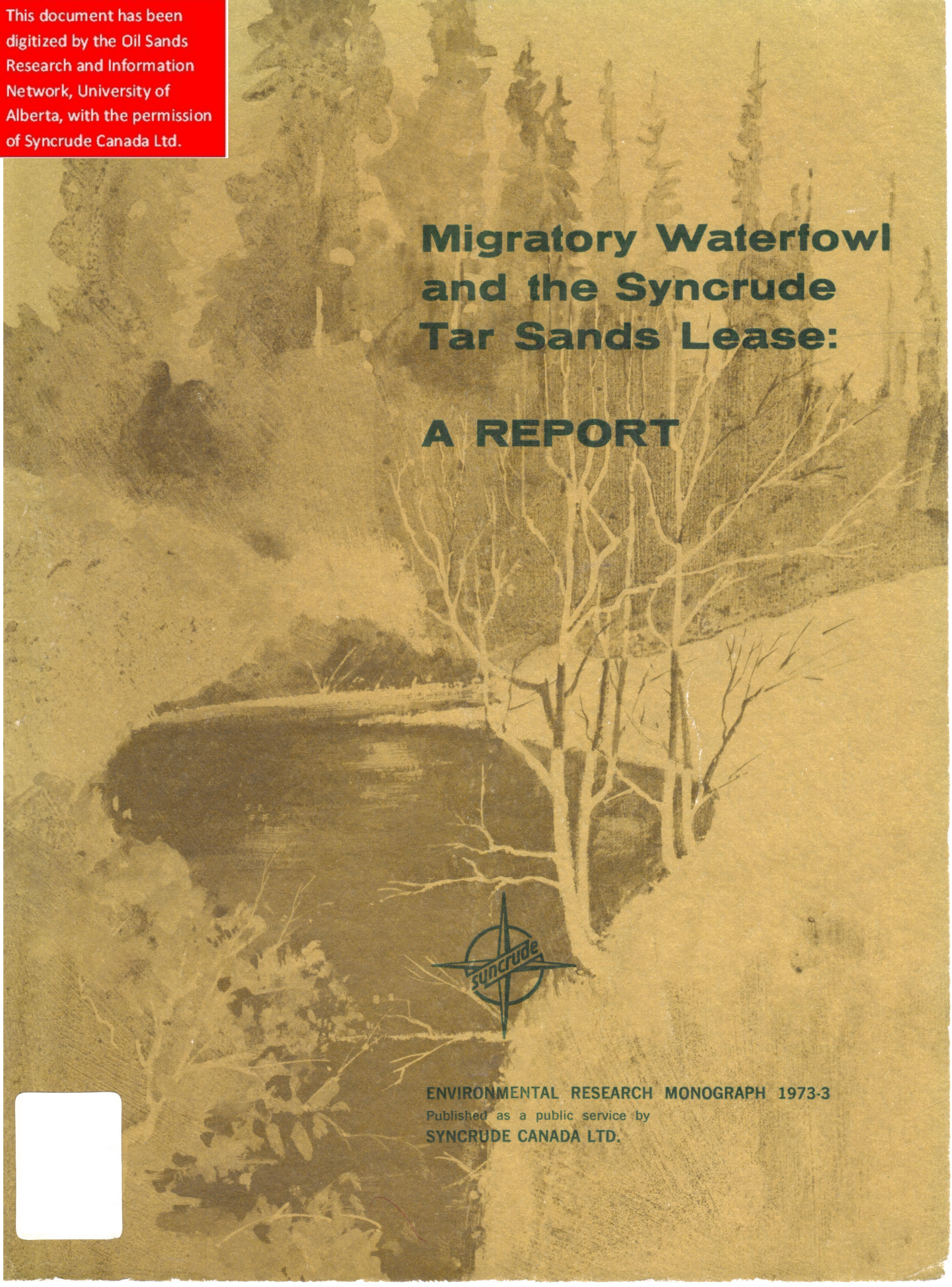

Migratory Waterfowl and the Syncrude Tar Sands Lease:

A REPORT

ENVIRONMENTAL RESEARCH MONOGRAPH 1973-3
Published as a public service by
SYNCRUDE CANADA LTD.

FORWARD

This environmental monograph on waterfowl use of the area of Syncrude Tar Sands Lease No. 17 and vicinity is part of continuing environmental studies carried on Syncrude Canada Ltd. The policy of Syncrude Canada Ltd. is to make available to the scientific community and the public at large ecological base line information as it relates to developments in the Athabasca Tar Sands. This study was commissioned by Syncrude and was performed by Renewable Resources Consulting Services Limited, an ecological consulting firm with headquarters in Edmonton, Alberta. This report is a summary of four studies conducted between October 1971 and July 1973. It attempts to identify the use of water bodies on and adjacent to Syncrude Lease No. 17 by migratory waterfowl. This information is necessary in order to minimize environmental impact on these populations. An understanding of the movements and requirements of waterfowl will make it possible for Syncrude Canada and their contractors to design facilities which will cause minimum disruption to the life cycles of avifauna in the development area. Subsequent monographs on other topics of environmental concern will be presented in the near future.

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Research and Environmental Affairs Manager
Syncrude Canada Ltd.

T A B L E O F C O N T E N T S

T A B L E S

F I G U R E S

FIGURES (Cont'd)

INTRODUCTION:

Early in its developmental operations on the Athabasca Tar Sands, Syncrude Canada Ltd. has shown concern for the ecological effects of its operations. In the Spring of 1971, the management of Syncrude contacted Renewable Resources Consulting Services regarding assessments of potential ecological impacts on the lease area. As a result, a preliminary investigation of ecological relationships was undertaken in July of 1971. This was followed by other surveys to assess fisheries, wildlife (including waterfowl) and the general ecological conditions of the Boreal Mixedwood Forest Ecosystem in which Lease #17 is located.

An attempt was made to identify potential areas of concern during the preliminary investigation of the development. Assessments of potential conflicts between resource extraction operations and the functioning of ecological relationships on the lease area were initiated. These preliminary investigations were not considered to represent quantitative or qualitative statements of ecological impacts, but were made primarily to determine whether or not significant potential problems existed.

Although many of the principles which govern ecological relationships among organisms living within a physical environment are well known, how these principles apply to the

Athabasca Tar Sands area is not known. Therefore, in order to evaluate the effects and impacts on a particular activity, it is necessary to know the conditions and interrelationships of the "baseline" or undisturbed ecosystem. These baselines must be established to provide a control against which the effects of activities can be measured.

As the ecosystem pertains to wildlife, an analysis of both primary and secondary consumers is required. This means that food chain and food web relationships, based on information from the vegetation survey, must be approximated for each habitat type. The presence, distribution, and population dynamics of all major species and representative minor species should be evaluated over the long term (Ca. 10 years). Preliminary investigation should delineate habitat types and the animals indigenous within the type.

Mapping of key winter ranges is essential to any ecological study. The distribution and cyclic densities of upland game birds should be determined. Requirements for nesting and their relationship to other factors within the community must be understood. Presence and chronology of waterfowl species should be determined. It is essential to know whether observed waterfowl are summer residents or simply migrants within the study area.

The factors of natural environmental resistance and potential productivity must be assessed and estimations made of the population's biotic potentials. In addition to this, the present carrying capacity of the habitat must be determined in

order to evaluate the extent of changes brought about by future human action. This report is a first order estimate.

OBJECTIVES:

Objectives of the waterfowl surveys are:

1.) To monitor waterfowl migrations through the Syncrude Lease 17 and general area during all seasons of use.

2.) To establish the locations and intensity of use.

3.) To document the chronology of migration through the area.

4.) To determine the key areas used during the migration.

5.) To further examine the implications of the Syncrude development upon waterfowl.

6.) To suggest mitigative measures, if any, that might be taken.

METHODS:

In October, 1971, two aerial surveys of waterfowl were made to determine the use of the Syncrude lease area by fall migrants. Three hundred and two mallards were observed on Mildred Lake during the first survey and none during the second. In general, it was concluded that the Ft. McMurray region is not a heavily used migration stopover during the late autumn. Waterfowl that had migrated at this time are believed either to have flown non-stop through the area to the south, or flown southeast from the Athabasca Delta through the province of Saskatchewan. The Fish and Wildlife Officer at Ft. McMurray stated that the movement of geese through the area had occurred almost two weeks earlier. However, neither he nor the local

residents observed any large migration of ducks through the area.

The survey was undertaken in a Cessna 180 flown by Brandon Zimmerman of Gateway Aviation. Observers were R. D. Jakimchuk, C. Surrendi and K. Baker. The survey began at 9:50 A.M. and travelled from Ft. McMurray north along the Athabasca River. An altitude of approximately 200 feet and speed of 100 m.p.h. was maintained.

All lakes, from Ft. McMurray to McLellan had open water as did the Athabasca River. Visibility was excellent despite an overcast ceiling. There was not snow in the lease area although 30 miles north snow cover was encountered. A considerable amount of fresh snow was observed south of Ft. McMurray. Many of the lakes and marshes between Edmonton and Ft. McMurray were partially or completely frozen.

No birds were observed along the Athabasca River in checkpoints 1 through 4. Checkpoint 4 was a small marsh adjacent to the Athabasca River (Figure 4). Two female moose (a cow and yearling) were observed on an island at checkpoint 3. The plane was then flown over Horseshoe Lake (checkpoint 5) which contained 40 mallards on its southwest end and 40 more mallards on its southest portion. Mildred Lake (checkpoint 6) was occupied by 300 mallards along the east shore, 5 unidentified (probably mallards) on its north end, and 1 pair unidentified, 1 pair mallards and 1 pair of unidentified loons or grebes along the west side.

The survey then progressed to marshy Saline Lake on the east side of the Athabasca River (checkpoint 7). However, no waterfowl were observed at this checkpoint. A small marsh just south of Saline Lake (checkpoint 8) contained one flock of 15 mallards and a second group of eight. Checkpoint 9 (Ruth Lake) contained only 3 common loons. Checkpoints 10 and 11 were small lakes between Ruth Lake and Mildred Lake. These had no waterfowl. From this point the Beaver River was flown to its confluence with the Athabasca River (checkpoint 12). No waterfowl were observed on the Beaver River. Checkpoint 13 (McLelland Lake) to the north and east of Ft. McKay was surveyed next. It was felt that this lake, because of it's large size, might attract large numbers of waterfowl. However, only 1 group of 40 mallards and 1 group of 15 mallards were seen.

Since few waterfowl were seen on the survey, it appeared that the main migration had occurred early. The radio operator at the Ft. McMurray airport was interviewed for additional information. However, he did not know of any large movements of waterfowl through the area. The nearest radar facility is at Cold Lake and data from that area would not be useful in assessing migrations through the Ft. McMurray area.

A second aerial survey was conducted on October 27, 1971 to try to determine the amount of use made by staging waterfowl of the area in and around the Syncrude Lease near Ft. McMurray. The survey was undertaken following a report that freeze-up had occurred in the Peace-Athabasca Delta region, and in anticipation

of southward migrations from the delta which might pass through the study area.

This survey was conducted in a Cessna 185 chartered from Contact Airways, Ft. McMurray and flown by Jack Bergeron. The observer was Keith Baker. The survey started at 10:00 A.M. at Ft. McMurray then travelled down the Athabasca River. The sky was overcast but visibility was excellent. An elevation of 200 feet and a speed of 100 m.p.h. were maintained during the survey.

A snow storm that had started around 2:30 P.M. the previous afternoon finished in the early morning leaving one half inch or more of snow on the ground. The last several days had been quite cool and the whole area was starting to freeze up. The Clearwater River was choked with large pieces of ice and the water flowing between the shore and sand bars was completely frozen over. The Athabasca River was also in the above semi-frozen state while most small ponds were completely frozen over.

The waterfowl survey began at the point where Clearwater River meets the Athabasca River and the plane progressed northward along the Athabasca River. Along checkpoints 1 through 3 (Figure 4) no waterfowl were observed and only 15 ravens, all in one flick, were seen. Checkpoint 4, a small marsh on the east side of the Athabasca River, was completely frozen over. A cow moose with twin calves was seen lying on the north end of this marsh. The Survey then progressed to Horseshoe Lake (checkpoint

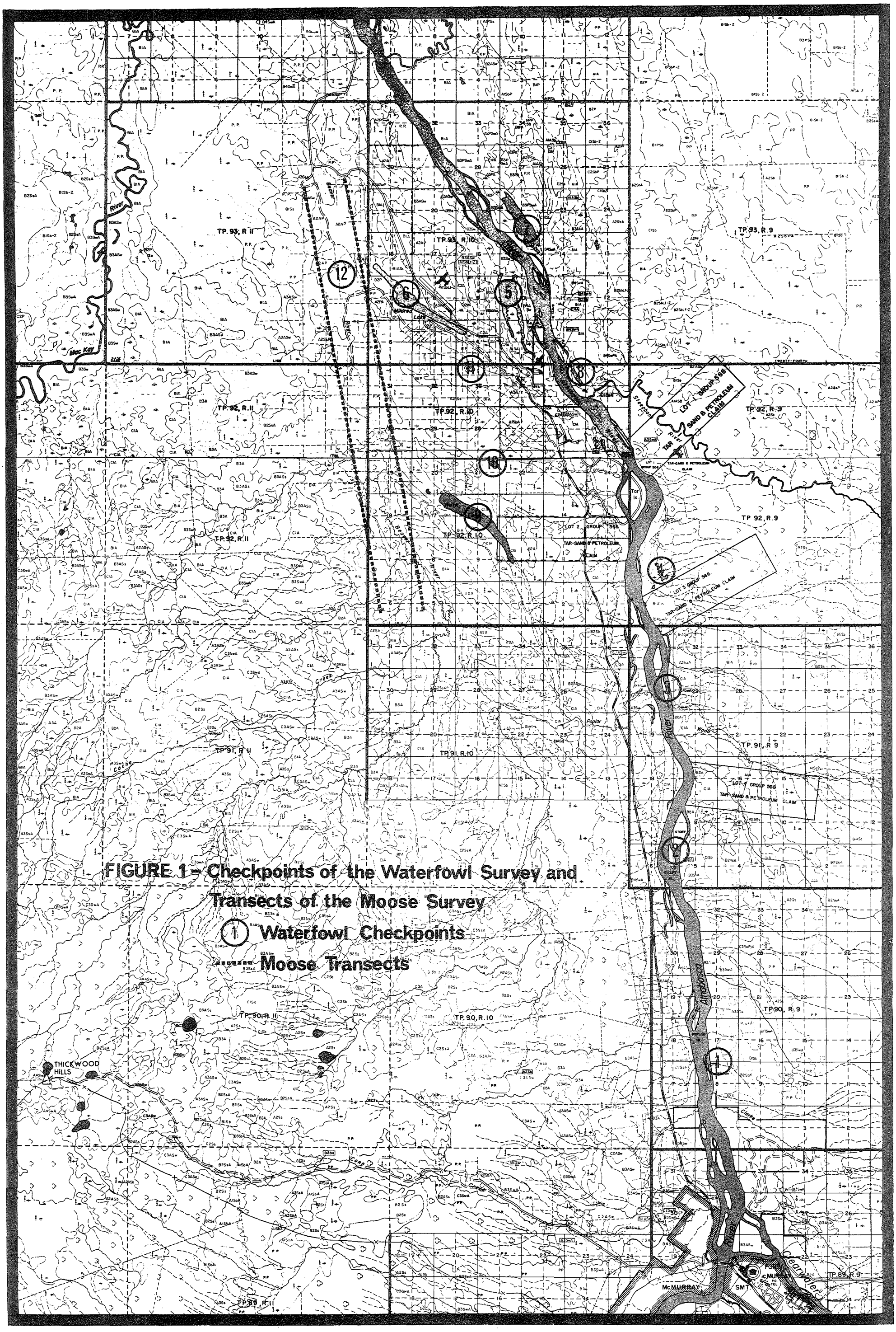


FIGURE 1 – Checkpoints of the Waterfowl Survey and Transects of the Moose Survey

① Waterfowl Checkpoints

Moose Transects

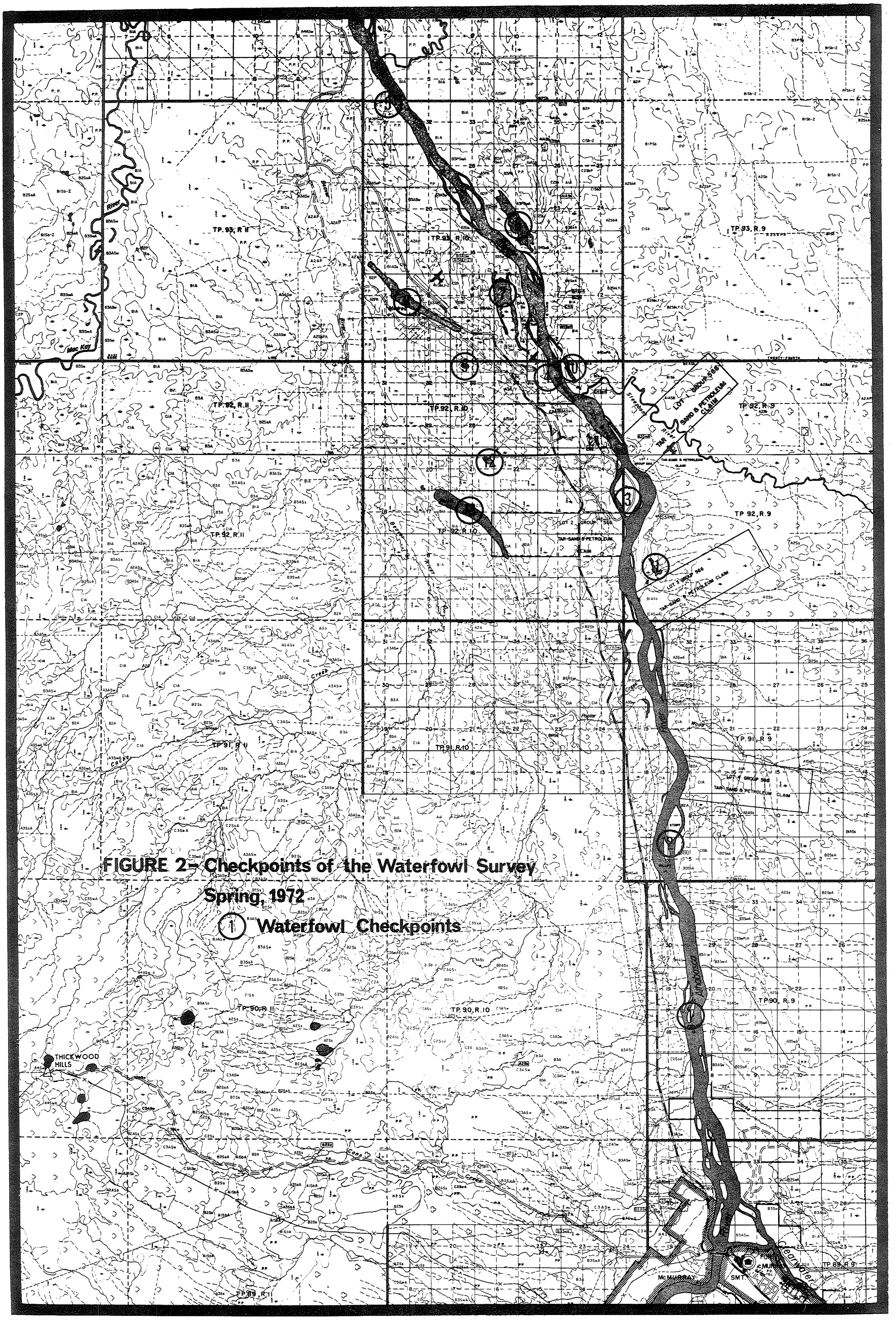


FIGURE 2- Checkpoints of the Waterfowl Survey

Spring, 1972

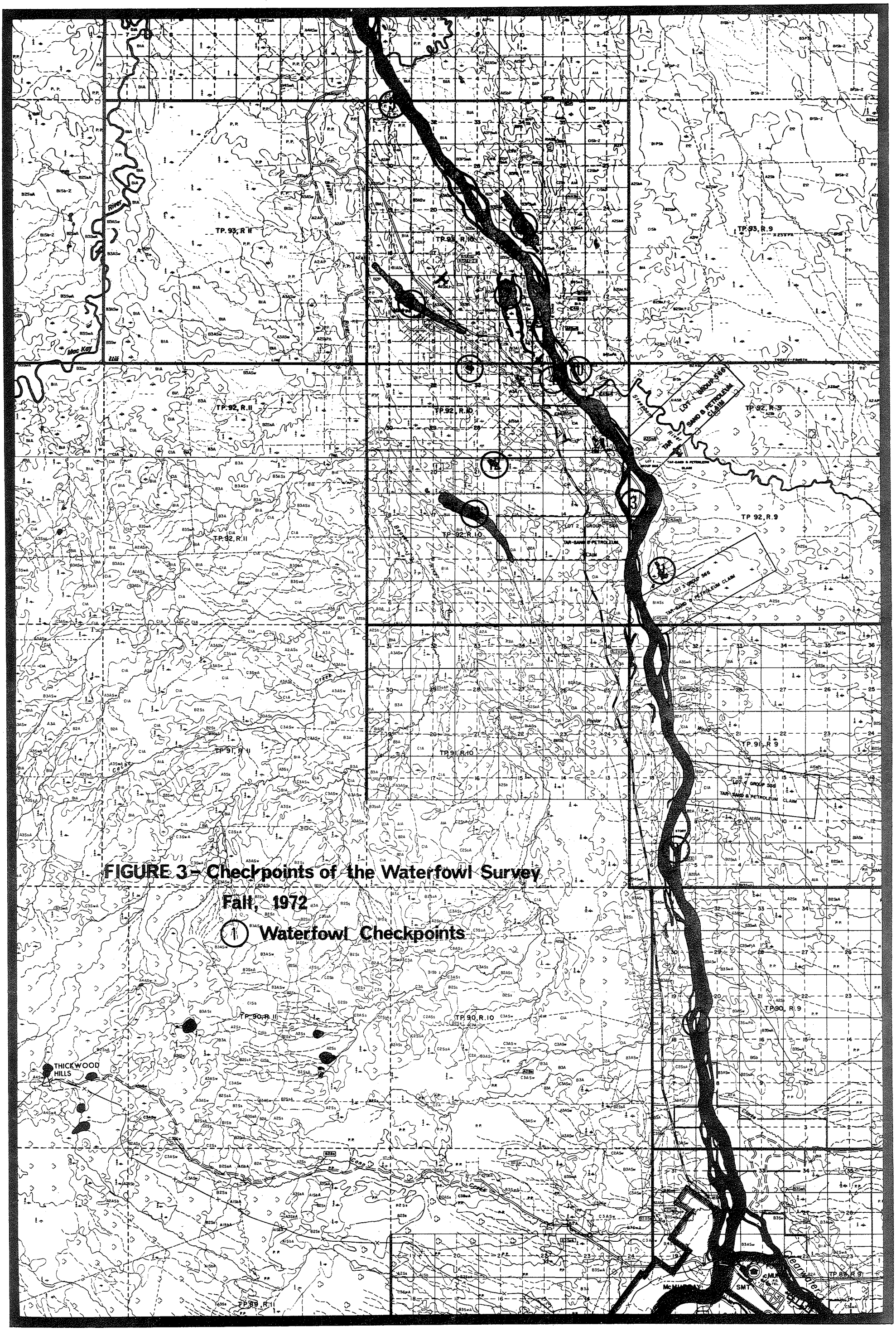


FIGURE 3– Checkpoints of the Waterfowl Survey

Fall, 1972

(1) Waterfowl Checkpoints

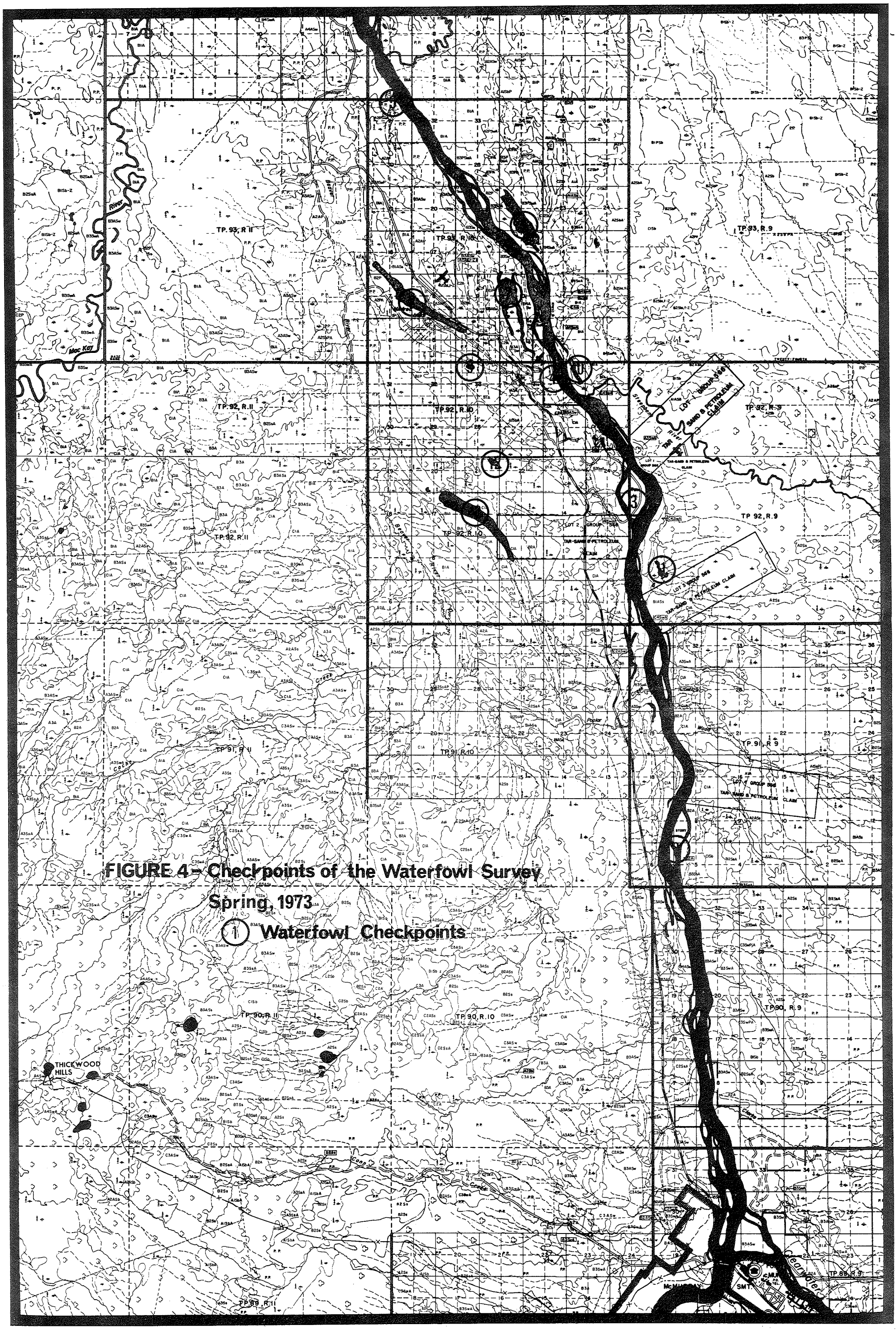


FIGURE 4 – Checkpoints of the Waterfowl Survey

Spring, 1973

1 Waterfowl Checkpoints

5) which also was frozen and contained no waterfowl. Checkpoint 6 was Mildred Lake which was frozen over at both ends but open in the middle. Again no waterfowl were observed and the plane was flown to Saline Lake (checkpoint 7). On one of the numerous patches of open water on this lake 9 mallards were observed. Checkpoint 8, the small marsh south of Saline Lake, was almost totally frozen and contained no waterfowl. The Beaver Creek (checkpoint 12) was also almost completely frozen over and no waterfowl were seen on the river.

The waterfowl survey continued to McLelland Lake. The lake was two-thirds frozen and no birds were seen. Since the entire region was largely frozen, and no evidence of significant migrating populations was obtained, aerial surveys for waterfowl were discontinued. Waterfowl that were migrating at this time are believed either to be flying non-stop through the area to the south, or from the Athabasca Delta southeast through Saskatchewan.

In an attempt to get information on waterfowl migrations in the area, Fish and Wildlife Officer, A. Boggs, was contacted and interviewed. He stated that movements of geese through the area had occurred almost two weeks earlier. This was also mentioned by the pilot during the aerial survey. Numbers of geese moving down the river were probably relatively small in 1971, although the pilot indicated large numbers encountered along the river in previous years. No estimate of actual numbers is available. Mr. Boggs and Mr. Bergeron did not notice any large migration of ducks through the area.

A summary of results for both surveys is presented in Table 10.

From April 28 to June 2, 1972, a spring waterfowl study was carried out on Syncrude Lease #17 and surrounding area. This study showed that the Syncrude lease and surrounding area is not a major spring staging area but does have fair use as a stopover for 28 species of ducks.

Few geese, swans, sandhill crances and great blue heron stopped over. The majority of ducks were distributed on Mildred, Ruth, Horseshoe and Saline Lakes and the Athabasca River, proximal to the proposed Syncrude development. Problems involving waterfowl and the Syncrude tailings pond are thus anticipated during spring migration.

In the spring of 1972, intermittent contact was kept with Mr. A. Boggs, Fish and Wildlife Officer at Fort McMurray on any spring movements of waterfowl into that area. Aerial waterfowl counts were begun on April 28. Flights were made intermittently every 3 - 5 days until June 2. A Cessna 185 from Contact Airways at Fort McMurray was used with Wayne McCrory as observer. An altitude of approximately 200 - 300 feet and a speed of 100 m.p.h. was maintained with reduced speeds over areas where concentrations of waterfowl occurred. Flights were usually made in the morning. Records were kept of other wildlife noted during the flight.

The flight route covered the west side of the Athabasca River from Fort McMurray downriver to the mouth of the Beaver River, a distance of 28.5 miles. Lakes and sloughs on the west

side of the Athabasca were then surveyed. Then the east side of the Athabasca was covered upriver to Fort McMurray with a survey of lakes and sloughs on the east side of the Athabasca River.

During the fall 1972 survey, aerial waterfowl counts were initiated on September 18th, and carried out twice weekly. Until October 5th, a Cessna 185 floatplane was used. From October 12th onwards, a Cessna 185 on wheels was used. Both aircraft were chartered out of Fort McMurray from Contact Airways.

Chronology of Break-Up And
Freeze-Up on Study Area, 1972

CHECKPOINT	NAME	BREAK-UP	FREEZE-UP
1 - 5	Athabasca River	April 28 - Open for 1 - 2 miles below G.C.O.S. plant. May 3 - River broken up and nearly free of ice flows.	October 10 to October 23: 10% frozen, mostly along shore. Some ice floating down river. October 26: 20% frozen.
6	Saline Lake	Partially open on May 3 All ice-free by May 8	20% frozen on October 12 95% frozen on October 26
7	Horseshoe Lake	Partially open by April 27 Nearly all open on May 3	90% frozen on October 12 100% frozen on October 16
8	Mildred Lake	60% open on May 8 100% open on May 9	30% frozen on October 12 99% frozen on October 26
9	Slough near Mildred Lake	Frozen on May 3 Open on May 8	100% frozen on October 12
10	Slough across from Syncrude	Frozen on May 3 Open on May 8	50% frozen on October 12 100% frozen on October 16 97% frozen on October 26
11	Slough across from G.C.O.S.	Frozen on May 3 Open on May 8	100% frozen on October 12
12	Slough near Ruth Lake	Closed on May 8 Open on May 11	100% frozen on October 12
13	Ruth Lake	Partially open on May 8 Open on May 11	95% frozen on October 26

The same study area and checkpoints were used in the Spring '72, Fall '72 and Spring '73 surveys (R.R.C.S., 1972) and are as follows:

Checkpoint 1: Fort McMurray to Poplar Island (5 miles).
" " 2: Poplar Island to Stony Island (4.5 miles).
" " 3: Stony Island to Great Canadian Oil Sands (G.C.O.S.) tailings disposal pond (8 miles).
" " 4: G.C.O.S. to Syncrude river landing (4 miles).
" " 5: Syncrude to mouth of Beaver Creek (7 miles).
" " 6: Saline Lake.
" " 7: Horseshoe Lake (Sometimes included small lake to north).
" " 8: Mildred Lake.
" " 9: Small lake to south of Mildred Lake.
" " 10: Slough across from Syncrude on East side of Athabasca River.
" " 11: Slough upstream from G.C.O.S. on East side of Athabasca River
" " 12: Small lake to north-east of Ruth Lake.
" " 13: Ruth Lake.

Some checkpoints varied from the checkpoints used in the October 1971 study because of a change in the aerial survey route.

Ground observations were made on either Horseshoe Lake or Mildred Lake to correlate with aerial counts and to determine breeding activity.

The study area was initially chosen to cover not only Lease 17 but also the area felt to be within the sphere of influence of developments on the lease. Also a better understanding of migratory patterns of waterfowl along the corridor of the Athabasca River was obtained by selecting a general study area rather than confining the study only to Lease 17.

More difficulty was encountered in identification of certain species during this fall survey than in the Spring because many of the birds, expecially the males, had not molted into full autumn plumage. Juvenile birds were also difficult to specify. For example, the white wing speculum of widgeon is one of the most positive means of identification from aircraft. However, during the fall, juvenile widgeon have very little white on their specula.

In addition, fall waterfowl were generally in larger flocks, sometimes composed of a variety of species. Thus, some guess work was necessary in estimating numbers of each species. Occasionally, air turbulence and poor visibility precluded any positive identification of species.

For the purposes of this report it is not thought that errors in identification and biases in estimating numbers would affect the results and conclusions; unless otherwise noted in the text.

No ground counts were made during the fall '72 survey.

In the spring of 1973, a slightly different approach was taken from that used by the observer of last year. More passes were made over an area when waterfowl were not immediately identifiable. Frequently, waterfowl were concentrated in groups which were composed mainly of one or two species, with a few individuals of other species mixed in. On the first pass, the majority of the waterfowl would be identifiable, and it would be the less common or less easily identified birds that would be enumerated on subsequent passes. This resulted in slightly longer flights and a much lower percentage of unidentified waterfowl.

THE STUDY AREA:

Syncrude Lease #17 is less than 100 miles straight south of the large Athabasca-Peace River Delta waterfowl staging area. Staging area, as used in this report, refers to an area where large numbers of migrant waterfowl build up before moving on. Stopover refers to areas where migrant waterfowl rest and feed but do not build up great numbers. Waterfowl from the four major North American flyways stage extensively in the Delta region. The proximity of the Syncrude lease to this major staging area has led the present study of waterfowl migration through the area.

Upstream from Fort McMurray the Athabasca River flows through a long section of rapids. Downstream, the river is more slack, flowing through a series of open bars and wooded islands, and thus is more suitable for waterfowl than the upstream portion.

Most of the waterfowl which pass thru the Tar Sands area nest in the Athabasca Delta to the north of Lease 17. This area is one of the major "duck factories" of North America. Careful attention is being paid to the hydrology of the Athabasca River as it affects "the Delta".

Five open sloughs including checkpoints 10 and 11 are found along the river bottom between Fort McMurray and the mouth of Beaver Creek. In addition, four lakes of approximately 300 acres or more (Saline, Horseshoe, Mildred and Ruth) are located within a 3-mile radius of the proposed tailings pond. This is the greatest concentration of small lakes along the Athabasca River for at least 50 miles in either direction from the Syncrude Lease.

Mildred Lake and Horseshoe Lake are located on Lease #17. Horseshoe Lake and Saline Lake, on the east side of the river, are located along the river bottom and are thus open in advance of lakes away from the river bottom. This enhances the attractiveness of the area near the Syncrude Development for early spring use by migrant waterfowl.

Detailed vegetative descriptions of Mildred and Horseshoe Lakes are given in "The Habitat of Syncrude Lease #17" (Syncrude Canada Ltd. 1973). The lakes and sloughs in the study area are far more attractive to waterfowl as stopover areas than as nesting habitat. Horseshoe Lake, part of Saline Lake, and some of the small sloughs along the Athabasca River bottom are fairly shallow and thus offer good stopover habitat for "dabbling" ducks. Ruth Lake, Mildred Lake, and part of Saline Lake are deeper and thus offer good stopover habitat for "diving" or bay ducks.

In addition, Beaver Creek (especially the areas with Beaver dams), the MacKay River, and some minor sloughs offer

limited stopover habitat to waterfowl on Lease #17.

DISCUSSION AND RESULTS:

Data obtained on both surveys indicate that the Ft. McMurray region in general is not a heavily used migration stop-over during the late autumn. The 302 mallards observed on Mildred Lake in the first survey was the largest number of ducks observed within the area. These birds likely represent a migrating flock since observations made on Mildred Lake during the summer did not reveal any more than a few scattered waterfowl, and these were primarily diving ducks. It is likely therefore that lakes and marshes in the area are used to some extent by migrating waterfowl, which probably originate in the Athabasca Delta. However, present evidence indicates that the area is insignificant as a staging or resting area for these populations. The largest proportion of migrants either overfly the area en route to grain growing areas further to the south or utilize a route southeast from the delta passing through Saskatchewan. Since the area was surveyed immediately following reports of an exodus of waterfowl from the delta following freeze-up, any sustantial use of the area would have been observed.

According to information obtained from a Ducks Unlimited observer at Ft. Chipewyan, in 1971, resident (nesting) waterfowl in the Athabasca delta gradually migrated south during September and October. A build up of populations from the north then occurred in the delta and these birds remained until approximately October 24th when freeze-up was general,

Table 1: List of common names, abbreviations and scientific names of waterfowl and other species of birds observed during spring waterfowl surveys on the Syncrude study area, 1973:

COMMON NAME	ABBREVIATION	SCIENTIFIC NAME
Common Loon	Loon	*Gavia immer*
Red-necked Grebe	R.N.Gre	*Podiceps grisegena*
Pied-billed Grebe	P.B.Gre	*Podilymbus podiceps*
Mallard	Mal	*Anas platyrhynchos*
Gadwall	Gad	*Anas strepera*
Pintail	Pin	*Anas acuta*
Green-winged Teal	G.W.T.	*Anas carolinensis*
Blue-winged Teal	B.W.T.	*Anas discors*
American Widgeon	Wid	*Mareca americana*
Shoveler	Shov	*Spatula clypeata*
Redhead	Red	*Aythya americana*
Ring-necked Duck	Ring	*Aythya collaris*
Canvasback	Can	*Aythya valisineria*
Greater Scaup	Sc	*Aythya marila*
Lesser Scaup	Sc	*Aythya affinis*
Common Goldeneye	C.G.	*Bucephala clangula*
Bufflehead	Buf	*Bucephala albeola*
White-winged Scoter	W.W.Scot	*Melanitta deglandi*
Surf Scoter	S.Scot	*Melanitta perspicillata*
Ruddy Duck	Rud	*Oxyura jamaicensis*
Common Merganser	Mer	*Mergus merganser*
Red-tailed Hawk	R.T.H.	*Buteo jamaicensis*
Marsh Hawk	M.H.	*Circus cyaneus*
Whooping Crane	W. Cr	*Grus americana*
American Coot	Co	*Fulica americana*
Great Blue Heron	G.B.H.	*Ardea herodias*

Table 2: List of common names, abbreviated names and scientific names of waterfowl species observed during fall waterfowl survey on Syncrude study area, 1972.

COMMON NAME	ABBREVIATION	SCIENTIFIC NAME
Mallard	Mal	*Anas platyrhynchos*
Pintail	Pin	*Anas acuta*
Widgeon (Baldpate)	Wid	*Mareca americana*
Gadwall	Gad	*Anas strepera*
Shoverler	Shov	*Spatula clypeata*
Green-winged teal	Teal or GWT	*Anas carolinensis*
Blue-winged teal	Teal or BWT	*Anas discors*
Common Goldeneye	CG	*Bucephala clangula*
Bufflehead	Buf	*Bucephala albeola*
Lesser Scaup	Sc	*Aythya affinis*
Greater Scaup	Sc	*Aythya marila*
Ring-necked Duck	Ring	*Aythya collaris*
Canvasback	Can	*Aythya valisineria*
Redhead	Red	*Aythya americana*
Ruddy Duck	Rud	*Oxyura jamaicensis*
Common Merganser	Mer	*Mergus merganser*
White-winged Scoter	Scot	*Melanitta deglandi*
Common Scoter	Scot	*Oidemia nigra*
Surf Scoter	Scot	*Melanitta perspicillata*
Oldsquaw	Olds	*Clangula hyemalis*
Red-necked Grebe	Gre, Red N.	*Podiceps grisegena*
Horned Grebe	Gre	*Podiceps auritus*
Eared Grebe	Gre	*Podiceps caspicus*
Western Grebe	Gre	*Aechmophorus occidentalis*
Coot	Co	*Fulica americana*
Whistling Swan	Sw	*Olor columbianus*
Canada Goose	Cang	*Branta canadensis*
Unidentified	Unid	

Table 3: List of common names abbreviations and scientific names of waterfowl species observed during spring waterfowl survey on Syncrude study area, 1972.

COMMON NAME	ABBREVIATION	SCIENTIFIC NAME
Mallard	Mal	*Anas platyrhynchos*
Pintail	Pin	*Anas acuta*
Widgeon(Baldpate)	Wid	*Mareca americana*
Gadwall	Gad	*Anas strepera*
Shoveler	Shov	*Spatula clypeata*
Green-winged teal	Teal or GWT	*Anas carolinensis*
Blue-winged teal	Teal or BWT	*Anas discors*
Common Goldeneye	CG	*Bucephala clangula*
Bufflehead	Buf	*Bucephala albeola*
Lesser Scaup	Sc	*Aythya affinis*
Greater Scaup	Sc	*Aythya marila*
Ring-necked Duck	Ring	*Aythya collaris*
Canvasback	Can	*Aythya valisineria*
Redhead	Red	*Aythya americana*
Ruddy Duck	Rud	*Oxyura jamaicensis*
Common Merganser	Mer	*Mergus merganser*
Red-breasted Merganser	Mer	*Mergus serrator*
White-winged Scoter	Scot	*Melanitta deglandi*
Common Scoter	Scot	*Oidemia nigra*
Surf Scoter	Scot	*Melanitta perspicillata*
Oldsquaw	Olds	*Clangula hyemalis*
Red-necked Grebe	Gre, Red N.	*Podiceps grisegena*
Horned Grebe	Gre	*Podiceps auritus*
Eared Grebe	Gre	*Podiceps caspicus*
Western Grebe	Gre	*Aechmophorusoccidentalis*
Common Loon	Loon	*Gavia immer*
Coot	Co	*Fulica americana*
Harlequin Duck	Harl	*Histrionicus histrionicus*
Whistling Swan	Sw	*Olor columbianus*
Sandhill Crane	S Cr	*Grus Canadensis*
Great Blue Heron	GBH	*Ardea herodias*
Unidentified	Unid	

Table 4: Waterfowl and other birds observed during five aerial surveys of the Syncrude study area, 1973.

SPECIES	May 4	May 11	May 18	May 25	June 4	Total	
Common Loon	-	8	8	2	1	19	3.8
Red-necked Grebe	4	6	5	7	1	23	4.6
Pied-billed Grebe	-	-	-	-	-	1	.2
Mallard	154	146	133	143	42	618	123.6
Gadwall	-	2	4	20	8	34	6.8
Pintail	57	6	22	6	3	94	18.8
Green-winged Teal	58	18	4	3	2	85	17
Blue-winged Teal	2	-	7	4	4	17	3.4
American Widgeon	154	161	170	149	54	688	137.6
Shoveler	61	21	37	32	7	158	30.6
Redhead	-	21	1	22	-	44	8.8
Ring-necked Duck	-	-	-	12	14	26	5.2
Canvasback	18	30	5	10	6	69	13.8
Scaup[1]	245	234	294	205	158	1136	227.2
Common Goldeneye	294	177	334	211	63	1079	215.8
Bufflehead	23	35	28	29	24	139	27.8
White-winged Scoter	-	-	2	6	2	10	2
Surf Scoter	-	5	4	6	-	15	3
Ruddy Duck	3	-	-	5	-	8	1.6
Common Merganser	22	-	2	2	1	27	5.4
Red-tailed Hawk	1	-	-	-	-	1	.2
Marsh Hawk	3	-	1	2	-	6	1.2
American Coot	80	268	241	592	279	1460	292
Unidentified Waterfowl	8	1	1	-	3	13	2.6
Great Blue Heron	-	1	-	-	-	1	.2
TOTAL	1187	1140	1303	1469	672	5771	1154.2

[1] Mostly Lesser scaup.

Table 5: Summary of aerial surveys of waterfowl from September 18 to October 26, 1972

	Sept 18	Sept 21	Sept 25	Sept 28	Oct 2	Oct 5	Oct 12	Oct 16	Oct 19	Oct 23	Oct 26	Total	Avg. No. Flight (11 days)
Puddle Ducks:													
Mal	815	337	470	857	910	611	182	2	43	17	19	4263	387.5
Pin	4		95	282		44	20					445	40.5
Wid	257		580	122	103	199	37		12	1		1311	119.2
Gad	12					2						14	1.3
Shov	4				2	4						10	0.9
Teal	8			100	14	13						135	12.3
Diving Ducks:													
CG	2		95	31	50	17			26	5		226	20.5
Buf		60	8		6	2						76	6.9
Sc	508	512	670	1660	536	1	1492	736	1110	84	57	7366	669.6
Ring				3	400	250						653	59.4
Can					30	5			10	2		47	4.3
Red				85		104	20		40			249	22.6
Rud				1			1	2	2	1	2	9	0.8
Mer		18	49	4	17	10		28	16	69	6	217	19.7
Scot	6				17			7	53	2		85	7.7
Olds	10											10	0.9
Gre	1	1			1	2			1	1		7	0.6
Loon													0.0
Co	4				52	6	42		40	10		154	14.0
Harl													0.0
Others:													
Sw		2	2					1	2			7	0.6
S Cr													0.0
GBH													0.0
Cang	88	33	6	20	10	12						169	15.4
Unid	87 (49 Dab)	260 (Dab)		136	89 (55 Dab)	93 (33 Div) (31 Dab)						665	60.4
Total	1806	1223	1975	3301	2237	1375	1794	776	1355	192	84	16,118	1465.3

Table 6: SUMMARY OF AERIAL SURVEYS OF WATERFOWL FROM APRIL 20 to JUNE 2, 1972

SPECIES	*April 29 a.m.	May 3 a.m.	May 8 a.m.	May 8 p.m.	May 11 a.m.	May 11 p.m.	May 15 a.m.	May 18 a.m.	May 22 a.m.	May 25 a.m.	May 30 a.m.	June 2	**Total	Average No/ Day (10 days)
Puddle Ducks:														
Mal	59	113	95	59	128	97	100	148	135	150	162	54	1144	114.4
Pin	8		5		2		8	2	7	14	6		52	5.2
Wid		98	58	78	66	107	91	105	96	99	115	56	784	78.4
Gad									2		5		7	.7
Shov					2	1	10	7	12	16	23	2	72	7.2
Teal	6	18			5	21	42	23	21	24	23	20	182	18.2
Diving Ducks:														
CG	95	33	20	25	57	20	13	12	37	5	21	2	295	29.5
Buf		27	8	2	29	21	33	33	48	60	34	32	304	30.4
Sc[1]	14	57	35	659	777	840	1002	570	128	263	74	29	3349	334.9
Ring								3	2	20	60	14	99	9.9
Can		6	8	4	18	8	12	2	25	1	7	24	110	11.0
Red			5	4						3			8	.8
Rud									20		2	3	25	2.5
Mer[2]		8	14	32	22	47	53	83	107	112	73	94	566	56.6
Scot							12	3	17	3	10	4	49	4.9
Olds										11			11	1.1
Gre[3]			17	22	26	9	10	10	16	13	11	7	110	11.0
Loon[4]		1		3	7	4	10	10	10	11	10	2	62	6.2
Co				2			30		52	28	19	4	133	13.3
Harl											2		2	.2
Sw		2	2	12									14	1.4
S Cr							3				12		15	1.5
GBH			1	1		1	1						4	.4
Unid	±445	±1128	±556	299	161	99	155	106	101	46	86	92	2976	297.6
Total	627	1491	1224	1202	1300	1275	1583	1117	836	879	755	439	10373	1037.3

Footnote:
1. Mostly Lesser Scoup
2. All Common Mergansers except for 2 Red-Breasted Mergansers
3. Mostly Red-Necked Grebes
4. Mostly Common Loons

*On April 28 a.m. total of ±1500 mostly Sc with some Mal, Pin, Teal, CG, and Buff; including 7 Can, 1 Loon, 1 S Cr.

**Excluding May 8 and May 11 p.m. counts

triggering a large migration.

In view of the foregoing, periodic use of lakes in the lease could occur during the first prolonged migration. However, there has been no indication of extensive use by large numbers of waterfowl in the area. At present it appears that casual use of the area is made by small flocks for a short period of time.

Since northward spring migrations progress fairly slowly in response to weather conditions, it was recommended that the 1972 spring migration should be monitored to supplement existing survey data. In addition, surveys on fall migrations should be repeated in 1972.

Table 3 lists the 28 different species of ducks that used the study area during spring '72 migration, plus whistling swans, sandhill cranes and great blue herons. A few geese also appeared to use the area at this time.

Table 2 lists the 25 different species of waterfowl that were noted to pass through the study area during fall '72 migration. Species recorded were similar to those of the spring migration except that no red-breasted mergansers, common loons, harlequin ducks, sandhill cranes, and great blue herons were noted. Canada geese were noted this fall but were absent in the Spring '72 survey.

Table 6 summarizes the results of the twelve aerial surveys made in Spring 1972, which are presented in Appendix 1. Appendix II presents the ground observations of waterfowl.

Local weather conditions and the degree of air haziness affected identification of waterfowl. As well, a sample bias was produced by some species being more difficult to identify from the air than others. For example, mallards are easier to identify than teal or ruddy ducks. Additionally, sampling errors were produced in making estimates of large flocks where counts from the air were possible. However, the sample biases and errors are considered to be relatively unimportant to the overall results of the data presented here.

A daily average of 1,037 birds from April 28 to June 2, 1972 indicates that the study area was not a major staging area but rather a stopover area. This daily average is conservative because some ducks hidden in vegetation were certainly missed during aerial surveys. Numbers of waterfowl using the study area would be expected to shift from year to year with fluctuations in duck populations and changes in migratory routes.

Unfortunately, the first aerial survey on September 18th, 1972 was initiated after the onset of fall migration. On that date, 1,800 birds were recorded in the area. Migration from the Peace-Athabasca Delta usually begins in early September (Ed Hennan, pers. comm.).

It is evident that, as in the spring, the study area is not a major staging area, but rather a casual stopover area. The average of the eleven flights was 1,465 birds per flight. However, Canadian Wildlife Service personnel conducting fall waterfowl counts in the area report large numbers of waterfowl

staging or stopping on some of the larger lakes south of the Peace-Athabasca Delta especially in the Gordon Lake area, about 50 miles southeast of Fort McMurray. Craig Schick (pers. comm.) reported estimates of up to 100,000 ducks in the Gordon Lake area in September; 75-80% of these were diving ducks. This may account for the higher proportion of diving ducks to dabbling ducks counted in the surveys. Dabblers appear to swing to the east of the study area. Ducks Unlimited data indicates that 80% of dabblers banded on the Delta were recovered in Saskatchewan (Craig Schick, pers. comm.).

Table 1 lists the 25 species of waterfowl and other birds of importance that were noted to use the study area during spring 1973 migration. Species were similar to those seen during the spring of 1972 except that no whistling swans, harlequin ducks, oldsquaw, common scoters, red-breasted mergansers, horned, eared or western grebes were seen. As well pied-billed grebes were seen that were not observed last year.

Table 4 summarizes results of the five aerial surveys made in spring 1973 which are presented in Appendix 1. Unfortunately, the first survey on May 5 was initiated after the onset of spring migration. On that date, 1187 waterfowl were observed. By then the Athabasca River and all the lakes were thawed and many of the dabbling ducks had already reached their peak. It would appear that because of the unusually mild weather in April (average mean temperature of 37.5 F in 1973 as compared to 31.9 in 1972, Government of Canada, Department

of Climatology, pers. comm.), spring break-up, and thus migration was about two weeks earlier than in 1972.

By mid-April flocks of Canada geese (*Branta canadesis*) were noted flying over the area. This is approximately when the Athabasca River first started to break up, and probably coincided with the advancement of the 35 F. isotherm which Canada geese are known to follow in spring migration (Lincoln, 1950).

Use of the study area during the period May 4 - June 4 averaged 1154.2 birds per day with a high count of 1469 birds on May 25. Average daily utilization was slightly higher than in 1972, but was probably a reflection of a more protracted migration, lasting into early June.

Comparative use of the study area by different species is illustrated in Figures 5 thru 10. Coots were by far the most common species, followed by scaup (mostly lesser), common goldeneye, American Widgeon, and mallard. Figures 5 thru 10 show the chronology of use of the Syncrude study area by dabbling and diving ducks. These figures illustrate that most waterfowl had already reached good numbers by May 4 and did not increase their numbers substantially after that date. Only the coot shows any marked increase after May 4th.

The results and discussion of results of the study are as follows:

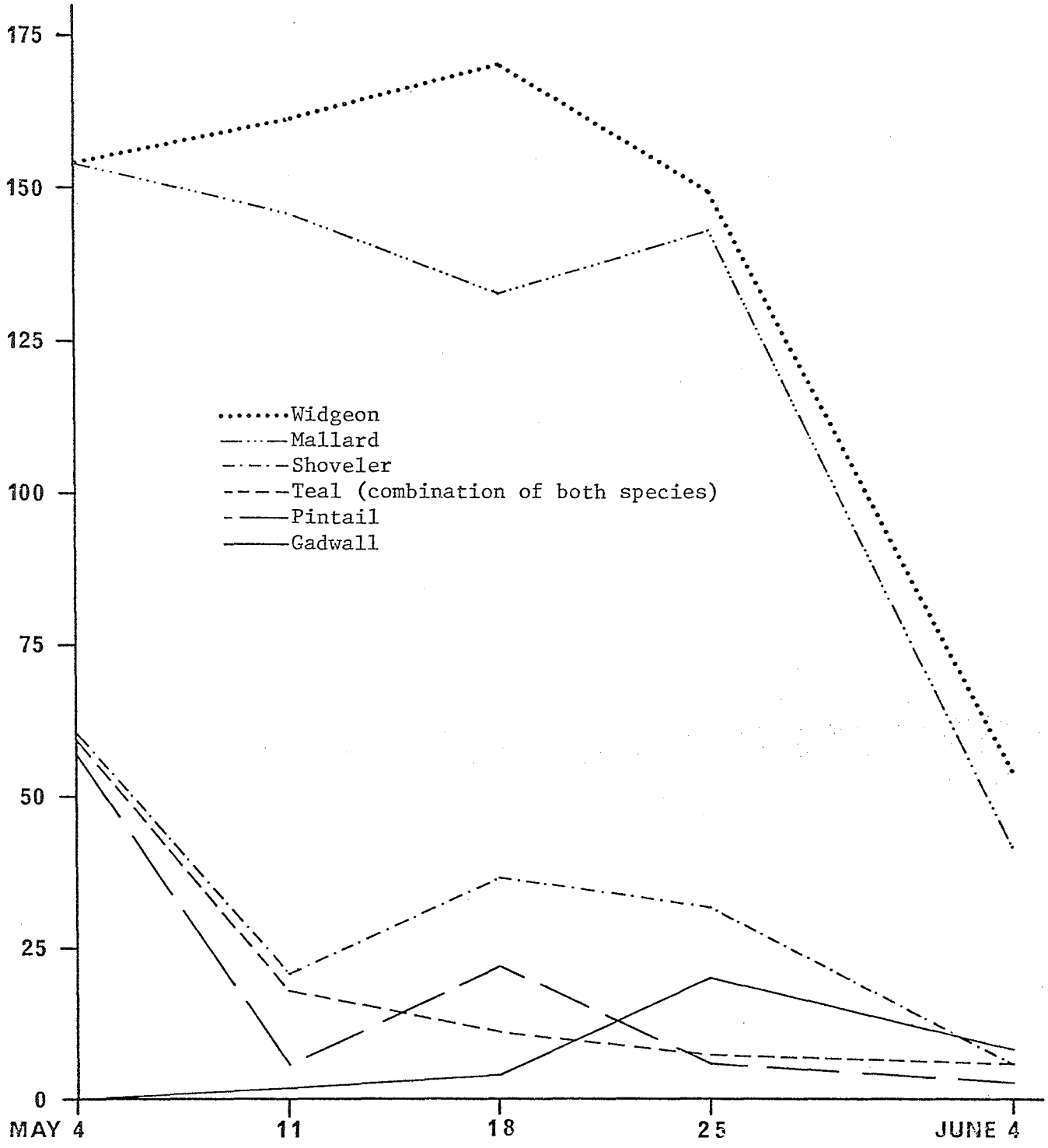


FIGURE 5: Use of Syncrude Study Area by dabbling ducks during spring migration, 1973.

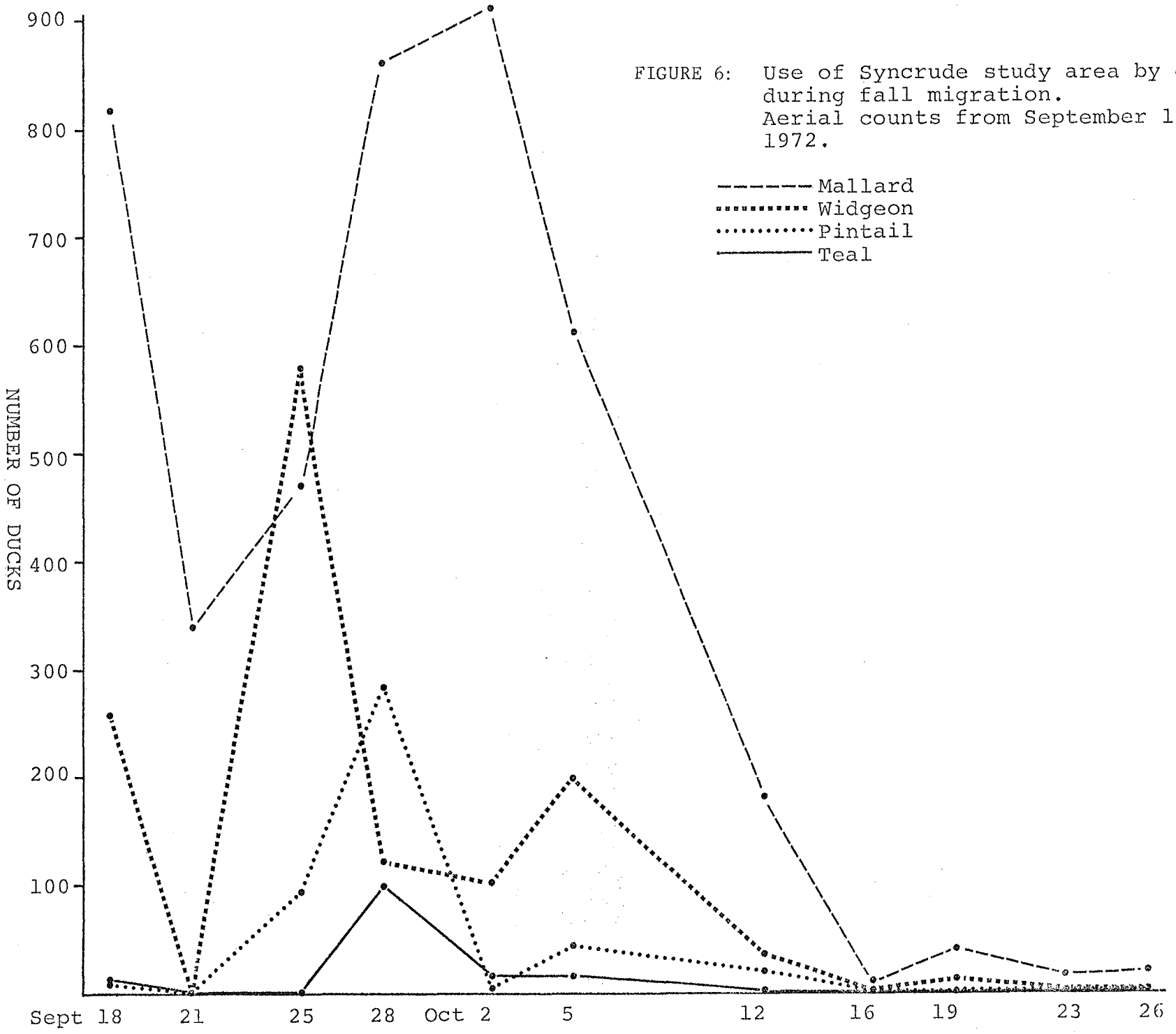
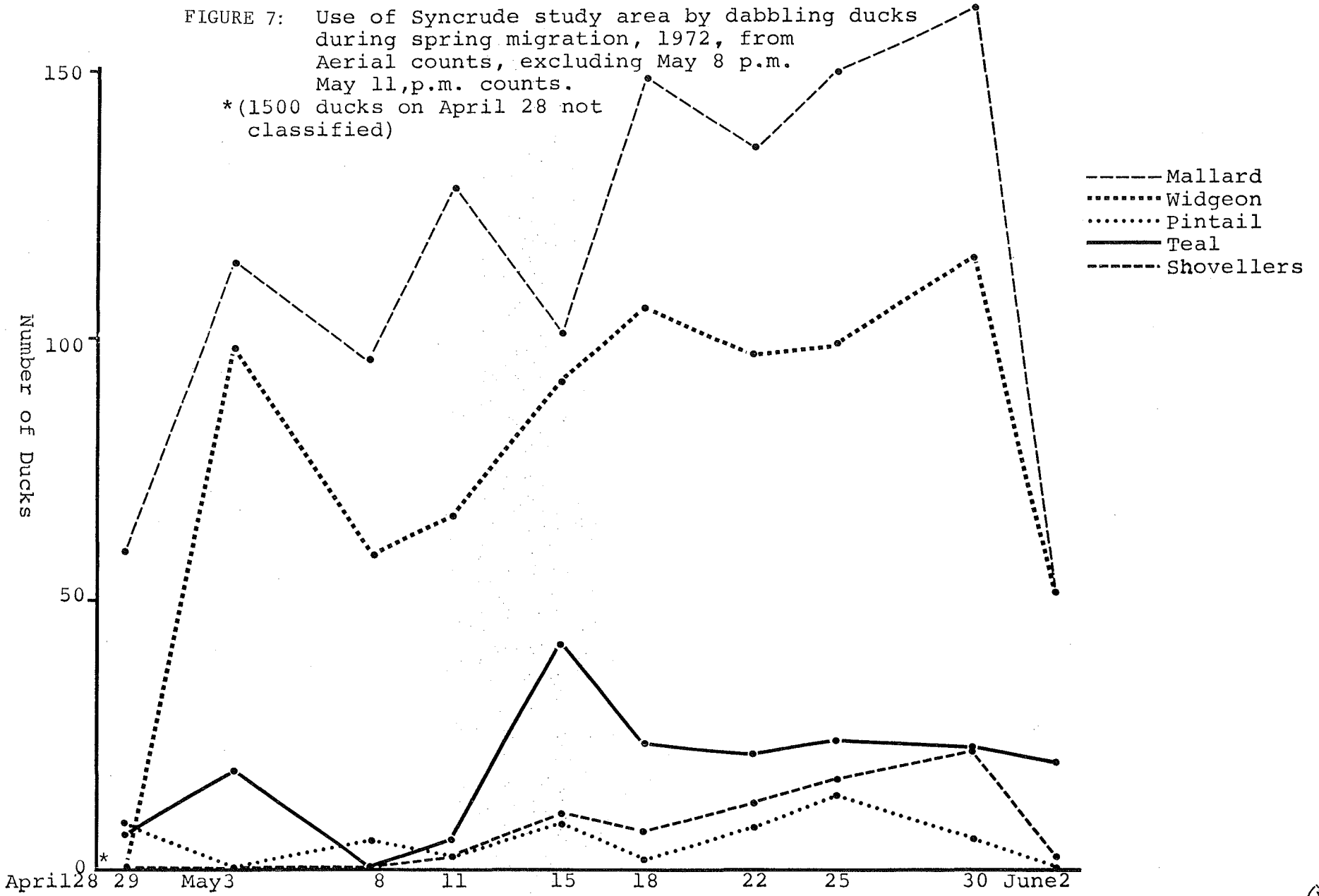


FIGURE 6: Use of Syncrude study area by dabbling ducks during fall migration.
Aerial counts from September 18 to October 26, 1972.

FIGURE 7: Use of Syncrude study area by dabbling ducks during spring migration, 1972, from Aerial counts, excluding May 8 p.m. May 11,p.m. counts.
*(1500 ducks on April 28 not classified)



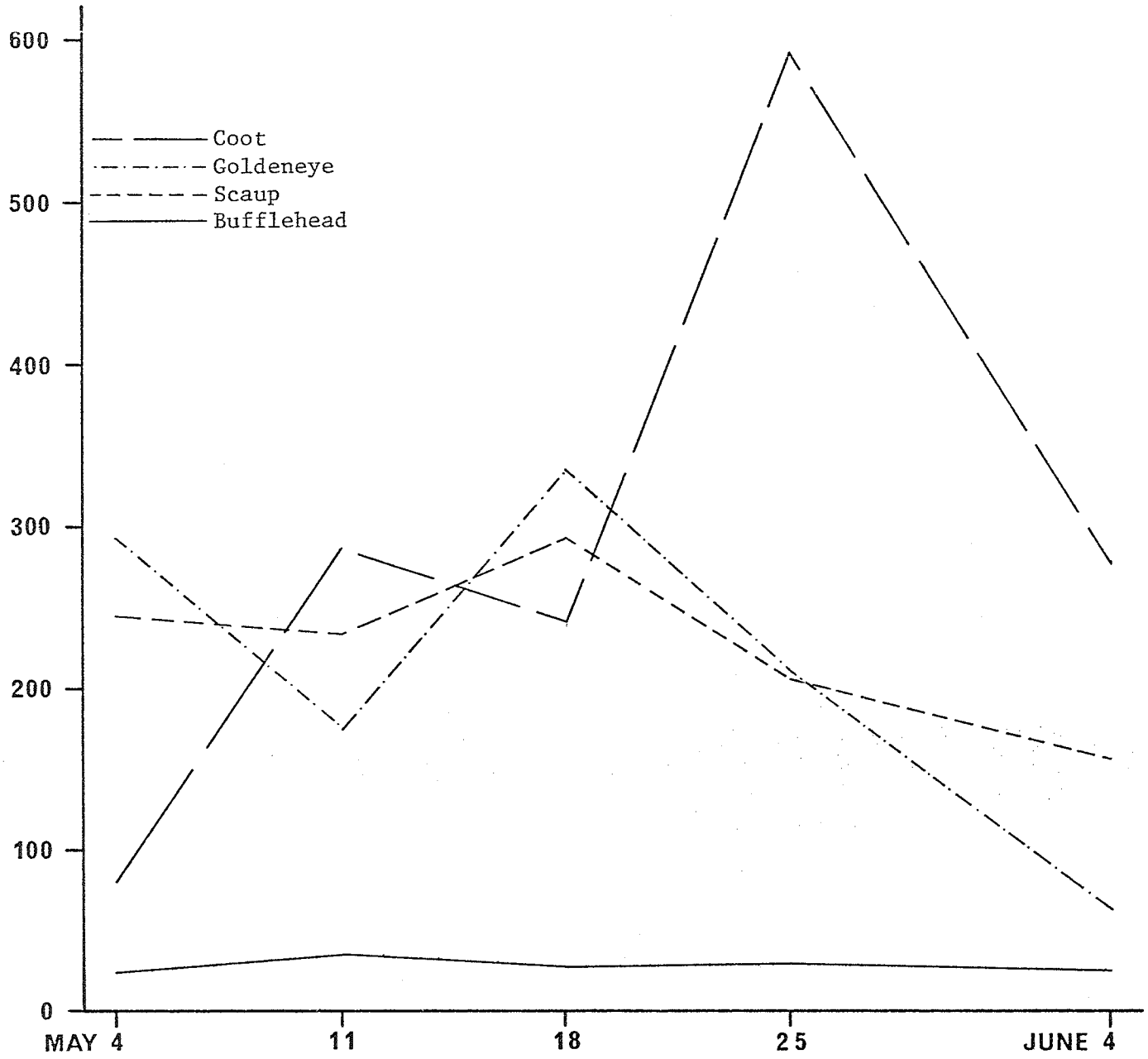


FIGURE 8: Use of Syncrude Study Area by diving ducks during spring migration, 1973, showing major species.

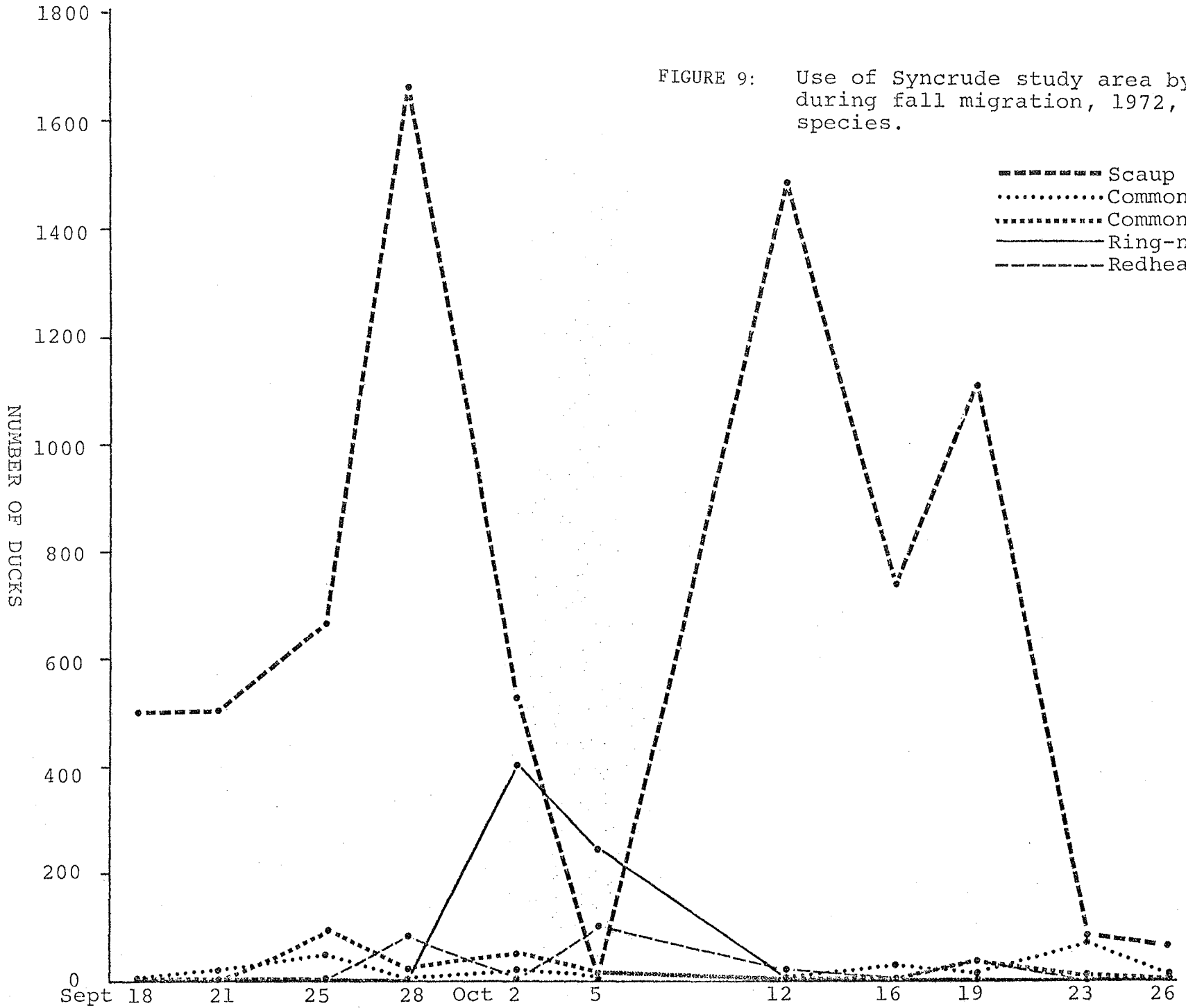
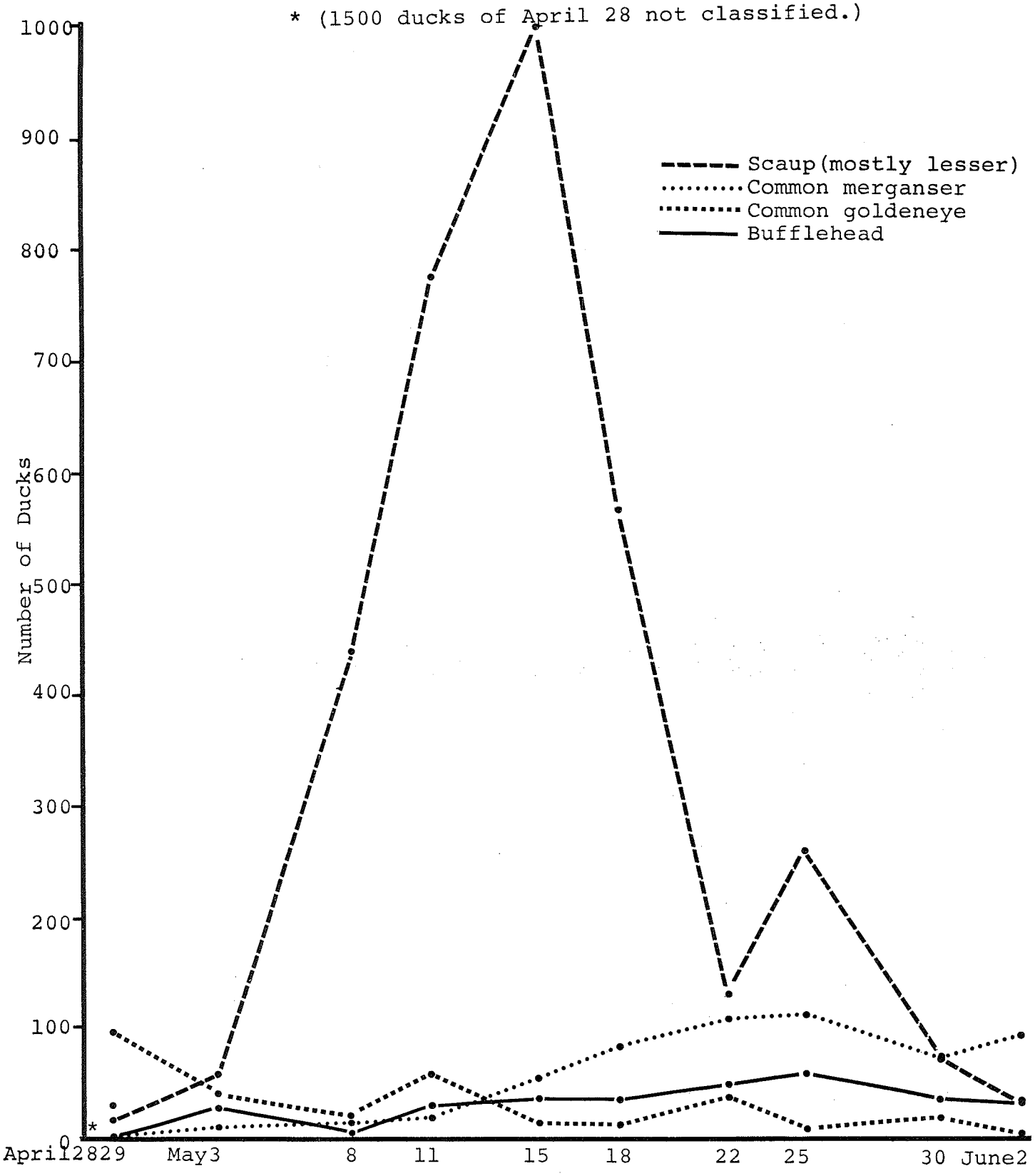


FIGURE 9: Use of Syncrude study area by diving ducks during fall migration, 1972, showing major species.

FIGURE 10: Use of Syncrude study area by diving ducks during spring migration 1972 showing major species. From aerial counts excluding May 8,P.M. and May 11, P.M.



Lesser Scaup are a spring migrant on Lease 17.

It is a diving duck and a late nester. The young almost immediately go to the water after hatching. Lesser scuap usually migrate early in the fall.

Distribution in the Study Area in Relation to Spring Break-up:

The early use of lakes, rivers and sloughs within the study area during spring migration closely follows the sequence of spring "break-up". Ducks use the first patches of water that are available.

According to A. Boggs, Fish and Wildlife Officer at Fort McMurray, no ducks were present before the weekend of April 22-23, 1972 when the first wave of ducks arrived.

During the first aerial survey, on April 28, about 1,500 ducks (mallard, pintail, goldeneye, bufflehead, canvas-back, and scaup) were counted on the patches of open river between the Great Canadian Oil Sands plant and the mouth of Beaver Creek, including about 300 on Horseshoe Lake (Table 6). This stretch of the Athabasca River is open nearly all year round because of hot water emissions from the G.C.O.S. plant. As well, Horseshoe Lake opens prematurely because it receives flow from the Athabasca River through a canal. Thus for this short initial period ducks were concentrated on the Athabasca River, many of them proximal to the Syncrude Lease.

Break-up advanced at a rapid rate, once it began. On April 29, the Athabasca River began breaking up more extensively and ducks dispersed more along its length between Fort McMurray and the Mouth of Beaver Creek (Table 6), mostly flocking on pockets of open water between the ice blocks.

As frozen lakes opened up, ducks made immediate use of them and use of the Athabasca River decreased. Thus by May 3,

Saline Lake was partially open and had attracted about 1/3 of all the ducks counted (Table 6).

The ducks were attracted to the freshly thawed lakes because of an obvious greater abundance of acquatic food on the lakes than on the Athabasca River. Mildred Lake had totally thawed by May 8 and Ruth Lake by May 11 and each received immediate use by numbers of ducks. Use of the deeper end of Horseshoe Lake by scaup also diminished as the other lakes thawed. After all the lakes had thawed, use of them continued to be considerably greater than use of the Athabasca River, thus concentrating the waterfowl close to the Syncrude development. Ducks that used the River, after break-up was completed, were mainly scattered pairs of mallards and widgeon and were more abundant between G.C.O.S. and the mouth of Beaver Creek than along upstream sections (Table 6).

Some ducks also used areas of meltwater on frozen muskegs and beaver dams but this use diminished as lakes thawed. Thus, 28 ducks were counted over the lease area on April 29, 60 on May 3 but only 2 on June 2.

Sixteen ducks were noted along the edges of the MacKay River on May 3.

Comparative Use of the Study Area by Waterfowl:

SPRING MIGRATION

Use of the study area during 1972 spring migration averaged 1,037 birds per day with the migration waning at the beginning of June (Table 6). These results are consistent with

the general pattern of spring migration where ducks gradually follow the northward occurrence of warm temperatures (the 35^{o} isotherm). Fall migration is more rapid with many birds waiting until freeze-up and then suddenly moving south.

Comparative use of the study area by different species is illustrated in Figure 7. Scaup (mostly lesser) were by far the most abundant species followed by mallards, widgeon, common mergansers, bufflehead, common goldeneye and teal.

For further discussion, ducks are segregated into 2 classes: puddle or dabbling ducks; and diving or bay ducks. Puddle ducks (such as mallards) are typically birds of shallow water and usually feed on the surface. Diving or bay ducks, such as scaup and canvasback, frequent deeper water and feed by diving.

As shown in Figure 7, scaup were the most abundant species counted in the study area followed in sequence of abundance by mallards, widgeon, ring-necked duck, and pintail. The three most abundant species in the fall were in the same relative order of abundance as in the spring.

Other species of lesser importance varied from spring to fall in abundance but were essentially similar in being low in numbers. After October 12, few dabblers were observed, indicating that they had either completed their movement through the area at this time or stopped using it.

Puddle (Dabbling) Ducks:

Mallards were the most abundant dabbler species

utilizing the study area during the spring migration. They averaged 114.4 birds per day with a range of 54 to 162 birds per day. Widgeon were the second most abundant averaging 78.4 birds per day with a range of 0 to 115 birds per day. Following in order of decreasing importance were teal (green-winged and blue-winged), shovelers and pintail. Only 7 gadwall were recorded throughout the survey period.

Mallards were the most abundant dabbler species observed on the study area during fall migration. An average of 387 mallards were tabulated per flight with a range of 2 to 910 ducks per flight (Table 8). Widgeon were the second most abundant species. An average of 119 widgeon were tabulated per flight with a range of 1 to 580 ducks per flight. Following in order of decreasing abundance were pintail, teal, gadwall and shoveler.

Some of the minor species were noted to be present with the large flocks of mallards and widgeon and estimates of their numbers are probably conservative.

The sequence of arrival in spring varied from species to species and was in agreement with the general migratory pattern outlined by Kortright (1960) with the exception that widgeon arrived earlier than is usual. Mallards, pintails, and green-winged teal arrived immediately at break-up followed shortly thereafter by widgeon. Blue-winged teal and shovelers were later migrants.

Use by mallards and widgeon was fairly constant throughout, increasing towards the end of May (Figure 7). Initially, most were in pairs, or small flocks of pairs; but as the migration progressed, greater numbers of unpaired drakes appeared. For the mallards, most of the unpaired drakes were probably juveniles in breeding plumage rather than drakes with mates on the nest. For widgeon, the appearance of more drakes towards the end of May probably represented in part the onset of nesting in the area. For example, on June 3, 1972, 11 widgeon drakes were scattered singly on the Athabasca River between Horseshoe Lake and Saline Lake indicating that their mates had begun nesting on these lakes.

Pintails appeared to pass through the area in two waves. The first wave, mostly flocks of pairs, passed through in late April and early May with a very short stopover period. A large number of pintails were noted on the April 28 aerial count but had passed onward by the April 29 A.M. aerial count. One hundred pintails were later counted on the evening of April 29 on Horseshoe Lake but were gone by April 30. The increase in pintails near the end of May appeared to be due to a later migration composed primarily of drakes.

As would be expected the dabblers tended to utilize the shallower waters in the area, i.e., mainly Horseshoe Lake and part of Saline Lake.

Widgeon were the most abundant dabblers observed in the study area in spring, 1973, averaging 137.6 birds per survey

with a range of 54 to 170 ducks per survey (Figure 5). Mallards were the second most abundant species. An average of 123.6 mallards were tabulated per survey with a range of 42 to 154 birds per survey. Although mallards were more abundant than widgeon in 1971 the difference in numbers of each of the two species between the two years was not great. Following in order of decreasing numbers were shoveler, teal, pintail and gadwall. The indicated general increase in numbers of these species in 1973 may have been due to more frequent passes over lakes and thus fewer unidentified waterfowl.

Bay or Diving Ducks:

Lesser scaup were by far the most abundant of all species utilizing the study area in spring 1972. They averaged 335 birds per day with a range of 14 to 1,002 birds per day. Many of the 1,500 ducks observed on April 28 were scaup. Peak use by scaup occurred around mid-May; by the beginning of June few remained in the area (Fugure 10).

Common mergansers, which are primarily fish-eaters, were the second most abundant of the diving ducks. They averaged 56.6 birds per day with a range of 0 to 107 birds per day. Common mergansers arrived later than scaup (Figure 10) and tended to concentrate on Saline Lake or downriver from the G.C.O.S. plant. Bufflehead averaged 30.4 birds per day and common goldeneye averaged 29.5 birds per day. Minor numbers of ringneck, canvasback, coots, scoters (mainly surf and a few white-ringed and common), common loons, grebes

(red-necked, earned, and horned), and ruddy ducks used the area. A few old-squaw, redhead, and harlequin ducks were also noted (Table 6).

An abundance of duck food on Saline, Horseshoe, Ruth, and Mildred Lakes tended to concentrate these ducks (especially the scaup) in large flocks on these lakes.

Saline Lake was the lake most intensively used by waterfowl in the area. In spring 1973, scaup were the most common diving ducks with an average of 227.2 and range of 158-294 birds per survey (Table 7). Common goldeneye was second in abundance with an average of 215.8 birds per survey and a range of 63 to 335. Following in order of decreasing numbers were bufflehead, canvasback, redhead, common merganser, ring-necked duck, scoters (both surf and white-winged) and ruddy duck.

The common goldeneye was the only diving duck to show a marked increase in number over 1972, increasing by a factor of 7.2 times.

Although the average scaup population per survey was about 2/3 that of last year's (227.2 as compared to 334.9), at the peak it was only 30% that of last year's (294 compared to 1,002). It is quite possible that a build-up did occur this year, but was not observed because of the week lapse between surveys. It is also obvious that this year the build-up at the beginning of migration was missed.

Other Species:

Whistling swans stopped only briefly in the area. Two were seen on Saline Lake on May 3, and twelve on May 8, 1972. Two were also seen at checkpoint 11 on May 8.

A few sandhill cranes appeared to stop briefly while passing through. Also, several large flocks were seen going over high northward.

No geese were noted during the field work except that one flock was heard passing over high late at night. Men working at the Syncrude Camp reported the occasional small flock in the vicinity and four Canada geese were reported near the Syncrude test pit area at the end of May. Thus they appear to overfly the area during the spring and the majority probably pass along another route. There was some observations by men who had spent some time in the area that geese do stop on the Athabasca River in the fall when the water is low and utilize the gravel bars which are not exposed during the spring. These sources, however, reported that few geese stopped during the fall of 1971.

A few great blue heron were noted to utilize the area briefly.

Utilization of the study area by shorebirds during the spring appeared minor. Occasional flocks of unidentified shorebirds were noted on Saline Lake or along the Athabasca River while one flock of 100 black-bellied plovers was noted at Saline Lake.

Coots were the most common species and in fact the most common bird of any type using the lakes in the study area (Table 7).

Canvasback ducks are not common on Lease 17 but provide excellent sport. They do not nest on Lease 17 but are occasional spring migrants.

In 1973, an average of 292 birds per survey were counted. Following in order of abundance were red-necked grebe, common loon, marsh hawk, red-tailed hawk, pied-billed grebe and great blue heron. Flocks of Canada geese and a few sandhill cranes (*Grus canadensis*) were observed in the area in mid-April by the R.R.C.S. fisheries biologists investigating spawning activity of fish in Beaver Creek.

Numbers of coots observed in 1973 increased 22 fold over 1972. An adequate explanation for this increase is difficult. Relatively dry conditions in southern Alberta in the spring may have resulted in displacement of coots to more permanent water bodies in northern Alberta. However, if this explanation is correct, it is difficult to explain why dabbling ducks did not respond similarly.

The few loons, grebes and scoters that were observed, appeared to be resident birds that arrived early and occupied specific territories.

Saline Lake received the most intensive use by waterfowl, as it did in 1972, averaging 45% of the total numbers, with a maximum of 59% on June 4. This was due to its close proximity to the Athabasca River, and its attractive habitat for both diving and dabbling ducks. There was an apparent gradual shift of concentration of dabbling ducks and coots from Horseshoe Lake, and the small ponds at Checkpoints 10 and 11 in early May, to Saline Lake by early June. This shift was probably caused by

Horseshoe Lake and the smaller ponds becoming less attractive to these birds as the season progressed. The birds that moved to Saline Lake may have come both from Horseshoe and Checkpoints 10 and 11, and from other lakes and sloughs both in the immediate area and from further south. Movement from further south may have included both post-breeding males and birds which were unsuccessful at breeding because of poor water conditions further south.

By the end of May, waterfowl on Ruth and Mildred Lakes had dropped considerably in numbers, and birds were sometimes seen in the emergent vegetation along the shore. These birds were probably nesting and undoubtedly many of them missed. By this time pond lily (*Nuphar variegatum*) had built up on the shallower lakes and sloughs, particularly Horseshoe Lake, to the point where waterfowl became very difficult to observe.

FALL MIGRATION

Fall migration patterns are shown in Table 5. Mallards and widgeon passed through in two waves, one which was underway on September 18 and one towards the end of September through the beginning of October. This is probably concomitant with the general pattern of southward migration from the Peace-Athabasca Delta. An initial and gradual migration of resident birds takes place from the Delta during early September. Birds from farther north then build-up after the third week in September and move out from that time until freeze-up (Ed Hennan, Pers, comm.). However, these peaks may also reflect a local build-up

of numbers due to favorable weather conditions.

Pintail and teal numbers appeared to peak only once near the end of September; unless an earlier wave passed through before the surveys began.

The duration of stay of migrants in the area is impossible to determine unless marking of birds in carried out. Length of stay probably depended on local weather conditions. Ducks probably stay in the area during warm weather and then move south when freezing conditions arrive. For example, the same flock of 60 - 75 widgeon was noted on the slough at Checkpoint 10 on October 2nd and 5th during a spell of mild weather but only 30 widgeon (either part of same flock or a different flock) were noted on October 12 when the slough was half frozen.

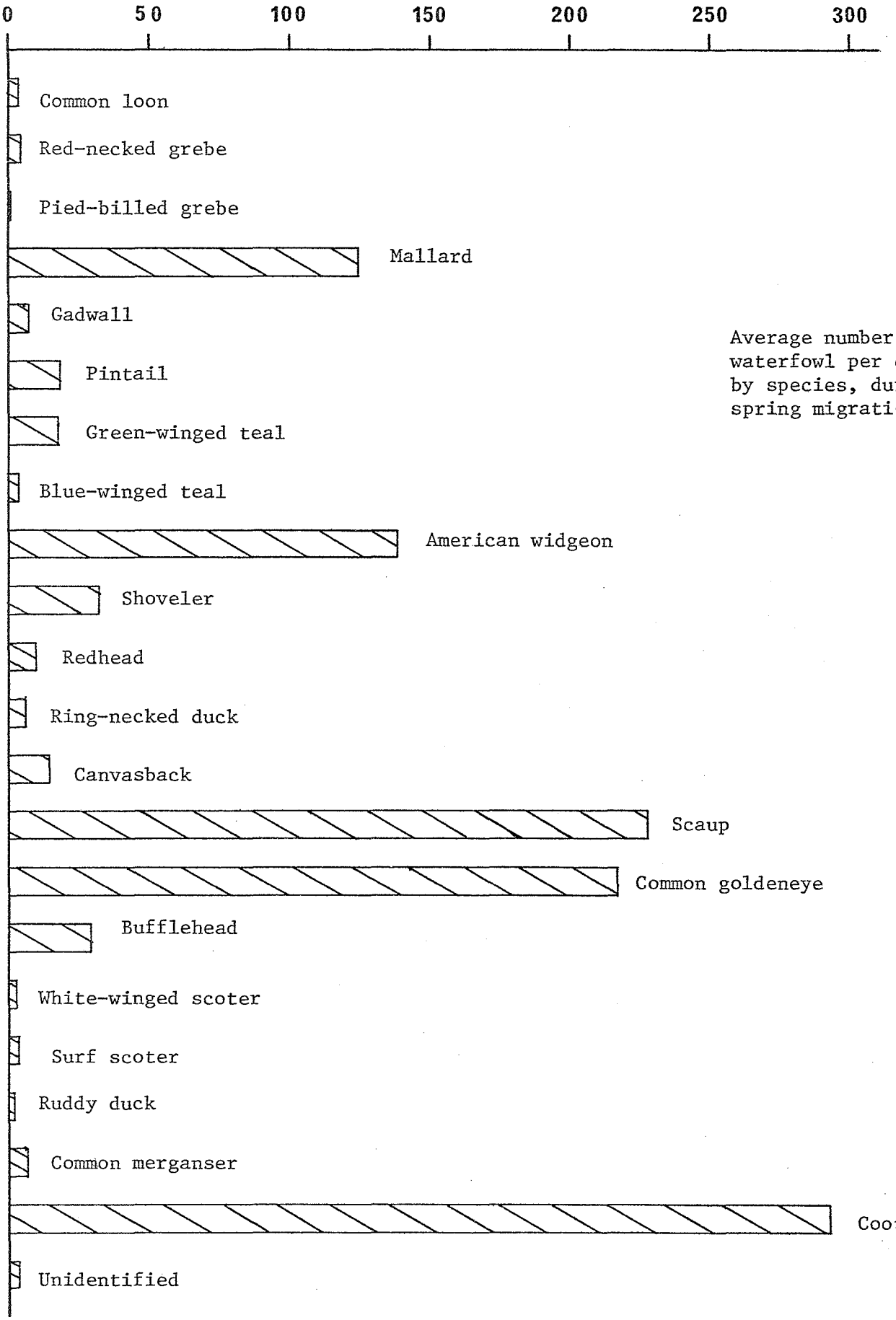
Bay or Diving Ducks:

As with the dabblers, the duration of stay (feeding/resting) of migrant divers in the area was impossible to ascertain. However, from the fluctuations in numbers of each species and variations in species composition of flocks from date to date, it appears that there was a regular turnover of birds.

Scaup were again the most abundant of the divers migrating through the study area. While most of these were Lesser scaup some Greater scaup were noted. The average number of scaup tabulated per flight was 670 birds with a range of 1 to 1,660 birds. Scaup also showed two distinct peaks of abundance (Table 8) which, as discussed previously, could reflect two waves of southward movements from the Delta. These peaks, however, might

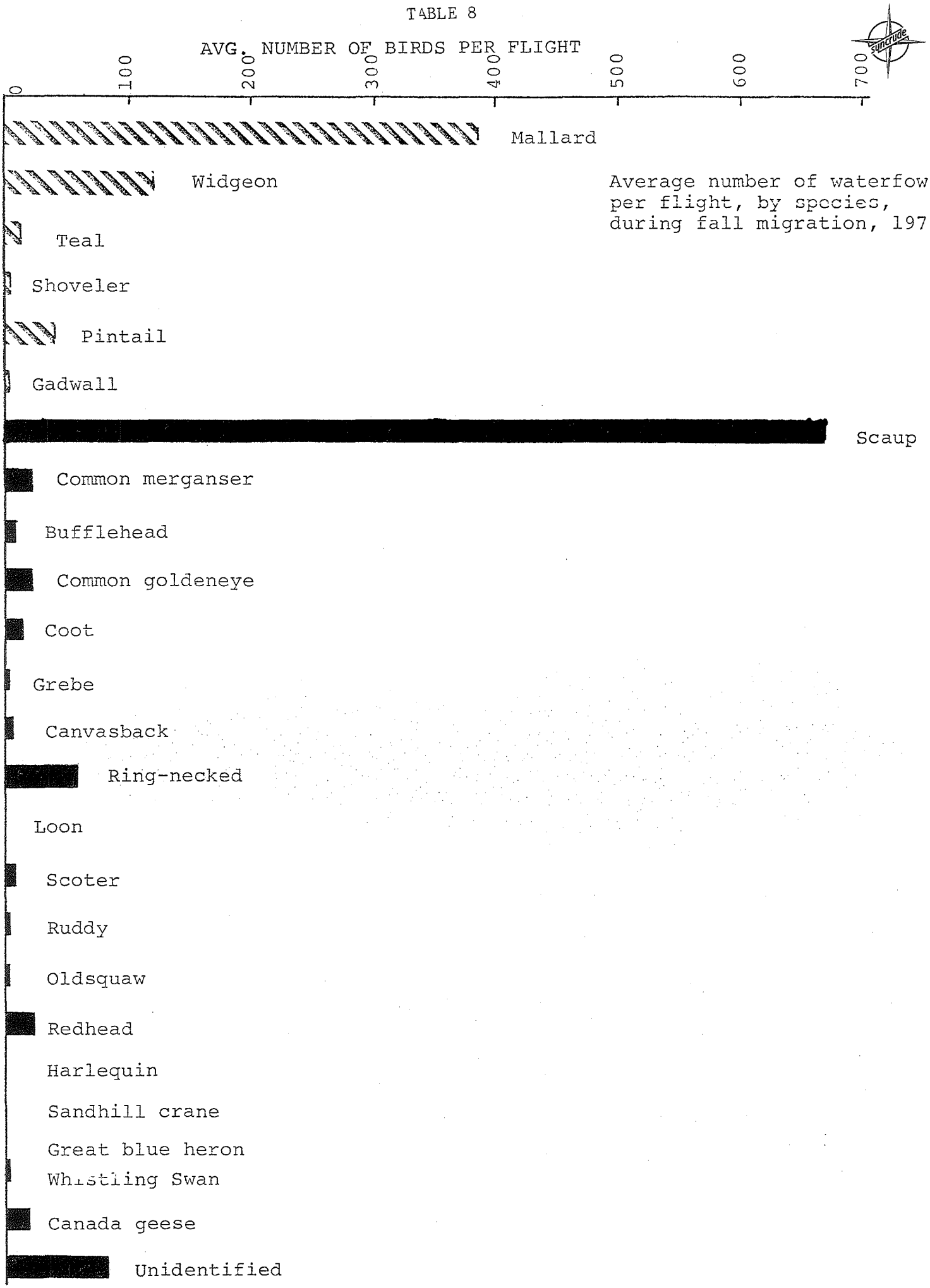
TABLE 7

AVERAGE NUMBER OF WATERFOWL PER DAY



Average number of waterfowl per day, by species, during spring migration, 1973.

TABLE 8



Average number of waterfowl per flight, by species, during fall migration, 1972.

also reflect local build-ups in numbers due to favorable weather conditions.

Ring-necked ducks were the second most abundant of the divers. An average of 59 ring-necked ducks were tabulated per flight. Their migration appeared very abrupt as they were noted only on September 28, and October 2 and 5, 1972.

Following in order of decreasing abundance were redhead, common goldeneye, mergansers (mostly common), and coots, minor numbers of bufflehead, canvasback, ruddy duck, scoters, old-squaw and grebes were noted.

No common loons, which nest in the area, were observed. Common loons are usually early migrants. However, three were noted on October 17, 1971, on Ruth Lake (R.R.C.S., 1972).

Other Species:

A few whistling swans were noted throughout the 1971-1972 survey period. One swan was observed to be "frozen in" on Horseshoe Lake on October 19, 1971.

An average of 15 Canada geese per flight was observed during the fall survey. The greatest number counted on a single day was 88. No geese were seen after October 5, 1972.

Few shorebirds were noted during this period (Fall 1972). The majority of shorebirds are very early migrants and would have passed through before the study began. However, a few yellowlegs were noted during the last three surveys.

Of some interest is the fall migration of eagles down the Athabasca River. A total of 2 golden eagles and 22 bald

eagles were counted during the 11 surveys. However, some of these were repeated sightings. It appeared that there was an initial migration of immature bald eagles as 5 of the 8 seen on September 25 were immature birds.

On October 19, one adult bald eagle was noted on the ice of Mildred Lake with a dead duck.

Two rough-legged hawks were also noted during the survey.

Comparison of the Habitats Used by Waterfowl:

On September 28, 1972, part of Beaver Creek, the MacKay River, and beaver sloughs to the west of the test pit were flown and checked for waterfowl. Only 12 unidentified ducks were noted and these were on a slough adjacent to the MacKay River. It was concluded that use of sloughs and creeks on Lease 17 during fall migration was negligible.

However, of all the waterfowl counted throughout the survey, the lakes on Lease 17 (Checkpoints 7, 8 and 9) accounted for 43% of the total.

Saline Lake and Ruth Lake accounted for most of the number of waterfowl counted off Lease 17. These lakes are on the margins of the lease. Therefore, in the migration "corridor" of the Athabasca Valley from Beaver Creek to Fort McMurray (25 linear miles) sampled by the study area, the most intensive use by waterfowl is concentrated on the proximal to Lease 17.

Lakes and sloughs on the study area received far greater use than the Athabasca River. As the lakes froze-up

however, a greater number of waterfowl used the river, especially towards the latter part of October.

Horseshoe Lake, the shallower and marshier of the larger lakes, as would be expected, received the most intensive and consistent use by dabblers. The largest number of dabblers counted on Horseshoe Lake was 720 on September 28; approximately 570 of these were mallards. After Horseshoe Lake became partially frozen few dabblers were counted in the study area. Saline Lake, Mildred Lake and Ruth Lake received some use by flocks of dabblers, but use was far less than Horseshoe Lake. This was similar to the pattern of use in the spring.

Saline, Ruth and Mildred Lakes, all deeper lakes, received the most intensive use by diving ducks usually in large "rafts". These lakes, being deeper and larger than the others, were the last to freeze-up and therefore accounted for most of the waterfowl observed in the area towards the latter part of October. Nearly all of the 1,350 ducks (mostly scaup) counted on October 19 were on Saline, Ruth and Mildred Lakes.

Canada geese were most frequently noted on the gravel bars and islands along the Athabasca River but also made fairly consistent use of the north end of Horseshoe Lake. On one occasion, a flock of Canada geese was noted on a partially vegetated mud bar between the G.C.O.S. tailings pond dyke and the Athabasca River. This was of interest because of the proximity of geese to heavy industrial activity.

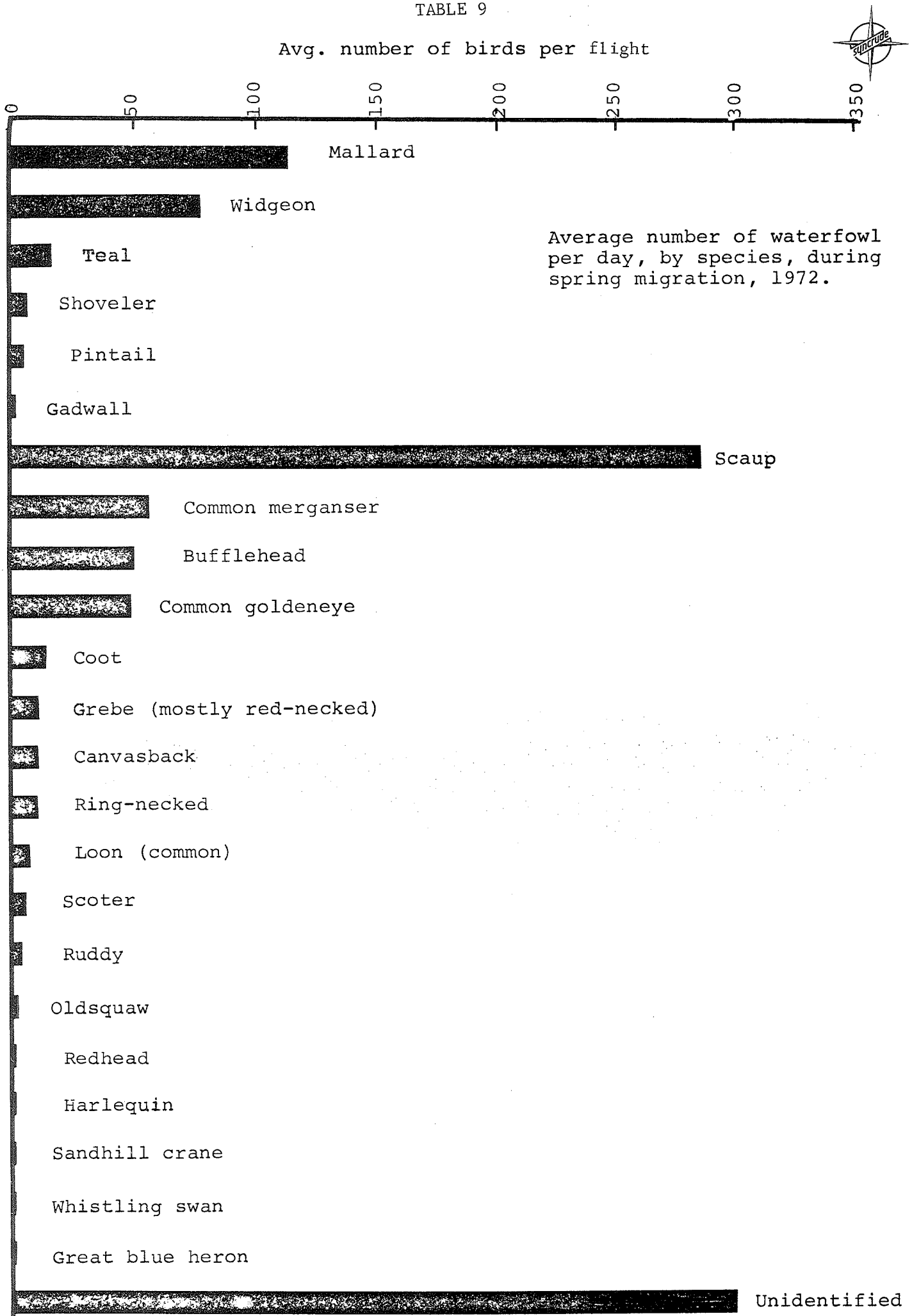
Duration of Stay of Spring Migrants:

In order to attempt to determine the duration of stopover of migrant ducks or rate of population turnover, aerial surveys were made on both the mornings and evenings of May 8 and May 11, 1972. The morning and evening counts of each day showed a marked similarity of composition and distribution for most species (Table 9). This suggested that the ducks stayed at least a day. However, the actual length of stay was indeterminable. Birds would have to be marked for identification in order to obtain accurate data. Length of stopover appears dependent upon weather conditions.

Variations, in aerial counts from date to date, plus ground observations, does suggest that the population is on a continual basis for some species such as mallards and widgeon. The appearance of more drakes in the population towards the end of migration also suggests a turnover of population.

Observations of scaup on Mildred Lake suggests more of a "staging behaviour" for this species in the area than for such species as mallards and widgeon. Ground checks made almost daily from May 9 onwards showed a build-up of scaup to about 400 birds by May 13. These scaup rested and fed in the same location on the lake until May 18. Then they decreased to 200 birds and on May 22 to only a few birds (see Table 9). The seasonal use of the whole area followed a similar pattern (Figure 10), i.e., movement to Mildred Lake.

TABLE 9



Average number of waterfowl per day, by species, during spring migration, 1972.

TABLE 10

SUMMARY OF WATERFOWL SURVEY RESULTS SYNCRUDE LEASE AND ADJACENT AREAS, 1971.

Location		October 17 Survey			October 27 Survey		
		Mallards	Loons	Unidentified	Mallards	Loons	Unidentified
#1							
2							
3							
4							
*5	Horseshoe Lake	80					
*6	Mildred Lake	302		9			
7	Saline Lake				9		
8		23					
*9	Ruth Lake		3		6		
*10							
*11							
*12							
13	McLelland Lake	55					
TOTAL		460	3	9	15	0	0

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* Checkpoints within Lease

This suggests a fairly rapid build-up of scaup on other lakes and then a fairly sudden departure.

Spring Migrant and Nesting Populations:

Most of the ducks that stopped in the area appeared to be paired migrants enroute to their breeding grounds farther north. Some breeding activity was noted, especially amongst mallards, widgeon, common goldeneye, and bufflehead and certainly these probably nest in limited numbers in the area. Most of the grebes and loons which were counted throughout the study appeared to be resident birds which arrived early and occupied their tradional territories. Two to three pairs of loons each occupied Ruth and Mildred Lakes shortly after break-up and remained throughout the study. Red-necked grebe nests were noted on Ruth Lake towards the end of May.

According to men working in the test pit area, a few sandhill cranes have nested in that vicinity for the past few years and were present this spring.

Large groups of male and female waterfowl, the changes in population composition from survey to survey and the decrease in total numbers towards the end of May, indicated that most of the waterfowl that stopped in the area were migrants enroute to breeding grounds further north. By June 4, numbers were considerably lower in all areas except Saline Lake, and most birds in these areas appeared to be breeders, particularly mallards, widgeon, scaup, goldeneye, bufflehead and coot. By this time groups of waterfowl were much smaller, and composed mainly of

males. Lone drakes were also observed along the shore lines of the lakes and females were occasionally seen in the emergent vegetation.

On Saline Lake larger groups of waterfowl, made up mostly of males where sex was determinable, were seen in the central portions of the lake. These groups consisted mostly of scaup and coot but with some goldeneye, mallards and widgeon among them. Concentrations of male scaup at this time of year could be attributed to birds beginning their postnuptial molt, presumably en route to traditional molting lakes after having completed or given up their reproductive efforts for the year (Hochbaum, 1944 cited by Rogers, 1964). This normally happens in late May and early June (Rogers, 1964).

Effects of Syncrude Development Upon Waterfowl:

The possible effects of the Syncrude development upon waterfowl has already been touched upon.

In the light of the results of the waterfowl study, some aspects were thought worthy of enlarging.

Since the use of Mildred Lake as a fresh water impoundment is planned, some enhancement of Mildred Lake may occur, however, from the increased water level which will enlarge its area. However, if seepage from the tailings pond into Mildred Lake occurs this may introduce change in the water chemistry of Mildred Lake.

The influx of people to work on the Syncrude project will result in increased hunting pressures on waterfowl.

Water diversion will create additional waterfowl habitat on and adjacent to Lease 17. Existing shorelines and habitat are receiving protection in any development plan.

Hunting, regulated by Federal and Provincial legislation, is not considered to be a serious issue.

The most serious potential impact on waterfowl will be from possible oil contamination on the 9.3 square mile tailings pond. Both the spring and fall waterfowl surveys have shown that appreciable numbers and varieties of ducks use lakes on or bordering the Syncrude Lease to rest and feed during migration. The creation of a body of water as large as the tailings pond will undoubtedly attract more waterfowl to the area, particularly as the Syncrude area appears to be on part of a broad flyway for large numbers of waterfowl. Gordon Lake, where an estimated 100,000 ducks staged this fall, is only 75 miles to the southeast. The Peace-Athabasca Delta, which has populations of up to 1.5 million ducks and 300 - 400 thousand geese during staging (Craig Schick, pers. comm.), is only 100 miles to the north.

Some alteration of waterfowl habitat has already occurred on Horseshoe Lake. A drainage canal was built at the north end of the lake in the mid-1950's, thus reducing the water-levels on Horseshoe Lake and altering its nature by the inflow of water from Athabasca River during the peak spring flow. This has probably reduced its attractiveness to waterfowl.

One of the tentative plans is to dam Beaver Creek above the mining areas, creating two detention storage reservoirs. This will create alternate waterfowl habitat in the lease area which may help alleviate the problem expected between waterfowl and the tailings disposal pond, by luring them south, away from

the sphere of activity in the plant site area.

Possible Effects of Large Tailings Disposal Pond:

Some species of waterfowl appear more vulnerable to contact with oil than others. Experimental studies on mallards and scaup exposed to oil contamination showed scaup to be far more vulnerable when oil-soaked than mallards. Mallards recovered after cleaning but scaup died because of a loss of buoyancy and an elevation of metabolic rates to compensate for the loss of feather insulation (McEwan, et al, 1972).

The presence of an average of over one thousand ducks per day, many of these scaup, for over a month near the large tailings disposal pond, will undoubtedly lead to problems of oiled ducks. The magnitude of these problems, however, is difficult to predict, and will be expected to vary with the degree of surface pollutants, status of waterfowl populations, and weather conditions.

There is some evidence that water fowl avoid the G.C.O.S. tailings disposal pond. No waterfowl were observed on the pond during aerial flights although fairly large flocks would sometimes be noted along the river immediately below the impoundment dyke. One of the senior officials involved with environmental control at G.C.O.S. stated that in 5 years he has noted only 2 oiled ducks at the plant site. One of these was found dead on the shore of the tailings disposal pond and another was found on the waste water disposal pond. He stated that ducks seem to avoid the G.C.O.S. water containment areas except for the sewage lagoon.

Mr. A. Boggs, Fish and Wildlife Officer at Fort McMurray, has had two oiled waterfowl, both loons, brought to him from the G.C.O.S. tailings pond over the past two years. Mr. Vincent Bouchier, who owns trapline #2565, stated he found two ducks some distance upstream from G.C.O.S. this spring. The ducks were on the bank of the Athabasca River. He "collected" one, a mallard drake, whose wing and breast feathers were matted with oil. The duck was flightless. The other duck escaped into the brush. Thus, it would appear that some ducks may land in the G.C.O.S. pond and take off with their feathers coated with oil, and later suffer after-effects. Mr. Jim Farley, cook at the Syncrude Camp, said he rescued a duck from the Syncrude test plant pond last year but it did not survive.

Problems with waterfowl on the Syncrude tailings disposal pond might be expected to be greater than with G.C.O.S. because:

1) The Syncrude pond will be much larger, about 17 times the size of Mildred Lake. This will create the second largest body of water proximal to the Athabasca River between Fort McMurray and Lake Claire near the mouth of the Athabasca River. It is well-known that large bodies of water attract waterfowl and create shifts in flyways of migratory waterfowl, (e.g., artifical reservoirs in parts of U.S. have changed flight routes of migrant geese.)

2) The Syncrude pond will be much closer to larger concentrations of migrant waterfowl that stop over during the spring.

Problems may also be encountered with Mildred Lake should it become contaminated with pollutants that are harmful to waterfowl. The complexity of the problem is compounded by the fact that Mildred Lake and portions of the Syncrude tailings disposal pond will be available to waterfowl when other bodies of water are frozen - either in late fall or early spring, thus serving as an attraction - particularly during spring migration.

The most significant aspect of the tailings pond as an attraction to waterfowl is its large size rather than as habitat. Waterfowl are characteristically attracted to large water bodies during fall migrations because of the security they represent during resting periods. The proposed pond represents an extremely difficult problem since it would be necessary to achieve high use of peripheral areas and maintain the pond in an unattractive state to waterfowl.

Four lakes of 300 acres or more are located within a 3-mile radius of the proposed Syncrude tailings disposal pond. This is the greatest concentration of small lakes along the Athabasca River zone for at least 50 miles in either direction from the Syncrude Lease. This concentration of lakes attracts the greatest number of waterfowl that stop over in the area during spring migration. Lakes on Lease 17 accounted for 43%

of all waterfowl counted throughout the survey. The most intensive use by waterfowl between Beaver Creek and Fort McMurray is concentrated on and proximal to Lease 17.

Use of these lakes occurs immediately after spring breakup and use of the Athabasca River decreases. The Athabasca River between G.C.O.S. and the mouth of Beaver Creek, and Horseshoe Lake, are prematurely open because of hot water emissions from the G.C.O.S. plant. These areas attract the first wave of migrants.

Twenty-eight species of ducks were noted in the 1971-72 studies. Twenty-five species of waterfowl and other birds of importance were noted during five aerial surveys of the Syncrude study area between May 4 and June 4, 1973. During spring '72, most of the ducks appear to be migrants, stopping over in the area for limited periods of time. By early June the birds still in the area included breeders, unsuccessful breeders, non-breeders and post-breeding males. By May 4, 1973, migration was well underway and appeared to be about two weeks advanced over last year's migration. The number of ducks diminished at the beginning of June when migration wanes.

In spring '72, an average of 1,037 ducks per day stopped-over in the area during the month of May. Few geese, swans, sandhill cranes, and great blue herons stopped-over. Results of eleven aerial surveys in spring '73, indicated an average of 1,465 waterfowl per survey flight. In 1972, the most abundant species were lesser scaup, followed by mallards, widgeon,

and common mergansers. In 1973, coots were the most common species, followed by scaup, common goldeneye, American widgeon and mallard.

Dabbling ducks preferred Horseshoe Lake and shallow parts of Saline Lake, whereas diving ducks tended to prefer Mildred, Ruth, and deeper parts of Saline Lake. Saline Lake received the greatest use by waterfowl and a shift in concentration of coots and dabbling ducks was noted from other lakes to this lake as the season progressed. By the end of May the few waterfowl left on Ruth Lake and Mildred Lake tended to hide in the emergent vegetation along the shore. This and the build-up of pond-lily (Nuphar) made observations difficult. Utilization by shorebirds appeared minor.

Limited evidence suggests waterfowl avoid the G.C.O.S. tailings disposal pond because of larger area. Mitigation must be undertaken to reduce waterfowl oiling problems.

By mid-September, 1972, considerable numbers of migrant waterfowl were already utilizing the study area which included lakes on Syncrude Lease 17. These waterfowl were mainly resting and feeding birds. Duration of stay in the area was indeterminable. Most of these occurred in large flocks composed of a mixture of species. For mallards and scaup, two general waves of migration were documented. In fall '72, scaup were the most abundant species observed, averaging 670 birds per flight. Mallards were the second most abundant species in the area (averaging 387 species per flight). Ring-necked ducks

were the second most abundant diver species averaging 59 per flight. Coots and common goldeneye showed appreciable increases in numbers over 1972, possibly a result of lower water levels further south. Scaup migration was more protracted than in 1972, showing no staging behavior. No common loons were noted.

Few ducks utilized the Athabasca River except late in October when most lakes were frozen or partially frozen. Most dabbler species utilized Horseshoe Lake. However, some flocks utilized other water bodies; primarily Saline, Ruth and Mildred Lakes. Dabblers were infrequent in the area once Horseshoe Lake became largely iced over before October 12, 1972. Divers, mostly scaup, remained later and were still present on October 26. They utilized open water on Saline, Ruth and Mildred Lakes. Canada geese were noted and averaged 15 birds per flight in fall '72. Canada geese utilized gravel bars and islands along the Athabasca River as well as the northern portion of Horseshoe Lake. The MacKay River, Beaver Creek and small sloughs on Lease 17 appeared to receive little or no use by waterfowl during fall migration.

Possible Mitigative Actions:

Careful monitoring will be required during the initial years of the development. Control measures should be initiated if a serious problem develops. Carbide cannons used to discourage waterfowl from crops might be used here. Oil slicks or froth might be gathered in booms and contained in certain areas.

Horseshoe Lake should be managed to improve its desirability to waterfowl. Horseshoe Lake is the first lake open when migrants arrive in the spring and will help to lure waterfowl away from the open water of the tailings disposal pond at a time when all other lakes are frozen over as well as after melt. The canal at the north end of Horseshoe Lake could be filled in or a wing gate built to control water levels at optimum conditions for good waterfowl habitat.

While it is difficult to predict the magnitude of waterfowl oiling problems, a mitigation study will be initiated while the project is still in the planning stage. Such a stage should include a review of the following factors:

1) Physical characteristics of proposed alteration and/or creation of water bodies and channels on Lease 17.
   - water temperatures and quality
   - volumes
2) Analysis of expected alteration and/or creation of water bodies on Lease 17 and surrounding area in relation to utilization by waterfowl. For example, a clean water reservoir for diversion of Beaver Creek will probably help to divert waterfowl from the tailing pond. Analysis of factors contributing to the attractiveness and unattractiveness of water bodies to waterfowl on migration will be carried out. Results can be

applied to the design of the tailings pond so that as many unattractive features as possible are incorporated. Additional habitat can be created to attract birds from the tailings pond.

3) Analysis of alteration of water bodies proximal to Lease 17: special enhancement of Ruth Lake and creation of new clean water detention storage reservoirs on Beaver Creek by Syncrude.

4) Analysis of above factors in relation to present data on waterfowl in the area so that problems that occur at critical times might be solved.

5) Analysis of all literature available on mitigation of waterfowl - oiling problems.

6) Recommendations for mitigation based on all of the above facets. Examples might be:

   Design alteration of the tailings disposal pond to create several smaller initial settling ponds which might confine surface oil to a smaller area rather than to the total surface of the tailings pond.

   Distrubance techniques to frighten birds away from tailings pond during the period when there is an influx of waterfowl in the area.

Increased hunting pressure might lead to complications with a mitigation program designed to entice waterfowl to certain ponds. Hunters might drive ducks away from such ponds and it is

possible that hunting restrictions would have to be instituted.

Additional waterfowl surveys will be made as a followup to this study including a brood count about mid-July to determine numbers and distribution of the breeding population of waterfowl. This would take only a few days, and while the breeding population would be expected to be small, the data would serve as baseline information. An extensive survey should be made to determine the use of the area during the full period of the fall migration.

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Appendix 1:

Aerial Count of May 4, 1973 — 9:38 - 11:25 A.M.
Visiblity: Good — Weather: Sunny, windy.
Pilot: John Merilees — Observer: T.W. Thormin

SPECIES	CHECKPOINT Ft.McM-1	1-2	2-3	3-4	4-5	TOTAL RIVERS	CHECKPOINT 6	7	8	9	10	11	12	13	TOTAL LAKES
R. N. Gre	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Mal	2	25	16	6	1	52	34	14	21	2	20	2	2	7	102
Pin	-	-	2	-	-	2	4	6	8	-	-	8	-	29	55
G.W.T.	-	34	23	-	-	57	-	-	-	-	1	-	-	-	1
Wid	40	8	24	2	8	32	-	44	4	-	8	4	3	9	72
Shov	-	-	13	-	-	13	-	6	-	-	-	28	-	12	46
Can	-	-	-	-	-	-	8	-	10	-	-	-	-	-	18
Sc	-	-	-	-	-	-	90	10	50	4	-	4	-	87	245
C.G.	-	-	-	2	-	2	208	20	28	-	18	18	-	-	292
Buf	-	-	-	-	-	-	6	2	-	4	3	2	2	4	23
Rud	-	-	-	-	-	-	-	2	-	-	1	-	-	-	3
Mer	-	-	6	4	2	12	-	8	2	-	-	2	-	-	12
R.T.H.	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-
M.H.	-	-	-	1	-	1	-	-	1	-	-	-	-	1	2
Co	-	-	-	-	-	-	-	50	-	-	-	30	-	-	80
Unid	-	-	-	4	-	4	-	-	-	-	-	-	-	4	4
TOTAL	42	67	86	20	11	226	350	162	126	10	51	98	7	157	961

GRAND TOTAL: 1,187

Appendix 2:

Aerial Count of May 11, 1973 — 9:10 - 10:55 A.M.
Visibility: Good — Weather: Cloudy
Pilot: Graeme Milne — Observer: T.W. Thormin

SPECIES	CHECKPOINT FT.MCM-1	1-2	2-3	3-4	4-5	TOTAL RIVERS	CHECKPOINT 6	7	8	9	10	11	12	13	TOTAL LAKES
Loon	-	-	-	-	-	-	-	-	2	-	-	-	-	8	8
R.N.Gre	-	-	-	-	-	-	-	-	3	-	3	-	-	-	6
Mal	-	-	4	-	17	21	50	35	13	2	3	14	2	6	125
Gad	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2
Pin	-	-	-	-	-	-	-	4	2	-	-	-	-	-	6
G.W.T.	-	2	4	-	-	6	-	6	2	-	2	-	-	2	12
Wid	-	-	12	-	15	27	65	43	2	-	-	22	2	-	134
Shov	-	-	1	-	-	1	-	18	-	-	-	-	-	2	20
Red	-	-	-	-	-	-	21	-	-	-	-	-	-	-	21
Can	-	-	-	-	-	-	27	4	-	-	-	4	-	-	30
Sc	-	-	2	-	-	2	100	6	94	-	5	-	2	25	232
C.G.	-	1	6	14	11	32	104	4	4	-	15	8	1	9	145
Buf	-	-	-	-	2	2	5	5	2	-	5	7	-	9	33
S. Scot	-	-	-	-	-	-	-	-	5	-	-	-	-	-	5
Co	-	-	-	-	1	1	10	153	-	-	-	104	-	-	267
G.B.H.	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Unid	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
TOTAL	1	3	29	14	46	93	377	281	129	2	33	159	7	59	1047

GRAND TOTAL: 1,140

Appendix 3:

Aerial Count of May 18, 1973
Visibility: Good
Pilot: Arnold Schreder

8:40 - 10:35 A.M.
Weather: Sunny
Observer: T.W.Thormin

SPECIES	CHECKPOINT Ft. McM-1	1-2	2-3	3-4	4-5	TOTAL RIVERS	CHECKPOINT 6	7	8	9	10	11	12	13	TOTAL LAKES
Loon	-	-	-	-	-	-	-	-	15	-	-	-	-	3	8
R.N.Gre	-	-	-	-	-	-	-	-	2	-	1	-	-	2	5
Mal	-	-	14	-	11	25	35	28	23	-	6	2	4	10	108
Gad	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4
Pin	-	-	5	-	-	5	12	3	-	-	-	1	-	1	17
G.W.T.	-	-	-	-	-	-	-	3	-	-	-	-	-	1	4
B.W.T.	-	-	4	-	-	4	-	-	-	-	-	3	-	-	3
Wid	2	5	8	1	6	22	73	65	-	-	4	2	-	4	148
Shov	-	-	8	-	-	8	2	15	-	-	6	6	-	-	29
Red	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Can	-	-	-	-	-	-	5	-	-	-	-	-	-	-	5
Sc.	-	-	20	-	14	34	87	4	82	-	5	33	-	49	260
C.G.	-	-	6	1	58	65	200	4	6	-	11	44	2	2	269
Buf	-	-	-	-	-	-	12	1	2	-	7	1	-	5	28
W.W.Sclt	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
S.Scot	-	-	-	-	-	-	-	-	4	-	-	-	-	-	4
Mer	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
M.H.	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
C.	-	-	-	-	-	-	79	82	-	-	-	76	-	4	241
Unid	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
TOTAL	3	5	65	2	89	164	513	206	124	1	40	168	6	81	1139

GRAND TOTAL: 1,303

Appendix 4:

Aerial Count of May 25, 1973 — 8:48 - 10:45 A.M.
Visibility: Good — Weather: Clear, windy
Pilot: Arnold Schreder — Observer: T.W. Thormin

SPECIES	CHECKPOINT Ft.McM-1	1-2	2-3	3-4	4-5	TOTAL RIVERS	CHECKPOINT 6	7	8	9	10	11	12	13	TOTAL LAKES
Loon	-	-	-	-	-	-	-	-	2	-	-	-	-	-	2
R.N. Gre	-	-	-	1	-	1	-	-	2	-	-	-	-	4	6
P.B.Gre	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Mal	-	1	4	2	6	13	66	23	7	-	-	29	2	3	130
Gad	-	-	-	-	-	-	8	8	-	-	2	-	2	-	20
Pin	-	-	-	-	-	-	4	2	-	-	-	-	-	-	6
G.W.T.	-	-	-	-	-	-	-	-	-	-	-	3	-	-	3
B.W.T.	-	-	-	-	-	-	-	-	2	-	-	2	-	-	4
Wid	-	2	5	1	14	22	62	38	-	-	12	7	-	8	127
Shov	-	-	3	-	-	3	6	9	-	-	-	14	-	-	29
Red	-	-	-	-	-	-	20	2	-	-	-	-	-	-	22
Ring	-	-	-	-	-	-	8	-	-	-	4	-	-	-	12
Can	-	-	-	-	-	-	10	-	-	-	-	-	-	-	10
Sc	-	-	-	-	-	-	96	14	6	-	27	17	5	40	205
C.G.	-	-	2	13	30	45	140	-	6	-	4	14	2	-	166
Buf	-	-	-	-	-	-	13	5	-	-	-	2	-	9	29
W.W. Scot	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6
S. Scot	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6
Rud	-	-	-	-	-	-	-	-	-	-	-	5	-	-	5
Mer	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
M.H.	-	-	-	-	-	-	-	1	-	-	-	1	-	-	2
Co	-	-	-	-	-	-	299	186	-	-	4	103	-	-	592
TOTAL	-	3	14	17	50	84	734	289	25	-	53	197	11	76	1385

GRAND TOTAL: 1,469

Appendix 5:

Aerial Count of June 4, 1973 — 9:55 - 11:25 A.M.
Visibility: Good — Weather: Cloudy, windy
Pilot: Arnold Schreder — Observer: T.W. Thormin

SPECIES	CHECKPOINT Ft.McM-1	1-2	2-3	3-4	4-5	TOTAL RIVERS	CHECKPOINT 6	7	8	9	10	11	12	13	TOTAL LAKES
Loon	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
R.N. Gre	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Mal	-	-	-	1	1	2	30	5	-	-	5	-	-	-	40
Gad	-	-	-	-	-	-	5	-	-	-	-	1	-	2	8
Pin	-	-	-	-	-	-	-	2	-	-	-	-	-	1	3
G.W.T.	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2
B.W.T.	-	-	-	-	-	-	-	2	-	-	-	-	-	2	4
Wid	-	-	-	-	4	4	31	7	-	-	3	9	-	-	50
Shov	-	-	-	-	-	-	4	2	-	-	-	-	-	1	7
Ring	-	-	-	-	-	-	-	-	-	-	10	4	-	-	14
Can	-	-	-	-	-	-	4	2	-	-	-	-	-	-	6
Sc	-	-	-	-	-	-	117	6	4	-	9	17	-	5	158
C.G.	-	-	1	1	-	2	57	-	-	-	-	1	-	3	61
Buf	-	-	-	-	-	-	16	1	-	-	4	3	-	-	24
W.W. Scot	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2
Mer	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
Co	-	-	-	-	-	-	130	138	-	-	1	9	-	1	279
Unid	1	-	1	-	-	2	-	-	1	-	-	-	-	-	1
TOTAL	1	-	2	2	6	11	396	167	7	-	32	44	-	15	661

GRAND TOTAL: 672

Appendix 6

General Aerial Reconnaisance of April 28, 1972 — 8:00 - 10:00 A.M.
Visibility: Fair — Weather: Intermittent clouds
Pilot: John Merilees. — Observer: Wayne McCrory and Jim Nalbach

Check-Point

1-5, and 7: ±1500 ducks, mostly between checkpoints 3 and 5 with about 300 on checkpoint 7. Most were Sc, Mal, Pin, CG, Buf, and (GWT). Also noted 7 Can, 1 common Loon, and 1 G.B.H. All other checkpoints frozen over. Beaver River and McKay River partially open.

Aerial Count of April 29, 1972 — 8:30 - 9:30 A.M.
Visibility: Fair — Weather: Sunny
Pilot: John Merilees — Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Ft.-1)E.	-	-	-	-	-	-	-	-	-	-	-	-	15	-	15
1-2) side	16	8	-	-	-	37	-	6	-	-	-	-	25	-	92
2-3)	-	-	-	-	-	7	-	-	-	-	-	-	60	-	67
3-5	31	-	6GWT	-	-	18	-	2	-	-	-	-	173	-	230
#7	12	-	-	-	-	33	-	6	-	-	-	-	72	-	123
3-1)W.side	-	-	-	-	-	-	-	-	-	-	-	-	±100	-	100
TOTAL:	59	8	6	-	-	95	-	14	-	-	-	-	445	-	627
Lease Area	15	-	-	-	-	5	-	-	-	-	-	-	8	-	28

Other checkpoints still frozen over.

Appendix 7

Aerial Count of May 3, 1972 — 8:45 - 10:00 A.M.
Visiblity: Poor — Weather: Cloudy
Pilot: John Merilees — Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Ft.-1	5	-	-	-	-	1	-	12	-	-	-	-	32	-	50
1-2	3	-	-	4	-	-	-	-	-	-	-	-	106	-	113
2-3	6	-	-	13	-	3	2	-	-	-	-	-	76	-	100
3-4	21	-	6GWT	20	-	9	-	-	-	-	-	8	±153*	-	217
4-5	51	-	12GWT	44	-	8	13	3	6	-	-	-	±171*	1 loon	309
Total River:	86	-	18	81	-	21	15	15	6	-	-	8	538	1	789
6	11	-	-	-	-	6	8	32	-	-	-	-	±424*	2SW	483
7	16	-	-	17	-	6	4	10	-	-	-	-	±166*	-	218
Total Lakes:	27	-	-	17	-	12	12	42	-	-	-	-	590	2	701
													Grand Total:		1491
Lease area	5	-	-	5	-	-	-	-	-	-	-	-	50	-	60
McKay River	2	-	-	10	-	2	-	-	-	-	-	-	2	-	16

*Mostly Sc with a few Can and others.
Other checkpoints frozen over.

Appendix 8

Aerial Count of May 8, 1972 — 8:45 - 10:15 A.M.
Visibility: Good — Weather: Sunny and warm
Pilot: John Merilees — Observer: Wayne McCrory

Transect	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M to #1	5	-	-	-	-	3	-	-	-	-	-	-	-	-	8
1-2	3	-	-	-	-	-	-	-	-	-	-	-	26	-	29
2-3	28	-	-	30	-	-	-	-	-	15	-	2	53	-	128
3-4	8	-	-	6	-	-	-	-	-	-	-	4	33	-	50
4-5	19	5	-	8	-	6	-	2	-	-	-	-	27	-	67
Total Rivers:	63	5	-	44	-	9	-	2	-	15	-	6	139	-	283
6	-	-	-	-	-	-	-	±200	-	-	-	-	±200	-	400
7	11	-	-	6	-	-	6	18	-	2	-	-	45	1 GBH	94
8	20	-	-	6	-	6	-	±104	-	-	-	4	66	5 Red	206
9	-	-	-	-	-	-	-	11	-	-	-	-	-	-	11
10	1	-	-	2	-	5	2	-	8	-	-	4	56	-	78
11	-	-	-	-	-	-	-	±100	-	-	-	-	±50	2 Sw	152
Total Lakes:	32	-	-	14	-	11	8	433	8	2	-	8	417	8	941
													Grand Total		1224

Checkpoints 12 and 13 frozen over.

Appendix 9

Aerial Count of May 8, 1972 — 8:45 - 10:00 P.M.
Visibility: Good — Weather: Clear and warm
Pilot: John Merilees — Observer: Wayne McCrory

Transect	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
1-2	4	-	-	-	-	12	-	-	-	-	-	-	18	-	34
2-3	4	-	-	6	-	-	-	-	-	4	-	-	61	-	75
3-4	11	-	-	28	-	-	-	30	-	12	-	18	25	-	124
4-5	3	-	-	8	-	4	-	-	-	-	-	10	5	-	30
Total Rivers:	24	-	-	42	-	16	-	30	-	16	-	28	109	-	265
6	-	-	-	-	-	-	-	300	-	-	-	-	100	12 Sw	412
7	12	-	-	2	5	-	2	55	-	-	2	-	21	1 GBH	100
8	16	-	-	24	2	-	-	44	4	5	-	-	24	1 Loon	119
9	3	-	-	-	-	-	-	30	-	-	-	-	-	-	33
10	2	-	-	10	2	-	-	50	-	-	-	4	30	2 Red	100
11	2	-	-	-	-	-	-	150	-	1	-	-	15	2 Red 2 Loon	172
Total Lakes:	35	-	-	36	9	-	2	629	4	6	2	4	190	20	936

Grand Total: 1202

Checkpoints 12 and 13 frozen over.

Appendix 10

Aerial Count of May 11, 1972
Visibility: Good
Pilot: John Merilees

8:45 - 10:00 A.M.
Weather: Sunny
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	7	-	-	-	-	-	2	-	-	-	-	1	6	-	16
1-2	5	-	-	2	-	-	-	11	-	-	-	-	2	-	20
2-3	16	-	-	6	-	5	-	32	-	-	-	7	1	-	67
3-4	11	-	-	2	-	14	-	8	-	-	-	3	7	-	45
4-5	8	-	-	22	-	21	-	3	-	2	-	9	4	-	69
Total Rivers:	47	-	-	32	-	40	2	54	-	2	-	20	20	-	217
6	31	-	-	16	-	8	12	445	-	3	-	-	61	-	576
7	13	-	-	10	1	3	3	5	1	-	-	-	17	-	53
8	29	2	-	2	-	3	1	216	-	4	-	-	10	4 Loon	271
9	-	-	-	-	-	-	-	6	-	-	-	-	3	-	9
10	3	-	5GWT	6	-	-	-	-	-	3	-	-	7	-	24
11	3	-	-	-	1	1	-	-	3	7	-	-	41	-	56
12	1	-	-	-	-	-	-	-	-	-	-	-	-	1 Loon	2
13	1	-	-	-	-	2	11	51	14	7	-	2	2	2 Loon	92
Total Lakes:	81	2	5	34	2	17	27	723	18	24	-	2	141	7	1083
													Grand Total:		1300

Appendix 11

Aerial Count of May 11, 1972
Visibility: Fair
Pilot: John Merilees

7:30 - 8:45 P.M.
Weather: Clear and warm
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	5	-	-	-	-	1	-	-	-	-	-	-	-	-	6
1-2	6	-	9	3	-	1	-	-	-	-	-	2	-	-	21
2-3	13	-	-	9	-	-	-	40	-	-	-	11	2	-	75
3-4	3	-	7	20	-	4	-	-	-	-	-	3	1	-	38
4-5	12	-	-	12	-	4	4	2	-	-	-	13	10	-	57
Total Rivers:	39	-	16	44	-	10	4	42	-	-	-	29	13	-	197
6	17	-	-	9	-	1	5	292	7	1	-	14	29	1 GBH	376
7	10	-	1	22	1	4	1	30	1	-	-	-	6	-	76
8	16	-	4	13	-	-	1	315	-	1	-	3	7	4 Loon	364
9	-	-	-	-	-	-	-	15	-	2	-	-	-	-	17
10	-	-	-	-	-	3	-	-	-	2	-	-	13	-	18
11	4	-	-	4	-	2	5	46	-	1	-	-	31	-	93
12	4	-	-	-	-	-	-	-	-	-	-	-	-	-	4
13	7	-	-	15	-	-	5	100	-	2	-	1	-	-	130
Total Lakes:	58	-	5	63	1	10	17	798	8	9	-	18	86	5	1078
													Grand Total:		1275

Appendix 12

Aerial Count of May 15, 1972
Visibility: Good
Pilot: John Merilees

7:30 - 8:45 A.M.
Weather: Sunny, light overcast
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	4	-	-	-	-	-	-	-	-	-	-	-	1	-	5
1-2	2	-	-	1	-	2	-	2	-	-	-	1	4	-	12
2-3	10	-	-	8	-	-	-	-	-	-	-	-	-	12 Scot 1 GBH	31
3-4	10	8	2	3	2	2	1	12	-	-	-	10	1	-	51
4-5	19	-	-	14	-	8	2	12	-	-	-	16	10	-	81
Total Rivers:	45	8	2	26	2	12	3	26	-	-	-	27	16	13	180
6	17	-	2	16	-	-	12	395	4	-	30	19	62	3 S Cr	560
7	12	-	14	7	8	-	2	26	2	2	-	-	46	-	119
8	7	-	24	28	-	1	6	421	-	2	-	3	8	4 Loon	504
9	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4
10	2	-	-	-	-	-	2	17	1	5	-	1	-	-	28
11	8	-	-	8	-	-	1	41	-	-	-	1	12	-	71
12	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Loon	2
13	9	-	-	6	-	-	7	72	5	1	-	2	11	4 Loon	117
Total Lakes:	55	-	40	65	8	1	30	976	12	10	30	26	139	13	1403
														Grand Total:	1583

Appendix 13

Aerial Count of May 18, 1972 — 7:45 - 9:15 A.M.
Visibility: Good — Weather: Windy, cloudy and raining
Pilot: John Merilees — Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	1	-	-	-	-	-	-	-	-	-	-	-	4	-	5
1-2	1	-	-	5	-	-	-	-	-	-	-	3	7	-	16
2-3	8	-	-	7	-	6	-	-	-	-	-	8 (C)	-	-	29
3-4	3	-	-	-	2	1	-	-	-	-	-	3 (C)	8	-	17
4-5	6	-	-	46	-	2	-	-	-	-	-	26 (C)	2	-	82
Total Rivers:	19	-	-	58	2	9	-	-	-	-	-	40	21	-	149
6	39	-	-	35	4	2	5	±288	2	-	-	27 (C)	59	-	461
7	55	-	11GWT	8	-	-	3	1	-	1	-	-	11	-	90
8	7	2	12	-	-	-	7	±175	-	4	-	5 (C)	2	6 Loon 3 Scot 3 Ring	226
9	-	-	-	-	-	-	-	6	-	1	-	-	-	-	7
10	-	-	-	-	-	1	-	-	-	3	-	3	8	-	15
11	24	-	-	2	1	-	4	10	-	-	-	8 (C)	3	-	52
12	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Loon	2
13	4	-	-	2	-	-	14	90	-	1	-	-	2	2 Loon	115
Total Lakes:	129	2	23	47	5	3	33	570	2	10	-	43	85	16	968
														Grand Total:	1117

*Note similarity of distribution at diff. checkpoints May 15 - 18.

Appendix 14

Aerial count of May 22, 1972
Visibility: Fair
Pilot: Brian Hardy

7:40 - 9:15 A.M.
Weather: Cool, cloudy
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. to 1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
1-2	5	-	-	2	-	-	-	-	-	-	-	3C	7	-	17
2-3	2	-	2	8	4	6	-	-	-	-	-	-	8	4 Loon 4 Scot	38
3-4	6	-	-	3	-	-	-	-	-	-	-	23(C) 2RB	-	-	34
4-5	1	-	-	18	-	6	2	6	-	-	-	36C	4	2 Loon	75
Total Rivers:	14	-	2	31	4	12	2	6	-	-	-	64	21	10	166
6	56	6	6	48	-	4	7	47	24	-	8	±40C	46	5 Scot 20 Rud	317
7	40	-	-	2	2	2	10	12	1	-	32	-	10	-	111
8	18	1	7	9	-	4	-	27	-	3	-	2C	6	5 Scot 1 Loon 2 Ring	85
9	-	-	-	-	-	12	-	-	-	-	-	-	-	-	12
10	2	-	2	-	-	-	5	8	-	1	-	-	2	3 Scot	23
11	-	-	1	6	6	1	11	7	-	-	12	1C	12	2 Gad	59
12	-	-	-	-Not checked, but looked like no ducks on it										-	-
13	5	-	3	-	-	4	13	21	-	12	-	-	4	3 Loon	65
Total Lakes:	121	7	19	65	8	25	46	122	25	16	52	43	80	41	670
													Grand Total:		836

Appendix 15

Aerial Count of May 25, 1972. 9:25 - 10:45 A.M.
Visibility: Good Weather: Low overcast and cold
Pilot: Graham Milne Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
1-2	2	-	-	6	-	-	-	-	-	-	-	-	-	-	8
2-3	6	-	-	8	-	-	-	-	-	-	-	-	-	1 Olds	15
3-4	2	-	-	-	4	-	2	-	-	-	-	22	-	-	30
4-5	-	-	-	6	-	-	-	-	-	-	-	2	-	-	8
Total Rivers:	10	-	-	22	4	-	2	-	-	-	-	24	-	1	63
6	85	-	13	39	10	3	29	130	1	4	25	88	11	3 Red H 2 Scot	443
7	35	-	1	12	2	1	2	10	-	2	1	-	2	-	68
8	13	2	-	6	-	-	-	15	-	2	-	-	6	1 Ring 4 Loon	49
9	2	-	-	-	-	-	2	4	-	-	-	-	-	15 Ring	23
10	-	-	-	-	-	1	2	6	-	4	-	-	2	-	15
11	5	12	10	17	-	-	3	69	-	-	-	-	25	-	141
12	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Loon	2
13	-	-	-	3	-	-	20	29	-	1	2	-	-	5 Loon 4 Ring 1 Scot 10 Olds	75
Total Lakes:	140	14	24	77	12	5	58	263	1	13	28	88	46	47	816
														Grand Total:	879

Appendix 16

Aerial Count of May 30, 1972
Visibility: Good
Pilot: Brian Hardy

7:30 - 9:10 A.M.
Weather: Warm and sunny
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Ft.-1	2	-	-	-	-	-	-	-	-	-	-	-	-	3 Scot	5
1-2	12	-	-	-	-	-	-	-	-	-	-	1	6	6 S Cr	25
2-3	12	-	-	12	-	6	-	3	-	-	-	6	4	6 S Cr	49
3-4	-	-	-	3	9	4	-	-	-	-	-	4	-	-	20
4-5	4	-	-	20	-	1	-	-	-	-	-	10	11	-	46
Total Rivers:	30	-	-	35	9	11	-	3	-	-	-	21	21	15	145
6	92	6	5	55	7	-	11	56	6	1	4	52	25	5 Gad 2 Harl	327
7	26	-	17	8	4	8	-	3	-	-	8	-	22	-	96
8	3	-	-	5	-	-	-	2	-	1	-	-	4	2 Scot 4 Ring 5 Loon	26
9	1	-	-	-	-	-	8	2	-	-	-	-	-	16 Ring	27
10	-	-	-	-	2	-	1	-	-	1	-	-	1	2 Scot	7
11	2	-	-	10	-	2	1	4	1	2	7	-	8	2 Rud 30 Ring	70
12	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Loon	2
13	8	-	-	2	1	-	13	4	-	6	-	-	5	3 Scot 10 Ring 3 Loon	55
Total Lakes:	132	6	23	80	14	10	34	71	7	11	19	52	64	86	610
														Grand Total:	755

Appendix 17

Aerial Count of June 2, 1972
Visibility: Excellent
Pilot: John Merilees

7:40 - 9:20 A.M.
Weather: Cloudy and gusty
Observer: Wayne McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Ft.-1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
1-2	-	-	-	-	-	1	-	-	-	-	-	-	1	-	2
2-3	-	-	-	3	-	-	-	-	-	-	-	-	2	-	5
3-4	-	-	-	2	-	-	-	-	-	-	-	31	4	-	37
4-5	-	-	-	11	-	-	-	-	-	-	-	-	1	-	12
Total Rivers:	-	-	-	16	-	1	-	-	-	-	-	31	9	-	57
6	38	-	6	32	-	1	11	18	24	2	-	63	57	2 Rud	254
7	5	-	8	7	2	-	6	2	-	-	4	-	11	-	45
8	8	-	6	-	-	-	-	-	-	2	-	-	-	2 Loon 6 Ring	24
9	-	-	-	-	-	-	-	4	-	1	-	-	2	2 Ring	9
10	-	-	-	-	-	-	1	-	-	-	-	-	1	1 Scot 1 Rud	4
11	-	-	-	1	-	-	3	3	-	-	-	-	12	3 Ring 3 Scot	25
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	3	-	-	-	-	-	11	2	-	2	-	-	-	3 Ring	21
Total Lakes:	54	-	20	40	2	1	32	29	24	7	4	63	83	23	382

Grand Total: 439

Appendix 18

Aerial Count of September 18, 1972
Visibility: Fair to poor
Pilot: John Merilees

10:30 - 11:45 A.M. (1.3 hours)
Weather: Overcast 37° - 45°F.
Observer: W. McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M. -1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	50 Cang	50
2-3	-	-	-	-	-	-	-	-	-	-	-	-	-	12 Cang	12
3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4-5	-	-	-	-	-	-	-	-	-	-	-	-	-	20 Cang	20
Total Rivers:	-	-	-	-	-	-	-	-	-	-	-	-	-	82	82
6	10	2	8	2	4	-	-	191	-	-	-	-	49 Dab	10 Olds	276
7	395	-	-	220	-	-	-	-	-	-	-	-	9	6 Cang	630
8	280	-	-	6	-	2	-	15	-	-	-	-	6	10 Gad 6 Scot	325
9	-	-	-	20	-	-	-	12	-	-	-	-	-	-	32
10	-	-	-	2	-	-	-	26	-	1	-	-	3	-	32
11	17	2	-	7	-	-	-	8	-	-	-	-	2	-	36
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	113	-	-	-	-	-	-	256	-	-	4	-	18	2 Gad	393
Total Lakes:	815	4	8	257	4	2	-	508	-	1	4	-	87	34	1724

Grand Total: 1806

Appendix 19

Aerial Count of September 21, 1972
Visibility: Good
Pilot: John Merilees

12:30 - 1:30 P.M. (1.0 hours)
Weather: Cloudy, 1" fresh snow, 32°F.
Observer: W. McCrory, T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	25 Cang	25
1-2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
2-3	-	-	-	-	-	-	-	-	-	-	-	11	-	-	11
3-4	-	-	-	-	-	-	-	-	-	-	-	6	-	-	6
4-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Total Rivers:	-	-	-	-	-	-	-	-	-	-	-	18	-	25	43
6	80	-	-	-	-	-	60	130	-	-	-	-	-	-	270
7	200	-	-	-	-	-	-	-	-	-	-	-	240 M,W 2 Sw Few Teal and Shov	8 Cang	450
8	45	-	-	-	-	-	-	30	-	1	-	-	8 Dab	-	84
9	-	-	-	-	-	-	-	60	-	-	-	-	-	-	60
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	12	-	-	-	-	-	-	2	-	-	-	-	12 Dab	-	26
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	-	-	-	-	-	-	-	290	-	-	-	-	-	-	290
Total Lakes:	337	-	-	-	-	-	60	512	-	1	-	-	260	10	1180
														Grand Total:	1223

Appendix 20

Aerial Count of September 25, 1972
Visibility: Good
Pilot: John Merilees

10:30 - 11:45 A.M. (1.3 hours)
Weather: Cloudy, 27°F.
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	70	-	-	20	-	-	-	-	-	-	-	10	-	-	100
2-3	-	-	-	-	-	-	-	20	-	-	-	-	-	-	20
3-4	-	-	-	-	-	-	-	-	-	-	-	10	-	-	10
4-5	30	-	-	-	-	10	8	-	-	-	-	29	-	-	77
Total River:	100	-	-	20	-	10	8	20	-	-	-	49	-	-	207
6	70	-	-	130	-	-	-	150	-	-	-	-	-	-	350
7	130	50	-	220	-	-	-	-	-	-	-	-	-	6 Cang 2 Sw	408
8	50	20	-	100	-	80	-	200	-	-	-	-	-	-	450
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	20	-	-	10	-	5	-	-	-	-	-	-	-	-	35
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	100	25	-	100	-	-	-	300	-	-	-	-	-	-	525
Total Lakes:	370	95	-	560	-	85	-	650	-	-	-	-	-	8	1768
														Grand Total:	1975

Appendix 21

Aerial Count of September 28, 1972
Visibility: Excellent
Pilot: John Merilees

12:00 - 1:40 P.M. (1.6 hours)
Weather: Sunny, 37°F.
Observer: W. McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2-3	-	-	-	-	-	5	-	-	-	-	-	4	-	-	9
3-4	3	-	-	-	-	-	-	-	-	-	-	-	-	20 Cang 8 Red	31
4-5	-	-	-	2	-	16	-	-	-	-	-	-	-	-	18
Total River:	3	-	-	2	-	21	-	-	-	-	-	4	-	28	58
6	102	132	-	8	-	-	-	400	-	-	-	-	100 Dab & Div	1 Rud	743
7	570	50	100	-	-	-	-	30	-	-	-	-	-	-	750
8	82	-	-	-	-	-	-	400	-	-	-	-	-	7 Red	489
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	2	-	-	-	-	-	-	-	-	6	-	8
11	-	-	-	-	-	-	-	-	-	-	-	-	26 Dab	3 Ring	29
12	-	-	-	-	-	-	-	-	-	-	-	-	4	-	4
13	100	100	-	110	-	10	-	830	-	-	-	-	-	70 Red	1220
Total Lakes:	854	282	100	120	-	10	-	1660	-	-	-	-	136	81	3243
														Grand Total:	3301

Appendix 22

Aerial Count of October 2, 1972
Visibility: Good
Pilot: John Merilees

9:20 - 11:00 A.M. (1.4 hours)
Weather: Sunny, 30°+F.
Observer: W. McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2-3	-	-	-	9	-	-	-	-	-	1	-	3	3 Dab	-	16
3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4-5	28	-	-	-	-	30	-	-	-	-	-	-	-	-	58
Total River:	28	-	-	9	-	30	-	-	-	1	-	3	3	-	74
6	83	-	2	-	-	2	2	45	-	-	20	14	46 Dab	200 Ring	414
7	575	-	12	19	-	-	-	-	-	-	-	-	2	10Cang	618
8	209	-	-	-	-	16	4	-	30	-	1	-	20	8 Scot 200 Ring	488
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	3	-	-	75	-	-	-	-	-	-	-	-	-	-	78
11	6	-	-	-	2	-	-	-	-	-	21	-	6 Dab 2		37
12	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2
13	6	-	-	-	-	2	-	489	-	-	10	-	10	9 Scot	526
Total Lakes:	882	-	14	94	2	20	6	536	30	-	52	14	86	427	2163

Grand Total: 2237

Appendix 23

Aerial Count of October 5, 1972 — 12:00 - 1:00 and 2:00 - 2:15 P.M. (1.4 hours)
Visibility: Good — Weather: Sunny, 35°+F.
Pilot: John Merilees — Observer: W. McCrory

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6
2-3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
3-4	-	-	-	-	4	-	-	-	-	-	-	-	-	-	4
4-5	7	-	-	-	-	1	-	-	-	-	-	-	2	-	10
Total River:	15	-	-	-	4	1	-	-	-	-	-	-	2	-	22
6	110	44	-	2	-	-	-	-	-	-	-	-	31 Dab	100 Ring	287
7	352	-	13	132	-	-	-	-	-	-	-	-	12 Cang	4 Red 30 M & Red	543
8	104	-	-	5	-	6	2	-	-	-	6	-	30 Div	150 Ring	303
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	60	-	-	-	-	-	-	-	-	-	-	60
11	-	-	-	-	-	-	-	-	-	-	-	-	-	2 Gad	2
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	30	-	-	-		10	-	1	5	2	-	10	-	100 Red	158
Total Lakes:	596	44	13	199	-	16	2	1	5	2	6	10	61	398	1353
														Grand Total:	1375

Appendix 24

Aerial Count of October 12, 1972
Visibility: Good
Pilot: G. Milne

11:45 A.M. - 1:30 (1.4 hours)
Weather: Cloudy, Windy, 40°-45°F.
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6
1-2	15	-	-	-	-	-	-	-	-	-	-	-	-	-	15
2-3	1	-	-	7	-	-	-	-	-	-	-	-	-	-	8
3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4-5	-	-	-	-	-	-	-	7	-	-	-	-	-	-	7
Total River:	22	-	-	7	-	-	-	7	-	-	-	-	-	-	36
6	70	20	-	-	-	-	-	650	-	-	40	-	-	1 Rud	781
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
8	60	-	-	-	-	-	-	410	-	-	2	-	-	-	472
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	30	-	-	-	-	-	-	-	-	-	-	30
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	30	-	-	-	-	-	-	425	-	-	-	-	-	20 Red	475
Total Lakes:	160	20	-	30	-	-	-	1485	-	-	42	-	-	21	1758
													Grand Total:		1794

Appendix 25

Aerial Count of October 16, 1972
Visibility: Good
Pilot: G. Milne

9:15 - 10:45 A.M. (1.4 hours)
Weather: Cloudy, 20°-25°F.
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2-3	1	-	-	-	-	-	-	-	-	-	-	9	-	-	10
3-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
4-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Total River:	1	-	-	-	-	-	-	-	-	-	-	9	-	-	10
6	1	-	-	-	-	-	-	206	-	-	-	4	-	1 Sw 4 Scot 3 Scot	219
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
8	-	-	-	-	-	-	-	265	-	-	-	-	-	-	265
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	-	-	-	-	-	-	-	15	-	-	-	-	-	-	15
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	-	-	-	-	-	-	-	250	-	-	-	15	-	2 Red	267
Total Lakes:	1	-	-	-	-	-	-	736	-	-	-	19	-	10	766
														Grand Total:	776

Appendix 26

Aerial Count of October 19, 1972
Visibility: Good
Pilot: G. Milne

11:15 - 1:15 P.M. (1.7 hours)
Weather: Cloudy, 32°-38°F.
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
1-2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	3
2-3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
3-4	-	-	-	1	-	-	-	-	-	-	-	-	-	1 Sw	2
4-5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Total River:	2	-	-	1	-	1	-	-	-	-	-	2	-	1	7
6	33	-	-	-	-	15	-	450	-	-	40	12	-	20 Scot 10 Scot	580
7	-	-	-	-	-	-	-	-	-	-	-	-	-	1 Sw	1
8	8	-	-	-	-	-	-	350	-	-	-	-	30 Red 2 Rud	1 Greb 3 Scot	394
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	10	-	-	-	-	-	-	-	-	-	-	10
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	-	-	-	1	-	10	-	310	10	-	-	2	10 Red	15 Scot 5 Scot	363
Total Lakes:	41	-	-	11	-	25	-	1110	10	-	40	14	42	55	1348

Grand Total: 1355

Appendix 27

Aerial Count of October 23, 1972
Visibility: Good
Pilot: G. Milne

10:00 - 11:30 A.M. (1.4 hours)
Weather: Cloudy, 38°-43°F
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
1-2	12	-	-	-	-	-	-	-	-	-	-	31	-	-	43
2-3	4	-	-	-	-	-	-	1	-	-	-	-	-	-	5
3-4	-	-	-	-	-	-	-	12	-	-	-	-	-	-	12
4-5	-	-	-	-	-	1	-	-	-	-	-	38	-	1 Scot	40
Total River:	17	-	-	-	-	1	-	13	-	-	-	69	-	1	101
6	-	-	-	1	-	2	-	6	-	-	10	-	-	-	19
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
8	-	-	-	-	-	-	-	30	-	-	-	-	-	1 Gre	31
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	-	-	-	-	-	2	-	35	2	-	-	-	-	1 Scot 1 Rud	41
Total Lakes:	-	-	-	1	-	4	-	71	2	-	10	-	-	3	91

Grand Total: 192

Appendix 28

Aerial Count of October 26, 1972
Visibility: Poor to Fair
Pilot: G. Milne

12:10 - 1:30 P.M. (1.3 hours)
Weather: Cloudy, 10°F.
Observer: T. Thormin

Check-Point	Mal	Pin	Teal	Wid	Shov	CG	Buf	Sc	Can	Gre	Co	Mer	Unid	Other	Total
Fort M.-1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6
1-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
2-3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
3-4	2	-	-	-	-	-	-	1	-	-	-	3	-	-	6
4-5	6	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Total River:	17	-	-	-	-	-	-	1	-	-	-	3	-	-	21
6	2	-	-	-	-	-	-	2	-	-	-	-	-	1 Rud	5
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
8	-	-	-	-	-	-	-	-	-	-	-	-	-	1 Rud	1
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
10	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13	-	-	-	-	-	-	-	50	-	-	-	3	-	-	53
Total Lakes:	2	-	-	-	-	-	-	56	-	-	-	3	-	2	63

Grand Total: 84

Appendix 29

GROUND OBSERVATIONS, SYNCRUDE WATERFOWL STUDY, SPRING, 1972

April 27 - p.m.	Wandering River to Fort McMurray
	11 pairs Mal, plus 8 Mal, 4 CG, 1 Buf, 9 GWT
	(1 drake Mal chasing hen on water)
May 4 - a.m.	Fort McMurray to Wandering River
	3 Mal, 7 GWT, 2 CG, 5 Buf, 9 Sc

Horseshoe Lake (Partial counts)

April 28 - p.m.	29 Mal, 21 GWT, 1 Wid, 16 CG, 9 Buf, 2 Pin,
	1 GBH, 1 Gre, 12 Shorebirds
	(Most paired. 1 drake Mal chasing hen)
April 29 - p.m.	10 Mal, 100 Pin, 11 Wid, 30 CG, 3 Buf, 2 Co,
	8 Shorebirds (Pintails came into flocks in
	evening to rest and feed.)
April 30 - p.m.	5 Mal, 6 GWT, 31 Wid, 12 CG, 14 Buf, 7 Sc, 2 Can
	1 Rud, 1 Loon (Common) (Male Buf approached
	female in typical breeding behavior)
May 1 - p.m.	6 Mal, 6 CG, 5 Buf, 20 Co, (14 Scr in V-flock
	going north, high-up.)
May 2 - a.m. (over 1/2 of Lake counted)	6 Mal, 2 Pin, 28 GWT, 14 Wid, 20 CG, 17 Buf,
	36 Sc, 5 Red-necked grebes, 3 Eared-grebes,
	1 Horned grebe. (TOTAL: 175)
May 11 - p.m.	2 Mal, 3 drake Shov

Appendix 29 (Cont'd)

May 22 - p.m. — 8 Mal, 7 Wid, 4 BWT, 2 Shov, 3 Ring, 12 Co, 2 Eared grebes (drake Wid with hen chases another drake away.)

Mildred Lake:

May 9 - p.m. — 18 Mal, 8 Pin, 22 Wid, 22 GWT, 2 BWT, 6 CG, 5 Buf, 118 Sc, 6 Can, 4 Old-squaws, 2 White-winged scoters, 1 Surf scoter, 9 Horned grebes, 1 Rednecked grebe, 2 Common loons, 75 unidentified. (Total - 285) (Lake was totally ice-free today, 60% ice-free yesterday. Breeding activity by Mal and CG.)

May 11 - p.m. (Total count) — 8 Mal, 26 Wid, 11 GWT, 2 CG, 2 Buf, Approx. 300 Sc (in same location as a.m. aerial count), 6 Red-necked grebes, 3 Common loons. (Total - 350) (Wid show breeding activity)

May 12 - p.m. (Total count) — 12 Mal, 2 Pin, 12 Wid drakes, 20 Wid, 12 GWT, 2 CG, 8 Buf, ±300 Sc (most in same place as yesterday and apparently same group, about 75% drakes) 2 Can, 2 Red-necked grebes, 3 loons. (Total - 375) (Most Sc resting, some feeding).

May 13 - p.m. (Partial count in middle) — ±400 Sc in middle of lake or same place as yesterday. Same group, but larger, still about 75% male. 3 drake Buf, 4 drake Wid, 1 drake Can.

May 14 - p.m. — Same ±400 Sc in same place.

Appendix 29 (Cont'd)

May 15 - a.m.	Same ±400 Sc in same place, 2 Mal, 3 Western grebes, 2 Buf, 2 Ring, 2 White-winged scoters, 1 loon. (2 Buf showed breeding behavior)
May 17 - p.m.	Only ±200 Sc in same place today. 3 White-winged scoters, 3 Surf, 2 Ring, and a few CG and Buf.
May 18 - p.m.	Count of 200 + Sc in same place. (Most resting, some feeding) 6 Mal, 3 BWT, 2 GWT, 12 CG, 8 Buf, 20 + Ring, 10 Surf scoters. (3 small groups of CG show vigorous breeding behaviour. Mating noted.)
May 19 - p.m.	Quick check showed same ±200 Sc in same place.
May 23 - p.m.	Only 11 Sc in same place as yesterday's aerial count. Note well. 3 Mal, 3 Wid, 4 CG, 5 Buf, 5 Rud, 7 Ring, 6 Surf scoters. (Surf scoters show some breeding behaviour)
May 23 - June 2	Sporadic checks showed small numbers of ducks daily.

Appendix 30

CHRONOLOGY OF BREAK-UP AND

FREEZE-UP ON STUDY AREA, 1972

CHECKPOINT	NAME	BREAK-UP	FREEZE-UP
1 - 5	Athabasca River	April 28 - Open for 1 -2 miles below G.C.O.S. plant. May 3 - River broken up and nearly free of ice flows.	October 10 to October 23: 10% frozen, mostly along shore. Some ice floating down river. October 26: 20% frozen.
6	Saline Lake	Partially open on May 3 All ice-free by May 8	20% frozen on October 12 95% frozen on October
7	Horseshoe Lake	Partially open by April 27 Nearly all open on May 3	90% frozen on October 12 100% frozen on October 16
8	Mildred Lake	60% open on May 8 100% open on May 9	30% frozen on October 12 99% frozen on October 26
9	Slough near Mildred Lake	Frozen on May 3 Open on May 8	100% frozen on October 12
10	Slough across from Syncrude	Frozen on May 3 Open on May 8	50% frozen on October 12 100% frozen on October 16 97% frozen on October 26
11	Slough across from G.C.O.S.	Frozen on May 3 Open on May 8	100% frozen on October 12
12	Slough near Ruth Lake	Closed on May 8 Open on May 11	100% frozen on October 12
13	Ruth Lake	Partially open on May 8 Open on May 11	95% frozen on October 26

Conditions of Use

Syncrude Canada Ltd., 1973. Migratory waterfowl and the Syncrude tar sands lease: A report. Syncrude Canada Ltd., Edmonton, Alberta. Environmental Research Monograph 1973-3. 67 pp. plus appendices.