

FRESHWATER FISHERIES ADVISORY SERVICE

MARINE DEPARTMENT

INVESTIGATION REPORT

JOB NO. 9

ACCLIMATISATION SOCIETY DISTRICT: Westland

TITLE OF JOB: Survey of spawning conditions at Lake Kaniere.

- OBJECTIVES:
- (i) To assess the amount of spawning in Sunnybight and Geologists Creeks, Lake Kaniere, and to try and determine the reason why rainbow trout only spawn in Geologists Creek.
  - (ii) To assess the amount of food available in Lake Kaniere.
  - (iii) To determine the mortality of fish in the Power Station races.
  - (iv) To determine the necessity of a fish ladder at the Coal Creek weir on the Kaniere River.

FINDINGS:

This investigation was carried out between 9 June and 20 August 1958.

Physical Features

Lake Kaniere is situated 12 miles east of Hokitika. It is surrounded on the north, south and east sides by steep bush clad hills, which rise in places to approximately 4,000 ft. To the west the Kaniere River flows from the lake following a narrow valley for approximately 9 miles, where it joins the Hokitika River. The Lake is 5½ miles in length and about 2½ miles wide at its widest point. It is about 600 ft deep at the deepest place and there is little shallow water, the banks plunging steeply into deep water close to the shore line. The Lake is filled by two main streams Geologists Creek near the north eastern corner, and Sunnybight Creek at the south western corner (see map). There are also several smaller streams emptying into the Lake.

Both Geologists and Sunnybight Creeks follow a similar pattern, in that they descend steeply from the hills, and then follow a more level and meandering course until they empty into the Lake. Geologists Creek is the steeper and more unstable of the two. After leaving the bush it flows across a grassy

flat for about 2 miles before entering the lake. The bottom is unstable and the stream frequently changes from side to side of its comparatively wide flood bed. Large logs scattered across the bed right to the mouth show that severe flooding occasionally takes place.

The bed of this stream is composed mainly of sharp, rough gravel and stones which become more rounded towards the mouth with a large proportion of coarse, sharp sand. Above the bush edge, boulders become more frequent in the stream bed and some are up to 15 ft in height. This stream is inclined to dry up for about half a mile at the mouth during dry periods.

Sunnybight Creek flows through thick mature bush right to the lake, except for about 100 yards, where it skirts a natural clearing. In contrast to Geologists Creek, Sunnybight Creek is fairly stable for approximately 1 mile, then there is  $\frac{1}{4}$  -  $\frac{3}{4}$  mile of more unstable bed, though the banks remain generally fairly stable. Above this point the stream becomes steep and rocky and is similar to Geologists Creek. This stream does not appear to flood as severely as Geologists Creek. About half a mile from the lake a small, stable tributary enters from the left and flows round the opposite side of the clearing mentioned above. In contrast to Geologists Creek, the bed of Sunnybight Creek is composed of fairly stable, well-rounded gravel and a few stones, mixed with sand.

Brown trout only spawn in Sunnybight Creek and Rainbow predominate in Geologists Creek, but two brown were noted there.

Temperature records of both creeks were kept, but there appears to be no significant variation (see graph).

#### The Trout Stock

Random observations were made on the trout seen in the spawning streams. The average weight of brown trout was just over three pounds, but sizes ranged from 1-10 lb.

Only one rainbow was weighed and this was a spent fish caught in a gill net in the lake, the weight being  $2\frac{1}{2}$  lb. None of the rainbow seen in Geologists Creek were actually handled, but the average size appeared to be slightly lower than the browns.

A total of 26 rainbow and 228 brown were seen spawning. Of these, 55 were in the race, 8 under the road bridge over the intake to the race and 165 in Sunnybight Creek. However, more fish than those counted could have entered both the race and the Creek, as counts were not taken every day.

Several fish were usually seen feeding out in the centre of the lake during the day, but only a few were noted in shallow areas.

#### Water Races

The Kaniere Electric Company draws water directly from the lake to operate the power house at Kaniere Forks, and from the weir at Coal Creek for the power house at McKay's Creek. These races are about 4 miles long. The upper, or No. 1 race, is approximately  $5\frac{1}{2}$  ft deep and 6-8 ft wide and normally draws off 50 cusecs of water at the intake. The water volume is controlled by a gate which is opened or closed according to the lake level. When the lake is at a normal level the gate is 12-14" above the bottom, but during low water may be 24" or more.

Trout enter this race and spawn in it, the greatest amount of spawning taking place in the mile upstream from Ward Road. There is a grating at Ward Road for the trapping of debris, but trout are able to pass through this and some spawn below it. Before the race flows down to the power house, there is another grating through which fish could also pass. The lower race (No. 2) is controlled in a similar manner to No. 1, but draws off 160 cusecs of water.

When the lake is at a normal level, the flow of water under the control gate of No.1 race would be approximately 6-8 ft per second. This would be too swift a current for fry to swim against, but when the lake is low and the gate wide, they may be able to get out by this means. However, fry tend to drift with the current, so that they would probably go through the power house and out into the river, rather than back into the lake. It is possible that the adult fish would be able to get back out into the lake, particularly at low water.

The No.1 power house is equipped with a turbine known as a Pelton or impulse wheel. The operation of this type of turbine is similar to a water wheel and it requires a high head of water to function efficiently. It is estimated that the water reaching the turbine passes through the nozzle to the wheel at a speed well in excess of 100 ft/sec (68 m.p.h.). Fish are unlikely to survive the effect of passing through the relatively small gap (0.5 sq.ft) and then striking the vanes of the turbine at this speed. The No.2 power house uses a Francis double running turbine. It is unlikely that all trout would survive their passage through this turbine, but with far lower water speeds and less constricted flow a number could be expected to survive. However, abrupt changes in pressure would be likely to cause some damage to fish passing through.

A total of 55 brown trout were noted in No.1 race and 137 redds, producing about 148,000 fry (see section E). However, only 7 trout and two redds were noted in No. 2 race. The volume of water in this race made it difficult to distinguish redds, so that others may have been present.

#### Kaniere Forks Weir

This weir is situated on the Kaniere River about 1½ miles above Kaniere Forks. Water is diverted from this weir through a race to the power house at McKay's Creek. The race draws off 160 cusecs of water, approximately two-thirds the total flow of the river. The weir is 1 ft 6" in height and is inclined downstream at an angle of approximately 45°. When the race is full, there is only a trickle of water flowing over the weir. Even if there was sufficient water, from the nature of its construction, it does not seem possible for trout to get over the weir.

The Kaniere River was examined both above and below the weir for spawning water, and in each case little or none was found. No fish were seen accumulated below the weir during the period of the survey.

#### Ova Production

The approximate ova production was calculated by digging selected redds of varying sizes, and counting the ova or alevins in them. The average was then found for the redds dug and this was multiplied by the total number of redds in the stream, giving the approximate total of ova produced. A total of 8 redds were examined in Sunnybight Creek but as the number seen in Geologists Creek was so low (21) it did not seem worthwhile examining any of them.

Results of redd digging in Sunnybight Creek are as follows:

<u>Pre-eyed Ova</u>		<u>Eyed Ova</u>		<u>Alevins</u>	
Alive	Dead	Alive	Dead	Alive	Dead
1161	-	372	-	425	16
1986	-				
518	34				
213	-				
1301	35				
600	6				

This gives a total of 8,646 specimens, of which 91 were dead, an average of 1069 alive and 11 dead per redd. Multiplying these figures by the total number of redds seen, 143, the total ova production is as follows:



Most of the shallows support a thick growth of aquatic weeds, *Nitella* being dominant where the bottom is mud. On the shingle the growth is not so abundant, and consists mainly of *Isoetes alpinus*.

Native fish were also sampled by means of a fyke net. However, this net was possibly not operating efficiently, as the water was generally too deep. The most frequently caught fish was the bully (*Gobiomorphus* spp.) 102 of these fish being caught in 28 settings. Catch numbers ranged from nil to 9. Also caught were 8 long finned eels, ranging from 1-6 lb in weight. Two kokopus (*Galaxias alepidosis*) were also caught and one freshwater crayfish.

Several small fish were noted out in the centre of the lake and the trout were often seen feeding on them. A number of these fish were caught, and identified as Galaxiids. It does not seem possible that they would be *G. attenuatus* but they could possibly be fry of *G. alepidosis*. Only one small perch was seen, but it is possible that perch fry would be an important source of food in the summer months.

#### CONCLUSIONS AND RECOMMENDATIONS

From the foregoing, the following conclusions can be drawn.

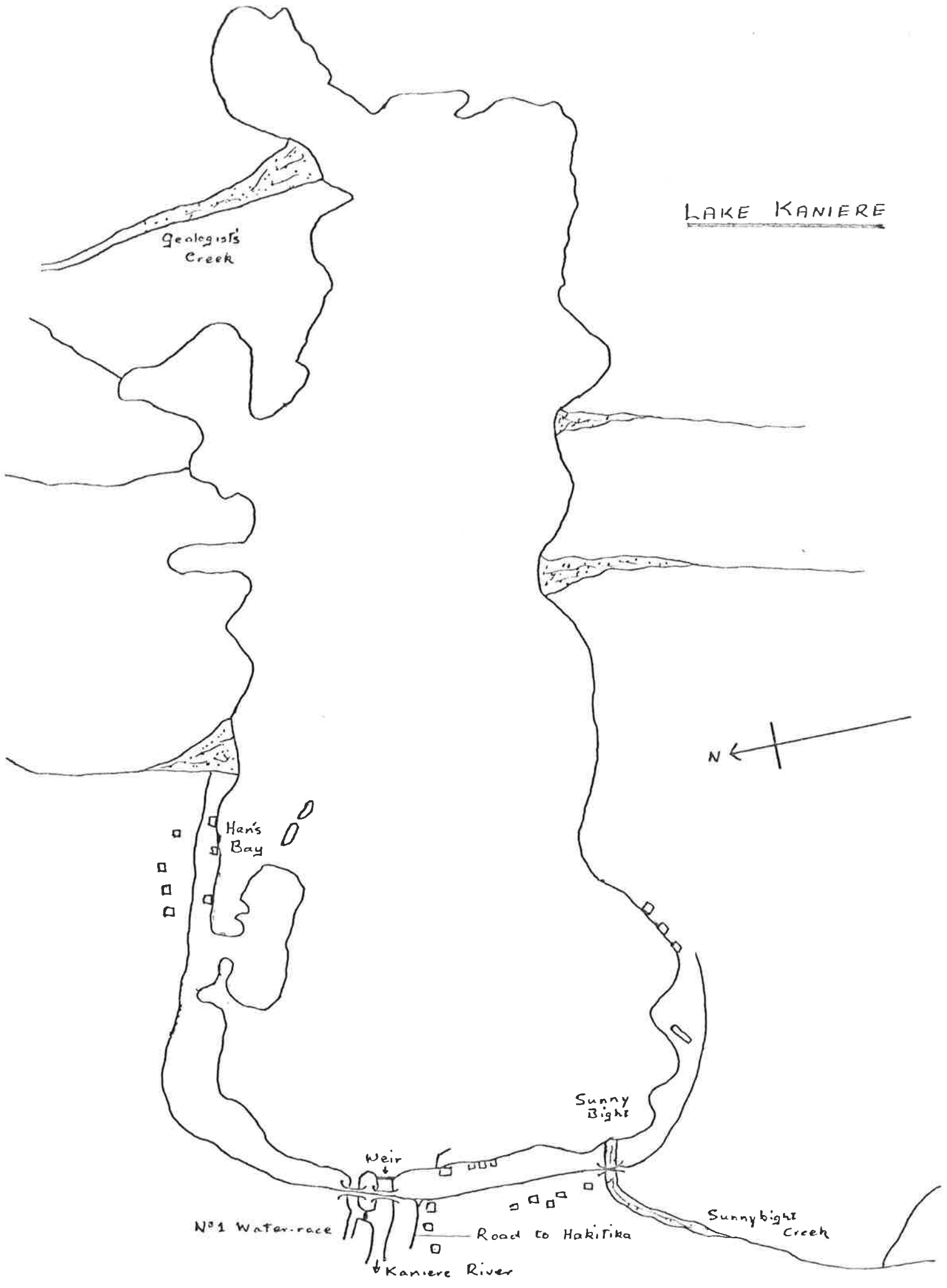
1. Sufficient spawning water is available to maintain a healthy stock of brown trout.
2. At least 50% of the brown trout ova produced is lost in the No. 1 race.
3. Owing to the instability of Geologists Creek and the fact that the lower half mile dries up insufficient rainbow fry survive to maintain a large population of this species. It is possible that they may gradually die out.
4. There is insufficient shallow water of a suitable nature to produce large numbers of food organisms. However, a more intensive programme of bottom sampling would have to be carried out to verify this.
5. It is possible that large numbers of native fishes are not present.
6. The weir on the Kaniere River at Coal Creek does not affect the population of trout in the lake.
7. If the ova produced in the race were kept in the lake, it is possible that the number of trout could be greater, but average size less.
8. No definite reason could be found for the preference of rainbow trout for Geologists Creek.

It is recommended that:

1. Some form of barrier be erected to prevent trout entering the No.1 race. A suggested position is at the bridge over the race inlet.
2. No modification of the Coal Creek weir is necessary.
3. An approach can be made to the Catchment Board with a view to permanently opening the mouth of Geologists Creek.

Executed by:           (sgd) R. Boud  
Technical Field Officer

Supervised:           (sgd) R.C. Watson  
Fisheries Officer



LAKE KANIERE

Geologists' Creek

Han's Bay

Sunny Bight

Weir

N°1 Water-race

Road to Hakitika

Kanieri River

Sunnybight Creek



upper limit of spawning

NATIVE BUSH

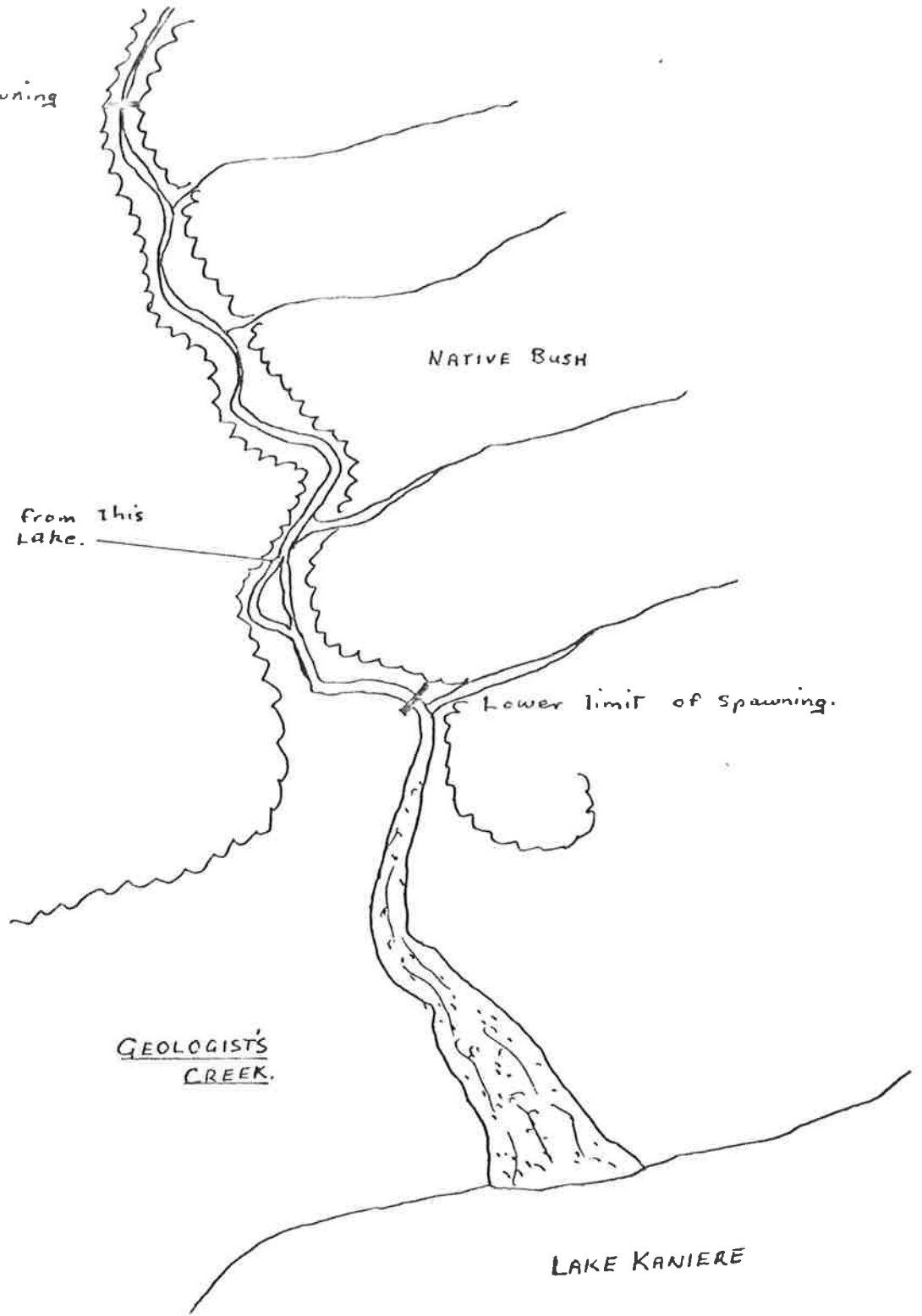
NATIVE BUSH

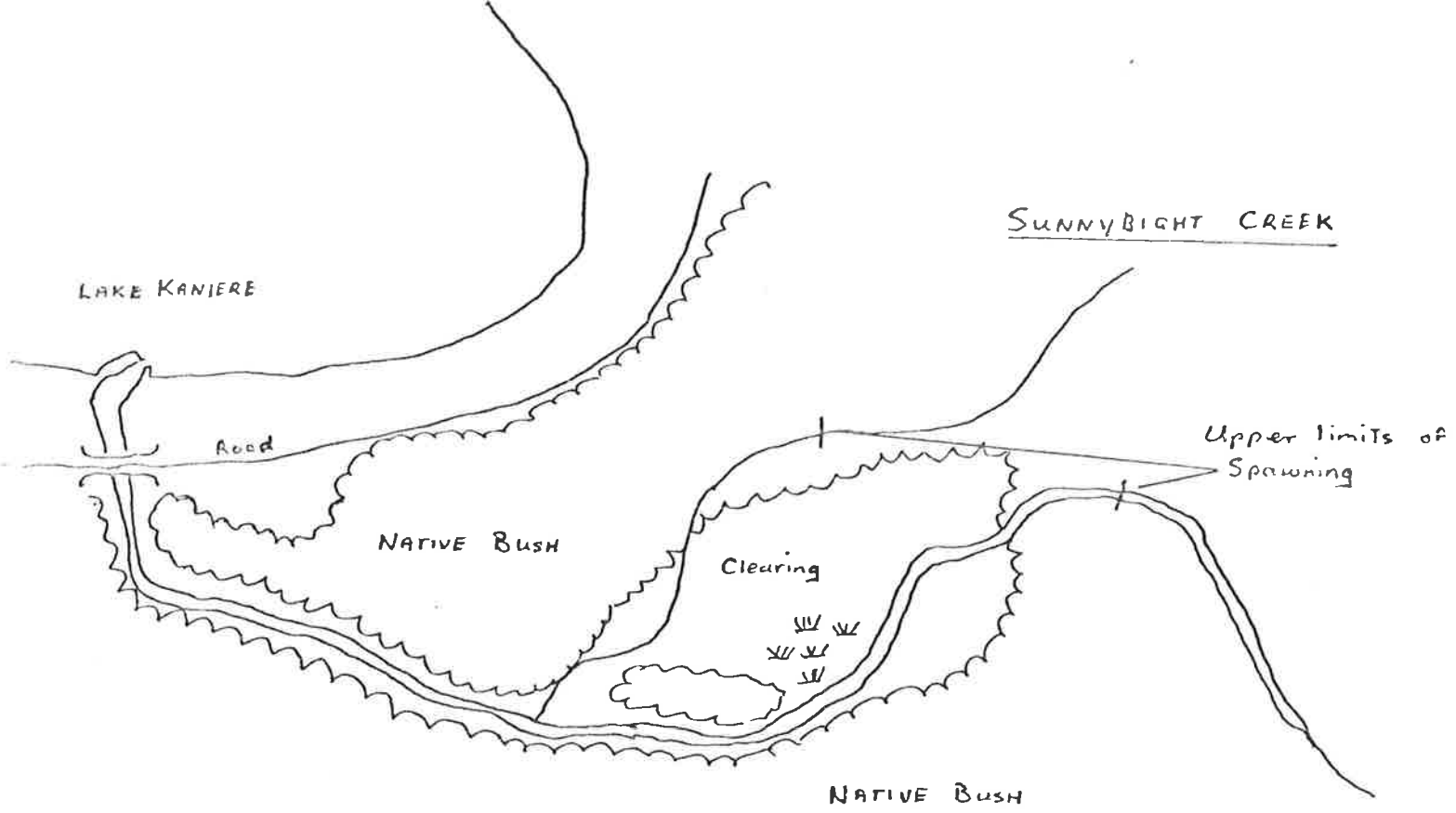
Bed unstable from this point to the Lake.

Lower limit of spawning.

GEOLOGISTS  
CREEK.

LAKE KANIERE





TEMPERATURES OF SUNNYBIGHT AND GEOLOGIST'S CREEKS  
(in °C)

