

AN ENVIRONMENTAL MANAGEMENT  
STRATEGY FOR THE KILMARNOCK CREEK  
DRAGLINE MINING PROPOSAL - A CASE  
STUDY

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## INTRODUCTION

Fording Coal Limited operates the Fording River Operations Coal mine located in southeastern British Columbia, Canada. The minesite, as shown in Figure 1, is within the medial range of the southern Canadian Rocky Mountains, approximately 136 km north of the United States - Canadian border, and 6 to 12 km west of the British Columbia - Alberta provincial border.

The Fording River Operations produces an average of 4 million tons of cleaned coal per annum, primarily for export to Japan. Both thermal and metallurgical coal are produced at the minesite. Mining operations commenced in 1972 and are carried out on a continuous basis. The operations employ both truck/shovel and dragline mining techniques in multiple seam pits. Total material moved annually is approximately 42.6 million bank cubic metres (BCM) of waste and 6.0 million BCM of raw coal.

### Kimarnock Creek Dragline Project

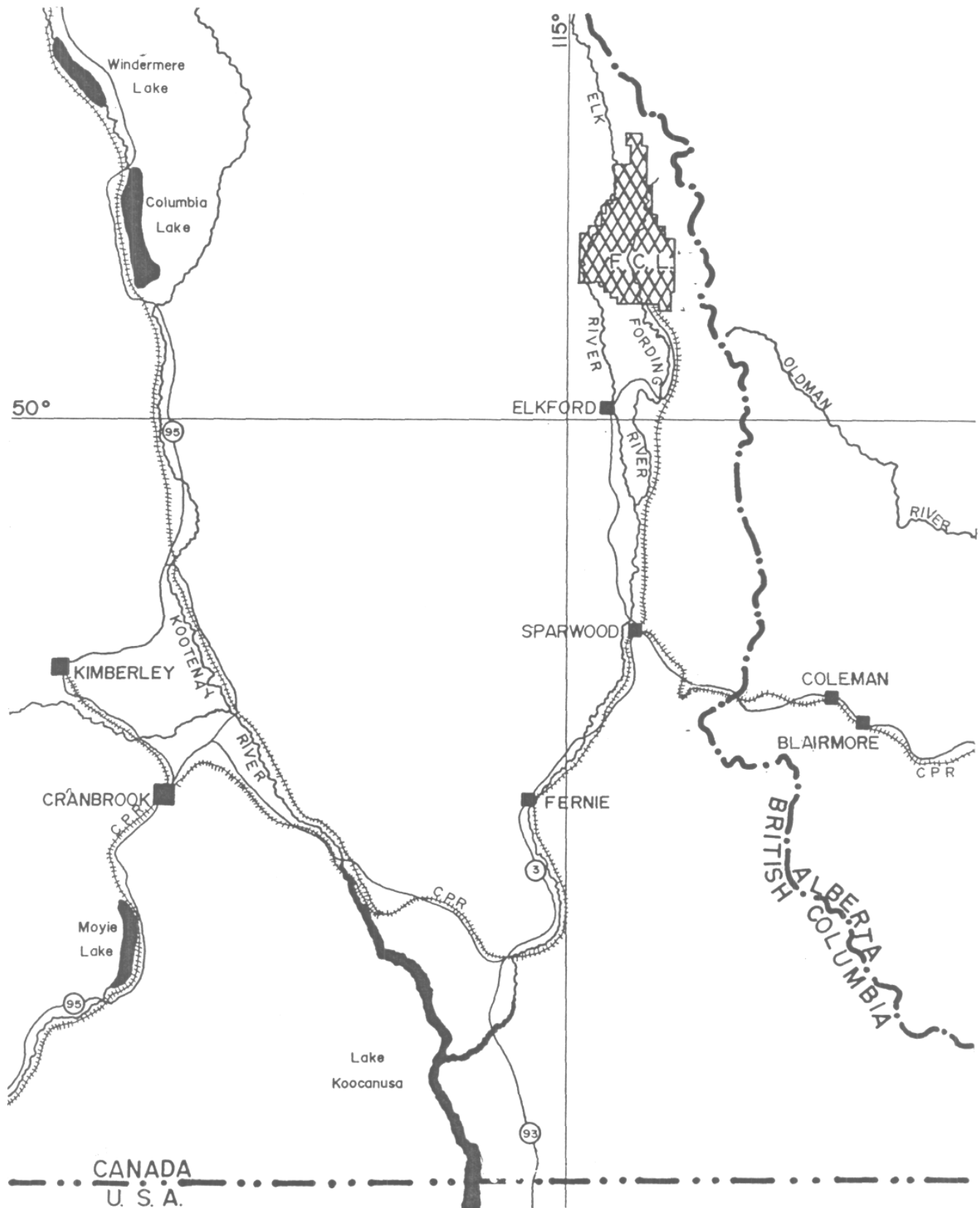
The Kilarnock Creek Dragline Project has been initiated by Fording Coal Limited in order to maintain dragline coal production as the current dragline mining area will be completed by 1987. The project involves dragline mining of a 1.1 km section of the Kilarnock Creek valley bottom.

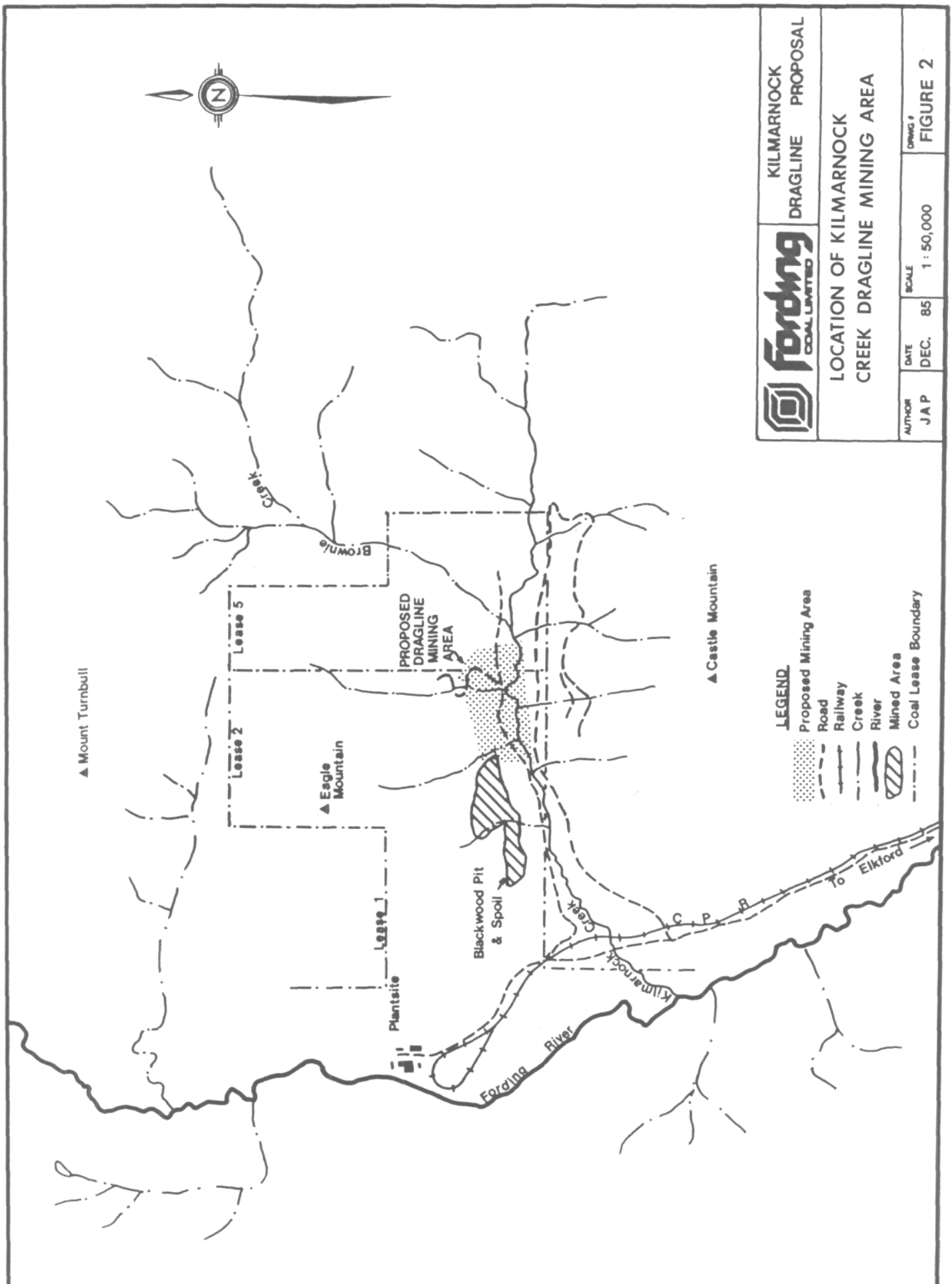
The general project area includes a portion of the Kilarnock valley bottom and the southeast flank of Eagle Mountain (Figure 2). The valley bottom was clearcut logged in the past and only scattered individual conifer trees remain. The lower slopes of Eagle Mountain were logged in 1985 to remove the remaining merchantable timber within the proposed mine area.

The primary land uses of the project area are the production of timber for forest harvesting and fish habitat in Kilarnock Creek for cutthroat trout. The Canada Land Inventory has classed the project areas as class k capability for forestry. Class k lands have moderately severe limitations to the growth

## FORDING RIVER OPERATIONS AREA LOCATION MAP

FIGURE- I





of commercial forests with productivities usually from 3.46 to 4.9 m<sup>3</sup> per ha per year. The fish habitat in Kilmarnock Creek is important locally for overwintering cutthroat trout and of moderate to low importance for summer rearing of cutthroat trout.

The Kilmarnock Dragline project area has values for wildlife but these are considered secondary to the forestry and fisheries values. The B.C. Ministry of Environments Biophysical Classification for Wildlife Capability has rated the project area as Class 3 Winter Range for elk. This classification system has been developed for the purposes of large scale regional planning and therefore must be refined with more detailed information for the purposes of assessing wildlife values for site specific project areas. Detailed habitat mapping and animal population surveys carried out on the Kilmarnock Dragline project area have indicated that winter use of the area by elk is severely limited due to snow depths.

The environmental management strategy for the Kilmarnock Creek Dragline Project deals with all the important components of the environment that will be impacted by the proposed mining activity. This paper considers two of the impacts, removal of forest lands and loss of summer and winter habitat for cutthroat trout, and discusses the development of mitigation strategies for these impacts.

The selection of mitigation strategies for the impacts from the Kilmarnock Creek Dragline Project required the consideration of future mine plans for the Eagle Mountain mining area. The long term mining plan for Eagle Mountain requires that a considerable volume of spoil be placed in the Kilmarnock valley. At the conceptual level, it is proposed to bury Kilmarnock Creek and conduct the water flow in this drainage under the spoil through a rock drain. It should be noted that at this time there are no obvious alternatives to the Kilmarnock spoil if Eagle Mountain mining is to continue.

The mitigation strategy for the lost forest values in Kilmarnock Creek is to re-establish commercial forests through tree planting. Therefore, the reclamation objective for the Kilmarnock Dragline mining area is to create a

commercial forest stand with productivity equivalent to the Class 4 forestry rating of the Canada Land Inventory system. The dragline mining activity in the Kilmarnock valley bottom will result in a post mining landform consisting largely of windrows of dragline spoil. Resloping of these spoils will be carried out to create an undulating topography suitable for the planting of commercial tree species. Reforestation of this site will have secondary benefits for land uses such as wildlife summer/fall range and recreation.

If spoiling in the Kilmarnock valley occurs then the reclamation objective for the dragline mining area will no longer be valid. Therefore, an alternate location will be selected elsewhere on the minesite to re-establish commercial forests. The choice of an alternate location will depend on several factors such as appropriate slope, aspect and soil conditions necessary to meet the reforestation objective. This alternate strategy is consistent with Fording Coal Limited's general policy to balance, on an area basis, the post-mining land uses with the pre-mining land uses for important resource values such as forestry and fish and wildlife habitat.

The complete removal of the existing Kilmarnock Creek channel within the proposed mine area and the method selected for diverting all water flows around the mine area have important implications on the impacts to the fisheries resource, the development of an appropriate fisheries mitigation strategy and the selection of a reclamation objective for the Kilmarnock Creek channel. The mine plan for the Kilmarnock Creek Dragline Project requires that mining and spoiling be carried out at the location of the existing Kilmarnock Creek channel. Therefore, all water flows (both surface and ground) must be diverted around the mine area in a manner which maintains dry mining conditions. An assessment of a number of options indicated that the best method for diverting all water flows in the Kilmarnock drainage around the mine area was to construct a cut-off dam upstream to intercept all surface and groundwater flows in the valley bottom and divert these flows around the southern perimeter of the mine area through a pair of corrugated metal pipe culverts. A key design criterion for these culverts was that they would be a temporary structure which would convey a maximum of two spring runoffs after which the water flows would be

returned to a channel constructed through the mined-out area.

The Kilmarnock Creek channel within the proposed mining area contains a major portion of the overwintering habitat available to cutthroat trout in Kilmarnock Creek and a portion of the Fording River. This habitat is critical to the survival of the trout which use it. The diversion of all water flows around the mine area through corrugated metal pipes effectively eliminates this winter habitat and any potential to mitigate this loss through the diversion structure.

Several alternative mitigation strategies were considered to deal with the impacts on fisheries and to develop a reclamation objective for re-establishing the Kilmarnock Creek channel through the mined-out area (Figure 3). The first consideration was whether or not the fish population that relied on this winter habitat was important first, in the context of the minesite area and second, in the context of the region. An assessment of winter trout populations in the area of the Fording River Operations was carried out in 1983. Trout were collected and tagged both in the Fording River and Kilmarnock Creek. The data from this study, in conjunction with information from previous fisheries studies, suggested that the Kilmarnock Creek winter habitat contained 37% of the observed winter trout population, indicating that the Kilmarnock winter population is significant from a minesite area perspective. The value of the Kilmarnock trout population from a regional perspective, is less clear. A comparison of the length-frequency distribution from samples of three cutthroat trout populations in the East Kootenay region is presented in Figure 4. The locations of these populations are the Fording River in the vicinity of the Fording River Operations, the Elk River from Elko to the Elk Lakes Provincial Park and the Wigwam River. The data for the Fording River is based on sampling carried out for the Eagle Mountain Project Phase 2 Environmental Assessment and the data for the Elk and Wigwam rivers is based on results from creel surveys as reported by Al Martin (Fisheries Biologist, Fish and Wildlife Branch, Cranbrook, B.C.) in a November, 1983 report entitled "Fisheries Management Implications of Creel Surveys conducted at the Elk River, Kootenay Region, 1982 - 1983". The length-frequency distribution for cutthroat trout in the Elk River is indicative of an over exploited population whereas the Wigwam River length-frequency

FIGURE 3      DECISION MAKING PROCESS IN THE SELECTION OF A  
MITIGATION STRATEGY FOR THE IMPACTS ON THE  
FISHERIES RESOURCE IN KILMARNOCK CREEK FROM  
THE PROPOSED KILMARNOCK CREEK DRAGLINE PROJECT

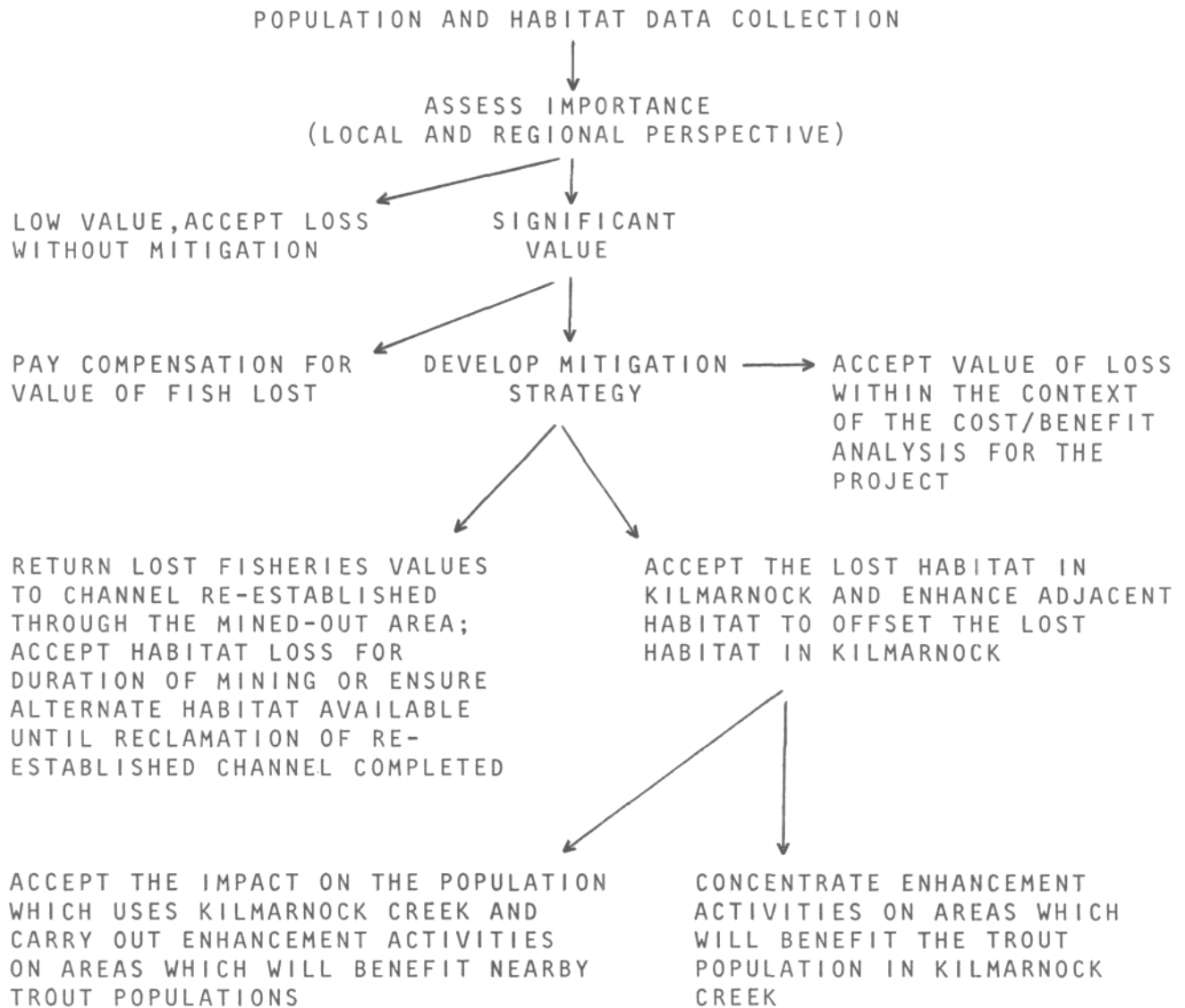
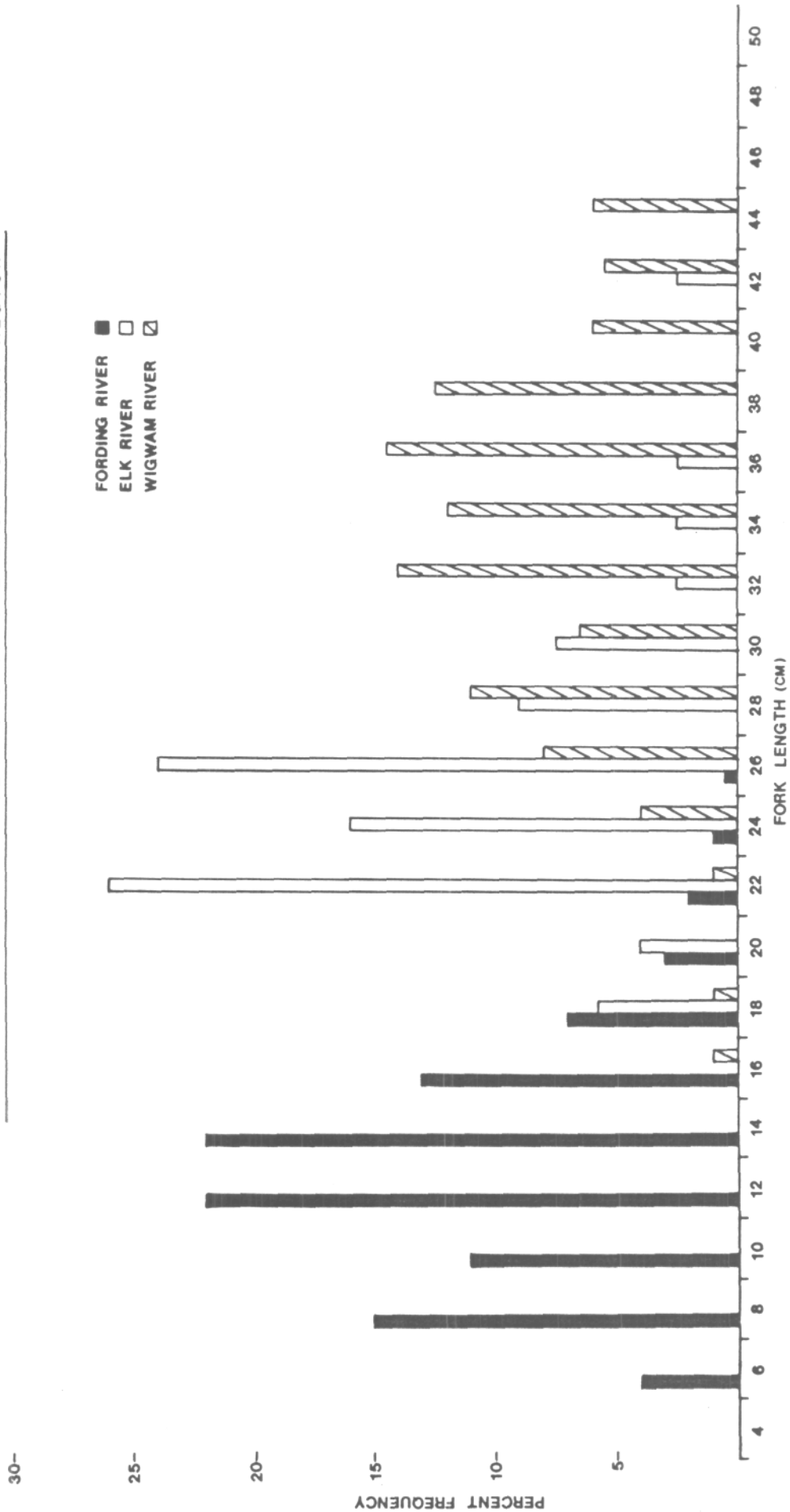




FIGURE 4  
A COMPARISON OF LENGTH-FREQUENCY DISTRIBUTION FROM THREE  
CUTTHROAT TROUT POPULATIONS IN THE EAST KOOTENAY REGION



distribution represents a normal, more desirable population structure. Figure 4 indicates that the cutthroat trout fishery in the area of the Fording River operations is less productive than either the fishery in the Elk River or the Wigwam River. Very few of the trout in the minesite area achieve a length of 30 cm which is the minimum size limit in the current fishing regulations for the Elk River and its tributaries. The current regulations, which have a daily aggregate catch limit for trout and char of 2 fish over 30 cm in length, have been put in place as the current fishing demand exceeds the fisheries supply in the Elk River and its tributaries. This shortcoming of fisheries supply to meet demand in a regional perspective suggests that the trout population which uses Kilmarnock Creek should be maintained to provide for maximum opportunity for future supply.

Following the logic in Figure 3 which depicts the mitigation strategy decision making process, it was decided that the fisheries resource had significant value. It was further decided that to pay compensation for the value of fish lost or to accept the value of the loss within the context of the cost/benefit analysis for the project were not desirable options and that a mitigation strategy needed to be developed. Following the decision making process illustrated in Figure 3 further, the option to reclaim the re-established Kilmarnock Creek channel through the mine-out area to return fisheries values was also dropped because of the long term implications of the possible spoil development in the Kilmarnock valley for Eagle Mountain mining. Enhancement of existing fish habitat was selected as the best option for mitigating the impacts on fish habitat in Kilmarnock Creek from the Kilmarnock Creek Dragline Project.

The reclamation objective selected for re-establishing the Kilmarnock Creek channel through the mined-out area was to construct a channel which would ensure adequate water quality with no requirement to create habitat for cutthroat trout. It should be noted, however, that should spoiling into the Kilmarnock valley not occur in the future, the carrying out of enhancement activities to re-establish fish habitat in Kilmarnock Creek will remain open as an option to offset any impacts on the local fisheries resource from future mining activities at the Fording River Operations.

## CONCLUSIONS

Post-mining land use objectives must be developed on a site specific basis with a complete data base, a thorough understanding of local, regional and provincial implications of the impacts on resources and of reclamation options and technology. The management objectives for each resource impacted by mining are a governmental function. The environmental impact management strategies for each resource must be jointly worked out by both government and industry. In this way, impacts can be placed and managed in proper perspective, with responsible allocation of funds and in the best interest of all.