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**A REPORT ON THE OIL SPILL
INTO THE KICKING HORSE RIVER**



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R. S. ANDERSON

OCTOBER 1970



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A Report on the Oil Spill from the
C.P. Rail Waste Ponds into the Kicking Horse River
at Field, Yoho National Park, B.C., on August 21, 1970.

by

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October, 1970

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Introduction

On Saturday, August 22, 1970, I was requested to go to Field in Yoho National Park, B.C., to make an assessment of possible ecological damage to the Kicking Horse River due to oil which spilled into the river from some waste ponds maintained at the river's edge by C.P. Rail. The retaining dikes around the waste ponds were initially damaged by high water in the river channel on August 20; high water again on August 21 destroyed part of the dike around one of the ponds, resulting in the escape of a large quantity of oil from the waste pond into the Kicking Horse River.

Because of the volume of flow and the velocity of the river, much of the oil had probably left that portion of the Kicking Horse River within the park boundary by the time I arrived at the scene of the accident on August 22. However, several localities at and downstream from the spill site were examined at this time and on several subsequent dates.

No previous examinations of the Kicking Horse River had been made, so there was no way of making a quantitative assessment of damage to particular groups of aquatic organisms. Furthermore, sampling in many stretches of the river would have been extremely difficult and hazardous because of the swiftness of the river and the magnitude of the daily water-level fluctuation, especially at that time of year.

This report is an attempt to (a) summarize the events leading to and subsequent to the accident, (b) review the subsequent cleanup operations, and (c) provide a qualitative estimate of possible ecological damage to the river. A few recommendations and suggestions are also offered.

I am grateful to Superintendent H. B. Webb, Mr. Phil Rolfson, Mr. Norm Darnforth, and other personnel of the National Parks Branch at Field who were most cooperative and informative. Also deserving praise and acknowledgment are the many persons (whether on duty or not) whose efforts were directed to containing the spilled oil and to focussing action and attention on the positive aspects of the problem.

The River

The Kicking Horse River arises from Wapta Lake, approximately 7 miles northeast of the town of Field, B.C. Three miles west of Wapta Lake, the river is joined by its major tributary, the Yoho River, which flows into the Kicking Horse River from the north. The Yoho River is fed mainly by glacial melt water from the Waputik and Wapta icefields. The Kicking Horse River continues through Yoho National Park for a distance of about 16 miles to the southwest of the town of Field. Here it leaves the park and eventually flows into the Columbia River. In approximately 23 miles, the river drops about 1700 ft.; 1100 ft. of this drop occurs between Wapta Lake and Field.

In the vicinity of Field, the Kicking Horse River winds its way through a gravel flat. During the months of July and August, there is a large daily fluctuation in the water level of the river due to the diurnal melting of the glaciers. In narrow channels (e.g. in the vicinity of the Natural Bridge, about two miles southwest of Field), the water level may vary by 6 feet or more daily. Variation may be a foot or less in the broader channels. Peak water levels in the vicinity of Field and the Natural Bridge usually occur between 9 pm and 11 pm, and minimum levels occur in the morning. During the period of highest annual runoff (usually August), the river may cut a new channel almost daily in some sections of the gravel flats. Because of the time at which high water levels occur, the river channel may have a different appearance in the morning to that of the previous evening.

During the summer, the river water is extremely turbid, especially during July and August, but it may become quite clear later in the autumn. The water is very cold (e.g. 10.0 C at Field on Aug. 31; 10.6 C at Finn Crk. picnic area Aug. 31). From Field, it is only 10 to 16 miles to the glaciers from which most of the river's volume comes.

The Site

For many years, the Canadian Pacific Railway (now CP Rail) has maintained a roundhouse and other railway facilities at the town of Field, B.C., within Yoho National Park. The present operation is small compared to what it was in the days of steam




Fig. 1 - CP Rail waste ponds at Field, B.C., in
Yoho National Park (no.2 pond in foreground).

locomotives. At that time, additional locomotives or special mountain locomotives were needed to haul the trains up the steep grades of the "Great Divide" area in Banff and Yoho national parks. With the conversion of coal-burning locomotives to oil-burners, there arose a need for fuel-oil storage and waste-oil disposal facilities. The large storage tank for bunker-C fuel oil and the waste ponds (Fig. 1) on the banks of the Kicking Horse River below the roundhouse were still present in August, 1970, even though the oil-burning steam locomotives had long since been replaced by diesel and diesel-electric locomotives. Somewhat further upstream, there was a septic tank located on the riverbank. This was intended to receive sewage from the railway station, roundhouse, bunkhouse, etc. A considerable quantity of waste oil seemed to find its way into this tank, the effluent from which drained into the Kicking Horse River. The septic tank had fallen into a rather dilapidated state of repair by 1970.

The waste ponds at the river's edge consisted of two artificial lagoon-like ponds about 35 ft. by 75 ft., holding liquids (water and oil) at depths of up to 4 ft. when near capacity levels. The dikes around the ponds consisted of mounds of river gravel and sand bulldozed to a height of 3 or 4 ft. above the approximate mean water level in the main river channel. That some of the dikes had remained undisturbed for some time was evident in the occurrence of a considerable

amount of vegetation in some places (see Fig. 1). According to reports from a number of sources, the waste oil in the pits was burned-off once or twice a year, usually in autumn after the summer tourist traffic had declined. There were also reports that oil from the ponds had escaped into the river periodically over the years when the dikes were damaged by high water-levels.

That the dikes were not impervious to water was evident to me between August 22 and August 31, 1970, when a considerable fluctuation in the level of the water in the no. 1 (undamaged) pond was observed. A continuous seepage of small amounts of oil through the dikes and into the river was obviously a possibility.

The Spill

High water on the evening of August 20, 1970 (and possibly on the two or three previous evenings as well), had seriously eroded the dikes around no. 2 waste pond, the furthest pond away from the railway tracks and the nearest to the main river. CP Rail had put a bulldozer into the area on Friday, August 21, to attempt to control the river channel which had been shifting as a result of the annual high-water levels and diurnal fluctuations discussed above. Apparently no effort was made to inform the Superintendent's office of the imminent danger to the waste-pond dikes at this time. On the night of August 21-22, about 20% of the dike around

no. 2 waste pond was completely washed out and an unknown quantity of accumulated waste oil escaped into the Kicking Horse River.

Early the following morning (August 22), crews and machines from the National Parks Branch in Yoho National Park attempted to contain the remaining oil in the waste pond and to direct the river away from the ponds. Bales of hay or straw had been strung together across the open section of the dike in an effort to retain any remaining floating oil. The heavy oil in the bottom of the pond did not move from the pond once the river current had been diverted away from the ponds. By midday, a new river channel had been bulldozed towards the far side of the gravel flats, and a temporary dike had been erected in front of no. 2 waste pond. No additional oil appears to have leaked from the waste ponds after this time.

I estimated that no. 1 waste pond may have contained between 5000 and 10,000 gallons (Imp.) of waste oil, mainly bunker-C. Although there was no way of knowing how much oil was in no. 2 waste pond before the dike was washed out, visible evidence (marks on the undamaged sections of dike and oil still present in the pond) indicated that the total amount of oil in no. 2 waste pond was about the same as in no. 1 pond. Few people at the site of the spill were prepared to commit themselves to an estimate of the volume of oil which escaped. Most of the oil was the heavy,

black, bunker-C grade of oil, similar to the oil that was accidentally spilled in June into Louise Creek, Banff National Park, from the CP Chateau Lake Louise (Anderson, MS, 1970). The bunker-C oil accumulated in the bottom of the ponds and was covered with a layer of water which varied in depth. A layer of lighter oil fractions (diesel fuel, sludge, greases, etc.) floated on the surface of the water.

As much as 2/3 of the bunker-C and nearly all of the floating oil may have escaped from no. 2 waste pond when the dike was washed out. A few large pools of heavy oil accumulated in depressions in the river channel below the spill site. Some of these held up to a barrel of the heavy, black oil. In certain stretches, for several miles below the waste ponds, vegetation was oil coated. But few large pools of oil accumulated in the main river, mainly because of the swiftness of the river current. Although the shoreline was distinctly marked with an oil line in places (Fig. 6), there was no well-defined and continuous line of oil along the shore as was the case in Louise Creek (Anderson, MS, 1970, cited above). Because of the swiftness of the current and the fluctuations in water level, no oil line at all was detectable in many locations downstream from the oil spill. In other sections of the river, a thin layer or trace of oil was evident on beaches at low water, but it was spread over much as 20 or 30 ft. of gradually sloping shoreline. In general, the oil tended to stick readily to vegetation and accumulations of driftwood, but comparatively little was found to adhere to the rocks or sand 24 hours after the

initial spill. A light film of oil was noted on the surface of the water in pools and eddies along the shoreline below the spill site. A month after the spill, much less surface film was detected in this case than was noted after two months in the Louise Creek oil spill.

The following is a résumé of observations made on August 22, 23, 31, September 28, and October 13, at a number of locations downstream from the waste ponds:

1. Pools and backwaters in the immediate downstream area, up to $\frac{1}{2}$ mile below the waste ponds.

Aug. 22-23 - Most heavy oil accumulated in holes and depressions in stream bed, usually under 6 inches to 2 ft. of water; little oil film on surface; little oil on rocks and sand; much oil on grasses and shrubs along shore (similar to Fig. 6).

Aug. 31 - Little change in the nature of the oil in pools, except that generally lower water levels had left many isolated accumulations of oil on the surface of the sand in ripples and depressions (Fig. 2); accumulations of oil at the bottom of pools of water were seen to release small globs of lighter fractions occasionally, and these rose to the surface, to remain there in isolated pools or to float downstream if there was a current (Fig. 3); cleanup operation well advanced in this area and much of the river bed cleaned up entirely; small sculpins noted in some of the backwater pools containing oil, but the fish seemed to be comparatively unaffected by the oil; no dead fish found.

Sept. 28 - Little evidence of the oil spill in the river bed below the waste ponds except for the oil remaining on the shoreline vegetation.

2. River 100-200 yards above the Natural Bridge

Aug. 22-23 - Little evidence of fresh oil on rocks and sand except in isolated patches; most oil present spread over a wide band along the shore between daily high- and low-water marks; some sooty material on rocks.

Aug. 31 - Many accretions of old oil, sand and gravel were pointed out by Mr. Norm Darnforth; these layers, resembling

Fig. 2 - Bunker-C oil retained in ripples in the sand after the river was diverted away from the south shore below the CP Rail waste ponds. 31 August, 1970.

Fig. 3 - Silt-covered masses of old bunker-C oil periodically released small amounts of lighter fractions which floated to the surface of the water. 31 August, 1970.

Fig. 4 - Old accretions of oil, sand, and gravel a short distance upstream from the Natural Bridge, Yoho National Park, 31 August, 1970. There was little fresh oil at this location.

Fig. 5 - Old accretions of oil, sand, and gravel at the south upstream abutment of the old highway bridge near the mouth of the Emerald River. There was a thin layer of fresh oil on the old accretions. 31 August, 1970.

Fig. 6 - Oil on the shoreline vegetation beside the old highway bridge near the confluence of the Kicking Horse and Emerald rivers, 31 August, 1970.

Fig. 7 - Coated with oil, this immature dipper appeared to have been alive and healthy not long before it was found in the Kicking Horse River near Leancoil on 23 August, 1970.

Fig. 8 - Black, sooty deposits on rocks in the Kicking Horse River near the Natural Bridge, 31 August, 1970.
There was no fresh oil on most of these rocks.

old sections of asphalt pavement, were up to 6 inches thick and could be found in many places along the river bank above and below the Natural Bridge (Fig. 4); in some places, such old oil accumulations were buried under several inches of alluvial sand and gravel and appear to have been there for many years.

Sept. 28 - Little evidence of fresh oil in this region.

3. Half-mile below the Natural Bridge

Aug. 22-23 - Thin layer of oil on some exposed sections of sandy or gravelly shoreline; much less on morning of Aug. 23 than the previous afternoon; nearly all vegetation between high and low water levels had some oil on it; a few dead caddisfly larvae found.

Aug. 31 - Little evidence of fresh oil; slight film on eddies and backwater; black layer on exposed rocks in main river was not fresh oil, but resembled a heavy coating of soot, apparently an oxidized layer of old oil from previous spills.

Sept. 28 - Virtually no evidence of fresh oil except for a few isolated patches on the exposed sand beach sections where any remaining oil had oxidized to a light brown color.

4. Old highway bridge near confluence of Emerald and Kicking Horse rivers.

Aug. 22-23 - Much heavy black oil on vegetation and accumulations of driftwood (Fig. 6); little oil on shoreline rocks except a section of shore between the mouths of the Emerald and Amiskwi rivers.

Aug. 31 - Oil on shore between Emerald and Amiskwi rivers cleaned up by Parks Branch personnel using a dragline; little change in oil on vegetation; accretions of old oil noted at the upstream side of the south abutment to the bridge (Fig. 5) and a thin layer of fresh oil on top of the old accretions.

Sept. 28 - Little evidence of fresh oil except on the vegetation, where the black oil had turned distinctly brown.

5. Finn Creek picnic area

Aug. 22-23 - A little oil on shore and shoreline vegetation, masses (1 to 4 quarts) of brownish, oily matter floating among driftwood in small eddies were reported to parks personnel; small, light brown slicks of floating oil noted almost constantly in mid-stream.

Aug. 31 - Little evidence of fresh oil along the shore; crews obviously cleaned up all shoreline accumulations; no oil slicks noted on main river.

Sept. 28 - Little evidence of fresh oil.

6. Leancoil picnic site, about 15 miles from the waste ponds

Aug. 22-23 - A little oil along shoreline - mostly on bits of vegetation and pine cones; recently dead young dipper (or water ouzel - Cinclus mexicanus) was found oil-coated (Fig. 7); several small slicks of light brown oily material noted floating downstream in the main channels.

Aug. 31 - Little evidence of oil along the shore, and most present had oxidized to light brown; no oil slicks on main river; very little surface film noted on backwaters and pools.

Sept. 28 - No evidence of fresh oil.

Action of the Oil in the River

The heavy, black oil had a specific gravity slightly greater than one, and so sank to the bottom unless buoyed up by the river's current. Because of low temperatures, the oil was very viscous and tended to remain in a mass unless disturbed. Masses moved slowly in small stream channels (e.g. 4 to 6 gallon masses moved along the bottom at a rate of about $1\frac{1}{2}$ ft. per hour, whereas the velocity of the water was about 1 to 2 ft. per second).

There was obviously a great deal of old oil in the waste pools - lighter fractions (along with oxidized masses and other masses which seemed to be emulsified) tended to float freely. Much of the oil which accumulated on shoreline rocks and gravel and on vegetation turned a light brown color much more rapidly than was the case for the oil in the Louise Creek spill.

Furthermore, there was much less surface film on the waters of the Kicking Horse River than was observed at Louise Creek. More of the light fractions had probably been removed in the former oil due to evaporation and periodic burning.

Oil remained on the vegetation along shore much longer in this case than at Louise Creek. However, the spill at Field occurred near the time of the maximum annual water level, whereas the water level in Louise Creek rose continuously for a month after the spill and much of the oil was scoured from the vegetation.

Cleanup Operations

On August 23, shortly after the original oil spill, an attempt was made to ignite the oil in some of the pools below the waste ponds. Repeated efforts resulted in complete failure - the thick masses of oil would sputter and bubble, but would not ignite.

By August 31, parks crews had made spot cleanups of most reported oil accumulations in the river a mile or more downstream from the waste ponds. Dragline operations had removed oil-laden gravel from certain shoreline sections. Three trucks, two bulldozers, and an overhead loader had begun the major cleanup from the half-mile section below the waste ponds. In the latter section, the procedure was to drain the water from the ponds and then to remove oil, sand and gravel together.

This material was hauled some distance away to an old borrow pit not on a natural waterway. There was an obvious and conscientious effort on the part of parks personnel to remove as much of the evident oil as was possible.

Oil-soaked bales of straw or hay from the original spill site were hauled to a refuse dump, also not on a natural watercourse. It has been found in some other recent oil spills that peat moss is probably more effective in soaking up spilled oil - a point worth noting in the event of future accidents.

By August 31, the dike around no. 2 waste pond had been repaired and reinforced with rock ballast by the CP Rail crew. At an early September meeting between National Parks officials and CP Rail officials, it was agreed that the waste ponds should be removed and that the septic tank should be repaired or removed. It was also agreed that the storage tank for bunker -C fuel should be removed at the earliest convenience, although no plan of action was proposed.

By October 13, the waste ponds were almost completely removed, and only some material from no. 1 pond remained. The oil and oil-soaked sand and gravel was removed from the river bed and hauled out of Yoho Park by CP Rail. The old septic tank and an associated drainage ditch were in the process of being removed or repaired.

Some proposals for removing the old accretions of oil and gravel were made, but it is felt that more damage to the

river could result from disturbing these deposits at this time than by leaving them alone. Comparing the thickness of some of the old deposits to the amount of fresh oil that was deposited as a result of the 1970 spill, it is fairly obvious that earlier spills were larger or more frequent, or that they involved fresher oil or may have occurred during colder weather, or combinations of all of these factors.

Fate of the Oil

Nobody knows the ultimate fate of oil in river waters (McCauley, 1966) or in arctic waters (Lotspeich, 1970). Because of our lack of knowledge of the fate of oil in water, much research and attention are being devoted to the subject (Mann and Sprague, 1970). In spite of extensive investigations, no cheap, efficient cleanup technique is in sight (Boyd, 1970). Biological degradation occurs but slowly at low temperatures (Boyd, 1970; McCauley, 1966). As experienced by the crews in the Yoho oil spill, no success was achieved in attempts to burn spilled bunker-C from the Arrow disaster at Chedabucto Bay, Nova Scotia (Boyd, 1970).

Although detailed quantitative studies were not carried out, I found that, in the Louise Creek oil spill, there was a great deal of variation in the ability of different groups of organisms to survive in the presence of oil (Anderson, MS, 1970). Fewer facts were gathered in Yoho, but the same trend appeared to be present. These observations are in agreement with the general findings of McCauley (1966) in a two-year follow-up study of oil pollution in a river. She noted that,

although over 100 species of bacteria, yeasts, and molds are known to attack hydrocarbons, decomposition of oil was slow but constant. Low BOD also indicated slow bacteriological decomposition of oil. In general, it seems that decomposition is slower at low temperatures, and that the lethal effects of oil on many groups of organisms may be lower for short periods at low temperatures. Clearly, there is room for a considerable amount of research on this aspect of pollution.

Ecological Damage

Fortunately, there appears to have been little permanent damage done to the Kicking Horse River as a result of the August 1970 oil spill. The main dangers in this type of situation may be due to the further taxing of a natural ecosystem already burdened to some extent with sewage effluent and silt. That damage was minimal in this oil spill was probably due to a combination of factors: old oil; low temperatures; water velocity; time of year; comparatively small volume of oil spilled relative to the river's volume of flow. The fluctuating water levels kept the oil from accumulating in large concentrations, but whether this was beneficial or detrimental to the river ecosystem is not known.

Although caddisfly larvae were known to have suffered adversely as a result of the oil, little is known of other groups of invertebrates in the river. It can only be assumed that their survival would be comparable to similar invertebrate groups in other streams for which some data exist. Although some fish are known to have survived with no ill effects, some birds may not have fared so well. The overall effect of the

oil spill on the vertebrates associated with the river remains immeasurable.

Damage to shoreline vegetation will not likely be evident next year. Most affected were the grasses and sedges along the shore, as well as a few willows. These plants had passed the peak growing season for the year and structures affected by the oil are replaced annually. Damage to river algae would be difficult to assess under any circumstances, but evidence in the Kicking Horse River between the mouths of the Emerald and Amiskwi rivers indicated that the algae flourishing there in the enriched waters from the Emerald River were not adversely affected.

Publicity Problems

The amount of attention currently given to pollution problems of a kind that were often ignored in the past does not necessarily mean that the problems are suddenly more important, even if they are more frequent. Much of the increase in attention that has been focussed on pollution during the past few years has been generated by a rise in public awareness of pollution problems and a concern for the protection of the natural environment. Publicity is undoubtedly the reason for much of the change in attitudes and awareness. However, it is unfortunate that the destructive aspects of pollution stories are so often considered more newsworthy than the corrective and constructive aspects.

More letters to The Editor

Editor, TheAlbertan:

Some weeks ago we read in your paper about oil killing birds off the Alaskan coast. According to an article in the June 6 issue of the Oil and Gas Journal this is completely false. Since Calgary is one of the important oil centres of the oil business and since the oil business is so vital to the economy of Alberta and Canada it would seem that at least the local papers would not want to be a party to an untruthful smear campaign and would try to get the facts straight.

For example, if you will check with the government in Ottawa you will find that the recent oil spill off Nova Scotia caused no loss of marine or bird life. There are enough scientists in Calgary to inform you that oil is a product of nature and is readily absorbed by nature and usually in the form of fertilizer. With a

minor alteration it is edible as food.

Any local geologist can inform you that natural erosion of the Athabaska tar sands constantly feeds oil into the Athabaska River. In this one spot alone perhaps 50 times more oil has been fed into the Arctic than has ever been produced in the world. No one condones unnecessary oil spills but if your reporters would go after facts they might find that they are being used for the latest whipping boy, the oil business. It would seem that some of you people are still around that were here during the war when German submarines released more oil in one day than has ever been spilled. We don't remember you reporting the destruction of the environment then. What has suddenly made oil so destructive?

"A GEOLOGIST"

Calgary.

THE ALBERTAN
Calgary, Alberta
Saturday, August 1, 1970

Oil in park will be cleaned up

Albertan Banff Bureau

BANFF — Canada's director of national parks has said the CP Rail is going to clean up the ponds of oil they maintain around Yoho national park to avoid any more disasters like the recent oil spill into the Kicking Horse River.

Speaking to the wind-up dinner of the national parks short course here Thursday, John Nicol said the spills that occurred in the Yoho park have happened before because of the necessity of the ponds for the old steam engines.

"Now that the steam engines are gone they don't need them any more and we are telling them to get a permanent solution for the oil ponds," he said.

The extent of damage done to the Kicking Horse River was reported to be extensive by parks' visitors, but parks superintendent Harley Webb said the damage was being controlled and should have been all cleaned up Thursday.

Controversy arose Aug. 21 when a parks employee was allegedly threatened with dismissal by Mr. Webb if he showed parks visitors the effects of a spill from one of the CPR waste ponds near the river.

Parks employee fired in dispute over Yoho oil spill

BANFF (Staff) — A national parks' employee has been fired for ignoring instructions given him by his employers.

Brian Levy, a seasonal naturalist on probation in Yoho National Park was "released from his probationary position" on Aug. 22 because of a number of incidents in which he deliberately ignored instructions given him," park officials said Tuesday.

Meanwhile in Banff, Raymond Aaron of Willowdale, Ont., has charged Yoho Park Superintendent Harley Webb with deliberately trying to suppress information of oil pollution.

In an open letter to Northern Affairs Minister Jean Chretien, Mr. Aaron Tuesday charged Mr. Webb with deliberately trying to prevent one of his employees from exposing other park visitors to the effects of an oil spill that occurred in the Kicking Horse River.

Mr. Aaron alleges in the letter that CP Rail maintains waste ponds for oil in Field, B.C., which are allowing the oil to spill into the river.

When a park employee, Brian Levy, scooped up some of the sludge to show other visitors at a nightly talk in which he parti-

cipates, Mr. Aaron said Mr. Webb told Mr. Levy not to show the pail.

"When Mr. Levy insisted that it was his duty to inform the public of the effects of pollution on the wild life that the park is supposed to be protecting, Mr. Webb asked for Mr. Levy's resignation," said Mr. Aaron in his letter.

Superintendent Webb would not comment on the letter but he did say the cleanup operations had been completed.

"The Kicking Horse River was successfully diverted from the spill Saturday morning and from then on, there was no more oil getting into the river.

"It's impossible to tell the amount of damage done to the river in terms of dollars, and we can't tell how much oil got into the river. Oil has been seen as far as 15 miles down the river but it's a fast-flowing river and could easily have been carried down that far very quickly," said Mr. Webb.

Mr. Aaron's letter is being sent to the minister of northern affairs. Copies have also been sent to Banff MP Allen Sulatycky, Conservative Leader Robert Stanfield, NDP Leader Tommy Douglas, and the press.

THE ALBERTAN
Calgary, Alberta
28 August, 1970

THE ALBERTAN
Calgary, Alberta
26 August, 1970

Bad publicity usually relates to a lack of facts, inappropriate or tardy abatement action, the sudden activation of potential hazards through accident or error, or a combination of any of these with other factors. Stands taken on matters pertaining to pollution can be as absurd at one end of the spectrum (see Letter to the Editor, p.21) as they are at the other (e.g. some aspects of the CFCN-TV Calgary newscast, evening of August 22, 1970, where the suggestion was made that complete devastation of the Kicking Horse River had occurred and where it was intimated from pictures and commentary that a blanket of black oil covered the river from shore to shore for 17 miles or more).

However, if adverse publicity can activate the machinery needed to get things done with regard to the preservation of environment, then such publicity cannot be considered entirely bad. (See newspaper clippings, p.22).

Some Recommendations and Suggestions

Relative to accidental pollution and as a matter of policy, there is a need for a factual, prompt, and official statement of the problem, causes, and intended action. This is not meant as a criticism of the Kicking Horse River problem, which was handled rather well under the circumstances, but as a means of obviating potentially undesirable or damaging publicity. There is a need for an official statement on the positive aspects of the problem after cleanup. Because this is a

constructive aspect, rather than destructive, it is not especially newsworthy, and publicity will have to be initiated from within. A statement should include a summary of action taken, estimates or assessments of damage, assessment of blame, if any, and preventative measures taken, if any.

Every accident or emergency causing pollution adds urgency to the need for a plan of action to deal with the overall problem of pollution, eutrophication, and waste disposal in the National Parks. The position seems to be emerging where it is likely to be more profitable politically, ecologically, and financially to clean up a problem than to put up with it. The establishment of priorities for dealing with matters concerning environmental destruction is in itself a "Gordian" problem - but, clearly no item should be low on the list.

There is need for a contingent plan for systematic monitoring of environmental quality as National Parks use increases. Fluctuations in the number of people using an area may mean that limits which are safe one year are not the next. An annual review of identified sources of actual or potential pollution and an annual statement on this matter could serve a useful purpose. There has been a tendency for news media, individuals, and certain organized groups to suggest that information on such matters is deliberately suppressed.

As suggested in an earlier report (Anderson, MS, 1970), there would be merit in appointing or designating someone to act as a "pollution control officer" in each park or group of parks. This person could be responsible for an inventory of potential problems, for coordinating action in emergency situations, and for the follow-up on various directives or recommendations made following emergencies or investigations. He should be aware of the whereabouts of essential types of equipment and knowledgeable personnel in case of emergency and he should have an opportunity to become familiar with some basic technique required for various emergency situations. For example, in the case of an oil spill or similar accident, the location and availability of the following should be known:

- pumps which could be used for collecting spilled oil, chemicals, etc.
- baled straw, hay, or peat moss
- sand bags (a ready supply of filled bags could be invaluable in certain emergencies)
- acceptable detergents, emulsifying agents, neutralizing agents, etc.
- various special types of fire-fighting equipment
- resuscitation apparatus.

Additionally, it would be of value to have selected in advance potential disposal sites for collected pollutants, spilled chemicals, etc.

Concluding Remarks

"Humans are prone enough to foul their own surroundings and there is even greater temptation to regard sparsely populated areas as fair game for any kind of wanton and destructive exploitation for the short-term advantage." 1.

It would be unfair to classify most activities of man in the western Canadian National Parks as "wanton and destructive exploitation." However, there are increasingly prevalent signs which indicate that man-centred activities in the parks can create problems similar to those resulting from the type of exploitation alluded to in the above quotation.

Both exploitation and pollution relate to people. Generally, environmental destruction due to wanton exploitation and excessive pollution relate to the extreme pressures generated by large numbers of people. The matter of numbers must be carefully weighed and incorporated into any proposed solutions to land use or pollution abatement programs. Otherwise, steps taken to alleviate environmental destruction will only postpone environmental collapse.

"An estimated 10,000 birds in the Kodiak Islands group of Alaska were oiled during February and March." 2.

The public and the authorities are subjected to a continual rain of facts and news items of the type and magnitude quoted above. Consequently, an attempt to generate concern for conservation by stressing the pollution-caused death of a single dipper (Fig. 7) is open to the criticism of being

1,2 - May 1970, Marine Pollution Bulletin 1(NS - 5): 65-66.

founded in emotion. Such an approach is unlikely to achieve a lasting, worthwhile result. On the other hand, we cannot afford to ignore the cause of death.

SUMMARY

1. The amount of oil spilled into the Kicking Horse River on 21-22 August, 1970, and the extent of immediate environmental damage were probably less than feared initially.
2. Prompt action and thorough cleanup operations by National Parks personnel minimized the damage.
3. Some bad publicity was one unfortunate by-product of the oil spill.
4. Investigation of the accident indicated a history of oil spillage into the Kicking Horse River over the years.
5. Long-term ecological damage to the river from this spill is expected to be slight as a result of a combination of factors.
6. Conditions contributing to the accident must be corrected, and an early reassessment of the total situation should be authorized.
7. An inventory of actual and potential problems and of equipment, methods and personnel needed to cope with such problems should be kept up to date. Inventory could be made the responsibility of a "pollution control officer".
8. An official plan of action to be followed in the event of accidents causing pollution or other environmental damage is necessary.
9. The systematic monitoring of environmental quality is necessary.
10. In the event of accidents or other happenings resulting in pollution or other environmental damage, there is a need for a prompt official statement of the problem, its causes, and correctional action to be taken.
11. An official statement or press release should follow the completion of correctional measures.

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