Province of British Columbia

Ministry of Environment and Parks
RECREATIONAL FISHERIES BRANCH

MEMORANDUM

To: Chris Bull
Regional Fisheries Biologist
Penticton, B.C.

Date: July 6, 1988

Re: The Trout Creek Slide

1. As per your request, I attach my comments on the Trout Creek slide and its possible implications for fish habitat and fish.

2. From our point of view, there appear to be two major issues that should be addressed:

   (a) What is the connection between the slide and fish and fish habitat in Trout Creek? The assumption appears to have been made that sediment input from the slide is the primary reason for the end of rainbow and kokanee spawning runs. There is no definitive evidence, however, that this is the case. We need to know more about the Creek including the history of water use and the potential habitat in it if we are to realistically assess the benefits of stabilizing the slide.

   (b) Why should slide stabilization be viewed purely as a fisheries issue? The potential for catastophic failure has been mentioned in several studies of the slide and by Frank Shannon in his December 23, 1986 letter to me (and which I copied to Water Management Branch). Should the downstream hazard risk not be of concern to either Water Management or to the Ministry of Transportation and Highways or both? This alone could justify the drilling and geotechnical evaluation recommended by Mike Wei. Or what about the potential implications of Trout Creek sediment on water quality in Okanagan Lake? I wonder what proportion of the total annual volume of fine sediment entering the southern part of the Lake comes from the Trout Creek slide?

3. If you have further questions or concerns, please don't hesitate to call me in Victoria (387-9553).

Pete Lewis

C. Peter Lewis
Head, Physical Processes Unit
Habitat Management Section

Enclosures

cc. D. Jones
R. Morley

THE TROUT CREEK SLIDE

Comments by C.P. Lewis, Physical Processes Unit,
Recreational Fisheries Branch, Victoria
July 1988

- the comments which follow are based on reviews of Riglin (1977) and Wei (1988); on correspondence and conversations with Chris Bull, Fish and Wildlife, Penticton, Mr. Frank Shannon of Summerland and Mike Wei, Water Management Branch, MOEP, Victoria; and on a part day visit to the slide area at low flow in Trout Creek in July 1986.
- a set of photographs of both the slide and of Trout Creek in the vicinity of the slide taken during the field visit are attached.

Introduction

- Trout Creek historically had good spawning runs of both rainbow and kokanee.
- those runs no longer occur and heresay evidence indicates that they ended in the 1950's or early 1960's (Shannon, 1986; Bull, pers. comm.).
- "siltation" (where "silt" includes all material too small to throw!) of spawning habitat by sediment introduced from the Trout Creek slide has been cited as a primary cause.
- recovery of Trout Creek spawning habitat or even of the water quality that used to exist in the Creek would be of major economic benefit to the Okanagan Lake area fishery.

Issues

1. Is the Trout Creek slide responsible for: (a) the loss of spawning habitat in the Creek itself; or (b) the increase in turbidity that affects the quality of water in the Creek, especially at low flow?
2. If the slide is a major controlling factor, can anything practical be done remedy the situation? Are there non-fisheries implications to the slide that would add to the overall benefit of slide stabilization?

The Trout Creek Slide

- the failure is a large slump/earthflow that moves gravel, sand and mud over the bedrock lip of Trout Creek Canyon and down into the stream below (Photos 1-4).
- it has been studied on numerous occasions -- on the surface (e.g. Riglin, 1977; Wei, 1988) -- but no holes have been

drilled and its stratigraphy and the nature and location of the failure plane are speculative: Riglin's and Wei's hypothesized down-slide geological sections, for example, are very different.

- the slide appears to have begun early this century and much of the total movement to date occurred during the initial failure.
- subsequent movement rates may have increased with the blasting of an upslope spring in the 1930's (Shannon, 1986) but probably have been relatively constant since.
- the material in motion is largely from within the failure area: the headscarp has been near its present location since before 1938 (Riglin, 1977).
- available evidence suggests that the failure was caused by and continues to be promoted by high groundwater levels that occur primarily because of upslope irrigation on Paradise Flats.

- several studies (eg. Thurber, 1973; Riglin, 1977) have noted the possibility of rapid slide movement resulting in complete temporary blockage of Trout Creek and subsequent flooding downstream.
- the lack of subsurface geotechnical information prevents realistic assessment of the risk.

Sediment Delivery to Trout Creek

- historical changes in sediment transport and bed material quality in Trout Creek have been hypothesized but not documented.
- evidence for the negative role of the Trout Creek slide on fish use of the Creek is, therefore, largely circumstantial.

- there can be no doubt, though, that the failure is a major source of sediment to the Creek.
- Riglin (1977), on the basis of less than one year's data, determined rates of movement as high as 18 m per year at the lower end of the slide and estimated that in the order of 11,500 m^3 (18,000 tonnes) of material was moved into the canyon that year.

- some moves directly into the Creek by surface runoff and mudflows fed by groundwater springs on the lower slide.
- this input will be primarily silt and clay and is highly visible because of its influence on water turbidity.
- the total amount may not be large, however, and much of it may move quickly as wash load out into Okanagan Lake and not be trapped in the channel bed sediments.
- surface erosion by groundwater springs in the lower slide, for example, would only account for about 7 per cent of

Riglin's estimated total annual sediment delivery volume, even assuming that the peak November-December spring discharge of 20 L/s continued throughout the year and that the concentration of suspended sediment transported averaged a very high 2,000 mg/L.

- most of the slide material is probably stored temporarily in canyon wall and bottom debris lobes and enters the stream system when those lobes are eroded by high flows in May and June.
- Photos 5-7 show scarps cut in the toes of debris lobes and coarse debris in the Creek.
- sediment from the lobes will include appreciable amounts of sand and gravel and could significantly affect both the nature and amount of fish habitat in the Creek.
- no data are available to permit assessment of the competence and capacity of Trout Creek to move this bed-material through its lower reaches.

Recommendations

1. Define more explicitly and in more detail the connection between the slide and fish. The implications of water quality and channel bed material degradation should be considered separately.

   - the question of why spawning runs continued for 40 to 50 years after the initiation of the failure and ended at a time when no great changes in slide activity are known to have taken place needs to be answered; are there non-slide factors -- water supply, for example -- which could have affected fish in Trout Creek?
   - what suspended sediment concentrations are presently found in the Creek, what are the implications for fish, and what concentrations would be acceptable? would slide stabilization provide those concentrations?
   - what is the present nature of channel bed material in former spawning areas? is it as bad as hypothesized? are there any sources of sediment along Trout Creek other than the slide which could also act to degrade fish habitat?

2. Develop options and costs for the re-establishment of Trout Creek as a fish stream -- if this has not already been done.

   what would the advantages and costs be of using river rather than lake water in a hatchery on lower Trout Creek?
   - would the hatchery be threatened by flooding following a catastrophic failure at the slide? what direct and indirect -- i.e. to the fishery on Okanagan Lake -- damage would be likely to occur?

- what area of potential spawning habitat exists on lower Trout Creek?
- how much would it cost to restore it to usable condition following slide stabilization?

3. Ensure that all interested parties, especially Water Management Branch and the Ministry of Transportation and Highways, realize that stabilization of the Trout Creek slide is not simply -- or even most importantly -- a fisheries issue. The potential for catastrophic failure with subsequent downstream flooding should be the primary driving force for initial drilling and geotechnical evaluation as proposed by Wei (1988).

   - given the warnings that have been given to government over a considerable number of years, the question of legal liability should be addressed immediately.
   - both Riglin (1977) and Wei (1988) comment on the inadequate geotechnical data base for the slide area.
   - this data base must be acquired for analysis of risk and for the evaluation and costing of remedial measures for slide stabilization.
   - it may be that the risk of catastrophic failure <u>plus</u> the opportunity to improve fisheries values <u>plus</u> the benefits of improving the quality of water entering Okanagan Lake will justify the cost of slide stabilization.

References

Riglin, L.D. 1977. The Perpetual Landslide, Summerland, British Columbia. M.Sc. Thesis, Dept. of Geological Sciences, Univ. of British Columbia, Vancouver, B.C.

Shannon, F. 1986. Letter dated December 23, 1986 to C.P. Lewis, Habitat Protection and Inventory Section, Recreational Fisheries Branch, Ministry of Environment and Parks, Victoria, B.C. (File 0140 Orcs).

Thurber Consultants Ltd. 1973. Trout Creek Groundwater Study. Report for the Water Resources Service, Victoria, B.C.

Wei, M. 1988. Trout Creek Landslide. Memorandum dated April 9, 1988 to A.P. Kohut, Groundwater Section, Water Management Branch, Ministry of Environment and Parks, Victoria, B.C. (File 82E/12 #31).

PHOTO 7: Boulders and wood debris in Trout Creek near the downstream end of the slide zone.

PHOTO 5: View up Trout Creek canyon past slide. Lone tree in foreground was also present in Fig. 1-4k of Riglin (1977). Note eroded toes of debris lobes.

PHOTO 6: Trout Creek at the slide. Note eroded debris lobes and gully-mouth fan.

PHOTO 3: Small slump block at the southwest corner of the Trout Creek slide. Note backward rotated trees in the foreground.

PHOTO 4: Ground surface on the upper block of the slide.

PHOTO 1: View southwest along the canyon wall toward the Trout Creek slide. Note the bedrock outcrops in the centre and the debris lobes to the left.

PHOTO 2: The lower block of the Trout Creek slide and its contact with the upper canyon wall.