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Fisheries and Environment Canada

Ministre
Pêches et Environnement Canada

Ottawa, Canada
K1A 0H3

His Excellency
The Right Honourable Edward Schreyer
Governor General and
Commander-in-Chief of Canada

May it Please Your Excellency:

We have the honour herewith, for the information of Your Excellency and the Parliament of Canada, to present the Annual Report of the Department of Fisheries and the Environment for the fiscal year ended March 31, 1979.

Respectfully submitted,

John Roberts

Roméo LeBlanc

Deputy Minister
Fisheries and Environment Canada

Sous-ministre
Pêches et Environnement Canada

Ottawa, Canada
K1A 0H3

The Honorable Roméo LeBlanc
Minister of Fisheries and Oceans
Ottawa, Canada

Dear Mr. Minister:

We have the honor to submit the Annual Report of the Department of Fisheries and the Environment for the fiscal year ended March 31, 1979.

Respectfully submitted,

D.D. Tansley

J. Blair Seaborn

Deputy Minister
Fisheries and Environment Canada

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The Honorable John Roberts, P.C.
Minister of the Environment
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Contents

Highlights of the Year

A long period of reorganization in the department culminated in mid-March 1979 with the passage of Bill C-35, creating a Department of Fisheries and Oceans. The new department is made up of the elements which functioned as the Fisheries and Marine Service in the Department of Fisheries and the Environment.

Management of Canada's 200-mile exclusive fishing zones continued to be carried out smoothly and effectively as a result of a refined system of surveillance by sea and air, combined with intensified scientific research on the state of the stocks and successful conclusion of a number of bilateral fishing treaties with foreign nations. A licensing system for foreign vessels fishing within Canadian fishing zones was introduced successfully at the start of the year, and there were very few licence infractions. The year also saw introduction of a commensurate benefits program, under which catch allocations were given to foreign fishing fleets in balance with marketing options granted to Canadian exporters.

A "bonanza" year for Canadian commercial fishermen, 1978 saw total landings of 1 358 000 tonnes with a landed value of more than $650 million--an increase of 35 percent over 1977. Value of exported fish products also rose dramatically to an estimated $1.1 billion, putting Canada in first place among the world's fish exporting nations. Fishermen's incomes, in most instances, rose significantly, and employment in processing plants was the steadiest for many years.

Licensing policy for east coast fisheries was the subject of a major study by a ministerial task force, continuing at the close of the fiscal year. A buy-back program, aimed at stabilizing and improving incomes in the lobster fishery, was introduced in New Brunswick and Nova Scotia, similar to an earlier successful program in Prince Edward Island.

In the Pacific Region, a comprehensive proposal for a licensing and fee system for the coastal fisheries of British Columbia was published and distributed to members of the fishing industry for their comments.

The multi-million dollar Salmonid Enhancement Program, designed to double production of salmon and sea-run trout in British Columbia by 1990, entered its second full year of operation, with enhancement facilities producing some 274 million juvenile salmon during 1978. A federal-provincial agreement formalizing the Salmonid Enhancement Program was signed by the federal government and the Province of British Columbia on March 1, 1979.

At the close of the fiscal year negotiations were continuing with the United States to resolve disputed boundary lines on east and west coasts resulting from the extended fishing jurisdictions of both countries to 200 miles.

In the Canadian Hydrographic Service, where 14 new or reconstructed navigation charts and 92 new editions were produced during the year, attention was focused on improving surveying techniques in ice-covered waters of the Canadian Arctic. Highlights of the oceanographic research of the Ocean and Aquatic Science sector included a major study of Labrador Sea currents, development of a computer-based integrated navigation system known as BIONAV, participation in the data buoy program of an international weather study, and various investigations in the Arctic related to oil and gas exploration. The new $21.7 million Institute of Ocean Sciences at Patricia Bay, B.C., was officially opened by Governor General Edward Schreyer at the end of February 1979.

On April 24, 1978 the Atmospheric Environment Service (AES), through reorganization, integrated the climate-related activities at its Downsview location by forming the Canadian Climate Centre (CCC). The centre was created in response to growing concern about the impact of climate change and variability upon food production, energy supply and demand, water resources, land use and concerns of society. On November 23, 1978 the Department of the Environment approved the Canadian Climate Program, a national program coordinating all climate-related activities in Canada, in support of the World Climate Program. The Canadian Forestry Service, Inland Waters Directorate and Ocean and Aquatic Sciences cooperated with AES to formulate the program and will continue to be active in its development. The CCC performs as the secretariat for the Canadian Climate Program and provides the focus for development, integration and coordination of climate activities in Canada.

A principal activity of AES during the year was a study of atmospheric sulfur in a three million square kilometre area in eastern Canada, including the Maritimes and large portions of Quebec and Ontario. Studies of acidic precipitation, data supplied by the Canadian Network for Sampling Precipitation (CANSAP), and a new Air-Precipitation Network indicated a high frequency of acid rain or snow.

Exploratory discussions took place between the United States and Canada on a possible agreement to resolve the problem of acid rain.

Investigations of the effects on the stratosphere of freons (chlorofluoromethanes) and exhaust emissions from supersonic transports were conducted in cooperation with the National Aeronautical and Space Administration. A World Meteorological Organization (WMO) Symposium on the Geophysical Aspects and Consequences of Changes in the Composition of the Stratosphere, hosted by AES and York University, was held at York University, Toronto, from June 26 to 30, 1978.

After a period of intensive planning, the field phase of the First GARP Global Experiment (FGGE) of the Global Atmospheric Research Program was launched on December 1, 1978. Canada's contribution consisted of the provision of 80 drifting buoys to measure surface pressure and temperature over the data-sparse southern oceans; coordinating the overall buoy program; seconding a scientist from Ocean and Aquatic Sciences to the Drifting Buoy Data Centre in Toulouse, France; and providing one ship (CSS Parizeau) for the Tropical Wind and Oceanographic Program.

The Ice Branch of AES initiated direct facsimile transmissions from reconnaissance aircraft to Ice Forecasting Central via the Department of Communications receiving station at Almonte, Ontario, and introduced satellite relay of ice data from Ottawa to Resolute and Frobisher Bay transmitting stations.

A severe weather advisory program was initiated in Quebec and Manitoba. New Weatheradio Canada stations were opened in Toronto and Halifax to broadcast weather warnings directly to the public.

In response to the government's policy of restraint, the Canadian Forestry Service instituted several major organizational changes. The Eastern and Western Forest Products Laboratories became FORINTEK Canada Corporation on April 1, 1979, after eight months of preparation for the transfer by CFS staff. A non-profit corporation, FORINTEK is jointly funded by federal and provincial governments and the private sector. A $4.6 million contribution by the federal government ensures continuation of programs which are a clear federal responsibility, e.g., codes and standards. FORINTEK carries out research into all phases of wood processing, with specialists in wood science, physics, chemistry, pathology, entomology, engineering and microbiology.

An amalgamation of three of the National Forestry Institutes took place to effect administrative savings of $1.6 million per year. The Petawawa National Forestry Institute came into being on April 1, 1979, combining elements of the Forest Management Institute and the Forest Fire Research Institute, previously located in Ottawa, and the Petawawa Forest Experiment Station. Areas of research for the new institute include fire management, tree improvement, national statistics, forest appraisal, energy from the forest and public awareness.

In April 1978, a new contract for a research, development and demonstration program known as Energy from the Forest (ENFOR) was inaugurated. Its objective is to establish the basis for replacement of fossil fuels and petrochemical feedstocks by forest biomass in an amount equivalent to 8 percent of Canada's primary energy demand. The program comprises two organizational segments: biomass production dealing with matters related to raw material supply; and biomass conversion, which is concerned with transformation of forest biomass into energy, prepared fuels or energy-intensive chemicals.

A revised Great Lakes Water Quality Agreement was negotiated and was signed by Canada's Secretary of State for External Affairs and the United States Secretary of State in November 1978. The new agreement reflects a number of major changes to the 1972 agreement. Provisions to largely eliminate discharge of toxic substances into the Great Lakes and to establish warning systems to prevent future toxic substances causing problems have been incorporated. New interim phosphorus loading targets are defined for each lake, along with new and revised water quality objectives for the Great Lakes. New final deadlines have been set by which municipal (December 31, 1982) and industrial (December 31, 1983) pollution control programs are to be completed and operating. Provisions have also been made for dealing with the increasingly important problems of pollution from land use activities and airborne pollutants. In addition, monitoring and surveillance requirements have been revised to better assess the effectiveness of control programs.

The spread of aquatic vegetation in Canadian inland waters is a growing concern. The Department of the Environment initiated a program to undertake research into long-term aquatic weed control based on ecological control methods. Nearly one million dollars was provided to the private sector through the unsolicited proposals program of the federal government for research into control of aquatic

weeds by both mechanical and chemical means, and into the potential for an economic return on mechanical harvesting costs by use of harvested weeds as an ingredient in animal feed and compost.

The Canadian Wildlife Service designated two important new National Wildlife Areas: Prince Edward Point in eastern Lake Ontario and Long Point in Lake Erie. Long Point represented the first major donation of land to the Government of Canada under the 1973 Canadian Wildlife Act. The land had been owned and managed by the Long Point Company since 1866. Management of this unusual and fragile piece of Canada's natural heritage will be a major challenge in the years to come.

Canada and the U.S. signed a protocol to the Migratory Birds Convention of 1916. The protocol, once ratified, will allow Canada to amend the Migratory Birds Convention Act and establish regulations that will permit status Indians and Inuit to take migratory birds for their own nutritional or other essential needs at periods outside the present hunting season.

Canada and the Government of British Columbia signed a five-year agreement to purchase about 600 acres of important waterfowl overwintering and salmon-rearing habitat in the Fraser River delta at a projected total cost of $2 600 000.

The Canadian Wildlife Service reported that the level of reproductive success of the herring gull in the Great Lakes returned to normal, after several years of being suppressed, at all 10 of the colonies which are being monitored for levels of toxic substances accumulating in tissues.

The Environmental Protection Service initiated a major review to clarify and define the federal role in a manner that is consistent with federal constitutional authority and that avoids duplication of government services. The new federal strategy, developed in close consultation with provincial governments, will serve as the basis for consultation in each of the provincial capitals early in the next fiscal year.

On December 13, 1978, an order adding Mirex to the Schedule of the Environmental Contaminants Act and a regulation on Mirex were published in Part II of the Canada Gazette. Amended regulations under the Clean Air Act were published in Part I of the Canada Gazette for emissions of vinyl chloride from vinyl chloride and polyvinyl chloride manufacturing operations. National emissions guidelines

for packaged incinerators were published in the Canada Gazette.

A comprehensive inventory of the sources and emissions of sulfur oxides in Canada, both natural and man-made, was completed, and a DPAT project on the evaluation of remote sensing techniques for measurement of sulfur dioxide emissions from large point sources was completed.

History and Responsibilities of the Department

Canada's Department of the Environment came into being in 1971, following the Government Organization Act of 1970. Its creation brought together in one department the responsibility for environmental quality and for protection, enhancement and promotion of the wise use of renewable resources.

The department's initial response to the challenge of protecting the environment was to establish standards to curb and control pollution. With better understanding of the relationship between resources, energy, technology and population, emphasis was placed on anticipating problems stemming from the impact of human activities on the environment, and on integrating resource and environmental management with Canada's development.

To carry out these responsibilities the department undertakes three major programs: the Fisheries and Marine Program, the Environmental Services Program and the Administration Program.

The Federal Environmental Assessment Review Office (FEARO) reports directly to the minister of the environment. It administers the federal Environmental Assessment and Review Process (EARP) which was established in 1973. Under EARP, all federal government activities must be examined for environmental effects. Activities with potentially significant adverse environmental effects must be referred by the initiating federal agency to FEARO for a formal review by an Environment Assessment Panel, which reports its recommendations to the minister of the environment.

The Canadian Forestry Advisory Council provides the minister with independent advice on forestry priorities and the effectiveness of departmental programs in meeting those priorities. The council was set up with the view that the federal government's forestry programs would benefit from regular policy guidance from outside government service.

The Canadian Environmental Advisory Council was established in 1972 to advise the minister on the state of the environment and on threats to it; on priorities for environmental action by the federal government or by the federal government and the provinces; and on the effectiveness of departmental activities in restoring, preserving and enhancing the quality of the environment. The council is composed of up to 16 members and members-at-large drawn from a wide cross-section of Canadian life. To carry out its functions, the council reviews environmental matters, and prepares statements and reports on the state of the environment in Canada.

In 1974, a minister of state for fisheries was appointed to help carry out the responsibilities that the minister of the environment has for the fisheries of Canada. The minister of state for fisheries was given both fisheries and environment portfolios in 1976, and the department became known as the Department of Fisheries and the Environment (DFE). With extension of Canadian fisheries jurisdiction to 200 miles on January 1, 1977, the minister's responsibilities greatly increased. A minister of state for the environment was appointed in late 1977, to be responsible for the environment component of the department.

In September 1977, the decision was made to create a separate Department of Fisheries and Oceans from the Department of the Environment. The decision took effect on April 2, 1979. In the intervening period, the department undertook a thorough review of the federal environmental mandate and of its role. The outcome of that review was a mandate for the Department of the Environment in which responsibilities are related to the theme of protection and wise use of the natural resources that compose our physical environment.

Fisheries and Marine Program

The mandate of the Fisheries and Marine Service includes a broad range of responsibilities related to the aquatic environment and the living resources of ocean and inland waters.

Included in these activities are management and development of Canada's fisheries; hydrographic surveying and charting of navigable coastal and inland waters; administration of small craft harbors; fisheries and oceanographic research contributing to the optimum use of aquatic renewable resources and their environment; environmental impact studies affecting coastal and inland waters; and research in support of international agreements relating to fisheries management and the quality of marine and freshwater environments.

Operations of the Fisheries and Marine Service are grouped under two major divisions--Fisheries, and Ocean and Aquatic Sciences--which operate in conjunction with the International Directorate and other policy and liaison groups at headquarters in Ottawa.

Environmental Services Program

The Environmental Services Program is carried out by the Atmospheric Environment Service, the Environmental Management Service and the Environmental Protection Service.

Atmospheric Environment Service

The Atmospheric Environment Service (AES) provides data and information on weather, climate, ice and sea-state conditions, and advice and consultation on the use and application of these data, in support of the safety of life and property and the day-to-day planning and activities of the Canadian public. In addition, meteorological information and services are provided on a priority basis to meet the transportation and military requirements of the Ministry of Transport and the Department of National Defence. AES conducts research and development on atmospheric processes, weather forecasting and observing systems, climate, air quality and other atmospheric environmental problems.

Environmental Management Service

The Environmental Management Service (EMS) was formed in 1973 by the amalgamation of the Canadian Forestry Service, the Canadian Wildlife Service, the Inland Waters Directorate and the Lands Directorate.

The Canadian Forestry Service conducts research to provide a scientific basis for federal policies affecting forestry and to help the provinces and industry improve forest management practices. It measures the environmental effects of forestry practices and assesses the effects of human activities on the forests.

The Canadian Wildlife Service is responsible for the protection and management of migratory birds through research, surveys, development of regulations, and habitat management. With the provinces and other agencies the service undertakes cooperative wildlife programs of research, management and interpretation. It also provides advice to other federal agencies and to territorial and provincial agencies.

The Inland Waters Directorate plans and participates in national and international water management programs, and conducts research on the quantity and quality of inland waters. Major concerns of the directorate include a flood damage reduction program, development of federal policy on inland waters, coordination of Canada's responses to boundary water problems, river basin planning with the provinces, and the research programs of the National Water Research Institute (formerly the Canada Centre for Inland Waters), and the National Hydrology Research Institute.

The Lands Directorate provides information on the ecology, capability and use of land. It operates mapping programs in support of federal and provincial resource management and environmental quality objectives, and conducts land classification and land use research.

Environmental Protection Service

The Environmental Protection Service (EPS) was formed to ensure that the federal government's responsibilities respecting the protection of the environment are carried out in a manner consistent with national policy and, where necessary, enforced under appropriate legislation and circumstances. EPS is concerned with air pollution, water pollution, waste management including resource and energy conservation, contaminants, environmental impact assessment and control, and environmental emergencies. As the control arm of Environment Canada, EPS is the focal point for contact and liaison on environmental protection matters with industry and with corresponding agencies of the provincial governments. It also acts as a focal point on environmental protection matters with departments and agencies of the federal government and as a point of contact for the public.

Administration Program

The Finance and Administration Service ensures that the legislative, regulatory and other administrative requirements of Parliament and the central agencies are met within the Department of the Environment.

In the fall of 1978, the Policy, Planning and Evaluation Directorate, with the Liaison and Coordination Directorate and most of the staff in the Office of the Science Advisor, were merged to form the new Corporate Planning Group under the direct authority of the senior assistant deputy minister. The new group was given special responsibility for departmental planning, evaluation, policy development and intergovernmental affairs and for certain formal, corporate relations with other departments.

The Information Directorate provides integrated, centralized support to the department's information programs. Information plans are carried out through a project coordination group working with creative specialists who write, edit, design and produce publications, films and exhibits. A separate unit is responsible for departmental media relations.

Fisheries and Marine Program

Fisheries and Marine Service

The Fisheries and Marine Service (FMS) is responsible for activities that include fisheries research, fisheries development and overall management of fishing operations on both coasts and in certain inland waters; oceanographic research and data collection; hydrographic surveying and charting; and the administration of small craft harbors throughout Canada.

FMS is divided into two main components: Fisheries, and Ocean and Aquatic Sciences. Activities consolidated under Fisheries include resource management and conservation; enforcement of fisheries regulations, including operation of a major ocean patrol fleet; industrial development of the fisheries; fish inspection; marketing and promotion; biological and technical research on fish and other aquatic fauna; economic planning and management; and international fisheries matters.

Activities consolidated under Ocean and Aquatic Sciences include physical and chemical oceanographic research; biological research on the quality of the marine environment; environmental assessments of activities affecting freshwater and marine life; marine geophysical mapping; operation of a fleet of research and survey vessels; hydrographic surveying; tide and water level measurement; and production of navigational, bathymetric and other charts of Canadian coastal and inland waters.

Fisheries

In the area of resource research and development, staff in most regions were engaged in assessment of fish stocks to provide management with recommendations on total allowable catches, including monitoring foreign fishing effort and obtaining biological information.

The potential use of bio-economic modelling to provide fisheries management advice was given considerable study, as were sophisticated models and acoustical survey techniques to assist in stock assessment.

At headquarters, staff took part in a number of departmental task forces, including a program submission on the economic development of Canada's offshore fisheries and development of an ocean information system. They also participated in the work of the Canadian Atlantic Fisheries Scientific Advisory Committee (CAFSAC), the International Council for the Exploration of the Seas, and scientific meetings of the International Commission for the Northwest Atlantic Fisheries (ICNAF), and its successor, the Northwest Atlantic Fisheries Organization (NAFO).

Staff members also served as scientific advisers on Canadian delegations to a number of international fisheries commissions and as commissioners to the Inter-American Tropical Tuna Commission and the International Whaling Commission. Advice was provided to such groups as the Canadian International Development Agency (CIDA) and the Food and Agricultural Organization (FAO) of the United Nations.

Reports showed that Canadian Fish Health Protection Regulations, administered by the department, are having an effect in controlling fish transfers and the spread of disease. Imports of fingerlings dropped by 57.5 per cent between 1972 (pre-regulation) and 1979 (post-regulation), while interprovincial shipments of eggs and fingerlings dropped by more than 90 per cent over the same period. No disease outbreaks in Canada were attributed to egg or fish shipments in 1978.

Highlights of Newfoundland Region activities were the planning of and participation in the International Flemish Cap Experiment--a multi-disciplinary study of an ocean system, studies on cod-capelin interaction, and tagging of cod in northern waters. The preliminary draft of a definitive work on freshwater/anadromous fish distribution was completed. Further data from the Fraser River counting fence and the Nain commercial fishery, in addition to a successful marine tagging program, brought development of a national management scheme for Labrador char closer to reality.

In the Maritimes, all major fish stocks were assessed at least once and progress was made in development of ichthyoplankton surveys to detect and model interactions and stock recruitment relationships. Other work included patch study methodology (intensive study of small areas), a study of cod-mackerel interactions in the Gulf of St. Lawrence, and a controlled escapement for gaspereau on the St. John River at Mactaquac, New Brunswick. Special attention was paid to the Bay of Fundy herring fishery, and telemetric and physiological studies were carried out on bluefin tuna in impoundments. Large-scale tagging studies of grey seals on Sable Island were also conducted.

A newly-formed section in Quebec Region was active in herring research, including tagging, in the Gulf of St. Lawrence. Arctic programs were continued, and extensive use was made of the new Frobisher Bay laboratory. Final reports were prepared on the distribution of whales in Lancaster Sound, and on the ringed seal breeding habitat and population studies for the Arctic Islands pipeline

program. Aerial surveys of beluga whale populations in Cumberland Sound and of bowhead whales in the western Arctic were carried out.

In the Western Region, preliminary analysis was completed of data from five years of intensive study on stock assessment and associated biology of Arctic char in Nauyuk Lake. National reviews of environmental impact studies for Davis Strait, Lancaster Sound and MacKenzie River dredging were undertaken, and a proposed Slave River hydro scheme was reviewed. A three-year Beaufort Sea/Mackenzie Delta study, and studies on the five Liard River tributaries to determine fish passage requirements in connection with the Liard Highway, were initiated. Fisheries study needs for the Slave River delta (Mackenzie River Basin Study) were identified.

Commercial, sports and domestic fisheries in Great Bear and Great Slave lakes, Keewatin, Victoria Island, Coppermine, Holman Island and the Hay River and Yellowknife areas were monitored and assessed. The data will be used to amend the N.W.T. fishery regulations. Effects of methane on a northern lake environment and on Arctic char swimming performance were assessed at the northern field camp at Saqvaqjuac.

In the Pacific Region, scientific and technical activity was expanded to support increased research and management responsibilities within the 200-mile zone. Highlights included a review of existing information and an assessment of the knowledge still required to manage coastal chinook salmon stocks effectively; a breakthrough in the technique for groundfish (hake or rockfish) stock assessment; and provision of information for management of the lucrative herring roe fishery.

Other research focused on the impact of the new coastal abalone fishery, studies to increase salmon production in hatcheries and development of high quality diets for hatchery-reared stock. The lake enrichment program, under which lakes are fertilized to stimulate growth of organisms on which salmon feed, was expanded to six lakes, with evaluation of 10 additional lakes completed. Progress was also made in endocrinology where controlled reproduction techniques were used to increase hatchery production, reduce pre-spawning adult mortality and increase egg production.

A series of federal-provincial meetings was initiated to ensure consistent national implementation of the recently-amended habitat protection provisions of the Fisheries Act. A report entitled "Fish Habitat Management

in Shore Zones" was produced for the Canadian Council of Resource and Environment Ministers (CCREM) Symposium on Shore Management.

Information that became available during the year showed that the problem of acid rain (precipitation polluted by atmospheric contaminants) was severe and widespread throughout eastern Canada. Work was started on a high-priority program to predict the effects of acid rain and identify remedial measures.

Domestic fisheries saw development and implementation of the 1978 Atlantic Groundfish Management Plan. The plan is designed to share the groundfish resource fairly among the various components of the fishing fleet, allow it to rebuild, and make the most of the benefits from this resource.

The Atlantic groundfishery, which had experienced serious difficulties since 1974, had recovered sufficiently to allow federal government assistance under the Temporary Assistance Program to be terminated in November 1978.

The lobster fishery was the object of two important management measures: a buy-back program aimed at stabilizing and improving incomes was introduced in New Brunswick and Nova Scotia; and an enforcement program aimed at reducing the level of poaching, using fishermen as special wardens, met with considerable success in Prince Edward Island.

The department's licensing policy was reviewed by a ministerial task force chaired by a consultant and staffed by senior departmental officials, and recommendations were made for improving the licensing system.

A foreign licensing fee system resulted in $5.38 million in revenue for Canada from foreign fisheries during calendar year 1978, including fees collected in the Canadian observer program during the year. A combination of observers and inspectors monitored the 758 foreign licences, keeping infractions to a minimum and providing scientific and statistical data used in fishing plan discussions for 1979. Under a new commensurate benefits program, catch allocations were made according to foreign marketing options received.

In an experimental hake fishery in the Pacific Region, four million pounds of fish, valued at $243 000, were offloaded under the terms of a joint fishery venture agreement with Poland. Under the agreement, fish caught by Canadian trawlers were processed by Polish factory trawlers. Three new limited entry licences were

implemented in the Pacific Region for groundfish, shrimp and abalone.

Inspection officers throughout Canada ensured that domestically-produced fishery products, valued at $1.5 billion, complied with quality, packaging, labelling and safety requirements. Products were inspected aboard vessels, at landing sites, on transport vehicles, in holding rooms, in processing areas and in storage. Some 840 registered fish processing plants were inspected to ensure that they met construction, equipment and operating requirements. Approximately 20 000 vessel and landed quality inspections, 3000 transport vehicle inspections, 3600 construction and equipment surveys and 200 000 operational and product inspections were carried out. In addition, 20 000 samples were taken, resulting in 130 000 evaluations in the laboratory.

Imported fishery products valued at $250 million were also inspected for compliance with regulations. Approximately 12 000 inspections were conducted at importing facilities, nearly 20 000 samples were taken, and 60 000 laboratory evaluations were made.

Approximately 160 complaints were investigated by field personnel; 700 complaints, on imports and domestic products, were evaluated in the laboratory. The result of these evaluations was that unsafe, mislabelled or poor-quality products were prevented from reaching the consumer approximately 500 times in the case of domestic products, and 900 times in the case of imported products.

The trend in technological research and development was for closer orientation to the needs of the primary fishing industry. The Atlantic Fisheries Development Program included fish handling systems in all the Atlantic provinces, fish chilling assistance, and technological innovation to assist in industry development.

Atlantic coast projects included demonstrations of the Norwegian system of automated longlining, Scottish seining, selective shrimp trawls and other gear innovations. Frozen storage deterioration and methods of control in non-traditional species such as mackerel, squid, argentines, silver hake and grenadier were investigated. Projects completed for the processing industry included demonstrations of the effectiveness of hypobaric storage, and use of EDTA (ethylene-diamine-tetra-acetate) to extend the shelf life of fresh fish. The program sponsored by the Ministry of State for Science and Technology for the processing, distribution and retailing sectors of the Canadian food industry was used to support projects dealing

with parasite detection and removal, and the use of chitosan, obtained from crustacean waste, to treat pulp mill effluents.

Investigations continued in the Pacific Region on freezing and chilling systems for vessels and on fish transfer systems. Evaluations were conducted on the quality of rockfish, arrowtooth flounder and Pacific hake; storage problems of shrimp in chilled seawater and excessive softness in blackcod were investigated. Practical information was provided to improve quality and yield in the roe herring fishery.

Whitefish roe production on a substantial scale was supervised in Alberta, Saskatchewan, Manitoba and the N.W.T., resulting in the establishment of a caviar industry in western Canada. Demonstrations of a mobile blast freezer continued in the Western Region.

The field work component of a worldwide fisheries marketing study, involving government and industry, was completed. The purpose of the study was to identify market opportunities for Canadian fishery products up to 1985, taking into account the worldwide extension of fisheries jurisdictions and shifts in global supply and demand.

The month of November was proclaimed Canadian Fish and Seafood Month. This promotional campaign, carried out in close cooperation with the Canadian retail food industry, was aimed at increasing fish consumption in the domestic market. The program is believed to have contributed significantly to the .5 kg increase in per capita domestic seafood consumption in 1978.

The Fisheries Food Centre continued to promote Canadian fishery products domestically and internationally by means of exhibits, demonstrations and sales missions. Notable among these were major missions to Japan, and to Atlanta, Boston and New York in the U.S. market.

A detailed investigation was made of the developments in eastern Canadian reefer container traffic and their significance for exporters of fisheries products, as part of an interdepartmental study on transportation and handling of perishable foods.

The first fish catch insurance program in Canada was introduced during the year, in the unpredictable Bay of Fundy herring weir fishery.

Responsibility for administration of the Fisheries Improvement Loans Act was transferred from the minister of finance to the department in June 1978. This legislation makes available short- and intermediate-term credit for the development of primary fishing enterprises. During

calendar year 1978, 1369 loans totalling $29.3 million were registered under the program.

Staff provided management and support services to the Fisheries Prices Support Board for the development of price stabilization programs designed to protect fishermen against sharp declines in prices, and consequent loss of income, due to causes beyond their control. Assistance programs, plus the purchase of fishery products for international food aid and development programs, required expenditures in excess of $1 million.

The department's Fishing Vessel Insurance Plan provided insurance to 7556 commercial fishing vessels for a total insured value of $156 402 597. The plan showed a surplus of more than $2 million, exclusive of administrative expenses. Some 368 claims, with a value of $3 326 655, were settled during the fiscal year.

The fishing vessel subsidy program, operated under the Fishing Vessel Assistance Regulations of the Fisheries Development Act, provided assistance to fishermen for construction of vessels according to approved criteria. During the year nearly $11 million was paid in subsidies to fishermen for construction of more than 650 commercial fishing vessels.

Resource recovery and improved markets were reflected in the large increase in applications for Development Incentive Grants from firms wishing to expand or build new fish processing facilities, particularly in the Atlantic provinces. For the same reasons, foreign-owned firms showed greater interest in establishing bases for operation in Canada. The Industry Policy Group continued to work in close liaison with DREE and the Foreign Investment Review Agency to address major policy issues and provide reports on specific cases. Support was also provided to the Canadian Saltfish Corporation.

Ocean and Aquatic Sciences

Ocean and Aquatic Sciences (OAS) conducts and coordinates research programs that contribute to the management and development of renewable and non-renewable ocean resources. It is also responsible for the planning and implementation of a national program of hydrographic surveying and charting of navigable coastal and inland waters under the direction of the Canadian Hydrographic Service (CHS).

Headquarters elements of OAS comprise policy coordination and review groups; the Marine Sciences and Information Directorate; and policy, coordination and

production units of CHS. Field programs are carried out from regional offices based at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, the National Water Research Institute, Burlington, Ontario, the Institute of Ocean Sciences at Patricia Bay, British Columbia, and at Quebec City.

Marine Sciences and Information Directorate

Within the Marine Sciences and Information Directorate, the Ocean and Aquatic Science Affairs Branch coordinates activities affecting the national interest in ocean and aquatic sciences. In its role as administrator of the Ocean Dumping Control Act, the branch participated in intergovernmental meetings to place global controls on ocean dumping.

Surveillance satellite (SURSAT) experiments continued and program office staff were provided for both this and the search and rescue satellite (SARSAT) projects. Scientific support was given for a major study of ice conditions in Viscount Melville Sound.

Contributions were made to the Intergovernmental Oceanographic Commission (IOC) of UNESCO through its subsidiary bodies and in formulation of new policy initiatives. Canadian marine policy positions and concerns were coordinated for the NATO Committee on Challenges to Modern Society, the Marine Environmental Protection Committee of the Intergovernmental Maritime Consultative Organization (IMCO) and the International Council for the Exploration of the Seas.

The Marine Environmental Data Services Branch continued to acquire, store and disseminate oceanographic data to fulfill national and international commitments. In support of the Flemish Cap International Experiment and the First GARP Global Experiment (FGGE), the branch produced a number of data products for distribution to participating agencies, including vertical hydrographic section plots, and surface and bottom horizontal plots. For the southern ocean drifting buoy program, maps of buoy tracks and sea surface temperature data were produced every five days.

Canadian Hydrographic Service

1978-1979 saw intensified efforts to survey and chart arctic waters. At the international level, the first meeting of the United States/Canada Hydrographic Commission was held in April 1978. The meeting reinforced the program of cooperation between the Candian Hydrographic Service and the United States' National Ocean Survey in all border waters, particularly the Great Lakes. As a continuation of the aid program to developing countries, two hydrographers

were evaluating the possibility of charting the Niger River in Mali.

A grant from the Interdepartmental Committee on Energy Development for research on new techniques to ensure safety of tankers operating in the Arctic resulted in production of five helicopter-mounted spike transducers, which more than doubled the speed of sounding through ice. Promising results were attained in use of aerial photographs to interpret shallow water bathymetry, an area where through-the-ice techniques are of less value.

In other projects, solar energy devices to provide power to positioning systems in the Arctic were investigated, and a study of tidal propagation in the Arctic Islands was started. A staff officer was part of the Canadian delegation to the Law of the Sea sessions and assisted in negotiations with the U.S., France and Denmark on extension of maritime boundaries.

Fourteen new or reconstructed charts, 92 new editions and 105 reprints were issued. The charts of Lake Superior were overprinted with fisheries statistical areas for the Province of Ontario and two vessel traffic management charts were produced for the Department of Transport. Two volumes of sailing directions and two small craft guides in English were revised, while other publications included two books of sailing directions and one small-craft guide in French, and the six-volume Canadian Tide and Current Tables for 1979.

Three sheets were published of the fifth edition of the General Bathymetric Chart of the Oceans, which is being drawn and printed by CHS on behalf of the International Hydrographic Organization and the Intergovernmental Oceanographic Commision, and six more are in preparation. Chart 914-A, showing the bathymetry of the Labrador Shelf and Sea, was issued incorporating data from the latest surveys, as were four complete sets of natural resource maps and an additional bathymetric sheet.

Regional OAS Activities

In the Atlantic region, the Atlantic Oceanographic Laboratory continued studies into oil seeps during a major cruise by CSS Hudson to Scott Inlet, off Baffin Island, and other Arctic locations. The objectives were to study potential seep areas, locate seep sources and determine the chemical nature and effect on marine life of the seep material.

A major physical oceanographic effort was devoted to the Labrador Sea Project, which has been under way since 1976. This included the placement of a series of current

measuring devices with which to evaluate the seasonal and year-to-year variations in the Labrador Current affecting the climate and fisheries of the area over a 10-year period.

An extensive experiment at the edge of the Nova Scotia continental shelf, south of Halifax, enabled physical oceanographers, working with biologists, to measure the low-frequency dynamics at the shelf break and the water mixing and exchange processes which take place there.

In view of the fact that accurate and rapid position fixing at sea are crucial to successful oceanographic research, considerable work has been conducted on an integrated navigation system which would both improve accuracy and extend the system's capability, such as tracking a water mass. Developed over a period of two years, the computer-based system, known as BIONAV, was installed on CSS Hudson in March 1979, with excellent results.

During 1978, the Marine Ecology Laboratory (MEL) launched a program to provide information for the Fundy Tidal Power Environmental Impact Assessment as part of the research effort being conducted by various government agencies and universities to predict ecological effects of barrage construction.

Studies by MEL on the sublethal effects on fish of such contaminants as DDT, diphenyl ether and n-octanohydroxamic acid were continued. Research in St. George's Bay, Nova Scotia, which began as a small project on the life history and ecology of larval fish, was considerably expanded due to the encouraging oceanographic information collected. It is now a large cooperative effort between MEL and Dalhousie University with the goal of giving further insights into the structure and potential production of inshore fisheries.

Construction of new buildings at the Bedford Institute of Oceanography complex continued on schedule, allowing MEL staff to move into new laboratory and office facilities in the John Strickland Building.

Work was started on the mid-life refit of the 22-year-old CSS Baffin which had a successful season surveying the approaches to the Koksoak River in Ungava Bay. The chartered ship Martin Karlsen completed a survey of the Labrador Shelf and continued the coastal survey between Cape Harrison and Makkovik. CSS Maxwell surveyed the eastern approaches to Head Harbor Passage, New Brunswick, and St. Mary's Bay, Newfoundland, while the

MV Meta carried out revisory range and small harbor surveys in Nova Scotia and New Brunswick.

In the Pacific Region, the Institute of Ocean Sciences conducted ice-drift studies, tracking icebergs with radar in eastern Lancaster Sound and employing ice-drift buoys to follow pack ice movements in the southeastern Beaufort Sea.

Field projects of the Frozen Sea Research Group were directed towards the Dundas Island polynya study and an oceanographic investigation at the proposed liquid natural gas terminal at Bridport Inlet on Melville Island.

Studies of the dynamics of tidal interaction with sills in the coastal zones continued, and an extensive program to study the oceanography of the continental shelf and Alberni Inlet was started. Numerical models have been developed for studies of the internal Kelvin wave reflection in fjords and for hydraulic jumps in tidal flow over sills.

Contributions to international deep-sea research programs included a study of the Equatorial Undercurrent, an eastward-flowing subsurface oceanic "jet," as part of the First GARP Global Experiment; participation in the Coastal Oceanic Dynamics (COD) experiment off the east coast of Vancouver Island; and collection of data on sea surface temperature anomalies in the North Pacific as part of the Mixed Layer Experiment at Ocean Weather Station PAPA. Another study involved the use of satellite imagery to interpret sea surface temperature.

Following several years of development, a system of measuring turbulent mixing in ocean microstructure, from the Institute of Ocean Sciences' submersible Pisces IV, was used successfully in British Columbia coastal waters.

The Remote Sensing Section was involved in evaluation of the NASA oceanographic satellite SEASAT, surveys of chlorophyll concentrations in coastal waters and in joint ocean optics experiments with France, designed to help make possible chlorophyll mapping from satellites.

In the area of ocean ecology, three phases of the Pelagic Ecosystem Prediction Project were begun and benthic studies of the north arm of the Fraser River were completed. Early in 1979 the Institute of Ocean Sciences was host to the first International Symposium on Aquatic Oligochaete Biology, which attracted scientists from many parts of the world.

Work of ocean chemists included developing criteria for ocean disposal of dredged or sedimentary material, methylation of lead in Pacific coastal sediment and PCBs in sediment samples. The environmentally sensitive area of Kitimat and its harbor approaches were studied to establish

baseline levels of hydrocarbons and other contaminants. Other work included a NATO intercalibration study of sampling techniques for measuring the amount of mercury and other trace metals in sea water.

Studies to document the background carbon dioxide in the atmosphere over the ocean, and the capacity of the ocean to absorb increased carbon dioxide from fossil fuel burning continued. The air-sea exchange of carbon dioxide was also studied during the cruise of CSS Parizeau to the South Pacific in connection with the FGGE program.

With construction work fully completed, the Institute of Ocean Sciences complex was officially opened by the governor general on February 28, 1979.

MV Pandora II completed a hydrographic survey of Amundsen Gulf, using a new ram transducer which enabled the ship to make soundings in heavy seas. CSS Parizeau carried out a major survey off the outer coast of the Queen Charlotte Islands, while CSS Richardson surveyed the inner part of Masset Inlet. Other work included surveys of Vancouver Harbor, including Roberts Bank and Boundary Bay, and the west channel of the Mackenzie River delta.

Central Region saw an increase in the Great Lakes biolimnology program in response to the revised Canada/United States Water Quality Agreement, signed in the fall of 1978. Studies were also begun on the effects of long-range transport of atmospheric pollutants on the aquatic ecosystem. Research by the Pollution from Land Use Activities Reference Group into the effects of land-use activities on the aquatic environment culminated in a final report and several technical reports.

The Research and Development Division undertook physical oceanography studies in the sub- and High Arctic (Chesterfield Inlet and Barrow Strait) and on shoreline processes on the Great Lakes. Although the current emphasis has been shifted to work in the Arctic, analysis continued on data previously collected in the St. Lawrence River, the Bay of Quinte, and James and Hudson bays.

Work undertaken by CHS included a survey of Hudson Bay to a five-mile line spacing, and surveys of Baker Lake, the Winnipeg River from Kenora to the Manitoba boundary, the south coast of Manitoulin Island and the west end of Lake Erie. The final phase of the limnogeological survey program in the Great Lakes was completed in southern Georgian Bay, while the offshore portion of Lake Superior was surveyed with one km line spacing. At the year-end, a through-the-ice survey of Wellington and Queen's channels and Penny Strait was nearing completion.

Oceanographic research in the Quebec Region concentrated on studies of the circulation in the St. Lawrence estuary and the mixing with water masses from the Saguenay River; the recycling of nutrients and primary production in the sublittoral zone; the distribution of trace metals; and the use of blue mussels as pollution indicators. Several of these projects were conducted jointly with universities in Quebec.

The Quebec Region of the Canadian Hydrographic Service completed its first full year of operating with one party surveying the Richelieu River and another revising all charts between Montreal and Quebec.

International Affairs

The International Directorate continued to play an important role in the United Nations Law of the Sea Conference, participating in work on fisheries, preservation of the marine environment, marine scientific research, and development and transfer of marine technology.

A short-term bilateral agreement was successfully negotiated with the European Economic Community following the pattern of earlier agreements, under which states recognize Canadian jurisdiction over fisheries within Canada's 200-mile limit. The issue of recognition of Canada's special interest beyond 200 miles was deferred for negotiation in the context of a long-term agreement. An important element of the agreement was the continuation, for 1978 and 1979, of the 1190 metric ton limit on salmon fishing off the coast of West Greenland, where approximately 40 percent of the salmon caught are of Canadian origin.

In cooperation with the Department of External Affairs, the directorate took a lead role in negotiations with the U.S.A. on fisheries and boundaries issues. These negotiations resulted in the signing of a number of related agreements affecting both coasts, which have been submitted to the two governments for ratification.

Work with 11 international fisheries commissions continued. Bilateral negotiations took place throughout the year with all states which conduct fisheries off the Canadian coast, concerning allocations and arrangements to ensure conservation of resources and other benefits to Canada. Negotiations with the U.S.A. toward a salmon interception agreement on the Pacific coast also advanced.

Implementation of the new NAFO Convention, designed to replace ICNAF, began with an inaugural and organizational meeting in Montreal in March 1979.

The directorate contributed to the work of the Legal Committee of IMCO which considered liability and compensation matters arising from the transportation of noxious and hazardous polluting substances. In work with OECD, considerable effort was devoted to international policies for the control of dumping and disposal of radioactive wastes in the ocean.

In bilateral relationships, the directorate was principally involved with China, Denmark, the Federal Republic of Germany, Portugal, Senegal, the U.S.A. and the U.S.S.R. Negotiations with the U.S.A. for a vessel traffic management scheme for the Juan de Fuca region reached the final stages of agreement. The directorate also played an active role in the proposed revisions to Part XX of the Canada Shipping Act, relating to pollution from ships, liability and compensation.

Small Craft Harbors

The Small Craft Harbors Branch is responsible for the provision, maintenance, acquisition, development and administration of a national system of harbors in support of commercial fishing and recreational boating. This system includes approximately 2300 facilities, ranging from full-scale harbors to small jetties.

The new Fishing and Recreational Harbors Act, proclaimed on October 5, 1978, made provision for the replacement of wharfingers by trained harbor managers to supervise and manage harbor operations. These managers work closely with fishermen, local groups representing fishermen's interests, and recreational boaters to provide effective harbor management.

The program budget of $30 million was augmented by approximately $3 million in support of the Canada Works Program and by $9.2 million for projects under the Federal Labor Intensive Program.

Larger projects undertaken during the year included a commercial fishing harbor at Steveston, British Columbia, where 400 berths were completed of the 1000 planned for completion in 1981. In Quebec, approximately $375 000 was committed to the repair and improvement of harbor facilities at Ile d'Entrée. At Blue Beach, Newfoundland, work began on a three-year harbor development project, costing an estimated $1.9 million. Overall, approximately

90 percent of the program was committed to commercial fishing expenditures and the remainder to recreational boating projects, including approximately $500 000 for dredging to assist in the provision of marina facilities at Whitby, Ontario.

In January 1979, a detailed study of the long-term needs for harbors and associated facilities for commercial fisheries and recreational boaters was initiated. The study will form the basis of a five-year program for the progressive development of harbors to meet the changing needs of the fisheries of the 1980s, including those occurring as a result of the extension of Canada's fishing jurisdiction to 200 miles and the resource conservation practices of recent years.

Ships

The Fisheries and Oceans fleet consists of 22 major vessels more than 30 m in length, 239 vessels between 6 and 30 m and more than 500 small craft under 6 m. This is Canada's second largest civilian-manned fleet.

During the year the Lady Hammond, a 51 m stern trawler, began a five-year charter for fisheries research on the east coast, while the 58 m Pandora II was chartered for a second five-year period as the surface support vessel for the department's submersible Pisces IV and for hydrographic and oceanographic research surveys on the Pacific coast and in the western Arctic.

The second phase of the vessel acquisition strategy plan was implemented with the awarding of contracts for the construction of two 50 m fisheries research vessels for the east coast and one 37 m aluminum high-speed fisheries patrol vessel to replace the Howay on the west coast. Approval was given for the construction of a 62 m fisheries patrol vessel for the east coast.

Recreational Fisheries

A sportfishing survey conducted by provincial and federal sport fisheries agencies was nationally organized and coordinated by the Recreational Fisheries Branch. It showed that more than five million Canadians and a million anglers from other countries fished 72 million days and caught close to 190 million fish in Canada in 1975. The survey also showed that sportfishing is a $1.7 billion industry in Canada.

Federal-provincial agreement to conduct another nationally-coordinated survey in 1980 was reached in October at the biennial Canadian Sport Fisheries Conference in Fredericton. For the first time, all major sectors of Canada's sport fish industry were represented at the conference, as were representatives from the United States, France, Britain and Holland.

In addition to the 1975 survey results, publications released during the year included a survey of sportfishing in Nova Scotia and one on angling licence sales in Canada. Economic research and advisory services were continued.

Departmental Secretariat

A departmental secretariat was established in 1978 with responsibility for provincial and federal affairs, conference coordination, parliamentary relations, ministerial correspondence management, cabinet document and order-in-council appointment coordination and control.

The Provincial and Federal Affairs Branch coordinated the follow-up action resulting from the First Ministers' Conference held early in 1978, and acted as the department's focal point for enquiries with federal-provincial implications.

Federal-provincial cooperation and consultation on policies, programs and matters of mutual concern is facilitated through four federal-provincial fisheries committees (Atlantic, Ontario, Freshwater and British Columbia) at the deputy minister level.

Data Acquisition

Three automatic observing stations were commissioned during the year. Two of these stations were installed at existing manned sites, reducing the number of observers needed. At year end, 38 Meteorological Automatic Reporting Stations were in service in the network. Development was begun on a new generation of automatic observing stations. It is expected that these READAC stations (Remote Environmental Atmospheric Data Acquisition Concept) will make automatic meteorological observations possible for aviation and other networks.

The last of five Raytheon weather surveillance radar installations was installed at Trepassey, Newfoundland. This unit monitors precipitation intensity and movement within 200 miles and provides weather radar coverage for fishing vessels in areas southeast of Newfoundland. Four remaining SCEPTRE systems (System for Constant Elevation Precipitation Transmission and Recording) were delivered and connected with the Raytheon radar installations. The systems are designed to transmit radar data in real time from remote locations to forecast offices.

The marine data acquisition network recorded more than 98 000 weather observations during the year from approximately 300 ships recruited by AES in the voluntary marine weather acquisition program. These ships observe, record and transmit coded weather observations while on voyages on the Great Lakes, coastal waters or on the high seas.

The 33-station network measuring temperature, humidity, wind direction and speed from the earth's surface to an altitude of 30 km was reduced by one land-based station, with the closure of Isachsen station as an economy measure.

Five prototype Aerological Data Reduction Systems (ADRES), designed to perform computations of upper air data at aerological stations, were constructed by SED Systems of Saskatoon. The systems were installed and thoroughly tested at five locations.

A phased decommissioning program was begun for Ocean Weather Station PAPA in the northeast Pacific. The two weather ships were to be phased out by July 1, 1981, while a less costly observing system is installed.

Four new Arctic Aviation Weather Reporting Stations and four new Private Aviation Weather Reporting Stations were established in northern areas of Canada.

Weather Services

Weather data from the AES data acquisition network is the basis for national and regional forecasts, disseminated to a variety of users. Other meteorologically-related environmental services are provided for the private sector and departmental activities.

Requests for weather information from the general public, agriculture, forestry, recreation and tourism, transportation and industry increased by more than 9 percent. The number of weather briefings provided to media personnel, combined with live or taped broadcasts by AES personnel, increased by 30 percent.

The weather service system continued to exploit advances in scientific and computer technology. A new version of the Canadian numerical weather prediction model was used for national forecasts; preliminary results indicated significantly improved performance. Computer facilities for regional forecasts were upgraded. Development of computerized routines and procedures continued, increasing efficiency and eliminating the majority of paper files.

To provide more advanced warning of summer storms, a severe weather advisory program was initiated in Quebec and Manitoba. The program was to be expanded to the Alberta and Ontario forecast offices for the summer of 1979.

Special attention was given during the year to better distribution of weather information. To send weather data and warnings directly to the general public and to special user groups, new Weatheradio Canada broadcast stations were opened in Toronto and in Halifax. Arrangements were made to expand distribution of weather information to cable television companies in three provinces, and automatic telephone answering devices were established in two more AES forecast centres.

Special weather forecasts and services were provided by AES to Canadian Marine Drilling and Imperial Oil in support of oil and gas exploration activities in the Beaufort Sea; to Transport Canada in support of salvage operations from the tanker spill off Cape Breton Island; to media personnel concerned with atmospheric winds during the Harrisburg nuclear contamination accident; to Operation Lorex 79 in support of research activities in the North Pole region; and to the surveillance satellite project (SURSAT), an experiment aimed at optimum use of satellite data.

The AES regions were heavily involved in analyses of weather-related activities which had impact on the environment, including the Alaskan Highway Gas Pipeline, the Roberts Bank superport expansion, east coast and

eastern Arctic offshore drilling proposals, air pollution studies, and the Point Lepreau nuclear power plant study.

Meteorological Services Research

Progress was made in development of computerized weather prediction aids that will help meteorologists to prepare routine public and aviation forecasts. A new regional scale numerical prediction model was used successfully during the summer to aid weather and ice forecasting for Beaufort Sea drilling operations.

In cooperation with the private sector, a method was developed for predicting the motion of oil slicks. Computerized and manual procedures were prepared to enable meteorologists to respond quickly to forecast requirements in oilspill emergencies. AES scientists participated in international conferences that dealt with this relatively new area of research.

AES staff members participated in the assessment of environmental impact statements prepared for companies wishing to explore for oil off the Labrador coast and in the eastern Arctic.

A computer snowsquall model was developed to help forecast the sometimes large snowfalls that occur in the lee of the Great Lakes.

Meteorological Services Research Branch helped Field Services Directorate and the Regional Weather Centres to design computerized systems to support regional weather forecast systems. A team was established to prepare a program that will automatically verify airport terminal forecasts.

The Aerospace Meteorology Division continued to develop advanced systems allowing AES to more effectively exploit opportunities provided by meteorological satellites. The Satellite Data Laboratory facilities provided real-time access to satellite data at weather and ice forecast offices across the country.

The wind engineering research program provided support to a wide variety of government agencies and, in cooperation with the private sector, investigated meteorological aspects of harnessing wind energy.

Canadian Climate Centre

The Canadian Climate Centre (CCC) was formed on April 24, 1978, in response to growing concern about the impact of climate on food production, energy supply and demand, water

resources, land use and other concerns. All climate-related activities at AES Downsview were integrated into the centre. Formation of the CCC was strongly supported by the other services within the Department of the Environment.

The CCC is organized into six divisions, to undertake research, data management, information services, applications, impacts, monitoring and prediction. The four divisions in the Climatological Applications Branch were transferred directly from the Central Services Directorate, and the Numerical Modelling Division was transferred from the Research Directorate. The Monitoring and Prediction Division was created at the time of CCC's formation to monitor climatic anomalies and their impact, and to develop long-range climate prediction techniques.

A Climate Program Office was formed to develop, integrate and coordinate climate programs. It coordinates the Canadian Climate Program (CCP), officially approved by the Department of the Environment in November 1978. The CCC was designated lead agency for this program, developed to coordinate all climate-related activities in Canada and to support the developing World Climate Program.

Demand from both public and private sectors for climatological services continued to increase in 1978-1979, with renewable energy resources, northern development and climate monitoring receiving the most attention.

In the renewable energy field, work was done to further improve the data base for estimating solar radiation and wind potential data over Canada. Studies of the relationship between solar energy and the demand for heating energy were begun.

In support of northern development and arctic transportation, both of key interest to the Canadian economy, the CCC undertook several studies including the climate of the Beaufort Sea and wind conditions in Barrow Strait. The second volume of Climate of Canadian Arctic Islands and Adjacent Waters was completed.

In response to public enquiries on Canadian climate and its impact, the Monitoring Division of the CCC began to issue Climatic Perspectives, a weekly publication providing charts and a narrative of the week's weather, its variation and impact. Climatological Services continued to produce and distribute the Monthly Record, and dealt with more than 11 000 requests for climatological information.

AES maintained its support of the CIDA Colombian Flood Forecast Project. The service has provided hydrometeorological training to eight Colombian scientists,

which has helped Colombia to begin its own national hydrology service. AES continued its involvement in the international hydrometeorology project in the St. John River Basin. The Climate Centre participated in the design of several national hydrology projects.

Several computerized climate models were developed or refined to improve climate prediction and to help assess the impact of human activity on climate, including the effect of increased levels of carbon dioxide in the atmosphere resulting from increased combustion of fossil fuels.

The Handbook on Agricultural and Forest Meteorology was completed, permitting user groups to assess the effects of climate. A study of the impact of climatic variability on agriculture and forestry was continuing.

Other projects completed or under way during the year included a recreation-climate study of Nahanni National Park, an impact study of climate change for the Province of Ontario, and preparation of climatic maps for the National Atlas of Canada produced by the Department of Energy, Mines and Resources.

Computing Centre

The Computing Centre concentrated its efforts on converting the climatological archive to metric units in a new easy-to-use format. By the year-end, conversion was nearly complete. The data could be retrieved and analyzed more quickly and at lower cost than in the past. The archive could be used by meteorologists and scientists directly without the assistance of computer specialists. In April 1979 the archive was to be turned over to the Canadian Climate Centre.

In August, a request for proposals was issued to industry for a new Downsview computer. With installation of the new computer, transformation of the Climatological Computing Centre into an internal computer service centre for AES will be complete.

Ice Services

Several improvements were made in ice services to users during the year. Highlights included initiation of direct transmissions from reconnaissance aircraft to Ice Forecasting Central via the Department of Communications receiving station at Almonte, Ontario; introduction of satellite relay of ice data from Ottawa through Resolute

and Frobisher Bay facsimile transmitting stations; and acquisition of an HP 1000 mini-computer for digitized ice forecasting operations.

The number of chartered flight hours of airborne reconnaissance decreased slightly to 2798 hours, although total reconnaissance activities remained at last year's level. Sideways Looking Airborne Radar (SLAR) on one aircraft proved particularly useful in the eastern Arctic during the summer months when there was extensive cloud coverage over marine areas, and during an arctic sortie in midwinter darkness. Two workshops for interpretation of SLAR imagery were held during the year.

During the winter, ice reconnaissance on the Great Lakes was undertaken from a Ministry of Transport aircraft rather than on commercially-operated platforms used in past years.

Ice Forecasting Central (IFC) continued its support of marine shipping, fisheries, and resource exploration activities, providing current ice charts, narrative reports and forecasts. Satellite data (NOAA and LANDSAT) from stations at Toronto, Edmonton, Prince Albert and Shoe Cove continued to be a major source of ice data. IFC also assisted in the Beaufort Sea drilling operation by training meteorologists at the Arctic Weather Centre, assigning a meteorologist to the Beaufort Weather Office at Tuktoyaktuk during the break-up period, and preparing specialized freeze-up and break-up forecasts. Training in interpreting ice charts and in effective use of broadcast ice information was also provided to Coast Guard personnel in Ottawa. Development of digital ice forecasting procedures to evaluate and upgrade the ice drift model currently in use was under way.

Routine ice climatological and advisory services were provided in response to requests from government and private sector users throughout the year. An additional 23 000 km of laser surface profile data were analyzed with the help of summer students. The development of a laser data analysis and data archival system was nearly complete.

Training

The AES Training Branch conducted courses in operational meteorology in both official languages for professional and technical personnel of DOE, the Ministry of Transport and other agencies. Nineteen employees on the educational leave program began first- or second-year graduate programs in meteorology. Professional development courses for

experienced meteorologists and meteorological technicians were presented in three program areas: operational meteorology, computer applications to forecasting and applied meteorology. More than 500 meteorologists and meteorological technicians were involved in formal courses, workshops and individual study programs.

Atmospheric Research

LRTAP

The Long-Range Transport of Airborne Pollutants Program (LRTAP) has been in operation since 1976. During 1978-1979, research continued in support of future regulation of transboundary pollutant transport.

A principal activity during the year was a study of atmospheric sulfur in a three million square kilometer area in eastern Canada, including the Maritimes and large portions of Quebec and Ontario. Studies of acidic precipitation, data supplied by the Canadian Network for Sampling Precipitation (CANSAP), and a new Air-Precipitation Network indicated a high frequency of acid rain or snow.

Clean Air and Environmental Contaminants Act Support Programs

The Proceedings of the Air Quality Criteria workshop were published in February 1979. Recommendations made at this workshop have resulted in a more unified and efficient approach to air quality criteria and standard-setting procedures.

A survey on mercury in the atmosphere was completed; instrumentation was developed and tested for measurement of background levels of mercury in the atmosphere.

Content analyses of lichens gathered at 45 sites in the North, in which 20 metals were assayed, were reported. A review of the effects of metal-loading in vegetation revealed that high concentrations of vanadium injure vegetation, an important finding in view of increased global levels of this element from increased fuel combustion.

An intensive background air quality assessment was carried out at Nanticoke, Ontario. Data collected were being used in the development of a model to describe diffusion of pollutants in the atmosphere near the shoreline.

A number of investigations were carried out to characterize the boundary layer under winter conditions. These included measurements of energy fluxes and vertical profiles of wind and temperature on Lake Simcoe; ocean heat-transfer processes over persistent open water areas

(polynya) in the Arctic Sea; and the formation and persistence of temperature inversions during clear, cold weather at Beaver Creek and Burwash Landing in the Yukon, along the route of the proposed Alaska-Canada pipeline.

The Monte Carlo-type numerical model was applied to provide numerical estimates of pesticide spray transport in connection with the Spruce Budworm Project in New Brunswick. Other models were developed to predict sulfur dioxide washout by rain, describe pollutant deposition over water, and predict modification of the planetary boundary layer by major topographical features.

Environmental Monitoring

Intensive use was made of remote sensing devices such as the Correlation Spectrometer (COSPEC), the laser radar (LIDAR) and the Acoustic Sounder in addition to other instruments such as the minisonde and portable boundary layer profiling tower. A multiwavelength sun photometer for measuring atmospheric turbidity received final testing prior to release for commercial manufacturing. A polar nephalometer capable of measuring light-scattering caused by suspended particles has been developed to aid in distinguishing particulate characteristics in polluted air over cities.

Three carbon dioxide and turbidity measurement sites were operated as part of the WMO background network in cooperation with Ocean and Aquatic Sciences.

Atmospheric Processes Research

In the area of stratospheric studies, investigations of the effects on the stratosphere of freons (chlorofluoromethanes) and exhaust emissions from supersonic airplanes were conducted in cooperation with the United States National Aeronautical and Space Administration.

A World Meteorological Organization Symposium on the Geophysical Aspects and Consequences of Changes in the Composition of the Stratosphere was held at York University, Toronto, from June 26 to 30, 1978. AES demonstrated the Canada-made Brewer Ozone Spectrophotometer at the symposium. This spectrophotometer was used on the CCS Parizeau as part of the FGGE (First GARP Global Experiment) project off Hawaii in December and January.

With the cooperation of the National Aeronautical Establishment, a rainfall enhancement experiment designed to investigate cumulus cloud-seeding techniques for forest fire suppression was conducted near Thunder Bay, Ontario, from June 19 to July 14, 1978. When 1977 and 1978 results were combined, it appeared that the cloud-seeding technique

used near Thunder Bay was not very successful, in contrast to experiments done near Yellowknife (1974, 1975) where rain fell from 40 per cent of the seeded clouds. It appears that the lifetimes of Thunder Bay clouds were too short for seeding to be effective and that the seeding technique chosen may only be suitable for specific areas in Canada.

Studies in radar meteorology have been made to increase the effectiveness of radar data communicated both to the forecast system and the public, including digital integration and transmission, dial-in services, and color TV display. Case studies incorporating radar and rain drop data were begun so that a stratified climatology of local rainstorm characteristics could be developed.

International Activities

After a period of intensive planning, the field phase of the First GARP Global Experiment (FGGE) of the Global Atmospheric Research Program was launched on December 1, 1978. Canada's contribution to the experiment consisted of providing 80 drifting buoys to measure surface pressure and temperature over the data-sparse southern oceans; coordination of the overall buoy program; secondment of one scientist from Ocean and Aquatic Sciences to the Drifting Buoy Data Centre in Toulouse, France; and provision of one ship (CSS Parizeau) for the Tropical Wind and Oceanographic Program at 0°, 150°W in the Pacific Ocean during the first Special Observing Period (January 5 to March 5, 1979).

A World Climate Conference was held in Geneva in February 1979, sponsored by the World Meteorological Organization (WMO) in collaboration with other international bodies. Specialists from many disciplines, including several from Canada, expressed their views concerning climatic variability and change and the implications for the world community. A special publication containing the Conference Declaration and supporting documents was issued by WMO. The assistant deputy minister of AES chaired one of the four working groups responsible for preparing the Conference Declaration. Several other Canadians were involved in organization of the conference, presentation of papers and chairing of sessions.

Canada was host for three important meteorological symposia. A major symposium on forest meteorology, jointly sponsored by the Canadian Forestry Service, AES and WMO, was held in Ottawa in August. The symposium, which was

attended by some 100 experts, provided a forum for dialogue between meteorologists and representatives of the forestry services and the forestry industry. As part of the WMO ozone program, the Symposium on the Geophysical Aspects and Consequences of Changes in the Composition of the Stratosphere was held in Toronto in June. The results of this symposium suggest that the threat to the ozone layer is still serious and warrants continued action to control chlorofluoromethane releases in the atmosphere. More than 130 scientists, senior government officials and industry representatives from North America, Japan and Europe attended a NATO-sponsored symposium on air pollution at AES Downsview in August. Discussions at this meeting focused on the use of mathematical models to determine air pollutant emissions and dispersions.

Among important meetings attended by AES representatives were the seventh sessions of the WMO Commissions for Basic Systems and Special Applications of Meteorology and Climatology (CoSAMC), and scientific meetings sponsored by the American Meteorological Society, the International Association of Meteorology and Atmospheric Physics and other international organizations. At the session of CoSAMC held in April in Geneva, the director general, Central Services Directorate, was elected president of the commission. With his election Canadians once again presided over four of the eight technical commissions of WMO.

As a member of the WMO Executive Committee, the assistant deputy minister, AES, attended the thirtieth session of the committee held in Geneva in June. The committee reviewed various programs, examined and commented on the secretary-general's proposed program and budget for the eighth financial period (1980-1983) and adopted the WMO program for 1979.

On behalf of the Canadian International Development Agency (CIDA), AES continued to serve as the agency responsible for providing professional, technical and other services to implement the hydrometeorological forecast and flood warning system in the Magdalena-Cauca river basins of Colombia, South America. The Canadian contribution includes provision of four Canadian experts at Bogota for approximately three years; provision of a mini-computer, communication equipment and hydrometeorological instrumentation; and training of eight Colombian professionals in hydrometeorology and flood forecasting. Target date for completion of the project is August 1980.

Study programs were arranged and practical training was provided for eight UNDP (United Nations Development Program)/WMO fellowship holders from Malawi, Jordan, Uganda, Tanzania, Nigeria, Sudan and the Barbados.

Through arrangements made by WMO, a Chinese ozone spectrophotometer was modernized and calibrated at AES Downsview and an AES expert was seconded to the People's Republic of China for about two weeks in November and December to advise on installation and to instruct observers on techniques for using the instrument.

Three meteorological technicians and one senior meteorologist, granted leave without pay from AES, were on fixed-term contracts at WMO Headquarters in Geneva. A meteorologist from the Canadian Meteorological Centre accepted the post of Expert in Synoptic Meteorology in Kuwait under a funds-in-trust arrangement with WMO. In addition, a meteorologist from the Ontario Weather Centre was loaned to CIDA for six weeks in May and June for a meteorological fact-finding project in Morocco.

Environmental Services Program

Environmental Management Service

The Environmental Management Service (EMS) plays a major role within the department in the preservation and enhancement of environmental quality and in renewable resource conservation and management. The service undertakes programs for forests, inland waters, wildlife and lands and combines expertise from these sectors to address complex environmental issues.

EMS Policy and Program Development

Economic studies were an important part of EMS policy work during the year. EMS took the lead in writing a report on the importance of renewable resources in national economic development, which was circulated widely in the government.

The Policy and Program Development Directorate launched a comprehensive study on the future from the perspective of resource and environmental management. The study will help EMS to assess priorities and program directions in a time of rapid change.

Canadian Forestry Service

The Canadian Forestry Service promotes effective management of Canada's forest resources. The service collects data and does analyses for forest policy development and program planning. As well, it conducts research and development for a broad range of programs.

National Forestry Policy

Unless Canada increases her investment in forest management, there will not be enough wood available to maintain the present forest industry, much less increase it. At the instigation of DOE, the Canadian Council of Resource and Environment Ministers (CCREM) sponsored a study on development of a national forest policy, and a federal/provincial task force prepared a report "Forestry Imperatives for Canada." The report suggested a broad policy outline for management of forestry resources.

Parallel with federal/provincial efforts to develop a national forest policy, DOE was proposing guidelines for federal forestry programs to ensure consistency with national policy.

Production Forestry

Cooperative programs in intensive forest management have been established with the Department of Regional Economic Expansion and several provincial agencies. One of these programs promotes salvage and renewal of budworm-destroyed forest. Similar cooperative programs have been established with other provinces.

Over the past few years, several seedling-planting machines have been developed, either through contracts or in cooperation with the provinces. Prototypes for these machines were evaluated.

Under the Seeds Act of Canada, the Canadian Forestry Service hired more seed analysts and seed inspectors to aid forestry regeneration programs across Canada.

The Energy from the Forest (ENFOR) program, a federal government contract program, supported research, development and demonstration of new technology aimed at substituting forest biomass for non-renewable fuels and chemical raw materials.

Another research program led to the development of low-level photography for use on forestry regeneration surveys. The technique may save thousands of hours of labor-intensive work.

Forest Products

Thirty-two ENFOR projects were supported during the year, and the program was authorized to continue to March 31, 1984.

A new finger-jointing process, suitable for producing structural finger joints in lumber of any moisture content, was developed in British Columbia. In commercial operations using the process, short lengths and low-grade lumber are upgraded, with a resulting increase in selling price. Product and quality-control standards were developed for finger-jointed structural lumber aimed at the U.S. market, enabling Canadian producers to export grade-stamped, finger-jointed lumber.

Adhesive research concentrated on the use of tree and pulp mill by-products as substitutes for traditional petroleum-based adhesives. It was found that finely-powdered foliage has potential as a partial replacement for powdered resins in waferboard, while dried and powdered bark has value as a filler in plywood adhesives. Kraft lignin by-product from pulp mills was successfully used in waferboard production. Central Mortgage and Housing Corporation now permits the use of waferboard bonded with kraft lignin adhesive.

A contract with CIDA (Canadian International Development Agency) to develop exterior-type composite panels and lumber from sugar cane rind was carried to the pilot plant stage; material is being manufactured for the construction of demonstration houses in the Barbados.

Forest Protection

Reviews were completed of two major CFS forest protection programs, the Forest Insect and Disease Survey and the

Eastern Spruce Budworm Research Program. It was expected that the reviews would significantly affect the future of these programs.

Large-scale trial applications of synthetic spruce budworm pheromone supported the concept that budworm mating can be suppressed by application of this pheromone. However, a number of problems must be solved before the budworm can be effectively controlled by this approach.

The European race of Scleroderris canker poses a threat to the more than 300 000 acres of red and Scots pine plantations in eastern Canada and to other trees, including west coast species. The disease was found for the first time in Canada, at one location in Quebec and two locations in New Brunswick.

Environmental Forestry

Studies of the effects of atmospheric pollution on forest vegetation and soils were expanded to include more point sources of sulfur dioxide and heavy metals, and acid rain. A comprehensive guide to the identification of injuries to foliage caused by a number of different pollutants was prepared.

Northern gas pipeline proposals, especially those along the Alaska and Dempster highways, and the Gull Island hydro-electric transmission line in Labrador, called for detailed assessments of impact upon forest vegetation.

Studies classifying land and vegetation resources in parks and other areas of exceptional interest were expanded. These areas include the Hudson Bay lowlands, Jasper and Banff national parks and the peatlands of northeastern Newfoundland. A study of peat stratification at the l'Anse aux Meadows archaeological site helped to estimate the amount of human activity at the site.

International Activities

The Canadian Forestry Service continued to provide the Canadian focal point for forestry activities of such international organizations as the Food and Agriculture Organization (FAO), the International Union of Forestry Research Organizations (IUFRO), the Organization for Economic Cooperation and Development (OECD), the Timber Committee of the Economic Commission for Europe (ECE), and their working groups.

Under the Canada/U.S.S.R. Science and Technology Agreement, a separate working group on forestry was established in 1978.

The Canadian Forestry Service coordinated and led a 23-person delegation to the Eighth World Forestry Congress in Indonesia in 1978.

The Canadian Forestry Service, through CIDA, continued to provide technical advice to forestry programs in developing countries, and to organize the placing of trainees from such countries.

A report outlining Canada's international role in forestry was published.

Inland Waters

Inland Waters Directorate (IWD) plans and designs water management programs and policies, especially for international and interprovincial water systems. The directorate conducts research into and collects data on the quantity and quality of Canada's inland waters. IWD also carries out river basin planning and implementation, and flood damage reduction programs with the provinces under the provisions of the Canada Water Act. The research programs of the National Water Research Institute and the National Hydrology Research Institute contribute to the effective management of water quality and quantity throughout the country and in boundary waters with the United States. The National Water Research Institute is the official collaborating centre on surface and ground water quality for the World Health Organization (WHO).

Research on Canadian Waters

At the National Hydrology Research Institute, studies related to disposal of high-level radioactive wastes in deep-lying rocks of the Canadian Shield were the major component in the contaminant hydrogeology program. Important questions included flow through systems of fine, widely-spaced fractures; retardation processes for radionuclides in such systems; and the simultaneous transport of heat and dissolved radionuclides.

Institute scientists devised a time-lapse photography system that successfully filmed the growth and decay of "frost blisters" and the filling and draining of a number of karst depressions at remote locations in the Canadian North. A cooperative federal-provincial study was initiated to model the Wilson Creek watershed in Manitoba and eventually to transpose the runoff model to other basins lying along the Manitoba escarpment.

Tests with a new airborne gamma-ray technique for estimation of the water equivalent of a snowpack proved very successful. The technique can be considered a major breakthrough in the aerial measurement of snow covers.

Research at the National Water Research Institute (NWRI) has led to a summary of the current understanding of

large-scale water circulation in lakes, intended to provide the necessary background for analyses and simulation of material transport in large basins. Parallel work in large-scale simulation models of water quality has resulted in a comprehensive review of the use of models and the knowledge that they impart, through examination of several models and available data for Lake Ontario.

Research has led to successful testing of oil recovery techniques for ice-covered rivers, and documentation of the ecological effects of oil-dispersant mixtures in fresh water.

As part of the study of atmospheric inputs of contaminants to surface waters, organic contaminants have been measured and an analysis of the susceptibility of surface waters to change due to rain acidity has been carried out.

The transport rate for bottom sediment in rivers has been calculated using flume data on bed profiles. The transport rate so calculated is more reliable than that calculated from formulae, and more reliable than field measurements by sampler.

Two microbiological techniques relating to sampling surface water and testing for Pseudomonas aeruginosa, developed at NWRI, have been included in the American Public Health Association Standard Methods, 15th edition.

Digital radiance data collected by the LANDSAT-1 space vehicle over the Big Otter and Big Creek basins in southern Ontario have been used to delineate principal groundwater regimes according to the distance of the water table from the surface.

Flood Damage Reduction and Water Management

During 1978-1979, federal-provincial programs employing structural and other measures continued to reduce the threat from flooding in the Montreal region, in southwestern Ontario and in the lower Fraser Valley of British Columbia. The federal-provincial Flood Damage Reduction Program, whose major aim is to reduce future flood damage by identifying risk areas and discouraging flood-vulnerable development in those areas, gained impetus when Nova Scotia joined the previously committed provinces--New Brunswick, Quebec, Manitoba, Saskatchewan and Ontario--in this cost-shared program. In the North, the signing of a Flood Damage Reduction Agreement for the Northwest Territories was pending, while negotiations for a similar agreement for the Yukon Territory were under way, and a lands-to-be-mapped schedule was prepared in anticipation of a proposed Indian Lands Agreement.

Management guidelines for the Souris River basin in Saskatchewan and Manitoba were brought to completion as was a comprehensive water quality plan of the St. Lawrence River, downstream from the international section near Cornwall.

An agreement was signed with Alberta, British Columbia and Saskatchewan and a three-year, $1.6 million federal-provincial program was inaugurated to investigate the water resources in the Mackenzie River basin.

Studies were under negotiation or in various stages of completion across Canada to assess the need for further federal-provincial cost-shared study agreements. One of these, a study to identify water management concerns in the lower Saskatchewan River basin was completed and a report released. Another study, for the Winter River (Prince Edward Island), was completed and the findings were under review. In the Yukon Territory, a study of the Yukon River in Canada was initiated, while a similar study for the Thompson River basin in British Columbia was being negotiated.

Water Data and Information

The Water Quality Branch continued its assessment of the quality of Canada's freshwater rivers and lakes, emphasizing international and interprovincial waters. The range of concerns was large and covered such topics as environmental monitoring of spruce budworm spraying in New Brunswick; water quality of Prince Edward Island; sediment quality in the Gulf of St. Lawrence; organic and heavy metal contaminants in the Lakes Erie, Michigan, Huron and Superior basins; water quality of the Souris River basin; and water investigations along the Alaska Highway Pipeline route. In total some 50 reports were published.

The Water Quality Branch participated in the development of water quality objectives for the Shubenacadie-Stewiacke River Basin Study and for the International Joint Commission's International Poplar River Water Quality Study, as well as in the development of guidelines for Canadian drinking water quality. Water quality guidelines for arsenic, cadmium, chromium and mercury were completed for publication. Draft guidelines have been prepared for copper, lead, nickel, selenium, silver and zinc. In addition, the branch participated in development of a biological monitoring program and a strategy paper for development of water quality objectives at the international boundary.

The branch has produced 10 reports related to the design of sampling programs and several reports on analytical

procedures, particularly in the areas of herbicides and pesticides. It continued the development of NAQUADAT as a national water quality data base, produced a data summary for Manitoba, and published various systems manuals, particularly GLOWDAT, a data system for the World Health Organization's Global Environmental Monitoring System.

The water quantity survey program continued to measure and provide information on streamflow, water level and sediment transport in Canadian water, under legislative mandates and federal-provincial cost-sharing agreements. The survey network continued to be evaluated during the year with the addition of new stations in some cases and the elimination of existing stations in other cases. The net result of the program was to decrease the survey network by three stations during the year, bringing the total number of stations to 2460.

Re-transmission via LANDSAT and GOES satellites continued to provide data from remote areas. A Canadian receiver station at Prince Albert, Saskatchewan, was operating.

Metric conversion of instruments and field installations continued, with approximately 35 percent of the network converted at year's end. Conversion is expected to be complete by 1981.

Canadian Wildlife Service

The Canadian Wildlife Service protects and manages migratory birds by developing regulations to control the taking of migratory game birds, evaluating enforcement programs, monitoring populations and studying and preserving habitat. With the provinces and other wildlife agencies, the CWS undertakes cooperative programs of research, management and interpretation on other wildlife of national interest, and provides advice to federal, territorial and provincial agencies. The service also administers in Canada the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Migratory Birds

Canada and the U.S. signed a protocol to the Migratory Birds Convention of 1916 to allow Indians and Inuit to hunt migratory birds for subsistence at times during the general closed season. (Amendment of the Migratory Birds Convention Act and enactment of special regulations will be necessary to give effect to the protocol in Canada.)

A new National Wildlife Area at Long Point, one of the most fragile and biologically vulnerable parts of the Lake

Erie shore, was established on land given by the Long Point Company and the U.S. Nature Conservancy. Another new National Wildlife Area was purchased at Prince Edward Point on Lake Ontario, and additions were made to several other wildlife areas. An agreement was signed with the province of British Columbia which will lead to the preservation of the valuable Sturgeon Bank coast and marshes, south of Vancouver.

A two-year pilot study for a long-term snow goose banding program was successfully completed at the colonies on the west side of Hudson Bay; 27 000 geese were banded in 1977 and 56 000 in 1978. It was expected that recovery of these banded birds would provide useful information on changes in the wintering distribution of the geese and on the kill in the U.S. and Canada. Eskimo Point Inuit, biologists from the southern United States, and CWS staff were involved in the study. Unfortunately, the long-term program originally envisaged will not be carried out in the near future because of its high cost.

Studies of the large seabird colonies on Prince Leopold Island at the west end of Lancaster Sound yielded valuable information on the relationships between the birds and their food supply.

CWS served as lead agency for a multi-disciplinary baseline study in the Hudson Bay lowlands of northern Ontario. The data being gathered were vastly improving knowledge of the environmentally sensitive ecosystems of the Hudson Bay Lowlands and allowing DOE to evaluate development proposals in the area.

Inventories of the nesting colonies of gulls, terns and other colonial nesting water birds were completed for the Canadian portions of Lakes Ontario, Erie, Superior and the north channel of Lake Huron. The remaining colonies in Lake Huron will be tallied and described in 1980. Studies continued on the impact on the common tern of expanding populations of ring-billed gulls in the Great Lakes.

More than 525 000 Migratory Game Bird Hunting Permits were sold. More than 7 percent of the purchasers were sent questionnaires for the National Harvest Survey and more than 30 000 hunters were asked to submit duck wings or goose tail fans for the Species Composition Survey. The results were being analysed and will be published.

Cabinet committed $1.3 million towards a one-year crop damage prevention program in the prairie provinces. CWS developed and obtained agreements with each of the three prairie provinces to implement that program.

The captive breeding and re-introduction program for peregrine falcons continued at Wainwright, Alberta. Thirty-four birds were released in various areas of western and eastern Canada. CWS and the U.S. Fish and Wildlife Service continued the whooping crane recovery program, using sandhill cranes at Gray's Lake, Idaho, as foster parents for whoopers.

A five-year study of migratory birds was completed under the Alberta Oil Sands Environmental Research Program. Migratory bird inventories were initiated in the Slave River Delta under the federal-provincial Mackenzie River Basin Study Program, as was a review of resource information on sensitive areas in the basin.

Wildlife Research and Interpretation

CWS led preparations for a migratory caribou convention with the United States to protect caribou that migrate annually between Canada and Alaska. Discussions with territorial officials and with native organizations resulted in substantial agreement on the main elements such a convention should contain.

CWS participated in ecological research in national parks under agreement with the Department of Indian and Northern Affairs and studied wolves in the boreal forest ecosystem in Riding Mountain and Wood Buffalo national parks.

The service conducted wildlife inventories in Banff and Jasper national parks as part of an innovative program of biophysical land classification. Jasper National Park was also the site of studies of grizzly bear movements.

With the Canadian Forestry Service, CWS participated in multi-disciplinary investigations of potential sites for new northern national parks at Bathurst Inlet and in the vicinity of the Anderson and Horton Rivers.

Along with the Northwest Territories and the Department of Indian and Northern Affairs, CWS developed a Canada Wildlife Act agreement on wildlife research north of 60°. The formal signing was scheduled to take place in the summer of 1979.

Under the Rare and Endangered Species Program, CWS transferred 10 wood bison to Moose Jaw Wildlife Park and three to the San Diego Zoo from Elk Island National Park. An attempt to transfer another 28 bison to Jasper National Park was unsuccessful.

CWS completed the first half of a study on the inter-island movement of Peary caribou over ice between Somerset and Prince of Wales islands. The service also studied the population ecology of Peary caribou, including

comparisons of body condition and natality and the digestibility of winter forage. Population and food supply studies of polar bears indicated that both the bears and their food, seals, were increasing from a low in 1974-1975.

A member of CWS staff was appointed secretary to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which is comprised of federal, provincial and non-government representatives. The committee identified 14 species of wildlife as endangered or threatened with extinction.

The CWS Wildlife Toxicology Division continued to monitor levels of toxic substances accumulating in the tissues of herring gulls in the Great Lakes as part of the surveillance program of the Canada/U.S. Great Lakes Water Quality Agreement. CWS was able to demonstrate significant declines in levels of six of the principal organochlorines and to predict future downward trends. The level of reproductive success of the herring gull in the Great Lakes had returned to normal at all 10 of the monitored colonies after several years of being suppressed.

A program to examine the effects of pollutants on wildlife chromosomes was initiated. Research on the effects of organophosphate pesticides on bird behavior and on cholinesterase levels was begun as part of a search for new techniques to monitor the effects of forest spray programs on migratory birds.

The newest CWS interpretation program, which focuses on the grassland region, continued to operate with a small mobile display on the Trans-Canada Highway near Swift Current, Saskatchewan. Construction began on permanent facilities at Webb, Saskatchewan, adjacent to the Trans-Canada Highway.

CITES

More than 2500 permits were issued by CWS, the provinces, and the territories for CITES (Convention on International Trade in Endangered Species) species and products during the 1978 calendar year. CWS published the first CITES reports.

Lands Directorate

The Lands Directorate promotes the effective and environmentally sound use of Canada's land resource. It participates in land related programs arising out of the Department of the Environment Act and associated government directives such as the Federal Land Management

Policy. Programs include preparation of inventories of land characteristics, land capability and land use, with emphasis on ecological land classification and its use in planning. Other programs include documentation of changes in the use of Canada's land resource, identification of national land use alternatives and development of land use policies for the federal government. All programs are directed to the promotion of environmentally-sound land use planning.

Land Use Policy Development, Analysis and Advice

During 1978-1979, the directorate chaired the interdepartmental task force on federal land use policy and studied various land use problems and issues. In connection with policy development it began production of a paper summarizing the facts, trends and issues in land use in Canada today, and studies analyzing the impact of specific federal programs on land use and land use issues.

Federal Land Management

The Lands Directorate continued to represent DOE on the Treasury Board Advisory Committee on Federal Land Management (TBAC/FLM). Regional offices undertook reviews of numerous proposals for the disposal of federally owned properties through TBAC/FLM. Late in the year a national committee with regional representation met to discuss the mapping of federal lands. This program was expected to begin operation in the next fiscal year.

In the Atlantic Region, a cooperative study with Transport Canada was undertaken to determine the feasibility of an ecological lands survey approach to the management of airport lands, with a final report and map completed in March 1979. Under the EMS/Parks Canada agreement an ecological land assessment of the Fortress of Louisbourg National Historic Park was initiated.

For the Quebec Region, a land management plan for Camp Bouchard and a biophysical inventory for the Ile Verte national wildlife area were prepared. Planning and coordination studies included the ports of Quebec and Chicoutimi, and Mirabel lands.

Land Research and Inventories

The Canada Land Data System (CLDS)/Canada Geographic Information System (CGIS) continued to help resource managers and land use planners examine data on natural resources. Services were extended beyond the directorate and included the building of user data banks and spatial data processing services for other federal agencies and provincial governments. Pilot studies related to the

mapping of and data input into CLDS of federal land holdings were completed.

During the last three years the directorate has provided the chairman and secretariat for the Canada Committee on Ecological Land Classification. The committee promotes and develops a uniform approach to ecological land classification in Canada.

Research continued on ecological land survey methodology, integration of water and wildlife data, refinement of vegetation classification, and use of remote sensing for land survey. Three new reports appeared in the Ecological Land Classification Series. One reviewed water classifications and possibilities for water integration in land survey, another reported on a workshop for northern resource planning, and the third is the proceedings of a meeting on applications of ecological land data in Canada. Regional ecological studies included an ecological land survey program for parts of Labrador under an interim agreement with the Newfoundland government, an ecological analysis of factors influencing forest productivity in Quebec and an ecological land classification system for the Hudson Bay lowland.

The Northern Land Use Information Series continued production in accordance with the September 1978 five-year interdepartmental agreement between DOE and the Department of Indian and Northern Affairs (DINA). All of the Western Arctic mainland has been mapped, a total of 190 maps.

Project design for the Canada Land Use Monitoring Project was initiated. Representation will involve all directorate regions.

In the Pacific and Yukon Region, a land use inventory and evaluation of land use trends along the major Yukon highway corridors were completed. A study of land suitability for rural settlement in the Whitehorse/Carcross area was completed at the request of DINA. Baseline information on the Fraser estuary was published in a series of reports issued by the federal-provincial Fraser River Estuary Study Steering Committee.

For the Atlantic Region, a study related to the effects of altered tidal regime on land resources was conducted in Cumberland Basin near a proposed tidal power barrage site.

Land Use Research and Planning Services

A Canada-wide review of land use policies, programs and legislation continued with publication of reports covering Saskatchewan and the Yukon Territory. Studies analyzing the impact of selected policies on the use of the land resource were prepared, including the impact of the

agricultural land reserves in B.C. and the Land Development Corporation activities in P.E.I. Studies on the impact of federal programs on land use, reclamation of despoiled lands, and factors influencing loss of agricultural land in selected parts of Canada continued. A major project entitled Canada's Special Resource Lands, an annotated atlas of lands critical to the economic and social well-being of the nation, was completed. A bibliography on the ecology and reclamation of lands disturbed by mining was completed and distributed. A report documenting the quality of the land resource around Canada's 23 largest cities, based on CLI data, was published.

Since 1972, the directorate has acted as lead departmental agency in the James Bay Environmental Studies Agreement with the Société de développement de la Baie James (SDBJ). For each year of the agreement, which terminated on March 31, 1979, an annual report was produced jointly by DOE and the SDBJ.

The directorate participated in the investigation of the environmental aspects of native land claims, continuing a role it began in 1975.

At the request of the Federal Environmental Assessment and Review Office, a report entitled "Ecological Land Survey Guidelines for Environmental Impact Analysis" was prepared. The Pacific and Yukon regional office completed environmental studies and reviews associated with the expansion of the Roberts Bank port and the construction of the Alaska Highway pipeline. A report of the management of coastal resources in B.C. was published and distributed at the CCREM meeting in Victoria by a joint federal-provincial committee chaired by the directorate.

Environmental Services Program

Environmental Protection Service

The Environmental Protection Service (EPS) initiated a major review of the federal role in preservation and enhancement of environmental quality in Canada. The purpose of the review is to define and clarify the federal role in a way that is consistent with federal constitutional authority and that avoids duplication of government services. It was planned that the new federal strategy, developed in close consultation with provincial governments, would be the basis for consultation in each of the provincial capitals early in the next fiscal year.

EPS initiated the Socio-Economic Impact Analysis Process (SEIA) for proposed major regulations to provide a broader social context for regulatory decisions. SEIA reports are available to all interested parties and a period of 60 days is allowed for comments.

EPS facilities include bacteriological, bioassay and chemical laboratories across Canada, the Air Pollution Technology Centre and a motor vehicle emission testing laboratory in Ottawa, and the National Water Pollution Control Technology Centre in Burlington.

Water Pollution Control

In keeping with the development of the federal environmental protection strategy, a review of water pollution control strategies was initiated; the review continued at the year's end. The main thrust of the new strategy was toward control of toxic substances, coupled with site-specific controls in areas under federal jurisdiction.

Development of effluent control requirements for industrial sectors progressed for textiles, alkali and associated products, organic chemicals, iron and steel, gold mining, base metal smelting, aluminum smelting and steam electric power generation. Control requirements for these sectors will be completed in accordance with the new water pollution control strategy.

Tailings deposit regulations were developed for the disposal of mill tailings by the Climax Molybdenum Corporation into the waters of Alice Arm, British Columbia.

An assessment of the financial impact of federal guidelines on the Canadian metal finishing industry was carried out and a technology transfer seminar on fertilizer industry environmental concerns was held in Toronto.

Biological treatment and physical-chemical design and operation manuals for food-processing wastewaters were

completed. A joint study was initiated with Agriculture Canada to investigate current water use practices in the meat and poultry industry. As part of the study, water conservation measures were implemented at several demonstration plants and the impact of these changes on product quality was being assessed.

The review of wastewater disinfection practices in Canada was completed and a report was published. The report summarizes disinfection practices throughout Canada, the United States and Europe. An extensive review was undertaken and a manual was prepared on the design and selection of small wastewater treatment systems for communities with populations of 2500 or less. The national inventory of municipal waterworks and wastewater systems in Canada was updated and republished.

As input to the International Joint Commission study of the Poplar River power development in Saskatchewan, detailed evaluations of the ash disposal and wastewater management systems were carried out. The resulting water pollution control recommendations have led to new pollution control design proposals for the project.

Briefs were provided to the Provincial Environmental Assessment Board hearings on the expansion of uranium mining in the Elliot Lake area.

The need for a program of technology development as part of the water pollution control program was confirmed in a departmental review exercise.

The "Radwaste" project, supported by the Atomic Energy Control Board and several mines, continued with field testing of the previously developed lime precipitation process. A two-year project undertaken as a joint venture by the Petroleum Association on the Canadian Environment (PACE) and the Environmental Protection Service showed that treated oil refinery effluents had sublethal effects on two fish species.

The Northern Technology Unit co-sponsored the Second Symposium on Utilities Delivery in Northern Regions held in Edmonton in March 1979. The Symposium was attended by more than 250 people from Canada, the United States and other countries. The Cold Climate Utilities Delivery Design Manual, a valuable reference for those involved in selection and design of water and waste management systems in northern regions, was distributed at the symposium.

The field portions of the ozone disinfection and rotating biological contactor (RBC) studies at Whitehorse were completed. The ozone project determined the effectiveness of ozone disinfection for a screened, cold,

dilute wastewater. The RBC study was concerned with the economics and practicability of wastewater treatment in northern communities which, to prevent freezing, bleed large quantities of potable water directly into the sewers.

The DPAT (Development and Demonstration of Pollution Abatement Technology) and CPAR (Cooperative Pollution Abatement Research) programs ended on March 31, 1979. The total value of water pollution control DPAT projects supported during the three years of the program amounted to $13 million, of which DPAT contributed $3 million. One 1978-1979 project, which demonstrated the technical feasibility of removing arsenic and cyanides from gold mining effluents, was completed. The remaining seven projects will be completed during the next three years.

Thirty-two projects valued at $1 250 000 were completed under the CPAR program during the year. The cost of supporting the 272 CPAR projects carried out during the nine years of program operation amounted to approximately $9 million.

Seventeen projects were completed and five were continuing in the SCAT (Sewage Collection and Treatment) research program. The total value of projects supported by SCAT, after four years of operation, was approximately $1.5 million. No new SCAT projects will be undertaken in 1979-1980 because the CMHC sewage loans program was terminated.

In cooperation with the Water Pollution Control Federation, directorate staff continued to produce training manuals and audio-visual material for wastewater treatment plant operators. The material is used by most provinces and has gained considerable international recognition.

EPS was active in a number of international, interprovincial, and federal-provincial water pollution control programs, including the fifth-year review and revisions to the Canada/U.S. Great Lakes Water Quality Agreement, the Canada/Ontario Agreement related to Great Lakes Water Quality, and the Garrison Diversion, Poplar River, Saint John River, Ottawa River, Okanagan basin, Mackenzie basin and St. Lawrence River studies. The director general of the Water Pollution Control Directorate was named Canadian delegate to the Water Management Group of the Organization for Economic Cooperation and Development (OECD).

Air Pollution Control

The objectives of the Air Pollution Control Program are to define air pollution problems in Canada, to promote desirable levels of air quality and to control emissions of air contaminants deemed to be a significant danger to public health or the environment.

During the year, amended regulations under the Clean Air Act were published in Part I of the Canada Gazette for emissions of vinyl chloride from vinyl chloride and polyvinyl chloride manufacturing operations. The final regulations were to be published in Part II of the Gazette in the next fiscal year. An amendment to the asbestos mining and milling regulations to include dry drilling operations was completed. Draft regulations limiting the emissions of arsenic from the gold roasting industry were prepared and the socio-economic impact analysis was finished. Development of regulations for emissions of asbestos from asbestos manufacturing operations and for emissions of lead, mercury and arsenic from the non-ferrous smelting industry continued.

Enforcement of the regulations limiting the emissions of asbestos from asbestos mines and mills and of mercury from chlor-alkali plants began. Both regulations came into effect during the review period. The enforcement of regulations concerning emissions of lead from secondary lead smelters progressed. A modified method to measure such lead emissions was completed. Action was initiated to determine the status of control options being implemented by vinyl chloride and polyvinyl chloride manufacturers to ensure early compliance with federal regulations when they come into effect in 1979.

National emission guidelines for packaged incinerators were published in the Canada Gazette. At the year's end, work was in progress on guidelines for thermal power plants, petroleum refineries, ferrous foundries, pulp and paper plants, iron and steel plants, industrial boilers and natural gas processing plants.

Implementation of guidelines continued for asphalt plants, coke ovens, the cement industry and the arctic mining industry. The Government of the Yukon Territory developed regulations based on federal guidelines for the arctic mining and asphalt paving industries.

New-car emission standards for hydrocarbons, carbon monoxide and nitrogen oxides will remain unchanged through the 1984 model year. A new standard to limit carburetor maladjustment on cars of the 1981 and later model years was completed. More than 400 emission tests were done on about 50 new motor vehicles to determine whether the vehicles

complied with emission standards. The federal government is working with the provincial governments and industry to develop a guideline for implementation of in-use vehicle inspection programs. To gather information for the guideline, more than 1000 vehicles were tested during a two-week project in Edmonton and Calgary in cooperation with the Alberta Ministry of the Environment and the Alberta Motor Association.

Transboundary movement of airborne contaminants has become a prominent issue between Canada and the United States in recent years. Both countries are addressing the problem through a joint scientific research project. Exploratory discussions took place during the review period on a possible agreement between the two countries to resolve the problem. A comprehensive inventory of the sources and emissions of sulfur oxides in Canada, both natural and man-made, was completed. A report on the transboundary movement of ozone in southern Ontario was prepared and surveys of the acidity of precipitation and the incidence of aerosol sulphates were completed in the Maritimes.

The National Air Pollution Surveillance (NAPS) network was expanded and improved. At the year's end it comprised 562 air monitoring instruments located at 159 sampling stations in all major urban centres. Data collected by the NAPS network are compiled and published each year as monthly and annual summaries. A national trend analysis was completed for 1970-1977 using NAPS data.

Ambient air surveys completed during the year included:

- mercury in the vicinity of a chlor-alkali plant at Dalhousie, New Brunswick;
- fluoride concentrations on Cornwall Island, Ontario;
- arsenic in Yellowknife; and
- carbon monoxide and nitrogen dioxide during the winter months in Whitehorse.

Stack tests were completed at an asbestos cement pipe manufacturing plant, a copper smelter, a copper-zinc smelter, an iron ore sintering plant, and at gold mines in the Northwest Territories and Ontario.

An inventory of the sources and emissions of benzene was completed. The 1974 inventory of sources and emissions of sulfur oxides, suspended particulates, carbon monoxide, hydrocarbons and nitrogen oxides was published.

Because of fiscal constraints, funding of the DPAT program ended on March 31, 1979. A project with the Algoma Steel Corporation to demonstrate a high-pressure water-jet system for cleaning coke oven doors was supported. A

second project was completed by Moniteq on the evaluation of remote sensing techniques for the measurement of sulfur dioxide emissions from large point sources. Two other development projects progressed well during the year: a granular bed filter at British Columbia Forest Products for the containment of fine particulates from the burning of wood wastes; and a scrubber at the St. Anne-Nackawic Pulp and Paper Company in New Brunswick, for the containment of odors and fine particulates from kraft mills.

Several projects were supported under the Department of Supply and Services' Unsolicited Proposal Program and one was completed. It resulted in the successful development of a laboratory prototype instrument for the continuous measurement of sulfur trioxide in the presence of sulfur dioxide.

More than 2500 samples of lead-free gasoline were tested and 4.2 percent were found to contain more than the allowable amount of lead. Inventory reports from refineries showed that the amount of lead being added to leaded gasoline continued to decline. The percentage of lead-free gasoline sold increased to 21 percent from 19.6 percent in the previous year.

Environmental Impact Control

The Environmental Impact Control Directorate had responsibilities in six broad areas during 1978-1979: environmental contaminants, environmental emergencies, ecological impact control, federal facilities clean-up, noise control and waste management.

Environmental Contaminants

On December 13, 1978, an order adding Mirex to the Schedule of the Environmental Contaminants Act and a regulation on Mirex were published in Part II of the Canada Gazette. Proposed regulations covering polychlorinated terphenyls, chlorofluorocarbons and an amendment to the Chlorobiphenyl Regulations No. 1 were published in Part I of the Gazette. Four notices of objection to the proposed amendment to the Chlorobiphenyl Regulations were received and were under thorough review. In addition, EPS participated in the OECD program to develop international testing requirements for chemicals.

Advice was provided to the Department of Agriculture on registration of new pesticides and on re-evaluation of those currently in use (under the Pest Control Products Act) with respect to environmental contamination, disposal and decontamination.

EPS continued to participate in the drafting of the National Code on the Transportation of Dangerous Goods, dealing with problems of proper identification, labelling, packaging, hazards, safety precautions, emergency response and other environmental aspects. This participation included reviews by federal and provincial agencies and industrial associations. The code will become a regulation under the proposed Transportation of Dangerous Goods Act which will be administered by the Department of Transport. EPS also provided representation to the United Nations Committee of Experts on the Transport of Dangerous Goods, and the Bulk Chemicals Subcommittee of the Intergovernmental Maritime Consultative Organization (IMCO).

Environmental Emergencies

The National Environmental Emergency Centre received more than 3000 spill reports for entry into the National Analysis of Trends in Emergencies System (NATES) data base, which now contains about 10 000 spill records. The marked increase in the number of spill reports is directly attributable to increasing contributions from provincial agencies in Saskatchewan and Alberta. The NATES information structure was broadened to provide better data for use in federal and provincial accident prevention programs.

The computerized National Emergency Equipment Locator System (NEELS) was made available to the Commission of the European Communities so that a comparable system may be developed for locating emergency equipment in Western Europe.

The most significant Canadian spill during the year was the breakup of the British tanker Kurdistan off Cape Breton on March 15, 1979. About 7900 tonnes of heavy Bunker C oil were released in ice-infested waters, and later polluted Cape Breton and mainland Nova Scotia shorelines as far south as Lunenburg. Thousands of birds died in offshore slicks and investigations are under way to determine the cause of death of a number of oil-coated seals.

A new Environmental Emergency Prevention Division initiated studies on the causes of spills of oil and other hazardous materials in order to identify problem areas where concerted action may be taken to prevent future accidental spills.

Contingency planning activities relative to offshore exploratory drilling expanded from the Beaufort Sea area into Eastern Arctic marine areas such as Davis Strait. This work included the review and assessment of industry

contingency plans and development of a government contingency plan to cover all arctic marine areas. Improvements were also made to the Joint Canada/Denmark Contingency Plan for Greenland/Canada Waters during this period.

Several training programs were planned and conducted in cooperation with regional and headquarters research and development staff. These programs included provision of formal basic spill response courses primarily for employees of other government departments (both federal and provincial), joint development of audio-visual programs with industry, and presentation of workshops and seminars for technology transfer.

Development of and consultations on proposed regulations under the Fisheries Act continued with regard to mandatory spill reporting, inspectors' procedures and the declaration of oil as a deleterious substance.

1978-1979 was the second year of the Arctic Marine Oilspill Countermeasures Program (AMOP). Forty studies were undertaken requiring the services of 30 consultants and the assistance of five other government agencies. More than $1.5 million was spent on equipment design and feasibility and related studies for removal of oil from ice-infested waters.

An integrated industry-government group that includes United States representatives was formed to prepare a comprehensive plan for experimental oil spills for the next two years. The purpose of these experimental oil spills is to evaluate countermeasures equipment and systems under actual field conditions.

The technology developed through the research programs was disseminated in a number of publications including the Spill Technology Newsletter, a bi-monthly publication describing advances in spill countermeasures technology distributed to more than 2500 subscribers in Canada and 33 foreign countries.

Ecological Impact Control

EPS continued to work in areas where major industrial projects have a potential effect on the environment, including northern roads and railways construction, terrestrial energy exploration and production, ports, offshore ship traffic, terrestrial pipelines, northern resource development and offshore hydrocarbon exploration and production. The work involved environmental assessment and design as well as prevention programs. In addition, the monitoring and surveillance of federal facilities were continued, as was the review and preparation of design

recommendations of new projects referred by other government departments. EPS was also involved in the analysis of environmental protection activities and practices related to the Alaska Highway Gas Pipeline, northern road construction, and drilling in Davis Strait, the Beaufort Sea and Lancaster Sound.

Air pollution guidelines were developed for boilers at federal establishments and an evaluation of a portable open-pit incinerator was carried out.

EPS continued to serve as a focal point on nuclear concerns, providing technical consultation and advice to the department, interdepartmental task forces and the Atomic Energy Control Board on environmental radiation protection in such areas as environmental impact assessment of uranium mining and milling activities, program design recommendations for uranium mining, development of guidelines for radioactive waste management, and evaluation of the long-term physical and chemical integrity of deep geologic repositories for high-level nuclear wastes.

Federal Facilities Clean-up

Fiscal year 1978-1979 marked the sixth year of EPS administration of the Federal Facilities Clean-up Program. The work involved assessing environmental problems associated with existing federal installations, providing environmental engineering advice to federal departments and ensuring that remedial measures for pollution control are carried out.

Under the Clean-up Program $5 million was allocated to federal departments for the cleaning up of pollution problems at more than 37 locations across the country. The Departments of National Defence, Transport, and Indian and Northern Affairs received the largest shares. Projects included:

- completion of a wastewater treatment system at CFB Borden, Ontario (total cost $835 000);
- construction of a wastewater treatment system at Winnipeg airport (total cost $265 000);
- completion of a wastewater treatment system for Fundy National Park, New Brunswick (total cost $200 000).

Noise Control

Technical information, advice, recommendations and report evaluations were provided to various levels of government on the effects of noise pollution created by facilities and activities of the federal government.

Waste Management

The problems of the proper management of hazardous wastes were brought into clearer focus during 1978-1979.

Agreement was reached on the appropriate roles for the federal and provincial levels of government and action commenced in certain key areas principally through the auspices of the Canadian Council of Resource and Environment Ministers. Inventories of hazardous wastes were developed in the Atlantic and western provinces. The problems associated with the management of PCBs were given special attention, including preliminary investigations of the feasibility of destroying PCBs in cement kilns. A national seminar on hazardous wastes was held during the year and attended by more than 300 persons. As a result of the seminar a government/industry committee was convened, and charged with developing an acceptable definition of hazardous wastes to satisfy interested parties.

EPS continued to exercise its mandate to encourage development of techniques for conservation of energy and materials. The successful office paper recovery program was expanded within the National Capital Area and introduced into selected regional offices, in some cases in cooperation with the provinces. Development of systems for collecting used lubricating oils and examination of their potential use continued. As a direct consequence of previous Environmental Protection Service efforts, the Province of Saskatchewan began work on a study to determine the feasibility of a plant that would convert waste rubber into a usable material. EPS was closely involved in a proposal to employ a heat recovery incinerator at the Queen Elizabeth Hospital in Charlottetown, Prince Edward Island.

Other 1978-1979 programs included continued operation of the Canadian Waste Exchange---a clearing house for the marketing of potentially useful materials; and DRECT, a program devoted to the development of resource and energy conserving technology.

Activities associated with technology transfer included presentation of a number of workshops, two international seminars (leachate treatment and landfill site utilization), direction of a film on resource recovery, and preliminary planning of a national conference for 1979-1980.

EPS continued to participate in professional, national and international committees associated with waste management activities such as OECD, NATO/CCMS (the NATO Committee on the Challenges of Modern Society), CCREM and the Governmental Refuse Collection and Disposal Association (GRCDA).

Administration Program

Finance and Administration Service

The Finance and Administration Service ensures that the legislative, regulatory and other administrative requirements of Parliament and the central agencies pertaining to finance and administration are met within the Department of the Environment. Departmental policies, systems and procedures are developed and common services are provided.

Computing and Applied Statistics Directorate

The Computing and Applied Statistics Directorate directs the electronic data processing activities of the department and provides scientific and technical assistance and services in applied statistics, scientific computing and computer-based information systems to department programs.

The directorate provided policy guidance and participated in the acquisition of large-scale computer systems for the National Water Research Institute in Burlington, Ontario, and the Bedford Institute of Oceanography in Dartmouth, Nova Scotia. The Burlington installation was completed in March 1979; the Dartmouth system was to be delivered in the first quarter of fiscal year 1979-1980. Procurement of a large-scale computer system for AES headquarters at Downsview continued, with selection of suppliers completed at year-end. Several new contracts were negotiated with commercial computer service bureaus. These were expected to result in lower rates to departmental users in 1979-1980.

Among 125 statistical and scientific computing projects undertaken during the year were a study of possible improvements to the standard method of monitoring airborne asbestos dust by adjustment of criteria and development of a programming solution to the problem of allocation of resources for reforestation in New Brunswick and Alberta. A statistical workshop organized for the staff of the Newfoundland Forest Research Centre was conducted in St. John's in March 1979.

The Environmental Libraries Automated System (ELIAS) was fully implemented and in operation. Microfiche had replaced many of the card indices and voluminous printed catalogues, improving library operations. A system to provide improved storage of and access to data on toxic chemicals in industrial products was developed and implemented for the Contaminants Control Branch of the Environmental Protection Service.

From December 1978 through March 1979, the directorate initiated a major reorganization as a result of the removal

of responsibility for providing services to the Fisheries and Marine Service.

Departmental Management Services

A major reorganization was carried out during the year, made necessary by the division of the department when the Department of Fisheries and Oceans was created, and by loss of resources as a result of the restraint program. Despite this major disruption, Departmental Management Services reduced the administrative burden and reduced costs, through improved systems and closer monitoring of departmental policies.

A detailed space analysis and utilization study, which will provide the basis for long-range accommodation planning, was completed. The Prairie Wildlife Interpretation Centre near Swift Current, Saskatchewan was completed, as were a new water treatment facility at the Petawawa Forest Experiment Station, Chalk River, Ontario, and energy conservation projects at the Maritime Research Centre, Fredericton, New Brunswick, the Northern Forest Research Centre, Edmonton, Alberta and the Wye Marsh Interpretation Centre, Midland, Ontario.

Security elements of the department were unified under one head for greater effectiveness. Telecommunications devices were acquired to protect transmissions between ships and from ships to shore when carrying out regulatory duties.

The departmental library's catalogue was added to the on-line data base of the Canada Institute for Scientific and Technical Information. The library played a major role in establishing a library for the Jamaican Department of Conservation.

The department's Energy Conservation Program continued to be successful, realizing savings of $5 474 000 (16.8 percent) against the base year 1975-1976.

Emergency Planning Branch

The branch participated in NATO and national studies aimed at evaluating civil emergency preparedness and took part in the planning and conducting of two NATO training exercises. A new departmental Alert organization was set up and designated personnel were instructed in their tasks. Assistance was provided to Atmospheric Environment Service in preparation of that service's emergency plans. The

branch also conducted a course on emergency operations for the Fisheries Emergency Control Organization.

Finance

The Finance Directorate provides functional direction to all financial units in the department and advises the minister and senior management on financial matters. It maintains liaison with central agencies, particularly the Treasury Board secretariat, the auditor general's office and the office of the comptroller general.

In cooperation with the Department of Supply and Services, development of a new computerized system of financial management and control continued. Amendments were made to manuals, as new procedures were written to provide guidance, direction and interpretation of policy.

Careful planning was again required to cope with budget reductions and the need to undertake new programs without using additional funds.

Internal Financial Audit

The Internal Financial Audit Branch reviews the effectiveness of the department's financial administration, and the extent to which departmental procedures comply with government financial policies.

It schedules audits, conducted on its behalf by the Audit Services Bureau of the Department of Supply and Services or by public accounting firms. It also ensures that responses to audit reports, stating the corrective action taken or proposed by management, are received.

Audits were conducted at 37 departmental establishments, 14 provincial offices (involving cost-shared agreements) and 42 commercial firms (involving subsidy payments or conditional grants).

Personnel and Organization

The Personnel and Organization Directorate has two principal spheres of activity: development of personnel policy and day-to-day operations.

A comprehensive program of performance assessment and employee appraisal was introduced.

The departmental Employee Assistance Program was developed to provide confidential health assistance or advice to employees who seek help, or to those who may require it where work performance is adversely affected.

A department policy on official languages was developed. In order to respond to departmental needs, an internal language training program was introduced in some regions.

Administration Program

Corporate Planning Group

In the fall of 1978, the Policy, Planning and Evaluation Directorate, with the Liaison and Coordination Directorate and most of the staff in the Office of the Science Adviser, were merged to form the new Corporate Planning Group under the direct authority of the senior assistant deputy minister. The new group was given special responsibility for departmental planning, evaluation, policy development and intergovernmental affairs and for certain formal, corporate relations with other departments. The group works in close cooperation with the science adviser to the deputy minister and with the director general of the Information Services Directorate as well as with the headquarters units of the various services and with the regional directors general.

The Corporate Planning Group itself now consists of the Planning and Evaluation Directorate, the Policy Directorate, and the Intergovernmental Affairs Directorate.

Planning and Evaluation Directorate

The Planning Branch of the directorate oversees the departmental planning processes, coordinates the department's response to science and technology contracting-out proposals and, with the Finance Directorate, is responsible for preparation of the annual program forecast, while the Evaluation Branch directs the department's evaluation program and provides direction and advice on development and implementation of performance measurement systems.

During the year the directorate completed a meticulous budget review of the Environmental Management Service and developed and implemented procedures for reallocation of resources. A framework was developed to help senior management assess the priority of proposals submitted for additional resources. In concert with the Finance and Administration Service and other services, the directorate completed a review of the department's program activity structure for implementation in the 1979-1980 fiscal year. In other areas, the directorate prepared policy and guidelines for program evaluation and a report on application of evaluation techniques to departmental programs.

Policy Directorate

The Policy Directorate is responsible for ensuring that issues and problems facing the department as a corporate

body are identified, examined and assigned, so that the social, economic, scientific and technical matters involved are addressed consistently and effectively, particularly in the context of the initiatives and activities of other federal government departments and agencies.

During 1978-79, in conjunction with services and regions, the directorate addressed a wide variety of subjects including (a) assisting in the development of a role for the Corporate Planning Group; (b) helping define the economic role of the department; (c) "eco-development," including the promotion of such special projects as the Conserver Society and the Ark; and (d) contributing to the various environmental activities of NATO, OECD, and the Economic Commission for Europe.

The directorate was heavily involved in the departmental zero base budget review. Advice and support was provided to the minister and to senior management for the first ministers' economic conferences, the programs of the Board of Economic Development Ministers and the Ad Hoc Committee of Economic Deputies.

Intergovernmental Affairs Directorate

The Intergovernmental Affairs Directorate monitors developments in intergovernmental relationships at both the national and international levels. It provides an overview of programs and strategic advice to senior managers on environmental and renewable resource issues and activities involving intergovernmental relations.

The directorate continued to provide the secretariat support for federal government participation in the Canadian Council of Resource and Environment Ministers (CCREM). The June 1978 meeting dealt with such matters as the need for guidelines for environmental impact assessments on projects which involve two or more jurisdictions, plans for the October 1978 Shore Management Symposium, hazardous waste management and developing concern about long-range transport of air pollutants.

The directorate coordinated departmental response to the Federal-Provincial Relations Office study of duplication in programs of the federal and provincial governments. It also coordinated preparation of information on departmental activities in the north for the Office of the Special Representative on Northwest Territories Constitutional Review.

The revised Canada/U.S. Great Lakes Water Quality Agreement was signed. The directorate continued to monitor

developments in the U.S. and to participate in a number of transboundary matters concerning the environment, including the proposed oil refinery at Eastport, the Garrison Diversion project and thermal electrical plants in Canada at Atikokan, Ontario and on the East Poplar River in Saskatchewan. It also participated in an informal Canada/U.S. meeting to discuss the possibility of a bilateral air pollution agreement.

Staff members compiled the 1978 Report (Country Monograph) for the Senior Advisers on Environmental Problems of the Economic Commission for Europe and helped to develop and present the Canadian position on a possible convention on long-range transboundary air pollution. The directorate also coordinated Canadian preparations for and represented Canadian interests at meetings of the Governing Council of the UN Environment Program, the OECD Environment Committee and the NATO Committee on the Challenges of Modern Society. Subjects considered at these meetings ranged from mankind's impact on the stratosphere to control of products containing toxic chemicals.

Administration Program

Public Information

In mid-1978 a thorough examination of the public information function at the Department of the Environment was begun. The project coincided with a re-examination of the department's mandate resulting from the creation of a separate Department of Fisheries and Oceans.

The project culminated in January 1979 with the establishment of a comprehensive, consolidated Information Directorate for DOE, designed to give greater central thrust and support to the department's information needs, eliminate duplication of effort, and improve planning and flexibility. The reorganization reduced by 18 per cent the number of departmental information personnel. Regional information resources were also reorganized to better provide for the public information needs of the department's five regions.

Media and Special Relations

In support of numerous department-wide and service programs and activities, 114 news releases were written and disseminated to selected broadcast and print media in Canada.

Thirty-one speeches were drafted or edited by the information services for delivery by senior officials to audiences across Canada.

A number of news conferences and press briefings were organized, including the official visit of the United States Secretary of the Interior on the occasion of the signing of the amendment to the Migratory Birds Convention, and the announcement of the minister of the environment's endorsement of the findings of the Federal Environmental Assessment Review office concerning the Alaska Highway Gas Pipeline and the proposed exploratory drilling in Lancaster Sound.

Information exchange among non-governmental environmental organizations continued to be aided through publication of the Citizens' Bulletin. A number of the projects and publications of these groups were supported through provision of funds.

Daily press clipping and broadcast media monitoring services covering subjects of interest to the department were provided to departmental management.

Advice was provided to Carleton University on development of a new undergraduate course on the environment.

Other special information and public relations initiatives taken during the year included those involving the east coast seal hunt, metric conversion of the fishing

industry, new fisheries habitat management regulations, and a nationwide sportfishing survey.

Arrangements were made for the opening of an addition to the AES Satellite Laboratory at Downsview by the minister of the environment on the occasion of World Environment Day.

Public acceptance of a weather modification research program in the Thunder Bay area during June and July was achieved by an intensive media and community relations campaign.

Broad information support was provided for the opening of Weatheradio services in Halifax (January 1979) and in Toronto (February 1979). In both cases, media reaction to the new service was extensive and positive. Introduction of the new services was facilitated through more widely based information support, including direct contact with radio and television stations and other users of the service, and use of brochures and exhibits.

Displays

Displays illustrating Canada's eight forest regions were produced for the Canadian Forestry Service. They were erected at two international meetings, the International Soil Science Society World Forestry Congress at Edmonton and at Djakarta, Indonesia, the latter in four languages and with an accompanying brochure.

Five displays on flood damage reduction were produced for use by the regional offices of the Inland Waters Directorate.

A major departmental display was produced for the three-week Canadian National Exhibition in Toronto. The theme, the importance of the forest ecosystem to man, was carried out through detailed re-creation of a living forest on the site. Judged by the Canadian Government Exposition Commission to be best display, it attracted by far the greatest number of visits by the public.

The Fisheries and Marine Service was represented at the Canadian National Exhibition through a display with an ocean exploration theme, featuring the research submersible Pisces IV.

A two-week display and film program was undertaken at the Adams River sockeye salmon spawning grounds in British Columbia. Displays were made at various fisheries festivals in the Atlantic provinces.

A permanent display depicting local Weatheradio services was produced on behalf of the Atmospheric Environment Service and erected at the CN Tower in Toronto.

Staff Publications

Contact, the departmental tabloid newspaper about people, their jobs and outside interests, was published monthly and distributed to employees across Canada. Other service and regional employee publications were produced to meet the needs of smaller audiences.

New Interpretive Publications

As part of its support of service programs, the public information community produced the following new publications:

- Cutting Our Flood Losses, a brochure produced in conjunction with a series of television announcements for the Flood Damage Reduction program;
- Canadian Wildlife Service Interpretation Program, a publication describing the variety of activities offered by the five wildlife interpretation centres across Canada;
- Environmental Protection Bulletin (second issue), highlighting the monitoring, regulatory and technology development work of the Environmental Protection Service;
- Fishermen's Information, a series of bulletins that dealt with fisheries science including how and why it worked for commercial fishermen, the new handling and transport system for the Newfoundland inshore fishery, and regional bulletins on the effect of the new Fishing and Recreational Harbors Act;
- Fishermen's Newsletter, a publication launched by the Pacific Region, Fisheries and Marine Service, to inform commercial fishermen and the processing industry of departmental programs, policies and regulations;
- Environment Source Book, A Guide to Environmental Information in Canada, a handbook published on behalf of the federal and provincial environment departments; and
- Water--A Vital Resource, a policy statement about freshwater resources and their management.

A question and answer booklet on the east coast seal hunt, a folder outlining the variety of nautical charts issued by the Canadian Hydrographic Service, and a folder describing a solar energy project at a departmental fish hatchery in Manitoba were also produced by the Fisheries and Marine Service Information Branch.

A color poster series on the life cycles and migration patterns of salmon, as well as a fact sheet and newsletters in support of the Salmonid Enhancement Program, were produced in the Pacific Region.

In addition to these new publications the following titles were revised and reprinted: Canadian Forestry

Service, describing CFS programs, and Fishermen's Information Handbook for east coast fishermen, issued by the Maritimes Region.

Audio-Visual Information Activities

As part of the Flood Damage Reduction Program of the Inland Waters Directorate, a public service announcement was produced and distributed to television stations across Canada. Film sequences were completed for a documentary film on Atlantic salmon with first public showing expected early in 1980.

Extensive coast-to-coast photographic coverage of fisheries and marine science activities was completed under contract and the Fisheries and Marine Service Information Branch photo library was reorganized.

Production work continued on the feature film The Biosphere, a joint undertaking with the National Film Board, with release expected in late 1979.

Public Enquiries and Publications Distribution

The public enquiries function of the Information Directorate was an important link with a wide audience. Over the year, some 141 000 telephone and written enquiries covering all aspects of the department's programs were answered by the Enquiry Centre.

A total of 2 729 890 publications were distributed during the year.

French Programs

The French Editorial Unit in Montreal, established four years ago, continued to provide specialized editing services on the varied scientific, technical and administrative documents of the department. The unit delivered a total of 103 edited documents, comprising more than a million words.

Administration Program

Federal Environmental Assessment Review Office

The Environmental Assessment and Review Process (EARP) was established in 1973 by Cabinet decision to assess the environmental consequences of federal programs, projects and activities before final decisions are made, and to incorporate the results of these assessments in planning and implementation.

All federal departments and agencies are subject to this directive, except proprietary Crown corporations and regulatory agencies which are invited to participate in the process. Federal projects are considered to be those initiated by federal departments and agencies, those for which federal funds are solicited, and those involving federal property.

EARP is administered by the Federal Environmental Assessment Review Office (FEARO) which reports to the minister of the environment on the functioning of the process.

In accordance with the process, departments and agencies make initial screenings of their own activities to identify environmental effects. Participating agencies are required to inform the public early in the planning stage of those activities that may be environmentally sensitive.

Projects with potentially significant environmental impacts are referred to the executive chairman of FEARO for a formal assessment. Each project submitted is reviewed by a separate independent panel.

The chairman of each panel is the executive chairman of FEARO or his delegate. Panel members are chosen for their objectivity and special knowledge of the technical and environmental factors associated with the activity. They are selected from the federal public service, provincial agencies and the private sector.

The panel develops guidelines for the preparation of an environmental impact statement. Preparation of the statement itself is the responsibility of the initiating federal department or agency. After studying the environmental impact statement, obtaining public response to this statement and receiving any additional advice considered necessary, the panel submits a report to the minister of the environment. This report includes an examination of the major impacts of the project and recommendations concerning implementation. The project may not proceed before the panel has presented its recommendations.

Panels conducted public meetings to review guidelines for environment impact statements and issued guidelines for 8 projects under review. A total of 48 days of public

meetings were held and recommendations were made to the minister on five projects: the Shakwak Highway Project (Haines Road/Alaska Highway); Eldorado Nuclear's project to construct a uranium hexafluoride refinery in Ontario; Eastern Arctic Offshore Drilling/South Davis Strait Project; the Roberts Bank Bulk Loading Facility Expansion Project; and the Lancaster Sound Offshore Drilling Project. The panels concerned recommended that the Shakwak and Eastern Arctic Offshore Drilling/South Davis Strait projects should proceed under conditions. After initially rejecting a proposed site at Port Granby, Ontario for Eldorado's refinery, three other sites (near Port Hope, Sudbury and Blind River) were reviewed and all found to be acceptable with certain conditions. The Roberts Bank panel recommended against the full-scale expansion but indicated that reduced expansion would be environmentally satisfactory under certain conditions. The Lancaster Sound panel recommended that exploratory drilling be deferred until the Canadian government addresses the issue of the best uses of Lancaster Sound and until the proponent could demonstrate preparedness to deal with a potential blowout.

Projects in advanced stages of panel review were the Alaska Highway Gas Pipeline, and proposals to reactivate Boundary Bay Airport near Vancouver, and to twin a portion of the Trans-Canada Highway in Banff National Park.

Participating agencies are now required to provide the executive chairman of FEARO, on behalf of the minister of the environment, with all essential information on activities assessed internally by these agencies. The information will be used to evaluate the performance of the process. Negotiations to obtain this data continued.

Scientific and Technical Information

Scientific and technical publications are the means by which research carried out by the Department of the Environment is translated into useful applications. Products of the scientific and technical information program include periodicals, manuals and directories, specialized scientific publications and computerized data banks. Access to information is provided through publication exchange, abstracting and indexing services, computerized retrieval systems, conferences, workshops and specialized library services.

Publications in 1978-1979 included scientific articles in international journals, textbooks and technical reports, manuals and interpretive articles describing research applications.

Periodicals

The Journal of the Fisheries Research Board of Canada, which continued to be rated the best journal of its kind in the world, published a special issue on the recovery potential of oiled marine northern environments.

As a response to public enquiries into Canadian climate and its impact, the Monitoring Division of the Canadian Climate Centre began to issue Climatic Perspectives, a weekly publication providing charts and a narrative of the week's weather, emphasising the effects of climate on Canadian society, the economy and the environment.

Climatological Services continued to produce and distribute the Monthly Record of Meteorological Observations, as well as The Canadian Weather Review and the Monthly Radiation Summary. Other periodicals issued less frequently included Supplementary Precipitation Data, Daily Soil Temperature Data, Ozone Data for the World and Snow Cover Data Canada.

The Canadian Forestry Service published 30 articles in the bilingual Bi-Monthly Research Notes during the year. A new bilingual publication, the CANUSA Newsletter, which reports the activities of the Canada/U.S. spruce budworm research and control program, began bi-monthly publication in April 1978.

Two newsletters of the Canada Committee on Ecological (Biophysical) Land Classification were published. The subjects covered included wildlife and wildlife data in ecological land classification, and the vegetation component in ecological land classification.

The Spill Technology Newsletter, published by the Environmental Impact Control Directorate, continued to be

the only publication in the world devoted to oil spill cleanup technology. This bi-monthly newsletter receives wide circulation--more than 2500 subscribers in Canada and 33 other countries. The Directorate also issues RESILOG, a new bi-monthly publication which offers an exchange of views and information on waste management topics at the professional level.

Directories and Manuals

The Scientific Information and Publications Branch of the Fisheries and Marine Service published sailing directions, small craft guides, tide tables and water levels covering all three oceans and navigable waterways of Canada, the Hydraulics Manual for Fishermen, British Columbia Herring Spawn Deposition Manual, and the Directory of Marine Scientists in Canada.

The Atmospheric Environment Service produced a number of publications during 1978-1979. The Canadian Climate Centre prepared a three-volume study for the Ontario Ministry of Industry and Tourism entitled The Tourist and Outdoor Recreation Climate of Ontario, which provides meteorological information for recreation and tourism planning. The centre also published A Handbook on Agriculture and Forest Meteorology, which offers chapters on plant-environment relationships, the climate of Canada, and agroclimatic data for stations from coast to coast.

Two meteorological studies, Selected Papers on Cloud Resources for Cloud Seeding in the USSR and A Contribution to the Theory of Heat Regime of Buildings were translated from Russian and published.

The Field Services Directorate produced a number of publications on weather services and meteorology:

- Making the Most of the Forecasts, a pamphlet containing a map of forecast areas and brief narrative description of service offered and terminology used;
- Weatheradio Canada, a series of pamphlets showing a map of the expected coverage area, with a brief narrative describing service;
- Marine Weather Forecast Areas, a map of marine forecast areas;
- Using the Marine Forecasts, a publication containing a map of marine forecast areas, a brief narrative describing services and location of AES offices;
- Location of Weather Offices - Canada, a map showing the location of all weather offices in Canada where information is available to the public;

- Aviation Weather Services, a booklet produced for Transport Canada as an aid to pilots;
- Flying the Weather - VFR, a text, prepared jointly by Environment Canada and Transport Canada, designed to meet the needs of private pilots;
- Weather Ways, the basic meteorology instruction text for aviation meteorology, suitable for use up to the most advanced levels.

The Lands Directorate produced a map index for the Canada Land Inventory. The index covered soil capability for agriculture and forestry; and land capability for recreation, ungulates and waterfowl.

Data Banks

The Fisheries and Marine Service is the Canadian input centre for the international Aquatic Sciences and Fisheries Information System (ASFIS). During the year Canada became the first country in the world to make the Aquatic Sciences and Fisheries Abstracts available for on-line searching. ASFA is now available in tape form, and can be searched by computerized retrieval systems.

WATDOC, the Water Resources Document Reference Centre of the Inland Waters Directorate, continued to build data bases related to the work of the directorate and other elements of the department. The Canada Water Data Base, WATDOC's major commitment, was the most heavily used of any publicly available Canadian data base of its kind. WATDOC's data bases are now directly accessible in 60 cities in Canada.

In the Lands Directorate, the Canada Land Data Systems Division builds and maintains a data bank which at year-end included more than 3200 maps. The tabular and map output are used by federal and provincial government departments, Crown corporations, universities and survey groups for land use planning and monitoring, parks planning and management, coastal zone studies, ecological land surveys, forest management, and a variety of other uses.

A number of data bases were being developed under the Water Effluent National Information System (WATENIS) to facilitate the handling of data on sources of water pollution. Although only limited information is available for industrial sectors, the Municipal Data System (MUNDAT) contains up-to-date information on municipal waterworks and wastewater systems across Canada.

In the Air Pollution Control Directorate, 5000 microfiche and 1500 books and reports were added to the

Technical Information System. There are more than 100 000 entries in this partially computerized system, which responded to more than 5000 enquiries from scientists, engineers and other professionals in government and industry.

Scientific Publications and Technology Transfer Seminars

The Scientific Information and Publications Branch of the Fisheries and Marine Service published Food from Water, Fishing with the Friedrich Busse, Hydrodynamique et énergétique de la propulsion des poissons, Ressources marines vivantes de Terre-Neuve et du Labrador, and more than 200 items in the Technical, Industry, Manuscript, and Data report series.

The Atmospheric Research Directorate published more than 100 scientific papers during the year, including nearly 50 journal articles on research projects in air quality, atmospheric processes and meteorological services research and development; and 25 other papers on a variety of topics, including Meteorological and Air Quality Field Study in the AOSERP Area, prepared by AES for the Alberta Oil Sands Environmental Research Program, and Prediction of the Motion of Oil Spills in Northern Waters, a Canadian Meteorological Research Report.

The Canadian Forestry Service published eight reports in its Information Report series, and five major reports in the Forestry Technical Report series. Seven major publications, including the Forest Insect and Disease Survey Annual Report, were also produced. In addition, reports on symposia, the Energy from the Forest Program, and the Tree Improvement Program were published in 1978-1979.

The Inland Waters Directorate published water quantity data, including streamflow, river and lake levels, sediment surveys, historical summaries and map supplements. Data on surface water quality, stored in NAQUADAT, the directorate's data processing system, were regularly printed in book form for use by scientists and technolgists.

The Canadian Wildlife Service published a major report on migratory game bird hunters and hunting in Canada, the result of 10 years of surveying selected hunters, and a paper on the responses of Peary caribou and musk-oxen to helicopter harassment. The CWS Occasional Papers series format was revised extensively; the new design is more economical and more rapidly produced.

The Lands Directorate published an index, a brochure and a report for the Northern Land Use Information Series. In addition, the Fraser River Estuary Study: Constitutional and Legislative Frameworks was produced.

Technology transfer activities of EPS' Water Pollution Control Directorate included publication of 95 reports, a newsletter on wastewater technology and a number of articles in major scientific journals. Seven seminars were held to ensure that specific sectors of the industrial community were aware of new technology.

The Air Pollution Control Directorate published 32 reports related to the department's responsibilities under the Clean Air Act. Subjects included inventories of air contaminants, studies of industries contributing to air pollution, abatement technology, and methods for measuring emissions of air contaminants. To complement these reports, 50 video cassettes on abatement technology were loaned to other government agencies, Canadian universities and industries. Seminars were held on measurement techniques, air pollution data analysis, and air pollution meteorology.

The Environmental Impact Control Directorate published a variety of scientific and technical reports, on topics that included radiation monitoring, hazardous waste management, toxic substances, environmental emergencies and resource conservation. Highlighting the year's reports were Probabilities of Blowouts in Canadian Arctic Waters, Guidelines for the Management of Waste Materials Containing Polychlorinated Biphenyls (PCBs) and Monitoring Program Design Recommendations for Uranium Mining Localities.

Related Responsibilities of the Minister

The minister of fisheries and the environment also has the responsibility of tabling the following reports in the House of Commons:

Canada Water Act, Operations
Canadian Saltfish Corporation, Annual Report
Canadian Saltfish Corporation, Budget
Clean Air Act, Operations
Energy Supplies Emergency Act, Operations
Fisheries Development Act, Annual Report
Fisheries Prices Support Board, Annual Report
Freshwater Fish Marketing Corporation, Annual Report
Freshwater Fish Marketing Corporation, Budget
International River Improvement, Operations
Ocean Dumping Control, Annual Report