HIGHWAY CONFLICTS AND RESOLUTIONS IN BANFF NATIONAL PARK, ALBERTA, CANADA

By:

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The Setting

Banff National Park is located on the east side of the Canadian Rockies, 100 km west of Calgary, Alberta. The Bow River heads in a major valley in Banff and flows east through Alberta, including Calgary. In 1881 a route decision for Canada's transcontinental railroad set the stage for one of today's major park problems. It was decided to access Canada's west coast across the Rockies by way of Calgary, up the Bow River Valley and over the Kicking Horse Pass rather than any of the other three major routes which were available. Rail reached Calgary in 1883 and pushed on up the Bow Valley. Canada's first National Park - Banff, centred on that valley, was established in 1885. In following years Banff became an internationally famous tourist destination, and societies' modern expectations followed. Early visitors arrived by train and travelled around by horse and horse drawn conveyances. Motor vehicles penetrated the park by the 1920's and touring coaches became popular during the 1930's. Personal affluence following WW II brought private vehicles and the need for public roadways. By 1950 a TransCanada Highway following the approximate route of the half-century old Canadian Pacific Railway was in place. By 1972, the need to upgrade the TransCanada Highway (TCH) which extended nearly 5000 km from St John's, Newfoundland to Victoria, British Columbia, was obvious in the accident statistics, traffic flow breakdown, wildlife collisions, and increasing economic importance of Canada's main traffic artery.

Planning begun in 1972 culminated in bitter public hearings in 1979. Again, decisions which will be historically significant were taken. All possible options, including alternate travel modes and transportation routes were examined. The conclusion was to twin (four lane) the existing two lane roadway through Banff. Once again, it was decided the Bow Valley/Kicking Horse route would be the main trans-mountain, multimode, transportation corridor between Canada's prairies and the west coast. Highway planners and park managers were charged with designing, constructing and operating the highway in a way which minimized its adverse impact on Canada's flagship national park. Construction got underway in 1980.

The Environment

The Bow River Valley is rich in natural, wildland resources, particularly wildlife. Banff National Park has 54 species of mammals and 280 species of birds. At various times during a year most of these species would utilize the Montane ecosystem of the Bow valley, on a transient or permanent basis. The Bow River has 15 species of fish, and four species of amphibians in close proximity. The TransCanada Highway has directly impacted many of these species of wildlife, or affected their habitats. Original construction in the 1950's had realligned the river in numerous locations. During the 1970's so many animals were killed on the TCH, it was locally referred to as the "meatmaker". In anticipation of responding to the need to upgrade the roadway, it was clear that environmental protection would be a major objective and a scientific challenge.

Elk (wapiti) were, and are, the most conspicuous and vulnerable species which the highway affects. Mule and white-tailed deer, moose, black bears, coyotes, bighorn sheep, and smaller mammals such as pine squirrels and hare were regularly killed on the highway. Occasionally, grizzly bear, wolf, wolverine, lynx, marten, porcupine, hawk, owl and others would be struck.

It was decided to fence both sides of the new roadway with a 2.4 m high page wire fence. Underpasses would be constructed to facilitate habitat access continuity and wildlife movement throughout their range. Texas gates and stiles were used to allow unimpeded vehicular and pedestrian passage through the fences. One-way and conventional gates were installed for wildlife management actions. Fish habitat was re-created where major fish-bearing streams were impacted.

Underpasses varied from conventional, bridge-like, concrete structures with 13 m span openings and 4 m headway, to 4 m circular culverts, and 4X7 m elliptical multiplate culverts. Side to side width varied depending on the centreline to centreline separation of the roadway. By 1990, 31 km of twinned highway and 10 underpasses had been constructed.

Results

Monitoring of the effects of the fence and underpass installation on wildlife collision rates and wildlife habits was undertaken. Elk were the species of main effort, although the research was designed to report on other species as well. About 800 elk inhabit the valley in the vicinity of the fence during the winter. This research revealed the fences to be highly effective in reducing wildlife collisions - over 94% for elk. Other large species were similar. During one short period when a segment of the roadway was twinned but the fences weren't installed yet, the kill rate was the highest recorded. Clearly, the fences were necessary and are highly successful for mitigating wildlife collisions.

Further research to determine the effect of the fences on elk migration and movement within their range revealed favourable results. After an initial familiarization period of about a year, it appears that most elk are using their habitat in patterns similar to their pre-fence habits. Of course, they have modified their travel routes to incorporate the underpasses, and they don't casually cross the highway as before. Importantly however, their range philopatry has not been significantly disrupted. Individual elk and herds migrate and use their winter and summer ranges as effectively as before the fence was erected.

Detailed research of deer has not been pursued, although tracking beds show deer use the underpasses. Most other highly transient species, e.g. wolf, grizzly and black bear, bighorn sheep, coyote, lynx and some small mammals have been recorded using the underpasses. However, problems have been identified and several unexpected wildlife impact occurences were recorded.

None of the other conspicuous wildlife species seem to have adapted to the underpasses as well as elk. Bears do not use the underpasses as frequently as we had expected. We have observations of black bears climbing the fences, and grizzlies digging under or tearing through. Coyotes appear to be attracted to the fenced corridor to hunt for mice and voles in the heavier grass cover which now is not removed by the large herbivores. Consequently coyotes are highly vulnerable to

roadkill. Wolf use of the underpasses is inconsistent. Although wolves have used the underpasses, there have been observations of wolves making substantial detours to end-run the fence in order to avoid use of a convenient underpass. Coyotes adapted the fence in their predator strategy to stampede bighorn sheep into the fence. Sheep predation was heavy until we attached a solid plastic sheet to the fence; then sheep were able to see the fence in time to avoid collision. However, it appears sheep use of that particular habitat has been substantially altered and declined. Although moose numbers are unusually low in this good quality habitat, those present have shown disinclination to use the underpasses.

Fish habitat re-creation was successful in one instance, but less so in another.

Current Need

Nearly 4 million people enter Banff National Park each year. About 95% of these visitors come to the Bow valley, and virtually all of them arrive in privately operated vehicles or motor coaches. By 1993, the level of traffic service and the human fatality/injury situation had deteriorated badly in the next 18 km two lane section of roadway. The 1992 summer average daily traffic (SADT) was 13,420. This equals a frequent Level of Service E - passing is impossible, maximum speeds drop below 80 km/h, percent time delay exceeds 75%, and platoons are long and frequent. Traffic growth to 2015 was projected at 3-4% per annum. Following the federal government's 1993 statement of intent to continue the twinning, and the preparation of an environmental assessment, approval to continue the project was rendered in 1995.

Again, environmental protection is a paramount priority. The budget for the first twinning in the early 1980's devoted 16% of the funds to environmental features. About 30% of the current $32 million budget for the next 18 km of twinning will be for environmental protection.

Environmental Issues

Environmental subjects in the current project are both similar, and more complicated than the previous work. Again, wetland ecosystems, steep terrain, aquatic environments, and limited montane habitat are encountered. Techniques utilized in earlier phases of the project will be employed. An important difference is confronted in this section, however; wolves and bears are more prevalent. Moose, which prefer this section of the valley, are highly vulnerable to roadway collision, and there is a special concern for the declining moose population in the Bow Valley. Consequently, it has been decided to construct two overpasses, in addition to 13 underpasses in the next 18 km section of twinned highway. These underpasses will range from as small as 1 m culverts to as large as 4X7 m elliptical multiplate underpasses. As before, 2.4 m high page wire fence will prevent wildlife access to the roadway.

Earlier research had shown that bears and wolves used a high, long, bridge crossing of the Bow River as a travel underpass. Therefore, it had been proposed to construct two very large underpasses - each with a 30 m span. However, when the opportunity to install two overpasses for the same cost as the large underpasses became available, we decided to favour the overpasses. Additionally, the overpasses are easier to construct, have a shorter construction time, and are

expandable.

The overpasses have been positioned at locations which are known to be preferred wildlife crossing points, have favourable terrain configuration for enginering and construction considerations, and fulfill driver safety requirements. The overpasses are 9 km apart.

The overpasses will be constructed over the highway, at grade, as two, separate, parallel, arched tunnels. Precast quarter circle arches secured on a poured foundation at each shoulder of the highway will be installed by crane to abut on top over the centreline of each roadway. Each arch rib is 1.5 m wide and will be installed side by side to create tunnels 52 m long. The tunnels, side by side, with a centreline to centreline separation of 31 m, have a peak headway of 8 m. The arches will span two traffic lanes, a paved shoulder and a barrier protected pedway - a total width of 17 m. The side approaches and the space between the arches will be backfilled to create a continuous pathway over the top of the highway and the tunnels. The pathway will be blended into the adjacent landscape in a way which is favourable to approach by wildlife. The pathway over the top is 50 m wide, and will be fenced on both sides to tie into the roadway fence. The pathway route will be reclaimed with ground cover, shrubs and forest in a manner conducive to wildlife security needs.

Concern exists regarding the best width for the pathway. European highway builders and wildlife researchers appear to have the most experience with these kind of structures. However, their wildlife species diversity and animal sizes are substantially less than the Banff situation. Subsequent to examination of their reports, and correspondence with European researchers, a width of 50 m was chosen for the Banff application. Should 50 m later be revealed to be too narrow for the wary species invloved, e.g. bears and wolves, the overpasses can be modified. The arch technology chosen facilitates removal of the end wall, and the addition of as many arches as desired to lengthen the tunnel and widen the animal pathway. However, this would be a costly modification.

The overpasses are presently under construction. The cost is $2.2 million each. Although the overpasses will be completed in 1996, the complete project will not be in place until late 1997. Monitoring and research will proceed in following years to determine the effectiveness of the structures for wildlife passage.

Dr. Leeson's lecture at the seminar was based on a slide illustrated presentation of the project setting and the project components.

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