Perception and communication in government response to the 1977 drought in Western Canada

by

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University of Toronto
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PREFACE

Emergency and Risk Research is a series of Working Papers on research in progress. The papers are intended to be used as working documents by scientists in Canada and elsewhere involved in research on peacetime emergencies, and environmental risks, including those of natural and man-made origin.

The series also serves as a means of disseminating results and ideas quickly to interested groups in the public and private sectors, and as a means of communication between research workers and those involved with managing risks and planning for emergencies.

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Any errors of fact or judgement which remain are not theirs, nor do the views expressed necessarily represent the views of Emergency Planning Canada, or of the Institute for Environmental Studies.

Diana M. Liverman

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1. INTRODUCTION

1.1 THE PRESENT STUDY

This paper sets out to examine the organisational structures and response systems which currently operate in response to drought in the Prairie Provinces; both routine responsibilities for water resources and those emergency functions operating only during severe deficits. Two key factors in response to an emergency or resource management problem are the communication of information, and the structure and functioning of the decision making process. In order to analyse the policy structures, decision styles and information networks which characterised the 1977 drought, interviews were conducted with key federal and provincial officials. Access to some files and internal memoranda permitted more detailed study of information flows and attitudes. These data were supplemented by information obtained through written correspondence and telephone interviews, published reports and newspaper articles.

The research is a case study in policy analysis; that is, a study of the course of government action on a public problem. It relates to the expanding literature on resource management and environmental policy and provides a Canadian example of the coordination of response to a multi-provincial hazard. The report illustrates the types of jurisdictional problems that exist in the coordination of emergency response in Canada. In particular, it describes and discusses questions of federal-provincial cooperation, and elaborates the differences in hazard perception and response capability as they appear to vary between provinces, and between different levels of government.

The extensive coordination of interdepartmental, interprovincial and federal provincial activities that occurred during the 1977 drought provides an opportunity to study Canadian preparedness for natural disasters. In the event, the Canadian drought response with its information networks, decision making structures and programme implementation were not tested or stressed to the limit by the water shortage. This was partly because this particular drought, after initial signs that it would be severe, turned out to be short lived and rapidly alleviated. The nature of drought, in general,

is that compared to earthquake, floods and hurricanes, it is a slowly developing hazard and usually accompanied by several months warning. Thus emergency response for drought is usually dominated by the need for emergency planning. Nevertheless there are lessons to be learnt from the events of 1977; lessons which may contribute to a greater understanding of the Canadian capability to deal with widespread emergencies.

1.2 THE 1977 CANADIAN DROUGHT

The period from September 1976 to April 1977 was the driest on record in many parts of the Canadian Prairie provinces. Precipitation during this period ranged between ten and seventy percent of the long term average. Mountain snowpack, upon which prairie runoff depends, was low and patchy, and ground water and reservoir levels were forecast for unprecedented lows. By the end of April 1977 both the government and public feared a return to the disastrous conditions of the nineteen thirties dustbowl era - a fear which was echoed in the local newspaper headlines (Figure 1.1). Farmers were deeply concerned about soil moisture, erosion, and stockwater for spring crop planting and summer livestock pasture. Community and city water supplies were threatened. Pasture and water quality seemed certain to suffer and forest fires and insect infestations seemed likely. In the long term, unemployment, farm poverty, food price inflation and water rationing were anticipated, with depletion of natural resources of ground and surface water, fertile soil, forest and wildlife.

During early spring 1977, provincial and federal governments were beginning to recognise a potential crisis and started to collect information about the drought and to coordinate their activities with regard to the threatened emergency. Although water resources are primarily a provincial responsibility, federal officials considered the drought to have such widespread implications for Canada that federal action moved to a full scale emergency response by mid May. The establishment of drought committees in each province was paralleled in Ottawa by the creation of a federal cabinet committee, a steering committee and a Task Force to coordinate federal response to drought. Provincial and federal water development programmes were expanded to accomodate emergency pumping, well drilling and community water resource augmentation. Proposals were made for assistance to transport emergency feed supplies, emergency pastures and water transportation.

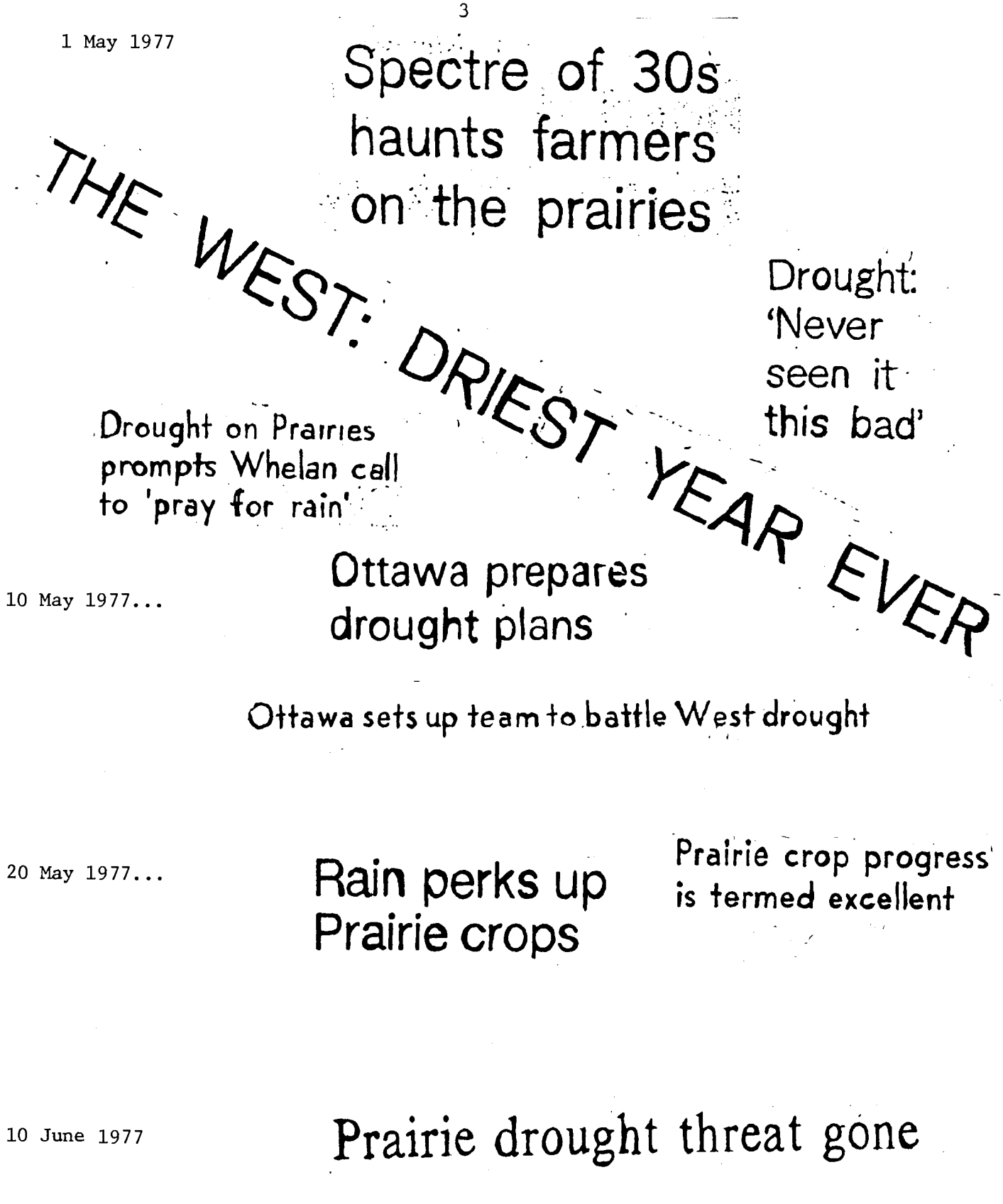


Figure 1.1 The course of the 1977 Canadian drought as reflected in Western Provinces newspaper headlines

Financial resources were set aside for the government programmes to combat the water shortage.

However in May rain fell, just at the right time for spring crop planting. Soil moisture conditions improved dramatically in most areas, and even wells and community water supplies began to recover. By June excellent crop progress and harvest prospects were being reported (Figure 1.1). Attention was turned to livestock and domestic water supply and forest fire conditions, which had still not recovered from the lack of important spring runoff. In a few areas in southern Alberta and Saskatchewan soil moisture conditions were still poor, but in general it appeared that continued summer showers together with farm pond programmes and reservoir pumping and drilling would relieve the threat of a water shortage.

By the end of the year, agricultural and economic evaluations of annual productivity indicated that little, if any, impact had resulted from the drought in the Prairies. The main effect had been on water development programmes which had not been previously tested by extreme weather conditions. Costs of the drought response were being assessed and in some cases found to be well under the initial estimates.[1] Committees were disbanded, or set aside and situation accounts and special data reports discontinued.

Thus the 1977 drought in the Canadian prairies did not develop into as severe a situation as had been feared and its impacts were much less than were forecast. Canadian conditions never reached the emergency status of the drought in the United States, particularly California, nor did the economic and social effects parallel those of the nineteen thirties' droughts. Yet provincial and federal governments had prepared themselves and had publicised programmes and policies to cope with some of the broadest effects of a water shortage.

		Provincial	Federal
1. For example in Saskatchewan	- Budgeted Costs	$910,500	$1,059,500
	- Actual Costs	$494,750	$ 934,250

Source: Saskatchewan Drought Committee Minutes 1977.

1.3 DROUGHT IN THE PRAIRIE PROVINCES

Drought is said to be endemic to the Prairies . The variability of rainfall in chronicled both in the history of prairie settlement and in earlier physical and biological evidence of climatic fluctuations before the white settlers arrived. The annual rainfall records for Regina and Winnipeg show the wide range from year to year that characterise the Prairies (Figure 1.2). The area most affected by drought lies in the southern part of Alberta and Saskatchewan, an area known as the Palliser Triangle (Figure 1.3a). This corresponds to the area with the greatest moisture deficit for most years (Figure 1.3b).

Droughts have occurred historically in 1805, 1816-19, 1840's, 1862-64, 1868 and 1894 as well as the infamous 1920's-30's (MacKay and Allsopp, 1977). In the early days, drought was primarily an agricultural hazard, but with increasing urban and industrial expansion, drought today affects non-agricultural populations directly through its impact on urban water resources. Population growth in the Prairie Provinces has increased from less than half a million people at the beginning of this century to over 3 million people today, of which more than half are urban dwellers (Figure 1.4).

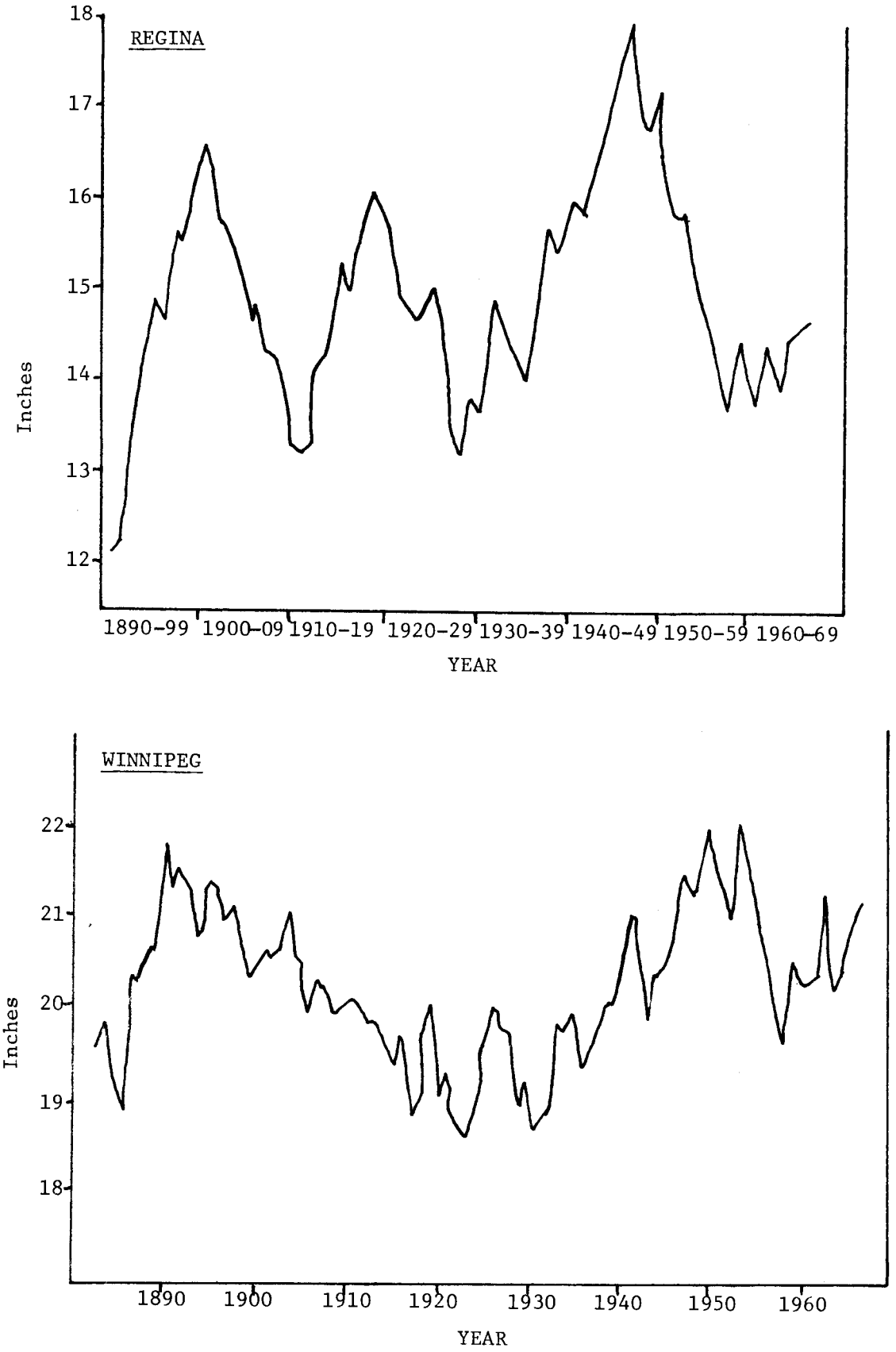
Drought is not simply low rainfall but an environmental condition in which

"there is a lack of water to meet requirements" (WMO, 1975b, p.3)

Drought can result from lower rainfall (reduced supply) or more water use (increased demand), or from both. In the Prairie Provinces, demand for water has steadily increased through both agricultural and industrial development, particularly since the mid-nineteenth century. At the same time, supply of water has continued to vary with the wide annual fluctuations of rainfall despite the development of surface reservoirs and groundwater aquifers to act as water storage buffers. Overall, the margins between water supply and water needs have been getting systematically narrower, and more dependent on modern water supply schemes.

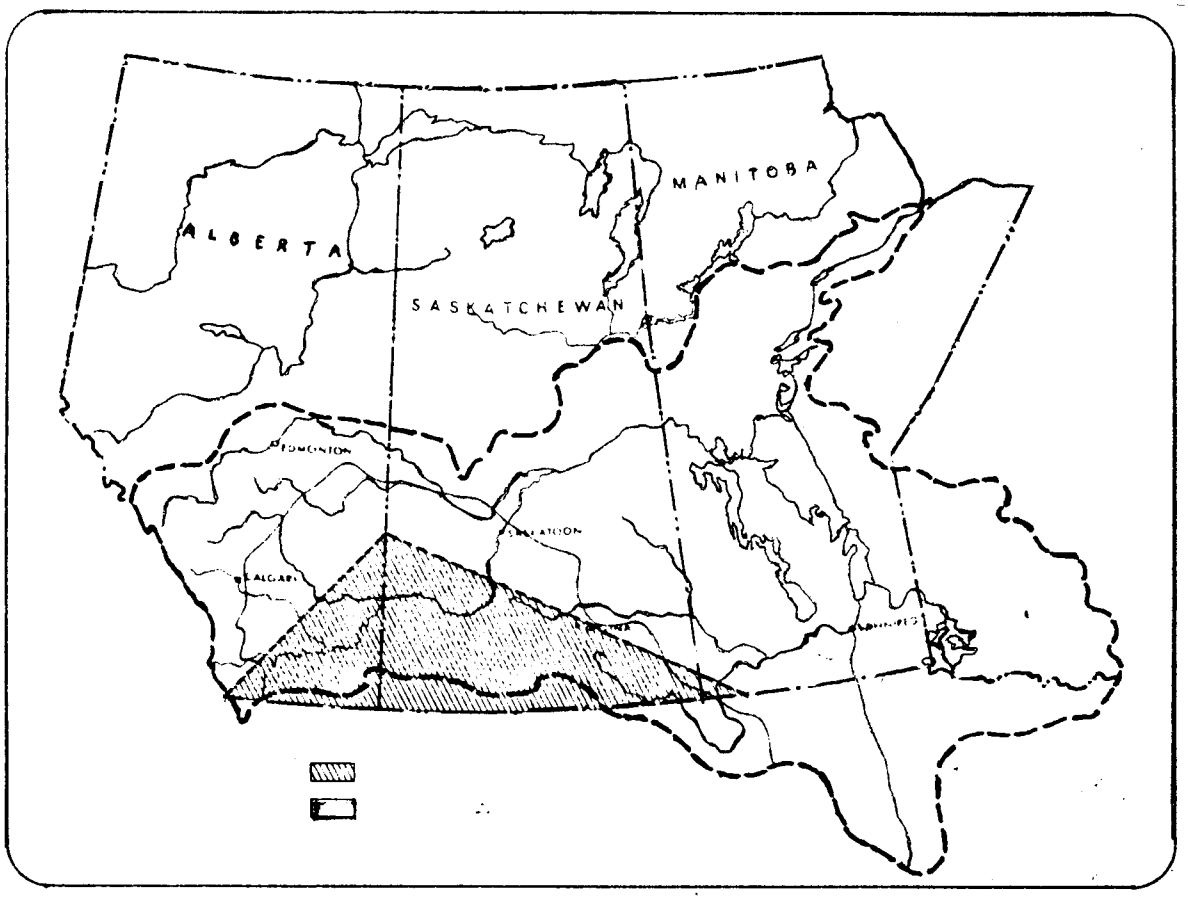
Thus drought is not simply a function of low rainfall but of a complex chain of interactions between human water use and environmental conditions.

Figure 1.2 Annual precipitation variability at Regina and Winnipeg, 1890-1970

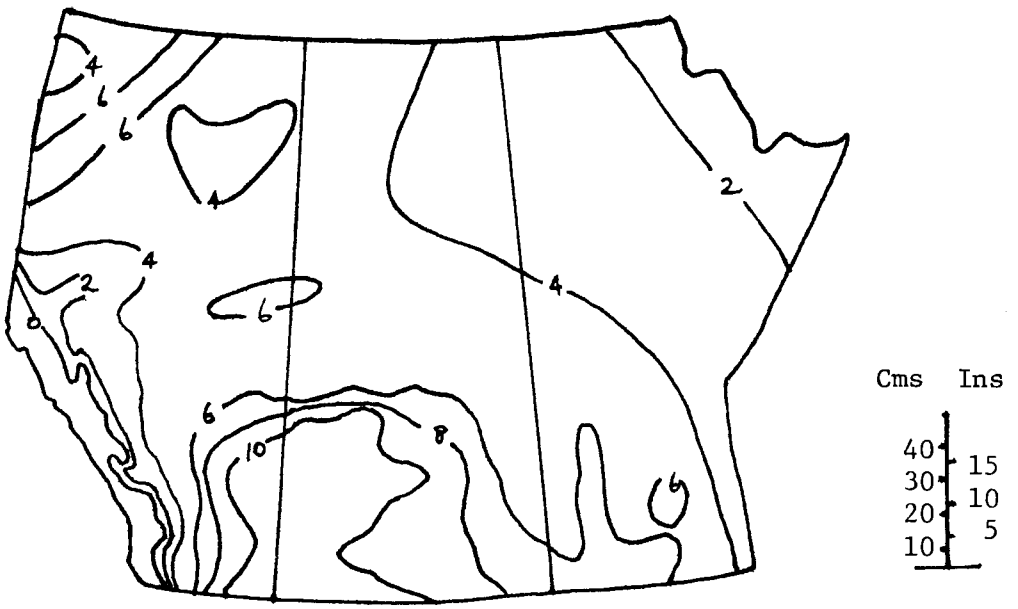


Source: Canada Dept. of Agriculture, January 1977, pp. 22-23

Figure 1.3 Drought affected areas of the Prairie Provinces

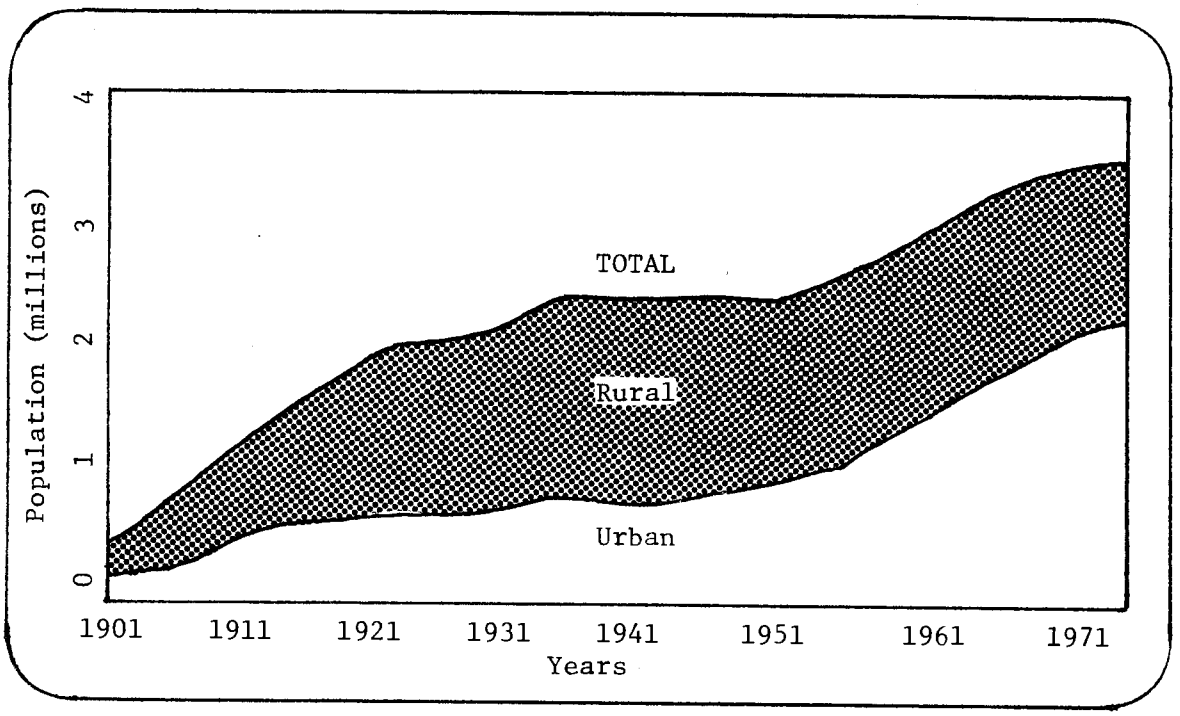


(a) The Palliser Triangle and the 1930's drought area



(b) Average Moisture - Inches 1921-1950 Deficit (Thornthwaite procedures) 4" storage.

Figure 1.4 Population growth in the Prairie Provinces 1901-1971



Source: Saskatchewan Nelson River Basin Study, Vol. II, p. 36

Drought impacts can affect not only short term crop production but also include pasture deterioration and livestock deaths, wind erosion and soil loss, forest fires, urban water shortages, industrial losses and even wide scale unemployment. In the period of history most closely associated with drought in the Prairies - the 1930's - low rainfall was only one cause in a web of circumstances, in which farming in marginal areas, disease, pests and economic depression combined to produce a major economic disaster. Today, adjustments to drought include not only agricultural ones but a whole series of technological, social and institutional strategies (Table 1.1).

In the early thirties government response was limited to emergency relief in the form of feed, shelter, fuel, seed feed and other supplies, directed particularly to southern Saskatchewan. The possibility of rehabilitation and mitigation was not considered until the end of the decade when both federal and provincial governments began longer term planning.

The most significant measure was the setting up of the Prairie Farm Rehabilitation Administration (PFRA) in 1935, established to formulate and implement programs for improved dryland farming practices, land utilization and water development.

The demonstrated sensitivity of the prairie region to agricultural and urban water deficits has led to strong institutional and individual response to the risk of drought. Politically, responsibility for water resources and emergency planning has been divided between federal, provincial and municipal governments and several semi-autonomous agencies. Both federal and provincial governments have made efforts to monitor and evaluate drought occurrence and impact, with the financial burden of loss shared between all three levels of government. In some cases drought creates new water management problems, but more often a water shortage today tends to exacerbate existing problems and conflicts.

Table 1.1 Adjustments to drought in the Prairie Provinces

SECTOR	STRATEGY	ACTION
Agriculture	Change cultivation practices to conserve soil moisture and reduce wind erosion	Summer fallow Summer Mulching Strip farming Shelterbelt construction (PFRA) Ploughing techniques
	Protect water supplies by reducing evaporation and seepage	Line canals and ditches Plan efficient reservoirs Cover reservoirs Control phreatophytes
	Augment water supplies by increasing precipitation or expanding storage	Weather Modification Irrigation - wells - river diversion - dam construction
	Alter farming operations, land use, type of farming, intensity etc.	Change crops and livestock to less sensitive/hardier types Improve existing stock Disperse land holdings Increase farm size Change cropping plan, plant later Buy in feed Store feed Feed crops to cattle Reduce livestock numbers Move livestock to other pasture Diversify operations Diversify employment Create community pastures
	Financial protection to alleviate or reduce economic impact	Establish insurance and credit Encourage savings
	Relief and Rehabilitation	Provide food, clothing, shelter
	Control demand	Population of people and animals Use crops and animals requiring less water Reduce exports
Forestry	Improve fire fighting	Recruit more fire fighters Increase water supplies
	Reduce risk	Restrict camping, etc. Create fire belts
Urban/ Industrial	Increase storage	Build reservoirs Increase use of natural storage
	Increase supply to storage	Transfer water Pump groundwater Haul water Manage watershed, afforestation, snow barriers etc. Weather modification
	Reduce losses	Seal pipes and canals Reduce evaporation Recycle water
	Change quality	Educate/change public attitudes Chlorinate Desalinate
	Alter demand	Meter linearly Price on sliding scale Restrict use, lawnwatering and pool filling, car washing, industry Educate Inform Control population, industrial development, energy development.

Source: Gray (1971), Smith (1972), Manitoba MREM (1977), Warrwick (1970)

2. RESEARCH DESIGN

A case study approach was adopted; that is, an in-depth examination of a specific event, rather than a sample survey across a spectrum of events.

It was decided to limit the study to the Prairie Provinces, although both British Columbia and Ontario suffered drought conditions in 1977. However these two provinces did not play important roles in the drought response; they had small committees and were the source of relatively few communications in the federal or interprovincial drought files. Traditionally the three Prairie Provinces, Alberta, Saskatchewan and Manitoba, have coordinated water resource management in frameworks such as the Prairie Provinces Water Board and Saskatchewan-Nelson River Basin, and federal programs such as the Prairie Farm Rehabilitation Administration and Feed Freight Assistance have been aimed at the three Prairie Provinces in a similar fashion. The prairie region has relative geographical, ecological and cultural homogeneity and has often been studied as a recognisable economic or political unit.

Fieldwork took place in Alberta in December 1977 and in Saskatchewan and Manitoba in February 1978. Visits to Ottawa were made in December 1977 and March 1978. Analysis of documentary materials and interview data took place between March and June 1978 and a draft report prepared September-October 1978.

2.1 RESEARCH QUESTIONS

The main objective of the study was to examine the roles of communication and perception in the coordination of government response to the 1977 threat of drought. It was hypothesised that organised government agency response is a function both of structural characteristics and individual behaviours within those structures, and that the crucial linking processes are perception and communication.

The research was designed to obtain information in relation to drought response on:

a) structural characteristics of each agency

- role and responsibilities, both formal and informal
- spatial jurisdiction
- routine and emergency responsibilities and programmes for water
- water data collection and dissemination activities
- establishment of intra-agency committees for drought

b) structural characteristics of the interagency network

- formal and informal interagency organisational links
- relative roles and jurisdictions
- routine and emergency liaison procedures, committees etc.
- data collection and dissemination between agencies
- routine and emergency interagency programmes (including initiation, financing, timing and distribution)

c) behaviour of key individuals

- routine and emergency role of individual
- membership of relevant committees, groups
- professional training and experience
- role in receiving and communicating different type of information
- previous experience of drought, emergency planning

d) perception of key individuals

DROUGHT RELATED

perception
- of drought water shortage, and relevant criteria
- of own and others capability for predicting drought
- of drought impacts and their severity
- of 1977 drought events

IN RELATION TO STRUCTURAL CHARACTERISTICS

perception
- of own role and own agency's role
- of other agencies' roles
- of interagency committees, arrangements, programmes
- of monitoring, forecasting information
- of short term and long term response
- of effectiveness of coordination

These research questions form the framework for the interviews and analysis of documentary sources. Information obtained in response to them enables an overall picture to be drawn of provincial, federal and inter-agency activities as the events of the 1977 drought unfolded. As far as possible, sources were cross-checked to verify information on the structural characteristics of government behaviour. In addition, the study began to explore the perceptions and behaviour of key individuals, largely within government agencies, to try to isolate the roles of individual perceptions and personal communication patterns on which, ultimately, organisational behaviour is based. Here, more reliance has to be placed on individual responses since cross-checking is often not possible to verify data.

2.2 RESEARCH METHODS

Two main methods were used; unstructured, key actor interviewing and content analysis of documentary materials. These were supplemented by questionnaires designed to obtain specific data on meteorological drought impact information flows between government agencies.

Interviews: Key actor interviewing differs from standardised interviewing studies in two important respects:

1) the interview is semi-structured, or individually tailored to each interviewee, because their unique or expert knowledge is considered more valuable to elicit, than strictly comparative responses to standardised questionnaires.
2) the people selected for interviews are chosen for their specific role or knowledge in relation to the case study, rather than being a "random sample" in any way.

The technique of key actor interviewing is to design an interview framework of topics to be covered (Table 2.1) but to allow the interviewee to guide and define what is most relevant to him within that framework, and to allow him to take the lead in ordering topics for discussion. The technique relies on the development of trust and respect between researcher and interviewee during the interview. When analysing the interviews, responses cannot be considered as equal in weight (as in random sampling techniques) and statistical comparisons are not made. However, the validity and reliability of the information given can be checked wherever possible by comparing

Table 2.1 Interview Framework

1. Actor/organisation characteristics
   - role and responsibilities of your organisation
   - legislated, formally defined, informal
   - spatial jurisdiction of your organisation (map?)
   - role of interviewee during regular operations
   - special responsibilities for water in routine work
   - additional role in water shortage situations
   - membership of ongoing and emergency committees
   - training of interviewee (professional qualification)
   - experience in water resources
   - experience of droughts
   - experience of emergency planning
   - relevant affiliations (farming ties?)

2. Organisational links
   - ongoing committees and communications
   - informal links
   - emergency coordination
   - drought stimulated contacts, now ongoing
   - interprovincial
   - federal-provincial
   - international
   - perception of others' roles
   - key or supporting actors

3. Communication and collection of information on drought and water resources
   - what data do you/this department collect?
   - where? how often? (maps, examples?)
   - what data do you receive from others?
   - who? how often? reliability?
   - who do you send data to?
   - which are the most useful data to you?
   - is the monitoring network adequate?
   - were data on drought sufficient and timely?

4. Definition and understanding of drought phenomenon
   - what is a drought?
   - physical characteristics
   - political, social, economic character
   - criteria for a drought problem
   - perception of what is a severe drought
   - when is a water shortage a disaster?
   - is there a role for EMO type response?

5. Forecasting capability
   - do you forecast for drought? how?
   - when can you make a forecast?
   - what is potential for long term prediction?

6. Drought impacts
   - what type of impacts might occur here?
   - what happened in 1977?
   - timing and spatial distribution
   - severity of impacts
   - when (or has) drought ended?

7. Drought response
   - ongoing problems
   - emergency programs
   - timing, financing, distribution, criteria
   - initiated by who?
   - perception of other programs
   - reason for particular programs
   - effectiveness
   - Indian reserves and National Parks
   - priorities
   - long term response

8. Coordination of response
   - establishment of committees
   - membership of committees
   - key actors and decisions
   - significant conflicts
   - long term cooperation

9. Further information
   - relevant literature
   - suggested contacts

responses with those given in other interviews, and with documentary sources such as minutes of meetings. A common reference point in the interviews was the May 20th meeting of the Task Force and specific questions were related to this. Extensive notes were taken during interviews and written up immediately afterwards. Suggestions for further contacts were followed up whenever possible.

Since the study focussed on drought management and government response all the interviews were with people who are considered experts or officials with some interest or responsibility in drought response. The choice of interviewees was guided by the formal structure of the federal and provincial organisational response as described by Emergency Planning Canada (1977). Letters requesting interviews were written to all members of the task force, interprovincial, provincial and federal committees, and in addition contacts were made with monitoring agencies and local university researchers.

Interviews were able to be conducted with about 50 percent of those initially contacted by letter. In all, 25 interviews were conducted; 10 with federal officials, 11 with provincial officials,and 4 with university researchers. In each jurisdiction (Alberta, Manitoba, Saskatchewan and federal government) at least one interview was conducted with government specialists in agriculture, environment and emergency planning. Tables 2.1 and 2.2 provide background information on this part of the study: Table 2.1 shows the design interview framework; and table 2.2 records when, where and with whom interviews were conducted.

Content Analysis of documentary material: In this study information was sought from government files, publications, research reports, media reports and the historical literature (Table 2.3). There was no central collection of data although Emergency Planning Canada and Saskatchewan Agriculture had fairly complete records of federal communications and Saskatchewan provincial operations respectively.

One way of analysing and structuring the interpretation of secondary sources (and in some cases unstructured interviews) is the technique of content analysis. Holsti (1969) describes the technique as a way of structuring the study of the content and meaning of communication where verbal

Table 2.3 Source material on drought used in content analysis study

SOURCE	DOCUMENTS		DATES
FEDERAL			
Agriculture	Agrometeorology : Soil moisture evaluation project		May-June 1977
	Economics Branch : Market Commentary		1976-77
	News Releases		1977
	Swift Current Research Station : Implications of Drought on Prairie Agriculture		April-Sept 1977
Emergency Planning Canada	Regional Director, Alberta	: Situation Reports	April-July 1977
		: Weekly water situation summary	May-July 1977
	Regional Director, B.C.	: Situation Reports	April-Aug 1977
	Regional Director, Manitoba	: Situation Reports	May-Aug 1977
	Regional Director, Ontario	: Situation Reports	April-June 1977
	Regional Director, Sask.	: Situation Reports	April-Nov 1977
	Headquarters, Ottawa	: Situation Reports	May-Oct 1977
Fisheries and Environment	Inland Waters Directorate/ Atmospheric Environment Service	: Synopsis of Streamflow and Precipitation Conditions in the Prairie Region	March-Sept 1977
		: News Releases	
Regional Economic Expansion		: News Releases	
	Prairie Farm Rehabilitation Administration	: Water Development Program	
		: Feed Freight Assistance Agreements	Sept, Oct 1977
		: Deep Community Well Agreements	July, Sept 1977
Statistics Canada		: Telegraphic Crop Report	July 1977
Interdepartmental Drought Task Force	Note on structure of Task Force		11 May 1977
	Minutes of Meetings		May-Sept 1977
	Minutes of Steering Committee/Task Force Meeting		20 May 1977
	Report		25 July 1977
Hansard Parliamentary Reports			May-June 1977

Table 2.3 (continued)

SOURCE	DOCUMENTS	DATES
ALBERTA		
Agriculture	Crop Report	
Disaster Services	Disaster Services Act; Bill 57, ch. 69	1973
	Emergencies Happen; A citizen's handbook, ADSA	1975
	Hail and Crop Insurance Act, Bill 42, ch. 164	1969
	News and Notes: ADSA Newsletter Vol. I-IV	1974-77
	Municipal Handbook for Peacetime Emergencies, ADSA	1976
	Peacetime Emergency Operations Plan, Alberta	December 1975
	Peacetime Emergency Response Procedures, Alberta	April 1977
Environment	Flow Forecasting Branch : Water Supply Outlook for Alberta	June-Oct 1977
Drought Committee	Reports : Operation Dryland 77	June-Aug 1977
BRITISH COLUMBIA		
Environment	Hydrology Division : Snow Survey Bulletin, B.C.	Jan-May 1977; Jan-May 1978
MANITOBA		
Agriculture	Research Reports : Emergency Grazing Capability	May 1977
	PFRA : Contract on groundwater	May 1977
Environment	Reports : Weather Modification	May 1977
	Groundwater Reconnaissance	
	Emergency Irrigation	May 1977
	Drought and Related Activities	
	Groundwater Levels in 1977	January 1978
	Memo : to raise dam levels	21 March 1977
Drought Committee	Report of first meeting	February 1977
	Report of meeting	19 May 1977
	Minutes of meeting with DREE and Fisheries & Environment Canada	29 August 1977
	Request for Use of Crownlands	7 June 1977
	Wheat Pool Report	16 August 1977

Table 2.3 (continued)

SOURCE	DOCUMENTS	DATES
SASKATCHEWAN		
Agriculture	Crop and Weather Reports	May-Oct 1977
	News Releases	
	Statistics	
	Wheat Pool Crop Reports	May-Oct 1977
	Extension Officer Field Reports	April-Aug 1977
Environment	Drought Reports	Mar-June 1977
Research Council	Reports	Feb-May 1977
Drought Committee	Reports	April-Dec 1977
	Memos to Committee	April-Dec 1977
Federal-Provincial Drought Committee	Reports	May, Aug 1977
UNITED STATES		
Agriculture	Weekly Weather and Crop Bulletin	April-July 1977
Wester States Water Council	Drought Conditions	
Utah Water Research Center	Western Water Stretcher	
NEWSPAPERS	Edmonton Journal	
	Globe and Mail, Toronto	
	Ottawa Citizen	
	Toronto Star	
	Winnipeg Free Press	

Table 2.2 Interviews conducted for drought study

INTERVIEW NUMBER	AGENCY	POSITION OF INTERVIEWEE	ROLE IN RESPONSE TO DROUGHT	DATE OF INTERVIEW	PLACE OF INTERVIEW	LENGTH OF INTERVIEW (hrs)
FEDERAL						
1	Agriculture	Chief Economist, Prairie Region	Chairman of Task Force	23.03.78	Ottawa	1
2	Agriculture	Economist	Fed-prov committee : liaison Ottawa	.01.78	Edmonton	½
3	Fisheries & Environment	Hydrologist, Inland Waters	Monitoring; liaison with Edmonton	09.02.78	Calgary	1
4	Prairie Farm Rehabilitation Administration	Director, Water Development	Member of Task Force	08.02.78	Regina	½
5	PRFA	Publicity Officer	Public information & relations	08.02.78	Regina	½
6	Department Regional Economic Expansion	Programme Director	Member fed-prov committee	.01.78	Edmonton	½
7	Emergency Planning Canada	Regional Director, Alberta	Information collection: liaison with EPC Ottawa	21.12.77	Edmonton	2
8	EPC	Regional Director, Saskatchewan	Information collection: liaison with EPC Ottawa	07.02.78	Regina	1
9	EPC	Regional Director, Manitoba	Member Task Force: liaison with EPC Ottawa	16.02.78	Winnipeg	2
10	EPC	Economist	Liaison and research	23.03.78	Ottawa	1
PROVINCIAL						
Alberta						
11	Environment	Engineer, Water Resources Management Branch	Monitoring of municipal water supply	20.12.77	Edmonton	½
12	Agricluture	Planning & Research Division	Drought response coordinator for agriculture	21.12.77	Edmonton	½
13	Disaster Services Agency	Executive Director) 2 people Program Director)	Coordination of Alberta Contingency plan and drought response	06.01.78	Edmonton	3
Manitoba						
14	Mines, Resources & Environ.Management	Director, Water Resources Branch	Provincial Drought Committee Chairman	17.02.78	Winnipeg	1
15	Agriculture	Assistant Deputy Minister, Technical Services	Member, Provincial Drought Committee	17.02.78	Winnipeg	½
16	Emergency Measures Organisation	Director	Member, Provincial Drought Committee	17.02.78	Winnipeg	½
Saskatchewan						
17	Environment	Operations Planning, Water Resources Branch	Member, Provincial Drought Committee	07.02.78	Regina	1
18	Agriculture	Executive Director, Farm Resources Devel.Division	Chairman, Provincial Drought Committee; Member, Interprov. Drought Comm. & fed-prov drought committee	06.02.78	Regina	2
19	Agriculture	Farm Finance Division	Secretary, Provincial Drought Committee	07.02.78	Regina	1
20	Emergency Measures Organisation	Director	Provincial emergency planning		Regina	1
21	Prairie Provinces Water Board	Executive Secretary	Information & monitoring	06.02.78	Regina	½
NON-GOVERNMENTAL						
22	University of Alberta	Researcher contracted to PPWB	Study of water deficits	27.12.77	Edmonton	2
23	University of Calgary	Researcher in Sociology	Study of emergency planning	09.02.78	Calgary	1
24	University of Manitoba	Researcher in Sociology	Study of emergency planning	17.02.78	Winnipeg	½
25	University of Victoria	Researcher in Geography	Study of 1977 drought	12.02.78	By telephone	½

or documentary evidence is the basis for inference. Given systematic categories for classifying content, and consistent criteria for categorisation, content analysis provides a degree of objectivity in assessing and comparing items or collections of information. It can be used to examine characteristics and trends in the content of documents; to make inferences about why certain information is in them; who authored them; and to examine the flow and response to information. The documents being analysed may be from a single source (person, agency); or from different sources. They may relate to quite different situations or be within a sufficiently close context to warrant direct comparison.

Content analysis is used here in its simplest form. Information content of documents and interviews was evaluated in terms of specific categories by noting the frequency with which certain themes were mentioned in each document analysed.

Questionnaire: After the interviews a short tabular questionnaire was sent to some of those people with whom discussions were held, and to others who were considered to have relevant information. The questionnaire concerned information flows relating to meteorological data and drought impact data (appendix A). Fifteen complete replies were received.

3. GOVERNMENT RESPONSE TO DROUGHT

3.1 HISTORICAL INSTITUTIONAL ROLE

Reliance on government help in drought situations is common among Canadian wheat and livestock farmers. Perhaps this results, in part, from the government programmes which started during the dust bowl years in Canada. The Prairie Farm Rehabilitation Administration (PFRA) see their image as the "drought fighters" with ready response for individual farm problems. The PFRA subsidise well drilling, dug-out planning, conservation practices and tree shelterbelt establishment, as well as the massive water development projects such as that on the South Saskatchewan River (Dept. of Regional Economic Expansion, 1960). The federal government presently operates crop insurance, grain market stabilisation, extension education services and farm credit. Provincial governments aid water development, insurance schemes, irrigation projects and farm improvement. Tax structures, incentives, price support and sales quotas all reduce the risk to the individual agriculturalist.

In other areas of water development, government involvement is primarily provincial or municipal, with institutional roles in water pollution control, water system planning, licensing, surveys, waste treatment, reservoir construction and water distribution. In many cases government monitors, regulates and acts in the use of water for power generation and industry. Municipalities receive delegated responsibility for community water supply and waste management, and the legal system moderates the individual industrial and domestic user. Institutional factors thus govern the development, allocation and use of non-agricultural water. In a drought situation where competition for water increases, systems are stressed, pollution increases, crops deteriorate and production is lowered, government agency coordination becomes an even more important aspect of water management.

3.2 ROUTINE AGENCY RESPONSIBILITIES FOR WATER MANAGEMENT

The major agencies involved in Prairie water management and development are Environment Canada, Department of Regional Economic Expansion, provincial environmental and resource management departments and the Prairie Provinces Water Board. In the agricultural sector, federal and provincial departments share responsibility, and for community water supply, provincial municipal affairs and federal Indian Affairs and Northern Development take jurisdiction (Fisheries and Environment Canada, 1975).

Table 3.1 outlines Canadian responsibilities for water and related activities. Most agencies operate semi-autonomously within the jurisdictional framework of the British North America Act. This Act, which gave the provinces ownership of natural resources; the federal government jurisdiction over navigation, fisheries and Indian reserves; and co-jurisdiction of provincial and federal governments in agriculture; guides the functional activities of respective water management and associated agencies. The federal government assumes a general responsibility for interprovincial and international waters; and, through the "peace, order and good government" clause of the British North America Act, assumes power in national crises and conflicts.

Early coordination of federal and provincial activities stemmed from the monitoring efforts of the federal water survey of Canada and related exchanges of data and information. Crises, such as the 1930's drought and 1950's floods, stimulated ad hoc coordination of response. For example, interaction was legislated through the Prairie Farm Rehabilitation Act (1935) and Canada Water Conservation Act (1953), and cost sharing agreements for disaster relief and water development have been developed. Joint basin studies such as that of the Saskatchewan-Nelson system, and bilateral agreements on specific projects such as the Canada-Manitoba Red River floodway programme, required interprovincial and federal-provincial cooperation through special boards and committees.

This ad hoc, case by case approach to coordination was considered inefficient and not comprehensive. Therefore in 1970 the Canada

Table 3.1 Canadian Responsibilities for Water and Related Activities in the Prairie Provinces

FEDERAL

FISHERIES AND ENVIRONMENT CANADA
- Inland Waters Directorate
- Atmospheric Environment Service
- Water Pollution Control
- Emergency Planning

AGRICULTURE CANADA
- Public Information and Education
- Economics
- Product Stabilisation
- Marketing
- Crop Insurance

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION
- Prairie Farm Rehabilitation Administration (PFRA)
- Agricultural Rehabilitation and Development Administration (ARDA)
- Regional Development

INTERDEPARTMENTAL COMMITTEE ON WATER - Coordinates Water Resource Activities

Environment	Indian & Northern Affairs	Industry, Tourism & Commerce
Agriculture	External Affairs	Urban Affairs
Regional Economic Expansion	Energy, Mines & Resources	Provincial Office
Health & Welfare	Transport	Treasury

FEDERAL-PROVINCIAL

CANADA WATER ACT

FEDERAL-PROVINCIAL CONSULTATIVE COMMITTEES

STUDIES:
- Saskatchewan-Nelson Basin (Alta/Man/Sask/Can)
- Qu'Appelle (Can/Sask/Man)
- Roseau
- Souris
- Water Demand Study
- Churchill
- Peace Athabasca

AGENCIES - Prairie Provinces Water Board (Can/Alta/Man/Sask)

EMERGENCIES
- Disaster Assistance
- Flood Hazard Mapping
- Joint Reservoir Development in PFRA

CANADIAN COUNCIL OF RESOURCE MINISTERS

PROVINCIAL

ALBERTA		SASKATCHEWAN	MANITOBA
Dept. of Environment)		Municipal Affairs	Mines, Resources, Environmental Management
Dept. of Agriculture)	Committee	Environment	
Municipal Affiars)	on floods	Agriculture	Agriculture
Disaster Services)		Emergency Measures Organisation	Emergency Measures Organisation
Federal & Intergovernmental Affairs			

WESTERN PREMIERS CONFERENCE

Source: Canada Dept. of Fisheries and Environment (1975).

Water Act was passed to establish water management principles "based on cooperation, coordination and consultation". The mechanisms for coordination are the interdepartmental committee, the federal provincial consultative committee and the river basin planning board. Even the Canada Water Act results in a complex administration and structure.

Although governments in Canada cannot transfer jurisdiction from one to the other to facilitate coordination, it is possible for both to delegate responsibility to a semi-independent agency such as a basin management authority. However, this was not achieved through the Canada Water Act because full administrative powers have not been given to the basin planning boards. Some coordination does occur at the political level through the cabinet, federal-provincial summit conferences, the western premiers meetings, and previously through the Canadian Council of Resource Ministers. Federal-provincial and interprovincial coordination also occurs through the Prairie Provinces Water Board which administers the apportionment agreement on east-flowing waters in the Prairies.

The development of farm and community water supply is carried out by the provinces or by the Department of Regional Economic Expansion in its unilateral programmes. Large reservoirs and dams are administered with joint cost shared programmes. In some provinces, agreements are negotiated between federal and provincial governments on the provision of water to Indian reserves and National Parks.

These coordination frameworks deal with long-term or routine planning and research for water management in the Prairies, and do not compose adequate emergency response structures for crises such as floods and droughts.

3.3 EMERGENCY RESPONSIBILITIES AND COORDINATION IN 1977 DROUGHT

Drought is not a sudden, unpredicted hazard, but one which develops over a long enough time frame for warnings to be given and response strategies to be put into place. Unlike some other hazards, therefore, there is often time, as a drought develops, for routine agency responsibilities to evolve into a more appropriate drought-response capability. The alternative is to institute a specific emergency response that overlies previous routine structures.

In the 1977 drought both responses occurred. The federal government and the Province of Alberta adopted emergency response orientations with strong political leadership by the beginning of May 1977. In Saskatchewan and Manitoba, coordination of the government response to drought continued under the routine responsibilities of the lead departments for water management; Agriculture and Environment.

Federal response: The drought response of the federal government was to establish a four-tier coordinating structure that linked the cabinet with what was taking place in the provinces. This structure, as set out in figure 3.1, consisted of:

1. Federal Cabinet Committee
   This was an ad hoc committee of eight ministers with Agriculture in the chair. It was responsible for initiating federal response and authorising programmes.

2. Steering Committee
   This committee, consisting of six senior civil servants in Ottawa, again chaired by Agriculture, was given overall responsibility for developing a contingency plan and longer term strategies, and was to coordinate the response of the federal departments. Emergency Planning Canada sat on this committee.

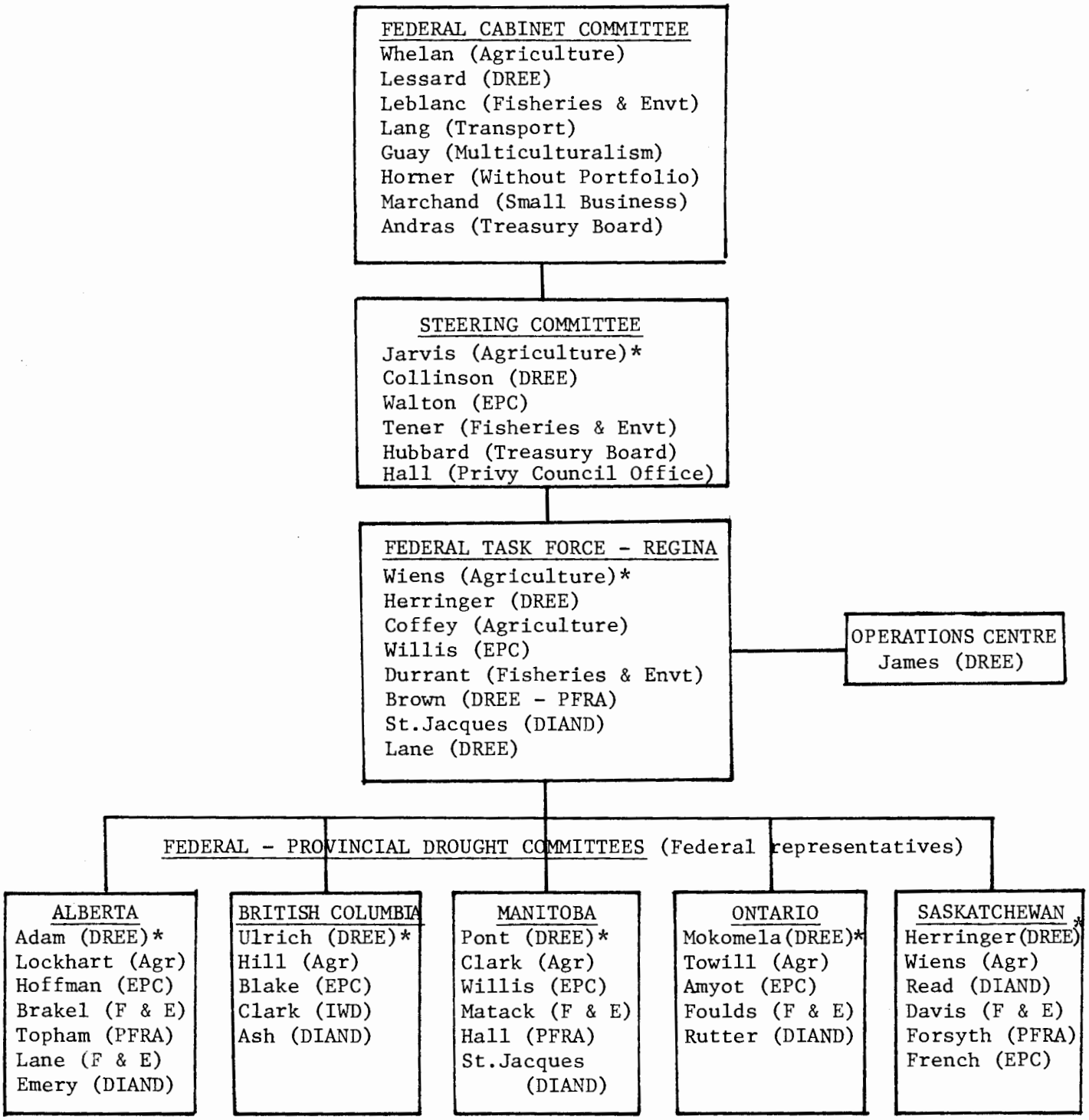


Figure 3.1 Federal coordinating structure for 1977 drought
(see appendix B for explanation of abbreviations)
* - chairman

3. Task Force

A task force, composed of departmental officials, was established in Regina to integrate relief measures and coordinate with the Inter-Provincial Drought Committee and the Federal-Provincial Drought Committees in each province. The Task Force provided policy guidelines for communications and programmes, monitored the drought situation and provided a regional base for federal coordination.

4. Federal-Provincial Drought Committees

These committees were established in Alberta, British Columbia, Manitoba, Ontario and Saskatchewan. One of the federal representatives on each committee was the Regional Director of EPC for that province. Federal members of these committees were appointed by the Task Force.

Provincial response: The provincial drought response comprised three main components (Figure 3.2):

Intra-provincial structure

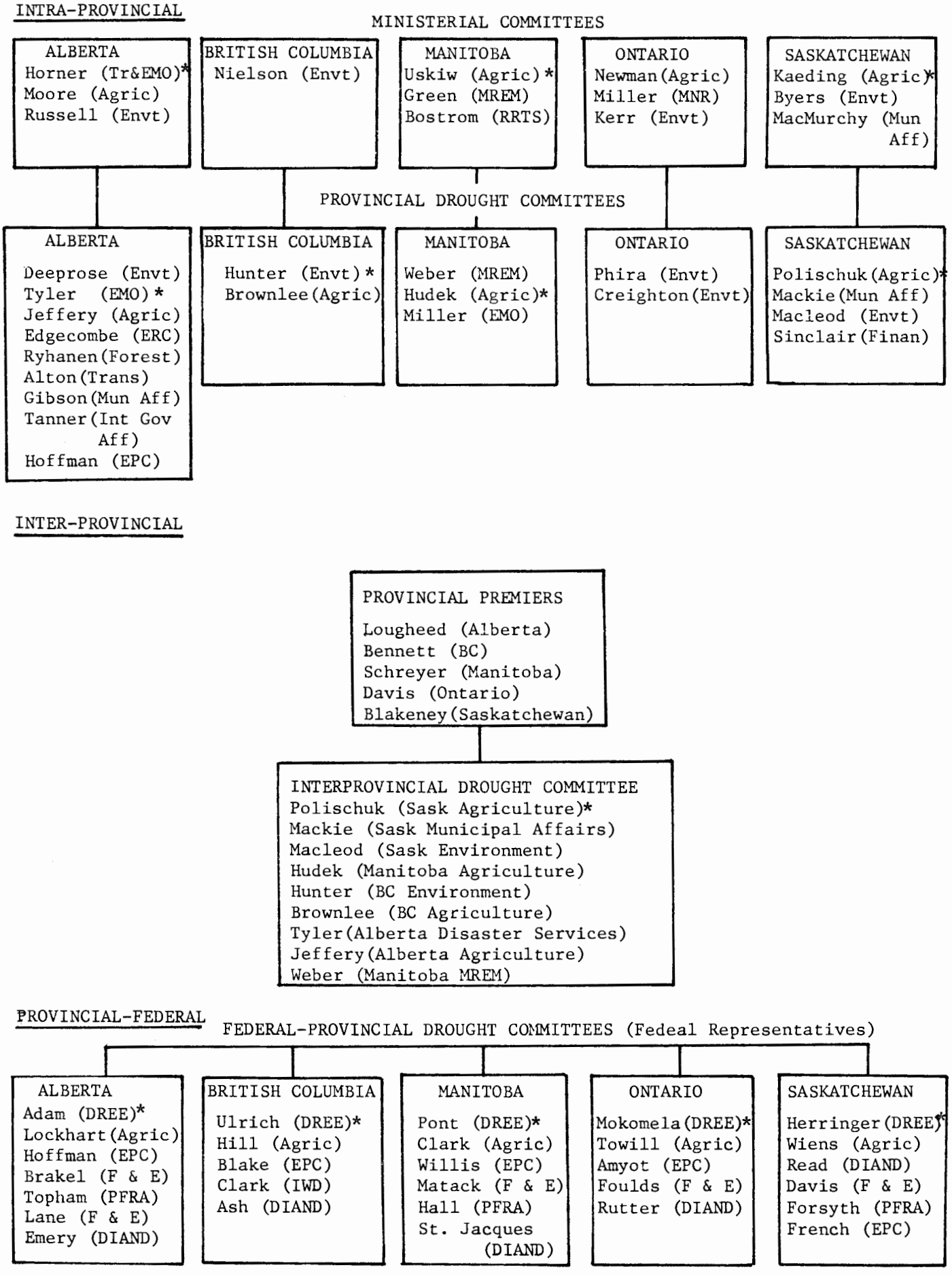
Each province established a Provincial Drought Committee. In Alberta this Committee was chaired by the Provincial Emergency Disaster Services who also coordinated the drought programmes. In Manitoba and Saskatchewan, the drought committees were chaired by the respective Agriculture Ministries; and Agriculture and Environment ministries acted as lead agencies in the coordination of activities.

Above these Drought Committees, Ministerial Drought Committees were established to authorise and initiate programmes.

Inter-provincial structure

Political coordination between the Provinces took place formally and informally between the Premiers and their ministers particularly during the Brandon meeting of

Figure 3.2 Provincial coordinating structures for 1977 drought
(see Appendix B for explanation of abbreviations) * - Chairman



western Premiers. In addition, an Inter-Provincial Drought Committee was set up at the directive of the Premiers, and was chaired by Saskatchewan Department of Agriculture.

Provincial-federal structure

Liaison with the federal government was formally accomplished through a joint Federal-Provincial Drought Committee set up in each Province. The federal members were regional officials of federal departments of Agriculture, Fisheries and Environment, Regional Economic Expansion, Indian and Northern Affairs and Emergency Planning. Similar provincial ministries were also represented on these committees.

In addition, bilateral negotiations took place between the federal government and each province over, for example, deep well agreements and feed freight assistance. Informal communication also played a role though it is difficult to specify except, for example, in cases like the Horner brothers[1]

3.4 ROUTINE VERSUS EMERGENCY STRUCTURE

The main differences between the routine (water resources) and emergency (drought) coordination structures are:

1) A proliferation of special committees for the drought emergency aimed at liaising between departments at all levels, between provinces and between the federal and provincial governments. At least 19 special drought committees were established charged with coordination. Many of these met rarely and several individuals sat on more than one committee.

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1. Hugh Horner, Deputy Premier of Alberta, responsible for Emergency Planning, is the brother of Jack Horner, federal Minister Without Portfolio, appointed to the Cabinet Drought Committee.

2) The usual routine lead department in most jurisdictions for water resources is Environment (sometimes together with Agriculture). In the drought emergency, Agriculture Canada and provincial Agricultural Ministries played the lead coordinating role. Agricultural interests were represented on all drought Committees and often chaired them.

3) Departmental representation on key drought emergency committees became narrowed compared to wider departmental involvement in water resource management. At the federal level; Agriculture, Fisheries and Environment, Department Regional Economic Expansion; Prairie Farm Rehabilitation Administration, and Emergency Planning Canada were the most involved in drought response. At the provincial level, Agriculture and Environment Ministries, together with Emergency Measures Organisations, and to a lesser extent, Municipal Affairs were active participants.

   The routine structure for water management is more widely representative of different sectors. For example, the Interdepartmental Committee on water - a key mechanism for coordination at the federal level - includes Health and Welfare; Indian and Northern Affairs; External Affairs; Energy, Mines and Resources; Transport; Industry, Tourism and Commerce; Urban Affairs; Provincial Office and the Treasury - in addition to departments also represented on most of the drought committees.

4) Emergency planners played active roles in the drought response, especially in Alberta (where the Alberta Emergency Disaster Services coordinated provincial response) and at the federal level. In Manitoba, the Emergency Measures Organisation was represented on the Provincial Drought Committee, although in Saskatchewan this was not so.

   In the routine structure for water management emergency planners play a very minor role and are regularly represented only on flood committees.

Overall, the two directions in which government water management structures were modified to become drought emergency response structures were towards a strong agricultural focus and towards coordination between different levels of government more than between different sectors within those levels.

4. COMMUNICATION PATTERNS

4.1 DECISION-MAKING COMMUNICATION SYSTEMS

The process of decision making is facilitated if information on which decisions are to be based is easily, comprehensively and quickly made available. In organisations, where decision making is often a group process, the efficient use and collection of information usually requires communication between individuals and departments. Communication is crucial to the functioning of committees and governments; determining the speed, accuracy and success of decision making and policy formation.

The total information needs of a resource manager are considerable. He not only requires knowledge of a wide range of interacting physical, economic and socio-political variables but must also acquire a meaningful problem framework in which to analyse and interpret the data. Assuming that data on the physical and socioeconomic environment is being effectively collected by field workers, remote sensors and statistical agencies, the next step should be to communicate this information to resource managers and decision makers. Communication on scientific information is not a one way process; decision makers need to advise those responsible for data collection of the type, nature and amount of information they require for specific objectives.

Furthermore, in any large organisation, personnel are not just divided into those who collect data and those who act on them, but also into those who, along the way, sort, classify, interpret and disseminate information. This implies a division of labour and a structuring of functions within an organisation. In one sense, the very concept of 'organisation' implies a restriction of communication because information is deliberately channeled and sequenced rather than random. Hierarchical responsibility and sectoral specialization are designed to pattern communication vertically and horizontally in a cost effective, goal-orientated fashion.

The line between effective channelling of information and inefficient restriction of information within complex organisations is a fine one, and its position changes as situations evolve. What was effective yesterday may become either unwieldy (too many information flows) or obstructive (too few) today.

Over and above what the designed communication pattern should be in a large organisation, there exist constraints on information flows that arise from jurisdictional boundaries, in-group interests and individual perceptions and behaviour. Jurisdictional boundaries and regulations often mean that information can officially exchange only between higher level actors and must therefore follow a tortuous route from the field worker in an Indian reserve in Alberta through Ottawa back to the regional operations of Agriculture Canada. Geographical distance also slows up information flow and may distort its contents. Federal-provincial political conflicts create artificial and limited flows of information especially in relation to carefully guarded natural resources (Meekinson 1977).

Communication, even of factual or scientific data within an organisation, is a social process. People's view of their own role and those of others, their likes and dislikes, professional orientation and group identity, with all influence to whom, and from whom they will provide and accept data and ideas. Information is often accepted not because it is the most accurate or relevant, but because the source is respected and liked (Havelock 1971). Katz and Kahn (1966) point out that "it is interesting to observe how often organisational leaders when going outside their own structures for information will seek their own status level. . . when the really critical information is at levels below them."

Studies of knowledge gathering, processing and dissemination have identified a number of factors which govern the flow and value of communication in an organisation (Havelock, 1971). The source, content, timing and form of data has been shown to influence receptivity and interpretation (Katz and Kahn, 1966). Organisational,

social and psychological links and structures govern flows, orientation and authority of selected information. The perception of information, individual and group goals and of other people and agencies influences, attitudes, decisions and operating relationships (Whyte, 1977).

In an emergency, communication becomes more critical and more urgent. More information is demanded by decision-makers; routine networks come under pressure, and are often by-passed. Thus the whole information network may become restructured during a crisis, and the lessons learned may result in permanent changes in communication patterns.

Emergency communication of information between decision-makers in the 1977 drought needs to be studied in the context of the routine, established contacts between and within water resource agricultural, emergency planning, federal and provincial agencies. Although perception of the drought and political pressure stimulated additions and expansions of monitoring systems in the Prairie provinces, crisis information flows were superimposed on traditional, informal, or legislated communication networks. These routine networks were traced in public government reports and key actor interviews, and in some cases were also able to be confirmed by access to files and agency records.

4.2 DROUGHT INFORMATION SOURCES

The nature and availability of environmental information relevant to drought prediction and mastering is determined not only by the current techniques for collecting data, but also by historical methods. Traditionally, measured weather parameters such as precipitation and temperature have relatively long records, adequate spatial coverage, frequent measurement and reliable, well calibrated instrumentation. Data are collected station by station on a daily, weekly or monthly basis (Table 4.1). Early records of precipitation and temperature in the Prairie Provinces date from the 1880's but only ninety stations

Table 4.1

FEDERAL AND PROVINCIAL MONITORING ACTIVITIES IN PRAIRIE PROVINCES FOR HYDRO-METEOROLOGICAL PARAMETERS

Agency	Activity	Parameters	Frequency	No. of Stations
FEDERAL				
Atmosphere Environment Service (AES)	Surface synoptic weather.	cloud, visibility, weather temperature, pressure, dew point, windspeed and velocity.	every 6 hours (some every 3)	National - 250
A E S	Hourly weather	as above	hourly	National - 209
A E S	Automatic stations	temp., humidity, wind, precip., pressure	hourly	National - 26
A E S	Ordinary Stations	as above	daily	National - 1885 (includes above)
A E S	Precipitation		various	436
A E S	Evaporation		daily	146
A E S	Insolation	hours of sunshine	continuous	307
A E S	Ice Observations	location, thickness, melting of lakes and rivers	weekly	National
A E S	Soil temperature		daily	67
Inland Waters Directorate (IWD)	Hydrometric	water level, discharge, temp., and velocity	level-continuous others- monthly	1800 600 includes provincial
I W D	Hydrometric	snow depth plus water equivalent	6 times p.a.	200 except Manitoba, B.C. and Quebec
I W D	Groundwater	level, flow, well yield	continuous	50 only in B.C., Manitoba Ontario and Maritimes
EMS Envt. Canada	Forest fires	fire situation & weather	daily during season	(from provinces)

Table 4.1 Cont'd.

FEDERAL AND PROVINCIAL MONITORING ACTIVITIES IN PRAIRIE PROVINCES FOR HYDRO-METEOROLOGICAL PARAMETERS

Agency	Activity	Parameters	Frequency	No. of Stations
PROVINCIAL				
Alberta Environment	Lakes	depth, level, volume	seasonal-weekly	185
Alberta Environment	Crest-stage	peak flow, level, velocity	seasonal	70
Alberta Environment	Evaporation and water balance	precipitation for studies agriculture	seasonal	40
Alberta Research Council	Groundwater levels			73
Alberta Environment	Lakes	water quality	monthly	
Saskatchewan Environment	Hydrometric	snow depth and density	4 x P.A.	87
Saskatchewan Environment	Hydrometric	lake levels	weekly	62
Saskatchewan Tourism and Renewable Resources	Climate	precipitation, temp. wind		Provincial parks
Manitoba MREM	Hydrometric	water level and discharge		
Manitoba MREM	Groundwater	level		from well drillers
Manitoba MREM	Hydrometric	snow surveys	flood season	

Sources: Canada Water Year Book 1975
D. Mackay & D. McDonnell (1975) Environmental Monitoring: A compendium of data governing activities of Environment Canada

Interviews with Alberta Environment, Saskatchewan Environment, Parairie Provinces Water Board, Manitoba Ministry of Mines Resources and Environmental Management

have relatively complete (70 percent) records since 1920 (Laycock,1964). Meteorological variables such as evapotraspiration, snow depth and water equivalent, insolation and precipitation have only recent or discontinuous records and inadequate networks (PPWB, 1964).

However, meteorological information is probably the most reliable, complete and comprehensive source of data on the Canadian environment. It is provided mainly by the federal government's Atmospheric Environment Service (previously the Canadian Meteorological Branch); supplemented by Provincial monitoring systems, particularly for snow surveys and evaporation measurements. Prairie weather and climate information is disseminated through AES Winnipeg office and provincial Environment Ministries.

Hydrological information is provided by the Federal Inland Waters Directorate; matched by data from provincial water monitoring agencies. Again, records are relatively recent (1912 onwards), and the network inadequate or poorly planned.[1] The Water Survey monitors lake and river levels; snow and glacier characteristics; streamflow, water quality and some groundwater levels. Provincial departments monitor water levels and discharges; map groundwater supplies and survey soil moisture and snow, adding to, although not always complementing the federal network (Table 4.1).

Information on water use and demand is less organised and comprehensive. In some cases information is collected on a municipal basis, or at the provincial level. Since the Canada Water Act (1970), the major river basin has been identified as the primary geographical scale for water resource management. Several major studies have provided abundant information on water use and demand in Canada's major river basins. In the Prairie Provinces the Saskatchewan-Nelson, Qu'appelle, Roseau and Peace-Athabasca river basin studies carefully catalogued the physical, agricultural, industrial, urban and domestic characteristics of water use and demand (Fisheries and Environment Canada, 1975). However these were 'one off' studies and in a rapidly changing economic and social environment the information has been rapidly outdated.

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1. Interviews with provincial hydrologists. See Table 2.2

Other than these studies, systematic collection of information relating to water occurs in federal departments of agriculture and municipal affairs. Agriculture Canada collects information which might reflect the water conditions in the Prairie Provinces such as farm income and cash receipts; crop and livestock prices and marketings (Agriculture Canada, December 1977), and through its research stations and experimental farms monitors and studies agricultural developments and problems relating to farming practices and environmental conditions. The Prairie Farm Rehabilitation Administration, previously in Canada Agriculture, now within the Department of Regional Economic Expansion, has special responsibilities for water development in the Prairie Provinces and, as such, monitors its programs in irrigation projects, pasture, well levels and field extension services to determine their effectiveness and consequently susceptibility to drought (Department of Regional Economic Expansion, 1976).

Statistics Canada, as the official information office of the federal government, publishes data on agricultural productivity and costs collected from federal and provincial agricultural agencies. Statistics Canada also gathers information on employment and industrial operation and is responsible for the national census (Statistics Canada, 1977). In most cases, Statistics Canada information is at least a month out of date, if not longer, and is only useful for post event assessments.

Provincial governments collect similar data in order to gauge the economic and social welfare of agriculture and industry in their jurisdictions. Agricultural conditions are usually reported on a day to day basis by field workers and farm contacts and information is provided by Wheat Pool cooperatives, and farm unions and organisations. Industrial and power water use is monitored by departments of energy, power, industry and natural resources. Water quality is assessed by public health and tourism agencies.

In addition, the media, newspapers and television play important roles in transmitting information about regional and national conditions and focussing attention on particular issues. Long term, specific

and problem orientated research programs in universities and research councils generate information which tends to be non comparable and discontinuous. However, the value of water balance, groundwater and impact studies carried out by such organisations has been emphasised by the hydrologists interviewedfor this study and by the PPWB and PFRA. International communication, particularly with the United States, provides a body of relevant hydrometeorological and other data which can be compared with Canadian data.

In contrast most agricultural, industrial and social data tend to be aggregated to very general spatial and temporal units. As such they lack the sensitivity and coverage of the Canadian hydrometeorological information when attempting to monitor drought onset and impacts. Improvements are however being sought in the social and economic monitoring systems at all levels of government.

4.3 DEMANDS FOR DROUGHT INFORMATION

The Atmospheric Environment Service Weather summarizes together with snow survey reports initiated awareness of an impending drought for most decision-makers interviewed. Together with newspaper and journal articles and personal appraisal of the poor moisture conditions in the region , these reports stimulated a number of telephone calls and memoranda within and between organisations. Research for this study uncovered early assessments and forecasts of a drought situation by Atmospheric Environment Winnipeg,[1] Saskatchewan Research Council,[2] Alberta and Saskatchewan Environment and Manitoba Mines, Resources and Environmental Management.[3]

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1. H. Fraser
2. Communications between Saskatchewan Research Council and Saskatchewan Agriculture.
3. Drought files of provincial drought committees.

During April and May, politicians in provincial and federal parliaments were demanding information on the likelihood and impact of a drought in the Prairie Provinces. In late April and during May all relevant governments had formed Interdepartmental Drought Committees and were engaged in active quests and reviews of data on hydrometeorological, agricultural and economic conditions.

Priority areas were generally for weather forecasts and for knowledge about soil moisture conditions for spring wheat plantings.[1] At the provincial level there was considerable concern about community and livestock water supplies. Drought committees and ministers requested surveys of reservoirs, dugouts and well reserves.

Rain in May and June alleviated the immediate crisis, and data-seeking activities turned from crop conditions to domestic, industrial and livestock water supply. During the summer the Federal Drought Task Force attempted to assess the impact of the water shortage by seeking information on cattle marketings, crop yields, forest fires, hydro output, business and farm incomes and irrigation schemes.[2] Information exchange was initiated between the United States and Emergency Planning Canada through the Federal Disaster Agency in Washington and a longer term federal study of drought problems was planned.[3]

4.4 DROUGHT INFORMATION FLOWS

The demands for information about the drought led to an expansion and intensification of monitoring activies. Data were collected more frequently and earlier in the season than normal. Environmental monitoring data, agricultural reports and water reserve information

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1. Minutes of Manitoba drought committee.
2. Task Force Minutes.
3. Emergency Planning Canada, drought files 1977-1978.

were more widely disseminated within both federal and provincial governments and were read directly by higher level officials than was routine practice.

Table 4.2 shows some of the main monitoring activities and new information flows that were stimulated by the drought between May and July 1977. Early information flows in May were largely hydrometeorological and went from the region to provincial capitals and Ottawa. Later information flows concerned municipal water supplies, conditions on Indian reserves and synopses of hydrometeorological data.

The distribution of drought data and its usefulness for either forecasting or policy-making varied considerably. Table 4.3 ranks some key information sources in terms of their widespread distribution during the emergency (drought) conditions. The table is based on the questionnaire sent to government departments and other relevant groups (appendix A) and on content analysis of documents and files (Table 2.3). The most widely disseminated material was the Inland Waters Directorate Water Synopses, followed by provincial and federal Drought Committee Reports. Generally, the official informations distributed concerned the state of physical reserves - precipitation,snow, streamflow, groundwater - rather than socio-economic data. The latter, particulartly agricultural impacts, were more highlighted in newspaper reports.

Table 4.4 summarises the perceptions of officials interviewed regarding the forecasting utility and timeliness of the drought information distributed. Specific comment was requested on its usefulness for forecasting (and thus for policy decisions) as opposed to monitoring.

The most useful indicators for forecasting drought are perceived to be hydrometeorological parameters of precipitation, streamflow and snow character published by Atmospheric Environment Service, Inland Waters Directorate and other agencies. Groundwater levels and drought indices monitor events rather than forecast them. Very

Table 4.2

MONITORING ACTIVITIES AND INFORMATION FLOWS STIMULATED BY THE 1977 DROUGHT

May

- Simple maps of moisture conditions in the Prairie provinces sent to members of Federal parliament; AES/IWD synopsis to key politicians.
- Environment Canada accelerates water quantity and quality monitoring especially on the interprovincial rivers.
- AES/IWD synopsis of precipitation and streamflow in the prairie region collected and disseminated by Regina IWD weekly.
- Emergency Planning Canada considers monitoring the impact of drought on business and industry.
- Task force collects information on crop and pasture conditions from provinces and what pools.
- Environment Canada considers environmental impact of drought.
- EPC sends and receives information from U.S.

June

- Forest fires monitored by EPC.
- Manitoba surveys water resevoirs.
- Task force office circulates at least 60 synopses of streamflow and precipitation to provinces and federal agencies.
- Department of Indian Affairs collects drought impact information on Indian reserves in Manitoba and Alberta.
- Alberta water situation and drought committee reports circulating to Ottawa.
- Saskatchewan surveys municipal water supplies and farm impacts.

July

- IWD/AES synopsis becomes fortnightly report.
- Marketing information collected by Task Force.

Source: EPC Files, Saskatchewan Agriculture Files, Hansard.

Table 4.3

DROUGHT INFORMATION SOURCES RANKED IN ORDER OF DISTRIBUTION TO GOVERNMENT AGENCIES DURING THE DROUGHT

I W D Water Synopses
Provincial Drought Committee Reports
Federal Drought Committee Reports
Research Reports
Statistics Canada Crop Report
Groundwater Data
Farmers Comments
Wheat Pool Reports
Palmer Moisture Index
Lake and Reservoir Data
Marketing Reports
Stream Forecasts
A E S Meteorological data
Thornthwaite Evapotranspiration Index
Agriculture Field Reports
Employment Statistics

Table 4.4

VIEWS ON THE FORECASTING UTILITY AND TIMELINESS OF 1977 DROUGHT INFORMATION

Type of Information	Used for Forecasting?	Used for Monitoring?	Not useful for For. or Man.	Up to date (1-2 days)	Delayed (1-2 weeks)	Very delayed (1 month plus)
A E S met.data	4	3	6	8	2	-
IWD stream data	5	2	-	6	3	-
Snow Surveys	7	2	1	2	6	1
Streamflow	4	1	-	3	2	-
Palmer Index	3	0	0	0	1	2
Thornthwaite Index	-	1	-	-	-	1
Crop indices	1	1	-	-	1	-
Other indices	1	-	-	-	1	-
Groundwater data	1	2	2	-	2	2
Lake and Reservoir	3	2	1	1	4	1
Marketing (prov. dept. agr.)	2	3	2	0	3	4
Wheat Pool Reports	1	3	5	1	2	3
Agricultural field reports	0	5	1	0	6	-
Farmers' comments	1	3	2	2	3	-
Statistics Canada Crop Rept.	0	4	3	0	2	5
Drought ctee. repts						
-provincial	0	6	3	2	7	2
-federal	0	4	3	1	4	1
Employment stats.	1	1	6	0	2	6
Newspapers	0	2	7	5	3	0
Research Reports	1	1	3	0	4	1

Numbers indicate numbers of officials expressing this view from 25 interviews and 15 questionnaires.

few people felt that any socioeconomic or impact data could be used for forecasting, although marketing information, field reports and newspaper articles could be used for monitoring. Several officials noted that Wheat Pool Reports, employment statistics and the media were not very useful for either forecasting or monitoring. The most up to date sources of information were the Atmospheric Environment Service daily forecast,the Inland Waters Directorate automatic streamflow gauges, provincial drought committee reports, farmers comments and newspaper articles. Data on impacts were less timely; marketing and employment information was percived as being at least one month out of date, particularly the Statistics Canada crop reporting service.

The interviews with key officials produced some of the most perceptive comments on the communications of scientific information during the drought emergency and there are also a number of documents which discuss data quality, availability and requirements.

At least three quarters of those interviewed believed that snow surveys provided a clear indication of a water shortage and that ground-water data are the best measure of water supply. However the nature of prairie climate is such that one chinook wind (which rapidly can raise the temperature by 20^{o}C in winter) can destroy the snow pack in a couple of days and negate all forecasts made on the basis of the snow surveys. It is also technically difficult to obtain accurate measures of snow-water equivalents and to extrapolate this to streamflow and soil moisture conditions. So much depends on the exact nature and timing of spring thaw and river break up. A speedy melt period results in low soil moisture and high runoff, an extended thaw will better replenish soil moisture condtions.

Atmospheric Environment Service forecasts are well respected and widely used; yet some provincial officials criticised the unwillingness of scientists to forecast more than three days ahead, or to risk emergency predictions. The homogenous nature of prairie weather

patterns is said to facilitate forecasts using only a few stations. However in Saskatchewan south of Swift Current, there is no Atmospheric Environment Service continuous recording station in this topographically isolated area. All three provinces perceive a need to supplement federal monitoring networks. In Manitoba, the development of a Weather-watch program by the Emergency Measures Organisation in cooperation with the Atmospheric Environment Service is hoped to provide speedy, local interpretation of weather conditions.

Few of those interviewed felt that groudnwater information was accurate, complete or frequent enough for the purposes of water resource planning or assessment. In Alberta, one official despaired of of ever understanding the movement or change in groundwater in the province, "each time they drill a well the knowledge and data base changes ... recharge rates are notoriously difficult to predict." During the drought, recent or comprehensive groundwater were not readily available and in Manitoba a special request was made to the Prairie Farm Rehabilitation Administration for assistance in mapping well levels.

For some of those interviewed, official networks of data collection and information flow were less useful than their own subjective assessments through personal observation, contacts or reports from field observers. In any case, those involved in drought response tended to favour information collected by their own agency or jurisdiction, claiming other sources to be too local, too general or too outdated.

One source of information which appears to have been neglected by most Canadian agencies was the considerable body of research and data available in the United States. The situation was severe in many states of the U.S.A. and the drought developed earlier there than in Canada. Two publications were potentially useful: the "Western Water Stretcher" (Utah Water Resources Centre 1977) published every two weeks in Utah, provided down- to-earth suggestions for domestic and agricultural response to the drought; and "Western Drought Conditions" collated by the Western States Water Council (1977) reported on the dry conditions and coordination of response.

These and other U.S. drought publications were eventually made available to the federal Task Force through Emergency Planning Canada's liaison with U.S. federal disaster agencies.

4.5 COMMUNICATION BETWEEN AGENCIES

A detailed study of communication links was possible only for one agency, and Emergency Planning Canada was selected as access to its files was more readily obtained.

Figure 4.1 shows the structure and external contacts of Emergency Planning Canada during regular operations. Information flows can be grouped as:

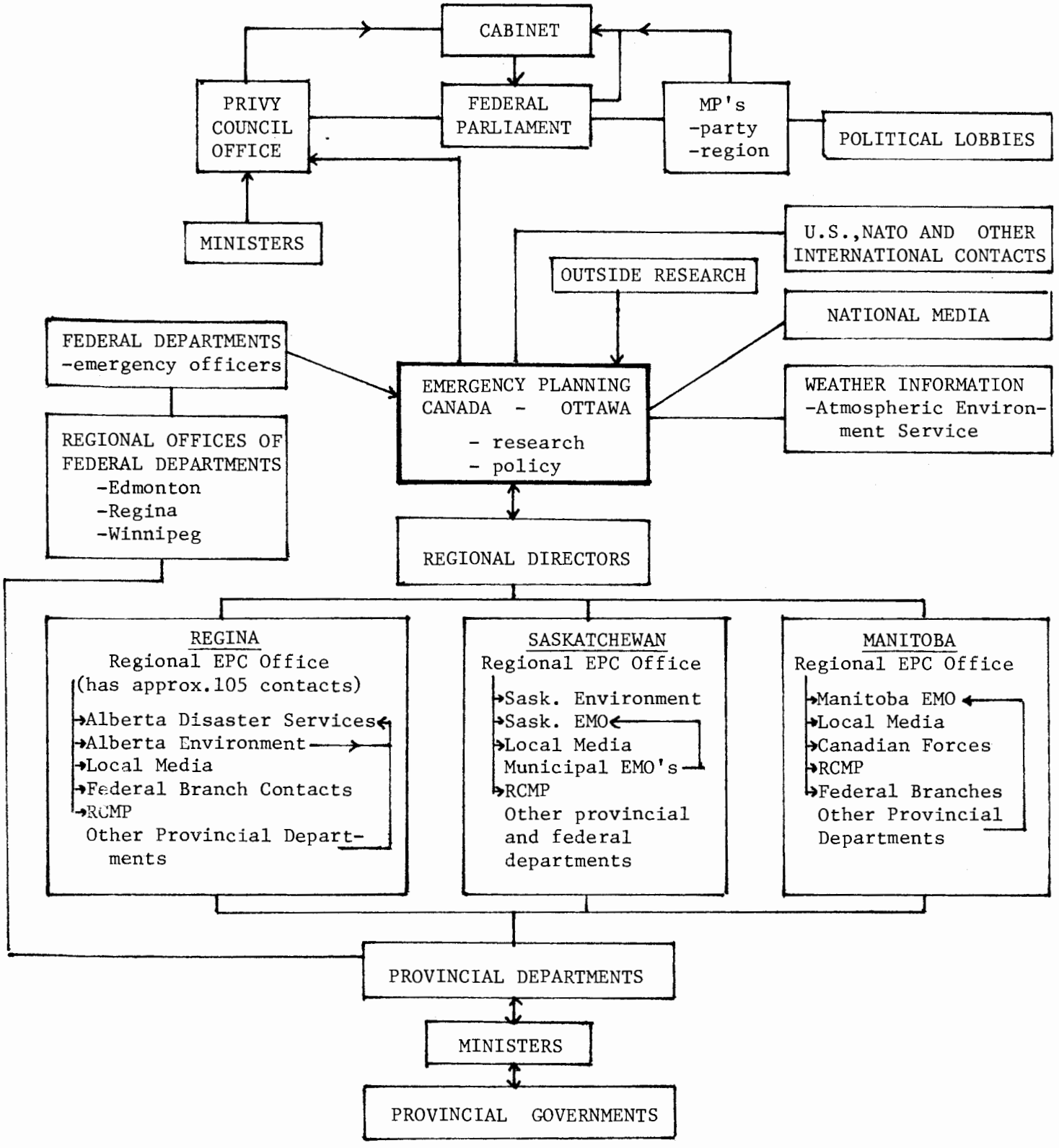
1) Interdepartmental flows through the federal network.
Information is received at EPC's Ottawa headquarters, often through emergency planning officers designated within federal government departments. For example, data on physical environmental conditions is received regularly from Atmospheric Environment Service, and on socioeconomic variables from Statistics Canada.

2) Hierarchial flows between EPC and the Privy Council Office.
EPC reports to the Privy Council office and receives policy and other directives from it.

3) Regional flows.
EPC maintains contact with the regions, primarily through its Regional Directors, who in turn liaise with provincial governments and departments, and with the Regional offices of federal Departments.

The information network of the Regional Directors varies considerably in nature, spread and openness in the three regions studied. The networks are based to some extent on inherited contacts (two of the Regional Directors are recent appointees, as well as social and professional relationships, linkages through provincial Emergency Measures Organisations, and, of course, personal initiative. Many of the stongest contacts relate to the civil defence functions of Emergency Planning Canada and to coordination of response to the flood hazard in the various

Figure 4.1 Existing network in the prairies to and from Emergency Planning Canada for water resources



provinces. Since the federal government relieves flood loss in a cost-sharing Disaster Assistance Program, the Regional Directors are closely involved in the assessment of flood hazard and losses.[1]

As well as helping to maintain federal-provincial communication in the Prairie provinces, Regional Directors aid in coordinating emergency planning within the regional offices of the federal government, particularly in relation to National Parks, Indian reserves, transportation and the Canadian forces. Normally a specific individual will act as the emergency planning officer in the regional office and will be responsible for coordinating emergency plans with Emergency Planning Canada personnel.

Regional Directors also maintain other useful information contacts in the regions, such as the Royal Canadian Mounted Police (specifically 'K' division), university researchers, and members of local city councils.

Information received from Emergency Planning Canada Regional Directors often circulates as situation reports received rapidly through telex or telephone messages. This information may then be refined, summarised and recorded at Emergency Planning Canada headquarters.

4) External flows.

EPC also exchanges information with external sources including foreign governments (through NATO, U.S. disaster and emergency agencies and other international contacts); university and other independent research workers and the mass media.

During the drought, this four-fold division of communications also operated, but in a modified form (Figure 4.2). The interdepartmental information flows were directed towards the Drought Steering Committee in Ottawa and the Drought Task Force in Regina (on both of which EPC was represented) rather than to EPC Operations headquarters.

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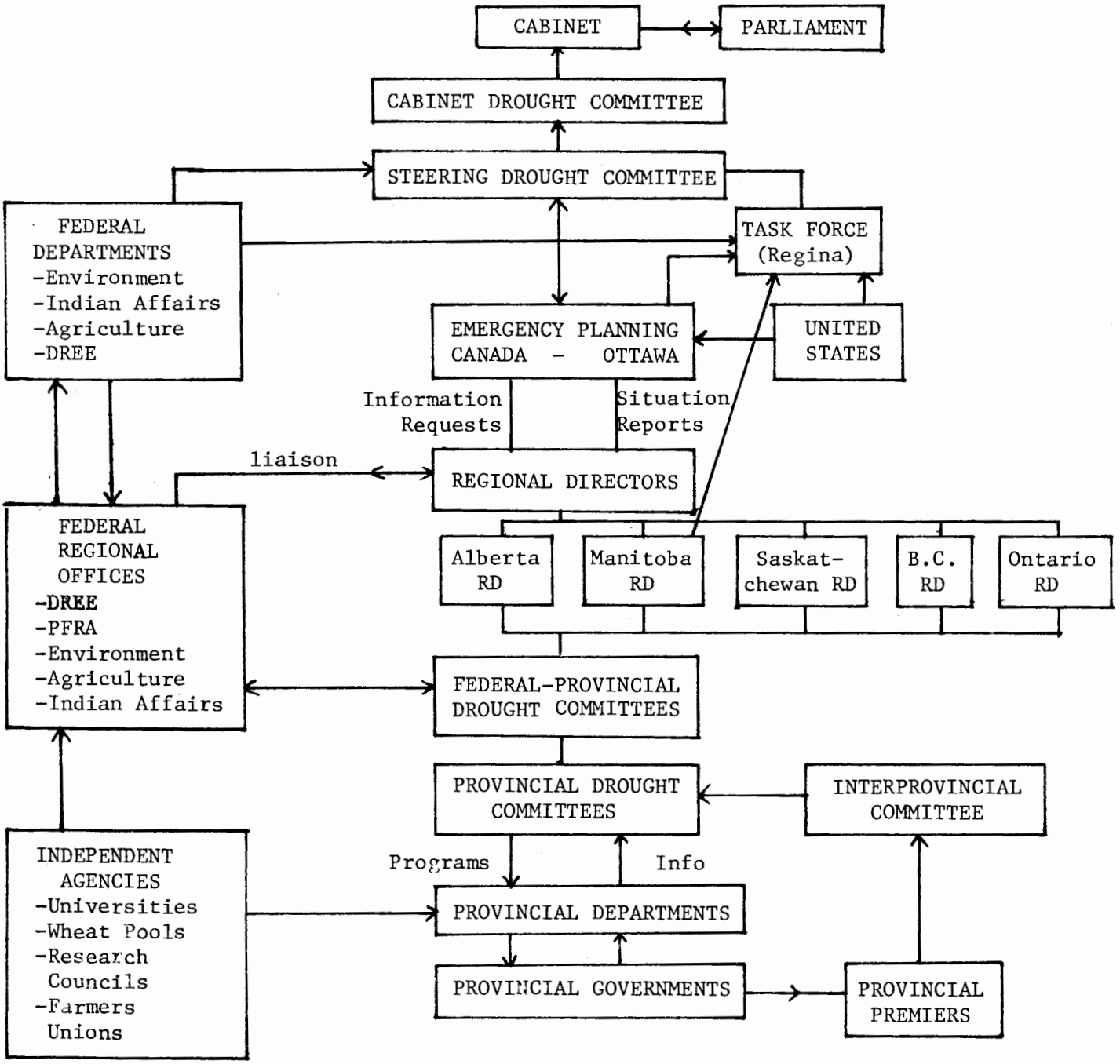
1. In Alberta, all disaster assistance is coordinated by Alberta Disaster Services.

Figure 4.2 Principal communication links of Emergency Planning Canada during the Drought Emergency



The hierarchial flows between EPC, the Privy Council and the Cabinet were channelled through the Drought Steering Committee and the Cabinet Drought Committee. Direct contact was made between EPC and the Federal Disaster Agency in Washington, D.C., and through this link, much of the U.S. drought information was disseminated through the Canadian network.

The main source of information to EPC headquarters for the drought remained that from the regions throug the work of the Regional Directors of EPC. They provided liaison with the regional activities of federal government offices, with the provincial drought committees and the federal-provincial drought committees in each province. Situation reports telexed by each Regional Director were key sources of information for EPC headquarters together with the provincial data sources that were relayed later through the mail.

A detailed analysis of flows through and from Emergency Planning Canada regional directors indicates the timing and frequency of selected communications to the Task Force and to Emergency Planning Canada headquarters. Table 4.5 shows the type of information transferred; the frequency of communication; and where possible, the time lag between the collection or publication of the data and their arrival at Emergency Planning Canada headquarters. The table is indicative only, as not all files were examined and not all communications that took place are on file in Emergency Planning Canada Headquarters. For example, Alberta environment stream flow forecasts are based on Inland Waters Directorate and provincial monitoring stations. They are prepared in the forecasting branch of Alberta Ministry of the Environment, passed to the Alberta environment representative on the provincial Drought Committee, thence to Alberta Disaster Services who makes them available to the Emergency Planning Canada Regional Director for Alberta. It is not unusual for a month to pass before such information reaches Ottawa.

Other information that passes between EPC headquarters and the Regional Directors is verbal or through personal contact and is not recorded in the files. Some information received by EPC headquarters is duplicated from several sources; for example, the AES/IWD Synopses.

Information about the drought contained in the Regional Director's

Table 4.5 Drought information transmitted to EPC headquarters from EPC Regional Directors : April - October 1977

INFORMATION - title and/or content of report	FREQUENCY - dates of arrival at EPC HQ and where noted length of delay between collection or publication of data and arrival at EPC HQ.
Alberta	
Weekly water situation report - a summary of federal branch activities.	Received weekly from 17.5 to 9.9, last one on 7.10. Delays range from 4 to 15 days, average 6 days.
Alberta Disaster Services "Operation Dryland 77"	Received weekly from 30.6 to 26.8. Delays range 8 to 19 days, average 12 days.
EPC situation reports -	
Crops and harvests	21.4 3.5 6.6 6.7 12.7 usually telexed
Forest fires	27.4 3.5 16.5 telexed
Flow forecasts (through Alberta Environment)	6.6 11.7 4.8 14.10 21.10, delay 3 to 22 days
Provincial activities	28.4 5.5 7.6 10.6 15.6 telexed
Flooding	13.6
Saskatchewan	
AES/IWD synopsis of stream-flow and precipitation	17.6 22.4 and some others, 3 to 8 days
Saskatchewan wheat pool	10.5 17.5 20.5 others undated
Sask. Agriculture crop and weather report	16.5
Saskatchewan Environment info.	15.4 6.5, 4 days
Sask. Municipal Affairs info.	2.5 5.8
Situation reports	
- harvests	9.9. 25.10 27.10 3.11 telexed
- moisture	9.5 27.5 9.6 12.6 16.6 27.6 telexed
- media	15.4 2.8
- fire	15.4 16.5 17.5 18.5 and others
- hydro	11.7
Manitoba	
AES/IWD synopsis	17.6 and probably others source not noted
Situation reports	
- fire	16.5 17.5 9.6 20.6 8.7 15.7 22.7 29.7 5.8 12.8 19.8 26.8 telexed
- harvests	4.5 27.7
- hydro	8.6
- provincial activities	19.5

Source: Files at Emergency Planning Canada, Ottawa.
Interviews with Regional Directors.

Situation Reports focussed on precipitation and soil conditions in the early summer; changing to provincial activities and forest fires in mid-summer; and to harvesting and economic outlook indicators in the late summer and fall. Situation reports arrive from regional directors almost daily at Emergency Planning Canada headquarters by telex, telephone or letter.

During the drought, information took as little as one, to as many as twenty-two, days to arrive at Emergency Planning Canada, Ottawa (Table 4.5). Delays were most frequent in reporting or documenting provincial activities, harvesting data and information on Indian reserves and National Parks. Ideally, the telex and telephone messages from regional directors, based on their first-hand contacts with provincial government and the field situation and recorded in the Emergency Planning Canada situation reports should be among the most concise, up to date and relevant indicators of a Western emergency situation for Emergency Planning Canada in Ottawa. This assumes that the Regional Director has good contacts with provincial government, that data is available and that he is not occupied with other emergencies.

5. ROLE OF PERCEPTION

The processes of environmental and interpersonal or inter-organisational perceptions are, however, essential components of resource management. It has been said that "a greater understanding of the perceptions and attitudes would make possible improvements in policy making and implementation, for it would permit the prediction of likely reactions to various alternative courses of action" (Sewell, 1970, p. 230).

An emphasis on perceptions and attitudes guided the approach adopted in the present study of the drought emergency in the hope that an understanding of decision makers' attitudes and perceptions may help to explain some of the conflicts and difficulties that arise in coordinating emergency response within a multijurisdictional setting.

5.1 DEFINITION OF THE DROUGHT

In the interviews, government officials concerned with drought response were asked to define 'drought' both in terms of its physical characteristics, and its political, economic and social aspects. They were asked what criteria they would use to determine a drought-related problem, and to give an opinion as to whether the 1977 drought could be considered an "emergency" or "disaster" situation. Some of those interviewed also commented on the frequency and magnitude of water shortages in their jurisdiction.

A high proportion, when asked "what is a drought?" responded with reference to a lack of moisture due to low precipitation. In particular, low soil moisture during the growing season was identified as a drought characteristic. Specific responses from several officials regarding the Prairie provinces referred to the need for adequate spring runoff from snowmelt without which soil moisture and water supplies would not be recharged. Those interviewed seemed to perceive drought as an agricultural problem, referring to soil and growing conditions, rather than giving specific meteorological definitions or other characteristics.

Decision-makers revealed professional bias in their perception of the drought problem. The two hydrologists interviewed commented definitively on low lake levels, reservoir heights and streamflows as characteristic of drought,

and an economist commented that a drought hazard cannot really be said to exist unless a demonstrable economic loss occurs.

It would seem that most officials saw the drought as a supply problem - a failure of precipitation in the fall and winter of 1976-77. Only three people mentioned the demand factor as a component of the drought hazard although, as was discussed in section 1.3, drought in the Prairies has characteristically been when demand for urban, industrial and agricultural water exceeds the available safe margin of supply. Only two people perceived water quality risks as part of the drought problem, and no one identified soil erosion, overgrazing and insect infestations as part of the hazard. In general decision makers viewed the 1977 drought in similar terms to the media and general public - as primarily an agricultural drought, with additional risks to community water supply.

The bounding of the 1977 drought hazard in time and space also differed between officials interviewed. The majority felt that the critical drought area was in southern Alberta, southwest Saskatchewan and southern Manitoba during the spring of 1977. Many also felt that the western region suffered a winter drought. Southern Alberta also was perceived to have a continuing drought problem. Some of those interviewed felt that no area experienced drought problems during 1977, only a mild "water shortage". This view was also held by some farmers in Alberta and Manitoba, who denied any drought problem in 1977, at least on the scale of the 1930's or 1950's experience.

Most officials would not give estimates of the frequency or probability of drought occurrence. They claimed either that drought was unpredictable or referred the question to agrometeorologists or Atmospheric Environment Service publications. Of those who gave estimates, three gave a 3-5 year cycle for droughts, one a 10 year cycle, and four a 20 year cycle. Only one person interviewed expressed the view that droughts were increasing in frequency because of demand increases on pasture and reservoirs.

5.2 PERCEPTIONS OF DROUGHT IMPACTS

Viewpoints on the major drought impacts varied between the three provinces and the federal officials. In Alberta, some officials only identified a winter drought (due to a minimal snowfall) which ended in May when rain

fell. Most of those interviewed in Alberta felt that drought in the region occurs mainly in the south of the province and is a groundwater problem. Inadequate winter precipitation and increasing demand depletes aquifers and puts farm and community well supplies at risk. The groundwater problem continued through the summer of 1977 and led two officials interviewed to believe an emergency water supply and pasture problem existed in the south west of Alberta through into 1978.

In Saskatchewan, the water shortage was not considered to be an emergency by any officials. Droughts, unless they occur over a number of years are considered routine and cyclical, and are accepted in the dryland farming areas as part of the challenge of living in the area. Even the drought hazards of the 1930's are now seen to be economic rather than meteorological in origin.

In Manitoba, the predominant view was that the drought problem was a summer phenomenon, affecting primarily community water supply and some farm pond dugouts and wells. It was not generally seen as an agricultural drought in terms of soil moisture deficits although the Manitoba Interdepartmental Drought Committee did consider the whole range of drought problems and possible solutions (table 5.1).

The Federal Department of Indian and Northern Affairs provided two statements which show a predominant concern over water supply problems of wells and river levels, river and lake transportation difficulties, forest fires and risks to wildlife and fish rather than the agricultural aspects of drought.[1]

Inland Waters Directorate identified the major drought problems with forestry, energy and industry, and predicted difficulties in interprovincial and international water apportionment agreements (Tate and Powers, 1977). This was a rather long term view of the drought hazard based on pessimistic forecasts.

The Prairie Farm Rehabilitation Administration, both in interviews and publications, termed the 1977 event a minor drought, and the Prairie Provinces Water Board did not really see a major deviation from the normal variability.

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1. Private correspondance.

Table 5.1

Drought Problems Considered By The

Manitoba Interdepartmental Drought Committee in 1977

Problem Description	Action Taken	Possible Future Actions
Municipal Water Supply	Install new wells	Lower intakes Deepen wells Divert rivers Haul water Impound temporarily Ration water
Rural Water Supply	Deepen wells Install community wells Pump dugouts Impound temporarily	Divert rivers Haul water Temporary pipelines
Water Quality Degradation		Provide other sources Chemical treatment
Lack of Pasture		Move cattle Emergency irrigation Oats for green feed
Hay Shortage		Cut hay on Crown Lands Haul feed.
Fire Hazard		Restrict camping
Crop Failure		Plant hardier crops Irrigate
Soil Drifting		Education on conservation
Insect Infestation		Education Pest control
Fisheries problems		Restock lakes Limit fishing
Wildlife Problems		Restrict hunting Impound marshes.
Unemployment	Provide extra jobs	Subsidies to industry & agriculture
Municipal finances		Government loans to municipalities

of Prairie conditions.

Emergency planning personnel approached the drought problem in much the same way as other natural hazards, perceiving an "emergency situation and Multifaceted problem". Most emergency officials saw drought as a cyclical phenomenon impacting all sectors of the economy and environment.

About 50 percent of those interviewed did not see the 1977 drought as an emergency or disaster type situation. They perceived it either as a routine and accepted risk of dryland farming or pairie settlement, or as a slow, widespread hazard which could be anticipated and dealt with by fairly routine agricultural and municipal responses.

5.3 VIEWS ON SOLUTIONS

Past responses to drought in the Prairie provinces have included the full range of adjustments - outmigration, employment changes, bearing the hardship, government relief, altered farming practices, water development programmes and marketing controls. Some adjustments have become permanent or long term risk reduction programmes such as the federal grain stabilisation and federal-provincial crop insurance schemes, the Prairie Farm Rehabilitation Administration water development, soil and moisture conservation and farm improvement projects, and the federal and provincial disaster assistance plans. These existing programmes were not perceived to be adequate to meet the 1977 water shortage, and efforts were made to expand the schemes and to consider alternatives.

The disaster assistance plan, proposed and administered by Emergency Planning Canada, was not considered appropriate by federal decision-makers to this type of emergency, since it was felt that financial assistance to specific water and farm projects would be more practical and useful.

The federal approach was to fund feed and water supply augmentation to reduce potential economic losses, rather than to share or bear the losses by giving farmers and communities untied relief aid. An economic solution was the most favoured within federal circles. In addition to funding of well drilling, water development and feed assistance, proposals for price stabalisation on livestock, import and export quotas, farm credit and income tax deferral, and funding of fire suppression were considered. In addition,

technical assistance for water development, regulation of water use and distribution, labour force manipulation, opening of parks and defence lands for grazing and educational and extension programmes were discussed.[1]

The federal programmes which were implemented were primarily short term technical and financial ones. But perhaps the key solution sought by the federal government was an administrative one - the establishment of a coordinated structure to administer the drought response. The coverage given to administrative organisation in the minutes of meetings, official reports and the media, indicates that "setting up an efficient and coordinated response structure" was perceived as "half the battle" by some federal officials.[2]

5.4 PERCEPTIONS OF ROLES AND RESPONSIBILITIES

The way in which an individual perceives his role, and the way in which others perceive it, governs his behaviour and communication in intra-agency and inter-agency activities. Thus in understanding the coordinations of response to the 1977 drought the perceived roles and responsibilities of individuals, officials and agencies can be shown to influence the structure, effectiveness and timing of communication and coordination. Individuals adopt and develop their role through cues from others, constitutional and legal rules, organisational structures and internal motivation.

A preliminary content analysis of the interview responses indicates the ways in which different groups and individuals were perceived by others. Table 5.2 lists the terms used to describe different agencies' roles by those outside and inside the agency. Perceptions varied widely as to, for example, the role of an emergency planner in drought response. Some felt that Emergency Measures Organisations should take full responsibility for coordinating response to drought, others felt that their role should be restricted to communicators or disseminators of information; to action on health or fire risks; or to the coordination of peripheral activities. Yet others relegated emergency planning to carry on only international communication, or to play no response role other than that related to strict civil defense functions.

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1. Task force minutes, especially May 20th meeting.
2. Interview quote.

Table 5.2

Internal and External Perceptions
Of Agency Roles in the 1977 Drought

ORGANISATION OR GROUP	Comments on Role and Responsibilities by Others
Federal government	-political role* -financial role* -interprovincial responsibility* -to stabilise economy* -to coordinate provinces* -unnecessary role
Agriculture Canada	-financial and research support* -political role* -grain stabilisation -not water development -insurance -statistical collection
Environment Canada	-monitoring agency* -planning* -management* -not forecasting -only national planning
Regional Economic Expansion	-distribution of financial aid* -coordinators* -redistribution of resources -increase federal influence -water development on farms -only large scale development
Emergency Planners (federal and provincial)	-coordinators at federal branches* -communicators* -civil defense* -observers -not needed -only for health and forest fires
Provinces	-management* -program development* -planning* -fieldwork* -inadequate capability -economic development

*Organisation also defines this as their own role.

Responsibilities of federal agencies were perceived to include upholding the present government's legitimacy; maintaining the power of Ottawa; promoting national unity, stabilising prices on national and international markets, co-ordinating provincial activities, selectively planning regional development increasing national health and welfare, and managing Canadian resources. Provincial roles were seen as managerial, practical, relating to economy and welfare, catering to local and regional political interests and self-sufficiency.

Table 5.3 categorises the roles of agencies according to the aggreement expressed during interviews about the "key actor" status of others. In table 5.4 the spatial jurisdiction of the various groups is added to provide a classification of organisations involved in the drought emergency.

At the national level, Canada Agriculture and the Drought Task Force were seen as the key actors in the response. In the Prairie Provinces, provincial departments of Environment and Agriculture were seen to take lead roles. In Alberta, all but one of the officials interviewed attributed the lead role to the Alberta Disaster Services.

Key individuals were perceived in terms of their roles and responsibilities for drought. Based on interview data and administrative records, agencies and individuals are classified according to function - that is whether they were primarily monitoring, communicating, implementing programmes etc. Most officials interviewed agreed on each other's functional roles, except for responsibilities for coordination and communication. Conflicting views were expressed whether Joint or Interdepartmental Committees should coordinate activities rather than give lead roles to Agricultural or Emergency Planning agencies. In general, the Environment and Agriculture agencies took major monitoring and implementation roles but were less effective in coordination and communication.

Provincial officials tended to view the federal role in the drought as little more than a political move to enforce their presence in western Canada. At the same time, it was admitted that the federal government could play a needed and welcome role in the provision of funding for emergency

Table 5.3

Perceived Core, Supporting and Peripheral Roles in Drought Response

AGENCIES	PLAYED KEY ROLE	CLASSIFICATION
Canada Agriculture	18	Core
Drought Task Force	15	
Whelan- Federal Min of Agriculture	10	
Saskatchewan Agriculture	9	
Wiens - Agriculture Canada	7	
PFRA	7	
Polischuk-Saskatchewan Agriculture	6	
Alberta Disaster Services	5	Supporting
Environment Canada	5	
Federal Steering Committee	4	
Regional Economic Expansion (Fed)	4	
Manitoba Provincial Drought Cttee	4	
Emergency Planning Canada	4	
Federal Indian Affairs	3	
Manitoba BMO	2	
Alberta Environment	2	Peripheral

Numbers refer to numbers of those interviewed expressing this view.

Table 5.4

Classification of Organizations Involved in Drought Response

	CORE	SUPPORTING	PERIPHERAL
LOCAL	Southern municipalities Individual farmers	Agricultural field reps. AES/IWD monitoring personnel PFRA fieldworkers	
PROVINCIAL	Provincial agriculture departments (S,A,M,) Provincial environment departments (S,M) ADSA	A. Environment M. EMO S. Municipal affairs	S. EMO A. municipal affairs A. forestry EPC regional directors Research councils
FEDERAL	Agriculture Canada DREE/PFRA	EPC Indian affairs Environment Canada	Research stations PPWB
INDEPENDENT	Farm lobby Media	Wheat pools	Universities

programmes, especially in agriculture and water development. However in Alberta, even federal financing was rejected by a few officials because it was regarded as "tied money".

The provinces recognised the water development role of the Prairie Farm Rehabilitation Administration (PFRA) and the Prairie Provinces Water Board, perhaps because these federal agencies have clear regional identity and a practical and personal approach. Federal officials interviewed however, did not emphasise these agencies, and stressed the Department of Regional Economic Expansion as the important management and planning group. It was claimed by provincial officials and by PFRA themselves that the PFRA are held in esteem by prairie farmers, as a result of successful post-nineteen thirties drought rehabilitation programmes and present water development projects.

Emergency Planning Organisations

The role of emergency planning organisations in the drought response was controversial and difficult to define. In Alberta, legislative authority, strong political backing, past successes in disaster relief and associated professional recognition allowed Alberta Disaster Services to take an active coordinating role in developing a provincial contingency plan and integrating a multidepartmental response.[1]

In Saskatchewan, neither the poorly funded and understaffed Emergency Measures Organisation, nor other government departments, perceived a role for a disaster type response to the "water shortage". Saskatchewan Emergency Measures Organisation felt that they would only play a role if evacuation, water hauling or severe health risks were to occur. The Saskatchewan government took a very low-key approach to the drought problem, with officials operating routine responsibilities and only one individual taking on the additional role of administrator to a small interdepartmental committee.

In Manitoba, the Emergency Measures Organisation was coopted at a relatively late stage onto the provincial drought committee, but did not appear to play an active role in either response or coordination.

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1. For a discussion of Alberta Disaster Services, see R. Kueneman, (1975).

Emergency Planning Canada played a role in the drought response by virtue of its membership of the federal steering committee and the Regina-based Task Force. The regional directors of Emergency Planning Canada also have some responsibility for natural hazards in Indian Reserves, National Parks and Defence land. Most of the regional directors saw their role as an observer of environmental conditions and provincial activities; as a coordinator of other federal agency activities in their region; and as an information source for the Task Force and Emergency Planning Headquarters in Ottawa.

Within the Drought Task Force roles were defined fairly clearly,with Emergency Planning Canada responsible for office support, forest fire assessments, U.S. situation information and communications and information dissemination.

Table 5.5

Internal Perceptions of Functional Responsibilities

FUNCTION	OFFICIALS AND AGENCIES CLAIMING THIS RESPONSIBILITY*
Monitoring	Atmospheric Environment Service Inland Waters Directorate Provincial Environment Depts Federal Dept of Agriculture Provincial Agriculture Depts Emergency Planners (Prov. and Fed.) Individual Farmers Statistics Canada
Communication	Federal Task Force Provincial Drought Committees Intergovernmental Affairs Office Emergency Planning Canada Departmental Press and Information Offices Politicians
Decision-Making	Cabinet Steering Commitee Provincial Politicians Individual Farmers and Municipalities Federal Task Force Provincial Drought Committees Federal Parliament
Programme Implementation	Prairie Farm Rehabilitation Administration (PFRA) Provincial Agr., Envt., and Municipal Depts Municipalities Individuals - farmers and householders Federal Field Personnel

* Based on interviews and documents

Table 5.5 Cont'd.

Internal Perceptions of Functional Responsibilities

FUNCTION	OFFICIALS AND AGENCIES CLAIMING THIS RESPONSIBILITY*
Finance	Federal Government Disaster Assistance (EPC) Municipalities Provincial Governments Treasury Board Individuals Insurance Companies
Coordination	Cabinet Federal Task Force Emergency Planning (Canada and Alberta) Interprovincial Drought Commitee Federal-Provincial Drought Committees Provincial Drought Committees Steering Committeee

* Based on Interviews and Documents

6. SPECIFIC ISSUES

6.1 THE RESPONSE TO LIVESTOCK FEED PROBLEMS

Prolonged drought may result in the degradation of pasture, and poor yields of fodder crops; which combine to create feed shortages for livestock, particularly in the winter following a severe drought. Although some farmers maintain fodder reserves from year to year, the impact of a drought will depend on the existence and extent of these reserves, or on the availability of alternative supplies. Government officials and researchers claim that because there has not been a feed shortage for some years, and because there is an expectation that in a disaster such as drought, alternative supplies will be made available, farmers are minimising or eliminating fodder reserve safeguards (interview 1,2,12,18,19,22).

When fodder reserves are stressed or inadequate, alternative supplies may be obtained by purchasing feed from other areas, expanding grazing area, haying new areas, or extending supplies by protein augumentation.[1] A feed shortage may result in the sale of livestock and reduction of herds, although governments may try to offset this process by offering financial buffers to drought hazards in the form of hay and fodder crop insurance, tax deferral or feed freight and purchase assistance.

The identification, selection and coordination of appropriate responses to livestock feed shortages anticipated for the 1977 drought in the Prairie Provinces covered most of the alternatives discussed in the previous paragraph, and case studies of the communications, decisions and attitudes to the various proposals illustrate a number of important problems in the coordination of response to drought in Canada. In particular the feed freight assistance and straw ammonification proposals are characterised by coordination and communication difficulties.

The first concern during the onset of drought conditions in 1977 was the impact of drought on crops for human consumption (particularly on cereals and fruits) and on water supplies for irrigation, domestic and municipal systems. (Interviews 4,8,9,11,13,14); Canada Hansard March 9, 1977).

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1. See straw ammonification issue on following pages.

However as dry conditions persisted and as observations revealed a focus of greatest impact in the ranching districts of the south western prairies, political and administrative concern turned to the provision of feed and water to livestock. (Canada Hansard, April 26, 1977, May 3, 1977; Alberta Hansard, April 27, 1977).

A review of provincial drought files indicates that concerns for livestock, together with that for municipal water supplies, persisted into the fall of 1977, several months after the physical manifestations of the drought faded. For example, in both Alberta and Saskatchewan sales of cattle to market were analysed with a view to identifying the effects of feed shortage through until spring 1978 (Provincial drought files).

6.2 FEED FREIGHT ASSISTANCE

It is not clear from the information available who, in either federal or provincial governments, initiated discussion on feed freight assistance as a possible response to the drought emergency. At the political level questions and suggestions relating to possible assistance in the transport of feed can be identified on April 27, 1977 (Alberta), May 2, 1977 (Saskatchewan) and May 3, 4 and 6 1977 (Canada). With regard to the 'official' drought response (drought committees and the Task Force), the inclusion of a cost sharing feed transportation assistance program as part of the federal contingency plan was apparently formulated by members of the Steering Committee in "late April and early May." (Emergency Planning Canada, July 1977, page 2).

Task Force files indicate that discussion about a feed freight assistance program took place at meetings on May 17, 20, June 28, July 13 and 31st, with discussions not only of program implementation but also of its advisabiltiy. However, the Federal attitude to a feed freight assistance program was somewhat constrained by the Agriculture Ministers' announcement in Parliament (and subsequent press release) of the federal drought response in which a livestock feed transportation assistance program would be an integral part. (Agriculture Canada News Release May 20, Canada Hansard May 5). Thus it appears that feed freight assistance was a component of federal policy at an early stage.

Federal initiatives on fodder transportation assistance have a precedent in the response to the 1961 drought emergency, and in financial assistance given for feed purchase in the 1930s. Feed freight assistance is also seen as politically expedient, particularly to gain electoral support in the agricultural sector and visibility for federal government (interviews 18, 22, Crown and Heady, 1972). However political considerations must be balanced against the disadvantages of the program, which were discussed by the Federal Task Force and Steering Committee (Minutes May 20, 1977) and very seriously by the provinces as they considered the option to cost share a feed freight assistance program provided by the federal contingency plan.

The basic objective of a feed freight assistance program is to pay or subsidise grants to livestock producers to defray the cost of shipping hay or other feed to deficit areas (Saskatchewan Drought Program Description). The program initiated by the Federal Government in 1977 specified a grant of $15 per ton for the transport of fodder to breeding herds for movements over fifty miles, to a maximum of $2,250, with the costs of grants shared equally between federal and provincial governments. Although the program was proposed in early May, bilateral negotiations with the provinces individually took most of the summer with the first agreement signed with Saskatchewan on September 16, 1977. The delays in the signing of these agreements, in contrast to the Deep Community Well program signed in July and September, result from extended within province and federal-provincial discussions on the wording, scope and advisability of the program. (Interviews with Alberta and Saskatchewan officials).

The majority of communication about the feed freight assistance programs appears to have taken place within committees of government and not between groups of officials. For example, reservations about the program are frequently expressed in memoranda of the Saskatchewan Interdepartmental Drought Committee, and at Federal Task Force meetings, but specific disadvantages are not discussed between these groups. Some external pressure is evident, such as a letter from the Saskatchewan crop growers association to their provincial agriculture minister in early September requesting feed assistance, and from the Canadian Cattlemens Association to the Task Force. Provincial officials admit that they felt political pressure to sign the agreements from

the farm lobby, particularly in Alberta, once Saskatchewan had publicised the signing of an agreement (Interview with Alberta Agriculture).

A quotation from a Saskatchewan drought committee discussion document summarises the basis of reservations about the program:

> "The Department of Agriculture has often administered fodder assistance programs and notes that, first, the bulk of the assistance tends to accrue to the seller and the trucker rather than the buyer and that, second, the predictability of such programs undermines any attempt to encourage producers to maintain adequate supplies on their own and to keep herd sizes and fodder production in balance."
>
> (Memo, Saskatchewan Drought Files Aug. 8, 1977).

However the alternative of not implementing the program, although it was considered unlikely to adversely affect the beef industry, (since only 8 percent of beef cattle were in the drought area) risked some political backlash from the agricultural community who expected the program as a result of tradition, and of federal government publicity (Interviews 18, 19).

Alberta and Manitoba discussions were of a similar nature. Alberta felt that if feed freight assistance was offered it would be politically inexpedient to offer it only to the southern drought affected area, and not also to northern and central areas who were suffering a poor harvest due to cold, wet conditions (Alberta memo, September 27, 1977). Manitoba preferred to consider other alternatives such as the purchase of reserve feed by the government, or, as implemented the expansion of grazing areas.

Other general concerns expressed by government official in interviews included the risk of exploration of the program by moving fodder within the farm or exchanging between neighbouring farms, the likelihood that prices for feed would be raised artificially in anticipation of the program, and that the supplies would not only come from areas with a surplus but also from drought areas where profit motives outweighed self help considerations. There is evidence of feed transportation <u>from</u> the area of Brooks, Alberta, which was a drought area, to the United States and to the swift current area of Saskatchewan, although the feed was required in Alberta. Here again there is little

evidence of communication of concerns between the various groups involved in the drought response other than a warning given by Alberta to Saskatchewan regarding "within farm" transportation which resulted in the fifty mile minimum clause in the final agreements.

Saskatchewan showed the greatest interest in the feed program, although it wished to include a provision for extension of existing supplies through straw ammonificaiton, and appears to have carried out careful research and discussion. Alberta was more reticent, and, it is said, was pressured to sign the agreement by political more than resource management considerations. Manitoba preferred, and had available, other alternatives.

The Federal government was concerned to implement the agreement in all three provinces, and may have urged this through publicity, perhaps against provincial objections (Canada Agriculture News Releases July 26, May 20, 1977). The bilateral nature of discussions constrained the expression and communication of common provincial concerns. Some cynicism was expressed at the deliberations on the wording and publicising of agreements which seemed to characterise the political rather than truly mitigating objectives of the agreements (Interviews with provincial officials). The response to the Alberta and Saskatchewan agreements, once signed, was not very great as expressed in a note from Saskatchewan Agriculture to the Task Force on October 31. As of December 15, 1977 $150,000 had been spent out of an estimated $450,000 in the Saskatchewan program.

One view of the feed freight assistance program is that it was an indirect financial subsidy to alleviate the impact of the drought and not a direct grant for feed purchase. It may also be easier to administer, and more economic for governments than a fodder insurance or farm income tax deferral system. Other indirect subsidies might include encouragement to use cereal crops for fodder and reimbursment through existing crop insurance plans or control of market pricing. Even a modification of the feed freight assistance helps the farmer, and not the sellers and truckers might be preferable, although this would not allay all provincial conerns.

In reviewing the feed freight assistance decision in the 1977 drought it is recognised that discussion and reservations were not confined to

provincial committes. The pros and cons of the program were discussed at the Federal level, and the federal Parliament debated the undesirable influence feed assistance may have in encouraging the maintenance of herd size and resultant overgrazing (May 3, 1977, Mr. Hargrave in Canada Hansard).

However this study has found no evidence of a clearly set out and communicated rationale for the feed freight assistance program. Furthermore there is a post-event realisation of poor coordination of federal and provincial objectives. Several of those interviewed feel that financial support, long term objectives and even political visibility of both federal and provincial governments might have been better served by a different response.[1] Certainly in any long term strategy for drought it would seem that feed freight assistance should only be considered as a response if all else fails, and that livestock feed should be safeguarded through conservation and maintenance of reserves by the farmer, recognition of pasture carrying capacity and reduction of overgrazing, possible nutrient treatment of straw to extend reserves and perhaps fodder and livestock insurance for severe emergencies.

The cycle of poor fodder reserves, overgrazing, drought emergency, expectation of assistance, political pressure and eventual implementation of a feed freight assistance program is ultimately deleterious to farmers' interests. In any future drought emergency this cycle maybe broken with better communication and coordination of programs and their fuller publicity by responsible authorities.

6.3 STRAW AMMONIFICATION

An alternative to feed freight assistance for protecting livestock feed in a drought is straw ammonification, a process in which the nutrient content of straw is enriched. The application of anhydrous ammonia to hay and straw increases the rate of organic breakdown, improving digestibility and increasing the nitrogen content. A protein increase of 9 percent and improvement in digestibility of 35-45 percent can be achieved (H. Bjorge in Saskatchewan Agriculture files). In the 1977 drought the Saskatchewan Department of

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1 In particular, a coordinated federal and provincial publicity campaign would avoid the pressures and bitterness felt by provinces with regard to the feed freight assistance proposals.

Agriculture, supported by the provincial interdepartmental drought committee, was in favour of straw ammonification as an alternative or complement to other fodder relief programs, and requested federal approval and cost sharing for a province wide program.

The process was studied by the Saskatchewan Research Council in 1976. There are fairly good communications between the Saskatchewan Research Council and the Provincial Department of Agriculture (the only province where files revealed such contact between Research Council and government). A meeting was held between the two organisations on April 26 1977 to discuss the relevance of an ammonification program to the predicted fodder shortage of 50-70 percent normal production.

The concern for livestock, particularly in south-west Saskatchewan, led to the inclusion of proposals for a straw ammonification demonstration program, a straw ammonification assistance program and a public information program in addition to feed freight assistance in the provincial drought response (Saskatchewan Drought committee report, June 1st, 1977). The Saskatchewan committee proposed 75 demonstration programs and a grant of $10 per ton of straw treated by other producers. The Department of Agriculture argued that it "would be more effective to provide farmers with assistance in the ammonification of straw. . . rather than provide fodder transportation assistance, a program which has been abused in the past" (Saskatchewan Drought Committee, June 1st, 1977, p.12).

Approval for this program with the backing of the Saskatchewan Research Council was formalised in the middle of May. The Saskatchewan drought committee decided to seek federal cost-sharing for the program and contracted the Task Force. Communications were between Saskatchewan Agriculture, Mr. Wiens (the Task Force chairman) and a member of the federal Department of Agriculture with whom there existed good informal contacts (June 27 report to Task Force). The proposal was discussed in the Federal Task Force on June 28, and it was decided to seek expert advice on the advisability of the program from the National Research Council.

According to both the Saskatchewan and Federal officials interviewed, the National Research Council recommended against a province-wide program on the basis of discussions with the Saskatchewan Research Council. Why the Saskatchewan Research Council recommended against straw ammonification to the federal government, after encouraging the development of a provincial program is not clear. It certainly indicates a breakdown of communication and coordination.

The reasons for recommending against straw ammonification, according to an official of Agriculture Canada, relate to 1) the risks of handling anhydrous ammonia, 2) the problems in determining appropriate quantities of application, and 3) possible calving problems. It was felt that the process had not been fully tested and that further pilot field tests were required.

The decision against a full scale straw ammonification program was taken at a Task Force meeting on July 13 and communicated to Saskatchewan Agriculture on July 14, 1977. However further discussions during the summer revised federal policy to consider possibilities for a set of demonstration projects to be cost shared by the federal government.

The outcome was the incorporation of an agreement on a straw ammonification demonstration project into the Canada-Saskatchewan cost sharing agreement on feed freight assistance signed on September 16, 1977. Twelve demonstration projects were funded, at a cost estimated on December 15, 1977 at $25,000, shared equally between federal and provincial governments. The effect of the straw ammonification was carefully monitored, especially with regard to impact on calving activities.

Neither Alberta nor Manitoba participated in this bilateral project between Saskatchewan and Canada, and the officials of these two provinces were not aware of the details of the proposals nor the outcome. Federal officials interviewed were not certain that in the event of another drought that straw ammonification projects would be generally encouraged as an appropriate response by provincial governments.

6.4 GRAZING IN PARKS AND ON DEFENCE LANDS

In addition to feed freight assistance and straw ammonification a number of other responses were discussed and adopted to alleviate livestock feed shortages during and after the 1977 drought. These included livestock or fodder insurance, tax deferral and expansion of grazing opportunities. Communication about the need for information, rationale and implementation of these programs between provincial governments and between provincial and federal governments was not very effective, and response to requests and suggestions made by different groups was ad hoc and poorly coordinated.

For example, there is little evidence of an explicit and coordinated policy for opening crown lands, national parks and defence lands for grazing during a drought. Concern for a clear policy was expressed in parliament at both levels of government (Saskatchewan Parliamentary Report April 29, 1977, Canada Hansard May 3, 1977, May 4, 1977, May 9, 1977, Alberta Hansard April 27, 1977). However the implementation and consideration of requests for grazing land was on an ad hoc basis; partly because national parks, crown land and defence lands are the responsibility of different federal departments.

There already exists considerable areas of community pasture established after the 1930s land degradation which is used by farmers to extend grazing capability. These are carefully managed and supplied with extra water during droughts. However these pastures, a federal provision under the Prairie Farm Rehabilitation Administration, are not equally distributed across the three prairie provinces, the large majority being in Saskatchewan, a few in Alberta and none in Manitoba. In the event, the P.F.R.A. community pasture system was not considered adequate to provide for the emergency (Interview with P.F.R.A. officials).

In Manitoba, the extension of grazing lands was the major response to drought impacts on livestock feed, in contrast to the interest which Alberta and Saskatchewan shared in feed freight assistance, tax deferral and other programs. One of the first actions of the Manitoba drought committee was to request a study of emergency grazing capabiltiy in the province (Drought files). Initially, requests were made to the provincial cabinet for emergency use of crown lands (June 7, 1977) but requests were also made to the Federal

government in relation to grazing in Riding Mountain National Park.

Federal Emergency planners indicated that they would take on the liaison role between provincial government and the federal departments responsible for parks and defence land in an emergency such as drought. However only the Alberta official appears to have been consulted on requests to expand grazing lands and the majority of liaison took place between provincial agricultural departments and their federal counterparts or between politicians.

In Alberta the Federal Defence area of the Suffield pasture has long been identified as valuable potential grazing land and the Alberta government made an early submission to the Federal government through the Department of Regional Economic Expansion (April 27, 1977). The Suffield alternative was considered as a specific response by the Task Force at their initial meetings and a decision was promised for June 1, 1977. The proposal was considered jointly by the Departments of Defence and Agriculture. The decision had been already taken by May 20, and announced in a News release on May 24 as an added response to the Federal drought contingency plans announced by Whelan. This opening of the Suffield pasture to 3,800 cattle by July 6 considerably benefitted ranchers in Alberta, but was felt to be inequitable by the other provinces (Interviews in Saskatchewan and Manitoba). This was especially in view of Federal government insistence that the water development and feed freight assistance programs should be uniform in each province (Task Force files, May 25, 1977).

In Saskatchewan the provincial government was approached by farmers requesting the opening of Prince Albert National Park for emergency grazing. A series of communications between the Saskatchewan Drought Committee and the Task Force chairman resulted in the need for a formal request to be made by a local politician (M.P.) to the federal government. Through this route, permission was eventually given for haying in the Park to the Yorkton M.P. at the end of July.

Inequity was also felt by sheep ranchers in southern Alberta who were not allowed to pasture their sheep on the Suffield emergency pasture (June 15, Alberta files). A request was made for permission to graze in Waterton Lakes

National Park to redress the balance, and permission was given on August 9, 1977. Although this may have alleviated sectoral impacts in Alberta the opening of Waterton Lakes seems to reveal the ad hoc nature of Federal Response to grazing problems of a very unbalanced regional emphasis. Drought files also indicate some inconsistency in federal attitudes on grazing in National Parks; since the Department of Indian and Northern Affairs recommended against the use of Parks for grazing but seems to have been overidden by political considerations, especially in Alberta. The grazing of domestic animals in National Parks is said to be risky, both to the animals who may be attacked or assaulted by wild animals and bison, and to the parks where fire hazards may increase and vegetation altered and degraded.

6.5 TAX DEFERRAL

In the United States, income tax deferral is permitted for farmers to mitigate the financial impacts of poor crop and livestock production in particular years. Although this was mentioned very early in the federal drought discussions (Task Force May 17), together with possible deferral in farm credit and interventions in the cattle market, it was not fully evaluated until September. At this time (September 1st) the task force received a submission from the Canadian Cattlemen's Association requesting tax deferrral as in the U.S. and claiming political support from Western Canadian M.P.s. The issue was discussed by the Task Force on September 19, stimulated by Alberta agriculture, requests made in parliament and the Canadian cattlemen's Association, but without imputs from the other two provinces.

The decision appeared to rest on the actual impact of drought on the cattle market in relation to the need and effect of tax deferral. The files of Alberta and Saskatchewan agriculture show that there was little, if any, effect on cattle marketing in 1977, which indicates that the Alberta request on tax deferral was largely political. However federal task force discussion did not use actual marketing figures but relied on individual perceptions of grass growth, hay yields and stock watering problems and the 'psychological impact' of drought. A figure of 8 percent increase in cattle marketings was suggested for the three provinces; although interviews in the present study attribute this to factors other than drought.

Despite the political advantages of income tax deferral, the policy recommendation was against deferring taxes for 1977. This decision was based on recognition of the long term effects of such responses to disaster in encouraging farmers to rebuild herds which are presently too large for long term management in relation to pasture carrying capacity. This recognition of long term implications of financial subsidies to livestock producers contrasts with the earlier federal policy on feed freight assistance which provides similar incentives for herd size maintenance. However the federal rationale for deciding against income tax defferal had not been communicated to provincial officials by the time the interviews for the present study took place, and the actual impact, if any, of drought on livestock in 1977 had not been disentangled from available statistics, because of the corresponding effects of general economic recession and other factors.

Summary

The above discussion of response to livestock feed problems illustrates the sequence of communications, coordination, decision making and program implementation of response to the 1977 drought. In particular the case studies show the ad hoc nature of provincial requests and federal responses, and the poor communication of reasons for and against particular programs expressed by different groups. The livestock feed emergency program was poorly coordinated in contrast with the emergency water supply responses, and after the event interviews with a number of officials indicate considerable disatisfaction with the overall response to livestock problems.

6.6 THE RESPONSE TO DROUGHT ON INDIAN RESERVES

The 1977 Drought affected Indian reserves in all three provinces, particularly domestic and livestock water supply, transportation routes and natural resources. However Indian and Northern Affairs were not in the first round of appointments to the Federal Task Force and a representative was not accepted until late May. The Task Force member, Mr. St. Jacques, was selected by the Department to coordinate the response to drought on Indian Reserves which was implemented at a regional level.

Information was collected on water supplies and fire risks on a regional basis but was not regularly forwarded to the Task Force or other response

agencies. Surveys of past costs were used to estimate requirements for current programs. Most of the discussion and decision on Indian Reserves took place during June 1977, although there had been earlier submissions from both provinces and D.I.N.A. regions in May. Indian Reserves were not covered by the federal-provincial cost sharing agreements developed by the Departments of Agriculture and Regional Economic Expansion for water development and feed assistance. Responsibility for water and feed in Indian Reserves was given to D.I.N.A. despite the inadequacy of D.I.N.A. resources, (pumping equipment etc.) and although adjacent areas were being serviced by D.R.E.E. (letter from D.I.N.A. official).

Subsequently, however, the Federal Department of Agriculture promised to include Indian Reserves in any joint feed freight agreements in assistance to farmers so long as individuals met the terms of the agreements. Provincial drought programs were also extended to cover Indian Reserves in some cases, such as the Alberta provincial dugout pumping program, Saskatchewan Agriculture pumping and well developments programs and under existing agreements on fire supression with the Alberta Fire Service.

Although provinces have important control and responsibility for land, people and resources within their boundaries there are a number of isolated areas of land in Federal ownership or jurisdiction including parks, defence lands, and, under various treaties and the Indian Act, Indian Reserves. There are a large number of Indian Reserves in the Prairie Provinces; particularly Saskatchewan, administered by the Federal Department of Indian and Northern Affairs; in which native peoples carry out agriculture, industry and community development in similar ways to adjacent non-reserve economies. Thus when drought affects large areas of the Prairie Provinces Indian reserves are affected equally with other areas in the province, and in some cases more severely, because of the poor economic status and specialist activities on the reserves. For example traditional hunting and fishing activities are important to reserve economy and individual livelihood, and habitat and reproduction of fish, per bearers such as beaver and timber resources are often damaged by drought.

Geographically it would seem sensible to treat Indian reserves in the same way as other provincial local authorities, especially in emergency

situations such as floods and snowstorms. In Alberta, the Disaster Services Agency has a formal agreement to treat Reserves as regular provincial municipalities in disasters; recouping costs where necessary (A.D.S.A. interview). In Manitoba there is a similar informal agreement for floods, but not explicitly for other emergencies. In general there are potential difficulties in coordinating response to an emergency involving Indian reserves, even in a small local area, because of adjacent federal and provincial responsibilities.

Many provincial and some federal officials were disappointed and surprised that the Department of Regional Economic Expansion would not take a responsibility for community water supply developments on Indian reserves as an extension of the federal provincial cost sharing program. This was explained in a memorandum stating that D.R.E.E. was overextended on drought programs and could not take a lead role on Indian Reserves; and that in addition it was too late to incorporate provisions into agreements (July 8, 1977).

However Indian and Northern Affairs drilled wells on existing budgets and with limited equipment, obtaining some refund of expenses in a Treasury Board special allocation. Individual farmers had some existing servicing agreements with the P.R.F.A. Fire supression was carried out with advice and assistance from the provinces, with particular concern in Manitoba. There was considerable regional variation in drought impact on reserves and in the need for cooperation from relevant Federal and Provincial departments. For example, in Manitoba there were pumping and drilling equipment problems, and a request for better monitoring information from Federal and Provincial environment groups to help identify and plan drought relief (Manitoba files). In Alberta, extra fire equipment was needed provided by municipalities and the provincial fire service. In Alberta reserves were serviced by provincial community water development programs with costs passed to D.I.N.A..

The interviews for this study indicate considerable confusion about who was responsible, who acted and what was done on Indian reserves in the 1977 drought. Many officials expressed concern at the lack of information and policy for drought impacts and alleviation on the Reserves. The Federal

Regional Emergency Planning Officials were particularly worried because they feel that it is one of their responsiblities to coordinate response to emergencies on Federal lands in the prairies such as Indian Reserves. Alberta and Manitoba officials were able to meet with other Federal officials and collect information on the drought situation on reserves. On the whole provincial officials were not aware of the response to drought on Indian Reserves other than in Alberta, although some felt that P.F.R.A. or D.R.E.E. had had some responsibility.

Some Federal officials felt that Indian Reserves, or at least the Department of Indian Affairs should have had equal treatment in the community well response, and that in an emergency equipment and finance should be made more easily available to reserves, or sharing agreements negotiated with the provinces. Those interviewed felt that the position of Indian Reserves for all types of emergency should be clearly expressed, although flexible, in relation to both federal and provincial governments. However any policy should recognise geographical differences and correlations, and the special nature of some native problems such as those of drought on commercial hunting and fishing. There is a need for useful communication channels to be developed at the local level, rather than information passing to the regional or national level to be directed to local provincial officials.

7. CONCLUSIONS

From this examination of the events that occurred in response to the 1977 drought in Western Canada, certain conclusions can be drawn about emergency planning and coordination. Some of these conclusions lead to recommendations for improving Canada's ability to respond to drought. The conclusions are discussed under the headings; Coordination in the 1977 drought; Institutional factors in coordination; Monitoring and Communication; and Perception.

7.1 COORDINATION IN THE 1977 DROUGHT

1) Full use was not made of existing coordination networks and institutions which could play a stronger role in responding to the drought; for example, the Prairie Farm Rehabilitation Administration and the Prairie Provinces Water Board.

2) Coordination was made more difficult where some agencies are organised by function (e.g. Agricultural Ministries) and others are structured into geographical areas (e.g. DREE).

3) The regional base of the federal Task Force in Regina improved its capability to act as a coordinating body.

4) The relationship between ongoing programmes (and responsibilities for them) and emergency programmes was often unclear and required more specific elaboration; for example, between routine PFRA water development and drought emergency programmes. In this way short-term emergency relief can be better coordinated with longer term (and related) mitigation measures. This improves continuity in government decisions and policy.

5) Programmes were negotiated bilaterally between the federal government and each provincial government in 1977. Although there are strong political and economic reasons for bilateral agreements, in the case of the Deep Community Well and Feed Freight Assistance Agremeents bilateral negotiations led to uncoordinated government policies in drought response.

6) The establishment of various committees was a principal mechanism for government drought response. Some of these appeared to be too large to effect adequate communicaion and decision-making (e.g. the Interprovincial Committee for Drought). Other committees were concentrated at too high a

decision-making level for the exchange of needed technical information and appeared to serve a political more than a practical response function.

7) The special drought committees, in some cases, lacked adequate guidelines and some confusion about roles and responsibilities resulted; for example, which Committee or Task Force was responsible for informing the public or acting as a centre for information gathering.

8) The establishment of special committees in 1977 to operate for the particular drought emergency without clearly defined termination dates (sunset provisions) and provisions for periodic review led to some suspicion and concern about other agencies' authority being infringed.

9) In 1977, coordination appeared to be most effective where there are clear statutory guidelines and legislative authority (such as that existing for the Alberta Disaster Services) or a widely accepted authority (such as that held by Saskatchewan Ministry of Agriculture). A lack of statutory authority or recognised responsibility constrained the coordinating role of other agencies, such as the EMO in Manitoba, and to some extent, EPC in Ottawa.

7.2 INSTITUTIONAL FACTORS IN COORDINATION

1) The division of responsibilities between federal and provincial governments that characterises the Canadian situation also played a significant role in the response to the 1977 drought. Under the British North America Act, the Provinces own natural resources and the federal government have responsibility for interprovincial and international waters, fisheries and Indian Reserves. Jurisdiction over agriculture is shared between federal and provincial governments. Moreover, in an emergency, the federal government can assume authority for the crisis. The constitutional framework thus provides, at the outset, for a complex government machinery with full potential for ambiguity and conflict over roles and responsibilities.

2) The Canada Water Act 1970, designed to improve and streamline coordination between the agencies involved in water resource management, provided for interdepartmental committees and federal-provincial consultative committees which tend to increase an already complex administration.

3) The sheer number and size of the agencies at all levels of government involved in drought response makes any preparedness planning and coordination very difficult before or during an emergency.

4) Emergency planning is only a small part of an agency's responsibilities and internally must compete with other programmes for resources. Interdepartmental planning for coordination in emergencies is likewise difficult.

5) The intergovernmental and interdepartmental bodies which have been established, such as the Prairie Provinces Water Board, the Prairie Farm Rehabilitation Administration, and the federal Interdepartmental Committee on Water, lack statutory power to make decisions and lack political visibility. Their strengths for drought response lie in their good network of local contacts and accumulated institutional experience at the local level.

6) Agencies tend to have spatial jurisdictions, and divide them into administrative subregions, which do not coincide geographically between agencies. This tends to exacerbate the problem of coordination at the local level.

7.3 MONITORING AND COMMUNICATION

1) In the 1977 drought, adequate hydrometeorological data were available except on groundwater.

2) There is a need for a realtime monitoring station in S.W. Saskatchewan because of the particular topography in the area and because it is a drought-sensitive area.

3) There was inadequate information available in 1977 on drought impacts, especially on up to date economic, industrial and social conditions. Data gathering on impacts tended to be ad hoc and oriented to specific programmes such as the Saskatchewan-Nelson River study. Data are not collected at regular nor frequent enough time intervals to allow trend interpretation at an early stage.

Agricultural information is probably the best developed and communicated, but it is only synthesised on an annual basis.

Understanding of the relationships between physical conditions and drought's economic and social impacts is hampered by the present collection of data within very different networks.

4) A better use of regional field staff is indicated in collecting data in the field, from farmers and members of the public.

5) Information on drought conditions and response strategies in the adjoining parts of the United States does not appear to have been communicated and used as rapidly and effectively as it might have been.

6) Information flows tend to have been vertical, especially within the federal government, where most flows concentrated on Ottawa, at the expense of better communcation networks being established within the drought affected area; for example, between regional government offices.

7) Some information flows involved considerable time lags before they reached Ottawa from the drought region. For example, EPC received drought information with time delays ranging from 1 hour to 1 month.

7.4 PERCEPTION

1) Government officials preferred, and used, others as contacts for information whom they perceived as having similar interests - professionally, politically, socially or geographically. These contacts provided the basis for informal communication networks, which operated alongside 'official' information flows and sometimes appeared to make the official networks operational in name only. The difficulty with informal communication links, is that although they may pass information rapidly, they are less visible, less consistent and less easily checked.

2) Provincial and federal governments had different perceptions of the best strategies to combat the drought impacts. Preference for financial subsidies to alleviate the drought on the part of the federal government conflicted with the water management strategies of conservation and increased supply favoured by the provincial governments.

3) Perceptions of the drought itself varied. Some government officials did not perceive the 1977 drought as an emergency and could not therefore see the necessity for any special committees or task forces.

The perception of drought as a water <u>supply</u> problem by the majority of those involved constrained any real attempts to coordinate a policy to control water <u>demand</u>.

4) The degree of understanding about different physical types of drought varied widely among the officials interviewed. Lack of understanding about the differences between snow drought, precipitation drought, and groundwater drought in terms of their varying impacts on agriculture, domestic water supply and tourism led to some failure to consider different types of emergency strategies. Similarly, overreliance was placed by some officials on snow survey data as a drought indicator. Other officials seemed to be unaware of all the indirect impacts and multiplier effects involved in drought and response to it.

5) Although this study did not examine public perceptions of the drought, there is some indication that government response could have better understood, and perhaps anticipated, what various sectors of the public felt about the drought and the government actions.

I have decided to examine in greater depth the question of data for drought forecasting, and information for estimating the impact of droughts in Canada. I do appreciate that you have already given me a lot of your time, and will quite understand if you are unable to reply. If possible I would like some brief comments on the following topics (even quick yes, no, moderately answers might be helpful).

Meteorological Information

Is the information below -	Collected by you?	Received on a regular basis?	Useful to you for drought forecasting?	Up to date? (how long does it take to arrive?	Easily understood?	Comprehensive?
AES daily forecasts						
IWD synopsis of streamflow and precipitation						
Snow survey (IWD or provincial?) Soil moisture						
Streamflow (provincial)						
Palmer drought index						
Thornthwaite index						
Indices for specific crops (Blaney-Criddle)						
Groundwater levels (IWD or provincial?)						
Lake levels						

Please make any other comments on specific information on a separate piece of paper. I would be particularly interested in information collected as a result of the drought emergency (or received), whether you continued to obtain this data, and any other brief notes on the availability, relevance, timeliness, spatial comprehensiveness and forecasting utility of data. Please tell me if I have omitted an important source.

Information on Drought Impacts

Is the information below -	Collected by you?	Received on a regular basis?	Useful for estimating impacts?	Up to date?	Comprehensive?	Direct or indirect indicator?
Marketing information -livestock sales and prices -crop sales and prices -farm equipment sales						
Wheat Pool crop report						
Agricultural field representative reports						
Farmers comments						
Statistics Canada telegraphic crop report						
Drought committee reports - Federal or provincial						
Employment statistics						
Newspaper reports						
Provincial/Federal gov't. dept. reports (please give example)						
Other ?						
Reservoir reserves						

APPENDIX B

ABBREVIATIONS USED IN REPORT

ADSA	Alberta Disaster Services Agency
AES	Atmospheric Environment Services
ARDA	Agricultural Rehabilitation & Development Administration
DINA	Department of Indian and Northern Affairs
DREE	Department of Regional Economic Expansion
EMO	Emergency Measures Organization
EPC	Emergency Planning Canada
EPC HQ	Emergency Planning Canada Headquarters
ERC	Energy Resources Conservation
F&E	Fisheries and Environment
IWD	Inland Waters Directorate
MNR	Ministry of Natural Resources
MREM	Mines, Resources and Environmental Management
NATO	North Atlantic Treaty Organization
PFRA	Prairie Farm Rehabilitation Administration
PPWB	Prairie Provinces Water Board
RCMP	Royal Canadian Mounted Police
RD	Regional Director
RRTS	Renewable Resources and Transport Services

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