A PRELIMINARY REVIEW OF BLACK BEAR-HUMAN INTERACTIONS AND RECOMMENDED STRATEGIES FOR THE AOSERP STUDY AREA

by

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for

ALBERTA OIL SANDS ENVIRONMENTAL RESEARCH PROGRAM

PROJECT TF 3.2

DECEMBER 1978

The Hon. D.J. Russell
Minister of the Environment
222 Legislative Building
Edmonton, Alberta

and

The Hon. L. Marchand
Minister of State for the Environment
Fisheries and Environment Canada
Ottawa, Ontario

Sirs:

Enclosed is the report "A Preliminary Review of Black Bear-Human Interactions and Recommended Strategies for the AOSERP Study Area."

This report was prepared for the Alberta Oil Sands Environmental Research Program, through its Terrestrial Fauna Technical Research Committee (now part of the Land System), under the Canada-Alberta Agreement of February 1975 (amended September 1977).

Respectfully,

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Deputy Minister, Alberta Environment

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A PRELIMINARY REVIEW OF BLACK BEAR-HUMAN INTERACTIONS AND RECOMMENDED STRATEGIES FOR THE AOSERP STUDY AREA

DESCRIPTIVE SUMMARY

ABSTRACT

The purpose of the report was to examine the components which have resulted in the establishment and maintenance of "nuisance" bear populations (i.e., the interaction between bears and a food supply generated by man's activity), and the management strategies which may be implemented to reduce the problem, with particular reference to the AOSERP study area.

Case studies from the Canadian Western National Parks, Yellowstone National Park, Glacier National Park, and the Peace River area, examining the evolution of the interaction problem and management strategies implemented, were used to supply background information for a problem analysis of bear-human interactions in the AOSERP study area.

The analysis of bear-human interactions in the AOSERP study area indicated that the major conflict arises from nuisance bears attracted to areas by garbage. Recommendations emphasize a preventative policy, whereby garbage is made bearproof (i.e., sanitary landfill surrounded by an electric fence, garbage incineration, etc.), thus saving the costs of transporting and relocating nuisance animals.

BACKGROUND AND PERSPECTIVE

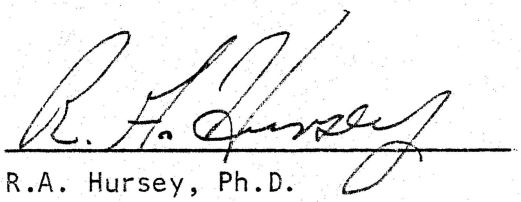
This report presents the results of Project TF 3.2, which was initiated in February 1976 to complete a problem analysis of bear-human interactions in the AOSERP study area and recommend alternatives to currently-employed control measures in the area. The project relates to the Land System objectives of assessing and reporting on all physical, chemical, and biological disruptions of the terrestrial ecosystems in the study area resulting from oil sands development.

ASSESSMENT

The report entitled "A Preliminary Review of Black Bear-Human Interactions and Recommended Strategies for the AOSERP Study Area", which was prepared by Diane E. Loucks, has been reviewed by the Alberta Oil Sands Environmental Research Program, the Oil Sands Environmental Study Group (OSESG), and the former Terrestrial Fauna Technical Research Committee.

In view of the value of the report for public education, and of the recommendations presented, the Alberta Oil Sands Environmental Research Program recommended that the report be published.

The content of this report does not necessarily reflect the views of Alberta Environment, Fisheries and Environment Canada, or the Alberta Oil Sands Environmental Research Program. The mention of trade names for commercial products does not constitute an endorsement or recommendation for use.



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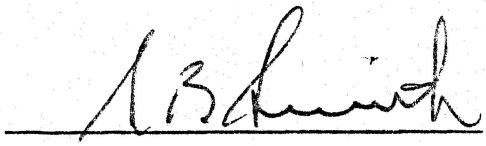

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ACKNOWLEDGEMENTS

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1. INTRODUCTION

Bear-human interactions have, in recent years, become a subject of considerable concern to both resource managers and the public generally. Increasing human use of remote wilderness areas, industrial developments in remote areas, loss of bear habitat, and in large part, an uneducated public, have contributed to an increase in the number of bear-human encounters and consequently, an increase in the number of encounters which lead to personal and private property damage. This paper examines the experiences of several areas of North America illustrating the evolution of the interaction problem and the management strategies which can be implemented to reduce the problem. Contacts with bear researchers and managers across North America, bear research experience over a 10 year period, and personal knowledge of a worsening situation in the Alberta Oil Sands Environmental Research Program (AOSERP) study area (Figure 1) resulted in this analysis of the problem.

One of the specific objectives of AOSERP is to advise regulatory and management agencies and the industry of new scientific and technological information pertinent to their jurisdictions, to minimize adverse environmental effects and maximize beneficial environmental effects. This paper does not present any new scientific information nor does it address itself to the whole spectrum of black bear management. Rather, the paper attempts to collate the existing information from numerous jurisdictions and researchers, with the principal focus of examining the components which have resulted in the establishment and maintenance of "nuisance" bear populations (i.e., the interaction between bears and a food supply generated by man's activity). In the AOSERP study area, the problem largely centres around the issue of garbage disposal.

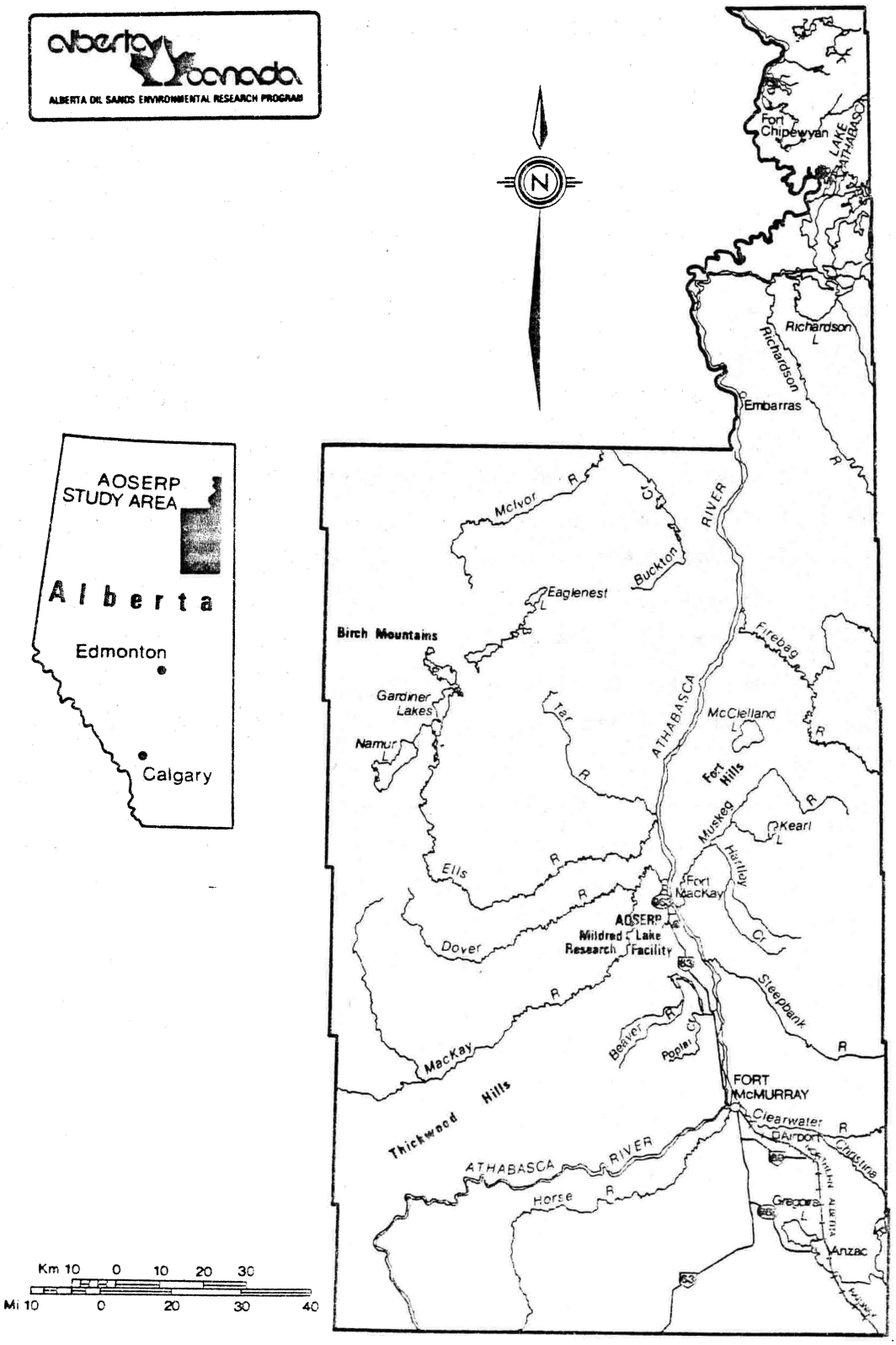


Figure 1. The Alberta Oil Sands Environmental Research Program study area.

Many of the areas examined have a long history of undesirable bear-human interactions. In spite of continuing problems and suggested alternatives, Banff National Park officials have continued to procrastinate while the situation only slowly improves (Retfalvi 1972). Yellowstone National Park officials recently reviewed the problem and then radically changed their waste management program (Cole 1976). Consequently, the situation has improved markedly. Glacier National Park officials after experiencing numerous individual human-bear interactions in remote areas, have devised a multi-faceted management strategy to reduce these interactions. The Peace River bear-beehive conflict illustrates the efficacy of electric fence enclosures and the subsequent decline in the magnitude of the problem (Gunson 1974). Certainly, continuing and future research will lead toward more refined management strategies.

The AOSERP study area does not have a long history of bear problems. Thus, it is an opportune time to examine the current options and propose management alternatives for consideration now, before a generation of bears have became habituated to garbage. The "problem" will be more difficult to resolve in future years if the alternatives are not examined now.

2. CASE HISTORIES

2.1 THE CANADIAN WESTERN NATIONAL PARKS

In Canadian national parks, bears are attracted to areas of heavy use because of the easy access to a food supply, that is, refuse. Serious problems for park managers and the public arise. The parks are developing bear management guidelines that will both preserve bears in the parks and protect people and private property. Retfalvi (1972) surveyed the major waste disposal sites in the western national parks and found that all of them attracted bears. Garbage represents food, and dumps attract and concentrate bears from all areas of the parks. Such concentrations periodically occur in the wild, but in the wild bears disperse when the food supply diminishes. Since the food supply at dumpsites does not diminish, bears continue to visit this feeding spot throughout the foraging season.

In the national parks, all waste disposal sites have been located within areas of heavy visitor use, and the high occurrence of bears in these areas cause "bear problems", which may range from upset garbage cans to damaged tents and warden cabins, to attacks on people. The death of a young girl at the Sunwapta Lodge in Jasper National Park in 1958 from a black bear attack illustrates the danger that nuisance animals can present.

Banff National Park has the highest visitor use of parks in the Canadian western region, and therefore the largest volume of waste, which is generated at widely separate points. Disposal sites have been numerous. In 1971, three refuse dumps and two sanitary landfill sites were in use and were frequented by both black and grizzly bears. Park wardens transported nuisance bears to remote areas of the park; habitual nuisance animals were destroyed.

In 1972, park managers realized the nuisance bear situation required remedies. All refuse and temporary dumps were closed and waste disposal was consolidated into two fenced sanitary landfill sites, which helped decrease the number of nuisance animals handled. Since the fencing around the landfill sites was not "bear-proof" they still attracted large numbers of nuisance animals. Landfill as a means of garbage disposal was not successful and overall maintenance and operation of these areas was substandard. In 1972, 42 black bears and 23 grizzly bears were transported with limited success (Table 1).

Simultaneous with the consolidation of dumps, park managers installed suspended garbage cans at campsites, roadstops, and picnic sites. These were not completely successful because bears still obtained garbage by overturning the cans.

In 1972, a bear management conference and in-service workshop was sponsored by Parks Canada in response to the bear problems that were present in the western regional parks. The workshop defined bear-human conflicts as originating in two main areas, bear-garbage problems and public education (Parks Canada 1972).

The workshop agreed that garbage disposal in the parks was unsatisfactory, and concluded that the best method of garbage disposal was high temperature incineration. The use of sanitary landfill was deemed inferior in efficacy, but superior in economy. Incineration of even small quantities of refuse was two or three times the cost of landfill. The workshop recommended that the best landfill location would be at least 10 miles from any human activity centre and would have bear-proof fencing. It was also recommended that garbage collection throughout the parks be twice daily, and in the townsite, should be frequent enough to prevent residential garbage cans from overflowing. It was also urged that there be universal adoption of improved bear-proof garbage receptacles at all campgrounds, picnic sites, roadsides, viewpoints, and residences.

Table 1. Number of nuisance animals handled in Banff National Park, 1972-1975.[a]

Species	Year			
	1972	1973	1974	1975
Grizzly Bear				
Trapped (transported)	23	15	1	0
Destroyed	6	7	-	-
Overdosed	0	7	-	-
Black Bear				
Trapped (transported)	42	15	1	0
Destroyed	0	6	-	-
Overdosed	3	0	-	-

[a] Information from personal communication with Peter White, Area Manager, Banff National Park.

The workshop decided that public education about the dangers posed by bears had to be improved. They recommended the distribution of information pamphlets and posters to the public, strict enforcement against feeding bears, and the implementation of a "pack-in", "pack-out" policy for all park visitors. All materials that had been packed in by a park visitor had to be packed out.

In 1973, Banff National Park instituted an intensive bear management program following the recommendations of the workshop. One sanitary landfill site replaced the previous two, and was surrounded by a "bear-proof" fence: a 12-foot high Frost Fence with a 3½-foot overhang, and 3½-foot cement pads as bases for the fence posts (Figures 2 and 3). Information about bears was distributed to campgrounds, and fines were levied for open garbage or food in campsites. Garbage pickup was made more often and more flexible. If a bear was habituating one particular campground at a regular hour, garbage collection was scheduled just prior to that hour for that campground.

The number of bears handled in 1973 decreased from previous years, even though visitor use increased in the parks (Table 1). The public relations work and new garbage pickup regime was rated as fairly successful. The number of bears habituating campgrounds and the number of roadside "begging" bears had decreased. The landfill site, however, was not bear-proof as bears could dig under, crawl over, or rip apart the fence.

In 1974 and 1975, Banff National Park maintained this system instituted in 1973. Currently, their garbage disposal methods are under review, with either incineration or hauling of garbage to a regional landfill being proposed. Banff is currently adopting bear-proof garbage cans at all campground and visitor use sites. The "mail-box" garbage can is accepted as the most effective model.

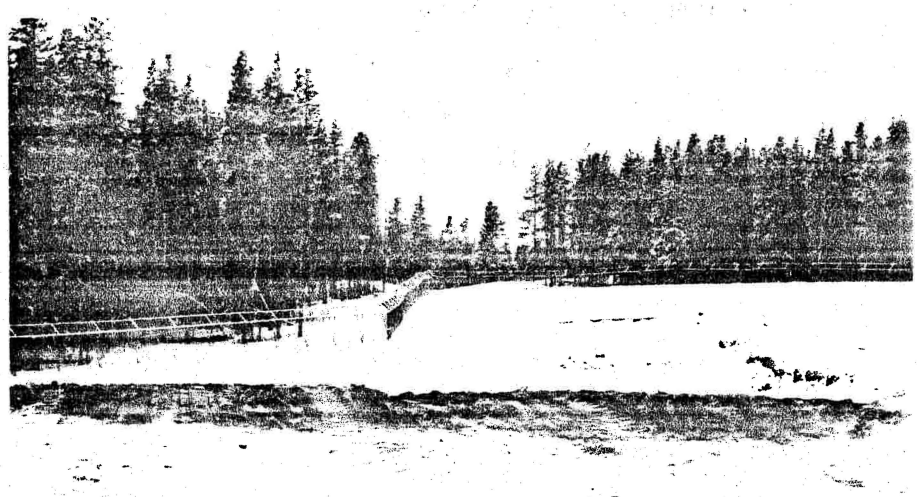


Figure 2. Fence surrounding Banff National Park's sanitary landfill.

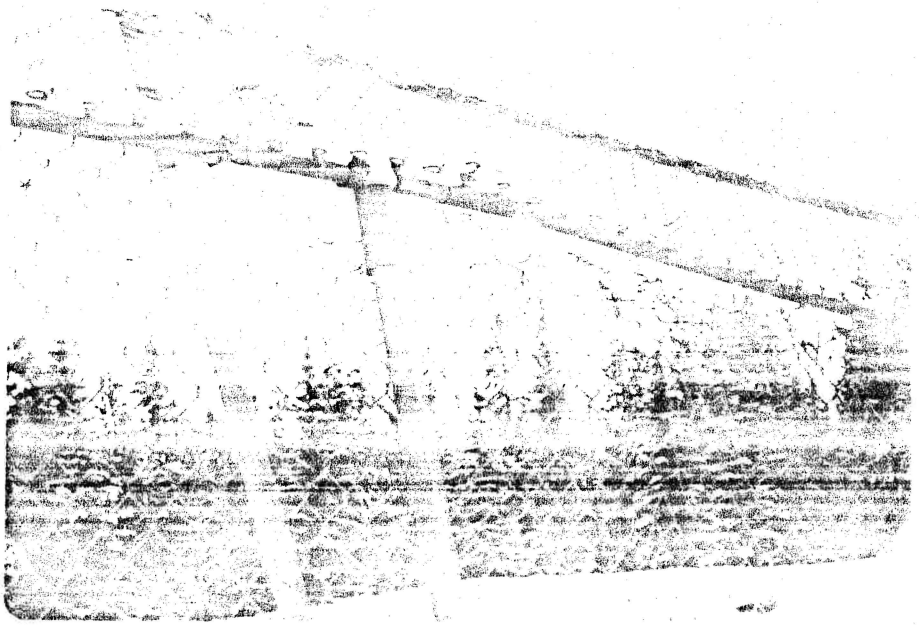


Figure 3. Damage to fence by black bear.

2.2 YELLOWSTONE NATIONAL PARK

Early in the history of Yellowstone National Park, black and grizzly bears utilized garbage as a supplementary food resource, a practice that encouraged concentrations of bears at garbage dumps in and around the Park (Skinner 1925). In 1968, Yellowstone authorities decide that garbage-habituation of bears was unnatural, that it reflected a poor image to public viewers, and constituted a substantial and unavoidable threat to people using the Park campgrounds. In addition, the roadside feeding of black bears was recognized as a very serious, continuing problem. A policy decision was made to deny garbage as a food source and to restrict the grizzlies and black bears to natural foods.

A controversy soon developed regarding the management technique that should be adopted. One group supported gradual phase-out of garbage dumps, which would decrease the number of bears gathering at the dumps. After several years all bear populations in the Park would decline and be existing entirely on natural foods. The alternative approach was to effect rapid dump closure (i.e., within two or three years) beginning with those closest to the campgrounds. It was argued that this policy would shorten the adjustment period needed for bears to revert to a natural food source and minimize the time needed to maintain emergency measures for the prevention of personal injury and property damage by hungry bears.

After seeking the advice of the Natural Sciences Advisory Committee, Park authorities decided to implement quick closure of garbage dumps. The amount of garbage in open dumps was sharply decreased beginning in 1968, and dumps within the Park were closed during the 1970-71 period.

Proponents of each viewpoint realized there were potential difficulties inherent in implementing either method, and intensified bear-control operations would be needed for a short period. In order to minimize the difficulties, the National Parks Service undertook an intensive program which included: bear-proofing

all garbage containers; special campground patrols at night; seasonal closure of campgrounds where the danger was regarded as serious; closing of temporary trails where bear contacts were most likely to occur; transportation of incorrigible bears from trouble areas to remote wilderness locations; and donating intractable bears to zoos or eliminating them.

After the closure of garbage dumps, control actions increased, and a large number of bears were removed from the park or destroyed (Table 2). Yellowstone National Park now operates incinerators that are electrically fenced, and their waste disposal methods are bear-proof.

Yellowstone also had a decline in the roadside segment of black bears from 150-200 animals in 1965-66 to about 16+ bears by 1975. Removals during this latter period were considerably less than previous years (25 per year from 1931-66, 14 per year to 1969, and 5 per year to 1975). Cole (1976) suggests that the removals declined because bears ceased to concentrate along roadside areas and this change in bear distributions would have increased the size of the segment that remained in the back-country areas.

2.3 GLACIER NATIONAL PARK

Bear management programs are not new to Glacier National Park. With increased visitation in the late 1930's, it became apparent that bears (both black and grizzly) were easily attracted to humans through the presence or feeding of unnatural foods. Accordingly, programs were developed to consolidate and incinerate refuse, discourage bear feeding by visitors, eliminate campground refuse, and educate the public. Capture and removal of offensive bears is still an integral part of their program and habitual offenders are destroyed. Intensified management during recent years has resulted in a general decline in bear problems, even though Park visitation passed the 1,000,000 mark in 1969.

Table 2. Numbers of injuries from black bears, control actions, and park visitors in Yellowstone National Park, 1931-75.[a]

Year	Mean Number of Injuries[b]	Control Actions: Mean Number of Bears Removed[b,c]	Control Actions: Number Captures and Transplants/year[d]	Average Number of Park Visitors (Millions)	Number of Visitors per Injury
1930's	58 (22-115)	33 (2-66)	-	0.3	5,000
1940's	29 (2-89)	15 (2-55)	-	0.5	17,000
1950's	56 (38-109)	19 (6-40)	-	1.3	23,000
1960's	41 (24-69)	31 (4-85)	-	1.9	46,000
1931-69	46 ± 28[e]	24 ± 20	?	0.7	15,000
1970	7	10	19	2.3	
1971	9	2	15	2.1	
1972	5	8	34	2.2	
1973	5	3	13	2.0	
1974	7	1	11	1.9	
1975	1	0	5	2.2	
1970-75 (mean)	6	4	16	2.1	350,000

[a]Reprinted from Cole (1976).

[b]Range is given in parenthesis.

[c]Bears killed intentionally or accidentally or sent to zoos. Removal figures for the 1950's and 1960's include some bears that were accidentally hit by cars and were killed outright or dispatched.

[d]Captures and transplants routinely made before 1970, but total numbers unknown.

[e]Mean ± SD.

A bear management policy review, by Glacier National Park in 1967, was initiated after the death of two individuals by grizzly bear attacks. The Park management felt that bears which did not associate man with food presented the least problem to Park visitors; therefore, efforts were intensified to increase the proportion of wild bears in their bear population. The last open pit refuse dump was closed in 1967 and known litter sources in back-country areas were removed. In addition, back-country visitors were provided with information on hiking and camping procedures in the Park.

In 1968, a refined bear management program was designed with the objective of reducing the number of bear-human interactions. This bear management plan included an intensified public information program and a direct action program. The public information program consisted of:

1. Hand-out materials, personal contacts, interpretive news releases, etc., which informed campers and other visitors about the inherent dangers of bears.
2. A trail registration system that provided visitors with safe travel routes and camping areas in bear country.
3. The initiation of a back-country trash carry-out policy.

The direct action program consisted of:

1. Bear-proof methods for trash and garbage disposal in developed areas, and the timely removal and/or incineration of such material.
2. Strict enforcement of the regulation preventing bear feeding.
3. Initiation of a bear monitoring system that compiled current records of bear sightings, molesting incidents, property damage, and personal injuries.
4. Restricting the travel of individuals into particular campgrounds or trails.

5. Implementing the following steps, when dealing with nuisance animals:
   a) Ranger investigation: If an artificial food source was involved, it was removed and a period of one week would be allowed for the nuisance animal to leave.
   b) If removal of the animal was necessary, it would be trapped, immobilized, and transported to a more remote area.
   c) If a relocated bear re-appeared, it would be immediately destroyed.

Travel and developed campground use increased in 1968, but the number of property damages and personal injuries caused by black bears remained about the same as in 1967, close to the 1958-67 averages (Martinka 1969). Since 1968, visitor use of the Park has continued to rise, but bear-human incidents have not increased. No new management policies have been initiated, but refinement of the 1968 policy guidelines has continued. Glacier National Park has not eliminated all bear-human interactions, but they feel the situation is under control. The bear population in Glacier has been restored to a more natural condition with fewer bears habituated to unnatural food sources and people and property being adequately protected against bear attacks.

2.4 THE ALBERTA-PEACE RIVER BEAR-BEEKEEPING CONFLICT

Extensive black bear damage to apiaries and agricultural activities has occurred in the Peace River area of Alberta for many years. Beehives are a strong attractant to bears, especially after the first encounter, and the problem of bears returning to bee-yards is similar to the situation of bears habituated to garbage disposal sites. Considerable damage can result from bear-beehive encounters, as seen by production losses to beekeepers in the Peace River area, which ranged from $63,000 in 1971 to $200,000 in 1973 (Gunson 1974).

During the late 1960's, beekeepers attempted to resolve the problem by organizing bear hunts, and poisoning or trapping bears. In the early 1970's, comprehensive studies were initiated by the Alberta Fish and Wildlife Division and the Department of Agriculture to evaluate the damage and design new control methods. At this time, bear removal and electric fence efficiency were studied throughout the Peace River area (Gunson 1974). Bear removal, in response to damage complaints, continued throughout 1974. In addition, a government-beekeeper cost-shared electric fence program was instituted and studied (Pecharsky 1975).

A project was also designed to evaluate lithium chloride as an aversive conditioning agent for the prevention of damage at beeyards (Dorrance and Gilbert 1975). (Aversive conditioning is a specialized form of learning that involves pairing a food, a space, or an event with a traumatic or painful experience, which leads to an avoidance of that item in subsequent encounters [Dorrance and Gilbert 1975]).

In 1973, 20 experimental electric fences were built by the Alberta Fish and Wildlife Division and their effectiveness evaluated. Despite a summer of extensive damage, only two of the 20 fences (10%) were penetrated by bears (Pecharsky 1975). In 1974, the program was continued and the penetration rate was 11.3% (Pecharsky 1975). Other factors contributing to fence effectiveness was analyzed in 1974. Neither wire type, distance between wires nor fence height proved to be important. The most significant factor was the intensity of the electric charge. The rate of fence penetration by bears was higher at low-charged fences than high-charged fences. Pecharsky (1975) felt that by attaching aromatic bait to certain sections of the fence, nuisance bears would receive electrical shocks in vulnerable areas, such as the mouth and head, and this would aid in conditioning a fenced-beeyard-aversion reaction.

Recently, many researchers have recognized the potential of aversive conditioning as a method of reducing damage and discouraging beeyard depredation by black bears. Gilbert and Roy (1974) tested the effectiveness of aversive conditioning in the prevention of black bear damage to beeyards in Alberta. They used an emetic compound, lithium chloride, in honeycomb and brood comb baits. These baits were set inside ground supers and located on likely avenues of approach or placed immediately outside electric fences enclosing beeyards. There was significant damage reduction in both fenced and unfenced beeyards; however, similar techniques did not reduce damage to beeyards in 1975 (M.J. Dorrance, unpublished data). The researchers felt that even though damage was not reduced in 1975, the results were encouraging enough to continue study in 1976.

3. THE AOSERP STUDY AREA

3.1 THE CURRENT SITUATION

Black bears are an integral part of the pristine fauna of the AOSERP study area. There are no exact figures available at the time of this writing on the amount of black bear habitat, bear densities, or numbers of bears in the area. Soper (1962), studying in Wood Buffalo National Park, defined habitat utilized by black bears as the aspen-spruce forest type of the Alberta plateau uplands. The poplar-spruce forest along rivers provides rich habitat whereas pure muskeg is rather poor habitat.

Estimates of black bear density range from 1/14.5 km^2 (1/5.6 mi^2) in Maine (Spencer 1955), 1/10.1 km^2 (1/3.9 mi^2) in Virginia (Stickley 1957), 1/2.6 km^2 (1/1 mi^2) in Tennessee (Pelton 1974), 1/1.3 km^2 (1/0.8 mi^2) in Montana (Jonkel 1960), and 1/2.6 km^2 (1/1 mi^2) in Alberta (Kemp 1972). Black bear density in the AOSERP study area is probably closest to Kemp's estimate for the Cold Lake region of Alberta. How much of the 29,490 km^2 of the AOSERP study area constitutes bear habitat, has yet to be determined.

The AOSERP study area has not had a long history of numerous bear complaints. In the past, the Alberta Fish and Wildlife Division handled five to ten bear complaints per year (A. Boggs, pers. comm.). Nuisance black bears were not a serious problem and did not pose any real threat to individuals or private property.

Along with the industrial development of the AOSERP study area, there has been a large influx of people, and the town of Fort McMurray is expanding at a rapid rate. As well, the major oil sands extracting operations and remote industrial camps have spread throughout the area. There has been a rapid loss of bear habitat in the townsite region, around industrial camps, and in areas that have been cleared for the oil sands operations.

As human activity in the study area increased, the number of black bear complaints and nuisance black bears also increased. In 1974, the Fish and Wildlife Division in Fort McMurray recorded 19 bear complaints; 63% were residential and 37% were from industrial locations. In 1975, the total number of black bear complaints jumped to 77; approximately 50% were residential and 50% were industrial complaints (Table 3). In past years, accurate records have not been kept on the number of bears relocated or destroyed, but in 1975 alone, 47 bears had to be destroyed and 54 were relocated. Bear control actions were far more numerous than previously experienced.

In the AOSERP study area, as in all other areas experiencing man-bear conflicts, the nuisance bears are habituated garbage eaters. As evidenced in the Yellowstone, Glacier, and Banff National Parks studies, landfill sites attracted and concentrated bears into small areas, and habituated them to humans and unnatural food. Churchill, Manitoba found that most of their polar bear problems resulted from operating refuse dumps near the townsite (Jonkel 1970).

The town of Fort McMurray has only one landfill site which attracts a large number of black bears. Kemp (pers. comm.) reported seeing six bears at one time feeding in the Fort McMurray site in 1976. The site is located 4.0 km from the townsite, and the closest residential subdivisions are 2.4 km away (Figure 4). Proposed future residential development is in subdivisions closer to the town landfill site. The landfill is located in an aspen-white spruce mixed forest type adjacent to the Hanging Stone River, which represents excellent bear habitat. The river valley probably serves as a travel lane, rich with natural foods, especially in the fall. Since the landfill site is located in prime bear habitat and does not have any protective fencing, bears have easy access. The landfill site was visited by the author in March 1976 and large amounts of garbage were found left unburned or unburied (Figures 5 and 6).

Table 3. Bear complaints in Fort McMurray.

Bear Complaints	1974	1975
Source of Complaint		
Residential	12	42
Industrial	7	35
Total	19	77
No. Bears Trapped		
Killed	-	47
Relocated	-	54
Total	-	101
Total Bear Contacts	19	178

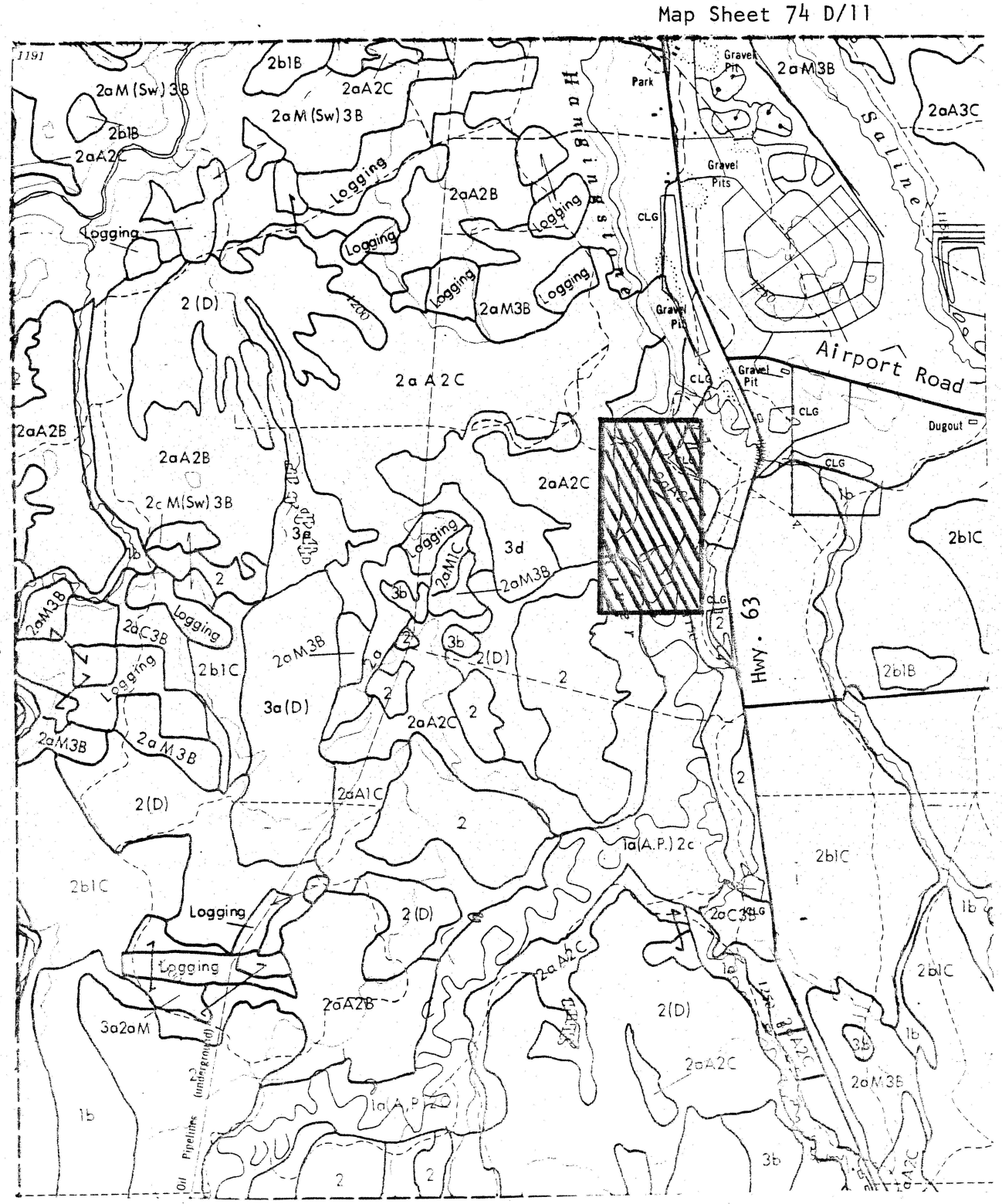
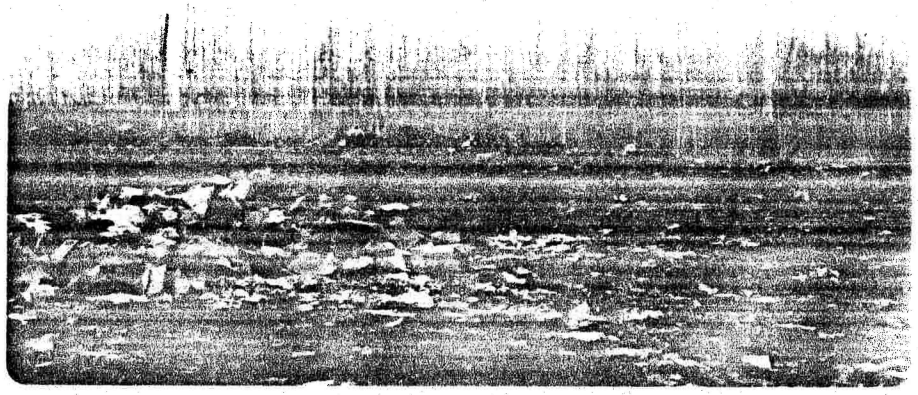


Figure 4. Map showing the location of the Fort McMurray sanitary landfill site, southwest of Fort McMurray. The base map is a vegetation map prepared for AOSERP Project VE 2.3.



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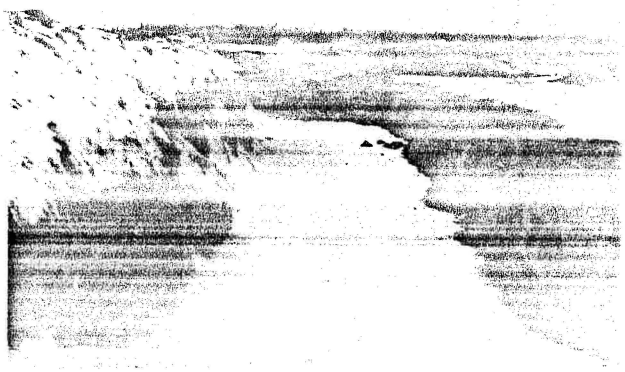

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Figures 5 and 6. Sanitary landfill site in Fort McMurray.

Garbage is picked up in the residental areas of Fort McMurray once a week, between the hours of 0800 and 1700. Residents of the area do not have bear-proof garbage cans (Figures 7, 8, and 9) and they let garbage accumulate in trash cans over the week-long period. Most of the residential areas are located alongside forested sections that are potential bear habitat, and many bears will wander into residential areas to raid overflowing garbage cans (A. Boggs, pers. comm.).

Remote industrial plants also experience bear-related problems. When a small work camp is established, there usually is no method of proper garbage disposal. Garbage is deposited in an open pit, close to the campsite and buried when the camp is disbanded. On the other hand, the larger permanent campsites have landfill sites. The garbage generated by Great Canadian Oil Sands (GCOS) is deposited in a sanitary landfill adjacent to the tailings pond and is generally inaccessible to bears. Syncrude's landfill site is located in a large cleared area over 1.5 km from any bear habitat. Syncrude reports that their landfill site is bulldozed every day and is not attractive to bears.

Even with their reported "bear-proof" garbage disposal methods, both GCOS and Syncrude have experienced bear problems. Both feel their bear problems are not a result of garbage disposal methods, but rather a function of the camp kitchen's strong attracting odors and an uneducated worker population. Workers feed, harass, and pester any animals that are drawn into the campsites. For example, the Fish and Wildlife officer in Fort McMurray reports (pers. comm.) that he was trapping a nuisance animal on the Syncrude campsite in the summer of 1975. Workers released the animal from the culvert trap and fed it. The bear was found wandering around the campsite the next day, and consequently was retrapped and relocated.

Provincial Fish and Wildlife officers are responding to nuisance bear complaints primarily by removing them to remote areas. In the summer of 1975, one of the two officers stationed in Fort McMurray spent most of the summer transporting problem

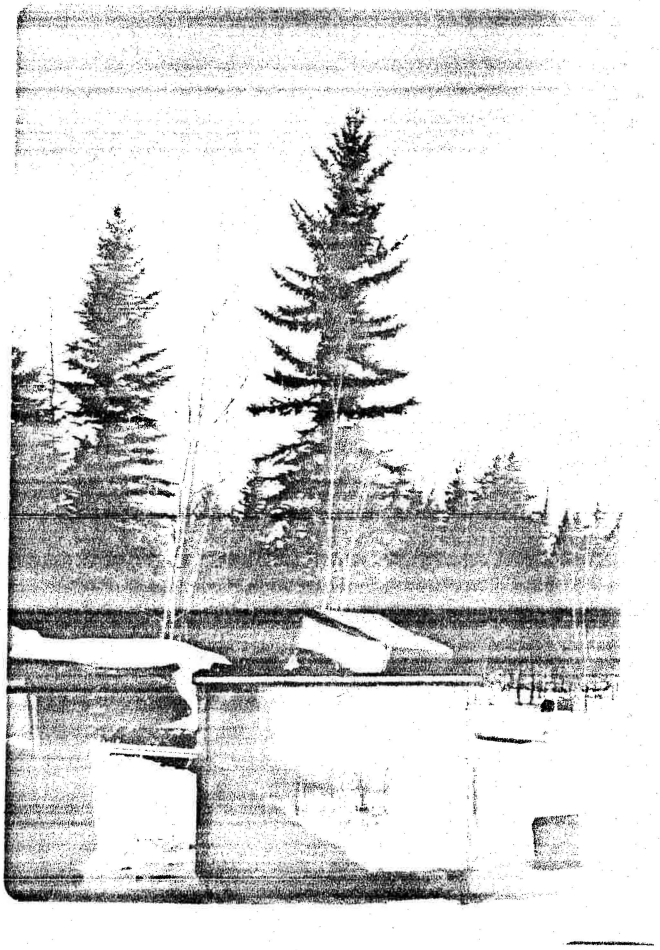

Figure 7. Garbage available to black bears in residential areas in Fort McMurray.

Figure 8. Garbage available to black bears in residential areas in Fort McMurray.

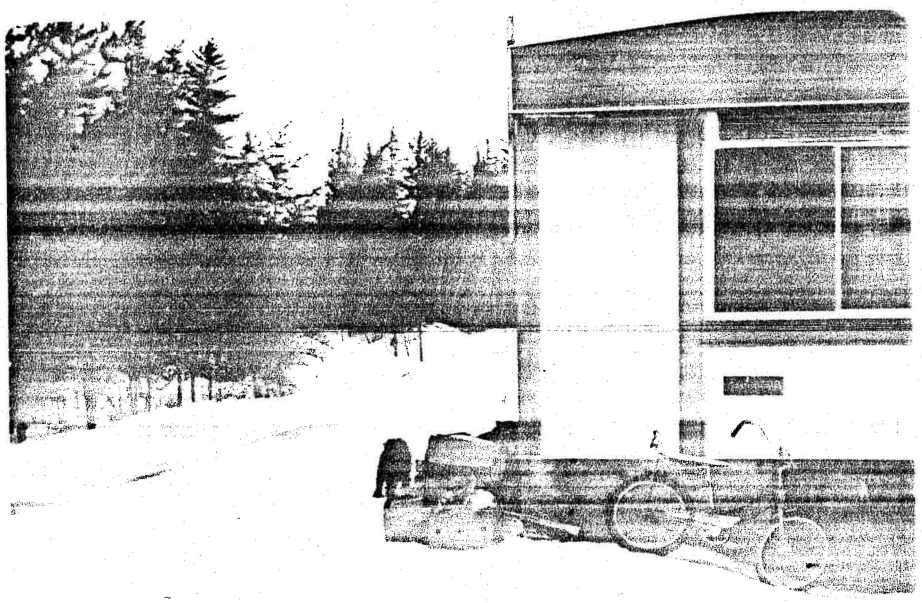

Figure 9. Garbage available to black bears in residential areas in Fort McMurray.

bears to more remote areas. Although this is the most humane method of handling nuisance bears, this procedure presents problems.

The effectiveness of this management technique is questionable because of the homing behaviour exhibited by most black bears. Wasmen (1968) reports that of 13 black bears relocated in Glacier National Park, eight individuals (62%) returned. Sauer et al. (1969) transported 52 nuisance animals 8.9 to 106.6 km from their point of capture and 43% returned. Pelton (1976) felt that removal of a nuisance animal to a remote area elicited homing behaviour in adults, subadults, males, and females.

In Pelton's (1976) study there was only a weak relationship between the percent of bears homing and the distance they were displaced, indicating that the distance displaced and the probability of homing may be independent factors. He also found that bears were more likely to home in the summer months rather than in the spring or fall, because in the spring, a bear may not be habituated to an area or an unnatural food source. Likewise, during the fall, the bear may have inadequate time to return to the nuisance area before denning. Pelton also found a highly significant difference between the homing capacities of experienced and inexperienced bears. Homing probability was increased and time of return was significantly decreased for experienced bears. If a nuisance bear had been relocated once, and exhibited homing behavior, the probability of relocation success on a second trial was low.

Incorrigible bears in the AOSERP area are destroyed. Destruction of nuisance animals may temporarily decrease their yearly numbers, but should not affect the numbers of back-country bears or the total population. Cole (1976), working in Yellowstone National Park, suggests that controlled killings of 6% before 1970, over-exploited the nuisance cohort of their black bear population, but not the population as a whole. Apparently,

dispersals from the largely unexploited back-country population contributed to maintaining the nuisance cohort in Yellowstone.

The known 47 bears destroyed in 1975 in the AOSERP study area probably constituted no more than 2-3% of the total bear population. Cowan (1970) concludes that populations of 300 or more black bears can compensate for 8-9% yearly removals from hunting. This suggests that the removals in the study area are well below dangerous percentages.

Responding to bear related problems by relocation or destruction is dangerous, time consuming, costly, and presents restrictions due to the availability of manpower. Capturing a nuisance animal requires considerable time and expensive equipment. Nuisance animals are captured in large culvert traps (Figure 10). This trap has a 100 pound steel gate which drops with considerable force when the trap is entered and the mechanisms triggered. In addition to the obvious danger faced by the trap operator, there is always the possibility that the trap will be entered by children. A cost estimate of $800.00 per bear per relocation was given in Banff National Park. Fifty-four bears were relocated in the AOSERP study area in 1975, and judging from the Banff estimates this may have cost the Province of Alberta $43,200.

With these available facts, relocation of nuisance animals should not be maintained as the primary management technique in the AOSERP study area. Overall, it is ineffective and costly. It is an action that responds to a problem, but does not solve it. Relocating animals, if effective, will remove a bear from a problem area, but the following year it would probably be replaced by another animal. Therefore, relocations would have to be continued yearly.

If other methods of handling nuisance animals were instigated, relocation could be used as a last resort. The highest probability of relocation success would be:

1. If the nuisance bear has not had prior relocation experience;

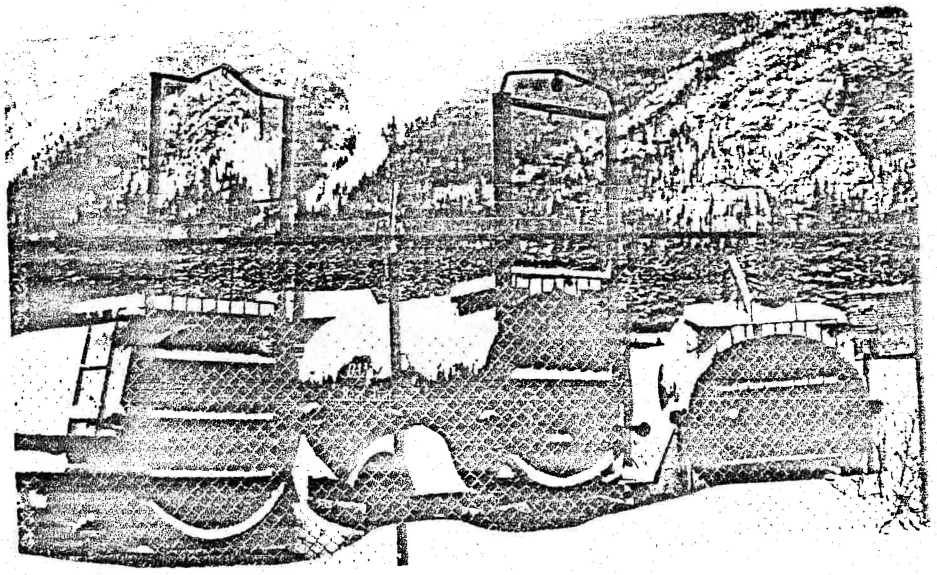

Figure 10. Culvert trap used in capturing black bears.

2. If the nuisance animal is relocated immediately after its first known appearance in an area (i.e., has not had time to become habituated);
3. If the nuisance animal is relocated in either the spring or the fall; or
4. If the safety modifications are applied to the culvert traps used.

Bear destruction is only a sound management technique when it is used in conjunction with preventative measures. As it stands, nuisance animals are increasing and so the number of destructions will have to increase each and every year. Bear destruction is only a stop gap measure and other management techniques that prevent bears from becoming nuisance animals must be initiated.

3.2 RECOMMENDED ALTERNATIVES FOR THE AOSERP AREA

Making garbage inaccessible to bears is a problem that has perplexed all areas experiencing bear-related problems. Theoretically, sanitary landfills are bear-proof, but their effectiveness is only achieved by the immediate covering of garbage and depositing the required thickness of fill. This requires considerable operation time by heavy equipment, and landfill sites are designed to be economical, not necessarily bear-proof. Other areas that have experienced bear problems have realized that landfill sites will always attract black bears and are difficult to bear-proof. A landfill site in Fort McMurray will continue to attract nuisance animals; however, if it is properly run, the problem should be reduced. The following steps should be taken immediately to improve their present landfill site:

1. The landfill site should be relocated to at least 16 km from the nearest residential area. It should be in an area that is not black bear habitat. A stand of jackpine or a muskeg area would be appropriate.

2. The landfill site should be properly maintained. Garbage should be burned and covered immediately after it is deposited.
3. Surrounding the landfill site with electric fencing could be effective as long as fences are properly constructed and maintained. In Churchill, Manitoba, a remote research station was surrounded with electric fence; the fence successfully repelled polar bears until the electricity was accidentally disconnected (Jonkel, pers. comm). In the Peace River country, electric fences were 90% effective in reducing depredation to beehives by bears. Gunson (pers. comm.) states that an electric fence will be most effective in repelling inexperienced bears to garbage, humans, or any other attractive force. Since the Fort McMurray area has not had a long history of nuisance animals and many of the bears that are now being attracted to the landfill site are probably inexperienced, the electric fencing of the landfill site, properly constructed and maintained, would decrease the number of nuisance animals feeding on garbage. Electric fencing of the landfill site would not eliminate nuisance animals, but it could decrease the problem considerably.

The most effective method of bear-proofing garbage is by processing it to decrease its attractiveness. The method used in Yellowstone National Park of complete incineration of garbage and electric fencing of the incinerator has been the most effective method of bear-proofing garbage. After experiencing many polar bear related problems, the town of Churchill, Manitoba closed all their garbage dumps and replaced them with an incinerator. Replacing landfill sites with an incinerator greatly decreased the number of nuisance polar bears (Jonkel 1970). Incineration has been the most effective method of bear-proofing garbage because the processed

product does not attract bears. Incineration of garbage is recommended for the townsite; however, this would require an extensive waste management study into the practicality and economic feasibility of comples combustion incineration.

Garbage in the residential areas must also be made inaccessible to bears. There are two designs for bear-proof garbage cans that could be easily installed in the home-owners' backyard. Residents should be encouraged not to let edible waste accumulate on their property. Garbage pick-up in the residential areas should be increased. Ideally, garbage should be picked up once a day, but twice weekly would be an improvement. A more flexible system of garbage pick-up would also help. If bears are raiding garbage cans in certain residential areas, garbage pick-up should be increased in that area immediately prior to the time that bears are seen.

Remote industrial camps produce smaller amounts of garbage than a townsite; therefore, the problem is easier to solve. Campsites are not required by law to treat their garbage and rubbish and most campsites deposit it in open pits close to the camps. The Amoco Petroleum operation at Anzac in the AOSERP study area is a good example of the bear problems that campsites can experience and methods of solving these problems. The Amoco camp accomodates 125 people and in the past they had an open pit garbage dump. The bear problems became so severe that the camp managers decided to install a garbage incinerator that had been designed by Imperial Oil for their industrial campsites in the North. Before the incinerator was installed, there were reported to have been anywhere from 10 to 20 bears in the vicinity of the campsite. Individual sightings of 20 and 27 bears in the dump at one time were reported by the camp manager. After the incinerator was installed in the spring of 1974, the number of nuisance bears was drastically reduced. The Alberta Forest Service has removed one problem bear from the campsite since the incinerator was installed, but the camp managers indicate that the problem is now under control.

Remote industrial areas could eliminate their bear-related problems relatively easily. Industrial sites are strongly recommended to incinerate their garbage. This would eliminate attractive odors and unnatural food sources for the bears in the area. Fully processed garbage eliminates motivation for bears to enter the campsite and, hence, become habituated to man. The cost of installing incinerators for camps of 50-150 men is between $6,500-8,500, respectively (Appendix 7.1). This cost is minimal when one considers the problems that will be avoided and the benefits of this type of garbage disposal.

As an alternative to incinerating garbage, remote industrial sites could use electric fences around their garbage pits. Bears will still be attracted to the garbage pits and into the vicinity of the campsite, but, theoretically, they will not become habituated to unnatural foods and the presence of man. The effectiveness of an electric fence is dependent on proper construction and maintenance. Because bears will still be attracted to campsites and electric fences are not 100% effective, this alternative is not strongly recommended. Electric fencing should only be used if incineration is not possible, or in conjunction with incineration (i.e., an incinerator could be electrically fenced). Cost estimates are included in Appendix 7.2.

The AOSERP Mildred Lake Research Facility should use the most advanced, environmentally sound methods of garbage disposal, not only for practical reasons, but also to set an example for other industrial operations. Presently, the Mildred Lake Research Facility operates an open landfill site that will be attractive to bears (Figure 11). Bear-related problems can be expected in the future. This situation is not environmentally sound and can be easily remedied. It is strongly recommended that the Mildred Lake Research Facility comply with the recommendations in this report for remote campsites. As a preventative measure the Facility should incinerate its garbage, and a cost estimate for installing an incinerator unit is included in Appendix 7.1.

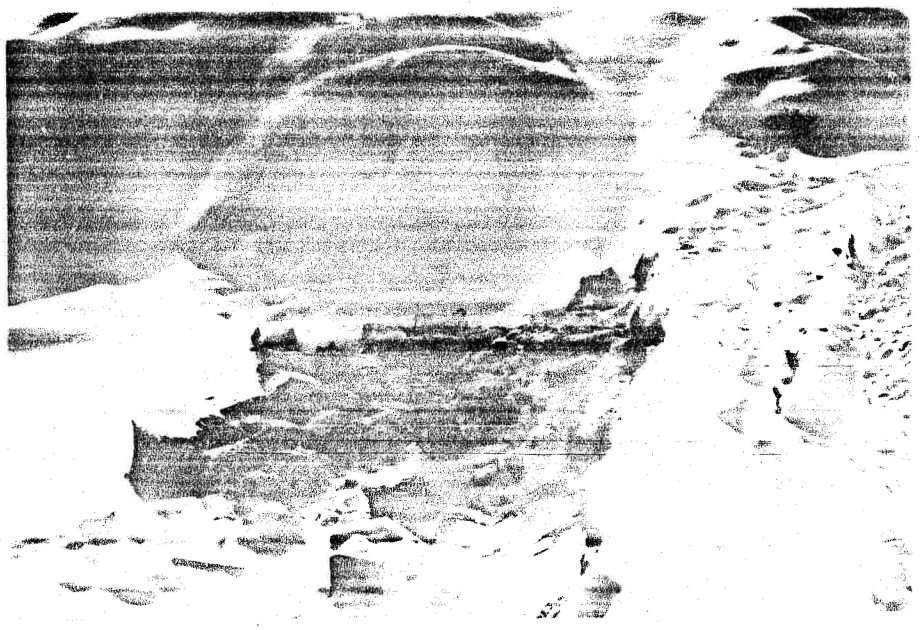

Figure 11. Mildred Lake Research Facility garbage disposal.

The agency responsible for black bear management in the AOSERP study area is the Alberta Fish and Wildlife Division, but as of today no firm bear management philosophy or policy exists. The Fish and Wildlife Division is reacting to the problem by removing or destroying incorrigible bears. This is not solving any of the problems and the present situation is simply perpetuated. Thus, the Fish and Wildlife Division urgently needs a bear management policy for the AOSERP study area.

Any bear management policy should have an active public education program. Residents of the area should have information available to them on bear biology, procedures to take with a bear encounter, and procedures during an emergency situation. This information is available in pamphlet form in most national parks and could easily be transposed to apply to the AOSERP study area. Posters could be placed in the townsite of Fort McMurray warning individuals of the danger of bears and against feeding bears. Posters are available in other areas and could be applicable to the AOSERP study area.

Currently, there are very few data on the black bear in the AOSERP study area. In order to have sound bear management, information should be available on the number of destructions, number of relocations, number of relocation failures, biology of bears that are handled, and an accurate record of all sightings and bear complaints. The Fish and Wildlife Division should keep accurate records of their bear-related activities, and report forms would provide useful information.

A bear management policy must encourage preventative control of bear-related problems. The Fish and Wildlife Division should insist that individual residents, the townsite of Fort McMurray, and remote industrial operations bear-proof their garbage. Relocating and destroying bears should be discontinued as a single control measure. If preventative actions are taken then responsive control measures could be used in conjunction with these measures.

If the Fish and Wildlife Division had a distinct bear management policy that encouraged preventative measures, the need to relocate or destroy bears would decrease.

4. CONCLUSIONS

Currently two scenarios concerning the bear-human conflict can be constructed for the AOSERP study area. The current situation can continue to be ignored; no change in management policies would be made and no measures would be taken to solve the problems. Evidence from other areas suggests the number of nuisance black bears in the area would continue to increase as would the probability of damage to private property and personal injury. It would only be a matter of time before a serious black bear attack would occur. The number of bear destructions and relocations would increase and the cost of maintaining responsive control measures would escalate.

An alternative series of events could occur. A bear management policy could be developed that incorporated and encouraged preventative measures. The evidence also exists that preventative control reduces the numbers of nuisance bears and, thus, the probability of personal injury or damage to private property. With declining nuisance black bears, the cost and number of necessary control actions would decrease.

The AOSERP study area is in a unique position. It has only a short history of bear-human problems, and probably only a small cohort of established nuisance animals. Other areas in North America have long histories of bear-related problems and they have spent much time and effort finding solutions to their problems. Unfortunately in most areas intensive bear management programs were not instigated until after a large nuisance black bear cohort was established. Effective bear management policies could be instituted in the study area before the problem becomes immense.

To initiate and maintain effective bear management policies in the AOSERP study area would require co-operative participation between individual residents, the town council of Fort McMurray, the Alberta Fish and Wildlife Division, and industrial operations in the area.

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7. APPENDICES

7.1 COST ESTIMATES FOR AN INCINERATOR UNIT FOR THE AOSERP MILDRED LAKE RESEARCH FACILITY

Requirements for an incinerator:

- Peak occupancy load at AOSERP camp = 65 = 65
- 16 lbs. of garbage/day/man = 5 = 5
  (This figure is based on ratings for a medium sized hotel ... personal communication with "Weldomatic").
- Peak total amount of garbage/day = 325 lbs/day

Two models of incineration would be recommended:

- CY-100 - burns 100 lbs/hr. = 3.25 hrs. operating time/day
- CY-150 - burns 175 lbs/hr. = 1.86 hrs. operating time/day

Weldomatic states that an incinerator can operate up to eight hours a day, so either model would suffice.

CY-100 = $6,219.00
+ transportation cost = $ 350.00
requires a standard 3 ton truck.
The incinerator unit is bought assembled on skids.
Total = $6,569.00

Operating costs:

- burn 2.5 gal. of diesel fuel/hr.
- diesel fuel = $0.40 gal.
- fuel per 3¼ hr. operating day = $1.30.

CY-150 = $ 8,219.00
+ transportation cost = $ 350.00
requires a standard 3 ton truck.
The unit is brought assembled on skids.
Total = $8,569.00

+ hook-up costs. A power line must be run from a standard 1100 volt electric power source.

Operating costs:

- burns 5 gal. of diesel fuel/hr.
- diesel fuel = $0.40/gal.
- fuel for a 1.86 hr. day = $0.74.

7.2 COST ESTIMATE FOR ELECTRIC FENCING THE AOSERP DUMP

This fence is to be a 100' x 100' with a standard 12' farm gate opening.

Quantity	Item	Unit Price	Total
34	T rail posts	$ 3.70	$125.80
1	spool plain wire	27.56	27.56
1	12' farm gate	66.00	66.00
3	angle iron posts	18.00	54.00
3	rolls of chicken wire	17.20	51.60
1	transformer unit	44.95	44.95
25	corner insulators	2.58/25	2.58
140	regular insulators	2.38/50	7.14
2	Hot Shot batteries	5.25	10.50
1	14 gauge 80 rod	9.00/coil	9.00
1	5/8" x 10' ground rod	6.98	6.98
	alligator clips	.56	.56
6	strap hinges	2.04/pair	12.12
	staples, one carton	12.85	12.85
			$431.04
	Fencing cost (400 linear feet)	=	$324.96
	cost per linear foot	=	1.23
	Electrical equipment	=	106.68

This fence would require 74 man hours of work or 3 man days of work.

The electric fence would have three barbed wires mounted on insulators, attached to fence posts. One strand is about 12 in. from the ground, one about 6 ft., and one in between. A continual charge is run through the fence by a 12 volt solid state fencer which has two settings and will generate about 5500 volts into a poorly insulated fence on "low" and more than 8200 volts on "high". It is made to be powered from a 12 volt storage battery. Short circuits on the fence do not affect the battery drain. Typical battery life on a "smaller" 12 volt battery (i.e., 55 AH), is more than 3 months on "low" and 6 weeks on "high".

If a bear attempts to climb over the fence a charge will be sent from the fence through the bear to the ground; if he attempts to dig under the fence (which is probable) he will receive a charge from the lower wire. In the summer during hot and dry weather, the ground will cease to be a good conductor. Therefore, it will be necessary to lay wire netting (chicken wire) on the ground next to the fence, connected to the fence. In this way the bear will be standing on a good ground to receive a shock.

8. AOSERP RESEARCH REPORTS

1.		AOSERP First Annual Report, 1975
2.	AF 4.1.1	Walleye and Goldeye Fisheries Investigations in the Peace-Athabasca Delta--1975
3.	HE 1.1.1	Structure of a Traditional Baseline Data System
4.	VE 2.2	A Preliminary Vegetation Survey of the Alberta Oil Sands Environmental Research Program Study Area
5.	HY 3.1	The Evaluation of Wastewaters from an Oil Sand Extraction Plant
6.		Housing for the North--The Stackwall System
7.	AF 3.1.1	A Synopsis of the Physical and Biological Limnology and Fisheries Programs within the Alberta Oil Sands Area
8.	AF 1.2.1	The Impact of Saline Waters upon Freshwater Biota (A Literature Review and Bibliography)
9.	ME 3.3	Preliminary Investigations into the Magnitude of Fog Occurrence and Associated Problems in the Oil Sands Area
10.	HE 2.1	Development of a Research Design Related to Archaeological Studies in the Athabasca Oil Sands Area
11.	AF 2.2.1	Life Cycles of Some Common Aquatic Insects of the Athabasca River, Alberta
12.	ME 1.7	Very High Resolution Meteorological Satellite Study of Oil Sands Weather: "a Feasibility Study"
13.	ME 2.3.1	Plume Dispersion Measurements from an Oil Sands Extraction Plant, March 1976
14.	HE 2.4	Athabasca Oil Sands Historical Research Design (3 Volumes)
15.	ME 3.4	A Climatology of Low Level Air Trajectories in the Alberta Oil Sands Area
16.	ME 1.6	The Feasibility of a Weather Radar near Fort McMurray, Alberta
17.	AF 2.1.1	A Survey of Baseline Levels of Contaminants in Aquatic Biota of the AOSERP Study Area
18.	HY 1.1	Interim Compilation of Stream Gauging Data to December 1976 for the Alberta Oil Sands Environmental Research Program
19.	ME 4.1	Calculations of Annual Averaged Sulphur Dioxide Concentrations at Ground Level in the AOSERP Study Area
20.	HY 3.1.1	Characterization of Organic Constituents in Waters and Wastewaters of the Athabasca Oil Sands Mining Area

21.		AOSERP Second Annual Report, 1976-77
22.	HE 2.3	Maximization of Technical Training and Involvement of Area Manpower
23.	AF 1.1.2	Acute Lethality of Mine Depressurization Water on Trout Perch and Rainbow Trout
24.	ME 4.2.1	Review of Dispersion Models and Possible Applications in the Alberta Oil Sands Area
25.	ME 3.5.1	Review of Pollutant Transformation Processes Relevant to the Alberta Oil Sands Area
26.	AF 4.5.1	Interim Report on an Intensive Study of the Fish Fauna of the Muskeg River Watershed of Northeastern Alberta
27.	ME 1.5.1	Meteorology and Air Quality Winter Field Study in the AOSERP Study Area, March 1976
28.	VE 2.1	Interim Report on a Soils Inventory in the Athabasca Oil Sands Area
29.	ME 2.2	An Inventory System for Atmospheric Emissions in the AOSERP Study Area
30.	ME 2.1	Ambient Air Quality in the AOSERP Study Area, 1977
31.	VE 2.3	Ecological Habitat Mapping of the AOSERP Study Area: Phase I
32.		AOSERP Third Annual Report, 1977-78
33.	TF 1.2	Relationships Between Habitats, Forages, and Carrying Capacity of Moose Range in northern Alberta. Part I: Moose Preferences for Habitat Strata and Forages.
34.	HY 2.4	Heavy Metals in Bottom Sediments of the Mainstem Athabasca River System in the AOSERP Study Area
35.	AF 4.9.1	The Effects of Sedimentation on the Aquatic Biota
36.	AF 4.8.1	Fall Fisheries Investigations in the Athabasca and Clearwater Rivers Upstream of Fort McMurray: Volume I
37.	HE 2.2.2	Community Studies: Fort McMurray, Anzac, Fort MacKay
38.	VE 7.1.1	Techniques for the Control of Small Mammals: A Review
39.	ME 1.0	The Climatology of the Alberta Oil Sands Environmental Research Program Study Area
40.	VE 7.1	Interim Report on Reclamation for Afforestation by Suitable Native and Introduced Tree and Shrub Species
41.	AF 3.5.1	Acute and Chronic Toxicity of Vanadium to Fish

These reports are not available upon request. For further information about availability and location of depositories, please contact:

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