NEPE FIELD REPORT 74/6

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NATIONAL EMERGENCY PLANNING ESTABLISHMENT
PEARSON BUILDING
OTTAWA, CANADA
JUNE, 1974

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WORKING PAPER
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DISASTER RESEARCH CENTER
THE OHIO STATE UNIVERSITY
COLUMBUS, OHIO 43210

Working Paper #61

The 1974 Southern Manitoba Spring Flood Response

by

John A. Hannigan
Rodney Kueneman
N.E.P.E. Research Fellows
Disaster Research Center,
The Ohio State University
Columbus, Ohio

1. General Background

The first broad step in the expansive western prairies of Canada, the plains of southern Manitoba are productive farm lands, peppered with numerous lakes and serpentine-like rivers. The area is characterized by heavy spring rains and rapid melting of winter snow, which by themselves, but particularly in combination, result in swollen rivers and flooding in the province each year.

In the ancient bed of glacial Lake Agassiz lies the Red River Valley and Manitoba's capital and chief metropolis -- Winnipeg. Situated 60 miles north of the U.S. border, Winnipeg has experienced high water and flooding on frequent occasions in the last quarter of a century. Thus, in 1950, and again in 1966 a temporary lake 70 miles long and 40 miles wide enveloped the Red River Valley. As a result of the 1950 flood, an investigation was launched in the following year to determine the feasibility and cost of constructing a floodway to divert part of the high water from the rivers which run through the city of Winnipeg. By 1969, this floodway was built and has since functioned effectively to spare Winnipeg from major spring flooding in 1969 and in 1974.

As part of the same flood control plan, another structure called the Portage Diversion was built on the Assiniboine River, west of the city of Portage La Prairie. Due to the interconnecting system of rivers in the province, the Portage Diversion also results in reduced water flowing into the Red River, and thus aids in alleviating Winnipeg's flooding problems.

The Red River winding its way northward from North Dakota, has, together with its tributaries, frequently subjected the farms and communities of southern Manitoba to high waters. The affected communities have responded by constructing ring dykes, while some farmers in the area have built dykes around their homes and put their barns and/or grain elevators on elevated pads. These "mitigating structures" were important in preventing wider damage this year when a record* water flow was recorded for the Red River.

When considering the 1974 flood response it is important to bear in mind two general factors: 1) Organizations and individuals in Southern Manitoba have had continuing experience with flooding, so that a great deal of general knowledge of typical flood related problems exists as well as the expertise required to utilize existing resources in dealing with these problems before and after they arise, 2) Damage mitigating structures have been built in many areas regularly affected by flooding in the past thus

* In the 1950 flood the water flow at Redwood Bridge was 103,000 c.f.s., which created a level of 30.3 ft. above city datum for Winnipeg. On the 1974 flood, the water volume was 120,000 c.f.s. and would have created a stage of over 31 feet, a stage where city services would have been largely immobilized.

necessitating the maintenance rather than the construction of protective structures in many areas.

Another central indication of a flood sub-culture has been the nature of the Manitoba Emergency Measures Organization and its organizational set. In March of each year, the Manitoba Flood Forecasting Committee meets, and prepares reports on possible flood conditions affecting Manitoba. Based on these reports, municipalities are alerted if they are faced with potential flooding. Three states of response readiness are possible, and the degree and nature of preparation required of each government department is specified for each stage in the Manitoba Flood Fighting Plan. A telephone fan-out system is updated so that the flood response can be escalated on short notice. When a flood is imminent, the Flood Plans and Operations Committee is activated and extraordinary measures are initiated to meet the threat.

Throughout the entire 1974 flood response it was constantly evident that the shared expertise developed through dealing with past floods contributed greatly to the foresight which officials involved exhibited in coping with this year's threat in time to prevent an even more serious disaster.

2. Environmental Conditions Leading to the 1974 Flooding

A number of factors combined this spring to create severe flooding throughout Manitoba. It created the "normal" flooding problems along the Red and Assiniboine Rivers; but in addition it created flash flooding problems in areas and communities which usually are not so threatened. As a result not only were the "regular" flooding problems generated but new situations arose which resulted in the emergence of a need to work with communities not normally involved in floods.

The general weather pattern which created the flooding was basically as follows. In the autumn of 1973, there was heavy precipitation followed directly by a hard frost and freeze. This meant that there was a land potential absorption question. That is, the land was so saturated that it was not able to absorb much of the spring run-off. An added aspect of the problem was that there were high snow levels in the Red River Estuary. As the weather remained quite cold, there were no short thaws in the spring. Then, suddenly there was a very rapid thaw with temperatures up to the upper 60^{0}'s together with heavy rains. Most of this precipitation ran off into the rivers and then flowed north into the still frozen rivers and lakes. Eventually the accumulating volume of water caused the ice to break up. The liberated ice then jammed, forming ice dams, which further complicated the water back-up problem. Thus a rather unusual series of natural conditions resulted in swollen rivers, tributaries and creeks, and generalized flash flooding.

3. Pre-Flood Activities

In terms of the activities of flood response organizations the chronology of major events was roughly as follows.

On February 18th, the first water report was issued by the provincial Water Resources Branch, and while no flooding was yet certain, high water was seen as likely. Based on this report, the two Manitoba E.M.O. zone officers were directed to contact municipalities in the province either by telephone or through personal contact. The purpose of these contacts was to ask the municipalities to: (1) review their flood plans, (2) inspect dykes and culverts to ensure their integrity and (3) to cover garbage in their land-fill sites to ensure that it was not able to float around in the event of high water. The zone officers attended municipal council meetings and meetings of local flood committees (in municipalities where they existed), and attempted to inform them of the spring water possibilities.

On March 11th, the Water Commission decided on the basis of weather reports and snow cover study, that some flooding would occur in many river areas of the Province. Zone officers were instructed to advise the municipalities that "river bank flooding" was the municipal responsibility and that river levels might reach 1969 flood levels. The zone officers were to advise and assist in their areas as necessary.

At this time arrangements were begun to establish flood headquarters at the Manitoba E.M.O. local office. For example, Manitoba Telephone Service was contacted for the allocation of a telephone number for the flood control switchboard.

On March 18th, Manitoba E.M.O. alerted the Provincial Department of Agriculture representatives by letter to the flooding possibilities. They were requested to make plans to move grain, stored crops and cattle to high ground and were asked to make plans to ensure that provision was made to ensure the survival of calves.

On March 21st, the water resources forecast indicated that there would be flooding problems. The Premier was notified by the Water Commission and put on "stand-to" alert.

On March 22nd, the zone officers were advised that the Flood Forecast Committee had implimented the "stand-to" alert. The time spent on flood matters by Manitoba E.M.O. increased steadily from this point. The zone officers dealt with flood matters full-time and assisted municipalities in their preparations. It was decided at this time to send letters to all municipalities to warn them of high water conditions.

On March 27th, the Flood Plans and Operations Committee had a meeting with 20 government representatives present at which basic plans were discussed.

On March 29th, the zone officers were instructed to prepare advisory letters to be sent to all municipalities and towns. These letters were all mailed by April 1st. At this time requests for sandbags, information, etc. began to increase and Manitoba E.M.O. began to impliment a high level of activity.

On April 4th, up-to-date situation reports were required from all departments in order that they might be used in a meeting with the Premier (Minister responsible for Manitoba E.M.O.).

On April 5th, the Department of Agriculture sent out questionnaires through municipal offices to farmers to establish where grain, cattle, livestock, etc. existed to make plans for possible evacuation.

On April 8th, Manitoba E.M.O. began setting up its flood headquarters. Emergency phones were installed, switchboard staff was added, and hours were extended to 8 a.m.-12 p.m. Then the weather became warmer and a snow melt became possible, factors which served to aggrevate the flooding problem. On Manitoba E.M.O. request, the Water Resources personnel went out to check the various dyking systems in the flood prone areas. Arrangements were also made at this time for obtaining 100,000 more sandbags.

On April 10th, the Wheat Board and the railroad companies began working together to move grain which was threatened by the high water. Also the City of Winnipeg ordered 200,000 more sandbags at this time.

On April 8th, representatives of the federal and provincial governments met with officers of the Roseau Reserve Council concerning flooding precautions and arrangements at this Reserve. A similar meeting was held on April 11 with officials from two reserves north of Winnipeg -- Peguis and Fisher River.

On April 13th the temperature had risen, but no run-off had yet occurred and water levels on the Red River were still forecast at below the 1969 flood levels. However, on April 15th water flow from the dams had to be increased due to heavy run-off in the U.S.; otherwise water would move south from Saskatchewan into North Dakota and then north again into Manitoba, thus worsening the situation. In light of this, more extensive flooding was expected. This information was contained in the Water Resources Report which was received at Manitoba E.M.O. headquarters on April 15th.

4. Flood Headquarters: Organization and Activities

On April 18th, directives were released which fully activated the 1974 flood response as a major operation. The Premier released 1974 Flood Operation Order No. 1 (a copy is supplied in this report as Appendix 1). This order designated the Manitoba E.M.O. coordinator as the chairman of

the Flood Plans and Operations Committee and as such placed him in charge of the flood response. General procedures were outlined and the various Provincial Departments were given tasks for which they were responsible in the flood response. All listed departments and agencies were instructed to have a representative at the Manitoba E.M.O. Flood Control Headquarters.

All departments were also instructed to maintain Operation Logs and submit daily situation reports to the Manitoba E.M.O. Flood Control Headquarters listing completed, continuing, or anticipated action. The delegation of responsibilities in this directive parellel and extend the task allocations as described in the Manitoba Flood Fighting Plan.

At this time, a $1,000,000 Flood Control and Restoration Expenditures Fund was created by Provincial Governmental order. Procedures were outlined in a directive from the Department of Finance as to how requests for release of these funds were to be presented. All expenditures had to be approved by the Manitoba E.M.O. coordinator and one set of books was kept on disaster-incurred expenses. This was done so that when Federal Government auditors came to determine the Federal portion of assistance under the Federal-Provincial Cost Sharing Agreement, a rapid and thorough audit would be possible.

Thus on April 18th, the Flood Control Headquarters was in full operation with representatives from the various departments and agencies present. At this point the Headquarters went into 24 hour a day activity. Originally the headquarters was situated in one building but, on April 23rd, the decision was made to split the operation and accordingly, the Federal Desk, Boats and Barge, Pumps and Sandbags operations were all moved to a building beside the Manitoba E.M.O. building. As a result, the space problem was solved but a communications problem was created, in that one phone in each building was often tied up for intracommunicative use.

In the Manitoba E.M.O. building, all phone calls were received at a central switchboard. Information on volunteers and sandbags were handled at the switchboard if possible. Calls to the Agriculture representative, the Federal Desk, Canadian Forces liaison representative, or Public Information desk were also routed by the switchboard. All other requests were sent to the Operations Desk which was on the second floor of the headquarters building. Here these requests were sorted out and representatives of Water Resources and the RCMP were on hand to handle any requests requiring their services. The Operations Chief was able to deal with some requests directly, while other requests were directed over an internal communications system within the headquarters. Through this, requests and information were funneled to the Federal Desk, Sandbags and Pumps or Boats and Barges operations. Direct phone lines out of the headquarters existed so that the switchboard was only used for incoming calls. The Canadian Forces liaison officer also had a direct line to their main base through which requests could be quickly channeled.

Turning now to the various operations within the headquarters, a brief summary of activities and procedures will be outlined.

The operations desk was involved in the relaying of information to the other relevant operations. Its essential task was to facilitate the coordination of the various field operations and to ensure that duplication did not occur. The Operations Chief also kept the Manitoba E.M.O. coordinator informed of developments and asked him on occasion for policy statements. Thus this desk was the heartbeat of the flood response. Through it requests were channeled and existing resources were assigned to the proper location as problems arose.

The public information desk was tasked with collecting all information on flood activities so as to keep the inquiring public, headquarters personnel and the media abreast of all developments. Each morning the public information officer compiled a news summary of flood response activities and released it to the media. Thus one source was disseminating correct information which kept the amount of incorrect information circulating down to a minimum. The officer also called local radio open line programs to correct inaccurate information which was occasionally offered by various citizens. Through this operation, a central source of up-to-date and accurate information was available throughout the flood response.

In the Health and Social Development area, a representative of the Provincial Hospital Commission was on hand, since some hospitals and nursing homes were under threats of flooding. As evacuations became necessary, arrangements were made through this operation.

The R.C.M.P. also had a liaison officer who relayed requests for traffic control. R.C.M.P. manned boats and radio equiped cruisers as were required in the flood response. Thus their contribution to the operation was of a resource and trouble shooting nature.

The City of Winnipeg had city engineers on hand to coordinate any response concerning local city flooding with the overall flood response. The 32 flood pumping stations operated normally throughout the high water and no sewer backups resulted. Over 600 persons were involved in the filling of the 500,000 sandbags used in the emergency dyking operations in the few flooding problems in Winnipeg itself. Traffic detours were effective around flooding problems and temporary traffic signals were installed wherever they were necessary. As of April 24th, all emergency dyking in Winnipeg had been completed.

City Welfare representatives were on hand and took care of the 48 families who visited the two reception centres at St. Vital and Fort Garry. Fifty additional families also received direct service from the main office of the Welfare Department.

A Provincial Board of Education representative was on hand to make arrangements for the use of school buses in the various evacuations as required.

The Provincial Department of Agriculture representative funneled agricultural requests to the various agricultural representatives and advised them of problems in their regions. If additional resources were required, these representatives contacted the Agriculture liaison officer at Flood Headquarters and these requests were given to the operations officer for action.

The Canadian Forces liaison officer was on hand to offer his services as requested by the Manitoba E.M.O. coordinator. Once asked to take care of a particular task, this assignment was directed through normal military operations procedures. The Canadian Forces supplied and operated helicopters for the evacuation of Indian reservations, supplied amphibious land craft to transport sandbags to difficult areas. They also unloaded and transported shipments of sandbags brought in on military aircraft to the city works field operations centre. The Canadian Forces also supplied vehicles as required, arranged reconnaissance aircraft flights and supplied approximately 200 troops in various tasks as required. They also had a radio communication net available if normal telephone communications should fail. Thus the Canadian Forces operations in this flood response was of a trouble shooting nature.

The water resources representative was on hand to fill water related requests. A large part of his efforts were directed towards keeping the operations desk informed of the latest water level forecasts and what trouble areas these level increases would create. Much of his effort was also to explain to inquiries as to how the Winnipeg floodway and Portage Diversion operated. He also attempted to explain to residents south of Winnipeg that their flooding problems were not the result of the floodway structure but rather natural flooding conditions which would exist even in the floodway's absence.

The Manitoba E.M.O. Coordinator was tasked with the authorization of flood related expenditures as well as the making of policy decisions and overall control of the flood response. He made sure problems were properly addressed and that conflicts were resolved quickly, He also kept the Premier informed regularily and called and chaired overall headquarter meetings at which progress to date, and problems in the future, were discussed. He also regularily gave pertinent suggestions as to the moment-to-moment operation and attempted to solve major flood response problems as they arose.

The Federal N.E.P.E. Coordinator was available on an 18 hour basis to offer any Federal assistance that was requested as well as offering suggestions to the solution of flood related problems. Together with other federal representatives from Emergency Welfare Services, Emergency Health, Ministry of Transport, Manpower and Immigration, Fisheries, etc., he was involved in coordinating railroad activities and the evacuation

of people, grain, and livestock. Based on their past experience, they also contacted the various Federal Departments in advance of the flood to get names of personnel who might be seconded to assist in the flood fighting operation as well as to secure clearance for the use of equipment from the directors of these departments. The Federal officials also contacted the Ministry of Transport for air clearance of U.S. Commercial Aircraft to land sandbags in Winnipeg, since they did not have landing rights in Canada.

The N.E.P.E. coordinator was also asked to plan the evacuation plan for airlifting of 1000 Indians from three reservations. As with all other operations in the flood headquarters, these officials were involved in responding to a myriad of diverse requests. The calls for suggestions, in all cases, greatly outweighed the specific requests made on any of these officials.

As previously mentioned, special operations existed for Boats and Barges requests. Prior to the flood, lists of available craft were assembled and clearance was acquired for their use in the flood response. Likewise Pumps and Sandbags stores were located and catalogued. When requests were made for such equipment calls were channeled to these operations. Deployment of equipment was documented so that the location of all equipment was maintained. Thus all available resources were located and utilized as effectively as possible. The Provincial Department of Public Works was involved in a Purchasing capacity also and maintained lists of where certain flood-fighting equipment could be purchased and made those orders upon authorization.

This, then, is a general overview of the major operations within the Flood Control Headquarters.

5. Evacuation

The evacuation operations were carried out, for the most part, in the area north of Winnipeg, with some evacuation south of the city.

On Friday, April 19th, it was necessary to evacuate 70 people from a home for the aged and a local hospital in Arborg, a town of 700, situated 75 miles north of Winnipeg. The evacuated hospital here was subsequently converted into a flood emergency centre. At the same time, the 42-bed Carman Memorial Hospital in the town of Carman, 50 miles south of Winnipeg, was evacuated as flood waters had found their way into the basement of the building, throwing heating and lighting equipment out of commission.

The major evacuations, however, occurred at the Peguis and Fisher Indian reserves, about 125 miles north of Winnipeg. The evacuation of

the northern reserves began on Friday, when 30 people were taken by road from the Peguis Reserve to Gimli. By the weekend, however, the roads in the area were impossible, and a massive helicopter airlift was initiated. Thirteen Canadian Forces helicopters transported 1039 flood victims to Hodgson, a nearby town, slightly south of the reservations -- an operation which took seven hours to complete. In Hodgson, the Canadian Legion had volunteered the use of their hall as a staging area where the evacuees were assembled in preparation for taking 900 of them to Gimli, about 55 miles south of Hodgson.

Upon arrival in Gimli, the evacuees were settled into barracks at an old air force base. Flood victims were registered in the recreation hall of the former base, and local residents provided food and clothing for the new arrivals.

A further evacuation was carried out at the Roseau Reserve southeast of Winnipeg, where 400 residents were evacuated to Rivers, Manitoba as a precautionary measure.

Evacuation of the reservations was a two-stage operation in terms of government responsibilities. That is, the responsibility for the actual evacuation and transport of the flood victims was a provincial responsibility, while the Federal Government had the responsibility for looking after the evacuees once they had been removed from the flood area. In the case of the three Manitoba reserves, the various levels of government and the participating departments within both the provincial and federal purviews worked together smoothly and effectively to accomplish the evacuation operation. A provincial Emergency Measures official with a mobile emergency van was in Hodgson and acted as the on-the-scene coordinator. Canadian Forces officers were also present at the scene of the evacuation, and played a notable part in making sure that the helicopter operation was run efficiently.

In Winnipeg, the provincial E.M.O. co-ordinator, the federal N.E.P.E. regional director, and the Canadian Forces officers at the Flood Control Centre all were significantly involved in the overall co-ordination of the evacuation operation. In addition, the provincial Health Services Commission sent nurses to the evacuation area, the Department of Health and Social Development (Manitoba) had field personnel assisting in the provision of accommodation, and the provincial Education Department provided buses for transport of the evacuees to Gimli. Among the tasks of the officials at the Federal desk were opening up the Department of Health and Welfare's "emergency hospitals" in order to provide linens and blankets, and arranging for the transport of 2400 fresh sheets for evacuees in Gimli. Also involved in the reservation evacuations were the R.C.M.P., the federal Indian Affairs Department, and the provincial departments of Mines, Highways, Agriculture, and Northern Affairs.

By Monday evening (April 22), a 15 mile stretch of the Red River immediately south of Winnipeg had begun to flood significantly. Hospitals in Morris and Emerson began evacuating patients to facilities in other southern Manitoba communities, and reception centres were established in Morris and St. Norbert to register evacuees, and to arrange accomodation for those with nowhere to go. In the Turnbull Drive area of St. Norbert, the provincial E.M.O. operated a round the clock information and operations van to assist and advise local residents. Monday also saw the evacuation of an additional 300 people from Carman, where half the community was seriously flooded.

By Wednesday evening (April 24), when the flood situation had finally begun to improve, 2500 Manitobans had found it necessary to leave their homes. This figure does not include those rural residents who voluntarily left their homes to stay with relatives or neighbours, and who were not registered at any of the evacuation reception centres.

6. Observations and Analysis

The most cogent feature of the 1974 Manitoba flood response was the highly developed nature of the disaster sub-culture which exists within a wide spectrum of government organizations and departments within the province. While this can be seen as being, in large part, a function of a continuing yearly flood threat, nevertheless the Manitoba response was not only particularly well organized, but was developed on an anticipatory rather than an emergent basis.

The Manitoba response was especially notable in five areas: 1)careful monitoring of weather and water level and flow conditions, 2)adequate warning to threatened municipalities, 3)precise definition of flood tasks per an explicit disaster plan, 4)pre-existing lists of resources available during a time of emergency, and 5)provision of a high level of autonomy and financial resources for the flood control operation.

The Flood Forecast Committee was found to carefully monitor the environment each spring to determine the possibilities of flooding that year. As required, various levels of flood response activity correspond with the gravity of the threat as determined by the Committee's forecasts. In 1974, this allowed serious preparations for flooding to begin a month in advance of the actual event, and the flood headquarters to be set up three weeks in advance.

Despite scattered claims by some municipal officials and Opposition members of the legislature that areas outside Winnipeg were not adequately warned of the seriousness of the flood situations and the actions required to combat this threat, we could find little evidence to support this position. Through the activities of the zone officers of the provincial E.M.O.

organization, through meetings with officials of the three flooded reserves, and through the letters sent out to the agricultural representatives, and mayors and reeves in the areas where flooding was expected, there is considerable evidence to suggest that more than ample warning was given.

The Manitoba Flood Fighting Plan was found to be a significant source for the clearly defined nature of the task allocation at the Flood Control Center. This document, prepared in the Office of the Provincial E.M.O. Co-ordinator is highly specific in setting out the emergency functions of each of the government departments involved in meeting the flood emergency as well as organizational structure and operating precedures. During the 1974 flood response, this division of labour appeared to be closely followed with sufficient room left, however, for informal co-operation based on emergency exigencies.

The presence of pre-existing lists of resources such as pumps, boats, etc. meant that they could be allocated in a rapid and controlled manner. It is also notable that supplies were obtained through normal government operating structures (i.e., Supply and Services Department) rather than through an ad hoc organizational structure.

Finally, by approving a centralized authority structure, and financial arrangement, the 1974 Flood Operation Order No. 1 ensured that the flood response would avoid factionalism and operate as a cohesive whole.

In short, then, the development of a disaster sub-culture in Manitoba government circles has meant that the problems of flood fighting were clearly understood and that comprehensive and efficient counter measures were developed well before the actual impact of the disaster was felt.

There were, of course, problems in the disaster response, but these were not of a nature which jeopardized the efficiency or effectiveness of the response; nor did they result as major time delays, duplication of efforts or loss of major equipment.

Most problems in the flood response were related to the physical environment of the flood control centre. Had the switchboard been designed so as to be able to reroute a greater percentage of the calls, the burden of the Operations Desk would have been considerally lessened. This would, of course, require switchboard staff with more detailed knowledge of the internal operations of the centre. As the switchboard staff during this flood were volunteers, there was, perhaps, insufficient time to carry out the type of orientation needed to achieve this situation.

By having a headquarters on two floors and latterly, in two buildings, problems of communications delays and fatigue were created. This set up required an excess of intercom and telephone calls and a surfeit of such energy draining activities as climbing stairs and walking between buildings. A large one-floor operation would have eliminated the need for this extra effort.

Another improvement would have been the setting-up of a reception area to regulate incoming human traffic. This would have separated official personnel from visitors, and reduced the overcrowding in the headquarters.

Staff would also have benefited from a rest and recreation area away from the centre of activity, where they could take a complete break before rejoining the operation. Also, as the disaster covered a wide area of the province, increased transportation facilities for flood workers would have been beneficial.

A more basic problem is that of the nature of the jurisdictional boundries between provincial and municipal governments. At present until the Premier of Manitoba judges the flood situation to be serious enough so as to issue an operational order, the local municipalities are responsible for their own flood response and related expenses up to that time. As a result some tend to wait for this order so that they do not incur flood related expenses. Thus often no dyking or other mitigating activities are initiated until after the critical stage has already been reached. What is felt to be necessary is either the earlier release of authority and finances to M.E.M.O. to fight the threat before it impacts or else some mechanism to encourage or force the municipalities to take action before the Premier signs an operational order. Perhaps other solutions are possible but attention is clearly necessary to resolve this jurisdictional problem.

A further problem revolved around the operation of open line radio programs during the flood emergency. That is, it was felt by some government officials that, unlike the "hard news" outlets in the media, the talk in radio programs on occasion became a forum for unsubstantiated rumours and misperceptions about the flood response. Clearly, communication between the operations centre and this type of radio program should be more frequent and co-ordinated.

Conclusion

The 1974 Manitoba Flood Response is clearly an example of how highly defined and rationally planned a flood response can be when an adequate disaster sub-culture exists to sensitize officials to tasks and problems before they occur. Clearly governmental support and financial assistance before the impact is essential to a well developed and executed flood response. Based on our other studies at the Disaster Research Center, it also seems clear that regular threats to the area are an important influence in maintaining this support. The Southern Manitoba Flood response is another case which dramatizes how man can and will develop the protective structures and plans to prevent the destructive effects of nature if he is regularly confronted with incidences of natural disaster.

The 1974 Southern Manitoba spring flood response /