CACKLING CANADA GEESE ON THE UGASHIK BAY PENINSULA, ALASKA DURING FALL STAGING/MIGRATION - 1984

by

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ABSTRACT

Between 5 and 19 October 1984, studies were conducted on fall staging cackling Canada geese (Branta canadensis minima) on the Ugashik Bay Peninsula 10 km south of Pilot Point, Alaska (57°30'N, 157°33'W). Migration patterns, habitat use, and behavior were observed. Numbers of birds using the area steadily increased from 1500 when we arrived on 5 October to 15,000 by 19 October. One-hundred twenty-eight individual neck-collars on cackling geese were read for a total of 387 sightings. We estimate that this represented about 55% of neck collars present at Pilot Point.

Use of the area was similar to that observed in 1983 with inland lakes being used for roosting at night. Initially, most geese fed on these lakes during daylight hours. Numbers of geese using these lakes for daytime feeding increased to about 7000, but this represented a steadily declining proportion of those present in the area. The remaining geese spent daylight hours on mud flats/bars along the Ugashik River and Bay. Feeding in the vicinity of the inland lakes consisted of grazing or eating seeds or bulbs of short, salt tolerant plants immediately surrounding the lakes, or of feeding on aquatic plants in open water. Behavior of geese using the lakes varied by age with juveniles spending 84% of the time feeding versus 54% for adults. Increased feeding time by hatching year birds was at the expense of maintenance and resting. There were no differences in behavior between the sexes.

INTRODUCTION

The Pilot Point - Ugashik Bay area of the Alaska Peninsula may be the single most important fall staging area for cackling Canada geese (Branta canadensis minima, Timm 1980, Bollinger 1984). Fall staging areas are particularly important for geese because they provide the nutrients necessary for lipid deposition prior to long migratory flights (Wypkema and Ankney 1979, Thomas and Prevett 1980, Bollinger 1984). Despite sporadic visits to the area by personnel of the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service since the mid 1970's (Timm 1980, Bollinger 1984), we still do not understand how critical a role this area plays in the annual cycle of cackling geese.

Understanding fall staging of cackling geese on the Alaska Peninsula is urgent because (1) numbers of cackling geese have declined dramatically recently (from 350,000 to $<40,000$, Raveling 1984), resulting in large segments of the population (ca. 50%) using a very small geographic area (ca. 10 km^2), (2) fall staging areas provide essential nutrients prior to fall migration and the wintering period, (3) there is potential for harassment during staging in the Ugashik Bay area, and (4) staging habitats along the Alaska Peninsula may be threatened by oil and gas development. The extremely small size of the cackling goose population presently (ca. 27,300-38,500 peak fall counts, Raveling et al. 1985) could cause large segments of the population to be affected by events in a single estuary.

The large neck-collaring program on cackling geese initiated in 1982 (Raveling et al. 1985) provided incentive to visit Pilot Point during the fall migration period in 1983 to attempt to read neck collars and to assess the possibility for further study. As a result of the potential indicated by the 1983 trip (Bollinger 1984), we returned to Pilot Point with the objective of continuing to read neck collars to better understand the timing and distribution of cackling goose migration, in addition to allowing a finer partitioning of annual mortality than is possible from wintering ground observations alone. We also had the goal of understanding the importance of the Pilot Point area for pre-migratory fattening and nutrient acquisition by cackling geese. The availability of a large number of neck-collared individuals allowed us to examine variation in behavior among sex and age classes.

MATERIALS AND METHODS

STUDY AREA

The study was conducted on the north side of the Alaska Peninsula near Pilot Point, Alaska (57°30'N 157°33'W) on a peninsula (ca. 10 km^2) at the mouth of the Ugashik River where it enters Ugashik Bay (Figure 1). This area is the only known major fall staging area for cackling Canada geese before their long migration across the Gulf of Alaska to Oregon and California. A cabin located on the peninsula (Figure 2, Area A) served as a base of operations.

Numerous shallow ponds and dry lake beds with interconnecting channels and tidal sloughs dominate the inland area, while vegetated and unvegetated mud flats, tide flats, and mud bars occur along the river and bay. The vegetation has not been described in detail, but the inland area contains sedges and grasses up to 1 m tall. Vegetation immediately surrounding the lakes included Hippuris tetraphylla, Puccinellia phryganodes, and Spergularia canadensis (Hulten 1968). Triglochin palustris occurred at low densities in inland areas. Mudflats along the river and bay also contained stands of Hippuris tetraphylla and Puccinellia phryganodes. Fauna observed in the area is described in Appendix I.

OBSERVATIONS

Weather

Weather data, including temperature (minimum and maximum), cloud cover, wind speed and direction, and precipitation were recorded daily.

Flock Movements

Flock size and composition, flight direction and height, and time were recorded daily for most flocks seen in the area. Data were

recorded more consistently for flocks observed in the morning and evening. Local movements, as well as migrating flocks, were recorded.

Total numbers of geese present were estimated during aerial surveys on 5 and 8 October. Estimates on other days were made when the geese flushed from the inland lakes early in the morning (see below).

Collar Sightings

Collar codes were read by observing geese using 20-60 power zoom spotting scopes. Observations were made from between 25 and 500m; (approximate average 140m). Distance varied depending on cover available to observers during approach. Condition of the birds and fit of the neck-collars were noted.

A Piper Supercub provided access to and from inland lakes during 3 days (8-10 Oct) of the study. It took 45-60 minutes to walk to the inland lakes from the cabin with an additional 30-60 minutes required to get into position to view a flock. Occasionally 4-5 hours elapsed between leaving the cabin and reading neck collars because of repeated flushing of large flocks of cackling geese by aircraft, eagles, hunters, and/or the investigators.

Associations of neck-collared geese were also recorded. We defined marked cackling geese as being associated with other geese if they were observed continuously with the same individual(s) for at least 10 min. (and up to 90 minutes) or they were seen together on more than one occasion (i.e. different days or different observers on the same day). Associated geese moved together in a coordinated manner and participated in the same activities, while other geese, although always in close proximity to others, moved independently.

Activity Budgets

When first viewing a flock, the entire flock was scanned several times to read collars before recording behavior of individuals. Following initial flock scans, an individual wearing a neck collar was selected for intensive observations, during which the behavior of the bird was recorded at 1 minute intervals for periods of between 10 minutes and 3 hours ($\bar{x}$ = 36 minutes). Behavior was recorded between 1030 and 1930 hours. We classified behavior into the following categories: 1) feeding, 2) drinking, 3) maintenance (preening, stretching, scratching, wing flapping), 4) resting/sleeping, 5) alert, 6) locomotion (swimming [not associated with bathing or feeding] flying, and walking); and 7) intra-specific interactions - including both aggressive and submissive postures or activities. Any disturbance to flocks of geese were also noted.

RESULTS

WEATHER

Weather was generally favorable for field work during our stay. Sunny, mild weather with little or no wind, occurred on 11 of the 15 days we were present at Pilot Point with high and low temperatures ranging from 39° to 59°F and 20° to 43°F, respectively (Table 1). Rain occurred on only 5 days and wind above 5mph, on only 4 days. The generally clear weather resulted in excellent visibility except on 6 October, which was overcast with drizzle and wind. Temperatures dropped below freezing on 12 nights resulting in ponds freezing (ice up to 1/4 in. thick) on 6 nights. Ponds became free of ice by mid-afternoon each day, but it is doubtful that they thawed on 20 October as temperatures remained below freezing during the day (accompanied by overcast skies with snow flurries and wind) at King Salmon.

Habitat conditions were much drier this year than in 1983 making walking to the inland lakes considerably easier since most ponds and sloughs were shallow enough to wade and the grass was generally shorter and less dense. Low pond levels resulted in more exposed mud flats surrounding inland ponds than in 1983.

TIMING AND MAGNITUDE OF MIGRATION

Fifteen hundred to 2000 cackling geese were present on our arrival on 5 October. Numbers increased steadily throughout the study to an estimated peak of 12,000-15,000 on 19 October (Table 2). Major arrivals occurred on 7 and 9 October when small flocks were observed arriving from the northwest during most of the day. Existing winds were generally favorable (NW) throughout the study for southerly migration. On 12 and 13 October, 4 flocks of cackling geese numbering 500, 125, 1000, and 200 overflew the area, flying from the northwest to the southeast. Some geese present at Pilot Point also departed on 12 October based on our observation of a neck collared bird (code 39N) on that date, which was resighted on 15 October in the Klamath Basin (E. H. McCollum, pers. comm.) One other neck collared bird (code V49) departed either coincident with or shortly after these departures because it was seen on 17 October in the Klamath Basin.

DAILY MOVEMENTS AND HABITAT USE

We believe that all geese spent nights on the inland shallow ponds and lakes throughout the study (Figure 2, Area B). During the first 2 days, most geese also stayed on these inland lakes throughout the day, but as more birds arrived and experienced disturbance here, a progressively smaller proportion (1/3 to 1/2 of the total) remained at the lakes during the day. Movement from the inland lakes usually began at first light when all geese roosting on the inland lakes flushed repeatedly over a short period of time. Each time the geese flushed, small flocks, sometimes totaling a few thousand birds, flew east 1.5 km to the extensive mud flat along the Ugashik River (Figure 2, Area C). This behavior was more pronounced during the latter half of our stay (13-19 October).

Departure from the lakes, particularly later in the day, was often caused by disturbance, including aircraft, bald eagles (Haliaeetus leucocephalus), hunters, and the investigators. Overnight freezing of the ponds did not seem to effect the number of geese that remained. Although most geese leaving the inland lakes flew to the large mudflat along the Ugashik River, the geese also made use of mud flats located at the southern tip of the peninsula and mud bars exposed at low tide in Ugashik Bay (Figure 2, Area D), and the area south of the Ugashik River at the mouth of the King Salmon River (Figure 1). We observed flocks returning to the inland lakes from mudflats along the Ugashik River between 1600 and 2000 hours. Morning flights (away from the lakes) were usually more concentrated than evening flights.

Geese that remained on inland ponds either grazed low vegetation on mudflats surrounding the ponds or fed on floating or submerged vegetation by tipping and dabbling. The presence of geese already on the ground attracted other geese flying in the area to specific feeding sites. Plants observed to be used by geese included Hippuris tetraphylla, Puccinellia phryganodes, Spergularia canadensis, and Triglochin palustris. Geese fed on Hippuris tetraphylla and Puccinellia phryganodes where available on the mud flats along the Ugashik River, but areas where little food was available (i.e. mud bars exposed at low tide), were used primarily for roosting.

ACTIVITY BUDGETS

Behavior was recorded during 67 observations on 47 individuals during a total of 39.7 hours (Table 3). The behavior of adult males and females differed only in the percentage of time spent resting (9% of daylight hours for females vs. 26% for males, $P = 0.037$, Mann-Whitney U Test; $P > 0.4$ for feeding, alert, and maintenance) and no differences existed between the sexes of the 2 youngest age classes combined, for any behavior ($P > 0.1$, all behaviors). Because of the lack of difference between males and females (7 of 8 comparisons), we combined the sexes for analysis of variation in behavior among age classes.

All age classes of geese spent the majority of daylight hours feeding, but there was a tendency for percentage of time spent feeding to decline with increasing age (84% of daylight hours for young of the year vs. 73% and 54% for second year and adult geese, respectively, Table 1; $P < 0.1$, Kruskal-Wallis Test). The difference between adults and the 2 younger age classes combined, was more pronounced ($P = 0.03$, Mann-Whitney U Test). The greater percentage of time spent feeding by young of the year was reflected in their spending less time resting (0%) and performing maintenance activities (3%) than the 2 older age classes (8% and 17% of the day spent resting by second year birds and adults, respectively, and 10% and 16% of the day spent in maintenance by these 2 age classes).

Neck collars did not seem to significantly alter the behavior of geese, except while preening, when they often tugged repeatedly at the collars. Most collars slid easily up and down the neck when the goose fed, although a few did fit more snugly. Two in particular (codes E03 and E06) were especially snug with the back of the neck feathers hiding part of the code. No wear on the feathers was noted on any of the collared geese from the distance at which we observed them.

COLLAR SIGHTINGS

Three-hundred eighty-seven neck-collar sightings were made, resulting in 128 individual neck collars being read (Table 4). Each collar was read an average of 3 (± 2.1 S.D., range 1-12) times, but 30% were seen only once. Three of the collars seen this year (codes E03, E06, and V99) were also seen at Pilot Point in 1983 (Bollinger 1984). We made at least 2 errors in reading collars; these were from birds (codes P23 and Y34) known to be dead prior to fall 1984. Hence a minimum estimate of our error rate is 1.5%. Sightings are summarized in Table 5 by date and flock and in Table 6 by collar code.

All but 5 of the collars were observed in flocks on the inland lakes (Table 5). Geese did not use the vegetated mud flats along the Ugashik River where most sightings were made in 1983 (Bollinger 1984). We attempted to read collars on the extensive mud flat located east of the cabin (Figure 2, Area C) 3 times, but only read one collar (using a Celestron). Separated from the inland lake area by a very wide slough, this area was unfeasible for observation due to both distance and lighting conditions (direction of observation was east and southeast toward the sun). Two attempts were also made to read collars at the mud flats located at the south tip of the peninsula (Figure 2, Area D). Two collars were read here. As before, distance and light made observation from this area difficult. Two collars were also read during an observation of geese on a mud bar in Ugashik Bay.

We observed a total of 10 associations of from 2 to 5 cackling geese, each involving at least one neck collared bird (Table 7). Six of these associations were seen on more than one occasion (range 2-6) and 7 associations contained at least 2 marked geese. Associations in which geese were marked represented one sibling group of young of the year (3 geese), 4 groups containing 1 adult and young of the year, and 2 pairs of adults.

Two suspected instances of birds regrouping were observed. On 18 October, C82 joined an unmarked bird 26 minutes after landing in the pond. C82 swam 50-75 meters before joining the unmarked bird which also swam toward C82. The unmarked bird lowered his head just prior to meeting C82. Another instance of regrouping was observed on 12 October, when an unmarked bird flew from a pond vocalizing loudly. This bird was almost immediately pursued by another unmarked bird from the same flock, also vocalizing. The first bird then joined the second and both returned to the same pond.

DISTURBANCE AND HUNTING

Geese were very sensitive to disturbance from bald eagles, aircraft, hunting (both hunter movements and shooting), and our activities. All geese in an area were observed to flush in response to overflights by eagles. On three occasions, an eagle was observed to fly over an area several times resulting in repeated flushing of flocks. Once an eagle pursued a cackling goose in flight unsuccessfully and on another occasion, an eagle landed and carried off a large bird.

Eight hunters, were present in the area from 5 through 7 October. Although restricted to duck hunting, their activities, nonetheless, frequently flushed geese present on the inland lakes. Shooting (presumably by residents of

Pilot Point and Ugashik) both on and across the Ugashik River was common and sometimes caused geese in the area to flush. Three parties of local residents were observed hunting geese in the study area.

Geese were also sensitive to the frequent aircraft traffic in the area, always flushing when aircraft flew over them below 100 m. Aircraft in the area often made intentional detours in their north-south flight path along the coast to fly over the inland lake area heavily used by geese. Intentional harassment of geese by aircraft occurred on 9 and 13 October and three consecutive "dive-bombs" of a large flock (3000-4000 geese) to within 20-30 m by a Piper Supercub was observed on 19 October.

DISCUSSION

MIGRATION AND USE OF PILOT POINT

Peak numbers of cackling geese present at Pilot Point during October 1984 represented about 40% of the total population of this species (15,000 of 38,500, estimate from Raveling et al. 1985). The total area used by cackling geese is approimately 10 km^2 and the areas of intensive use are considerably smaller. Such a large proportion of a species at critically low levels spending about 2 weeks in so small an area should be of concern to wildlife managers, particularly in view of the potential importance of the area to cackling geese (see below) and our lack of knowledge of the area.

The area received a heavy influx of birds with little outmigration as the population steadily increased from 1500 birds to a maximum of 15,000 during the 15 day period from 5 to 19 October. A steady build-up of geese was observed during our stay in both 1983 and 1984. Although consistent surveys have not been done historically, it is known that much greater numbers of geese used this area in the past (64,000 geese were present during a single count in 1969, Table 8). The decline in numbers of geese since 1969-1970 at Pilot Point is similar to the general decline in the population and does not seem to indicate a shift in usage away from this area.

The chronology of migration through Pilot Point is poorly understood. Since 1968, migration appears to have been quite variable; dates of major arrival varied from 4 October (1971) to 19 October (1979, Table 9), while dates of departure ranged from 9 October (1980) to 7 November (1981, 1983). Apparently arrival dates are influenced in part by condition on the Yukon-Kuskokwin (Y-K) Delta; when fall freeze-up is late, cackling geese delay their departure from the Y-K Delta and their subsequent arrival on the Alaska Peninsula (C.P. Dau cited in Timm 1980).

Our field work has not extended late enough to observe the major departure of geese from Pilot Point. It is believed that freeze-up usually precipitates the departure of geese, but the influence of other factors such as major weather systems, food availability, condition of the birds, hunting pressure both in Alaska and California, and tradition are unknown. Dramatic reduction of hunting pressure in their wintering areas and associated patterns of fall migration may provide insight into the relationship between hunting and the timing of migration. This year most geese remained in the area past 20 October despite generally favorable or nonexistent winds and freezing of the

ponds on 6 nights. Further study is needed to better understand factors related to the chronology of use of the Pilot Point area.

The number of individual neck collars identified at Pilot Point in 1984 (128) was an order of magnitude higher than the number read in 1983 (12). We attribute the increase to more geese being present for a longer period of time, greater use of inland lakes where geese were more observable, the presence of an additional observer, and better weather in 1984. The increase in number of neck collars sighted provided a clearer picture of both migration patterns and use of the area by cackling geese.

Analysis of the patterns of neck collar sightings indicates some heterogeneity in use of the area by cackling geese. We compared the distribution of the frequency of sighting individual neck collars (ie. the number of collars seen 1,2,3,...,n times) with the distribution expected if all collars had equal probability of being seen each day (Poisson distribution) using a X^2 goodness of fit test. The observed distribution was significantly different from expected ($X^2 = 29.3$, $P < 0.001$), due to a large number of collars seen only once. We interpret this pattern to indicate that many geese used the inland ponds infrequently or for short duration during daylight hours, thus providing few opportunities for resightings.

Infrequent and/or short duration visits to the inland lakes were also suggested by the proportion of neck collars present that were seen at least once compared to the daily sighting rate of collars known to be present. We read collars of geese known to be present (i.e. excluding the first and last days collars were read) with probability 0.29. We read approximately 55% (128 of 234) of the neck collars present at Pilot Point. (We estimated the number of collars available to be 15,000/38,000 x 600, where 15,000 and 38,000 were numbers of geese at Pilot Point and in the total population, respectively, and 600 was the number of collars seen in California during 1984-1985, that were applied prior to fall 1984, Raveling et al. 1985). The larger proportion of neck collars actually seen than expected from the daily sighting rate of those known to be present further suggests limited use of inland lakes by a component of the geese actually present, because almost a third of the collars were seen only once.

BEHAVIOR

Cackling geese at Pilot Point were hyperphagic prior to their long fall migratory flight as has beeen described for giant Canada geese in spring (Branta canadensis maxima), (McLandress and Raveling 1981). This behavior allows them to deposit the lipid necessary to fuel the migration.

Adults fed significantly less than 2-year-olds and young of the year combined. It is possible that this difference reflects the greater nutritional demand of young geese, some of which may not have had enough reserves to complete migration (see below). Alternately, it may reflect the superior competitive abilities of adults, who can gain access to better foraging areas, thereby meeting their requirements with less effort.

The relatively large number of cackling goose assoiations that were present at Pilot Point suggests that they are important during staging or, alternately, that ecological conditions or low levels of disturbance "allowed" the

persistence of such associations. Goslings, and possibly some adults, were still gaining weight at Pilot Point (Bollinger 1984) which was probably important for migration and overwinter survival. Raveling (1970) has demonstrated family groups are dominant, hence associations of geese may have gained access to superior foraging locations, thus improving their ability to gain weight.

Activity budgets presented here must be interpreted with caution for 2 reasons. First, we were unable to observe geese on a large mudflat along the Ugashik River where up to 70% of cackling geese spent most of the daylight hours. Therefore, it is possible that our data are not representative of the majority of geese. Second, we are uncertain of the quality of foods available in the various habitats at Pilot Point making it more difficult to understand the significance of use of particular habitats or behaviors in those habitats.

DISTURBANCE

Although the hunting season was closed on cackling geese this fall, they seemed to experience more disturbance from shooting in 1984 than 1983. Perhaps this greater disturbance was due to more extensive use of the inland lakes by geese during the day.

Disturbance of staging geese at Pilot Point by aircraft is not a new phenomenon. Timm (1980, 1982) reported an average of 3.6 and 1.7 aircraft per hour flew below 150 m over Ugashik Bay with similar reactions by geese to those we observed.

Disturbance had the following impacts on geese: (1) when flushed, geese flew for up to 1/2-5 minutes at a considerable energetic expense; (2) feeding time was further reduced because feeding did not resume immediately after geese landed; and (3) the entire flock often left the area and flew to mudflats along the Ugashik River. In view of the potential importance of Pilot Point for pre-migratory fattening, disturbance may significantly impact geese that are "behind" others in lipid deposition (e.g. young of the year).

IMPORTANCE OF THE AREA FOR CACKLING CANADA GEESE

Several lines of evidence indicate that Pilot Point is an important area for cackling geese: (1) nearly half the population stages there during fall, (2) it is the last stopping point prior to a long overwater flight to Oregon and California, (3) geese (particularly young of the year) spend a great deal of time feeding, apparently still building reserves for migration, and (4) body weights of cackling geese are near annual highs when at Pilot Point (Bollinger 1984, D. Sellers, pers. comm.).

The large weight gain that occurs prior to and during the stopover is especially important. Cackling geese lose about 500 g during the migration to California [compare weights in Bollinger (1984) to those in Raveling (1978)]. Some young of the year may not have had sufficient reserves to undergo this migration (One hatching year male weighed 1400 g in 1983.). Weight gained on the Alaska Peninsula may provide sufficient extra lipid to allow some young that otherwise would not have survived to successfully complete migration. Lipid gained by adults may improve their overwinter survival.

CONCLUSIONS

Pilot Point is an important area for cackling geese during fall migration. We suspect that in most years feeding there provides critical nutrients for migration and overwinter maintenance, particularly for young of the year. Levels of disturbance are high, often disrupting foraging and possibly displacing geese from preferred feeding sites or from the area entirely. Our understanding of nutrients available to geese (both in terms of quantity and quality of foods) is poor. We also have a poor understanding of population segments using Pilot Point and factors that might be influencing temporal and spatial patterns of use. Our lack of understanding of important aspects of the biology of cackling geese at Pilot Point makes it difficult to assess potential management actions (e.g. control of disturbance).

RECOMMENDATIONS

STUDY DESIGN AND METHODS

1. Continue to read collars and document timing and magnitude of use of the area, habitat use, and behavior of geese in the area.
2. Use a light boat and motor to attempt to gain access to areas unapproachable by land.
3. Make regular aerial surveys (twice weekly) to count total numbers of geese present and record habitats used.
4. Arrive in the area prior to 1 October and plan to leave at least 1 person until geese depart. Since departure may coincide with freeze-up, arrangements need to be made to pick up the remaining person(s) on the river or to use a helicopter to ferry them from the area. This necessitates use of a portable radio.
5. Experiment with use of decoys to evaluate their effectiveness in attracting flying geese to a particular site - to aid in observations and possibly cannon netting in the future.
6. Estimate the quantity of major habitat groups and the availability and quality of foods within these groups.
7. Examine major concentrations of Canada geese at other locations on the Alaska Peninsula for groups of cackling geese. Attempt to read neck collars on cackling geese located at areas other than Pilot Point for better determination of the population segments using available migration routes.

MANAGEMENT

1. Monitor the major sources of disturbance (i.e. aircraft traffic and hunting) and take action to reduce them if necessary.
2. Make spot checks for illegal hunting from King Salmon. Local residents were apparently aware of the presence of law enforcement personnel and illegal activity increased dramatically after their departure.

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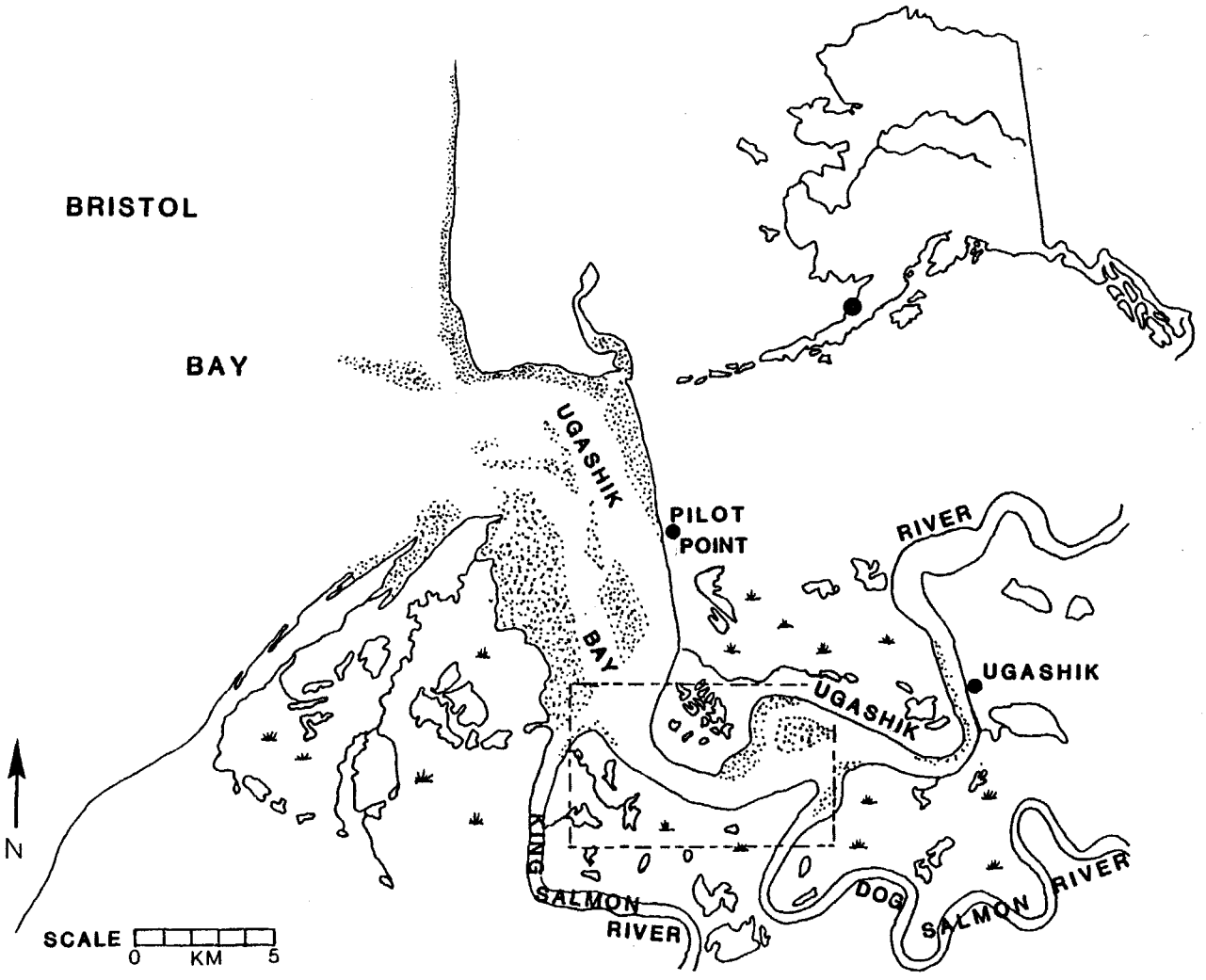

Figure 1. Location of Pilot Point - Ugashik Bay, Alaska.
The area enclosed in the rectangle is the location of Figure 2.
The study area is the large peninsula on the north side of
Ugashik River that is positioned at the top of the rectangle.

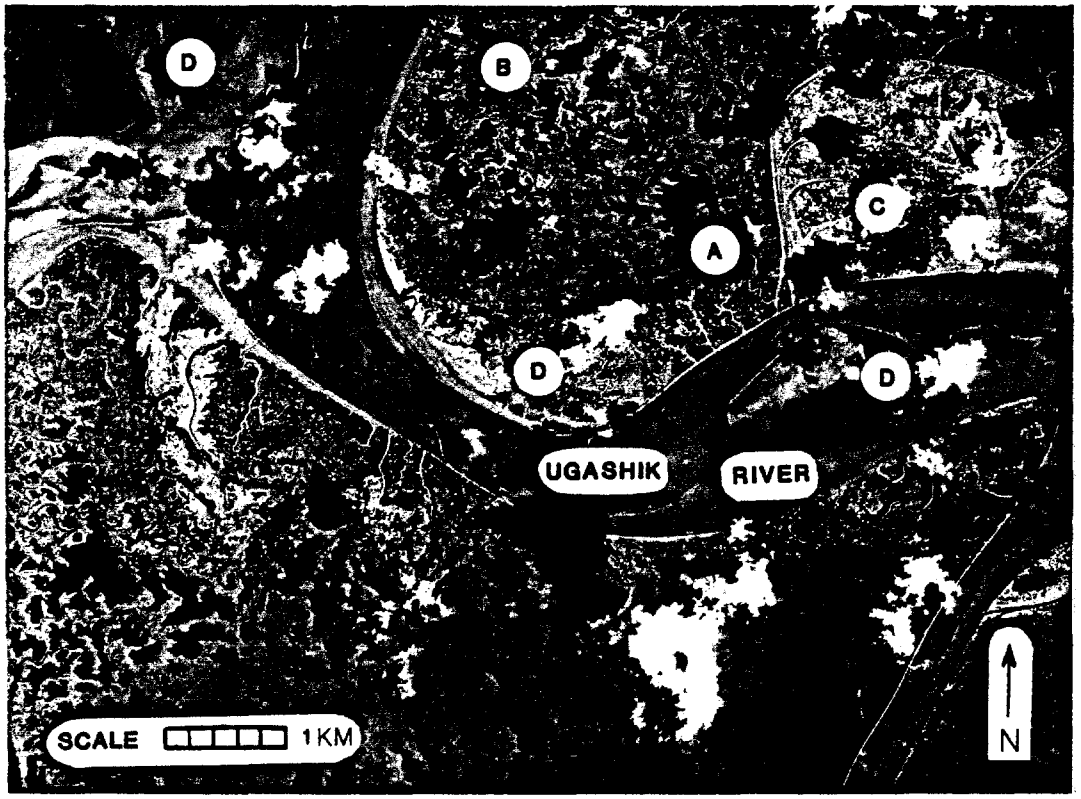

Figure 2. Fall staging area of cackling Canada geese at Pilot Point - Ugashik Bay, Alaska.
A. Cabin B. Inland Lake Area
C. Mud Flat D. Sand Bar/Mud Flat

Table 1. Weather recorded at Pilot Point, Alaska, 5-19 October 1984.

DATE	TEMPERATURE		WIND		CLOUD COVER	PRECIP.	POND ICE
	MIN.	MAX.	VEL.	DIR.			
5	43	54	10-20	NNE	80%	trace	--
6	38	41	10-12	NW	100%	0.1	--
7	27	42	<5	N	20%	0.0	--
8	28	39	<5	NNW	50%	0.0	--
9	25	44	<5		40%	trace	film until 1300
10	25	53	calm		40%	0.0	film until 1330
11	20	46	<5	NW	25%	0.0	1/4" until 1500
12	23	47	<5		50%	trace	3/8" until 1500
13	27	40	10-15	WNW	100%	0.1	--
14	31	44	<5	N	90%	0.0	--
15	30	49	<5	SSW	25%	0.0	--
16	29	51	5	NE-E	0%	0.0	--
17	35	59	5-20	E-N-S	0%	0.0	--
18	21	42	<5	NW	0%	0.0	3/8" until 1500
19	22	41	<5	SW-NW	25%	0.0	1/4" until 1500
20	--	--	--	--	100%	trace (snow)	--

Table 2. Number of cackling Canada geese estimated to be at Pilot Point, Alaska 5-19 October 1984.

DATE	ESTIMATED NUMBER OF CACKLING GEESE
5	1100-1500
8	5000-6000
10	8500
12	9000-10000
13	10000
19	12000-15000

Table 3. Activity budgets of each age class of cackling Canada geese observed at Pilot Point 5-19 October 1984.

AGE CLASS	FEED	DRINK	LOCOMOTION	MAINTENANCE	ALERT	REST	INTRA-SPECIFIC INTERACTIONS
ASY (N=46)	53.3 ± 38.2	0.7 ± 2.7	6.6 ± 8.8	15.5 ± 21.6	6.5 ±10.8	17.2 ±29.4	0.2 ± 0.8
SY (N=12)	73.2 ± 33.6	0	6.0 ± 7.0	9.8 ± 15.5	1.4 ± 2.5	8.0 ± 18.8	1.5 ± 5.2
HY (N=9)	83.5 ± 12.4	0.2 ± 0.5	9.6 ± 8.9	2.7 ± 8.0	3.7 ± 4.2	0	0.4 ± 1.1

Table 4. Summary of cackling Canada goose collars seen at Pilot Point, Alaska 5-19 October 1984.

COLLAR CODE	DATE SEEN[a] FIRST	LAST	# OF DAYS/ TIMES SEEN	FIRST DATE SEEN IN CALIFORNIA[b]
A16	12	16	3/3	--
A28	8	10	2/3	--
A41	17	17	1/1	--
A96	11	17	2/2	--
C13	11	11	1/1	--
C82	10	18	5/6	--
C99	12	16	2/3	--
E03	15	17	3/3	--
E06	11	15	3/3	--
E09	8	8	1/1	--
E37	15	18	2/2	--
E45	9	15	5/6	--
H11	9	12	2/2	--
H14	9	12	3/3	--
H17	18	18	1/2	--
H18	10	12	2/2	--
H21	8	10	3/3	26 OCT
H29	8	10	3/3	26 OCT
L32	13	15	2/3	--
N01	10	18	6/7	--
N20	16	16	1/1	--
N22	10	10	1/1	--
N23	10	10	1/1	--
N26	9	17	4/4	--
N27	8	18	5/6	--
N29	8	10	2/3	--
N39	8	8	1/1	--
N59	11	11	1/1	--
N93	11	18	3/3	--

Table 4. continued.

COLLAR CODE	DATE SEEN[a] FIRST	LAST	# OF DAYS/ TIMES SEEN	FIRST DATE SEEN IN CALIFORNIA[b]
P06	8	14	4/6	--
P19	11	18	3/4	--
P31	11	11	1/1	--
P53	15	15	1/1	--
P59	10	18	5/5	--
P60	12	17	2/2	--
P78	15	18	2/2	--
P88	9	19	4/6	26 OCT
P93	8	16	5/5	--
P95	8	8	1/1	--
T30	10	10	1/1	--
T45	10	10	1/1	--
T82	8	15	4/4	--
T84	6	10	3/4	--
T89	8	12	3/3	--
T94	13	13	1/1	--
V07	8	18	3/3	--
V22	17	17	1/1	--
V49	8	8	1/1	17 OCT
V62	8	18	8/11	--
V99	10	14	2/2	--
X00	8	12	3/5	--
X30	10	12	3/4	--
X35	15	19	2/2	27 OCT
X44	9	18	5/5	--
X84	11	19	4/5	--
X94	13	18	5/6	--
X95	8	12	3/5	--
X99	13	18	5/6	--
Y10	13	13	1/1	--
Y25	9	12	3/4	--
Y36	10	11	2/2	--
Y39	8	12	2/2	--
Y53	8	8	1/1	--
Y55	19	19	1/1	--
Y65	18	18	1/1	27 OCT
Y67	8	8	1/1	--
Y83	12	15	3/5	--
Y85	15	15	1/1	31 OCT

Table 4. continued.

COLLAR CODE	DATE SEEN[a] FIRST	LAST	# OF DAYS/ TIMES SEEN	FIRST DATE SEEN IN CALIFORNIA[b]
Z12	13	13	1/1	—
Z14	9	15	3/4	—
Z56	8	10	2/3	—
Z57	18	18	1/1	—
Z70	18	18	1/1	26 OCT
Z71	15	19	3/5	—
Z96	12	12	1/1	—
0A6	15	17	2/2	27 OCT
0A7	18	18	1/1	—
1A4	13	13	1/1	—
2A8	15	19	2/2	—
5A8	11	18	3/3	—
5A9	17	17	1/1	—
6A0	9	17	2/2	30 OCT
6A1	17	17	1/1	—
6A4	9	17	2/2	—
6A7	10	19	3/6	27 OCT
7A0	10	19	3/6	—
0C6	10	19	5/6	—
0C7	12	12	1/2	—
0C8	8	18	3/3	—
1C7	12	18	2/3	—
2C0	12	18	3/4	—
2C6	12	18	2/3	—
3C1	10	10	1/1	—
3C4	12	12	1/2	—
3C8	12	12	1/2	—
0L8	13	19	3/5	—
5L4	10	18	4/5	—
6L6	12	15	3/4	—
7L6	13	18	3/3	—
8L5	13	13	1/2	—
9L2	10	18	3/4	—
6N5	10	18	4/4	—

Table 4. continued.

COLLAR CODE	DATE SEEN[a] FIRST	LAST	# OF DAYS/ TIMES SEEN	FIRST DATE SEEN IN CALIFORNIA[b]
0T4	15	15	1/1	—
1T8	18	18	1/1	—
3T2	13	17	3/5	—
3T5	14	17	3/3	—
4T7	8	18	4/5	31 OCT
7T1	11	11	1/1	—
7T2	10	17	3/3	—
8T0	8	19	7/7	—
27L	12	12	1/1	—
38L	8	18	4/5	—
60L	18	18	1/1	—
67L	10	11	2/2	—
70L	13	15	3/4	—
80L	19	19	1/1	—
87L	14	14	1/1	—
92L	11	18	3/3	—
98L	8	18	5/5	—
01N	14	18	3/3	—
23N	15	18	2/2	—
25N	17	17	1/1	—
39N	8	12	5/8	15 OCT
40N	10	19	8/12	—
43N	8	17	4/5	—
45N	10	17	3/4	—
76N	10	10	1/2	—
87N	10	17	4/4	—

[a]Date in October
[b]Includes geese observed only in October.

Table 5. Summary of flocks of cackling Canada geese observed from 5-19 October 1984 at Pilot Point, Alaska.

DATE	TIME	ESTIMATED # BIRDS IN FLOCK	ESTIMATED # BIRDS IN VIEW	VIEWING DISTANCE (m)	COLLARS READ
6 OCT	1200-1230	1000	—	--	T84
7 OCT	1252-1717[b]	1000-1500	1000	200-300	6 collars not read
8 OCT	1220-1243	600	100	75-125	N29[a]+1 unmarked
	1330-1815	1000	800	50-200	A28 E09 H21[a]/H29[a] N27 N39
	after 1611	3500	3000		P06 P95 T82 T84 T89 V07 V49 V62[a] X00 X95[a] Y39 Y53 Y67
	Flock Behavior:	95% feeding-land & H_2O	2.5% resting	2.5% preening	Z56 4T7 8T0 38L[a] 98L[a] 39N 43N
	1900-1927	500	500	100-150	P93 V62 OC8
9 OCT	1153-1209	200	200	200	H14 H21/H29 N26 X00 98L 39N
	1246-1259	300	50	200	X44 39N
	1400-1714[b]	1000	150-250	200	E45[a] Z14[a] -7 collars not read
	Flock Behavior:	95% resting	5% preening		
10 OCT	1245-1353	1000	1000	100-150	A28 C82 E45 H14 N27 N29 P06 T45 T84 V62 X95 Y25 Y36[a] 6A7/7A0 5L4 9L2 4T7 67L 40N

Table 5. continued.

DATE	TIME	ESTIMATED # BIRDS IN FLOCK	ESTIMATED # BIRDS IN VIEW	VIEWING DISTANCE (m)	COLLARS READ
10 OCT	1523-1805	2500-3000	2500	50-200	A28 E45[a] H18 N01 N22/N23 N27[a] P06 P93 T30 T82 T84 T89 V62 X30 X95 Y25 Z56 6A7[a]/7A0[a] 3C1 5L4 9L2 6N5 4T7[a] 7T2 8T0 38L 98L 39N 40N[a] 43N[a] 45N 76N 87N
	1841-1929	1000	1000	100-150	H21[a]/H29[a] N29 P59 V99 Z56 6A7/7A0 0C6 38L 40N 43N 76N
11 OCT	1115-1220[b]	2000	500	500	N59[a] - unable to read many
	1412-1745	500	300	100-150	A96 C13 Y36 40N[a]
	1750-1805	500	500	150	E06 E45 N01 X84 43N
	1901-1910	500	500	150	5A8 5L4 8T0 39N
12 OCT	1255-1316	2000	500	200-250	Y83 1C7[a]-unable to read several
	1401-1548	3000-4000	500	75-100	C82 C99[a] H11 H14[a] P06 P88 X00 X30[a] X44 X95[a] 0C6 5L4 2C0/2C6+1 unmarked 7T2 39N 0C7[a]/3C4[a]/3C8[a]+1 unmarked
	1552-1632	3000	1000	100-200	A16 C99 N01[a] P59 T89 X00 Z14 Z96 0C7/3C4/3C8 6N5 27L 39N[a]
	1713-1923	3000	1000	50-100	E06[a] N27 X00[a] Y25[a] Y39 Y83 6A7/7A0 2C0[a]/2C6[a]+1 unmarked

Table 5. continued.

DATE	TIME	ESTIMATED # BIRDS IN FLOCK	ESTIMATED # BIRDS IN VIEW	VIEWING DISTANCE (m)	COLLARS READ
13 OCT	1140-1227	200	200	75	L32 T82 0L8[a] 8L5[a] 92L
	1255-1315	500	500	150-200	L32 T94 Z12
	1347-1434	500	500	100	V62 Y10 0C6 0L8[a] 98L[a]
	Flock Behavior:	1355-1423: feeding-85% in H_2O 7.5% on land 7.5% resting			
		1423-1437: feeding-35% in H_2O 20% on land 40% preening 5% resting			
	1440-1605	2000-4000	1000	100-200	N01 N26 P88 V62[a] X94[a]/X99[a] X44 1A4 0L8 6L6 7L6 8L5 3T2
	1700-1715	300	300	75-100	N01 P88 3T2 70L 40N
14 OCT	1213-1235	2000-3000	150	100	70L[a]
	1415-1610	250	250	75-100	A16[a]+1 unmarked E45[a] P06 Y83 70L
	1633-1832	300	300	50-100	P59 P93[a] 40N[a]
	Flock Behavior:	90% feeding 7.5% resting 2.5% preening			
	1858-1927	1500	1500	100-200	V62 V99 X94/X99 3T2 3T5 87L 01N
15 OCT	1053-1150	500	500	100-150	P53 P78 Y83 Z14 Z71[a] 0A6[a] 3T5 23N
	1250-1328	250	250	75-100	L32 N26[a] 6L6 70L[a] 45N[a]

Table 5. continued.

DATE	TIME	ESTIMATED # BIRDS IN FLOCK	ESTIMATED # BIRDS IN VIEW	VIEWING DISTANCE (m)	COLLARS READ
15 OCT	1445-1533[b]	500	500	100-150	X35 40N
	Flock Behavior:	1445-1511: 95% resting 5% preening			
	1550-1705	1000	1000	150-200	E45[a] N01 P19 Y85 Z14 0T4 87N
	1707-1756	500	500	150-200	T82 X84 2C0 40N
	-1724	+500	+500		C82 V62 X94/X99
	1854-1927	2000	2000	100-150	C82 E03 E06 E37 N27 P19 P59 Z71 2A8 0L8
16 OCT	1500-1506	2000	400	150	38L
	1551-1735	250	250	100-150	A16[a] C99 N20 P93 V62[a] X44 X94/X99 Z71 0C8 9L2 01N
	1814-1825	500	500	100	E03 Z71
17 OCT	1447-1500	300	300	150	40N
	1520-1806	500	500	50-100	A41[a] 5A8[a] 8T0 40N 43N
	-1700	+500	+500		45N[a]+1 unmarked A96 E03 P60 V07 V22 0A6 5A9/6A0/6A1/6A4+1unmarked 7L6 6N5 3T2 3T5 25N 87N
	1832-1839	300	300	25-100	N26
	1900-1932	250	250	75-150	3T2 7T2 45N

Table 5. continued.

DATE	TIME	ESTIMATED # BIRDS IN FLOCK	ESTIMATED # BIRDS IN VIEW	VIEWING DISTANCE (m)	COLLARS READ
18 OCT	1417-1510	3000	2000-3000	100-200	H17 N01 P78 V62 X94/X99 Y65 Z70 0A7 5A8 0C8 6N5 40N
	1559-1909	800	800	100-200	1C7/2C0/2C6+1 unmarked 98L 01N
	-1606	+300	+300		N93 P59 Z57 9L2 1T8 38L 60L 23N
	-1619	+200	+200		E37 H17[a] V07 0C6
	-1709	+300	+300		P19 8T0
	-1727	+400	+400		X94/X99 5L4 4T7[a]
	-1751	+100	+100		C82+1 unmarked N27 X44 7L6 92L
19 OCT	1255-1342	2000	700	100-200	P88 X35 X84 Y55 Z71 2A8 0C6 6A7[a]/7A0[a] 0L8 8T0 80L 40N
	1415-1509	2000	1500	75-200	Y55

[a]Activity budget recorded.
[b]Flock observed on mud flat or sand bar in river. All other flocks observed on inland lakes.

Table 6. Summary of collared cackling Canada geese observed at Pilot Point, Alaska from 5-19 October 1984.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
A16	12 OCT	1552	ATY-M	3AUG82	Kokechik Bay	
	14 OCT	1415[a]				1426-1558(93)
	16 OCT	1551				1644-1654(11)
A28	8 OCT	1330	TY-M	3AUG82	Kokechik Bay	
	10 OCT	1245				
		1523				
A41	17 OCT	1520	ATY-M	3AUG82	Kokechik Bay	1520-1631(40)
A96	11 OCT	1412	ATY-F	3AUG82	Kokechik Bay	
	17 OCT	1700				
C13	11 OCT	1412	TY-M	7AUG82	Kokechik Bay	
C82	10 OCT	1245	ATY-M	8AUG82	Kokechik Bay	
	11 OCT	—				
	12 OCT	1401				
	15 OCT	1724				
		1854				
	18 OCT	1751[a]				
C99	12 OCT	1401	ATY-M	9AUG82	Kigigak Island	1447-1507(22)
		1552				
	16 OCT	1551				
E03	15 OCT	1854	TY-F	9AUG82	Kigigak Island	
	16 OCT	1814				
	17 OCT	1700				
E06	11 OCT	1750	TY-F	9AUG82	Kigigak Island	
	12 OCT	1713				1902-1923(22)
	15 OCT	1854				
E09	8 OCT	1330	TY-F	9AUG82	Kigigak Island	
E37	15 OCT	1854	ATY-F	1AUG83	Anerkochik River	
	18 OCT	1619				
E45	9 OCT	1400	SY-M	1AUG83	Anerkochik River	1652-1714(22)
	10 OCT	1245				
		1523				1610-1621(10)
	11 OCT	1750				
	14 OCT	1415				1446-1456(11)
	15 OCT	1550				1625-1657(33)

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
H11	9 OCT	--	ASY-M	25JUL84	Newtok	
	12 OCT	1401				
H14	9 OCT	1153	ASY-M	26JUL84	Newtok	
	10 OCT	1245				
	12 OCT	1401				1418-1542(85)
H17	18 OCT	1417	SY-F	26JUL84	Newtok	
		1619				1649-1832(50)
H18	10 OCT	1523	ASY-M	26JUL84	Newtok	
	12 OCT	--				
H21	8 OCT	1330	ASY-F	26JUL84	Newtok	1445-1517(33)
	9 OCT	1153				
	10 OCT	1841				1858-1928(31)
H29	8 OCT	1330	HY-M	26JUL84	Newtok	1445-1517(33)
	9 OCT	1153				
	10 OCT	1841				1858-1928(31)
L32	13 OCT	1140	ATY-M	7NOV82	Tule Lake NWR	
		1255				
	15 OCT	1250				
N01	10 OCT	1523	SY-M	8NOV83	Klamath Basin NWR	
	11 OCT	1750				
	12 OCT	1552				1605-1631(27)
	13 OCT	1440				
		1700				
	15 OCT	1550				
	18 OCT	1417				
N20	16 OCT	1551	TY-F	8NOV83	Klamath Basin NWR	
N22	10 OCT	1523	ASY-M	8NOV83	Klamath Basin NWR	
N23	10 OCT	1523	ASY-F	8NOV83	Klamath Basin NWR	
N26	9 OCT	1153	ASY-F	8NOV83	Klamath Basin NWR	
	13 OCT	1440				
	15 OCT	1250				1313-1328(15)
	17 OCT	1832				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
N27	8 OCT	1330	SY-M	8NOV83	Klamath Basin NWR	
	10 OCT	1245				
		1523				1734-1746(13)
	12 OCT	1713				
	15 OCT	1854				
	18 OCT	1751				
N29	8 OCT	1220[a]	ASY-F	8NOV83	Klamath Basin NWR	1223-1242(20)
	10 OCT	1245				
		1841				
N39	8 OCT	1330	ASY-M	8NOV83	Klamath Basin NWR	
N59	11 OCT	1115	SY-M	8NOV83	Klamath Basin NWR	1125-1215(51)
N93	11 OCT	--	ASY-F	8NOV83	Klamath Basin NWR	
	12 OCT	--				
	18 OCT	1606				
P06	8 OCT	1330	ATY-F[b]	1NOV82	Tule Lake NWR	
	10 OCT	1245				
		1523				
	12 OCT	1401				
		--				
	14 OCT	1415				
P19	11 OCT	--	ATY-M[b]	1NOV82	Tule Lake NWR	
	15 OCT	1550				
		1854				
	18 OCT	1709				
P31	11 OCT	--	ATY-M	4NOV82	Tule Lake NWR	
P53	15 OCT	1053	ATY-F	4NOV82	Tule Lake NWR	
P59	10 OCT	1841	ATY-F	4NOV82	Tule Lake NWR	
	12 OCT	1552				
	14 OCT	1633				
	15 OCT	1854				
	18 OCT	1606				
P60	12 OCT	--	ATY-F	4NOV82	Tule Lake NWR	
	17 OCT	1700				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
P78	15 OCT	1053	ATY-F	4NOV82	Tule Lake NWR	
	18 OCT	1417				
P88	9 OCT	--	ATY-M	4NOV82	Tule Lake NWR	
	12 OCT	1401				
		--				
	13 OCT	1440				
		1700				
	19 OCT	1255				
P93	8 OCT	1900	TY-M	4NOV82	Tule Lake NWR	
	10 OCT	1523				
	11 OCT	--				
	14 OCT	1633				1633-1826(96)
	16 OCT	1551				
P95	8 OCT	1330	ATY-F	4NOV82	Tule Lake NWR	
T30	10 OCT	1523	ATY-F	5NOV82	Tule Lake NWR	
T45	10 OCT	1245	ATY-M	7NOV82	Tule Lake NWR	
T82	8 OCT	1330	ATY-F	7NOV82	Tule Lake NWR	
	10 OCT	1523				
	13 OCT	1140				
	15 OCT	1707				
T84	6 OCT	1200	ATY-M	7NOV82	Tule Lake NWR	
	8 OCT	1330				
	10 OCT	1245				
		1523				
T89	8 OCT	1330	ATY-M	7NOV82	Tule Lake NWR	
	10 OCT	1523				
	12 OCT	1552				
T94	13 OCT	1255	TY-M	7NOV82	Tule Lake NWR	
V07	8 OCT	1330	ATY-F	4NOV82	Tule Lake NWR	
	17 OCT	1700				
	18 OCT	1619				
V22	17 OCT	1700	ATY-M	4NOV82	Tule Lake NWR	
V49	8 OCT	1330	ATY-M	4NOV82	Tule Lake NWR	

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
V62	8 OCT	1330	ATY-M	4NOV82	Tule Lake NWR	1620-1727(68)
		1900				
	10 OCT	1245				
		1523				
	11 OCT	—				
	13 OCT	1347				
		1440				1545-1605(21)
	14 OCT	1858				
	15 OCT	1724				
	16 OCT	1551				1700-1717(17)
	18 OCT	1417				
V99	10 OCT	1841	ATY-F	4NOV82	Tule Lake NWR	
	14 OCT	1858				
X00	8 OCT	1330	ATY-F[b]	1NOV82	Tule Lake NWR	
	9 OCT	1153				
	12 OCT	1401				
		1552				
		1713				1722-1847(57)
X30	10 OCT	1523	ATY-F	1NOV82	Tule Lake NWR	
	11 OCT	--				
	12 OCT	1401				1500-1527(28)
		—				
X35	15 OCT	1445	ATY-M	1NOV82	Tule Lake NWR	
	19 OCT	1255				
X44	9 OCT	1246	ATY-M	1NOV82	Tule Lake NWR	
	12 OCT	1401				
	13 OCT	1440				
	16 OCT	1551				
	18 OCT	1751				
X84	11 OCT	1750	ATY-M	1NOV82	Tule Lake NWR	
		—				1839-1853(14)
	12 OCT	—				
	15 OCT	1707				
	19 OCT	1255				
X94	13 OCT	1440	ATY-F	1NOV82	Tule Lake NWR	1447-1543(57)
	14 OCT	1858				
	15 OCT	1724				
	16 OCT	1551				
	18 OCT	1417				
		1727				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
X95	8 OCT	1330	ATY-M	1NOV82	Tule Lake NWR	1641-1702(20)
	10 OCT	1245				
		--				1429-1440(11)
		1523				
	12 OCT	1401				1516-1542(27)
X99	13 OCT	1440	ATY-M	1NOV82	Tule Lake NWR	1447-1543(57)
	14 OCT	1858				
	15 OCT	1724				
	16 OCT	1551				
	18 OCT	1417				
		1727				
Y10	13 OCT	1347	ASY-M	27OCT83	Klamath Basin NWR	
Y25	9 OCT	--	SY-F	29OCT83	Klamath Basin NWR	
	10 OCT	1245				
		1523				
	12 OCT	1713				1819-1832(14)
Y36	10 OCT	1245	ASY-M	29OCT83	Klamath Basin NWR	1307-1342(36)
	11 OCT	1412				
Y39	8 OCT	1330	ASY-M	29OCT83	Klamath Basin NWR	
	12 OCT	1713				
Y53	8 OCT	1330	ASY-M	29OCT83	Klamath Basin NWR	
Y55	19 OCT	1415	ASY-F	29OCT83	Klamath Basin NWR	
Y65	18 OCT	1417	ASY-F	29OCT83	Klamath Basin NWR	
Y67	8 OCT	1330	ASY-F	29OCT83	Klamath Basin NWR	
Y83	12 OCT	1255	ASY-M	3NOV83	Klamath Basin NWR	
		1713				
		--				
	14 OCT	1415				
	15 OCT	1053				
Y85	15 OCT	1550	ASY-M	3NOV83	Klamath Basin NWR	
Z12	13 OCT	1255	ASY-F	14DEC83	Sacramento NWR	
Z14	9 OCT	1400	ASY-F	14DEC83	Sacramento NWR	1628-1714(47)
	12 OCT	1552				
	15 OCT	1053				
		1550				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
Z56	8 OCT	1330	ASY-F	14DEC83	Sacramento NWR	
	10 OCT	1523				
		1841				
Z57	18 OCT	1606	SY-F	14DEC83	Sacramento NWR	
Z70	18 OCT	1417	ASY-F	14DEC83	Sacramento NWR	
Z71	15 OCT	1053	ASY-F	14DEC83	Sacramento NWR	1132-1150(19)
		1854				
	16 OCT	1551				
		1814				
	19 OCT	1255				
Z96	12 OCT	1552	ASY-M	14DEC83	Sacramento NWR	
0A6	15 OCT	1053	ATY-M	3AUG83	Kokechik Bay	1053-1150(58)
	17 OCT	1700				
0A7	18 OCT	1417	SY-F	3AUG83	Kokechik Bay	
1A4	13 OCT	1440	SY-M	3AUG83	Kokechik Bay	
2A8	15 OCT	1854	SY-F	3AUG83	Kokechik Bay	
	19 OCT	1255				
5A8	11 OCT	1901	ASY-M	29JUL84	Kokechik Bay	
	17 OCT	1520				1637-1709(33)
	18 OCT	1417				
5A9	17 OCT	1700[a]	HY-M	29JUL84	Kokechik Bay	
6A0	9 OCT	--	HY-M	29JUL84	Kokechik Bay	
	17 OCT	1700[a]				
6A1	17 OCT	1700[a]	ASY-M	29JUL84	Kokechik Bay	
6A4	9 OCT	--	HY-F	29JUL84	Kokechik Bay	
	17 OCT	1700[a]		29JUL84	Kokechik Bay	
6A7	10 OCT	1245	ASY-F	29JUL84	Kokechik Bay	
		1523				1551-1658(64)
		1841				
	12 OCT	1713				
		--				
	19 OCT	1255				1256-1342(19)

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
7A0	10 OCT	1245	HY-M	29JUL84	Kokechik Bay	
		1523				1551-1658(64)
		1841				
	12 OCT	1713				
		—				
	19 OCT	1255				1256-1342(19)
0C6	10 OCT	1841	ASY-F	31JUL84	Kokechik Bay	
	12 OCT	1401				
		—				
	13 OCT	1347				
	18 OCT	1619				
	19 OCT	1255				
0C7	12 OCT	1401[a]	HY-F	31JUL84	Kokechik Bay	1407-1539(15)
		1552				
0C8	8 OCT	1900	ASY-F	31JUL84	Kokechik Bay	
	16 OCT	1551				
	18 OCT	1417				
1C7	12 OCT	1255	HY-M	31JUL84	Kokechik Bay	1300-1316(17)
		—				
	18 OCT	1559[a]				
2C0	12 OCT	1401[a]	ASY-F	31JUL84	Kokechik Bay	
		1713[a]				1722-1837(67)
	15 OCT	1707				
	18 OCT	1559[a]				
2C6	12 OCT	1401[a]	HY-F	31JUL84	Kokechik Bay	
		1713[a]				1722-1837(67)
	18 OCT	1559[a]				
3C1	10 OCT	1523	ASY-F	31JUL84	Kokechik Bay	
3C4	12 OCT	1401[a]	HY-M	31JUL84	Kokechik Bay	1407-1539(15)
		1552				
3C8	12 OCT	1401[a]	HY-F	31JUL84	Kokechik Bay	1407-1539(15)
		1552				
0L8	13 OCT	1140	ATY-F	9NOV82	Tule Lake NWR	1209-1227(19)
		1347				1414-1423(10)
		1440				
	15 OCT	1854				
	19 OCT	1255				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
5L4	10 OCT	1245	ATY-F	10JAN83	Sacramento NWR	
		1523				
	11 OCT	1901				
	12 OCT	1401				
	18 OCT	1727				
6L6	12 OCT	--	ATY-F	10JAN83	Sacramento NWR	
	13 OCT	--				1321-1410(28)
		1440				
	15 OCT	1250				
7L6	13 OCT	1440	ATY-M	10JAN83	Sacramento NWR	
	17 OCT	1700				
	18 OCT	1751				
8L5	13 OCT	1140	ATY-F	10JAN83	Sacramento NWR	1211-1227(17)
		1440				
9L2	10 OCT	1245	ATY-M	10JAN83	Sacramento NWR	
		1523				
	16 OCT	1551				
	18 OCT	1606				
6N5	10 OCT	1523	ATY-F	10JAN83	Sacramento NWR	
	12 OCT	1552				
	17 OCT	1700				
	18 OCT	1417				
0T4	15 OCT	1550	ASY-F	3NOV83	Klamath Basin NWR	
1T8	18 OCT	1606	ASY-M	3NOV83	Klamath Basin NWR	
3T2	13 OCT	1440	ASY-F	3NOV83	Klamath Basin NWR	
		1700				
	14 OCT	1858				
	17 OCT	1700				
		1927				
3T5	14 OCT	1858	ASY-M	3NOV83	Klamath Basin NWR	
	15 OCT	1053				
	17 OCT	1700				
4T7	08 OCT	1330	ASY-M	3NOV83	Klamath Basin NWR	
	10 OCT	1245				
		1523				1525-1624(31)
	11 OCT	--				
	18 OCT	1727				1745-1820(36)
7T1	11 OCT	--	SY-F	8NOV83	Klamath Basin NWR	

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
7T2	10 OCT	1523	ASY-F	8NOV83	Klamath Basin NWR	
	12 OCT	1401				
	17 OCT	1927				
8T0	8 OCT	1330	SY-F	8NOV83	Klamath Basin NWR	
	10 OCT	1523				
	11 OCT	1901				
	12 OCT	--				
	17 OCT	1520				
	18 OCT	1709				
	19 OCT	1255				
27L	12 OCT	1552	ASY-M	27OCT83	Klamath Basin NWR	
38L	8 OCT	1330	ASY-F	27OCT83	Klamath Basin NWR	1643-1658(16)
	10 OCT	1523				
		1841				
	16 OCT	1500				
	18 OCT	1606				
60L	18 OCT	1606	SY-M	27OCT83	Klamath Basin NWR	
67L	10 OCT	1245	SY-F	27OCT83	Klamath Basin NWR	
	11 OCT	--				
70L	13 OCT	1700	ASY-F	27OCT83	Klamath Basin NWR	
	14 OCT	1213				1220-1230(11)
		1415				
	15 OCT	1250				1254-1312(19)
80L	19 OCT	1255	ASY-F	27OCT83	Klamath Basin NWR	
87L	14 OCT	1858	ASY-F	27OCT83	Klamath Basin NWR	
92L	11 OCT	--	SY-M	27OCT83	Klamath Basin NWR	
	13 OCT	1140				
	18 OCT	1751				
98L	8 OCT	1330	ASY-F	27OCT83	Klamath Basin NWR	1721-1802(42)
	9 OCT	1153				
	10 OCT	1523				
	13 OCT	1347				1355-1413(19)
	18 OCT	1559				
01N	14 OCT	1858	ASY-M	8NOV83	Klamath Basin NWR	
	16 OCT	1551				
	18 OCT	1559				
23N	15 OCT	1053	ASY-M	8DEC83	Sacramento NWR	
	18 OCT	1606				

Table 6. continued.

COLLAR CODE	DATE	TIME	AGE/SEX	CAPTURE DATE	CAPTURE LOCATION	ACTIVITY BUDGET (min.)
25N	17 OCT	1700	ASY-F	8DEC83	Sacramento NWR	
39N	8 OCT	1330	ASY-F	8DEC83	Sacramento NWR	
		—				1815-1842(23)
	9 OCT	1153				
		1246				
	10 OCT	1523				
	11 OCT	1901				
	12 OCT	1401				
		1552				1606-1618(13)
40N	10 OCT	1245	ASY-M	8DEC83	Sacramento NWR	
		1523				1508-1521(14)
		1841				
	11 OCT	1412				1440-1745(186)
	13 OCT	1700				
	14 OCT	1633				1633-1832(120)
	15 OCT	1445				
		1707				
	17 OCT	1447				
		1520				
	18 OCT	1417				
	19 OCT	1255				
43N	8 OCT	1330	SY-M	8DEC83	Sacramento NWR	
	10 OCT	1523				1718-1746(30)
		1841				
	11 OCT	1750				
	17 OCT	1520				
45N	10 OCT	1523	SY-M	8DEC83	Sacramento NWR	
	15 OCT	1250[a]				1254-1305(12)
	17 OCT	1520				1636-1717(43)
		1900				
76N	10 OCT	1523	SY-M	8DEC83	Sacramento NWR	
		1841				
87N	10 OCT	1523	SY-F	8DEC83	Sacramento NWR	
	12 OCT	—				
	15 OCT	1550				
	17 OCT	1700				

[a]Observed with one unmarked bird.
[b]Hatched in 1981.

Table 7. Groups of associated cackling Canada geese observed at Pilot Point, Alaska between 5-19 October 1984.

COLLAR CODE	AGE/SEX	DATE OBSERVED[a]
A16 + 1 unmarked	ATY-M	14 OCT
C82 + 1 unmarked	ATY-M	18 OCT
H21/H29	ASY-F/HY-M	8 OCT 9 OCT 10 OCT
N22/N23	ASY-M/ASY-F	10 OCT
N29 + 1 unmarked	ASY-F	8 OCT
X94/X99	ATY-F/ATY-M	13 OCT 14 OCT 15 OCT 16 OCT 18 OCT (2)
5A9/6A0/6A1/6A4 + 1 unmarked[b]	HY-M/HY-M/ASY-M/HY-F	9 OCT 17 OCT
6A7/7A0	ASY-F/HY-M	10 OCT (3) 12 OCT 19 OCT
0C7/3C4/3C8 + 1 unmarked	HY-F/HY-M/HY-F	12 OCT (2)
1C7/2C0/2C6 + 1 unmarked[c]	HY-M/ASY-F/HY-F	12 OCT (2) 18 OCT

[a]Number in parenthesis indicates multiple observations on the same day.
[b]Only 6A0 and 6A4 observed on 9 October.
[c]1C7 not observed on 12 October.

Table 8. Approximate peak numbers of cackling geese using Pilot Point, Alaska during fall staging - 1969-1984.

YEAR	NUMBER OF GEESE	TYPE OF SURVEY
1969[a]	64,000	Single count
1970[a]	33,600	Single count
1979[a]	10,000-15,000	Multiple counts
1983[b]	6000-8000	Daily estimates
1984[c]	12,000-15,000	Daily estimates

[a] Timm 1980.
[b] Bollinger 1984.
[c] See methods.

Table 9. Chronology of cackling Canada goose migration at Pilot Point, Alaska, 1968-1984.

YEAR	MAJOR ARRIVAL	MAJOR DEPARTURE
1968[a]	-	23 OCTOBER
1969[a]	6 OCTOBER	-
1970[a]	8 OCTOBER	-
1971[a]	4 OCTOBER	-
1975[a]	-	17 OCTOBER
1979[a/b]	19 OCTOBER	21 OCTOBER
1980[b]	7 OCTOBER	9,21 OCTOBER
1981	-	17-21 OCT, 2-7 NOV[d]
1983	8-13 OCTOBER[c]	22 OCT, 5-7 NOV[d]
1984	6-7 OCTOBER	22-23 OCTOBER[e]

[a] Timm 1980.
[b] Timm 1982.
[c] Bollinger 1984.
[d] R. Fields, pers. comm.
[e] H.E. McCollum, pers. comm.
[d/e] based on arrival dates in California

APPENDIX I

FAUNA

A total of 36 bird and 7 mammals species was observed in the area (Table A). Cackling Canada geese are essentially the only geese to use the Ugashik Bay peninsula. Although no larger Canadas were observed in the flocks, a few geese with distinct markings were observed. Individuals with distinct white neck rings, white breasts, white extending up the neck, white forehead, and one with a white neck ring and white markings on each wing were observed regularly. A single black brant (Branta bernicla nigricans), white-fronted goose (Anser albifrons), emperor goose (Chen canagica), and 2 snow geese (Chen caerulescens) were also observed almost daily with the flocks of Canadas. Dabblers were always present with the most numerous species being northern pintail (Anas acuta), green-winged teal (Anas crecca), and American wigeon (Anas americanus). Uncommon sightings included European wigeon (Anas penelope), coot (Fulica americana), and ruddy duck (Oxyura jamaicensis). Other common species in the area included shorebirds, bald eagles (Haliaeetus leucocephalus), and short-eared owls (Asio flammeus).

Emperor geese did use the Ugashik Bay area while most snow and white-fronted geese overflew the area. Large flocks of emperors were observed in Ugashik Bay, as well as a few small flocks on the study area. On the 6th, we observed both snow and white-fronted geese migrating through the area in a southeasterly direction during most of the day. Snow geese, in flocks ranging from 10 to 1200 and totaling 3900 birds, flew through at an altitude of 500-1500 ft ($\bar{x}$ = 950 ft). White-fronts, totaling 2000, flew through at 400-2500 ft ($\bar{x}$ = 1275 ft) in flocks of 27-1000 birds.

Ducks in the area decreased from an estimated 3,000-5,000 on the 5th to approximately 1000-2000 on the 10th, which coincided with the first freezing of the ponds. The duck population remained at this level for the duration of the study.

Table A. Fauna observed at Pilot Point, Alaska from 5-19 October 1984.

SCIENTIFIC NAME	COMMON NAME
Cygnus columbianus	Tundra Swan
Anser albifrons	Greater White-fronted Goose
Chen caerulescens	Snow Goose
Chen canagica	Emperor Goose
Branta bernicla nigricans	Black Brant
Branta canadensis minima	Cackling Canada Goose
Anas crecca	Green-winged Teal
Anas platyrhynchos	Mallard
Anas acuta	Northern Pintail
Anas clypeata	Northern Shoveler
Anas strepera	Gadwall
Anas penelope	Eurasian Wigeon
Anas americana	American Wigeon
Mergus serrator	Red-breasted Merganser
Oxyura jamaicensis	Ruddy Duck
Haliaeetus leucocephalus	Bald Eagle
Circus cyaneus	Northern Harrier
Lagopus lagopus	Willow Ptarmigan
Fulica americana	American Coot
Grus canadensis	Sandhill Crane
Tringa melanoleuca	Greater Yellowlegs
Calidris mauri	Western Sandpiper
Calidris minutilla	Least Sandpiper
Calidris acuminata	Sharp-tailed Sandpiper
Calidris alpina	Dunlin
Limnodromus scolopaceus	Long-billed Dowitcher
Gallinago gallinago	Common Snipe
Larus philadelphia	Bonaparte's Gull
Larus canus	Mew Gull
Larus glaucescens	Glaucous-winged Gull
Asio flammeus	Short-eared Owl
Corvus corax	Common Raven
Lanius excubitor	Northern Shrike
Passerculus sandwichensis	Savannah Sparrow
Calcarius lapponicus	Lapland Longspur
Ondatra zibethicus	Muskrat
Erethizon dorsatum	Porcupine
Delphinapterus leucas	Beluga Whale
Vulpes vulpes	Red Fox
Ursus arctos	Brown Bear
Rangifer tarandus	Caribou
Microtus sp.	Voles