

Aerial Waterfowl Surveys
Wrangell-St. Elias National Park and Preserve, Alaska
May – June 2007



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The Alaska Bird Observatory

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EXECUTIVE SUMMARY

As part of cooperative efforts among state and federal agencies in the preparation for response to an avian influenza virus H5N1 outbreak in North America, we conducted aerial surveys during May and June, 2007, to investigate the chronology, distribution and areas of aggregation, and species of waterfowl present in Wrangell-St. Elias National Park and Preserve (the Park).

Surveys were flown along transects spaced at 2-mile intervals throughout probable waterfowl habitat within the Park and were replicated in three consecutive weeks between 24 May and 13 June. Estimates of waterfowl abundance in the Park declined from a high of 25,115.8 (SE = 4,096.9) in week 1 to 15,159.2 (SE = 2,973.8) in week 2 to 13,762.5 (SE = 2,996.3) in week 3.

Diving ducks were the most abundant group of waterfowl, and of 19 observed species, scaup were the most common. I observed few large aggregations of waterfowl, and the majority of observations consisted of breeding pairs and lone males. Therefore, I suspect that waterfowl use during spring within the Park may be limited primarily to nesting and brood rearing.

INTRODUCTION

The recent outbreak of highly pathogenic avian influenza virus H5N1 (H5N1) in Southeast Asia, Europe, and Africa resulted in large die-offs of domestic poultry and wild birds. Although transmission of H5N1 to humans is relatively uncommon, the virus has caused more than 100 human deaths in 9 countries (Webster et al. 2007). H5N1 has not been found in North America. However, the threat of its cross-continent spread and the potential for a pandemic has generated much concern.

Wild migratory birds, specifically waterfowl and shorebirds, are a known vector of avian influenza and represent a potential source for the spread of H5N1 (Alexander 2000). As Alaska is a main crossroads for migratory bird populations from around the world, it represents an area of great concern for the appearance, and potential spread, of H5N1 in North America (Winker et al. 2007). Therefore, Alaska may provide the best opportunity for early detection of mortality and morbidity events associated with H5N1 transmitted to North America by wild birds.

Knowledge regarding the species of waterfowl present and where they occur in high densities is important for the response to an outbreak. Unfortunately, little is known about the timing of migration and the distribution of waterfowl during spring in many areas of Alaska. As part of cooperative efforts among state and federal agencies in the preparation for response to an H5N1 outbreak in North America, and to supplement existing spring waterfowl survey data within Alaska, we conducted aerial surveys during May and June, 2007, to investigate the chronology, distribution and areas of aggregation, and species of waterfowl present in Wrangell-St. Elias National Park and Preserve.

STUDY AREA

The study area consisted of probable waterfowl habitat within the boundaries of Wrangell-St. Elias National Park and Preserve (hereafter: the Park) in eastern Alaska (Fig. 1). The Park is characterized by mountainous terrain surrounded primarily by low elevation spruce forest interspersed with semi-permanent and permanent wetlands. Surveys were limited to probable waterfowl habitat (< 3,000 ft msl) in 5 general regions of the Park: 1) the northeast corner near Tetlin National Wildlife Refuge (NE), 2) the north-central boundary south and west of Slana (NC), 3) the western boundary between Glennallen and Slana (NW), 4) the southwestern boundary between Glennallen and Nabesna (SW), and 5) the central portion south of McCarthy (SW; Fig. 1).

METHODS

Data Collection

Our survey protocol was based on methods outlined in the U.S. Fish and Wildlife Service and Canadian Wildlife Service Standard Operating Procedure (USFWS and CWS 1987) – a protocol used to assess the number of breeding waterfowl in North America. Surveys were conducted using Cessna 185, Aviat Husky, and Piper Supercub aircraft with a single observer and were flown along transects established at 2-mile intervals within probable waterfowl habitat (Fig. 1, Appendix 1). Due to the varied terrain within the Park, and to optimize survey efficiency, transects were oriented in the direction that allowed for maximum transect length.

Surveys were flown 100-150 feet (30-50 meters) above ground at ground speeds of 90-105 mph (78-90 knots). All identified waterfowl within 1/8 mi of one side of the aircraft were counted and categorized as breeding pairs, lone males, or flocks. I used USFWS software (Moving Maps) to simultaneously record voice observations and associated GPS coordinates. To assess seasonal variation in abundance and species distribution, study area-wide surveys were replicated three times: 1) 24 May – 30 May, 2) 3 June – 6 June, and 3) 10 June – 13 June. Following completion of the initial replication, transects that did not cover waterfowl habitat were removed. Furthermore, transects were shortened if beginning and ending points did not traverse waterfowl habitat. In total, survey lines spanned 893.5 miles and required approximately 17 hours of flight time for completion.

Data Analysis

I estimated weekly waterfowl abundance in the Park using species-specific visibility correction factors (VCF) to account for birds present but not seen (Smith 1995). Because I lacked VCF data for swans and geese, I assumed them to have a detection probability of 1.0. Furthermore, I estimated weekly breeding waterfowl abundance, where only observations of breeding pairs and lone males were included in the analysis. I assume that aerial transects covered the majority of potential waterfowl habitat within the Park, and furthermore, that potential waterfowl habitat spanned 1 mile on both sides of each transect. Therefore, given total transect length of 893.5 mi, the study area consisted of 1,787 mi² and the total area surveyed each week was 111.7 mi².

I assessed spatial variation in waterfowl abundance by estimating visibility-corrected densities for sub-sections of survey transects (hereafter: sub-transects). Sub-transects were established by dividing existing transects longer than 23 miles into 2 or 3 equal parts such that no sub-transect exceeded 23 miles in length. To produce a figure depicting relative densities among sub-transects, I averaged weekly density estimates and categorized sub-transects as low (< 5.0 birds/mi²), moderate (5.0–20.0 birds/mi²), and high (> 20.0 birds/mi²) density. Due to their similar appearance, counts of lesser scaup (*Aythya affinis*) and greater scaup (*Aythya marila*) were combined.

RESULTS

I observed 19 waterfowl species representing 4 tribes (a taxonomic classification between family and genus, usually containing several genera; Appendix 2). The number of observed waterfowl declined from 754 during the first replication (24 May – 30 May; week 1), to 446 during the second replication (3 June – 6 June; week 2), and 455 during the third replication (10 June – 13 June; week 3).

Relative Species and Tribe Composition

Ducks from the tribes Aythyini and Mergini (hereafter: diving ducks) were most common and comprised 71.4–78.2% of weekly waterfowl abundance. Dabbling ducks (tribe: Anatini) made up 17.3–25.3% of weekly waterfowl abundance while geese and swans (tribe: Anserini) contributed the remaining 3.2–5.1% of weekly waterfowl abundance.

Diving ducks were the most abundant breeding tribe; 65.6–74.5% of estimated weekly breeding bird abundance. Dabbling ducks comprised 20.1–29.8% of weekly breeding abundance while geese and swans were 4.6–6.8% of breeding abundance.

Scaup were the most abundant species in all weeks, comprising 43.1–62.9% of estimated weekly waterfowl abundance and 38.3–59.7% of estimated breeding bird abundance. Relative scaup abundance increased to a high in week 3 while relative abundance of most remaining species was highest in week 1. Trumpeter swans (*Cygnus buccinator*), American green-winged teal (*Anas crecca*), American wigeon (*A. americana*), mallards (*A. platyrhynchos*), scoters (*Melanitta spp.*), bufflehead (*Bucephala albeola*), and Barrow's goldeneye (*B. islandica*) were other common species (Table 1, Table 2).

Chronology

Estimates of waterfowl abundance in the Park declined from a high of 25,115.8 (SE = 4,096.9) in week 1 to 15,159.2 (SE = 2,973.8) in week 2 to 13,762.5 (SE = 2,996.3) in week 3. Similarly, abundance estimates for diving ducks, dabbling ducks, and swans and geese declined from highs in week 1 to lows in week 3 (Fig. 2). As the season progressed, the estimated percentage of breeding waterfowl increased from 60.8% in week 1 to 74.3% in week 2, to 82.0% in week 3 while the percentage of observed lone males increased from 5.8% in week 1 to 10.7% in week 2 to 17.7% in week 3.

Spatial Variation

Study-area-wide waterfowl density decreased among weeks from 14.1 to 7.7 birds/mi². Waterfowl density per sub-transect ranged from 76.3 to 0.0 birds/mi² (Appendix 3). The highest densities of waterfowl were located mainly in the northwest and west-central portions of the Park while the lowest densities were located in the northeast and southeast portions (Fig. 3). I observed few large aggregations of waterfowl and did not observe flocks of dabbling ducks, swans, or geese containing more than 10 individuals. Across all weeks of surveys, I encountered 8 flocks containing 25 or more diving ducks, 4 of which were observed during week 1. The

largest observed flock consisted of 50 diving ducks (scaup, Barrow's goldeneye, bufflehead) and was located on the northern portion of transect NW2. While in transit between transects, I consistently observed large concentrations of diving ducks (>150 individuals) on the Cobb Lakes in the northwest corner of the Park.

Incidental Observations

During transect surveys I observed 27 swan nests, 9 Pacific loons (*Gavia pacifica*), 8 common loons (*Gavia immer*), 48 moose (*Alces alces*), and 3 grizzly bears (*Ursus arctos*).

DISCUSSION

I suspect that waterfowl abundance was highest, and the percentage of breeding birds was lowest, during week 1 as a result of the presence of migrants from other breeding locations and because many birds were in pre-laying or pre-incubating stages when they spend considerably more time away from the nest and are thus available for observation. Furthermore, I speculate that estimates of abundance declined as the season progressed as a result of an increasing percentage of females entering the incubating stage. This is further supported by the apparent increase in abundance of lone males. Although incubating hens were likely present on the study area, I would have been unable to detect them. As compared to other waterfowl in Alaska, scaup are among the latest-nesting species (Flint et al. 2006). Therefore, the increase in relative scaup abundance, and simultaneous decline in relative abundance of other species, may be due to variation in nesting chronology among species.

The majority of observations consisted of breeding pairs and lone males. Furthermore, I did not detect many large aggregations of waterfowl as is typical in high-use spring staging and migrating corridors. Because the majority of lakes and wetlands on the study area were ice-free by 24 May, it is possible that waterfowl migrating to other breeding locations passed through the Park prior to the initiation of the survey. However, given the lack of large concentrations of waterfowl, and because spring breakup occurs relatively late in the Park as compared to other breeding areas in Alaska, large numbers of waterfowl nesting in locations further north and west may not migrate through the Park, and instead, spring waterfowl use within the Park may be limited primarily to nesting and brood rearing.

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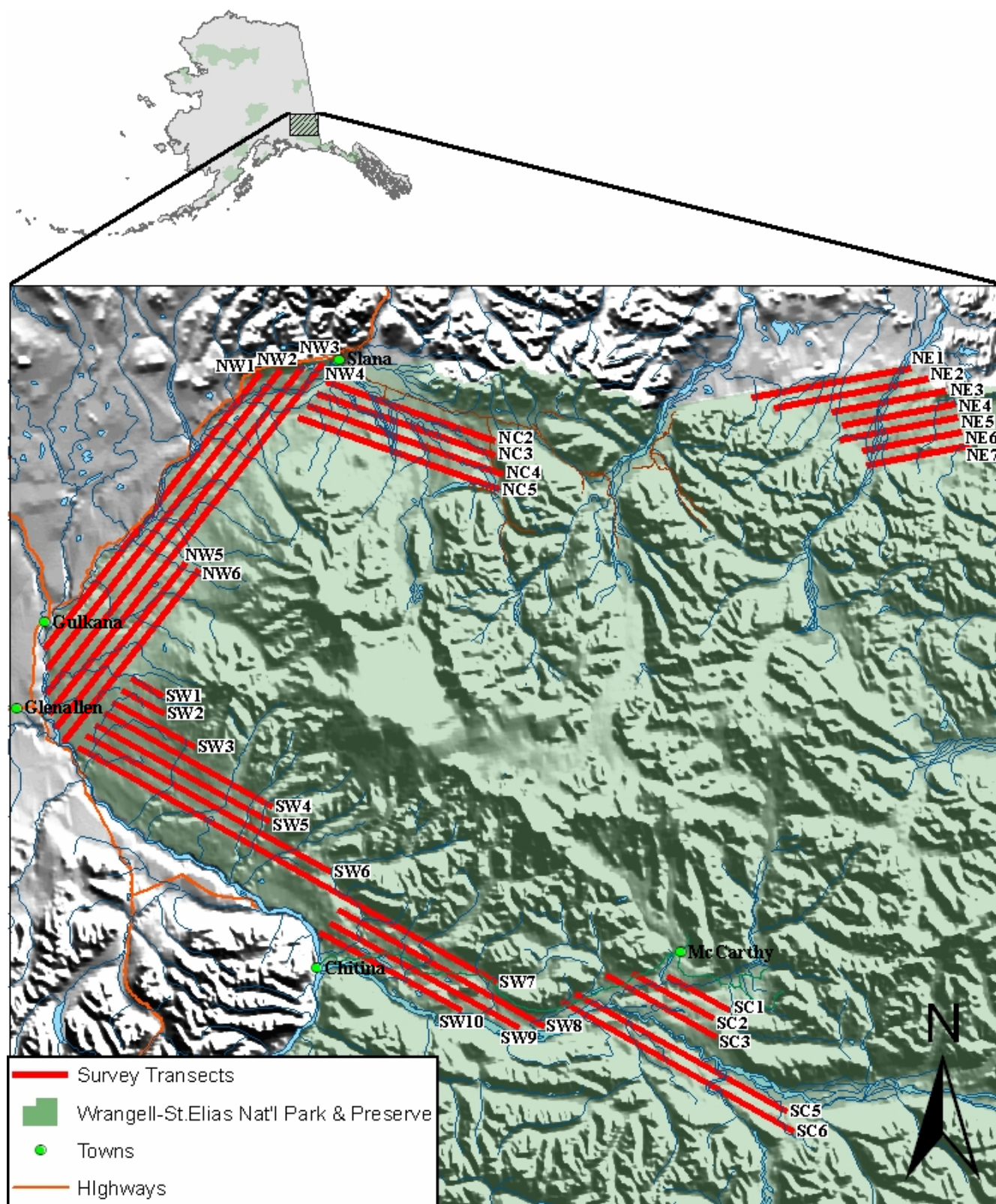


Figure 1. Location of study area and aerial survey transects within Wrangell-St. Elias National Park and Preserve, Alaska. Total transect length = 893.5 miles.

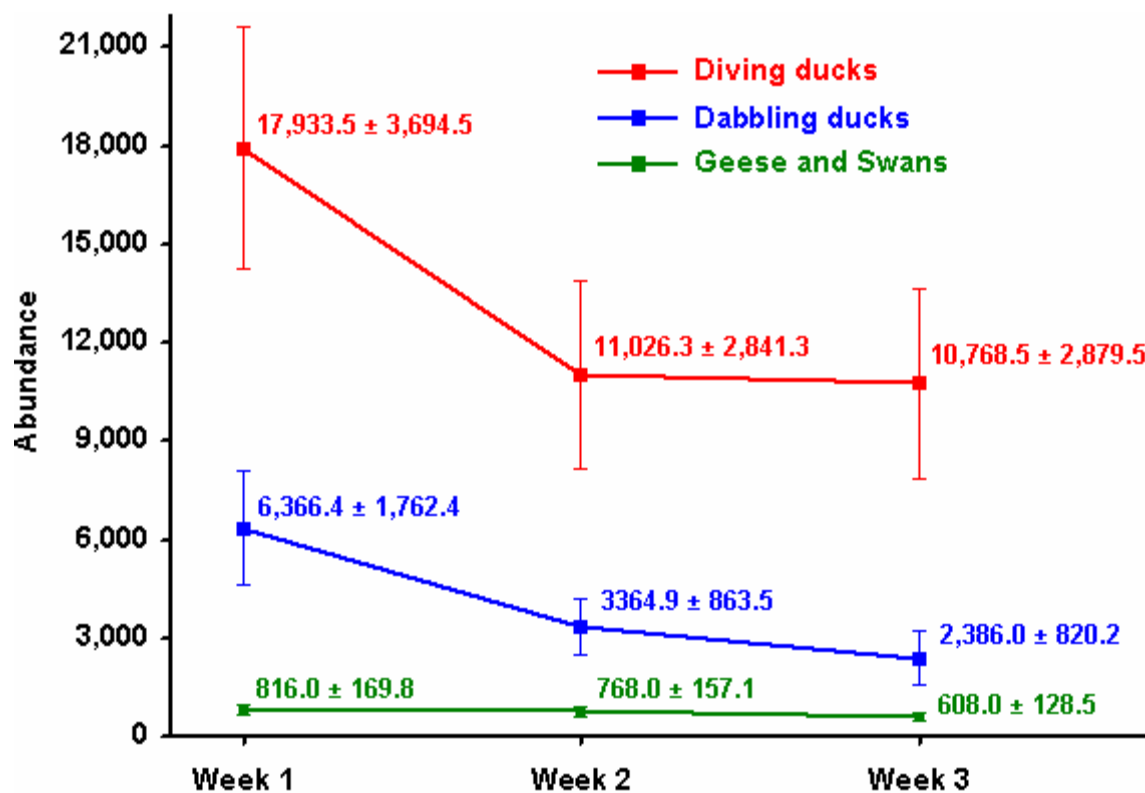


Figure 2. Weekly estimates ($\pm$ SE) of diving duck, dabbling duck, and goose and swan abundance within Wrangell-St. Elias National Park and Preserve, Alaska. Species-specific abundance estimates are corrected for detection probability. Survey dates spanned 24 May – 30 May for Week 1, 3 June – 6 June for Week 2, and 10 June – 13 June for Week 3.

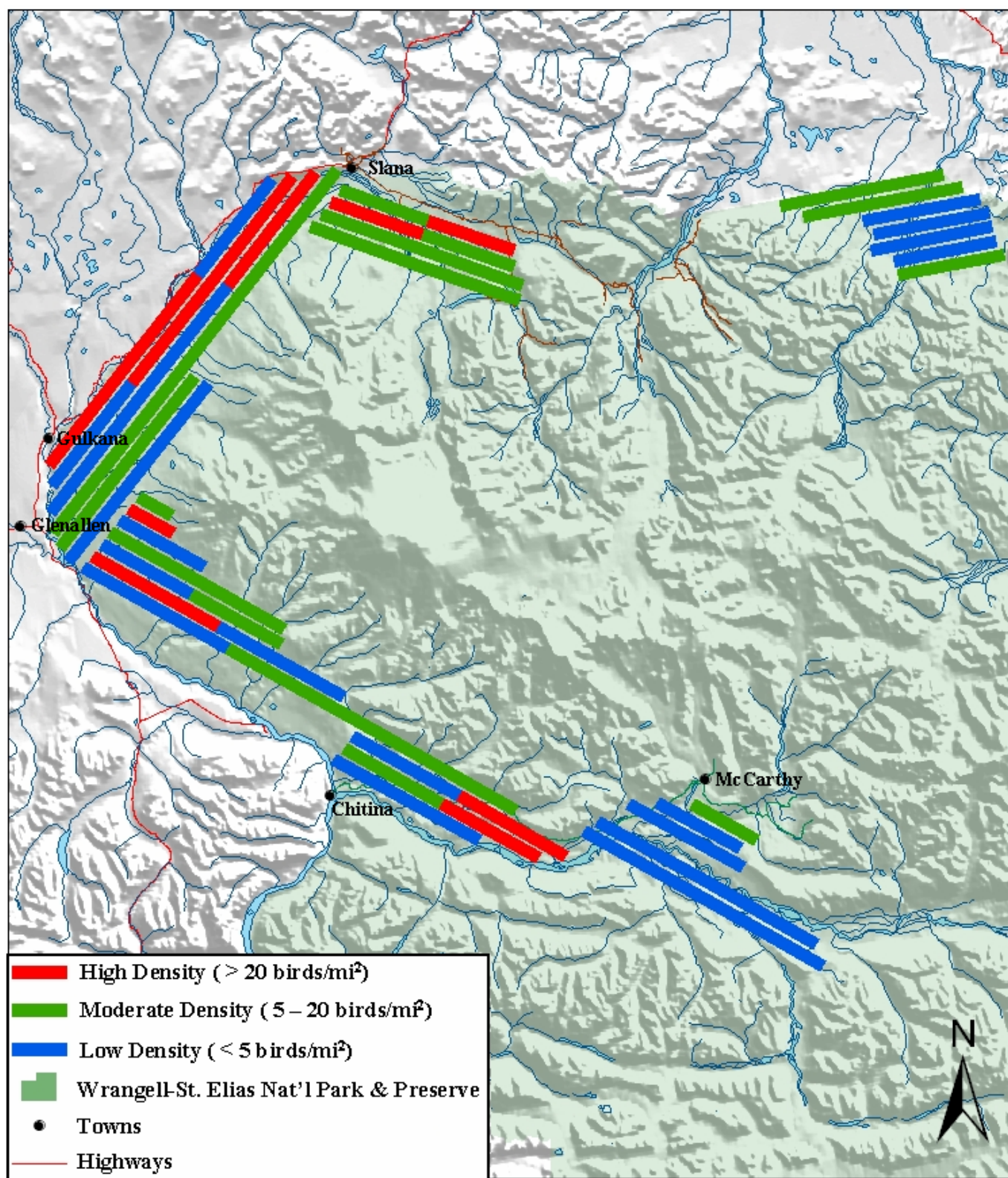


Figure 3. Relative waterfowl abundance within Wrangell-St. Elias National Park and Preserve, Alaska. Density estimates are averaged across weeks.

Table 1. Weekly estimates of species-specific abundance ($\hat{N}$) in Wrangell-St. Elias National Park and Preserve, Alaska.

Species	Survey Replication ^a					
	Week 1		Week 2		Week 3	
	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
Geese and swans ^b						
Trumpeter swan	704.0	127.3	672.0	140.8	608.0	128.5
Greater white-fronted goose	112.0	112.3	-- ^c	--	--	--
Canada goose	--	--	96.0	69.8	--	--
Dabbling ducks ^d						
American wigeon	701.6	268.0	701.6	248.4	233.9	160.2
American green-winged teal	2274.0	1517.3	284.3	278.9	1137.0	654.6
Mallard	2344.5	772.1	1601.2	630.9	800.6	443.1
Northern pintail	724.3	283.1	241.4	181.9	--	--
Northern shoveler	321.9	236.0	536.5	418.4	214.6	148.5
Diving ducks ^e						
Canvasback	--	--	13.9	13.8	110.8	110.2
Redhead	127.7	123.4	--	--	--	--
Ring-necked duck	191.6	192.8	--	--	--	--
Scaup ^f	12615.9	3455.5	6526.5	2438.8	8653.4	2712.9
Long-tailed duck	--	--	--	--	123.6	124.8
Black scoter	176.8	177.4	--	--	--	--
Surf scoter	117.9	79.6	58.9	45.5	88.4	71.0
Scoter spp. ^g	1119.9	652.2	265.2	156.3	854.7	613.2
Bufflehead	2201.1	997.4	1873.9	864.8	713.9	330.6
Barrow's goldeneye	1006.3	438.4	1900.7	1145.4	223.6	163.6
Common goldeneye	335.4	203.7	223.6	162.6	0.0	0.0
Common merganser	40.9	40.1	163.6	110.6	--	--

^a Survey dates: Week 1: 24 May – 30 May; Week 2: 3 June – 6 June; Week 3: 10 June – 13 June.

^b Species in Tribe Anserini.

^c -- indicates no observation.

^d Species in Tribe Anatini.

^e Species in Tribes Aythyini and Mergini.

^f Does not distinguish between lesser scaup and greater scaup.

^g Includes counts of scoters that were not identified to species.

Table 2. Weekly estimates of species-specific breeding waterfowl abundance ($\hat{N}$), in Wrangell-St. Elias National Park and Preserve, Alaska.

Species	Survey Replication ^a					
	Week 1		Week 2		Week 3	
	$\hat{N}^b$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$	$\hat{N}$	$\hat{SE}$
Trumpeter swan	704.0	127.3	672.0	140.8	608.0	128.5
Canada goose	-- ^c	--	96.0	69.8	--	--
American wigeon	701.6	268.0	701.6	248.4	233.9	160.2
American green-winged teal	852.8	503.8	284.3	278.9	1137.0	654.6
Mallard	1944.3	638.7	1601.2	630.9	686.2	356.0
Northern pintail	724.3	283.1	241.4	181.9	--	--
Northern shoveler	321.9	236.0	107.3	103.7	214.6	148.5
Canvasback	--	--	13.9	13.8	110.8	110.2
Redhead	127.7	123.4	--	--	--	--
Ring-necked duck	255.4	257.1	--	--	--	--
Scaup spp. ^d	5856.3	1338.1	4982.3	1669.6	6730.4	2030.1
Long-tailed duck	--	--	--	--	123.6	124.8
Surf scoter	117.9	79.6	58.9	45.5	88.4	71.0
Scoter spp. ^e	618.9	438.6	206.3	133.5	412.6	287.5
Bufflehead	1665.7	605.1	1130.3	448.0	713.9	330.6
Barrow's goldeneye	1006.3	438.4	782.7	392.1	223.6	163.6
Common goldeneye	335.4	203.7	223.6	162.6	--	--
Common merganser	40.9	40.1	163.6	110.6	--	--

^a Survey dates: Week 1: 24 May – 30 May; Week 2: 3 June – 6 June; Week 3: 10 June – 13 June.

^b Abundance estimates were calculated using only observations of waterfowl observed as lone males or breeding pairs.

^c -- indicates no observation of breeding waterfowl.

^d Does not distinguish between lesser scaup and greater scaup.

^e Includes counts of scoters that were not identified to species.

Appendix 1. List of transects, endpoint coordinates, and transect lengths for aerial waterfowl surveys within Wrangell-St. Elias National Park and Preserve, Alaska.

Transect	Transect Endpoint Coordinates		Length (miles)
	Western Point	Eastern Point	
NC2	N62.66852 W144.03309	N62.49911 W143.34331	25.0
NC3	N62.64777 W144.08022	N62.46973 W143.35779	26.2
NC4	N62.62703 W144.12770	N62.43142 W143.33618	28.7
NC5	N62.60643 W144.17527	N62.40403 W143.35841	29.7
NE1	N62.50000 W142.21718	N62.50000 W141.51500	22.5
NE2	N62.47118 W142.12947	N62.47130 W141.45043	21.8
NE3	N62.44243 W141.88983	N62.44209 W141.38490	16.2
NE4	N62.41337 W141.85296	N62.41321 W141.35627	16.0
NE5	N62.38423 W141.87653	N62.38503 W141.35853	16.7
NE6	N62.35533 W141.79063	N62.35583 W141.35276	14.1
NE7	N62.32640 W141.78362	N62.32642 W141.32938	14.6
NW1	N62.21948 W145.39815	N62.70742 W144.30825	48.6
NW2	N62.17973 W145.39722	N62.70627 W144.21916	52.5
NW3	N62.12826 W145.42000	N62.70894 W144.12103	57.9
NW4	N62.08826 W145.41876	N62.70829 W144.02887	62.0
NW5	N62.05755 W145.39554	N62.35264 W144.74743	29.3
NW6	N62.02990 W145.36959	N62.33673 W144.69318	30.5
SC1	N61.39119 W142.99490	N61.30152 W142.76009	10.0
SC2	N61.40711 W143.13572	N61.29068 W142.83017	13.0
SC3	N61.41241 W143.24776	N61.25496 W142.83395	17.6
SC5	N61.38690 W143.38205	N61.08443 W142.59565	33.6
SC6	N61.37465 W143.44655	N61.04171 W142.58057	37.0
SW1	N62.13751 W145.04873	N62.09312 W144.92138	5.1
SW2	N62.11742 W145.09323	N62.05841 W144.92434	6.8
SW3	N62.09718 W145.13773	N61.98494 W144.81717	13.0
SW4	N62.07680 W145.18192	N61.84540 W144.52670	26.7
SW5	N62.05631 W145.22584	N61.81619 W144.54702	27.7
SW6	N62.03637 W145.27074	N61.69880 W144.32200	38.8
SW7	N62.01573 W145.31435	N61.43213 W143.70009	66.7
SW8	N61.62223 W144.31409	N61.33108 W143.53100	32.8
SW9	N61.60062 W144.35508	N61.33513 W143.64059	30.0
SW10	N61.58349 W144.40467	N61.38629 W143.86683	22.4

Appendix 2. Common and scientific names of waterfowl species observed during aerial surveys in Wrangell-St. Elias National Park and Preserve, Alaska.

Tribe	Common name	Scientific name
Anserini	Trumpeter swan	<i>Cygnus buccinator</i>
	Greater white-fronted goose	<i>Anser albifrons</i>
	Canada goose	<i>Branta canadensis</i>
Anatini	American wigeon	<i>Anas americana</i>
	American green-winged teal	<i>Anas crecca</i>
	Mallard	<i>Anas platyrhynchos</i>
	Northern pintail	<i>Anas acuta</i>
	Northern shoveler	<i>Anas clypeata</i>
Aythyini	Canvasback	<i>Aythya valisineria</i>
	Redhead	<i>Aythya americana</i>
	Ring-necked duck	<i>Aythya collaris</i>
	Lesser scaup	<i>Aythya affinis</i>
	Greater scaup	<i>Aythya marila</i>
Mergini	Long-tailed duck	<i>Clangula hyemalis</i>
	Black scoter	<i>Melanitta nigra</i>
	Surf scoter	<i>Melanitta perspicillata</i>
	Bufflehead	<i>Bucephala albeola</i>
	Barrow's goldeneye	<i>Bucephala islandica</i>
	Common goldeneye	<i>Bucephala clangula</i>
	Common merganser	<i>Mergus merganser</i>

Appendix 3. Estimates of weekly waterfowl density (# of birds/mi²) by sub-transect within Wrangell-St. Elias National Park and Preserve, Alaska.

Sub-transect	Density Estimates			Sub-transect Endpoint Coordinates	
	Week 1	Week 2	Week 3	Western Point	Eastern Point
NC2W	11.5	6.4	1.2	N62.66852 W144.03309	N62.58361 W143.68472
NC2E	24.5	9.4	47.6	N62.58361 W143.68472	N62.49911 W143.34331
NC3W	71.2	20.1	10.1	N62.64777 W144.08022	N62.55933 W143.71739
NC3E	13.7	9.0	4.5	N62.55933 W143.71739	N62.46973 W143.35779
NC4W	11.1	27.2	1.1	N62.62703 W144.12770	N62.52998 W143.73264
NC4E	33.6	10.8	15.0	N62.52998 W143.73264	N62.43142 W143.33618
NC5W	4.8	8.2	7.0	N62.60643 W144.17527	N62.50569 W143.76749
NC5E	23.6	7.0	0.0	N62.50569 W143.76749	N62.40403 W143.35841
NE1	7.6	7.2	1.4	N62.50000 W142.21718	N62.50000 W141.51500
NE2	12.5	0.0	5.3	N62.47118 W142.12947	N62.47130 W141.45043
NE3	1.8	0.0	0.0	N62.44243 W141.88983	N62.44209 W141.38490
NE4	3.5	9.2	0.9	N62.41337 W141.85296	N62.41321 W141.35627
NE5	8.5	0.0	1.8	N62.38423 W141.87653	N62.38503 W141.35853
NE6	3.1	0.0	0.0	N62.35533 W141.79063	N62.35583 W141.35276
NE7	5.9	1.0	13.7	N62.32640 W141.78362	N62.32642 W141.32938
NW1W	76.3	6.3	4.3	N62.21948 W145.39815	N62.38324 W145.03728
NW1C	56.3	11.9	0.0	N62.38324 W145.03728	N62.54589 W144.67524
NW1E	0.0	12.5	0.0	N62.54589 W144.67524	N62.70742 W144.30825
NW2W	3.3	0.0	1.7	N62.17973 W145.39722	N62.35693 W145.00897
NW2C	22.3	32.3	24.3	N62.35693 W145.00897	N62.53173 W144.61648
NW2E	30.3	82.9	43.0	N62.53173 W144.61648	N62.70627 W144.21916
NW3W	0.0	4.5	5.5	N62.12826 W145.42000	N62.32252 W144.99372
NW3C	0.0	0.0	2.3	N62.32252 W144.99372	N62.51698 W144.55934
NW3E	41.3	15.8	30.3	N62.51698 W144.55934	N62.70894 W144.12103
NW4W	11.1	5.4	14.6	N62.08826 W145.41876	N62.29621 W144.96323
NW4C	0.0	0.0	0.0	N62.29621 W144.96323	N62.50252 W144.50016
NW4E	14.0	0.8	3.6	N62.50252 W144.50016	N62.70829 W144.02887
NW5W	1.1	19.9	1.0	N62.05755 W145.39554	N62.20587 W145.07231
NW5E	26.8	15.8	6.1	N62.20587 W145.07231	N62.35264 W144.74743
NW6W	5.7	5.6	0.0	N62.02990 W145.36959	N62.18360 W145.03326
NW6E	0.0	11.5	0.0	N62.18360 W145.03326	N62.33673 W144.69318

Appendix 3 continued.

Sub-transect	Density Estimates			Sub-transect Endpoint Coordinates	
	Week 1	Week 2	Week 3	Western Point	Eastern Point
SC1	13.3	5.9	0.0	N61.39119 W142.99490	N61.30152 W142.76009
SC2	2.3	2.4	0.0	N61.40711 W143.13572	N61.29068 W142.83017
SC3	5.0	2.6	0.0	N61.41241 W143.24776	N61.25496 W142.83395
SC5W	0.0	5.2	1.0	N61.38690 W143.38205	N61.23666 W142.98361
SC5E	2.6	0.0	0.0	N61.23666 W142.98361	N61.08443 W142.59565
SC6W	6.2	4.6	0.0	N61.37465 W143.44655	N61.20832 W143.01113
SC6E	9.4	3.1	1.6	N61.20832 W143.01113	N61.04171 W142.58057
SW1	27.7	0.0	0.0	N62.13751 W145.04873	N62.09312 W144.92138
SW2	21.4	12.8	44.4	N62.11742 W145.09323	N62.05841 W144.92434
SW3	4.5	0.0	0.0	N62.09718 W145.13773	N61.98494 W144.81717
SW4W	14.7	1.2	0.0	N62.07680 W145.18192	N61.96110 W144.85154
SW4E	15.2	0.0	2.2	N61.96110 W144.85154	N61.84540 W144.52670
SW5W	0.0	0.0	0.0	N62.05631 W145.22584	N61.93724 W144.88660
SW5E	8.5	4.2	3.2	N61.93724 W144.88660	N61.81619 W144.54702
SW6W	59.0	5.3	35.1	N62.03637 W145.27074	N61.86872 W144.79433
SW6E	0.0	2.4	0.0	N61.86872 W144.79433	N61.69880 W144.32200
SW7W	0.0	0.0	0.0	N62.01573 W145.31435	N61.82318 W144.76881
SW7C	10.7	4.7	11.3	N61.82318 W144.76881	N61.62887 W144.23123
SW7E	10.7	22.1	11.2	N61.62887 W144.23123	N61.43213 W143.70009
SW8W	2.8	0.4	8.0	N61.62223 W144.31409	N61.47751 W143.92292
SW8E	22.3	35.7	11.6	N61.47751 W143.92292	N61.33108 W143.53100
SW9W	4.9	5.8	5.8	N61.60062 W144.35508	N61.46840 W143.99581
SW9E	41.6	5.0	46.7	N61.46840 W143.99581	N61.33513 W143.64059
SW10W	0.0	2.7	8.1	N61.58349 W144.40467	N61.48546 W144.13588
SW10E	1.4	2.6	5.2	N61.48546 W144.13588	N61.38629 W143.86683