ROLE AND PROGRAM
of the
CANADIAN FORESTRY SERVICE
in
RESEARCH AND DEVELOPMENT

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of the
CANADIAN FORESTRY SERVICE
in
RESEARCH AND DEVELOPMENT

ASSESSMENT

by the

MINISTRY OF STATE FOR SCIENCE AND TECHNOLOGY

JULY 1976

Study Team

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SUMMARY

The Deputy Minister of the Department of the Environment requested the Ministry of State for Science and Technology in December, 1975, to assess the role and program in research and development of the Canadian Forestry Service (CFS), a directorate of the Environmental Management Service (EMS) of that department. Agreed terms of reference were to examine and make appropriate recommendations concerning:

- the broad direction and purpose of the research and development carried out by the CFS in relation to the existing mandate and objectives of the department;
- the decision-making procedure and structures within the CFS, and its interaction with the directorates of DOE, with other federal departments, with provincial governments, industry, universities, and the public; and
- the nature of the federal-provincial relationship.

The CFS comprises a head office group and thirteen establishments, including six Regional Forestry Research Centres (RFRCs), five National Forestry Institutes (NFIs) and two Forest Products Laboratories (FPLs). The RFRCs report to the respective Regional Director General (RDG) of EMS whereas the NFIs and FPLs report directly to the Staff Director General (SDG), Forestry. The RDGs have budgetary responsibility for the regional centres' activities. The SDG has a coordinating role with respect to the programs of these centres but has both budgetary and program responsibility for the NFIs and FPLs. The directorate had expenditures for FY 1975-76 of $37.9 million and a total staff of 1515.

The study team (2 officers) visited each of the thirteen CFS establishments and the head office groups of EMS plus other federal departments. On each field trip appropriate representatives of the provinces, industry, the university forestry schools and associations were contacted. About sixty-five groups were consulted involving well over one hundred individuals. In addition, a questionnaire was circulated to each of the CFS establishments for specific information.

The forests and forestry are of significance to Canada in that about forty-six percent of the total land area of the provinces is forested and Canada has about ten percent of the forest growing stock of the world. Forest industry activities provide employment for about 200,000 people. Canada is

second only to the United States in the production of woodpulp and is the world's largest exporter of forest products. Such products are the single largest net export item and are, thus, the most significant factor in Canada's balance of trade.

The federal government undertakes R&D activities on forestry, agriculture and mining at approximately the same level (1%) as a percentage of value added by manufacture. Also, aggregate federal government and industry expenditures in R&D and related activities are of the same order of magnitude as those of the United States and Sweden (the third largest producer of forest products). However, additional statistical data are required for an effective comparison of international activities.

Program activities of the CFS are covered by the Government Organization Act (1970) and the Forestry Development and Research Act (1966) which is now incorporated with the later act. These acts give the CFS the mandate to promote practices and conduct leading to the better protection and enhancement of environmental quality and to provide for the technology relating to the protection, management and utilization of the forest resource and the better utilization of forest products. Discretionary mechanisms are identified for achieving these obligatory functions.

Major problems identified in the study are that CFS activities are not sufficiently relevant to the needs of the forest manager for non-consumptive as well as consumptive applications; and the failure of the CFS to present a stronger federal focus for dealing with forestry matters.

Federal involvement in forestry is similar to that in other natural resources and is concerned with international implications; national economic impact; interprovincial concerns; equalization with respect to less advantaged provinces; and critical supply of the resource. To date, the CFS has interpreted its role rather narrowly and has been concerned primarily with the performance of R&D to provide the technology base in forestry. Most problems facing the forests and forestry, including protection, natural regeneration, reforestation, growth and yield, harvesting, multiple use of forest land, ecological effects of land use and utilization of the resource are common interprovincial concerns. Establishment of R&D facilities by each province would be both economically and technically inefficient and the more effective approach would be to have common aspects of a problem handled nationally with the application technique reflecting regional variations developed to an increasing degree by the provinces.

As a result of the current assessment of the role and program in R&D of the Canadian Forestry Service, a number of conclusions have been developed and from them the following recommendations are made.

- The CFS should continue to provide the federal and national focus in forestry both within the government and with other sectors but should increase the emphasis given to problems of resource management and environmental impact. This required shift in emphasis can be implemented within the existing Government Organization Act (1970) and the annexed Forestry Development and Research Act.

- In order to respond effectively to the changing emphasis, the CFS role should be to:

  . undertake planning and evaluation studies to define the current national situation and to identify problem areas and opportunities;

  . provide the focus for carrying out inventories and surveys by establishing standards and methodologies for their implementation by the provinces;

  . undertake R&D appropriate to the federal government; and

  . ensure effective communication with the user through the increasing use of direct collaboration, seminars, workshops, etc. for good technology transfer.

- The CFS should initiate broad-based projects utilizing the services of other EMS directorates to respond to problem areas concerned specifically with the multiple uses of the forests.

- The CFS should continue to undertake oriented basic and applied research but should ensure that projects are addressed to specific forestry problems to be pursued within an agreed time frame.

- Current program activities should be assessed project by project, to determine their priority with respect to newly identified national, provincial and industrial problem areas and thereby establish future program and manpower requirements, and whether the existing allocation of manpower and financial resources is adequate.

- Program areas having both regional and national implications require a detailed and comprehensive information-base before long range planning is possible. The CFS should initiate joint federal-provincial activities to:

  . undertake requisite market studies;

  . develop a standard inventory system; and

  . assist provinces to develop management standards related to forestry.

- To develop the statistical base required for planning studies, the CFS should implement the recommendations of the recent national conference on forest statistics as required activities can be identified and defined, and resources made available. Also, information relating to the technological capability of the user should be developed.

- To undertake required planning studies, the CFS should strengthen its planning and evaluation group.
- The CFS should also strengthen its role in communications by:
  - . establishing more effective advisory councils, especially with the provinces;
  - . giving greater emphasis to the use of mechanisms other than publication for technology transfer, such as collaboration with the user, and greater use of seminars and workshops;
  - . issuing publications, except regional newsletters, as CFS documents; and
  - . monitoring all technology transfer activities.
- To provide effective direction to the RFRCs, the CFS should establish two-level advisory groups with each province, comprising a board and program committees.
- The regional boards should be organized with provincial chairmen to identify problems related to forestry of provincial concern and to establish their priority. Their principal function should be to deal with joint policy matters, and their federal membership should include the RDG and a representative from the SDG's Office as well as the director of the RFRC.
- The program committees should also be organized with provincial chairmen and should comprise subject experts to monitor projects, assess the impact of R&D results and recommend mechanisms for transferring results to the user.
- The CFS, through advisory groups, should encourage and facilitate the development of mechanisms whereby the provinces share in the costs of the R&D, testing and pilot experimentation affecting their region. Use of jointly funded activities should be encouraged whereby initially the operating costs of the pilot-stage projects are the responsibility of the province and research is carried out by the CFS, and for the future jointly-funded regional centres be considered. This approach should be discussed in connection with the National Forest Policy.
- The federal-provincial forestry agreements should be renewed to:
  - . facilitate the identification of regional problems and deficiencies;
  - . provide direction to their respective agencies;
  - . support cost-shared projects; and
  - . define cost recovery mechanisms for activities undertaken specifically for a province.
- The SDG and his office should provide the focus in forestry for the directorate and should recommend to the ADM, in concert with the RDG, program activities developed by the regions.

- The SDG's Office should include regional coordinators for the RFRC programs, and a coordinator for the Forest Products Laboratories.
- The National Forestry Institutes should be organized into three sections for pest control, management practices and the experiment station, and continue to report to the SDG. They should be operated exclusively as forestry institutes, and should provide the technological base for the CFS with their major role being longer range R&D of national interest.
- An advisory committee for the NFIs comprising the directors of the Regional Forestry Research Centres and a representative from CFS headquarters plus non-federal members should be established.
- Arrangements should be made to have the Petawawa Forest Experiment Station property transferred from DND to the CFS.
- The RFRCs should undertake R&D relating to problems affecting the region which originate with the province, the National Forestry Institutes or other EMS directorates, and should work closely with the provinces to assist them in increasing their technological capability required to manage the provincial forests effectively for multiple use with due regard for the impact on the environment.
- The Forest Products Laboratories should remain as a component of the CFS for the present time but every effort should be made to increase the involvement of industry groups in program direction and DITC should be encouraged and supported in fostering the establishment of an effective national association to represent these groups. The situation should be reviewed in three to five years to determine when and to what extent the existing effort could become a joint industry-federal government institute.
- The two Forest Products Laboratories should continue to report to the SDG and their program activities should be closely coordinated.
- The CFS should augment the level of coordination with other federal departments and agencies by establishing an Interdepartmental Committee on Forestry to review federal programs and establish priorities for forestry matters. This Committee should be chaired by the ADM of EMS and membership should be drawn from the CFS, DITC, DREE, NRC, CDA, DINA, DND, FIN, TBS, MOSST, and possibly others with the CFS providing the secretariat.
- The CFS should be involved in the planning and implementation of all federal-provincial agreements concerning DREE-funded technical programs dealing with forestry.
- The CFS should assist the university forestry schools by fostering the involvement of staff in giving lectures to, and directing the research of graduate students, and by making greater use of university expertise.

- The CFS should enhance its public awareness program on forestry.

- The CFS should undertake or arrange for a comparison of international R&D activities in those countries in which forestry and forest products are of major concern. Relevant statistics should be developed on a continuing basis for future use.

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Appendix "A".....Abbreviations
Appendix "B".....Letter Implementing Study
Appendix "C".....Themes for Discussion on Field Trips
Appendix "D".....CFS Project Development and Technology Transfer Activities.

INTRODUCTION

Purpose and Terms of Reference

After exploratory discussions, the Deputy Minister of the Department of the Environment (DOE) requested the Ministry of State for Science and Technology (MOSST) to undertake a study of the role and program of the Canadian Forestry Service (CFS) as they relate to its research and development activities. The agreed purpose of this study was defined as being to assess the federal role in forestry, review current programs and make recommendations concerning future activities and the organizational structure required to carry them out.

Terms of Reference for the study as prepared by MOSST were to examine and make appropriate recommendations concerning the following:

(a) the governing legislation, objective and strategies of the Canadian Forestry Service and the broad directions and purposes of its research and development programs and science related activities in relation to the Government's objectives and to the specific mandate and objectives of the Department of the Environment;

(b) the decision making procedures and institutional structures within the Canadian Forestry Service with respect to the provision of science related services in response to the needs of clients within the Department, within the Federal government (DITC, DREE, CMHC, DINA, etc.) and outside the Federal government (provincial governments, industry and universities, and the general public); and

(c) the nature of federal-provincial jurisdictional relationships with respect to forestry research and development and science related services.

These terms were approved* by DOE with the comment that the study should contribute to the preparation of a federal position on forestry R&D and

*Letter from Dr. J.M. LeClair to Mr. J.B. Seaborn and Mr. J.B. Seaborn to Dr. J.M. LeClair attached as Appendix B.

related scientific activities vis a vis the provinces and the private sector. The results should thus provide a contribution to the development of a national forestry policy. Hope was also expressed that the study might yield as well some insight into the adequacy of forestry R&D generally in Canada in light of the social and industrial importance of Canada's forest resources.

In carrying out the study, consideration was given to the R&D and related scientific activities of the CFS, the rationale for such federal involvement and from an organizational point of view the operation and structure of CFS as a component of the Environmental Management Service (EMS) of DOE. The scope of the study and the interface to be explored can be represented best by Chart I.

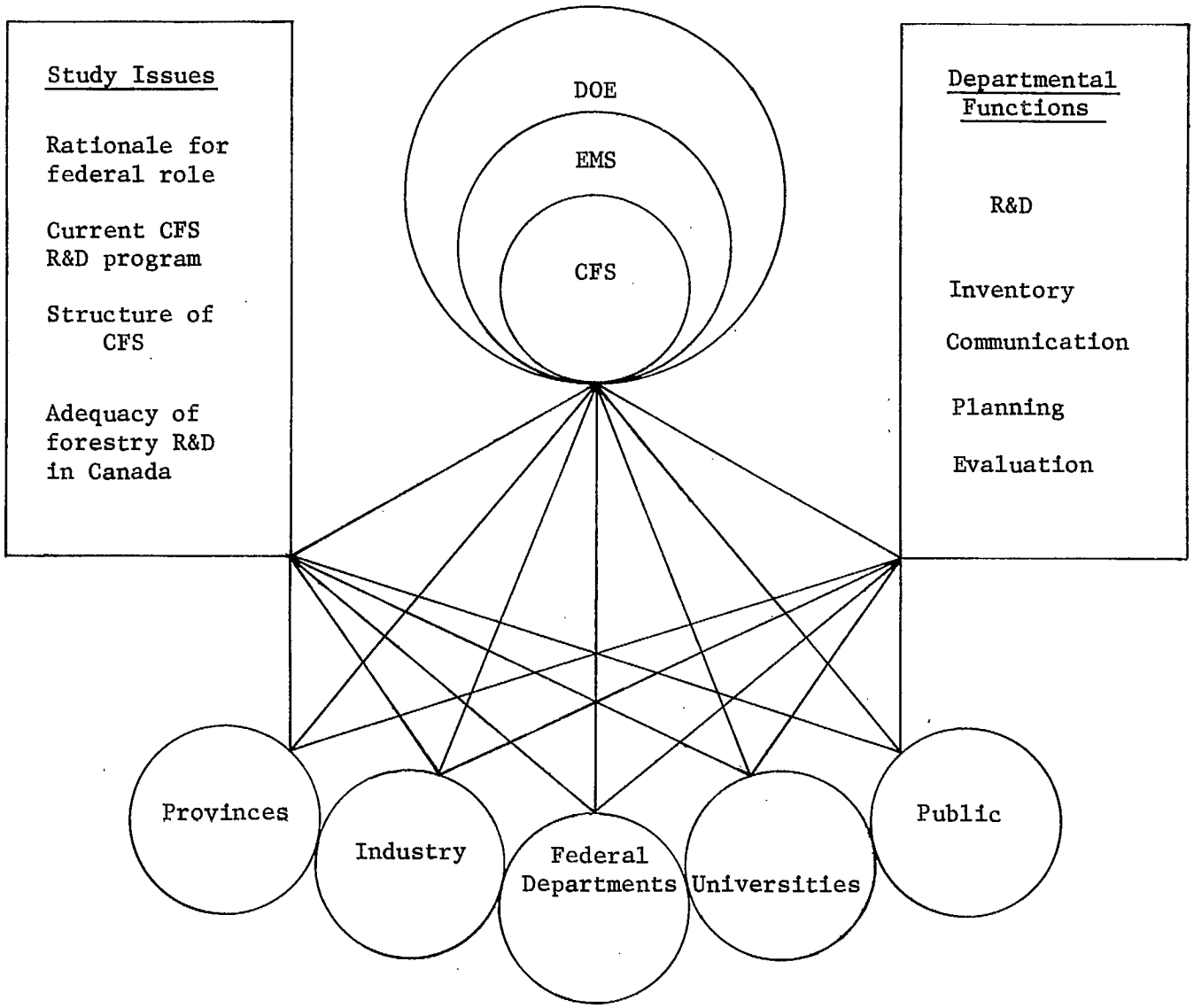

CHART I - STUDY ELEMENTS

Chart I indicates the basic elements to be considered by the study. The principal actor being CFS in the milieu of EMS and DOE with the secondary actors being the provinces, industry, federal departments, universities and the general public. Study issues are shown on the left with the functions available to the CFS on the right. As indicated, the current principal function is R&D.

Study Plan

In undertaking the study, MOSST has attempted to ensure that good representation was achieved of both the groups within CFS and the various users of the service with whom a regular interface is maintained. Because of the geographic distribution of the activities and the integration of CFS* within the EMS* organization of DOE, the contacts and discussions were divided into local visits around Ottawa and field trips. As EMS is divided into five regional groups, six field trips ranging in duration from three to over five days each were required to cover the desired contacts. Appropriate representatives from the provinces, industry, the universities and the associations were met in each region.

The study team (2 officers) held discussions with the ADM and the 5SDGs* (CFS, IWD, CWS, LD, PPDD)* of the EMS; the directors of the 5 National Forestry Institutes (NFIs), the directors and senior staff of the 6 Regional Forest Research Centres (RFRCs); the director of the 2 Forest Products Laboratories (FPLs) and the 5 program directors in the SDG, Forestry Office. Eight federal departments (CDA, DITC, DREE, DINA, NRC, FPRO, FIN and TBS)* were consulted. During the field trips the 5 Regional Director Generals (RDGs) of EMS were contacted and discussions were held with representatives of 7 provinces, 7 integrated forest-based companies, 4 university forestry schools and 11 associations. In total, about 65 groups were consulted involving well over 100 individuals. Themes discussed on the field trips are listed in Appendix C.

Client discussions were concerned with the role of the federal government in forestry, the relation of current activities to actual problems and the CFS interface with the user and hence the effectiveness of the technology transfer function for R&D results. For the CFS establishments, discussions were focussed on the mission of the establishment, the origin of projects, client-orientation of R&D, distribution of effort between "management" forestry and environmental impact, effectiveness of internal and external advisory committees and of technology transfer, inter-establishment activities and current staff and line relationships within CFS and EMS. A questionnaire (Appendix D) was also circulated to the 13 CFS establishments to develop statistical plus additional information, concerning project development and evaluation, transfer of results, and also comment on potential areas of R&D activity.

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* CFS Canadian Forestry Service
EMS Environmental Management Service
SDG Staff Director General
These and other abbreviations used in this report are listed in Appendix A.

The format of the report has been organized around the terms of reference developed for the study. The report comprises six chapters in addition to these introductory comments.

The Background chapter discusses the relevance of forestry to Canada, federal involvement (historical and legislated) in forestry, the adequacy of the Canadian R&D effort compared with the effort on other renewable resources and with other countries, and a brief general description of the current CFS level of effort, and its organization and integration within EMS.

CFS Mandate and Program discusses the relevant legislation affecting R&D activities in forestry. It examines the compatability of current activities with the CFS and DOE mandates, assesses R&D implementation mechanisms, and the impact of results based on client observations. It also discusses the rationale for federal involvement and areas of future federal activity in forestry.

Decision Making and the CFS Structure examines the CFS structure, both internal and as a component of EMS. It focusses on the three types of activity undertaken by the national forestry institutes, regional centres and forest products laboratories, in relation to a federal program and focus in forestry. Interaction with other federal departments, and with industry and other non-government sectors, is also assessed.

Federal Provincial Relations investigates the intergovernmental coordination at the policy and project implementation levels and the role of advisory committees. The possibility of negotiating new Federal-Provincial Agreements to replace the earlier (lapsed) agreements is discussed.

The final chapters on Conclusions and Recommendations provide a summary of the conclusions developed in foregoing chapters and the recommendations of the study.

BACKGROUND

Forestry in Canada

A comparison of the forested and total land areas of the provinces is given in Table I.

TABLE I: FORESTED AND TOTAL LAND AREA OF PROVINCES - 1973

	Forest Land	Total Land	Percent of Land Area Forested
	'000,000 acres		%
Newfoundland	31,504	89,960	35.0
Prince Edward Island	619	1,397	44.3
Nova Scotia	10,982	12,883	85.2
New Brunswick	15,594	17,637	88.4
Quebec	171,998	323,157	53.2
Ontario	106,806	218,630	48.9
Manitoba	33,476	135,048	24.8
Saskatchewan	31,678	143,387	22.1
Alberta	75,963	159,232	47.7
British Columbia	134,652	227,771	59.1
TOTAL	613,272	1,329,102	46.1

Source: National Forest Inventory, 1973, compiled by the Canadian Forestry Advisory Council for the Third Report to the Minister of the Environment.

As noted, forests cover about 613 million acres or 46 percent of the total land area of the provinces. Much of this is still economically inaccessible, due to high transportation costs and the lack of adequate infrastructure, so that the area allocated for economic wood production (including both Crown and private lands) is estimated (1973) at about 405 million acres. The total volume of growing stock in the provinces in 1973 was estimated to be 673 billion cubic feet.

The total Canadian volume of growing stock represents about 10.0% of the world supply compared with the USSR having 33.2% and the USA 8.4%. The actual cut of wood in Canada for all purposes, industrial roundwood and fuel, amounted to about 4.2 billion cubic feet in 1972.* Losses by fire, disease and pests would add appreciably to this amount so that the total reduction in the volume of growing stock would be of the order of 7 billion cubic feet, about 87% of the estimated allowable cut. For the more economically accessible areas this volume approaches the maximum allowable cut and in certain areas the allowable cut is exceeded. Recent forecasts indicate that the growth in demand will require increased usage of the forest resource to the extent that there will be a balance in supply and demand by the beginning of the next century, assuming no change in current practices.

Forest based manufacturing activities are listed in Table 2** which shows that of a total of nearly 33,000 manufacturing establishments in Canada over 10,000 or about 30% are oriented to utilize forest resources or intermediate products made directly therefrom. This ratio is surprisingly consistent from province to province so that forest resources would appear to have a similar relative level of significance throughout the country.

Of the forest based industries shown in Table 2, the paper and allied group has the greatest economic significance. A comparison of world production figures for woodpulp (for use in the production of newsprint and of all types of paper and paperboard products) is given in Table 3.

TABLE 3: WORLD PRODUCTION OF WOODPULP

	1973 '000T	1970 '000T	1960 '000T	1950 '000T
North America - Canada	20,506	18,308	11,461	8,473
- United States	48,355	42,216	25,316	14,849
Western Europe	30,686	28,140	17,269	9,876
Latin America	2,416	1,763	846	264
Asia, Africa & Pacific	14,519	12,307	4,850	1,004
Other	13,916	12,505	6,933	3,696
TOTAL	130,318	115,239	66,675	38,162

Source: CPPA Reference Tables 1975, Table 58

As shown in Table 3, Canada is the second largest producer of woodpulp in the world. Major producing countries in order of size, included in the above data for 1973, are as follows:

* Source: CPPA Reference Tables, 1975
Tables 9, 10 and 65

** See page 7

TABLE 2: FOREST BASED MANUFACTURING ESTABLISHMENTS BY INDUSTRY & PROVINCE

Number of Establishments

	NFLD.	PEI.	NS.	NB.	QUE.	ONT.	MAN.	SASK.	ALTA.	BC.	YUKON & NWT	TOTAL
Wood	74	28	209	150	1,090	775	91	99	250	724	11	3,501
Furniture and Fixture	4	1	40	25	782	944	109	33	120	254	1	2,313
Paper and Allied	4	1	13	18	208	291	24	7	20	54	--	640
Printing Publishing	26	7	74	48	1,054	1584	187	121	225	321	5	3,652
Total Forest Based	108	37	336	241	3,134	3594	411	260	615	1353	17	10,106
Total All Industry Groups	259	148	846	628	10,467	12976	1381	748	1,862	3,329	52	32,676

Source: Statistics Canada, Annual Census of Manufactures for 1969, Ottawa 1971.

	1973 Production of Woodpulp '000T
United States	48,355
Canada	20,506
Sweden	11,207
Japan	11,155
USSR	8,665
Finland	7,690
Norway	2,593
France	2,133

The relative significance of the forest industry to Canada is illustrated in Tables 4 and 5 which provide manufacturing and export data for the five major natural resources - forestry, fishing, agriculture, petroleum and mining.

TABLE 4: COMPARATIVE DATA ON FOUR MAJOR RESOURCE INDUSTRIES IN CANADA-1972

	Number of Employees	Salaries and Wages $'000,000	Value Added by Manufacture $'000,000
Forestry and Forest Products 1/	199,095	1,839	3,295
Fishing and Fish Products 2/	est. 80,100	174	429
Agriculture and Agriculture Production 3/	954,362	2,700	5,366
Petroleum, Mining and Mineral Products 4/	227,189	2,242	6,587

1/ Includes Logging, Sawmills, Shingle Mills, Veneer & Plywood, Pulp & Paper Mills. (Only the first stage of manufacture is included for comparative purposes).

2/ Includes Primary Fishing and Fish Products Industry.

3/ Includes Primary Agriculture and Food Processing Industries.

4/ Includes Primary Metal Industries, Non-metallic Products Industries, Petroleum and Coal Products Industries and Primary Mining.

Source: Statistics Canada - Various Industry Reports
CFAC Report, September 1975

As noted in Table 4, the forest industry provides employment for almost as great a number as the petroleum and mining industries combined. Of greater importance are the export statistics. Exports of forest, petroleum and mineral products each amount to about $5 billion, Table 5, below. However, major imports of both petroleum and mineral products (especially at the next higher level of manufacture) offset in large measure the substantial exports sales realized for these products and, consequently, the forest-based products provide the single largest net export item and are thus the most significant factor in Canada's balance of trade.

TABLE 5: CANADIAN EXPORTS OF SELECTED RESOURCE-BASED PRODUCTS - 1974

	$'000,000	Percent of Total
Wood, Wood Products and Paper	5,564	17.8
Fish and Fish Products	371	1.2
Agriculture Products	3,996	12.8
Petroleum, Natural Gas and Coal Products	4,748	15.2
Other Minerals	5,755	18.4
TOTAL, All Exports	31,293	100.0

Source: Statistics Canada - Catalogue 65-004
CFAC Report, September 1975

The foregoing statistics relate only to consumptive uses of the forest. The very major recreation industry is not included. Unfortunately, although the forests are recognized to be a major factor in the overall value of this industry to Canada, both nationally and as an earner of foreign exchange, sufficient data are not available at this stage to permit a value to be placed on the contribution provided by the forest estate to this industry.

Similarly, the value of the forest area in watershed control or providing a habitat for wild life cannot be estimated because the necessary statistics are not available.

Federal Involvement in Forestry

Federal involvement in forestry embraces half a dozen departments and agencies directly, and an additional twenty indirectly in a wide range of activities. Principal activities include:

- development of forest statistics related to inventories and surveys, and market and production data;
- development of technology required for the protection, maintenance and enhancement of the forest estate and its utilization for primarily, solid wood products;
- support of forest-based industries in both non-consumptive and consumptive applications;
- assessment of the environmental impact of forest-oriented activities;
- direct operational management of forests on federal lands in the territories and in national parks and military establishments; and
- use of the forest resource in regional development programs.

The CFS is directly responsible for forest inventories and surveys, development of technology relating to the forest estate (in conjunction with the provinces who are the operational managers of all provincial Crown lands) and its utilization, and environmental impact assessments. Because of its technology base, the CFS has a wide range of expertise relating to the forest resource and, consequently is the principal adviser to:

- DITC on resource matters related to forest industries (including recreation);
- DINA in managing forest areas in national parks and the territories;
- DND in managing the forest resource on Canadian Forces Bases; and
- DREE in regional development wherever the forest resource is involved.

The Federal Government has maintained a strong background and has a long history in the development of technological expertise in forestry. This effort has been centred in the CFS and its predecessor units since 1899 when the Timber, Mineral, Grazing and Irrigation Branch was established in the then Department of the Interior. Organizational changes which have occurred in this activity since that date are shown in Table 6.

TABLE 6: CHRONOLOGICAL LIST OF CHANGES IN THE FEDERAL FORESTRY AGENCY

1899	Timber, Mineral, Grazing & Irrigation Branch	Dept. of Interior
1902	Forestry Branch	Department of Interior
1926	Forest Service	Department of Interior
1936	Dominion Forest Service	Dept. of Mines & Resources
1950	Forestry Branch	Dept. of Resources & Development
1953	Forestry Branch	Dept. of Northern Affairs & Natural Resources
1960	Department of Forestry	
1966	Forestry Branch	Dept. of Forestry & Rural Development
1968	Forestry Branch	Dept. of Fisheries and Forestry
1969	Canadian Forestry Service	Dept. of Fisheries and Forestry
1971	Canadian Forestry Service	Department of the Environment (Environmental Management Service)

As noted in the foregoing table, the stature of the federal forestry service remained relatively constant until 1960 when it was made a Department, a situation which continued for six years. Between 1966 and 1971, the service was associated successively with rural development and fisheries. It was then integrated with three other directorates, Canadian Wildlife Service, Inland Waters Directorate and Lands Directorate, to become the Environmental Management Service of DOE.

Activities of the CFS have been covered by a series of Acts as shown in Table 7.

TABLE 7: FEDERAL LEGISLATION AFFECTING FORESTRY

The Canada Forestry Act	1949
The Department of Forestry Act	1960
Forestry Development & Research Act	1966
The Department of Fisheries and Forestry Act	1968
Government Organization Act	1970

In 1949 the Canada Forestry Act was enacted to bring together the various forest-related activities identified in several earlier acts. This act was repealed by the Department of Forestry Act which covered the establishment of a separate department for forestry. In order to define further the federal role in forestry, the Forestry Development and Research Act was passed in 1966. In 1968 the earlier Department of Forestry Act was repealed with the enactment of the Department of Fisheries and Forestry Act. This was repealed, in turn, by the Government Organization Act of 1970. This last legislation provided for the establishment of the Department of the Environment with the CFS an integral component of the Environmental Management Service of that Department. The Forestry Development and Research Act, with minor amendments concerning duties of the Minister, was annexed in full to this legislation for administration by the Minister of the Environment.

As noted above, and as will be discussed more fully in subsequent sections of this report, federal involvement in forestry must be closely coordinated with activities of the provincial governments and of the industrial and university sectors. To clarify the respective roles, particularly of the federal and provincial governments, a major effort has been initiated to define a national forest policy. This effort is now underway and it is anticipated that the current study will, in part, provide an input in the development of this national policy.

Canadian R&D in Forestry

The series of studies undertaken by the Science Council on the level of R&D on renewable resources provides some comparative data concerning the distribution by sector of R&D expenditures on these resources. These data are presented in Table 8.

TABLE 8: NATIONAL R&D EXPENDITURES ON RENEWABLE RESOURCES - 1968

SECTOR	Renewable Resource							
	Fisheries		Agriculture		Wildlife		Forestry	
Total R&D ($'000,000)	26		75		8		54	
Distribution (% of TOTAL)	'000,000 $	%	'000,000 $	%	'000,000 $	%	'000,000 $	%
Federal	22.1	85	39.8	53	3.3	41	22.1	41
Provincial	3.4	13	8.2	11	4.0	50	3.2	6
Industry	-	-	5.3	7	0.4	5	26.0	48
University	0.5	2	21.7	29	0.3	4	2.7	5

Source: Science Council of Canada, Special Study No. 14, p 183; Report No. 9, p 31; and Special Study No. 10, p 38.

Table 8 shows that for 1968 the federal government spent similar amounts for R&D in forestry and fisheries but about 80% more in agriculture. Involvement of industry varies widely in that it carried out no R&D in fisheries and accounted for only 7% (about $5 million) of the total in agriculture but accounted for the largest portion (48%) of the total expenditure in forestry.

Although more recent data to show aggregate expenditures by sector for each resource are not available, statistics comparing R&D expenditures by industry and the federal government may be of interest in indicating the current pattern. Expenditures on R&D in forestry, agriculture and mining (including petroleum and mineral products) for 1972 are shown in Table 9 with the relationship to the total value added by manufacturing calculated.

TABLE 9: COMPARISON OF R&D EXPENDITURES AND VALUE ADDED - 1972

	R&D Expenditure		Value Added	% R&D/Value Added	
	Federal Gov't. $'000,000	Industry $'000,000	$'000,000	Federal	Total
Forestry	33	21	3,384	1.0	1.6
Agriculture	58	est. 7	5,366	1.1	1.2
Mining	66	78	6,587	1.0	2.2

Source: Estimates 1974-75;
Statistics Canada Catalogue 13-203, 1973-75 Table 3.

The data in the above table relate R&D expenditures to value added, which reflects the actual work done on the resource. *The aggregate level of R&D by industry and the federal government varies considerably but the government effort is remarkably consistent at about* 1.0 - 1.1% *of the value added for forestry, agriculture and mining. Industry involvement is* 0.1% *for agriculture,* 0.6% *for forestry and* 1.2% *for mining.* The industrial level of R&D in forestry at $21 million shows a major decrease from the level in 1968, $26 million (Table 8). The economic slump of the late 60's and early 70's had a major impact on the forest industry which resulted in a decreasing level of R&D effort between 1968 and 1972. There has been a recent recovery in that estimates for the 1975 industrial R&D expenditures on forestry by Statistics Canada ($30 million) are approximately 40% higher than the 1972 level ($21 million) but only 15% above the 1968 expenditure ($26 million).

International Comparison

In the foregoing section, R&D expenditures by Canadian performers on various natural resources have been compared. As Canada is a major producer of forest-based products, being second to the U.S. and ahead of Sweden in total output, a comparison of R&D expenditures by these three countries would be of interest. Unfortunately, sufficient data are not available and could not be developed within the time-frame of the current study. However, isolated items of data have been obtained and a rough comparison is possible; these data are shown in Table 10.

TABLE 10: COMPARISON OF R&D EXPENDITURES BY COUNTRY

	Canada 1972	United States 1972	Sweden 1973
R&D			
Federal)	33.0	62 est.	15.5
Industry)	21.0		22.5
Total) $'000,000	54.0		38.0
Value Added)			
Pulp & Paper)	1,962	5,364	1,260
Wood Products)	1,422		664
Total	3,384		1,924
Ratios (percent)			
Federal R&D / Value added (total)	1.0		0.8
Industrial R&D / Value added (total)	0.6		1.2
Federal R&D / Value added (pulp & paper)	1.7	1.2	1.2
Total Pulp Produced, million tons	20.5	48.4	11.2
Federal R&D/Ton of pulp (approx.)	$1.60	$1.30	$1.40

Data in Table 10 indicate that for 1972, the CFS budget (1.7%) was higher than expenditures by the Swedish and U.S. governments (1.2%) as a percentage of the value added by the manufacture of pulp and paper. If value added for the total forest industry is used, the data show that Swedish industry spent twice that of Canadian industry but the Canadian and Swedish governments spent about the same amount (1.0 vs 0.8%). A comparison of government expenditures per unit of production (total pulp) shows that the governments of Canada, Sweden and the U.S. spent, respectively, approximately $1.60, $1.40 and $1.30 per ton of pulp.

It must be stressed that a firm conclusion cannot be drawn from the above comparison. Consequently, *an effective comparison of international expenditures on R&D and related activities on forestry is required. However, based on available data R&D expenditures by the Canadian government and industry are of the same order of magnitude or slightly higher than similar expenditures by Sweden and the U.S. based on value added by manufacture and on unit production.*

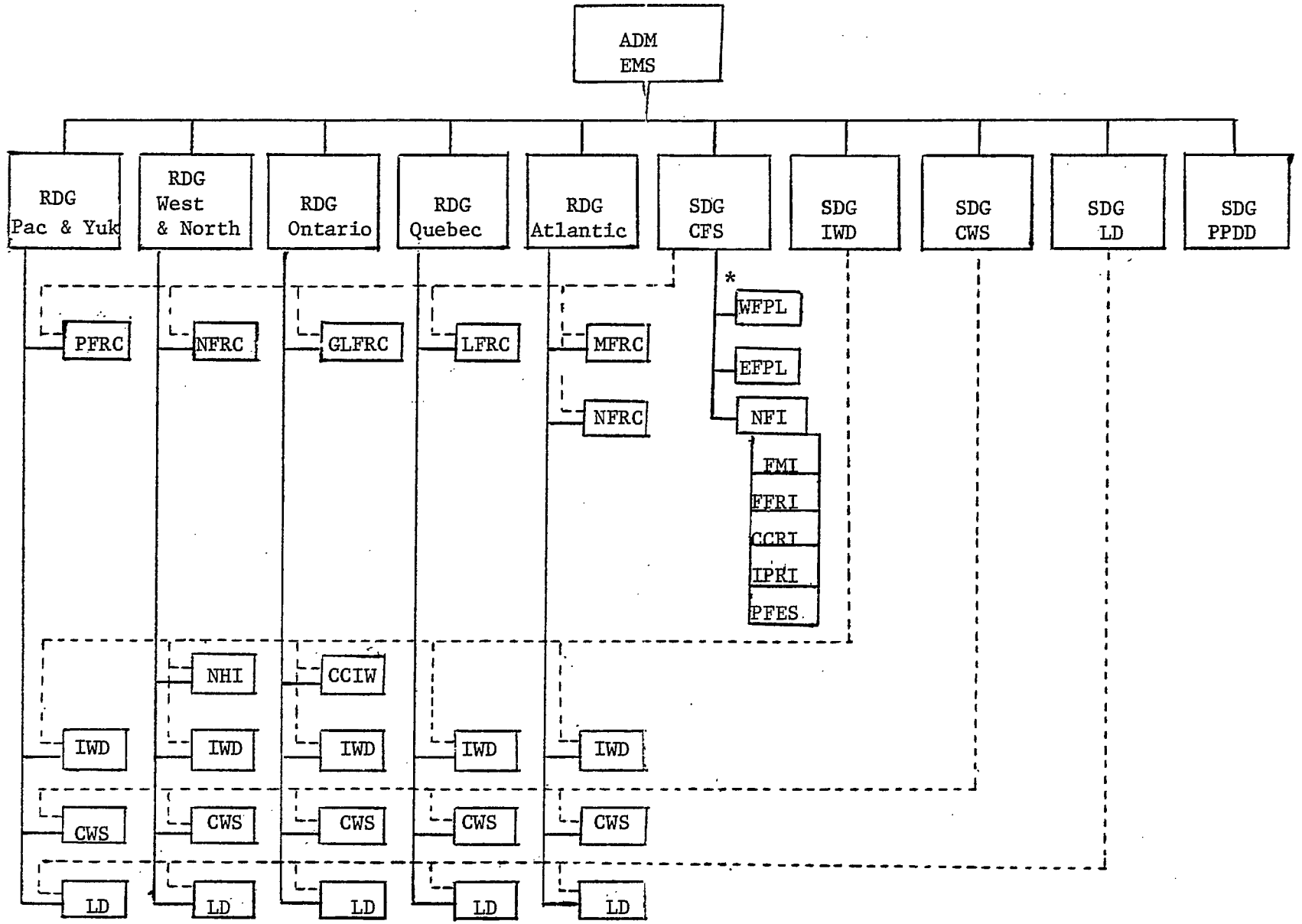
Canadian Forestry Service

The CFS is one of the five directorates which comprise the EMS of DOE. These directorates include, as well, Inland Waters (IWD), Canadian Wildlife (CWS), Lands (LD), and Policy and Program Development (PPDD). The EMS is organized as a matrix in that operational functions are undertaken in five regions and line responsibility for all directorates is vested in the Regional Director Generals. Headquarters functions of each directorate are headed by a Staff Director General. The ADM of EMS thus has reporting directly to him, ten DGs of whom five have operational (budgetary) control and the remaining five have advisory functions with respect to directorate programs.

Currently the CFS directorate consists of a headquarters establishment with five principal groups, six regional research centres, five national institutes and two forest products laboratories. The organizational structure of CFS and its integration within EMS are shown in Charts 2 and 3. The six regional centres report to the respective RDGs in EMS but the national institutes and forest products laboratories now report, on a temporary basis since April 1976, directly to the SDG, Forestry. The portion of the organizational structure of EMS which affects only the CFS is given in Chart 3 which also identifies the headquarters groups in the SDG's Office.

The level of effort undertaken by the CFS has varied appreciably during the past ten years. As noted earlier, during the mid-60's an increasing emphasis was given to forestry as a federal interest and in keeping with the change in status of the Service to Ministry level, plans to enhance the program were given serious consideration. However, after several years, budgetary constraints forced a re-assessment of this approach. As a result the stature of the Service was reduced and subsequently the CFS was made a component of the EMS within DOE. Changes in budgets and man-years during this period are shown in Table 11.

Chart 2. ORGANIZATION OF EMS BY REGION, DIRECTORATE AND ESTABLISHMENT



* Temporary as of April 1976

Chart 3. INTEGRATION OF CFS WITHIN EMS

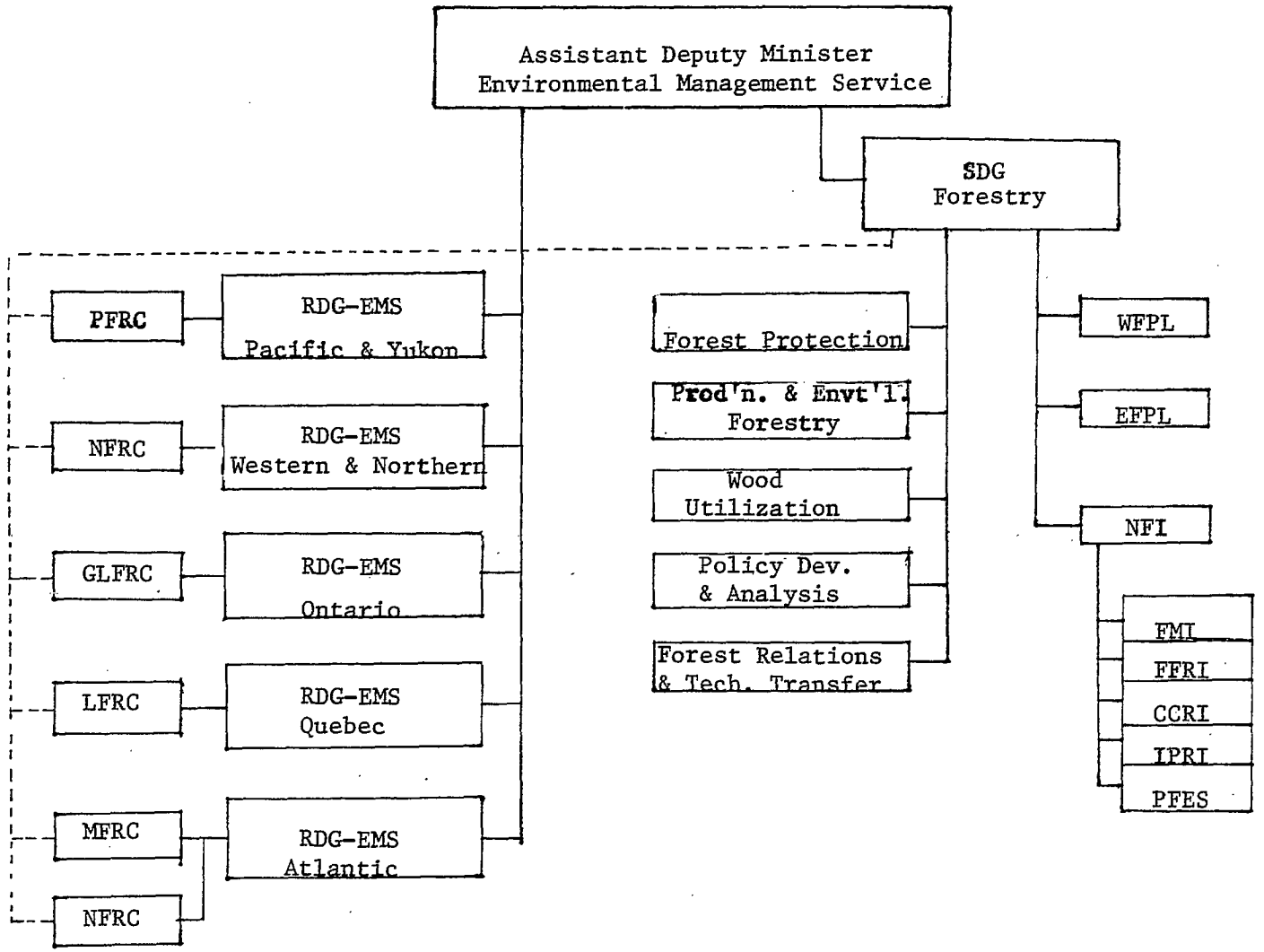


TABLE 11: DISTRIBUTION OF CFS EXPENDITURES BY BUDGET CATEGORIES

Department	Year	MY	Salary '000 $	O&M '000 $	Capital '000 $	Grants '000	TOTAL '000 $
Dept. of Forestry & Rural Dev. (Forestry Br.)	1965-66	1236	5,774	3107	1722	7910	18,513
	1966-67	1455	9,717	2903	3063	8660	24,343
	1967-68	1926	12,778	4265	3952	1750	22,745
Dept. of Fisheries & Forestry (Forestry Br.)	1968-69	2181	13,703	4568	3679	1516	23,466
	1969-70	1933	13,910	4637	3131	1151	22,829
	1970-71	1711	14,927	4976	2540	1243	23,686
Dept. of the Environment (CFS)	1971-72	1639	15,614	4999	2040	1553	24,206
	1972-73	1624	19,161	6808	5170	1855	32,994
Dept. of the Environment (Forestry Directorate)	1973-74	1657*	20,590	8431	4564	1855	35,440
	1974-75	1629	21,965	8863	5647	3624	40,099
	1975-76	1515	24,657	8185	3972	1075	37,889
	1976-77	1444	26,264	8318	1763	1370	37,715

Source: CFS
*Includes 55 MYs for Summer Students

The level of effort as indicated by MYs employed increased from 1236 in 1965-66 to a peak of 2181 in 1968-69. Since that time the level has steadily decreased, with the exception of a minor increase in 1973-74, because of the use of additional summer students, so that the total MYs employed in 1975-76 was only 1515. For the current FY the level has been further decreased to 1444.

The reductions over the past several years have been used in part to augment activities in other directorates of EMS and to a limited extent to permit the integration of common activities. Thus, the total reduction in MYs cannot be regarded as a complete loss of function to the CFS as the activities performed may be undertaken elsewhere in EMS. However, it does reflect a dilution of effort on forestry activities.

Data for the salary, O&M, grants and contracts categories of the CFS budget given in Table 11 show a continuous increase over the ten-year period despite the concurrent reduction in MYs. This increase reflects salary adjustments with major revisions occurring in FYs 1971-72 and 1973-74 and some changes in grants, etc.

A breakdown of the CFS budget according to type of activity (applied R&D,

basic research, contracts, grants, capital and related scientific activities) for the past five years is provided in Table 12. As noted, totals for the two tables are not consistent; this is because they have been developed from a different statistical base.

TABLE 12: DISTRIBUTION OF CFS BUDGET ESTIMATES BY SCIENTIFIC CATEGORY*

R&D	1972/73 $'000	%	1973/74 $'000	%	1974/75 $'000	%	1975/76 $'000	%	1976/77 $'000	%
-Applied	17,555	55	17,300	49	18,290	47	20,989	58	23,000	59
-Basic	1,950	6	3,000	9	2,000	5	2,400	7	3,000	8
Contracts	866	3	3,025	9	3,137	8	1,750	5	2,400	6
Grants	355	1	1,855	5	4,115	10	1,075	3	1,370	4
Related Scientific Activity	11,328	35	10,003	28	11,680	30	9,845	27	9,056	23

Source: CFS

*Table 12 is based upon CFS input to the Statistics Canada annual survey on scientific activities within the federal government. There is a variance in the totals of Table 11 and Table 12 as the latter figures are based on estimates whereas, Table 11 shows actual expenditures (except for FYs 1975-76 and 1976-77).

The data of Table 12 are estimates developed by CFS for Statistics Canada and hence follow their definitions as closely as possible. As noted, the R&D effort has increased from $19.5 million in FY 1972/73 to $26.0 million in FY 76/77 representing about 52% and 67% of the total budget for these years.

The breakdown between applied and basic research indicates the amount of background research undertaken to develop new leads and to support the applied research. The level of basic research has ranged between 5% and 9% of the total budget which is a generally accepted level in most mission-oriented R&D establishments in either government or industry. CFS has indicated that essentially the total R&D effort is problem oriented at this stage.

Contracts have varied widely from 1% to 9% of the total budget. The amounts for the past four years reflect DOE's response to the Make or Buy Policy. The CPAR" program, started in 1973/74, is an example of this. However, recent reductions have resulted from budget constraints which have tended to have had a greater impact on discretionary categories of the budget, such as contracts. Grants include contributions to universities, to both domestic and international associations and to the provinces for assistance with forest spray programs. Amounts for this last item can vary widely so the totals have also varied.

*CPAR: Cooperative Pollution Abatement Research

Related scientific activities include surveys, inventories, economic studies, technology transfer activities, advisory functions, and public awareness programs. The level of effort in such activities has shown an actual decrease in amount during the five-year period and on a percentage basis has dropped from 40% to 23% of the total budget. The decrease in level of effort indicates that these activities tend to be more discretionary in nature than the R&D effort and consequently have been affected to a greater extent by budget constraints. These activities are of major significance and an integral component of the CFS program and will be discussed in subsequent chapters of this report in greater detail.

MANDATE AND PROGRAM

Current Legislation and Role

As noted earlier, legislation dealing with federal activities in forestry, which are currently in effect, includes the Government Organization Act, 1970 and the Forestry Development and Research Act, 1966 which is now an annex to the later act. The relevant items of these acts are as follows:

Government Organization Act

"The Minister shall:

initiate, recommend and undertake programs, and coordinate programs of the government of Canada, that are designed to promote the establishment or adoption of objectives or standards relating to environmental quality, or to control pollution; and

promote and encourage the institution of practices and conduct leading to the better protection and enhancement of environmental quality, and cooperate with provincial governments or agencies thereof, or any bodies, organizations or persons, in any programs having similar objects".

Forestry Development and Research Act

"The Minister:

shall provide for the conduct of research relating to the protection, management and utilization of the forest resources of Canada and the better utilization of forest products, and may establish and maintain laboratories and other necessary facilities for such purposes.

may undertake, promote or recommend measures for the encouragement of public cooperation in the protection and wise use of the forest resources of Canada.

with the approval of the Government in Council, may enter into agreements with the government of any province or with any person for forest protection and management or forest utilization, for the conduct of research related thereto, or for forestry publicity or education.

may provide for the making of forestry surveys and provide advice relating to the protection and management of forests on lands administered by any department or agency of the government of Canada or belonging to her majesty in right of Canada;

may conduct economic studies relating to the forest resources, forest industries and marketing of forest products, make investigations designed to aid the forest industries and woodlot owners of Canada, and assist external aid programs relating to forestry; and

at the request of any department or agency of the government of Canada, may assume responsibility for the protection and management, including the disposal of timber and other forest products, of any forest or land administered by such department or agency".

The above excerpts indicate clearly that the CFS as a component of DOE has the mandate not only to promote "practices and conduct leading to the better protection and enhancement of environmental quality" but also to provide for the technology "relating to the protection, management and utilization of the forest resources of Canada and the better utilization of forest products." A number of discretionary mechanisms are also identified whereby these obligatory functions might be achieved.

In essence the legislated mandate of the CFS is to provide for technology relating to protection, production and utilization (consumptive and non-consumptive) of the forest resources of Canada which ensures the protection and enhancement of the quality of the environment. Mechanisms identified for undertaking this mandate allow the CFS to:

1. establish and operate laboratories;
2. undertake inventories and surveys;
3. carry out economic studies and investigations;
4. provide advice;
5. undertake management functions if requested; and
6. promote public cooperation.

Existing legislation does not define the purpose or objective of the federal involvement in any way except to "provide for the conduct of research" and to promote and encourage practices which will enhance environmental quality nor does it discuss the respective roles of the federal government, provincial governments, industry and the universities. The mandate might be interpreted simply that the CFS has the responsibility to provide the technology base whereby the forests of Canada can be managed effectively on a long term basis without degradation to the environment. Further definition of the spheres of responsibility and functions of the various performers involved with forestry R&D will have to be developed in conjunction with the preparation of a national forest policy.

CFS Program

Orientation

As discussed in the foregoing section, the Forestry Development and Research Act identifies that the Minister shall provide for the conduct of research in three principal areas. The Government Organization Act in

embracing the above Act extends the role within forest management to include activities relating to better protection and enhancement of environmental quality. Accordingly, the CFS program has been developed in line with the above acts especially the former because it or the earlier statutes which it succeeded, has been in effect for more than twenty-five years. Since the CFS has been incorporated within EMS, increasing emphasis has been given to projects having an interdirectorate focus. Nevertheless, all studies can be classified within the three principal areas of activity, namely: forest protection, production and environmental forestry, and forest utilization.

The R&D activities can be oriented to the sector having responsibility for application of the results of the research effort. Thus, R&D on forest protection and production and environmental forestry is oriented to the provincial governments which have responsibility for operational management of the Crown forest lands in the provinces, although environmental impact studies will be of interest as well to other Services of DOE and to industry. Forest utilization studies are of primary interest to segments of the forest industry sector. Needs and interests of the potential user will have a major effect on the scope of the work undertaken.

The above areas of activity are discussed in the following paragraphs, in which both current activities and future program requirements based on CFS reports, and on discussion with establishment staff and with provincial governments, industry and university representatives are included.

Forest Protection

Forest protection is a major activity of the provinces but their programs are almost exclusively operational. For the past forty-five years, they have depended almost entirely on the federal government for R&D for protection methods and the CFS is the major source of expertise and advice in this field. Areas of program activity include fire research and forest insect and disease surveys and research.

Fire R&D is heavily problem oriented and provides immediate solutions to problems encountered by provincial fire control agencies. Current R&D covers prediction of fire occurrances and behaviour, prescribed fire applications, evaluation of fire control systems, development of procedures to optimize use of modern fire control technology, fuel appraisal, clarification of the role of fire in forest ecology, and the development and testing of fire management systems.

Forest insect and disease activities are covered by two major functions, surveys and R&D. The CFS provides regular monitoring of forest and tree pests and environmental disturbances. This effort embraces all provinces and territories and is carried out by the six regional research centres. The surveys identify the depletion of the forest resources attributable to pests and environmental damage, to forecast trends in pest populations, and to obtain biological and damage impact data necessary for pest control. Data developed are required by the provincial governments, industry and the general public. At this stage, Quebec and to a limited degree Ontario, have

a capability to undertake forest pest detection and appraisal programs; all other provinces depend fully on the federal government for this effort.

Current R&D activities on forest insects and diseases cover all aspects of predicting, preventing and controlling forest pests. Approaches include long term ecological studies to determine the relationship among the various pests, control agents and the host tree; safer pesticides and improved application techniques; alternative control methods such as naturally occurring insect viruses, bacteria, etc.; and cultural and management practices.

Total operating costs for forest protection activities was $7.1 million for FY 1975/76 or 19% of the total CFS budget. This program required 368 MYs (24% of the total) and the R&D was carried out in four of the national institutes and in each of the six regional research centres.

Additional future requirements in the program area of forest protection include developments relating to:

- the role of fire in the broad context of resource management
- use of prescribed fire as a management technique for site preparation, brush control, and insect and disease control
- fire behaviour indices, damage appraisal and rating, and the effect on the environment
- basic chemical and physical processes of ignition and combustion
- pest management strategies without exclusive reliance on pesticides
- deterioration of trees killed by insect or disease
- biological control of forest pests as an operational procedure
- economics of forest protection

The above list is not exclusive but provides an indication of the type of program considered by both the CFS and the non-federal groups to be necessary for the next several years. A number of items extend or broaden current projects, others introduce new activities. In general, a definite shift in focus is evident toward the integration of forest protection as a component of forest management rather than as a separate function.

Production and Environmental Forestry

The production and environmental forestry program is also oriented to the provinces. It is directed to obtain a better understanding of forest ecology by assessing man's impact on the forest and by developing management systems which will enhance productivity and improve overall quality of the environment. A major objective is to support and promote the general trend to replace traditional forestry practices with resource management approaches which will meet forecast demands for wood fibre while fulfilling society's needs for recreation whereby wildlife, water sources and quality, and the

aesthetic character of the forest estate are protected. Projects fall into three groups: collection and handling of relevant base data, resource management and environmental management.

CFS plays a major role in developing methods and systems for collecting and using data for resource and environmental management. Projects cover developing the use of ERTS imagery for remote sensing, bio-physical and ecological surveys and analysis procedures, inventory methods, and data storage and retrieval. The directorate has collaborated with various provinces in developing inventories for resource management, a computer assisted planning system to schedule harvesting, product yield, simulate operations and thereby control impact on the environment for areas with specific resources or with several resources. Also, a metric conversion program is underway to standardize forestry and forest products mensurational units throughout the country.

Resource management activities include improved methods of rearing, establishing and tending trees and stands in order to maintain and enhance productivity and environmental quality in the face of the increasingly large areas depleted annually by cutting, fire and insect and disease attack. Systems under development relate to a wide variety of species, forest and terrain types and to production of fibre in response to the wide range in demand for wood products. Production of fibre for energy, for oils and extractives, and for cattle feed is under investigation. Development or improvement of systems to manage the forests for non-consumptive uses such as recreation, aesthetics (for example, urban forestry) and watershed control and regulation of water quality. Major contributions are continuing to studies undertaken by the Newfoundland and New Brunswick governments to formulate resource management and development policies and programs.

Environmental impact studies are concerned with conservation and enhancement of the environment in two ways. Firstly, investigations are underway to understand the impact of forestry practices such as the effect of logging or forest fertilization on water yield and quality. As information is developed, it is compiled into guidelines on the conduct of forestry operations, particularly for environmentally sensitive sites. Secondly, assessments, monitoring and R&D are carried out in relation to the effects of industrial activity such as atmospheric emissions, and other major developments (pipelines) on soils and vegetation.

The operating budget for production and environmental forestry was $6.1 million for FY 1975/76 (16% of the total CFS budget) and 311 MYs were required to carry out the work. Projects are carried out at two of the national institutes and at the six regional research centres.

Future additional or extended program activities in the area of production and environmental forestry include:

- economic studies relating to Canada's position as a source of forest products to meet national and international demands

- collection of data and development of inventory systems required for intensified forestry and integrated and multiple land use

- guidelines and standards for forest and environmental management including computer modelling techniques
- site requirements for natural and managed forest ecosystem
- development of trees superior in rate of growth, wood quality and resistance to pest attack
- regeneration of lands that once bore forest cover but which are now treeless or seriously understocked
- intensified plantation management and mechanization of silviculture
- urban forestry and greenspace management
- environmental impact assessment
- involvement in baseline, land use and water basin studies
- watershed role of the forest cover

As with the list of future activities for forest protection, the above list demonstrates a marked shift in focus to planning and management problems.

Forest Utilization

The forest utilization program is concerned primarily with solid wood applications and is thus oriented to that portion of the forest products industry including sawmilling, and plywood and laminated beam fabrication. A minor portion of the program is directed to the development of technology to permit the use of waste wood and less desirable species for applications such as wood structures and woodpulp.

R&D on forest products has been a major and continuing effort of the CFS for many years and the program has been maintained to promote the efficient utilization of forest resources for solid wood products. (The Pulp and Paper Research Institute of Canada (PPRIC) has the mandate to develop technology related to the use of major tree species for pulp and paper products). The CFS program provides for a federal involvement in the maintenance of quality and performance standards for wood products and for the establishment of safe practices for their use in housing, etc. Participation in the development of national and international standards and codes is a major activity.

Major problems currently under study include the protection of wood against fire and its preservation against decay, the use of less toxic chemicals for wood treatment, utilization of more of the tree and less desirable species in composite products and in woodpulp, development of better approaches for designing and building with wood, and for converting wood into products (furniture), and the use of wood for energy and animal fodder.

The Cooperative Pollution Abatement Research (CPAR) program is related to both the forest utilization and production environmental forestry programs. It is concerned with improving the quality of the environment, in the areas of water and air, and is required because of pollution problems resulting from operations of the pulp and paper industry. This program provides funds for contract research which for FY 1975/76 were $1.2 million. Funding for this and future years to 1981 has been increased to $1.5 million. Administration of the program is included in the forest utilization program and the program is developed and guided by a joint government-industry committee.

Total operating costs for the forest utilization program for FY 1975/76 were $6.2 million (including $1.2 million for CPAR) which was 16% of the total CFS budget. The program required 278 MYs and is carried out in the two forest products laboratories located in Ottawa and Vancouver.

New or extended areas considered to require effort in future programs include the following:

- process and product development leading to more efficient and higher-profit use of trees brought to a mill
- enhanced utilization of secondary species, especially poplar
- properties of wood established on a national basis for development of limit state design standards for building codes
- housing design innovations to develop new ways of using wood
- utilization of forest biomass as an energy or chemical source

Compatibility with Mandate

Although the program areas discussed in the foregoing sections have been developed from the legislated mandate, their compatability with DOE objectives and purpose has been questioned in certain areas. The programs concerned with forest protection, and production and environmental forestry are oriented to provincial operational roles, and projects undertaken are very much in response to problems of resource management or environmental impact. The program on forest utilization is oriented to a segment of the industrial sector and is thus in response to a very different set of problems. However, points which apply to the CFS forest utilization activities would also be pertinent to DOE activities in other resource areas such as fisheries where a major portion (approximately 50%) of the total budget is oriented to industrial problems and is concerned with fish products.

Of equal significance, is the question whether the program as now supported or planned for in the next several years, is as broad in scope as the mandate permits. From the lists of proposed program activities, it is obvious that a shift in focus and direction is in process and the work now undertaken, and especially that proposed, has a broader scope and is concerned more with the management aspects of the forest estate rather than the study of specific tree species or insect and disease problems. This shift is a positive response to both user demands for technological assistance in the

management area and to environmental problems included in the broader scope defined by the Government Organization Act (GOA).

Based on the foregoing, *the current R&D program carried out by the CFS is compatible with the legislated mandate defined by the Government Organization Act and the Forestry Development and Research Act but the emphasis given to problems of resource management and environmental impact must be increased to respond to current and future problems but the effort required is fully compatible with the broader role defined by the Government Organization Act.*

Functions

General

As defined in Chart I, the functional elements available to the CFS in undertaking its mandate include: R&D, inventories, communications, and planning and evaluation. The Forestry Development and Research Act (FDRA) clearly states that the Minister shall "provide for the conduct of research..." and may engage in the other functions so that a definite priority rating of the different functions is thus implied. This mandate to undertake research for the development of expertise in specific areas has tended to dominate programming with CFS for many years. The GOA which now incorporates the FDRA neither includes any such restriction nor gives priority to a function such as research. This act states simply that the Minister "shall provide and encourage the institution of practices and conduct leading to the better protection and enhancement of environmental quality...". Presumably the earlier act may be interpreted in light of the operative terminology of the GOA which would thus imply that the CFS shall provide and encourage the institution of practices and conduct leading to the better protection, management and utilization of the forest resources of Canada, etc. In practice this broader interpretation of the act is being followed. The lists of additional or extended program requirements give further significance to the need for such a shift in approach.

This shift in focus is evident in all government science-based activities, especially those related to the natural resources. For many years the undertaking of research to extend knowledge or to develop and maintain expertise in a given field without reference to specific problems, provided sufficient justification for federal involvement. This has been the accepted rationale for many of the programs in mining and forestry and in large measure in agriculture and fisheries. However, *research without a specific problem orientation, or not in support of other departmental activities, can no longer be justified for mission-oriented departments and a different rationale for federal involvement must be established. R&D must be viewed as an instrument to facilitate implementation of the role not the role itself.*

CFS activities with respect to these different functions are discussed in the following sections based on information collected by questionnaire, from CFS reports and in discussion. A description of the questionnaire and the results obtained are provided in Appendix D.

R & D

R&D has been the principal function performed by the CFS for at least the past twenty-five years. Table 12, page 18, shows that the proportion of the total budgets allocated to "basic and applied" research for FYs 1974/75, 1975/76, and 1976/77 are 52, 65 and 67%, respectively, with the remainder being contracts and grants, and related scientific activities. Thus for the 1975/76 and 1976/77 fiscal years about two-thirds of the total CFS effort has been devoted to the performance of R&D. This increased proportion can be attributed largely to budget constraints. In addition, the establishment directors have indicated that the lack of personnel to undertake functions other than R&D is a major problem and could delay the initiation of many management-oriented projects.

The question whether the CFS should undertake any basic research or concentrate only on current problems has been discussed on numerous occasions. The Science Council Study,* refers to discussions on the subject in 1965 with the point stressed that "It is the optimum balance between the continuum of basic and applied research for which we should be striving...". The question was also discussed during the field trips for this study with the conclusion that the problem appears to be largely one of definition. The term "basic" is insufficient and a distinction must be made between "free" and "oriented" basic research according to Statistics Canada terminology. Free basic research is defined as being conducted solely to increase scientific knowledge whereas oriented basic research is "directed towards the definition and solution of fundamental technical and scientific problems in a general area of interest". This distinction is still unsatisfactory but as such the "free basic" should be performed only at a university but "oriented basic" could well be justified in the solution of current technical problems. It is, of course, "oriented basic" that is meant by the term "basic research" as used in this report. *The CFS should continue to undertake basic, in a reasonable balance, with applied research, but caution must be observed in identifying projects that the purpose of the work can be clearly defined in terms of a recognized problem.*

With respect to the changing emphasis in programming toward environmentally oriented projects, the level of interdirectorate R&D being performed was investigated. As noted in Table V, Appendix D, twenty-nine projects (13%) of a total of 219 in all establishments could be defined as having an explicit environmental management orientation. However, there was little consistency in this ratio among the various establishments. In order to foster an emphasis on integrated resource management problems, the CFS must minimize the stress on discipline orientation especially at the RFRCs. In this connection *the CFS has tremendous potential to initiate broad-based environmental R&D programs, utilizing the services of other EMS directorates, and must take a positive lead to utilize these opportunities not because it is a part of EMS but because, its credibility and the usefulness of its programs will depend on the adoption of a broader systems-oriented approach to forestry problems.*

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* Science Council, Special Study No. 14, p.67

Project duration was considered by the questionnaire which showed (Table II, Appendix D) that of the total number of projects in force for 1975/76 (266), 59% were of long duration, over 10 years, or open ended. The RFRCs had the highest proportion, 68%, the NFI's second, with 58% and the FPLs lowest, with 9%. Although the long-term nature of R&D related to forestry problems is fully recognized, the necessity for the predominance of long-range projects often results in a commitment of resources without the flexibility to re-allocate manpower or other resources to other activities. This situation does require that *the CFS must look more critically at all R&D projects to ensure that the packaging of individual studies into a project is done only after careful scrutiny and that the project is addressed to a specific forestry problem which can be pursued within an agreed time frame.*

Inventories and Surveys

In an earlier section, it was indicated that the CFS undertakes insect and disease surveys and inventories of forest resources. Annual surveys are made, primarily on behalf of the provinces, to provide assistance in the implementation of insect and disease control programs. Industry and the general public also have an interest in the results. Expertise required to undertake these surveys and to assess results is provided by the CFS except in Quebec and to an extent in Ontario. Demand for this function is expected to continue and likely increase, especially as old growth forests are depleted and more intensive forest management practices are implemented with emphasis given to recreational and amenity forestry. Because of the national character of the problem and the international implications, federal leadership in the activity should be maintained especially to ensure that there are uniform standards across the country and coverage is sufficiently complete. However, every effort should be made to increase the level of provincial involvement so that responsibility for the actual counts and initial interpretation of results can be taken over by more of the provinces than are currently involved.

The CFS is responsible for the National Forest Inventory and by agreement with Statistics Canada provides such data as are available on the extent, growth, productivity, and use of Canada's forest resources. These data are currently incomplete and inadequate for many management purposes or policy decisions; for the needs of industry, the general public, and advisory and planning functions of the directorate; and for meeting obligations to international agencies.

Inventories are currently carried out primarily by provincial authorities. However, the provincial data are often insufficient in details of utilization standards, sampling design and completeness of cover. Also, the data are almost completely incompatible with international data.

Because of the seriousness of the problem a national conference on forestry statistics involving the provinces, industry groups, universities and several federal departments was convened recently. Concerning activities involving the CFS, the delegates agreed on the following effort.

- A new on-going forest inventory for Canada is needed which should consider the dynamics of the forest for multiple use (consumptive and non-consumptive) and should be compatible provincially and regionally.

- The provinces should be chiefly responsible for collecting the data but a group headed by the CFS should be formed to design and set minimum standards.

- World-wide commercial intelligence (economic and biological) is needed by provincial forest managers and DITC in cooperation with the CFS, should have responsibility for developing information reports country by country.

- Specific periodic studies should be undertaken on the state of forestry, the statistical knowledge, and the art of remote sensing.

- Models should be developed of the economic supply and demand for forest products with federal-provincial cooperation and with the CFS and DITC being the lead agencies.

- CFS should prepare an analytical report on the state of Canada's forests.

The level of adequacy of the statistical data available on Canada's forests was commented on by a number of representatives of provincial governments, industry, the universities and the associations. *Because of the current inadequate state of forest statistics, the recommendations developed by the recent national conference convened to review the problem should be implemented as soon as the required activities can be identified and defined, and resources made available.*

The foregoing has dealt primarily with the role of the CFS in developing forestry statistics. Some consideration must also be given to the use made of the data developed. This will be discussed in a later section. As noted in the conclusions of the conference, CFS has been designated the focus for a number of activities of which the more interesting include the preparation of analytical reports on the state of Canadian forests. This should be prepared and published on a regular basis as the effort should provide the basic information for planning activities carried out by the directorate and also by other departments as well as the provinces and the non-government sectors. R&D programming should be oriented and responsive to such planning activities. In this regard, *the CFS should become more involved in the use of forestry statistics as a basis for planning, especially with respect to R&D programming.*

Communications

Communications for an organization such as the CFS whose major effort is the development of technological expertise is an extremely important function. Basically the function must be a two-way exercise; to identify problems and define the scope of the project required for their solution, and then to

transfer the results to the potential user. The work undertaken is of little use if the problem has been poorly defined. Also, R&D results are useful only to the extent that they are understood and can be applied somewhere to increase efficiency in forest protection, management and utilization; to increase employment; to benefit the economy; and to protect and enhance the environment. In addition to communications between the performer and potential user, information exchanges are of major importance with other performers, nationally but more significantly, internationally, to ensure that Canadian developments can gain from the technologies of other countries and thereby avoid unnecessary duplication.

Mechanisms used by the CFS for communication include the use of advisory councils, direct collaboration (the most positive form of technology transfer), acting as an advisor, publications, seminars, working groups, exhibits, conferences, and public awareness programs plus participation in international activities dealing with forestry matters.

As the R&D portion of the CFS program is problem oriented, the advisory council is one of the more effective and efficient mechanisms for communication. Such groups can represent the user to:

- identify problems;
- define (with the establishment) the extent of work required (but not the actual work program);
- review on an on-going basis projects carried out by the establishment, or in a specific subject area;
- ensure that results are in terminology understandable to the user; and
- facilitate distribution of the results among the user group.

The Science Council * in its forestry study identified terms of reference for such councils and stressed their importance. A look at the current situation is significant.

A senior advisory council, CFAC,** was formed several years ago to advise the Minister of the Environment and to make recommendations concerning national needs and the role of the directorate. Their latest report, October 1975, stressed the need for a strong focus in forestry within the federal government and greater federal leadership. It also emphasized the need for a national forest policy based on the major contribution the forest resource gives to the national economy both domestically and in terms of foreign exchange earnings.

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* Source, Science Council Special Study No. 14, p. 73
**CFAC - Canadian Forestry Advisory Council

Several of the RFRCs have active advisory councils, the most notable being with Ontario, British Columbia, Alberta and Newfoundland. With the other provinces, councils are either embryonic in form, awaiting conception, or in the case with Quebec are kept low key and on an informal basis to avoid political involvement. The vigour of these councils depends in large measure on the status of forestry in the provincial economy and hence the level of technical capability of the provincial forestry service. As these councils provide a major component of federal-provincial relations with respect to forestry, they will be discussed in greater detail in a later chapter under that heading.

The Forest Products Laboratories have a National Advisory Council with a number of Research Program Committees (RPCs) dealing with specific subject areas. This Council provides the best example of an advisory group in that it and the specific subject sub-committees identify problems, review the FPL programs and participate in identifying priorities in the projects undertaken, and in technology transfer activities. NAC and RPC members are drawn from industry, the provinces, universities and associations. Major comments made in discussions with the various sector representatives were concerned largely with the points that the councils should have greater authority and have a stronger role in determining priorities.

The National Forestry Institutes have a number of advisory councils, the principal one being the Canadian Committee on Forest Fire Control. Its major role appears to be to help in identifying problems, and provide a forum for discussion of results and thereby assisting in transferring the results to the user.

Based on the findings of this study which corrobrates earlier suggestions, *the role of the advisory councils is of major importance in communications as they ensure that the relevance to the user of the results of the R&D carried out on his behalf is maximized. The CFS should promote the establishment of councils which have a real function in identifying problems, defining shared-cost and other projects, establishing program priorities, and reviewing and transferring results to the user. To be effective, council chairmen should be from outside the CFS and only the RDG and the establishment director or their designates should be council members.*

A most effective means of communication is direct collaboration. Essentially all establishments use this mechanism. It involves the potential user in the R&D process, and provides an opportunity to get close to the client and thereby gain an appreciation of his problems. This problem was addressed in the questionnaire, Table III, Appendix D, but the results were inconclusive. However, *because of the potential benefit, increased attention should be paid to collaboration as a vehicle for technology transfer. Both provinces and industry should be considered not only as suppliers of services but as participants who will be using the technology developed and who ultimately must become self-reliant in the problem area.*

The directorate is required on a regular basis to provide advice on forestry matters. Major areas include advising: DREE with respect to regional forest resource development projects, including forest access road construction;

DITC on the metrication program and the availability of forest resources for industrial projects; DINA and DND on forest management in the territories, national parks, Indian reserves and Canadian Forces Bases; and CMHC and NRC in developing national codes and standards involving wood and wood products. The CFS is represented on the boards of the PPRIC and FERIC. In addition, the CFS including each establishment advises provincial and industrial representatives in their respective areas of interest. Over the years, the CFS has developed a recognized expertise on forestry problems which has been a significant factor in sustaining the credibility of the directorate as the primary focus in forestry within the federal government.

A measure of the number of requests for advisory service provides an indicator of the effectiveness of this form of technology transfer. Results of the study questionnaire, Table VI, Appendix D, show that during 1974/75 39% of the requests for service to the RFRCs came from the provinces and 68% of the requests to the FPLs from industry. The major sources of requests to the NFIs was the general public (49%), and federal departments (23%). The results suggest that as provinces and industry are the major users, greater effort is needed to inform them of current CFS activities. Also because of inconsistencies in the nature of the data, regular and standardized records of principal requests for advice and service should be maintained by the CFS establishments.

Publications have historically been recognized as the primary vehicle for bringing expertise developed by the CFS to the attention of those outside the directorate, and it has been largely through such publications that the recognized high level of scientific competence has been established. The major drawback is that publications in scientific journals are directed to peers of the performer not necessarily to the user. Major concern was expressed by many contacted during the study that research results could not be interpreted in terms of the requirements of the forest manager or the industrial supervisor.

In addition to publications in scientific journals, the CFS also publishes a variety of books, information reports, patents, fact sheets, brochures, folders and other printed material. These are produced either by the SDG's office, the NFIs, FPLs or the RFRCs. Many have a wide readership including professional and technical people, students at various levels, and the general public. Such publications provide an effective means of informing both professionals and the public of CFS activities.

Other vehicles for technology transfer including seminars, workshops, exhibits and conferences are gaining importance. Increasingly seminars are being sponsored on a regular basis and during 1974/75 the NFIs, PFRCs and FPLs held 66, 68 and 66 seminars, respectively, with major increases in numbers held since 1971/72 by the RFRCs and FPLs (Table VII, Appendix D). Through the auspices of COJFRC, seminars are also held whereby regional forest managers are informed of new developments of both the CFS and the Ontario Department of Natural Resources. Such seminars afford the user the opportunity to participate more effectively, in that presentations are closely oriented to the potential user and he, in turn, can question the R&D performer directly. *The use of seminars and work shops, etc., which promote participation of the R&D user should be fostered.*

Distribution of publications among journal papers and other forms were determined by questionnaire. As shown in Table VII, Appendix D for 1974/75 over 50% of all publications were journal papers.

Publications will continue to have an important place in the transfer of technology but other vehicles will, in future, have to be given greater emphasis if results of the CFS R&D program are to gain maximum application.

Public awareness programs have been instituted by the CFS headquarters and several of the RFRCs. These have taken the form of "Ecotour" maps which describe landscape types, ecological features, vegetation, wildlife and points of historical interest along sections of the Trans-Canada Highway, with the objective of eventually covering its whole length. "Walks in the Forest" have also been established at forested sites at Petawawa, Ontario and Kenanaskis, Alberta. The Petawawa "walk" attracted some 10,000 visitors during 1975. Other walks are planned. *Programs should be fostered which will increase the level of public awareness to the value of the forest resource and the problems associated with its management so as to protect and enhance the environment.*

International exchanges of scientific and technical information concerning forestry are an important component of the communication function. The CFS provides the focus for federal involvement in international activities. The directorate provides literature, seeds and trees for embassies abroad on behalf of DEA. In collaboration with CDA, it imports parasites and predators to control forest pests. For CIDA, it reviews forestry-related capital and technical assistance programs and other programs such as establishing a forestry school in Malaysia. The directorate is involved heavily with FAO in various activities throughout the world, has participated in forestry missions between Canada and China; and with DITC has participated in the exchange of forest and forest industry technology with the USSR. Technology exchanges between Canada and other major forest industry countries, particularly the US., continue on a regular basis. *As Canada is the second largest producer of woodpulp and the largest exporter of forest industry products, international exchanges of statistical and scientific technical information will continue and undoubtedly increase, the CFS should continue to provide the focus for such exchanges.*

In general the study has revealed that technology-transfer, especially respecting the transfer of usable results to the two major users, the provinces and industry, has been largely neglected until quite recently. Comment by various individuals contacted are significant and the following provides the substance of representative statements.

- The CFS may be ineffective because of inefficient communication of results in terms that are meaningful to the user.

- Forest researchers have been notoriously poor salesmen.

- Provinces and other clients do not have the resources to effect the necessary application.

- Too much reliance has been placed on technical reports and publications in scientific journals and not enough on the more informal but effective communication techniques.

- CFS does not provide any situation reports or annual national reports on the status of surplus wood supply, new developments in the forest industry or broad forest management standards.

- There is no correlation between funds allocated and results anticipated.

- The reward system is based on publication in scientific journals, not on day to day management and practical problems.

With respect to communication, a vital aspect of R&D management, it may be concluded that *a significant effort must be made to complete the "project development - user" loop and it is essential that, prior to project definition, the R&D establishment must have sufficient information on the users' technical competence and knowledge of regional, national and international market conditions with regard to the economics of implementing the results. Special attention should be given to find out how the R&D results can be effectively transferred and at what stage the potential user should become involved in the R&D process.*

Also, a detailed and regular system of monitoring technology transfer throughout the CFS is required. A consistent approach to this function will provide a record and pattern of the requests for advice and service from the various clients, of the usage and transfer mechanisms, such as publications, seminars, field trials, etc. These data will not only improve the quality of the mechanism but will enable results to reach the "right" user and contribute to future research planning.

Planning and Evaluation

The planning and evaluation function embraces two facets of the CFS program of activities, namely long range planning related to forestry to identify problems and opportunities; and R&D planning and evaluation. The CFS formerly included a forestry economics institute among the NFIs but it was disbanded in 1974. This institute undertook economic studies on various aspects of forestry in Canada. Subsequently any retained activities were taken over by the headquarters group in the SDG's office. Because of other problems including budget constraints very few of these activities could be supported on a continuing basis and the personnel was dispersed. Consequently, at the present time, the directorate is supporting no more than a very limited effort on long range planning.

This is not expected to change materially because the major focus of the Policy Development and Analysis Division of the SDG's Office for some time will be development of the National Forest Policy, responsibility for which has recently been assigned to the group.

R&D planning and evaluation is also going through major changes throughout the directorate as a result of the introduction within EMS of a Program Activity Structure (PAS) by which all projects can be categorized and ultimately given a priority rating. Several years ago, the CFS developed and was in the process of implementing an R&D evaluation technique which was oriented basically to forestry and forest-based R&D activities. When the CFS became a directorate within EMS an evaluation technique was needed with an orientation broad enough to cover all aspects of environmental management - forestry, inland waters, wildlife and lands. The desired technique has been developed and all regions have now been instructed in its use and the plan is to have it in full use for the current program forecast (1977-78) exercise. The PAS has been well described elsewhere so no further description is needed here. It must be noted, however, that the PAS as presently defined can be used to classify projects but the classification is not sufficiently precise to be used as yet for priority setting. It is understood that this aspect of the PAS is now being modified. As initial application of the technique is just now getting underway, comment concerning the level of effectiveness which can be expected from its use cannot be made at this time.

Other than the introduction of the PAS technique, only 3 of the 13 establishments identified a specific activity dealing with long range planning or appraisal.

Even the effort that was identified was confined to the activities of annual program review and forecasts for budget purposes. Generally, program review and evaluation are the responsibility of the establishment's management committee, some using formal criteria by which to judge the merits of each new and on-going project, others base the evaluation on the perception of practical need. Consequently, the review exercise varies from region to region with no standard format for project initiation, review, appraisal or priorization.

The current planning and evaluation function of the CFS must be considered to be almost completely inadequate for the future program requirements identified by representatives of the CFS and of all user groups. The developing PAS has potential as a technique for program and budgetary control but the major lack in the directorate's activities is long range planning. At the national level, only such an effort can effectively provide an identification of future problems and opportunities concerning the multiple use of the forests of Canada with full regard for the environment. Regionally, long range planning in coordination with the national effort should project in a systematic manner anticipated needs, problems and subsequent demands to be imposed on the regional forestry system. Thus, future R&D requirements and the establishments' capabilities for undertaking the work can be identified in response to the planning activities.

Relevance and Impact of Results

In order to assess effectively the relevance of the work being done by the CFS and the impact of the results obtained on the forest managers and other users, a detailed evaluation, project by project, would be necessary. This, of course, is needed and should be undertaken as an internal directorate activity. Such an evaluation is outside the scope of the current study primarily because of time limitation but a judgement on the overall impact of the CFS program has been attempted based on user comment. An interesting factor in this regard is that user observations are more concerned with the functions of the CFS rather than the subject content of the program. As noted in a foregoing section, there have been many references made by those contacted during the study to the inadequacies of the CFS in getting results transferred to the user.

In the past, CFS expertise has been relied upon by the provinces for pest and fire control as well as for many aspects of forest management. However, it is only within the last few years that most of the provinces have begun to take an active interest and to play a major role in the technological management of their own forests. As an example, New Brunswick has been spraying its forests for over 25 years but the Ministry concerned has provided very little control over the spraying operation until the current year. Operation of the Federal-N.B. funded spraying program has been based primarily on advice provided by the CFS. The major forest-oriented provinces, Ontario, British Columbia and Quebec, have had technical programs of their own and, hence, have been able to make more effective use of the expertise provided by the CFS. In general, provinces are becoming more conscious of good management and are now identifying problems requiring R&D which will provide the basis for management policies. Basically the impact on the user will depend in large measure on the level of his sophistication in utilizing technology to assist in managing the forest resource.

With industry, as noted earlier, the segment to which the CFS R&D output is directed includes primarily the sawmills, solid wood product producers, and the furniture producers. This segment is, of course, less technically oriented than the pulp and paper industry, but needs technical assistance to a greater degree. Technology transfer is more difficult and because of the lack of understanding of the results the impact tends to be less.

It would appear that the relevance and impact of results from CFS R&D on the user has been dependent on his capability to understand and use the data developed. To increase the impact the CFS must give greater emphasis to technology transfer to ensure that the results are available in a form that is understood by the user. This form will vary depending on the client and the subject. The most effective application comes from work planned and carried out in active cooperation with the user.

Future Program and Federal Role

Future Program Requirements

New and extended areas of activity which are considered to require effort in the future by the CFS have been identified in an earlier section. These lists, associated with the three major current program areas, clearly indicate an increasing shift in emphasis for future CFS programs toward management and economic studies. Comments from representatives of all sectors contacted during the study substantiated the necessity for this trend and stressed the point that the CFS should be providing leadership in defining trends and in developing and making available the technology required in future to provide effective management of the forests with full regard for the environment on a national basis.

The required shift in emphasis does not require an actual shift in program as the three primary areas, protection, management and utilization, cover the extended areas of effort, although increasingly the first two will become merged into what might be termed forestry management. The broader term would, of course, cover existing protection and management activities but increasingly in the context of environmental protection and enhancement. As noted before, it must be stressed that this broader role is not because of the association of CFS with EMS but it is a real program evolution which has been developing for a number of years. It does imply, however, that there is nothing incompatible with the CFS being a component of EMS.

Similarly, utilization activities will become more oriented to environmental considerations, whereby the forest use will have to be optimized to conserve a finite resource in a continually increasing demand situation. Also major efforts will be required to maximize the utilization of the trees cut to ensure that the highest value added can be realized and all forest biomass is used as a source of chemicals or energy.

Federal Role

Federal involvement in forestry embraces the following major elements:

- international relations and implications
- national economic impact
- interprovincial concerns
- equalization with respect to less advantaged provinces
- critical supply of resource

International relations and implications involve both technological and economic factors in that Canada is the second largest producer of woodpulp and the largest exporter of forest products (solid wood products and pulp and paper) in the world. As such, forest products are Canada's single largest net export earner. On a national scale employment is of the order of 200,000 and the value added is in excess of $3 billion annually.

Forestry is very much a federal-provincial concern and the federal government must evolve a joint, cooperative approach. Although regional manifestations vary greatly, there is a basic similarity to most problems. Protection, natural regeneration, reforestation, growth and yield, harvesting, multiple use of forest land, and ecological effects of land use practices are common problems in forest management. Because of this situation, establishment of research facilities by each province would be both economically and technically inefficient; the more effective approach would be to have the common aspects of the problem handled nationally with the development of application techniques and their regional variations handled to an increasing degree by the provinces. Required statistical data must be developed jointly with the provinces. In wood processing, there are many small companies in all regions of the country with similar problems that are unable to support R&D on their own and there are certain national problems that even the large companies cannot be expected to undertake. Similar problems occur in two or more provinces and can be handled best on a regional or national basis.

Regional disparities exist among the provinces and the federal government has a number of legislated programs to overcome this problem through equalization payments and regional development programs. In keeping with this approach it is appropriate for the federal government to continue to provide greater assistance to such provinces with respect to matters affecting forestry.

With respect to the fifth element cited above, the forest resource is forecast to become a critical supply problem about the turn of the century.

In addition to the foregoing factors, industry tends to establish a consensus for negotiating with the federal government, and similarly, provinces act in unison in advancing proposals relating to such topics as forestry management and resource problems or policies. It is, thus, necessary for the federal government to have a focus which can receive such submissions and, in turn, present its policies and programs to the provinces and the industrial sector. The CFS has successfully provided this focus in the past and although the role has been eroded somewhat in recent years, there is no effective alternative within the federal government.

As there is a large number of federal departments and agencies which have a direct or indirect interest in activities and technologies related to forestry, a focus is also required to coordinate these interests. The CFS is the logical candidate because, again, there is no alternative. Also, forestry related R&D in the provinces, universities and certain segments of industry is a minor effort, and a strong coordination of these fragmented activities is required to optimize their usefulness and impact. The CFS would be the most effective agent for the purpose.

Based on the foregoing, *the rationale for federal involvement in forestry has a number of major elements in common with that for other natural resources, and although the provinces have the operational management responsibility for such resources, there is an identifiable federal role. For forestry, this role is related to management planning and utilization. The CFS should continue to provide the federal, and hence national focus, in forestry both internal to the government and with all other sectors.*

Functional Priorities

As discussed in preceding sections, there is not expected to be a major shift in subject content but the CFS will have to alter the functions employed in order to respond effectively to future problems facing forestry in Canada. Greater emphasis will be required in technology transfer; but of greater significance, the major shift in effort in the future will be to increase the emphasis on long range planning. In a number of the new or extended areas of activity required in the future, development of technology is not the dominant problem; organizing data and developing plans to utilize existing technology is. In others, the technological gaps will have to be identified, hence planning activities will be needed to define what R&D effort is required.

At the present time, R&D is the primary function and as shown graphically in Chart I, page 2, functions like inventories, communications, and planning and evaluation tend to be secondary in importance. *In future, the primary role of the CFS will become increasingly one of planning and evaluation for which inventories and R&D will be the major inputs and communications both as input and output. In this way the R&D will relate to problems and opportunities identified in the planning and evaluation function and will thus be undertaken in support of a federal role.*

The listing of functions shown in Chart I, in order of priority should thus become:

Current	Proposed
R & D	Planning
Inventory	Evaluation
Communication	Inventory
Planning	R & D
Evaluation	Communication

Based on the foregoing, *the CFS functions required to meet forecast trends in program emphasis may be defined as follows:*

- *Undertake planning and evaluation studies on a regular basis to define the current national state of the resource and to identify problem areas and opportunities; such activities being carried out with the cooperation of other federal departments, the provinces and industry, and including their input.*

- *Provide the focus for carrying out inventories and surveys relating to all forestry activities by establishing standards and methodologies for their implementation by the provinces (ultimately in the case of the insect and disease surveys).*

- Undertake R&D appropriate to the federal government relating to the problems and opportunities identified by the planning and evaluation studies.

- Ensure effective communication with the user through the increasing use of advisory groups, direct collaboration, seminars, workshops, etc., for good technology transfer.

DECISION MAKING AND THE CFS STRUCTURE

Matrix Organization

CFS as a Federal Focus

In the foregoing chapter, the changing emphasis in the program and primarily the functions of the CFS has been discussed. The points have been made that continued federal involvement in forestry is justified and that the focus for this involvement should be the CFS. Furthermore, this focus should embrace activities of the many departments and agencies which have an interest in forestry and should thus function internally as well as externally with all sectors outside the federal government. In addition to a focus, the CFS should strive to provide leadership in the field. Operation of the CFS was discussed with a number of provincial and industry representatives. The consensus reached was that *in order to achieve a federal focus in forestry, the approach required would be for the CFS to function as a unit, with sufficient stature to provide or develop a federal position and in all contacts with groups outside the government to present itself as a single unit having a strong federal voice on forestry matters.*

In order to implement the role of the CFS as the federal focus on forestry, two factors of a public relations type should be considered. Namely, the name Canadian Forestry Service should be retained for the directorate and used exclusively outside government circles; use within government should also be encouraged. Also, all major publications, books, journal articles, brochures, patents, etc., should be issued as CFS documents and prepared to common standards established by the SDG's Office. It may also be desirable, and necessary, to have final editing and publication handled by headquarters. Only the newsletters or equivalent should be issued under an establishment's masthead.

EMS Coordination

EMS as a major component of DOE, is developing an increasing number of programs which require inputs from the various directorates in that their scope cuts across the individual mandates and areas of interest. Examples include baseline studies to assess man's impact on the environment in specific areas, water basin studies and land inventories. For example, a

series of baseline studies is planned in Ontario to cover the province as three major regions: the north, centre and south. The intention is that a directorate will become the lead agency for each regional study, CWS would be the proposed lead for the study of the northern region where migratory birds could be used as an indicator, CFS would be the lead in the central region where impact on the forest areas would be the primary consideration, IWD would provide the lead in the south where shoreline problems along the Great Lakes would be the major factors. Other regions are planning similar baseline studies. In addition, the Quebec and Ontario regions are currently developing plans for a major water basin study along the St. Lawrence and Lower Great Lakes.

Involvement of the CFS in such studies is very much in line with the broader role the directorate must take in responding to current and future problems affecting forestry and the impact of management, including protection and utilization practices on the environment. As noted, these studies will involve CFS or another directorate as the lead agency but each study will require inputs from all directorates within EMS and in certain cases from groups in other areas of DOE or from other departments and agencies.

Interdirectorate activities involving the CFS must become identified in the programs of the respective establishment(s) and as such must be coordinated with other projects. In this way both the establishment(s) concerned and the SDG's Office will have to become involved, one, as the performer, the other to coordinate the activity with the overall directorate's program.

CFS Manpower and Contracts

The shift in function to planning with the emphasis on projects relating to environmental management problems, will require a changing approach involving personnel having a different orientation. A certain amount of "retreading" will be necessary but may not always be effective or even possible. *The question whether the program shifts and new functional emphasis can be undertaken within the current manpower allotment cannot be determined at this stage. Current program activities will have to be assessed, project by project, to determine their relevance and impact to the newly identified national, provincial and industrial problem areas. Only after that exercise is complete can an estimate be made of the detailed future program and the total manpower requirements and categories for its implementation.*

Because of current budget constraints and the indication that federal expenditures on forestry are comparable with those on other natural resources and of the same order at least as those of Sweden and the U.S., a major increase in budget would be difficult to justify and the future program may have to be confined to current manpower resources. Every effort should be made to retain existing resource levels until the required assessment exercise can be completed.

The change in emphasis in the functions performed by the CFS will affect each establishment and the SDG's Office. In order to satisfy the staffing requirements, for this shift in focus, personnel may have to be moved, others re-oriented and re-classified. This type of problem was discussed to a limited degree with establishment directors. The consensus was that periodic moves between the institutes and centres should be fostered in any case, and that coordinators in the SDG's Office should be rotated on a periodic basis. Under the circumstances, the required changes should not be overly difficult to implement.

The extent to which contracts have been used by the CFS was discussed with all establishments. Budget statistics, Table 11, page 17, shows the aggregate of grants and contracts, however the data include the highly variable earlier grants to the provinces and more recently the grants in support of FERIC and the universities so have little significance. Most of the establishments use contracts and the CPAR program mentioned earlier is based on contract funds. From discussions it was evident that all establishments have been contracting out to the extent possible but that the level has been decreasing in recent years. Contract allowances represent a major proportion of the discretionary funds available to the establishments and under current budget constraints have been used increasingly to augment other budget categories.

In order to make better use of contracts in response to the Make or Buy policy, it will be necessary in assessing current activities, as well as the newly identified program areas, to identify those projects which could be undertaken effectively by industry-oriented Canadian research organizations. A number of projects on forest utilization and some on forest protection and management would undoubtedly be in this category. Also it should be taken into consideration that new funds can generally be obtained more easily for contract work when additional manpower is not required.

Role of Establishments

SDG's Office

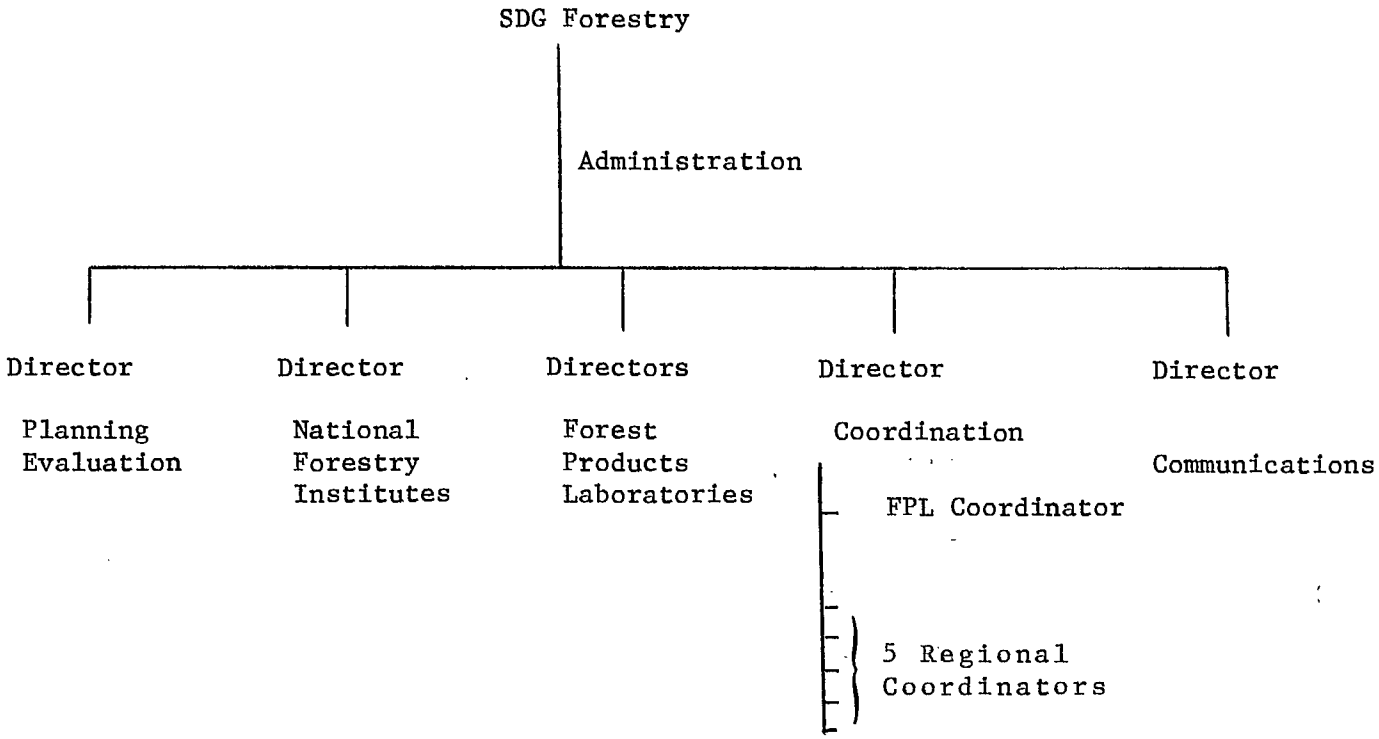
The SDG, being the senior officer of the directorate, and his office, provide the focus and direction for all operations of the directorate in the responsibility-matrix within EMS. The role of the SDG's Office involves the following principal areas: program development, evaluation and co-ordination for the whole directorate; the functions of long range planning and development of evaluation mechanisms; and coordination of technology transfer activities. In addition to these major functions, the office must act as general advisor to the ADM, EMS on forestry matters; provide the focus for responses to ministerial inquiries; provide national and international representation on behalf of the federal government; and provide the liaison with other federal departments and agencies for the directorate.

Discussions with the RDGs, establishment directors and program managers have given the impression that the role and impact of the SDG's Office has definitely declined since EMS regionalization. As shown in Chart 3, page 16 , the Office currently includes 5 program directors covering forest protection; management and environmental forestry; forest utilization; policy, planning and evaluation; and forest relations and technology transfer. The current impact of these coordinators on regional programs has been described as being minimal. One explanation is that the coordinator role has been defined as being that of a "specialist" whereas, in reality, the role requires more of a "generalist". Because of this definition of role, incumbents have usually been specialists with the result that as an insufficient number could be assigned to this effort to cover all disciplines (probably 20 would be required), the overall impact of the positions has suffered.

As defined in earlier sections, the CFS program is undergoing a major transition and a further shift in emphasis, especially with regard to functions, to satisfy the new requirements will have to be made if an effective response to the major problems facing forestry is to be achieved. *The SDG's Office must provide the focus and leadership for this new approach.*

Line and functional reporting for CFS activities and personnel, Charts 2 and 3, pages 15 and 16 , show that budget and line responsibilities for the RFRCs rest with the RDGs, and the SDG's Office is involved in program forecasts and budget estimates largely by request. The same responsibilities for the NFIs and the FPLs now rest with the SDG, Forestry. Discussions with the RFRC directors and their program managers have indicated that there is growing concern over the decreasing role of the SDG's Office, and that CFS identification has decreased markedly over the past several years. A number of personnel seriously questioned the future role and usefulness of the Office. As such a degradation of the CFS identification is not the intention of senior DOE management the existing situation will require some modification. Primarily, as will be discussed in the following section, *programs of the RFRCs must be effectively coordinated and to ensure this approach, overall development and assessment of programs at the project level should be coordinated by the SDG in concert with the RDG. For an effective responsibility-matrix, program forecasts and budget estimates must be developed by the RFRCs in conjunction with both the RDG and the SDG's Office and the forecasts and estimates must have the recommendation of the SDG before approval by the ADM. Similarly, any changes in forecasts or estimates must have the recommendation of the SDG. For the NFIs and the FPLs, where both line and functional responsibilities lie with the SDG, the matrix approach is not required. The ADM should ensure that the appropriate balance between the EMS region and the CFS headquarters exists.*

A possible structure for the SDG's Office which would implement this approach would be the following.



The approach required in organizing the SDG's Office is to develop a group which will bring the CFS together as an identifiable, single unit which would provide the focus and leadership for the whole directorate. In this way, operations of the CFS could be directed, or coordinated, to develop a focus for all forestry matters; and at the same time, promote an increasing involvement by the user, the provinces and industry, in the performance of R&D activities; and to increase the number and scope of projects undertaken which are oriented to interdirectorate objectives concerned with environmental protection and enhancement.

The suggested organization is considered to provide the necessary focus for the SDG's Office in that all activities of the CFS report either directly or via program coordination to the SDG, Forestry. The director, planning and evaluation, would be responsible for long range economic studies with the purpose of defining future opportunities and problems in forestry. This group would play a major role in identifying R&D requirements and in increasing the relevance of the R&D program of the directorate. An improved range of statistics over that now available, would be a necessary input for its effective operation but as noted earlier plans are underway to develop the required forest statistics on a regular basis. The group would be a successor to the former economics institute.

The director for communications would be expected to provide national and international liaison but, more importantly, would coordinate all communications activities of the directorate to ensure that results developed from R&D programs are understandable and available to the user.

Roles of the NFIs, RFRCs and FPLs in the organization are discussed in more detail in the following sections.

National Forestry Institutes

The National Forestry Institutes (NFIs) include 5 establishments (Charts 2 and 3, pages 15 and 16). These are listed below, Table 13, with manyear and budget data, based on FY 1975/76 estimates.

Table 13: STATISTICS FOR NATIONAL FORESTRY INSTITUTES

Institute		MYs	1975-76 Budget $'000,000
Chemical Control Research (Ottawa)	(CCRI)	47	1.1
Insect Pathology Research (Sault Ste. Marie)	(IPRI)		1.3
Forest Management (Ottawa)	(FMI)		1.8
Forest Fire Research (Ottawa)	(FFRI)		0.7
Petawawa Forest Experiment Station (Petawawa)	(PFES)		2.1

These institutes report to the Director, National Forestry Institutes who has, temporarily, been reporting to the SDG, Forestry. In general, the institutes undertake R&D on nationally oriented problems, concerned with two or more provinces or regions, whereas the regional centres confine their activities to R&D on problems concerned with a province or region. Also, the institutes concentrate their efforts on a specific program area. A brief description of each institute and its activities follows.

The CCRI has as its objective the control of forest pests and undertakes R&D in such areas as insect toxicology, control methods and ecological impact. It has major interfaces with the National Aviation Establishment of NRC (aircraft usage), with NHW, and the many chemical suppliers. With respect to ecological impact, monitoring and follow-up activities, the institute works closely with CWS, Parks Canada, IWD and EPS. It is the principal advisor to the provinces on formulations and techniques for forest spraying activities, for example, New Brunswick and the spruce budworm spray program.

The IPRI was established during the 1930's as the Forest Biology Laboratory and undertakes the development of pathogens which might be used as alternatives to chemicals in the control of forest insect pests. It is considered to be the most successful institute of its kind in the world. Currently the major project area is concerned with the spruce budworm. This institute works closely with the CCRI and with the RFRCs.

The FMI is oriented to forest management studies from a statistical base. Major project areas include forest productivity, mechanization and remote sensing, including both aerial photogrammetic and ERTS imager. As statistics relating to forestry are the primary input to the institute's studies, a major recent activity has been the national conference on forest statistics mentioned earlier.

The FFRI is also oriented to studies from a statistical base and major areas of activity include forest meteorology, fire management systems, remote sensing and forest fire control systems. Some experimental and field work is also carried out, largely at the PFES. The institute works closely with the Canadian Committee for Forest Fire Control, which embraces all provinces plus many industrial organizations, and provides its secretariat functions. It also works closely with the RFRCs in British Columbia, Alberta and Ontario which have fire research personnel on staff and also with the PFES which undertakes experimental work on fire.

The PFES was the original national institute, dating to 1917, and provides the CFS with the only large area of forest under its own control. The station is adjacent to the Petawawa Canadian Forces Base. The land is still controlled by DND although it has been under continuous use by the CFS since its inception as an experiment station. Consequently, it has the oldest continuous forest experiment plots in the country. The station provides services and accommodation for other institutes, or establishments, that wish to undertake field studies under well controlled conditions. It undertakes work at the suggestion of other establishments but primarily works on its own program which includes provenance work, fire danger rating studies (the senior fire researcher for the directorate who works closely with the FFRI is located at the station), and tree improvement studies. It also runs one of two "walks in the forest" programs established by the CFS to enhance public awareness.

The NFIs have developed gradually since the PFES was opened in 1917 and new units have been introduced as the need was identified. At this stage, levels of competence have been established in many major areas so that the CFS has within the institutes expertise in at least 25 specific areas and disciplines dealing with forestry. This expertise is recognized both nationally and in world circles and should continue to evolve in response to the changing, and growing, problems facing forestry in Canada today and expected in the future. Because the institutes are operated on a national basis and undertake problems which have a broader scope than that of a single region, they provide the major source of expertise on a national basis. This

role should be continued because *within the institutes lies the technological base for the CFS and for this reason they should be retained as exclusive forestry institutes. Only this way can a strong forestry focus, needed to respond to the problems facing Canadian forestry and to provide an effective interface between the federal government and the provinces and industry, be maintained.*

The role of the institutes, as noted, is to deal with nationally oriented problems. However, because of the stress on problem orientation, they have tended in recent years to increase their efforts to get closer to the user and thereby become more responsive to immediate problems. In this respect, it is interesting to note that of the total number of projects supported, the RFRCs have more long term projects (68%) than the NFIs (58%) (Table III, Appendix D). It can be stated that for most forestry problems, the national aspect relates primarily to the basic concept but the application of results developed for their solution can be highly variable because of regional differences in terrain, species mix, climate, etc. Because of this factor, the role of the institutes should be directed to the more basic, longer range aspects of a problem, which would have national implications, whereas the RFRCs should take over the required applied research to develop the technology for regional application. Close cooperation between the NFIs and the RFRCs must continue. In line with the foregoing, *the major role of the NFIs should be the performance of longer range research for the CFS and to undertake this research on problems to the extent of the national interest, and then turn the projects over to the respective RFRCs for further applied research and development as required for application of the results in the region. In so doing, the NFIs would become the principal scientific advisor and the focus of expertise within the CFS.*

Projects now in progress at the institutes have been initiated as a result of requests from provinces directly, from national advisory councils, from the RFRCs or from within the institutes. No formalized procedure exists. Similarly, the transfer of results to the user is largely on an ad hoc basis. Designation of the "client" of the institutes is also very much an open question but the RFRCs are most frequently identified in this role. Despite this informality, or possibly because of it, the institutes have established a very enviable reputation in the field. As the most logical client is the RFRC, which must be the principal contact with the provinces, a more effective liaison between the two is required.

Although certain of the institutes participate in various specific advisory councils, there is no general council to coordinate their work. As noted above, the RFRCs are identified as the principal client and closer liaison with them would be desirable. Based on discussions with the institutes, the RFRCs and others in the CFS, it would appear that *in order to strengthen the role of the NFIs and to improve coordination among the CFS establishments, an advisory body for the institutes comprised of the directors of the RFRC s plus representation from the SDG's Office (long range planning) and from the*

universities and possibly the provinces should be established. This body would ensure effective involvement of those concerned with the identification of problems and the transfer of results at the appropriate time to the regions.

The N F Is are currently organized as 5 separate units, each with a director but reporting to a director of national forestry institutes. Until April 1976, he reported to the RDG, Quebec, but since that date has reported directly to the SDG, F orestry. As stressed above, *the institutes should provide the technological focus for the directorate and should continue to be identified as a component of the CFS; consequently, the director of national institutes should report to the SDG, Forestry.*

During the late 1960's plans were developed to a stage at which implementation was possible, to combine the institutes in a single organization to be located in Hull. The plan has the advantage that all institute activity would be closely integrated but was shelved because budget constraints and the government's emphasis on de-centralizing federal operations resulted in a lessening of interest in the plan. At this stage, it is very unlikely that a single institute in the Ottawa-Hull region can be realized.

The extent to which the institutes can be integrated physically depend on a number of factors. Geographically, they are now located in Sault Ste. Marie (IPRI), Petawawa (P F ES) and various locations in Ottawa (CCRI, F F RI, FMI). TheIPRI and CCRI have common objectives and purpose, must work closely together and, consequently, could be integrated as the national forestry institute - pest control. Location would require some study, but Sault Ste. Marie offers advantages in that the IPRI is already there and space should be available at the GL F RC for a number of years. Alternatives include a new location or Ottawa at the CCRI building but new facilities would be required. Also the latter would be counter to declared policy concerning de-centralization. Unlike the foregoing institutes, the F MI and FF RI have differing objectives but utilize a similar methodology, both require a statistical base and are concerned predominantly with the management aspect of forest production and fire protection. The common methodology should permit integration of the two as the national forestry institute - management practices. As special facilities are not required, continued location in the Ottawa area would be justified or the unit could be transferred elsewhere.

The need and desirability to maintain the P F ES as an institute has been questioned on a number of occasions. At the present time, it is underused but is the only institute with the capabilities and facilities to undertake long term provenance and tree improvement studies and basic experimental studies on fire protection. The pest control institutes regularly require a suitable location for field experimentation, both F MI and FF RI carry out some experimental work, and the E F PL operates an experimental sawmill on the station. As noted, the station has a number of long term forest experiments which will continue to develop data for many years. More effective use of the station is not made at present, primarily because of its location and the approach held by some that its personnel should live

on site. If the CCRI, IPRI, FMI, and FFRI are integrated into two institutes, oriented respectively to pest control and management procedures, the station should continue, as the national forestry institute - Petawawa experiment station, to carry out its own experimental program and provide the site for field work required by the other institutes. Special field work for the RFRCs might also be undertaken as appropriate. As a result of this study, the favoured approach is that the station should be brought back into more complete service because the alternative of arranging for field work elsewhere would be difficult and the potential value of the continuing studies would represent a major loss to the CFS. As the station property is still nominally under DND jurisdiction, arrangements should be made to have ownership of the station transferred to the CFS.

Because of common objectives of the two institutes involved in pest control, the CCRI and IPRI should be integrated at one location. Also, because of the common methodology utilized in dealing with problems undertaken by the FMI and FFRI, these institutes should be combined. The PFES should be used more effectively than at present to undertake long range experimental work and to provide a location for field work required by the other institutes, and the RFRCs as appropriate. Arrangements should be made to have ownership of the PFES property transferred from DND to the CFS.

Regional Forestry Research Centres

Operations of EMS are divided into 5 regions across Canada. The CFS operates RFRCs in each of these regions with 2 in the Atlantic Region (Charts 2 and 3, pages 15 and 16). The centres are listed as follows (Table 14) with manpower and budget data based on 1975/76 estimates.

Table 14: STATISTICS FOR REGIONAL FORESTRY RESEARCH CENTRES

Centre		MYs	1975-76 Budget $'000,000
Pacific Forestry Research (Victoria)	(PFRC)	185	3.9
Northern Forestry Research (Edmonton)	(NFRC)	147	3.2
Great Lakes Forestry Research (Sault Ste. Marie)	(GLFRC)	154	3.4
Laurentian Forestry Research (Quebec)	(LFRC)	122	2.7
Maritime Forestry Research (Fredericton)	(MFRC)	170	3.4
Newfoundland Forestry Research (St. John's)	(NFRC)	70	1.4

As shown in the above-mentioned charts, these centres report to the respective RDG of the EMS region so that line and budget responsibility for the centres' activities are on an EMS basis; program coordination is maintained with the SDG, Forestry through the program directors in his office. The centres are described briefly in the following paragraphs.

The PFRC undertakes R&D in areas including insect and tree diseases, regeneration, tree improvement, forest genetics, firecontrol, watershed studies etc., and carries out a limited number of planning and economic studies. The centre works closely with the province of British Columbia which has its own R&D program oriented strongly to tree improvement, specifically with Douglas fir and spruce. Because of this effort, the PFRC's activities in tree improvement are concerned with other species, mainly western hemlock. One interdirectorate study is underway. There is only a minor interface with industry because responsibility for forest management and reforestation is retained by the province, not given to industry with cutting rights. In addition to the B.C. government, the centre also has the Yukon territorial government as a client. The B.C. coastal forest is unique in Canada whereas the interior and Yukon forests have features and problems common to the rest of Canada's boreal forest. The province has established a B.C. Forest Research Board, the basic format of which was developed from an earlier advisory council, to review and advise on all R&D activities related to forestry in the province, including the two governments, industry and the University of B.C. All sectors are represented on the board. Its organization is three-tiered with the Board, a Working Group and Technical Advisory Committees. Although formed more than a year ago, it has not yet held a meeting (February, 1976). The function of the Board is to receive proposals for new work, from the Working Group or any other source, evaluate them along with ongoing work and develop priorities for R&D programs to be carried out by all sectors in the province.

The NFRC, Edmonton undertakes R&D on problems arising in the three prairie provinces and the Northwest Territories. The program covers such areas as fire control, air pollutants, growth and yield, regeneration (highest priority), tree experiments, hydrology, etc. The centre maintains offices in Prince Albert and Winnipeg to improve liaison with clients, holds a number of seminars with the forest managers (30 in 1974-75) and operates a public awareness program. Alberta has established an Alberta Forestry Advisory Council to coordinate R&D activities in the province. This group is the advisory group for the NFRC. A number of shared cost projects with the province are supported. With Saskatchewan and Manitoba, advisory committees have been formed but are not active largely because of the lack of interest by the provinces. The centre works with Parks Canada as an advisor with respect to the National Parks, and to a limited extent with industry because Alberta does require that reforestation is carried out by industry to the province's specifications.

The GLFRC works very closely with the province of Ontario and major program activities include urban forestry, regeneration of hardwoods in southern Ontario, Dutch elm disease, effect of industrial pollutants, impact

of forestry practices, baseline studies of the Hudson Bay Lowlands, etc. The province of Ontario took back responsibility for forest management from industrial lease-holders in the early 1960's, enhanced its R&D capability, and with the CFS established an advisory committee, the Canada-Ontario Joint Forestry Research Committee. This committee includes representation of both governments, but is chaired by Ontario, reviews all proposals for new R&D work as well as ongoing R&D activities of both the GLFRC and the provinces, and makes recommendations concerning priorities and future programs for each group. In addition, the COJFRC briefs industry on the activities of both groups, and organizes and holds regular seminars and workshops with the regional forest managers of the province. About 80% of the program at the GLFRC is directed by COJFRC and, accordingly, the centre has very little contact with industry; except in one case involving privately owned forest land. The centre acts as an advisor to DND with respect to the Canadian Forces Base at Camp Borden.

The LFRC works closely with the Quebec government which has been establishing an R&D capability in forestry over the past several years. Program areas of activity include forest diseases, insect control, especially the spruce budworm and in the resources area, is undertaking a major study on private wood lots which comprise a large proportion of the provinces forested land. Projects are oriented to three major zones of the province, the inhabited Montreal - Quebec corridor, the central forest industry zone and the northern fragile zone. The centre is directing its program to problem orientation but has experienced difficulties because of the large number of specialists, and too few generalists on staff. The clients include both the province and industry because of the larger proportion of private lands than in the western provinces. There are no formal advisory councils because the province considers they would become too politically oriented. There are several coordinating committees dealing with specific subject areas and these appear to be effective, based on comment of both the province and the centre. A public awareness program is being developed and to enhance communication, all projects are classified as to research, development and technology transfer.

The MFRC undertakes projects related to problems encountered in the three maritime provinces. The current program includes: work on the spruce budworm, silviculture, mensuration, tree improvement and nutrition, forest growth modelling, intensive management, etc. Only Nova Scotia carries out a small amount of work on forest capability so the centre is the principal source of technology for these provinces. New Brunswick has recently established an advisory council to coordinate the activities of the MFRC with the problems facing that province in forestry. However, after two meetings and a change in the deputy minister of the Ministry of Natural Resources, further meetings have been deferred for an indefinite period. Nova Scotia and Prince Edward Island have no advisory committees. A major problem in the maritimes is that a large portion of the forest lands is privately owned and, thus, not under provincial government jurisdiction. Also, difficulty has been encountered in getting the provinces to identify problem areas.

The NFRC works closely with the Newfoundland government and currently undertakes work on major insect problems, including impact studies, forest improvement and regeneration, environmental studies, urban forestry, remote sensing, etc. The centre provides the technical backup for the provincial forest managers. An active advisory committee exists which meets twice yearly to define the centre's programs for the year and then to review results and proposals for new activities. Increasing emphasis is being given to liaison with the province, improving technology transfer and public awareness.

As indicated in an earlier section, each centre is responsible for the forest insect and disease surveys in their respective region and is also involved with the collection of forest inventory data from the provinces. Discussions indicated that essentially all R&D carried out by the RFRCs is heavily problem oriented except in the situation noted. A frequent comment in this regard was that the centre could not respond to all problems identified by the province. Projects are reviewed annually or biannually to assess results and continuing relevance. Evaluation techniques vary appreciably from centre to centre so would have relatively little merit for priority setting among the different centres. Efforts generally are being increased to improve communications with the provinces and the public with particular emphasis on getting the results to the user. At this stage, most centres have a unit designated with this responsibility. Additional effort is still required.

Interdirectorate projects were discussed but are still very much in the planning stage. Interestablishment projects exist but are not common partly because regionalization on an EMS, rather than a CFS, basis has tended to re-direct lines of communication so that the interface between adjacent centres may be decreasing. As indicated by lists of projects carried out, a number of centres are doing work in similar areas. The program coordinators in the SDG's Office have a continuing overview of these activities to ensure there is no unnecessary duplication but more direct coordination on a project basis is required to optimize results. A major example is the work on the spruce budworm. This is a major problem in Eastern Canada and studies are carried out by the CCRI, IPRI, and the GLFRC, LFRC, MFRC and NFRC. Projects and results are reviewed annually by an inter-establishment committee but there is no overall direction on a CFS basis.

The possibility of coordinating more closely those activities at the various establishments which deal with a specific problem should be pursued and where appropriate a project co-ordinator or leader should be identified to ensure that a common focus is maintained.

In the foregoing section, the proposed role of the NFIs was described as being to undertake research on problems have a national focus and to carry the work forward to a stage at which the results could be taken over by the RFRCs for any further research needed to adapt the technology to its region. The centre's role would, thus, be the additonal R&D, undertaken in coordination with the province, to carry the project to a stage at which the results could, in turn, be transferred to the province for further development or direct application. The point at which these transfers should be made would, of course, vary for each project. The transfer from the NFIs to the centres would occur generally after the initial research phase when factors associated

with site, terrain, climate, etc., would have an impact on subsequent studies. The transfer from the centres to the provinces would be based on a different rationale and would depend largely on the capability of the province to undertake the regional development work and testing prior to application. Efforts should be encouraged to enhance the level of technological capability of the province as this would facilitate the transfer mechanism. Thus, *for major projects having annational focus, the NFIs should concentrate on the general aspects of the problem which may or may not involve basic research, whereas the centres should undertake the applied research necessary for transfer of the results to the province for application. For problems having only a regional concern, the full range of R&D activities, until the results could be turned over to the province, would be the responsibility of the centre.*

Effective interfaces will be essential between the RFRCs and the NFIs on one hand, and the province on the other. As proposed earlier, the directors of the RFRCs plus a representative from the SDG's Office should form the advisory body *for the NFIs. This body should have the role of keeping the institutes informed of problem areas, identified by the regions to require R&D effort on a national basis, assessing all proposals (originating from any source) for work to be carried out, and reviewing results to ascertain their merit and at which stage projects should be turned over to a centre for further work with a regional focus.*

Existing advisory groups with the provinces for the RFRCs vary, and development of a more or less common type of forum for communication with each province, even Prince Edward Island, is essential if the work carried out is to have relevance. *The role of the advisory body for the RFRCs would be to identify problems facing the regions; segregate them into those having national significance and, thus, best handled by the NFIs in the initial stage, and those that have only regional impact; and when a project is to be initiated by the centre, either directly from the province or from the NFIs define the broad terms of reference and a time frame for executing the work; review results on a regular basis; and define and arrange the mechanism for technology transfer and turning over the project to the province for further development or application.*

These advisory councils should have two levels as will be discussed later and include appropriate representation from the province, be chaired by a senior member of the provincial group, and include the RDG and the director of the RFRC or their designates. The regional coordinator from the SDG's Office would be a full member to provide the national perspective and federal focus and to develop information required for long range planning and evaluation purposes.

Forest Products Laboratories

The CFS operates two forest products laboratories at Vancouver and Ottawa (Charts 2 and 3, pages 15 and 16). Statistical data, based on 1975-76 estimates, relating to these establishments are provided in Table 15 and a brief description of each laboratory follows the table.

Table 15: STATISTICS FOR FOREST PRODUCTS LABORATORIES

Laboratory		MYs	1975-76 Budget $'000,000
Western Forest Products (Vancouver)	(WFPL)	119	2.7
Eastern Forest Products (Ottawa)	(EFPL)	149	2.9

The WFPL handles both regional problems encountered by industry groups west of the Ontario-Manitoba border and national problems. Major program areas include wood engineering, plywood and gluing, lumber,production and fibre products. The program is, thus, fully oriented to solid wood products except for the last project on fibre. This effort deals with improving chip storage (a project requested by the Quebec Lumberman's Association to improve use of sawmill residues) and the more complete use of the tree as cut, and of less desirable species for pulp and paper production. Much of the program is heavily oriented to problems encountered by the B.C. segment of the forest industry concerned with sawmilling, and plywood and laminates manufacture and as such is viewed as a major source of technological expertise for this industry group.

The EFPL also handles regional (east of the Manitoba-Ontario border) and national problems. The program includes lumber production (eastern problems), protection by coatings and impregnations from fire, rot, etc., composite products, wood construction, packaging and furniture components. The program is, thus, geared to the eastern Canadian industrial segment, including sawmilling, and the various fabricators of solid wood products.

Although there is an obvious regional orientation to the respective programs, the national focus has been increasing. This trend is expected to continue based on forecast program requirements, discussed earlier. A close link with CFS headquarters would thus be desirable. Until recently, the laboratories reported respectively to the Pacific & Yukon RDG and the Ontario RDG of EMS. This was changed on a temporary basis in April, 1976, and the two laboratories now report directly to the SDG, Forestry. In order

to foster the national focus which has been increasing, closer integration of the direction of the two laboratories should also be considered. As will be discussed, this is already in progress with respect to advisory councils. *Because of the desirability to enhance a single CFS approach to the program of the FPLs, activities of the two laboratories should be fully coordinated.*

The FPLs established in conjunction with industry, five or six years ago, a National Advisory Council (NAC) with a number of Research Program Committees (RPCs) oriented on a subject basis. Membership of this NAC consists of the chairmen,from industry,of the 10 RPCs. The NAC is fully national in scope and at this stage so are most of the RPCs. The role of the council and committees is to: review on-going projects at both laboratories; submit new R&D proposals; examine all proposals for new work; develop priority ratings for new projects; and identify mechanisms for transferring results to the user. Membership is from all segments of the sawmilling and wood fabricating industry, and chairmen are all from outside the CFS. The priority rating exercise is carried out in the absence of FPL personnel. Decisions of the council are considered to be advisory but the acceptance rate is of the order of 85%. The NAC and RPC system appears to be functioning effectively based on discussions with both FPL personnel and industry and association representatives and must be considered as the best advisory mechanism in the CFS; the COJFRC with Ontario being a close second. The only adverse comment from industry representatives is to the effect that direction of the program should be more fully the responsibility of the NAC; thus, the NAC should be more than an advisor. As all proposals for new projects (about half originate externally via the RPCs, the remainder within the laboratories) are reviewed by the respective RPC and recommended by the NAC before implementation, the industry suggestion would have merit provided membership is such to appreciate the necessity for a mix of long term as well as short term projects. *Thus, in order to maximize the relevance of the FPLs programs, the NAC should continue to be involved in all program direction but should increase its input in identifying future problem areas for long range planning activities carried out by the CFS.*

The role or mission of the two FPLs can be described as being to: undertake R&D as a service to a segment of the industrial sector; contribute to the development of codes and standards as they apply to the wood and wood using industries; and provide advice and act assa neutral arbiter between industry and governments. A breakdown of the activities at the WFPL show that the split is about 55%, 30% and 15% among the three roles. For the EFPL similar figures were not available but the distribution of effort was described as being of the same order of magnitude.

Several program activities relate closely to areas of interest of other laboratories. The FPLs work closely with the NRC on the material properties of wood and major NRC test equipment is utilized. Formerly the NRC undertook development work on wood structure but has recently dropped this effort to be able to give attention to more general forms of construction. Consequently, the FPLs have taken over this activity and the limits state design concept for wood construction has been identified as a major future

program requirement. The FPLs overlap with the Pulp and Paper Research Institute of Canada (PPRIC) in the program area related to fibre products. For example, the chip storage project was of interest to both the sawmilling and pulp and paper segments of the forest industry so could be justified as a CFS project. Other projects such as the use of less desirable species and wood types for pulp production, and in the case of a recent proposal on thermo-mechanical pulp, would appear to be more within the mandate of the PPRIC than the CFS. As the PPRIC has expertise and facilities to carry out such work, the establishment of the necessary equipment by the CFS would be difficult to justify. Since the CFS participates on the advisory group for the PPRIC, such problem areas should be identified for that institute's consideration. *The FPLs should not include in their program areas activities which might be better undertaken by industrially oriented institutes, such as the PPRIC.*

The rationale for federal involvement in activities of interest to industry, such as those carried out by the FPLs has been questioned within government circles on a number of occasions recently. The argument is that industry should undertake the work on its own behalf and that the FPLs might be transformed into industry oriented and supported institutes as was done when the PPRIC, and more recently, FERIC, were established. Despite the clear mandate, identified in the relevant acts discussed earlier, which states that CFS shall provide for research on utilization of the forest resource and the better utilization of forest products, there would be a major advantage in having industry undertake the work in that the R&D would be performed at or as close as possible to the point of application of the results. The possibility was, accordingly, investigated and compared with two alternatives; ther retention within the CFS or their transfer to NRC (as proposed by the Lamontagne Senate Committee). Pertinent factors concerning this comparison follow.

R&D programs undertaken by the FPLs as noted earlier, are primarily on behalf of the sawmilling, plywood, composition board, laminated wood products, and furniture segments of the forest industry. Nearly 8000 individual operators are included and are represented by small regional or provincial associations most of which have membership on the respective RPC for the FPLs.

Of the total number of operators, no more than 20 are large integrated forest industries which could support their own R&D effort. A number of these now participate to a limited extent in the R&D program of the FPLs through cooperative activities or by contract.

The principal national focus for these associations is the Canadian Wood Council (CWC) which represents only a portion of their functions so its scope would have to be broadened before it could effectively represent all of the forest operators involved. By comparison, the PPRIC has a focus in the CPPA, and FERIC at this point is supported by 44 of the major forest industries (who can benefit most from the newer large scale forest harvesting developments) and, consequently, represents only a small protion of the forest operators.

Industry briefs to the Minister of the Environment (e.g. CWC Brief of June 3, 1975) and discussions held in connection with this study indicate that industry values the FPLs as neutral technical advisors and for their role in developing codes and standards as well as for the direct results of their R&D effort. Several industry representatives indicated a willingness to participate in a government-industry, jointly - funded FPL program if the industry input would be used to augment the budget not displace federal funding.

The Senate Committee on Science Policy recommended that the NRC should be re-focussed to incorporate all mission-oriented R&D performed by the operating departments of the government. Such a move would include the CFS activity on forest products. This approach could have merit only if and when the Senate Committee recommendations are implemented. Incorporation of the FPLs within the existing NRC structure would do nothing to improve operation of these laboratories but would only tend to isolate them from other forestry functions.

Based on the foregoing considerations, *although the possibility of converting the FPLs into an industry-oriented institute has merit in that the R&D undertaken would be performed somewhat closer to the point of application, the move should not be considered at this stage because the industry groups concerned are comprised primarily of small operators, who need technical and, in many cases, financial assistance and support, and at this point no association exists which could represent them on a national basis. Also, industry groups would lose the neutral advisor and codes and standards functions now provided by these laboratories.*

Every effort should be made to develop joint funding of projects, to undertake work on a cost recovery basis, and by the use of contracts, to involve these industry groups to the fullest extent possible and thereby enhance the level of their technological capability; and to support and encourage DITC in fostering the establishment of an effective national association which could provide the desired focus for these operators, with the objective of increasing their involvement in directing the programs of the Forest Products Laboratories. The situation should be reviewed after three to five years to determine when and to what extent the existing effort could be supported assa joint industry-government institute.

Interaction with Other Federal Departments

In this section, the CFS interaction with federal departments such as DITC, DINA, DND, DREE and NRC is discussed.

DITC

The CFS interface with DITC in forestry is primarily due to their common interest in seeking optimum utilization of forest resources. DITC with its market orientation, is specifically interested in maintaining a continous supply of raw material to the forest industry. It seeks to determine industrial needs in general and specifically the resource expectations, and for this purpose, is continually engaged in evaluating the status of forestry related industries.

The major involvement of CFS with DITC is through the Forest Products Laboratories. The FPLs participate in the inter-sector Forest Industries Development Committee which is chaired by DITC. They have also participated inrresearch funded by DITC through its PAIT program on forest utilization (e.g. development of adhesives from sulphite waste liquor). Participation in FPL activities has also been through seminars and as a member of some of the FPL Research Program Committees. DITC has also cooperated with the Eastern Forest Products Laboratory in a task force on thinner veneers.

From the above, three main areas of CFS-DITC liaison emerge: forestry research, forest economics and forest products. Supply and demand data in the wood-based and pulp and paper industries are still being developed on a product basis but should be increasingly rationalized around the needs of resource managers and the fibre supply needed. *Between DITC and CFS a mechanism should exist so that the two can meet once or twice a year to identify needs in the three areas of mutual concern, especially in relation to forest industries. This will help to avoid duplication of effort and keep both DITC and CFS aware of the industry and forestry management needs respectively. This closer collaboration will assist in forecasting the status of forestry systems, and in identifying technical opportunities in the forest industries.*

The tourism group of DITC predicts a four-time increase in probable demand of leisure services by the year 2000. There will be growing pressure on outdoor recreation, mainly within 150 miles of the major cities. These developments have serious implications for forestry resources and services. Tourism officials feel that CFS has not delved into this aspect of tourism, and has tended to ignore the contribution forest-based tourism and recreation has made to the national economy. *CFS will have to be concerned with the problems and pressures relating to the multiple, and more specifically the non-consumptive, uses of forests in the future.*

DREE

DREE has a specific mandate to help less-advantaged provinces to get started in particular fields on their own. Formalization of agreements is done after the provinces have made a request for assistance under the DREE Federal-Provincial General Development Agreements. Sectoral subsidiary agreements are drawn in specific areas (e.g. forestry). Although DREE is the federal department responsible for funding and general monitoring of these agreements, other federal departments provide assistance in areas involving their specific national mandate and focus when deemed necessary.

Negotiations about these agreements are carried out at the provincial or regional level in the initial stages, so that the CFS-DREE interface at the regional level is important. To date, two major forestry subsidiary agreements have been formulated, with Newfoundland and New Brunswick. In some provinces, negotiations are still going on. On the whole, of the nine General Development Agreements with provinces, eight make references to forestry as a sector of their concern.

Because of the substantial provincial interface in this area, the CFS-DREE relationship has been discussed in greater detail in the following chapter on Federal-Provincial Relations.

DINA

The major interaction between CFS and DINA is in the management of forestry resources in the territories and national parks. Activities relating to the national parks are described as satisfactory except that the required work is not always given the desired priority. DINA is responsible for administration and development of northern natural resources; the protection of the northern environment; and the formulation of natural resources and environmental policy. In both the Yukon and North-west Territories, small forest services are operated which maintain some contact with the CFS regional centres.

The DINA forest managers would like CFS to carry out research in the North, because information is lacking. However, it is felt that CFS does not give sufficient attention to problems in the North and although a thorough job is done, in many instances, it takes too long to complete assignments. One department official commented:

"As a resource manager, I am interested in project oriented research, based upon my priorities. Costs and time-limits are important to me. If I can get work done at better prices somewhere else, I will get it done there. CFS should be able to provide me with such flexibility that I get from other forestry consultants".

CFS should consider its role in forestry in the territories seriously as there are large areas of forest lands in the North which are expected to become economically productive within the near future. CFS should thus strive toward a more positive research-contractor image to attract federal 'clients' like DINA.

DND

CFS also provides technical and management advice on forest lands owned by DND.

General

Among others, CFS interacts with federal departments and agencies like the National Research Council, CDA and Urban Affairs.

From the foregoing, it is apparent that because of its discipline-orientation in the past, CFS has not adequately responded to forestry related needs and priorities of other federal departments and agencies. Because of this situation, other federal agencies have taken the lead on their own in some areas.

CFS must attract its clientle in the federal departments and agencies and to establish its credibility as an efficient technical contractor, it must be aware of the needs, problems and priorities of the related federal departments. It should be able to assure its clients of the timing and estimated costs. On the other hand, federal departments and agencies before going outside the government for forestry related technical services, should ascertain if the desired capability exists within the CFS. Closer liaison between the CFS and the federal departments will be mutually beneficial not only in designing problem-oriented research programs, but will also minimize any duplication of research effort.

One of the major problems within the federal government has been a lack of focus for review and discussion of forestry activities. Presently, as stated earlier, DITC, DREE and DINA have major involvements in forestry, and NRC, CDA, DND, MOSST, and others have minor interests in this resource sector. To review federal programs, identify their priorities and to provide a forum for forestry matters, an interdepartmental committee on forestry is necessary. Such a committee would be effective in acting as a clearing house for federal forestry programs in a manner paralleling existing committees on water and energy.

Interface with Non-Government Sectors

Industry

The interface between the CFS and industry is with two principal segments of the sector; namely, that segment of the forest products industry including sawmilling, plywood, particleboard, furniture, etc., which deals primarily with solid wood and associated products; and forest management which embraces all aspects of the operation required to provide and maintain the forest resources for both consumptive and non-consumptive applications.

Each of the above situations have been discussed in preceding sections. The interface with the solid wood segment can be described as good but certain changes for improvement have been identified. Since the provinces are increasing their interest in the overall management of forests under their jurisdiction for multiple use, the role of industry in this area of activity is actually decreasing. Only that group of companies which owns areas of forest land would have a direct interface; a situation that exists in the Maritimes and Quebec and to a lesser extent in the rest of Canada. In addition, there will be industry liaison in provinces such as Alberta which requires that cutting and reforestation must be according to strict standards and be carried out by industry when the harvest is made. Such interfaces cannot be assessed because they are usually in conjunction with the province so become a part of the overall federal provincial relationship.

Industry representatives, contacted during the regional visits, deplored the fact that contract levels have been decreasing during the past several years. They indicated that sufficient capability exists in the industrial sector to carry out a number of the projects now undertaken intramurally by

the CFS on particularly, utilization problems but also on some protection and management activities. The question was raised why more work could not be contracted in response to the Make or Buy policy. Also, contracting to date has been concerned primarily with pilot testing to determine production problems and thus has been used to augment R&D activities rather than support full projects, which is an objective of the Make or Buy policy. As discussed in an earlier section, contracts have been an increasing problem within CFS because of budget constraints but greater attention will have to be given to their more effective use in future.

Universities

The six forestry schools, located at the University of B.C., Alberta, Lakehead, Toronto, Laval and N.B., have been encountering increasing financial problems for a number of years and the deans have collectively been approaching, with assistance from the Science Council of Canada, the federal government for assistance. As a result, the NRC established a visiting committee including MOSST representation to examine the problem. Recommendations developed include changes in the procedures and approach of the granting councils to give greater consideration to forestry grant applications (now being reviewed by the NRC Committee on Grants and Scholarships), and to the re-instatement by DOE of the CFS block grants to the forestry schools for specific purposes for a period up to five years. These recommendations have been discussed in a DOE brief* which identifies a mechanism for funding the grants on an interim basis and also recommends that the use of CFS staff and facilities for teaching and directing research at the graduate level at the forestry schools should be fostered as a CFS policy.

Discussions were held with the deans of four of the forestry schools during this study to determine the extent of current relations with the CFS without specific reference to the NRC Visiting Committee. Results of these discussions indicated that much could be done to optimize the use of the expertise located in both the forestry schools and the CFS establishments. University staff could be employed both on sabbatical or during the regular term as advisors to the CFS establishments. Similarly, expertise located in the CFS establishments could be used to a greater extent for lecturing and research direction. Both of these latter activities are carried out now, especially by those establishments located at or near a forestry school or other university having relevant areas of interest. However, current activities are largely on a local and ad hoc basis without any CFS focus. Consequently, *the recent recommendations by the CFS to have staff assist the forestry schools by giving lectures to and directing the research of graduate students, and to make available research facilities of the laboratories for graduate student use where appropriate, is strongly supported. Also, greater use should be made of the universities for advice and developing and maintaining specific areas of expertise.*

*Brief by Dr. I.C.M. Place, May 27, 1976
Meeting with the Executive of the
Association of University Forestry Schools

The question of direct funding was without intent, in the background during discussions with the deans. However, as this issue has been dealt with by the NRC Visiting Committee with MOSST participation, and the recommendations are currently under review, no further comment is provided in this report.

Associations and Institutions

Relations with the various associations concerned with forestry and forest products appear to be generally good and the more relevant interfaces have been discussed with respect to the group of C F S establishments involved.

General Public

As has been noted, the C F S is becoming increasingly involved with public awareness programs. This involves such activities as the "Ecotours" and the "walks in the forest" already mentioned. In addition, work in such areas as urban forestry, ecological impact, and the baseline studies have a very important and far-reaching impact on the public at large. *Greater awareness of the public to the ramifications of the CFS activities can only assist the directorate in strengthening its position and the public understanding of its role as a national focus for all aspects of the long term, multiple use of forestry in Canada.*

FEDERAL PROVINCIAL RELATIONS

Background

Federal Assistance

The Canada Forestry Act, passed in 1949, first authorized the Government of Canada, to enter into agreements with the individual provinces, with a view to promoting sound management and protection of the country's forest resources. Under this legislation, federal financial assistance was provided, to carry out certain forestry activities which included reforestation, forest inventory, stand-improvement, and access roads improvement. The resultant Federal-Provincial Forestry Agreement served well in advancing the provincial programs over a period of more than 15 years. By its termination, March 31, 1967, almost $64 million in federal funds had been contributed since the first agreement in 1951-52. Activities included forest inventories in eight provinces ($14.3 million); establishment of forest nurseries, seed extraction plants and planting nearly 350 million seedlings ($5.0 million); stand improvement ($1.3 million); forest fire protection ($19.5 million); improvement and development of access roads to forests ($23.5 million).

In addition to the composite agreement embracing all provinces, special agreements were made where circumstances warranted further federal participation. These included spray operation agreements in Newfoundland, New Brunswick, Quebec, and British Columbia, to which almost $8.0 million were contributed between 1953 and 1968.

Regional Orientation of CFS

With reorganization of the federal forestry branch in 1969, to the Canadian Forestry Service, further attempts were made to bring the CFS closer to the provinces. The role of the Service was to respond to the needs of its 'clients', especially the forest management agencies. In this new organization, each regional laboratory was to deal effectively with major problems of its respective region of which there were five, similar to the current regions. Their functions included development of comprehensive research and survey programs, competent consultative, advisory and liaison services; and the delivery of effective public information programs.

Advisory Councils

Regional Aspect

To develop a closer liaison between the CFS regional establishments and the provincial forest management agencies, Regional Advisory Committees were

constituted to assist the CFS establishment directors in making comprehensive assessments of research needs and priorities. Their terms of reference, in general, were to: *

- Provide advice to the regional director;
- Establish criteria for evaluating major forestry problems of the region, to the solution of which the CFS might contribute;
- Review problems brought forward by their membership and through other channels, with the purpose of defining them in specific terms and advising on priorities;
- Advise on the broad programs and required resources, and review progress; and
- Advise on coordination of CFS programs and those undertaken by other agencies.

Membership of these advisory committees comprised representatives of provincial forest services, other appropriate governmental or regional agencies, associations of the forest industries, universities and the CFS. They were to meet at least once a year to discuss the RFRC current programs and emphasis for the coming year, and to suggest new undertakings.

Current Status

Examination of the advisory committees linked with the six RFRCs shows that since the idea of external advisory groups was introduced more than six years ago, in many cases, their terms of reference are still at the embryonic stage. The Regional Advisory Board in the Maritimes has not met for four years; no decision has been yet made on the future of forestry advisory boards in either B.C. or Quebec. In Alberta, Newfoundland and Ontario where the relationship between provincial and federal research establishments has materialized, the federal-provincial cooperation has been mainly confined to exchange of information. Only in the case of the Canadian-Ontario Joint Forest Research Committee (COJFRC) where a written forest research agreement between the federal government and the province of Ontario exists, in addition to transmission of information, a research coordination function is also fulfilled.

In general, the external advisory committees tend to look at centres' programs after the fact rather than guiding them from the problem identification stage. In this respect, they appear to be less involved and effective than the RPCs of the FPLs. In our survey, directors of the RFRCs identified only 20% of their research projects as having origins in these advisory committees (compared with about 50% identified by the FPLs) (Appendix D).

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* Science Council, Special Study no. 14, p. 73

Among major problems of advisory committees, the study found that there was a lack of consistency in their roles and functions; specifically whether they were to provide broad guidance on a long-term basis, or to criticize current programs. Thus, directions provided by the committees varied from province to province. In general, it was seen that because of their predominant technical composition, instead of problem-identification and technology-transfer assessment, a lot of effort was spent by members lobbying for pet scientific projects.

In a recent CFS review of the advisory committees, four main discrepencies in the existing structures* were identified, namely

- Representation is largely technical and is drawn from the research ranks rather than from the decision-making level, and even where decision-makers are committee members, they are often too busy to articulate adequately long-term or future problems;

- The full range of clients is not represented on the committee;

- Advisory committees are only partially successful in translating advice into effective programs;

- There is a strong tendency to review existing programs and projects because they are documented and easy to criticise; thus valuable advice concerning the long-term overview and exploitation of research results is not forthcoming.

Effectiveness

In summary, it may be stated that existing federal-provincial advisory committees have not made a major impact on CFS programs, and the client input has not been significant. There has been little effort by the committees to establish criteria for evaluating major forestry problems in the region. It is necessary for provinces to ascertain their priorities in terms of the long-range productivity and multiple use of forests; whether R&D effort is required to achieve those objectives; and of which activities should be undertaken by the province itself and by the CFS or other federal agencies.

The nature of the advisory function of these committees has varied from region to region depending mainly upon the level of provincial technical competence in forestry. In provinces where this competence is long established (e.g. Ontario, B.C.), research coordination has been effective, both on a formal and informal basis. However, a joint broad problem-identification mechanism is still lacking. On the other hand, in the case of provinces where the R&D expertise in forestry is either absent or is only now evolving, CFS

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* CFS, Formulating Forestry and Forest Products Research Objectives in Canada, p. 4

establishments seem to have assumed an advisory role in helping the province to identify its major forestry problems and to maintain an R&D function for the whole region.

Approaches to Improve Advisory Committees

Over the past decade, the provinces have been actively getting involved in management of their own forests. The general trend is towards a more strict surveillance, and whenever possible, buying back the forest land. Instead of inexhaustible forestry resources as supposed earlier, almost all the provinces now seem to recognize the importance of forest management on a sustained-yield basis for long-term productivity and multiple use.

In light of these changing attitudes toward forestry as a resource, two sets of alternative mechanisms for making CFS research relevant to the provincial and regional needs are suggested. The first approach deals essentially with improving existing advisory mechanisms by the establishment of a two-level advisory body; the second deals with collaborative mechanisms between the federal and provincial governments on a shared-cost or cost recovery arrangement.

At present, a great deal of time and effort is spent in the discussion of policy, research coordination, and program review in the same forum. *To provide clearer directions to the regional CFS establishments, it will be useful to evolve a two-level advisory body, with specific functions and suitable membership composition. These two levels should comprise an advisory board and program committees.*

At the board level, the advisory body under provincial chairmanship, should identify problems related to forestry of provincial concern and establish their priority. Its main functions should be: to advise the responsible minister on resource management options; to assess and approve cost-shared or cost recovery proposals for new work identified by the committees and make recommendations relating to other programs; to evaluate approaches for problem solving with input from the regional coordinator (SDG's Office) relating to national focus; to evaluate progress on all on-going and new projects; and to make recommendations concerning project coordination with provincial activities and technology transfer.

At the program committee level, the groups (chaired by provincial representatives) should comprise subject-experts who should review and monitor projects, and assess the impact of the R&D results to determine their contribution to solving regional forestry-problems; the feasibility of effective application by transfer of research results to the province and industry; and the contribution to the overall quality of life in the region.

It should be pointed out that such a two-level advisory structure by itself is not sufficient. *Provinces will be able to identify their research needs meaningfully only when they have sufficient technological capability particularly at the operational end of the R&D spectrum. It is through such a capability, that the CFS results will be effectively transferred to a province for application. There should be a far greater financial involvement*

on the part of provinces in testing and pilot-experimentation of CFS performed R&D. Therefore, use should be encouraged of jointly-funded 'shared-cost' pilot-stage projects with operating costs a provincial responsibility and research funded by the CFS.

The most effective means of bringing the RFRCs closer to provinces is through jointly funded federal-provincial forestry research centres. Over the past 5 years, as earlier stated, the advisory committee approach has not been too successful. The gap between the needs of forest managers and the activities of researchers has not been reduced significantly. Complaints about the lack of relevancy and usefulness of the CFS R&D activities persist. Furthermore scientists while continuing their research work have looked for recognition mainly in the publication of papers; often limiting their role in tendering advice. A collaborative effort to bridge this knowledge gap and bring together both forest management agencies and research centres would be desirable for the development of relevant research programs and subsequent technology transfer. Furthermore technology transfer should not be considered as the last stage of the R&D effort; it must become an integral part of project development and also of the implementation stage to determine when transfer of results can be achieved most effectively.

As a longer range objective, *establishment of jointly funded federal-provincial forestry research centres should be considered. Such mission-oriented research centres would avoid duplication of research effort* by *involving provinces directly in the authorization of relevant programs and subsequent technology transfer. In addition, the approach would ensure the development of provincial scientific and technological capabilities in the forestry sector and should be discussed in connection with the National Forest Policy.*

Agreements

CFS Agreements

Since termination of the Federal-Provincial Forestry Agreements in 1969, there has been no formal liaison mechanisms available for CFS officials to interact with their provincial counterparts. Most of the current liaison is based upon personal initiatives and contacts of the concerned officials. As stated earlier, *the lack of liaison is not at the working level, but at the policy level wherein problem areas can be effectively defined and articulated. A renewal of the federal-provincial forestry agreements should be considered to provide an opportunity to the two levels of government: to identify problems and deficiencies in the sector; to provide direction to their respective agencies for action; to undertake cost-shared projects when appropriate; and to define cost recovery mechanisms for CFS effort undertaken specifically for a province.*

It should be stressed that the nature of the research activities will vary from province to province as in no two cases, are priorities related to forestry the same. Due to varying climatic and geographical conditions, forest behaviour tends to differ from one region to another. Variations in problems can also be due to institutional structures and mechanisms e.g.

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licensing-leasing regulations, structure of forest industries, level of regional economic development and the availability of skilled manpower. It is therefore necessary that *in an attempt to make CFS programs relevant to provincial needs and to help provinces develop their own forestry research centres, the federal government should negotiate agreements with the provinces on a bilateral basis, taking into account regional peculiarities.*

Also, there are a number of areas which have both regional and national implications. These areas require a more detailed and comprehensive information-base without which any long range planning of forestry on a national basis is not possible. The areas of joint federal-provincial activities are to:

- *Undertake forest-based market studies on international national and provincial levels as the present framework of knowledge relating market conditions to resource generation is very weak;*

- *Develop a detailed comprehensive standard resource inventory system, which will provide resource-based statistics, needed to plan for the multiple-use of our forests; and*

- *Help provinces to develop management standards for regulating the resource, its growth, utilization, protection and the related environmental aspects on a cross-sectoral basis.*

Activation of federal-provincial agreements in these key areas should become a basis for cooperation between the CFS and the provinces.

DREE's Forestry Subsidiary Agreements

The Department of Regional Economic Expansion (DREE), in recent years, has become increasingly involved with the provinces in the forestry sector on the shared-cost basis through forestry subsidiary agreements. These agreements cover some of those areas which were dealt with earlier under the federal-provincial forestry agreements.

In the eastern provinces, DREE has been responsible for initiating a number of Federal Provincial Task Forces on forestry. In addition, as a part of its regional development schemes, it has funded some provinces to develop their technical capabilities in forestry.

During the field visits, it was noted that communication between DREE and CFS at the regional level was often unsatisfactory. CFS was usually invited to participate in the federal-provincial task forces on forestry, mainly on a consultative basis but was generally kept outside the management committee, and was not involved in overseeing the implementation of the forestry programs. CFS involvement in DREE programs was often at a latter stage when the program was about to be finalised. In two provinces (Quebec and New Brunswick), DREE had decided to fund the provinces to develop technical capabilities in forestry without any consultation with CFS. Furthermore, in the absence of formal liaison mechanisms between DREE and CFS at the regional or national levels, knowledge about their related mutual activities usually tended to be filtered through rumours and informal contacts.

Closer contact between DREE and CFS at the national and more specifically the regional level is essential to bridge the communication gap between the two federal agencies. CFS should be consulted and actively involved in the initial stages of program development, and along with DREE, should be responsible for monitoring technical aspects of all DREE-funded federal-provincial forestry programs. Furthermore, recognizing that technical development is an integral part of regional development, the role of CFS in this area should be strengthened.

CONCLUSIONS

General

The R&D role and program of the Canadian Forestry Service has been assessed based on discussions with directorate staff in Ottawa and at each establishment, with other DOE officials and with representatives of other federal departments, of the provincial governments, industry, the universities and associations; and on the results of a questionnaire sent to, and a review of Work Program Plans of, each CFS establishment. Throughout the foregoing chapters, various factors affecting the CFS have been discussed and a number of conclusions developed. Although each will have the greatest significance in the context of the theme in which it was developed, the conclusions are summarized below in relation to the terms of reference established for the study.

Background

Canadian R&D in Forestry

- The federal government spent similar amounts for R&D in forestry, agriculture and mining as a percentage of the value added by manufacture.

International Comparison

- Available international data suggest that aggregate R&D expenditures by the Canadian government and industry are at least of the same order of magnitude as similar expenditures by the U.S. and Sweden based on value added and unit production. Because of the limited data available, a more detailed comparison of international expenditure is required.

Mandate and Program

Current Legislation

- Existing legislation, the Government Organization Act (1970) and the annexed Forestry Development and Research Act, identifies and defines the purpose of the federal involvement in forestry to be the promotion of practices which will enhance environmental quality; and provides for the conduct of research. The respective spheres of responsibility and functions of the federal government, provincial governments,

industry and the universities are not defined. These will have to be developed in conjunction with the preparation of a national forest policy.

Program

- The current R&D program carried out by the CFS is fully compatible with the legislated mandate but emphasis given to problems of resource management and environmental impact must be increased to respond to current and future problems.
- CFS will have to be concerned with the problems and pressures relating to the multiple, and increasingly the non-consumptive, uses of forests in the future.

Functions

- R&D must be viewed as an instrument to facilitate implementation of a departmental role not the role itself.
- The CFS should continue to undertake basic and applied research, but the purpose of the work must be clearly defined in terms of a recognized problem.
- The CFS has tremendous potential to initiate broad-based environmental R&D programs, utilizing the services of the other EMS directorates, and must take a positive lead to utilize these opportunities not because it is a part of EMS but because its credibility and the usefulness of its programs will depend on the adoption of a systems-oriented approach to forestry problems.
- All projects must be addressed to specific forestry problems which can be pursued within an agreed time-frame.
- The CFS should become more involved in the use of forestry statistics as a basis for planning especially with respect to R&D programming, and recommendations developed by the recent national conference on forest statistics should be implemented as required activities can be identified and defined, and resources made available.
- The role of advisory councils is of major importance in communications as well as program development to ensure that the relevance to the user of results of R&D carried out on his behalf is maximized. The CFS should promote the establishment of councils having a real function in identifying problems, defining projects and establishing their priorities when cost shared and in reviewing results and transferring the results to the user. To be effective, council chairmen should be from outside the CFS and only the RDG and the establishment director or their designates should be council members.
- Publications will continue to have their place in the transfer of technology and should be issued as CFS documents except in the case of regional newsletters. Other vehicles will, in future, have to be given greater emphasis; collaboration with the user should be given increased attention and the use of seminars and workshops, etc., fostered.

- To complete the "project development-user" loop, the establishment must have sufficient information on the users' technical competence and knowledge of regional national and international market conditions with regard to the economics of implementing the results.
- A detailed and regular system of monitoring technology transfer throughout the CFS is required.
- The current planning and evaluation function is inadequate for future program requirements identified by representatives of the CFS and non-federal groups. The developing PAS has potential for program and budgetary control but the major deficiency in the directorate's activities is long range planning. Only such an effort can effectively provide an identification of future problems and opportunities concerning the multiple use of the forests of Canada with full regard for the environment. Regionally, long range planning in coordination with the national effort should define in a systematic manner anticipated needs, problems and subsequent demands to be imposed on the regional forestry system.

Future Program and Federal Role

- The required shift in emphasis does not require an actual shift in program as the three primary areas, protection, management and utilization, cover the extended areas, although increasingly the first two will become merged into what might be termed forestry management in the context of environmental protection and enhancement. This broader role is a real program evolution which has been developing for a number of years and confirms the compatibility of CFS as a component of EMS.
- In future, the CFS role will become increasingly one of planning and evaluation concerning national aspects of the forest resource for which inventories and R&D will be the major inputs, and communications both an input and output. Thus, R&D will be undertaken in support of a federal role.
- The rationale for federal involvement in forestry has certain elements in common with that in other natural resources, and although provinces have the operational management responsibility for such resources, there is an identifiable federal role. For forestry, this role is related to management planning and utilization. The CFS should continue to provide the federal and national focus in forestry, both internal to the government and with all other sectors. In line with existing legislation, the required CFS role and functions to meet forecast trends in program emphasis may be defined as follows:

    . Undertake planning and evaluation studies on a regular basis to define the current national state of the resource and to identify problem areas and opportunities; such activities being carried out with the cooperation of other federal departments, the provinces and industry, and including their input.

. Provide the focus for carrying out inventories and surveys relating to all forestry activities by establishing standards and methodologies for their implementation by the provinces (ultimately in the case of the insect and disease surveys).

. Undertake R&D appropriate to the federal government relating to the problems and opportunities identified by the planning and evaluation studies.

. Ensure effective communication with the user through the increasing use of advisory groups, direct collaboration, seminars, workshops, etc., for good technology transfer.

Decision Making and the CFS Structure

CFS as a Federal Focus

- The CFS must function as a unit within EMS, with sufficient stature to provide or develop a federal position and to present a strong federal voice on forestry matters.
- Interdirectorate activities involving the CFS must become identified in the programs of the respective establishment(s) and as such must be coordinated with other projects. In this way both the establishment(s) concerned and the SDG's Office will have to become involved, one, as the performer, the other to coordinate the activity with the overall directorate's program.

CFS Manpower

- The question whether the program shifts and new functional emphasis can be undertaken within the current manpower allowance cannot be determined at this stage. Current program activities will have to be assessed project by project, to determine their relevance and impact to newly identified national, provincial and industrial problem areas. Only then can an estimate of the future program and manpower requirements be identified.

SDG's Office

- The SDG's Office must provide the focus and leadership for the forestry program to have an effective responsibility-matrix. Regional coordinators from the SDG's Office should provide the national perspective required for preparing program forecasts and budget estimates by the RFRCs, and the SDG should review such submissions from the RDG before approval by the ADM. For the NFIs and the FPLs such a matrix approach is not required.

- The SDG's Office must bring the CFS together as an identifiable single unit,and operations of the CFS should be directed, or coordinated, to develop a national focus for all forestry matters; promote an increasing involvement by the user (provinces and industry) in the performance of R&D activities; and increase the number and scope of projects oriented to interdirectorate objectives concerned with environmental protection and enhancement.

NFIs

- The institutes provide the technological base for the CFS and should be retained as exclusive forestry institutes, an approach needed to ensure the forestry focus for the CFS to respond to problems facing Canadian forestry and to provide an effective interface between the federal government and the provinces and industry. Consequently, the director of national institutes should report to the SDG, Forestry.
- The major role of the NFIs should be longer range research undertaken to the extent of the national interest, at which stage projects would be turned over to the respective RFRCs for R&D required for application in the region. Thus, the NFIs would become the principal scientific advisor and the focus of expertise within the CFS.
- In order to strengthen the role of the NFIs and improve co-ordination among CFS establishments, an advisory council for the institutes comprised of the directors of the RFRCs plus representation from the SDG's Office (long range planning) and from non-federal sectors, should be established to ensure effective involvement of those concerned with the identification of problems and the transfer of results at the appropriate time to the regions.
- Because of common objectives in pest control, the CCRI and IPRI should be integrated at one location. Also, because of common methodology utilized, the FMI and FFRI should be combined. The PFES should be used more effectively to undertake long range experimental work and provide a location for field work required by other institutes, and the RFRCs as appropriate. Arrangements should be made to have ownership of the PFES property transferred from DND to the CFS.
- For major projects having a national focus, the NFIs should concentrate on the national aspects of the problem whereas the centres should undertake the applied research necessary for transfer of the results to the province for application. Problems having only a regional concern would be the responsibility of the centre.
- The possibility of coordinating more closely those activities at the various establishments which deal with a specific problem, should be pursued and where appropriate a project co-ordinator or leader should be identified to ensure that a common focus is maintained.

- The advisory council for the NFIs should have the role of keeping the institutes informed of problem areas, identified by the regions to require R&D effort on a national basis, assessing all proposals (originating from any source) for work to be carried out, and reviewing results to ascertain their merit and at which stage projects should be turned over to a centre for further work with a regional focus.

RFRCs

- The RFRCs have been operated largely as research arms for the provinces. Increasingly the provinces will have to develop their own technological capability in forestry and the CFS should work closely with the provinces to this end. Cost shared programs should be promoted and mechanisms for cost recovery for work carried out exclusively for a province should be developed.
- The role of the advisory board and committees for the RFRCs would be to identify problems facing the regions; segregate them into those having national significance to be handled by the NFIs in the initial stage, and those that have only regional impact, and when a project is to be initiated by the centre, either directly from the province or from the NFIs, define the broad terms of reference and time frame for executing the work; identify cost sharing or cost recovery mechanisms; review results on a regular basis; and define and arrange the mechanism for technology transfer and turning over the project to the province for further development or application.

FPLs

- To enhance a single CFS approach to the FPLs program, activities of the two laboratories should be well coordinated. Also, the FPLs major advisory body, the National Advisory Council, should increase its input in identifying future problem areas for long range planning activities carried out by the CFS.
- The FPLs should not include in their program areas activities which might be better undertaken by industrially oriented institutes, such as the PPRIC.
- The possibility of converting the FPLs into an industry-oriented institute has merit in that the R&D would be performed somewhat closer to the point of application. However, the move should not be considered at this stage because the industry groups concerned are comprised primarily of small operators, who need technical and, in many cases, financial assistance and support, and at this point no association exists which could represent them on a national basis. Also, industry groups would lose the neutral advisor, and codes and standard functions now provided by these laboratories. Every effort should be made to develop joint funding of projects, to undertake work on a cost recovery basis and by the use of contracts to involve these groups to the fullest extent

possible to enhance the level of their technological capability. DITC should be encouraged to foster the establishment of an effective national association which could provide the desired focus for these operators, with the objective of increasing their involvement in directing the programs of the FPLs. The situation should be reviewed after three to five years to determine when and to what extent the existing effort could be supported as a joint industry-government institute.

Interactions with Other Departments

- DITC and CFS should meet once or twice a year to identify needs in areas of mutual concern. This will help avoid duplication of effort and keep both DITC and CFS aware of the industry and forestry management needs and will assist in forecasting the status of forestry systems; and identifying technical opportunities in the forest industries.
- CFS should consider its role in forestry in the territories where there are large areas of forest lands which are expected to become economically productive within the near future.
- CFS must establish its credibility as an efficient technical contractor with other federal departments and agencies and must be aware of their needs, problems and priorities and assure them of the timing and estimated costs. On the other hand, federal departments and agencies should ascertain if the desired capability exists within the CFS. Hence, closer liaison among federal departments will be mutually beneficial not only in designing problem-oriented research programs, but also in minimizing any duplication of effort.
- As a number of departments and agencies have a continuing interest in forestry matters, an interdepartmental committee chaired by the ADM of EMS with the secretariat from the CFS, is required to provide the necessary forum for reviewing federal programs and establishing priorities on forestry matters. Committee membership should include CFS, DITC, DREE, NRC, CDA, DINA, DND, FIN, TBS, MOSST, and possibly others.

Interface with Universities

- Recent recommendations by the CFS to have its staff assist the forestry schools by giving lectures and directing the research of graduate students, and to make available research facilities of the laboratories for graduate student use where appropriate, is strongly supported. Also, greater use should be made of the universities for advice and developing and maintaining specific areas of expertise.

Interface with the General Public

- Greater awareness of the public is required to the ramifications of the forest resource and the problems associated with its management so as to protect and enhance the environment. Such an awareness of

CFS activities can only assist the directorate in strengthening its position and the public understanding of its role as a national focus for all aspects of the long term, multiple use of forestry in Canada.

Federal-Provincial Relations

Advisory Boards and Committees

- To provide clearer direction to the regional centres, it will be useful to establish a two-level advisory body comprising a board and program committees with each province.
- The board, under provincial chairmanship, should identify problems related to forestry of provincial concern and establish their priority. Its main functions should be to:

  . assess and approve cost shared and cost recovery proposals for new work identified by the committees and make recommendations relating to other proposals;

  . evaluate approaches for problem-solving with national input from the SDG's Office;

  . evaluate progress on all on-going and new projects; and

  . make recommendations concerning project co-ordination with provincial activities and technology transfer.

- The program committee, chaired by provincial representatives, should comprise subject-experts who should review and monitor projects, and assess the impact of the R&D results to determine their contribution to solution of regional forestry-problems; the feasibility of effective application by transfer of research results to the province and industry; and the contribution to the overall quality of life in the region.
- Provinces will be able to identify their research needs meaningfully and to apply results only when they have sufficient technological capability. Provinces should have greater financial involvement in testing and pilot-experimentation of CFS performed R&D. Also, use should be encouraged of jointly-funded pilot-stage projects with operating costs a provincial responsibility and research funded by the CFS. For the future, jointly funded federal-provincial forestry research centres should be considered to avoid duplication of effort, by involving provinces directly in relevant programs and the subsequent technology transfer. The approach would ensure the development of provincial scientific and technological capabilities in the forestry sector and should be discussed in connection with the National Forest Policy.

CFS Agreements

- Lack of liaison is not so much at the working level, but is primarily at the policy level wherein problems can be effectively defined and articulated. Renewal of the federal-provincial forestry agreements, taking into account regional pecularities and disparities, should be considered to provide an opportunity to the two levels of government to:

    . identify problems and deficiencies in the sector;

    . provide direction to their respective agencies for action;

    . undertake cost-shared projects when appropriate; and

    . define cost recovery mechanisms for CFS effort undertaken specifically for a province.

- A number of areas have both regional and national implications and require a more detailed and comprehensive information-base without which long range planning of forestry on a national basis is not possible. Joint federal-provincial activities would be to:

    . undertake forest-based market studies on international, national and provincial levels as present knowledge relating market conditions to resource generation is weak;

    . develop a detailed comprehensive standard resource inventory system, which will provide resource-based statistics, needed to plan for multiple-use of the forests; and

    . help provinces develop management standards for regulating the resource, its growth, utilization, protection and the related environmental aspects.

- Activities of federal-provincial agreements in these key areas should become a basis for cooperation between the CFS and the provinces.

DREE Agreements

- Closer contact between DREE and CFS at the national and more specifically the regional level is essential to bridge the communication gap between the two federal agencies. CFS should be consulted and actively involved in the initial stages of program development, and along with DREE, should be responsible for monitoring technical aspects for all DREE-funded federal-provincial forestry programs. Furthermore, recognizing that technical development is an integral part of regional development, the role of CFS in this area should be strengthened.

RECOMMENDATIONS

A number of conclusions summarized in the preceding chapter have been developed as a result of the current assessment of the Canadian Forestry Service. Based on these conclusions the following recommendations are made.

- The CFS should continue to provide the federal and national focus in forestry both within the government and with other sectors but should increase the emphasis given to problems of resource management and environmental impact. This required shift in emphasis can be implemented within the existing Government Organization Act (1970) and the annexed Forestry Development and Research Act.
- In order to respond effectively to the changing emphasis, the CFS role should be to:
    - undertake planning and evaluation studies to define the current national situation and to identify problem areas and opportunities;
    - provide the focus for carrying out inventories and surveys by establishing standards and methodologies for their implementation by the provinces;
    - undertake R&D appropriate to the federal government; and
    - ensure effective communication with the user through the increasing use of direct collaboration, seminars, workshops, etc. for good technology transfer.
- The CFS should initiate broad-based projects utilizing the services of other EMS directorates to respond to problem areas concerned specifically with the multiple uses of the forests.
- The CFS should continue to undertake oriented basic and applied research but should ensure that projects are addressed to specific forestry problems to be pursued within an agreed time frame.

- Current program activities should be assessed project by project, to determine their priority with respect to newly identified national, provincial and industrial problem areas and thereby establish future program and manpower requirements, and whether the existing allocation of manpower and financial resources is adequate.

- Program areas having both regional and national implications require a detailed and comprehensive information-base before long range planning is possible. The CFS should initiate joint federal-provincial activities to:

    . undertake requisite market studies;

    . develop a standard inventory system; and

    . assist provinces to develop management standards related to forestry.

- To develop the statistical base required for planning studies, the CFS should implement the recommendations of the recent national conference on forest statistics as required activities can be identified and defined, and resources made available. Also, information relating to the technological capability of the user should be developed.

- To undertake required planning studies, the CFS should strengthen its planning and evaluation group.

- The CFS should also strengthen its role in communications by:

    . establishing more effective advisory councils, especially with the provinces;

    . giving greater emphasis to the use of mechanisms other than publication for technology transfer, such as collaboration with the user, and greater use of seminars and workshops;

    . issuing publications, except regional newsletters, as CFS documents; and

    . monitoring all technology transfer activities.

- To provide effective direction to the RFRCs, the CFS should establish two-level advisory groups with each province, comprising a board and program committees.

- The regional boards should be organized with provincial chairmen to identify problems related to forestry of provincial concern and to establish their priority. Their principal function should be to deal with joint policy matters, and their federal membership should include the RDG and a representative from the SDG's Office as well as the director of the RFRC.

- The program committees should also be organized with provincial chairmen and should comprise subject experts to monitor projects, assess the impact of R&D results and recommend mechanisms for transferring results to the user.

- The CFS, through advisory groups, should encourage and facilitate the development of mechanisms whereby the provinces share in the costs of the R&D, testing and pilot experimentation affecting their region. Use of jointly funded activities should be encouraged whereby initially the operating costs of the pilot-stage projects are the responsibility of the province and research is carried out by the CFS, and for the future jointly-funded regional centres be considered. This approach should be discussed in connection with the National Forest Policy.

- The federal-provincial forestry agreements should be renewed to:

    . facilitate the identification of regional problems and deficiencies;

    . provide direction to their respective agencies;

    . support cost-shared projects; and

    . define cost recovery mechanisms for activities undertaken specifically for a province.

- The SDG and his office should provide the focus in forestry for the directorate and should recommend to the ADM, in concert with the RDG, program activities developed by the regions.

- The SDG's Office should include regional coordinators for the RFRC programs, and a coordinator for the Forest Products Laboratories.

- The National Forestry Institutes should be organized into three sections for pest control, management practices and the experiment station, and continue to report to the SDG. They should be operated exclusively as forestry institutes, and should provide the technological base for the CFS with their major role being longer range R&D of national interest.

- An advisory committee for the NFIs comprising the directors of the Regional Forestry Research Centres and a representative from CFS headquarters plus non-federal members should be established.

- Arrangements should be made to have the Petawawa Forest Experiment Station property transferred from DND to the CFS.

- The RFRCs should undertake R&D relating to problems affecting the region which originate with the province, the National Forestry Institutes or other EMS directorates, and should work closely with the provinces to assist them in increasing their technological capability required to manage the provincial forests effectively for multiple use with due regard for the impact on the environment.

- The Forest Products Laboratories should remain as a component of the CFS for the present time but every effort should be made to increase the involvement of industry groups in program direction and DITC should be encouraged and supported in fostering the establishment of an effective national association to represent these groups. The situation should be reviewed in three to five years to determine when and to what extent the existing effort could become a joint industry-federal government institute.
- The two Forest Products Laboratories should continue to report to the SDG and their program activities should be closely coordinated.
- The CFS should augment the level of coordination with other federal departments and agencies by establishing an Interdepartmental Committee on Forestry to review federal programs and establish priorities for forestry matters. This Committee should be chaired by the ADM of EMS and membership should be drawn from the CFS, DITC, DREE, NRC, CDA, DINA, DND, FIN, TBS, MOSST, and possibly others with the CFS providing the secretariat.
- The CFS should be involved in the planning and implementation of all federal-provincial agreements concerning DREE-funded technical programs dealing with forestry.
- The CFS should assist the university forestry schools by fostering the involvement of staff in giving lectures to, and directing the research of graduate students, and by making greater use of university expertise.
- The CFS should enhance its public awareness programs on forestry.
- The CFS should undertake or arrange for a comparison of international R&D activities in those countries in which forestry and forest products are of major concern. Relevant statistics should be developed on a continuing basis for future use.

APPENDICES

ABBREVIATIONS

List of Abbreviations Used

ADM	Assistant Deputy Minister
AFAC	Alberta Forestry Advisory Council
BCFRB	British Columbia Forestry Research Board
CCRI	Chemical Control Research Institute
CDA	Canadian Department of Agriculture
CFAC	Canadian Forestry Advisory Council
CFS	Canadian Forestry Service
CIDA	Canadian International Development Agency
CMHC	Central Mortgage Housing Corporation
COJFRC	Canada-Ontario Joint Forest Research Committee
CPPA	Canadian Pulp and Paper Association
CWC	Canadian Wood Council
CWS	Canadian Wildlife Service
DEA	Department of External Affairs
DINA	Department of Indian and Northern Affairs
DITC	Department of Industry Trade and Commerce
DND	Department of National Defence
DOE	Department of Environment
DREE	Department of Regional Economic Expansion
EFPL	Eastern Forest Products Laboratory
EMS	Environmental Management Services
FAO	Food and Agriculture Organization (UN)
FERIC	Forest Engineering Research Institute of Canada
FIN	Department of Finance
FFRI	Forest Fire Research Institute
FMI	Forest Management Institute
FPL	Forest Products Laboratory
FPRO	Federal-Provincial Relations Office
FY	Fiscal Year
GLFRC	Great Lakes Forest Research Centre
IPRI	Insect Pathology Research Institute

IWD	Inland Waters Directorate
LD	Lands Directorate
LFRC	Laurentian Forest Research Centre
MFRC	Maritimes Forest Research Centre
MOSST	Ministry of State for Science and Technology
NAC	National Advisory Council
NFIs	National Forestry Institutes
NFAC	Newfoundland Forestry Advisory Council
NFRC(1)	Northern Forest Research Centre, EDMONTON, Alta.
NFRC(2)	Newfoundland Forest Research Centre, ST.JOHN's, Nfld.
NRC	National Research Council
PAS	Program Activity Structure
PFES	Petawawa Forest Experimental Station
PFRC	Pacific Forest Research Centre
PPDD	Policy and Program Development Directorate
PPRIC	Pulp and Paper Research Institute of Canada
RDG	Regional Director General
RPC	Research Program Committee
SDG	Staff Director-General
TBS	Treasury Board Secretariat
WFPL	Western Forest Products Laboratory

Appendix "B"

LETTERS

IMPLEMENTING STUDY

cc: Dr. M. LeClair
MOSST Registry
Mr. D.B. Dewar
Mme C. Fauteux
Dr. D.E. Read

NOV : 1975

Mr. J.B. Seaborn,
Deputy Minister,
Environment Canada,
Fontaine Building,
14th floor,
Hull, Quebec
K1A 0H3

Dear Mr. Seaborn:

Following our conversation this summer on a number of points of concern within your Department, I believe my officials have explored further with you and your people possible ways in which MOSST might be of assistance. I understand it has been suggested that the Ministry might undertake a study of the role and program of the Canadian Forestry Service as they relate to its research and development activities. We would be pleased to do such a study.

We are aware of the priority the government has attached to the development of a national forest policy and the importance of the forest industry to the Canadian economy. As well as being a direct aid to you, our study may be a useful contribution to defining the Federal position on certain aspects of the national policy. Based on discussions with your officials, we would propose to direct our study at an assessment of the research and development policies and programs of the Canadian Forestry Service and the science related services provided by the Service, to clients both within and outside the federal government. The terms of reference of the study might be to examine the following and make appropriate recommendations.

(a) the governing legislation, objectives and strategies of the Canadian Forestry Service and the broad directions and purposes of its research and development programs and science related activities in relation to the Government's objectives and to the specific mandate and objectives of the Department of the Environment;

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(b) the decision making procedures and institutional structures within the Canadian Forestry Service with respect to the provision of science related services in response to the needs of clients within the Department, within the Federal government (ITC, DREE, CMHC, INA, etc.) and outside the Federal government (provincial governments, industry and universities, and the general public), and

(c) the nature of federal-provincial jurisdictional relationships with respect to forestry research and development and science related services.

I would be grateful for your views on these suggested terms of reference. If they are acceptable, we could begin the study right away. As a first step, I would suggest that our officials review a work plan which we would prepare and agree on a schedule for the study, which at this point we visualize will require about six months to complete. It might also be useful to constitute a Steering Committee consisting of one or two senior people from each of our departments to oversee the conduct of the study.

We look forward to cooperating with your Department in this interesting exercise.

Yours sincerely,

SIGNAL SIGNED BY
SIGNÉ PAR
LECLAIR

Maurice LeClair

Secretary of the Ministry of State
for Science & Technology

Deputy Minister
Environment Canada

Sous-ministre
Environnement Canada

DEC 9 1975
1300-2

Ottawa, Ontario.
K1A 0H3

DEC 3 1975

Dr. Maurice LeClair,
Secretary of the Ministry of State
for Science & Technology,
270 Albert St.,
Ottawa, Ontario.
K1A 1A1

Dear Dr. LeClair:

Thank you for your letter of November 25 about MOSST's study of the role and program of the Canadian Forestry Service. The suggested terms of reference seem eminently appropriate.

Mme Sauvé gives high priority to development of a national forest policy. As you suggest, your study will undoubtedly contribute greatly to preparing the federal position on forestry research and science related activities vis a vis the provinces and the private sector. I hope it will also yield some insight into the adequacy of forestry research generally in Canada in light of the social and industrial importance of Canada's forest resources.

I am looking forward to your findings. You may rely on receiving whatever information and cooperation from my department necessary to enable you to complete the study on schedule.

Sincerely yours,

J.B. Seaborn

P.S. I shall let you have the names of our senior people for a Steering Committee in a few days, when [illegible] Trevor returns from his leave.

[illegible]

OFFICE OF THE SECRETARY
DEC [illegible] 1975
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Major Themes of Discussions with: RESEARCH ESTABLISHMENTS

Mission and Program Development

- What is the mission of R&D Establishment?
- Does the establishment perform R&D exclusively for Departmental purposes or if it identifies undertaking projects for outside 'clients'?
- What are the criteria of project selection?
- Who determines the scientific merit of work and how is it determined?

Internal and External Advisory Committees

- Are there 'internal' Establishment committees concerned with project development? What are their functions & composition?
- Are there 'external' Advisory Committees of the Establishment? What are their functions & composition?
  Are they responsible for assessing:
  * whether a R&D program is relevant?
  * what priority it should get?
  * what funds be allocated?
  * what is the future of the project, in terms of bringing forward it into developmental stage?
  * what is the feasibility of direct application of its result?
  * what is the future going to be like & the problems of tommorow? (articulating long-term or future problems?)
- How independent is the Advisory Committee's Membership of the Research Establishment?
- How often do these Committees meet?

Client-orientation of Programs

- Who does the lab. identifies as 'client'? Is client asked to contribute towards project development - level of involvement?
- Is client aware that the work is being done on his behalf?
- Does the Establishment carry out joint program with other federal establishments and clients?
- Does the Establishment pursue a policy of contracting in/ contracting out?
- How is a Collaborating Agency defined? At what stage and levels are they involved in program development?

Personnel

- What is the academic and professional background of establishment director and senior research staff? Is there any exchange/rotation of staff with the Departmental Headquarters, Industry & University?

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- What is the status of establishment personal and other operational and capital expenditures?

  (Age, salary, qualifications, OM costs, capital costs)

- What is the criteria adopted for appraising research scientists and technologists?

Long-Range Planning & Appraisal

- Are the opportunities for areas of research in future explored & identified through a systematic long-range planning and appraisal of past projects?

Relationship with other Establishments

- What mechanisms are available to coordinate activities with other research establishment? What is establishment's perception of others' roles (eg. National Institutes' perception of regional research centres and vice versa)?

Environmental Research

- What has been the shift towards Environmental Research since joining DOE in 1971?

- What is the nature of 'Integrated Environmental Projects'?

Staff and Line Relationships

- How effective has been the reporting through Regional Director General's office?

- What type of role is visualized for the SDG's office?

Major Themes of Discussions with: PROVINCIAL GOVERNMENTS

Roles and Programs

- What role is visualized of the Federal Government in forestry R&D, and of CFS in particular?

- Can Province identify specific areas in which the effort must be Federal? Should the province be developing its own research capabilities?

- At what level, provincial government's research activities are conducted (pure, applied, developmental-experimental)? What are the general areas of research?

Association with CFS

- What is the nature of historic association with CFS?
  * cost-sharing agreements
  * utilization of CFS's in-house facilities
  * cooperative research programs
  * joint committees

- How does CFS coordinates its research activities with the Province?

- How frequently formal meetings take place with CFS - committee strucutre, terms of reference, composition of membership?

- To what extent CFS research has been useful to the Provincial Government?

Provincial Involvement with other Federal Departments and Agencies

- Has the Provincial Forestry related Departments got special bilateral agreements with federal agencies other than CFS on research matters pertaining to forestry and environment? What are their terms of reference and the current status?

- How closely integrated are the concerns of Resource Development and Environment within the Provincial Government?

- Should the CFS be involved more extentisvely in future joint federal-provincial agreements which deal with developing technical capability of the Province in the forestry sector?

Major Themes of Discussions with: UNIVERSITIES

Roles

- In what areas universities can provide leadership in forestry research?
- What role do you visualize for CFS in forestry research?

CFS - University Interface

- What is the nature of participation of the university in CFS advisory committees?
- To what extent, the university has found the CFS research results useful?
- Does the university utilize CFS 'in-house' facilities?
- Is there any exchange of scholars, supervision of Ph.D. students by CFS staff, any policy of adjunct professorship?
- How useful will be location of CFS research establishments on the campus?
- To what extent, forestry faculty is dependant on funding by the CFS?
- Should CFS revert to its 'block grant' policy or insist upon for directed research related to its mission?
- To what extent forestry schools are orienting their curriculum to integrated resource management?

Janaury 1976.

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Major Themes of Discussions with: INDUSTRY

Role

- What role is visualized of the Federal Government in forestry R&D, and of CFS in particular?

- In what way, CFS should or does complement the industrial R&D effort in the forestry sector. Why?

Association with CFS

- Does the industry provide any input into CFS's industry related programs? What are the mechanisms available to do this?

- Are the 'in-house' facilities of CFS utilized by the industry and vice-versa?

- Is the collaboration with CFS done on 'industry' basis (through associations) or on individual company basis.

- To what extent research results generated within CFS labs. have been useful; and what are the mechanisms through which results transferred?

January 1976

CFS PROJECT DEVELOPMENT AND TECHNOLOGY TRANSFER ACTIVITIES

This paper summarizes and interprets data related to the CFS program obtained through an examination of annual 'Program Work Plans' and a survey-questionnaire sent to the CFS research establishments. It was designed to provide insights into the processes of R&D program development and technology transfer at the research establishment level.

Methodology

Two sets of questionnaires were developed: (a) Program Work Plan Analysis; and (b) CFS-Client Interaction Questionnaire (attached). The data collection was done at the project level to facilitate grouping of a number of related studies under one subject-area, and to follow the same grouping denominator used by CFS.

The first questionnaire examined the status of current CFS projects, while the second dealt with more specific data which was obtained directly from the directors of CFS establishments. The questionnaires were designed to find out: the origin of projects and identification of clients; the life span of R&D activities undertaken; and the mechanisms used for transmitting research results to users.

To determine a pattern of change and emphasis in the related CFS activities, years 1971; 1974 and 1976 were chosen for the survey.

Data Analysis

a) Origin of Projects and Client Orientation

Table I: Origin of Projects (in percentage)

	NFIs [2]		RFRCs [3]		FPLs [4]	
	71-72 %	74-75 %	71-72 %	74-75 %	71-72 %	74-75 %
Federal Departments [1]	63	62	56	45	44	45
National Advisory Council	5	4	-	-	-	2
Regional Advisory Council	-	-	14	20	49	50
Provinces	18	21	17	19	-	1
Industry	13	13	13	11	8	3
General Public	-	-	1	2	-	-
Others	-	-	-	3	-	-
	100	100	100	100	100	100

Source: CFS-Client Interaction Questionnaires

Notes: 1. CFS, DOE and other federal departments; 2. National Forestry Institutes; 3. Regional Forestry Research Centres; 4. Forest Products Laboratories.

Table I shows that in the case of Regional Forestry Research Centres (RFRCs) and the National Forestry Institutes (NFIs), a dominant portion of the projects originated within the federal departments, mainly the CFS establishments themselves. In comparison, relatively few projects began at the initiative of provinces, industry or the regional advisory councils or committees.

Furthermore, there was not much use made of the advisory councils, either regional or national, in sponsoring projects. Only in the case of Forest Products Laboratories (FPLs), 50% of their projects originated with their advisory councils (the research program committees). With regards to the RFRCs, 20% of their projects in 1974 came from the regional advisory committees, while in the case of NFIs only 4% of the projects were shown to have begun at the initiative of national advisory councils.

In general, for each group (RFRCs, FPLs and NFIs), mention of a specific client or customer on whose behalf the work was being done was rarely made.

The preceding examination suggests two aspects. Firstly, a majority of CFS R&D activity is carried out without an explicit identification of its client customer. Secondly, the consultative role to be played by the advisory committees/councils in project selection and their sponsorship, with the exception of FPLs, has not yet been adequately realized.

In this regard, the CFS should minimize the number of R&D projects generated within its own establishments, and make the CFS program increasingly relevant to the needs of external clients. Thus, a more active participation of advisory councils, both regional and national, in project-development is needed. In addition to the sponsorship of projects by advisory councils, CFS should identify a specific client/customer on whose behalf the R&D is being undertaken.

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b) Short-term / Long-term Orientations of R&D

Table II: Life Span of R&D Projects

CFS Establishments	Short-term under 5 years		Medium-term 5-10 years		Long-term over 10 open-ended		TOTAL	
	#	%	#	%	#	%	#	%
National Forestry Institutes (NFIs)	12	35	3	17	21	58	36	100
Regional Forestry Research Centres (RFRCs)	19	10	42	22	128	68	189	100
Forest Products Laboratories (FPLs)	11	27	21	51	9	22	9	100
Total Number	42		66		158		266	
Percentage		16		25		59		100

Source: CFS Program Work Plans, 1975-76

Table II shows that 59% of CFS projects were long-term, either more than 10 years or open-ended. Of the remaining 41%, 25% were of 5 to 10 years duration while only 16% of the projects were shorter than 5 years.

The RFRCs had the largest share of on-going long-term projects, 68% of the total number of projects. In the case of NFIs, the long-term projects constituted 58%. For the FPLs, their number was significantly lower, only 22%.

In many cases, long-term project-orientation tended to arise because of a broad definition of the problem area. At places, it was difficult to differentiate the stated problem area for a project from its subject discipline. Usage of "biological deterioration of wood" as a problem is a good example of this tendency.

A long term or open-ended approach to research programs often results in a commitment of resources without sufficient flexibility to re-allocate manpower, or financial and capital resources, when priorities need to be changed. Consequently, the CFS should look more critically at their R&D projects to ensure that the packaging of individual research studies into a project is done only after careful scrutiny; and that the project is directed to a concrete forestry problem to be solved within an agreed time-frame.

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c) Collaborative Orientation

Table III: Number of Collaborative Agencies

CFS Establishments		Number
National Forestry Institutes	(NFIs)	77
Regional Forestry Research Centres	(RFRCs)	175
Forest Products Laboratories	(FPLs)	67

Source: CFS Program Work Plans, 1975-76

The Program Plan shows that a majority of CFS research establishments made use of 'collaborating agencies'. For example, during 1975-76, 175 of these agencies were identified in research programs of the RFRCs (Table III). The definition of collaborating agency was very loosely applied from one CFS establishment to another. In some cases, it referred to those who provided services free of cost (including other CFS establishments) while in other cases, contractors were included as collaborators.

Collaboration with other related agencies is useful in two ways. It involves the potential users of research in the R&D process, thereby familiarizing them with work being undertaken within the CFS establishment. It also provides CFS scientists an opportunity to get closer to the client in an attempt to understand the problems of application from his point of view. In practice, the mechanism has been used narrowly so that neither of the above aims have been effectively supported.

Attention must be paid to 'collaboration' because it is a key to effective technology-transfer. Provinces and industry should not be considered only as providers of a service (land, equipment, manpower) but as a client to whom the knowledge generated has to be eventually transferred, and who must become self-reliant in that problem area in the long run.

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d) Role Orientation

(i) Regional/National

Orientation of CFS establishments towards 'Regional' and'National' problems was examined by analyzing perceptions of the establishment directors regarding major thrusts of their research projects. Table IV shows that for FY 1974-75 under 'Regional' orientation, 66%, 18% and 13% of the RFRC, FPL and NFI projects could be grouped in this category. Under 'National' for the same year, only 4% of RFRC projects belonged to this category, whereas 37% of FPL and 30% of NFI projects could be grouped under the same heading. Some projects were identified as having both 'Regional' and 'National' implications. NFIs had the highest number of projects, in this group (57%); FPLs followed the NFIs pattern (45%); while RFRC project orientation in this direction was relatively small, 30% of its total number.

Table IV: National, Regional, Regional-National Projects

	National Forestry Institutes		Regional Forestry Research Centres		Forest Products Laboratories	
	1971-72 %	1974-75 %	1971-72 %	1974-75 %	1971-72 %	1974-75 %
Regional	11	13	60	66	18	19
National	32	30	4	4	38	36
Regional/ National	58	57	36	30	45	45
TOTAL	100	100	100	100	100	100

Source: CFS-Client Interaction Questionnaire

From the above data, it would appear that National Forestry Institutes perceive their work having both 'Regional' and 'Regional-National' orientations. Increasing tendencies in this direction should be avoided as this will lead to role-conflict with the Regional Research Centres.

(ii) Environmental

'Environmental Projects' refer here to those projects in which CFS research establishments have an interface with other directorates of DOE's Environmental Management Services (Inland Water Directorate, Canadian Wildlife Service, and Lands Directorate).

An examination of CFS research projects for the year 1975-76 show (Table V) that only 13% of the total number of CFS projects could be categorized as 'environmental'. The Forest Products Laboratories, because of their industry orientation, understandably had no projects which could be categorized within an integrated resource management concept, 18% of the RFRC projects could be described in this category. This trend was not consistent, one region having 25% of its work in the environmental management area whereas another establishment had only 5% environmental projects. In the case of NFIs, environmental projects constituted only 12% of their total.

Table V: Projects with Environmental Orientations (1975-76)

CFS Establishments	a Environmental Project No.	b Total Projects No.	% a/b
National Forestry Institute	6	45	12
Regional Forestry Research Centres	23	128	18
Forest Products Lab.	-	46	-
TOTAL	29	219	13

Source: CFS Program Work Plans, 1975-76

The preceding examination suggests that it is necessary for CFS to minimize its earlier approach of perceiving single discipline-interest problems, and shift towards an examination of forestry problems in a forest eco-system context. An increase in the number of environmentally oriented research projects is essential, especially at the RFRCs. This will help CFS to re-orient its research programs in a broader problem area context.

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CFS has tremendous potential in the forestry sector to initiate broad-based environmental R&D programs, utilizing the services of other EMS directorates. CFS must take a positive lead and utilize these opportunities. It should be pointed out here that this recommendation is not being made because CFS is a part of EMS, but because even if CFS should exist in a different configuration in the future, its credibility and the usefulness of its programs will still be very much dependent on the adoption of this broad systems-oriented approach to forestry problems.

e) Technology-Transfer

To assess the effectiveness of research results and the mechanisms through which the results are transmitted outside the CFS establishment, the survey sought to ascertain patterns of requests by users, and the means through which the results were transferred to them.

(i) Users

Table VI: Source* of Requests for CFS Services and Research Results

	National Forestry Institutes		Regional Forestry Research Centres		Forest Products Laboratories	
	1971-72 %	1974-75 %	1971-72 %	1974-75 %	1971-72 %	74-75 %
Federal Departments & Agencies	26	23	24	39	7	9
Provinces	13	12	16	5	4	9
Industry	21	16	21	23	79	68
General Public	40	49	38	32	9	14
TOTAL	100	100	100	100	100	100

Source: CFS-Client Interaction Questionnaire
Note: *Excludes Others

As per Table VI, an examination of requests for services and research results received by CFS from its 'clients' showed that the primary source of requests, during 1974-75, in the case of RFRCs were provinces (39%); while in the case of FPLs and NFIs the major clients, industry (68%) and general public (49%), respectively. In the case of NFIs, the second largest source of requests originated within the CFS and other federal departments.

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Observing the change in pattern of requests over a 4-year period (1971-72 to 1974-75), it was noted that there was a decrease in the number of requests from industry for the FPLs,from 79% to 68%; whereas in the case of Regional Forestry Research Centres, there was an increase in the number of requests from provinces - 24% to 39%. In the case of NFIs, no significant changes were noticeable.

Two main considerations arise.

- Firstly, as provinces and industry are CFS's major clients, more effort should be made to attract their attention to CFS R&D activities.
- Secondly, a detailed regular and consistent record of principal requests and their originators should be maintained by all CFS establishments.

(ii) Mechanism

As Table VII shows, seminars and publications were the most frequent means of technology transfer.

Table VII: Technology-Transfer Mechanisms

	National Forestry Institutes				Regional Forestry Research Centres				Forest Products Laboratories			
	1971-72		1974-75		1971-72		1974-75		1971-72		1974-75	
1.Patents No.	-		5		8		6		1		5	
2.Seminars No.	64		66		35		68		38		66	
3.Publications (% of total)												
Journals	50	100%	50	100%	69	100%	57	100%	55	100%	50	100%
Dept.Reports	5		12		5		2		8		12	
Info.Reports	35		32		18		38		29		32	
Bi-monthly Research Reports	10		5		8		3		8		5	

Source: CFS-Client Interaction Questionnaire

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Among the publications, emphasis on journal papers seemed to be most prevalent. Almost half of CFS publications were journal contributions and 30-38% of the publishing effort dealt with 'Information Reports'. Significant changes were evident only with the FPLs, and the number of their Information Reports doubled from 18% to 38% from 1971 to 1974. A significant shift was also noted in the number of seminars held by the FPLs and NFIs. They showed a 100 percent increase over a four-year period.

A lot of emphasis was laid upon 'direct transfer of information to client'. However, no consistent set of data was available for a comparative analysis. One establishment showed this transfer as 20,000 whereas another indicated 'many', while a third mentioned a figure of around 300. No records of requests mailed, seminars, telephone inquiries, and field consultations have been maintained.

An assessment of the implementation of research results was also done by examining statements of project-termination as described in the Program Work Plan. A post-completion assessment of research work was rarely done; it was only visible in one case, that of the Forest Products Laboratories.

It appears that technology transfer, a vital aspect of R&D management, has been largely neglected. Although almost every research establishment is now developing 'Public Awareness' and 'Technical Services' programs, the efforts do not appear to be well coordinated at either regional or national levels. A rationalization of mechanisms for information transmission and understanding of the recipient's technical competence has not yet been seriously considered. At the same time, delivery mechanisms have, in some cases, been misused. One critic of CFS pointed out that information reports for example, generally contained the 'left-over' matter which was not accepted for publication in journals.

Significant effort must be made to complete the R&D 'project development-user' feedback loop. It is essential that prior to project formulation, the research establishments should have sufficient information on the users' technical competence and the knowledge of regional, national and national market conditions with regard to economics of application of results.

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At the same time, post-completion assessment of a project should be seriously considered. A project must be considered successfully completed only when its results are being effectively applied or utilized. Research results for their application often need pilot-testing, demonstration-seminars, and a wider publicity. A great deal of economy in this direction can be achieved, as stated above, by the users' early involvement and commitment in the R&D processes.

Special attention should be paid to find out how the research results can be effectively transferred; at what stage the potential user should be involved in R&D processes; and the lessons which could be learned from the research information still lying dormant in the CFS establishments.

A detailed and regular system of monitoring information-transfer throughout CFS is required. A consistent approach to this aspect will seek to develop a record of pattern of requests for the results from various clients, and usage of delivery mechanisms such as publications, seminars, field-trials. These data will not only improve the quality of the mechanisms but enable them to reach the 'right' user, and contribute to planning of research in future.

f) Long-range Planning (Table II)

Of the 13 establishments, only 3 CFS establishments had specific projects which dealt with long-range planning. However, these projects, under an economist's guidance, were confined largely to the activities of annual program review and budgetary forecasts. None of the CFS establishments, including the SDG's Office, supported a major effort to identify and consider long-range problems to define opportunities for future S&T within the forestry sector.

It should be stressed that long-range planning projects on an on-going basis should be initiated at the Regional level with a clear definition of their roles and objectives. They should deal with more than mere data-collection or preparation of annual program forecasts and must be well coordinated with the relevant national activities. They should project into future areas in a systematic manner to anticipate needs, problems and subsequent demands imposed upon regional forestry systems. In view of the above, they should participate in the identification of opportunities for future S&T and of the capabilities within CFS to meet the problem areas.

Survey of Canadian Forestry Service Science Activities

CFS - Client Interactions Questionnaire

SECTION 'A': STATISTICAL DATA

1. Name of Establishment _____

2. Head of Establishment _____

3. Address _____

_____

4. Region _____

5. Reporting Year 1971-72 and 1974-75

6. Origin of Projects: Projects were undertaken in response to requests from:

Number of Projects.

	71/72	74/75
Own Establishment Other CFS Establishment Other DOE Services Federal Department / Agency National Advisory Council Regional Advisory Council Province Industry General Public Others		
Total		

7. Research Utilization:

a) Information Transfer

	71/72	74/75
i) Number of Patent Applications ii) Number of Publications Journal Departmental Publications Information Reports Bi-monthly Research Notes iii) Seminars iv) Direct Transfer of Information to Clients v) Others		

b) Number of Requests from Clients for Services and for Utilization of Research Results.

	71/72	74/75
Other CFS Establishments DOE (e.g. Fisheries, Wildlife, Inland Waters etc.) Other Federal Departments / Agencies Provinces Industry General Public Others		

8. Number of 'Interestablishment' Projects

Year	Within CFS Establishments	With Others (identify)
1971-72		
1974-75		

9. Number of 'National', 'Regional', 'Regional-National' Projects

Year	Total	Regional	National	Regional-National
1971-72				
1974-75				

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SECTION 'B': INTERPRETATIVE DATA

(Add sheets if space below is insufficient)

10. Assessment of Research Needs

a. Taking into account your own knowledge of Forest Resources Research activities in Canada and elsewhere and the forestry related issues facing Canada, what aspects of forestry resources research should be emphasized more strongly at this time?

b. Are available results of R&D on forest resources, with which you are most familiar being applied as effectively as they could be in Canada? If not, what are the main problems to effective application?

c. If manpower and other limitations could be removed, what additional research projects would be needed to satisfy the objectives of your establishment or agency? Please list projects in order of priority and give a rough estimate of total costs and manpower requirements?

Upon completion, please return the questionnaire to Dr. D.E. Read, Government Branch, Ministry of State for Science and Technology, 270 Albert Street, Ottawa K1A 1A1.

Explanatory Notes

This questionnaire is to be completed by each Canadian Forestry Service Research Establishment. Establishment, for this purpose, refers to the CFS Regional Research Centres, Forest Product Laboratories, and the National Institutes.

The terms used here, in general, are in accordance with the annual CFS's Program Plan prepared on the establishment basis.

'Services' refer to provision and utilization of facilities like laboratory equipment, consultary advice, transfer of forestry related information (see Item 7).

Categorisation of projects into 'Regional', 'National' and 'Regional-National' (Item 9) are based on an assessment of assumed motivation of work. The motivation considered is, however, always that of the project rather than the personal motivation of individual scientists.

Regional Projects refer to those research activities which are initiated in a region either to meet the regional client's needs or in response to special ecological characteristics of a region.

National Projects refer to those research activities which were either initiated by the Region or Headquarters; or are being coordinated by Headquarters, across two or more Regions. These R&D activities emphasize the underlying commonality of the research problem, research application and its usefulness on national scale.

In either of the above cases, the projects may have both regional and national connotations. In such cases, it will be useful to classify them also under a 'regional-national' category.

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