



british columbia department of

recreation & conservation



annual report
1970

Hon. W.K. Kiernan
Minister

H.G. McWilliams
Deputy Minister



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PROVINCE OF BRITISH COLUMBIA
DEPARTMENT OF RECREATION AND CONSERVATION
HON. W. K. KIERNAN, *Minister* H. G. McWILLIAMS, *Deputy Minister*

REPORT OF THE
Department of Recreation
and Conservation

containing the reports of the

GENERAL ADMINISTRATION, FISH AND WILDLIFE BRANCH,
PROVINCIAL PARKS BRANCH, BRITISH COLUMBIA
PROVINCIAL MUSEUM, AND COMMERCIAL
FISHERIES BRANCH

Year Ended December 31

1970



Printed by K. M. MACDONALD, Printer to the Queen's Most Excellent Majesty
in right of the Province of British Columbia.
1971

VICTORIA, BRITISH COLUMBIA, February 24, 1971.

*To Colonel the Honourable JOHN R. NICHOLSON, P.C., O.B.E., Q.C., LL.D.,
Lieutenant-Governor of the Province of British Columbia.*

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of the Department of Recreation and Conservation for the year ended December 31, 1970.

W. K. KIERNAN
Minister of Recreation and Conservation

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VICTORIA, BRITISH COLUMBIA, February 23, 1971.

*The Honourable W. K. Kiernan,
Minister of Recreation and Conservation.*

SIR: I have the honour to submit the Annual Report of the Department of Recreation and Conservation for the year ended December 31, 1970.

H. G. McWILLIAMS
Deputy Minister of Recreation and Conservation

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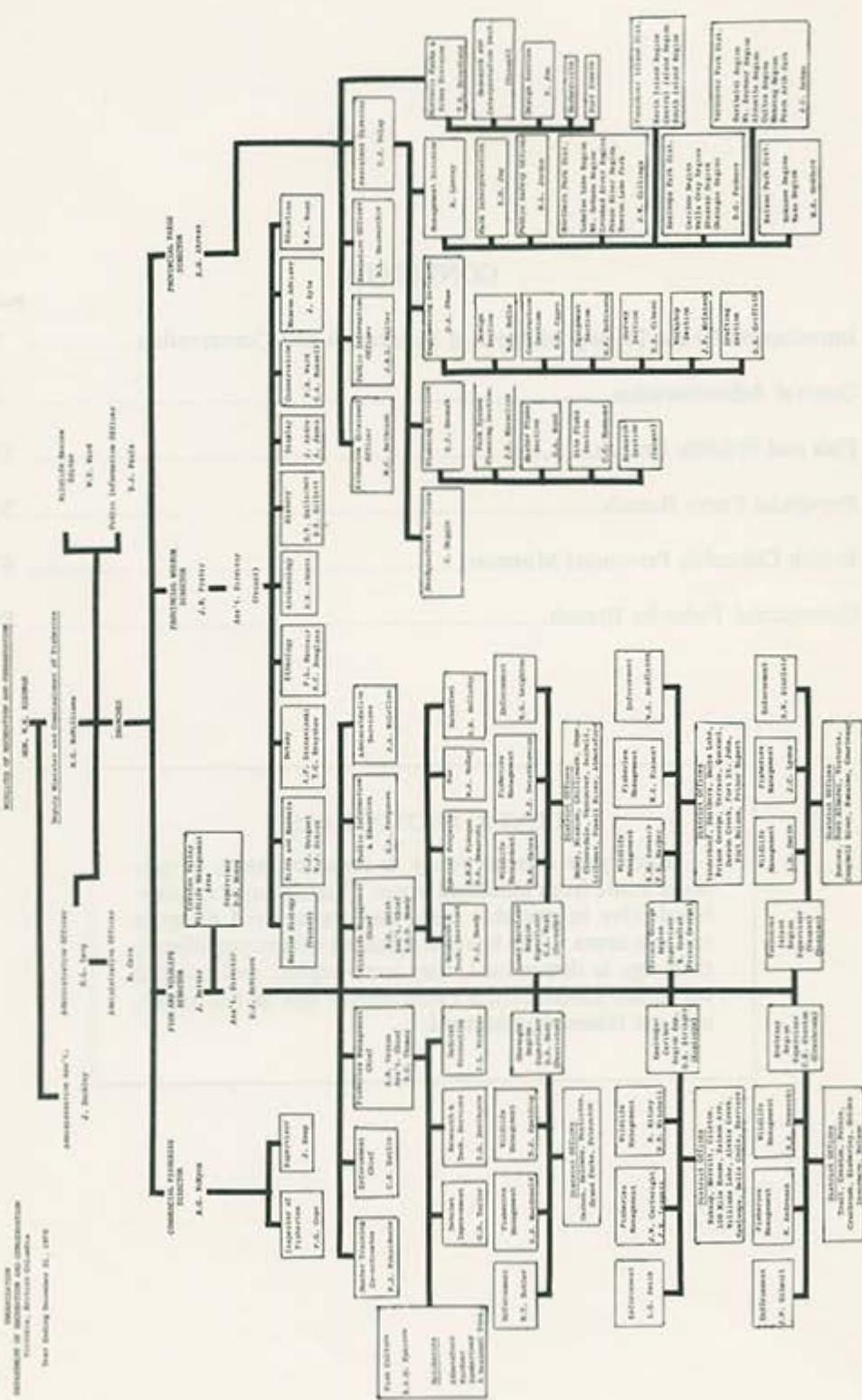
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COVER PHOTOGRAPH

Each year it is necessary to remove dozens of nuisance bears from inhabited areas. The animals are captured alive in portable traps and transported to more suitable areas. The bears are treated with tranquillizers, their age is determined, they are weighed and marked for future identification (with yellow dye in this case), and are released unharmed.

ESTATE OF WENDELL AND LUCILLE
PRUITT, SPOUSES OF GLENDA
FANN STAGG, Deceased. 1976

Journal of Economic and Statistical
Literature, Volume 30, Number 1, March
1998



Report of the Department of Recreation and Conservation, 1970

H. G. McWILLIAMS, DEPUTY MINISTER AND COMMISSIONER OF FISHERIES

INTRODUCTION

Considerable progress was made throughout the year by all Branches in working toward a common goal of improving our resources in the fields of recreation and conservation. Members of the Department were pleased to participate on many different committees in co-operation with other departments of government at both the Federal and Provincial level. These included many meetings with the Federal Department of Fisheries, with particular reference to a number of cost-sharing projects to improve the mollusc fisheries in British Columbia. Also, the Land Use Committee is proving invaluable in co-ordinating the management of our natural resources in the Province.

The increased public interest in our environment was evident from the continuing upward trend to 7,500,000 park visits, more than 800,000 visits to the Provincial Museum, and the purchase of more angling and hunting licences than ever before.

In November an unfortunate fire at Manning Park Lodge completely destroyed 24 motel units, much to the inconvenience and disappointment of many guests who had made reservations for the ski-ing season at Gibson Pass. It is anticipated that these units will be replaced in the summer of 1971.

The acquisition of land for Phase I of the National Park on the west coast of Vancouver Island is moving forward steadily, but it will be some time before it is all assembled for conveyance to the Federal authorities.

In 1970 a total of 7,100,000 trout and other game fish were stocked in 415 lakes, while the collection of 18,000,000 wild eggs will ensure a plentiful supply of young fish for the 1971 planting programme. The development of the Creston Valley Wildlife Management Area is progressing very well in co-operation with the Canadian Wildlife Service and Ducks Unlimited (Canada).

It is gratifying to note a marked reduction in hunting accidents over previous years, even with an increase in the number of hunters. No doubt this can be attributed to the success of the Hunter-training Programme.

The very popular publication *Wildlife Review* continues to be in demand, with increased subscriptions and sales.

DR. G. CLIFFORD CARL

It is with regret that we must record the sudden passing of Dr. Carl on March 27, 1970. This was only a few months after he had relinquished the Director's position in order to carry on a research programme in marine biology. His death is a great loss to the Museum and to the Province.

GENERAL ADMINISTRATION



GENERAL
ADMINISTRATION



GENERAL ADMINISTRATION

General Administration consists of the Deputy Minister's Office, the attached Public Information Officer, and the Accounts and Personnel Office.

The staff of General Administration work closely with all branches, including the Department of Travel Industry, in such Departmental matters as putting policy into effect, office and work facilities, personnel, and finance.

The Personnel Section of General Administration processed 53 requisitions to the Civil Service Commission for the purpose of obtaining new and replacement positions for all Branches of the Department.

This section also processed 81 Civil Service Commission requisitions for the Department of Travel Industry.

The personnel officer sat in on many interviewing panels for the selection of these candidates.

One employee in this Department completed the three-year Executive Development Course and two employees in this Department were selected for the one-year Basic Public Administration Course. One employee in the Fish and Wildlife Branch and one employee in the Parks Branch were awarded 25-year continuous-service certificates.

Regular meetings are held with employees of the Parks Branch and the Fish and Wildlife Branch for the purpose of reviewing personnel accidents and seeking methods of improving safety.

PUBLIC INFORMATION AND EDUCATION

The Public Information Officer of the Department of Recreation and Conservation has as his primary duty various writing and editing assignments for *Beautiful British Columbia* magazine (Department of Travel Industry). His secondary duties are to carry out other specific projects as determined by the Minister.

During 1970 the general public interest in the activities of the Department was dramatically reflected in the number of inquiries received in the Public Information Office. About four times as many inquiries were processed in 1970 as in 1965, and of significance is the increasing level of sophistication inherent in the inquiries. Also indicating this growing public interest in the Department was an increase by 25 per cent during the period of 1965-70 in the number of news releases originating in the Department (which are an administrative function of the Public Information Officer), while the number of outlets for these releases increased from approximately 300 to more than 500. Another measurement is the press clipping service which monitors press references to the Department and activities of interest to the Department—these tripled in number during the five-year period.

During 1970, various information and education projects were completed by the Public Information Officer and, worthy of special note, were two Province-wide publicity campaigns based on the *Litter Act*, which entailed the production and distribution of two brochures. Two other brochures were produced for distribution by the Canadian Forestry Association. Assistance to other agencies preparing material on a multitude of subjects was provided on scores of occasions.

For the fifth consecutive year the Public Information Officer assisted the Department of Travel Industry in its annual travel writers' tour in British Columbia. This included the preparation of numerous press kits, and co-ordination and distribution of orders from the travel writers for more than 400 photographs.

In 1970 the Public Information Officer became the Department's representative on the Resource Use Information Subcommittee of the Environment and Land Use Committee and, as well as being secretary, became involved in several research projects and the preparation of news releases.

During the year the Public Information Officer continued to act as secretary of the Wildlife Review Advisory Board and compiler of the Annual Report.

In 1966 a proposal made in the Department to co-ordinate public information and education activity in a "Departmental Section of Information and Education" was set aside because the situation at that time was found "satisfactory." In 1970, because of the evident increase in public and press attention and the conclusion that some co-ordination among the Department's various public information officers might provide increased efficiency, the proposal was revived and, at the end of the year, Branch Directors were preparing submissions on the subject for study by the Minister.

FISH and WILDLIFE BRANCH





Some of the 457 delegates registering for the 50th Annual Conference, Western Association of State Game and Fish Commissioners and Western Division American Fisheries Society, held in Victoria July 13-16, 1970.



Creston Valley Wildlife Management Area staff inspecting wood duck nesting-box.

FISH AND WILDLIFE BRANCH

J. HATTER, DIRECTOR

The work of the Fish and Wildlife Branch covers such a diversity of activities that the body of the Annual Report itself must of necessity be only a summary. Instead of a further condensation of this report, the usual "highlights" of the year's work are presented for the reader who may not wish to read the report in more detail:

- (1) Direct revenue for 1969/70 was \$2,908,000, an increase of \$203,000 over 1968/69.
- (2) Hunting licence sales to residents and nonresidents increased 5 per cent to a total of 159,098.
- (3) Revenues generated by licensed hunters increased by \$63,000 to a total of \$1,775,000.
- (4) The severe 1968/69 winter effected lower harvests of big-game animals.
- (5) Monitoring pesticide levels in wildlife continued; 313 specimens were analysed.
- (6) Hunting regulations were distributed by July 1.
- (7) There was active participation in the British Columbia Waterfowl Technical Committee and in the preparation of Waterfowl Management Plans for the Fraser Valley and the Capital Regional District.
- (8) The first Province-wide survey of falcon populations was conducted and a moratorium was declared on the capture of falcons.
- (9) Wildlife ranges in the southern Rocky Mountain Trench were surveyed to provide background information for resolving conflicting range uses.
- (10) There were 220,000 additional acres of wildlife habitat reserved.
- (11) Over 4½ miles of dyke were completed in the Creston Valley Wildlife Management Area.
- (12) Fourteen sea otters were introduced to the west coast of Vancouver Island in co-operation with the State of Alaska, Federal Department of Fisheries, and the Fish and Wildlife Branch.
- (13) A tag licence (\$5) was introduced for cougar.
- (14) Resident anglers' licence sales increased from 187,000 in 1969 to 203,000 in 1970.
- (15) 7,100,000 trout and other game fish were planted in 415 lakes throughout the Province.
- (16) 200 lakes throughout the Province were surveyed for fisheries potential.
- (17) Recently constructed spawning channels at Meadow Creek (Kootenay Lake) and Eightythree Creek (Green Lake) produced 7,000,000 kokanee fry and 10,000 rainbow-trout fry respectively.
- (18) Box Lake, near Nakusp, was chemically treated to remove coarse-fish populations and improve angling success.
- (19) Studies to assess and evaluate the angling activities of both resident and nonresident fishermen were carried out during the year.
- (20) Fish and wildlife habitat is receiving increased recognition and protection as a result of staff involvement in the Technical Study Group operating under the newly created Provincial Land Use Committee.



Peale's falcon. The Queen Charlotte Islands is one of the few remaining nesting areas in the world for this rare species.



Rocky Mountain goats.

A most noticeable trend during the past year is the accelerating public concern about the future of our environment and the quality of life in years to come. Concern is being expressed not only about environmental pollution but also about protection of land areas from alienation and water bodies from peripheral habitation. Although these are basically land and water use matters in the administrative sense, fish and wildlife problems become indicators of the quality of the environment, and the public is quick to point out any apparent deterioration in recreational opportunities.

Another noticeable trend is the increasing demand for more intensive protection and management activity, particularly as this relates to law enforcement and steel-head-trout propagation. As we approach the level of 400,000 hunters and fishermen in this Province, it is inevitable that increased demands will be made upon the Fish and Wildlife Branch for more intensive management.

WILDLIFE MANAGEMENT

The regulation of hunting and activities associated with protection of wildlife habitat continued to occupy most of the energies and resources of the Wildlife Management Division in 1970.

Regulation of hunting has, with the application of modern wildlife technology, developed into a relatively routine programme, largely designed to allow public opportunity to harvest maximum sustained yields of game stocks. Continued public resentment of "liberal" game-management policies indicates a need for a new look at management objectives; the implication is that wildlife managers need to pay more attention to the qualitative and ethical aspects of hunting. Public demands for the management of wildlife for nonconsumptive appreciation have grown enormously in recent years, placing added demands on the services of the wildlife manager.

The protection of wildlife populations and their habitat consumes most of the energies of the small group of scientists engaged in the management of wildlife in the Province. Although the scale of such work remains small and losses of wildlife to environmental change and competitive land uses continues, substantial gains have been made in the development of policies of multiple resource use; however, our capacity to apply these policies still requires improvement.

New problems and demands affecting the protection and management of wildlife continually emerge from the process of social and economic development in the Province. Industrial schemes, river-basin developments, expanding urban encroachment in rural areas, pollution, and the merging public concern about the welfare of the environment are relatively new events, having profound effects on wildlife resources and on the kind of services the wildlife manager is expected to offer society.

The wildlife management programme in the Province is not presently scaled to meet many of the new demands being placed on the resource. This is in part attributable to a lack of public and managerial appreciation of the social and economic values of the resource, and to delay associated with the development of new concepts and technology of management. Much work remains to be done in this area of management before effective programmes can be created and applied to wildlife conservation and to satisfying public demands for the use and appreciation of the resource. However, these costs and benefits are not readily assessed in traditional economic ways due to the social pattern of our wildlife use.

PUBLIC USE OF WILDLIFE RESOURCES IN BRITISH COLUMBIA

Hunters in British Columbia are almost exclusively males of between 20 and 64 years of age. This age-group comprises 26 per cent of the total human population in the Province; 28 per cent of 151,653 people in this age-group were licensed hunters in 1969. In addition, 7,445 nonresidents were licensed to hunt in British Columbia in 1969. Table I shows the trend in hunter numbers for the past five years.

Table I—Number of Licensed Resident and Nonresident Hunters in British Columbia, 1965–69

Year	Resident	Nonresident
1969	151,653	7,445
1968	145,052	7,093
1967	143,021	6,933
1966	134,351	6,635
1965	134,448	5,797

Revenues generated by hunters reached \$1,775,000 in 1969. This was an increase of \$63,000 over the 1968 total of \$1,712,000. Of this total, nonresident guided hunters contributed \$185,000 in licences and \$328,000 in trophy fees, thereby supplying a considerable proportion of the Branch's revenue.

The 1970 harvest by resident hunters is not available at the time of writing, but the results of the 1969 harvest are compiled. In 1969, 140,000 game-harvest questionnaires were sent to resident hunters. Of those contacted, 80,000 hunters responded.

In 1969, hunters were less successful in the number of game animals harvested. This was due in large measure to the fact that big-game populations were reduced by the severe 1968/69 winter, and this is indicated by the lower harvest figures given in Table II.

In the 1969 Annual Report, using incomplete data, we predicted about a 40-per-cent reduction in big-game harvests.

Table II—Summary of Game Harvests by Residents of British Columbia, 1965–69

Species	1965	1966	1967	1968	1969
Deer	56,877	76,692	70,534	77,013	57,035
Moose	15,183	19,940	19,397	22,469	15,205
Elk	1,800	1,970	1,709	2,257	1,498
Caribou	521	798	1,191	830	854
Goat	1,967	1,762	1,577	1,661	1,557
Sheep	242	225	221	267	227
Ducks	474,670	491,493	483,182	381,819	
Pheasants	39,223	29,207	32,324	23,531	23,634
Grouse	621,162	508,514	979,485	623,979	807,229
Licensed hunters	134,448	134,351	143,048	145,052	151,653

In 1969 the harvest of deer declined by 26 per cent from 1968, moose declined by 32 per cent, and elk declined by 34 per cent. Harvests were also lower than those of previous years for trophy species such as sheep, goat, and caribou. Hunting seasons in most areas in the southern portion of the Province were shortened considerably in 1969 to reduce hunting pressure on depressed big-game populations.

Native upland game birds experienced an excellent production year; harvests of native grouse were at a near record high. Only 1967, with a harvest of 979,000 birds, exceeds the 1969 harvest of 807,000 birds.

The Cache Creek Checking Station was again in operation, but on a reduced scale. It operated 12 hours a day from September 15 to October 1 and 16 hours a day from October 1 to November 15. The station's main purpose is to gather biological information on game populations in the northern and central portions of the Province. Computers were again used to tabulate the information gathered and, although shortened hours of operation resulted in a loss in the total number of hunters checked, 95 per cent of the normal biological information on animals killed was collected. A total of 20,412 hunters were checked in 1970, with 5,153 moose, 2,540 deer, and 17,766 grouse. A more complete summary of the Cache Creek Checking Station operations is contained in Table III.

Table III—Cache Creek Checking Station Results, 1966–70

Species	1966	1967	1968	1969	1970
Moose	7,264	7,258	6,661	5,336	5,153
Deer	3,008	3,635	2,678	2,761	2,540
Goat	197	183	163	148	65
Sheep	74	63	59	49	22
Black bear	138	121	209	135	118
Caribou	414	514	366	351	327
Elk	22	21	43	20	22
Waterfowl	7,265	6,720	6,298	6,967	3,779
Grouse	6,494	17,482	14,399	23,715	17,766
Residents	19,123	20,503	19,198	20,919	17,503
Nonresidents	4,093	4,106	3,908	3,610	2,909

An important measure of an animal population is the age-structure. From this information, inferences can be drawn about the status of a specific population and how heavily it is being hunted. In previous years, moose and deer were aged by using a technique based on tooth wear and tooth replacement. This technique is reliable only in the early years of life (juveniles to 4-year-olds), but even this gross information gives the wildlife manager some indication about the age-structure of an animal population. This year, a tooth-sectioning machine was installed at the Cache Creek Checking Station. By sectioning the teeth and examining the tooth rings under a microscope, the manager can assign a more accurate age to an animal. The oldest animal aged in 1970 was a 23-year-old cow moose from the Prince George area; the oldest deer aged was a 21-year-old doe from the Williams Lake area.

Moose-hunting is a major attraction to nonresidents wishing to hunt in British Columbia. The nonresident game harvests for the period 1960–69 are summarized in Table IV. In 1969 the moose harvest was down slightly from 1968. However, for most other trophy species, harvests were up.

Table IV—Big-game Harvests in British Columbia by Nonresident Hunters, 1960–69

Year	Licence Sales	Deer	Moose	Elk	Goat	Sheep	Caribou	Grizzly Bear	Black Bear
1960	3,767	407	1,649	145	445	192	217	153	190
1961	3,826	393	1,878	137	392	191	197	128	132
1962	4,370	435	2,047	176	433	214	270	184	206
1963	5,226	467	2,436	214	560	312	290	166	163
1964	5,265	427	2,512	178	439	271	331	193	183
1965	5,797	307	2,817	194	580	390	397	241	244
1966	6,635	352	3,266	184	692	376	578	212	250
1967	6,933	417	3,328	182	569	392	492	181	152
1968	7,093	383	3,285	205	621	415	611	268	368
1969	7,445	333	3,158	231	695	465	681	246	306

A major activity of the Wildlife Management Division is the annual production of hunting regulations. The responsibility for setting the annual hunting seasons falls largely upon personnel in the eight regional administrative areas. To overcome the perennial problem of hunting regulations becoming available after the hunting season had opened in the northern areas of the Province, the target date in 1970 for distribution of the hunting regulations was advanced to July 1. Over 275,000 copies of regulation abstracts were distributed to subissuers throughout the Province. An unforeseen problem with early distribution is that hunters apparently misplace or lose their first copy of the regulations. The Branch reprinted an additional 20,000 copies to meet a continued demand throughout the hunting season.

PROTECTION OF WILDLIFE RESOURCES

A recent threat to wildlife populations is that of biocides. The Division maintained its monitoring activities in 1970. A major problem area is the occurrence of pesticide residues such as DDT and mercury in the tissues of fish and wildlife. In some cases, the levels found exceeded the tolerances established for residues in food-stuffs, and warnings were issued to the public not to consume the affected animals. The number of specimens submitted for analysts was 313, of which 231, or 74 per cent, contained DDT-type residues. The number of specimens found to contain mercury was 21. The highest levels found were 140 parts per million DDT derivatives in the fat from a pheasant from the Okanagan Valley and 13 parts per million mercury in the liver from a pheasant in the Fraser Valley. The use of DDT and mercury pesticides in the Province has now been reduced, and problems of this nature are likely to decline. Because of the residual nature of some pesticides, research will continue into their effects on fish and wildlife populations and, in particular, into their occurrence and effects on raptorial birds.

The use of foliage-spraying techniques during the summer months is especially damaging to nesting birds and their young inhabiting the treated areas. The damage is due to the loss of habitat and the destruction of insects which form an important element in the diet of the birds. There is also a danger to big-game animals which may suffer indirect poisoning by eating noxious plants which become more palatable as a result of increased sugar levels following herbicide application, or by eating normally palatable plants which become noxious due to a high nitrate content in the treated foliage. The use of alternate methods to control brush and weeds has, therefore, been encouraged in order to overcome the possibility of this problem.

There is accumulating evidence to suggest that a number of soil sterilants commonly used in weed control are potentially dangerous by their effects on the genes of animals (mutagenic). The low, acute toxicity of many of these compounds can result in a lack of caution on the part of users, and standard precautions are now being enforced to prevent entry of these substances into water bodies and other areas of ecological sensitivity. Potential damage of an ecological or genetic nature to man, fish, and wildlife is thereby minimized.

With the appointment of a waterfowl biologist in 1969, the Division made a further commitment to the management of waterfowl provincially, nationally, and internationally.

Considerable time was spent in the field during May conducting waterfowl-breeding surveys in the Interior and investigating various private and industrial proposals of interest to marshland-habitat protection. An important effort in respect to waterfowl has been involvement of staff in the British Columbia Waterfowl Technical Committee. The Thirty-third Federal-Provincial Wildlife Conference recommended the formation of technical groups in waterfowl management which could

advise executive members of government on technical matters. Other provinces in Western Canada began forming similar committees. In the west, all Provincial committee members and other interested people meet once a year to discuss technical matters of common interest.

Another objective of the British Columbia Waterfowl Technical Committee is to develop co-operative approaches to various aspects of waterfowl management. Areas of present concern include an inventory of waterfowl populations resident and in passage, local and pre-season banding, habitat preservation and development, enhancement of waterfowl recreational opportunities for residents of British Columbia, and the development of resident Canada goose populations in selected areas. Benefits to the Province through such co-operative efforts include a greater source of funds, more professional expertise, and a minimum of duplication in all management activities. Presently, the Federal and Provincial Governments and Ducks Unlimited (Canada) are co-operatively developing several major marsh areas in British Columbia and actively planning the development of many others.

The Wildlife Management Division has also been involved directly in preparing aquatic wildfowl management plans for community planners at the regional district and local government levels. The purpose of this work is to provide local governments with information about wildfowl resources and associated recreational uses in their area, so that they may incorporate such information in their land-use planning. Preliminary plans are now completed for the Fraser Valley and the Capital Regional District. It is anticipated that complete reports for these areas will be available by early 1971. Other areas for which such plans are actively being considered involve the Regional Districts of Cowichan Valley, Nanaimo, Comox, Strathcona, North Okanagan, Central Okanagan, and Okanagan-Similkameen.

As an outgrowth of worldwide interest in the birds of prey, and effects of pesticides on this form of wildlife, active participation continued in monitoring birds of prey in British Columbia. Surveys centred on the Queen Charlotte Islands. On the basis of our data for this area and data from our Province-wide inventory on raptors, a moratorium was declared on the capture of all falcons in the Province.

Wildlife studies in the Libby Basin have to date been designed to evaluate the extent of losses attributable to the Libby project, and to identify the most feasible means of mitigating these losses. This phase of study has now been completed, and has resulted in the decision by the Land Use Committee to improve wildlife management by adjustments in the distribution and intensity of displaced live-stock grazing.

With this decision having been taken, there is now a need to identify the areas in which such grazing adjustments can be made, and to select areas which will yield the greatest benefits to wildlife, and yet minimize conflict with established ranching and other uses of Crown lands. There is every likelihood that many of the best choices of this programme of mitigation may lie outside the immediate reservoir area. It is also possible that the extent to which mitigation for both game and live stock can be conducted would be unnecessarily limited if practised only within the immediate reservoir area.

In order to determine areas most suitable for mitigation, a range-condition appraisal was conducted in the southern Rocky Mountain Trench from Brisco south to the United States border. The objective of this study was to ascertain the present condition and successional stage of all plant communities in the southern Rocky Mountain Trench. A cover-type map and the acreage of each cover type will be included in a final report.

The Branch has commissioned a series of reports which will look into the economic significance of the resident hunter in British Columbia. Using 1970 as a base

year, resident hunters will be contacted by a firm of economic consultants to determine the value of resident hunting in British Columbia.

The Wildlife Management Division participates actively in the reservation and development of important habitat for wildlife. In 1970, 220,000 acres were added to reserve areas, bringing these to a total of 786,000 acres throughout the Province.

RESEARCH

One of the more specific types of wildlife work is that conducted by the Wildlife Research and Technical Services Section. Studies of the ecological position, productivity, and utilization of five important big-game winter ranges in the East Kootenay winter ranges of British Columbia were continued and are nearing completion. The results are currently being analysed and incorporated into comprehensive reports for each range. Detailed cover maps showing current ecological conditions, physiography, and land use, as well as tabular estimates of annual forage production, levels of utilization by wildlife and domestic stock, and suggested range-management plans for each range are included. Preliminary results reveal that the annual production of grasses is largely grazed and that domestic stock removes more forage than wildlife, especially in sodgrass communities. These studies also reveal that grazing by wild and domestic animals continues to exceed the desirable levels under proper range management.

To test range-improvement methods, the effects of full protection from grazing, shrubbery removal, fertilization, and reseeding have been studied on each winter range. Increases in yield, beneficial changes in botanical composition, and increases in the proximate nutritional constituents have occurred, as a result of these treatments. Fertilization, particularly with nitrogen, markedly increases the protein content of forage samples. A residual effect of a single application has been observed four years after treatment, although peak changes appear to occur in the third year.

Complementary studies carried out through the graduate student research programme have been conducted on some big-game ranges. The effects of fertilizer applications on soil and plant phosphorus, and on forage yields, were studied on two East Kootenay ranges which were demonstrated to be deficient in phosphorus. In addition, the effect of grazing on the available carbohydrate reserves of certain grasses, the age and productivity of bitterbrush, and the changes in forage yields resulting from seral succession have received attention. The latter has revealed an 80-per-cent reduction in forage productivity when tree-canopy closure exceeds 50 per cent, as well as a decrease in the nutritive quality of understory vegetation resulting from changes in species composition. These results quantify the effects of seral succession on range productivity and are, therefore, important for the preparation of range-management programmes for wildlife.

An intensive study of the ecology of the Wigwam winter range, involving an attempt to simulate on a computer the growth and competitive interactions between trees, shrubs, and grasses, has also been continued and is nearing completion. In this study, many of the results obtained through the efforts of the Research Section from the student research programme, and from additional field work, will be incorporated into the model. This simulation will be extremely valuable in predicting the results of different strategical and tactical decisions in nature-resource management, particularly with regard to forestry, wildlife, and domestic grazing. The effects of seral succession and hunting on a Vancouver Island deer population were studied, and other aspects of population status and assessment received considerable attention. The progressive deterioration of the range, reflected by decreasing age, specific body weights, and lower deer densities, was established, but rapidly declining catches per unit effort suggest that hunting may have played a more important role in influencing

population densities than previously suspected. The Northwest Bay deer data were also used in a simulation model available at the University of British Columbia to determine acceptable harvest rates and the probable effects of discontinuous rather than annual harvests. This study will be continued in 1971 in expectation that more refined techniques can be developed for the assessment of wildlife populations upon the impacts of managerial alternatives.

Comparative growth rates in black-tailed deer received further attention in 1970. This study has provided basic information concerning the effect of genetic, sexual, and nutritional factors on growth in body weight and seasonal patterns of weight change under experimental conditions. The growth characteristics established under known experimental conditions provide a means of comparing growth responses in free-ranging animals. The results suggest that innate patterns of seasonal weight loss in winter have survival value for wild deer.

A continuing study of wildlife diseases and parasites provided more information about the organisms which affect a wide variety of wildlife species and their pathological effects.

Work was done on histological sections of teeth obtained from known-age deer, unknown-age deer, and from moose. As a result of this study it is now possible to accurately determine the age of an animal, using the tooth-annulation technique and to pinpoint errors made in aging by the tooth wear and eruption method.

Other studies completed in late 1969 or 1970, primarily through the student research programme, include a detailed study of reproduction in Columbian black-tailed deer, an intensive study of immunology of bighorn sheep and response to lungworm infections, and a study of the food habits and habitat of waterfowl on the Lower Mainland.

ENHANCEMENT OF WILDLIFE RESOURCES

Activity on the Creston Valley Wildlife Management Area land during 1970 was centred around construction of marsh-improvement works. This 16,000-acre area of Crown land, set aside by an Act of the Legislature in 1968, will be devoted primarily to the production and recreational uses of waterfowl. Water-level fluctuations, which coincide with the peaks of waterfowl nesting activities, generally destroy the nests of ducks and geese. In addition, muskrat populations have little chance to increase because of severe annual flooding. Thus, the bulk of the activity on the management area for the next several years will be the construction of dyking systems which will enable the Management Authority to control water levels.

During 1970, 3½ miles of dyke were completed. The installation of new pumping facilities increased the existing 50,000-gallons-per-minute capacity in the Duck Lake Unit by approximately 80,000 gallons per minute. These construction activities have resulted in the ability of the Authority to now control water levels for waterfowl production on 1,200 acres. The British Columbia Hydro and Power Authority completed most of its construction activities in Duck Lake before the end of 1970. This work consisted of the installation of permanent pumping-stations and the construction of a 10,000-foot dyke across the southern third of Duck Lake. One hundred small nesting islands are now being constructed in the southern third of Duck Lake in an effort to increase the potential nesting habitat of that unit in the management area.

Ducks Unlimited (Canada) has contributed substantially to the construction programme. Their personnel have assumed a responsibility for the construction of dykes and access roads in the Leach Lake unit of the management area. To date, Ducks Unlimited (Canada) contractors have completed 5,500 feet of new dyke at the south end of Leach Lake. This dyke is the first of several which will eventually permit complete control of water levels within Leach Lake.

The Department of Highways had nearly completed the major access route to the southeastern portion of Duck Lake at the year's end. The road, when completed in early 1971, will greatly increase access to the east side.

In co-operation with the State of Alaska and the Federal Department of Fisheries, the Division trapped, transported, and reintroduced 14 sea otters to the west coast of Vancouver Island. Difficulties were experienced with the use of sea transport for transferring the animals. The long sea voyage resulted in a high mortality among the captured otters, however the experience gained will ensure better survival of ensuing transplants.

MEETINGS

The Wildlife Management Division hosted during 1970 the Sixth Annual North American Moose Conference held in Kamloops and the Third Annual North American Wild Sheep Conference held at Williams Lake. The Branch was responsible as host for publication of the transactions of these two meetings and they are available upon request.

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FISHERIES MANAGEMENT

Resident angling licence sales exceeded 200,000 for the first time in the 1969/70 fiscal year, and angling licence sales of all types continued to increase, as shown in Figure I.

The total number of licensed anglers has increased by 74.1 per cent between 1960 and 1970, an average rate of increase of 7.4 per cent per year. During the past five years the rate of increase was 9.1 per cent per year.

Total revenue from angling licence sales increased by 125 per cent between 1960 and 1970, an average rate of 12.5 per cent per year. Between 1965 and 1970 the increase has averaged 15.6 per cent per year.

The sales of annual (\$10) angling licences to non-Canadians have not increased substantially in the past four years, but the short-term (three-day \$3.50) licence continues to be very popular, and 8,256 more licences of this type were sold in 1970 than during the previous year.

Table V summarizes angling licence sales of all types from 1965 to 1970, and indicates the fee charged for each type of licence.

*Table V—Total Angling Licence Sales in British Columbia, 1964/65–1969/70
(Licence fees in parentheses)*

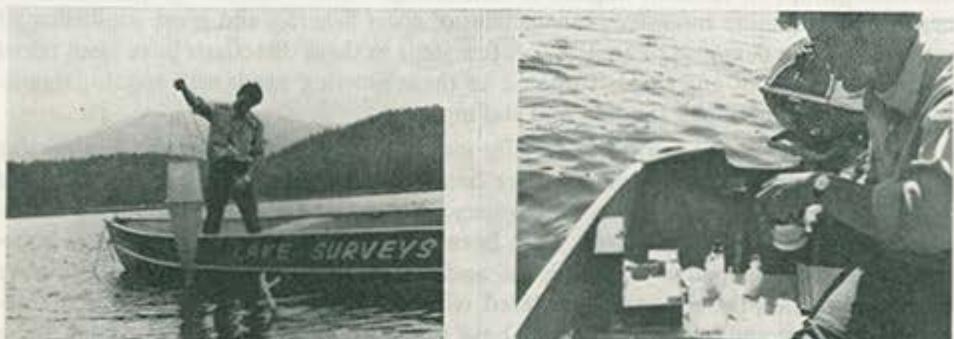
Type of Licence	Fiscal Year					
	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70
Resident anglers	154,201 (\$2)	166,340 (\$2)	180,795 (\$2)	183,964 (\$2)	186,744 (\$2/\$3)	203,376 (\$3)
Resident, steelhead	(¹)	(¹)	20,271 ² (\$0.25)	38,831 (\$0.25)	37,848 (\$0.25)	43,425 (\$0.25)
Nonresident Canadian	13,981 (\$3.50)	14,821 (\$3.50)	15,019 (\$3.50)	15,115 (\$3.50)	21,954 (\$3)	22,662 (\$3)
Non-Canadian	35,420 (\$7)	39,075 (\$10)	24,792 (\$10)	23,654 (\$10)	23,272 (\$10)	25,703 (\$10)
Non-Canadian, steelhead	(¹)	(¹)	1,273 ² (\$5)	1,690 (\$5)	1,927 (\$5)	2,399 (\$5)
Non-Canadian, three days	(¹)	(¹)	29,234 (\$2)	34,356 (\$2)	39,139 (\$2/\$3.50)	47,395 (\$3.50)
Non-Canadian, minor	15,949 (\$1)	16,553 (\$1)	18,052 (\$1)	18,180 (\$1)	17,883 (\$1)	20,731 (\$1)

¹ Not applicable.

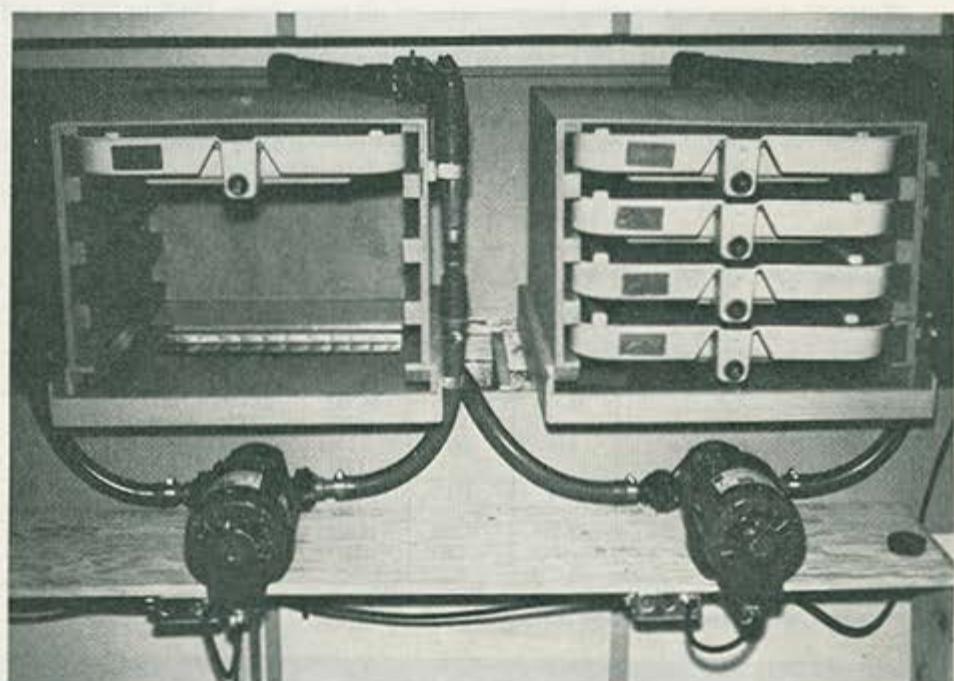
² Incomplete figures, licence requirement changed during the fiscal year.



Eightythree Creek rainbow-trout spawning channel near Green Lake (Clinton district), showing stream-diversion structure in left foreground. Trees will be planted and natural ground cover encouraged to provide shade and cover for spawning trout.



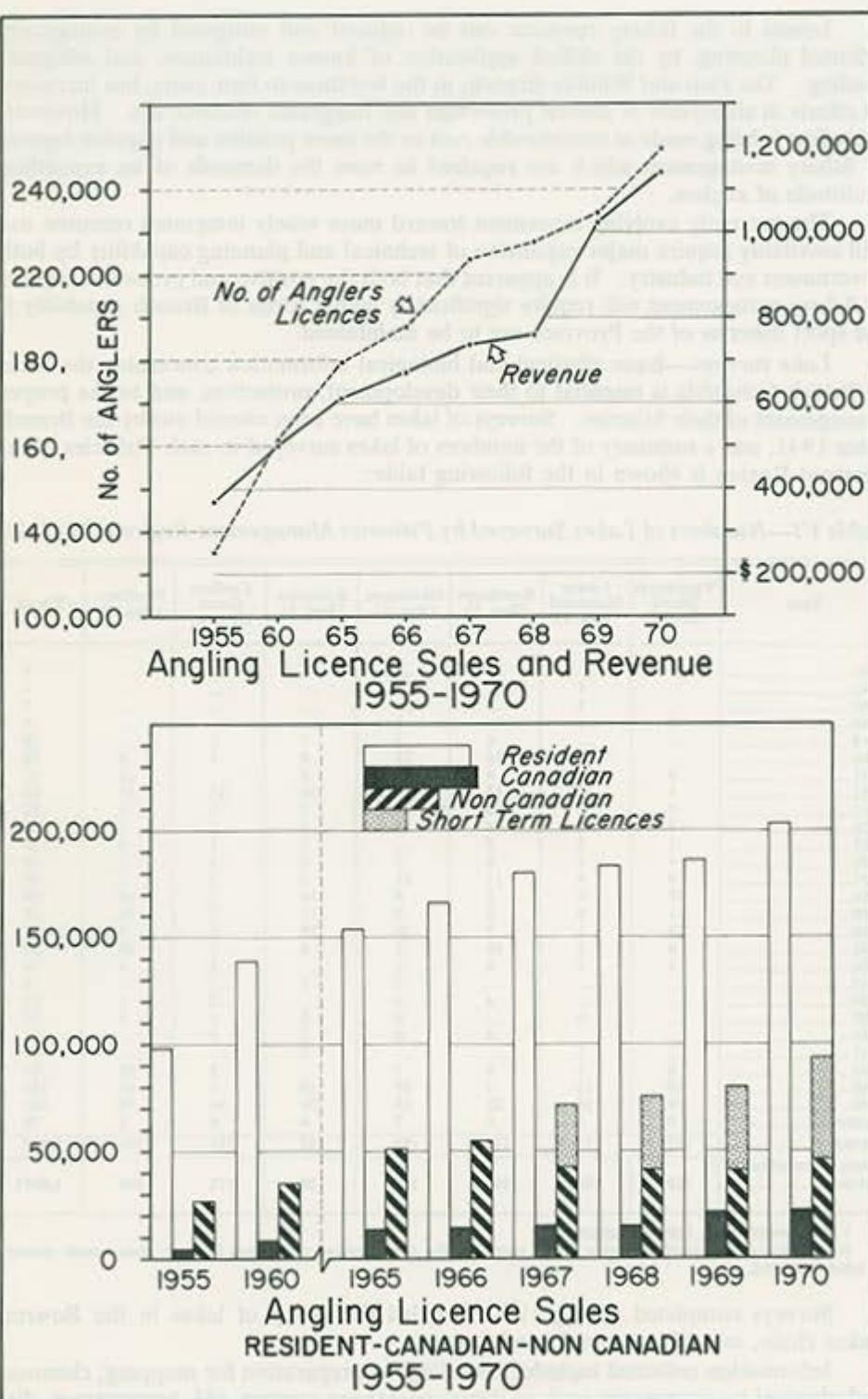
Lake survey crews each summer collect minute forms of aquatic animal and plant life with fine-meshed plankton net (left). Contents are measured for indication of quantity and quality of fish food in each lake. Dissolved oxygen, acidity, alkalinity, and dissolved solids are also measured (right) to determine suitability of each lake for fish life.



Experimental apparatus for evaluation of controlled water reuse in trays containing trout eggs. Pumps in foreground circulate water over the trays, each of which may contain up to 20,000 trout eggs for hatching.

Studies in progress during 1970 indicated that the fresh waters of the Province in 1969 supported over 3.6 million days of fishing for 320,000 licensed anglers who caught over 8.6 million fish. The magnitude of this participation, which does not include some 50,000 unlicensed juvenile anglers, underlines the growing evidence that serious overcrowding of some fishing waters is beginning to occur, and that interference between anglers is becoming noticeable. Resident anglers are becoming increasingly intolerant of the presence of nonresident anglers, and conflict between different groups of resident anglers is also rising. These are all symptoms of the need to initiate more intensive management of sport fisheries and more sophisticated responses to the demands of anglers. A few steps in these directions have been taken in recent years, but any major response to these growing needs will require significant increases in Branch funding and staffing.

During the recent period of rapidly increasing demands upon the fresh-water fishery resources of the Province, there has been a concomitant escalation in the rate of erosion and degradation of the fishery resource as a result of expanding industrial development. Watercourses have been continually encroached upon by housing developments, roadways, pipe-lines, and dykes. Large storage reservoirs have inundated stream fisheries and interfered with fish movements. Mining, manufacturing, pulping, and logging industries have degraded water quality. In total, these expanding activities are reducing the supply of sport fishing as the demand for angling increases. These opposing processes (increasing demand and diminishing supply) will inevitably increase the value of the fishery resource.



Losses to the fishery resource can be reduced and mitigated by ecologically oriented planning, by the skilled application of known techniques, and adequate funding. The Fish and Wildlife Branch, in the last three to four years, has increased its efforts in all aspects of habitat protection and integrated resource use. However, this effort is being made at considerable cost to the more positive and popular aspects of fishery management which are required to meet the demands of an expanding multitude of anglers.

The currently evolving movement toward more wisely integrated resource use will inevitably require major expansion of technical and planning capability by both government and industry. It is apparent that both the positive and protective aspects of fishery management will require significantly higher levels of Branch capability if the sport fisheries of the Province are to be maintained.

Lake surveys—Basic physical and biological information concerning the lakes of British Columbia is essential to their development, protection, and to the proper management of their fisheries. Surveys of lakes have been carried out by the Branch since 1941, and a summary of the numbers of lakes surveyed in each Fisheries Management Region is shown in the following table:

Table VI—Numbers of Lakes Surveyed by Fisheries Management Regions, 1941–70

Year	Vancouver Island (Reg. 1)	Lower Mainland (Reg. 2)	Kamloops (Reg. 3)	Okanagan (Reg. 4)	Kootenay (Reg. 5)	Cariboo Coast (Reg. 6)	Northern (Reg. 7)	Totals
1941	—	—	—	—	1	—	—	1
1942	—	1	—	—	—	—	—	1
1943	—	1	—	—	—	—	—	1
1948	2	—	—	1	—	—	—	3
1949	—	—	6	2	7	3	—	18
1950	—	6	36	23	4	1	8	78
1951	9	22	4	25	3	—	12	75
1952	1	2	15	9	10	15	14	66
1953	5	5	20	8	7	1	6	52
1954	8	3	4	4	1	1	1	22
1955	1	3	5	—	2	1	4	16
1956	4	3	2	7	6	1	1	24
1957	4	4	11	11	4	1	1	36
1958	10	2	5	4	14	7	16	58
1959	11	9	5	3	11	2	14	55
1960	18	1	5	10	18	6	9	67
1961	8	5	10	2	8	7	18	58
1962	1	1	4	1	—	3	4	14
1963	—	—	—	3	1	—	—	4
1964	—	—	4	6	—	2	1	13
1965	—	9	—	6	2	1	3	21
1966	—	—	4	6	1	4	—	15
1967	—	5	—	—	3	—	—	8
1968	8	3	4	7	—	3	36	61
1969	19	12	1	38	19	4	40	133
1970	19	16	20	15	26	54	50	200
Undated	4	4	6	2	4	6	2	28
Surveys	132	117	171	193	152	123	240	1,128
Lakes surveyed to date	128	108	160	158	128	115	208	1,0051

¹ Lakes worked on, fully or partially.

NOTE—Some lakes received repeat work, therefore the total number of surveys is larger than actual number of lakes surveyed.

Surveys completed during 1970 included the group of lakes in the Bowron Lakes chain, as well as several nearby waters.

Information collected included soundings in preparation for mapping; chemical and physical measurements such as dissolved oxygen content, pH, temperature, dissolved solids, and turbidity; and plant- and animal-life samples, including fish where

present. Intensive gill-netting was carried out in the major lakes of the Okanagan Valley in order to obtain an indication of pesticide residues in the various species of fish.

Steelhead harvest analysis—Approximately 37,300 steelhead were caught by anglers during the 1969/70 season. Non-Canadian anglers caught about 3,400 of these, and about 500 were taken by residents of other provinces. As in past years, approximately one-third of the catch was taken from the rivers and streams of Vancouver Island.

Questionnaires totalling 20,000 in number were mailed to licensed steelhead anglers, and replies were received from 9,369. Analysis of the information received indicates that 24,515 of the 45,824 licensees actually fished for steelhead at least once during the year, and 8,339 people succeeded in catching one or more fish. Anglers spent approximately 371,000 days angling for steelhead, an average of 15 days per angler.

Top steelhead-producing rivers in the Province were the Thompson, with a catch of 3,093; the Vedder, 2,841; the Copper, 1,534; the Morice, 1,464; the Dean, 1,461; and the Bulkley, 1,244.

HABITAT PROTECTION

Referral systems—By agreement with the Pollution Control Branch, the Water Rights Branch, and the Chief Gold Commissioner, all applications to these agencies for permits are referred to this Branch for our comments, objections, or recommendations. As the number of people and standard of living in British Columbia increases, an increasing pressure is placed upon all natural resources. Consequently, the number of applications increases annually, and attention to permit referrals consumes the major part of habitat protection time.

More than 1,500 applications for water licences were processed in 1970. Coupled with the intensive use of water were problems of extremely low discharge caused by the unusually dry summer. Concern that fish were suffering from lack of water led to several meetings with staff of the Water Rights Branch. A better understanding of mutual problems was gained and negotiations are continuing to resolve problems. Flow studies on the Heber River were completed this summer, and negotiations are presently under way to establish a minimum flow to be released into the river at all times.

The number of pollution control permits processed by the Fish and Wildlife Branch increased this year as a result of the decision that all effluent discharges must be licensed by the Pollution Control Branch by the end of 1970. A computer programme, designed by the Habitat Protection Section, proved useful in predicting the effects of effluent discharges into rivers throughout the Province.

Collection and dissemination of information—Field surveys are extremely valuable in providing information for the Habitat Protection Section to use in its capacity as an adviser to the Pollution Control Branch and other agencies. During 1970, inspections were made of all the inland pulp-mills and extensive surveys were conducted at two of these mills. Surveys conducted outside British Columbia also provided useful information, and much time was spent searching the literature for information on thermal pollution, pesticides, and methods of pollution abatement. The collection and dissemination of information to the public, other agencies, and Branch staff is an important function of this Section. This year, in addition to normal methods, information was presented at three public hearings.

Mining—The Fish and Wildlife Branch, as a member of the Reclamation Committee, made recommendations for bonding and clean-up at a number of mines

throughout the Province. At the insistence of the Branch, erosion-control facilities were incorporated in strip-mining operations in the East Kootenay area.

Placer-mining operations in the Quesnel area threatened fisheries values, and several meetings were held with the Chief Gold Commissioner and his staff to try to resolve the problems. A reserve against placer-mining operations was agreed upon in the South Fork of Quesnel River between Likely and Drop Creek. In order to assist the Department of Mines and Petroleum Resources in its decisions to allow or disallow placer-mining leases in nonreserve areas, the Fish and Wildlife Branch agreed to supply maps showing the areas in which sport fish are likely to be adversely affected by placer-mining operations.

Pesticides—A study of the effects of an organo-phosphate insecticide (sumithion) on fish was started in 1969 and finished this year. The results showed the sublethal effects of this insecticide on fish, and pointed out new methods for detecting low levels of pollution. The methods may be used to remedy pollution problems before fish are killed.

Mercury—An extensive programme of monitoring mercury contamination of Provincial waterways was undertaken during 1970. In June, samples of fish from Pinchi Lake were analysed and shown to contain relatively high levels of mercury. The public was subsequently warned of the health danger. Collections of fish were made in the Bridge River system where numerous mercury mines have been operating in the past and where a new mercury mine is slated to begin operation in 1971. Collections were also made from the Fraser River near Vancouver. A programme of Province-wide mercury monitoring is planned for 1971.

Reservoirs—Much of the work which commenced on the Libby and Ross Reservoirs in 1969 continued in 1970. Information on the Libby Reservoir was compiled into a preliminary report and recommendations for mitigation were proposed.

The proposed extension of Ross Reservoir on the Skagit River has required considerable investigation. A preliminary report has been compiled and made available for public information. The report describes the biological capabilities of the Skagit River watershed, and estimates the effects of the proposed flooding. Fish and Wildlife Branch staff attended meetings in Seattle, Vancouver, Victoria, and on-site in connection with the Ross Reservoir proposal.

Forestry-Fishery co-operation—A co-operative system between the Federal Fisheries Service, British Columbia Forest Service, and Fish and Wildlife Branch was finalized, which should provide greater protection from damage caused by logging operations. A stream-protection clause system provides for the inclusion of stream-protection clauses in all logging contracts and the notification of fisheries agencies when cutting permits will affect their interests. The Fish and Wildlife Branch will soon provide forest district offices and engineering services with a Province-wide map series showing the location of sport-fish populations. These maps will enable foresters to predict potential problems and to take steps to prevent them.

HABITAT IMPROVEMENT

During 1970, construction of habitat-improvement projects generally declined, while postconstruction evaluation increased. In addition to on-site biological and engineering reconnaissances for future projects, a number of diverse types of improvements was completed at the regional level.

Projects included spawning-stream improvement through removal of obstructions caused by debris, logs, storage dams, and beaver dams. Improvements were completed at Pelican Lake (Prince George area), Dunbar and Kaslo Creeks (Cran-

brook area), Paleface Creek (Lower Mainland Region), and Haslam and Marshall Creeks (Vancouver Island Region). In some streams, various amounts and combinations of gravel and rock were placed to create habitat for spawning and rearing (Loon Creek near Clinton, and Peachland Creek, a tributary to Okanagan Lake). Co-operation with the Department of Fisheries and Forestry resulted in enhancement of holding habitat for adult and juvenile steelhead in the Big Qualicum River, Vancouver Island.

Eightythree Creek spawning channel—Construction in 1970 included the placement of rock on banks bordering artificially placed spawning gravels in Eightythree Creek, an inlet to Green Lake in the Cariboo. In addition, shallow resting-holes were dug in a section of cleared stream to accommodate rainbow trout during early rearing. Spawning success and fry production were evaluated in both the artificial channel and cleared section of stream near its exit to Green Lake. About 600 adults spawned in 1969 and 1970, and, in spite of extremely low water in both years, production of fry to Green Lake was much higher in 1970 than in 1969. This condition is attributable to increased quantities and quality of gravel and improved downstream access. Due to stream clearance, 50 per cent of the 1970 postspawners descended to Green Lake, while in 1969 only 10 per cent successfully returned to the lake. In 1969, postspawners contributed significantly to the late summer and winter fishery. A similar contribution is expected of fish surviving spawning in 1970. In the summer of 1970, limited pulses of water were released from irrigation dams upstream of the channel, and a number of fry were flushed to Green Lake before critical water levels were reached. In 1971 this method will be further explored to increase production of fry to the lake.

Ruby Lake spawning channel—During the past two spawning seasons, cutthroat trout from Ruby Lake near Sechelt have used more of the artificially created, outlet spawning channel. The increase was due, in part, to modifications which reduced the water velocity by widening the original channel and lowering the gradient. Fish appear to prefer to spawn near pools and shade which provide cover. Fry recruitment to Ruby Lake was greater in 1970 than in 1969 or in years prior to spawning improvement.

In a straight section of the channel, not previously used for spawning, temporary overhead cover has been created by the installation of plywood sheeting. Should this type of cover prove unsuccessful, several new pools will be created. These changes in habitat are being evaluated to better understand the relatively unknown spawning requirements of the Coastal cutthroat trout.

Meadow Creek spawning channel—Fry production in the Meadow Creek spawning channel (Kootenay Lake area) was estimated in the spring of 1970 after 123,000 kokanee had spawned in the fall of 1969. Survival from egg deposition to fry emergence was near 13 per cent and higher than 1969 production, but less than first production in 1968.

In 1970 the largest adult kokanee run (since completion of the spawning channel in 1967) moved into Meadow Creek from Kootenay Lake. Nearly 700,000 fish entered the system and 220,000 spawned in the channel and 220,000 above the channel. Approximately 260,000 more kokanee spawned in the lower reaches of the stream between Duncan River and the spawning channel. Comparative studies will continue in the improved and natural sections of the stream to determine their relative efficiency as fry producers.

Stream surveys—As part of a programme to outline problems and potential of fish production in selected tributaries of Okanagan Lake, further stream surveys were conducted in 1970. Fish distributions and physical conditions were documented, with special attention given to areas of irrigation intakes, diversions, and obstruc-

tions (both natural and man-made). Many of these structures presently preclude upstream production potential. Although most streams had recordable flows in headwater areas, most lower sections of streams had low, intermittent, or *nil* summer flows. Spawning, rearing, and subsequent migration of rainbow trout to Okanagan Lake were severely limited in most streams investigated in 1970.

Lake rehabilitation—In anticipation of chemical treatment of Chain Lake in the Okanagan Region, a permanent coarse-fish barrier was constructed downstream of the lake in 1970. In 1968, Link and Osprey Lakes, upstream of Chain Lake, were rehabilitated as the first phase of a two-part programme to rid the system of coarse fish. In addition, through the exceptional efforts of local residents, water from Shinish Creek has been diverted to Chain Lake to reduce algae build-up. Link and Osprey Lakes are now providing good fisheries for rainbow trout through restocking. Chain Lake should offer a similar type fishery after chemical treatment and restocking.

The chemical treatment of Box Lake near Nakusp was completed in mid-September. Excellent co-operation between 35 members of the Nakusp Rod and Gun Club and seven Branch regional personnel resulted in good coverage of tributary streams and swamps bordering the lake. This phase of a lake-rehabilitation project is most important in order to minimize the probability of reinvasion of the treated lake by nongame fish. Following detoxification of the lake, it will be replanted with trout and should provide greatly improved angling in the future.

FISH CULTURE

A peak in production was reached in 1970 when the greatest weight and number of fish ever recorded were released into 433 lakes from the three permanent trout hatcheries. About 7.5 million fish between 2 and 16 months of age, of various species, weighing over 50,000 pounds, were liberated from the Fraser Valley, Koote-nay, Summerland, and Loon Hatcheries. A total of 20 million eggs of all species was collected. This level of fish production cannot be greatly increased owing to the limited size of present hatchery facilities.

Suitable water flows persisted throughout the period of May and June, enabling fish-culture staff to collect 11.7 million rainbow eggs from native or "wild" stocks. To collect this number of eggs, as well as to assess new egg-collection sites, about 16 streams were provided with weirs (fences) and associated collecting facilities at the following lakes: Bear, Beaver (Swalwell), Bouleau, Knouff, Oyama, Pennask, Postill, Premier, and Tunkwa. In total, 9.7 million viable "eyed" eggs were incubated.

In an attempt to restore the number of trout in the Duncan River and Wilkie Creek (Trout Lake), about 15,000 eggs were collected from large rainbow trout which ascend the Duncan River to the present dam.

Approximately 165,000 Yellowstone cutthroat-trout eggs were obtained from Kiakho Lake near Cranbrook. This number was inadequate for fisheries-management purposes due to the high losses experienced in rearing this species to a suitable size for release. Consequently, Connor Lake was chosen for evaluation in 1970 and as a collecting site in 1971.

Almost 7 million kokanee eggs were taken from fish in five streams. Most of the eggs were from adult fish which had spent their life in Chilliwack and Skaha Lakes. Next year will likely be the last year for such large collections of kokanee, most of which are planted in the Great Lakes in a co-operative exchange programme with the Ontario Department of Lands and Forests.

This was the first year in which eggs were collected from brook trout (brood stock) held at Kootenay Hatchery. Eggs taken from these 2-year-old fish did not survive, for reasons presently unknown.

A small number of steelhead was reared at Fraser Valley Hatchery as part of a project to determine the growth of this species at the water temperature of the Abbotsford facility.

As part of a continuing programme aimed at obtaining all eggs from sites within the Province, a start was made in evaluating a site for the collection of Coastal cutthroat and establishment of a "domestic" rainbow-trout brood stock.

Of the 433 lakes planted with fish in 1970, 360 were stocked with rainbow trout. Aircraft were used for liberating fish in 204 of the 360 lakes stocked with rainbow, and 40,000 miles were travelled by trucks to distribute fish to the remaining 229 lakes. Over one-half of all the lakes planted were situated in the Kamloops and Okanagan Regions.

The total numbers and weight of each species liberated were as follows:

	Numbers	Pounds
Cutthroat trout	75,000	197
Brook trout	1,247,899	2,424
Kokanee	746,450	1,885
Lake trout	1,500	1,500
Rainbow trout	5,440,758	44,099
 Totals	 7,511,607	 50,105

During 1970, several large projects were completed, or in various stages of design. Of major importance were the completion of a preliminary design for a new hatchery in the Fraser Valley and a study of the quality of hatchery effluents. In connection with the proposed hatchery at Abbotsford, the groundwater supply was pump-tested by the Department of Public Works with the Groundwater Division of Water Resources Service being responsible for evaluation.

Design drawings for conversion of the used 3,200-gallon trailer tank purchased in 1969 were completed in 1970. When modified, this trailer will be used for fish transfers between hatcheries, and some distributions to lakes involving large numbers of fish.

In consultation with the Department of Public Works, plans were completed for enlarging and improving egg incubation as well as storage and workshop facilities at Kootenay Hatchery.

The programme, started in 1969, to compare trout foods from two companies was continued at Summerland and Kootenay Hatcheries in 1970. This year's experiment compared the growth and survival of fish fed high- and low-fat rations.

To evaluate the effects of water reuse during egg incubation and hatching, small incubators were constructed at Summerland and eggs were incubated in varying amounts of fresh and recirculated water (see photograph). Several physical and chemical parameters suspected of influencing egg mortality were monitored throughout the development period from "eyed" eggs to swim-up of the alevins.

Other applied research projects continued or undertaken during the year included additional study of fish reared in a circular pond, a comparison of egg disinfectants, monitoring water conditions within tanks used for transporting fish, and an assessment of an antifouling paint for prevention of algae growth in rearing ponds.

About 28,000 people (16,000 in 1969) visited Fish and Wildlife Branch fish hatcheries in 1970. Included in this total were numerous organized groups of school

children. An aquarium exhibit organized for "Salute to the Salmon," held at Adams River in October, was well received by the large number of persons attending this display.

FISHERIES RESEARCH AND TECHNICAL SERVICES

Studies to determine and measure factors which regulate juvenile-trout production in an outlet rearing-stream (Loon Lake near Clinton) were continued. Fish were counted at two traps in 1970 to facilitate calculation of fish production within a closed study area.

A total of 13,657 spawning rainbow trout were counted into Loon (outlet) Creek from mid-March to end of June 1970 (6,029 females and 7,628 males). Of these, 1,383 females and 1,336 males continued downstream through the second trap. Thus, 4,646 females and 6,292 males remained in the production-study area between the traps, or about 4.6 fish per square yard over the spawning season. Females and males (3 or more years old) averaged about 12.6 inches in length. Precocious males (2 years old), averaging 7 inches in length, comprised 74 per cent of the male spawning population. Survival of spawners back to the lake was 45 per cent.

Data on spawning-site preference and relative egg survival were obtained. Eggs from 1970 outlet spawners produced 5,412 young which migrated to the lake during the summer as fry, and an estimated 1,000 young which overwintered in the outlet creek. Low survival can be partly explained by unfavourable conditions brought on by a severe algal bloom in the lake, coupled with high temperatures and low flows in the outlet creek during the early alevin and fry stages. Large masses of decaying algae blanketed the bottom of much of the stream, reduced the dissolved oxygen levels to nearly zero at times, and smothered food organisms. About 50 per cent of all fry migrating to the lake from the study area moved during this time. A very heavy mortality was sustained by those remaining.

From June to August, 6,243 juveniles (1 year or older) migrated from the study area to the lake. Total contribution to the lake by the outlet stream in 1970 was 7,430 fry and 10,858 juveniles. All were fin-clipped (adipose fin) to permit recognition of outlet-produced fish in the lake study. Studies will continue on production of young trout in rearing-streams of the Loon Lake system and will examine differences in population density, distribution, food availability, and emigration from both inlet and outlet streams. Some production factors such as water flow and food also have been studied experimentally to delimit more clearly their effects.

A study of the lake ecology of juvenile rainbow trout was begun at Loon Lake in 1970. Reliable techniques for sampling juvenile fish in the onshore and offshore areas of the lake were developed. All age-classes were caught at night by seining along the shoreline, but very few young were taken by mid-water trawling in the offshore zone. Echo-sounder recordings showed that large fish were widely scattered throughout the lake or near the shore during the day, but at night were concentrated in a layer at about 30 to 50 feet depth across the lake.

Work continued on the collection and analysis of fish for heavy metal content. Muscle and livers were analysed for copper, lead, mercury, and zinc from over 70 lakes and rivers in British Columbia to provide a base level for future assessment of possible changes in concentration of these metals in freshwater sport fish.

The last phase of sampling for the hatchery stocking-evaluation study was completed in 1970. No differences were apparent in survival of fin-clipped young trout that had been stocked in "barren" lakes and in lakes having rainbow trout. However, fewer fin-clipped fish survived in lakes that contained populations of both rainbow trout and redside shiners.

Increased demands for production and limited water supply are forcing fish hatcheries to recycle water. Recycling may increase disease susceptibility and mortality of fish. Metabolites of developing rainbow-trout eggs were monitored at the Summerland Hatchery. A slight build-up of ammonia was detected, but there was no apparent change in oxygen, carbon dioxide, or pH under conditions examined. Metabolites of kokanee eggs were monitored in four experimental incubators with different recycling levels. Greater amounts of recycled water showed increased concentrations of ammonia, and these appeared to be correlated with higher mortalities before and after hatching.

Yellow Lake, near Kaledon, was artificially circulated in the late autumn of 1969 to prevent winter kill of rainbow and brook trout. The circulation itself was only partially successful. Nevertheless, substantial numbers of trout survived the winter and provided an attractive and readily accessible sports fishery during 1970 in a lake where none had previously existed.

Evidence (meristic and biochemical) was found for genetic differences between rainbow-trout populations living above and below waterfalls on Kokanee Creek, tributary to the West Arm of Kootenay Lake. Progeny of these two stocks held under identical conditions and diets at Fraser Valley Hatchery also showed consistent differences in growth rate (below falls greater than above falls).

Work on general characteristics (growth, age at maturity, population density, migratory behaviour, etc.) of trout populations above and below waterfalls continued. Collections of subadult trout from above and below the waterfalls on Kokanee Creek were made and are being held to permit selection of pure genetic strains of above and below falls stocks. These will be subjected to a series of biochemical, physiological, and behavioural tests to determine the suitability of such strains for stocking in discrete types of habitat.

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PUBLIC INFORMATION AND EDUCATION

We are pleased to report that there is a steady increase in general public interest each year in the various wildlife resources of British Columbia.

During 1970, more than 10,000 mail inquiries were handled by the Public Information and Education Section. There has also been an obvious increase in the number of visitors to the offices of the Fish and Wildlife Branch in Victoria, Regional Offices, and District Offices throughout the Province.

Once again, through the co-operation of the Department of Education, we were able to provide 8,000 copies of posters and classroom lessons on the general conservation theme for distribution to schools throughout the Province during National Wildlife Week.

ACTIVITIES

A public display and information booth was provided at the British Columbia Wildlife Federation's Sport and Vacation Show held in Vancouver, April 28 to May 4, 1970.

The Public Information and Education Section participated in the 50th Annual Conference, Western Association of State Game and Fish Commissioners and Western Division of American Fisheries Society, held in Victoria, July 13 to 16, 1970.

The Public Information Officer, Mr. George Ferguson, joined the Department of Travel Industry on a two-week tour of California. Talks and slide presentations were made to many groups about fishing and hunting opportunities in British Columbia.

Lectures were given during a special travel counsellors' course sponsored by the Department of Travel Industry at the British Columbia Institute of Technology.

Circulation of the *Monthly Activity Report* of the Branch has increased to 950 copies. The report goes to all newspapers, radio and television stations, other Government departments, rod and gun clubs, as well as to interested members of the public.

Twelve editions of the monthly *News Letter* were prepared for distribution.

Many of our present information pamphlets were updated and several new ones created.

Several hundred talks, slide presentations, and film showings were given by conservation officers, fish and wildlife biologists, and other field staff to interested groups throughout the Province.

We extend our appreciation to all staff for their continued and increasing efforts in keeping the public informed on the many aspects of fisheries and wildlife management.

HUNTER-TRAINING PROGRAMME

Thirty instructors' courses have been completed to date, qualifying a total of 519 instructors. These are from 19 localities on the Island and 74 on the Mainland.

During the year, 81 student courses were completed, qualifying approximately 1,500 students. The majority of the student courses were sponsored by such organizations as fish and game clubs, Adult Education, local school boards, Boy Scouts, and men's clubs.

The programme has been accepted by the Adult Education Branch, Department of Education, and courses may be held in as many as 90 localities throughout the Province. The Department of Education has expressed interest, particularly in the conservation aspect of the course, and there is a possibility that it may be incorporated in a summer school course for interested teachers.

Various interested organizations and individuals have recommended that the title be changed to convey better the content of the lectures; accordingly, it is proposed to change the name from Hunter-training Programme to Hunter Training, Conservation, and Outdoor Safety.

The Honourable W. K. Kiernan, Minister of Recreation and Conservation, announced that in 1969 all persons involved in firearms accidents would be required to graduate from a hunter-training course before their licences would be reinstated.

In 1970, in addition to persons involved in firearms accidents, all juveniles under the age of 18 who were involved in infractions of the Wildlife or Firearms Acts were required to graduate from a hunter-training course before they could obtain another hunting licence.

In 1972 it is anticipated that all juveniles between the ages of 14 and 18 and residents of all ages applying for their first hunting licence will be required to qualify for a hunting licence by graduating from a hunter-training course.



Fishing can still be the least expensive and most enjoyable form of outdoor recreation.

PROVINCIAL PARKS BRANCH

or take the first steps to consider measures such as parkland transfers that may assist DNR and your board and guild. Staff support and guidance may be available to help you move effectively after your community has adopted a management plan.



For more information contact your local DNR office or the provincial branch office. Staff can provide advice and assistance with the parkland transfer process and other issues related to the protection of parks.



Park naturalist Carleton MacNaughton entrances audience of young and old alike at Okanagan Lake Provincial Park. During the summer more than 10,000 persons enjoyed nature talks and walks in Okanagan Valley parks as part of the Province-wide park-interpretation programme.



Sisters Lynne and Glenda Simpson add up the day's camping receipts at Golden Ears Provincial Park. The girls were two of the camping-fee collectors employed at various Provincial Parks during the summer of 1970.



View of Sun-Oka Beach Provincial Park at Summerland, showing parking-lots, change-house, picnic-tables, and beach area. This park was opened in June and proved immediately popular with local residents and visitors to the Okanagan Valley.



Lower terminal of new chair-lift in the Gibson Pass Ski Area of Manning Provincial Park during early stages of construction in August. The chair-lift was completed and operating by December 1970.



Workmen making final adjustments to Gibson Pass Ski Area Chair-lift No. 2, prior to acceptance for public use.



Chair-lift No. 2 at the Gibson Pass Ski Area of Manning Provincial Park was completed in November 1970.

PROVINCIAL PARKS BRANCH

R. H. AHRENS, DIRECTOR

In 1970 the Provincial Parks Branch, affected by continent-wide national policies aimed at slowing down inflationary trends, concerned itself with providing necessary public services and essential maintenance of the park establishment.

The unsettling effects of wage-contract negotiations in a number of British Columbia industries were expected to reduce outdoor recreation travel. However, particularly fine weather from spring through autumn resulted in an increase in visits to Provincial Parks of 4 per cent approximately, over the last-recorded highest level; and this was despite a period of forest closure.

The recent trend to wheeled accommodation has built to the point where overnight use of parks purely as a base for accommodation is difficult to differentiate from camper accommodation incidental to enjoyment of park features. Policy as to what kinds of accommodation should, or should not, be placed in Provincial Parks is receiving review.

The Province of British Columbia has brought the *Litter Act* into force. The Parks Branch, on behalf of Government, has worked out procedure for the laying of information under the *Litter Act*, and certain staff of the Branch have been designated Park Rangers to enforce the statute, along with designated staff of other departments and agencies.

Park regulations were expanded to provide for "controlled campgrounds," i.e., campgrounds with full registration and manned gates in effect. A pilot operation in Cultus Lake Park, which has inherited rowdyism problems as a consequence of a large, nearby metropolitan population, will check the worth of this style of campground operation. Other campgrounds have been designated "campgrounds" as defined for legal purposes in application of regulations.

Interest on the part of volunteer workers in development of hikers' trails in Provincial parks continues to be encouraging. The Marble Meadows Trail in Strathcona Park was brought to completion by Vancouver Island Hikers, and a shelter cabin was prefabricated and erected on Marble Mountain by the Shawnigan Lake Boys School. In the latter part of 1970, organizational meetings for trail-building volunteers in Mount Seymour Park commenced. It is hoped that this kind of citizen support of the park system will grow. In the same vein, assistance of the Princess Louisa Society with development of Princess Louisa Marine Park is acknowledged. In the proposed West Coast National Park, Phase III, the Parks Branch, with student labour, continued improvement of the Coastal hiking trail.

The Provincial Parks Branch co-operated with the National and Historic Parks Branch National Demand Study in public-reaction surveys of users of British Columbia Provincial parks. Data gathered here are in one phase of this 18-phase national study.

The signing of an agreement in March 1970 by British Columbia and Federal Canada paved the way for assembly by the Province for the first national park in the Province since 1920. Land assembly will take several years.

Liaison with Regional District Boards on regional park system endeavours continues to centre on park acquisition. Land-use concerns are occasioning increased contact with Technical Planning Committees.

PLANNING DIVISION

In general, the Planning Division of the Branch is responsible for the design of a park system, and the extent and design of development within individual parks. Three Sections take in the three major phases of park planning—planning for the Provincial Park System in terms of number, kind, size, and location of areas to be included and the acquisition of these lands; the preparation of master plans for individual parks, which plans zone parks according to their intended uses, and suggests the method of management; and site planning, which is the detailed planning for development of facilities and other needed improvements within the broad outlines set forward in the master plan. Although the Planning Division anticipates a Research Section to guide its various activities, it must be pointed out that the Branch has not, in recent years, conducted a comprehensive research programme.

Apart from normal staff turnover in 1970, some staff reorganization was necessary to efficiently undertake a major land-acquisition programme within the boundaries of the proposed West Coast National Park. At the beginning of the year, staff number and classification were as follows:

	Professional	Technical	Clerical	Total
Division Chief	1	—	—	1
Park system planning	4	2	1	7
Master planning	2	—	—	2
Site planning	1	3	—	4
Vacancies	2	—	—	2
Totals	10	5	1	16

During the year, one park officer resigned to join the National Park Service, and a mapping assistant transferred to the Branch's Engineering Division. At the same time, one new technical position was created and filled and two professional vacancies were filled. Because of unfavourable economic circumstances, a third professional vacancy could not be filled. At the year's end, staffing was as follows:

	Professional	Technical	Clerical	Total
Division Chief	1	—	—	1
Park system planning—				
(a) West Coast National Park Project	1	2	—	3
(b) General	6	—	1	7
Master planning	1	—	—	1
Site planning	—	3	—	3
Vacancies	1	—	—	1
Totals	10	5	1	16

PARK SYSTEM PLANNING SECTION

(a) *West Coast National Park Project*

On the invitation of the Honourable W. K. Kiernan, Minister of Recreation and Conservation, a joint Federal-Provincial survey was carried out in 1967 of potential national park areas on the west coast of Vancouver Island. Subsequently, it was recommended and tentatively agreed that a national park be established over the following three land areas:

Part I—Long Beach, approximately 16 miles of sandy beach and coastline, with a land area of 26,000 acres.

Part II—Barkley Sound, including the Effingham Island Group, with a land area of approximately 2,800 acres.

Part III—The West Coast Lifesaving Trail from Port San Juan to Cape Beale, with a tentative land area of approximately 22,500 acres (boundary subject to revision by mutual agreement).

Detailed planning and study now commenced in earnest. Mutually agreeable boundaries had to be selected; an acquisition programme of private land within these boundaries had to be drafted on a Federal-Provincial cost-sharing basis; and satisfactory arrangements had to be made with the forest industries regarding the acquisition of committed timber resources within the proposed boundaries and the future access to committed timber resources adjacent to these park boundaries.

Finally, on April 21, 1970, the West Coast National Park agreement was formally approved by the Government of the Province of British Columbia, represented by the Honourable W. K. Kiernan, and the Government of Canada, represented by the Honourable Jean Chretien, Minister of Indian Affairs and Northern Development.

The Provincial Parks Branch was awarded the task of land acquisition under the terms of this agreement. A 50-per-cent cost-sharing land-acquisition arrangement by each government was agreed upon. Parts I and II lands were to be acquired by October 1, 1972. Part III land was to be acquired and named by April 1, 1975, following completion of a ground survey. During the last seven months of 1970 the Provincial Parks Branch had appraised properties, negotiated with the owners, expended the Province's share of funds for the fiscal year, committed the Federal Government's share, and, at the time of this writing, is awaiting the first payment from Federal funds.

(b) *Provincial Park System Planning*

The function of this office is to maintain a viable system of natural area Provincial parks through the selection and acquisition of culturally, scenically, and (or) ecologically outstanding land areas, and the deletion of superfluous parkland. It is self-evident that this necessitates projection into future Provincial parkland requirements and, consequently, the reservation from private and commercial exploitation of the inherent natural features on such potential parkland.

In addition to this function, the Park System Planning Section has been instrumental in establishing and administering numerous general recreation reserves with the co-operation of the Forest Service and the Lands Service of the Department of the Lands, Forests, and Water Resources. Most of these reserves are not designated for future park status, but, in the administrative arrangement of the Park System Planning Section, have been incorporated in the park reserve file system. The Forest Service, in its management programme of the Provincial Forest Reserves, anticipates incorporating the function of these extant general recreation reserves. At that time, Park System Planning Section will continue to expend its energies mainly on its park reserve responsibility.

Parkland field reconnaissance during 1970 was spread over most of the Province.

An over-all evaluation of the Queen Charlotte Islands as to Provincial park potentials constituted a major project. Other investigations were carried out in the Shuswap Lake area, Bowron River and McGregor River watersheds, the headwaters of the Columbia River, the Valhalla Mountains west of Slocan, the headwaters of the Tulameen, the Alta Lake area of the Cheakamus watershed, and Meziadin Lake.

A joint inspection with Forest Service personnel was made of a park proposal around Gwillim Lake near Chetwynd. Several reconnaissance trips were made into the proposed reservoir area of the Skagit River, together with members of the Site Planning Section and the Forest Service to evaluate and locate mutually agreeable park boundaries and to plan adequate recreational facilities for an extension of Skagit River Park in the event the proposed reservoir becomes a reality. Further reconstruction of the West Coast Lifesaving Trail was continued this year, with the co-operation of the National Parks Service.

Eight new Provincial Parks were established in 1970:

	Acres
1. Skagit River Park, Class A, south of Hope	3,700.0
2. Thurston Bay Marine Park, Class A, Sonora Island	875.0
3. Racing River Wayside Park, Class A, Alaska Highway	176.0
4. Buckinghorse River Wayside Park, Class A, Alaska Highway	135.0
5. Kickininee Park, Class A, near Penticton	120.5
6. Downing Park, Class A, near Clinton	248.0
7. Drewry Point Park, Class A, Kootenay Lake	51.0
8. Chaster Park, Class C, Sechelt Peninsula	0.7

Rainbow Nature Conservancy Area, 121,900 acres, was established within Tweedsmuir Park.

Four Provincial Parks were cancelled in 1970:

- (1) Little Shuswap Park, Class C, 3.5 acres, was cancelled upon request of its Park Board and its administration transferred to the Municipality of Chase.
- (2) Pass Creek Park, Class C, 54 acres, was cancelled upon request of its Park Board and its administration transferred to the Regional District of Central Kootenay.
- (3) Beaver Harbour Park, Class C, 101 acres, was cancelled upon request of its Park Board and its administration transferred to the Regional District of Port Hardy.
- (4) Cameron Lake Park, Class A, was cancelled and its land area incorporated within the boundaries of contiguous Little Qualicum Falls Park, Class A.

Two parks were reduced in size to eliminate right-of-way conflicts—Bromley Rock Park by 1.2 acres and Mount Robson Park by 9.6 acres.

Mount Maxwell Park, on Saltspring Island, was reclassified from Class C to Class A status. The Provincial Parks Branch had administered this park in the absence of a Class C park board for a number of years.

Five parks were increased in size in 1970:

- 494 acres were added to Kleanza Creek Park, Class A, near Terrace.
- 205 acres were added to Hirsch Creek Park, Class C, near Kitimat.
- 123 acres were added to Big Bar Lake Park, Class A, near Clinton.
- 76 acres were added to Goldstream Park, Class A, near Victoria.
- 20.6 acres were added to Inkaneep Park, Class A, near Oliver.

SUMMARY OF ALL PROVINCIAL PARKS TO DECEMBER 31, 1970

Classification	Number	Total Acreage
Class A parks	197	1,824,231
Nature conservancy areas in B parks (6)		1,579,694
Total protected park acreage		3,403,925
Class B parks	8	4,632,971
Class C parks	74	28,514
Total parks	279	6,485,716
Recreation areas	5	102,266
Nature conservancy areas in A parks, (1)—Black Tusk (Garibaldi Park)		44,032
Nature conservancy areas in B parks (6)—		
Big Den (Strathcona)	29,784	
Central Strathcona (Strathcona)	215,000	
Comox Glacier (Strathcona)	58,010	
Eutsuk (Tweedsmuir)	629,300	
Rainbow (Tweedsmuir)	121,900	
Murtle Lake (Wells Gray)	525,700	
		1,579,694
Total, nature conservancy areas (7)		1,623,726

The residents of British Columbia are indebted to Mr. Cornelius Bergen, of Clearbrook, for his generous donation of 9.25 acres of land for park purposes at Burns Lake.

During 1970, 90 new recreational reserves were established on Crown land through the co-operation of the Lands Service and Forest Service of the Department of Lands, Forests, and Water Resources; 30 established recreational reserves were cancelled. For its residents, British Columbia now has 2,572 areas designated for public recreational use (apart from its Provincial Parks System), containing 458,050 acres.

PARK MASTER PLANS SECTION

Staff for this Section was cut in half when Jacob Masselink was transferred to head the Park System Planning Section in March, although he continued to work, as time permitted, on master plans for Mount Assiniboine Park and Strathcona Park. An additional constraint on master-planning activities was the lack of student assistants for summer field work. They were victims of the economic slump which saw Government spending reduced to the minimum.

The winter portion of the year was spent on a park system plan for Vancouver Island produced at the request of the Minister. This "White Paper," as it was called, inventoried parkland and outlined the long-term requirements for the region. The White Paper was actually a task for the Park System Planning Section, but because

its staff members were already committed to other work, the Master Planning Section was required to participate.

In 1970, planners carried out an aerial reconnaissance of Wells Gray Park and a boat reconnaissance of the Murtle Lake area. A wilderness policy for this area was recommended in the outline master plan which resulted from these studies. A similar outline master plan was drawn up for the Berg Lake area of Mount Robson Park following field studies. Public shelters and trail improvements were the subjects for examinations in the Black Tusk area of Garibaldi Park.

By the end of the year an over-all plan was nearly completed for Mount Seymour Park. The plan has been a back-log project for several years and it represents the most comprehensive master plan yet undertaken.

The Master Plans Section took special interest in a study conducted in three Provincial parks by a doctoral degree candidate in the School of Regional and Community Planning at the University of British Columbia. His study is of the human and social aspects of wilderness in Bowron Lake, Mount Robson, and Garibaldi Parks. The Parks Branch gave financial backing to this project, as it was anticipated that it would be helpful in establishing policies and plans for wilderness parks.

PARK SITE-PLANNING SECTION

Site-planning activities in 1970 were similar to preceding years but with greater emphasis on designing for reconstruction and expansion of facilities in some of the older and more heavily used parks.

Development plans were drawn up for the restoration of McDonald, Yahk, and Princess Louisa Parks. Englishman River and Little Qualicum Falls Parks were examined and an extensive trail-reconstruction programme was proposed for Youth Crew employment. At Newcastle Island, 250 feet of new dockage was planned and installed.

Planning efforts were also directed to other parks where continuing construction of new development or minor additions were in progress. These included China Creek, Syringa Creek, Paul Lake, Lac Le Jeune, Kokanee Creek, Manning, and Mount Seymour. At Cultus Lake a new gate-house, which had been designed to facilitate registration of campers, was installed. A landscape plan was drawn up for the change-house area of Sun-Oka Beach Park, and Phase II of Gordon Bay campground was designed.

Two new developments involving site-planning personnel were Gordon Bay Park campground, Phase I, and field layout and inspections of Christina Lake picnic-ground.

Examinations of several lakes were made to determine mapping requirements for future developments. These included Jewel, Sheep (Nancy Greene), and Norbury Lakes.

In Manning Park a hazardous traffic situation was rectified by the design and completion of a new parking-lot and entrance road for the Beaver Pond stop-of-interest. This allowed closure of the old parking area, which was located on a highway curve with poor visibility.

Parking facilities were also increased at MacMillan Park following on-site planning and field staking of an extension to the parking-lot and redesign of the entrance to the new "Cedar Grove" trail.

Extension work consisted of giving recreational development advice to members of municipal and Class C park boards and other agencies. This technical assistance included the production of detailed development plans for Manitou Class C Provincial Park, Naramata; Princeton Class C Provincial Park; Bob-O-Link Park,

Northfield District, Nanaimo; and Athalmer Beach, on Lake Windermere, for the Community of Athalmer.

Planning assistance was given to the Victoria Outdoor Club with regard to their Centennial project of trail construction in Goldstream Park.

Liaison work with the Canadian Forces Base at Chilliwack was carried out in conjunction with a students' summer work programme, under the jurisdiction of the Canadian Armed Forces. This work included the field planning of recreational facilities at Dolly Varden Creek at the south end of Chilliwack Lake.

New road standards for campground and picnic-ground developments have been redrafted and submitted for approval. Other projects have included a start on the compilation of new sign standards. Research work and studies are being made, leading toward a possible change-over, at least in part, to a system of signing with internationally recognized symbols.

Special designs produced have included an entrance portal for the newly found Euclataws Cave to control access to, and hopefully, deter vandalism of the delicate limestone formations.

A plaque to designate marine parks and a small firewood corral for picnic areas have also been designed.

Two special projects produced by the Site-planning Section were proposals for future recreational development in two widely divergent parts of the Province.

One was a proposed new access to Garibaldi Park in the Cheakamus area, incorporating a large multi-use development along the Cheakamus River and a service complex at Function Junction that would ultimately become the headquarters centre for Garibaldi Park.

The other is a preliminary proposal for a park development designed to provide a major recreational outlet on the Libby Reservoir south of Wardner on the Kootenay River.

This is an extensive multi-use design centred on Baynes and Surveyors Lakes, with access to 5,000 feet of potential beach frontage on the reservoir.

PUBLIC INFORMATION AND EDUCATION

The continued demand for information of a general and educational nature concerning Provincial parks was reflected in the 36.5-per-cent increase over 1969 in written requests, answerable by brochures or folders, which were received during the year. In addition, an average of about three letters or memos per day was prepared in reply to requests needing more than publications. Coupled with these public requests was an unprecedented requirement for similar information from other Government agencies and various travel, tourist, and outdoor-oriented organizations, as well as educational institutions.

In an attempt to meet the demand, new folders on Garibaldi and Wells Gray Provincial Parks were made available during 1970 and revised editions of other park and general-interest folders and brochures were received in quantity from the printers. Toward the end of the year, work was begun on a completely revised marine park folder and a new Tweedsmuir Provincial Park folder. New Mount Robson and Strathcona Provincial Park folders were in the hands of the Queen's Printer and will be ready for distribution early in the new year.

At the request of the 'Ksan Association and ARDA, a *Hand of History* pamphlet describing points of interest in the Hazelton area was prepared and the 'Ksan folder revised. Special photographs were taken and used in the *Hand of History* cover montage.

The assistance of the draughting section has been invaluable in the preparation of the maps used in various park folders.

In the interests of providing educational information to the public, a display was set up and manned in Vernon and slide presentations were prepared for the Agent-General in London and a University of British Columbia geography class. In addition, illustrated talks were given to an education class at UBC and to local senior-secondary school students as well as other interested groups.

The annual Travel Counsellors' School in Vancouver was again given a special presentation and this year, as an innovation, similar presentations were given to tourist groups at Salmon Arm and Revelstoke. In April, the Public Information Officer took part in the Department of Travel Industry promotional tour of San Francisco and Los Angeles.

Early in the summer a guest appearance was made on Barrie Clark's *Open Line* show on Radio Station CKWX in Vancouver, and in December a visit was made to Victoria's Channel 10 television station to assist in the Christmas programme. Numerous news releases were written during the year and a number of special writing assignments completed, including a travel article for *Chatelaine* magazine and the text for the plaque marking the completion of the Marble Meadows trail project in Strathcona Provincial Park.

During the year, visits were made to parks throughout the Province and, in August, the official opening of the 'Ksan project at Hazelton was attended. Photographs of many activities were taken for Branch records and for inclusion in the Annual Report. Additionally, photographs and colour slides were made available to agencies and individuals on request.

HISTORIC PARKS AND SITES DIVISION

BARKERVILLE HISTORIC PARK

The park enjoyed another good year with a total of nearly 170,000 visitor-days. One distinguished visitor who appeared to enjoy himself as much as anyone else was Prime Minister Pierre Trudeau, who flew in on August 6 during a whirlwind tour of northern British Columbia. Joining whole-heartedly in the fun, the Prime Minister drove Barkerville's four-horse stage coach, panned gold at the Eldorado Claim, and enthusiastically applauded what proved to be one of the better Theatre Royal productions of the past eight years.

A start has been made toward the projected reconstruction and restoration of Barkerville's Chinatown. Plans are nearing completion and work will progress over the next five years.

New exhibits this year included the J. H. Todd Store next to the Wake-Up-Jake Café, a dining-room and barrister's office in the wings of the Government Assay Building, and a kitchen in Dr. Watt's residence.

Because of overcrowding of Barkerville's limited campgrounds, plans are being drawn for improvement and extension of the camping facilities.

A marked increase in visitation by school groups, some from as far distant as Vancouver, has led to planning for a start on orientation lectures and guided tours in the coming year.

COTTONWOOD HOUSE HISTORIC PARK

The various buildings within the park have had their foundations replaced during the past three years and attention was given this year to improving the exhibits. Unfortunately, resident supervisor A. Pedersen died during the summer and

the project missed his keen interest, involvement, and knowledge. The new residence was started during the year and should be ready for occupancy next summer.

FORT STEELE HISTORIC PARK

Attendance maintained its pace, and some 125,000 visitors were attracted to the park during the period May to October.

The shell of the new 300-seat theatre was completed during the year. While originally scheduled for stage performances during Centennial '71, interior finishing will not be possible until next fall, so that the theatre is not expected to be operational until 1972.

Probably the highlight of the year was the acquisition of 10 Clydesdale horses from Oakalla Prison Farm in Burnaby. These horses were well known throughout the Province because of their annual performance at the horse show of the Pacific National Exhibition. They appeared to adapt readily to their new home at the foot of the Rockies, and only a week after their arrival were used to pull a wagon-load of visiting dignitaries during official ceremonies at the park's annual opening on May 16. A large corral was constructed for the horses just inside the palisade fence, and a barn was built at the end adjacent to the workshop complex.

On June 30 a filly was born to mare Heather Winalot and soon became the star attraction to visiting horse-lovers. Plans are being made for wider use of the Clydesdales next year through such activities as full show-harness performances on Sundays, and daily hauling of passengers throughout the park on specially built wagons.

The *Dunrobin* steam train continued to do well, hauling in excess of 25,000 passengers during the summer. The engine and recently acquired British Railways coach were painted at the start of the season. Plans were made to transfer an old Shay logging locomotive from the Coast to the park, where it will augment the growing collection of railway equipment. While it will be used primarily as an exhibit item in keeping with its relation to the old railway-logging days of East Kootenay, it will serve also as a standby for the *Dunrobin*, as it is in excellent condition.

HISTORIC COMMEMORATIONS

Ten new stop-of-interest plaques which were to be placed this year have been held over until next year because of the death of plaque programme supervisor L. E. Cook. Two new plaques were cast for the Centennial '71 project and will be erected during the coming year, along with an additional eight plaques.

The Division participated with the Historic Commemorations Subcommittee of Centennial '71 in producing an exhibition of 15 double-sized panels which will be shipped to museums and other organizations throughout the Province during 1971. Through photos, colourful illustrations, and simple texts, the panels will portray the people and events that led to British Columbia's joining of Canadian Confederation on July 20, 1871.

MANAGEMENT DIVISION

Continuing a trend of many years, there was a substantial increase in park attendance for 1970 over 1969 (see graph). Day-use visitations were up 171,000, and camper use 174,000, showing a 2.9-per-cent increase in the former and a 12.3-per-cent increase in the latter.

An analysis of the point-of-origin of campers showed little change over past years. British Columbia, 59 per cent; Canada, 18 per cent; United States of America, 23 per cent.

This year for the second time a survey was made to determine the type of accommodation used by campers, with the following results: Camper-vehicles, 26 per cent; trailers, 17 per cent; tent-trailers, 17 per cent; tents, 40 per cent. These percentages show little change from 1969.

Use of Provincial parks continued at a heavy rate, with substantial numbers of campers turned away daily in most campgrounds during the high-use summer season. With the appointment of a public safety officer in 1969 and a better-organized approach to hooliganism, the incidence of anti-social behaviour in the parks has dramatically declined.

Turnover in park personnel has followed the usual pattern of past years and can best be described as minimal. The Parks Branch has been fortunate in attracting and retaining a highly motivated work force over the years. The dedication of these people has made it possible to cope with the ever-increasing numbers of park users, without lowering the quality of the services offered.

VANCOUVER MANAGEMENT DISTRICT

Early in the year, J. C. Leman, Prince George District Park Officer, was appointed to the newly posted Vancouver District Park Officer position. The Vancouver District Park Officer is directly responsible to Chief of the Management Division for the administration of the maintenance and operations of the Provincial parks in the Vancouver Park District.

Provincial park facilities in the Lower Mainland continue to record substantial increases in day-use. Camper-use at Alice Lake Park, Cultus Lake Park, and Golden Ears Park recorded modest increases. At Manning Park, camper-use increased by approximately 28 per cent during the 1970 season. This substantial increase in camper-use points to Manning Park becoming a popular retreat for the residents of the Lower Mainland area.

As in previous years, Mount Seymour Park, with 850,000 day-use visits, remains the most heavily used park in the Province. While skiing and other related winter sports account for a substantial portion of the use, hiking in Mount Seymour Park is fast becoming a popular family activity.

At Manning Park, the installation of a new chair-lift, T-bar, and several new ski-runs will undoubtedly lead to the Gibson Pass Ski Area becoming one of the finest family ski resorts within easy-driving distance of the Vancouver metropolitan area. Camper-use at Manning Park showed a substantial increase, with a noticeable trend that people were staying longer in the area to enjoy the many varied and interesting forms of outdoor recreational activities that this park offers.

Cultus Lake Park and Golden Ears Park continue to prove their popularity with the residents of the Lower Mainland and the travelling public by recording increases in both day-use and camper-use. The introduction of a new type of camper registration form and method of collecting camp-site fees, plus increased patrolling of the park areas, resulted in a substantial reduction in the incidence of hoodlumism and vandalism.

At Garibaldi Park, the Black Tusk Nature Conservancy Area continues to provide our planning and management personnel with the most challenging task of designing facilities and trail systems that will protect the fragile flora and fauna of this magnificent wilderness area against overuse. A very successful Youth Crew Programme was carried out in 1970, with the crews completing several trail projects that will assist greatly in preserving the fragile meadows of this nature conservancy area.

Alice Lake Park continues to remain a great favourite with Vancouver people, and is filled to capacity all summer.

Peace Arch Park continues to provide our visitors from the United States with their first glimpse of Provincial parks. The peaceful scene that is created by the well-manicured appearance of this park provided an ideal setting for picnicking, an activity that is enjoyed by the thousands of visitors that utilize the facilities provided for this purpose.

VANCOUVER ISLAND MANAGEMENT DISTRICT

Parks on Vancouver Island continue to receive unrelenting use and seldom during the summer season are any of the 1,800 picnic-tables free from use. On the Island, no doubt due to the mildness of the climate, combined with the ever-increasing number of camper vans and trailers, there is a trend to year-round use of campground facilities. Seldom now are these campgrounds free of campers.

At Wickaninnish Beach, the facilities, as in the past, were overcrowded and considerable trouble was experienced in controlling unrestricted use. It is expected that national park personnel will take over operations of facilities in 1971.

At Miracle Beach Park, campers and picnickers will miss Frank Rainbow, supervisor, who has retired after many years of faithful service.

In other parks, the work of repair and maintenance continued. At MacMillan Park, trail development was carried on; at Englishman River Falls Park a new trail to the lower falls was commenced; a cleanup crew was stationed in the Forbidden Plateau area for the summer, a Batzer mountaineering hut was airlifted into Marble Meadows, Strathcona Park. These and a multitude of similar projects made up the working-year for Vancouver Island Provincial parks.

KAMLOOPS MANAGEMENT DISTRICT

Following an established pattern, no new development projects were initiated in the 1970/71 fiscal year. The phase development of Paul Lake, Sun-Oka Beach, Lac Le Jeune, and Clearwater River Parks continued at a reduced pace. Minor rehabilitation work was undertaken in certain of the more badly worn parks. Two sanitations, one at Lac la Hache and one at Okanagan Lake Park, were started and will be completed for the 1971 season, at which time the Yard Creek picnic-shelter started in 1969 should also be completed.

Increased maintenance funds were largely offset by similar increases in the cost of labour, materials, and supplies. For instance, the cost of firewood to supply campers increased by over 50 per cent in most regions. This District will be budgeting for \$23,000 for firewood alone in 1971/72.

The completion of the second year of the Youth Crew Programme at Mahood Lake saw 40 camp-sites, boat-launching and parking facilities, a service building, and the Youth Crew camp buildings brought to standard.

District staff continued to assist Class C park boards, recreation commissions, and civic forms of Government, including various regional districts in the formulation of development plans and in furthering park aims. Slide talks were presented to various clubs and literature distributed through correspondence and public inquiries.

A 21-per-cent increase in the use of District parks was of course heavily influenced by the opening of Sun-Oka Beach Park. Additional maintenance funds provided stepped-up security patrols which, combined with the continued and excellent co-operation of the Royal Canadian Mounted Police, had the effect of reducing incidents of serious outbreaks of rowdyism and vandalism.

NORTHERN MANAGEMENT DISTRICT

J. W. Gillings, a recent graduate from the University of Washington and the University of Victoria, was appointed to the position of District Park Officer, Northern Management District, to replace J. C. Leman, who was transferred to Vancouver in April.

During the 1970 season the emphasis in the northern districts was placed on the rehabilitation and modernization of basic facilities, rather than on the development or expansion of new parks and facilities.

Projects were initiated in each of the five regions. In an effort to meet the need and demand for water and sewage facilities, emphasis was placed on improving these services. The water system at Bowron Lake was extended to include the whole campground. The water system at Furlong Bay was extended along the picnic terrace and the first camping-loop. In Mount Robson Park, wells were drilled at Lucerne and Robson Meadows campgrounds. Sani-stations were constructed at Charlie Lake Park in the Peace-Liard Region, and at Beaumont Park in the Bear Lake Region.

Youth Crews were employed in both Mount Robson Park and Crooked River Park. In conjunction with the programme at Crooked River, the fourth stage of the redevelopment programme was completed, and 16 camp-sites were completely renovated. The planting programme was continued, and 2,000 seedlings were sited throughout the park. The Youth Crew Programme at Mount Robson Park put the finishing touches on last year's development at Robson Meadows campground, and prepared an additional 20 sites for completion next year.

In addition to their normal maintenance and administrative tasks, Northern District staff continued to provide advice and guidance on outdoor recreational matters to regional district planning committees and other groups concerned with and interested in natural resource management.

NELSON MANAGEMENT DISTRICT

Wasa Lake Park in the East Kootenay and Champion Lakes Park in the West Kootenay recorded 14 per cent and 28 per cent increases respectively in park attendance over the 1969 season. Camper attendance in the East Kootenay had 49 per cent of its origin coming from other Canadian provinces, while the West Kootenay had only 25 per cent from other parts of Canada as against 51 per cent from British Columbia.

A redesign of the Syringa Creek Park's large day-use parking-lot was completed in time for paving by the Department of Highways. The new highway from Castlegar to Syringa Creek Park was paved in June. Although no maintenance was carried out because of staff shortages, the park was well used by both local people and tourists.

The development of a large day-use facility at the south end of Christina Lake was completed in September. Approximately 24,000 yards of sand were placed along the 1,000-foot shoreline, to make it one of the most attractive beaches on the lake. It is expected that this park will exceed 100,000 visits per season in the next three or four years.

The 1970 season saw an expansion of the Youth Crew Programme with the development of a new camp at Wasa Lake Park. Once again these young men provided much-needed assistance with the over-all maintenance of parks in the Kootenays. Their tasks include such projects as building trails, painting buildings and furniture, installation of water lines, cutting wood, and the cleaning-up of campgrounds and beaches. This youth programme is designed to create a challenge for the participants through a wide variety of outdoor experiences ranging from mountain climbing,

glacier excursions, canoeing, water skiing, to learning skills in trapping, tanning, knife-making, and participation in driver-training and hunter-training courses.

Our Nelson District staff were involved in assisting the Department of Highways in planning and locating sites for their Roadside Rest-stop Programme.

District staff also assisted the Planning Division in their field examination of the Valhalla Wilderness Park proposal near Slocan Lake; in the location of a major park proposal near Surveyors Lake to meet future recreational needs on the Libby Reservoir; in the preparation of the report on the Top-of-the-World Wilderness proposal; in the purchase of Miss Elizabeth Rummel's leasehold improvements in Mount Assiniboine Park for the establishment of an administrative centre and Youth Crew camp; and in many other advisory capacities necessary for the co-ordination of the Branch's activities.

Involvement of District staff with regional districts in regional planning and the subsequent establishment of by-laws regulating use in unincorporated areas is a continuous responsibility. All regional districts are being encouraged to become involved in regional parks to meet the fast-growing need for recreational lands and facilities by both the communities and their surrounding districts. Good progress has been made in the East Kootenay, where the regional district has acquired approximately 350 acres of the old Forest Service nursery near Wycliff for development of a wide variety of recreational interests, ranging from gymkhana grounds and snowmobile trails to playgrounds and picnic-sites.

The Nelson office is becoming deeply involved with land-use planning initiated by the Minister's Land Use Committee. Reports on future recreational needs have been prepared for guidance to other Government departments on the Lardeau and Trout Lake valleys, on the lands surrounding Kootenay Lake, on the Granby River valley, and on the East Kootenay Canada Land Inventory study area.

PARK INTERPRETATION

The 1970 Park Interpretation Programme has been the most successful on record. Some 225,000 people attended the variety of programmes offered in 15 parks throughout the Province. Statistically, this represents a 29-per-cent increase over 1969 attendance; practically, it means more people visited more parks and participated more in park activities.

Nature houses hosted 80,000 visitors, while 20,000 more turned out for morning guided walks in alpine areas, on beaches, and in the forests. Evening campfire talks proved interesting to 38,000 campers.

The Goldstream Park salmon run, Victoria's annual fish-watching spectacle, drew 60,000 visitors. Of these, 5,000 were school children transported to the park during school-hours. A park naturalist provided visitors with information and guided walks along the stream in explanation of the salmon's life-cycle.

This year, 17 seasonal naturalists were employed for the summer programmes in parks from the Rocky Mountains to the Pacific Ocean.

Naturalist workshops were again held in June at Miracle Beach and Manning Parks to train new naturalists in interpretive techniques.

New programmes this year included travelling naturalists who lived in campers, like the many park visitors they serve. These naturalists provided guided walks, hikes, and evening campfire talks at several parks each week during the summer. On Vancouver Island, Rathtrevor Beach, Englishman River Falls, and Little Qualicum Falls Parks were all served in this way by one naturalist. In the Kootenays, Champion Lakes and Kokanee Creek Parks also had a camper naturalist programme.

British Columbia's first nature house in the Rocky Mountains was opened this year at Mount Robson Park. A temporary tent-frame structure, located at the start of the Berg Lake Trail, hosted 6,000 visitors. This was a good beginning in one of our finest parks for natural history interpretation.

Pilot programmes were initiated at Cultus Lake and Golden Ears Parks on the Lower Mainland and at Alice Lake Park near Squamish.

The Langford interpretation workshop planned and constructed 28 major displays for four nature houses, together with five outdoor informational displays.

The great success of the 1970's park naturalist programme was the direct result of hard work by a fine group of seasonal and permanent naturalists. Their common interest is a dedication to the conservation of wild things in wild places and a willingness to tell others of this knowledge.

YOUTH CREW PROGRAMME

Although no more extensive than last year, the 1970 Youth Crew Programme was organized differently. The camp at Nairn Falls Park was discontinued and a new one was built at Wasa Park. The season started with 180 boys in the field—30 at Little Qualicum Falls, 30 at Garibaldi, 30 at Manning, 15 at Crooked River (Bear Lake), 15 at Mount Robson, 15 at Kokanee Creek, 15 at Champion Lakes, 15 at Wasa, and 15 at Wells Gray (Mahood Lake).

A variety of work was carried out, including trail building and light construction, new campground construction and old campground reconstruction, painting, firewood cutting, and general park maintenance. There was heavy emphasis on safety in all the crews, and we came through the season with only two minor accidents.

Each camp had a well-rounded programme of sports, moving-pictures, and talks on outdoor subjects, as well as visits to historic sites or industrial points of interest, and hikes into alpine country. By and large, the programme was very popular with all the boys, as well as with participating Parks Branch personnel.

One rather unfortunate incident was the loss, by fire, of the Manning Park cookhouse. No one was to blame for the fire, and the Youth Crew did a splendid job as part of a successful effort to confine it to only one building of the camp. This incident took place close to the end of the season and had no adverse effect on the crew's operation.

As usual, each crew closed the season with a ceremony, in some cases complete with skits put on by the boys. Certificates of merit and group photographs were presented by a local dignitary or a member of the Provincial Legislature. On the whole, 1970 was a successful year.

ENGINEERING DIVISION

The 1969 reorganization of the Division continued, with emphasis on project teams. Professional staff co-ordinated the specialist function of Waterworks, Buildings, and Draughting Sections, based in Victoria; the Workshop Section at Langford; and the Equipment, Construction, and Survey Sections in Vancouver. Field execution was, as usual, split between contract services, regional forces, and Construction Section staff. Consultant engineering firms were retained for seven projects. Registration of sewage effluent and solid-waste disposal was undertaken as required by the *Pollution Control Act, 1967*, and surveys in connection with toilet application and garbage disposal are continuing. In addition to capital works, about half the Division's technical capacity was involved in support of the remainder of the Branch.

WATERWORKS SECTION

This Section was responsible for implementing all waterworks and sewage-disposal projects. The services provided included site investigations, feasibility studies, detailed design, materials supply, and project supervision. Execution was predominantly by regional forces, with emphasis on the training of operating staff.

BUILDINGS SECTION

The introduction of a building maintenance supervisor was initiated with a major survey of Kamloops District buildings. In addition to specific projects, standard toilet building, change-house, and picnic-shelter designs were prepared. Closer ties with the Workshop Section were augmented with lighting and ventilation improvements, prefabricated structures, unit-cost study, and prototype design. Alterations for Planning Division offices were implemented.

DRAUGHTING SECTION

Final drawings were provided on a large variety of projects for all divisions of the Branch. About one-quarter of these were directly related to Engineering Division commitments. In scope, the assignments covered topographic maps, development plans, water and sewerage layouts, working plans for buildings and structures, detailed tourist maps, reports, and publicity assignments. In June, the Parks Standards booklet was issued in a new three-ring binder form, and a systematic updating is continuing. All plans were produced in the new standard-size system.

WORKSHOP SECTION

A high level of production was maintained, in spite of a low-development year, with 3,400 items produced in 60 categories. The drop-off in new installations has been more than offset by the growing demand for replacement production. Tables, fireplaces, and carved signs dominated, but reinforced fibreglass continues to gain favour with the development of unique items such as the ski-rescue toboggan and the standard marine park sign. The 1969 prototype fireplace became a standard item. Organizational work continued, with emphasis on broad utility training and staff rotation. Personnel were temporarily transferred to the Provincial Museum for exhibit work and to Manning Park for field experience. In all, some 34 off-yard jobs were carried out. A unit-cost study was completed for all 1969/70 production. Nineteen vehicles forming the headquarters car pool were maintained and dispatched from the Workshop. Lighting and ventilation improvements were initiated to conform with Provincial regulations.

EQUIPMENT SECTION

Key technical staff work was carried out in electrical and mechanical projects, notably the conversion of ski-tows to electric drive, diesel-electric generating stations, and distribution-system improvements. High maintenance standards were achieved by twice-yearly inspections of all Branch equipment. Specifications were supplied for the purchase of new and replacement equipment. Field personnel were instructed in the proper operation and maintenance of equipment, with emphasis on safety practice. Monthly operating cost records were compiled for all regions.

CONSTRUCTION SECTION

The Division's continuing flexibility to execute project assignments on short notice resides in large measure with this Section. Its project supervisors were re-

sponsible for the majority of capital works, apart from the Gibson Pass programme, which was a joint production in liaison with the Park forces. Here, as on the Sun-Oka project, the construction superintendent's jurisdiction was extended to cover regional development work. The first season of the Young Men's Conservation Programme was terminated in May, with 55 candidates receiving training and guidance in construction practice, machine operation, and project safety.

SURVEY SECTION

In addition to the basic functions of topographic mapping, boundary surveys, project control, feasibility studies, and route surveys, all surveying required in the Branch operation was consolidated in the Survey Section. At the peak, three field parties were involved. Engineering control of projects was strengthened by comprehensive involvement in such works as the Mount Seymour road, Gibson Pass chair-lift, Rathetrevor Beach development, Lac Le Jeune campground, Cultus Lake gate-house, and Christina Lake picnic area.

VANCOUVER ISLAND REGION

The China Creek Park development was completed, the lower Englishman River Falls bridge was replaced, and plans initiated to replace the lower Little Qualicum Falls bridge. Work continued at Rathetrevor Beach Park on the first-stage development of access roads, parking-lots, equipment shed, pumping-station, trail system, landscaping, and a double sani-station, all in conjunction with the Young Men's Conservation Programme. A first-stage campground was developed at Gordon Bay Park and a handpump water supply installed. An entrance revision was constructed at the Euclataws Cave. A boundary survey was completed for Strathcona Park and maps prepared for MacMillan, Goldstream, and Arbutus Grove Parks. Quinsam campground water system was extended, and China Creek water investigation continued. Miracle Beach water system renovation and sani-station construction were tabled. A summer residence design for Buttle Lake was prepared. Plans were completed for the Goldstream bridge, and the Victoria Fish and Game Protective Association building at Goldstream was appraised for future use as a nature interpretation centre. Planning began for the Goldstream workshop.

MOUNT SEYMOUR REGION

Improvements were carried out at Princess Louisa Marine Park in the form of flush-toilets, caretaker's residence, tables, signs, buoys, and further dockwork. The Porpoise Bay topographic plan was completed. A one-half-mile section of the Mount Seymour road was reconstructed to three paved lanes, and working drawings and estimates completed for the unfinished section. Initial design and costing were undertaken for the dock extension at Plumper Cove Marine Park. Structural assessment, combined with moving and renovating, was carried out for the Mount Seymour V.O.C. building as a potential concession staff quarters. The North Vancouver Water District main was extended through the service area and connected to the headquarters system. The annual Mount Seymour electrical inspection was carried out and corrective action taken. Planning continued for permanent ski-hill lighting, a power factor correction programme was initiated, and a survey of the electric power rate structure begun. Ski-tow renovations continued, and the first electric drive conversion completed for Goldie Tow. The Vancouver-based extension of Engineering Division, comprising the Equipment, Construction, and Survey Sections, was consolidated in the staff building at Mount Seymour Park, with planning begun for permanent offices and yard facilities.

CULTUS REGION

A gate-house installation was designed and constructed for improved public control of Cultus Lake Park, with exterior lighting and paved off-highway access at Entrance Bay. A Delta Grove-Clear Creek topographic map was completed. Maple Bay plumbing revisions were prepared, and at Entrance Bay a sani-station was commenced. The pumping-station for Greenpoint picnic-ground was renovated.

GARIBALDI PARK

Improved campground toilet facilities were planned for Alice Lake Park in the form of two six-unit buildings with septic disposal. A sani-station installation was commenced. The Cheakamus Lake mapping project was completed and survey control supplied for the Singing Pass Trail.

ALOUETTE REGION

Stream-bed revisions were carried out at the Gold Creek Bridge crossing for erosion control. Transfer of the Alouette waterworks material stockpile to the Mount Seymour centre was planned.

MANNING REGION

A new chair-lift, with a 3,798-foot slope length, a 1,091-foot vertical rise, and 1,100 passengers-per-hour capacity was constructed at the Gibson Pass ski area in Manning Park. Additional work was carried out to complete the T-bar lift, expand the generating-station capacity, relocate the toboggan run, landscape and seed slopes, and finish the ski runs. The day-lodge catering facilities were modified to accommodate greater traffic, the observation platform was altered, and new tables designed. The Gibson Pass map was consolidated and extended. An interpretation centre at the top of Blackwall road was implemented with a prefabricated hut. The annual inspection and replacement programme for Manning headquarters electrical system required distribution, lighting, and fire-warning improvements. The Coldspring campground water-system design continued, and a sani-station was prepared for the lodge area. Planning began for replacements of the lodge motel and Youth Crew cookhouse, both destroyed by fire. Foundation work and abutment design were carried out for a new Lightning Lakes bridge, and the lake picnic area was improved with a handpump water supply and vault toilets.

OKANAGAN REGION

The Sun-Oka Beach Park picnic-ground at Summerland was completed with parking-lots, playground, toilet and change building, and picnic terrace. Full irrigation, domestic water service, septic disposal system, and electric power were included, along with extensive landscaping and planting. A maintenance inspection was carried out for all region buildings, and a programme of essential renovations compiled. Change-houses were completed for Haynes Point Park. At Okanagan Lake Park the campground water system was improved with conversion to drilled-well supply and replacement of the delivery main. A sani-station above the picnic area was initiated. Boundary surveys were carried out for Cathedral and Johnstone Creeks, Okanagan Falls, and Ellison Parks. Control was supplied for Cathedral Park access.

SHUSWAP REGION

The first-stage redevelopment of Lac Le Jeune Park was completed, with improved access, parking, additional camp-sites, and day-use facilities. Yard Creek picnic-shelter was tabled. A maintenance inspection of all region buildings was carried out and initial action implemented on a continuing renovation programme. The Victor Lake water system improvements were tabled and a Monck Park summer residence was begun. A boundary survey was completed at Paul Lake and a fence installed.

CARIBOO REGION

The Lac la Hache sani-station was begun, with provision for water system extensions. At Skihist Park, flush-toilets were completed in the picnic area.

WELLS GRAY REGION

A higher-capacity heating-plant was selected for installation in the Wells Gray workshop.

KOKANEE REGION

A new picnic-ground was developed at Christina Lake, with parking-lots, service area, fencing, trails, vault toilets, change-houses, picnic terrace, and sanded beach area. Syringa Creek Park was initiated with paved parking-lots. Kokanee Creek water system was extended to Sandspit campground. Christina Lake and Syringa Creek were examined for water supply.

WASA REGION

Extension of the Wasa workshop was planned. Moyie Lake water system was extended to the campground. Wasa Lake sani-station construction began, and planning for the final picnic water system continued.

BEAR LAKE REGION

The Beaumont Park sani-station was commenced to introduce this service to Highway 16. Flush-toilet facilities were planned for Ten Mile Lake Park, but construction was tabled.

LAKELSE REGION

The Furlong Bay water system was extended to the picnic area and first-stage service provided in the campground.

MOUNT ROBSON REGION

Replacement of the diesel-electric generation system was initiated for Mount Robson headquarters, and an electric-power system installed for the Interpretation Centre. Handpump wells were drilled at Lucerne Lake campground and the proposed picnic-ground. Drilling failed at Robson River, but a weak well was obtained at Robson Meadows. The water survey is continuing and a sani-station is planned.

PEACE-LIARD REGION

Boat-launching facilities at Charlie Lake Park were improved with stabilized riprap, concrete-slab construction, and improved access. A sani-station installation was begun.

BOWRON REGION

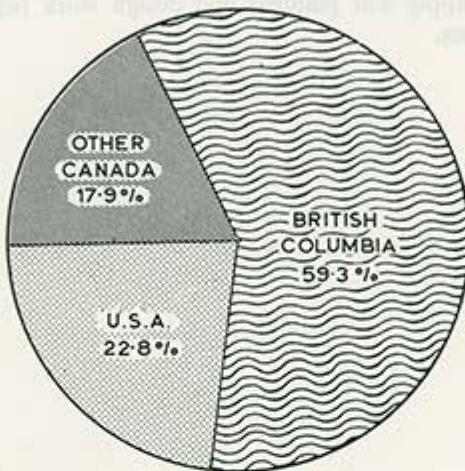
The workshop and warehouse were completed at Bowron Lake Park service area and a matching design prepared for a staff house. The water system was extended to the campground and a sewerage system planned for the service area. An electric-power system was installed.

HISTORIC PARKS

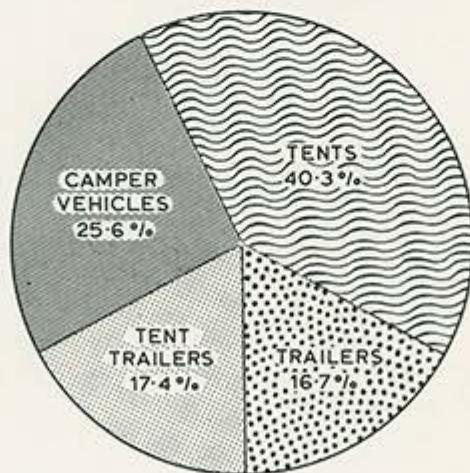
Fort Steele railway station plumbing was designed, winter-use horse troughs were installed, and the start made on the theatre water and sewage services. Barker-ville auxiliary water supply was planned and design work begun for Cottonwood House residence services.

ORIGIN OF CAMPERS VISITING PROVINCIAL PARKS AND TYPE OF ACCOMMODATION USED

ORIGIN

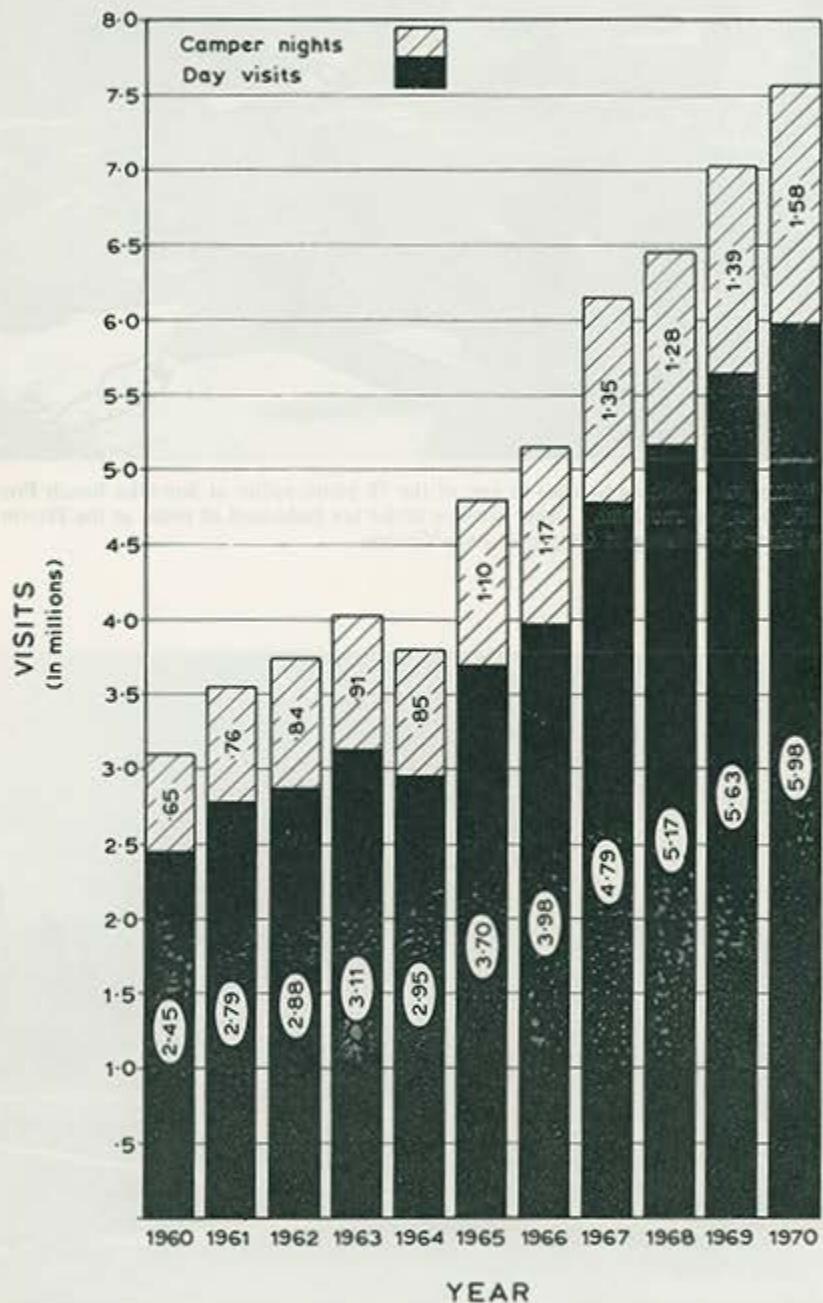


TYPE OF ACCOMMODATION



62

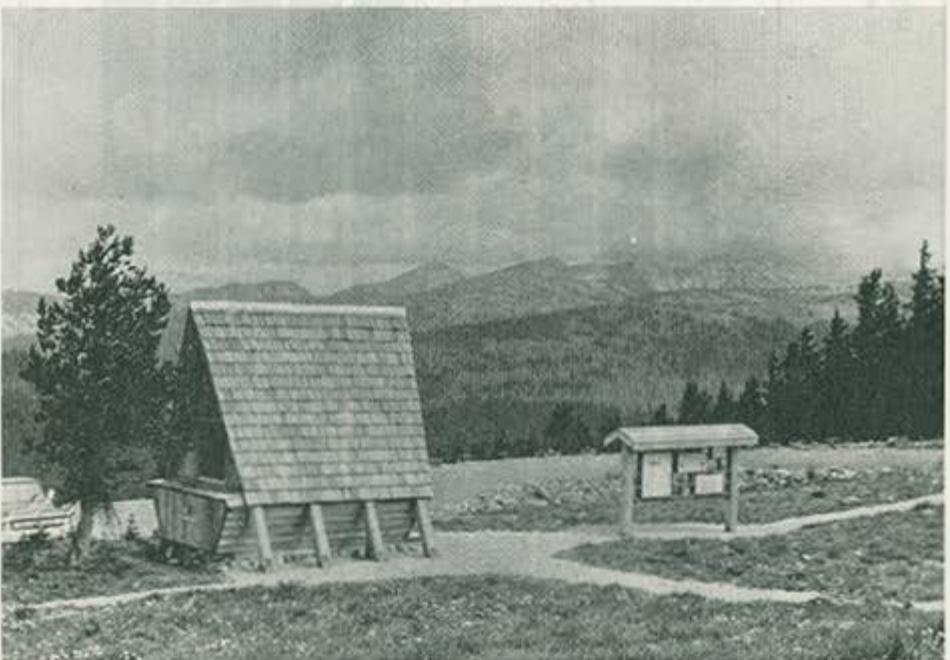
ANNUAL ATTENDANCE



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Workman puts finishing touches to one of the 78 picnic-tables at Sun-Oka Beach Provincial Park, near Summerland. These massive tables are fashioned of cedar at the Provincial Parks Branch workshop at Langford, near Victoria.



Naturalist hut in the alpine zone of Manning Provincial Park. Guided walks through the meadows start from here in July and August.

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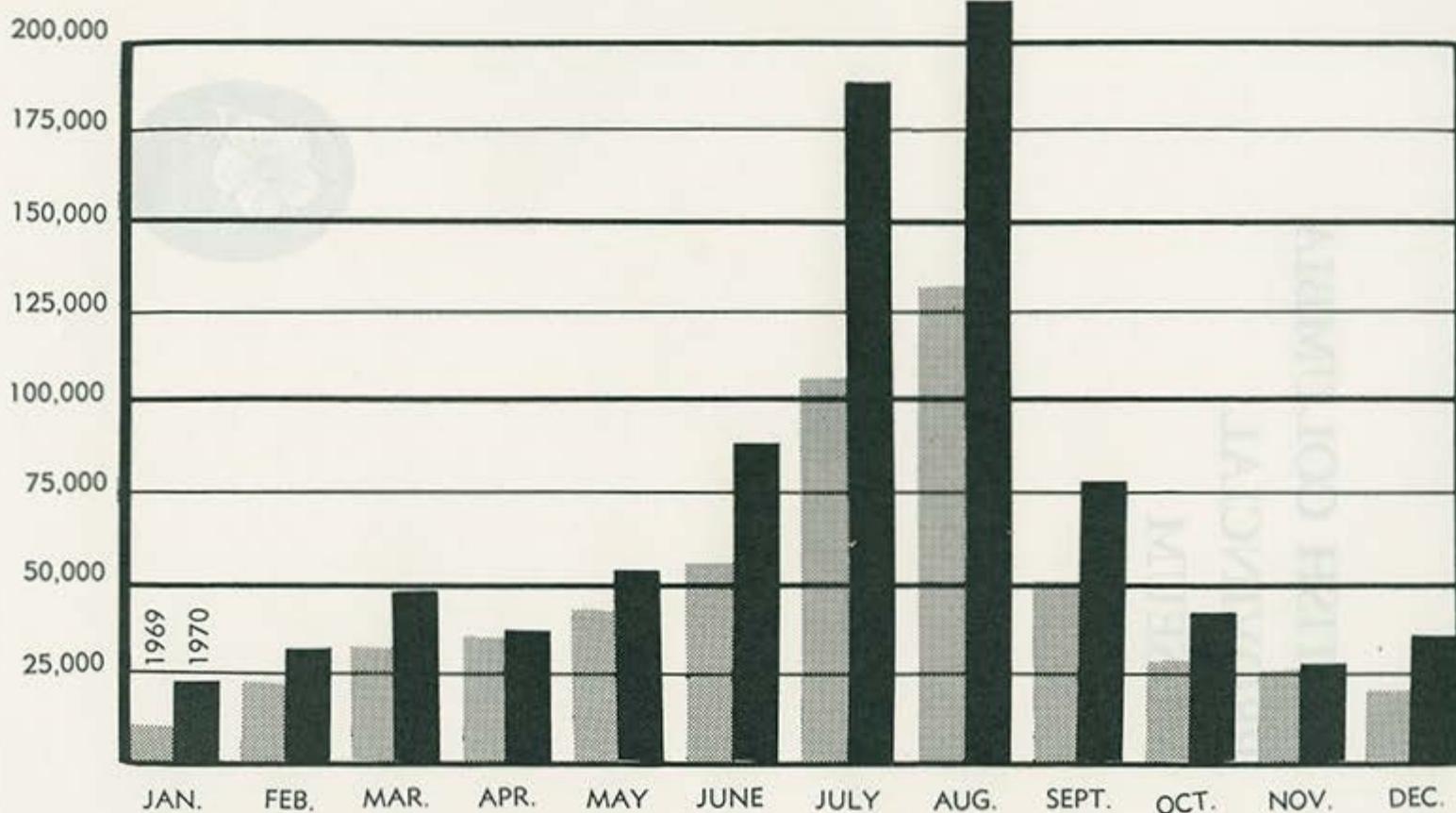
Ten of Oakalla Prison Farm's popular Clydesdales were transferred to Fort Steele Provincial Historic Park in 1970. The horses lost no time in acclimatizing to their new home near the Rockies.

soft moist soil has been found to more effectively reduce plant height than hard soil, while soil moisture has been found to have little effect on plant height (Hartley, 1973). In fact, according to Hartley (1973), soil moisture had little

BRITISH COLUMBIA PROVINCIAL MUSEUM



AUG. 1970—209,440



Provincial Museum Attendance 1969 and 1970

BRITISH COLUMBIA PROVINCIAL MUSEUM

OBJECTS

- (a) To secure and preserve specimens and other objects which illustrate the natural history and the human history of the Province.
- (b) To increase and diffuse knowledge in these fields by research, exhibits, publications, and other means.

(Section 4, *Provincial Museum Act, 1967*, chap. 41, S.B.C. 1967.)

ADMISSION

The Provincial Museum is open free to the public. During 1970 the hours of admission were:

January 1 to May 31.....	10 a.m.-4.30 p.m.
Sundays.....	1 p.m.-4.30 p.m.
Closed Mondays.	
June 1 to September 15.....	10 a.m.-8.30 p.m.
Sundays.....	1 p.m.-4.30 p.m.
September 16 to December 31.....	10 a.m.-4.30 p.m.
Closed Mondays.	

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BRITISH COLUMBIA PROVINCIAL MUSEUM

DR. J. B. FOSTER, DIRECTOR

The following points are the highlights for the year 1970:

- A total of 848,266 visitors passed through the Museum's doors, 53 per cent more than 1969.
- The greatest effort of the Museum was placed on the construction of new history displays. Major advances were achieved in the street scene and primary industry galleries.
- All curatorial divisions expended much time and effort in moving into and reorganizing collections in the Curatorial Tower.
- More than 35 talks and lectures were given by staff members to the public during the year.
- The "Friends of the Provincial Museum" was registered as a society and is in addition to the more specialized Docents' Association of the Provincial Museum. Members of both aided in many activities within the Museum. The 60 volunteer guides helped to conduct 500 tours for 21,220 children by donating 4,786 hours of work, the equivalent of three full-time employees for one year.
- Nine Museum handbooks were reprinted in an attempt to keep up with burgeoning demands by the public. Almost \$20,000 worth were sold during the year in spite of some of the most popular handbooks being out of print. The third volume of the Museum's scientific publication *Sysis* appeared, and a special archaeological supplement was being prepared as the year ended.
- Three Indians were hired for a year on the First Citizen Fund—two as apprentice carvers and one as a teacher interpreting the Indian culture to school children.
- Many people and institutions rendered the Museum assistance, courtesies, and information. Others donated so many valuable objects and specimens that we are unable to list them individually as in previous reports. To all these people we extend our sincere thanks.

G. CLIFFORD CARL, 1908-70

The museum field, particularly in the Province of British Columbia, suffered a severe loss with the death of Dr. G. Clifford Carl on March 27, 1970.

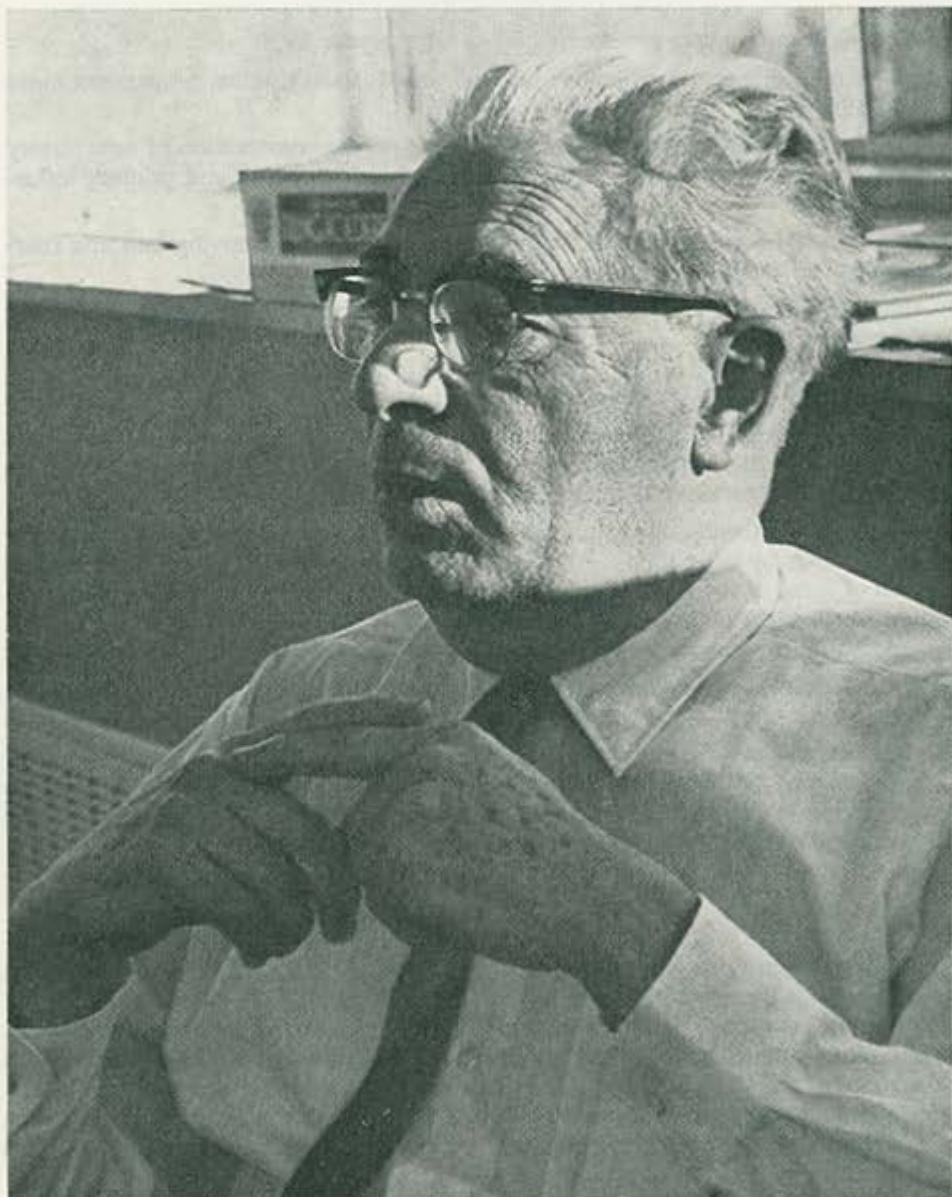
During his many years as Director of the Provincial Museum, he maintained a continuous contact with the smaller museums and museum personnel throughout British Columbia. His interest and activity in this field led to the formation of the British Columbia Museums Association in 1957, an association now recognized as one of the most progressive in Canada. Of outstanding importance, too, was his initiation of a series of handbooks on the flora and fauna of the Province.

The highlight of his 29 years as Director was the opening of Heritage Court in August 1968. This new museum complex is a monument to the man known always as being kindly and knowledgeable.

Cliff Carl's knowledge of natural history was vast; his first love, however, was marine biology, and in January 1970 he stepped down from the directorship to become the Provincial Museum's first Curator of Marine Biology. He was looking forward to relief from administrative duties and to involvement in the proposed "Hall of the Sea" when, after a brief illness, he died of acute leukemia.

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SCOTTISH INSTITUTE OF TECHNOLOGY
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G. Clifford Carl, 1908-70.

After a long and distinguished career in engineering, G. Clifford Carl died at the age of 62 on 20th January 1970. He was born in Edinburgh on 1st April 1908 and was educated at the Edinburgh Technical School. After leaving school he joined the Royal Engineers and served in France during the First World War. On demobilisation he became an electrical engineer with the British Electric Light & Power Company, and later joined the Electrical Engineering Department of Edinburgh University where he taught for nearly twenty years. He was a member of the Institution of Electrical Engineers and a fellow of the Royal Society of Edinburgh.

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ARCHAEOLOGY

The Archaeology Division has multiple responsibilities. Like other curatorial divisions of the Museum, it is broadly charged with the collection, preservation, and interpretation of objects and data relevant to the cultural and natural history of British Columbia. As one of only a handful of archaeological departments in the Province, it also shares a heavy portion of the burden for the protection of a precious, irreplaceable, and highly vulnerable resource—British Columbia's remaining archaeological sites. Recommendations on administration of this resource are made by the Archaeological Sites Advisory Board. The Curator is the Provincial Museum representative on the board, and this Division maintains all Board records as well as the central Provincial archaeological sites advisory file. In these and other respects we are attempting to assemble a "data bank" for archaeologists working in British Columbia. We are also expected to do our share in the scientific salvage of archaeological remains threatened by destruction from various causes. By means, and also by more problem-oriented research, we endeavour to contribute to unravelling the prehistory of our Province. The ultimate aim of diffusing this knowledge to the public is attempted through direct response to inquiries, through museum displays, education and extension services, through assistance to other researchers, and through publication.

The Curator, D. N. Abbott, was assisted by three technicians—J. H. Sendey, Mrs. N. I. Hayden, and Miss K. E. Jamieson.

Special thanks go to the following volunteers: Miss Josephine McDougall, Denis St. Clair, Miss Sharon Keene, Alan Carl, Greg Monks, Mrs. Beth Hill, Mrs. Jean Turner, Mrs. Anna Reeves, John Pollitt, Ebbe Larsen, and to several members of the Archaeological Society of Vancouver Island.

During 1970 the main emphasis was upon organizing records and collections following the move into our new permanent quarters and upon compilation of earlier research material into publishable form.

The writing of REPORTS consisted primarily of the Curator's analysis and writing-up of the Pedder Bay site in Metchosin, excavated in 1964. The work includes a fairly detailed study of aspects of the natural and human history of south-eastern Vancouver Island as they may effect the interpretation of archaeological evidence. At the same time, Mr. Sendey has been preparing a report on the George-son Bay site on Galiano Island. He made five return trips to the island at various times during this year to collect additional historical and environmental information needed to supplement the archaeological data obtained in 1968. Alan Hoover, Assistant Curator of Ethnology, on a year's leave of absence, is preparing an archaeological report on the 1967 excavations at the False Narrows (Gabriola Island) site for his thesis at Simon Fraser University. Mrs. Marjory Gordon, of the University of Calgary, is concurrently analysing the skeletal material from that same excavation for her thesis in physical anthropology. John McMurdo, of Simon Fraser, is working up our material from the 1968 excavation at Helen Point, Mayne Island.

COLLECTIONS were moved into the new building and the space now available has made it possible for the first time to begin organizing and storing the archaeological and human osteological collections in a logical and accessible manner by sites and geographic provenience. This work reached only a very preliminary stage in 1970, and further years of effort will be needed to bring the collections, and particularly the records, to the state of organization in which they will be of optimum value as sources of information on prehistory. Thousands of man-hours were expended this year by the staff and by volunteers cataloguing collections; abstracting entries from the old general anthropology records into new specific catalogues for

archaeology and osteology; indexing library sources and files; sorting and filing photographs, field-notes and records, journals, drawings, maps, correspondence, etc.; attempting to keep the site inventory file current and correct; and other tasks of similar nature. In addition, Mrs. Hayden made a start on the preliminary analysis of faunal remains from three excavated sites (DeRv 1, DeRt 15, DIRu 24). New accessions during the year numbered 143 lots. Most of these contained numerous individual specimens, each of which had to be separately catalogued.

FIELD WORK was minimal in 1970 due to the sheer lack of time and personnel. None the less, emergency situations, major new discoveries, and the need to assess personally certain sites which were inadequately recorded or threatened with disturbance, and requests for investigation variously necessitated the following field trips:

- (1) A salvage excavation, lasting one week, at Departure Bay, carried out by Mr. Sendey and Miss Jamieson, with volunteers Miss Sharon Keene and Alan Carl.
- (2) A one-day reconnaissance of a threatened site near Williams Lake and others in the vicinity by Mr. Abbott, Mr. Sendey, Mrs. Hayden, and Miss Jamieson.
- (3) Another one-day reconnaissance of possibly threatened sites at Blunden Harbour and Smith Sound by Mr. Abbott.
- (4) As already mentioned, five one- or two-day trips to Georgeson Bay by Mr. Sendey, three times accompanied by volunteer Alan Carl.
- (5) A four-day trip by Mr. Sendey to check sites near Hope and to participate in the Archaeological Sites Advisory Board's emergency salvage project at the Katz Village site.
- (6) A three-day trip to check sites near Hope, on the Harrison River, and on the Fraser Delta by Mr. Sendey and Mr. Carl.
- (7) Separate one-day trips by Mr. Abbott and Mr. Sendey to investigate, record, and photograph an important newly discovered petroglyph site near Nanaimo.
- (8) A trip by Mr. Abbott, Mr. Sendey, Miss Jamieson, and volunteer John Pollitt to check disturbed burial-sites near Kelowna and record sites near Lytton.
- (9) Several brief excursions to check out sites in the immediate vicinity of Victoria by the staff.
- (10) While not directly a Museum project, The Archaeological Society of Vancouver Island's training "dig" at Willows Beach in Oak Bay has received this Division's encouragement and support, including the use of equipment and some physical assistance. It has been under way most of this year. All finds and records are being turned over to the Museum.

OTHER ACTIVITIES included participation by the Curator in the British Columbia Museums Association seminar in Penticton and in two conferences at the University of Calgary on "Ancient Man and Environments in the Northwest." He also gave a lecture to the University Extension Association in Victoria. Mrs. Hayden gave several illustrated talks to school groups in Victoria, Lantzville, and Hammond Bay.

We were pleased to assist visiting scholars during the year who were seeking information relating to their own research. As well, during the summer, Bjorn Simonsen, Field Director for the Archaeological Sites Advisory Board, shared our facilities, and we welcomed Dr. Barbara Efrat, Honorary Curator of Linguistics, who shared our office during the final third of the year.

Mr. and Mrs. Perry Monsell, of Nanaimo; Mr. and Mrs. William Stafford, of Williams Lake; and Mr. Kamil, of East Sooke, all were most generous of their time and knowledge in showing us archaeological remains on their properties. The Department of Highways at Nanaimo gave very material assistance by surveying our Departure Bay excavations into their datum and preparing a contour map for us. Mrs. M. Backlund and Mrs. B. Stallybrass, of Galiano Island, not only contributed a great amount of valuable information, but also donated about 400 important historical negatives.

BIRDS AND MAMMALS

The Curator, C. J. Guiguet, was assisted by W. J. Schick, Assistant Curator; P. R. Nott, technician; and E. Lemke (until June 30), taxidermist; Mrs. M. Hoffman and Miss W. Speechly provided excellent help as volunteers. The Birds and Mammals staff completed the arduous task of moving the Division's collections from the old Museum to the new Curatorial Tower. When finally settled in and with the equipment functioning, this Division's output should greatly increase.

RESEARCH included six weeks of zoological exploration during June and August on islands in Barkley Sound, 14 days of general collecting for scientific study and display in the Peace River district during October, four days at Hedley on specific display collecting in March, six days on northern Vancouver Island in November for reconnaissance on possible future field work in view of the heightened industrial activity beginning in that area, and several short local field trips in accordance with the Division's routine collecting programme. Laboratory research was confined mainly to mensuration for statistical analysis of a large series of small west coast mammals.

COLLECTIONS restoration continued throughout 1970 to the extent that upward of 7,200 mammals (80 per cent of the total collection) have been treated. The preparation of material for display terminated in June, when Mr. Lemke resigned. The latest of our dioramas—that of the west coast forest (Roosevelt elk habitat)—was completed by Clarence Tillenius, artist; John Hermann-Bloem, taxidermist; and members of the display staff. A total of 234 specimens of birds and mammals was collected by staff, and by donation from the general public. These specimens will ultimately be used for both display and scientific study. Notable accessions were a right whale dolphin—the first for Canada (see *Syesis* 3:2:188); an adult male Caspian tern collected in Barkley Sound—the first record of the species in British Columbia (see *Syesis* 3:2:187); and a wood ibis collected at Telegraph Creek—also the first recorded in British Columbia.

PUBLICATIONS and REPORTS included short papers on the above-mentioned specimens, an article on the Roosevelt elk for a local newspaper, scientific data on the California sea lion and the elephant seal (will be published in *Syesis*), a rough draft of Barkley Sound nesting sea bird colonies scheduled for use in a revision of Drent and Guiguet's *Catalogue of British Columbia Sea Bird Colonies*. Extensive field-notes from the British Columbia Coast were indexed and bound.

Jack Schick, Assistant Curator, delivered talks on British Columbia fauna to groups in Victoria and Campbell River.

BOTANY

The Curator, Dr. A. F. Szczawinski, was assisted by Dr. T. C. Brayshaw, Associate Curator, and Mrs. S. Y. Newnham, herbarium assistant. Volunteers in the Division included R. A. With, illustrator, employed by the National Museum, who

helped in preparing a number of botanical drawings; Miss Sheilagh Craig, who during the summer months was engaged in the preparation of botanical drawings; and Mrs. D. Peakman and Mrs. M. Hale, who provided much appreciated general help in the Division.

The Botany Division's most notable achievement of 1970 was in its ability to attract well-known botanists for both contractual and volunteer work. Of particular significance, Dr. T. M. C. Taylor completed a manuscript of the Rose Family (*Rosaceae*) of British Columbia and made considerable progress on a similar manuscript for the Legume Family (*Leguminosae*). Dr. Brayshaw made good progress on the Willow Family (*Salicaceae*) with the completion of many illustrations and distribution maps. The flora of the Saanich Peninsula, a study completed by Dr. Szczawinski one year ago, is now in the final stage of revision and will be ready for publication in 1971. The collection now consists of 55,304 sheets, which is an increase of 1,216 sheets over 1969. As our herbarium is listed in *Index Herbariorum*, there has been a marked increase in requests for loans of our material; this year a total of 1,543 sheets was loaned out—triple that of any previous year. An increased work load resulting from our move was completed, including the unpacking and reorganizing of 55,000 herbarium sheets into new cases.

COLLECTIONS involving aquatic plants, which hitherto have been weakly represented in the herbarium, were added to extensively from collecting trips conducted in the areas of the Saanich Peninsula, Gold River, Campbell River, Kelsey Bay, and Kamloops. Eight local trips to obtain living plants for landscaping the Museum Complex grounds were made with V. W. Ahier and J. Derrick. Various institutions as well as biologists, foresters, agriculturists, and individuals have contributed a number of plant collections and individual plant specimens during 1970. Deserving a special mention were the National Museum of Natural Sciences, Ottawa; Mrs. G. Mendel, Kitimat; Dr. T. M. C. Taylor, Victoria; Dr. V. C. Brink, Vancouver; A. Luckhurst, Victoria; and J. Risse-Sawitski, Prince George.

DISPLAY WORK centred upon resolving the storyline for displaying the most ecologically complicated Province of Canada.

FIELD WORK included collecting trips and surveys to the Nimpkish Valley, Gold River area, Kelsey Bay, Haydon Lake, Fraser Valley, Skagit River Valley, and the Okanagan. Plants added to our collection included *Euonymus occidentalis*—newly discovered both in this Province and Canada.

In connection with the work of the ecological committee of the International Biological Programme, botanical studies were made of San Juan Ridge near Port Renfrew, and the Rae-Boat Basin area at western Vancouver Island. It was subsequently recommended by this Division that both the Rae-Boat Basin and the Skagit Valley become ecological reserves. In the Skagit Valley, moreover, the distribution of California rhododendron (*Rhododendron macrophyllum*) was mapped as part of preliminary studies involving proposals for extending the Ross Lake Reservoir. The Curator, with Dr. Sigurd Olsen of the College of Fisheries, University of Washington, Seattle, made a study of the occurrence of aquaspheres (fibrous balls) at Heydon Lake. The study will be extended to cover other areas of the Province in the future.

During the year a number of botanists from Canada and abroad worked in our herbarium. Dr. B. Boivin, University of Toronto, set aside 795 sheets during his check of Canadian flora records which were sent to Toronto on loan for critical study; Dr. J. H. Soper, Chief Botanist, National Museum, Ottawa, and the Curator conducted joint studies of the flora of the national parks in British Columbia; Dr. J. M. Gillett, of the Plant Research Institute, Ottawa, made studies of the family

Hypericaceæ; Dr. R. T. Ogilvie, University of Calgary, Alberta, carried out ecological studies and checked our herbarium material; Dr. H. T. Harrington, Colorado State University, Colorado, studied weeds of suburban areas of Victoria; and Dr. J. Kajak, University of Warsaw, Poland, examined our aquatic plants collection.

The botanical staff gave lectures at Victoria, Campbell River, and Vernon; a series of lectures on the ecology of southern Vancouver Island was given to Dr. Ogilvie's students by the Curator and Associate Curator. The Associate Curator spent two days demonstrating facets of the local vegetation pattern to forest research officers at the Canadian Forest Service Laboratory, Victoria. The Curator gave a lecture to the British Columbia General Practitioners at the Vancouver General Hospital on the toxicity of plants, and later discussed the same subject on local television.

ETHNOLOGY

1970 was an especially satisfying year for the Ethnology Division as it marked the first time in which the ethnological collection was housed under a single roof under controlled and secure conditions. The collection is now organized and accessible, facilitating research for the staff and students of British Columbia Indian cultures. The Curator, Peter L. Macnair, was assisted during the year by Mrs. Susan C. Douglass and Miss Kathy Jamieson (March 15 through August 31). Employed under the Thunderbird Park carving programme were Henry Hunt, chief carver, Tony Hunt, carver, and apprentice carvers Ron Wilson (June–December), Lawrence Bell (June–December), and Oscar Matilpi (July–August). During the year the able volunteer assistance of Mrs. June Ruskin and Mrs. Pauline Green was greatly appreciated.

Work with the COLLECTION included fumigation prior to moving it into the storage area and installation in specially designed cabinets. The entire Newcombe collection of photographs (over 2,500 negatives) was recatalogued. A 5- by 7-inch print was made from each negative and the prints were mounted on cards to which descriptive notes were added. Significant purchases during the year were one Chilkat blanket, one Kwakiutl button blanket, two Kwakiutl dance aprons, one Kwakiutl dancing headdress, two Tsimshian painted boxes, four silver bracelets, two Nootka dance screens, and two contemporary Kwakiutl masks. The most outstanding donation of the year came from the G. W. Dea Ville estate and included, significantly, two argillite totem poles, eleven mountain goat horn spoons, three Haida silver spoons, one Tsimshian mask, and a Tsimshian puppet in the form of an owl.

Mrs. Douglass made a preliminary study of the textile collection.

A selection of superior pieces from the ethnological collection was loaned to the Musée de l'Homme for their show "Masterpieces of Indian and Eskimo Art from Canada." The show was later exhibited in Ottawa. A replica totem pole from Kitwancool and a large feast dish carved by Henry Hunt were loaned to the exhibit "Flora Pacifica" in Honolulu, Hawaii.

FIELD WORK included virtually every week-end, January through April, with the Curator attending Coast Salish winter dances in a continuing study of that institution. In June and September, several Kwakiutl potlatches were filmed and tape-recorded.

The Curator gave five lectures to anthropology students at the University of Victoria; a Heritage Court Presents lecture entitled "A Visit to the Home of Bakbakwalanooskiway, the Cannibal at the North End of the World," ably assisted by the Hunt family and Mrs. Douglass; "Technical Achievements of the Northwest Coast Indians" to the Canada-Indian Cultural Association and the students in the

Indian studies programme at the Institute of Adult Studies, Victoria; a lecture upon "The Role of the Community Museum" to the Alert Bay Museum and Library Association; discussions on "Northwest Coast Indian Art: A Structural Analysis" to the International Association of Art Critics; and a lecture on "The Mungo Martin Memorial Pole" to the British Columbia Indian Arts and Welfare Society.

THUNDERBIRD PARK had its most active year. Tony Hunt nearly completed the frontal painting for the Kwakiutl House inside the Museum. Henry Hunt carved a speaker's figure to accompany the house. Several masks and other paraphernalia were carved for the Heritage Court Presents lecture and for the Mungo Martin pot-latch. The apprentice carvers finished the weeping woman of Tanoo pole. Mr. Bell completed a replica of a shaman's grave figure and two smaller carvings; Mr. Wilson worked on a replica of a shark mortuary from Skedans. Mr. Matilpi carved two masks and two feast bowls for eventual use in the potlach programme designed by the Education Division.

The most significant work produced by the Thunderbird Park carvers was the Mungo Martin memorial pole. Carved from a 32-foot cedar, this pole honouring the late Mungo Martin is without question the finest pole yet produced by the father-and-son team of Henry and Tony Hunt. It was erected at Alert Bay on September 18.

In line with an increased awareness of the urgent need to preserve native Indian language material, the Museum appointed, in September 1970, Dr. Barbara S. Efrat as Honorary Curator of Linguistics. This appointment is primarily a research position to facilitate the continuing investigation into the structure of several indigenous Coast Salish languages and to provide work space and a safe repository for irreplaceable data. Since the number of speakers of the particular native languages under study is unfortunately diminishing rapidly, the preservation effort by the Museum is of prime historical significance.

HISTORY

The History Division's staff concerns itself with all facets of the white man's experience in British Columbia from the 1770's to the present. During 1970, the Curator, Daniel T. Gallacher, the Assistant Curator, David E. Gillett (to September 30), together with two technicians, Monte J. Wright and Miss Katherine Jamieson (the latter from September 1 to December 31), made significant progress, particularly in the fields of displays, restoration, accessions, and publications. To these ends they were ably assisted by volunteers, including Mrs. Marjorie Parsons, Mrs. Nel Skuce, Mrs. Stella Heard, Mrs. Lena Vincent, and Mrs. Elenor Palmer, all of whom worked at length sorting and cataloguing the collection. Mrs. Skuce began extensive archival research into the development of British Columbia commercial outlets for the years 1886-1914.

COLLECTIONS were enlarged considerably as a result of newspaper, radio, and television appeals for display objects. Public response went beyond our immediate requirements; however, since approximately half of the items donated need not be used in the current exhibit, but will help instead to round out the collection. It is intended to publish all accessions for 1970 under separate cover, probably in a compendium for the years 1970-74.

FIELD WORK was devoted solely to either acquiring objects or studying structures and sites for possible duplication in the displays. Barkerville, the Lower Mainland, southern Vancouver Island, Kamloops, Merritt, the Okanagan, the Gulf Islands, and Princeton were all visited to seek objects, photograph sites, and study local

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