SOUTHERN LAKES WATERBIRD INVENTORY PROJECT

YEAR 2001 SURVEY RESULTS

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INTRODUCTION

A one-year landcover and three-year waterbird inventory project was initiated in the Southern Lakes Region of the Yukon Territory in 1999. The GIS-based inventory project focused on a 3.2 million hectare (8 million acre) area centred on Whitehorse that encompassed portions of two Thematic Mapper (TM) multi-spectral images (Figure 1). The waterbird program complements the landcover inventory and is an evaluation of the use of selected wetland areas by waterfowl and other wetland-dependent waterbirds. Specific intervals of interest are the breeding, brood rearing, moulting and pre-migration staging periods. This three-year study will provide an assessment of wetlands capability within the Southern Lakes Region and an indication of the importance of various wetland types/riparian areas to breeding and post-breeding waterbirds. This document provides a summary of the waterbird survey activities and data collected during the year 2001 (for the 2000 summary report see van de Wetering et. al. 2001).

This co-operative project was funded by the Canadian Wildlife Service, Ducks Unlimited Canada, Yukon Energy Corporation, Yukon Fish and Wildlife Enhancement Trust, and the Yukon Department of Renewable Resources. The project also had First Nations and community support from the Alsek Renewable Resources Council, the Champagne and Aishihik First Nation, and the Teslin Tlingit Council.

METHODS

Overview

To determine waterbird use of wetland habitats we conducted four rotary-wing aerial surveys during spring/summer (breeding pair and brood surveys) and 3 fixed-wing aerial surveys in late summer/early fall (post-breeding surveys). The timing of the surveys was planned so as to maximize the chance of seeing pairs and broods (both early and late nesting species), and fall migrants (both early and late migrants). The dates we picked were based on local information provided by the Canadian Wildlife Service in Whitehorse (Jim Hawkings personal comments) and from information obtained during the 2000 field season (van de Wetering et. al. 2001). We also relied on published waterfowl breeding information (Wishart 1983, Harrison 1984, Klett et al. 1986, and Cooke et al. 1995).

All surveys involved the use of two observers, one for each side of the aircraft. Species of interest, including all waterfowl and other wetland-dependent avian species (Appendix I), were

recorded into hand-held tape recorders. Other species of interest (such as beaver, moose etc.) were recorded as they were encountered and may be of interest at a later date. Data tapes were transcribed onto data sheets and sent to DU Canada in Edmonton for entry into a database management program (Waterbird Survey Program Ver. 1.0) developed specifically for these types of waterbird inventories.

Figure 1: The Southern Lakes waterbird inventory project study area.

Site Selection Protocols for Breeding Pair and Brood Surveys

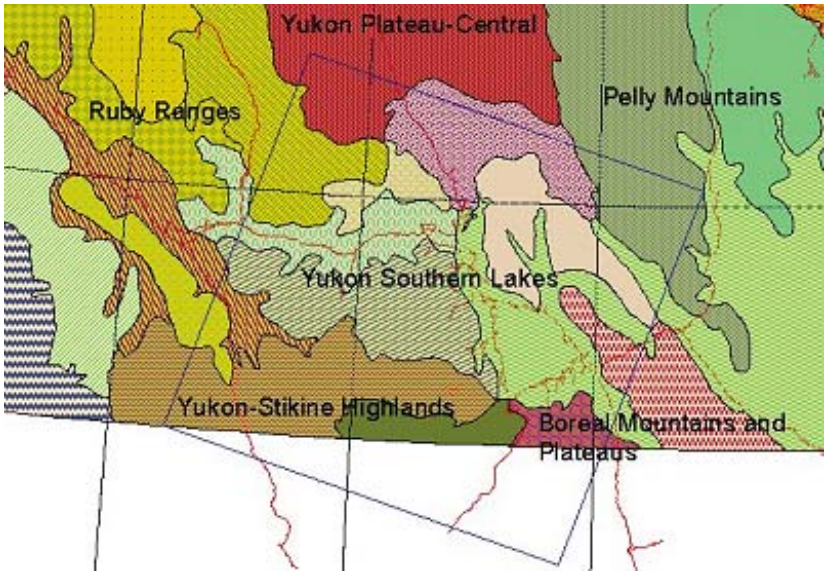
Wetland sites for study were randomly selected using GIS analysis of an unsupervised landcover classification. We assumed that waterbird use would vary by wetland type across the scene and

chose to stratify the landsat scene using an ecoregion and ecodistrict classification framework (Wiken 1986, Ecological Stratification Working Group 1996). Our rational was:

- Ecoregions are subdivisions of an ecozone characterized by distinctive large order landforms or assemblages of regional landforms, small order macro- or meso-climates, vegetation, soils, water, and regional human activity patterns/uses, and
- Ecodistricts are subdivisions of ecoregions and are characterized by distinctive assemblages of landform, relief, surficial geologic material, soil, water bodies, vegetation, and land uses.

Within the Southern Lakes Region there are 14 ecodistricts in 6 ecoregions; Ruby Ranges, Yukon Plateau- Central, Yukon Southern Lakes, Pelly Mountains, Yukon-Stikine Highlands and the Boreal Mountains and Plateaus (Figure 2).

Figure 2. Ecodistricts within the Southern Lakes Study Area, Yukon, with ecoregions indicated by name.



Prior to the first year of surveys in 2000, an unsupervised classification was imported into ArcView (ver 3.1; ESRI 1996) so that basins (individual lakes and ponds) could be determined. Sites < 2.0 ha were excluded from the sample universe to reduce risks of misclassification due to terrain shadow or misclassified small clusters of pixels. Each basin was given a unique number. The total number of basins within each ecodistrict was determined and then individual basins were randomly selected using a 'proportional allocation protocol' (a ratio of basins per ecodistrict

to total basins on the scene). Budgetary constraints limited the surveys to < 150 basins. Most basins > 300 ha were omitted from the surveys due to survey constraints, and replaced by the next randomly selected site available.

In 2001, we randomly selected 20% of the year 2000 sites from each ecodistrict for repeated surveys, and then randomly selected the remaining sites based on the 'proportional allocation protocol'. We hope that this approach will allow us to assess yearly variation in waterbird abundance and use of wetland habitats while maintaining a large enough sample size to capture the variation of wetland types within the study area.

Site Selection Protocols for Staging Surveys

In 2000, the staging surveys were completed on the same basins as the breeding pair and brood surveys. An analysis of staging survey data from several DU Western Boreal Forest projects led us to change our staging survey protocols to better represent the size variation of wetlands in each study area. In the Southern Lakes, wetlands were divided into 6 basin size classes; (1) 2 – 4.9 ha, (2) 5 – 9.9 ha, (3) 10 – 49.9 ha, (4) 50 – 299.9 ha, (5) 300 – 999.9 ha, and (6) > 1000 ha. Each basin size class was represented by 25 basins except class 6 as there were only 16 basins in this size class. Then the proportion of basins among ecodistricts within each size class was determined and sample sites were randomly selected based on the proportional allocation protocol.

Rotary-Wing Breeding Pair and Brood Survey Protocols

Breeding pair and brood surveys were conducted using a Bell 206B helicopter on skids equipped with bubble windows. The survey crew consisted of the pilot, with an observer / navigator seated beside the pilot in the front left and an observer seated in the rear right responsible for observations on opposite sides of the aircraft. One sortie was flown per day generally in the morning between 8:00 am and 1:00 pm. The reasons for this were, 1) an assumption that birds would be most active in the morning, 2) cooler morning temperatures result in better visibility (heat causes a 'shimmering' effect over water), and 3) winds tend to increase throughout the day. Deteriorating weather sometimes required us to fly more than one survey per day in order to complete the work within the scheduled period. Surveys consisted of a single transect flown down the length of a basin (if narrow) or a single transect flown around the perimeter of a basin (for larger lakes), whichever technique maximized coverage of the basin. The priority during

brood surveys was to document brood information (species, number of young and age class of young) with non-brood observations being of secondary importance.

Surveys were generally flown at 25 m to 35 m above ground level. Lower elevations were occasionally required to confirm species or sex or due to complex shoreline vegetative cover. Higher elevations were sometimes required for safety. Ground speeds were generally maintained between 30 and 60 km/h during the active survey effort. Slower ground speeds were required over well-developed cover and faster ground speeds could be used over bare or sparse shoreline areas. The techniques employed were consistent with, or developed upon, protocols developed by the Canadian Wildlife Service (CWS) for application in Eastern North America (Black Duck Joint Venture, 1996). Navigation software (Fugawi) was used to pre-select flight paths and to navigate to the correct basins during surveys.

Fixed-wing Staging Survey Protocols

Staging surveys were flown using a Cessna 206 fixed-wing aircraft. An observer / navigator sat next to the pilot and a second observer sat in the rear seat behind the pilot. Two sorties were flown per day, one in the morning and one in the afternoon. Poor weather sometimes caused a delay or cancellation of a sortie. Ideally, the aircraft was flown at approximately 150 km/hr and 150-200 m elevation, however weather conditions often required a faster speed and/or higher elevation for safety reasons. Small wetlands were surveyed in one pass with either one or both observers having lake area to cover. The inside perimeter of larger wetlands were flown to allow one observer to view the shoreline and a second observer to view the middle of the lake.

Statistical Analyses

Indicated breeding pair (IBP) totals for each species were determined from breeding pair surveys; Survey I was used for Barrow's Goldeneye, Bufflehead, Canvasback, Common Goldeneye, Mallard, Northern Pintail, Surf Scoter and White-winged Scoter; Survey II was used for Blue-winged Teal, Canada Goose, Common Loon, Pacific Loon, Red-necked Grebe, Ring-necked Duck, scaup spp. and Trumpeter Swan; and an average of both Surveys I & II was used for American Green-winged Teal, American Wigeon, Harlequin Duck, and Northern Shoveler. The IBP for duck species was calculated as the total sum of lone males and pairs. For swans, grebes and loons (species not sexually dimorphic) 2 birds in close proximity to eachother and single bird observations were considered indication of a pair.

Brood age was estimated from observed brood classes (Gollop and Marshall 1954 for ducks, Yocom and Harris 1965 for geese). Hatch date was estimated by back dating brood age from the survey date. Clutch initiation date was estimated by back dating hatch date by known or estimated species specific nesting periods (Wishart 1983, Harrison 1984, Klett et al. 1986, Cooke et al. 1995). The total number of unique broods for each species was determined by comparing the age and hatch dates of broods observed during survey I and II for each basin.

RESULTS

Breeding Pair Surveys

Breeding pair surveys were conducted May 9 - 11 and June 4 - 6, 2001. On the first survey, many basins were either completely frozen or had just their edge ice free. Dabbling ducks were observed in pairs along the open edge of frozen lakes and at the open areas near the intake and out-take of lakes. Diving ducks were also seen in pairs but were also observed in mixed male/female groups as well as mixed species groups. On the second survey most basins were open or had only patches of ice.

A total of 1097 and 1900 birds, representing 24 species, were recorded during surveys I and II, respectively (Table 1). The most common species were Scaup spp., Barrow's Goldeneye, American Wigeon, Mallard, American Green-winged Teal, Bufflehead, Ring-necked Duck and Northern Pintail. Dabbling ducks numbers were highest on the first surveys whereas diving duck numbers were highest on the second survey. Loons and grebes were not observed until the second survey.

Table 1. Total number of waterbirds observed during breeding pair surveys (n = number of basins surveyed) in the Southern Lakes Region, Yukon, 2001.

	Breeding Pair Surveys 2001 (year 2000)		
	I	II	
SPECIES	May 9 – 11 (n = 143)	June 4 – 6 (n = 139)	Total (year 2000)
American Green-winged Teal	147	55	202 (187)
American Coot			0 (1)
American Wigeon	213	110	323 (239)
Barrow's Goldeneye	119	236	355 (412)
Bufflehead or Goldeneye			0 (37)

Bufflehead	62	138	200 (201)
Blue-winged Teal		25	25 (22)
Canada Goose	4	16	20 (36)
Canvasback	1	1	2 (84)
Cinnamon Teal	1		1 (0)
Common Goldeneye		2	2 (9)
Common Loon		40	40 (13)
Common Merganser		2	2 (15)
Goldeneye spp.	47	23	70 (80)
Greater Scaup		9	9 (14)
Harlequin Duck		7	7 (7)
Horned Grebe			0 (5)
Lesser Scaup			0 (29)
Mallard	154	117	271 (356)
Merganser spp.			0 (3)
Northern Pintail	114	33	147 (80)
Northern Shoveler	59	35	94 (93)
Oldsquaw			0 (3)
Pacific Loon		32	32 (8)
Red-breasted Merganser		4	4 (5)
Redhead		2	2 (2)
Ring-necked Duck or Scaup spp.	5	59	64 (263)
Ring-necked Duck	34	124	158 (322)
Red-necked Grebe		29	29 (35)
Ruddy Duck			0 (10)
Scaup spp.	56	498	554 (544)
Surf Scoter		19	19 (20)
Trumpeter Swan	4	16	20 (8)
White-winged Scoter		112	112 (6)
Unidentified Dabbler	41	10	51 (165)
Unidentified Diver	15	82	97 (113)
Unidentified Duck	19	59	78 (144)
Unidentified Loon		5	5 (0)
Unidentified Swan	2		2 (40)
Unidentified Teal			0 (10)
TOTAL	**1097 (2225)**	**1900 (1387)**	**2997 (3612)**

A total of 488 breeding pairs (Table 2), representing 20 different species were calculated from observations made on 143 basins for an average of 3.4 breeding pairs/basin. The most common species pairs recorded were scaup spp. (125), Barrow's Goldeneye (72), Mallard (56), American Wigeon (41), Bufflehead (29), Ring-necked Duck (26), and Common Loon (26).

Table 2. Observed and estimated breeding pair and brood information (n = # of basins surveyed) for waterbird species based on waterbird breeding pair and brood surveys in the Southern Lakes Region, 2001.

	A	C	D	E	F	G	H	I
SPECIES	IBP Interval[1]	IBP[2] (n = 143)	Average clutch initiation date[3]	Average hatch date[4]	Sample Size for D and E	Number of unique broods (year 2000)	Number of observed young	Average brood size
American Green-winged Teal	Avg.	24	27-May	29-Jun	15	15	74	4.9
American Wigeon	Avg.	41	25-May	27-Jun	29	29	139	4.8
Barrow's Goldeneye	I	72	18-May	4-Jul	59	63	318	5.0
Bufflehead	I	29	27-May	10-Jul	27	27	118	4.4
Bufflehead or Goldeneye	-	-				8	43	5.4
Blue-winged Teal	II	5	12-Jun	17-Jul	2	2	11	5.5
Canada Goose	II	5	14-May	17-Jun	2	3	13	4.3
Canvasback	I	1						
Common Goldeneye	I	0	18-May	1-Jul	2	2	6	3.0
Common Loon	II	26				8	8	1.0
Common Merganser	II	1						
Greater Scaup	II	1						
Harlequin Duck	Avg.	1	9-Jun	7-Jul	1	1	5	5.0
Mallard	I	56	19-May	23-Jun	52	52	267	5.1
Northern Pintail	I	16	1-Jun	3-Jul	14	14	81	5.8
Northern Shoveler	Avg.	9	6-Jun	10-Jul	3	3	15	5.0
Pacific Loon	II	18				5	6	1.2
Redhead	Avg.	0						
Ring-necked Duck or Scaup spp.	II	0				3	22	7.3

Ring-necked Duck	II	26	11-Jun	16-Jul	16	16	84	5.3
Red-necked Grebe	II	20				10	17	1.7
Scaup spp.	II	125				51	303	5.9
Surf Scoter	I	1	11-Jun	20-Jul	2	2	19	9.5
Trumpeter Swan	II	5						
White-winged Scoter	I	0	12-Jun	22-Jul	1	1	10	10.0
Unidentified Dabbler	Avg.	1				6	24	4.0
Unidentified Diver	Avg.	1				5	16	3.2
Unidentified Duck	Avg.	1				16	57	3.6
Unidentified Loon	II	3						
Grand Total		**488**				**342 (155)**	**1656**	

[1] based on survey I, survey II or an average (Avg.) of both surveys I & II.
[2] calculated as the sum total of lone males and pairs.
[3] a function of survey date, brood age (see below), and nesting period (based on Wishart 1983, Harrison 1984, Klett et al. 1986, and Cooke et al. 1995).
[4] a function of survey date, and brood age (based on observed brood class as per Gollop and Marshall (1954) for ducks, and Yocom and Harris (1965) for geese and swan).

Brood Surveys

Brood surveys were conducted July 3 – 5 and 10 and August 1- 4, 2001. Average clutch initiation dates varied from May 14 to June 12 and average hatch dates varied from June 23 to July 20 (Table 2). Assuming no brood movement occurred between basins, a total of 342 unique broods, representing 18 different species, were observed on a survey of 140 basins (average 2.4 broods/basin). Seventy percent of lakes surveyed had at least one observed brood (98 of 140 basins). Three basins had > 10 broods, 16 basins had 5 to 10 observed broods and 79 basins had less than 5 observed broods. The species most often observed with broods were goldeneye spp. (63), Mallard (52), scaup spp. (51), American Wigeon (29), and Bufflehead (27). Also observed were 10 Red-necked Grebe broods and 8 Common Loon and 5 Pacific Loon broods.

Staging Surveys

Fall staging surveys were completed September 3 - 4, September 17 - 19, and October 1- 4. Poor weather on the first survey prevented us from completing one of 4 sorties. We were unable to survey the 141 basins randomly selected for the staging surveys due to fuel and budget contraints. Ideally, we would have dropped sites in accordance to the random sequence, in proportion to basin size and ecodistrict. In reality, most decisions regarding which basins to drop occurred while flying the first surveys and were based more on logistics than on scientific protocols. A total of 1723, 6490 and 4502 waterbirds were observed during surveys I (74 basins), II (95 basins) and III (97 basins) respectively (Table 3). We observed birds on 88% of the basins surveyed during the staging surveys (85 of 97 basins). Six of the basins had > 500 birds, 16 basins had between 100 and 500 birds, and 63 basins had less than 100 birds. The 6 basins with over 500 birds were 35 ha, 93 ha, 487 ha, 604 ha, 815 ha, and 7737 ha.

The most common species observed were Bufflehead, goldeneye spp., Ring-necked Duck and scaup spp., Common Loon and swan spp.. Observations of migrating swans increased with progressive surveys and it is likely that we did not see the peak of this migration. A number of factors contribute to less reliable species identification during staging surveys, as indicated by the higher proportion of individuals in unidentified classes. These factors are: 1) the use of a fixed-wing vs. rotary wing aircraft, 2) the presence of young of the year and moulting birds that lacked plumage characteristics to aid in species identification, and 3) large aggregations of mixed species. Trumpeter Swans breed within the study area but Tundra Swans migrate through the region on spring and fall migrations. This is why swans can be identified to species during

breeding pair and brood surveys (by default) but can not be identified to species during progressive staging surveys.

Table 3. Total number of waterbirds observed during staging surveys (n = number of basins surveyed) in the Southern Lakes Region, 2001.

	Staging Surveys 2001 (yr 2000)			
SPECIES	**Sept. 3-4 (n = 74)**	**Sept. 17-19 (n = 95)**	**Oct. 1-4 (n = 97)**	**Total**
American Green-winged Teal	4		5	9
American Wigeon	19			19
Barrow's Goldeneye	8		21	29
Bufflehead or Goldeneye	22		458	480
Bufflehead	24	314	167	505
Canada Goose		4		4
Common Goldeneye		3	77	80
Common Loon	44	118	40	202
Common Merganser		10	5	15
Goldeneye spp.	176	33	19	228
Mallard	8	15	10	33
Northern Pintail	2	40		42
Pacific Loon	5	5		10
Ring-necked Duck or Scaup spp.	194	98	80	372
Ring-necked Duck			3	3
Red-necked Grebe	3	19	2	24
Scaup spp.	140	10	8	158
Surf Scoter			28	28
Trumpeter Swan	10	19	12	41
White-winged Scoter	1			1
Unidentified Dabbler	314	1347	454	2115
Unidentified Diver	331	1107	836	2274
Unidentified Duck	411	3288	2178	5877
Unidentified Loon	2			2
Unidentified Swan	5	60	99	164
TOTAL	**1723 (1246)**	**6490 (911)**	**4502 (1693)**	**12715 (3850)**

DISCUSSION

As in 2000, the first breeding pair survey indicated the importance of ice-free lakes to early migrants. Large numbers of waterbirds were observed on the limited ice-free areas of rivers and lakes within the study area. In general, the same species were common or uncommon in both 2000 and 2001 with the exception of White-winged Scoter (6 in 2000 and 112 in 2001).

By comparing estimated clutch initiation and hatch dates we can judge whether the timing of our breeding pair and brood surveys was adequate. Our breeding pair surveys may have been a week early as both the earliest and latest average clutch initiation dates were after our first and second surveys respectively. We can adjust our 2002 surveys to better capture the expected peak of early and late pairing. The timing of our brood surveys appeared adequate to capture both early and late hatching species.

In general, brood production (numbers of broods per wetland) seemed low relative to other sites in the Western Boreal Forest Initiative (WBFI) program area (e.g., over 700 broods on 119 wetlands at Fort Nelson in 1999 [both surveys])(Arner et al. 1999). We observed more broods in the study area in 2001 than in 2000. This could be the result of different basins in the survey (only 20% were the same as last year) or could reflect yearly variation in waterbird production. Hopefully, we will be able to better answer some of these questions following our final year of surveys in the Southern Lakes next summer.

Relatively low brood numbers are not completely unexpected for boreal forest wetlands at our latitude. In general, submerged aquatic vegetation is sparse throughout the study area; most lakes in the region, in contrast to the larger wetlands on the Boreal Plain, appear to be deep lake basins with poorly developed littoral zones. This results in a severely restricted extent of suitable habitat for most waterfowl species, and goes hand in hand with the brood numbers observed. Three lakes within our study that did have well developed litteral zones also had the highest brood counts (40, 14 and 12). Although not conclusive, the relatively high transparency of many of the sites investigated suggests low phytoplanktonic algal productivity, again suggesting relatively poor waterfowl habitat. These wetland productivity factors were investigated this summer by Dr. Kevin Devito of the University of Alberta, in conjunction with Ducks Unlimited Canada. Dr. Devito and his assistant took water samples from approximately one third of the basins within our breeding pair and brood surveys. Their report on Southern Lakes water chemistry and wetland productivity will be available in April 2002.

The new protocols established for the staging surveys this year (proportional random selection of basins within ecodistricts based on size classes) appeared to better capture the extent of migration within the study area. Four of the 6 basins with over 500 birds observed were over 300 ha in size. In 2000, we avoided basins over 300 ha in an effort to maximize the number of basins we could afford to survey and because we thought we would not be able to get complete coverage of large

basins. Although our coverage of large basins is less certain than for smaller basins we believe the data adequately represents the relative abundance of birds on the basins surveyed. Assuming that birds were moving through the region on fall migration and each observation represented a unique individual, over 8,000 more birds were observed during 2001 than were observed in 2000. The timing of our surveys appears to have captured both early and late migrants but we may require a fourth survey in 2002 to capture late migrants such as Bufflehead and swans.

Plans for 2002 include the third and final year of waterbird surveys following the same protocols as followed in 2001 with some slight adjustments to breeding pair survey dates. Analysis of the distribution of pair, brood and staging observations in relation to wetland characteristics and population density estimates will be undertaken following the completion of the 2002 field season and incorporation of the classified landcover map.

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Appendix I. Species of interest for waterbird surveys in the Southern Lakes Region, Yukon.

Common name	Scientific name	American Ornithological Union Species Alpha-codes
American Coot	*Fulica Americana*	AMCO
American Green-winged Teal	*Anas crecca*	AGWT
American Wigeon	*Anas Americana*	AMWI
Barrow's Goldeneye	*Bucephala islandica*	BAGO
Blue-winged Teal	*Anas discors*	BWTE
Bufflehead	*Bucephala albeola*	BUFF
Canada Goose	*Branta Canadensis*	CAGO
Canvasback	*Aythya valisineria*	CANV
Common Goldeneye	*Bucphala clangula*	GOGO
Common Loon	*Gavia immer*	COLO
Common Merganser	*Mergus merganser*	COME
Greater Scaup	*Aythya marila*	GRSC
Harlequin Duck	*Histrionicus histrionicus*	HADU
Horned Grebe	*Podiceps auritus*	HOGR
Lesser Scaup	*Aythya affinis*	LESC
Mallard	*Anas platyrhnchos*	MALL
Northern Pintail	*Anas acuta*	NOPI
Northern Shoveler	*Anas clypeata*	NSHO
Oldsquaw	*Clangula hyemalis*	OLDS
Pacific Loon	*Gavia arctica*	PALO
Redhead	*Aythya Americana*	REDH
Red-breasted Merganser	*Mergus serrator*	RBME
Red-necked Grebe	*Podiceps grisegena*	RNGR
Ring-necked Duck	*Aythya collaris*	RNDU
Ruddy Duck	*Oxyura jamaicensis*	RUDU
Surf Scoter	*Melanitta perspicillata*	SUSC
Trumpeter Swan	*Cygnus buccinator*	TRSW
Tundra Swan	*Cygnus columbianus*	TUSW
White-winged Scoter	*Melanitta fusca*	WWSC