YUKON GAME BRANCH

Studies of Waterfowl Staging Areas

Winter 1976

D. Mossop

INTERIM REPORT

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Areas of water at the outlets of larger lakes in the southern Yukon which remain ice-free during winter are undoubtedly of great importance to northwestern waterfowl populations. These areas are used as traditional spring staging areas. Large numbers of water birds are able to migrate northward well in advance of the general opening of water bodies by using these unique sites as staging areas enroute.

Some information is accumulating regarding a few of the more accessible of these sites. Trumpeter Swans especially seem to be dependent upon the Tagish and Marsh Lake outlets. This fact has attracted attention to the general concept of spring staging in the Yukon and steps have been suggested by the Game Branch for proper land use practices in these critical areas.

One of the interesting ancillary factors regarding these sites is the occasional over-wintering of waterfowl on them. This phenomenon, though of no great consequence to waterfowl on a population scale, is nevertheless fascinating for ornithological reasons.

In the winter of 1976 the Game Branch conducted several flights in the southern Yukon as part of a prolonged study of the waterfowl spring staging areas. The objectives of this work are:

1. To catalogue all areas known to have extensive ice-free areas of water in winter and early spring.
2. To census the waterfowl and other wildlife using the sites at various times of year.
3. To investigate the factors responsible for the continuing use of the areas by wildlife (food supply, etc.)

4. To investigate the factors responsible for the occurrence of the ice-free waterway.

The overall objective of this work is to suggest management policies which will serve to protect the areas as critical wildlife areas and perhaps enhance their value as wildlife habitat. It has already been suggested that present watershed management practices may be having adverse results on some of these areas.

The survey

The winter work of 1976 consisted of five survey flights and two ground surveys. The dates, method of survey, and purpose of each is summarized in the following table:

Date	Method of Survey	Purpose
February 3	ground	Census waterfowl using Tagish Lake outlet, take water temperature readings in outlet.
March 3	helicopter	To census waterfowl, utilizing areas of open water at Tagish Lake, the Teslin system and Lake Laberge.
March 10	ground	Census waterfowl using Teslin Lake outlet.
March 12	helicopter	Census waterfowl using open water at Marsh, Tagish, Teslin and Laberge Lakes. To take water temperature readings at outlet of Lake Laberge.
March 19	helicopter	Census waterfowl using Big Salmon Lake, Quiet Lake.
April 13-14	fixed-wing aircraft	Conduct aerial photography with cooperation of Canadian Armed Forces: All open water areas in southern Yukon.
May 4-5	fixed-wing aircraft	To census outlets of all larger lakes in southern Yukon to measure use for staging at peak of spring migration.

The aircraft used for all the helicopter surveys was a Bell 206, a DeHaviland twin-otter was used for aerial photography, and a Cessna 337 was used in the final survey during spring migration. A tape recorder was used for recording all data and all waterfowl counts were made by D. Mossop. The ground surveys were primarily for the purpose of making positive identification of duck species for making ground correction on aerial counts.

A standard military 2½" x 2½" format hand-held aerial camera was used for all photography. In most instances approach was made from the lake side of the outlet and an oblique angle photograph was taken to give an impression of the size of open water area. An altitude of about 1,000' a.g.l. was maintained. All larger water bodies in the southern Yukon were visited. Areas of open water were very obvious on the generally white winter background and it is unlikely any of any consequence were missed.

A remote reading thermocouple type thermometer with a 50 foot lead was used for taking all water temperatures. It read accurately to ½ degree C and could give acceptable readings to ¼ degree C. Holes were bored through the ice cover lake-ward from the outlets of lakes and the lead was lowered to various depths where readings were taken. The ice thickness and water depth was taken at each boring. Generally, the technique was to bore holes in a series approaching the open water from the lake-ward side. This was done at two lakes, Tagish and Laberge.

A greater elaboration of method will be given as this becomes necessary to describe the results below.

Results

A summarized catalogue of open water areas in winter and early spring is given in Table 1. The classification of areas as Major and Minor is done in an arbitrary manner. A major area is over 20 acres of open water by late winter and is considered of possible importance to waterfowl in spring. This catalogue of open water areas is probably not complete for the Yukon Territory and should not be quoted as such. Some of the areas have not been researched adequately to determine their importance to waterfowl (or other wildlife).

Table 1. Areas of ice-free water during winter and early spring prior to general break-up in the southern Yukon Territory and their relative importance of waterfowl.

Area #	Name of Area	Use By Waterfowl	
		Winter	Spring
A.	MAJOR AREAS:		
1.	Marsh Lake outlet	Ice-free some winters; about 10 acres; few divers have wintered.	A major staging area for swans and ducks. Area used is over 1000 acres.
2.	Tagish River	Ice-free some winters; about 25 acres. Some divers and mergansers have wintered.	A major spring staging area for swans, ducks, geese and shorebirds. Area used is over 2000 acres.
3.	Teslin Lake outlet	Ice-free most winters; at least 25 acres. Divers winter most years.	A major staging area for swans, ducks. Area used is over 2000 acres
4.	Big Salmon, Sandy Lakes	Ice-free most winters; about 5 acres. Some dabblers and divers have overwintered.	A moderately important spring staging area. Swans, diving ducks and dabblers use about 500 acres.
5.	Lake Laberge outlet	Ice-free most winters; about 200 acres. Divers winter most years.	A minor staging area used by few divers. Area is about 1000 acres.

6.	Bennett Lake outlet (Carcross)	Ice-free most winters; 1 acre.	A moderately important staging area primarily for dabblers. About 100 acres.
7.	Francis Lake	Ice-free at outlet and at Narrows in East Arm most winters. Divers winter most winters.	A major staging area for swans, geese and divers. Area used is over 2000 acres.
8.	Aishihik Lake	Ice-free between Canyon Lake and Aishihik; about 100 acres open most winters.	A minor staging area.
9.	Kluane Lake outlet	Ice-free for about 50 acres in milder winters. No known wintering ducks.	A suspected major staging area for swans, geese and divers. Area used is about 1000 acres.
10.	Dezadeash Lake	Ice-free some winters; about 5 acres.	Moderately important staging area, primarily dabblers. About 1000 acres used.
11.	Little Atlin outlet	Ice-free in creek most winters; 1 acre.	Swans use, dabblers, divers, in conjunction with early opening bays and narrows in Atlin Lake.

B. MINOR AREAS

12.	Quiet Lake outlet	The river to Sandy Lake is open most winters. Some divers and dabblers winter. About 15 acres.	A minor area
13.	Kusawa Lake outlet	Very shallow water with rocky bottom. Small opening most winters.	Very few ducks, mostly mergansers and goldeneye use.
14.	Kusawa Lake narrows	Sandy bar with shallow water. Some winters open.	Very few divers.

15.	Kathleen Lake	Open water most winters. The river is open about 10 acres. Few divers winter.	A minor area; about 500 acres is open and used by few swans, geese, dabblers, divers.
16.	Tincup Lake outlet	Frozen most winters.	Very small area (10 acres). No known use.
17.	Wellesley Lake	Outlet open downstream just a trickle.	About 5 acres available, few dabblers use.
18.	Sekulmun Lake	About 1 acre open some winters.	About 5 acres available, very shallow, little used. A few dabblers.
19.	Canyon Lake outlet	Otter Falls area and diversion ditch open; about 1 acre some winters.	About 5 acres available no use known.
20.	Taye Lake	Frozen most winters.	About 1 acre available, no use known.
21.	Frenchman Lake	Frozen most winters.	About ½ acre available.
22.	Tatchun Lake	Not checked.	
23.	Little Salmon Lake	Open water some winters.	About 20 acres availabl Used by few dabblers.
24.	Drury Lake	Not checked.	About 1 acre open. Waterfowl use unknown.
25.	Fortin Lake	Not checked.	Outlet open only a trickle.
26.	Finlayson Lake	Outlet frozen.	Outlet open only a trickle.
27.	Wolverine Lake	Outlet open a trickle.	Outlet open in very small area.
28.	Simpson Lake	Not checked.	Outlet open for about 2 acres. Very few dabblers.
29.	Wolf Lake	Not checked.	Outlet open for about 1 acres. Very little use.

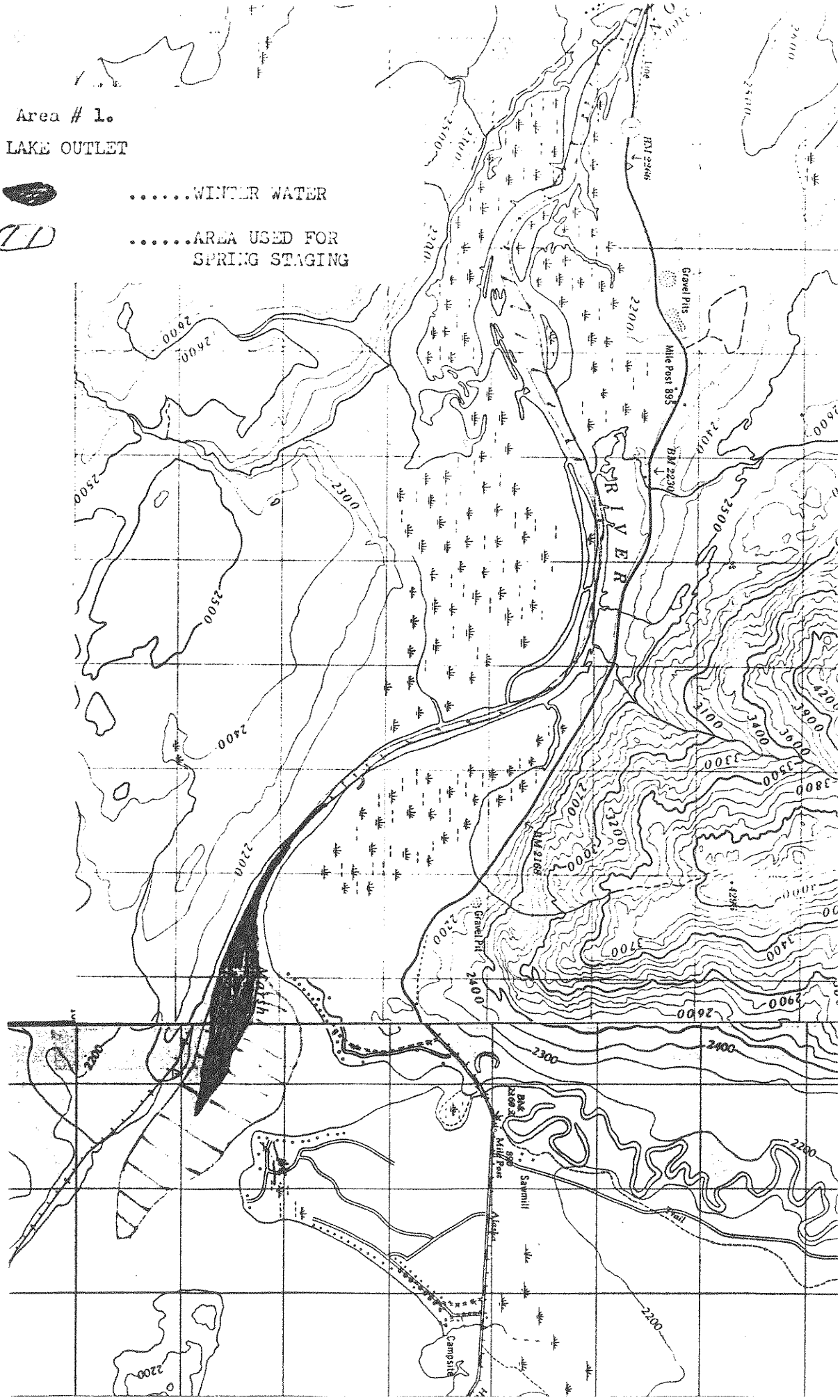
30.	Lewes Dam	Open 1 acre most winters.	About 10 acres available. Very little use.
31.	Whitehorse Rapids	Open about 5 acres most winters. Some divers winter.	Open at outlet of Schwatka Lake and below rapids. Area available about 100 acres. Used by a few swans, divers, dabblers.
32.	Little Kalzas Lake	Reported open water with some dabblers.	Reported used by dabblers.
33.	Stokes & Earn Lakes	Reported open water with some dabblers.	Reported used by dabblers.
34.	Moose Lake	Reported open water.	Not checked.
35.	Mayo Lake	Reported open water.	Not checked.

Area # 1.

MARSH LAKE OUTLET

.....WINTER WATER

.....AREA USED FOR SPRING STAGING



Census Results, Winter and Spring 1976.

Area #1

Marsh Lake

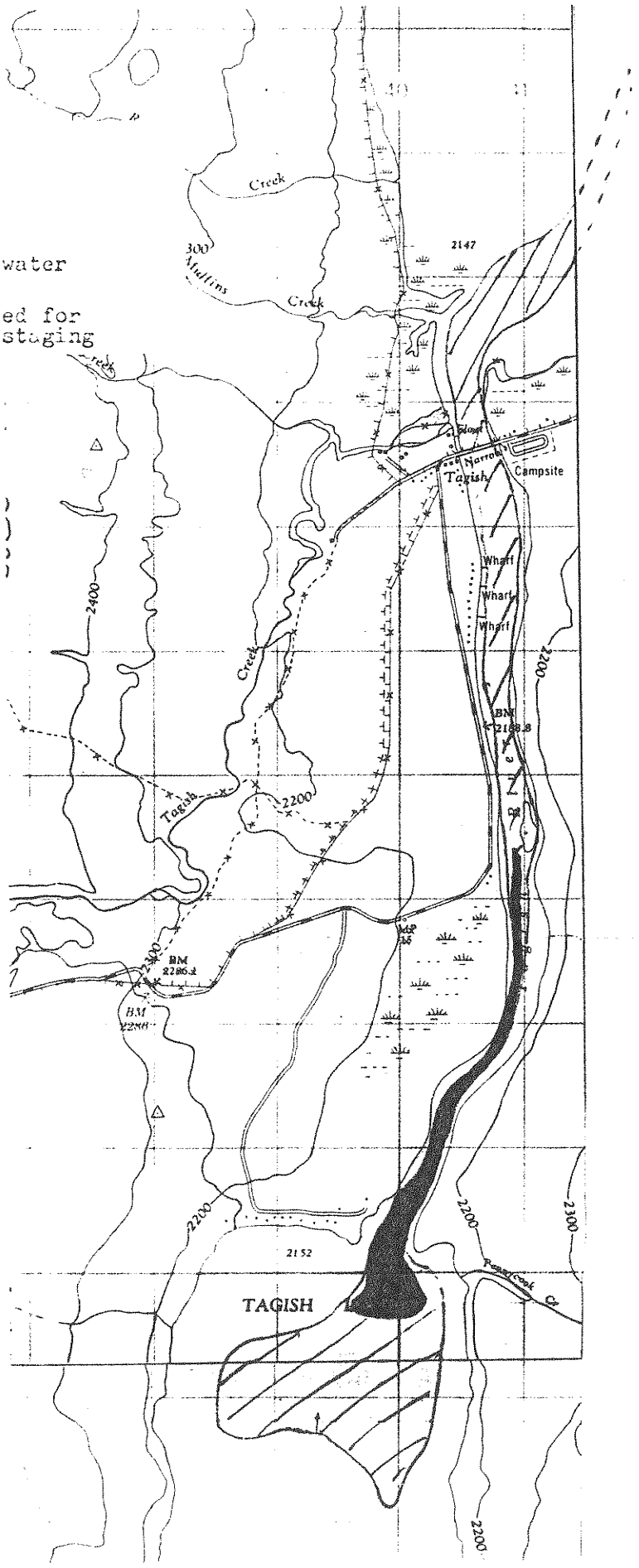
Date	Waterfowl	Other Observations
March 3	(no open water)	
March 12	(no waterfowl)	- open channel 10' wide extending 2 miles below lake
April 14	swans 51	- open water extends from lake to highway crossing
April 23	w. swan 425	- large w. swan movement began over Whitehorse on 22nd.
	t. swan 75-100	
	pintail 600	
	mallard 150	
	g.w.t. 5	
	redhead 2	
	bufflehead 15	
	wigeon 50	

Area # 2

TAGISH RIVER

.....Winter water

.....Area used for spring staging



Census Results, Winter and Spring 1976.

Area #2

Tagish River

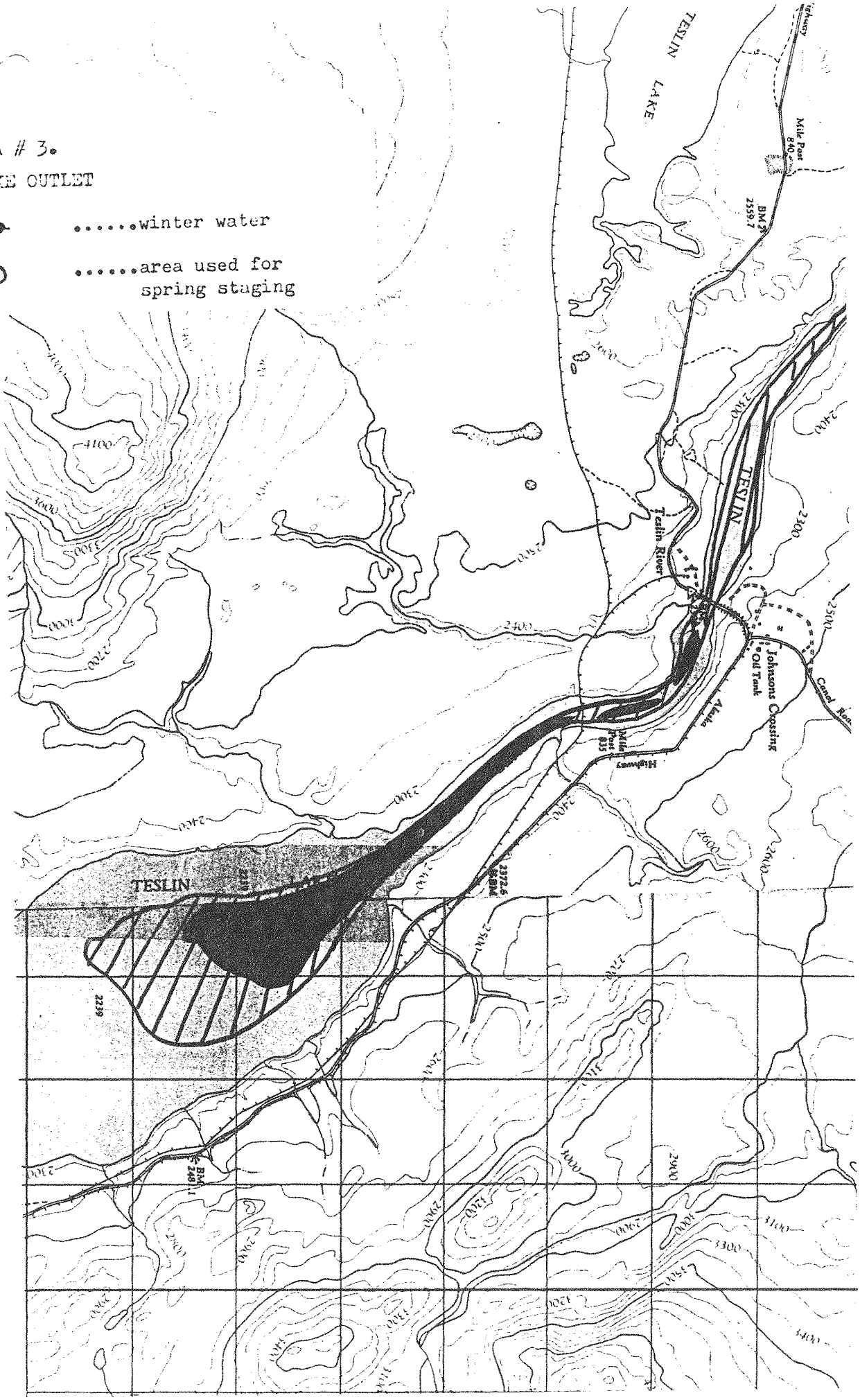
Date	Waterfowl	Other Observations
Feburary 3	goldeneye 2	- surface had frozen completely earlier in winter
March 3	goldeneye 9	- open water from island to clay cliffs in patches, plus small area in Tagish L.
March 12	goldeneye 8	- open water from island to Tagish Lake with 200 acres in lake open
April 14	swans 41	- aerial photograph
	divers 25	
May 5	swans 250	- ground count, 600 acres open in Marsh Lake, entire river
	divers 1,500	and 1,000 acres in Tagish Lake.
	dabblers 2,500	

Area # 3.

TESLIN LAKE OUTLET

.....winter water

.....area used for spring staging



Census Results, Winter and Spring 1976.

Area #3

Teslin Lake outlet

Date	Waterfowl	Other Observations
March 3	goldeneye 46 merganser 10	- open water extends about a mile into lake and downstream to powerline crossing, then in patches to bridge. A long stretch starts a mile below bridge for 3 miles - Roaring Bull Rapids frozen solid this date
March 12	goldeneye 28	- open water extends from about a mile into the lake where 500 acres are open to a mile above mouth of Squanga Creek
March 19	goldeneye 38 merganser 10 unident. 1	- open water now extends to mouth of Squanga Creek
April 13	swans 16 (ducks not counted)	- open water extends well past mouth of Squanga Creek
April 23	w. swan 1,600 Canada goose 1 w.f. goose 5 mallard 100 pintail	- count was from bridge only

Area #3 (cont'd)

Teslin Lake outlet

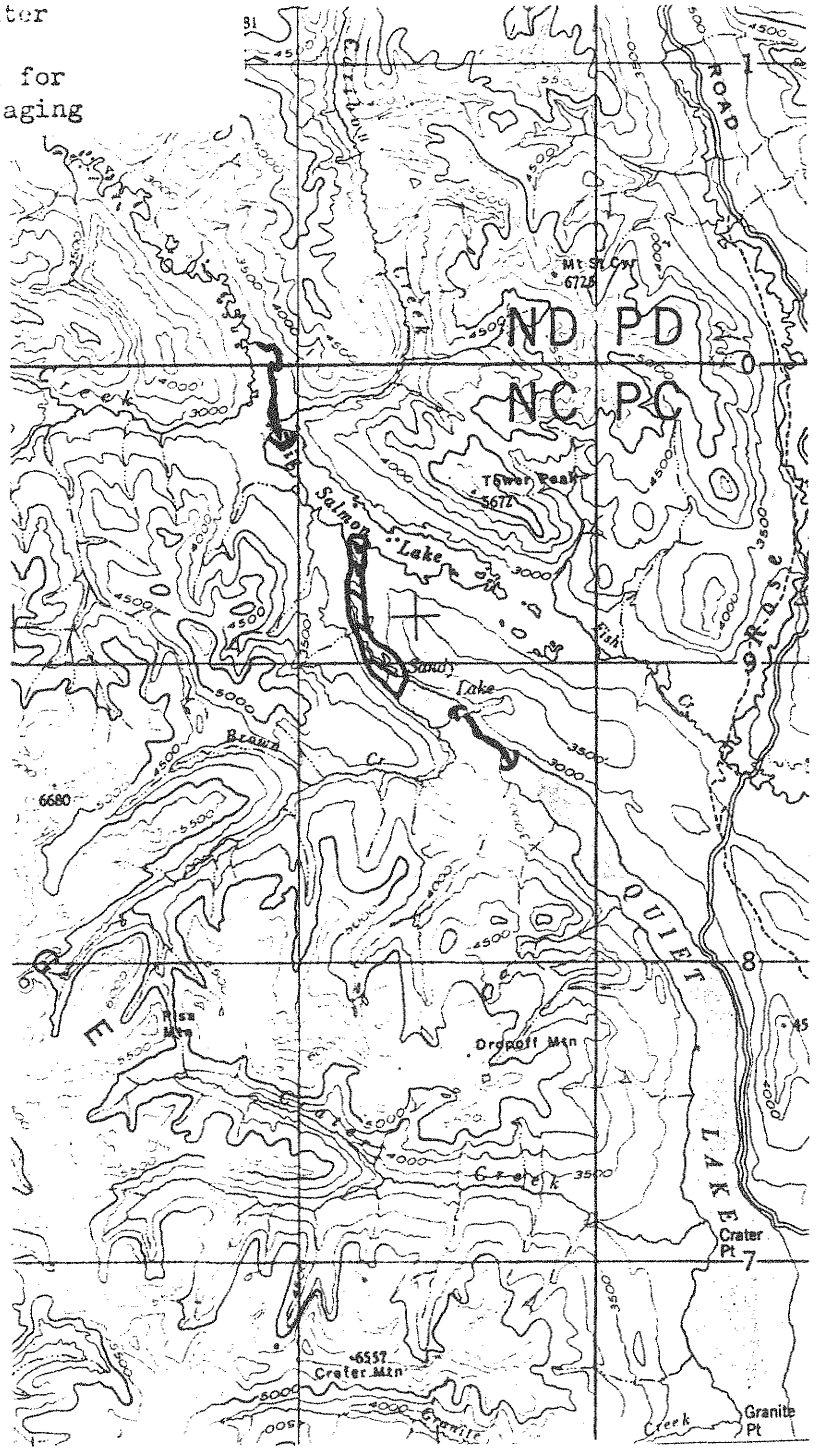
Date	Waterfowl	Other Observations
May 5	Canada goose 20	- total count from lake to Squanga Creek only
	goldeneye 225	
	wigeon 110	
	pintail 300	
	bufflehead 20	
	ringneck 10	
	g.w.t. 25	
	scaup 255	
	merganser 10	
	herring gull 10	
	mew gull 5	
	Bonapart's gull 10	

Area # 4.

BIG SALMON, SANDY LAKES

.... winter water

.... area used for spring staging



Census Results, Winter and Spring 1976.

Area #4

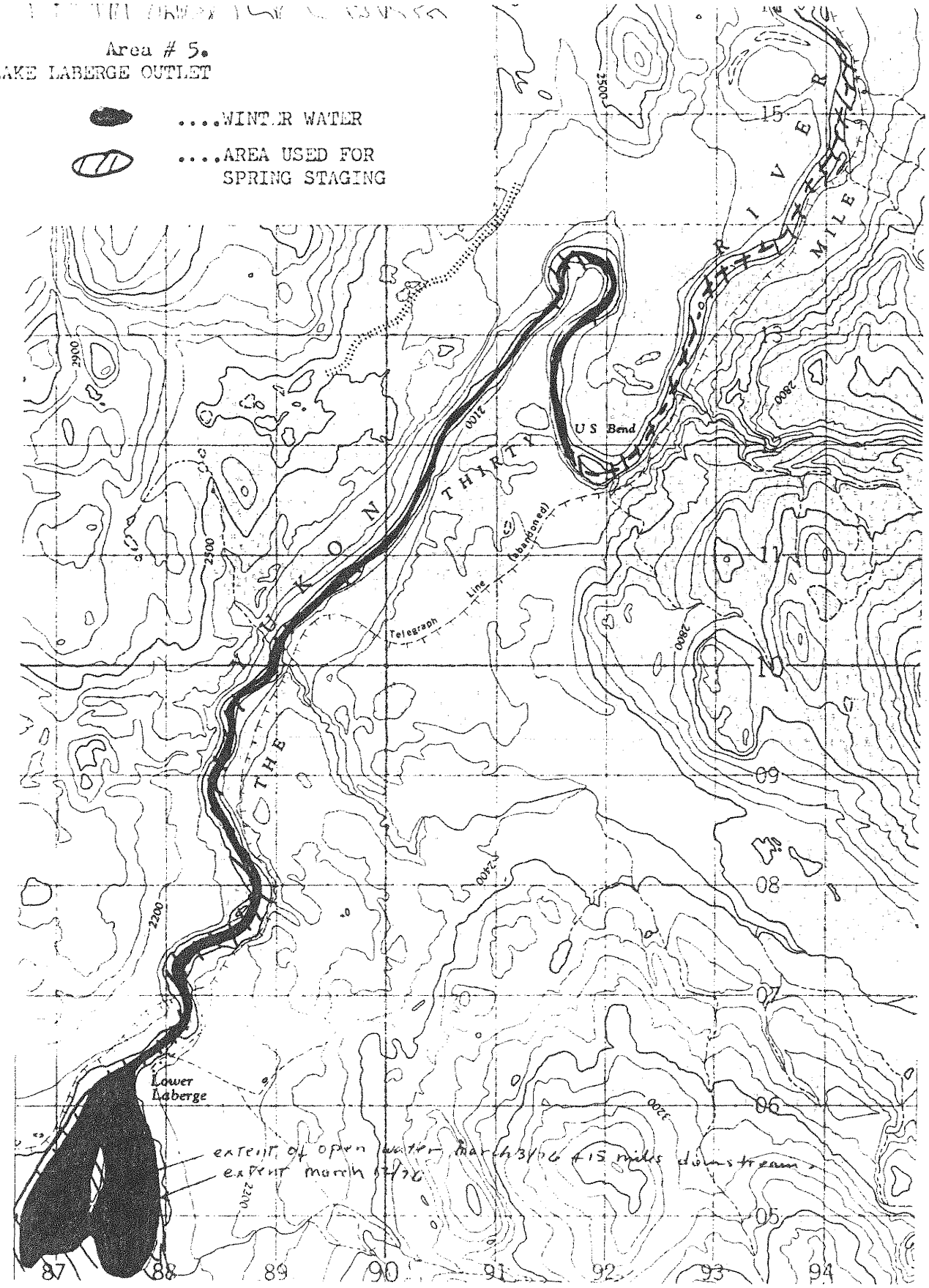
Big Salmon, Sandy Lakes

Date		
March 19	no waterfowl seen	- outlet of Sandy Lake has about 4 acres of water, patches throughout creek are open. Very little water at outlet of Big Salmon (1 acre in creek).
April 14	pintail 150 (no count made)	- aerial photograph. Creek is open between Sandy and Big Salmon; 2 acres in Big Salmon.
May 4	pintail 260	- area of water about the same as on April 14.
	wigeon 100	
	mallard 35	
	g.w.t. 25	
	scaup 75	
	goldeneye 130	
	unident. duck 40	
	swan 75	

Area # 5.
LAKE LABERGE OUTLET

....WINTER WATER

....AREA USED FOR SPRING STAGING



Census Results, Winter and Spring 1976.

Area #5

Lake Laberge outlet

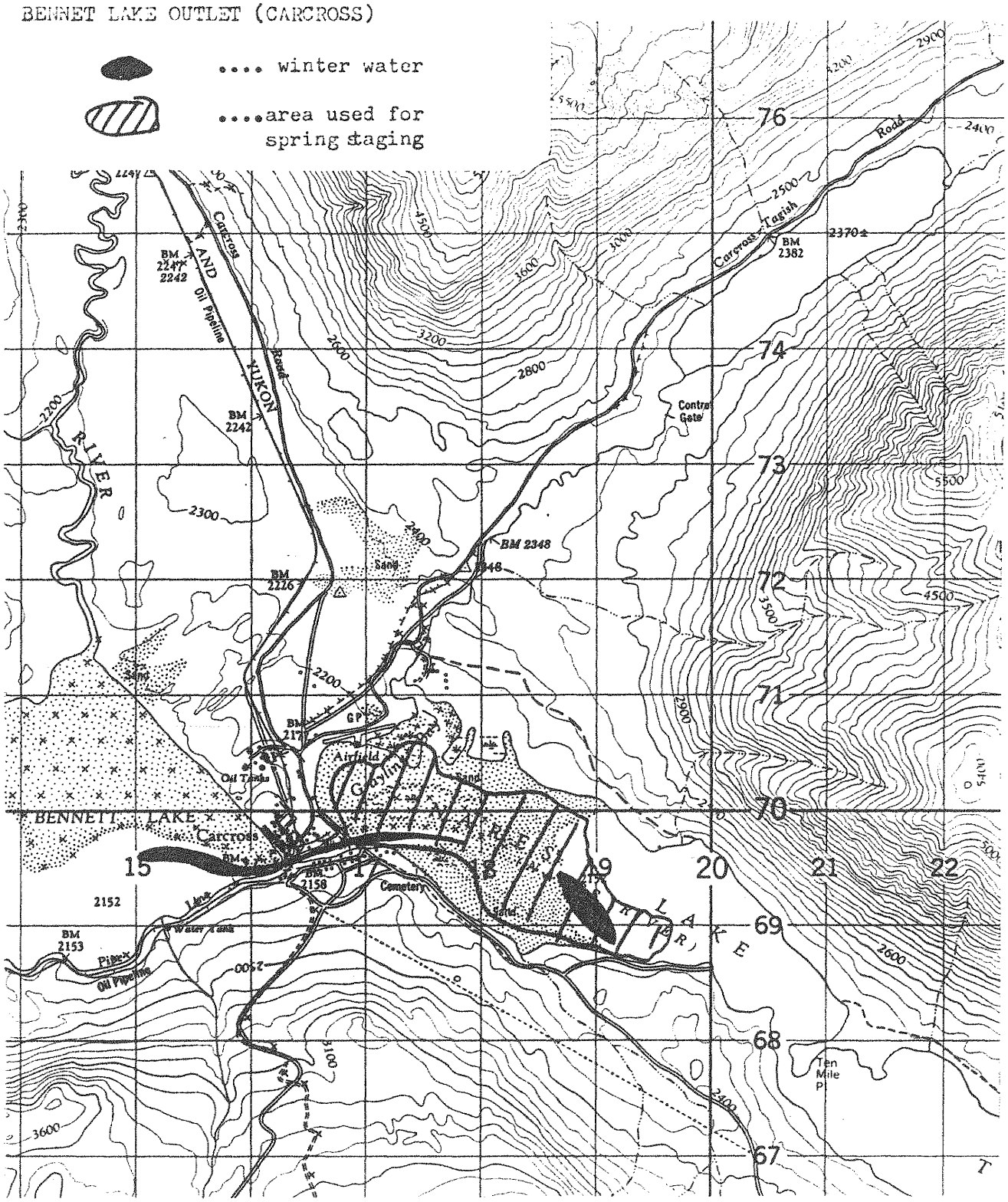
Date	Waterfowl	Other Observations
March 3	goldeneye 15 merganser 12	- open water extends downstream 12-15 miles with 200 acres open in lake.
March 12	merganser 10 (no count made)	- water temperatures taken
April 14	(no count made)	- 250 acres open in the lake and river is open all the way to Teslin.
May 4	goldeneye 100 canvasback 10 unident. diver 100 gull 15 merganser	- coverage not ideal due to wind problem

Area # 6.

BENNET LAKE OUTLET (CARCROSS)

.... winter water

....area used for spring staging



Census Results, Winter and Spring 1976.

Area #7

Francis Lake

Date	Waterfowl	Other Observations
April 14	2 swans (no count made)	- aerial photograph - four 100 acre areas open in lake: upper west arm, mid west arm, narrows in east arm, the site of old village. The mouth of Francis River is open for 5 acres and river is open for 16 miles
May 4	west arm: goldeneye 5 scaup 25 west narrows: goldeneye 10 scaup 75 mallard 25 wigeon 35 east narrows: goldeneye 10 scaup 100 pintail 25 wigeon 150 village: swan 1 scaup 225	- open water much the same as on the 14th

Area #7 (cont'd)

Francis Lake

Date	Waterfowl	Other Observations
May 4	village:	
	ringneck 25	
	shoveler 25	
	pintail 225	
	outlet and river:	
	swan 15	
	goldeneye 25	
	scaup 235	
	ringneck 10	
	bufflehead 15	
	canvasback 40	
	merganser 8	
	Canada goose 75	
	mallard 60	
	pintail 200	
	wigeon 175	
	g.w.t. 20	
	shoveler 10	
	gull 5	
	TOTAL: 1854	

Census Results, Winter and Spring 1976.

Area #8

Aishihik Lake

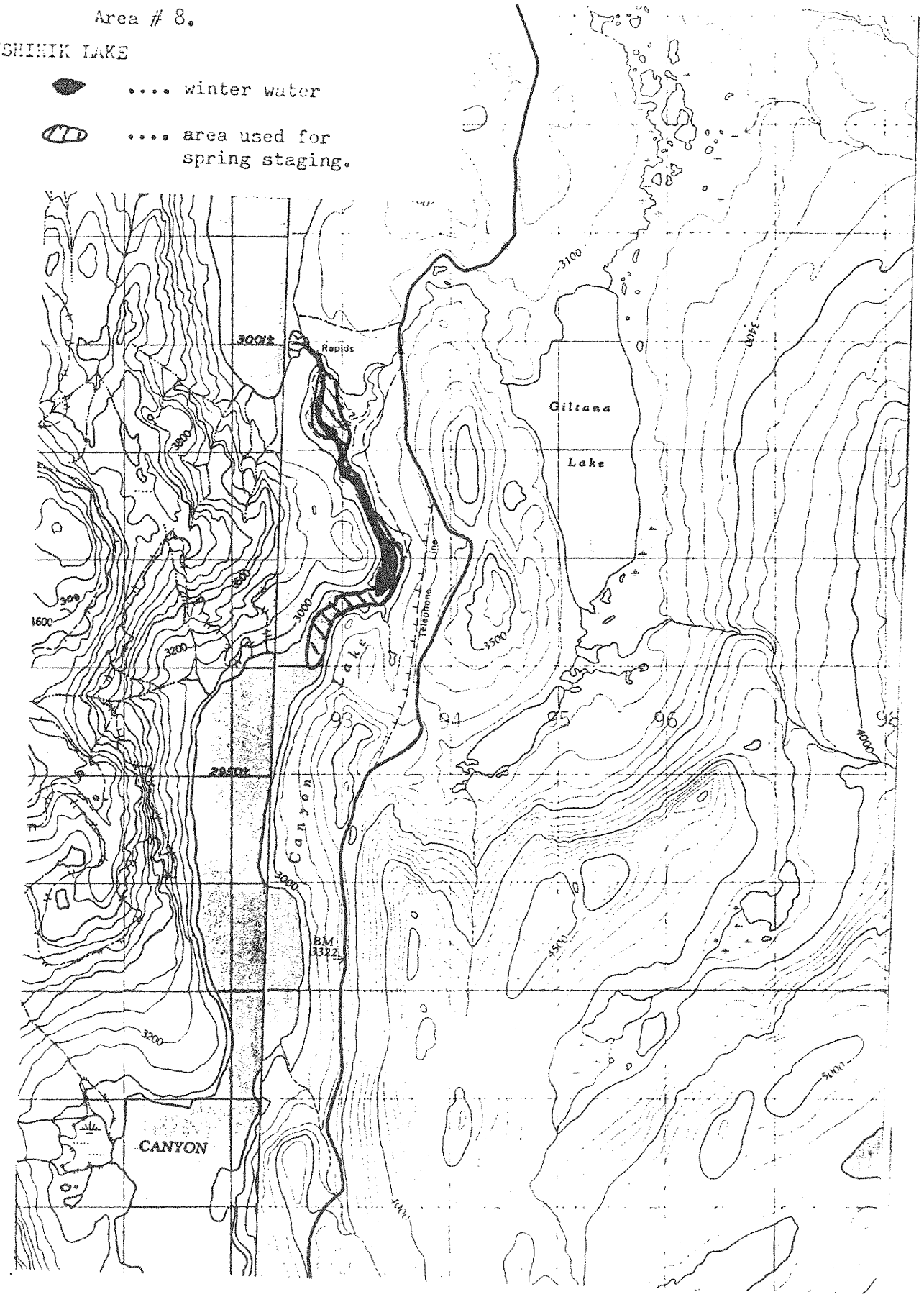
Date	Waterfowl	Other Observations
April 2	no waterfowl seen	- from ground at dam only, no complete survey. - bald eagles at nest - Area of open water is about 100 acres.
April 13	no waterfowl seen	- aerial photography, high level pass, no count of birds - a large area of open water extends all the way between Aishihik and Canyon Lakes; several hundred acres.
May 5	wigeon 25	- very windy at site

Area # 8.

AISHIHIK LAKE

.... winter water

.... area used for spring staging.



Census Results, Winter and Spring 1976.

Area #6

Bennett Lake outlet (Carcross)

Date	Waterfowl	Other Observations
April 13	(no waterfowl seen)	- area of open water is about 200 acres.

Census Results, Winter and Spring 1976

Area #9

Kluane Lake outlet

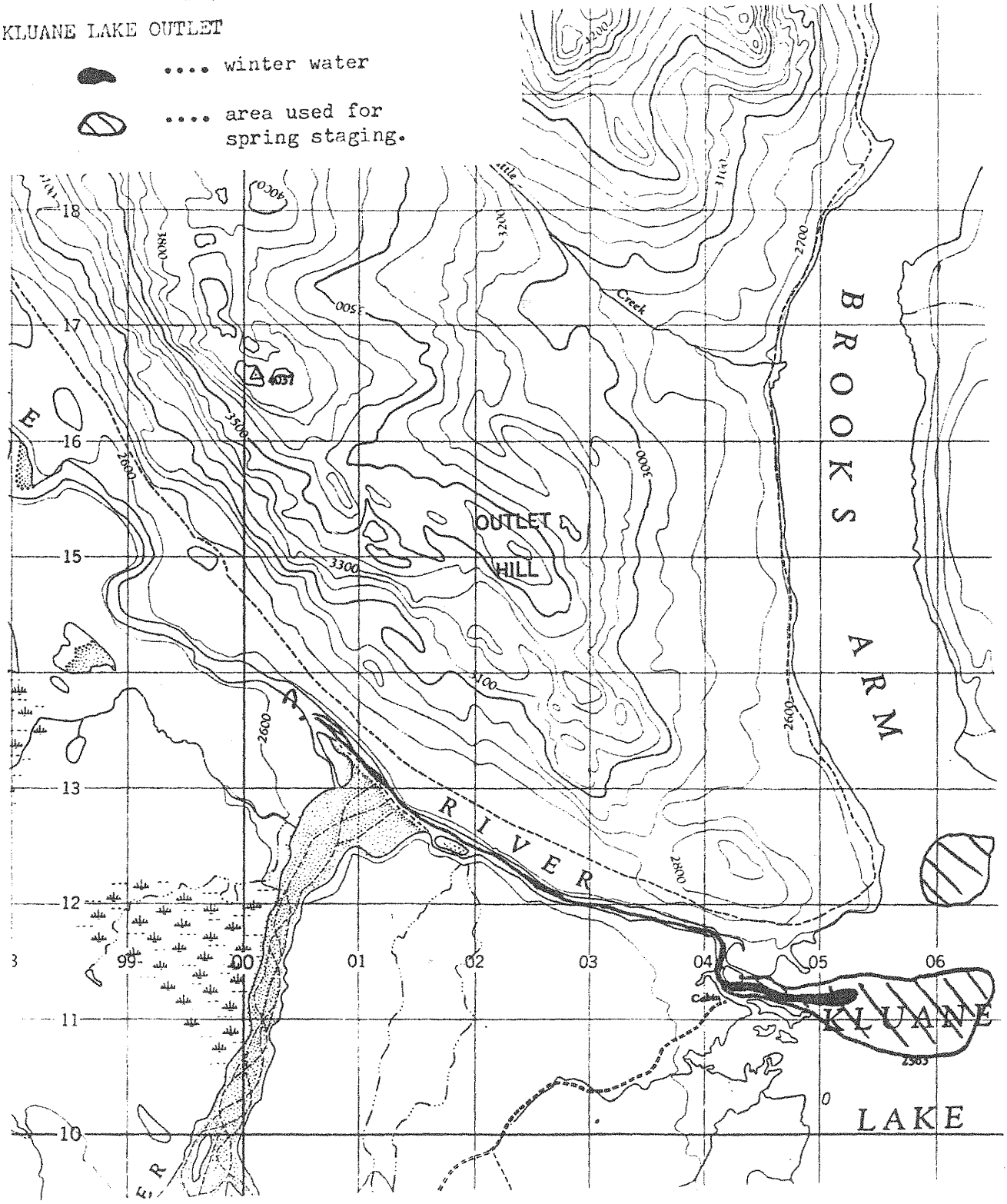
Date	Waterfowl	Other Observations
April 13	swan 5	- no low level count area of open water is about 50 acres in the lake but extends downstream about a mile
May 5	canvasback 900 goldeneye 150 wigeon 150 mallard 100 g.w.t. 10 pintail 540 1,850	- open water in the lake is about 100 acres. A secondary area of open water has developed along the north shore of Kluane Lake at the mouth of Brooks Arm

Area # 9.

KLUANE LAKE OUTLET

.... winter water

.... area used for spring staging.



Census Results, Winter and Spring 1976.

Area #10

Dezadeash Lake

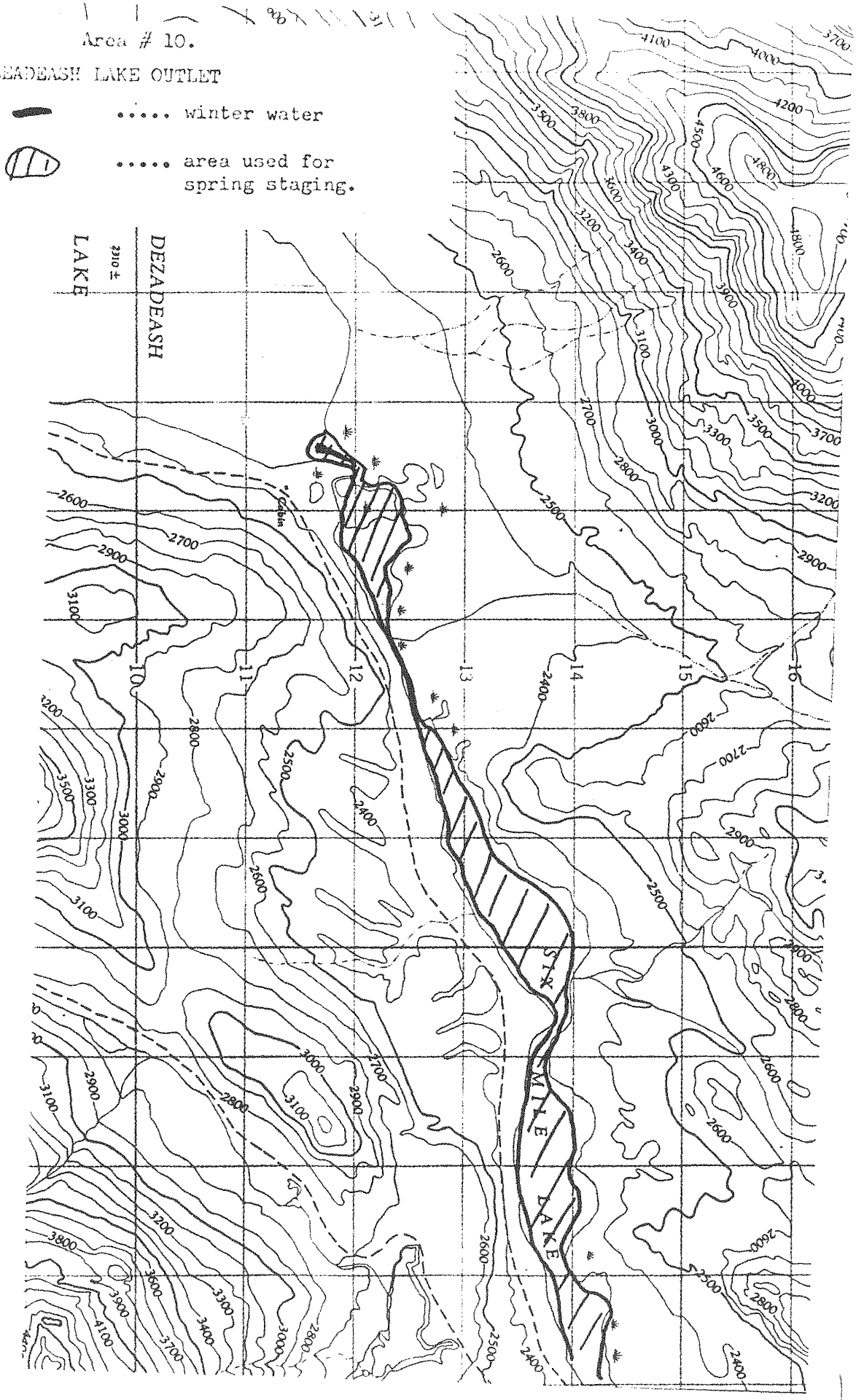
Date	Waterfowl	Other Observations
April 13	no waterfowl seen	- open water only at mouth of Dezadeash River. - about 5 acres
May 5	canvasback 2	- shorebirds in abundance - open water extends several miles downstream
	goldeneye 105	
	merganser 6	
	bufflehead 15	
	mallard 145	
	pintail 850	
	wigeon 545	
	g.w.t. 155	
	gull 115	
	1,933	

Area # 10.

DEZEADEASH LAKE OUTLET

..... winter water

..... area used for spring staging.



Census Results, Winter and Spring 1976.

Area #11

Little Atlin Lake outlet

Date	Waterfowl	Other Observations
March 12	no waterfowl	- only open water is a small channel in the narrows near the south end and small patches in Lubbock Creek.
April 13	swans 9	- no low level count - area in lake is about 1 acre - Lubbock River is open for at least 1 mile downstream
May 4	canvasback 50 scaup 410 goldeneye 70 swan 35 Canada goose 75 bufflehead 10 650	- ponds and sloughs along Little Atlin Lake are being used by good numbers of dabblers and some divers by this date

Water Temperatures and Limnological Phenomenon at Lake Outlets

This part of the study addresses the problem of understanding the causes of open water at outlets of Yukon lakes during winter and early spring. The striking nature of this phenomenon in a country where winter temperatures commonly hover near -40°C and where rapids and small waterfalls freeze over completely is especially acute. In spite of this, there is no known published description or explanation for the phenomenon.

Typically the outlet of lakes displays an amount of ice-free water in direct correlation to the size of the lake and secondarily the amount of flow. The latter seems to be of less importance as areas where flow is the dominant feature (at rapids etc.) open water does not invariably result.

The ice-free water begins in the lake across a wide fan up to half a mile lake-ward from the outlet. (See figure 1 for an aerial view of a typical outlet in winter). A large area then extends downstream from the outer edges of the 'fan' consisting of 'pocked' ice and finally floating pans. Downstream from this ice-free water extends into the outlet channel a variable distance but in some instances up to 10 miles. Flow is often not obvious from an aerial view. A feature of the ice in the river is that it can become fairly thick and well developed along the shores with a very abrupt edge near the active stream channel. This stable shore ice is often used by wildlife.

The results of our soundings and temperature readings at Tagish and Laberge Lakes is illustrated in figure 2.

The hypothesis suggested by these data is as follows: In winter Yukon lakes assume a typical winter stagnant state with warmer water on the bottom. The current moving through the lake system moves through the layers of water in the lake (laminar flow). Outlets of lakes typically are shallow with a slowly rising bottom approaching the outlet. This forces at least some of the warmer water from the bottom layers to mix with the surface layers at the outlet. This in turn raises the surface temperature above 0°C.

Figure 1. Outlet of [illegible] Lake, April [illegible], [illegible]; a typical lake outlet exhibiting the phenomenon of ice free water.

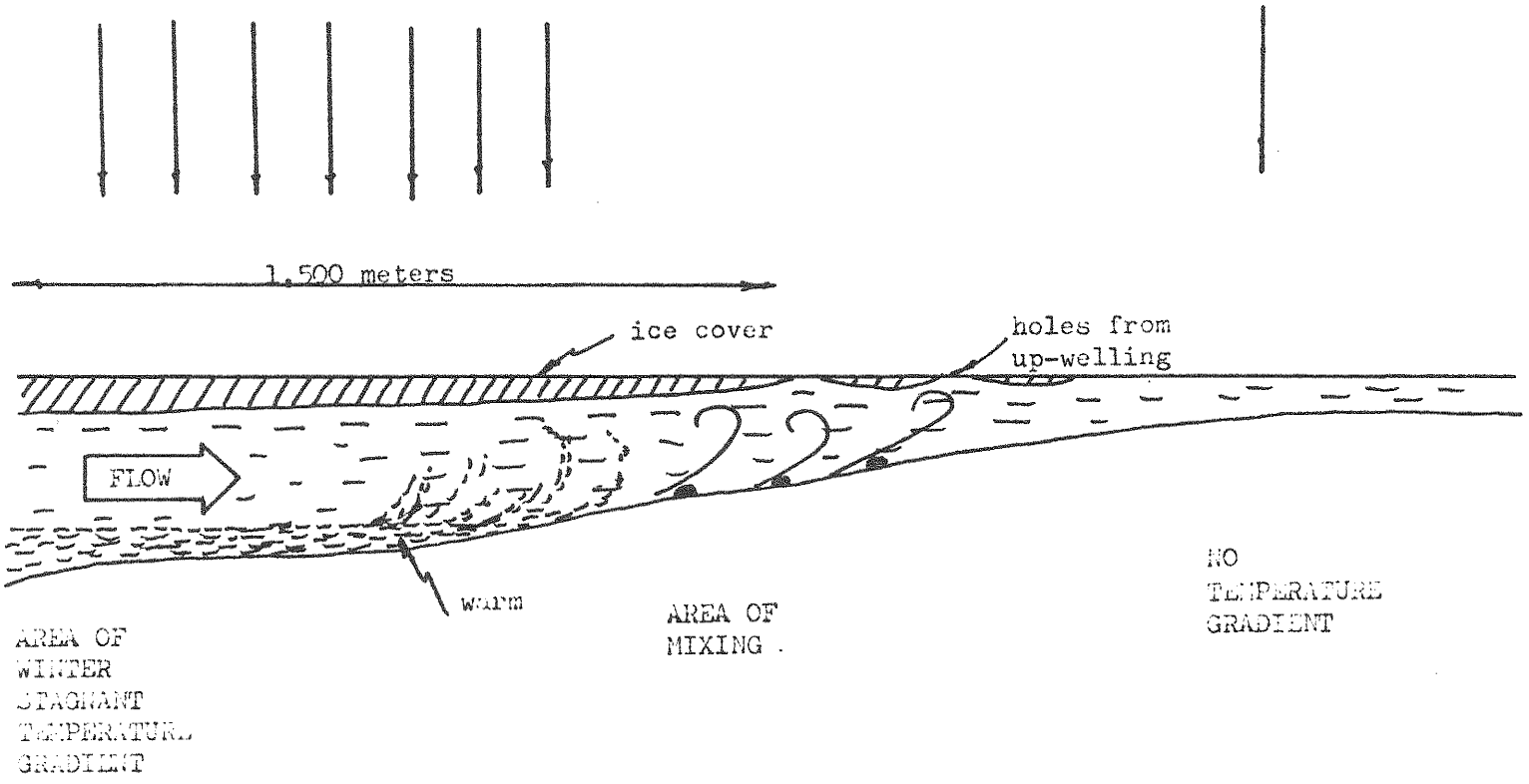
Ice Thickness:	60.9	50.8	50.8	25.4	25.4	12.7	(cm)
Water Depth:	7m	5m	5m	5m	3m	2½m	2½m
Surface Temp:	0	0	+1	+1	+1	+1½	+1
Bottom Temp:	+2	+1½	+½	+½	+½	+½	+½

* 0 cm

1½m

+1

+1



* (estimated from temperatures taken at Tagish Lake outlet)

Figure 2. Temperature readings, ice thickness and water depths at Lake Laberge outlet, March 12, 1976

Future Work

Testing this idea will require the duplicating of the effort this winter many times at various times of year. It will also be necessary to measure current flows throughout the layers of lakes in winter and summer.

Future study will include a better analysis of the use of these areas by waterfowl. Notably, we will try to understand the response of aquatic vegetation and invertebrates to the phenomenon. The biology of ducks using the area (notably in winter, but also in early spring) is an interesting unknown.

Other wildlife are undoubtedly affected by the phenomenon. It is obvious upon cursory examination that many forms of wildlife use the areas by preference in winter. Studies of mammals dependent on the sites should begin immediately. The value of the areas to the total ecology of the Yukon is undoubtedly very far-reaching. The fact that management of water systems in the Yukon often means damming and destruction of flow at lake outlets, lends urgency to the need to properly understand the importance of these areas.