

ECOLOGICAL ROAD PLANNING IN NORTHERN SASKATCHEWAN

A Study of Alternative Routes for the Proposed Road from Besnard Lake to Sandfly Lake, Sask.

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In this report we use data on Bald Eagle nesting and feeding habitat presented in other articles in this issue to suggest how roads in northern Saskatchewan might be planned to minimize effects on Bald Eagles. The study reported here has already been submitted to the Honourable Ted Bowerman, Minister of the Department of Northern Saskatchewan, and the final decision on the route of this road currently hangs in the balance. We present this study here to show how our earlier research can be used to plan roads in northern Saskatchewan, and to generate support among the members of the Saskatchewan Natural History Society for a change in the proposed location of this road and a change in the present policy of planning roads in northern Saskatchewan.

Research during the last 8 years has shown that Saskatchewan has a large breeding population of Bald Eagles.^{4 7} With the decline in numbers of this species in many parts of North America,^{2 5 14 15 16} northern Saskatchewan with a mid-summer population of about 12,000 Bald Eagles is now one of the major remaining breeding areas, and is a major source for Bald Eagles wintering in the midwestern United States.⁹ The continued existence of large numbers of these big beautiful birds in northern Saskatchewan depends on preservation of their nesting habitat and the continued availability of fish for them to eat.

Currently, the economy of northern Saskatchewan is in transition from one of hunting, fishing and trapping to a more diversified one in which pulp-milling, mining and recreation are

playing important roles. New roads are now providing easy access to areas which heretofore had been accessible only to travellers by canoe or bush plane. These roads are the arteries along which future development will take place. Presently, many of these roads are designed and built by the Prince Albert Pulp Company to reach areas of harvestable stands of timber. The routes for these roads are usually the shortest alternative between two points with a view to minimizing trucking costs which are estimated at a fixed rate per mile. In view of the many other features of northern Saskatchewan which are worthy of consideration, in particular Bald Eagles, we reviewed the location of a segment of a proposed road running north from Besnard Lake towards Sandfly Lake (Fig. 1). Emphasis was placed on habitat requirements for Bald Eagles. In addition, ecological features which will be important to the future fishing, hunting and

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recreational potential of northern Saskatchewan were considered. To obtain a balanced view of the alternative routes for the road, landscape features which play a role in the cost of construction and maintenance of a highway were also identified along with forests suitable for pulp harvest.

METHODS. The method employed in planning the optimum route was that of McHarg.¹² Briefly, each of the factors to be considered was graded on a scale of one to three. A map was then drawn with optimum areas for the road (grade 1) left transparent, suboptimum but acceptable areas for the road (grade 2) coloured grey, and poor areas for the road (grade 3) coloured black. Each factor (soil, slope, etc.) was analyzed separately, and the maps for each factor were then superimposed so that the optimum position for the road could be visualized as the place where the lightest coloured areas were located.

RESULTS. *Optimum terrain for road construction:* Two factors relating to optimum terrain for road construction are soil conditions and the slope of the land.

The optimum soil conditions for road construction in this area are sandy and gravelly soils (Fig. 2), because gravel is required for a road bed and it is easier and less costly to build a road on a sand or gravel base than on a rock base. Specific information on soil types in this area is lacking, but it is known that Jack Pines tend to grow in areas with sandy and gravelly soils. Thus areas where there were Jack Pines were considered to have optimum soil conditions (grade 1). Marshes and lakes were considered poor conditions for roads (grade 3). All other areas were considered grade 2. Information of the location of Jack Pine stands and the areas where there were lakes and marshes was obtained

from inventory maintenance map (Dept. of Natural Resources, Sask.). An example of current soil erosion may be seen in Fig. 7.

Steep slopes (greater than 10%) were considered poor places for road construction (grade 3).¹² More gentle slopes (2.5-10%) were considered intermediate (grade 2). Flat land (slopes less than 2.5%) were considered optimum for road construction and graded 1. Information on slopes was obtained from a 1:50,000 map (Surveys and Mapping Branch, Dept. Energy, Mines and Resources, Ottawa, 1973) with contour intervals of 25 feet (Fig. 3).

Optimum Route for Harvesting Forests for Pulp: Mature forests where trees were greater than 50 feet in height were considered optimum for harvesting for pulp (grade 1). Areas where trees were 30 to 50 feet in height were classified as intermediate (grade 2) and areas where trees were less than 30 feet in height were considered grade 3 (Fig. 4). The presence of softwood and hardwood in the stands was not taken into consideration because determination of the optimum soil conditions had already created a bias towards softwoods, and future harvesting for pulp will include hardwoods as well as softwoods. Tree density was not taken into account, except that sparsely treed areas such as road ridges were classified grade 3, because this complicated the analysis without altering the map significantly.

Optimum route to Minimize Effects on Wildlife: In the preparation of this map (Fig. 5) the following areas were considered: 1) the marshes with trees near forest edge and associated streams and ravines which are the most productive habitat for wildlife — turkeys, ducks, moose and fur bearing animals — important to local trappers and hunters; 2) spawning grounds for fish and 3) nesting and feeding areas

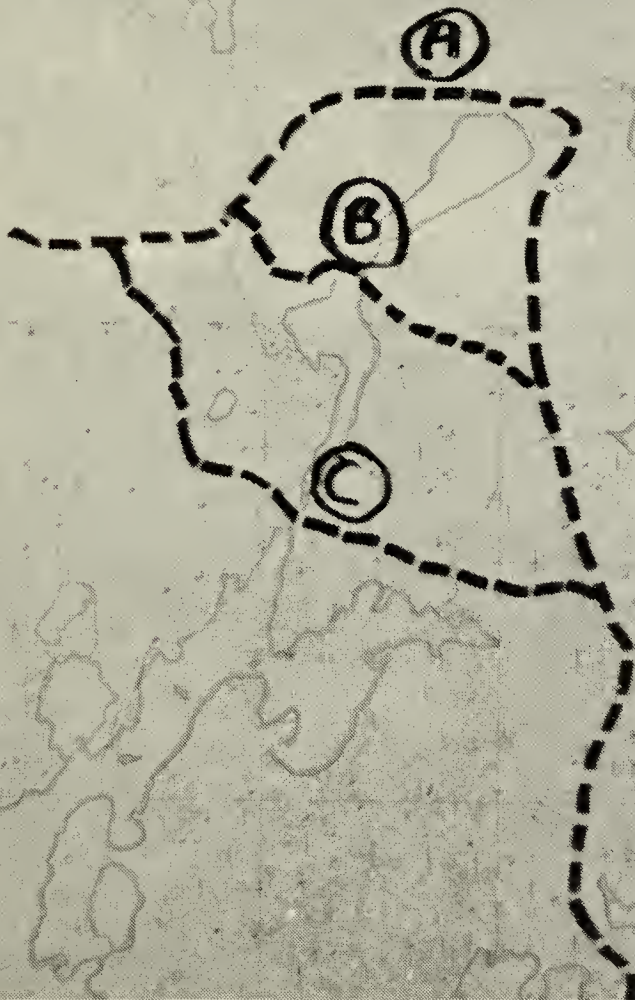


Fig. 1. The area covered by the present study. Route C is the proposed road location. Routes A and B are alternatives. The lake on the right hand side and on the lower left is Besnard Lake. The spawning stream considered by this study is located just below the letter C.

Bald Eagles. The marshes are classed as poor locations for roads in Fig. 2, and were not again marked on the map shown in Fig. 5. John Hastings, manager of Red's Camp and a long time resident of Besnard Lake, was asked to mark important spawning streams flowing into the lake. The only spawning area in the region considered by the present study is at the entry of a small stream into Besnard Lake (Figs. 1 and 8). Walleye and Northern Pike can be seen spawning in large numbers each spring near this stream and in the adjacent bay. The importance of Besnard Lake for fishing (both commercial and sport) and the importance of this spawning area as a source of food for Bald Eagles on their arrival at Besnard Lake in the early spring, led us to suggest a buffer zone (a circle 1/2 mile in diameter) as a poor place to put a road (grade 3) and an additional zone, 1/2 mile in width, which would be intermediate in terms of the route (grade 2). Eagle nests were given a buffer zone (1/4 miles in diameter — grade 3) where definite adverse effects of a road would be expected and an additional zone 1/4 mile wide was considered grade 2 where less severe adverse effects might occur. These figures are taken from a study by Greg Jeunemann done in northern Minnesota on the Chippewa National Forest.¹¹ They represent the best available figures on the effects of human disturbance on Bald Eagles. We suggest that, if anything, these zones may be too small for northern Saskatchewan, though more research will be needed to substantiate this belief. We have already shown that the most critical time for disturbance near eagle nests in Saskatchewan is from March 20 to July 1 during courtship, incubation and when the young are small, and it may be that a larger buffer zone for this time interval alone will suffice.⁶

Since about 12% of Bald Eagles in

northern Saskatchewan change nest sites each year, we also considered habitat suitable for Bald Eagle nesting but which currently has no nest sites. Using quantitative data on the utilization of shoreline habitat in the area by Bald Eagles,⁸ we coloured black all zones where these birds could be expected to have one or more nests per 1/4 sq mi, and we coloured grey all habitat where Bald Eagles could be expected to have one or more nests per sq mi.

A Composite Map: A consideration of possible routes for the road going north from Besnard Lake toward Sandfly Lake yields three alternatives for the segment studied in this report (Fig. 1). Superimposition of the map shown in Figs. 2-5 gives a composite map in which areas are graded one to five in degrees of darkness (Fig. 6). On the composite map the areas most suited for the road are lightest, and the areas least suited are the darkest. The route which is most consistently light is route A from Fig. 1, and this is labelled first choice (1) on Fig. 6. The route which appears to offer the second best alternative is route B, and this is labelled second choice (2) on Fig. 6. Route B needs to be seriously considered since it is somewhat shorter than route A. However, there is a steep slope along route B which would make construction more difficult.

From the composite map it can be seen that route C is the poorest choice of all. This route would necessitate putting the road through three areas of steep slope. It might be possible to avoid one or two of these areas of steep slope but at a cost of putting the road through marshes. Furthermore the route goes through a small stream where fish spawn in the spring, an area that is an important spring feeding ground for Bald Eagles. In view of the importance of this area to eagles, and to future fishing, hunting and trapping,

we feel that the road should not go near this small stream if there is any other possible location. The present study shows that routes A and B are both possible alternatives, and that they are both feasible and indeed superior to route C when looked at from several aspects. In view of these findings, we strongly urge that the present plans which would put the road through on route C be altered and instead either route A or route B be chosen.

DISCUSSION. The present investigation has studied a segment of a proposed road from Besnard Lake to Sandfly Lake placing particular emphasis on the habitat requirements of Bald eagles. The dependence of these eagles on shoreline habitat which is the same habitat most frequently chosen by people for cottages makes these birds uniquely susceptible to the influence of human development. A review of the decrease in numbers of Bald Eagles in other parts of North America suggests that human disturbance and habitat destruction are major factors.^{1 3 5 14 16} On Manhattan Island in New York in the 1800's, George Grinnel recalled that the Bald eagle was "extremely abundant on the floating ice of the river and sometimes brought its captive fish to the trees in the park, there to eat them or as often to quarrel about them with its fellow, and sometimes drop the prey."¹⁰ Alas, this sight is now only a memory. Roberts in *The Birds of Minnesota* mentions that there used to be one or more pairs nesting on nearly every large lake in the state.¹³ Presently Bald eagles breed commonly in only a few parts of northern Minnesota. Today in Saskatchewan there are one or more pairs of eagles nesting on nearly every reasonably sized lake in northern Saskatchewan from the Cumberland marshes in the southeast to Lake Athabaska in the northwest. Larger

lakes like Besnard Lake have many more. Concern for the future of these eagles prompted the present study.

In this report, we emphasize the fact that, in the rush to build roads for harvesting pulp, important aspects of the northern environment are not receiving adequate attention. We prepared this study not just to look at alternatives to a short segment of proposed road, but also to serve as an example of how various factors in the northern Saskatchewan environment, particularly eagles, can and should be considered in the building of roads. We recognize that there are defects in the present study. Due to lack of information, the depth of bedrock, an important consideration for northern road building, was not taken into account. Jack Pines can grow on well drained areas where there is exposed bedrock as well as on sandy and gravelly soils. In such areas, Jack Pines are usually sparse and short. We feel that through consideration of tree height and classification of sparsely treed areas as grade 3 in Fig. 3, most such areas have been included in the darker areas on the composite map.

In spite of these defects, we feel this study has served a useful purpose in integrating several environmental factors and future human activities into plans for road building in the north. It was instructive to us to realize that the optimum place for road construction and harvesting pulp — well drained areas with climax forest — are usually poor places for wildlife, while the most productive areas for wildlife — marshes with the nearby forest edge and the associated streams and ravines — are usually poor places for road building and pulp cutting. With careful planning it should, therefore, be possible to have considerable pulp cutting in the north and still minimize the adverse effects on wildlife. Without such planning, it is likely that many important aspects of our nor-

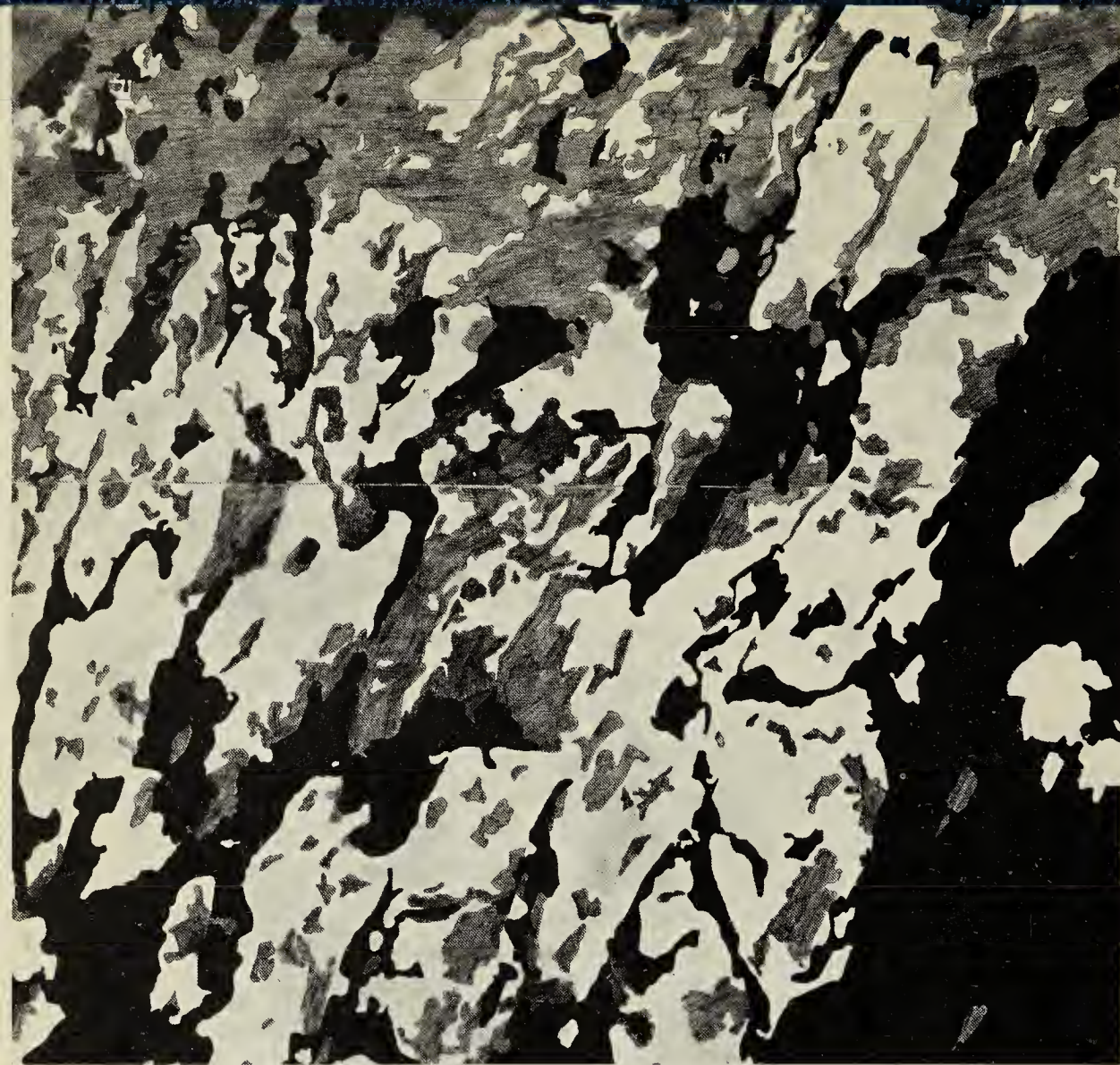


Fig. 2.
Analysis
of soil
conditions.
Optimal
conditions
for the
road are
white,
suboptimal
conditions
for the
road are
grey and
poor
conditions
for the
road are
black.

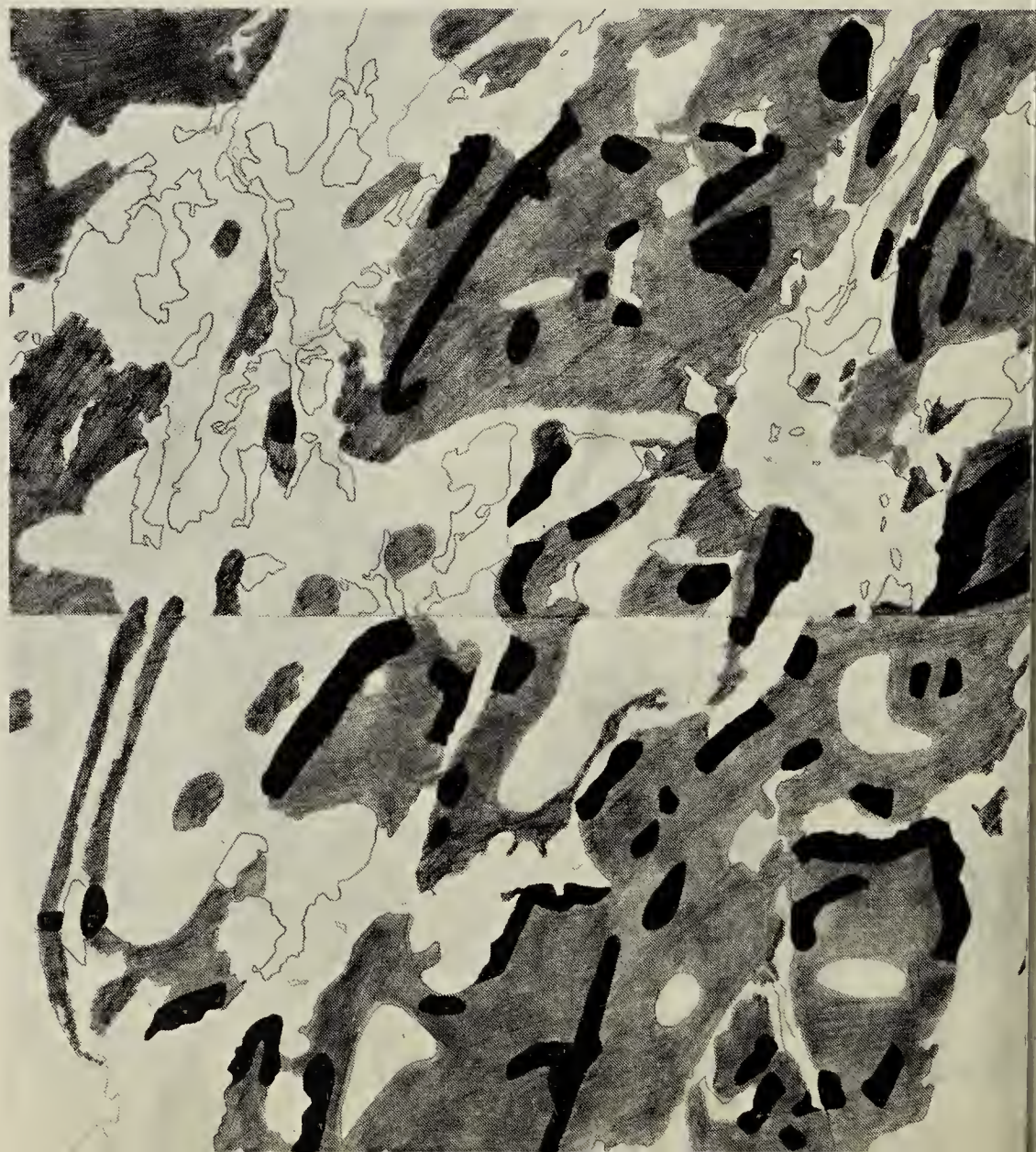


Fig. 3.
Slope of
the land.
Areas of
steep slope
are black,
moderate
slope grey
and flat
land is
white.



Fig. 4. Suitability of forests for harvest for pulp. Optimum forests for pulp are white, suboptimum grey, and poor forests are black.

Fig. 5. Areas important to wildlife. Black areas represent eagle nest sites, fish spawning areas or optimum eagle nesting habitat. Grey areas are buffer zones for the above, or suboptimal eagle nesting habitat. White areas are poor Bald Eagle nesting habitat.

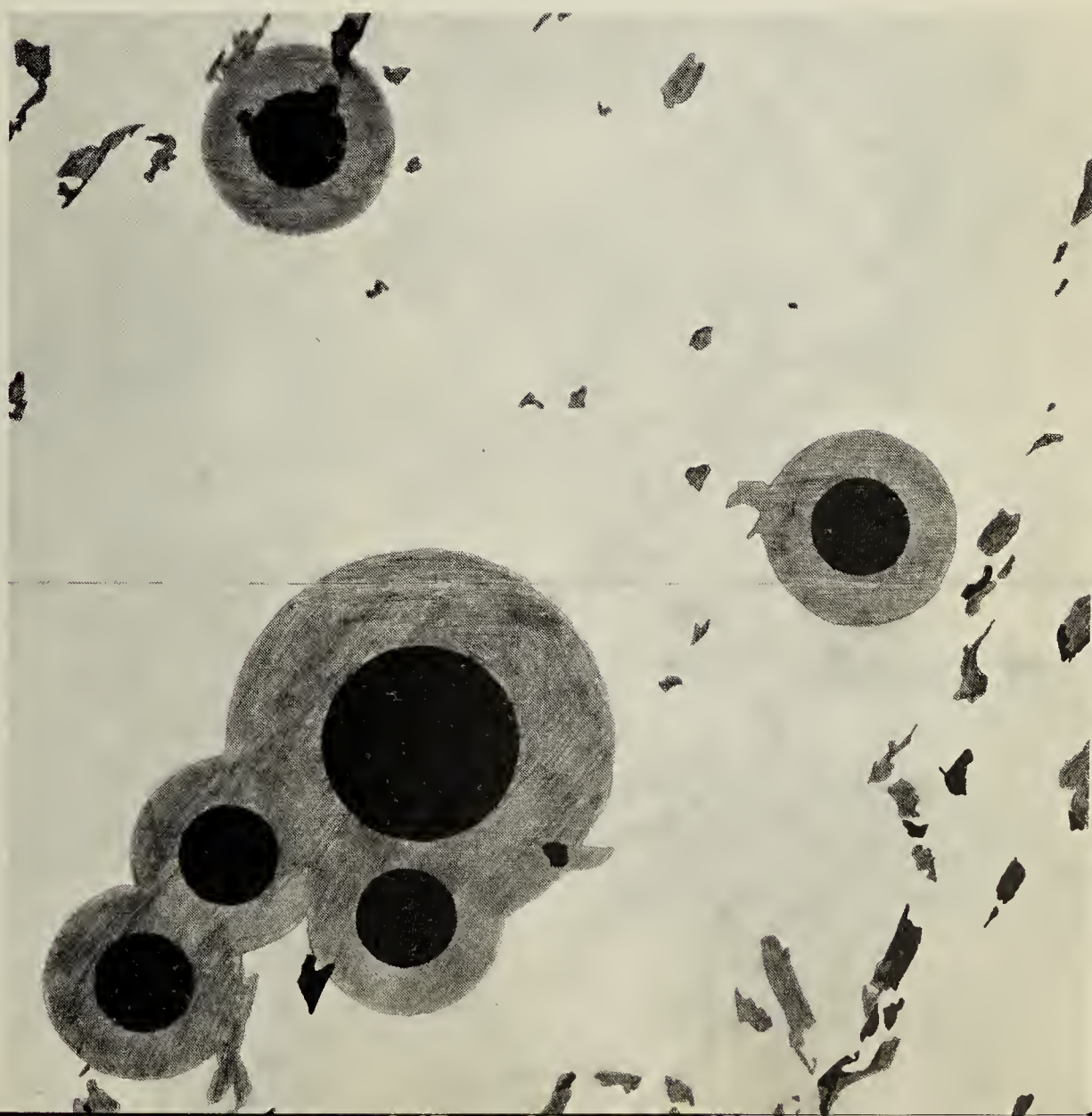


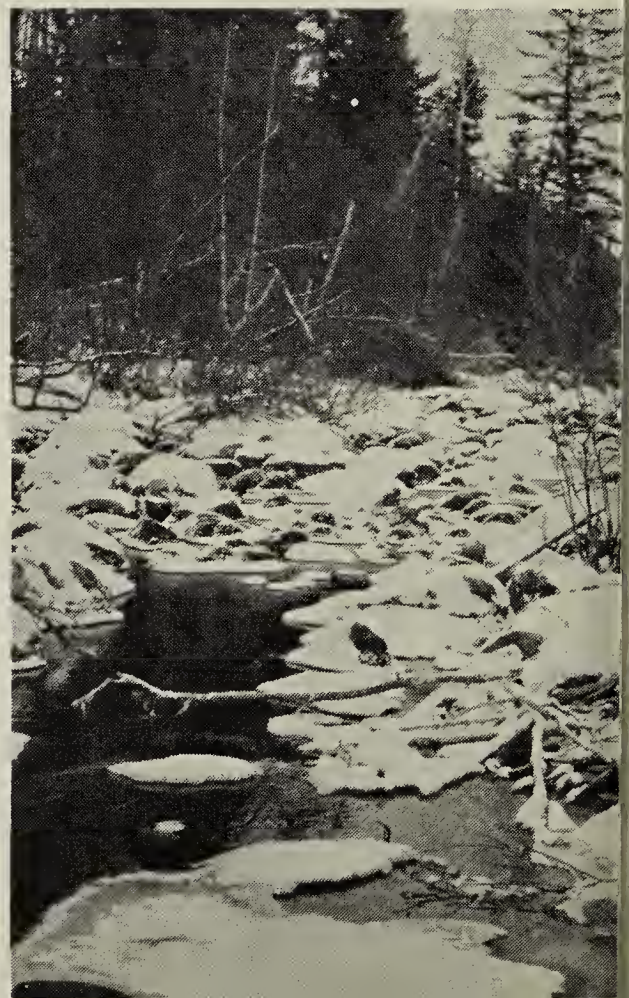


Fig. 6. The Composit map: The alternative labelled (1) is the best over route. Alternative (2) is the second best.

Fig. 7. Erosion along the present road to Besnard Lake is particularly severe where the road crosses the Montreal River. As a result of this erosion the Montreal River in spring changes from a clear stream above the road to a brown turbid stream below it. Such increased turbidity in a spawning area during the critical time of spring runoff may have a drastic effect on spawning fish.



Fig. 8. The small stream referred to in the present study where fish spawn early in spring. This photograph was taken in early April, 1975, 5 to 7 weeks before the ice is usually gone from the main body of the lake. Already the flow in this stream has resulted in some open water.



ern Saskatchewan heritage will be lost.

SUMMARY. Studies were conducted on alternate routes for a segment of the road planned from Besnard Lake to Sandfly Lake. These studies take into account 1) the most suitable terrain for a road, 2) the location of forests with trees which are suitable for harvest for pulp and 3) the location of important areas for wildlife. The study suggests two alternative routes for the road, either of which would be more suitable than the presently proposed route and serves as an example of how planning for roads and other development in northern Saskatchewan might take into account the habitat requirements of Bald Eagles and other wildlife.

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The largest number of Bald Eagles recorded in the 1974 Christmas Bird Census for North America was at Klukwan, Alaska (59° x 135°). In the standard 6-sq-mi count area, 1162 eagles were found.