RECONNAISSANCE REPORT
(Fish Habitat Improvement)

PROJECT: Seymour Lake Rehabilitation

REGION: VI (Smithers)

LOCATION: 1.5 mi. south of Smithers

MANAGEMENT UNIT: 6-9

MAP REFERENCE NO: 93 L 11, 14

AIR PHOTO REFERENCE NO: BC 7748 45-48
BC 7748 70-74

DATE SURVEYED: July 12, 1978

REPORT DATE: July 28, 1978

PERSONS PRESENT: R. P. Griffith, D. Tredger

REPORT PREPARED BY: R. P. Griffith

PURPOSE: To provide further information on the proposed rehabilitation of Seymour Lake with special attention to potential problem areas and coarse fish barrier location.

OBSERVATIONS: (see attached)

PROPOSED ACTION: (see attached)

PHOTOGRAPHS ATTACHED: YES X NO ___ AVAILABLE: YES ___ NO ___

CIRCULATE TO: M. R. Whately, S. Hatlevik, G. D. Taylor

SUGGESTED CONTACTS:

COMMENTS BY:

SEE ATTACHED SHEETS: YES X NO ___

GDT/71/75/76

1. LAKE SURVEY SUMMARY:

Seymour Lake is located only 1.5 miles south of Smithers and is equipped with rudimentary boat launching facilities (Fig. 1). Several summer and permanent residences border the lake (Fig. 2). Although trout fishing was reasonable in the late sixties (Falls and Beune, 1974), only a dwindling population of cutthroat trout (Salmo clarki clarki) remains (Table 1). Coarse fish are abundant. In a discussion of management opportunities for Seymour Lake, Shepard and Algard (1977) suggest total-kill chemical rehabilitation and subsequent stocking to create a good local trout fishery for local anglers.

Pertinent physical and chemical data (per Branch inventory files) are provided in Tables 2 - 4. Although the low pH levels (Table 4) throughout the water column should enhance the effectiveness of rotenone (Lennon et. al., 1970) the relatively large size of the lake, the maximum depth of 9.1 m (30 ft.), and the occurrence of summer stratification necessitate special attention to ensure adequate treatment of the lower strata. Temperature and oxygen data (Table 4) suggest the presence of a broad thermocline to approximately 4.5 meters (15 ft.). On this basis, the hypolimnion may be expected to represent approximately 30% of the lake's total volume (Table 3).

2. FIELD OBSERVATIONS

For the purposes of this report, half a day (July 12, 1978) was spent examining Seymour Lake and its tributaries to assess chemical rehabilitation feasibility. Field observations are supplemented by map and aerial photograph interpretation.

Table 1. Gill-netting results per inventory files for Seymour Lake near Smithers.

Species	Whately and Neilson Aug. 20/68	Falls and Beune June 31/74	Burns and Tredger Aug. 12/75
Peamouth chub (*Mylocheilus caurinus*)	75	2	241
Redside shiner (*Richardsonius balteatus*)	6	12	160
Squawfish (*Ptychocheilus oregonensis*)	36	18	39
Large scale sucker (*Catostomus macrocheilus*)	3	13	6
Prickly sculpin (*Cottus asper*)	--	1	---
Cutthroat trout (*Salmo clarki clarki*)	7	5	1

Table 2. Physical data, Seymour Lake (Whately and Nielson, 1968).

Surface Area	221.4 ac.	89.6 ha
Volume	4,151 ac. ft.	5,120,258.5 m^3
Perimeter	13,500 ft.	4,115.9 m
Maximum Depth	30 ft.	9.1 m
Mean Depth	18.7 ft.	5.7 m

Table 3. Lake volume by stratum (Whately and Nielson, 1968).

Stratum (ft.)	Volume (ac. ft.)	% of Total Volume
0-5	1055.40	25.4
5-10	953.02	22.9
10-15	856.80	20.6
15-20	720.42	17.4
20-25	471.62	11.4
25-30	94.27	2.3

Table 4. Chemical data, Seymour Lake (Whately and Nielson, Aug. 20, 1968/ Burns and Tredger, Aug. 12, 1975).

Depth m	°C		DO ppm		pH		TDS ppm		H_2S	
	1968	1975	1968	1975	1968	1975	1968	1975	1968	1975
0	21.7	16.5	7.0	9.0	7.2	7.3	56	64		
0.5	18.6									
1.0	18.3									
1.5	18.0									
2.0			5.0							
2.5										
3.0	17.0	15.7		9.0		7.0				
3.5	15.9		1.0							
4.0	15.0	14.9		0.8		6.5				
4.5	11.7	14.0								
5.0	10.9									
5.5	10.0	13.5				6.5		67		*
6.0	9.4		0	0.6			70			
6.5										
7.0	8.9								nil	

2.1 Associated Tributaries and Swamps:-

Beaver activity at the outlet of Seymour Lake (see map) has resulted in considerable flooding of several areas of the lake's shoreline. Vegetation is thick in many of these areas, and while they do not represent true swamps, piscicide treatment would be extremely difficult, necessitating special consideration (Fig. 3). Flooding at the outlet itself has caused a pond/swamp area of approximately 5000 m^2 (1.2 ac.). Most of this area is choked with fallen trees and flooded vegetation, and water depth exceeded 1.5 m in several spots (Fig. 4, 5). Flooding at the south end of the lake covers approximately 7000 m^2 (1.7 ac.). Beaver lodges were observed near the shore in the southwest corner and north end of the lake. Another extensive flooded area of approximately 3000 m^2 (0.74 ac.) occurs at the north end. Due to the relatively steep shores on the western and eastern shorelines, flooding of terrestrial vegetation is limited to a distance of less than 2-3 m (from the apparent original shoreline) in most cases. Assuming a mean distance of 1.5 m over a shoreline length of approximately 4000 m (exclusive of major flooded areas and swamps), this represents an additional flooded area of 6000 m^2 (1.5 ac.), for a total flooded area of 21,000 m^2 (5.2 ac.). At an approximated mean depth of 0.5 m,the water volume of the flooded areas is 10,500 m^3 (8.5 ac. ft.). Aquatic macrophytes, primarily lily pads, reeds, and Potomogeton, occur in relatively dense patches in the shoal areas at the north and south ends of the lake (Fig. 6). Again special attention will be required to ensure adequate chemical dispersal in these patches.

Previous surveys of the lake describe tributaries as seasonal. On the 1:50,000 map two tributary streams are indicated but labeled "underground" (see map). Shepard and Algard (1977) report only the southernmost inlet. In May, 1977 they report it contained water at least 183 m (200 yds.) above the lake. Our attempts to locate the inlet stream were fruitless, greatly hampered by the extensive flooding in this area as previously mentioned. Aerial photographs suggest a rather diffuse, low gradient water-course through low terrain immediately south of the lake. This appears linked with creeks draining two small lakes and two swamps approximately 3 mi. west and southwest of Seymour Lake (see map). However, the aerial photographs, dated July 6, 1975, do not suggest the presence of water in these channels at that time.

Other possible inlets on the western side of the lake (per aerial photos and maps) were investigated by boat from the lake and by road to the west of the lake. The topography of the western shore rises abruptly and although small, relatively well-defined channels were located, these were dry and obviously attributable to seasonal run-off only.

2.2 Outlet:-

The outlet is located at the southeast end of the lake. Beaver activity is extensive for the first 150 m. Fifty meters from the lake there is a major dam approximately 1 m high and 5 m across (Fig. 7). A second major dam, approximately 1.2 m high and 3 m across is located about 100 m downstream from the first (Fig. 8). In addition, at least two other dams are present but have been flooded over by later activity. Below the second major dam the outlet stream follows a definite channel 2-3 m wide. At 170 m below the lake the stream is crossed by a bridge (Fig. 9-11). In following the stream for 550 m (1/3 mi.) below this crossing, although no further beaver activity was encountered, thick riparian vegetation, considerable braiding, side-pooling, and debris accumulation was observed.

2.3 Potential Coarse Fish Barrier Sites:-

Shepard and Algard (1970) suggest that the barrier be located further down the outlet at the end of the ravine or near a lower road crossing. This would entail the treatment of between 0.8 and 1.5 km of the outlet's course. In view of the fact that coarse fish were observed throughout the outlet stream, the above proposal seems inadvisable because of the stream's complexity, resultant treatment difficulties, and low probabilities of a complete kill. To maximize success and minimize cost the barrier should be located at, or in the vicinity of the first bridge crossing. Ideally, an effective barrier could be constructed by modification of the existing bridge by installation of an oversized, flat-arch culvert or construction of a cement apron on the downstream edge (Fig. 11). Rising topography immediately to the north of the bridge and elevation of the road to the south (to form a dyke) eliminate any possibility of channel relocation subsequent to barrier installation. If permission is not forth-coming from the bridge/road owner to modify the structure, a barrier could be installed immediately above the bridge (channel width approx. 2 m, banks 0.5-1.2 m high) (Fig. 12), or, preferably, 25-50 m below the bridge (channel width approx. 2 m, banks 1-1.5 m high) (Fig. 13). Engineering advice should be sought to bring the above possibilities into technical and cost perspective.

3. COST

As rehabilitations are carried out by personnel within the Branch, labour costs are not included in this forecast. However, numbers of personnel required for various phases of the operation are estimated and costs arising from travel expenses should be considered. As all necessary equipment is available within the Branch; costs here relate to chemicals only.

Rotenone (Chem-fish Synergized) could be used for all phases of treatment at a cost of $20.42/gal. (Taylor, 1978) and a concentration from 0.25-2 ppm (average 1 ppm). One gallon treats 3 ac. ft. at 1 ppm (Tredger, 1977). A breakdown of initial estimates of chemical volumes and costs is given in Table 5. Before costing can be finalized, the nature of the southernmost tributary (headed by lakes and swamps) must be determined. Although the tributary appears to dry through the summer months, during peak runoff periods there may be passage of coarse fish from the upper lakes and swamps to Seymour Lake. In this case, the two lakes and swamps and any sections of the tributary containing water must also be treated. While this would entail an additional chemcial cost of only $714.70 (Table 5), it may require as many as 11 extra man/days. The estimated 7 man/days to treat the 10 km of the tributary and its branches assumes that the entire length of the tributary would require treatment at an estimated rate of 1.6 km (1 mi.)/man/day. In reality, little treatment of the tributary itself may be required consistent with drying, and the rate may well exceed that estimated.

The cost of the barrier will depend on whether or not permission is forthcoming to modify the bridge. In any event a cost in the vicinity of $2000 or more may be expected (G. D. Taylor, pers. comm.).

4. RECOMMENDATIONS

4.1 Due to the depth and occurence of stratification, Seymour Lake should be treated at fall overturn (Cartwright, 1978).

Table 5. Breakdown of costs and expected man/day requirements.

Phase	Volume ac. ft.	Amount of Chemical gal.	Cost @ $20.42/gal.	Estimated Man/Days
Seymour Lake	4151	1384	$28,261.28	6
Flooded areas	8.5	3	61.26	4
Outlet to bridge	0.1	-	-	
TOTAL	4159.6	1387	$28,322.54	10
Lake 1	47.5*	16	326.72	4
Lake 2	0.8*	-	-	
Swamp 1	5.5*	2	40.84	
Swamp 2	40.9*	13	285.88	
Tributary Creek	8.7*	3	61.26	7(max.)
GRAND TOTAL	4263	1421	$29,037.24	21(max.)

* estimated from maps and aerial photographs.

4.2 In view of the difficulty in treating the flooded areas resultant from beaver activity, removal of beaver dams on the outlet and inlet (Shepard and Algard, 1977) would be highly advantageous. The probability of a complete kill would be greatly enhanced and there would be a saving in both chemical costs and required personnel. Discussion with lake residents (re lake level suitability) should precede any such activity.

4.3 The southernmost tributary should be thoroughly investigated during peak runoff periods, to determine the likelihood of coarse fish passage from the upper lakes and swamps into Seymour Lake. The slightest possibility of re-introduction of coarse fish will necessitate treatment of these areas as well.

4.4 For reasons previously mentioned, the coarse barrier should be located at, or near the first bridge crossing. The appropriate owner should be contacted regarding permission/approval to modify the bridge.

4.5 Subsequent to beaver dam removal, a hydrological survey is recommended to assess the compatibility of a barrier (culvert, cement apron, or other) providing a 2 ft. jump with maintenance of a suitable lake level.

LITERATURE CITED

1. Burns and Tredger. 1975. Lake inventory files, Seymour Lake. B. C. Fish and Wildlife Branch.

2. Cartwright, J. W. 1978. Piscicide Application Course, unpublished manuscript. B. C. Fish and Wildlife Branch. 13p

3. Falls and Beune. 1974. Lake inventory files, Seymour Lake. B. C. Fish and Wildlife Branch.

4. Lennon, R. E., J. B. Hunn, R. A. Schnick, and R. M. Burress. 1970. Reclamation of ponds, lakes, and streams with fish toxicants: A review. FAO Fisheries Technical Paper No. 100. pp. 15-25.

5. Shepard, C. and J. Algrad. 1977. Lake surveys of the Bulkley Valley and Burns Lake area with emphasis on the age and growth of stocked rainbow trout. Fish and Wildlife. Unpublished.

6. Taylor, G. D. 1978. Memo, re Accelerated Fisheries Development Program. File No. 0340, May 25, 1978.

7. Tredger, D. 1978. Ste. Marie - Francis Lake Rehabilitation Possibilities. B. C. Fish and Wildlife Branch Reconnaissance Report. 7p

8. Whately and Nielson. 1968. Lake inventory files, Seymour Lake. B. C. Fish and Wildlife Branch.

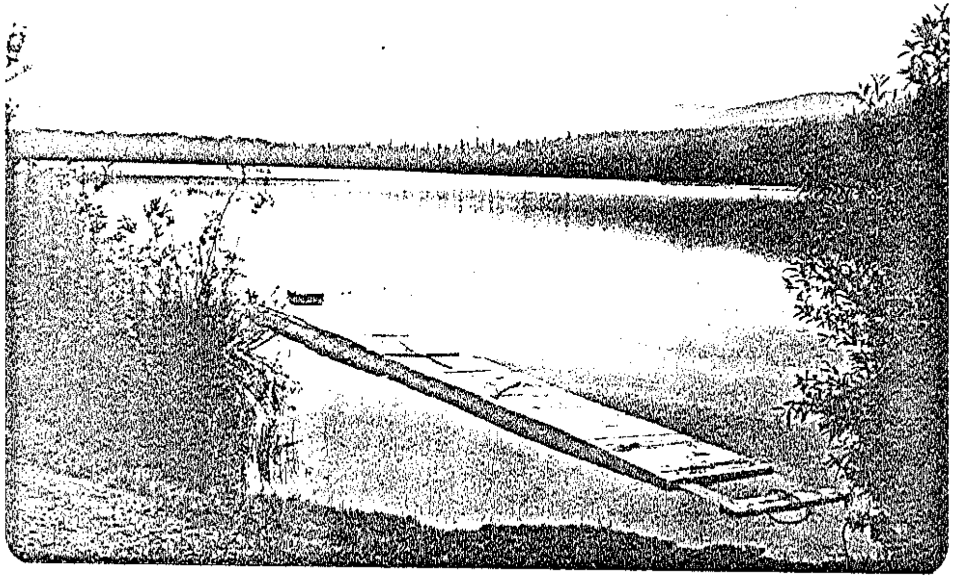


Fig. 1. Seymour Lake - from NE looking SW.

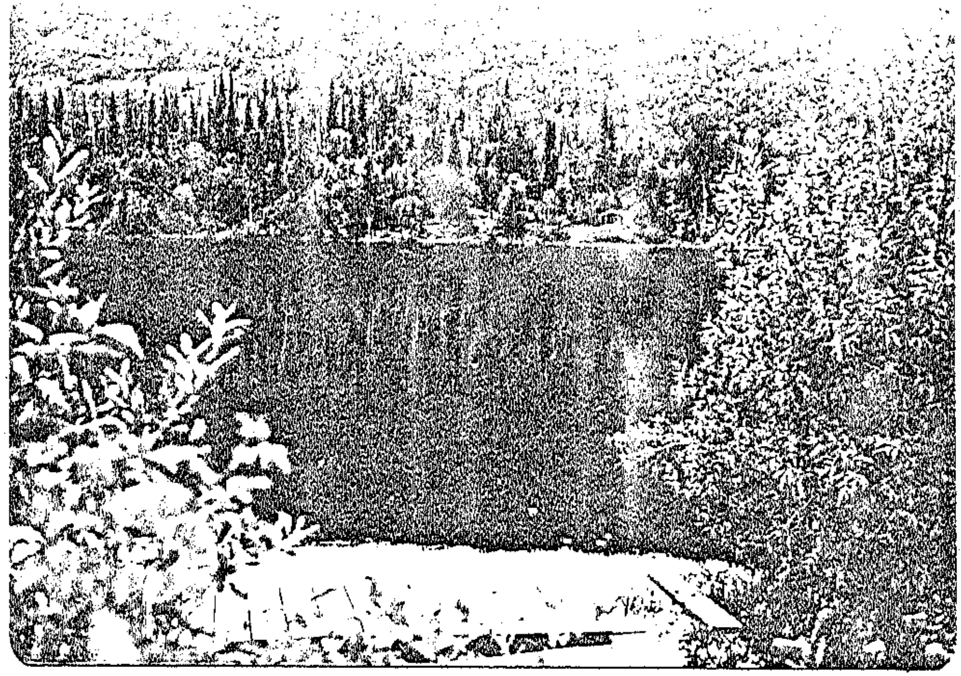


Fig. 2. Residences on NW shore.

Fig. 3. Flooded vegetation on lake periphery.

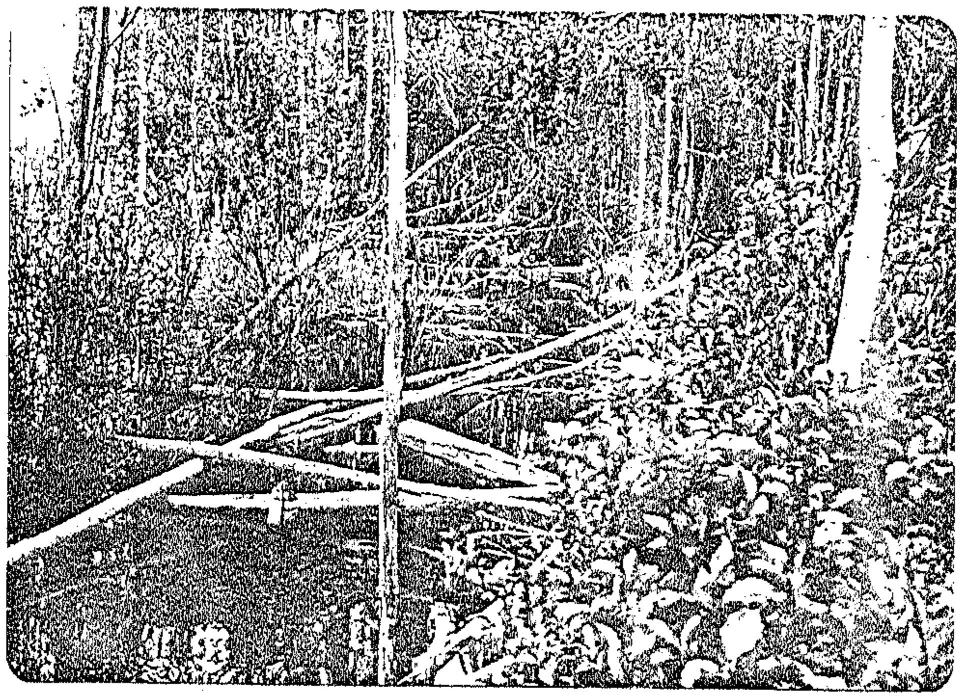


Fig. 4. Pond/swamp at outlet.

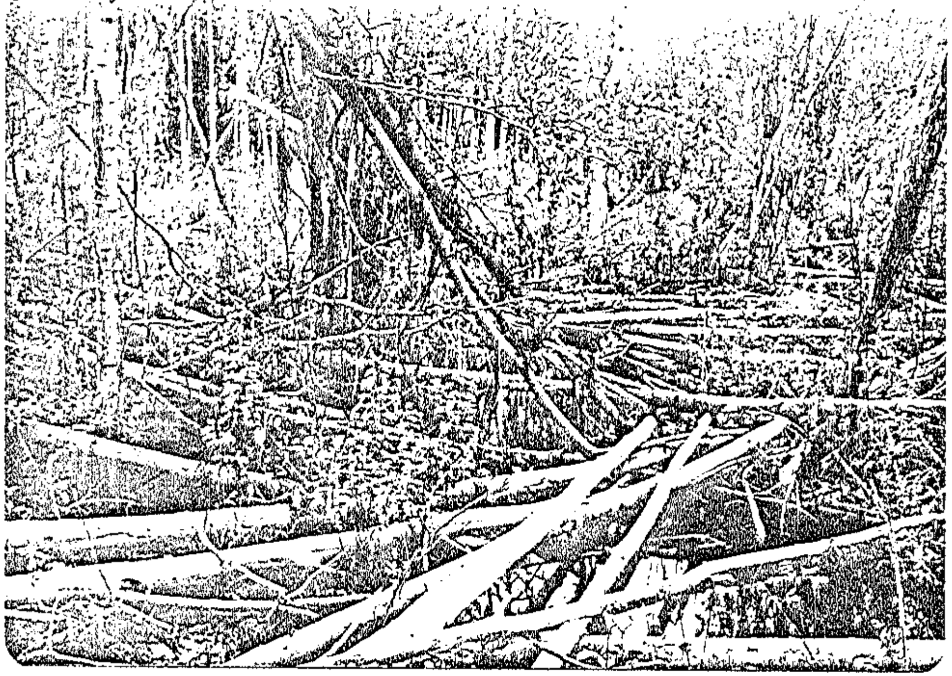


Fig. 5. Pond/swamp at outlet.

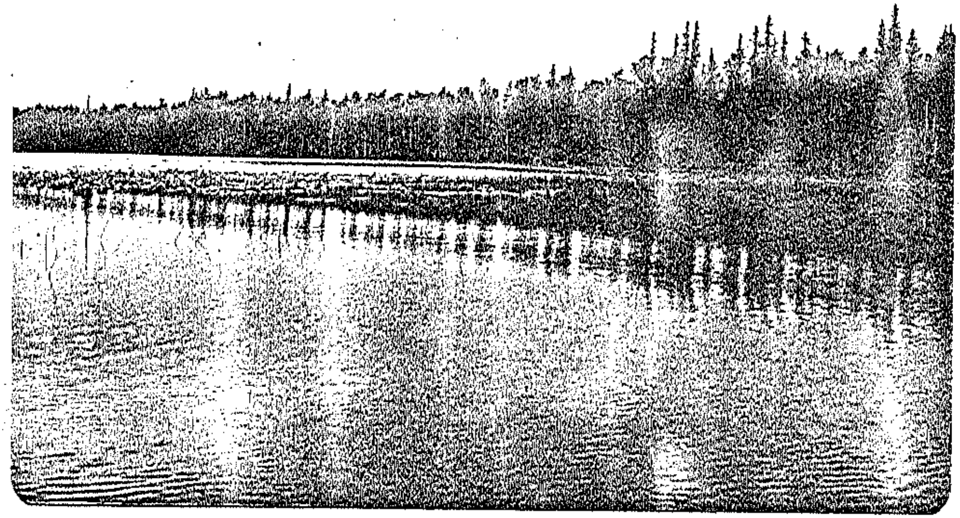


Fig. 6. Lily pads and reeds at SE end of lake.

Fig. 7. Beaver dam on outlet - 50 m from lake.

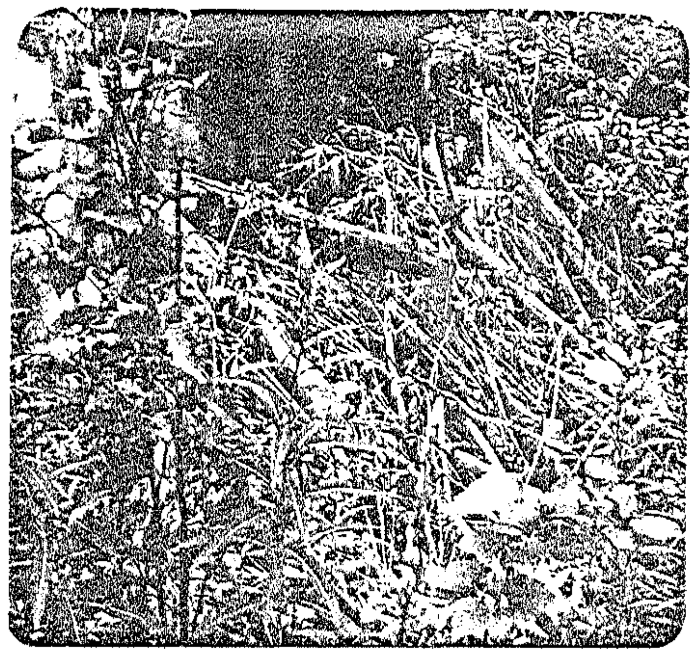


Fig. 8. Beaver dam on outlet - 150 m from lake.

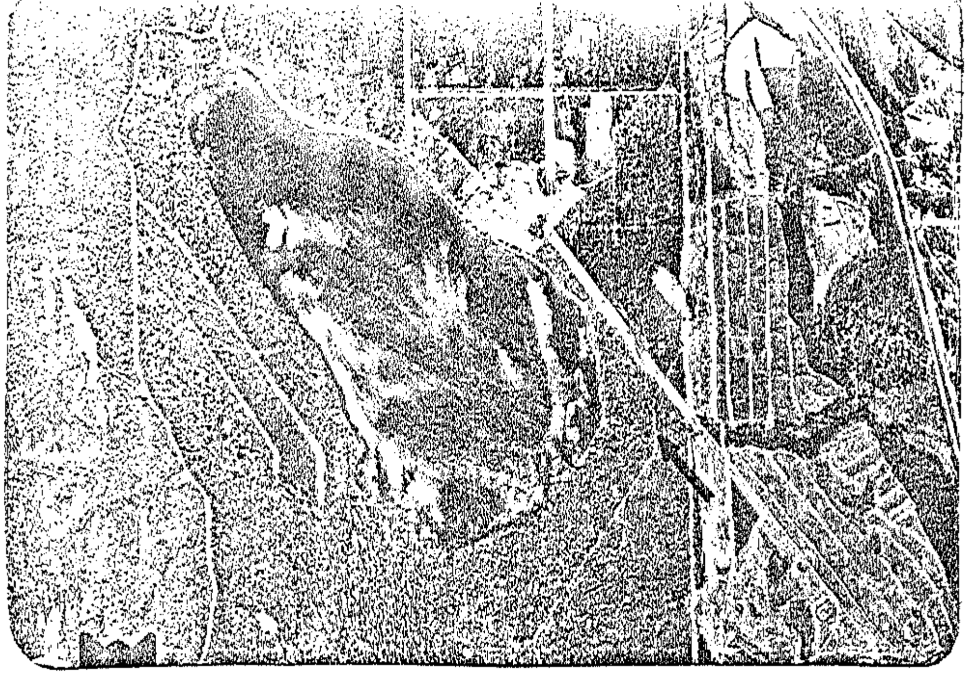
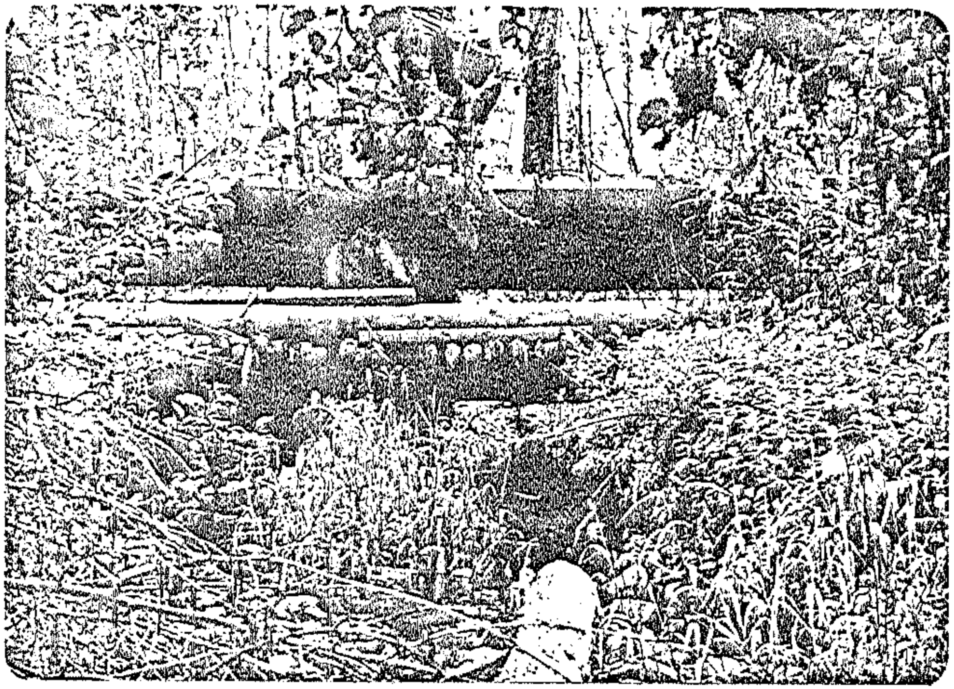


Fig. 9. Aerial photo showing first bridge crossing on outlet (see arrow).



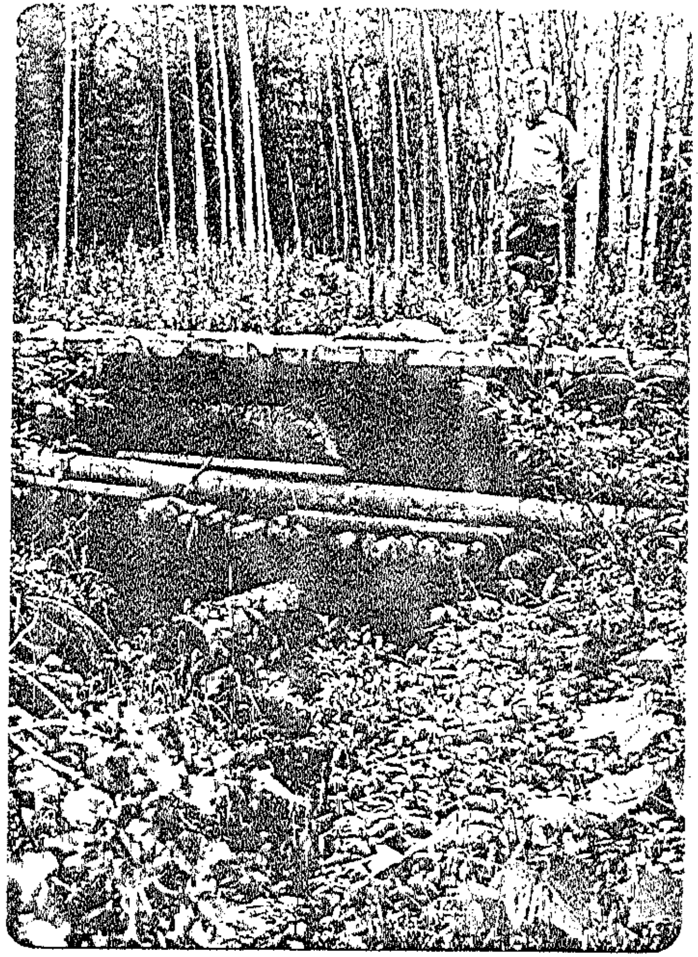


Fig. 10.

First bridge crossing on outlet

Fig. 11.

(looking upstream)

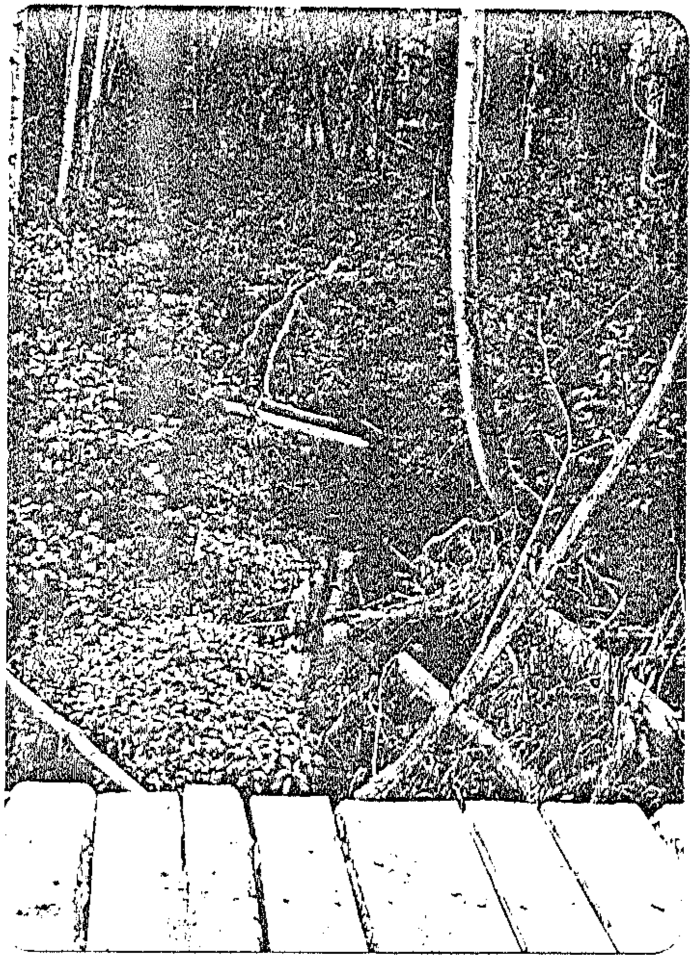


Fig. 12. Potential barrier site immediately above first bridge crossing.

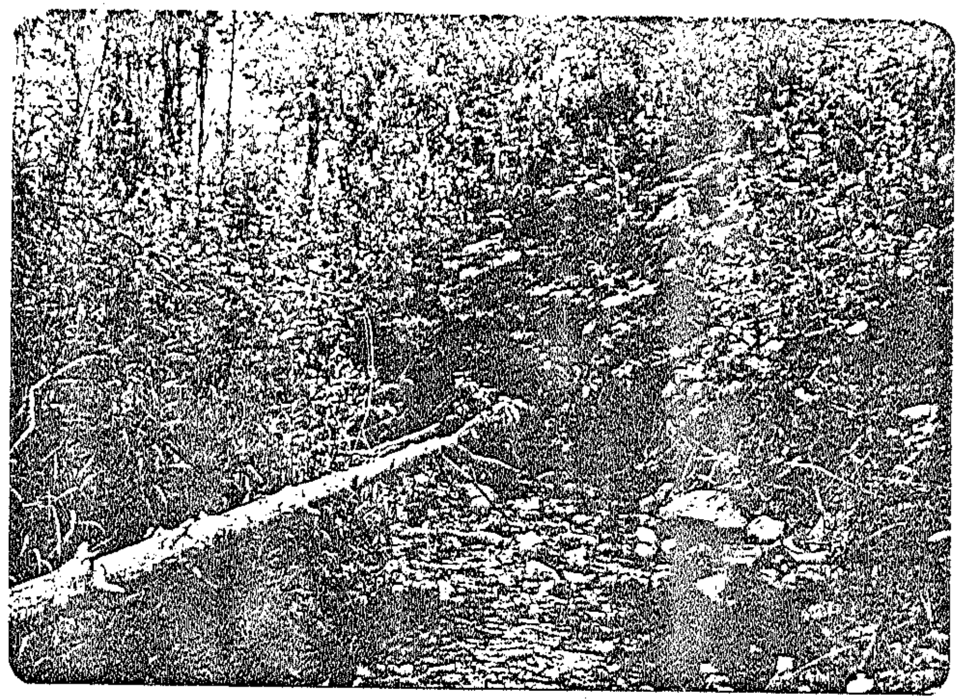
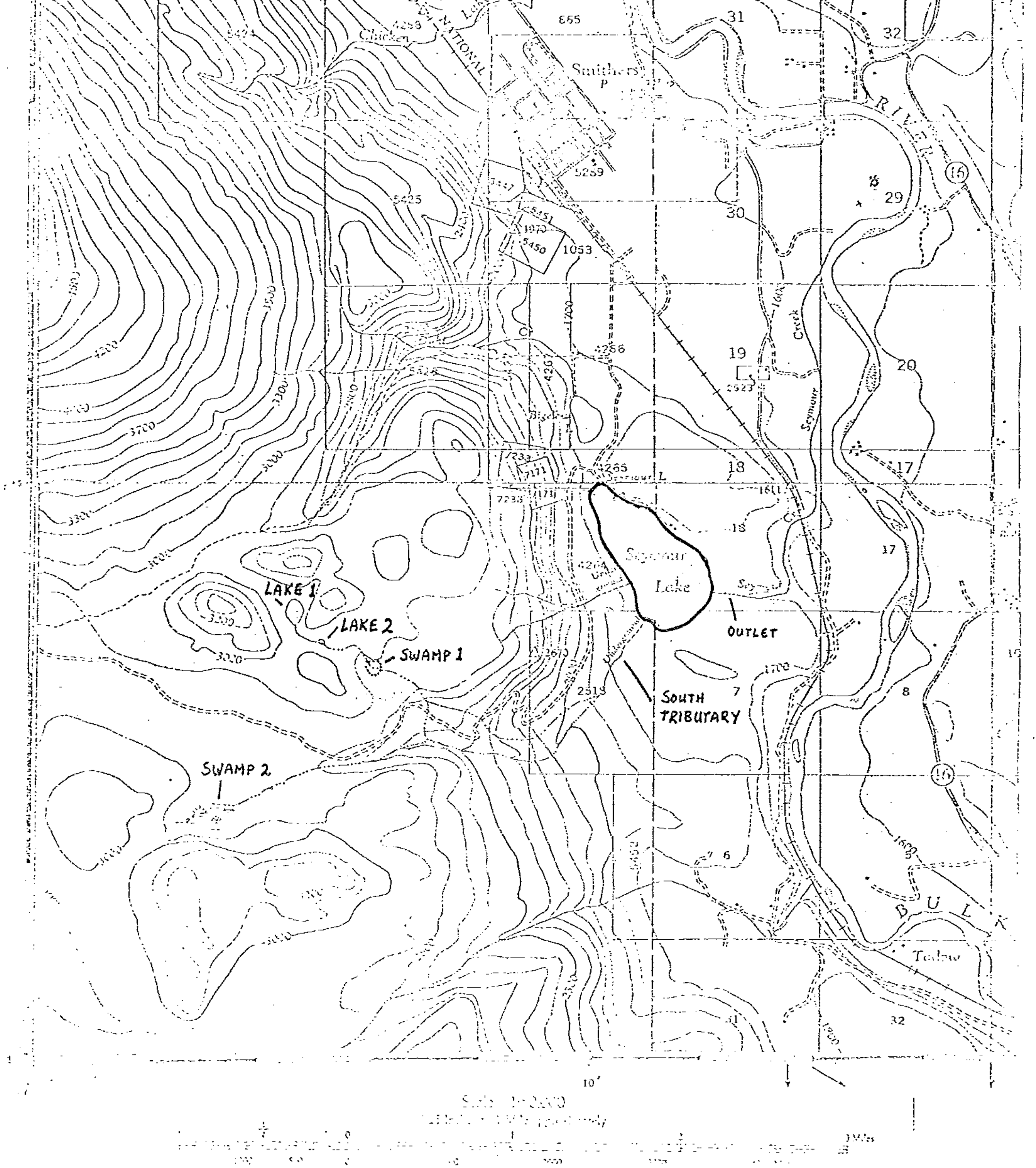


Fig. 13. Potential barrier site 25-50 m below first bridge crossing.



Seymour Lake and environs.