

WATER STUDIES IN SASKATCHEWAN

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INTRODUCTION

The development, conservation and use of the water supplies of the arid regions of the world have become of increasing importance in recent years. In many areas of the world, water development is already equal to or greater than the available supplies with consequent problems to people and industry who rely on the water resources. On the Canadian Prairies the rate of development of industry and population has not yet placed a serious burden on the water resources and careful planning in their development and use can still prevent many of the problems encountered in other parts of the world. At the present time a number of governmental agencies, educational organizations and private firms are involved in various aspects of the development of water resources in Saskatchewan. Much of the work done by these groups is undertaken without consideration of the effect it will have on overall resources and without consultation with other groups who might benefit from or provide assistance to such programs. This has led to the conclusion that some means of providing co-ordination in hydrologic programs undertaken by various agencies was a necessity so that information from research and practical programs would be readily available to all concerned.

It has also become increasingly apparent that there is a lack of properly trained personnel to meet the requirements of the various agencies involved in hydrologic studies. While training in specific areas of hydrology has been available in a number of colleges and departments at the University of Saskatchewan very few students have taken advantage of interdisciplinary studies to obtain a broad training in hydrology. This has resulted in an increasing need for "on the job" training of hydrologists by the organizations involved in the study and development of water resources. "On the job" training is of course likely to be limited in scope and may result in the failure of such workers to recognize the advantages of and needs for co-ordination with related programs of other organizations. It has thus become obvious that consideration must be given to training

personnel in various phases of hydrology, but having the type of broad training which will encourage co-ordination of their work into the overall program of water development, conservation and use.

The University of Saskatchewan and other interested agencies on and off campus have undertaken two major programs in an attempt to meet the requirements for orderly water resources development. These are,

1. The formation of the "Water Studies Institute".
2. The formation of a "Division of Hydrology" within the College of Engineering.

WATER STUDIES INSTITUTE

The Water Studies Institute was formed because of the realization by many of the agencies working with water resource development that there was insufficient communication and co-ordination in the various phases of work which was being undertaken. The needs of development agencies were not always clear to research organizations. The results of research work were not always known by those agencies which could use them. In 1963 members of the Saskatchewan Research Council and the University of Saskatchewan initiated a meeting of all interested organizations which has finally resulted in the establishment of the Water Studies Institute. Recognition of the need for such a development is shown most clearly by the number and variety of agencies and University departments which have expressed interest in this association. They are listed in Appendix 1 of this presentation.

Objectives

The objectives of the Water Studies Institute as developed and agreed to by the interested agencies and departments are as follows,

1. To study the needs for research and teaching related to water, and to assist the University and other organizations in satisfying these needs.
2. To encourage the provision of more adequate funds for research on water problems, and where appropriate and possible, to ob-

tain funds for distribution in the form of scholarships and assistantships to graduate students, and for the operation of the Institute.

3. To provide information to interested people on water studies teaching and research being conducted here. This implies: (i) obtaining, collating and disseminating short summaries of all the relevant research programs at present underway or planned at the University or at various on-campus institutes; (ii) organizing and sponsoring seminars and/or symposia covering the broad field of water studies; (iii) providing more extensive course summaries than are offered in the calendar and making these available both to the teaching staff and to interested students.
4. To draw attention to needs in the University courses given and to offer to help see how these might be filled.
5. To encourage University use of external teaching talent.
6. To act as a clearing house on outside requests for research among University departments and among Institutions on the campus.
7. To assist the University campus to become a centre of intellectual and research activity in the general field of water studies and to encourage outside institutions with interests in this area to locate here.

Organization

The Water Studies Institute was originated to further the progress of water studies pertinent to Saskatchewan and the prairie region and as such welcomes the participation of all agencies with interests in this field. In order to direct the activities of the organization, a central committee has been set up along the following lines,

1. It shall be headed by a chairman and a committee of nine members.
2. The committee shall consist of at least one person from each of the following six broad fields of

interest in water studies:

(i) meteorology or atmospheric water; (ii) surface water; (iii) soils; (iv) groundwater; (v) vegetation; (vi) medical veterinary or animal science; at least one member shall be from the Regina area. Membership shall be for a triennial period, with three members retiring each year.

3. The chairman shall be approved for a three year term by the University President and the Director of Saskatchewan Research Council, acting on the recommendation of the committee.

While an attempt has been made to ensure representation of certain major fields of hydrology on the directing committee, it would not be possible for all related disciplines to have such representation at one time. Thus the provision of rotating membership is vital in keeping people from all fields actively interested in the program of the Institute.

With the primary aims of the Water Studies Institute so closely associated with teaching and research, the University of Saskatchewan and the Saskatchewan Research Council have taken the lead in providing assistance to the organization. As a result, the physical aspects and major activities of the "Institute" will centre around the Saskatoon campus.

Program to Date

As a beginning toward the implementation of the objectives of the Water Studies Institute, the following steps have been taken by the first committee under the chairmanship of Dr. T. P. Pepper, Head of the Physics Division of the Saskatchewan Research Council.

1. The first of the proposed seminars was held in October, 1963, at which representatives of nine different agencies presented their views on research needs in relation to water. The papers presented at this seminar have been published as Report Number one "Research needs in relation to water" and are available on request from the Water Studies Institute.
2. In November 1964 the Water Studies Institute sponsored two notable activities:
 - (a) Convening the International Hydrologic Decade Seminar at which a number of the national representatives from across Canada were present to express their views on Canadian participation

in the program.

(b) Sponsored a one day symposium on "Water and Climate" at which six papers were presented dealing with the various aspects of climatological effects on water resources. The papers presented, together with discussion papers will be published in the near future.

3. At the suggestion of the Institute, the University of Saskatchewan has obtained membership in the "University Council on Water Resources" which was formed several years ago by a number of Universities in the Western United States with the primary aim of co-ordinating research in the field of Hydrology.
4. The Saskatchewan Research Council in co-operation with the Meteorological Branch of the Canada Department of Transport have established a climatological reference station on the University campus at Saskatoon.
5. A sub-committee, established to study the teaching needs at the University is awaiting the establishment of a Division of Hydrology within the College of Engineering before continuing their study.

DIVISION OF HYDROLOGY

Several departments within the College of Engineering at the University of Saskatchewan have been actively involved in teaching and research related to various phases of Hydrology. These include primarily the departments of Agricultural Engineering, Civil Engineering and Geological Sciences. The Agricultural Engineering department's interest is mainly in irrigation and water conservation and to some extent in groundwater development. The department of Civil Engineering is mainly interested in surface hydrology and the Geological Sciences department works mostly with groundwater hydrology. Other departments could conceivably develop interests in the field of hydrology, particularly where presently existing facilities could be used. For example, the Department of Physics offers classes in climatology, and Electrical Engineering work with digital and analogue computers could play an important role in hydrologic studies. To co-ordinate the teaching and research work in hydrology within the College of Engineering, a Division of Hydrology is being established. While the division's main responsibility will be research and graduate stu-

dies, its work will be reflected in teaching at the undergraduate level. Professor F. H. Edmunds, of the Department of Geological Sciences, has been appointed as chairman of the Division of Hydrology.

Responsibilities of the Division

The basic function of the Division is to encourage, to co-ordinate, and to supply general direction to the training in Engineering Hydrology. To fulfill this function the responsibilities of the Division are as follows,

(a) *With regard to research*

(i) All requests for funds for research in hydrology by members of the Division are to be submitted through the Division as well as through the Departments Heads concerned.

(ii) The application of graduate students who have expressed a definite interest in majoring in hydrology are to be submitted to the Division by the Department Head. These students will be given guidance in their selection of specific areas of study. They will then be recommended to a specific department for registration and will be subjected to the normal rules and regulations of that department.

(b) *With regard to graduate classes*

(i) All classes given in hydrology are to be under departmental numbers as at present. However, the content of these classes is to be reviewed periodically by the Division and where necessary the Division is to make recommendations to the departments concerned for changes that would increase their interdepartmental value.

(ii) All proposals for new classes in hydrology are to be placed before the Division for consideration, co-ordination, and recommendation prior to submission to the Curriculum Committee.

(iii) Where necessary the Division is to recommend to the departments concerned the establishment of new postgraduate classes in hydrology.

(iv) Where necessary the Division is to recommend to the departments of other faculties the establishment of service classes for hydrology students.

(c) *With regard to other matters*

The Division is to recommend when necessary to a committee of the

Dean of Engineering and the Heads of Departments the acquisition of additional staff members for hydrology, teaching and research. These members would be appointed by the Departments concerned if they agreed to the recommendation of the Division.

Degrees and Diploma Courses

Engineering studies at the Masters level to students specializing in hydrology would continue to be directed primarily from a single department. Thus a graduate student would be attached to one of the existing Engineering departments, depending primarily on his chosen area of research. The academic work required for such a degree might include basic studies in surface hydrology, groundwater hydrology and flow through porous media, if undergraduate training in these areas had not reached an acceptable level. In any case the student would have considerable freedom to specialize in any phase of Engineering hydrology. The main purpose of the division in relation to such a program would be to ensure that the class work taken would meet the needs of the student in forming a basis for his research work, and have sufficient breadth to qualify the student as an hydrologist.

Graduate Diploma courses have recently been introduced at the University of Saskatchewan to serve the needs of those students wishing to take post graduate work but who for various reasons may not wish to undertake a research program. Such diploma courses will be available to students wishing to undertake advanced studies in Hydrology. As with the degree course students will be assigned to a particular department in line with their interest or field of specialization. The graduate diploma course, through elimination of research requirements, allows students considerably more time in which to undertake formal class work, and a minimum of five full classes are required.

Research Programs

Generally speaking, research programs for graduate students are available within the various Engineering departments on the following basis,

1. In the Department of Agricultural Engineering work may be undertaken relating to irrigation, groundwater flow or water conservation problems. Irrigation facilities are available on the campus and in co-operation with the provincial Department of Agriculture on other irrigation development projects throughout the Province.
2. In the Department of Civil En-

gineering, work may be undertaken relating to problems of water development, hydraulic structures and municipal water supply. Hydraulic and Sanitary laboratory facilities are available in the department and close liaison with industry and government organizations offer the possibility of off campus facilities for research studies.

3. In the Department of Geological Sciences, work may be undertaken relating to problems of the occurrence and development of groundwater. Opportunity for field studies may be arranged in cooperation with the Geological Survey or the Saskatchewan Research Council. The Geological, Geophysics and Petroleum Engineering laboratories are available within the department for lithological, porosity, permeability and other aquifer studies.
4. Financial assistance to students engaged in hydrologic research in any of the departments is available from a number of sources including research institutions, government agencies and industry.

The function of the division in regard to research programs will be primarily one of co-ordinating work between the various departments. Thus duplication of effort will be eliminated, classes will be designed to meet some of the broader needs of hydrology, and students will have ready access to staff and facilities in a number of departments. It is also anticipated that the division will be in a much stronger position to obtain research funds than would an individual staff member or department.

The hydrology division and the Water Studies Institute have very similar interests in the research field, although the Institute will be limiting its consideration to the Engineering aspects of hydrology. Obviously the concerted effort of the two organizations should ensure a strong and pointed research program to meet the needs of the region, and for which financial assistance would be readily available.

APPENDIX I

Following is a list of agencies and University Departments who have been represented in the formation of the Water Studies Institute.

- Saskatchewan Department of Public Health
- Saskatchewan Department of Agriculture
- Saskatchewan Department of Natural Resources

- Saskatchewan Research Council
- Canada Agricultural Research Station (Saskatoon)
- Prairie Farm Rehabilitation Administration
- Canada Department of Transport—Meteorological Branch
- Canada Wildlife Service
- National Research Council
- University of Saskatchewan:
 - Department of Agricultural Engineering
 - Department of Civil Engineering
 - Department of Electrical Engineering
 - Department of Geological Sciences
 - Department of Agricultural Economics
 - Department of Animal Science
 - Department of Crop Science
 - Department of Soil Science
 - Department of Plant Ecology
 - Department of Biology
 - Department of Chemistry
 - Department of Geography
 - Department of Physics

SOIL HYDRAULIC CONDUCTIVITY

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water table as calculated from the probe readings compared very closely with measured depths.

It is anticipated that the probe will find wide usage in drainage and water table investigations, particularly in heavy soils, because the water table position can be calculated without having true static conditions.

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