Volume III, Chapter 11
Dusky Canada Goose

TABLE OF CONTENTS

11.0 Dusky Canada Goose *(Branta canadensis occidentalis, Baird)*

11.1 Introduction

The dusky Canada goose (*Branta canadensis occidentalis*) is a distinctive race of medium size (about 6 lbs. [3 kg]) and dark brown plumage that nests on Alaska's Copper River Delta, migrates through southeastern coastal Alaska and coastal British Columbia, and winters primarily in southwestern Washington and western Oregon. The population has been intensively managed since the 1950s with habitat preservation in the form of federal refuge creation and harvest regulations that reduced the harvest of dusky geese. Despite this, the size of the population has fluctuated considerably over the past three decades, with an overall decline since the late 1970s. Events on both the breeding and wintering grounds have affected the status of duskys. In 1964, an earthquake caused their nesting grounds to be uplifted an average of 7-ft (2 m), initiating decades of ongoing dramatically accelerated plant and animal succession and physiographic change. This succession has resulted in significant habitat changes, with associated effects on activities and populations of goose predators, and subsequent detrimental effects on productivity and numbers of geese.

Beginning in the early 1970s and increasing to the present, tens of thousands of Canada geese of several other races began wintering sympatrically with duskys. Only 25,000 Canada geese, the vast majority duskys, wintered in the Willamette Valley in 1973. Over 250,000 Canada geese, less than 10% duskys, winter there today. Harvest management that focuses on subspecies other than duskys became more complex and challenging in the face of this massive build-up of geese, particularly given the duskys' declining productivity and relatively high vulnerability to hunting. Habitat losses are now a critical threat to the long-term viability of the population. Crop depredations by geese that encourage farmers to plant alternative crops and increasing urbanization threaten goose habitat in their wintering areas. State agencies that manage harvest and habitat are under increasing pressure to reduce overall goose numbers while stabilizing or increasing dusky numbers. The dusky Canada goose is highly prized by consumptive as well as non-consumptive users, and revenue is generated by hunting and watchable wildlife activities that contribute to local economies.

11.2 Life History & Habitat Requirements

11.2.1 Life History

11.2.1.1 Diet

Food habits during nesting, brood rearing, and molt are poorly known. Geese were observed feeding on tidal mudflats in early spring and during brood rearing and molt (pers. obs.). They use spring melt pools in horsetail and sedge stands during the early spring melt, and they have been observed feeding on early sedge and horsetail shoots, and unfurled leaves of prostrate willow late in the melt (pers. obs.).

Duskys consumed at least 26 species of 13 families of plants on the eastern Copper River Delta during September and October (Hawkings 1982). Leaves were the most important component by volume overall, but seeds and roots increased in importance as fall advanced.

Although there have been no studies on diet of duskys during winter, it is of common understanding that they rely largely upon agricultural crops (e.g., Clark and Jarvis 1978, Pacific Flyway Council 1998). Federal and state refuge management directed towards providing food crops are likely a good reflection of the favored winter foods of duskys. Crops most commonly provided on federal and state lands, in descending order of acreage, include pasture grasses, moist soil (Fredrickson and Taylor 1982) vegetation, annual ryegrass, perennial ryegrass, fescue, Sudan grass/millet, clover and corn (Pacific Flyway Council 1998).

11.2.1.2 Reproduction

Arrival

The first dusky Canada geese arriving in spring on the Copper River Delta, Alaska are frequently observed in March (Isleib pers. comm.; Campbell and Rothe 1985; Crouse *et al*. 1996). Major influxes occur some time later, apparently depending upon weather conditions and the state of spring snowmelt. Records of major arrival dates range from 9 April (Campbell and Rothe 1986, Crouse *et al.* 1996) to 18-25 April (Bromley and Jarvis 1993).

Nest Initiation

Peak nest initiation (laying) dates have varied annually from 29 April - 5 May 1992 (Campbell 1992a) to early June, 1972 (Timm 1972, and Timm and Havens 1973). On the east Copper River Delta, initiation dates in 1978 and 1979 ranged from 6-31 May, with a peak from 6-11 May (Mickelson *et al.* 1980). Re-nesting occurs, especially in years of high early nest loss, causing the period of nest initiation to be much longer than for first nests, and in some years resulting in a bimodal distribution of initiation dates (e.g. Campbell *et al.* 1987, Grand *et al.* 1998). Duration of the initiation period was 30 and 39 days in 1974 and 1975 respectively (Bromley 1976) and averaged 38 days, with a maximum of 50 days from 1993-1995 (Crouse *et al.* 1996).

Incubation

Trainer (1959) determined a mean incubation period, i.e. "the number of days between the laying of the last egg and the hatching of the last egg," of 30.2 days (n=36, range=28-33 days). However, Bromley (1976), defining incubation as the period from the day after the last egg was laid to hatch of the first egg, found a mean of 27.4 days (n=21, range=25-31 days). Possibly the chilling effect of tidal flooding (Trainer 1959, Hansen 1961) slowed embryo development (e.g., Drent 1973, Bromley 1984) and led to a longer incubation period.

Constancy of incubation for successful dusky females was 89.5%, with twice the amount of recess time during the last third compared to the first two thirds of incubation (Bromley 1984). This pattern reflected changes in body weight, where steep declines were observed for the first two thirds of incubation, and no change thereafter, indicating a switch in emphasis from dependence on endogenous reserves to a much greater reliance on environmental food resources during the last phase of incubation. Constancy of incubation and recess frequency steadily declined during the first 13 days of incubation for unsuccessful nesting geese, while no change was detected during this period for successful nesters (Bromley 1984).

Hatch

Olson (1953,1954b) estimated peak hatch dates of 20-25 June 1953 and 22-27 June 1954 based on brood ages. Other peak hatch dates were about 1 July 1971, and 12-18 June, 1974 and 17-23 June 1975 (Bromley 1976). Crouse *et al.* (1996), for the years 1993-1995, noted earliest hatch dates of 4 June in 1994 and 1995, and 13 June 1993, with median hatch dates of 27 June 1993 and 17 June 1995.

Eggs

Eggs of dusky Canada geese on the Copper River Delta average about 2 in (56 mm) wide by 3 in (82 mm) long with a fresh egg mass of about 0.3 lbs (140-144 g) (Bromley and Jarvis 1993, Crouse *et al.* 1996). They are laid at the rate of one per day (Bromley 1976).

Mean annual clutch size has ranged from a low of 3.6 in 1971 to a high of 5.8 in 1965, with individual clutches of 2-8 eggs. Typically, low mean clutch size is observed in phenologically late springs (e.g. 1964, 1971, 1972) and high mean clutch size occurs in early springs (e.g., 1959, 1979).

Fledge

By 5 August 1953, about on- third to one-half of young observed could fly, whereas one quarter of the young were capable of flight on 5 August 1954 (Olson 1954b). An estimated one-half to three-quarters could fly by 12 August that year (Olson 1954a). Trainer (1959) estimated that 5% of goslings were still flightless on 19 August 1959, and Bromley (1976) noted a few flightless young as late as the second week of September.

11.2.1.3 Nesting

Nest Densities

Shepherd *et al.* (1967) established 15 random 24,000 yd^2 (2 ha) plots, in which they located 13 nests in 1966 (0.4/ha). Seven of these 15 plots hosted 27 nests (1.9/ha) in 1970 (McKnight 1971) and 20 nests (1.4/ha) in 1972 (Timm and Havens 1973). In an area overlapping part of Trainer's study area, Bromley (1976) found a density of 0.8 nest/ha in 1975. Bromley (1976) in 20 random plots of 2 ha found a mean density of 0.6 nests/ha in 1974, and in larger non-random plots spanning low, medium and high density strata found densities of 0.3 to 1.3 nests/ha in 1975. Studies in the late 1960s through the 1970s reflected continually increasing densities of nests on the Copper River Delta.

Crouse *et al.* (1996), based on random plots within a 82 $miles^2$ (212 km^2) extensive study area, found average nest densities of 22.0 +4.3/km^2 (0.2/ha) from 1993 through 1995. In 1998, Youkey *et al.* (1998), in a repeat of this study, found 17.2 nests/km (0.17 nests/ha - uncorrected for detection rates and late-initiated nests) during the early search (i.e. probable re-nests found later not included). Youkey also examined nest detection rates by next-day repeat searches of

plots with independent field personnel, and derived a detection rate of 83.2%+0.4% (95% CI) for nests on plots. Thus, a corrected mean density would be about 0.21 nests/ha. In an area overlapping with Trainer (1959) and Bromley (1976), Grand and Anthony (1998) found 412 nests in 13.5 km^2 (0.31/ha) within the high-density stratum in 1997. Based on these studies, nest densities apparently peaked in 1978, and declined thereafter to levels similar to those measured during the 1950s.

Renesting

Investigators have long suspected that re-nesting occurred, based on different ages of broods and observation of young broods late in the season (Olson 1953, 1954a), and based on patterns of nest initiation dates (Bromley 1976, Campbell *et al.* 1987, 1988; Campbell and Rothe 1989, Grand *et al*. 1998). Evidence became stronger with records of several second nests in the same bowls as those of earlier nests that had been destroyed (Campbell and Rothe 1989), and finally with the collection of 5 females in 1997 from relatively late-initiated nests, for which examination of ovarian condition provided certainty that at least 4 of the 5 were re- nesting (Grand and Anthony 1997). Grand *et al.* (1998) have attempted to model the extent of renesting based on nesting data during 1997 and 1998.

Nest Success

Although Mayfield-type nest success (Mayfield 1975) was not calculated until 1997 (Grand *et al*. 1998), at least until recent times even destroyed nests were easily detected, and were included in the apparent nest success estimates to alleviate the inherent bias in apparent nest success estimates. Clearly, nest success was much higher during the 1950s through the early 1970s than it has been since, and thus an overall declining trend is reflected. Note that in several years, nest success estimates are minimums, because late-initiated nests that typically are more successful than early-initiated nests were not followed to completion. Nevertheless, because nest success has been so low, net productivity of adults has declined over time.

The high degree of re-nesting in the 1980s and 1990s (Campbell *et al.* 1987, 1988; Campbell and Rothe 1989; Crouse 1995; Grand and Anthony 1997, Grand *et al.* 1998) may have mitigated, to some degree, the lowered success of individual females, particularly because nest success was higher in late-initiated nests compared to earlier ones in some years. Bromley (1976) and Bromley *et al.* (1995) found that most nest depredation on Canada geese occurs during the early stages of nesting. Although relatively low in absolute numbers, re-nests and late-initiated nests have higher success than do early nests.

11.2.1.4 Migration

Dusky Canada geese migrate along the Pacific coast of Alaska, British Columbia, and Washington. Based on collar observations, the islands in eastern Prince William Sound, Prince of Wales Island in southeast Alaska, and the Queen Charlotte Islands of British Columbia are important fall staging areas; although little is known about the habitats that dusky geese use in these areas or the length of time they use these areas in the fall or spring.

Fall

Relatively little is known about the distribution of duskys during migration. Hansen (1962) suggested that they migrate offshore, seldom stopping during the fall migration to wintering areas. Some areas used by geese during fall migration as determined from band returns include the southwest coast of Prince of Wales Island, Alaska; Graham Island, British Columbia: the northern tip of Vancouver Island, British Columbia; the west central coast of Vancouver

Island; and the southern interior of British Columbia (Hansen 1960). It is also clear that duskys use the Queen Charlotte Islands, British Columbia. Subsequent to their departure from Vancouver Island, or for those birds passing that point, the geese fly to Gray's Harbor and Willapa Bay, Washington (Chapman *et al.* 1969). Dawson (1909) reported that *occidentalis* migrate through, but were not a common winter resident in Puget Sound, Washington. From the southwest Washington coast, the majority of the population moves up the Columbia River to the mouth of the Willamette River where most turn south until settling in the central Willamette Valley, Oregon (Chapman *et al*. 1969).

Spring

Information is even more scant for the distribution of duskys during spring migration. Numbers briefly build on Sauvie Island, Oregon in the Lower Columbia River valley as the migration begins, and a subsequent surge in numbers is observed at Willapa Bay, Washington. A brief increase in numbers is again noted at the Queen Charlotte Islands, British Columbia. Large flocks have been observed in the Yakutat Bay, southeastern Alaska in spring (Gabrielson and Lincoln 1959, Petersen *et al.* 1981. Mickelson *et al.* (1980) and Hawkins (1982) found that most duskys migrated through the Copper River Delta without stopping during spring. Crouse (1994) surveyed the Copper and Bering river deltas weekly from 1 April through 1 May. Few geese were observed on 1 April, and numbers peaked on 23 April. Important use areas included Okalee Spit on 1 and 8 April, and coastal areas between the Edward and Bering rivers during the 16 April surveys. While geese were present on the Copper River Delta during surveys on 8 and 16 April, a large movement onto the area was noticed on the 23 April survey (Crouse 1994).

11.2.1.5 Mortality

Hansen (1962) was the first to estimate mortality rates of duskys. Using the composite dynamic method, he estimated the average annual mortality rate was 28.9% for adults, and 56.9% for juveniles for the period 1952-1960. Similarly, Chapman *et al*. (1969) analyzed data for 1952-1965, yielding average annual mortality rate estimates of 34.6%, 37.7% and 57.4% for adults, yearlings and juveniles, respectively. In recognition that the composite dynamic method can yield underestimates of survival rates (Seber 1972), Sheaffer (199321) re-analyzed and estimated survival rates for several periods during 1953 through 1990 for normal, leg-banded-only duskys, determining average annual adult survival rates of 65.8-77.2% and immature rates of 30.7-42.5%. Both Chapman *et al*. (1969) and Sheaffer (1993) also noted that adult survival rates increased over time in tandem with incremental restrictions in harvest regulations. Sheaffer (1993) also examined survival estimates based on resightings of marked birds for the period 1983-1990, and calculated mean annual adult survival rates of 78.8%. They were not significantly different from the rates estimated on the basis of band recoveries for the same period.

Following population modeling to simulate what was known of the dusky population from the early 1950s through 1989, Chapman *et al*. (1969) and Sheaffer (1993) concluded that large harvests were supportable by the population during the 1960s because the average recruitment rate was high. Subsequently, as recruitment rates declined during the 1980s, the population could not continue to increase despite modest increases in adult survival rates (Sheaffer 1993). Ultimately, very low rates of recruitment accompanied by moderate adult survival rates resulted in population decline. That is, as recruitment rates declined, population size became relatively more sensitive to small changes in adult survival. As severe restrictions were placed on hunting during the mid- to late-l980s, adult survival increased, leading to an apparent end to the decline.

Campbell and Griese (1987) estimated that over 85% of duskys were of breeding age, with 70% in the category of prime breeders aged 6-14 years. Longevity was subsequently noted to be at least 19 years of age, with evidence of breeding at 17 years of age (Campbell 1991b). Sheaffer (1993) concluded that the chances for the population to increase were favorable if recruitment and survival rates remained at or above levels typical of the late 1980s and early 1990s, noting also that the population would have a higher chance of increasing with greater variation in recruitment rates.

11.2.2 Habitat Requirements

11.2.2.1 Breeding Habitat

Almost the entire population of the dusky Canada goose nests on the Copper River Delta in south-central Alaska. Dramatically accelerated successional changes have occurred as a result of the uplift by the earthquake. By 1975, 23% of nests were in low shrub habitat (Eromley 1976), and an average of 46% were in low and tall shrub habitat by 1986 (Campbell 1990). Geese did not stop using sedge meadow and grass-forb nesting habitat even with the prolific colonization of those habitats by low and even tall shrubs.

During the late 1980s, beavers colonized the nesting area in great abundance, causing much of the area to be flooded (Campbell *et al*. 1988, Campbell and Rothe 1989, Campbell 1992b). Although this caused some nests to be flooded, an apparent decrease in large mammalian predators also may have resulted (Campbell *et al*. 1988, Campbell 1992). In recent years, no nests have been lost to flooding (Crouse *et al*. 1995).

Both Crouse *et al*. (1996) and Bromley (1976) concluded that geese preferred low shrub cover at nest sites: Eromley (1976) suggested that the geese may select for good visibility from nests and ease of escape if attacked. Campbell (1990) and Crouse *et al*. (1996) found that for 1982-86 and 1993-95, nests in all community types were equally susceptible to depredation.

11.2.2.2 Migration Habitat

Little is known of migration habitat for duskys. Hansen (1962) suggested that geese migrate offshore, stopping occasionally at the few accessible places en route. During early September to mid-October staging on the eastern Copper River Delta, geese use first salt marsh habitat, then freshwater meadow habitat (Hawkings 1982, Crouse 1994). Riverine habitats were more important than estuarine habitats. Bromley and Jarvis (1993) concluded that about half the energy costs of spring migration were derived from lipid reserves, with the remainder met through acquisition of food enroute.

11.2.2.3 Wintering Habitat

The lower Columbia River and the Willamette Valley provide ideal habitat for wintering Canada geese (Chapman *et al.* 1969, Cornely *et al*. 1985). Common agricultural practices, including dairy farming and production of ryegrass seed (Kimerling and Jackson 1985), yield high quality forage with high protein content (Riewe and Mondart 1985, and reviewed in Jarvis and Bromley 1998). Land acquisition for William L. Finley National Wildlife Refuge, Baskett Slough National Wildlife Refuge, and Ankeny National Wildlife Refuge were established in the 1960s and Ridgefield National Wildlife Refuge on the lower Columbia River was acquired in 1965 (Pacific Flyway Council 1998). Their mandate is to provide wintering habitat for dusky Canada geese. The Shillapoo and Vancouver Lake State Wildlife Areas in southwest Washington provide additional habitat. WDFW has expanded these areas through acquisitions.

Duskys tend to concentrate in and near federal and state wildlife refuges in the Willamette Valley, Oregon and the lower Columbia River in Washington and Oregon (Simpson and Jarvis 1979, Havel and Jarvis 1988, Lowe 1987 and Lowe pers. comm.). The largest proportion of wintering dusky Canada goose flocks consistently occur on and in association with William L. Finley National Wildlife Refuge, the southern-most of the valley refuges (Simpson and Jarvis 1979). Although there are seasonal differences related to the temporal proximity of spring and fall migration, the proportions of duskys are consecutively smaller at Sauvie Island, Ridgefield National Wildlife Refuge, and Willapa Bay National Wildlife Refuge (Havel and Jarvis 1988, Atkinson 1992).

Crop depredation has become a serious matter in the recent past. Landowners in Oregon and Washington have become unwilling to tolerate thousands of geese and the damage they cause to crops. A group of landowners, agency personnel, and others formed the Canada Goose Agricultural Depredation Working Group and developed a management plan to deal with increasing goose numbers and impacts on habitats (Pacific Flyway Council 1998). The plan outlines strategies to reduce Canada goose numbers, protect the dusky subspecies, improve goose habitat on public lands, outline critical habitats for acquisition, and quantify the dollar value of the crop losses among others. The future of goose wintering habitat and adequate dietary intake for geese is critical to future populations.

11.3 Population & Distribution

11.3.1 Historic

11.3.1.1 Population

The dusky population has been estimated annually in Washington and Oregon since 1953 (Hansen 1962), and has fluctuated from lows during the mid-1950s to highs during the late 1970s, and back to lows during the 1990s.

Kebbe (1958) reported winter inventories of duskys in western Oregon for 1947-58 (1962). Based on calculations of numbers of geese produced and harvested from studies by Olson (1953, 1954) and Trainer (1959) and compared with wintering ground studies (Kebbe in Hansen 1962), Hansen (1962, 1968) concluded that the best estimates of dusky numbers were the mid-winter aerial survey counts conducted in Oregon. However, he noted that counts did not include Washington and British Columbia, so he recommended adding 2,000 birds to annual estimates to account for this gap. Thus, total population estimates from 1953-60 ranged from 7,080 to 16,450 birds.

11.3.1.2 Distribution

Breeding Range

Early investigators considered all large dark Canada geese breeding along the Pacific coast, i.e. from Prince William Sound south to the Queen Charlotte Islands, British Columbia, to be occidentalis. Gabrielson and Lincoln (1959) considered the breeding range of duskys to include the region of Prince William Sound and Cook Inlet and inland through the Copper River drainage. They also noted that numerous flocks occurred in Yakutat Bay in spring.

Based on extensive aerial survey experience, Hansen (1962:303) delineated the breeding range of duskys, which extended “along the coast from the vicinity of the Bering Glacier on the southeast to Cook Inlet on the west, a distance of about 275 miles” (440 km). He noted that only small numbers occurred in Prince William Sound and the lower Susitna River, Cook Inlet, and

even fewer near the confluence of the Bremner River with the Copper River. Hansen clearly defined two zones essentially devoid of breeding Canada geese because of habitat differences that helped to isolate and define dusky from Vancouver range and from Taverner's (or lessers) range.

Wintering Range

Baird *et al.* (1884) reported that *occidentalis* occurred south to California. Dawson (1909) noted that *occidentalis* migrated through the Washington coast area but was not a common resident in Puget Sound. Brooks (1917, 1923) reported large dark geese in interior British Columbia and on the coast. Jewett (1953) reported observations and harvest of duskys throughout the Willamette Valley and Sauvie Island from 1931-52. In *The Birds of Washington State*, Jewett *et al.* (1953) reported observations restricted to the coastal fringe, but concluded that the race was probably much more common than present information indicated. Finally, Hansen (1962) compiled an extensive set of information based on 1,129 recoveries of 3,943 duskys banded on the Copper River Delta, and on 164 recoveries of 3,593 Vancouvers banded in the vicinity of Glacier Bay, to demonstrate 1) that to a great extent, their ranges were discrete, and 2) that duskys wintered primarily in the Willamette Valley, Oregon.

11.3.2 Current

11.3.2.1 Population

As of January 2003, the total population size of dusky Canada geese is an estimated 16,724 (Table 11-1). The population estimate was obtained by multiplying the estimated number of neck-banded dusky geese by the ratio of unmarked to marked geese. The indirect estimate for 2002-03 of 16,724 dusky Canada geese was similar to the estimates from the previous two years (17,191 and 17,346, respectively) (Table 11-1). Duskys continue to maintain the increase in numbers since the previous low estimate in 1998-99. However, the winter indirect estimate has not followed increases exhibited by spring/summer surveys over the past few years (Drut and Trost 2003).

Table 11-1. Estimated total population size of dusky Canada goose, 1986- 2003 (Drut and Trost 2003).

Estimated number of neck-banded dusky geese (SE)	# unmarked # marked (SE)	Estimated total population of dusky geese (SE)		
778.76 (50.78)	21.47 (1.93)	16,724 (1,856)		
Year	Winter [a] Indirect Estimate (SE)	Breeding bird index	Spring/summer[b] Total goose index	%Young
1986-87	—	2,418	4,946	10.7
1987-88	—	2,121	4,528	9.8
1988-89	—	2,182	4,194	22.8
1989-90	12,438 (997)[c]	2,208	5,896	8.6
1990-91	19,768 (2,001)[c]	2,259	4,591	23.5
1991-92	17,996 (1,580)[c]	1,367	2,985	21.5
1992-93	—	2,250	5,637	21.3
1993-94	—	2,015	5,618	5.9
1994-95	7,948 (2,292)[d]	2,092	5,129	7.0
1995-96	18,175 (5,880)	1,668	3,199	3.9
1996-97	11,198 (1,711)	1,520	2,919	21.6
1997-98	21,280 (3,642)	1,759	3,587	10.8
1998-99	13,447 (1,679)	1,830	4,519	11.9
1999-2000	15,459 (2,459)	1,569	2,809	14.7
2000-01	17,346 (2,719)	1,276	2,343	22.7
2001-02	17,191 (2,820)	1,451	2,754	25.4
2002-03	16,724 (1,856)	1,599	3,444	30.5

[a] Survey conducted winter of 2nd year in series (i.e., 1987 for 1986/1987); [b] Survey conducted spring/summer of 1st year in series (i.e., 1986 for 1986/1987); [c] From Scheaffer 1993; [d] Survey conducted mid-March 1995; may have resulted in low estimate because of onset of migration. All other surveys conducted mid-winter.

11.3.2.2 Distribution

Breeding Distribution

The primary nesting range of *occidentalis* remains the Copper River Delta (Figure 11-1).

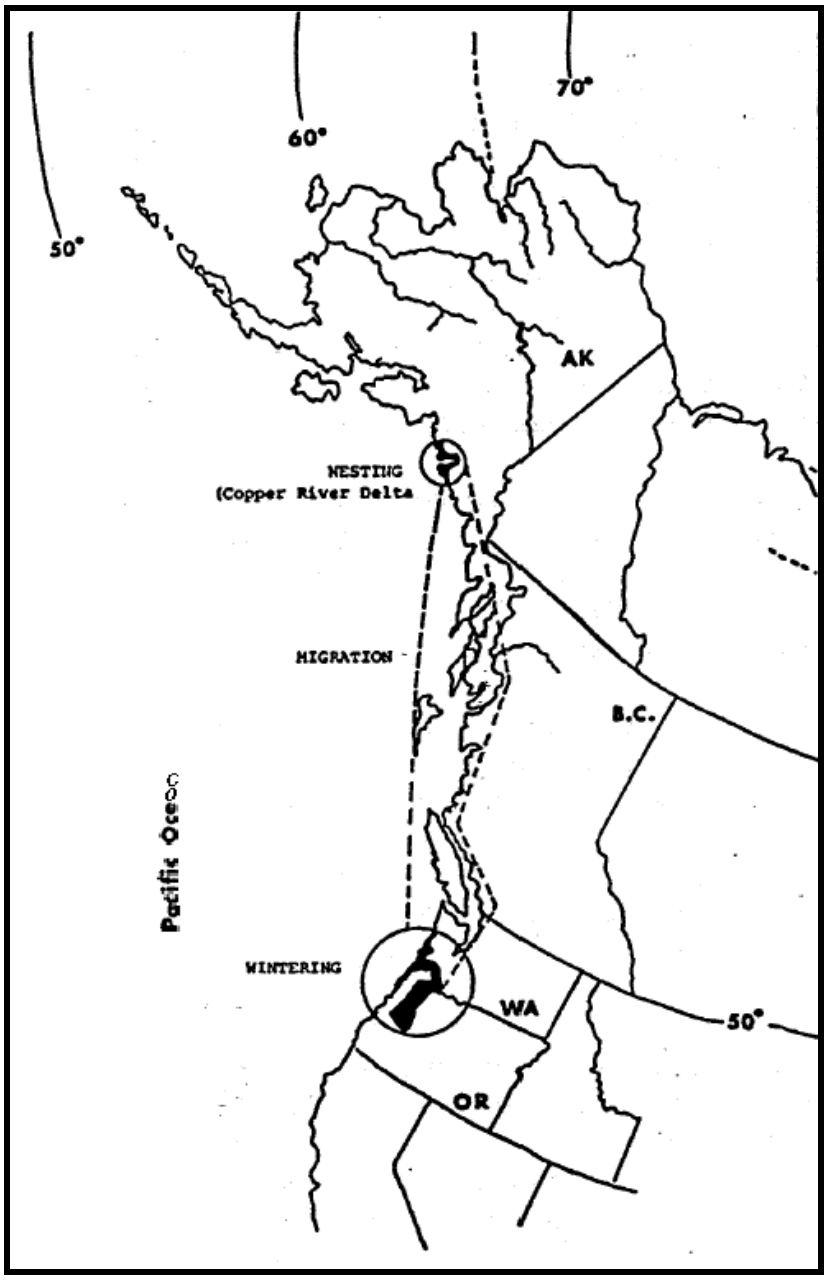

Figure 11-1. Primary range of dusky Canada geese (Pacific Flyway Council 1997)

Transplant to Willapa Bay, Washington

In accord with a previous USFWS policy to establish breeding Canada goose flocks, 41 dusky goslings were transplanted from the Copper River Delta to the Willapa National Wildlife Refuge in July 1958; 38 survived to 1961 when successful nesting began. This flock was free-flying by 1967 and was 407 birds in 1977 (Welch 1978). Refuge personnel now distinguish between migrant duskys and resident duskys and dusky hybrids (Atkinson 1987). About 120-175 resident birds are still associated with the refuge.

Wintering Range

In recent years, duskys have used Willapa Bay and Willapa National Wildlife Refuge, the lower Columbia River floodplain, the Woodland Bottoms, Vancouver Lowlands, and Ridgefield

National Wildlife Refuge in Washington (Figure 11-2). A high proportion of the population resides in the Willamette Valley and along the Columbia River from Portland to Astoria.

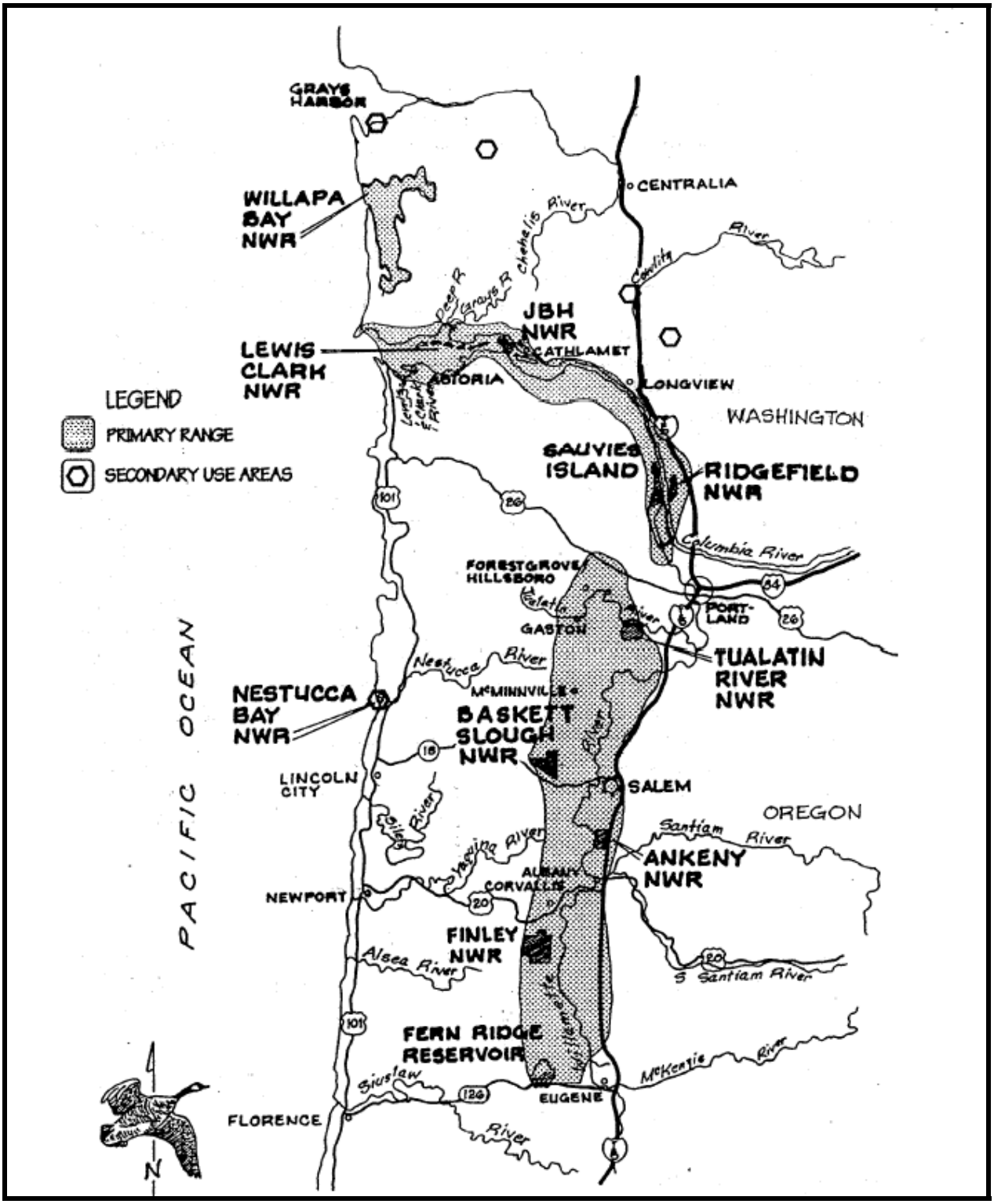

Figure 11-2. Winter distribution of dusky Canada geese (PFC 1997).

Cornely *et al*. (1998) identified 11 Washington and Oregon core areas used by wintering duskys in the mid-1980s.

11.4 Status & Abundance Trends

11.4.1 Status

The dusky Canada goose is classed as a migratory bird by federal regulation and a game bird by Washington rule. The Pacific Flyway and Washington Fish and Wildlife Commission regulate harvest.

11.4.2 Trends

Mid-winter indices from 1947 to the present indicate an increasing population to the mid-1970s (Figure 11-3). Jarvis and Cornely (1988), based on 3-year moving averages of mid-winter counts, concluded that the dusky population declined 8.3% per year from 1975-84, with most decline occurring since 1979. This decline continued through 1990, with widely fluctuating population estimates since that time (Pacific Flyway Council 1997, Drut *et al*. 1998).

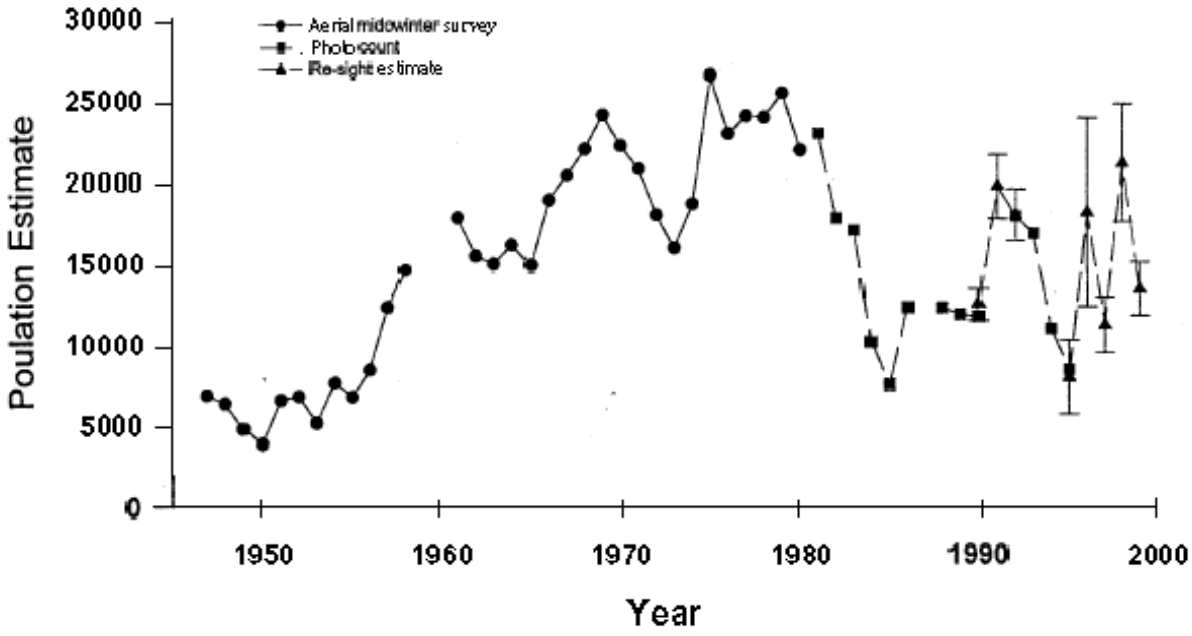

Figure 11-3. Winter population estimates of dusky Canada geese in Oregon and Washington, 1947-1999 (Bromley and Rothe 1999).

Similar to mid-winter indices, breeding ground surveys (Figure 11-4) from 1978–90 reflected a 50% linear decline over the 12-year period (Conant and Dau 1990), with a further decline in 1991 (Butler 1991). In an independent analysis considering both breeding population estimates and annual estimates of young produced, Stehn (1992) confirmed an average annual rate of population decrease from 1978-91 of 7-8% per year. However, the population rebounded in 1992 to a level similar to 1984 (Butler 1992, Conant and Dau 1990). In recent years, lower indices during 1995 and 1996 were offset by modestly higher indices during 1997 and 1998 (Eldridge *et al.* 1998). Assuming the early breeding ground surveys were equivalent to the current operational survey, a significant population decline occurred from 1978-85; however, the population has fluctuated around the level measured in the mid-1980s since then, without evidence of a further net decline.

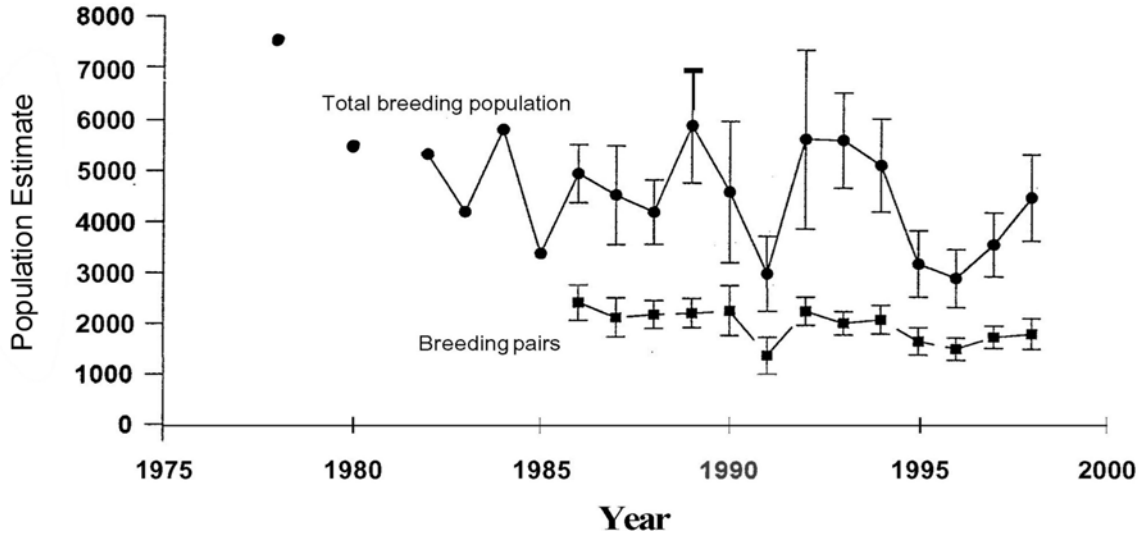

Figure 11-4. Breeding population estimates of dusky Canada geese on the Copper River Delta, Alaska, 1974-98 (Bromley and Rothe 1999).

11.4.3 Productivity

Productivity of duskys on the Copper River Delta has changed over the nearly three decades of study. During 1979, productivity dropped to a low level, and though moderate levels of production have occasionally occurred, years with peak production documented during the 1970s have not recurred. Over the long term, assuming no change in estimates caused by variation in methodology, production declined from the 1970s to the 1980s, with little or no change during the 1990s. Sheaffer (1993) assumed 80% of 2-year olds nested with nest success of 30% compared to 40% for 2- to 3-year old geese. These levels of nest success have only been realized in two of the past ten years.

11.4.4 Environmental Conditions

11.4.4.1 Habitat Distribution

Almost the entire population of dusky Canada geese nests on the Copper River Delta in south central Alaska. This has always been the case.

Dusky geese have always shown a high affinity for the Lower Columbia and Willamette Valley for wintering, finding winter forage in agricultural fields and wetland marshes. In recent years, duskys have consistently used Willapa Bay and Willapa National Wildlife Refuge, the lower Columbia River floodplain, the Woodland Bottoms, Vancouver Lowlands, and Ridgefield National Wildlife Refuge in Washington (Figure 11-2). A high proportion of the winter habitat is still found in the Willamette Valley of Oregon and along the Columbia River from Portland to Astoria. Other areas include Chehalis Bay, south Gray's Harbor, Deep River, Wallace, and (to a lesser extent) Silver Lake and La Center, and possibly Port Susan Bay (Krueger 1995).

11.4.4.2 Habitat Status

Breeding

Breeding habitats historically were a mixture of USFS and Alaskan Native Corporations. Today, breeding habitat for the dusky Canada goose is nearly all owned by the USFS and

managed as wildlife management area. Commercial uses are limited by permit and must be compatible with the primary focus of maintaining and enhancing wildlife habitat.

Wintering

Wintering habitats historically were a mixture of private ownerships in commercial operations to provide crop land and recreational uses. The lands were bought and sold with little regard for wildlife use. Today, wintering habitat is a mixture of public and private ownerships. Federal refuges and state wildlife areas protect many areas of high intensity dusky use. Private landowners control substantial portions of goose habitat in the Woodland and Vancouver areas. These private properties are not secure habitat and may be used for crop or industrial development that would be detrimental to the dusky and other goose subspecies.

11.5 Factors Affecting Population Status

11.5.1 Low Productivity on Breeding Grounds

The primary limiting factor for dusky Canada geese is low breeding ground recruitment. The "consensus opinion ... is that population growth is limited by poor recruitment directly related to the 1964 earthquake that significantly altered habitats on the primary breeding grounds." (Pacific Flyway Council. 1997. p. 23). "Continuing poor production [at Copper River Delta] has not only resulted in a population decline but has also lead to an unfavorable age structure...": (60% of population is older than 7 years old). At Copper River Delta "reduced capacity for goose production" has been due to high nest predation, which was less than 6% in 1959, but in the 1990's greater than 60%. Unfortunately, predator management options on the breeding grounds are limited, not cost-effective, or impractical (ibid. pp. 14-16).

The existence of 2 other breeding sites should be noted: 1) Middleton Island, which supports an increasing number of dusky Canada Geese (approximately 2000 currently) with high productivity; and 2) Prince William Sound, which has an unknown number of Dusky Canada Geese whose productivity is also unknown.

11.5.1.1 Breeding Habitat & Recruitment

In the absence of tidal influence on the Copper River Delta since 1984, the area has become less saline, and an accelerated rate of succession by salt-intolerant species has led to invasion of the breeding habitat by shrubs and trees, resulting in primarily closed habitat. Associated with this succession has been the advance onto the nesting grounds of a greater suite of predators, or at least of predators in greater numbers and with greater effectiveness. Greater depredation on eggs, nesting adults, and goslings has caused a gradual decline in goose productivity. Since 1978, years with the peak production that typified the earlier period have been lacking.

Studies of nest success have indicated that rates of depredation are similar in the various types of habitat used by nesting geese; that is, nests in each habitat type are predated in proportion to the number of nests located there (Campbell 1990, Crouse *et al*. 1996). Thus, even though the predatory agents largely responsible for nest loss have varied over time, nests seem to be similarly susceptible to destruction regardless of the habitat type in which they are found.

A current trend of particular interest is the tendency for eagles to establish new nest sites in maturing cottonwood and spruce trees on the nesting grounds of the outer delta (Grand pers. comrn). Given the tendency of adult eagles to remain within 2,000 yd (2 km) of their nest sites during nesting, and a nesting chronology that indicates egg laying in mid- to late April through

early May (Bowman pers. comm.) overlapping with duskys, these efficient predators will become increasingly established and active on the high-density nesting areas of the geese. Their depredation on nesting female geese as well as on goose eggs has the potential to greatly elevate their effect on duskys.

Natural changes continuing on the Copper River Delta will lead to changes in habitat that will affect the types of depredation on nesting geese and their eggs. Colonization of the area by beaver in the mid-1980s caused the creation of many ponds and extensive areas of wet habitat, and thus may have deflected mammalian predators from many dusky nest sites (Campbell *et al*. 1988, Campbell and Rothe 1989). Nevertheless, avian depredation increased concurrent with lower depredation from mammals (Campbell *et al.* 1988), leading to little change in the net rate of nest loss. Undoubtedly some habitat changes will occur on the Copper River Delta that are unpredictable, and will cause similarly unpredictable chains of events that may affect goose productivity.

11.5.1.2 Depredation on Geese & Eggs

Predators of geese and goose eggs on the Copper River Delta during the reproductive season include brown bears, coyotes, wolves, red fox, river otter, mink, bald eagles, northern harriers, short-eared owls, glaucous-winged gulls, herring gulls, mew gulls, parasitic jaegers, ravens, northwestern crows, and possibly magpies. Depredation occurs on nesting adults, eggs, goslings and molting geese, but the known level of intensity varies widely throughout the season in association with the stage of reproduction and vulnerability of the birds. The amount of depredation has increased over the years. During initial studies when adult geese and goslings were being banded in the 1950s, several workers reported the presence of predators. Olson (1953, 1954a) noted the potential for nest depredation was high, because bears could travel along the slough banks and go from nest to nest. However, the effect of predation was apparently minimal (e.g. Elkins 1952). Both Courtright (in Olson 1954a, 1954b) and Trainer (1959) found low rates of nest depredation. Hanson (1962), referring to those studies, noted that there were so few predators after incubation was completed that juvenile mortality was considered negligible.

11.5.1.3 Depredation on Adults

Little depredation of geese is known to occur in early spring. During arrival on the Copper River Delta, flocks of foraging geese are very sensitive to bald eagles that frequently circle overhead, indicating at least the possibility of depredation attempts at that time. As geese disperse, become territorial, begin to lay eggs and become associated with nests, the adults become more susceptible to depredation. Geese may be vulnerable to predators while distracted during territorial disputes, or they may attempt to defend nests from predators, and be killed in the process. Based on remains of adult geese and their nests, bald eagles are a more important predator than previously thought.

Occasional remains of flightless duskys (based on stage of wing molt in carcass remains) have been found at mink and red fox dens (Bromley 1976). Brown bears have been observed from a distance engaging in behavior suspected to be running down and consuming molting geese and their young (Bromley 1976, Timm in Bromley 1976). Trainer (1959) found fresh remains of an adult-sized goose in the stomach of an adult coyote taken near Copper (Alaganik) Slough on the Copper River Delta. Wolves on the Copper River Delta are known to prey upon molting geese on occasion (Stephenson and van Ballenberghe 1995).

11.5.1.4 Depredation on Eggs

Generally not vulnerable when attended by geese (Bromley 1976), unattended eggs are vulnerable to depredation by avian, bear, and canid predators.

From 1987-98, the rates of nest loss to predators have remained high (Campbell and Rothe 1989, 1990; Campbell *et al*. 1992; Crouse et al. 1996, Grand and Anthony 1998, Youkey *et al.* 1998), and have included occasional depredation by wolves (Stephenson and Van Ballenberghe 1995). However, loss to mammalian predators has declined since 1990, perhaps partially in response to widely flooded areas and wetter habitat as a result of beaver activity (Campbell 1992b).

11.5.2 Hunting Mortality

In the mid- to late- 1900's, harvest by waterfowl hunters exceeded recruitment; hunting mortality was unsustainable and the population declined to a low of 7,500 in 1985. Hunting regulations have been restrictive since 1984, and the dusky quota is limited to 200 birds per hunting season. Hunting mortality is now low, and the population has recovered. A recent study found "average annual survival rates ... very high (76-85% ... and current hunting seasons are not adversely affecting population trends" (Pacific Flyway Council 1997, p. 18). Hunting, now strictly regulated, is no longer a factor limiting the population. In fact, the low Dusky population and continuing restrictive regulations for this subspecies are more likely to limit (or complicate) hunting opportunity for other subspecies of Canada Geese, which have increased dramatically in the past 30 years.

A limited harvest of Dusky Canadas occurs during migration in Alaska and British Columbia. In Alaska, bag limits are less restrictive than in Washington, but the beginning of the hunting season is delayed to allow most Duskies to migrate out of the area.

There is good evidence that hunting mortality can be a limiting factor for the dusky population. Duskys are known to be vulnerable to hunting and may be heavily harvested (Hanson 1962, Chapman *et al*. 1969, Jarvis and Cornely 1988). They frequent small fields which provide better access to hunters, they approach fields at lower altitudes with less circling before landing, they feed with smaller numbers of other geese than do other races of Canada geese (Have1 and Jarvis 1988), and they are known to be 2.7 to 3.0 times more vulnerable to hunting than are Taverner’s Canada geese (Simpson and Jarvis 1979, Jarvis and Cornely 1988).

In 1984, hunting restrictions began to give extra protection to duskys. Seasons were delayed in Alaska to allow the departure of duskys before the hunting season, and bag limits and seasons were reduced in both Washington and Oregon (Pacific Flyway Council 1997). In 1985, hunting was limited to a quota of 300 duskys; this was reduced to 200 in 1995, with the Canada goose season to be closed in western Oregon and southwestern Washington when the quota was reached. A quota of 250 is in effect today (Table 11-2). In the recent past, a greater emphasis on hunter education has resulted in the reduction of dusky mortality. Hunters participating in the hunt must complete a home study course and pass an examination to be able to hunt geese in the special hunt areas. Harvest rates on duskys are now very low, less than 5% of the total goose harvest (Figure 11-5). It is unlikely that hunting limits the population.

Table 11-2. Composition and estimated total harvest of Canada geese in western Oregon and southwestern Washington, as determined from reporting station bag check information, 1984-1996 (PFC 1997).

Year	Dusky	Cackler	Taverner	Lesser	Western	Vancouver	Aleutian	Unknown	Total
Oregon									
1984	603	0	641	0	0	0	0	21	*1,265*
1985	157	8	1,156	257	95	2	0	0	*1,675*
1986	134	19	1,157	103	0	0	0	127	*1,540*
1987	118	54	2,524	235	258	3	0	1	*3,193*
1988	142	26	3,067	273	415	3	0	0	*3,926*
1989	79	16	2,563	346	1,623	5	2	0	*4,634*
1990	177	18	2,684	572	1,846	6	0	0	*5,303*
1991	121	42	2,287	378	1,091	9	0	0	*3,928*
1992	147	36	2,294	422	1,333	8	0	0	*4,240*
1993	188	72	2,699	748	1,348	41	0	4	*5,100*
1994	142	1,220	2,669	447	1,415	9	1	8	*5,911*
1995	83	1,758	1,885	462	598	10	1	2	*4,799*
1996	87	2,503	1,773	809	1,110	9	1	0	*6,292*
Washington									
1984	37	0	63	0	20	0	0	0	*120*
1985	66	11	113	116	67	0	0	25	*398*
1986	36	8	172	51	241	0	0	0	*508*
1987	45	7	478	225	224	4	1	34	*1,018*
1988	43	17	617	136	763	0	1	6	*1,583*
1989	52	37	455	92	391	9	0	0	*1,036*
1990	65	28	555	165	383	20	0	3	*1,219*
1991	88	39	675	295	483	14	4	11	*1,609*
1992	91	84	1,340	270	722	25	2	0	*2,534*
1993	90	93	944	299	697	8	3	1	*2,135*
1994	77	422	1,011	246	703	31	3	2	*2,495*
1995	57	320	787	134	516	12	6	1	*1,833*
1996	35	1,018	1,724	222	967	9	0	2	*3,977*

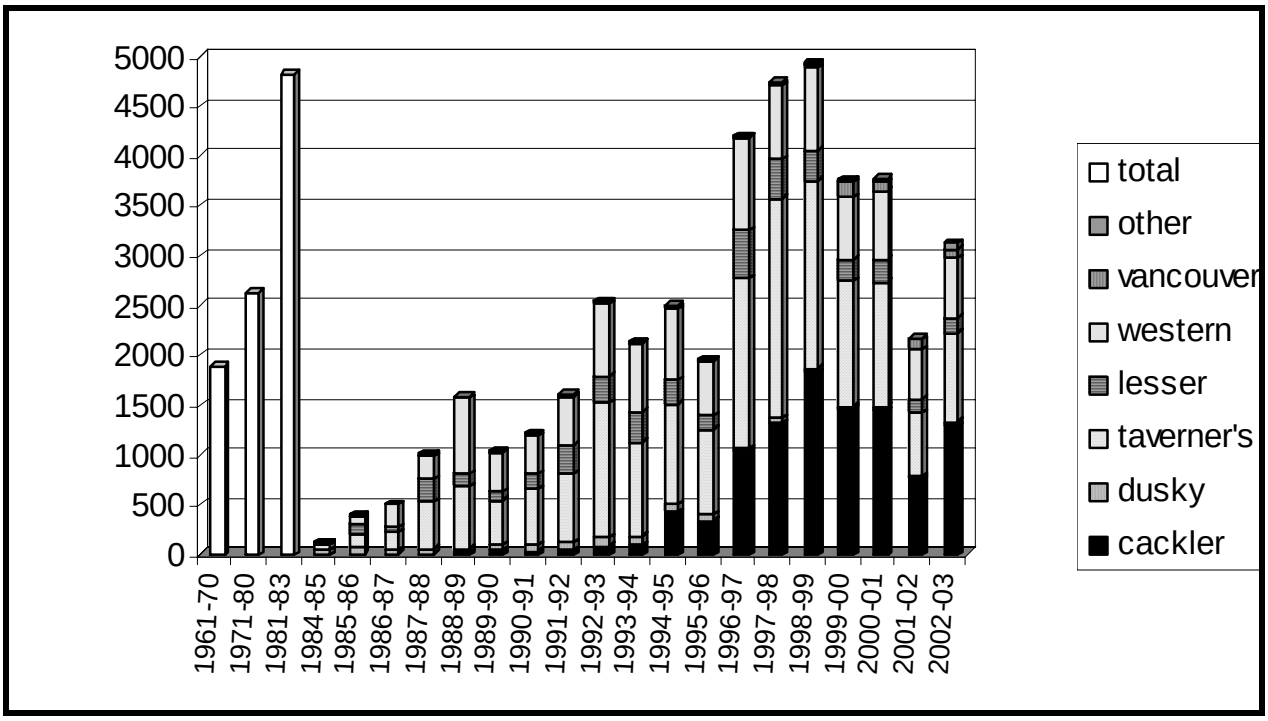

Figure 11-5. Southwest Washington Canada goose harvest summary, showing the geese harvested by year and by species. In recent years, dusky harvest has been a very low proportion of the total.

11.5.3 Wintering Habitat

The Lower Columbia River floodplain is one of only two primary wintering areas (Willamette Valley being the other). Wintering habitat is probably not limiting at present, although uses of private lands are changing. Number of acres of winter habitat under active management in 1998 on these public lands for goose foraging was about 17,458 acres (Pacific Flyway Council 1998). The amount of winter habitat under management has increased somewhat since that time, with additions to the Shillapoo Wildlife Area, Ridgefield Refuge and Clark County conservation holdings. Even with these additions, if populations of dusky geese were to increase significantly, or if private lands now providing forage were converted to other uses, wintering habitat could become a limiting factor.

As an example, conversion of bottomland pastures along the Columbia River to hybrid cottonwood plantations already threatens feeding sites. Bottomland pastures are also being converted for housing and development. Loss of wintering habitat and lack of sanctuary on refuges moves geese to remaining agricultural lands, increasing depredations (Pacific Flyway Council 1997, p. 20). It is not likely that public land now managed for geese can provide the entire amount of winter habitat required.

Prior to the establishment of federal refuges, hunt clubs strongly influenced the distribution and harvest of wintering duskys in Oregon (Hansen 1962, Chapman *et al*. 1969). Chapman *et al*. (1969) report that in the absence of a public refuge program, the harvest could have been much greater had the hunt clubs not provided refuge and regulation of the take. However, by the late 1960s, refuges had assumed this role (Hansen 1968, Chapman *et al*. 1969).

Duskys arrive in the lower Columbia River and Willamette Valley prior to the arrival of the most abundant races, Cackling and Taverner's Canada geese (Jarvis and Bromley 1998, Simpson and Jarvis 1979). The relative abundance of duskys is consistently highest at William L. Finley National Wildlife Refuge, particularly after the hunting season is over. Sheaffer (1993) studied subflock behavior based on 947 individually marked duskys, and concluded that those wintering at the southern and northern extremes of their wintering range had the highest wintering site fidelity. Over 65% of these geese were not observed outside of their respective wintering areas. The marked geese formed 9-10 clusters of 191-206 groups averaging 2.8 birds per group each of the three years of study, and groups had the same affiliations during both harvest and non-harvest periods (Sheaffer 1993).

Duskys typically select smaller fields for feeding than do other sympatric races of wintering Canada geese (Simpson and Jarvis 1979, Havel and Jarvis 1988). Based on research at Sauvie Island, Havel and Jarvis (1988) concluded that duskys are segregated during commuting flights but mixed during feeding, select fields with fewer geese to feed in, and approach lower and circle less prior to landing than do other subspecies. These characteristics result in higher vulnerability of duskys to harvest (Simpson and Jarvis 1979, Havel and Jarvis 1988, Jarvis and Cornely 1988).

Habitat losses in the wintering area are taking place at an alarming rate. Crop depredations have caused many farmers to select crops that geese do not eat and reduce the total winter habitat base. Conversions to berry crops are common in the Woodland Bottoms. Other farmlands have been leased to produce hybrid cottonwood for the pulp industry. Land is being converted to industrial development and housing. Securing adequate dusky habitat in the future will be important to the long-term vitality of the subspecies.

11.5.4 Sanctuary

Recreational use, such as hunting, dog training, bird watching, hiking and jogging, is allowed on some wildlife refuges and management areas. These activities reduce the area's usefulness to dusky Canada geese for foraging and sanctuary. Disturbances on managed wildlife areas also moves geese from public lands to private agricultural lands, where they along with other Canada goose subspecies, may cause depredations and be exposed to hunting pressure.

While there is curently a number of refugia for dusky geese where hunting is not allowed, there is also an increasing recreational pressure on these areas and indeed all areas, which may become a limiting factor in the future. In addition it is not possible to provide a refugium for one subspecies of goose without others using it too, which in the end contributes to the overall increase in wintering goose numbers.

The mixing of subspecies in winter, the scarcity of public hunting opportunities, and hunter confusion between subspecies complicate hunting opportunity to protect Dusky Canada Geese. Protective regulations and quotas to protect dusky Canadas increase the difficulty and expense of managing hunting programs both for this and other Canada Goose populations, and reduce hunting opportunities for the more abundant subspecies.

11.6 Inventory & Assessment of Existing Management Plans

- Pacific Flyway Council. 1988 Guidelines for management of the dusky Canada goose.

The management plan for the Dusky Canada goose was developed by USFWS, ODFW, WDFW, OSU, and Pacific Flyway representatives. This group developed harvest, nest survey, management and research tasks with the goal of improving the declining dusky population. If these tasks are funded, then the population of dusky geese will reach a level where special protection is not needed. Funding has been limited recently and many projects are not being implemented as planned.

- Pacific Flyway Council. 1998. Pacific Flyway management plan for NW Oregon/SW Washington Canada goose agricultural depredation control

This plan is a list of strategies and tasks to reduce the agricultural depredation committed by geese on private property. The plan was developed by WDFW, ODFW, USFWS, APHIS-WS, OSU, and the Oregon and Washington Farm Bureaus. The funding for this plan is inconsistent and recent reductions have caused landowners to potentially suffer more crop damage. Assistance from agencies to landowners has also declined by lack of funding.

- Wildlife Area Plan for Vancouver Shillapoo Lake Wildlife Areas

This plan outlines land management practices that will enhance goose habitat and provide a secure resting area for wintering geese. The plan was written by the Wildlife Area manager for WDFW with involvement of a Citizens Advisory Group and review by other biologists. Funding has limited implementation of all the appropriate land practices that could enhance goose habitat and improve population status.

11.7 Inventory & Assessment of Existing Restoration & Conservation Plans

- Annual Hunting Regulations, WDFW

The WDFW Wildlife Commission has adopted rules that reduce the harvest of dusky geese by implementing a daily and annual quota for dusky harvest. Hunters are also required to pass a home study course before hunting geese in the area where duskys winter. This program has reduced dusky harvest from 25% of all geese harvested to less than 5%. Funding limitations may restrict the number of hunt days or length of season.

- Nest Searches on Copper River Delta, coordinated by USFS

Nest searches are conducted every other year on the Copper River Delta to monitor population trends in the breeding grounds. The effort is coordinated by the USFS at Cordova, Alaska, and assistance is provided by ODFW, WDFW, ADFG, DU and other interested volunteers. Data is used to evaluate harvest quotas and harvest management.

- Banding Operations on dusky Canada geese

Dusky Canada Geese are leg banded and neck collared on a biannual basis. The project is designed to provide data for estimates of the wintering population in Oregon and Washington. The project is coordinated by ADFG and participants include WDFW, USFS, and ODFW. Funding is needed to purchase collars and charter a helicopter to conduct the capture.

11.8 References

Aldrich, J. W. 1946. Speciation in white-cheeked geese. Wilson Bull. 58(2):94-103.

AOU (American Ornithologists' Union). 1910. Checklist of North American birds. 3rd ed. American Ornithologists' Union, New York. 430 pp.

_____, 1957. Checklist of North American birds. 5Ih ed. American Ornithologists' Union, Port City Press. Baltimore, Maryland. 691 pp.

_____. 1983. Checklist of North American birds. 6Ih ed. American Ornithologists' Union, New York. Allen Press, Lawrence, Kansas. 877 pp.

Annear, J. 1976. Letter to D. E. Timm, Alaska Dept. Fish and Game. 21 April. 1 page.

Anonymous. 1986. Summary of observations on dusky Canada geese Willapa Bay, Winter of 1985-1986. Unpubl. rep., Willapa Bay NWR, Ilwaco. Washington, 2 pp.

Anthony, A. W. 1886. Field notes on the birds of Washington County, Oregon. Auk 3:161-172.

Atkinson, J. B. 1987. The distribution and abundance of migrating and wintering Canada geese at Willapa Bay, Washington from September 1987 through April 1988. Unpubl. rep. Willapa NWR, Ilwaco, Washington. 11 pp.

_____. 1988. Distribution and abundance of migrating and wintering Canada geese at Willapa Bay, Washingtin from October 1988 through April 1989. Unpubl. Rep. Willapa NWR, Ilwaco, Washington. 8 pp.

_____. 1989. Distribution and abundance of migrating and wintering Canada geese at Willapa Bay, Washington from October 1988 through April 1989. Unpubl. rep. Willapa NWR, Ilwaco. Washington. 9 pp.

_____. 1990. Distribution and abundance of migrating and wintering Canada geese at Willapa Bay, Washington from October 1989 through April 1990. Unpubl. rep. Willapa NWR, Ilwaco, Washington. 10 pp.

_____. 1992. Distribution and abundance of migrating and wintering Canada geese at Willapa Bay, Washington from October 1991 through April 1992. Unpubl. rep, Willapa NWR, Ilwaco, Washington. 10 pp.

Babler, S., D. Youkey and J. A. Crouse. 1998. Eleven years of artificial nest islands for dusky Canada geese on the Copper River Delta, Alaska. Unpubl. rep., US. Dept. Agriculture, Forest Service. Cordova, Alaska. 36 pp.

Bailey, A. M. 1927. Notes on the birds of southeastern Alaska. Auk 44:l-23, 184-205, 351-367.

Baird, S. F. 1858. Reports of explorations and surveys to ascertain the most practical and economical route for a railroad from the Mississippi River to the Pacific Ocean. Vol. IX., Birds, pgs. 765-766. B. Tucker, printer. Washington, DC 1,005 pp.

_____, T. M. Brewer and R. Ridgeway. 1884. The Waterbirds of North America. Vol. 1, Memoirs of the Mus. Comparative Zool. Harvard College 12:l-537. US Senate Ex. Doc. No. 78.

Banks, R. C. 1992. Memo to Chief, Ofice of Migratory Bird Management on Subspecies of Canada Geese. 16 April.

Bellrose, F. C. 1986. Ducks, Geese and Swans of North America. Stackpole Books, Harrisburg, Pennsylvania. 540 pp.

Bernatowitz, J. A, T. D. Bowman and P. F. Schempf. In Press. Seasonal and regional movements of radio-tagged bald eagles from Prince William sound, Alaska. In Bald eagles in Alaska, B. Wright and P. Schempf, eds. Am . Bald Eagle Institute. Juneau, Alaska.

_____, P. F. Schempf and T. D. Bowman. 1996. Bald eagle productivity in south-central Alaska in 1989 and 1990 after the Exxon Valdez oil spill. Amer. Fish. SOC. Symp. 18:785-797.

Boggs, K. In Press. Classification of community types, successional sequences and landscapes of the Copper River Delta, Alaska. Tech. Rept. US Dept. Agriculture, Forest Service, Pac. Northwest Res. Stn.. Portland, Oregon.

Bowman, T. D., P. F. Schempf and J. A. Bernatowitz. 1995. Bald eagle survival and population dynamics in Alaska after the Exxon Valdez oil spill. J. Wildl. Manage. 59(2):317-324.

_____, P. F. Schempf and J. I. Hodges. 1997. Bald eagle population in Prince William Sound after the Exxon Valdez oil spill. J. Wildl. Manage. 61 (3):962-967.

Bromley, R. G. H. 1976. Nesting and habitat studies of the dusky Canada goose (*Branta canadensis occidentalis*) M.Sc. thesis, Univ. on the Copper River Delta. Fairbanks, Alaska. 81 pp.

_____. 1981. Analysis of dusky Canada goose body weights on the wintering grounds - mid-1960s to mid-1970s. Unpubl. rep., Oregon State University, Corvallis. 15 pp.

_____. 1984. The energetics of migration and reproduction of dusky Canada geese (*Branta canadensis occidentalis*). MSc. thesis, Oregon State University, Corvallis. 116 pp.

_____ and R. L. Jarvis. 1993. The energetics of migration and reproduction of dusky Canada geese. Condor 95(1):193-210.

_____, D. C. Heard and B. Croft. 1995. Visibility bias in aerial surveys relating to nest success of Arctic geese. J. Wildl. Manage. 59(2):364-371.

Brooks, A. 1917. Birds of the Chilliwach District, BC. Auk 34:28-50.

_____. 1923. Notes on the birds of Porcher Island, BC. Auk40:217-224.

Buchholz, W. G., J. M. Pearce, 6. J. Pierson and K. T. Scribner. 1998. Dinucleotide repeat polymorphisms in waterfowl (family Anatidae): characterization of a sex-linked (Z-specific) and 14 autosomal loci. Animal Genetics 29:l-2.

Butler, W. L. 1986. Preliminary Progress Report on the Development of Aerial Survey Procedures for Dusky Canada Geese (DCG) Nesting on the Copper River Delta for the July Pacific Flyway Study Committee Meetings. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 2pp.

_____. 1987. Preliminary Progress Report on the Development of Aerial Survey Procedures for Dusky Canada Geese (DCG) Nesting on the Copper River Delta for the July Pacific Flyway Study Committee Meetings. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm. USFWS, Anchorage. 3 pp.

_____. 1988. Report to Pacific Flyway Study Committee on Breeding Pair Survey for Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 3 pp.

_____. 1989. Report to Pacific Flyway Study Committee on Breeding Pair Survey for Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 4pp.

_____. 1990. Report to Pacific Flyway Study Committee on Breeding Pair Survey for Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 5pp.

_____. 1991. Report to Pacific Flyway Study Committee on 1986-1991 breeding ground surveys of dusky Canada geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 4pp.

_____. 1992. Report to Pacific Flyway Study Committee on 1986-1992 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 6pp.

_____. 1993. Report to Pacific Flyway Study Committee on 1986-1993 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 4pp.

_____. 1994. Report to Pacific Flyway Stucly Committee on 1986-1994 Breeding Ground Sirveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 4pp.

_____, J. A. Crouse, R. Stehn and W. D. Eldridge. 1995. Nest numbers and aerial surveys: management tools for monitoring dusky Canada geese. Abstracts of 7'h N. Amer. Arctic Goose Conf., pg. 35.

_____ and W. D. Eldridge. 1988. Development of an aerial breeding pair survey for geese nesting in the Copper River Delta. Unpubl. rep., USFWS, Anchorage. 31 pp.

_____ and W. D. Eldridge. 1991. Development of an aerial breeding pair survey for dusky Canada geese (*Branta canadensis occidentalis*) on the Copper River Delta, Alaska - Final report. Unpubl. rep., USFWS, Anchorage. 30 pp.

Campbell, B. H. 1984. Annual report of survey - inventory activities. Part V. Waterfowl. Vol. XIV. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-22-2, Job 11. Juneau, Alaska. 29 pp.

_____. 1987. Memorandum: Middleton Island trip report, June 18, 1987, to Waterfowl Coordinator. Alaska Dept. of Fish and Game, Anchorage. 3 pp. + figures.

_____. 1988. Habitat availability utilization and nesting success of dusky Canada geese on the Copper River Delta, Alaska. Unpubl. rep., Alaska Dept. Fish and Game, Anchorage. 45 pp.

_____. 1990a. Factors affecting the nesting success of dusky Canada geese, *Branta canadensis occidentalis,* on the Copper River Delta, Alaska. Can. Field Nat. 104567-574.

_____. 1990b. Annual waterfowl program progress report. Unpubl. Rep., Alaska Dep. Fish and Game. Anchorage. 41 pp.

_____. 1991a. Waterfowl program annual report. Unpubl. rep., Alaska Dept. Fish and Game, Anchorage. p. 35.

_____. 1991b. Longevity records for the dusky Canada goose (*Branta Canadensis occidentalis*). Northwestern Nat. 72:34-45.

_____. 1991c. Activities of brown'bears on the Copper River Delta, Alaska and their impact on nesting dusky Canada geese. Northwest Naturalist 72:92-99.

_____. 1992a Dusky Canada goose production, 1992. Unpubl. rep., Alaska Dept. Fish and Game, Anchorage. 7 pp.

_____. 1992b. Recent changes in production and population trends of the dusky Canada goose. Presentation at 7Ih N. Am. Arctic Goose Conf., Albuquerque, New Mexico.

_____. 1999. Homing of translocated brown bears (*Ursus arctos*) in coastal south-central Alaska. Northwestern naturalist 8022-25.

_____ and E. F. Becker. 1991. Neck collar retention in dusky Canada geese. J. Field Ornithol. 62(4):521-527.

_____ and J. E. Cornely. 1992. Dusky Canada goose: An annotated bibliography. US Dept. Interior, Fish and Wild. Serv. Resource Publ. 187. 30 pp.

_____ and H. J. Griese. 1987. Management options for dusky Canada geese and their predators on the Copper River Delta, Alaska. Unpubl. Rep., Alaska Dep. Fish and Game. Anchorage. 91 pp.

_____, D.H. Rosenberg, and T.C. Rothe. 1987. Annual report of survey and inventory activities - waterfowl. Vol. XVII, Part XIII. Fed. Aid Wildl. Rest. Proj. W-22-5, Job 11. Alaska Dept. Fish and Game, Anchorage. 55pp.

_____, D.H. Rosenberg, and T.C. Rothe. 1988. Annual report of survey and inventory activities - waterfowl. Vol. XVIII, Part XIII. Fed. Aid Wildl. Rest. Proj. W-22-6., Job 11. Alaska Dept. Fish and Game, Anchorage. 75pp.

_____, D.H. Rosenberg, and T.C. Rothe. 1992. Waterfowl program annual report. Unpubl. Rep. Alaska Dept. Fish and Game, Anchorage. 43 pp.

_____ and T.C. Rothe. 1985. Annual report of survey and inventory activities -waterfowl. Vol. XIX, Part XIII. Fed. Aid Wildl. Rest. Proj. W-22-3, Job 11. Alaska Dept. Fish and Game, Anchorage. 31 pp.

_____ and T.C. Rothe. 1986. Annual report of survey and inventory activities - waterfowl. Alaska Dept. Fish and Game, Anchorage. Vol. XVI, Part XIII. Fed. Aid Wildl. Rest. Proj. W-22-4, Job 11, 36 pp.

_____ and T.C. Rothe. 1989. Annual report of survey and inventory activities -waterfowl, Vol. XIX, Part XIII. Fed. Aid Wildl. Rest. Proj. W-23-1, Study 11. Alaska Dept. Fish and Game, Anchorage. 42pp.

_____ and T.C. Rothe. 1990. Annual report of survey and inventory activities - waterfowl. Vol. XX, Part XIII. Fed. Aid Wildl. Rest. Proj. W-23-2, Study 11. Alaska Dept. Fish and Game, Anchorage. 42 pp.

_____ and D. E. Timm. 1983. Annual report of survey - inventory activities. Part V. Waterfowl. Vol. XIII. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-22-1, Job 11. Juneau. 45 pp.

Carnes, J. C., V. Van. Ballenberghe and J. M. Peek. Ecology of wolves on the Copper and Bering River deltas, Alaska. Unpubl. Progress rep., US Forest Serv., Pac. Northwest Res. Sta., Anchorage. 46 pp.

Chapman, J. A. 1970. Weights and measurements of dusky Canada geese wintering in Oregon. Murrelet 51(3):34-37.

_____, C. J. Henny, and H. M. Wight. 1969. The status, population dynamics, and harvest of the dusky Canada goose. Wildl. Monogr. 18:l-48.

Clark, S. L. and R. L. Jarvis. 1978. Effects of winter grazing by geese on yield of ryegrass seed. Wildl. SOC. Bull. 6(2):84-87.

Conant, B. and C. P. Dau. 1989. Dusky Canada goose breeding population survey. Unpubl. rep. Migratory Bird Management, USFWS, Juneau, Alaska. 4 pp.

_____ and _____. 1990. Dusky Canada goose breeding population survey. Unpubl. rep. Migratory Bird Management, USFWS, Juneau, Alaska. 4 pp,

_____ and J. Hodges. 1986. Dusky Canada goose breeding population survey. Unpubl. rep. Waterfowl Investigations, USFWS, Juneau, Alaska. 4 pp.

Cornely, J. E., B. H. Campbell, and R. L. Jarvis. 1985. Productivity, mortality, and status of dusky Canada geese. Trans. N. Amer. Wildl. and Nat. Resour. Conf. 50:540-548.

_____ and R. L. Jarvis. 1984. Status of Canada geese wintering in Western Oregon and Southwestern Washington. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Cornrn., Oregon St. Univ., Corvallis. 8 pp.

_____ and R. L. Jarvis. 1985. Status of Canada geese wintering in Western Oregon and Southwestern Washington. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Cornm., Oregon St. Univ., Corvallis. 7 pp.

_____, _____ and M. R. Hills. 1986. Status of Canada geese wintering in Western Oregon and Southwestern Washington. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 5 pp.

_____, M. B. Naughton, M. R. Hills and K. M. Raftery. 1998. Distribution of wintering dusky and cackling Canada geese in western Oregon and western Washington, 1985-1989. Pages 221-229. In D. H. Rusch, M. D. Samuel, D. D. Humberg, and B. D. Sullivan, eds. Biology and Management of Canada Geese: Proceedings of the International Canada Goose Symposium, Milwaukee, Wisconsin.

Crouse, J. 1994. The distribution of migrating Canada geese on the Copper and Bering river deltas during the spring and fall of 1992. Unpubl. rep., US Dept. Agriculture, Forest Serv., Cordova, Alaska. 5 pp.

_____. 1994. Dusky Canada goose nest distribution and abundance on the Copper river Delta, Alaska (1993). Unpubl. Rep. USDA Forest Service, Chugach Nat. Forest, Cordova Ranger District, Cordova. 9 pp.

_____. 1995, Dusky Canada goose nest distribution and abundance on the Copper river Delta, Alaska (1994). Unpubl. Rep. USDA Forest Service, Chugach Nat. Forest, Cordova Ranger District, Cordova. 11 pp.

_____, D. Youkey and S. Babler. 1995. Dusky Canada goose nest distribution and abundance on the Copper river Delta, Alaska (1995). Unpubl. Rep. USDA Forest Service, Chugach Nat. Forest, Cordova Ranger District, Cordova. 11 pp.

_____, _____ and _____ . 1996. Dusky Canada goose nest distribution and abundance on Unpubl. Rep. USDA Forest Service, the Copper river Delta, Alaska, 1993-1995.

Chugach Nat. Forest, Cordova Ranger District, Cordova. 23 pp.

Crow, J. H. 1967. Inundation of land surfaces by sea water: effects and regeneration. Unpubl. course paper, Soils 504, Washington State Univ. Seattle. 9 pp.

_____. 1968. Some effects of the March 27, 1964 earthquake on the ecology of the Copper River Delta, Alaska. In P. E. K. Shepherd, B. Hilliker and J. H. Crow. Waterfowl Report. Vol. IX. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-13-R-2 and 3, Work Plan C. Juneau. p. 24-34.

_____. 1971. Earthquake-initiated changes in the nesting habitat of the dusky Canada goose. In the Great Alaska Earthquake of 1964: Biology. Washington, DC. National Academy of Sciences Publ. 1604:30-136.

Crowley, D. 1998. Status of the urban population of Canada Geese in Anchorage, Alaska - 1998. Unpubl. rep. Alaska Department of Fish and Game, Div. Wildl. Conserv., Anchorage. 11 pp.

_____, D. H. Rosenberg, M. Petrula, and T.C. Rothe. 1997. Middleton Island Canada geese: a status report. Unpubl. rep. Alaska Dept. Fish and Game, Div. Wildl. Conserv., Anchorage. 8 pp.

_____, M. Petrula, T. Rothe, D. Rosenberg, B. Scotton. 1998. Marking Canada Geese on the North Gulf Coast of Alaska - 1998. Unpubl. rep. Alaska Dept. Fish and Game, Div. Wildl. Conserv., Anchorage. 5 pp.

Darrow, R. 1938. Possibilities of recognizing the evidence of depredation and the species involved in the remains of grouse and grouse nests found destroyed. Trans. N. Amer. Wildl. Conf. 3:834-838.

Dawson, W. L. 1909. The birds of Washington. Occidental Publication Co., Seattle, Wash. 997 pp.

Delacour, J. 1951. Preliminary note on the taxonomy of Canada geese, Branta canadensis. Am. Mus. Novitates 1537:l-10.

_____. 1954. The Waterfowl of the world. Vol. 1. Country Life limited, London. 284 pp.

Dickinson, J. C. 1953. Report on the McCabe collection of British Columbia birds. Bull. Mus. Comparative Zoo. Harvard College 109:123-209.

Dixon, J. 1908. Field notes from Alaska. Condor 10:139-143.

Drent, R. H. 1973. The natural history of incubation. Pp. 262-31 1 In Breeding Biology of Birds. D. S. Farner, ed. Washington, DC. National Academy of Sciences.

Drut, M. S. and R. E. Trost. 1997. Estimated number of dusky Canada geese, January 1999. Unpubl. rep., USFWS, Portland, Oregon. 3 pp.

_____ and _____. 2003. Estimated number of dusky Canada geese, January 2003. Unpubl. Rep., USFWS, Portland, Oregon. 4 pp.

_____, _____ and M. Naughton. 1997. Estimated number of dusky Canada geese, January 1997. Unpubl. rep., USFWS, Portland, Oregon. 4 pp.

_____, _____ and _____. 1998. Estimated number of dusky Canada geese, January 1998. Unpubl. rep., USFWS, Portland, Oregon. 3 pp.

Eldridge, W. and R. Platte. 1995. Report to the Pacific Flyway Committee on 1986-1995 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage, 9 pp.

_____ and _____. 1996. Report to the Pacific Flyway Committee on 1986-1996 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS. Anchorage. 6 pp.

_____, _____ and Larned, W. 1997. Report to the Pacific Flyway Committee on 1986-1997 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage, 11 pp.

_____, _____, C. P. Dau and W. Larned. 1998. Report to the Pacific Flyway Committee on 1986-1998 Breeding Ground Surveys of Dusky Canada Geese on the Copper River Delta. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. USFWS, Anchorage. 6 pp.

Elkins, W. A. 1952. Alaska Pacific Flyway Report. p. A-7 In Pacific Flyway Waterfowl Report, No. 20. Bureau of Sport Fisheries and Wildlife. Juneau, Alaska.

Ely, C.R. and K. T. Scribner. 1994. Genetic diversity in arctic-nesting geese: implications for management and conservation. Trans. N. Am. Wildl. and Natur. Resour. Conf. 59:91-110.

Fleagle, M. 1991. Cottonwood harvest. Horizon Air Magazine, March issue:5.

Frair, J. and K. Liska. 1998. Dusky Canada goose observations and nest search results - Unpubl. rep., Bureau of Land Manage. Bering Glacier Islands, 26-29 May 1998. Glennallen, Alaska. 7 pp.

Fredrickson, L. H. and T. S. Taylor. 1982. Management of seasonally flooded impoundments for wildlife. USFWS Resour. Publ. 148:l-29.

Gabrielson, I. N. and S. G. Jewett. 1940. Birds of Oregon. Corvallis, Oregon. 650 pp

_____ and F. C. Lincoln. 1959. Birds of Alaska. Stackpole Co., Pennsylvania and Wildlife Management Institute, Washington, DC. 922 pp.

Gould, P. J., and A. E. Zabloudil. 1981. Reproductive ecology of seabirds at Middleton Island, Alaska, 14-26 June 1981. Unpubl. Rep., Marine Bird Section, USFWS, Anchorage. 15 pp.

Grand, J. B. and R. M. Anthony, 1997. Re-nesting, nest depredation, and survival of dusky Canada geese on the Copper River Delta, Alaska. Unpubl. report to the Dusky Canada Goose Subcommittee, Pacific Flyway Study Comm., location. 11 pp.

_____ and R. M. Anthony. 1998. Re-nesting, nest predation, and survival of dusky Canada geese on the Copper River Delta, Alaska. Unpubl. report to the Dusky Canada Goose Subcommittee, Pacific Flyway Study Comm., location. 2 pp.

_____ , _____ and T. F. Fondell. 1997. Productivity of dusky Canada geese in the Copper River Delta, Alaska. Abstracts of 8" N. Amer. Arctic Goose Conf., Victoria, British Columbia. pg. 47.

_____, _____, and _____. 1998. Renesting, nest depredation, and gosling survival of dusky Canada. geese on the Copper River Delta. Progress Report. USGS, Alabama Cooperative Fish and Wildlife Research Unit, Auburn, AL. 15 pp.

Grinnell, J. 1910. Birds of the 1908 Alexander Alaska expedition. Univ. California Publ. Zoology 5:361-428.

Gullion, G. W. 1951. Birds of the southern Willamette Valley, Oregon. Condor 53:129-149.

Hills, M. R., B. H. Campbell, and M. Naughton. 1991. Status of the dusky Canada goose. Report to Dusky Canada Goose Subcornm., Pacific Flyway Study Cornm. USFWS, Ridgefield, WA. 7 pp.

Hansen, H. A. 1960. Annual Waterfowl Report, Alaska. US Bureau Sport Fisheries and Wildlife, Juneau.

_____. 1961. Loss of waterfowl production to tide floods. J. Wildl. Manage. 25(3):242-248.

_____. 1962. Canada geese of coastal Alaska. Trans. N. Amer. Wildl. Conf. 27:301-329.

_____. 1968. Pacific Flyway Canada goose management -federal and state cooperation. Pages 47-49 R. L. Hine and C. Schoenfeld, eds. Canada goose management: current continental problems and programs. Dembar Educ. Res. Serv., Madison, WI.

_____ and H. K. Nelson. 1964. Honkers large and small. Pg. 109-124 In J. P. Linduska, Hansen, W. RI, and E. B. Eckel. 1971. Setting and effects of the earthquake. In The great Alaska earthquake of 1964: geology:5-43. National Academy of Sciences, Washington, DC. Editor. Waterfowl Tomorrow. USFWS, Washington, DC.

Havel, L. H. and R. L. Jarvis. 1988. Formation of feeding flocks during winter by dusky and Taverner's Canada geese in Oregon. Pages 91-101 In M. W. Weller, ed. Waterfowl in winter. University of Minnesota Press, Minneapolis. 624 pp.

Hawkins, J.S. 1982. Migration and habitat relationships of geese on the eastern Copper River Delta, Alaska. MSc. Thesis. University of Alaska, Fairbanks. 113pp.

Henny, C. J. 1967. Estimating band-reporting rates from banding and crippling loss data. J. Wildl. Manage. 31(3):533-538.

Isleib, M. E. "Pete". 1977. The Canada goose (*Branta canadensis*) in Prince William Sound, Alaska: A summary. Unpubl. rep. 18 pp.

_____. 1986. Middleton Island bird survey, 5-12 November, 1986. Unpubl. rep. Univ. Alaska Museum, Fairbanks. 13pp.

_____ and B. Kessel. 1973. Birds of the North Gulf Coast - Prince VVilliam Sound Region, Alaska. Biol. Papers of the Univ. Alaska 14. 149 pp.

Jarvis, R. L.. 1978. The dusky Canada goose - an entrenched minority. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 15 pp.

_____. 1980. Status of dusky and Taverner's Canada geese in the Willamette Valley. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 10 pp.

_____. 1982. Status of Canada geese wintering in Western Oregon – Southwestern Washington. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comrn., Oregon St. Univ., Corvallis. 9 pp.

_____. 1988. Estimated mid-winter population of dusky Canada geese, 1988-89. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon St. Univ., Corvallis. 4 pp.

_____. 1989. Estimated mid-winter population of dusky Canada geese, 1988-89. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon St. Univ., Corvallis. 4 pp.

_____. 1990. Estimated winter population of dusky Canada geese, 1989-90. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon State Univ.. Corvallis. 5 pp.

_____. 1992. Estimated mid-winter population of dusky Canada geese - 1992. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon St. Univ., Corvaliis: 5 pp.

_____. 1993. Estimated mid-winter population of dusky Canada geese - 1993. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comrn. Oregon St. Univ., Corvallis. 4 pp.

_____. 1994. Estimated mid-winter population of dusky Canada geese - 1994. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon St. Univ., Corvallis. 6 pp.

_____. 1995. Estimated mid-winter population of dusky Canada geese - 1995. Report to Dusky Canada Goose Subcomm. Pacific Flyway Study Comm. Oregon St. Univ., Corvallis. 6 pp.

_____, 1997. Estimated mid-winter population of dusky Canada geese - 1997. Report to Dusky Canada Goose Subcomrn. Pacific Flyway Study Comm. Oregon St. Univ., Corvallis. 6 pp.

_____ and R.G. Bromley. 1998. Managing racially mixed flocks of Canada geese. Pages 413-423. In D. H. Rusch, M. D. Samuel, D. D. Hurnberg, and 8. D. Sullivan, eds. Biology and Management of Canada Geese: Proceedings of the International Canada Goose Symposium, Milwaukee, Wisconsin.

_____ and J. Cornely. 1983. Status of Canada geese wintering in Western Oregon - Southwestern Washington. Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 10 pp.

_____, and _____. 1988. Recent changes in wintering populations of Canada geese in western Oregon and southwestern Washington. Pages 517-528 a M. W. Weller, ed. Waterfowl in winter. University of Minn. Press, Minneapolis. 624 pp.

_____ and R. S. Rodgers. 1976. The dusky Canada goose - a new minority? Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 18 pp.

_____ and _____. 1977. The dusky Canada goose - a new minority! Report to Dusky Canada Goose Subcomm., Pacific Flyway Study Comm., Oregon St. Univ., Corvallis. 14 pp.

_____ and P. Sekora. 1981. Status of Canada geese wintering in Western Oregon - Southwestern Washington. Report to Dusky Canada Goose Subcornm. Pacific FlywayStudy Comm., Oregon St. Univ., Corvallis. 8 pp.

Jewett, S. G. 1932. The white-cheeked geese in Oregon. Condor 34:136.

_____. 1953. *Branta canadensis occidentalis* in the Willamette Valley Oregon. Murrelet 34(1): 10.

_____, Taylor, Shaw and Aldrich. 1953. Birds of Washington State. Univ. Washington Press, Seattle. 767 pp.

Johnson, D.H., D.E. Tirnm and P.F. Springer. 1979. Morphological characteristics of Canada geese in the Pacific Flyway. Pages 56-80 In R.L. Jarvis and J.C. Bartonek, eds. Management and biology of Pacific Flyway geese. Oregon State Univ. Book Stores, Inc. Corvallis.

Johnson, O. B. 1880. List of the birds of the Willamette Valley, Oregon. Am. Nat. 14:485-491 and 635-641.

Kebbe, C. 1958. Preliminary report on the Western Canada goose. Unpubl. rep. US Bureau of Fisheries and Wildlife, Portland, Oregon. 4 pp.

Kempka, R. G., 8. S. Maurizi, D. W. Logan, D. E. Youkey and F. A. Reid. 1995. Utilizing SPOT multispectral imagery to assess wetland vegetation succession in the Copper River Delta, Alaska. 5'h Arctic Goose Conference. Albuquerque, New Mexico.

Kimerling, A. J. and P. L. Jackson, eds. 1985. Atlas of the Pacific Northwest. Oregon State Univ., Corvallis. 136 pp.

Klein, D. R. 1955. Copper River Delta banding and reproduction studies. Unpubl. rep., US Bureau Sport Fish. and Wildl., Juneau. 4 pp.

Kraege, D. 1995. Memo to L. Harb, 15 March. Washington Dept. Fish and Wildlife. Olympia. 2 pp.

Kruger, L. E. and C. B. Tyler. 1995. Management needs assessment for the Copper River Delta, Alaska. Gen. Tech. Rep. PNW-GTR-356.. US. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon. 45 pp.

Kurhajec, D. J. 1977. Breeding Canada geese of the Port Etches area Hinchinbrook Island, Alaska. Unpubl. rep., Special Studies, USFWS, Anchorage. 12 pp.

Lebeda, C. S. 1980. Nesting and brood rearing ecology of the Vancouver Canada goose on Admiralty Island in Southeast Alaska. MSG. Thesis, South Dakota State University, Brookings. 72 pp.

_____ and J.T. Ratti. 1984. Reproductive biology of Vancouver Canada geese on Admiralty Island, Alaska. J. Wildl. Manage. 47(2):297-306.

Lowe, R. 1987. Coastal Canada geese: a preliminary report. Oregon Birds 13(2):143-146.

MacCracken, J. D. 1992. Ecology of moose on the Copper River Delta, Alaska. Ph.D. thesis, Macgregor, W. 1993. Collared dusky Canada geese. Victoria Naturalist 49(4):5

Mayfield, H. F. 1975. Suggestions for calculating nest success. Wilson Bull. 87(4):456-466. Univ. of Idaho, Moscow. 320 pp.

McKnight, D. E. 1971. Report of survey and inventory activities-waterfowl and small game. Vol. I/. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-3, Jobs 10 and 11. Juneau. 76 pp.

Mech, L. D. 1970. The wolf: ecology and behavior of an endangered species. The Natural History Press, New York, NY. 384 pp.

Mickelson, P. G. 1984. Brown bear, coyote, and avian predation on the dusky Canada geese Unpubl. rep., Wildl. and Fish., Univ. Alaska, of the Copper River Delta, Alaska. Fairbanks. 32 pp.

_____, J. S. Hawkings, D. R. Herter, and S. M. Murphy. 1980. Habitat use by birds and other wildlife on the Eastern Copper River Delta, Alaska. Unpubl. rep., Alaska Cooperative Wildl. Res. Unit, Fairbanks. 189 pp.

Miller, S. D. 1990. Population management of bears in North America. Int. Conf. Bear Res. and Manage. .8:357-373

_____. 1997. Impacts of heavy hunting pressure on the density and demographics of brown bear populations in southcentral Alaska. Research Final Rep. Grants W-24-2, W-24-3, W-24-4. Fed. Aid Wildl. Rest. Study 4.26. Alaska Dept. Fish and Game, Anchorage. 97pp.

Moffit, J. 1937. The white-cheeked goose in California. Condor 39:149-159

Morgan, R. P., S. T. Sulkin and C. J. Henny. 1977. Serum proteins of Canada goose (*Branta canadensis*) subspecies. Condor 79:275-278.

Morgan, S., (ed.). 1989. Brownlgrizzly bear, Vol. XIX, Part V. Alaska Dept. Fish and Game Fed. Aid Wildl. Restor. Prog. Rep. Proj W-23-1, Study 4.0. Juneau. 189 pp.

Murphie, B. L. 1993. Distribution and abundance of migrating and wintering Canada geese at Willapa Bay Washington, from October 1992 through April 1993. Unpubl. rep. Willapa National Wildlife Refuge Complex, Ilwaco, Washington. 9 pp.

Naughton, M. 1995. Summary of dusky Canada goose midwinter estimates, 1953 - 1995. Report to Dusky Canada Goose Subcomm. Western Oregon NWR, Corvallis. 1 p.

Nelson, U. C. 1953. Alaska Pacific Flyway Report. Page A-I3 In Pacific Flyway Waterfowl Report, No. 23. Bureau of Sport Fisheries and Wildlife. Juneau, Alaska.

Nysewander, D. and P. Knudtson. 1977. The population ecology and migration of seabirds, shorebirds, and waterfowl associated with Constantine Harbor, Hinchinbrook Island, Prince William Sound, 1976. Pages, 500-575 in Part IX, Population dynamics and trophic relationships of marine birds in the Gulf of Alaska and southern Bering Sea. J. C. Bartonek, C. J. Lensink, R. G. Gould, R. E. Gill and G. A. Sanger, Co-principal Investigators. US. Fish and Wildl. Serv., Anchorage.

Ogilvie, M. A. 1978. Wild Geese. Buteo Books, Vermillion, S. Dak. 350 pp.

Olson, S. T. 1953. Copper River Delta banding operations. Fed. Aid Wildl. Rest. Proj. 3-R-8, Alaska, 34-42.

_____. 1954a. Report on Copper River Banding and Production Studies for 1954. Migratory waterfowl studies: Banding and Production Studies. Fed. Aid Wildl. Rest. Proj. 3-R-8, Work Plan C. US Bureau Sport Fish. and Wildl., Juneau, Alaska. 14 pp.

_____. 1954b. Copper River Delta banding operations. Unpubl. rep., Juneau, Alaska. 34-42.

_____. 1954c. Breeding ground survey for 1954 - Copper River Delta. Unpubl. rep., Juneau, Alaska. 9 pp.

Oregon Department of Fish and Wildlife. n.d. Sauvie island Wildlife Area - a wildlife treasure. Brochure.

_____ and Washington Department of Fish and Wildlife. n.d. Pacific Northwest goose management. Pamphlet for Canada goose hunters. Portland, Oregon.

Pacific Flyway Council. 1973. Guidelines for management of the dusky Canada goose. 12 pp

_____. 1985. Pacific Flyway management plan for the dusky Canada goose. Dusky Canada Goose Subcomm., Pacific Flyway Study Comm. [c/o USFWS], Portland, Oregon. Unpubl. rep. 23 pp.

_____. 1992. Pacific Flyway management plan for the dusky Canada goose. Dusky Canada Goose Subcomm., Pacific Flyway Study Comm. [c/o USFWS], Portland, Oregon. Unpubl. rep. 25 pp.

_____. 1997. Pacific Flyway management plan for the dusky Canada goose. Dusky Canada Goose Subcomm., Pacific Flyway Study Comm. [c/o USFWS], Portland, Oregon. Unpubl. rep. 46pp.

_____. 1998. Pacific Flyway management plan for Northwest Oregon – Southwest Washington Canada goose agricultural depredation control. Unpubl. rep. of the Canada goose agricultural depredation working group, Pacific Flyway Study Comm. [c/o USFWS], Portland, Oregon. 33 pp.

Palmer, R. S., Ed. 1976. Handbook of North American birds, Vol. 2. Waterfowl (Pt. 1). Yale Univ. Press, New Haven, CT. 520 pp.

Patten, S., Jr., and ~L. Patten. 1979. Evolution, pathobiology and breeding ecology of large gulls (Larus) in the Northeast Gulf of Alaska and effects of exposure of gulls and Kittiwakes to petroleum. Res. Unit 99. NOAA, US Dept. Comm., Environmental Res. Lab., Boulder,. Colorado. 315 pp.

Pearce, J. B. and K. S. Bollinger. 1997. Analyses of morphological characteristics of Canada Unpubl. rep., Alaska Biological Sciences goose subspecies *pawipes* and *occidentalis*. Center, US Geological Survey, Anchorage. 7 pp.

_____, Pierson, S. Talbot, D. Derksen, K. Bollinger, K. Scribner and D. Kraege. 1998. Population genetic analyses of Pacific Flyway Canada geese and analysis of hunter check station geese. Unpubl. Progress Rep., Alaska Biological Science Center, US Geological Survey, Anchorage. 14 pp.

Petersen, M. P., J. C. Greilich and N. M. Harrison. 1981. Spring and fall migration, and habitat use by water birds in the Yakutat forelands, Alaska - 1980. Unpubl. Rep., Marine Bird Section, National Fishery Center, Anchorage. 106 pp.

Pewe, T.L. 1975. Quaternary geology of Alaska. US Geol. Surv. Prof. Pap. 835. 145pp.

Plafker, G. 1990. Regional vertical tectonic displacement of shorelines in south-central Alaska during and between great earthquakes. Northwest Science 64(5):250-258.

_____, K. R. Lajoie and M. Rubin. Determining the recurrence intervals of great subduction zone earthquakes in southern Alaska by radiocarbon dating. p. 436-453 In Radiocarbon After Four Decades, R. E. Taylor, Austin Long and R. Kra, eds., Springer-Verlag, New York. 1992.

Ploeger, P.L. 1968. Geographical differentiation in arctic Anatidae as a result of isolation during the last glacial. Ardea (56):l-159.

Potyondy, J. P., M. P. Meyer, and A. C. Mase, Jr. 1975. Hydrologic response of the Copper River Delta-Controller Bay Area, Alaska, to land emergence and uplift. Univ. Minn., St. Paul. 81 pp.

Ratti, J. T. and D. E. Timm. 1979. Migratory behavior of Vancouver Canada geese: recovery Biology and rate bias. Pages 208-212 In R. L. Jarvis and J. C. Bartonek, eds. management of Pacific Flyway geese. Oregon State Univ. Bookstores, Inc., Corvallis.

_____ and D. R. Anderson. 1978. Reevaluation of survival estimates for Vancouver Canada geese: application of modern methods. Wldl. SOC. Bull. 6(3): 146-148.

_____ and F. C. Robards. 1977. Weights and measurements of Vancouver Canada geese. Bird-Banding 48(4):354-357.

Rausch, R. 1958. The occurrence and distribution of birds on Middleton Island, Alaska. Condor 60:227-242.

Raveling, D. G. 1978. The timing of egg laying by northern geese. Auk 95(2):294-303.

Rearden, J. D. 1951. Identification :of waterfowl nest predators. J. Wildl. Manage. 15:386-395.

Reimnitz, E. 1972. Effects in the Copper River Delta. Pages 290-302. The great Alaska earthquake of 1964: Oceanography and coastal engineering. Nation. Acad. Sci. Publ. 1605:290-302. Washington, DC.

_____ and N. F. Marshall. 1971. Effects of the earthquake and tsunami on recent deltaic sediments. Nation. Acad. Sci. Publ.:Tectonics:265-278. Washington, DC.

Riewe, M. E. and C. L. Mondart, Jr. 1985. The ryegrasses. Pages 241-246 In Heath, M. E., R. F. Barnes, and D. S. Metcalfe, eds. Forages: The science of grassland agriculture, 4th ed. Iowa State Univ. Press, Ames.

Rodgers, R. S. 1973. Letter to D. E. Timm, Alaska Dept. Fish and Game, regarding Mid-winter count. 29 January. Wm. L. Finley National Wildlife Refuge, Corvallis, Oregon. 5 pp.

_____. 1974. Letter to Regional Director, Portland, Oregon, regarding Mid-winter count. 18 January. Wm. L. Finley National Wildlife Refuge, Corvallis, Oregon. 2 pp.

_____. 1975. Letter to D. E. Timrn, Alaska Dept. Fish and Game. 28 April. 1 page

Rosenberg, D.H., D. Crowley, M. Petrula, and T.C. Rothe. 1996. Middleton Island Canada geese: a status report. Unpubl. rep. Alaska Dept. Fish and Game, Div. Wldl. Conserv., Anchorage. 8 pp.

Rothe, T. 1993. 1993 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

_____. 1994. 1994 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

_____. 1995. 1995 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

_____. 1996. 1996 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

_____. 1997. 1997 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

_____. 1998. 1998 dusky Canada goose production survey. Unpubl. rep., Alaska Dept. Fish Game, Anchorage. 1 pg.

Sargeant, A. B., M. A. Sovada, and R. J. Greenwood. 1998. Interpreting evidence of depredation of duck nests in the prairie pothole region. US Geological Survey, Northern Prairie Wildlife research Center, Jarnestown, ND and Ducks Unlimited, Inc., Memphis, TN. 72 pp.

Scribner, K., J. Pearce, B. Pierson, S. Talbot and D. Derksen. 1997. Preliminary analyses of spatial population genetic structuring of Canada geese from the Pacific Flyway with particular emphasis on dusky Canada geese. Unpubl. Rep., Alaska Science Center, Biological Resources Division, US Geological Survey, Anchorage. 11 pp.

Searby, H. W. 1969. Coastal weather and marine data summary for Gulf of Alaska, Cape Spencer westward to Kodiak Island. US Dept. Commerce, Silver Spring, MD. ESSA Technical Memorandum EDSTM 8.

Seber, G. A. F. 1972. Estimating survival rates from bird-band returns. J. Wildl. Manage. 36(2):405-413.

Sellers, D. 1980. Letter to R. G. Bromley, 5 June. Alaska Dept. Fish and Game, Anchorage. 3 PP.

Sheaffer, S.E. 1993. Population ecology of the Dusky Canada goose. Ph.D. Thesis, Oregon State University, Corvallis.

_____ and R. L. Jarvis. 1995. Bias in Canada goose population size estimates from sighting data. J. Wildl. Manage. 59(3):464-473.

Shepherd, P. E. K. 1961. Mortality studies of Western Canada Geese - Copper River Delta. Annual report of progress, Vol. 2. Alaska Wildlife Investigations. Fed. Aid to Wildl. Rest. Rep. Proj. W-6-R-2, Job 3-A, Juneau. 77 p.

_____. 1965. Waterfowl Report. Vol. VII. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-6-R-5, Work Plan H, Jobs 1, 2 and 3. Juneau. 16 pp.

_____. 1966. Waterfowl Report. Vol. VII. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest.Prog. Report. Proj. W-6-R-6 Work Plan H and W-13-R-1, Work Plan C. Juneau. 26 pp.

_____. 1967. Letter to J. A. Chapman, 2 March. Alaska Dept. Fish and Game, Juneau. 1 pg.

_____, B. L. Hilliker and R. J. Somerville. 1967. Waterfowl Report. Vol. IX. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-13-R-1 and 2, Work Plan C. Juneau. 27pp.

_____ and J. H. Crow. 1968. Waterfowl Report. Vol. IX. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-13-R-2 and 3, Work Plan C. Juneau. 39 pp.

Shields, G.F. and J. P. Connor. 1998., Phylogenies of North American geese: the mhochondrial DNA record. Pages 405-411. In D. H. Rusch, M. D. Samuel, D. D. Humberg, and B. D. Sullivan, eds. Biology and Management of Canada Geese: Proceedings of the International Canada Goose Symposium, Milwaukee, Wisconsin.

_____ and A. C. Wilson. 1987a. Sub-species of the Canada goose (*Branta canadensis*) have distinct types of mitochondrial DNA. Evolution 41: 662-666.

_____ and _____. 1987b. Calibration of mitochondrial DNA evolution in geese. J. Mol EvoI. 24: 2 12-2 17.

Sibley, C.G. and B.L. Monroe. 1990. Distribution and taxonomy of birds of the world. Yale Univ. Press.

Simpson, S. G., and R. L. Jarvis. 1979. Comparative ecology of several subspecies of Canada geese during winter in western Oregon. Pages 223-241 R. L. Jarvis and J. C. Bartonek, eds. Management and biology of Pacific Flyway geese. Oregon State Univ. Book Stores, Corvallis.

Smith, J. L. 1971. Subspecies composition of wintering Canada geese in the mid-Willamette Valley of Oregon. Unpubl. rep., Wm. L. Finley National Wildl. Ref., US. Fish and Wildl. Serv., Corvallls, Oregon. 22 pp.

Sooter, C. A. 1946. Habits of coyotes in destroying nests and eggs of waterfowl. J. Wild1 Manage. 10:33-38.

Stehn, R. 1991. Nesting populations and production of geese on the Yukon-Kuskokwim Delta. Unpubl. rep., Alaska Fish and Wildl. Res. Center, USFWS, Anchorage. 99 pp.

_____. 1992. Analysis of Dusky Canada Goose aerial SUNey data on breeding pairs and production, 1978-1991. Unpubl. rep., Alaska Fish and Wildl. Res. Center, USFWS, Anchorage. 5 pp.

Stephenson, , T. R. 1995. Nutritional ecology of moose and vegetation succession on the Copper River Delta, Alaska. Ph.D. thesis, Univ. of Idaho. Moscow. 172 pp,

_____, V. Van Ballenberghe and J. M. Peek. 1993. Ecology of wolves on the north gulf coast of Alaska. Unpubl. Progress rep., US Forest Sen/., Pac. Northwest Res. Sta., Anchorage. 32 pp.

Swarth, H. S. 1911. Birds and mammals of the 1909 Alexander, Alaska expedition. Univ. California Publ. 2001. 7:9-172.

Taylor, M. K., F. Bunnell, and R. Schweinsburg. 1987. Modeling the sustainable harvest of female polar bears. J. Wildl. Manage. 51 (4):811-820.

Thilenius, J. F. 1990. Woody plant succession on earthquake-uplifted coastal wetlands of the Copper River Delta, Alaska. Forest Ecol. and Manage. 33/34:439-462.

_____. 1990. Plant succession on earthquake uplifted coastal wetlands, Copper River Delta, Alaska. Northwest Science 64(5):259-262.

_____. 1995. Phytosociology and succession on earthquake-uplifted coastal wetlands, Copper River Delta, Alaska, Gen. Tech. Rep. PNW-GTR-346. Portland, Oregon: US Dept. Agriculture, Forest Service, Pacific Northwest Res. Station. 58 pp.

Timm, D. 1972. Report of survey and inventory activities-waterfowl. Vol. IV. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-4, Job 10. Juneau. 46 pp.

_____. 1974. Report of survey and inventory activities-waterfowl. Vol. V. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-6, Job Nos. 11 and 22. Juneau. 53 pp.

_____. 1975. Report of survey and inventory activities-waterfowl. Vol. VI. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-7, Jobs 11 and 22. Juneau. 53 pp.

_____. 1976. Report of survey and inventory activities-waterfowl. Vol. VII. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-8, Job 11. Juneau. 61 pp.

_____. 1977. Report of survey and inventory activities-waterfowl. Vol. VIII. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-9, Jobs 11 and 22. Juneau. 37 pp.

_____. 1978. Report of survey and inventory activities-waterfowl. Vol. IX. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-10, Job No. 10. Juneau. 27 pp.

_____. 1980. Report of survey and inventory activities-waterfowl. Vol. IX. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-19-1, Job No. 10. Juneau. 35 pp.

_____. 1982. Annual report of survey and inventory activities-waterfowl. Vol. X. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-19-2, Job No. 11. Juneau. 48 pp.

_____, R. G. Bromley, D. McKnight and R. S. Rodgers. 1979. Management evolution of dusky Canada geese. Pages 322-330 h R. L. Jarvis and J. C. Bartonek, eds. Management and biology of Pacific Flyway geese. Oregon State Univ. Book Stores, Corvallis.

_____and P. Havens. 1973. Report of survey and inventory activities-waterfowl. Vol. IV. Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-5, Jobs 10 and 22. Juneau. 64 pp.

_____ and D. Sellers. 1979. Annual report of survey and inventory activities-waterfowl. Vol. X: Alaska Dept. Fish and Game. Fed. Aid Wildl. Rest. Prog. Report. Proj. W-17-11, Jobs 10. .Juneau. 29 pp.

Townsend, J. K. 1839. Narrative of a journey across the Rocky Mountains to the Columbia River and a visit to the Sandwich Islands, Chili, etc., with a scientific appendix. Henry Perkins, Philadelphia, Penn. 352 pp.

Trainer, C. E. 1959. The 1959 western Canada goose (*Branta canadensis occidentalis*) study Ann. Waterfowl Rep., Alaska. USFWS on the Copper River Delta, Alaska. Serv., Juneau. 9 pp.

_____, 1967. Appraisal of Canada goose nesting densities on the Copper River Delta, Alaska. Unpubl. rep. 9 pp.

Trost, R. E., M. Naughton and L. Harb. 1995. Estimated number of dusky Canada Geese, March 1995. Unpubl. rep., USFWS, Portland, Oregon. 2 pp.

US Department of Interior. 1980. Objectives for managing the Willamette Valley National Wildlife Refuges. Report of Willamette Valley and Oregon Coastal Refuge Complex, U. 'S. Fish and Wildl. Serv., Corvallis, Oregon. 70 pp.

_____. 1998. Rules and Regulations. Federal Register 63(167):46133

Viereck, L. A,, and C. T. Dyrness. 1980. Preliminary classification system for vegetation of Alaska. USDA, For. Serv., PNW For. and Range Exper. Sta., Fairbanks. 38 pp.

Welch, J. M. 1978. No title. RE: Translocation of dusky Canada geese from Copper River Delta, Alaska to Willapa National Wildlife Refuge, Washington. Unpubl. rep. 5 pp.

Witten, E. 1995. The role of a Sitka spruce (*Picea sitchensis*) population in plant community succession following tectonic uplift of the Copper River Delta, Alaska. Master of Env. Studies thesis, Yale School of Forestry.

Woodcock, A. R. 1902. An annotated list of the birds of Oregon. Oregon Agric. Exper. Sta. Bull. 68:l-119.

Yocum, C. F. 1963. July bird life in the Copper River delta country Alaska. Murrelet 44(2):28-34.

Youkey, D. 1995. Preliminary analysis of dusky Canada goose nest searches. Memo to D. Logan, US Dept. Agriculture, Forest Service, Cordova, Alaska. 2 pp.

_____, E. Cooper, S. Babler and D. Logan. 1998. Artificial nest island program for dusky Canada geese on the Copper River Delta, Alaska. Annual report. US Dept. Agriculture, Forest Service, Cordova, Alaska. 5 pp.

Zeillernaker, C. F. 1973. Letter to D. E. Timm, Alaska Dept. Fish and Game. 19 April. 1 page.

_____. 1974. .Letter to D. E. Tirnm, Alaska Dept. Fish and Game. 21 April. 1 page

_____ and A. C. Wilson. 1987a. Sub-species of the Canada goose (*Branta canadensis*) have distinct types of mitochondrial DNA. Evolution 41: 662-666.

_____ and _____. 1987b. Calibration of mitochondrial DNA evolution in geese. J. Mol EvoI. 24: 2 12-2 17.

Personal Communications

Steve Babler, US Forest Service, Cordova, Alaska

Brad Bales, Oregon Department of Fish and Wildlife, Portland

Tim Bowman, USFWS, Anchorage, Alaska

Dave Crowley, Alaska Department of Fish and Game, Anchorage

Barry Grand, USFWS, Anchorage, Alaska

Margo Hearne, Delkatla Wildlife Sanctuary, Queen Charlotte Islands, British Columbia

Pete Isleib, Cordova, Alaska—deceased

Roy Lowe, USFWS, Newport, Oregon

John Pierce, USFWS, Anchorage, Alaska

Richard Rodgers, USFWS, Corvallis, Oregon

Tom Rothe, Alaska Department of Fish and Game, Anchorage

Phil Schempf, USFWS, Juneau, Alaska

Bob Stehn, USFWS, Anchorage

Dan Timm, Alaska Department of Fish and Game, Anchorage

Robert Trost, USFWS, Portland, Oregon