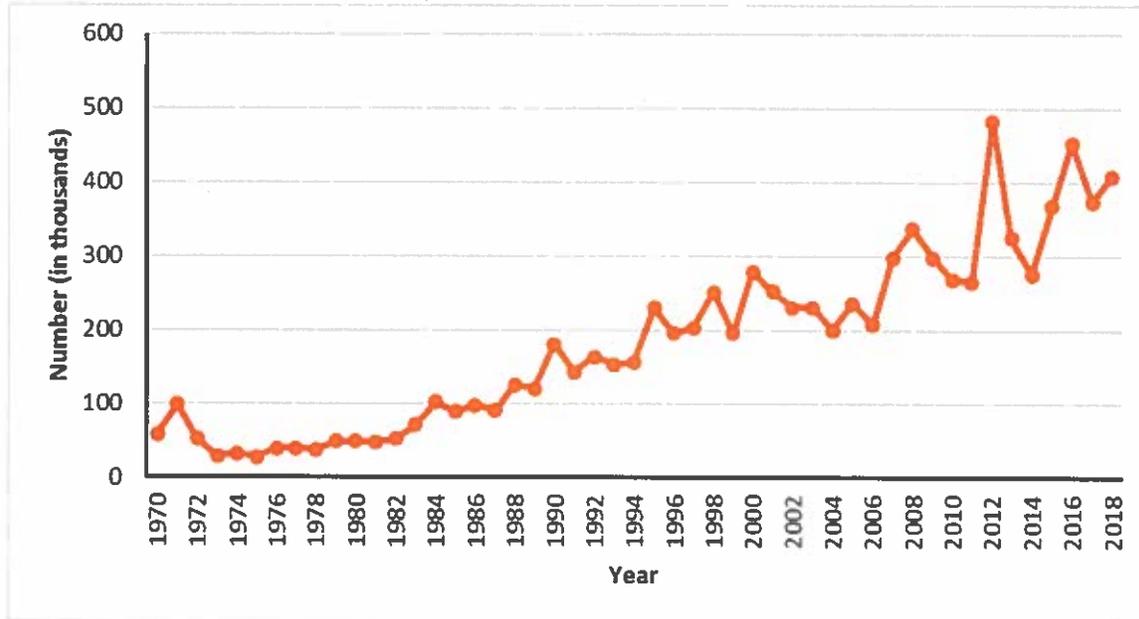
HLP Canada geese nest in southeastern Alberta, southwestern Saskatchewan, and eastern Montana, Wyoming, and Colorado; this population winters primarily in these states and New Mexico (Central Flyway Council 2010). Resident Canada geese that breed in Colorado east of the Continental Divide are part of the HLP. In Colorado, concentrations of breeding, nonbreeding, and molting HLP Canada geese occur during the spring and summer in North Park (Jackson County), South Park (Park County), the San Luis Valley (Alamosa, Conejos, Costilla, and Rio Grande counties, and portions of Hinsdale, Mineral, and Saguache counties), and the Northern Front Range (Adams, Arapahoe, Boulder, Broomfield, Denver, Jefferson, Larimer, and Weld counties). Smaller, local concentrations of HLP Canada geese occur during spring and summer in El Paso and Pueblo counties, and additional breeding HLP Canada geese are scattered at low densities throughout eastern Colorado.

Although it does not include the Colorado and Wyoming portions of the HLP breeding range, the Waterfowl Breeding Population and Habitat Survey (WBPHS) conducted annually by the USFWS does include Canada and Montana and provides an index to the breeding population of HLP Canada geese (U.S. Fish and Wildlife Service 2018). Results of this survey show an approximate seven-fold increase in the HLP from the 1970s to the present (Fig. 1). The 2018 WBPHS estimate for HLP geese was 409,200 (343,700–474,800). There was no significant trend in these indices during 2009–2018 ($P = 0.084$) (U.S. Fish and Wildlife Service 2018).

Eastern Colorado is a primary wintering area for HLP Canada geese from throughout their breeding range. As the overall HLP breeding population has grown, the numbers of HLP in Colorado during fall migration, winter, and spring migration has increased. HLP Canada geese present in Colorado during the breeding period primarily spend the fall and

winter in Colorado and New Mexico (Gammonley 2010, Sanders and Dooley 2014, CPW unpublished data).

Figure 1. Estimates of Hi-Line Population Canada geese from the U.S. Fish and Wildlife Service Waterfowl Breeding Population and Habitat Survey in Alberta, Saskatchewan, and Montana (U.S. Fish and Wildlife Service 2018).



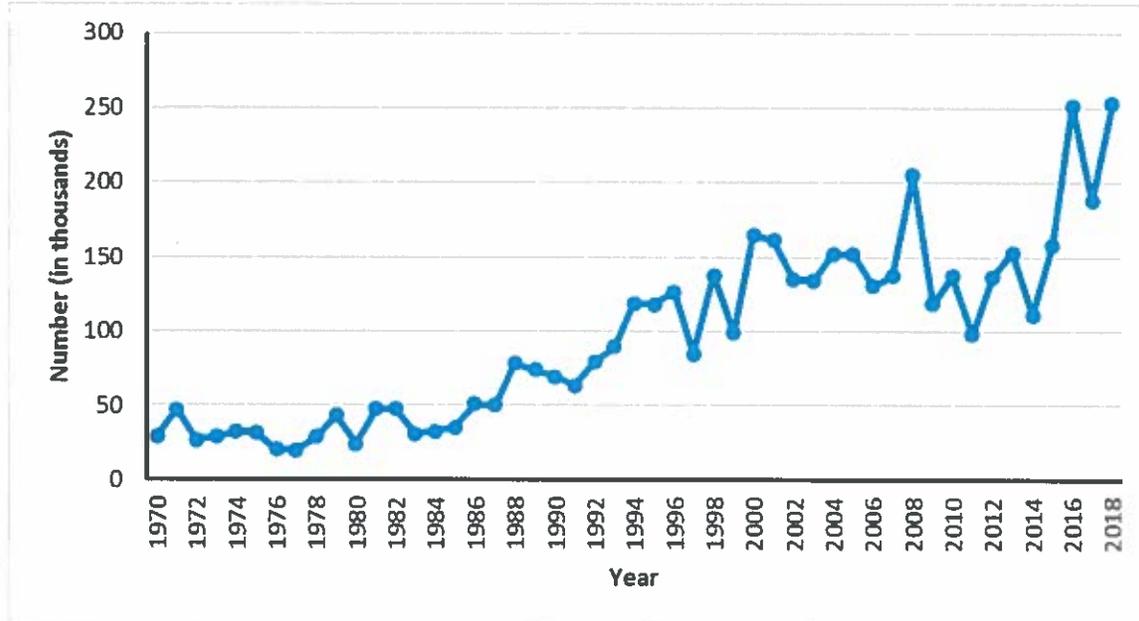
Rocky Mountain Population (RMP)

RMP Canada geese nest in southern Alberta, western Montana, Wyoming, and Colorado, and the intermountain regions of Utah, Idaho, and eastern Nevada (Pacific Flyway Council 2000). This population winters mainly in central and southern California, Arizona, Nevada, Utah, Idaho, Colorado, Wyoming, and Montana. Resident Canada geese that breed in Colorado west of the Continental Divide are part of the RMP. Local concentrations of breeding, nonbreeding, and molting HLP Canada geese occur during the spring and summer in Middle Park (Grand County) and throughout the river valleys of western Colorado.

WBPHS estimates from portions of Alberta and Montana provide an index of the breeding population size of RMP Canada geese (U.S. Fish and Wildlife Service 2018). In 2018, the WBPHS estimate for RMP geese was 252,700 (188,600–316,800). The WBPHS estimates for RMP geese have shown an approximate nine-fold increase from 1970 to the present (Fig. 2), and have increased 8% per year during the past ten years ($P = 0.007$).

Although western Colorado is not a primary wintering area for the overall RMP, the number of Canada geese wintering in western Colorado has increased as the local breeding population and overall numbers of RMP Canada geese have increased. RMP Canada geese present in Colorado during the breeding period primarily spend the fall and winter in Colorado and New Mexico (Sanders and Dooley 2014).

Figure 2. Estimates of Rocky Mountain Population Canada geese from the U.S. Fish and Wildlife Service Waterfowl Breeding Population and Habitat Survey in Alberta and Montana (U.S. Fish and Wildlife Service 2018).



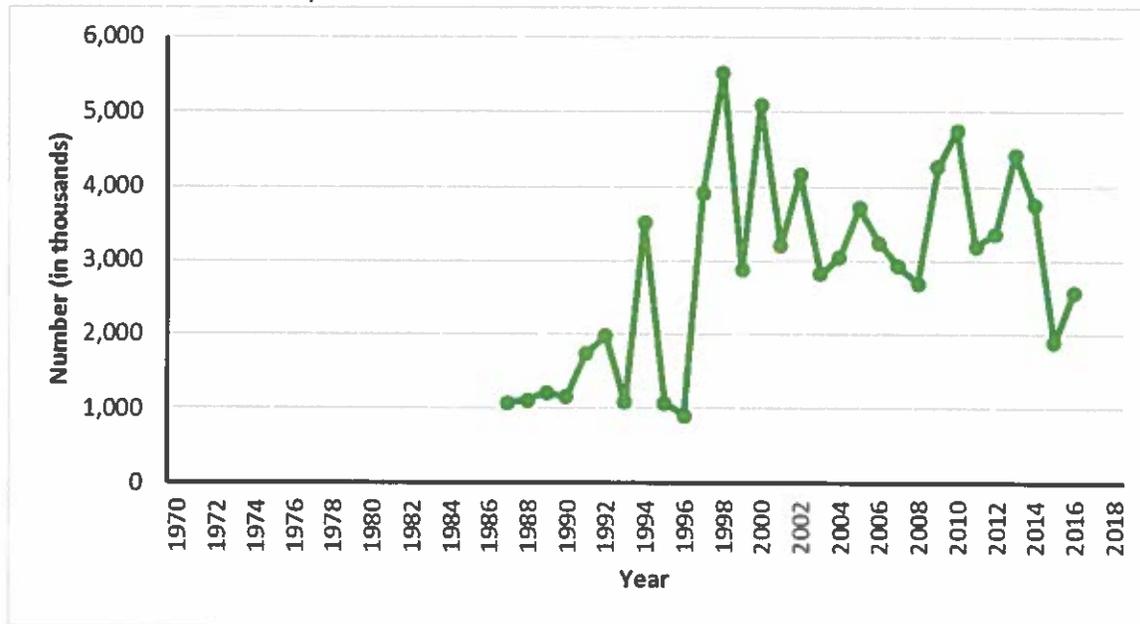
Central Flyway Arctic-Nesting Canada and cackling geese (CFAN)

CFAN geese are comprised primarily of cackling geese that nest north of the tree line in the Canadian arctic, but also includes some portions of smaller subspecies of Canada geese that nest near the tree line. Consequently, CFAN geese are not resident Canada geese as defined by USFWS. CFAN geese were previously managed separately as the Short Grass Prairie and Tall Grass Prairie populations of Canada geese, which are now referred to as West-tier and East-tier CFAN, respectively (Central and Mississippi Flyway Councils 2013). West-tier CFAN nest in Canada on Victoria and Jenny Lind Islands and on the mainland from the Queen Maud Gulf west and south to the Mackenzie River. East-tier CFAN nest on Baffin, 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. West-tier CFAN geese winter in eastern Colorado, northeastern New Mexico, and the Oklahoma and Texas panhandles, and East-tier CFAN winter mainly in Oklahoma, Texas, and northeastern Mexico; considerable overlap in use of wintering areas can occur. Eastern Colorado is a primary wintering and spring migration area for West-tier CFAN geese, where they mix with HLP Canada geese.

Lincoln estimates of the adult cohort of CFAN geese are the primary management indices for this population (U.S. Fish and Wildlife Service 2018). Lincoln estimates are derived from annual estimates of total harvest and harvest rate and represent an indirect measure of abundance. Due to the methodology, Lincoln estimates are typically not available from the most recent years. The 2016 adult Lincoln estimate was 2,562,400 (1,565,400–

3,559,300). The CFAN population increased from the late 1980s to the late 1990s and has since remained relatively stable (Fig. 3), and during the past 10 years, there was no significant trend in these estimates ($P = 0.424$). A portion of the West-tier CFAN breeding range is covered by the WPHS in the Northwest Territories. In 2018, the WPHS estimate was 165,400 (119,500–211,300). There was no significant trend in these estimates from 2009 to 2018 ($P = 0.979$) (U.S. Fish and Wildlife Service 2018).

Figure 3. Estimates of adult Central Flyway Arctic Nesting Canada and cackling geese (U.S. Fish and Wildlife Service 2018).



Establishment of Local Breeding Populations in Colorado

Although historical records are sparse, it is likely that many locally breeding Canada geese in Colorado were eliminated as the state was settled (Szymczak 1975). By the 1950s, locally breeding RMP Canada geese were concentrated in northwestern Colorado along the Yampa, Green, and Little Snake rivers; very low numbers of breeding Canada geese were scattered through eastern Colorado; and a few non-migratory Canada geese resided in the Denver area, which originated from captive decoy flocks liberated in the 1930s (Rutherford 1967, Szymczak 1975). HLP Canada geese migrated through Colorado mainly along the eastern side of the Rocky Mountains between primary wintering and breeding areas, and the primary winter concentration area of CFAN geese in Colorado was located in the lower Arkansas River Valley in southeastern Colorado (Szymczak 1975, Colorado Division of Wildlife 1989).

During the 1950s, many state wildlife agencies across the coterminous United States began efforts to establish or re-establish local breeding populations of Canada geese. After the completion of a statewide habitat suitability study, Canada geese (primarily juveniles translocated during June and July) were first released in the San Luis Valley, North Park, and north-central Front Range foothills areas north of Denver during 1956–1957 (Szymczak 1975). A concerted effort was made in 1957–1967 to build the breeding

population in north central Colorado (Fort Collins area), which would supply stock for transplants into other areas in Colorado east of the Continental Divide beginning in 1967. Geese transplanted from outside Colorado were obtained from other United States breeding populations in the Central Flyway and likely represented 3 races of large Canada geese including western (*B. c. moffitti*), giant (*B. c. maxima*), and interior (*B. c. interior*). Canada geese were translocated to local areas west of the Continental Divide from native stocks in northwest Colorado beginning in 1967. The state completed major efforts to translocate geese to local breeding areas in Colorado in 1974 east of the Continental Divide and 1988 west of the Divide. In the early 1990s, managers translocated geese from the Denver and northern Front Range area to supplement a small local breeding population in Pueblo County. These efforts successfully established local populations of breeding Canada geese throughout the western valleys, the mountain parks, and the Front Range corridor in Colorado.

Current Abundance of Resident Canada Geese in Colorado

There are no statewide, rigorous breeding population surveys of Canada geese conducted by CPW or USFWS in Colorado. To obtain a rough index for contemporary numbers of resident Canada geese in Colorado, we used information from recent banding studies (Table 1). During 2000-2006, CPW conducted a large-scale project to legband resident RMP and HLP Canada geese during the summer wing-molt period at concentration areas in the mountain parks and western valleys of Colorado (Sanders and Dooley 2014). During 2003-2008, CPW conducted a separate project to legband resident Canada geese during the summer wing-molt period at sites along the I-25 Front Range corridor (Gammonley 2010). The population of geese present during the summer banding period includes local breeders, local nonbreeders, molt migrants from surrounding states, and young produced that year. Combining results from these two banding projects, CPW captured about 8,700 geese annually during the period when the studies overlapped

Table 1. Resident Canada geese captured during large-scale banding operations in Colorado (Gammonley 2010, Sanders and Dooley 2014).

Banding area	Years	Geese banded/year	Banded geese recaptured/year	Total geese captured/year
RMP range		1,537	440	1,977
Northwest	2002-2006	84	12	96
West central	2002-2006	958	292	1,250
Southwest	2003-2006	283	68	351
Middle Park	2000-2006	212	68	280
HLP range		4,053	2,678	6,731
North Park	2002-2006	1,195	739	1,934
South Park	2003-2006	719	323	1,042
San Luis Valley	2002-2006	393	292	685
Front Range	2003-2008	1,746	1,324	3,070
Statewide total		5,590	3,118	8,708

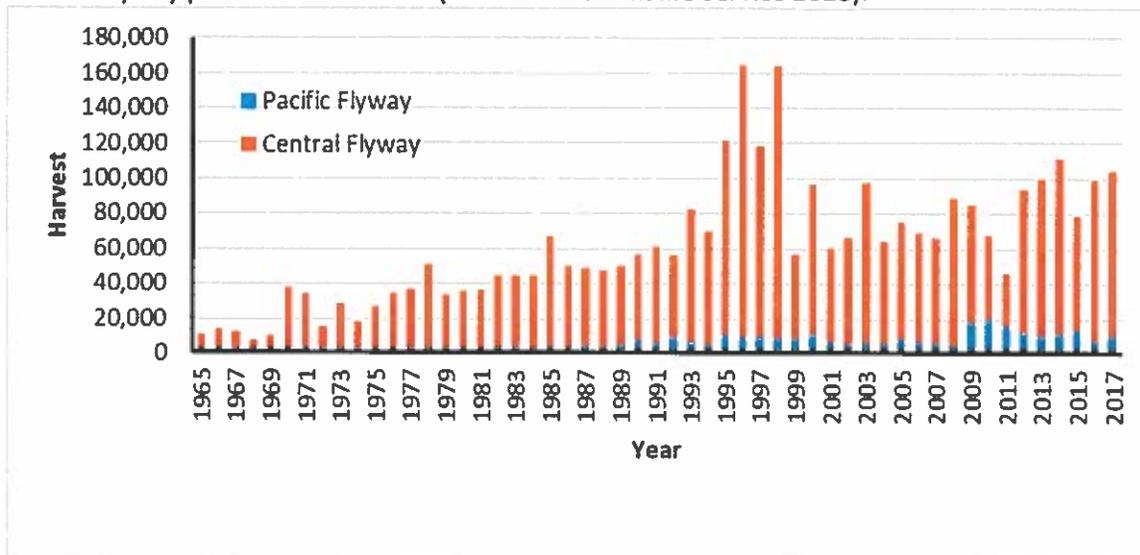
(2003-2006). Although these studies included many of the sites where concentrations of resident Canada geese occur during summer, CPW did not capture every goose at some sites, and did not capture geese at numerous other sites where resident geese occur around the state. We roughly estimate there were 2-3 times as many resident geese in Colorado than CPW captured during these studies, indicating a potential summer statewide population of 17,400-26,100 during the mid-2000s.

Canada Goose Harvest in Colorado

Recreational hunting harvest is the primary method used to manage Canada goose populations in North America. Prior to the 1960s, Canada goose hunting regulations were very restrictive. Hunting was initially prohibited or very restricted in areas where managers were trying to establish local breeding populations (Szymczak et al. 1981). As local resident populations and the overall populations of HLP, RMP, and CFAN geese increased, managers liberalized hunting regulations throughout Colorado. Currently, federal regulation frameworks permit CPW to provide 107-day hunting seasons (the maximum allowed under the Migratory Bird Treaty Act), with daily bag limits of four in the Pacific Flyway and five in the Central Flyway portions of Colorado.

Canada goose harvest in Colorado has increased as local and migrant populations have increased and regulations have become more liberal (Fig. 4). Since the 1990s Canada and cackling goose harvest in Colorado has averaged about 87,000 per year. From 1999-2017, an average of 14,044 hunters in Colorado spent an average of 5.86 days/hunter hunting geese, and the average seasonal harvest was 6.3 geese/hunter (Dubovsky 2018).

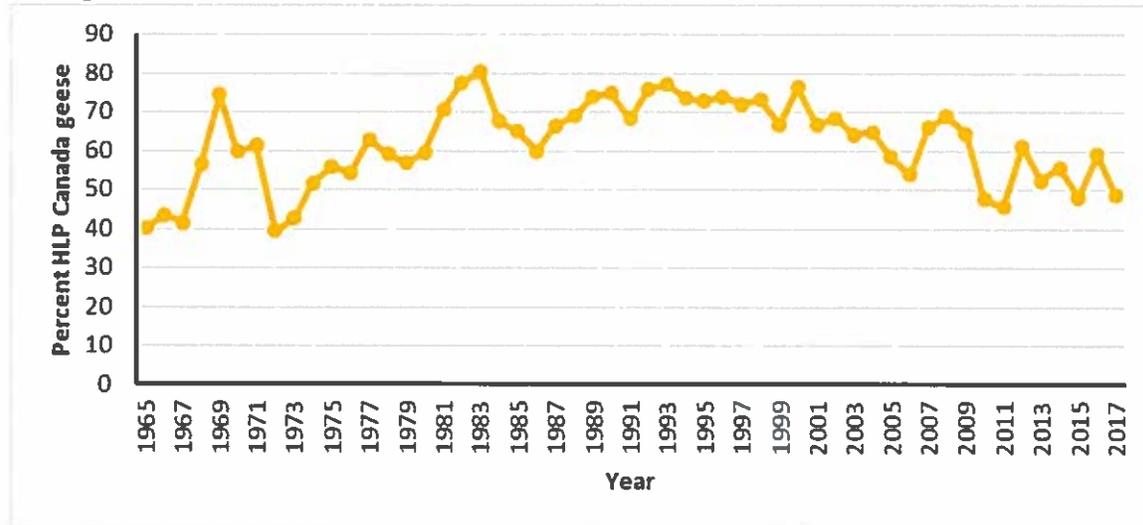
Figure 4. Estimates of annual harvests of Canada and cackling geese in the Pacific Flyway and Central Flyway portions of Colorado (U.S. Fish and Wildlife Service 2018).



In the Central Flyway portion of Colorado the annual Canada goose harvest is a mix of resident HLP Canada geese, HLP geese migrating to Colorado from breeding areas outside Colorado, and CFAN geese migrating to Colorado from their arctic and subarctic

breeding areas. Both the HLP and CFAN populations have increased over time, and the proportion of HLP Canada geese in the total Canada/cackling goose harvest in Central Flyway Colorado has fluctuated around an average of about 60% since the 1960s (Fig. 5).

Figure 5. Annual estimates of the percentage of Canada and cackling geese harvested in the Central Flyway portion of Colorado that are HLP Canada geese (including resident geese), versus CFAN geese.



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