

THE WINTER DISTRIBUTION OF TRUMPETER SWANS IN RELATION TO BREEDING AREAS: THE FIRST NECKBAND STUDY, 1972-81

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ABSTRACT

Between 1957 and 1968, 186 Trumpeter Swans, *Cygnus buccinator*, were marked in their Alaskan breeding grounds with U.S. Fish and Wildlife (USFWS) metal tarsus bands only. Only two (1%) of these were subsequently recovered. Both, banded in the Copper River Delta area, were found dead off Vancouver Island, British Columbia. This paper reports results from the first use (1972-81) of color coded neckbands on Trumpeter Swans. A total of 231 Trumpeter Swans was banded in the Pacific Coast Population (PCP), and 79 in the Rocky Mountain Population (RMP). Of the 310 total that were neckbanded, 78 (25%) were subsequently resighted. Forty one (18%) of those neckbanded in the PCP, and 19 (24%) of the 79 neckbanded in the RMP were resighted in their wintering grounds. The PCP wintered along the Pacific coast, whereas the RMP wintered in Montana's Red Rock Lakes National Wildlife Refuge (NWR) and Vancouver Island. Neckband resightings also demonstrated that each population had unique migratory and wintering tendencies, although populations sometimes mixed in wintering grounds and frequently mixed on migration.

INTRODUCTION

From 1957-68, a total of 186 Trumpeter Swans was banded with USFWS metal tarsus bands in Alaska, mostly in the Copper River Basin. During two of these summers, color dyeing was unsuccessfully attempted on 42 swans and in 1958, nine were experimentally marked with blank colored plastic neckbands (Hansen *et al.* 1971, Hansen 1973). The only long-distance results recorded from this effort, involving 228 trumpeters, appear to be two recoveries on Vancouver Island, British Columbia. The first was a swan originally tarsus banded in 1958 as a female cygnet in the Copper River area which was found dead during her second winter after banding at the mouth of the Nanaimo River. The second swan was banded in 1960 as an adult female in the Copper River Delta and shot over 7 years later on the Ucona River. Hansen *et al.* (1973) concluded, presumably with these two recoveries in British Columbia as the main evidence together with circumstantial evidence from sight records of non-banded birds, that the Alaskan trumpeters wintered from southeast Alaska as far south as southern Washington State.

In addition to the need to supplement this scant knowledge on the winter dispersal of Trumpeter Swans, there were two other good reasons for initiating a neckbanding program:

(i) By 1972, the Swan Research Program of the Johns Hopkins University and the Chesapeake Bay Foundation (now with Environmental Studies at Airlie) had completed 2 successful years of neckbanding Tundra Swans (*Cygnus columbianus columbianus*). Resighting rates of neckbanded Tundra Swans in the 1st year were from 80% to 90% in contrast to a recovery rate (recaptures or dead) of 7% from metal tarsus bands only (Sladen 1973, Sladen 1975). Because of the high resighting rate of neckbanded Tundra Swans, it was likely that this method would work for Trumpeter Swans as well.

(ii) Impact Statements on the Copper River area and the 1968 Alaska census (Hansen *et al.* 1971) emphasized that one-third of the world population of Trumpeter Swans (about 1,180 birds) was not only concentrated in the Copper River area, but within 70 miles of the terminus of the proposed Alaska oil pipeline at Valdez. Oil spills in the Copper River Delta where the entire population was likely to concentrate in the spring and fall could have very serious consequences.

The National Audubon Society, sharing our concern, contributed \$1,000. In July 1972, armed with this small grant and with our usual excellent cooperation from USFWS and the Alaska Department of Fish and Game, we launched our *Trumpeter Swan Migration Study*. In this paper we will present data from our initial neckbanding program during the late summers

from 1972-73, and summarize the total results of neckbanding from 1972-81 in the PCP and RMP.

MATERIALS AND METHODS

The color and codes of the plastic neck and tarsus bands followed the circumpolar protocol established through the Swan Research Group of the International Waterfowl Research Bureau (now Wetlands International) (Sladen 1973, 1976, Sladen and Kistchinski 1977). Thus, the neckbands used in Alaska were blue and those used in Saskatchewan and Alberta were yellow. The four-digit codes engraved vertically and repeated four times around the bands were approved for Trumpeter Swans (with two numbers followed by two letters, e.g. 23VY). This distinguished them from Tundra Swans, also being neckbanded blue in Alaska, which were engraved with a code of one letter followed by three numbers (e.g. A304). Identical codes were engraved on the tarsus bands of the same color. Both neck and tarsus color bands were designed with an overlap that was permanently fixed by fast-drying cement.

The North American metal tarsus band design (size nine), while a satisfactory size for Tundra Swans was, in 1972, considered too small for trumpeters. Instead, trumpeters were fitted with a special double inscription overlap aluminum band of size eight, designed for albatrosses (Sladen *et al.* 1968). Though still far from satisfactory, it enabled us to use the extra length available in the overlap for this large swan and thus prevent injury from the smaller standard USFWS design.

Following international protocol, all swans of known age (i.e. banded as locals or with juvenile-gray plumage) were metal-banded on the left tarsus while all swans of unknown age (adult plumage) were metal-banded on the right tarsus. The color-coded band was attached to the tarsus opposite the metal band.

Swans were caught during the flightless stage of the molt (King 1973). A USFWS Piper Cub airplane on floats was used in the Cook Inlet Basin. Molting nonbreeders were captured from an aircraft as well as a light, aluminum, motor-propelled boat in the Copper River Delta. This boat was transported to Peninsula and Bering Lakes on the float of a single-engine Beaver aircraft. A long-handled net was used for the final capture. The swans were brought to land where they were carefully processed, each bird taking at least 15 minutes. These methods were also employed in Montana's Red Rock Lakes NWR,

Alaska's Lower Tanana River, Alberta, and Saskatchewan.

Subsequent observations were made with a spotting scope and zoom lens of x20 to x60 mounted either on a steady tripod or a car-window mount. Two people (if possible) independently read and recorded the code and then compared observations. The letters were first noted and the code read up or down using the letters as a guide. The codes were only recorded when both observers were certain they were correct. If the slightest doubt existed, the uncertain digit of the code was recorded with a question mark (e.g., 2(?)VY).

RESULTS

Pacific Coast Population 1972-73

In our first effort in Alaska, 44 trumpeters were marked. Nineteen trumpeters were neckbanded in the Cook Inlet Basin and 25 in the Copper River Delta between July and September 1972. On 29 October, our first neckbanded trumpeter, 48VY, was reported from Port Alberni, Vancouver Island, British Columbia. That winter and spring (1972-73), we received (some seen by ourselves) resightings of seven individual trumpeters; four from Vancouver Island, British Columbia, and three from Washington State. Our most southerly record was from Ilwaco, Washington, close to the mouth of the Columbia River. This 16% resighting rate in their wintering grounds for the first year and from such a small sample far exceeded our expectations and aroused a great deal of interest in the project, particularly among private citizens in Canada. It also instantly and very accurately confirmed the Hansen *et al.* (1971) conjecture that the Alaska trumpeters wintered as far south as southern Washington and were confined to the Pacific Coast.

In July 1973, 22 more Trumpeter Swans were neckbanded in the Cook Inlet Basin, mostly in the Lower Tanana River, and another 12 in the Copper River Delta, making a grand total of 78 trumpeters for the first two summer activities.

From this small sample we were able to plot the winter distribution of trumpeters in British Columbia for nine individuals on Vancouver Island, concentrated in six locations. Most were in the river estuaries along the eastern coast and in one other location in the coastal mountain region near Terrace, British Columbia. Three scattered locations close to the west coast of Washington (Clear Lake, Skagit

County; Ilwaco, Pacific County; Ocean Shores, Grays Harbor County) were also identified.

The location of these long-distance resightings in relation to the location of original banding suggests an equal scatter into Washington and Vancouver Island. For example, two from Kenai were resighted in Washington, two from the Lower Tanana River on Vancouver Island and a third from the Lower Tanana River at Terrace, British Columbia. All but one of the eight individuals resighted in winter that were originally neckbanded in the Copper River area were resighted on Vancouver Island. Moreover, the single resighting of a Copper River swan at Ilwaco, Washington, identified that location as the most southerly of the Alaskan records at that time.

This initial success encouraged further banding in the same areas, as well as in some breeding habitat near Fairbanks, Alaska. Between 1977 and 1980, a second round of neckbanding was undertaken in these areas, after which a total of 114 swans had been neckbanded in Kenai, 88 in the Copper River Delta, and 29 in the Lower Tanana River area. In total, 231 Trumpeter Swans were neckbanded in the PCP. In addition, in the RMP, 29 were neckbanded in Alberta, 8 in Saskatchewan, and 42 in Red Rock Lakes NWR, Montana (Figure 1, Table 1).

Pacific Coast Population 1972-80

Cook Inlet

Twenty of the 114 (18%) Trumpeter Swans neckbanded in the Cook Inlet were later resighted in their wintering grounds (Figure 2, Table 1). Of these, 10 (50%) were resighted two or more times in their wintering grounds. Eighty percent of winter resightings were recorded in Skagit County, Washington, 2% were recorded in Grays Harbor County, 2% were recorded in Prineville, Oregon, and 10% were recorded near Vancouver Island, British Columbia (Figures 2 and 3). Fifty-four percent of the resightings recorded on migration occurred at Blind Slough, Alaska; 15% were recorded in Cordova, Alaska; 8% were recorded in the Snake River, Idaho; Petersburg, Alaska; and Comox Harbor, British Columbia. All resightings during the breeding season were recorded near Cook Inlet.

Copper River Delta

Eighteen of the 88 (20%) individuals neckbanded in the Copper River Delta were later resighted in their wintering grounds (Figure 2, Table 1), of which nine (50%) were resighted two or more times in their

wintering grounds. All individuals except one (34VY) were resighted around Vancouver Island, British Columbia (Figure 3). 34VY was resighted in Pacific County, Washington, on 16 November 1972, but was found dead two days later in the same location. Of the 18 individuals resighted in the winter, 16 (89%) were reported around Vancouver Island, BC (Figure 3). The remaining individual was resighted in Ilwaco, Washington, occurred within 2 days of each other. Both of these reports identified the same bird (34VY), with the second report being the recovery of this bird after it had died. Thirteen observations of Trumpeters banded in the Copper River Delta were recorded on migration. Eleven of these resightings were recorded within six days of each other at Blind Slough, Alaska. The remaining two resightings were reported within two days of each other at Barnes Lake, Alaska. All resightings during the breeding season were reported in the Copper River Delta.

Lower Tanana River

Three of the 29 individuals (10%) neckbanded in the Lower Tanana River were resighted in their wintering grounds (Figure 2, Table 1). One of these swans was resighted twice. All winter resightings occurred around Vancouver Island, British Columbia (Figure 3). However, two swans banded in the Lower Tanana River were seen in Skagit County, Washington, during November, and one was seen in the Copper River Delta staging for migration. No swans banded in the Lower Tanana River were observed during the breeding season.

Rocky Mountain Population 1973-81

Saskatchewan

Of the eight banded in Saskatchewan, two were resighted during the winter. One individual was resighted three times at Red Rock Lakes NWR during the winter, fall, and spring (12 February 1974, 26 October 1975, and 8 March 1975). A second was observed during the winter, also at Red Rock Lakes NWR. Overall, these two individuals comprise 25% of the swans banded in this area (Figure 2, Table 1).

Alberta

Of the 29 banded in Alberta, two individuals (7%) were re-sighted during the winter (Figure 2, Table 1). One swan was observed on consecutive days between 30 December and 10 January 1975 at Ravalli NWR, Montana. Four years later, this swan was again observed this time at Blind Slough, Alaska during

November 1979. The other was observed twice on its Vancouver Island wintering grounds on 26 March and 8 April 1975.

Red Rock Lakes National Wildlife Refuge, Montana

Of 42 Trumpeter Swans banded in Red Rock Lakes NWR, 20 (48%) were resighted. All of these resightings occurred on the Refuge during all seasons. Though they did not migrate, these birds were not isolated from other populations. Swans banded in Alberta, Saskatchewan, and Cook Inlet were seen wintering on or near the Refuge.

The total individuals re-sighted

In total, 310 Trumpeter Swans were marked with neckbands, and 78 were resighted (25%). Twenty nine individuals (9%) were resighted in their breeding territories, 31 individuals (10%) were resighted on migration, and 60 individuals (19%) were resighted on their wintering grounds (Table 1). One hundred eighty six Trumpeter Swans were banded with metal bands only between 1957 and 1968. From this effort, only two were resighted (0.09%), both recovered dead off Vancouver Island, British Columbia.

DISCUSSION

The overall resighting rate of Trumpeter Swans wearing neckbands (25%) (Table 1) exceeds those wearing only metal bands (1%). Furthermore, resightings of neckbanded swans showed where breeding populations staged for migration, wintered, bred, and died. Using only metal bands on Trumpeter Swans demonstrated where the birds died. This result is comparable to the results gathered from the first neckbanding experiments on Tundra Swans (Sladen 1973) when 151 of 179 (84%) neckbanded in 1970 were resighted in their wintering grounds. The resighting rate of Tundra Swans was a result of the concerted effort made to resight neckbanded Tundra Swans around the Swan Research Program headquarters near the Chesapeake Bay.

Each breeding population of Trumpeter Swans had distinct wintering habits. Some populations were almost completely separated, and some mixed with other breeding populations substantially in the wintering areas. No populations were completely isolated.

Trumpeter Swans breeding in Cook Inlet, Alaska, showed a strong preference for wintering grounds in Skagit County, Washington. One swan from this

population was observed in Prineville, Oregon, to date the most southerly reporting of an Alaskan Trumpeter Swan. This swan was recovered dead at the same location the day after it was first observed. However, its movement so far south may not have been a migratory movement, but an anomalous movement due to the bird's health, and should not be considered the southerly range of Alaskan Trumpeters banded during this time.

Trumpeter Swans breeding in the Copper River Delta were most likely to winter further north at Vancouver Island, British Columbia. The swans of the Lower Tanana River wintered at Vancouver Island, British Columbia as well. However the swans banded here were observed in Skagit County, Washington, during November indicating that they may have migrated past their wintering grounds into a more southerly staging area in Skagit County, then moved north to Vancouver Island. This is supported by the observation of one individual (06UJ) observed in Skagit County, Washington, in November 1978, and then seen on Vancouver Island in January of 1980. All of these populations also staged at Blind Slough, Alaska, along with some of the swans breeding in Alberta. Therefore, these three Alaskan breeding populations intermingled during the migration, but the Cook Inlet Population remained separate during the winter and summer. The swans banded in the Lower Tanana River and those banded in the Copper River Delta mixed with each other during all seasons except during the breeding season.

Trumpeter Swans breeding in Alaska were also seen mixing with the RMP. Our most frequently resighted swan, (00VT) was observed in Skagit, Washington, but was twice observed near Red Rock Lakes NWR in Ennis Lake, Montana, on 14 December 1974, and again on 30 December 1974 at Ravalli NWR, Montana. One swan banded in Alberta (42TY) was observed staging at Blind Slough, Alaska, as well as wintering at Red Rock Lakes NWR.

Trumpeter Swans banded in Alberta wintered in Red Rock Lakes NWR and Vancouver Island, British Columbia. Those banded in Saskatchewan were only observed wintering in Red Rock Lakes NWR. Those swans banded at Red Rock Lakes NWR were only resighted near these breeding grounds, regardless of season, showing this flock to have been resident, but interacting with migratory swans from the RMP and PCP.

These trends were recently supported through genetic research (Oyler-McCance *et al.*, in press). The breeding populations were shown to have genetic

similarities common within the breeding populations, with some genetic markers common between populations. However, analysis of Trumpeter Swan nuclear DNA showed a marked separation between the RMP and the PCP.

ACKNOWLEDGMENTS

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Editors' Note: This paper was not presented at the 20th Conference, but is included here because of its relevance to the PCP.

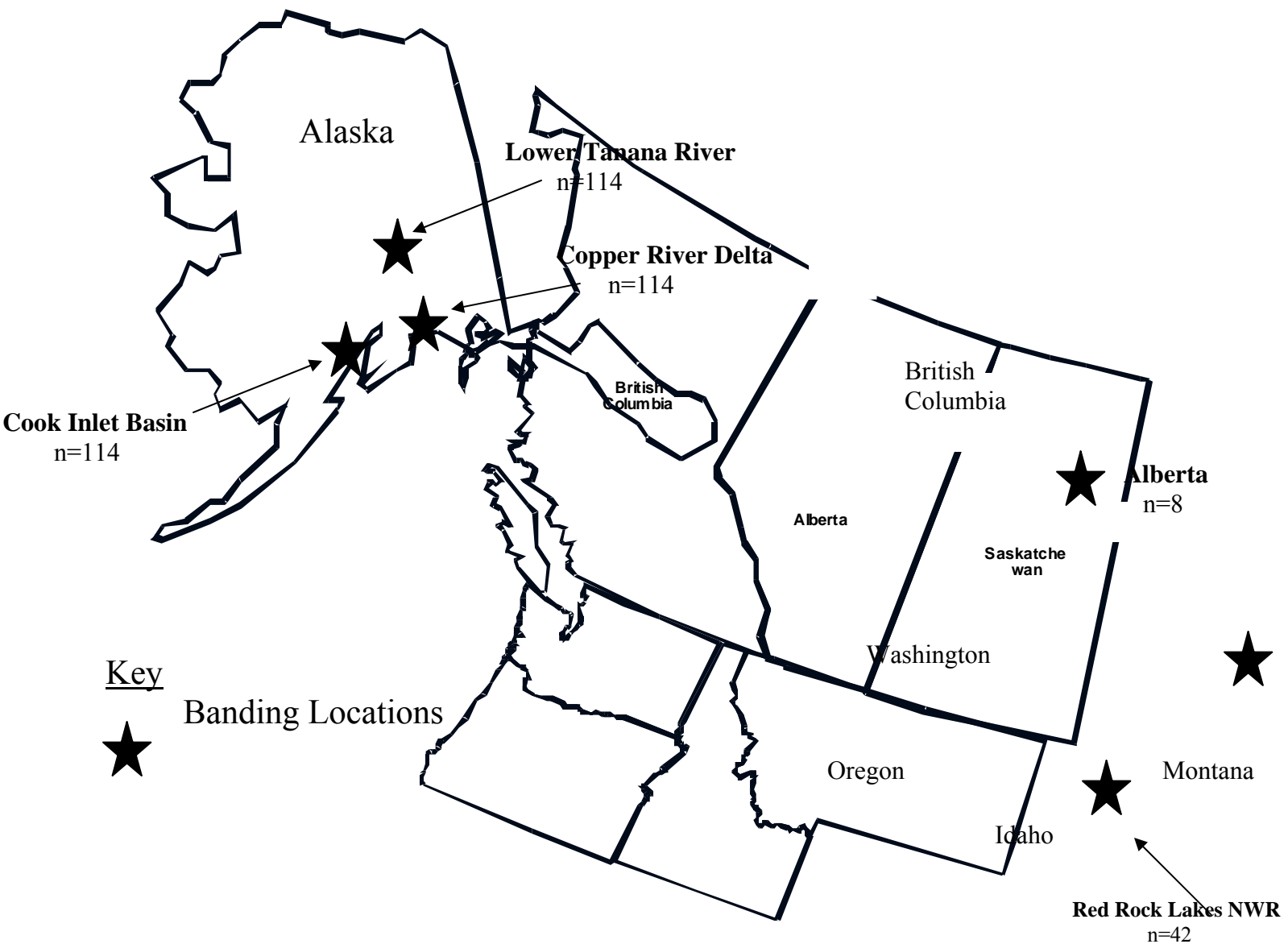
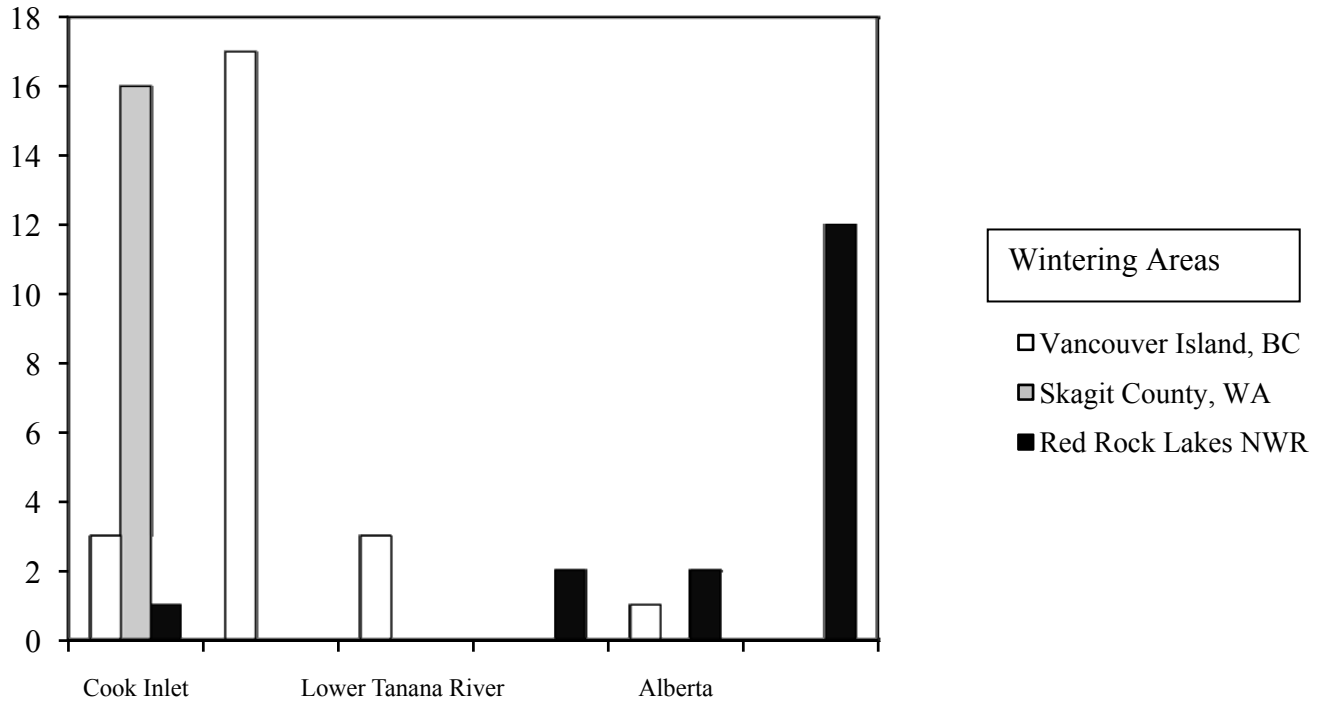


Figure 1. Banding locations in the Pacific Coast and Rocky Mountain Trumpeter Swan populations. Black stars on the map represent each banding location and their labels indicate the number of swans neckbanded in each location.



Figure 2. Wintering locations of neckbanded Trumpeter Swans.



Breeding Areas

Figure 3. The number of Trumpeter Swans from each of the six breeding territories that were resighted in each of the three main wintering locations.

Table 1. Resightings of individual Trumpeter Swans neckbanded during summers 1972-73.

Location and Code	Total Banded	Individuals Resighted*			Total Unique Individuals Resighted
		Breeding Season	Migration	Wintering Grounds	
PACIFIC COAST POPULATION					
Cook Inlet Basin	114	14 11%	7 6%	20 16%	31 25%
Copper River Delta	88	5 2%	9 11%	18 16%	23 26%
Lower Tanana River	29	0 0%	3 10%	3 10%	4 14%
<i>Pacific Coast Pop. Total</i>	231	19 8%	19 8%	41 18%	58 25%
ROCKY MOUNTAIN POPULATION					
Saskatchewan	8	0	0	2 25%	2 25%
Alberta	29	0	1 3%	3 10%	2 10%
Montana	42	10 24%	11 26%	14 33%	20 48%
<i>Rocky Mountain Pop. Total</i>	79	10 13%	12 15%	19 24%	20 25%
<i>Grand Total</i>	310	29 9%	31 10%	60 19%	78 25%

* Some individuals were resighted in more than one category .