Fisheries and Environment Canada

Pêches et Environnement Canada

Annual report 1977/1978

Annual Report 1977/1978

Cat. No.: En1-1978
ISBN: 0-662-50152-7

Copies available from:

Information Services Directorate
Department of Fisheries and the Environment
Ottawa, Canada K1A 0H3

Minister
Fisheries and Environment Canada

Ministre
Pêches et Environnement Canada

Ottawa, Canada
K1A 0H3

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

May it Please Your Excellency:

I have the honor 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, 1978.

Respectfully submitted,

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
the Environment
Ottawa, Canada

Dear Mr. Minister:

I have the honor to submit the Annual Report of the Department of Fisheries and the Environment for the fiscal year ended March 31, 1978.

Respectfully submitted,

J.B. Seaborn

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Highlights of the Year

The year under review was the first full year of operation of Canada's new fisheries management regime, following the extension of jurisdiction to 200 miles on east and west coasts on January 1, 1977. Surveillance and control operations in the vastly-expanded zones proved very effective, with fisheries patrol vessels reinforced by Canadian Coast Guard and National Defence ships and aircraft. Most foreign fishing vessels operating off the Canadian coasts respected catch quotas and other restrictions imposed to protect Canadian fishermen and allow stocks to recover.

Catch statistics at year's end underscored the effectiveness of Canada's management policies, with Atlantic landings, at 972 000 metric tons, the highest since 1971. The nationwide catch of 1 210 000 metric tons was also the highest since 1971, setting a new record for landed value at $457 million. Market value of Canadian fishery products in 1977 topped the $1 billion mark for the first time. The Canadian share of finfish (all species except invertebrates) catches from inside and outside the 200-mile zone increased by 14 per cent over 1976, and is expected to rise higher in 1978 as foreign quotas are progressively cut back.

Canada's expanded management role required a substantial boost in research activities. For this reason, some 102 man-years were added to the marine fisheries research staff, and a five-year, $50-million vessel construction program was announced to strengthen research and surveillance programs.

1977 saw introduction of the first fishing plan for the Atlantic groundfish (bottom feeding fish such as cod and haddock) fleet, to control fleet deployment and resource exploitation in Atlantic Canada. Incentives provided under the plan enabled trawlers based in the Gulf of St. Lawrence to open new fisheries on the Grand Banks and in northern waters, and groundfish plants to operate year-round. Under the 1978 plan, fishing quotas rose by 49 000 tons, an increase of 35 per cent, with inshore fishermen in particular benefiting from higher cod allocations.

Wide-ranging amendments to the Fisheries Act came into effect on September 1, 1977, providing greater protection for fish habitat and stiffening penalties for poaching and other offences. A $41 million fisheries rebuilding program was announced to improve the quality and value of inshore fish landings, explore new offshore fishing grounds, and modify the structure of the fishing fleet.

The multi-million dollar Salmonid Enhancement Program in British Columbia was approved. The program is designed to double the value of commercial salmon production in the province to $400 million annually by the 1990s, and greatly enhance recreational fishing opportunities.

Physical oceanographic research continued in the Labrador Sea, centred on two major cruises by CSS Hudson. Two long-term projects were involved: the Labrador Shelf and Slope Study, in which changes in the Labrador Current were examined; and the Labrador Sea Physical Oceanography project, concerned with formation of deep and intermediate waters.

In the Pacific Region, highlight of the year was the move by hydrography, ocean chemistry and Ocean and Aquatic Sciences administration divisions to the Institute of Ocean Sciences, Patricia Bay, B.C.

Twenty satellite-tracked drifting buoys were deployed in a preliminary test for the First GARP (Global Atmospheric Research Program) Global Experiment (FGGE) as part of Canada's contribution.

The Atmospheric Environment Service's forecast operations were enhanced by an increase in satellite information. On October 31, 1977, a satellite readout station was installed in Edmonton to provide pictures of cloud, ice, open water and land masses in arctic regions. Because the satellite can operate in the infra-red as well as the visible spectrum, imagery can be obtained throughout the winter period of polar darkness.

The second Weatheradio Canada facility began continuous bilingual broadcasts of weather information from Mount Royal, Montreal, in December 1977, joining its sister station in Vancouver. Seventeen stations are planned for major centres.

AES's Ice Branch installed a Side Looking Airborne Radar (SLAR) on an ice reconnaissance aircraft, in response to increased demands for year-round arctic ice information. The system, which permits day or night all-weather reconnaissance, will be used for data collection and tactical support of marine activities. A precedent-setting midwinter reconnaissance exercise through the Arctic was flown in February 1978, as a result of the installation of SLAR.

The movement of air pollutants over long distances has been recognized as a serious environmental problem in eastern North America. DFE has begun a major program on the long-range transport of air pollutants (LRTAP), with AES as lead agency. One objective of the program is to

determine the state of the environment in eastern Canada prior to the impact of emissions from projected increased coal burning in North America, and to try to understand the ecological and socio-economic costs of such emissions.

A full-scale research program was initiated by the Canadian Forestry Service to develop forest biomass as an energy source, in particular to use mill and forest waste as raw material in the production of methanol. The program involves all regional forest research centres, as well as the Petawawa Forest Experiment Station and the Forest Management Institute. A forest-based methanol industry could help secure Canada's energy supplies, provide liquid fuel for Canadian automobiles, produce a valuable export and improve the balance of trade.

The spruce budworm, a grave threat to Canada's forests, remained a prime concern. The struggle against this menace was intensified with establishment of a Forest Pest Management Institute at Sault Ste. Marie, and the launching in August 1977 of a six-year international budworm control program by Canada and the United States. The program is intended to double the research effort on the budworm in North America.

The Canadian Wildlife Service began to acquire land for a new national wildlife area on the Bay of Fundy. Establishment of the area as a wildlife refuge would protect the most important rest stop for migrating shorebirds on Canada's Atlantic coast.

A number of important measures have improved the department's environmental protection program. Regulations governing emissions of mercury and asbestos were published in the Canada Gazette, and National Ambient Air Quality Objectives were announced for sulphur dioxide, suspended particulate matter, carbon monoxide, oxidants and nitrogen dioxide. Regulations and guidelines for the potato processing and metal finishing industries were promulgated.

An important step was taken toward eliminating PCBs (polychlorinated biphenyls) from the environment with the publication of Chlorobiphenyl Regulation No. 1, placing PCBs on the schedule of the Environmental Contaminants Act.

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 elements of this new department, which were combined with what was then the Department of Fisheries and Forestry, included the Canadian Meteorological Service of the Ministry of Transport; the Air Pollution Control Division and the Public Health Engineering Division from the Department of National Health and Welfare; the Water Sector from the Department of Energy, Mines, and Resources; the Canada Land Inventory from the Department of Regional Economic Expansion; and the Canadian Wildlife Service from the Department of Indian Affairs and Northern Development.

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 Environmental Assessment and Review Process was established in 1973 to control the threat to the environment posed by large-scale projects. The process is mandatory for all projects in which the federal government is involved, and is administered by the Federal Environmental Assessment Review Office, which advises the minister.

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 without 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, including an annual review of 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 fall 1977, to be responsible for the environment component of the department.

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 (FMS) are grouped under three major divisions -- Fisheries Management, Ocean and Aquatic Sciences, and Small Craft Harbors -- 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 atmospheric, ice and sea-state conditions, and advice and consultation on the use and application of this 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 environmental problems, and instrument design and evaluation.

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 co-operative 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 Canada Centre for Inland Waters.

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) ensures that the federal government's responsibilities for protection of the environment are carried out in a manner consistent with national policy and, where necessary, enforced under appropriate legislation. EPS is concerned with air pollution, water pollution, solid waste management, management, resource and energy conservation and environmental emergencies, and contributes to environmental impact monitoring and control. As the control arm of the department, EPS is the point of contact on environmental protection with industry, corresponding agencies of the provincial governments, departments and agencies of the federal government and the public.

Administration Program

The Planning and Finance Service consists of two major elements: directorates dedicated to policy support, and those providing common services. The policy support directorates assist in the development of departmental policy, and provide the minister and deputy minister with an overview of department activities. The common services provide liaison with central agencies such as Treasury Board and the Public Service Commission, and develop guidelines, procedures and systems to support all elements of the department.

Information Services Directorate coordinates the information function of the department, which it carries out jointly with service information groups at headquarters and in regional offices. These information groups communicate with the public on the policies, legislation, services and regulations of the department and foster communication among the department's own employees.

Fisheries Management

Resource Services

The Resource Service Directorate serves as a national focus for conservation, restoration and culture of renewable aquatic resources. It is responsible for national coordination of program management in protection, rehabilitation and enhancement of fisheries habitats, and has functional responsibilities for research programs to support these activities. The overall objectives of the directorate are to achieve rational utilization of the fisheries resource, to promote research in conservation, to increase the biological productivity of the aquatic environment and to safeguard the habitat for fisheries. Resource Assessment Section was heavily involved in programs to implement the increased research necessary for management of the new 200-mile zone. It helped to create a Canadian scientific advisory body that will replace ICNAF (International Commission for the Northwest Atlantic Fisheries) domestically. A resource forecast was prepared through 1985, as a basis for planning development of the Atlantic fishing industry.

Internationally, the Resource Assessment Section contributed to several subcommittees of ICNAF, to negotiations with the United States and other countries for fishing agreements, and negotiations for a new international tuna treaty in the Pacific. It provided a commissioner to the Inter-American Tropical Tuna Commission, and the scientific adviser to both that commission and the International Commission for the Conservation of Atlantic Tunas.

The section helped to develop a new lobster policy and co-operated with the Canadian International Development Agency and the UN Food and Agricultural Organization in a training seminar on marine resources evaluation for scientists of west African countries.

The major focus for the Resource Enhancement Branch was the Salmonid Enhancement Program in British Columbia, particularly in support of negotiations of policy and budgetary agreements during the planning phase. In eastern Canada, the branch coordinated salmon enhancement and assessment matters and took part in a regional review of the Atlantic salmon management program. Contributions were made to other salmon fishery management decisions, including extension of the six-year commercial salmon ban and negotiations on international catch quotas off West Greenland.

The Aquatic Environment Branch continued its efforts to protect fish habitats that support Canadian commercial and recreational fisheries. Nationally, it helped to assess

fish stock contamination by PCBs, Mirex, pesticides and mercury, and to design manufacturing controls to protect fish under the Pest Control Products Act and the Environmental Contaminants Act.

Policies and information programs were initiated to implement the new fish habitat protection provisions in the amended Fisheries Act.

In the Newfoundland region, activities resulting from extended jurisdiction included initiation of a new section for foreign co-operative research; expanded studies on all species of groundfish, capelin, shrimp and squid; and an increase in the groundfish sampling program.

Top priority was again given to providing fisheries management advice to scientific subcommittees of ICNAF and the Canadian Atlantic Fisheries Scientific Advisory Committee, including advice on the effects of mercury contamination in western Labrador, and forest spraying on freshwater fish.

Maritimes research included cod stock analysis in the southern Gulf of St. Lawrence, assessment of capelin and American plaice resources in the gulf, and development of a model to estimate harp seal production.

Five co-operative research studies were conducted with foreign nations, including an acoustics survey with Cuba; a study with Japan to test the efficiency of "off-bottom" trawls; and fish larvae and mesh selection studies with the USSR.

Monitoring of Atlantic salmon in major New Brunswick rivers indicated that although populations are increasing, spawning levels could not yet support a reopening of the commercial fishery, closed since 1972. Approximately 1.25 million hatchery-reared juvenile salmon were used in efforts to rehabilitate major salmon rivers, while several biological studies were conducted on disease, nutrition, physiology and stock evaluation. Enhancement of the LeHave River salmon run, through fishway construction and hatchery stocking, has been a notable success.

Ecological work relating to stream rehabilitation, atmospheric transport of pollutants and acidification of freshwater lakes was complemented by evaluation of proposals likely to harm fish habitats, such as the Fundy tidal power development, the Miramichi dredging program, a proposed liquid natural gas terminal in New Brunswick, and exploratory drilling for oil and gas on the continental shelf.

Research in the Great Lakes, under the Canada/U.S. Agreement on Great Lakes Water Quality, included studies of

the effects of heated effluents, increased nutrients and toxic substances on aquatic life in the lakes.

Western Region research focused on the effects of commercial exploitation on the walleye, selective harvesting of unexploited fish populations in small lakes, and the ecology and life cycle of arctic char in the Kent Peninsula and N.W.T.

The South Indian Lake research station studied the environmental effects of the impoundment of South Indian Lake and the diversion of the Churchill River for hydroelectric development. Contamination of natural freshwater systems by heavy metals, radionuclides and acid rain were examined in the Experimental Lakes area.

Living aquatic resources were inventoried in connection with proposed industrial developments in the Western Region, in particular, the Arctic Islands pipeline, Mackenzie and Liard highways and the Snare River hydroelectric scheme. Impact assessments were made for a number of arctic offshore oil exploration proposals. Advice on fishway designs was provided for the Qu'Appelle Valley Implementation Agreement, and for other proposed fishways in the three Prairie provinces. A camp was established at Sagvaqjuac, 50 km north of Chesterfield Inlet, where research was conducted on the impact of industrial development on fisheries habitat, including a simulated gas pipeline rupture during the winter.

The newly-formed research section in Quebec Region undertook studies of blue mussels as pollution indicators, and a study of herring in the St. Lawrence estuary.

Biological investigations in the North centred on the effect of a gas pipeline from the Arctic Islands on the distribution and abundance of marine mammals. Further data were gathered on ecological factors that control breeding and growth of marine mammals in the sea; and effects of environmental stress, particularly those associated with offshore development of oil in Baffin Bay and Davis Strait. Research was also conducted on several commercially important marine mammals on the east and west coasts, such as the harp seal, hooded seal and North Pacific fur seal.

In the Pacific region, extensive research included studies of techniques for enhancing Pacific salmon stocks. A nutrient enrichment experiment at Great Central Lake, Vancouver Island, resulted in a record catch of 1 000 000 sockeye salmon in Barkley sound in 1977 -- about 30 times the average harvest. A Japanese-style chum salmon hatchery and a hormone treatment method to eliminate pre-spawning mortality of chinook salmon were tested. Successful

breeding of saltwater-reared coho and chinook salmon opened the way for genetic improvement of fish-farm stocks. Other fish-farming research included development of feeds for Pacific salmon that could be manufactured in Canada. Investigations of salmon habitat requirements, stock identification and management models continued.

Marine environmental risks associated with 11 potential Pacific coast supertanker ports were analysed. Studies strongly indicated that salmon rearing capacity in estuaries is reduced by extensive log booming, particularly on Vancouver Island.

Tagging cruises, during which 10 000 fish were tagged, brought new insights into the distribution and population of black cod stocks. Research was conducted on the shrimp, abalone and oyster fisheries, and new techniques for assessing the extent and intensity of herring spawning were tested.

Fishing Services

Surveillance of foreign fishing was expanded to include monitoring of compliance with regulations. Foreign vessels are charged a fee, in addition to their fishing licence fee, to pay for this program.

More than 1100 foreign and Canadian vessels on the Atlantic and Pacific coasts were inspected. Under the ICNAF joint enforcement scheme, more than 50 Atlantic coast inspections were made outside the 200-mile limit. Seventeen violations were detected, with fines up to $15 000, and, in some cases, cancellation of fishing licences and forfeiture of catches.

With an increasingly mobile and efficient domestic commercial fishing fleet posing the threat of over-exploitation on both coasts, limited entry programs have been introduced in a growing number of fisheries. In 1978, no fewer than 13 fisheries were controlled by policies restricting the issue of new licences.

Problems posed by poaching and other illegal fishing activities occupied fishery officers across the country. In the Pacific Region, an enforcement team was formed, for dispatch at short notice where extra manpower was needed. Fishery officer training included a four-week course in law enforcement at the RCMP academy in Regina.

Controversy again surrounded the east coast seal hunt, and charges were laid under the Seal Protection Regulations. Canada's seal quotas, set by ICNAF, were 62 000 animals for the Front (icefields northeast of Newfoundland and Labrador), and 73 000 for the Gulf of St. Lawrence and land-based hunters.

A management program for commercial and recreational Atlantic salmon fisheries, introduced in Newfoundland Region at the start of 1978, reduced the fishing seasons in some sectors to restore stocks depleted by over-fishing.

In the Maritimes Region a management plan was developed for the Northumberland Strait scallop fishery. Under the Bay of Fundy herring program, the 1977 landed value of seiner-caught herring approached $7 million.

Industry-government committees set up by area managers improved communication with clients. They were successful in dealing with the disastrous 1977 lobster harvest in Nova Scotia, the lack of groundfish markets for fishermen on Campobello Island, and lobster and tuna poaching in western Prince Edward Island.

To help rehabilitate Canada's inland and northern fisheries, an inventory of commercial fisheries in Ontario was completed, and proposals made to enhance economic returns.

Fishermen's Services Branch developed a catch-insurance plan for the Bay of Fundy herring weir fishery, a management strategy for the herring gillnet fishery, and a cost-recovery proposal for the British Columbia Salmonid Enhancement Program.

Fishing Vessel Insurance Plan claims paid during the year totaled approximately $2.5 million.

Industry Services

Projects were initiated to assess long-term implications of the 200-mile limit for Canadian fish marketing. A worldwide supply-and-demand assessment to 1985 was prepared (in collaboration with the Department of Industry, Trade and Commerce) to forecast changes in fish landings and resulting changes in imports and exports by the principal fish producing and consuming countries. This will provide a basis to determine market opportunities for Canadian fishery products. A National Marketing Committee was formed to coordinate all national and regional marketing activities.

Industry Services helped plan an interdepartmental study on transportation and handling of perishable foods, and to develop a national fisheries food strategy. A revenue stabilization scheme was developed for the Canadian groundfish industry.

As focal point for consumer education and product promotion, the Fisheries Food Centre in Ottawa organized exhibitions, seminars, and radio and television programs. Half a million recipe brochures and educational publications were distributed to consumers, retailers and

institutions. The centre took part in fishery product promotions in western Europe and the United States, and in promotional activities of the North Atlantic Seafood Association, comprising the Scandinavian and Canadian fishing industries.

Domestically-produced fishery products valued at $1.2 billion were inspected for quality, compliance with grading standards, labelling, wholesomeness and safety criteria. Imported products valued at $220 million were inspected at ports of entry; 248 shipments from 35 countries failed to meet Canadian standards and were refused entry. Domestic and imported fishery products were monitored for hazardous substances, such as mercury and polychlorinated biphenyls.

Development programs in the Newfoundland, Maritimes and Quebec regions were aimed at rehabilitation of the east coast fisheries. The feasibility of a freezer trawler to fish non-traditional stocks, use of ultrasonic methods to detect parasites in fish fillets, and development of a Gulf of St. Lawrence roe capelin fishery were evaluated. As a result of trials conducted in 1976-1977, a program to improve fish unloading, holding and transportation facilities at 300 landing sites was implemented.

To meet increasing industry demands for technology, Industry Services undertook a wide range of projects. In the Maritimes, these included tests of an automated system for longline fishing, a more efficient lobster trap, a basket for harvesting Irish moss, sonar equipment designed to detect shrimp, a mechanical washer for scallops, a salt-fish drier, an improved method for skinning mackerel and tuna prior to canning or freezing, and a new process for salting minced fish.

In the Pacific Region, a three-month experimental dogfish fishery was undertaken in co-operation with two Polish factory trawlers. Canadian trawler captains and departmental officials were stationed aboard the Polish vessels to observe fishing and processing techniques and gather scientific data.

To improve the technology of the small-vessel inshore trawl fishery in Newfoundland, the pair bottom-trawl technique was demonstrated at Fortune Bay and Notre Dame Bay under the supervision of European master fishermen.

Technological assistance provided to freshwater fisheries included advice on processing plant design, demonstrations of a prototype aluminum vessel for the small-skiff fishery, and experimental harvesting and processing of whitefish roe for the Japanese market.

The Canadian groundfishery began the year under greatly improved economic conditions. The crisis years of low resources and low market returns were giving way to guarded optimism as resources showed signs of improvement and the industry realized higher market prices and a favorable exhange rate. In April 1977, payments to groundfish processors were withdrawn as the need for assistance in production of frozen groundfish fillets and blocks diminished. However, deficiency payments on groundfish landings continued throughout the year, totalling $21 504 000.

A wide-scale economic analysis of plants and vessels was made available to industry participants. The Fresh and Frozen Groundfish Industry Bulletin was sent to processors who had submitted confidential cost and earnings data to the department.

Industry Services coordinated joint undertakings between Canadian and foreign fishing interests. It arranged for harvesting of previously under-utilized species such as mackerel, squid, silver hake and capelin and traditional species which are surplus to Canadian domestic catching capacity, for delivery to plants with raw material supply problems. Whenever possible, these under-utilized species were processed in Canadian plants.

Liaison with the Foreign Investment Review Agency and the Department of Regional Economic Expansion increased substantially. This was the result both of declaration of the 200-mile zone and anticipation of resource recovery as a result of the department's management policies. Domestic and foreign investors showed renewed interest in Canada's fisheries. Of particular concern was greatly increased activity of Japanese firms in British Columbia. Effects of these initiatives on the fishing industry were the subject of intense study by the Industry Policy Group, working with regional offices and other headquarters services.

Support was provided to Fisheries Prices Support Board programs designed to protect fishermen against sharp declines in prices and consequent loss of income. Assistance programs administered under the Fisheries Prices Support Act totalled $1.9 million.

Ocean and Aquatic Sciences

Ocean and Aquatic Sciences has two major headquarters elements: the Marine Sciences and Information Directorate (MSID) and the Canadian Hydrographic Service (CHS).

Marine Sciences and Information Directorate

Within MSID, the Ocean and Aquatic Science Affairs Branch coordinates all matters that affect the national interest in ocean and aquatic sciences. It continued to administer the Ocean Dumping Control Act, prepared the second national report on ocean dumping activities, and participated in intergovernmental meetings to place global controls on ocean dumping.

Involvement in the surveillance satellite (SURSAT) experiments continued, and program office staff was provided for both the SURSAT and search and rescue satellite (SARSAT) projects.

Scientific support was provided for a major study of ice conditions in Viscount Melville Sound during the spring of 1978.

Contributions were made to the Intergovernmental Oceanographic Commission of UNESCO through its subsidiary bodies and formulation of its new policy initiatives. The Canadian position on marine scientific research at the UN Law of the Sea negotiations was reviewed. Canadian marine policy positons and concerns were coordinated for the NATO Committee on Challenges to Modern Society, the Marine Environmental Protection Committee of the Intergovernmental Maritime Consultative Organization, and the International Council for the Exploration of the Seas. Progress was made in negotiating science and technology agreements with Germany, France, Belgium, the Soviet Union and Japan.

The Marine Environmental Data Services Branch (MEDS) continued to acquire, store and disseminate oceanographic data to fulfill national and international commitments. It shared experiences in oceanographic data base management with the National Oceanographic Data Centre of the Federal Republic of Germany. An experimental pollution data base was jointly developed with the Bedford Institute of Oceanography. MEDS became the centre for distribution in Canada of manuals and guides published by the Intergovernmental Oceanographic Commission. Requests for data and information increased by about 30 per cent.

Regional Activities

Physical oceanographic research in the Labrador Sea centred on two cruises by CSS Hudson. Two separate long-term projects were involved: the Labrador Shelf and Slope Study, in which both spatial and temporal changes in the offshore branch of the Labrador Current are being examined, and the Labrador Sea Physical Oceanography project, which is concerned with the formation of deep and intermediate waters.

In other physical oceanographic research on the Atlantic coast, scientists continued their investigations of the Gaspé Current to gain a better understanding of its formation, dynamics and structure. The research is directed towards fisheries, pollution, navigation and economic development problems.

Phase III of the Canadian Ocean Data Buoy System was established and planning began for future systems to meet requirements of DFE and other departments.

Initial studies of synthetic rope for mooring instruments, in place of stainless steel wire, were disappointing.

Chemical oceanographic studies in the eastern Canadian Arctic were conducted in Davis Strait, Baffin Bay, Lancaster Sound, Jones Sound and Smith Sound. They established levels of dissolved or dispersed petroleum residues throughout Baffin Bay, and indicated substantially higher levels at Scott Inlet, northeastern Baffin Island. Studies of suspected petroleum seepage in Scott Inlet are planned.

Bedford Institute of Oceanography conducted a symposium at Halifax on the recovery potential of northern marine environments polluted by oil; 160 scientists from nine countries participated and focused attention on world oil pollution.

Ecological studies of the Bay of Fundy's Minas Basin continued, in an effort to understand the effects of a possible tidal power dam across the inlet. Staff scientists also participated in a CIDA-sponsored investigation of the Peruvian anchovy fishery, operating from CSS Baffin.

Ocean Physics Division concentrated on oceanographic studies for environmental impact assessments in Lancaster Sound and the approaches to Kitimat. Inlet and fjord circulation studies in the Arctic and off the west coast continued, and currents were measured in arctic waters where gas pipelines may be laid. Satellite-tracked drifting buoys measured summer surface currents in Lancaster Sound, while moored meters measured deep currents at the sound's eastern end.

Physical oceanographic studies were conducted between Vancouver Island and the mainland, and a numerical model of tides was developed for the Queen Charlotte-Hecate Strait-Dixon Entrance region. Development of numerical modelling of tides and currents in Georgia and Juan de Fuca Straits continued.

In studies funded under the Ocean Dumping Control Act, Ocean Chemistry Division studied the chemical variability of dumped material, bio-accumulation of heavy metals by marine organisms, and methylation of mercury. Ocean Weather Station P continued to document the increase in atmospheric carbon dioxide over the ocean and the capacity of the ocean to absorb future carbon dioxide from fossil fuel burning. The international Controlled Ecosystems Pollution Experiment in Saanich Inlet studied Prudhoe Bay crude oil emulsified with a new commercial dispersant, Corexit 9527, and studied the behavior of trace metals using lead-210 and cadmium tracers.

With a staff increase at the Ocean Ecology division, plankton biology projects went into full operation. Studies related to ocean dumping and distribution of aquatic worms continued.

In the Central Region, the Physical Oceanography Division completed shore property studies and environmental assessments as part of the St. Lawrence River middle estuary current study; conducted a hydrodynamic study of the Adolphus Reach/North Channel of the Bay of Quinte; and freshwater studies in James Bay.

Canadian Hydrographic Service

Increased interest in energy resources that exploit frontier and offshore reserves led to an increase in arctic surveys by the Canadian Hydrographic Service. The Interdepartmental Committee on Energy Research and Development approved funding for a long-range program to develop equipment and techniques to measure depths and ice thickness in support of arctic transportation.

A detailed calibration of the new Loran-C chain was carried out on the west coast to determine errors caused by transmitting the signal over long overland paths with irregular terrain. A series of charts with corrected latticing are now in production as a result of the calibration.

Seven field parties fron the Atlantic region operated from the Bay of Fundy to the eastern Arctic. CSS Baffin continued her survey work in Jacques Cartier Passage before heading north. Hydrographers on CCGS Labrador completed the route survey from Cape Cockburn, on Bathurst Island, almost to Cameron Island. Three other Coast Guard icebreakers carried out beaching and harbor surveys. MV Martin Karlsen continued the Labrador Coast inshore route from Cape Harrison to Cape Makkovik, then resumed the offshore survey of the Labrador Shelf. CSS Maxwell and charter vessel MV Meta carried out a variety of high

priority range, revisory and harbor surveys along the coasts of New Brunswick, Nova Scotia, Prince Edward Island, Quebec and Newfoundland. A shore party completed the Bras d'Or Lakes survey.

Central Region made an arctic survey, using helicopters and tracked vehicles, of the entire western portion of Viscount Melville Sound, including bays of the north shore of Victoria Island. The survey was made on a six-kilometre grid, with a shipping corridor surveyed on a more closely-spaced grid. Bridport Inlet, proposed site of a liquefied natural gas terminal, was surveyed in detail.

A number of projects were carried out in the Great Lakes. In northern Lake Huron, a survey of offshore waters was begun in co-operation with the U.S. National Ocean Survey; coastal surveys of southern Manitoulin Island began; the launch Vedette continued surveys in Lake Erie, Lake Huron and Georgian Bay; the Verity worked in Lake Ontario and the upper St. Lawrence River, and completed surveys for the metric chart of Toronto Harbor.

In the Pacific Region, a re-survey of Vancouver Harbor was completed. Caamano Sound was surveyed by CSS Parizeau, while CSS Richardson made a side-scan sonar sweep of most of the route to Kitimat. Pandora II conducted multi-disciplinary surveys in Amundsen Gulf in the western Arctic and completed a survey of Dickens Seamount, a sea mountain.

Chart production units were established in the Central, Atlantic and Quebec regions, requiring a transfer of cartographers from headquarters. Regions now produce all new charts and new editions. A unit to process chart reprints and another to develop new cartographic procedures will remain at headquarters after this phase of decentralization.

Ten new and reconstructed charts, 87 new editions and 90 reprints were published. Of 1100 published charts, 112 were in metric units and 52 were in preparation; 154 charts were bilingual, with 147 nearing completion. Two chart catalogues replaced information bulletins. The Graphical On-Line Manipulation and Display System (GOMADS) was brought into operation to edit digitized cartographic data. International symbols and standards and the new chart presentation format were incorporated into computer programs.

Seven bathymetric, four free air gravity, four Bouguer gravity, four total field and six magnetic anomaly Natural Resource Maps were published. Marine Sciences Papers 19 and 20, describing the surficial geology of the eastern

Gulf of Maine and Bay of Fundy, and Canso Bank, were published. Four sheets of the 1:10 000 000 General Bathymetric Chart of the Oceans were being prepared for publication at the year's end.

Five volumes of Sailing Directions in English and one in French were issued, and the six-volume 1978 Canadian Tide and Current Tables was published. 1975 Water Levels was issued in two bilingual volumes. 1976 Water Levels, using metric units, was in preparation.

Marine Sciences Papers 19 and 20, describing the geology of the eastern Gulf of Maine and Bay of Fundy, and Canso Bank, were published. Four sheets of 1:10 000 000 General Bathymetric Chart of the Oceans were in preparation.

International Directorate

International Directorate continued to play a key 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. This included an assessment of the draft Law of the Sea articles.

Work with 11 international fisheries commissions continued, as did involvement with bilateral fisheries agreements directed at improving fisheries management, securing advantages under existing agreements and deriving increasing benefits from the extension of jurisdiction to 200 miles.

The directorate negotiated bilateral agreements with the German Democratic Republic, Roumania, Bulgaria and Japan. These follow the pattern of earlier agreements, under which countries agree to abide by Canadian laws and regulations within Canada's 200-mile fishery zones, regarding stocks declared surplus to Canadian requirements. In addition, they recognize Canada's special interest in the area beyond and immediately adjacent to its 200-mile limit on the Atlantic coast.

A diplomatic conference on multilateral fisheries co-operation in the northwest Atlantic was organized. It laid the foundation for a new North Atlantic Fisheries Organization (NAFO), to replace the International Commission for the Northwest Atlantic Fisheries (ICNAF).

Discussions continued with the United States on development of a new Canada/United States Pacific salmon convention. Directorate staff were seconded to the office of the special negotiator for maritime boundaries and related resource arrangements, to help develop a boundary

settlement and long-term fisheries agreement with the U.S., and negotiate further interim arrangements for 1978. Establishment of new maritime boundaries was the subject of negotiations with France (with regard to St. Pierre-Miquelon) and with Denmark (with regard to Greenland).

Directorate staff were involved in preparation for and negotiation of the Tanker Safety Convention, and they advanced Canadian positions on marine environmental matters in the United Nations Environment Program, the OECD, NATO/CCMS, and the EEC.

Discussions continued with the United States on a proposed joint Canada/U.S. vessel traffic management plan for the Strait of Juan de Fuca. Marine environmental relations with the U.S. included discussions of compensation in cases of trans-frontier pollution, improvement of joint oilspill contingency plans, and strategic petroleum oil reserve sites.

Discussions with Denmark resulted in an improved joint oilspill contingency plan for Davis Strait offshore drilling operations, and assurances that Danish liability and compensation arrangements were adequate for Canadians who might suffer damage from Denmark's offshore drilling operations.

The directorate's role as clearing house for international organizations concerned with bringing Canadian fisheries and marine technology to developing countries continued to increase. To help developing countries manage and develop fisheries in their exclusive economic zones, the department, with assistance from FAO, conducted workshops on legal and institutional aspects of fisheries, fisheries development planning and management, resource evaluation and fisheries processing technology. Each workshop was attended by representatives from 20 or more countries.

Small Craft Harbors

The Small Craft Harbors Branch administers and develops approximately 2300 commercial fishing and recreational harbors across Canada.

Improved management and supervision at wharves resulted from increasing the number of wharfingers or wharf managers, and by providing them with better training, greater support and increased supervision by regional staff.

Approximately $35 million was allocated to the Small Craft Harbors program, including a Federal Labor Intensive Program grant of $1.7 million supplemented by $10.6 million provided through the Canada Works Program. Some 1000 projects were valued at more than $10 000 each, with approximately 85 per cent of the budget spent on fisheries projects, the remainder devoted to recreational boating facilities.

The Canada Works Program achieved its objectives, with 193 projects undertaken under the program. The branch provided material and supervisors to help local groups prepare submissions, and engineering assistance during construction.

Construction of a fishing harbor at Steveston, B.C. continued, with expenditures during the first two years of $5.5 million. Steveston is a centre of the west coast fishing industry. The completed harbor will accommodate 1000 vessels.

Other projects in progress included a breakwater and wharf at Wood Islands, P.E.I.; wharf reconstruction at Freeport, Nova Scotia; a slipway and wintering facility at Blanc Sablon, Quebec; assistance in completing a marina at Bluffer's Park, Ontario; and an expanded harbor at Lameque, New Brunswick.

Ships

Ship Branch advises senior management on the acquisition of vessels and aircraft, vessel maintenance, and safe, efficient operation of the fleet.

The Fisheries and Marine Service fleet consists of 23 major vessels more than 30 m long, 240 vessels between 6 and 30 m, and more than 500 small craft under 6 m. It is Canada's second largest civilian-manned fleet, with a replacement cost estimated at more than $350 million.

During the year the Cape Roger, a 62 m fisheries patrol vessel, the Louisbourg, the second 37 m aluminum high speed fisheries patrol vessel, and the Marinus, a 20 m fisheries research vessel, went into service on the east coast. The Gadus Atlantica, a 79 m stern trawler, began a five-year charter for fisheries research on the east coast and in northern waters. The Gadus Atlantica is the largest stern trawler under Canadian registry.

The second phase of the long-range strategy plan for vessel acquisition was approved, calling for 11 vessels to be acquired between 1978 and 1983, replacing aging vessels

of the fleet and providing additional support for management of extended Canadian fishing zones.

Recreational Fisheries

Recreational Fisheries Branch provided research, planning and advisory services to the recreational fisheries component of the Salmonid Enhancement Program in British Columbia. This included economic evaluation, sport fisheries licensing, investment cost-recovery mechanisms, and related research and consultations.

In co-operation with provincial authorities, an inventory was made of Labrador sportfishing camps. Results of a sportfishing survey in Nova Scotia were prepared for publication. Advisory services included contributions to a film on Atlantic salmon and the forthcoming national atlas of Canada.

Provincial and Federal Affairs

The Provincial and Federal Affairs Branch is the focal point for enquiries with federal-provincial implications. Close relationships between provinces and the department on policies, programs and matters of mutual concern are made possible through four federal-provincial fisheries committees (Atlantic, Ontario, Freshwater and British Columbia). Membership consists of deputy ministers of provincial government departments responsible for fisheries, and their federal counterparts.

The branch was assigned principal responsibility for meetings between federal and provincial fisheries officials in preparation for the First Ministers' Conference in Ottawa in February, 1978, and coordinated follow-up activities from that conference.

Weather Services

Atmospheric Environment Service operations reflected recent advances in computer technology with further development of computer models to improve weather and other environmental forecasts. In addition, computer facilities at each of the regional offices and at the AES communications centre were upgraded.

In Edmonton, a Computerized Prediction Support System) at the Arctic Weather Centre continued to provide support to local forecast operations and to the Beaufort Advanced Base at Tuktoyaktuk, forecasting weather, wind-waves and ice-floe motion for offshore oil exploration sites in the Beaufort Sea.

From April 1977 to March 1978, more than 25 000 public, marine and extended outlook forecasts were issued by the 10 forecast offices across Canada. In the same period, 900 weather warnings were provided to the public concerning such diverse weather conditions as blizzards, freezing rain and thunderstorms.

A tornado and severe thunderstorms in Manitoba last summer spurred plans to develop a program that would provide more advanced warning of severe weather in the province. The program was scheduled for testing in the summer of 1978.

Distribution of weather information to the public and to special user groups continued to receive special attention. In addition, arrangements were made to have weather information displayed continuously on a cable television channel in Vancouver. Similar services were operating in Winnipeg and were being developed in Toronto and Montreal.

The weather service system, which includes 63 weather offices, responded to a record total of nearly seven and a half million requests for weather information, an increase of 6.6 per cent over the previous year. Information was provided in support of agriculture and forestry for frost prevention, crop spraying and forest fire control. Energy and food enquiries and environmental studies were of particular interest, requiring increased demands from regional AES scientific support units.

Projects reviewed by AES as part of the Environmental Assessment and Review Process included the Nanisivik, Arvik and Pine Point mines, Liard and Dempster highways, Canadian Marine (CANMAR) offshore drilling, the Petro-Canada liquid natural gas project and the Alaska pipeline project.

In the Arctic, public weather services to residents of Cambridge Bay, Coppermine, Nanisivik, Pond Inlet and Resolute were initiated. Broad-scale descriptions and

trends were broadcast via the CBC northern television service and CBC radio in Inuvik.

On the east coast, marine weather forecasts were expanded to include George's Bank, Belle Island Bank and Funk Island Bank as a result of the establishment of the 200-mile fishing limit. These forecasts are considered vital for the safe operation of east coast fishing.

Two new weather observation systems--11 Arctic Aviation Weather Reporting Stations and 12 Private Aviation Weather Reporting Stations--were established in northern areas of Canada in 1977 to contribute to the safety and security of aviation operations.

Climatological Services

Meteorological data are acquired from land, sea and air networks to meet the needs of the AES.

The land network gathers meteorological information from radar and satellite remote sensing equipment, in addition to receiving data from manned observation stations and from automated reporting stations.

Ten automatic observing stations were commissioned during the year, bringing to service a total of 35 Meteorological Automatic Reporting Stations. Plans were developed for the design phase of the next generation of automatic stations, called Remote Environmental Atmospheric Data Acquisition Concept. The design of these stations will allow them to serve the aviation industry, particularly at secondary airports.

Two automatic stations reporting wind and pressure data were developed by Bristol Aerospace and funded by CANMAR in support of drilling exploration activities in the Beaufort Sea. AES coordinated strategic placement of the stations, one on the ice pack and one just north of Great Bear Lake, and arranged for satellite transmission of data.

In the AES radar program, three additional Raytheon weather radars were installed at Villeroy, Quebec; Exeter, Ontario; and Abbotsford, British Columbia. The first of six SCEPTRE systems (System for Constant Elevation Precipitation Transmission and REcording) was connected with the Raytheon radar at Carp, Ontario, and an AES working group was established to prepare comprehensive plans for the radar program for the next decade.

The satellite data progrm was exhanced during the year with the establishment of a Geostationary Observational

Environment Satellite (GOES) receiving station at Vancouver.

Advances in instrumentation included awarding a contract to develop a "stand-alone" electronic thermometer which stores temperature data for four days, allowing a volunteer climatological observer to be absent for that period.

The marine data acquisition network collected more than 95 000 weather observations from approximately 300 ships. In addition, 20 prototype drifting buoys of the type to be provided by Canada for the First GARP (Global Atmospheric Research Program) Global Experiment were launched in the southern hemisphere during the spring and summer of 1977.

The upper air network is designed to gather meteorological data to altitudes of 30 km. An important development for this network was the signing of a contract with SED Systems, Saskatoon, for the design and construction of 40 Aerological Data Reduction Systems. This equipment performs computations of upper air data semi-automatically, and greatly reduces equipment maintenance needs at aerological stations.

Two stations in the upper air network, Resolute, N.W.T., and Stony Plain, Alberta, performed special ozone observations in support of a United States Air Force program to measure total ozone in the atmosphere.

Data acquisition priorities were reassessed in an attempt to identify areas where costs could be reduced. One result of this was a review of the Ocean Weather Ship PAPA observing program in the northeast Pacific, which has rapidly escalating operating and maintenance costs. A study group was set up to plan an observing system that could substitute for PAPA.

In the Computing Centre, a move was made toward automatic data entry by recording hourly weather reports on magnetic tape directly from teletype circuits and machine processing them for the national archives. Progress was made in the design of a new metric archive format.

In addition to contributions to the First GARP Global Experiment, staff members helped to prepare a manual for the Global Observing System of the World Meteorological Organization (WMO), and attended meetings of the Commission for Instruments and Methods of Observation.

Canadian Climate Centre

As part of a growing recognition of the importance of climate for social, economic and environmental affairs, the decision was made to create a Canadian Climate Centre at AES Downsview to provide a comprehensive Canadian climate program. By incorporating climate monitoring, modeling,

prediction and applications, the centre will become a focus for national climatic concerns.

Ice Services

Services provided by the Ice Branch underwent several changes during the year. Potentially the most important was the installation of a Side-Looking Airborne Radar (SLAR) in one of the ice reconnaissance aircraft. The SLAR system, owned by the Department of National Defence, was transferred to DFE on indefinite loan and incorporated into the program in February 1978.

As part of the Arctic Development Program, a government-wide program to develop Canadian arctic expertise, two meteorologists were added to staff to develop new forecasting and climatological data processing techniques.

Reconnaissance activities during the year included 4360 hours of airborne observations, of which 2906 hours were undertaken on chartered aircraft. The Electra L-188C reconnaissance aircraft, severely damaged in an accident in Summerside, P.E.I., in March 1977, was rebuilt in California and returned to active duty in February 1978. Development of a new airborne laser profilometer, which will be capable of ice-surface profiling at higher flight altitudes, should be completed in the 1978-1979 fiscal year.

The ice forecasting program continued to support marine shipping, oil exploration and fishing.

A system that uses electronic data processing methods to provide improved ice climatological services was started. Procedures were developed for manual archiving of NOAA and LANDSAT satellite imagery, and analysis of remotely sensed data continued. Work progressed on the arctic and eastern seaboard ice atlases, which are expected to be made available during fiscal 1978-1979.

Training

The AES Training Branch conducted courses in operational meteorology for professional and technical personnel of DFE and the Ministry of Transport (MOT) as well as for employees of other agencies. An effort was made to present courses which applied new technology to meteorological operations, especially computer programs for weather prediction and satellite data for weather observations.

Professional courses in operational meteorology were given to eight new anglophone employees at AES Downsview. Eight francophone employees began their training at the University of Quebec at Montreal (UQAM) and completed their courses at Downsview. Training in applied meteorology was provided to 11 M.Sc. candidates taking degrees in meteorology at the Universities of Alberta, McGill and Toronto and at UQAM.

Professional development courses for experienced meteorologists and meteorological technicians were presented in three major areas: operational meteorology, computer applications to meteorology and applied meteorology. In all, 642 personnel were trained in 22 courses of study.

Training courses were conducted at the AES Meteorological Training Centre, Ottawa, for more than 600 personnel of DFE and MOT employed as meteorological technicians, radio operators and air traffic controllers, and for 98 others at Toronto. Support was provided to regional instructors for the training of non-federal employees as meteorological observers, including 20 native people for community airports in the territories, and more than 60 persons for private airfields. More than 90 persons, under contract to make observations at DEW Line stations, were trained by AES at Streator, Illinois.

Meteorological Applications

Climatological services were provided in response to a wide range of social, environmental and economic concerns during 1977-1978, with renewable and non-renewable energy exploration and development, marine transportation, agriculture and flood forecasting among the most active areas of interest.

In the renewable energy field, assessment of potential use of solar and wind power in Canada began, along with design of systems that will make the best use of these resources. This work included standardization of meteorological data, and development of a climatological data base for use with energy systems. Other work included development of a model for assessing heat loss from buildings, relative to prevailing weather, and publication of an analysis of solar radiation for selected Canadian stations.

In the areas of non-renewable resources and transportation, interest was focused on offshore weather as

a potential hazard to shipping and offshore drilling, and as factors in the selection of ports.

In applications to agriculture, emphasis was placed on the potential impact of climate variability, especially on land use and crop yield. Studies were completed on climatic considerations for wheat growing on the prairies, the impact of inclement weather on fruit crops and the effect of variations in terrain on temperature.

Hydrometeorological support for flood forecasting continued, both within Canada and internationally. A four-year United States/Canada pilot study on the Saint John River basin, assessing the application of World Weather Watch (a WMO program) to operational hydrology, neared completion. A major CIDA flood-forecasting project in Colombia was begun, and meteorological support continued for a DFE spring-flow forecast program for the Ottawa River basin. Statistical analyses of storm rainfall in Canada were brought up to date, and computer programs developed for analysis of precipitation data from the new AES radar network. New systems were developed to map snow cover and lake temperatures from satellite imagery.

Marine and lake applications included assessment of the feasibility of tidal power in the Bay of Fundy and analyses of climate along both the east and west coasts of Canada. The joint Canada/United States International Field Year study for the Great Lakes neared completion, with major studies carried out by AES.

Other studies and assessments completed or under way during the year included meteorological considerations in land-use planning and wildlife management; the tourism and recreation climate of Ontario; the occurrence of ice fog in the Arctic; meteorological factors affecting a decline in caribou population in the Arctic Islands; and social, environmental and economic impacts of climatic fluctuations in Ontario. In response to the great demand for climatic data on the North, comprehensive climatologies for the Yukon and the Arctic Islands were in preparation.

Requests for information at the Climatological Services Division, already in the thousands, increased by 9 per cent during the year. Monthly Record: Meteorological Observations in Canada, a publication used to answer many of these enquiries, was revised to a metric and bilingual format.

Atmospheric Research

DFE has developed the Long-Range Transport of Air Pollutants Program, with AES as lead agency, to examine the environment in eastern Canada prior to increased coal burning in North America, and to try to project the environmental consequences of greater use of coal. Data from the Canadian network for sampling precipitation, a 55-station network which began operation in May 1977, has confirmed the occurrence of long-range transport of air pollutants within and into Canada. Modeling studies helped to establish sources of pollution, and additional studies were expected to make important contributions to program objectives in the next few years.

A number of studies are in progress under the mandates of the Clean Air Act and the Environmental Contaminants Act.

- A method of atmospheric quality monitoring based on lichen species frequency, cover and distribution was further developed. This is a low-cost procedure with wide application.
- Analysis of vegetation from the High Arctic is under way to define background values for various pollutants in these delicate ecosystems.
- A workshop was conducted to examine criteria and standard-setting procedures for air pollutants in Canada. Wide participation from federal and provincial agencies was expected to produce a more unified and efficient approach for such procedures.
- An occurrence of pollutant transport from Sudbury to Tronto was documented using an improved remote sensing technique.
- Numerical models of air pollution dispersion and transformation processes, designed to improve environmental impact assessments, were being developed.
- A field study near Beaver Creek, Yukon, helped define environmental conditions of potential concern in connection with the Alcan gas pipeline development.

A variety of instrumentation systems--including laser, radar and acoustic sounder sensing--were further developed to assist in studies of atmospheric structure, important for an understanding of pollution dispersion.

AES staff members took part in the development of environmental assessment guidelines for fossil fuel power generation, and environmental codes of practice for steam-electric power. Air quality impact assessment studies were carried out for the Hudson Bay Mining and Smelting Company operations at Flin Flon, Manitoba, and for the proposed thermal power plant at Atikokan, Ontario.

Assessment of the impact on the Canadian Arctic of incineration of oil spills and blowouts was begun.

Studies made as part of the spruce budworm project in New Brunswick showed that sea breezes, which can penetrate far inland, affect moth dispersal. Better understanding of this phenomenon may lead to better control strategies in the future. Studies at a number of other locations reported the effects of weather on air pollution and plant physiology, and thus on crop injury and loss.

In the area of hydrometeorology, programs to improve the accuracy of rainfall, snowfall and evaporation measurement techniques were continued. Computer modeling was used to increase understanding of Canada's national water resources.

A computerized ice-status system and other prediction systems that combine satellite coverage with computerization were developed to study the characteristics and motions of the arctic pack ice, oil on water, storm surges and other hazardous conditions. These studies support offshore resource exploration and development, and help to satisfy the increasing demand of ocean traffic operators for more accurate predictions of ice motion in navigable waters.

Studies of wind and turbulence statistics at a suburban STOLport (Short Take-Off and Landing), conducted in co-operation with the National Research Council and the Ministry of Transport, provided meteorological support for aircraft and air operations safety.

In co-operation with the private sector, a wind energy research program was initiated to study commercially feasible ways of harnessing this source of energy.

The Satellite Data Laboratory has continued to conduct research to increase the application of satellite data in regional forecasting. Systems that can receive meteorological data from the TIROS-N and GOES-VISSR weather satellites were inaugurated.

The first major output of the general circulation climate model was a January climate simulation. It was to be the basis for discussion at a climate modeling workshop sponsored by AES in April 1978.

As a prelude to Canadian Climate Centre activities, modelling studies emphasized two important areas: prediction of climate variation, and the sensitivity of climate to various natural and man-made effects.

The basic design of the Atmospheric Environment Service's computerized forecast system was completed.

Among other things, this is a useful management tool for the planning of future meteorological services.

In atmospheric processes research, a project to determine the feasibility of cloud-seeding for rainfall increase was again carried out, this time in the Thunder Bay area. Differences in cloud structure were being examined to determine if weather modification is as feasible around Thunder Bay as it appeared to be in the Yellowknife area in 1976.

Studies of the effects of human activity on the stratospheric ozone layer continued. The results of these experiments confirmed the depletion of ozone, and suggested that the expected reduction of ozone by high-altitude aircraft will be greater than had previously been predicted.

International Activities

During 1977-1978, greater emphasis was placed on the role of the World Meteorological Organization in such areas as water resources, agrometeorological activities in support of food production, climatic change, weather modification, ozone depletion, atmospheric pollution and energy problems. Participation by AES scientists in these undertakings included planning and implementation of World Weather Watch, the basic operational program of the WMO; planning of the World Climate Program and organization of the World Climate Conference, to be held in February 1979; planning for the international Precipitation Enhancement Project; and implementation of the Joint WMO-ICSU (International Council of Scientific Unions) Global Atmospheric Research Program, especially the corresponding First GARP Global Experiment (FGGE) to take place in 1978-1979.

Canada's contribution to FGGE consists of provision of buoys to measure surface pressure and temperature over the southern oceans, coordination of the overall buoy program, secondment of a scientist from Ocean and Aquatic Sciences to the Drifting Buoy Data Centre in Toulouse, France, and provision of one ship in the Pacific Ocean during the first special observing period in 1979.

AES staff members edited a GARP report, coordinating analysis of data from the FGGE program.

Staff members represented Canada on all eight technical commissions of WMO and served on several WMO working groups and panels. Among important international events in which Canadians participated during 1977-1978 were the seventh session of Regional Association IV (North and Central

America) in Mexico City; the seventh session of the Commission for Instruments and Methods of Observation in Hamburg, FRG; the 29th session of the WMO Executive Committee in Geneva; the seventh session of the Commission for Atmospheric Sciences in Manila; and the Second Special Assembly of the International Association of Meteorology and Atmospheric Physics in Seattle, Washington.

Following his appointment as assistant deputy minister, AES, Dr. Arthur Collin was designated the permanent respresentative of Canada with WMO and shortly thereafter was elected to serve as a member of the WMO executive committee. As the year closed, Canadians presided over three of the eight WMO technical commissions.

During 1977-1978, work continued on a number of EMS national programs. These integrated programs, each of which involved two or more EMS directorates or services, included environmental impact assessments, research on toxic substances, shore zone studies, land inventory and land use planning.

Canadian Forestry Service

The Canadian Forestry Service promotes effective management of Canada's forest resources. The service undertakes data collection and analysis for forest policy development and program planning, and research and development for a broad range of programs.

Forestry Policy

In June 1977, the Canadian Council of Resource and Environment Ministers agreed to develop a national forest policy for Canada. A steering committee of senior federal and provincial forestry officials was established, an executive committee was appointed, and a project director was hired on contract in January 1978. The study was scheduled to be completed in June 1979.

Production Forestry

Progress was made toward establishing co-operative programs in intensive forest management practices with the Departments of Regional Economic Expansion, Employment and Immigration and provincial agencies. With the co-operation of industry and the provinces, work proceeded on decision-making models. These models include data from new remote-sensing equipment such as the Resource Inventory and Management System (RIMS) developed at the Pacific Forest Research Centre.

Other research and development programs were concerned with tree seed production and procurement, genetic improvement of reforestation stock, and development of machinery for site preparation and planting. A CFS workshop on tree and tree seed improvement at the Petawawa Forest Experiment Station was attended by representatives from provincial agencies, universities and industry.

Forest Products

A full-scale program was initiated to develop forest biomass as an energy source, in particular to use mill and forest waste as raw material in the production of methanol. The program involved all regional forest research centres, the Petawawa Forest Experiment Station and the Forest Management Institute.

An interdepartmental committee completed a study on the production of liquid fuels from renewable resources. The study showed that it was feasible to locate methanol plants using forest biomass in regions where economic development is most needed. A forest-based methanol industry could help secure Canada's energy supplies, provide liquid fuel for Canadian automobiles, produce a valuable export and improve the country's balance of trade.

A new technique for slicing lumber instead of sawing it was shown to require less energy while increasing yield and eliminating dust and noise. It was also found to be safer.

A new preservation technique for spruce and other hard-to-treat species was accepted by the Canadian Standards Association, and was expected to satisfy the increasing demand for wood utility poles; a salt-latex treatment for pine and spruce sidings upgraded them so that they could be used to replace western red cedar; and composite railway ties made from small trees offered improved performance in service.

Forest Protection

CFS established a Forest Pest Management Institute at Sault Ste. Marie, which is to play a vital role in the continuing struggle against the spruce budworm. The struggle was further intensified with the launching in August 1977 of a six-year co-operative research program by Canada and the United States. This program is intended to double the research effort against this forest menace.

Computerized systems for forest fire control, developed earlier by CFS, were upgraded and expanded as a result of trials in Ontario and Quebec. A new national Fire Weather Index system was developed and published.

Environmental Forestry

Environmental impact studies focused on steep-slope harvesting and forest road construction on both the Atlantic and Pacific coasts, and on the long-range transport of air pollutants. Studies of sulphur dioxide pollution in the Athabasca tar sands and fluoride pollution in Newfoundland gave a clearer insight into the effects of pollutants on forest species.

Studies on the effects of forest harvesting practices on water quality were brought to the point where pilot programs could be developed. These programs were expected to assist in the department's efforts to alleviate the impact of drought in western Canada.

Northern pipeline studies played an important part in CFS environmental research, and were expected to do so for

the next few years. Meanwhile basic environmental information was collected for the Hudson Bay lowlands.

International Activities

The Canadian Forestry Service was active in such international organizations as the Food and Agriculture Organization (FAO), the International Union of Forestry Research Organizations, the Organization for Economic Co-operation and Development (OECD), the Timber Committee of the Economic Commission for Europe (ECE), and their working groups.

Under the Canada/USSR Science and Technology Agreement, progress was made in separating the Forest-Based Industries Working Group into two smaller groups. One of the groups will deal with pulp and paper, timber, and woodworking; the other will deal with forestry.

The director general of CFS headed a six-member Canadian delegation to the ninth session of the North American Forestry Commission of FAO in Puerto Rico.

CFS gave advice to such organizations as CIDA, providing technical expertise for forestry programs abroad. The service also organized the placing of trainees from developing countries in forestry establishments in Canada.

Canadian Wildlife Service

The Canadian Wildlife Service is responsible for the protection and management of migratory birds through development of regulations, habitat management and research. With the provinces and other wildlife agencies, the service undertakes co-operative programs of research, management and interpretation related to other forms of wildlife of national interest, and provides advice to federal, territorial and provincial agencies.

Migratory Birds

Steps were taken to acquire a new national wildlife area on the Bay of Fundy, which would protect the most important resting stop for shore birds on Canada's Atlantic coast. Investigation of the number and distribution of shore birds in the upper Bay of Fundy continued, as part of studies investigating the environmental impact of proposed tidal power developments in the area.

Investigations on the feeding habits of the Hudsonian godwit were conducted at Long Ridge Point on the James Bay coast. The third year of a shore bird banding study was completed at James Bay. A total of 13 536 shore birds were caught and dyed, bringing to 30 263 the number of birds caught since the project began.

The breeding biology and ecology of ring-billed gulls were studied at Leslie Spit in the Toronto Harbor area. It was found that the nesting population of the gulls was expanding at the apparent expense of common tern and herring gull populations.

A Canadian whooping crane recovery agreement was concluded with the United States Fish and Wildlife Service. Under the plan, the sandhill crane foster parent program at Gray's Lake was to continue, as were investigations into the possibility of using sandhill cranes as foster parents in Manitoba's interlake region.

A pilot study for a 10-year banding program on lesser snow geese in the eastern Arctic was carried out at the McConnell River snow goose colony on the west side of Hudson Bay. The work was jointly funded by the U.S. Fish and Wildlife Service, the Mississippi and Central Flyway Waterfowl councils and the CWS. A long-term study of the breeding biology of lesser snow geese at La Pérouse Bay, Manitoba, yielded insights into the ways that new stock enter the breeding population.

Surveys of colonial nesting water birds continued along the St. Lawrence estuary and the north shore of the Gulf of St. Lawrence. The eleventh census of sea birds conducted in north shore sanctuaries marked over half a century of such monitoring. Results of a three-year study of nesting sea bird ecology on Prince Leopold Island were prepared for publication.

A census was made of great blue heron colonies in Quebec. Ecological data was also gathered to provide guidelines for conservation of this species in Forillon National Park.

Wildlife Research and Interpretation

CWS contributed to environmental assessments of the Arctic Islands pipeline route. Monitoring of the Beaufort Sea polar bear population continued in relation to the ringed seal and the bearded seal, its major food supply. Populations of these seals and polar bears declined severely two years ago, and observations of their recovery rates were expected to help future management decisions. Further negotiations continued between the provinces and CWS on polar bear quotas.

The effects of aircraft disturbance on muskoxen and caribou in the Northwest Territories were studied. Plans were made to extend behavioral studies to the effects of exploration activities on mainland barren-ground caribou herds.

Anticipating that development activities in the boreal forest and increasing numbers of visitors to national parks would lead to management problems with grizzly bears, studies of grizzly subpopulations were made in two ecosystems: the boreal forest (Swan Hills, Alberta) and the montane region (Jasper National Park).

Ten wood bison calves were transferred from Elk Island National Park to the Metro Toronto Zoo. Future transplants were planned to establish isolated herds of wood bison, making the species less vulnerable to devastation by disease.

The breeding program for birds of prey continued at Wainwright, Alberta. Some peregrine falcons were released and more releases were planned. In Riding Mountain National Park and Wood Buffalo National Park, research continued on the behavior of wolves and their relationship with moose, elk and bison. Muskrat and bison were studied in Wood Buffalo National Park and surrounding areas.

CWS initiated a research program on the effects of forest sprays on songbirds in New Brunswick, including physiological, reproductive and behavioral studies in field and laboratory situations.

The newest CWS interpretation program, which focuses on the grassland region, continued to operate at Swift Current, Saskatchewan. Pending construction of permanent facilities, a small mobile display told the story of prairie wildlife, stopping at picnic sites and campgrounds along the Trans-Canada Highway.

Inland Waters

Inland Waters Directorate (IWD) plans and formulates water management programs and policies, especially in international and interprovincial water systems. To do this, the directorate conducts research and data collection programs 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 Canada Centre for Inland Waters 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 Canada Centre for Inland Waters is the official collaborating centre on surface and ground water quality for the World Health Organization.

International Studies and Water Policy

The directorate prepared a federal policy statement on inland waters, to be released to the public in April 1978. The statement expressed continuing commitment to co-operative agreements with the provinces in water resource management, and reaffirmed Canada's obligations regarding boundary waters.

Research on Canadian Waters

Research at the National Water Research Institute revealed that the pesticide pentachlorophenol was present in most of the coastal waters of the Great Lakes and in municipal sewage treatment plant effluents as well. A method was developed to assess the extent of the natural breakdown of herbicides in surface waters.

The high production of algae and aquatic weeds in prairie lakes was found to be caused by the release of nitrogen and phosphorus from lake sediments. Release of these nutrients caused a massive fish kill and made it necessary to change the fish stocking program in the lakes.

Studies of subsurface water quality at the National Hydrology Research Institute focused on factors important to disposal of high-level radioactive materials at depths of about 1000 m. Research included studies of physical and chemical factors controlling subsurface movement of contaminants.

A mathematical model was used in extensive tests by the Water Survey of Canada to predict surface runoff.

Glacier studies emphasized the growth, shrinkage and present mass of the Columbia icefield; the modeling of the glacier melt component in river flow forecasting; and assessment of flood hazards from glacier-dammed lakes along the Alcan Highway and pipeline route.

Flood Damage Reduction and Water Management

The flood damage reduction program supports the mapping of flood-prone areas, to reduce flood damage and discourage further development in these areas. During 1977-1978 Saskatchewan and Ontario joined the previously committed provinces--New Brunswick, Quebec and Manitoba--in this federal-provincial cost-shared program. Meanwhile, negotiations for formal agreements continued with Nova Scotia, Alberta, the Northwest Territories and British Columbia. The New Brunswick program was expanded with the signing of an agreement on flood forecasting for the Saint John River basin.

Federal-provincial programs continued to reduce flood damages in the Montreal region, in southwestern Ontario and in the lower Fraser valley.

Management guidelines for the Souris River basin neared completion. A five-year water quality study of the Lake Winnipeg basin was launched.

Seven ministers, representing the federal government, Alberta, British Columbia and Saskatchewan, signed a memorandum of intergovernmental co-operation in the Mackenzie basin. A three-year study agreement to assess the impact that various forms of development would have on the waters and ecosystems of Canada's largest river basin was expected to begin early in fiscal 1978-1979.

Phase one of a Canada-P.E.I. watershed management study of the Winter River basin near Charlottetown was begun. With the governments of the Yukon Territory and British Columbia, the directorate was considering a cost-shared intergovernmental study for the Yukon River basin. The directorate also provided engineering leadership for the reassessment of tidal power potential in the Bay of Fundy.

Water Data and Information

The water quantity survey program continued to measure streamflow, water level and sediment transport in Canadian waters. The survey network was increased by 33 stations during the year, bringing the total number of stations to 2463. The provinces finance all or part of the operating costs of these stations.

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

Metric conversion of instruments and field installations continued, with 22 per cent of the network converted at year's end. Conversion is expected to be complete by 1981.

Water quality monitoring and surveys of surface waters continued, with increasing emphasis on international and interprovincial waters. Pollution surveys included studies of contaminants and toxic substances to determine compliance with water quality objectives.

The directorate helped to develop water quality objectives for a revised Canada/U.S. Great Lakes Water Quality Agreement, as well as the International Joint Commission Poplar River Study and the Schubenacadie River Basin Study. Draft water quality guidelines were prepared on several toxic metals including chromium, arsenic, mercury and cadmium.

A survey of water quality in Canada and several reports covering water quality conditions in Alberta, Saskatchewan, Prince Edward Island and the Northwest Territories were published. A report was produced on the presence of

nitrilotriacetic acid (NTA), a substitute for phosphates in laundry detergent, in the Canadian environment.

Lands Directorate

The Lands Directorate promotes the effective and environmentally sound use of Canada's land resource. The directorate supports and 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, capability and use; formulation of land use alternatives; development of land use policies for the federal government; and promotion of ecologically sound land use planning.

Policy Development and Advice

During 1977-1978, the directorate chaired the interdepartmental task force on federal land use policy, and studied various land use problems and issues. It represented the department on the Treasury Board advisory commmittee on federal land management and provided advice to other committees such as the steering committee on environmental monitoring and the departmental liaison committee on atomic energy.

Environmental Impact Assessment

Since 1972, the Lands 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 will terminate on March 31, 1979, an annual report has been produced jointly by the department and the SDBJ.

The directorate participated in the investigation of the environmental aspects of native land claims, continuing a role it began in 1975 in the negotiation of the precedent-setting agreement with the Cree and Inuit of northern Quebec.

Under the federal Environmental Assessment and Review Process, the directorate provides advice and assistance on a number of government-sponsored development projects. The Atlantic regional office was involved in environmental impact assessments relating to the Fundy tidal power development, the Wreck Cove hydroelectric project, and the Labrador-Newfoundland Electric Power Transmission Line and Tunnel. The Pacific and Yukon regional office continued environmental studies and reviews associated with the expansion of the Roberts Bank port, the construction of the

Alaska Highway pipeline and the evaluation of alternative port sites for west coast oil tankers. Baseline information for the Fraser River estuary was gathered, and an environmental assessment of the proposed reconstruction of the Haines Road/Alaska Highway was completed. The Ontario regional office participated in the environmental review of the Hamilton Airport expansion and the proposal by Eldorado Nuclear to construct a refinery at Port Granby.

Ecological Land Classification

During the last two years, the Lands 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 classification methodology; the integration of water data; the refinement of vegetation classification; and the applications of remote sensing, particularly to land inventory.

Two new reports appeared in the directorate's Ecological Land Classification Series. One describes ecological survey in the Quebec region, and the other presents the proceedings of a workshop on ecological land classification in urban areas.

Land Resources Mapping

The largest of the directorate's mapping programs is the Canada Land Inventory (CLI). More than 1000 maps have been published to date illustrating land capability in the settled areas of Canada.

Other mapping programs include the extension of the Northern Land Use Information Series to cover the Bear-Slave Upland area and the preparation of two map folios. One of the folios identifies and describes Canada's critical lands, the other illustrates the conversion of agricultural land to urban uses. In the Ontario region, land use maps were prepared for the Saugeen Valley, the Rideau-Trent-Severn corridor, and the coastal zone of the Hudson Bay lowlands. In the Quebec region, the Service des Etudes écologiques régionales (SEER) conducted ecological inventories and produced base maps for a number of study areas. As part of the James Bay Environmental Studies Agreement, SEER prepared ecological maps that now cover an area of 140 000 k^2.

Land Use Studies

A Canada-wide review of provincial land use policies, programs and legislation continued with the publication of reports covering Ontario and Saskatchewan.

The results of other land use studies published during the year included analyses of the rural-to-urban land conversion rates between 1966 and 1971 for Canada's urban areas, the agricultural capability of land surrounding urban areas, the use and management of federal lands, and non-resident land ownership in Prince Edward Island. Studies continued on the impact of federal programs on the use of land, the reclamation of despoiled lands and the effects of agricultural land reserve legislation in B.C.

Information Programs

Analysis of the large volume of CLI land capability and land use data in the Canada Geographic Information System continued.

The Atlantic regional office co-operated with the Nova Scotia Department of the Environment in a coastal zone environmental education program. In the Pacific and Yukon Region, a report of the management of coastal resources in B.C. was prepared by a joint federal-provincial committee chaired by the Lands Directorate.

Environmental Protection Service (EPS) develops and enforces regulations to implement federal laws protecting the environment. It advises other federal departments on such matters and is a point of contact with the public on environmental issues. EPS facilities include bacteriological and chemical laboratories across Canada, a motor vehicle emission testing laboratory in Ottawa, a Northern Technology Unit in Edmonton and a Wastewater Technology Centre in Burlington.

Water Pollution Control

The basic strategy of the water pollution control program includes development of baseline or minimum effluent control requirements to apply uniformly across Canada, and development of more stringent control requirements based on specific needs when baseline standards do not provide adequate protection. Legislative instruments used in the program are the Fisheries Act, the Canada Water Act and a number of international agreements including the Canada/U.S. Great Lakes Water Quality Agreement and the Canada/U.S. Bilateral Shellfish Agreement.

Under 1977 amendments to the Fisheries Act, procedures are now available for reviewing any industry or undertaking that causes pollution of water frequented by fish, or harm to fish habitat. Where necessary, the minister may make orders to prevent such pollution.

National effluent control requirements were promulgated for the potato processing and metal finishing industries. Revised Chlor-Alkali Mercury Liquid Effluent Regulations also became effective. Effluent controls were at varying stages of development for other industrial sectors including textiles, organic chemicals, base metal smelting, alkali and associated products, dairy products, iron and steel, wood preservation and gold mining.

A review of compliance with the Chlor-Alkali Mercury Regulations indicated that drastic reductions had been achieved in both mercury consumption and losses since 1970. Mercury consumed by the plants had been reduced by approximately 50 per cent, while losses of mercury into liquid effluents had been reduced to less than 1 per cent.

The national inventory of municipal waterworks and wastewater treatment systems--carried out by EPS in co-operation with other federal departments, provincial agencies and the Federation of Associations on the Canadian Environment--was extended to cover facilities serving more than 90 per cent of Canada's population. MUNDAT, the data

base which stores this data, was updated during the year, and PETROREF, the data base for petroleum refinery data, was extended to the Quebec Region.

An interdepartmental working group conducted a review of data on wastewater disinfection practices in Canada to establish the technical basis for a national policy on wastewater disinfection.

Under the Ocean Dumping Control Act, 168 applications for ocean dumping were approved; 15 were rejected because prohibited or restricted substances were identified in the material to be dumped.

A task force was convened to develop environmental codes of practice for steam-electric power generation. A national inventory of steam-electric generating stations was conducted to locate sources of water pollution and technologies for control. The environmental and economic implications of siting coal- or nuclear-fueled power stations either adjacent to or remote from load centres (where the power is actually used) were examined, as were implications of open- and closed-cycle cooling systems.

A series of research projects on the biological removal of nitrogen from municipal wastewaters was conducted as part of a co-operative research program with McMaster University. These projects have produced design data used in a feasibility study for a full-scale nitrogen removal facility for Penticton, British Columbia.

The rotating biological contactor is fast gaining acceptance in Canada as a biological waste treatment process particularly suited to small communities. A project jointly funded by the Water Pollution Control Directorate, a consultant and CMHC was conducted to establish a data bank for the development of design criteria for the device.

A sludge dewatering design manual, which presents step-by-step procedures for developing full-scale sludge dewatering processes, was prepared for the operators of water treatment plants.

In response to increased concern about 226 Ra (an isotope of radium) from uranium tailing effluents, the technology development program was accelerated. Design criteria established for a lime precipitation process, aimed at reducing levels of 226 Ra, were to be evaluated in a pilot project in the field. The project is supported by resources from EPS, the Atomic Energy Control Board and several mines.

A project completed under the DDPAT Program (Development and Demonstration of Pollution Abatement Technology)

demonstrated the feasibility of burning waste petroleum coke in a cement kiln, retaining the pollutants within the cement.

The Co-operative Pollution Abatement Research Program (CPAR) supported 35 projects for pollution abatement research in the pulp and paper industry, valued at $1 250 000. This program was transferred from the Forestry Service.

In the SCAT (Sewage Collection and Treatment) research program, 12 projects were completed, three are continuing, and seven were initiated. Total program commitment, after three years of operation, is approximately $1 500 000.

In co-operation with the Water Pollution Control Federation, directorate staff continued to develop training manuals and audio-visual materials for wastewater treatment plant operators. The materials are used by most provinces, and have gained considerable international recognition.

Ontario Region staff, in co-operation with the Ontario Ministry of the Environment and the Atomic Energy Control Board, began to implement effluent regulations and guidelines under the Fisheries Act amendments described above, with emphasis on four uranium mines.

The Northwest Region designated Anderson Lake in Manitoba environmentally suitable for deposit of sulphide tailings under the Metal Mining Liquid Effluent Regulations.

In the Quebec Region, the accent was on industrial effluent inventories in three sectors: aluminum, fruit and vegetable processing, and iron and steel.

Pacific Region staff conducted water quality and sanitation surveys associated with shellfish production in the areas of Saltspring Island, Semiahmoo Bay, White Rock and Nanaimo.

In the Atlantic Region, success was achieved in programs aimed at lowering acute toxicity of effluents from a number of industries.

Air Pollution Control

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

Regulations under the Clean Air Act were published in Part II of the Canada Gazette for emissions of mercury from mercury cell chlor-alkali plants, and emissions of asbestos

from asbestos mines and mills. Proposed regulations limiting emissions of vinyl chloride from vinyl chloride and polyvinyl chloride manufacturing operations were published in the Gazette. A draft amendment to the asbestos mining and milling regulations, extending the regulations to include dry drilling operations, was completed. Work continued on the development of regulations for emissions of arsenic from gold roasting operations, iron-ore processing and non-ferrous smelters.

Progress was made in enforcing regulations covering emissions of lead from secondary lead smelters, and in ensuring that asbestos mines and mills and chlor-alkali plants will be operating in compliance with regulations when they come into effect in 1978.

Implementation of guidelines continued for coke ovens, asphalt plants, the cement industry and the arctic mining industry. The government of the Northwest Territories promulgated regulations based on federal guidelines for the arctic mining industry. The provinces have taken steps to incorporate federal guidelines for coke ovens, asphalt plants and cement plants into their air pollution control programs. Work progressed on guidelines for boilers and incinerators, the pulp and paper industry, non-ferrous smelters, thermal power plants, natural gas processing plants, petroleum refineries, ferrous foundries, iron and steel plants and ferro-alloy plants.

National Ambient Air Quality Objectives were announced for sulphur dioxide, suspended particulate matter, carbon monoxide, oxidants and nitrogen dioxide.

New-car emission standards for hydrocarbons, carbon monoxide and nitrogen oxides will remain unchanged until the 1981 model year. A new standard to limit carburetor maladjustment is being developed for 1980 model-year automobiles. A survey of 40 cars of the 1977 model year revealed significant improper tuning. They were emitting twice as much carbon monoxide and consuming 7.5 per cent more gasoline than allowed.

Data on carbon monoxide and suspended particulates in the ambient air at Lake Louise were collected as part of a co-operative venture with Parks Canada. Two surveys near Lingan, Nova Scotia, provided data on meteorological variables and concentrations of air contaminants near the site of a proposed coal-fired thermal power generation station.

Stack tests were completed on a chlor-alkali plant, a wood waste incinerator, a copper-zinc smelter, a thermal power plant, a secondary lead smelter and a polyvinyl

chloride plant. Inventories were completed for emissions of sulphur oxides, suspended particulates, carbon monoxide, hydrocarbons and nitrogen oxides, based on data for 1974. An inventory of sources and emissions of selenium, based on data for 1973, was completed.

Further assistance was given to Saskatchewan to develop regulations for the potash industry, and to Manitoba to plan air pollution control programs for two smelters. Technical advice was provided to Quebec in developing stack testing methods for a non-ferrous smelter and to British Columbia in a public enquiry on environmental objectives. The Greater Vancouver Regional District received assistance in assessing air pollution emissions from a sludge incinerator.

An analytical quality control program was started, with 50 industrial and government laboratories participating. The first study involved analysis of lead from ambient air, collected on high volume filters which permit a large sample of air to be tested.

Support was also given to Moniteq Limited of Ontario in evaluation of two remote-sensing techniques for measurement of sulphur dioxide emissions from specific emission sources.

The department supported proposals submitted under the Department of Supply and Services's Unsolicited Proposal Program, a federal government program designed to stimulate industrial research. A proposal to develop a laboratory prototype instrument to measure concentrations of sulphur trioxide in the presence of sulphur dioxide was supported. A second project was attempting to enhance the efficiency of precipitators on non-ferrous smelters.

Less than 4 per cent of the samples of lead-free gasoline tested contained more than the allowable amount of lead. One consignment of gasoline was seized in New Brunswick when gross contamination was detected. Legal proceedings initiated in 1977 against a company for infractions of the leaded gasoline regulations were completed when the company pleaded guilty and was fined $3000.

Other highlights of the Air Pollution Control Program included:

- completion of air pollution assessment studies for the Kitimat oil port, the northern pipeline, the Silver Dahl pipeline, the AECL heavy water plant at Laprade, the Coast Guard base at Dartmouth and the proposed expansion of Vancouver International Airport; and

participation in the development of a departmental program plan on the long-range transport of air pollutants.

Ontario Region staff, with headquarters personnel, established that levels of fluoride compounds in vegetation and air at Cornwall Island in the St. Lawrence River are higher than normal, and notified the International Joint Commission. Northwest Region completed an evaluation of the best practicable technology to control sulphur dioxide emissions from the Syncrude plant. Staff of the Yukon District Office in the Pacific Region surveyed metal mines in the Yukon and published a document entitled A Survey of Air Pollution Control Systems in Yukon Base Metal Mines. Lead emissions occupied Quebec Region staff, who visited 986 retailers of unleaded gasoline and six secondary lead smelters. Eleven infractions were discovered among the retailers, and two factories were not complying with regulations.

Environmental Impact Control

The Environmental Impact Control Directorate has responsibility in six broad areas: environmental contaminants, ecological impact control, federal facilities clean-up, noise control, environmental emergencies and waste management.

Environmental Contaminants

Chlorobiphenyl Regulation No. 1, placing PCBs on the Schedule of the Environmental Contaminants Act, was published on September 28, 1977 in Part II of the Canada Gazette. Proposed regulations covering Mirex and polybrominated biphenyls (PBBs) (flame retardants) were published in Part I of the Gazette as were notices requiring all those engaged in the manufacture, sale and use of a series of dechloranes and chemical compounds of mercury to notify the minister of the environment. Reports were prepared on Mirex, PBBs and polychlorinated terphenyls (PCTs) in the environment. A national survey on mercury was in preparation.

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

EPS helped draft the National Code of the Transportation of Dangerous Goods, which deals with the problem of properly identifying and labelling such goods. Items in

the code will become the regulations for the proposed Transportation of Dangerous Goods Act, to be administered by the Department of Transport.

Ecological Impact Control

EPS continued to use environmental assessment and design as well as prevention programs in areas where major industrial projects have a potential effect on the environment. Monitoring and surveillance of federal facilities, and referral of projects by other departments for environmental review and design recommendations, continued.

Information provided to government and the private sector included air pollution guidelines for incinerators at federal establishments, evaluation of controlled air incineration of solid waste and sewage disposal, remote sensing, analysis of environmental protection activities related to the Alaska Highway gas pipeline and participation in the assessment of an oil port proposal for Canada's west coast.

Ontario Region monitored development of a mobile air quality measurement instrument called a Trace Atmospheric Gas Analyzer.

EPS served as a focal point on nuclear concerns, providing technical consultation and advice to the department, to interdepartmental task forces and to the Atomic Energy Control Board on environmental radiation protection. Activities included environmental impact assessment of the proposed uranium refinery project in Port Granby, Ontario; radioactive waste management facilities; radiation control programs in areas of increased background radiation; and development of criteria for household levels of radon and radiation.

Federal Facilities Clean-Up

1977-1978 was the fifth year of EPS administration of the Federal Clean-Up Program. Work on the program involves assessing environmental problems associated with federal installations, providing environmental engineering advice to other federal departments, and ensuring that remedial measures for pollution control are carried out. Under the program, nearly $10 million was allocated to federal departments for cleaning up pollution problems at more than 68 locations across the country. The Departments of Transport, National Defence, and Indian and Northern Affairs received the largest shares.

Noise Control

Technical information, advice and recommendations were provided to various levels of government on noise pollution and control.

Environmental Emergencies

The National Environmental Emergency Centre received more that 1300 spill reports during the year. The most significant spill occurred at Stewart Creek, near Fort St. John, B.C. A total of 1230 tons of oil spilled from a broken pipeline, killing large numbers of beavers, goslings and fish in the affected waters. Information about all spills--which involved over 3.3 million gallons of petroleum products and 57 625 tons of other hazardous materials--was added to the NATES (National Analysis of Trends in Emergencies System) data base. The computerized National Emergency Equipment Locator System was made available to the United States so that a similar system could be developed there.

The Beaufort Sea, where offshore exploratory oil drilling is taking place, was the focus for oilspill emergency planning activities. The Beaufort Sea Contingency Plan was tested in an exercise which evaluated the information sources, lines of communication and decision-making abilities of participants from the oil industry and all levels of government.

The five-year Arctic Marine Oilspill Program began in 1977-1978. Thirty studies were undertaken, requiring the services of 21 contractors and four other government agencies. As a result of amendments to the Fisheries Act, new regulations were being developed to make reporting of spills of oil or hazardous materials mandatory. Workshops and seminars on oilspills were held jointly with regional and provincial authorities and with the oil industry, and training activities were expanded.

Response by the Atlantic Region to two spills in Portugal Cove, Newfoundland, prevented the loss of 2800 gallons of furnace oil into area streams. Pacific Region completed two reports: "Potential Pacific Coast Oil Ports, a Comparative Environmental Risk Analysis," and "Recommended Environmental Practices for the Proposed Alaska Highway Gas Pipeline."

Waste Management

The Canadian Waste Materials Exchange began operation during the year. The program puts potential users of so-called waste materials, and the firms producing such materials, in touch with each other. The Development and Demonstration of Resource and Energy Conservation Technology Program was developed, for implementation during fiscal 1978-1979. Northwest Region released a report on the potential for waste rubber utilization in the Prairie provinces. Guidelines were developed for the disposal of waste materials containing polychlorinated biphenyls (PCBs).

A variety of waste management projects occupied the attention of Quebec Region, including recovery of silver from photographic processes; investigation of repeated fires in abandoned garbage dumps at Caughnawaga; and disposition of sand containing peat moss, which had been used to clean up an oilspill at Restigouche.

Administration Program
Planning and Finance Service

The Planning and Finance Service provides policy support and common services to the department.

Policy, Planning and Evaluation

The Policy, Planning and Evaluation Directorate focuses on policy areas that transcend specific responsibilities of individual services. It oversees planning for the department and, with the Finance Directorate, is responsible for preparation of the annual program forecast.

The directorate led a zero-base budget review of all departmental activities, to identify areas where economies can be realized and programs made more efficient. Analytical work was conducted by a task force that included representatives from Treasury Board and the Ministry of State for Science and Technology as well as staff from the program area under review; recommendations were made to a senior review committee chaired by the deputy minister. Reviews were completed for Fisheries and Marine, Atmospheric Environment and Environmental Protection services, and the review was under way for the Environmental Management Service.

The directorate consolidated and refined a series of departmental position papers on food production, transportation, industrial activity and human settlements. These papers were intended to aid in the development of departmental programs, and to influence other departments to include environmental considerations in their program development.

Liaison and Coordination

The Liaison and Coordination Directorate makes recommendations and coordinates departmental positions on environmental and renewable resource issues with international, federal-provincial or interdepartmental dimensions.

The June 1977 meeting of the Canadian Council of Resource and Environment Ministers, attended by directorate staff, dealt with national forest policy, pesticide use and control in Canada, amendments to the Fisheries Act, environmental impact assessment practices and a proposed shore zone management conference.

The directorate coordinated departmental and interdepartmental activities related to the fifth-year review of the Canada/U.S. Great Lakes Water Quality

Agreement. It participated in other transboundary environmental matters including the proposed Eastport oil tanker port; the construction of thermal electrical plants in Canada on the East Poplar River and at Atikokan; west coast tankers, including establishment of more effective means of vessel traffic management; and the setting of terms of reference for a Canada-U.S. study group on the long-range transport of air pollutants.

Staff members coordinated Canadian preparations for meetings of the senior advisers on environmental problems to the Economic Commission for Europe, the Governing Council of the UN Environment Program, the OECD Environment Committee and the NATO Committee on the Challenges of Modern Society.

Directorate staff coordinated visits between department officials and representatives of the Commission of the European Communities in a number of overseas countries. It coordinated the department's contributions to exchange activities under the Science and Techology Agreements with Belgium, the Federal Republic of Germany, France and the Soviet Union.

A review was conducted and changes made to the coordinating committee structure for Canadian participation in the UNESCO program on Man and the Biosphere. Several reports and discussion papers on the program were published.

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 newly-appointed comptroller general.

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

Internal Financial Audit

The Internal Financial Audit Branch reviews and appraises the effectiveness of the department's financial administration, and the extent to which department 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 (DSS) or by public accounting firms. It ensures that responses to audit reports, stating the corrective action taken or proposed by management, are received.

During the past year, audits were conducted at 25 departmental establishments, 23 provincial offices (involving cost-shared agreements) and 46 commercial firms (involving subsidy payments or conditional grants).

Departmental Management

Steps were taken by the Departmental Management Services Directorate to reduce administrative burdens in the department by introducing semi-automated systems such as word processing machines.

A study established uniform statistical reporting and performance measurement standards for the departmental library.

A number of facilities were completed, including the Institute for Ocean Sciences at Patricia Bay, B.C., a district fisheries building at Sydney, N.S. and an addition to the Bedford Institute of Oceanography at Dartmouth, N.S.

Through use of conservation measures, energy consumption by the department was reduced to 74.4 per cent of 1975-1976 levels. Paper recycling continued to be effective. Designs for the use of solar energy at the Rockwood Fish Hatchery were completed.

Personnel and Organization

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

A training and development policy, designed to enable more employees to meet departmental objectives, was introduced.

A policy aimed at increasing the participation of Indians, Metis, non-status Indians and Inuits in the department's activities was developed, and support was given to the provision of equal opportunities for women. Attention was given to improved service to the public in both official languages and to providing equal opportunities to employees regardless of language.

A new on-line personnel Information Reporting System was introduced to improve the accuracy of personnel data supplied to management and central agencies. In response to budget restraints, an improved personnel planning system was implemented on a trial basis in two directorates.

Results were satisfactory, and expansion of the system to the whole department was planned.

Computing and Applied Statistics

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

The directorate helped obtain Treasury Board approval for large-scale computer installations at AES headquarters in Toronto, the Bedford Institute of Oceanography at Dartmouth, and the Canada Centre for Inland Waters in Burlington. Contracts negotiated with commercial computer service bureaus are expected to result in savings of more than $250 000 in fiscal 1978-1979. A three-day workshop was held in Ottawa for senior data processing personnel and managers.

The directorate provided advice and assistance to departmental projects, including determination of the best tilting angle of solar collectors used in the heating of fish ponds; prediction of remaining time and fishing effort required for a foreign fleet to reach its catch quota; and the development of a sampling scheme to estimate manpower expenditure in an organization. In addition, staff members conducted a four-day statistics course for the Air Pollution Control Directorate and the Canadian Society for Chemical Engineering, and organized a statistics and scientific computing workshop at the Great Lakes Forest Research Centre.

Regional participation in the Environmental LIbraries Automated System (ELIAS) was established for AES Toronto and for the Quebec City region. The WATer Effluent National Information System (WATENIS) now processes data relating to the petroleum industry. Staff participated in the joint DFE-DSS Financial Control project.

Energergency Planning

The Emergency Planning Branch develops and coordinates departmental policies, programs and procedures for use in war and peace emergencies within the framework of national, NATO and Allied practices. It coordinates the department's civil emergency planning activities with the Privy Council Office, Emergency Planning Canada, other federal and provincial departments and industry.

The branch represented the department at a number of working groups, seminars and conferences on civil emergency planning, and took part in the planning and conducting of NATO exercises. It coordinated the department's input to a manual on responsibilities of federal departments in emergencies.

The Departmental War Book, Readiness Plan, operational manuals and essential records were reviewed and updated. The branch also conducted a course on emergency operations for field staff of the Fisheries Emergency Control Organization.

The Office of the Science Adviser (OSA) provides advice to the minister and to senior management on issues affecting the policies, interests and responsibilities of the department. The office coordinates scientific activities that are not the sole responsibility of one service but upon which the department must act.

The OSA continued to coordinate the department's activities in the area of energy and the environment. An important part of the work was concerned with nuclear energy, in particular with naturally occurring radioactivity, the department's participation in the Bayda Inquiry into uranium mining in Saskatchewan and participation in the Joint Panel on Occupational and Environmental Research for Uranium Production. Activities with the Department of Energy, Mines and Resources (EMR) continued, including the coordination of the DFE contribution to the Long-Term Energy Assessment Program. With EPS, OSA provided the departmental input to the EMR Coal Policy Study.

Canadian representation on the OECD (Organization for Economic Co-operation and Development) Energy and Environment Group was provided by the OSA, coordinating contributions from DFE, EMR and the National Research Council. OSA provided an adviser for the Canadian delegation to the UN Economic Commission for Europe seminar on habitat and energy. The science adviser was appointed chairman of a task force of the Canadian Council of Resource and Environment Ministers to produce a statement on the environmental impacts of energy production. As part of an executive interchange with New Zealand, a senior adviser was provided to the New Zealand Commission for the Environment to draft a policy and program plan with respect to energy development, energy conservation and the use of renewable energy resources.

OSA investigated environmental aspects of the government's decision whether or not to approve construction of the northern gas pipeline. The science adviser was invited by the U.S. Department of the Interior to take part in a critique of their trans-Alaska pipeline system, and participated in the examination by the joint Canadian-U.S. Arctic Environmental Council of the environmental regulations and stipulations of the trans-Alaska pipeline.

Examination of the concept of a conserver society and the application of environmentally compatible technology continued. OSA continued to direct federal activities at the ARK in P.E.I., an experiment in production of food and

energy with minimal impact on the environment. The co-operative program with CIDA continued, exploring ecologically sound development concepts in industrialized and developing countries. Several reports were issued: Ecodevelopment, National Development and International Development Policies; The Socio-Political Scene in the Coming Years with Special Reference to East Asia; and Environment and Development: A New Rationale for Domestic Policy Formulation and International Co-operation Strategies.

Climatic variation and weather modification received special attention. The OSA helped formulate departmental programs and policies in these areas, and chaired the interdepartmental working group on weather modification policy.

Other activities included administration of the Visiting Fellowships in Government Laboratories Program on behalf of the nine user departments; coordination of departmental requirements for airborne and remote sensing; and interdepartmental and international work on environmental statistics.

The office continued to act as liaison between the government of Canada and the national and international geographical community, through provision of the secretariat for the Canadian Committee of the International Geographical Union and by representation on the national committee of the Pan-American Institute of Geography and History.

Information services played an integral role in many of the activities described elsewhere in this report. Information groups in Atmospheric Environment, Environmental Management, Environmental Protection and Fisheries and Marine services, as well as regional information officers, completed a variety of information tasks. Information Services Directorate coordinated the department's information function and supplied specialized services.

Media Relations

Important departmental events received media coverage through press conferences and briefing sessions for the minister and department officials; news releases; distribution of background information on departmental issues; and response to media enquiries. A total of 91 785 radio and 1419 television broadcasts were made from weather offices during the year.

Community Relations

The network of contacts with citizens' groups was extended with an additional 150 requests for the bimonthly Citizens' Bulletin, which provides an information exchange for community environmental groups.

ISD participated in the Canadian Environmental Advisory Council's meeting with non-government environmental organizations, assisting groups with their projects, and drafting a policy for support of non-government organizations for the department.

Speeches

Speeches and announcements were drafted for a number of senior officials for delivery to a variety of audiences in Canada and abroad, including specialized industrial groups, labor unions, senior military and industry executives and universities.

A clipping and broadcast monitoring service was provided to department management.

Displays

Displays for fairs, boat shows, exhibitions and conferences were increased in all regions, and tours were arranged for student and adult groups.

Staff Publications

Publication of service staff magazines and regional newsletters continued, as did Contact, the department magazine, which focuses on people, their jobs and outside interests and attempts to bridge the wide geographical gap between department institutions.

New Publications

New publications included:

- "A Most Prudent Ark," a brochure describing the experimental bio-shelter at Spry Point, P.E.I., which received funding from the department.
- Audio-visual Aids Catalogue, annotated listing of films, filmstrips, film loops, slide sets, overhead projectual and multi-media kits available in Canada in the fields of departmental interest.
- "Planning Work Near the Water," a brochure explaining legislative changes affecting fisheries habitat.
- Environmental Protection Bulletin (1st issue), listing prosecutions for infractions of environmental law, and providing a layman's interpretation of laws and regulations.
- Report to Atlantic Fishermen, a special bulletin.
- Rural to Urban Land Conversion, a major text on land use.
- "Deciduous Trees of the Ottawa Valley," a folder.

In addition, three Forestry Fact Sheets, eight Hinterland Who's Who pamphlets and two Flood Damage Reduction Program pamphlets were published.

Fisheries and Marine Information Branch issued a Fishermen's Information bulletin on vessel stability, B.C. fishery resources, and the impact of the metric system on the industry.

Six information film clips were produced by EMS and provided to television stations across Canada.

New Projects

Information officers helped to organize a federal-provincial forestry conference, and the Jobs and the Environment conference attended by representatives of labor, business and government.

There was wide media coverage and public acceptance of the Weatheradio Canada inauguration in the Quebec Region. Law of the Sea negotiations, fisheries rehabilitation programs, the Salmonid Enhancement Program in B.C., and amendments to the Fisheries Act received intensive public relations support.

Public Enquiries

Responding to enquiries from the general public, researchers, students, teachers and special interest groups was a major task of public information groups.

Telephone and written enquiries exceeded 150 000, including 90 000 handled by the Canadian Wildlife Service. Major areas of interest included air and water pollution, fisheries, meteorology, land use, forestry, water, wildlife, alternative technologies and environmental

assessment. Some 2 500 000 printed items were distributed to the public.

French Programs

The French Information Section helped 10 directorates and regional offices provide information to French audiences. The French editing unit in Montreal prepared 137 technical documents for publication, totalling more than two million words, while 54 other documents were being edited or typeset.

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 Cabinet 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.

In accordance with the process, participating agencies make initial screenings of their own activities to identify environmental effects. They are required to inform the public early in the planning stage of 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 is reviewed by a separate independent panel, chaired by the executive chairman of FEARO or the executive chairman's 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 it 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.

Of the 22 projects under review in 1977-1978, seven were referred to FEARO during the fiscal year. Recommendations were made to the minister on three projects: the Wreck Cove hydroelectric development in Nova Scotia, an interim report on the Alaska Highway gas pipeline, and Eldorado

Nuclear's proposal to construct a uranium refinery in Ontario. The panels concerned agreed that the Wreck Cove and Alaska pipeline projects could proceed under certain conditions. However, the Eldorado panel recommended to the minister that the project should not be located at Port Granby as proposed.

Projects in advanced stages of panel review were the Shakwak project (Haines Road/Alaska Highway), the Alaska Highway gas pipeline (final phase), the project to reactivate the Boundary Bay Airport, the eastern Arctic offshore drilling project, the review of alternate sites for Eldorado Nuclear's proposal to construct a uranium refinery in Ontario, the Lancaster offshore drilling project and the Roberts Bank bulk loading facility expansion. To deal with the large number of complex projects in the British Columbia and Yukon district, a regional office was opened in Vancouver in April 1977. An increase in the number of projects under panel review is expected in the coming year.

Participating agencies are now required to provide all the essential information on activities that they have assessed internally to the executive chairman of FEARO, on behalf of the minister of the environment. The information will be used to evaluate the performance of the assessment process. Negotiations to obtain this data have begun.

Scientific and Technical Information

In DFE, the dissemination of scientific and technical information is the primary means by which research is translated into useful applications. Major products of the scientific and technical information program are 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 1977-1978 covered the spectrum from scientific articles in international journals and textbooks to technical reports, manuals and interpretive articles describing research applications.

Periodicals

The Journal of the Fisheries Research Board of Canada continues to be rated the best journal of its kind in the world. A special issue was devoted to pulp and paper mill effluents in freshwater environments. The Aquatic Explorers, a history of the fisheries research board, was published during the year.

Twelve climatological periodicals were issued by the Atmospheric Environment Service, including the Monthly Record of Meteorological Observations, now in bilingual format with metric units. The Heating Degree-Day Summary was added recently.

Newsletters published by Canadian Forestry Service regional and research centres have evolved from mimeographed sheets providing information to regional specialists, into attractive, popular publications. These newsletters -- Information Forestry (Pacific Region), Forestry Report (Western and Northern Region), Forestry Research Newsletter (Great Lakes Region), and Milieu (Laurentian Region) -- vary widely, but all are presented in a non-scientific report format.

The Spill Technology Newsletter, published by the Environmental Impact Control Directorate, has been successful in its first year of publication. Letters from subscribers in Canada and abroad have indicated that the newsletter is both timely and valuable.

Directories and Manuals

Fisheries and Marine publications ranged from Sailing Directions, Small Craft Guides, Tide Tables and Water

Levels, covering all three oceans and all the navigable waterways of Canada, to a Directory of Marine Scientists in Canada.

Work is progressing on Information Reports Digest, a bimonthly Canadian Forestry Service publication to inform clients of all CFS information reports and new CFS publications. The digest will provide an abstract of information reports, and list publication addresses.

Compilation and cartographic work on the Hydrological Atlas of Canada was in the final stages. The atlas is the product of 10 years of hydrology research in Canada, carried out under the International Hydrological Decade sponsored by UNESCO.

Scientific Publications

A number of publications were issued in response to requests for technical or scientific information. For example, An Analysis of Solar Radiation for Selected Locations in Canada was published by the Atmospheric Environment Service for an international research and design audience interest in renewable energy.

The scientific publications section of the Canadian Wildlife Service produced 13 Progress Notes and six Occasional Papers, including The Birds of Boreal Canada and The First Ten Years of the Co-operative Breeding Bird Survey in Canada, both by Dr. A.J. Erskine.

The Scientific Information and Publications Branch of the Fisheries and Marine Service published three taxonomic studies on chironomidae, an important food for fish; a monograph on seismic sea waves; reports on the Skylab floating ice experiment; and more than 200 items in the technical, industry, manuscript and data report series.

Inland Waters Directorate established a series of reports that interpret water quality data to the general reader. The first of these was published, for Prince Edward Island. Twenty-seven volumes of water quantity data, including streamflow, river and lake levels, sediment surveys, historical summaries and map supplements were published. Data on surface water quality, stored in NAQUADAT, the directorate's data processing system, are regularly printed in book form for use by scientists and technologists.

Technology transfer activities by EPS Water Pollution Control Directorate during the year included publication of 92 reports, a newsletter on wastewater technology and numerous articles in major scientific journals. Five

seminars were held to ensure that specific sectors of the industrial community were aware of new technology. Feedback from industry allows adjustment of technology to changing needs.

Publications from the Environmental Impact Control Directorate have drawn wide interest. They include two from the environmental emergencies program: Probable Behavior and Fate of a Winter Oil Spill in the Beaufort Sea and Field Evaluation of Oil Spill Recovery Devices: Phase Two; and two publications from the waste management program: The Potential for Waste Rubber Utilization in the Prairie Provinces and Recommended Procedures for Landfill Monitoring Program Design and Implementation.

Data Banks

The Fisheries and Marine Service is the Canadian input centre for the international Aquatic Sciences and Fisheries Information System (ASFIS). DFE has provided substantial input into ASFIS, indexed 1977 FMS publications, and advised on development of the system.

At year's end the Atmospheric Environment Serice had approximately 10 000 microfiche summarizing climatological information on temperature, precipitation, wind, etc. A quick-retrieval microfilm system was being developed to provide rapid access to original weather records, now in excess of 10 million. Interest in climatic changes and variability was increasingly focusing attention on such documents.

WATDOC, the Water Resources Document Reference Centre of the Inland Waters Directorate, continues to build data bases of information 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 accessible in 56 cities in Canada.

To facilitate handling of data on water pollution from both industrial and municipal sources, the Water Effluent National Information System (WATENIS) was established. 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 for 90 per cent of the population.

In the Air Pollution Control Directorate, 1000 microfiches and 1500 books and reports were added to the Technical Information System. There are now 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.

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
Fisheries Development Act, Operations
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