by J.T. Hanscom and T.E. Osterkamp

Potential Caribou - Ice Problems in the Watana Reservoi

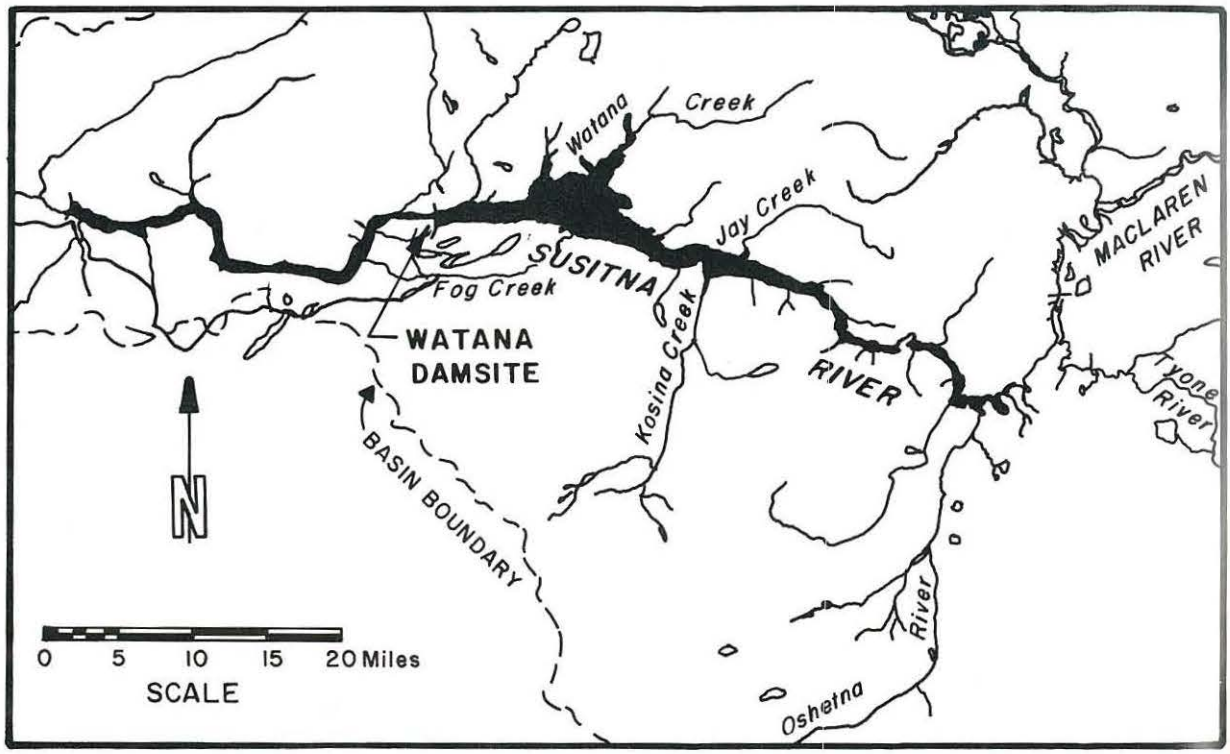


Figure 1. Susitna hydroelectric site.

INTRODUCTION

Caribou from the Nelchina herd cross the Susitna River biannually in the vicinity of the proposed Susitna Hydroelectric Project. It appears that the Watana Reservoir will be sited near or on three caribou crossing areas. Since past studies[1] of caribou behavior have shown that disturbance of their natural habitat by various construction projects (e.g. roads, pipelines etc.) can disrupt their normal behavior, it is important to try to determine what effect the Susitna Hydroelectric Project will have on the Nelchina caribou herd. The purposes of this article are to show that the Watana Reservoir does have the potential to affect caribou migrations and to raise some questions that should be answered before the nature and extent of the effects that the presence of the reservoir may have on the caribou can be predicted.

The Watana Reservoir on the Susitna River will be 54 miles (90 km) in length with the dam located about 134 miles (216 km) from the mouth of the river (Fig. 1). The reservoir will be contained

usitna Hydroelectric Project

within a narrow canyon 1/3 to 1 mile (0.5 to 1.6 km) wide for much of its length, except near the tributaries where it will be wider, particularly at Watana Creek and to a lesser extent at Jay and Kosina Creeks and the Oshetna River.[2] The reservoir level is expected to vary 80 to 125 ft (24.4 to 38.1 m) from October to April of the hydrologic year which corresponds to the period of ice formation and growth in the reservoir. Maximum daily variations should be less than 2 ft (.61 m). Table 1 shows the minimum draw-down schedule for the pool, starting at its maximum level of 2185 ft (666.4 m).

Parts of the Nelchina caribou herd, consisting of 15,000 animals, cross the Susitna River from the north to south in late April and early May to reach their calving grounds. Later in the summer (late July to early September), they recross the river going north.[3] Although very little work has been done on current migration routes, and these may change periodically or may even be random, it is thought that the Watana Reservoir will affect three general crossing areas at Fog Creek, Jay Creek, and the Oshetna River. Caribou have been observed in these areas at the time of breakup, possibly waiting until the largest ice floes clear from the river before crossing.[4] It is not known exactly how many caribou cross at these points.

POTENTIAL PROBLEMS AND QUESTIONS

Possibly the most serious problem may be the presence of the reservoir; the caribou may not even attempt to cross it. We leave this important problem to

The two caribou photographs in this article are courtesy of Dr. David Klein.

TABLE 1

Maximum Water Level — Minimum Draw-down Schedule

Mid-month	*Starting Level*	*Ending Level*	*Change*
Oct.	2185′	2185′	0
Nov.	2185′	2185′	0
Dec.	2185′	2175′	-10′
Jan.	2175′	2145′	-30′
Feb.	2145′	2130′	-15′
March	2130′	2115′	-15′
April	2115′	2105′	-10′
May	2105′	2125′	+20′
June	2125′	2170′	+45′
July	2170′	2185′	+15′
Aug.	2185′	2185′	0
Sept.	2185′	2185′	0

Figure 2. Eklutna Lake showing ice shelving on a gently sloping shore. (Photograph by C. Stephens.)

students of caribou behavior and proceed to potential problems caused by the physical nature of the reservoir.

Warm water released from the reservoir will prevent a stable ice cover from forming on the river. This open water may extend downstream to Talkeetna or farther, depending on weather conditions, so that the Fog Creek crossing will be open water at all times of the year. This should not create a problem for the caribou since they normally swim the river, unless they somehow depend on the ice cover for crossing at certain times.

Winter draw-down of the reservoir will produce ice-covered shores or so-called ice shelves. These ice shelves are formed when the floating reservoir ice cover becomes grounded on the shores as the reservoir level decreases during the winter. An example of ice shelving on a gently sloping shore at Eklutna Lake, near Anchorage, is shown in Figure 2. The grounded ice cover may assume the same shape as the shore or it may fracture, creating deep cracks, or it may even remain suspended in some places. We suggest that an ice-covered shore that is steep, contains cracks, or has the potential for caving under the weight of caribou, may present a serious obstacle to their crossing the reservoir.

The slope of the ice-covered shores in the draw-down zone can be used to give an indication of the location of very steep areas that the caribou may have difficulty negotiating. We have measured the slope of the north and south shores of the reservoir using a 1:63,360 scale map. The slope was measured between the 2075 ft (632.9 m) contour line and the 2185 ft (666.4 m) contour line which corresponds to the largest draw-down when starting from maximum pool. Figures 3 and 4 are graphs of the slope values along the north and south shores of the reservoir.

The north shore of Watana Reservoir will be 67.1 miles (108 km) in length and the south shore 51.5 miles (83 km) in length. Jay Creek area lies between 38.8 - 45.1 miles (62.5 - 72.5 km) on the north shore and 18.6 - 28 miles (30 - 45 km) on the south shore. The Oshetna River is at

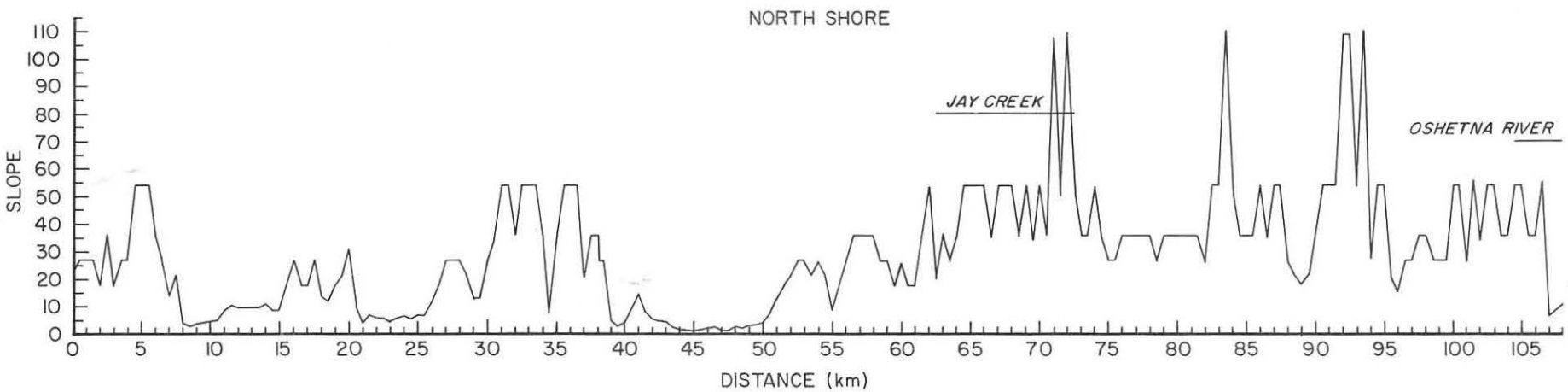
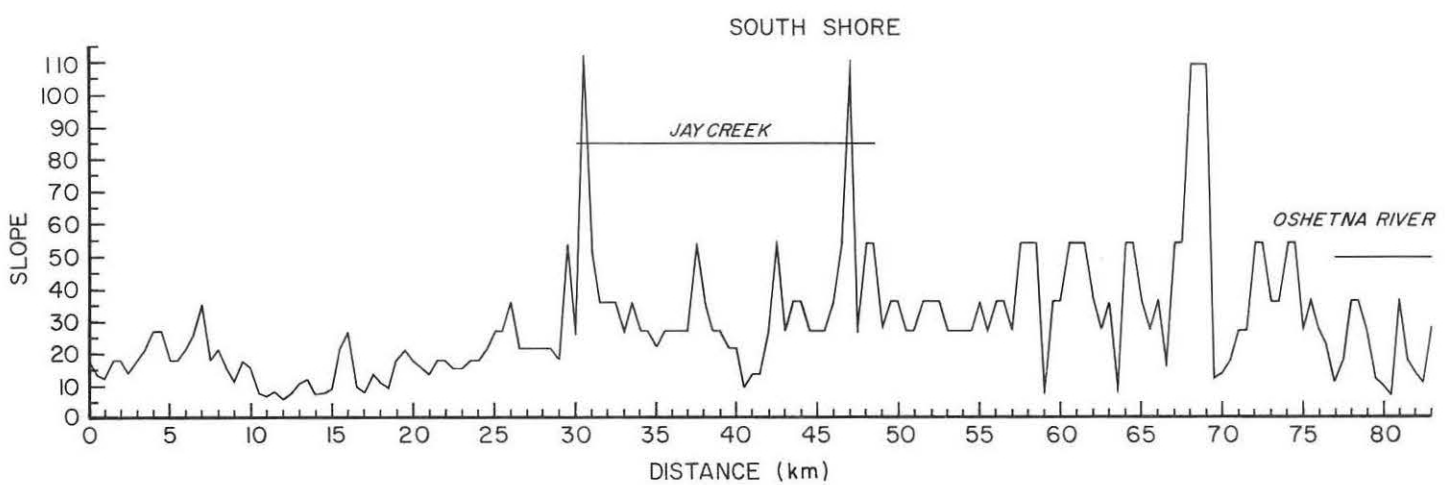


Figure 3. % slope vs. distance along the north shore. The two crossing areas of Jay Creek and Oshetna River are marked on the graphs both where they flow into the proposed reservoir and on the opposite shore. It should be noted that the scale map from which these slopes were taken would not show features such as a small gully which could enable caribou to negotiate easily an area that the graphs indicate would be difficult.

Figure 4. % slope vs. distance along south shore of Watana Reservoir.



65 - 67.1 miles (104.5 - 108 km) on the north shore and 47.8 - 51.6 miles (77 - 83 km) on the south shore. It appears that the two areas have little in common and must be considered separately as caribou crossings.

Realistic assessment of the effects of ice shelving requires consideration of both caribou behavior and ice conditions. With regard to the ice conditions, the greatest need is for a realistic model of the formation, growth and decay of the reservoir ice cover. Some questions that should be addressed are: What are the shore conditions or slope values that may cause the settling ice cover to break, leaving cracks in which caribou could be injured or possibly trapped? What is the timing of this settling, cracking and snow cover development that might mask the cracks? The thickness of the settling ice cover will increase through the winter but what will the thickness distribution be? Will the wind keep the ice clear of snow? What are the maximum slopes of clear ice and snow-covered ice that caribou can negotiate? How long will the ice shelves remain after breakup, and will caribou be forced to negotiate melting (wet) ice shelves?

During the spring caribou migration, the reservoir may still be frozen in the Jay Creek area, where the caribou will be coming from the north down a slope that varies from 109% to 21.5% with much of the shore between 40 - 60% slope. Probably the only problems the caribou would have getting down this shore would be falling into cracks formed as the ice sheet settles or breaking through the areas where the ice has bridged gaps. The south bank has a slope that varies from 109% to 9.0%, with much of the shore between 30 - 60% slope, so it is possible the caribou would have trouble climbing out on the south side.

The breakup dates of Jay and Kosina Creeks would also be important. If these two creeks break up before the caribou try to cross, there could be water flowing on top of the reservoir ice, and melted areas formed at the mouths of the creeks. An overflow, by itself, would probably cause no problems unless it cut a channel through the ice. Then the caribou might have trouble climbing out on the floating ice cover after swimming or walking through the overflow.

In the Oshetna River area these same questions need to be answered, but the situation is a little different. The slope on the north shore varies from 53.8% to 6.8% and on the south shore from 35.9% to 6.8%, so both shores have a more gradual slope than do those at Jay Creek. This area may be affected by the breakup of the Tyone River as well as the Oshetna River. For 3.7 miles (6 km) upstream of the Oshetna River, the draw-down of the reservoir may leave an ice sheet on the river bed and flood plain. When the Tyone River breaks up, water will be flowing into this ice-covered area. The actual effect is unknown but there could be ice jams and/or ice chunks floating in the area which would make it difficult or impossible for caribou to cross.

In conclusion, it seems likely that the reservoir will cause the caribou some problems, but the seriousness of the problems cannot be realistically assessed until more information has been gathered on caribou behavior and on the ice conditions in the reservoir.

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[3]Eide, Sterling. 1979. Personal communication.

[4]*Ibid.*

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