The Granite Canyon Dam Proposal

A Preliminary Ecological Reconnaisance

of the Impoundment Area

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Introduction:

In mid-1974, the Northern Canada Power Commission announced the need for a major hydro power development in order to meet Yukon projected power demands through the 1980's. The first phase of the development program resulted in the publication of "The Development of Power in the Yukon" in January 1975 by Sigma Resource Consultants Ltd. The main objectives of the Sigma Report were: to estimate the probable range of future loads; to inventory available energy sources, and to select the more promising site alternatives. This report also included discussions of the fish, wildlife, forest, mineral, recreational, historical and scientific values in general terms as they pertain to hydro development.

The Yukon Conservation Society, in May 1975, sponsored a seminar on power development and the Game Branch was solicited for input at this seminar. After thoroughly examining the Sigma Report, Assistant Direct Hoefs publicly criticized the inadequacies and mis-statements of that portion of the Sigma Report dealing with wildlife resources.

As a result of this seminar and the lack of current wild-life information from higher priority hydro sites, the Game Branch initiated a biological reconnaissance of the Granite Canyon impound-ment area.

Because of time and monetary restrictions, these surveys and this report are limited in depth of coverage and serve only as a preliminary examination of the lower Macmillan and adjacent Pelly River flood plains.

Methods and Equipment:

On the June and September river surveys we used a rented 28 foot river boat powered by a 35 H.P. outboard engine. A field outfit sufficient for three men for seven days was carried. In June, Mr. Jared Wilkinson accompanied Mr. J. Jack and Mr. G. Lortie of the Game Branch; while in September Mr. Ed Wilkinson accompanied Mr. M. Hoffman and Mr. Lortie. The Wilkinson brothers, having lived in the area for more than forty years, provided invaluable practical assistance on the river and a wealth of local information.

Our daily procedure consisted of alternately travelling for an hour or so on the river, taking notes while underway on birds, tracks, beaver houses seen, etc., and then stopping to examine representative habitats, recording in more detail the life forms present, describing the habitat and photographing the area. Each site was given an observation number on a map and in the field notes.

A search of the Yukon Regional Library and Archives was conducted to gather information for an historical perspective.

The Study Area:

The proposed impoundment area was visited on two occasions during 1975: firstly, from the 16th to 22nd of June we travelled the Pelly River between the Wilkinson place (14 miles above Pelly Crossing) and the mouth of the Earn River, and the Macmillan River from its confluence with the Pelly upstream to "Mud Slough" directly south of Mt. Kalzas. Our second visit from the 15th to 19th September was spent on the Pelly River above the Wilkinson place to the mouth of the Macmillan River and upstream on the Macmillan as far as Lone Mountain. In January, 1976, we intend to visit the area via helicopter to inventory wintering moose populations on the river flood plains. The results of this flight will appear as a separate appendix to this report.

Survey Cost:

June:	
10 man days at $50.00/day	$ 500.00
Food	60.00
Boat Rental	200.00
Fuel & Oil	120.00
Miscellaneous	20.00
	$ 900.00
September:	
6 man days at $50.00/day	$ 300.00
Food	40.00
Boat Rental	120.00
Fuel & Oil	75.00
Miscellaneous	20.00
	$ 555.00
Report Preparation and Photowork:	
5 man days at $50.00/day	$ 250.00
Photowork	60.00
	$ 310.00
	$1,765.00

Study Area:

(i) Physiography:

The physiography and glacial history of the area is described in considerable detail by McConnell (1902), Bostock (1948a) and Campbell (1967). These authors, however, have descriptively little to say of the river valleys. The Macmillan and Pelly River valleys are generally described as being composed of silt, sand and gravel stream deposits or till of glacial origin. The Macmillan valley is geologically the oldest valley in the Yukon Territory (Bostock to J. Wilkinson, pers. comm.). circ. 1948.

(ii) Soils:

Noteworthy, with regard to soils, are the thick clays and silty clays, believed to be of lake origin, found along the Macmillan River and the 15 miles of Pelly River above the Macmillan mouth. The clay, when saturated with water, slides on very low gradients and several slide scars have been observed. Some of these slides must have dammed Macmillan River for brief periods (Campbell, 1967). This writer observed similar phenomena, minor examples of which were photographed and will be discussed later. A large slide did dam the Macmillan briefly in 1937 (J. Wilkinson, pers. comm.) and was large enough to defy photography from the river.

(iii) History:

On 22 July, 1840, Robert Campbell "discovered" the Pelly River at Pelly Banks, and in June of 1843 he "discovered" and named the Macmillan River (Todd, 1958). These and following events were the beginning of the commercial fur trade in the Upper Yukon.

After the discovery of gold on Rabbit Creek in August of 1896 and the subsequent influx of thousands of white men to the Yukon Basin, many of the unsuccessful gold seekers and those arriving too late for the rush made a livelihood by trapping on the main tributaries of the upper Yukon River. The first white trappers arrived on the Macmillan River at Moose Lake in 1899 (Armstrong, 1937), and traded at Fort Selkirk. The significance of this alternate livelihood is clear; in 1901 15 trappers took seven thousand dollars worth of marten, and in 1904 50 trappers, active in the Macmillan valley, took eighteen thousand dollars in marten and lynx pelts (Keele, 1910).

The Macmillan River has a sustained history of trapping. At various times independent traders operated on the river, among them - one Anton Leland, a colourful Norwegian, and a Mr. and Mrs. Zimmerlie, who opened a trading house at the Macmillan forks in 1925 (Armstrong,1937). Four trappers are currently active along the lower Macmillan and adjacent Pelly Rivers.

As a further consequence of the Klondike Gold Rush the search for gold spread over the entire Yukon drainage. In 1898, Duncan Gillis discovered gold on Russell Creek, a tributary of the Macmillan River (Bostock, unpublished).

Following this discovery, in August of 1901, a small party comprised of Gillis, N.A.D. Armstrong, Charles Barwell, a legal surveyor and four others established a mining concession on Russell Creek, their having arrived by the steam launch "Prospector", the first such craft to ascend the Macmillan River. Indeed, interest in gold on the Macmillan persisted, as in August of 1914 Armstrong met R. Henderson, co-discoverer of the Klondike, in a prospecting camp on the Macmillan. Armstrong and his various associates were active at Russell Creek until 1926, their dream of riches never being realized (Bostock, unpubl.).

(iii) History (cont'd)

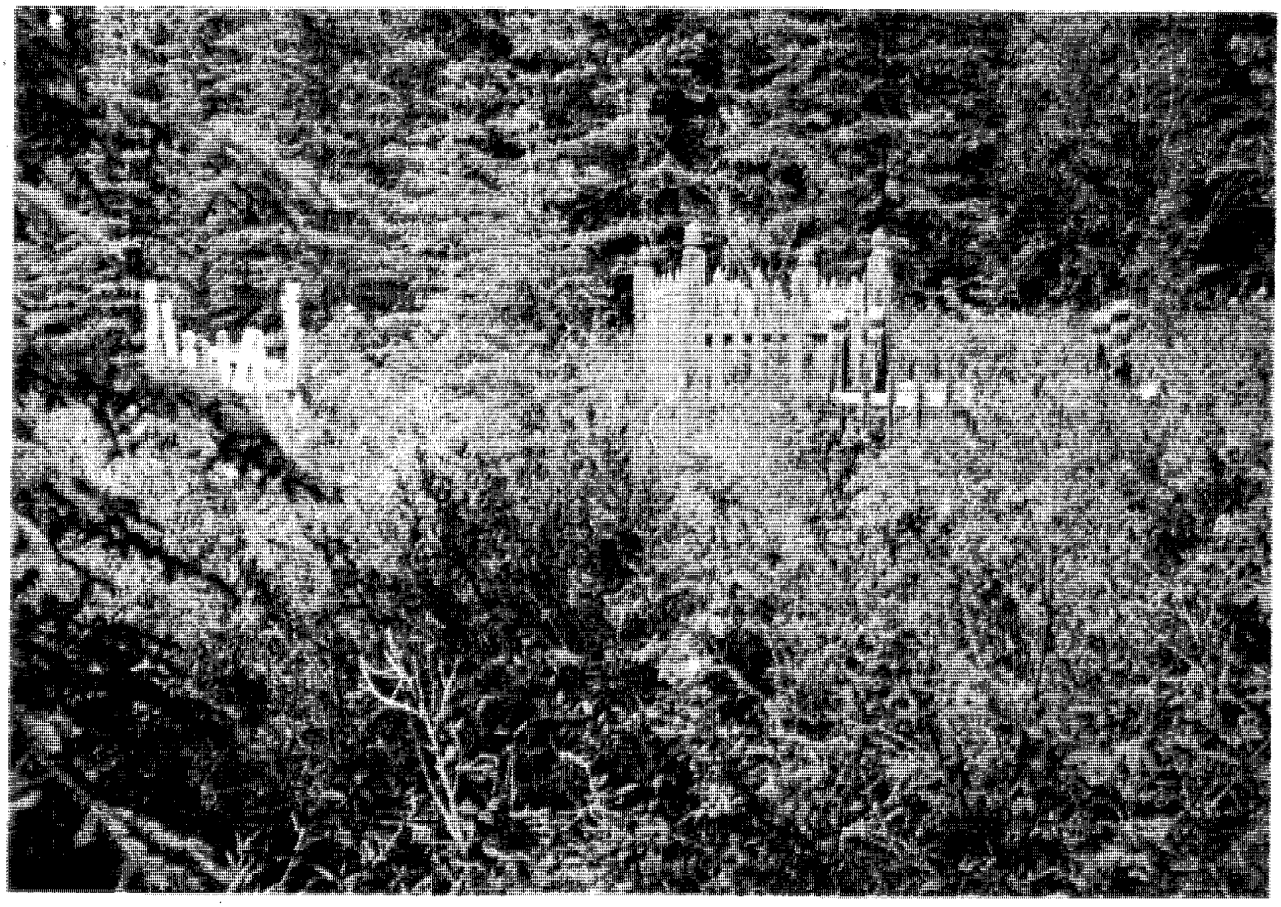
The superb stands of white spruce along the Pelly and Macmillan Rivers did not go unnoticed during and after the gold rush. Rafts of saw logs destined for the Dawson mill were cut annually along these rivers (Keele, 1910) and at least until the mid-1930's the cutting of commercial timber destined for Dawson was practised (J. Wilkinson, person. comm.).

Historically, game in the Pelly and Macmillan valleys was considered abundant (Campbell, 1840; Selous, 1907; Osgood, 1909; Sheldon, 1911; and Armstrong, 1937). More recently, a sustained abundance of game, most particularly moose, is substantiated by observations of J. Wilkinson (pers. comm.) and Uwe Ponisch (pers. comm.) on the upper and middle Macmillan River. Sheldon (1911) notes having met market hunters at Fort Selkirk in 1904 returning to Dawson with the carcasses of several moose and caribou from the Macmillan country. The recent history of this area is fragmentary. Worthwhile historical information may probably be found in R.C.M.P. records from Selkirk, government documents such as land titles, church records and persons still living. An historical search of this sort is beyond the scope of this report.

(iv) Archeology:

Specific archeological references on the Macmillan and adjacent Pelly Rivers were not found. Archeological work to-date in this area of the Yukon seems to have been concentrated around Ross River, Pelly Crossing and Mayo. It is not clear whether the want of archeological information is due to a lack of research effort or lack of material with which to work. But as noted in the Sigma Report, the former is likely.

Recent native habitation of the Macmillan valley is evidenced by the site of Kalzas village, now derelict and abandoned, and the adjoining graveyard on the opposite (north) side of the Kalzas River at the mouth.



The Graveyard at the confluence of the Kalzas and Macmillan Rivers near the site of Kalzas Village.

A Catalogue of Major Habitat Types on the Proposed Granite Canyon Impoundment - Macmillan and Pelly Rivers.

This section pictorially presents and briefly discusses the dominant flora and the significance of the major habitat types found on the proposed impoundment area. The descriptions are very much incomplete and do not account for comprehensive floral compositions of the various communities; nor do they include the wide array of microhabitats, the description of which is beyond the scope of this report.

The Needle Rock at the low end of Granite Canyon.

Pelly River

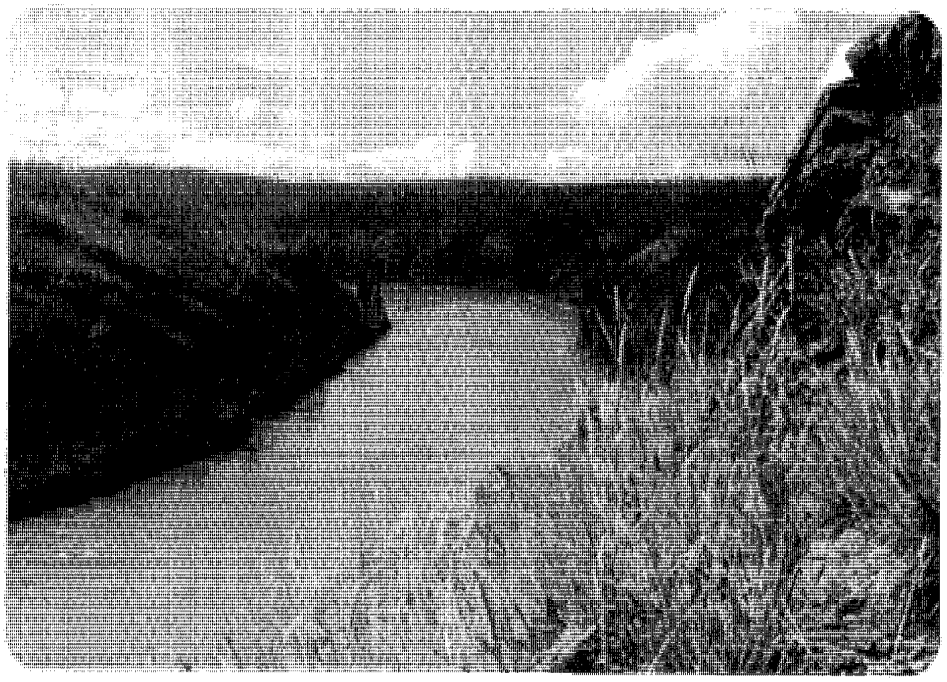


Photo #1: The Dam Site near Upper End of Granite Canyon. (June)

Riparian Habitats

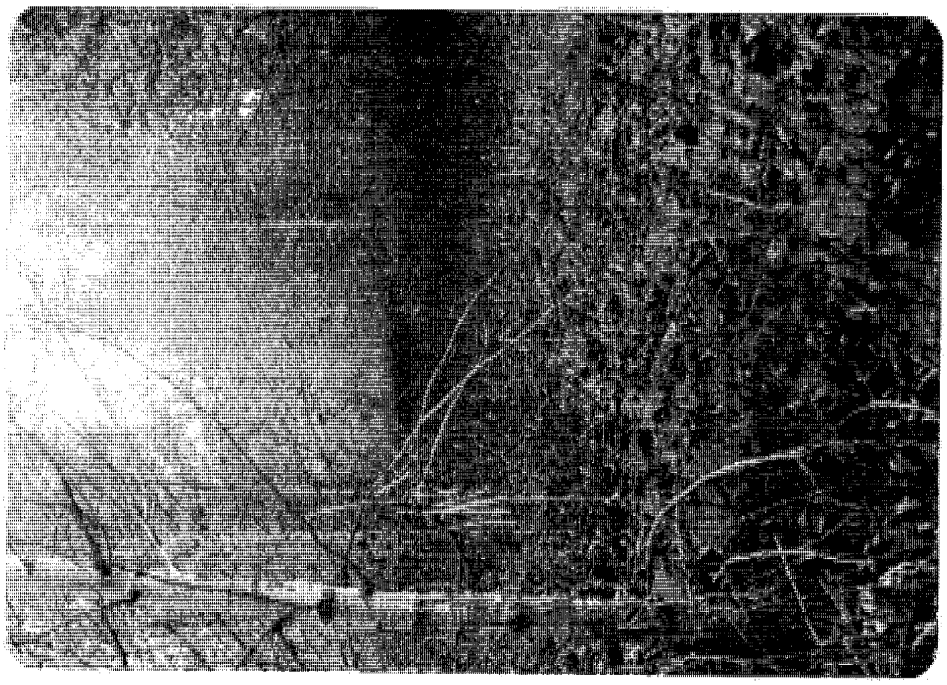


Photo #2: Poplar-Alder-Scouring rush
Observation #2 (June)

Flora: Alder (Alnus), Poplar (Populus) and Willow (Salix) in both dense and open stands. The annual flooding and consequent deposition of silt precludes the establishment of grasses, sedges and forbs. The ground cover is Scouring rush or horsetail (Equisetum) of two species.

The recurring annual flooding on these sites maintains the vegetational sequence at this stage. Riparian habitats of this type are very important to beaver as a source of food and building materials. Not evident in the photo, the less robust of the Equisetum within a few weeks will cover the ground surface. This plant is an important food source to bear in early summer and extremely important to geese in the late summer and fall.

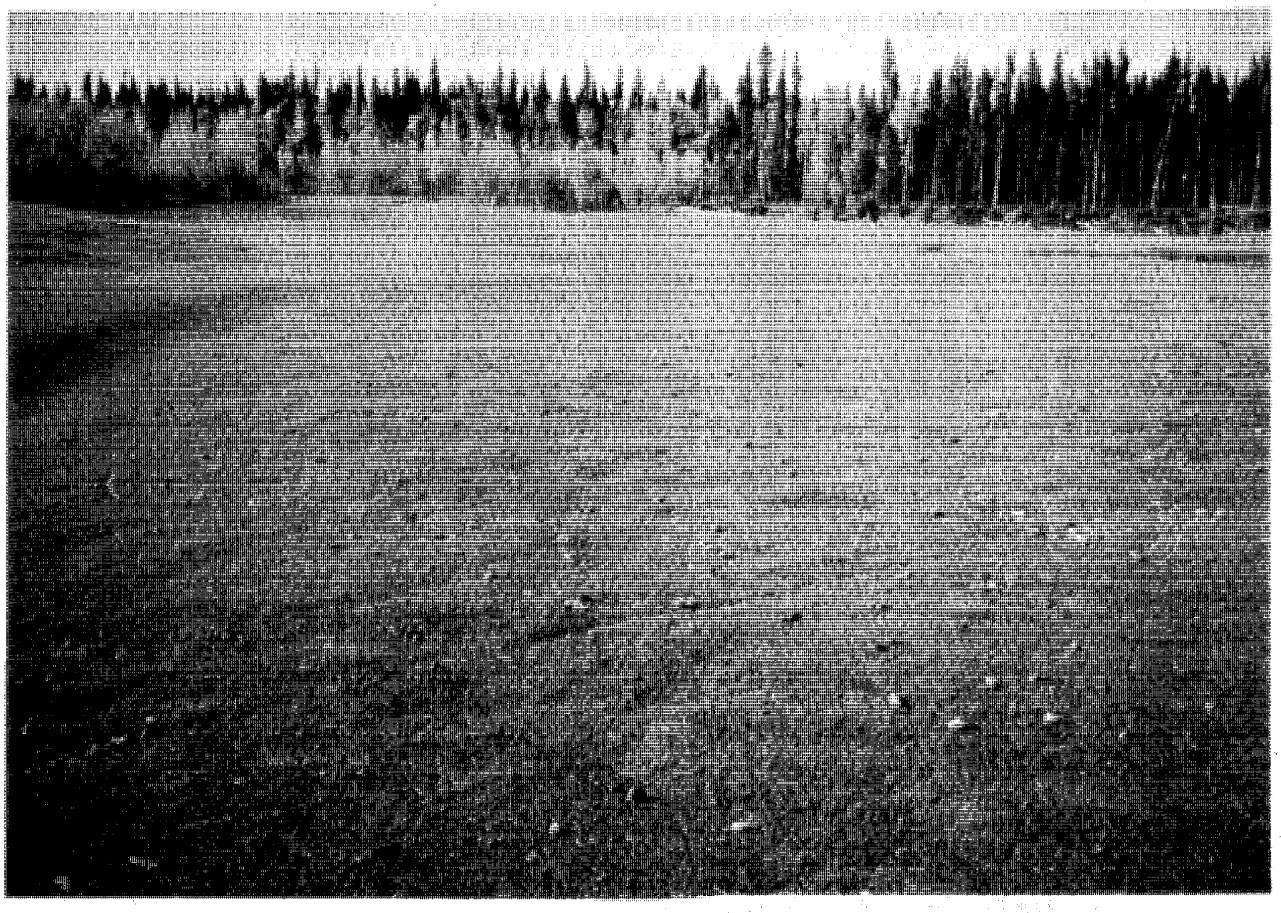


Photo #3: Goose Bar at Mouth of Macmillan River. (September)

Silt bar habitat similar to that of Photo #2, taken at a lower water stage, showing the dense stand of grazed Equisetum which develops on the slack or deposition side of a bar. This bar has been completely grazed by geese. Note the entire area covered with goose droppings.

Photo #4: Heavily Browsed Willow and Dogwood. (June)
Observation #8

Extensive browsing of Willow (Salix alaxensis) and Red Osier Dogwood (Cornus stolonifera) on a stable bar. The winter browsing of these high quality forage species reflects a dependence of wintering moose on river bottom sites such as this.

Stable Flood Plain Communities

Photo #5: White Spruce Stand. (June)
Observation #9

A stand of mature white spruce on the natural levee adjacent to the river. Reaching 70 feet or more on the drier and more stable sites on the flood plains, these stands occupy a significant portion of the river bottom. Note the ground cover of Equisetum and mosses.

This type of habitat is important to bear in the spring and serves as cover to wintering moose.

Photo #6: Black Spruce - Ledum - Sphagnum Muskeg. (June)
Observation #13

Sites such as this represent the floral climax on poorly drained stable sites. Notice the undercutting with resulting overhang of the root mat and mosses. Notice also the lens of permafrost in the bank on the extreme left.

This plant community is of lesser value to game animals. However, sites like this are typical of those favoured by wintering caribou, and they do have a unique complement of small mammals and migrant birds during the summer months.

Upland Communities

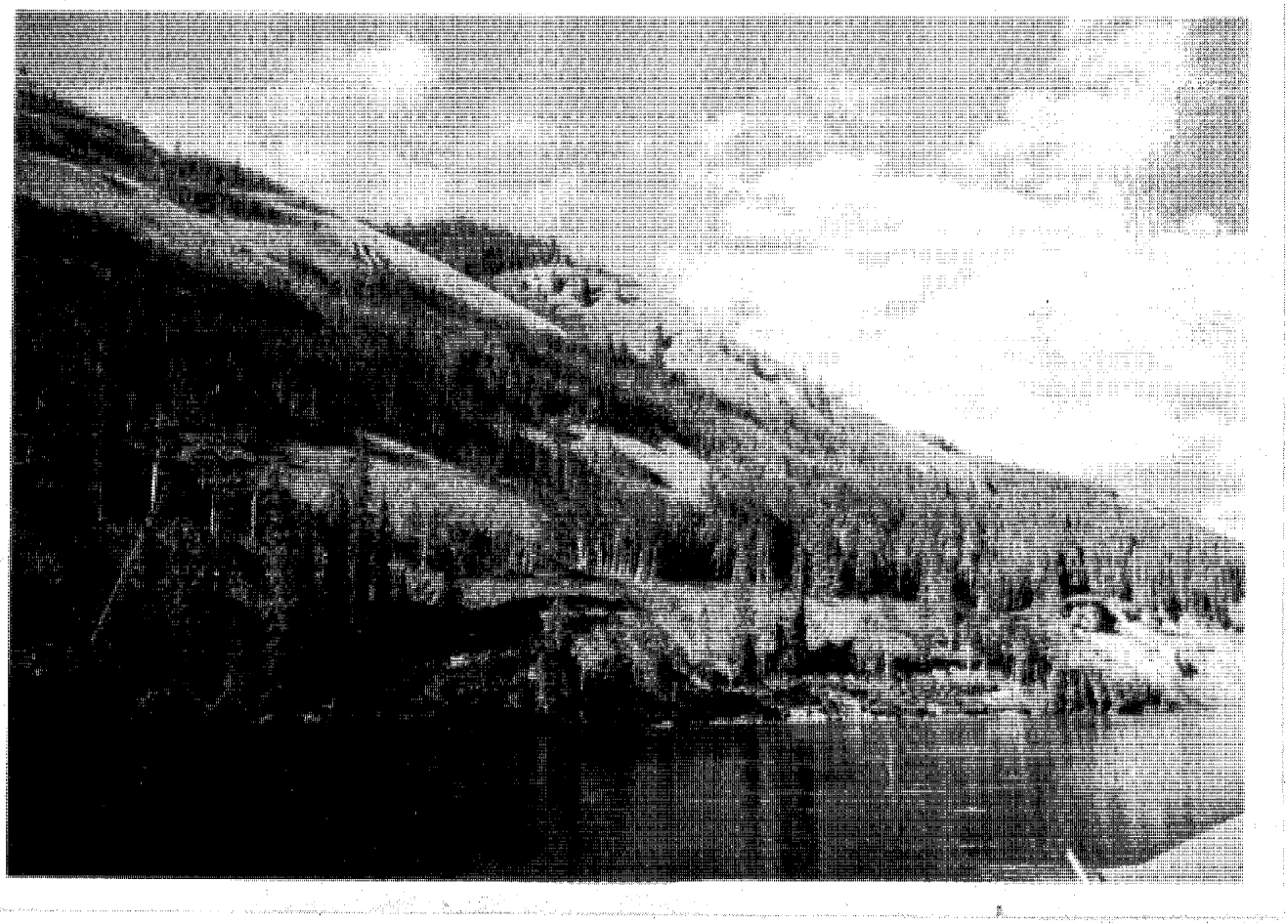


Photo #7: Mixed Conifer-Deciduous-Grassland
Observation #9

This plant community occupies the south facing slope on Pelmac Ridge from the mouth of the Macmillan to Observation point #12. This habitat is critical to bear in the spring. The slope and exposure permit an early snow melt and plant growth, upon which bears emerging from dens depend.

(See App. #3 for a more detailed floral description)

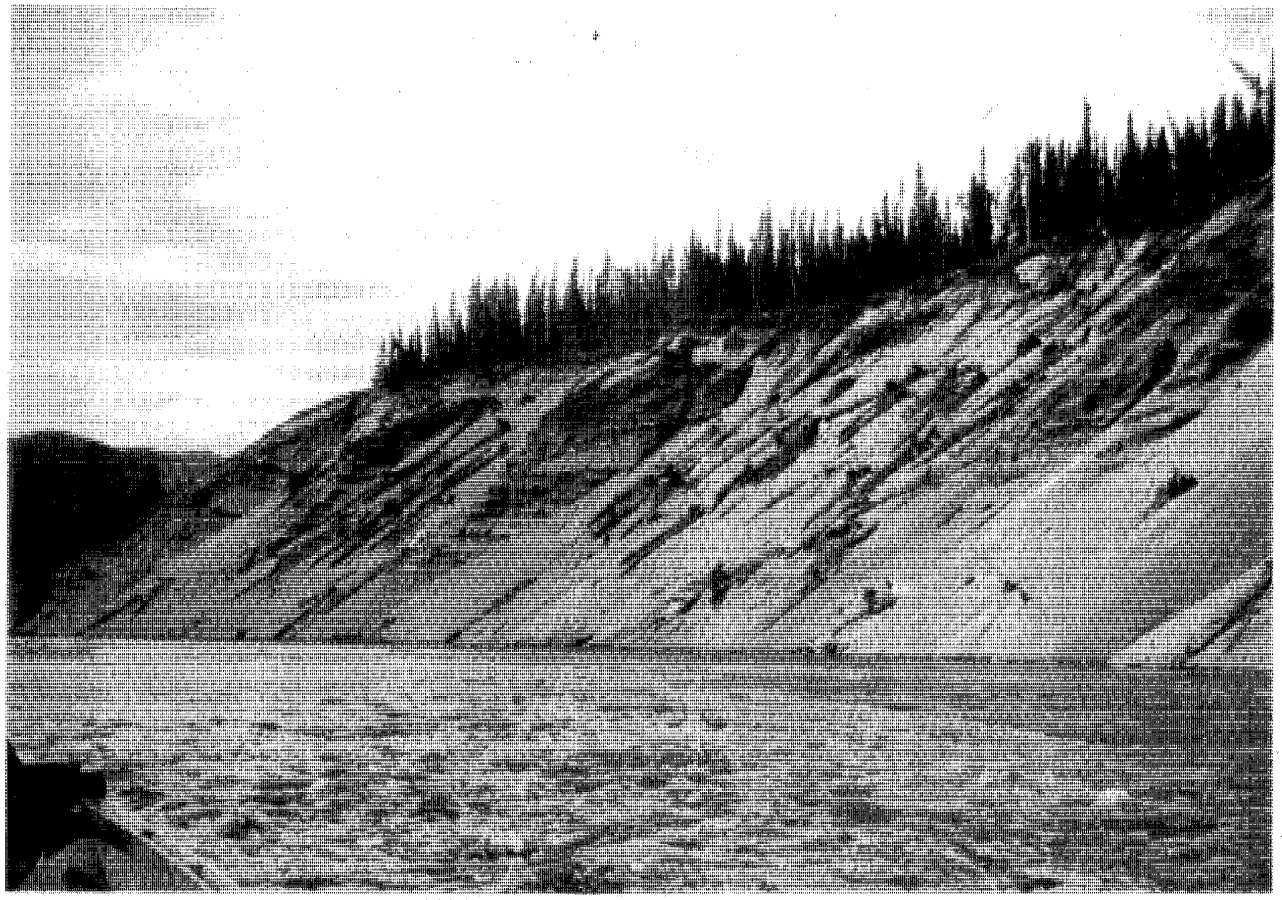


Photo #8: Upland Climax White Spruce.

The benchlands adjacent the river are primarily occupied by this climax white spruce community. While not the most productive community in terms of game animals it is important to furbearers such as marten. Recent fires have destroyed large tracts of this forest type, creating higher quality habitat for game animals, notably moose.

Macmillan River

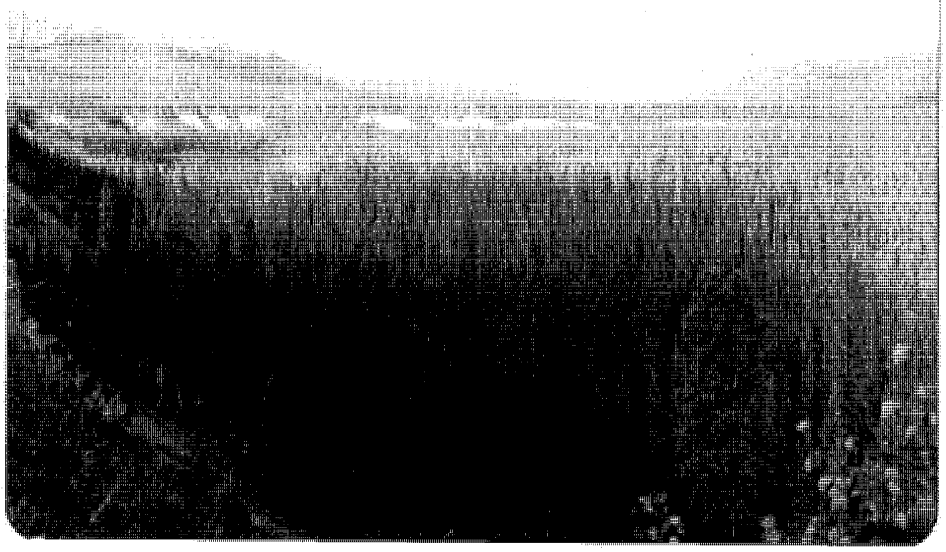


Photo #1: Looking up the Macmillan valley from the silt bluff north of the mouth. Note the stand of mature white spruce in the foreground. Pelmac ridge is on the right with Mt. Kalzas in the middle background.

Wetland Habitats

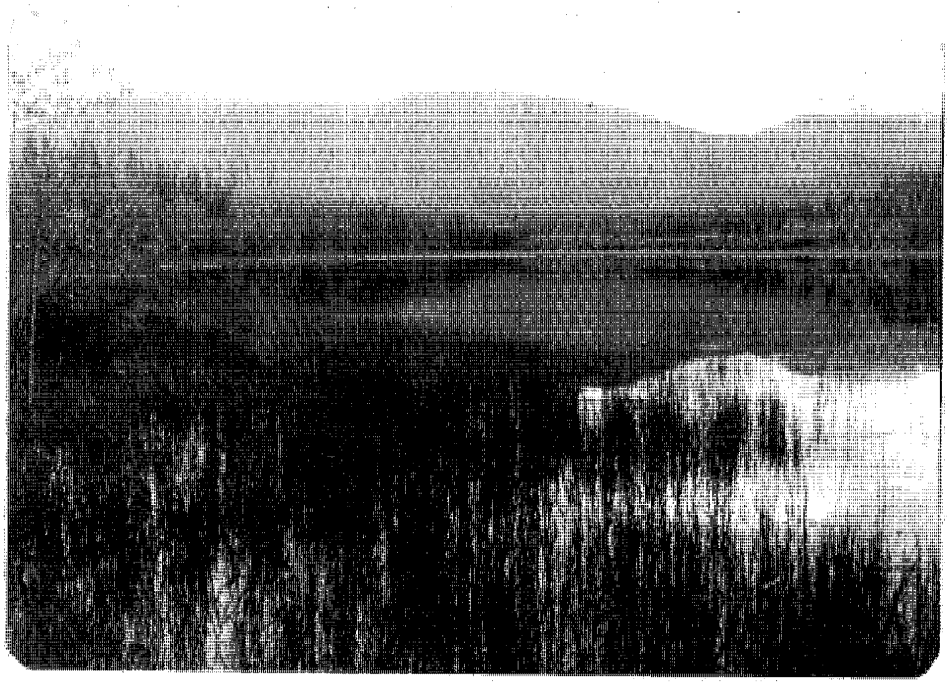


Photo #2: Eutrophic oxbow at Observation point #W_2

This abandoned channel of the Macmillan River in an early stage of eutrophication is characterized by a shallow shore (littoral) zone with a moderately developed Carex edge. Nutrient rich water supports dense invertebrate populations and aquatic plants. This habitat is valuable to breeding waterfowl because of the abundant food supply and available cover for young broods. The well developed dense band of poplar and willow surrounding the lake is important to a variety of small birds and wintering moose. Note the mature white spruce on the levee of the active channel.

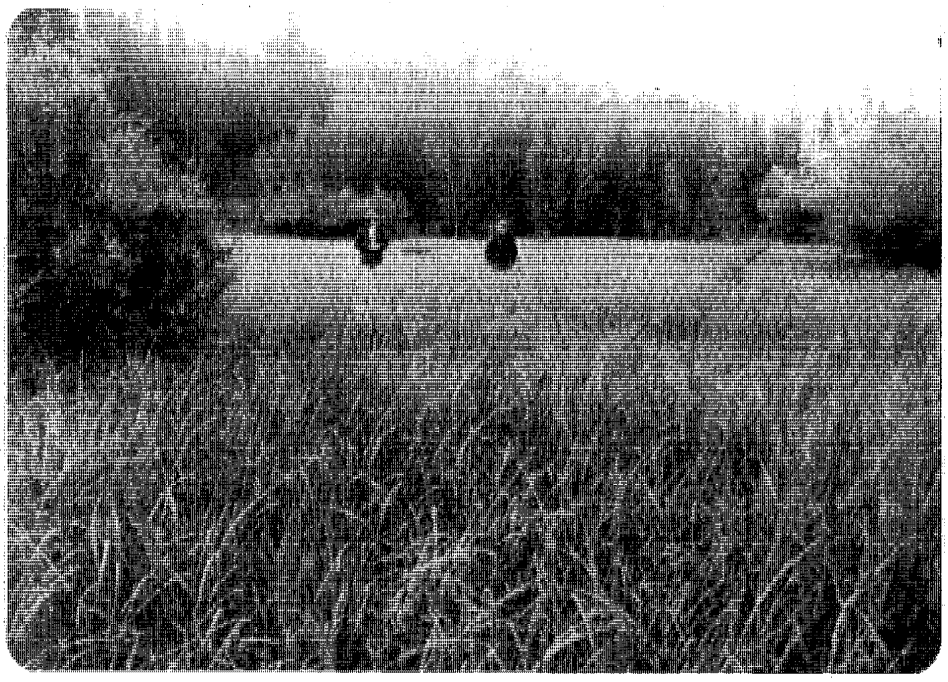


Photo #3: Dystrophic stream channel - W_3

This wet sedge (Carex) meadow represents an advanced stage in the successional sequence on an abandoned stream channel. Shallow remnant patches of water and the dense Carex stand provide food and cover for Wilson's snipe and lesser yellowlegs. Note the encroachment by willow into the meadow and the browsed limbs of the willow on left. This habitat is important to wintering moose.

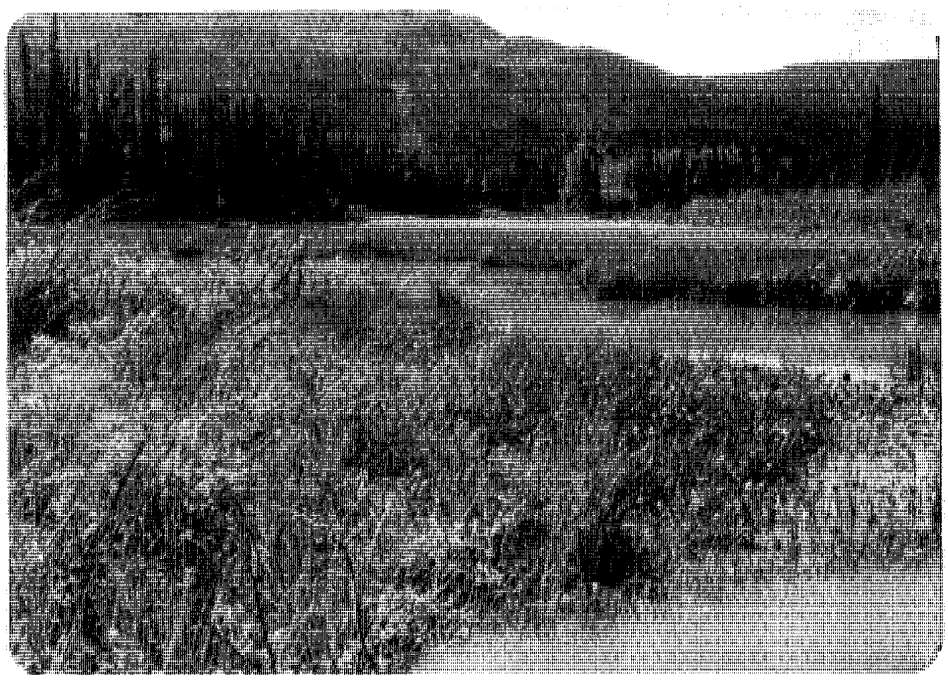


Photo #4: "Henderson Slough" -W_4

In the successional sequence, this slough is midway between the habitats in the previous two photographs. The edge of Carex and buckbean (Menganthes) is very advanced. This is good waterfowl, muskrat and mink habitat. Three old moose rutting pits were found in the area.

Photo #5: "Snipe Slough" -W_5

This oxbow in the middle stages of eutrophication is characterized by a sedge, grass and forb edge. The blue flowers are Tall Jacob's Ladder (Polemonium). Eleven species of waterfowl and large shore birds were noted at this site. The site is named because of the large number of Wilson's snipe frequenting the area in the spring. We found a nest with 4 eggs. The area is further noted among those familiar with it, as a good fall duck hunting place. Moose use this area on a year round basis. Trapper, Jared Wilkinson, with Mt. Kalzas in background.

Photo #6: "Mud Slough" -W_7

Another oxbow in the advanced stages of eutrophication. Taken in September, this photo shows approximately 100 mallard, wigeon, pintail and green-winged teal in a mixed flock. Our fall trip was much too late for good waterfowl counts. Geese had used the area recently and on the June trip 3 pair of Canada Geese were here. This site is known locally as one of the best areas to hunt ducks and geese. The east end of the Kalzas Range is in the background.

Other Flood Plain Communities

Photo #7: Birch Island: (see App.#3 for a more detailed floral description)

A beautiful mixed forest of poplar and spruce dominated by mature paper birch (Betula). This community is locally abundant on islands and meanders over the surveyed length of the Macmillan. The understory of lowbush cranberry (Viburnum), Red Osier Dogwood (Cornus), wild rose (Rosa), was moderately to heavily browsed by moose with a strong preference for the dogwood. A dense ground cover of Equisetum and fresh digging indicates the importance of this habitat to bear.

Photo #8: Poplar Dominated Community - #4.
(see App. #3 for a more detailed floral description)

This community of predominantly balsam poplar is common along much of the low lying but stable shoreline. Young white spruce are coming up through the understory of wild rose and low bush cranberry. Habitats like this and Birch Island with a shrubby understory of berry producing plants are important to bear in August when the crop is ripe.

Moose leave the mountains earlier in the fall in this area due to heavier snowfalls and shed antlers may be seen on bars in this vicinity by mid-December. (J. Wilkinson, pers.comm.)

Photo #9: Mature White Spruce -W5
(See App. #3 for a more detailed floral description)

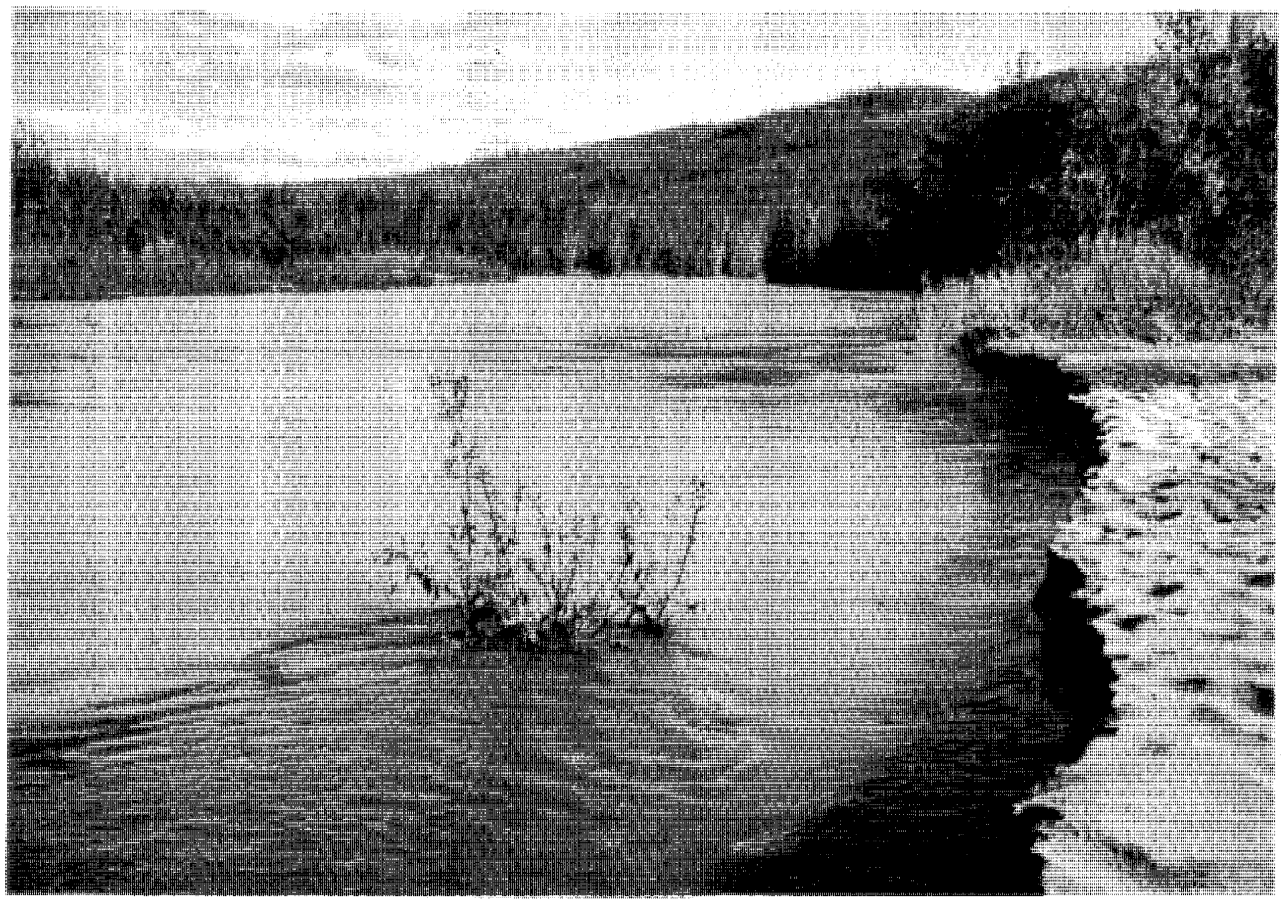
Specimens like this are typical in white spruce stands on stable, drier sites on the natural levee. These stands are not extensive but occur in frequent small areas and strips along the river. This forest type is the vegetational climax on these sites and apart from its potential commercial value it is important as cover to wintering moose and furbearers such as marten and red squirrel.

The Ecology of the Impoundment Area

The prime intent of this section is to convey to the reader that the variety and interspersion of these habitats is of utmost importance to a variety of wildlife.

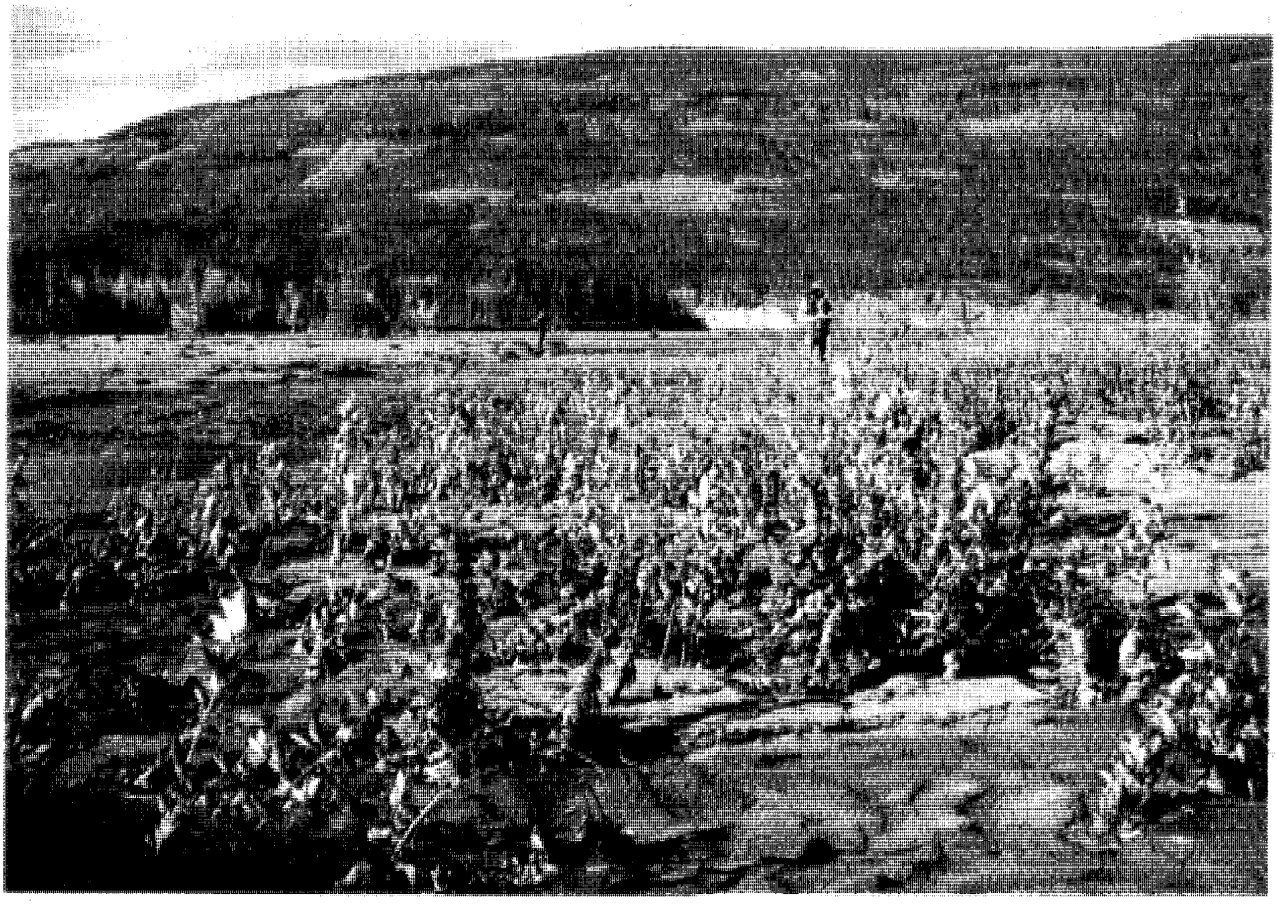
This array of habitats is a result of two major forces: (i) the action of the rivers themselves by continually modifying the flood plains through cutting and the annual re-distribution of sediments and nutrients, and (ii) the recent fire history on adjacent uplands.

To illustrate the first point, refer to Photo #6 in the Pelly River catalogue. The river here is destroying a relatively unproductive climax black spruce habitat. As a result, on the inside of the same bend or immediately below, a productive riparian habitat is developing similar to that shown immediately below.



This picture as well depicts minor cutting at high water on one side of a bar with the consequent destruction of vegetation.

The following photograph is the opposite side of the same bar, an area of deposition in slack water, showing the vigorous growth of new willow.



Upland coniferous habitats similar to that shown in Photo #8 of the Pelly catalogue have been extensively modified by fire with the following result.

Taken at Observation point #1, the spruce forest burned in 1971. The tremendous flood of nutrients released by the fire is reflected in this profusion of pioneering annual forbs and grasses which are dominant in late summer.

After twenty years this site will be similar to that shown below.

The 1952 fire photographed at Observation point #2 has, at this stage, regenerated to Aspen (Populus) and willow (Salix of several species) in pure and mixed stands. These second growth habitats with their robust development of deciduous shrub species are heavily utilized by wintering moose.

Discussion:

The Sigma Report (tables 14.1 and 14.2) summarizes the effects of the various hydro development proposals. Phase 2 of hydro development planning provides for the detailed examination of the leading schemes, the selection of the site to be developed, and the preparation of a detailed impact assessment on that site.

These writers have several questions to raise regarding this planning procedure. Should not detailed environmental impact assessments be forwarded on the two or three first priority sites; and these findings form a more meaningful basis for site selection? In the absence of detailed environmental information, how can one use ecological criteria in site selection? In other words, what is the point in conducting an after-the-fact environmental assessment?

Phase 1 provided for public information meetings in several Yukon communities. Without current environmental information and the ecological implications to site alternatives, how were the public to evaluate these alternatives? They could not.

This report serves as a first installment in providing environmental information to the public on a first priority site.

On the basis of these on site examinations and the knowledge of what has occurred on similar developments in British Columbia, these writers present two serious implications of a reservoir above Granite Canyon.

(1) The Sigma Report did not specifically comment on the clearing of the proposed reservoir, but did suggest that clearing costs of $400 to $500 per acre were appropriate. Large areas of the proposed impoundment have burned over in recent years and the cost of clearing the reservoir of dead timber must certainly be considered in evaluating this site. Failure to clear the flooded portion of these burns will destroy any recreation potential the reservoir may otherwise provide.

Masses of floating snags will be commonplace on the downstream and leeward portions of the lake. This situation is aesthetically repugnant, a navigation and recreational hazard, and an enourmous day-to-day maintenance chore above the power plant. (2) Our second major concern is the problem of shoreline stabilization in an area with unique soil properties. Massive river bank slumping in clay soils was mentioned earlier. The photographs following illustrate this phenomenon in areas which are at the upper end of the proposed reservoir on both the Pelly and Macmillan Rivers.

Taken at Observation Point A, Macmillan River. Note the burned timber.

Taken one mile below Observation point #13, Pelly River.

The effects of saturation and wave action on these soils are obvious. Progressive slumping, masses of uprooted timber in the reservoir and shoreline stabilization an unknown but considerable distance back from the proposed shoreline are probable. The bottom profile near the shore will be very shallow. Draw downs of 50 feet will result in wide, snag-infested mud flats at low water stages. Because of the draw down timing and subsequent reservoir refilling during the summer months, these shallow shore zones will be totally unproductive of aquatic vegetation, waterfowl and aquatic mammals. The reservoir will be turbid with a subsequent reduction in light penetration, jeopardizing the potential for the establishment of submerged aquatic plants and any surviving fishery.

Further, these soils may have a direct effect on reservoir life through siltation, and considering the ultra fine texture of these soils, suspended material may have effects below the dam.

Unlike the clearing of burns, there is nothing that can be done to alleviate this condition.

Another major concern of the Granite Canyon proposal is the potential impact on the McArthur Game Sanctuary. This area has been recently investigated under the International Biological Program (IBP). Because of the sanctuary's unique ecological values, the entire area has been recommended as an IBP reserve. (Geist and Ogilvie, 1972)

Table 14.1 of the Sigma Report suggests possible effects on the McArthur IBP reserve due to loss of valley winter range. This project has far more serious implications to this reserve. There is the potential for serious damage to the several distinct plant communities unique to the south eastern reserve lowlands, the damaging of which negates the principle of the reserve.

Recommendations:

(1) We fully concur with the Sigma Report in the adoption of the Science Council of Canada recommendations as presented in Section 6.5 "Public Participation".

(2) In order to provide a more meaningful level of public input into a new hydro development, we recommend that more detailed environmental information of first priority sites be made available before a final decision.

(3) We recommend that the potential conflict between this proposal and the McArthur Sanctuary - IBP reserve be evaluated before a final site selection.

With specific regard to the Granite Canyon site we recommend:

(4) The clearing and burning of burned timber on the impoundment area.

(5) That the costs of clearing be considered in the economic evaluation of this site.

(6) That the wildlife, fishery, forest and recreational values of this site be fairly compared to similar values on other sites, - including Five Finger Rapids.

We further suggest that the unique properties of valley sediments above Granite Canyon be seriously regarded as a negative factor in the selection of this site.

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A P P E N D I C E S

Appendix I Annotated List of Birds - June (days afield)

Species	No. of Observations	No. of Days Observed	
Mallard	4	2	
Pintail	2	1	
Wigeon	9	4	
Shoveller	2	2	
Green-winged Teal	1	1	
Blue-winged Teal	1	1	
Unidentified Dabblers	1	1	
Bufflehead	4	4	
Goldeneye	5	2	
Lesser Scaup	2	2	
Common Merganser	2	2	
Canada Geese	15	4	
Trumpeter Swan	1	1	Site W_1, $\pm$ 40 birds every fall. (J. Wilkinson, pers. comm.)
Spotted Sandpiper	2	2	Approx. 1 pr/mi. of granular sloped shore line
Wilson's Snipe	2	2	Locally abundant
Lesser Yellowlegs	2	2	Locally abundant
Mew Gull	2	2	
Bonaparte's Gull	2	2	
Unidentified Charadriiformes	1	1	1 pr. large shore birds, W_5

Appendix I (cont'd)

Species	No. of Observations	No. of Days Observed	
Bank Swallow	many	5	Abundant in colonies established in all south-facing stable cut banks. Between the upper limit of Granite Canyon and the Macmillan mouth colonies comprised of the following no. of holes were noted: 150, 75, 100, 300, 150, 170, 100, 50, 200.
Com. Flicker	3	2	
Yellowbellied Sapsucker	1	1	
Varied Thrush	3	3	
Robin	1	1	
Swainson's Thrush	4	3	
Ruby-crowned Kinglet	1	1	
Rusty Blackbird	3	2	
Boreal Chickadee	1	1	
Nighthawk	2	2	
Kingfisher	3	3	
Phoebe	1	1	
Tree Sparrow	1	1	
3 Unident. Warblers	1	1	
2 Unident. Warblers	1	1	
Ruffed Grouse	3	3	
Bald Eagle	2	1	
Pigeon Hawk Merlin	1	1	
Raven	4	3	

Appendix I: Annotated List of Birds - September (days afield:)

Species	No. of Observations	No. of Days Observed	
Mallard	2	2	
Pintail	1	1	
Wigeon	1	1	
Green-winged Teal	1	1	
Canada Geese			None seen, but recent sign abundant on all bars sustaining stands of Equisetum
Sandhill Crane			Migrants, four flocks seen or heard
Unident. Shorebirds	1	1	Flock of 12, W7
Varied Thrush	1	1	
Pine Grosbeak	1	1	
Unident. Sparrow	1	1	
Unident. Passerines	1	1	2 large flocks, ± 150 birds
Spruce Grouse	1	1	
Hawkowl	4	3	

Appendix II Annotated List of Mammals - June ( )

Species	No. of Observations	No. of Days Observed	Evidence
Moose	16	4	1 moose seen, fresh sign, in the form of tracks, was abundant
Bear	3	3	Fresh digging in Hedysarum patches. Seasonally abundant on flood plain and south-facing slopes earlier in spring.
Grizzly Bear	3	3	Fresh tracks on bars
Wolf	1	1	Fresh track on bar
Wolverine	1	1	Fresh track on bar
Beaver	7	3	3 active houses, 1 animal seen, tracks and cutting.
Mountain Sheep			None seen, but small bands periodically seen at EW_1 and EW_2

Appendix II Annotated List of Mammals - September

Moose	many	3	6 animals seen from the river, sign abundant along the travelled portion of Macmillan River, in the form of fresh tracks on bars and beds - 3 rutting pits found.
Black Bear	2	2	Fresh tracks on bars
Grizzly Bear	1	1	Older track on bar
Lynx	1	1	Older track on bar
Wolverine	1	1	Older track on bar
Beaver	9	2	Active houses, fresh cutting
Muskrat	1	1	1 animal seen
Red Squirrel	2	2	Heard

APPENDIX III

Birch Island

At this site, the stand is of a mixed type with white birch (Betula papyrifera) being the dominant species and white spruce (Picea glauca) being the co-dominant. The canopy covers about 50 - 70% of the understory. White birch had an average height of 60 - 70 feet with an average DBH (diameter at breast height) of 10 - 12 inches. White spruce which was commonly mixed throughout had heights of 70 - 100 feet with average DBH of 12 inches.

The understory mostly consisted of lowbush cranberry (Viburna edule) which grew in a dense cover due to the moist, warm microclimate created by the canopy. Red-osier dogwood (Cornus stolonifera), wild prickly rose (Rosa acicularis), northern chiming bells (Mertensia paniculata var. paniculata), horsetail (Equisetum sp.), grew abundantly. Pink wintergreen (Pyrola asarifolia), northern red currant (Ribes triste) and bunchberry (Cornus canadensis) were common.

Decaying leaves in this stand contributed to a thick layer of humus.

Observation Point #4: Poplar Dominated Community

This hardwood stand is predominantly of balsam poplar. The crown cover is about 50 - 70% with stand height of 50 - 70 feet. The average DBH of the stand is 10 inches.

The understory is densely covered with lowbush cranberry, with white birch abundantly found and thoroughly mixed throughout the stand. Wild prickly rose formed a solid hedge row on the outer margin of the stand. Willow (Salix sp.) densely covered the sand bars and grew commonly in the stand, regenerating to white spruce.

Accumulation of decaying leaves formed a thick humus layer within the stand.

Observation Point #5: White Spruce Stand

This stand was mixed with white spruce being the dominant species. Balsam poplar (Populus balsamifera) and white birch grew commonly, but occasionally were found in clusters or clones. Canopy cover was 50 - 70% with an average height of the stand being 70 - 100 feet. The average DBH for white spruce was 20 - 24 inches, and for the co-dominant species was 15 - 20 inches. The stand in general seemed to be in a healthy state with very little destruction by insect or disease noticed.

Lowbush cranberry, red-osier dogwood, horsetail, wild prickly rose, northern red currant and northern black currant (Ribes hudsonianum) grew commonly in the understory. Willows (Salix sp.) were common.

The acidic soil layer was about 4 - 6 inches thick, with a good humus decay.

Heavy summer and winter browsing were evident on willows, red-osier dogwood and lowbush cranberry.

Pelmac Ridge

The south aspect of the Pelmac Ridge is made up of a combination of different plant communities, varying from pure white spruce stands to deciduous to grassland. Pure stands of white spruce were found near the river's edge, in creek beds, depressions, and at the top of the ridge. The south-facing slopes are of mixed stands with open areas of grassland meadows. Trembling aspen (Populus tremuloides) make up about 75% of these mixed stands. In the forested portion, the crown cover is about 50 - 70% with the average height being 30 - 50 feet.

No ground observations were made to catalogue specific plant species.

APPENDIX IV Number of Furbearers Trapped Each Trapping Season In A Portion Of The Impoundment Area By Registered Trapline Holder, Mr. Jared Wilkinson.

SEASON	NUMBER OF FURBEARERS HARVESTED
63/64	2 red fox, 1 x-fox, 1 silver fox, 26 lynx, 1 marten, 2 mink, 100 squirrels, 5 weasels, 1 wolf, 1 wolverine
64/65	5 lynx, 100 squirrels, 5 weasels, 1 coyote, 1 wolverine
65/66	4 red fox, 7 lynx, 2 marten, 103 squirrels, 8 weasel, 2 wolverine
66/69	no record
69/70	no record
70/71	1 beaver, 4 red fox, 1 lynx, 7 marten, 77 squirrels, 8 weasels, 1 wolf
71/72	5 beaver, 2 red fox, 26 x-fox, 23 lynx, 5 marten, 2 mink, 10 squirrels, 6 wolf, 2 coyote, 2 wolverine
72/73	1 beaver, 10 red fox, 7 x-fox, 37 lynx, 2 marten, 3 mink, 63 squirrels, 4 wolverine, 4 wolves, 1 coyote
73/74	32 beaver, 10 red fox, 6 x-fox, 18 lynx, 15 marten, 140 squirrels, 1 otter, 2 weasel, 5 wolverine, 5 wolves
74/75	1 beaver, 4 red fox, 6 lynx, 9 marten, 70 squirrels, 2 wolverine, 4 wolves

Source: General Hunting Licence Returns; Yukon Game Branch.

A WINTER MOOSE SURVEY ON THE PROPOSED GRANITE CANYON IMPOUNDMENT AREA - PELLY AND McMILLAN RIVERS

DATE: 19th February, 1976

WEATHER: Clear and cold (-39° C)

OBSERVATION CONDITION: Excellent

AIRCRAFT: Bell 206 C-GTND

PILOT: Norman Rafuse

OBSERVERS: Drummond, Nette and Lortie

SURVEY ALTITUDE: 150'

SURVEY SPEED: 75 m.p.h.

A morning reconnaissance of Pelly River from the "Hairpin Bend" near the upper limit of the proposed reservoir to the mouth of the McMillan River resulted in 61 moose observed on the floodplain. Moose were concentrated with scarce sign in adjacent uplands.

A similar reconnaissance up the McMillan River from the mouth to "Antone Bend" at the upper limit of the proposed reservoir resulted in 27 moose seen.

Below the McMillan mouth on the Pelly River to the dam site in upper Granite Canyon, no moose or their sign was noted.

Vegetation cover in the McMillan is much denser than that on the Pelly, consequently the visibility of, and the probability of seeing moose is lower. Little was to be gained by a transect survey on the McMillan.

A cross valley transect survey was taken on the Pelly River. Thirteen transects were flown 2 minutes apart with an aircraft speed of 75 m.p.h. and an altitude of 150' above the terrain. Observable width of transect was ¼ mile.

This survey was conducted for an approximate cost of $1,600.00

DATA (summary):

Time on transect survey:

1522 - 1437 = 45 minutes

Miles flown:

45 x 1.25 miles/min. = 56.25 miles

Area surveyed:

56.25 x .25 mi. transect width =
14.06 square miles

Total moose observed on transect: 29

Moose density on area surveyed:

14.06/29 = 1 moose/0.48 square miles

Total area surveyed: 60 square miles

COMPUTATIONS:

Estimate of moose wintering on the Pelly River between the McMillan and Tummel Rivers:

$$\frac{\text{60 square miles}}{\text{1 moose/0.48 sq. mi.}} = 123 \text{ moose}$$

Estimate of moose wintering on the McMillan River from the mouth to "Antone Bend" the upper limit of the proposed reservoir:

Moose seen on Pelly:
Moose estimate on Pelly: $\frac{61}{123}$ = a factor of 0.49

Moose seen on McMillan: 27

Estimate of moose wintering on McMillan River:

27/0.49 = 55 moose

Total moose estimated to be wintering on the Granite Canyon Impoundment:

= 178 moose

DISCUSSION:

Because of the low visibility of moose in the McMillan valley, the estimate of 55 moose wintering there should be considered a minimum.

Moose compositions:

Of the 88 moose observed in the McMillan and Pelly River valleys on the reconnaissance flight

Unsexed adults: 61

Cows with calves: 13

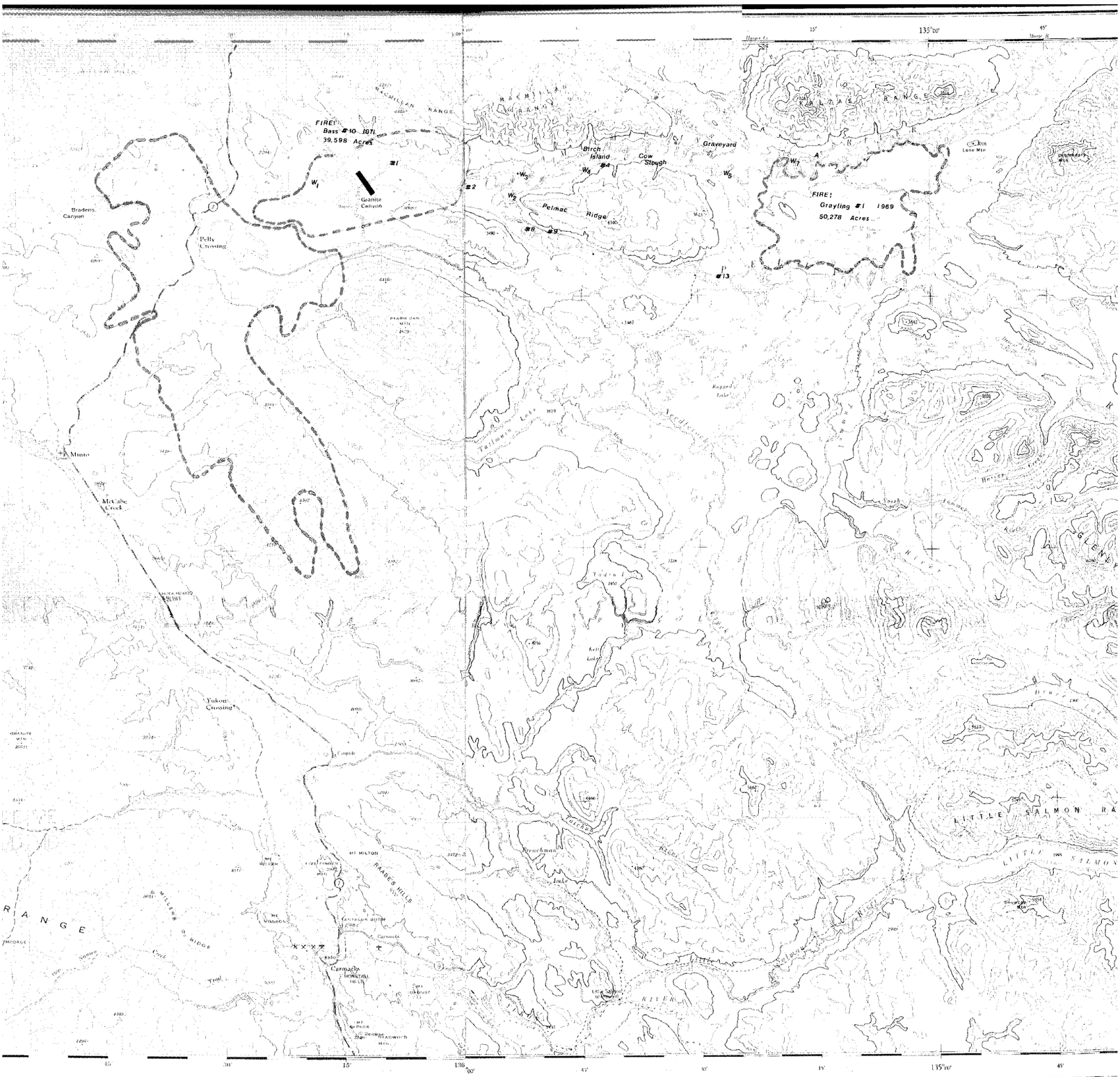
Calves: 14

$$\frac{\text{Total calves: } 14}{\text{Total adults: } 74} = 19\% \text{ late winter recruitment}$$

One case of a cow with twin calves was noted.

NOTES ON WOLVES:

(i) No wolves were seen on this survey, but an old wolf trail and an old kill were observed on the McMillan River.



CKS
RITORY

REFERENCE

Scale 1:250,000 or 1 inch = 4 miles (approximately)

Miles 5 0 5 10 15
Kilometres 5 0 5 10 15 20 25 30 Kil