

Water Management Framework

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Saskatchewan

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Executive Summary

Vision:

Safe and reliable water supplies within healthy and diverse aquatic ecosystems.

Saskatchewan people recognize the importance of water to their lives and well-being and recognize the need to protect and use those water resources wisely. The importance of water to provincial residents and the need to address critical water issues has led the Government of Saskatchewan to develop an integrated Water Management Framework.

This Framework helps ensure that safe and healthy water resources are available now and for future generations. The Framework's vision statement describes our desire for the future. The Framework stresses the concepts of water resource availability, sustainability and protection and lays out steps that will allow the vision to be realized. The following six principles are the foundation of the Water Management Framework and will help direct Saskatchewan's future water management actions:

- **Stewardship**
- **Partnerships**
- **Integrated Management**
- **Value of Water**
- **Sustainable Development**

Best Practice

The Water Management Framework is a comprehensive strategy and builds nine goals, 16 objectives and 58 actions around three themes:

- **Protection** of water and wetlands;
- **Management and Development** of the resource; and
- **Co-ordination** of government activities and **Public Involvement** in decision-making.

The Framework establishes goals and objectives for water management and identifies specific actions by which objectives can be pursued. By emphasizing the principles of partnerships and best practice the Framework gives government departments and agencies the flexibility to use a variety of tools to meet water management objectives.

This document provides an overview of the vision, principles and goals that guided the development of the Framework. It describes objectives that provincial agencies must fulfill in order to realize the water management goals, and lists various actions that provincial agencies will be initiating over the next five years.

Introduction

Management of water in Saskatchewan today is more complex than in the past. Demands on water are greater than they were even a few years ago.

Water resource management strategies must balance competing demands, address growing and more specific requirements and optimize social, cultural, environmental and economic benefits for all the people of Saskatchewan. There continue to be rapid advances in technology. As well, confusing or sometimes conflicting information is available to the public.

A number of critical issues, important to residents of the province and those who manage Saskatchewan's water resources, need to be resolved.

These include:

- ensuring access to safe and reliable drinking water supplies;
- sustainable development to meet the needs of present generations without harming the ability of future generations to meet their own needs;
- the conflicting nature of some activities, such as agricultural drainage and protection of wetlands, which reflects the diversity of stakeholder values and interests;
- the need to streamline approvals and have improved co-operation between government agencies, and increased opportunities for public input in decision-making;
- lack of sufficient scientific data and the need for additional analyses to better understand problems for more effective management;
- the need to balance economic development and sustainable use of water resources;
- the desire on the part of the public to have better awareness and understanding of current policies pertaining to water management; and
- the need to recognize competing demands in a fair and equitable manner — hydro power generation and instream flow needs or municipal and industrial supply and recreational use, for example.

In recognition of the importance of water to the well-being of its citizens and the need to address the critical issues outlined above, the Government of Saskatchewan has developed an integrated Water Management Framework that will:

- help ensure that safe and healthy water resources are available now and for future generations;
- provide policy direction, guide the water management activities of government agencies, and help ensure sustainable management of Saskatchewan's water resources;
- recognize the importance of protecting aquatic ecosystems and the need to more effectively control developments such as drainage; and
- promote economic diversification through sustainable use of water and related land resources.

Perhaps most importantly, the development and implementation of the Water Management Framework will contribute to integrated resource management in the province. Other documents were prepared as part of the framework development process — a discussion paper entitled *Water Management: Issues and Challenges*, a report detailing results of the public consultation process entitled *What Was Said*, and two brochures providing a brief history of water management in the province and describing roles and responsibilities of various agencies. These documents are available from Sask Water or Saskatchewan Environment (Saskatchewan Environment).

Wide circulation of the *Issues and Challenges* paper in late 1997 resulted in a comprehensive cross-section of responses representing rural and urban areas, private citizens, large organizations, special interest groups and industry representatives. Not surprisingly, divergent opinions were heard on many issues, depending on how the issue affected an organization or individual. Every effort was made during the development of the Framework to recognize the scope of opinion and to find workable, balanced solutions to address the issues.

This document provides an overview of the vision, principles and goals that guided the development of the Framework. It describes objectives that provincial agencies must fulfill in order to realize the water management goals, and lists various actions that provincial agencies will be initiating over the next five years.

Background

In 1994, a Water Management Working Group was established to lead the development of an integrated Water Management Strategy. A number of provincial government agencies participated in the working group: Sask Water, Environment and Resource Management, Agriculture and Food, Economic and Co-operative Development, Health, Intergovernmental and Aboriginal Affairs, Municipal Affairs, Culture and Housing (formerly Municipal Government), Northern Affairs, Saskatchewan Research Council, Saskatchewan Wetland Conservation Corporation, Finance and Crown Investments Corporation.

As part of the development process, the provincial government undertook consultations with special interest groups and the public on its proposed statements of ethic, vision, mission, values and strategic principles. This information was used to develop draft principles for water management and identify more than 40 water-related issues. The *Water Management: Issues and Challenges* discussion paper outlined elements of a framework to guide water management activities and was made available to the public in November, 1997. The discussion paper included a questionnaire that asked people for their opinion on a variety of issues.

As part of the consultation process, the working group received written submissions and made presentations at special interest group meetings.

Over 3,000 copies of the discussion paper were distributed to more than 850 organizations, municipalities and individuals. The proposed strategy was discussed with approximately 1,000 people at five seminars, workshops and conventions. Meetings were also held with 26 organizations between December 1997 and May 1998, attended by over 350 people from throughout the province representing a wide range of water concerns and interests. Feedback, including letters, questionnaire responses and meeting notes, are summarized in the *What Was Said* document.

Four key values were identified, with an emphasis on availability, quality and long-term sustainability of the water resource:

- all residents should have access to an adequate and safe supply of drinking water;
- water is to be safeguarded to preserve opportunities for future generations (i.e., sustainable use);

- importance of natural water processes should be recognized; and
- government and residents share responsibility to protect and use water wisely.

Following consultations, the water management working group developed the Water Management Framework, which includes a vision and principles as well as nine goals, 16 objectives and 58 recommended actions. The goals, objectives and recommended actions address the issues and challenges raised in the discussion paper, and are built around the themes of Protection, Management and Development, and Co-ordination and Public Involvement. The first theme focuses on protecting and sustaining water and wetlands. The second theme involves managing and developing the resource for economic and other uses. The third theme, focusing on co-ordination and public involvement, describes the way in which government intends to work with the public to implement the strategy. The three themes each represent an important part of the vision and, taken together, form an integrated, balanced strategy.

Vision:
Safe, Safe and reliable water supplies within healthy and diverse aquatic ecosystems.

Principles: *These are the foundation of the Water Management Framework, helping to direct Saskatchewan's future water management actions. They emphasize the concept of sustainability for all developments and recognize the potential for maximizing opportunities by improving management practices rather than only depending on new technologies to solve problems.*

Stewardship: The quality and quantity of the water resource must be protected for the benefit of present and future generations.

Partnership: Wise management and use of the water resource is an individual and collective responsibility. The provincial government will work co-operatively with individuals, organizations, local governments, Aboriginal people, business, industry, neighbouring provinces and the federal government to develop and implement water management decisions.

Integrated Management: Water management requires integration of numerous government programs and policies relating to the hydrological, ecological, social and economic development aspects of water. Effective water management requires full awareness of the interrelationship of these programs and the interaction of the responsible agencies.

Value of Water: Water must be recognized and dealt with as a limited resource to be valued and conserved because of its social/cultural, economic and environmental importance.

Sustainable Development: Government will support economic development and diversification through water allocations to projects and programs that are bound by the principle of sustainable water use.

Best Practice: New technologies, more effective use of existing technologies, and adoption of best management practices will help achieve the Vision.

Goals: *The Framework has nine goals, organized under the themes of Protection, Management and Development, and Co-ordination and Public Involvement:*

1. Protection

- Healthy Aquatic and Riparian Ecosystems and Drinking Water Sources
- Safe and Sustainable Aquifers
- Protection of Wetlands and Effective Control of Drainage

2. Management and Development

- Access to a Safe and Reliable Supply of Drinking Water
- Sustainable Economic Development
- Adequate Water Infrastructure
- Protection from Flood, Drought and Climate Change

3. Co-ordination and Public Involvement

- Integrated Water Management
- Meaningful Public Awareness and Involvement

Implementation of the Water Management Framework

The Framework addresses protection of water and wetlands, management and development of water resources, increased public involvement in decision-making and better co-ordination of government activities. It establishes goals and objectives for water management and identifies specific actions the government can pursue to achieve these goals.

The Framework allows the province to bring greater focus and consistency in its dealings with water issues and how those issues affect Saskatchewan people.

Some actions can be initiated quickly, with little cost.

Others represent significant costs or could change how water is managed in Saskatchewan and may require further public consultation before they can be implemented. The framework for water management is a combination of planning, public consultation, education, implementation and legislation.

The importance of the quality of drinking water to Saskatchewan residents is emphasized in the Framework. Reflecting this importance, drinking water quality is associated with five of the nine goals, six of the 16 objectives, and 13 of the 58 actions.

The 58 actions are ways to achieve the objectives.

They were developed by participating government departments and agencies following public consultation. Although lead agencies for implementing each action will be assigned, many actions require an integrated effort by more than one provincial agency. Sask Water and Saskatchewan Environment are leading most of the recommended actions, as they have the most direct interest and involvement in water.

The outlined actions supplement ongoing activities of provincial agencies with water management responsibilities. The 58 actions have been developed to deal with new and emerging issues that are not adequately addressed by existing programs and policies. They will be initiated by provincial agencies over the next five years. The Framework will help ensure optimum management of our water resources into the next century.

Objectives and Recommendations

i) Protection

Objective 1:

Maintain, restore and protect the habitat of aquatic and riparian ecosystems and drinking water sources.

Background: Acknowledge of aquatic ecosystems and an understanding of specific aquatic habitats and processes is needed to develop management and protection strategies which incorporate sustainable use and biodiversity. An ecosystem includes the community of living things and the physical and chemical factors which form the environment. An aquatic ecosystem includes all water in a given area along with the organisms living in the water and the processes, factors, and natural cycles which affect the elements within the system. It is important that ecosystems are protected from the negative impacts of many human activities.

Problem: Aquatic ecosystems are experiencing changes and in some cases deterioration. More has to be done in terms of monitoring and mitigation to reduce long term effects or consequences.

Actions:

1. Develop indicators and monitor the health of drinking water sources and aquatic ecosystems.

This action is a key component of an ecological monitoring program to determine the overall health of aquatic ecosystems, including sources of drinking water. The data collected will help guide future water resource management and also identify existing significant problems as well as future threats. Ongoing compliance monitoring by municipalities will continue to be required.

2. Establish criteria on aquatic system integrity, which can be used to meaningfully guide economic development activities.

Variables need to be selected which indicate integrity. They must be closely related to the maintenance of essential environmental processes (e.g., water level fluctuations) and ecosystem functions (primary production), indicate changes in entire communities rather than on a micro scale, quickly respond to stresses and changes, and yet be simple and easy to measure.

3. License works that modify flows in streams, giving due consideration to in-stream use.

Instream water uses are those that depend on the maintenance of a specific depth or rate of flow in a

stream such as fisheries and other aquatic life, boating, and other recreational uses. Water uses and works have been licensed in Saskatchewan since 1931. However, instream water uses have not been licensed. This provision will ensure future water allocation decisions take into account instream needs.

4. Ensure that aquatic ecosystems and riparian areas are considered in the Representative Area Network. Representative areas are natural areas that have been relatively undisturbed by intensive or commercial activities. Developed by the provincial government, RAN is a comprehensive system of ecologically important lands and waters that will aid in conservation of provincial biodiversity.

5. Review screening procedures and expand existing protocol regarding non-native plant and animal introductions into Saskatchewan. A new policy to provide a consistent approach as well as ecological and disease protection, needs to be developed. Current import practices, which are mostly unregulated in terms of interprovincial movement, also need review.

6. Develop policy for conserving riparian habitat on a watershed basis. Riparian areas are those adjacent to the banks of rivers, lakes or other waterbodies. A policy identifying the benefits of riparian areas and providing a framework for their protection is required. Riparian area conservation guidelines for specific watersheds can then be developed.

7. Make decisions on proposals involving inter-basin transfer of water, taking into effect potential effects of donor and receiving basins. Diversion of water from one basin to another has been undertaken primarily to alleviate water shortages in some areas of the province. Interbasin diversions should only be considered where a surplus supply of water exists, where the net benefits to be derived are greater in the receiving basin than in the donor basin, and where other alternatives are not feasible. Evaluations of projects must include an examination of the potential for interbasin transfer of biota and suitable mitigation, since connecting two formerly separate watersheds could allow the introduction of parasites, new fish species and other organisms into new ecosystems.

Objective 2: Minimize contamination of waterbodies.

Background: Shorelands and their associated water bodies provide habitat for wildlife, recreational and development opportunities. Plant cover above the waterline filters nutrients and sediments washed into receiving waters from surrounding upland areas, helps prevent erosion and provides valuable habitat for many wildlife species. The shallow waters along shorelines support aquatic plant communities that capture sediments, provide habitat for aquatic insects and other invertebrates, and supply important spawning habitat for fish. Increasing demands by forestry, mining, agriculture, recreational development, human habitat, livestock watering activities and agriculture warrant careful management. Some activities are more concentrated in certain areas of the province, such as forestry and mining in northern Saskatchewan.

Problem: Activities in riparian zones, urban developments, forestry, mining and farming practices can result in contamination of waterbodies and degradation of aquatic ecosystems.

Actions:

8. Promote more buffer strips and environmental reserves for activities such as forestry, mining and agriculture. A program to achieve greater riparian protection on private and Crown lands will be developed. The program will incorporate conservation easements, replanting of buffer strips, land use guidelines and increased extension efforts.

9. Carry out additional field research and monitor on the effects of pesticide, nutrient and sediment impacts, and develop strategies to reduce impacts. An expanded program of ongoing monitoring and assessment of major waterbodies in the province is needed, as is research to establish a water quality index for assessing waterbodies. Additional research is also required to develop methods of managing common problems such as algal toxin, weed growth, fish kill and impact of acid rain in lakes and rivers.

10. Develop and implement best management practice guidelines for livestock access to shorelines. Best management practices (BMPs) represent a practice or combination of practices currently determined to be effective for preventing pollution. They are a way to prevent or reduce the amount of pollution generated by non-point sources to meet water quality objectives. In agricultural applications, BMPs are management and cultural practices that allow the farmer to get the most

beneficial use out of the land while preserving the purity of water bodies.

11. Develop and implement best management practice guidelines to reduce impacts of urban runoff. Storm water runoff in urban areas is often contaminated with various water pollutants which are byproducts from urban activities like automobile use, lawn and garden care and industrial processes. These pollutants can damage aquatic life in downstream lakes, streams and wetlands. Most storm water runoff is not treated by municipal wastewater facilities.

12. Ensure adequate monitoring and enforcement of septic tank regulations. Cottage developments are a potential source of contamination to adjacent waterbodies. Increased public awareness and enforcement of existing regulations will help minimize this source of pollution.

Objective 3:
Protect aquifers from depletion and contamination.

Background: Aquifers vary in extent, depth, water quality and water supply and are susceptible to contamination. Water demands in a particular location may be met by surface water supplies, ground water supplies or some combination of the two. Ground water resources can play an important, and sometimes critical role in the overall water supply in a watershed. Ground water quality, quantity and availability and ground water uses need to be inventoried during the development of an aquifer management plan. These plans must consider ground water resources as part of the overall water supply and the role they can play in meeting various water demands.

Problem: Ground water is a critical resource and is subject to contamination, prone to depletion if overused, and difficult and costly to inventory. There is also a lack of public awareness of the importance and sensitivity of aquifers.

Actions

13. Develop management plans including monitoring strategies for all major ground water sources for domestic, municipal and industrial uses. The extent of aquifers are not mirrored by the distribution of overlying surface water resources. Aquifers vary in extent, depth, water quality, water supply potential and vulnerability to contamination. All of these unique characteristics need to be taken into account when managing major aquifers.

14. Evaluate potential for use of municipal planning bylaws to provide added protection for aquifers.

Municipal bylaws offer a way of controlling development in communities. Appropriate zoning controls can help protect aquifers by preventing certain types of industries, developments or activities from being located or permitted near aquifer recharge areas or other sensitive locations.

Objective 4:
Foster wetlands retention and orderly drainage, in accordance with regulations and public policy.

Background: Saskatchewan wetlands support diverse populations of plants, animals, and micro-organisms. Many low, undrained areas including wetlands are linked by ground water to aquifers. Wetlands provide a wide variety of ecosystem and socio-economic benefits. During the last 100 years, 40 per cent of Saskatchewan's wetlands have been lost. This trend is continuing.

It must also be recognized that draining farmland to eliminate sloughs and allow earlier access for seeding is an activity with immediate and significant economic benefits for farmers. In addition, establishment of the current provincial wetlands policy has raised awareness of the importance of wetlands but has not been able to eliminate conflicts with long-standing farming and drainage practices.

Problem: There is a lack of understanding and appreciation of the true impacts of drainage with respect to the wetlands drained, the effects downstream, and the benefits that accrue to the draining farmer. These factors have led some landowners to ignore drainage regulations. As a result, wetlands continue to be destroyed and degraded. This also leads to widespread conflicts between neighbours, between those who would drain and those who would preserve wetlands, and between regulating agencies and the general public.

Actions:

15. Pursue private and economical incentives to encourage wetland retention by landowners.

Opportunities to use economic incentives such as tax benefits, land purchase or lease, conservation easements, grants and subsidies need to be explored with landowners, local governments and non-government organizations.

16. Establish interdepartmental Task Force to undertake public consultation, build on the findings of the Upper Assiniboine River Basin Study, and make specific recommendations to cabinet on government's role in protecting

wetlands and developing a new drainage policy.

The provincial government currently has programs and policies, administered by different departments and agencies, which are not well integrated.

Further evaluation of how to protect wetlands and promote the agricultural economy is required to provide the government with the information necessary to make informed policy and program decisions that will have public support. The UARBS is expected to provide some of the required information; conclusions of this study must be reflected in the recommendations of the Task Force which will gather province-wide input on questions related to wetlands, drainage and regulation enforcement.

17. Develop and implement a wetlands conservation plan, consistent with Saskatchewan's Wetland Policy, following development of a new drainage policy.

A logical, measured development process will result in the preparation and implementation of a provincial wetlands management plan that achieves the necessary balance of competing interests. More information on wetlands, including data on their size, location and type must be collected, and a monitoring system which allows wetlands and the health of their associated ecosystems to be accurately measured over time must be developed.

A new drainage policy is required which addresses the need to protect wetlands but does not unduly penalize landowners, farmers and other users.

18. Develop interagency enforcement strategy and change legislation to more effectively deal with unauthorized drainage.

There is a widespread belief that the province is not doing enough to prosecute cases of illegal drainage.

There is a need to develop a new strategy for enforcement that will help reduce the incidence of unauthorized drainage. The use of punitive measures such as fines also need to be explored.

19. Clarify role and reporting function of the Water Appeal Board.

The Water Appeal Board serves as a mechanism to anyone appealing a regulatory decision of Sask Water. Ambiguities in current legislation create difficulties in acting on Appeal Board decisions. Additional clarity will support more timely and effective water management.

20. Explore feasibility of introducing a conservation assessment on drainage to mitigate impacts and to develop and enhance wetlands. Establishing a conservation assessment on landowners who elect to drain would contribute funds for use in mitigation projects such as the

construction of artificial wetlands and the purchase or leasing of lands containing wetlands to ensure their preservation. The merits of such a mechanism and how it could be applied would be one of the issues explored by the interdepartmental Task Force when it undertakes public consultation on wetlands and drainage.

ii) Management & Development

**Objective 5:
Enhance safety of municipal and domestic drinking water supplies.**

Background: Saskatchewan water resources are both limited and vulnerable. Human use of water and land can degrade the quality of water and preclude other uses in the future. Agricultural, municipal and industrial development, as well as climate extremes, can cause degradation of water quality. As a result, water becomes unsuitable for some uses, such as drinking. While recognizing the vital importance of water in our society, the Government of Saskatchewan must also protect the resource for all users, now and in the future.

Problem: Some provincial residents do not have adequate potable water supplies, while others only have access to water of poor quality or water susceptible to contamination. Many water supplies are unreliable.

Actions:

21. Implement mandatory operator training and certification for water and wastewater operations.

Certification of water and wastewater treatment operators helps ensure staff at treatment plants are competent and efficient.

22. Review municipal water and wastewater treatment operations and monitor practices and provide support and advice as appropriate.

Water quality monitoring needs, data collection for chemical and bacteriological quality of treated water and design guidelines for construction and operation of facilities need to be reviewed. In addition, the province should continue to actively participate in the Federal - Provincial Drinking Water Quality sub-committee, a national working group established to develop, update and implement water quality guidelines.

23. Enhance Rural Water Quality Advisory Service program and encourage regular use by rural residents. Rural Saskatchewan has unique

water quality problems. Under the fee-based Rural Water Quality Advisory Service program, a Sask Water technician will sample a private water supply, have it analyzed at a certified laboratory, and explain the results to the landowner. The technician will also inspect the existing plumbing system, and provide advice on how to improve or protect the quality of such rural water supplies as wells, dugouts and reservoirs.

24. Facilitate development of municipal and regional water utilities where technically feasible and cost effective. Sask Water currently has a program to assist with the establishment of water supply utilities. In order to improve the quality and/or quantity of water available, it is usually necessary to employ more expensive supply and treatment options than those currently used. The costs associated with improved water supplies may be high, even beyond the ability of a community to finance without assistance. The development of an improved supply or effluent treatment facility may not be financially justifiable for one community but may be feasible if a regional system is developed for several communities and/or industries.

**Objective 6:
Promote water developments with broad public benefits.**

Background: When the province assists in the development of water projects, it expects the provincial economy to benefit. The amount of assistance depends on how the project supports the Water Management Framework objectives and what benefits are provided to the province. The province typically provides assistance to three kinds of water developments: water supply and effluent treatment utilities, drainage and flood control projects and irrigation projects.

Water supply and effluent treatment utilities: In order to improve the quality and/or quantity of water available, it is usually necessary to use more expensive supply and treatment options than those currently used. An improved supply or effluent treatment facility may not be financially justifiable for one community but may be feasible if several communities and/or industries can be served. The province currently owns and operates utilities to provide water to potash mines, communities, farms, wildlife and recreation projects.

Drainage and flood control: By providing project construction and maintenance assistance, the government addresses the inability of Conservation

Area Authorities to identify and tax all of the beneficiaries of project works, and recognizes the economic benefit of protecting productive farm land from periodic flooding.

Irrigation: Historically, irrigation development has been cost-shared by government because of the provincial and local economic benefits resulting from increased crop production. The maximum economic impact of irrigation projects is realized when high value, non-traditional crops are grown in conjunction with in-province agricultural processing and intensive livestock production.

Actions:

25. Evaluate financial and technical assistance programs to determine distribution of costs and environmental acceptability, and modify government contributions accordingly.

Provincial assistance for water project developments must reflect the degree to which the project benefits the provincial economy and supports the Water Management Framework objectives.

**Objective 7:
Promote economic diversification and stability through sustainable use of water and related land resources.**

Background: Economic development and diversification initiatives, particularly in smaller urban centres, often face water-related constraints. These can include insufficient or unreliable quantities of water, poor water quality or lack of facilities to treat and deliver water and to handle effluent. Providing water to industrial plants for potash, pulp and fertilizer production and power generation supports important economic production. An adequate water supply is vital to the economic viability of communities.

Similarly, water of adequate quality and quantity is a key factor in irrigation and livestock operations and value-added developments like potato and hog processing.

Problem: Unreliable water supplies, poor water quality and inadequate infrastructure can act as barriers to economic development and diversification.

Actions:

26. Develop regional analyzes of the availability and quality of water supplies for economic development purposes. There is a general lack of comprehensive information on the province's surface and ground water resources, particularly in

rural areas and those regions farther away from major rivers. The proponents of potential economic developments require information regarding water supply and water quality.

27. Support infrastructure for projects which provide significant benefits to the province, are environmentally sound, are cost-shared based on projected derived benefits. The province remains committed to encouraging development of projects which meet its requirement of sustainability. This includes, for example, encouraging the stability and viability of the farm and rural economy by the sustainable use of available water and land resources through flood and drainage works that are undertaken in an environmentally sound manner.

28. Explore opportunities for increased development of the aquaculture industry. Because of increasing interest in expanding the aquaculture industry in Saskatchewan, a development strategy is required that will provide environmental protection guidelines to protect ecological integrity and ensure economic sustainability. This strategy should encourage aquaculture development, facilitate related industrial development and streamline the review and approval processes.

29. Continue to support new irrigation developments in accordance with The Irrigation Act, 1996. Irrigation is the largest consumptive user of water in the province. It is also an important aspect of agricultural diversification. Provincial programs supporting irrigation are limited to projects where the long-term benefits exceed the full economic and environmental costs of development.

Objective 8: Prevent bulk export of water.

Background: Saskatchewan's current water export policy for out of Canada destinations requires the water to be shipped in containers with volumes equal to or less than 10 litres and the water must be in a final processed condition ready for retail sale as a primarily water beverage.

Furthermore, the total quantity of all containerized water authorized for annual export at any one time cannot exceed 20,000 cubic decametres. Bulk water export must be differentiated from certain apportionment obligations. Longstanding agreements such as the Boundary Waters Treaty of 1909 between Canada and the United States set

out the basic principles to govern boundary water use and management between the two countries. The treaty requires Saskatchewan to ensure a portion of the water in international streams that flow across the border is delivered to the United States. This allows each jurisdiction to effectively allocate their water resources.

Problem: Increasing water demands outside Saskatchewan could result in more requests for water export. Water demands beyond Saskatchewan's boundaries could jeopardize water supplies for the future use of provincial residents.

Actions:

30. Develop legislation to strengthen current policy preventing bulk export of water. The province recognizes the need for provincial legislation reflecting current Sask Water policy preventing bulk export (Appendix II), and plans to develop the necessary legislation. Bulk export means exporting water by railcar, tanker truck, canal, or pipeline, or by using a structure such as a dam to divert the natural flow of water in a river system to a new location.

Objective 9: Establish innovative approaches for financing costs of developing, operating, maintaining and upgrading infrastructure.

Background: The responsibility for water management is shared between the federal and provincial governments. The provincial government is responsible for all water management except water on federal land, international waters and regulation of navigation and fish habitat. A number of water management structures like dams and weirs are owned by the federal and provincial governments.

Municipal governments are responsible for acquiring and developing local water supplies, operating treatment and delivery systems for drinking water and collecting, treating and disposing of wastewater. The province's water management capabilities are a cornerstone of its water infrastructure. The cost of these activities is significant. These costs include monitoring activities, administration, development, management and operation of facilities, flood forecasting, water resources management and planning, regulatory functions including enforcement, and wildlife and fisheries management. Good water management requires

adequately trained staff, equipped with accurate and comprehensive data.

Problem: The provincial infrastructure (dams, canals, pipelines, flood control works, etc.) is aging and in need of financial resources for upgrading and maintenance. In addition, the costs associated with water management and administration continue to increase, putting additional financial burden on provincial agencies and municipal governments. In some situations, such as in smaller communities, there are insufficient resources available to replace aging infrastructure and meet existing regulations.

Actions:

31. Establish a funding mechanism to support provincial water infrastructure. Potential solutions to resolve investment capital and water supply problems include municipally owned and operated regional utilities, government insured development bonds and municipal pooling of borrowing requirements.

32. Encourage communities to establish user-free based funds to support municipal water infrastructure. Communities must begin preparations to ensure the long-term sustainability of their existing municipal water infrastructure. Much of this infrastructure was originally developed with the assistance of senior governments; levels of financial support for such projects have been declining in recent decades. Services must be provided on a cost recovery basis.

33. Strengthen existing programs and regulations to ensure on-going dam safety. There are a number of significantly-sized, privately owned dams and reservoirs. In order to attain a reasonable level of public safety, the province needs to ensure these structures are regularly inspected and maintained. Dam safety legislation would require dam owners to maintain their works in a safe condition. The proposed legislation would require owners to undertake any needed rehabilitation or breach the works.

Objective 10:

Plan developments in consideration of the potential effects of flood drought and climate change.

Background: In Saskatchewan, many communities and rural developments are located in river valleys or along lakeshores and are susceptible to flood damage. Some agricultural lands are also subject

to flooding. Floods can cause extensive property damage, and result in permanent or temporary loss of agricultural land, erosion and siltation. Flooding conditions can also have significant social and economic impacts on less populated areas in northern Saskatchewan when water levels on lakes and rivers change drastically.

Saskatchewan's climate displays a wide variation in precipitation from year to year. When precipitation is significantly below normal, drought can occur.

The agriculture industry can be severely affected by drought through a lack of water for crops, livestock and irrigation. Economic hardship to farmers, damage to soil and shifts in livestock populations because of herd reductions or herd relocation can occur, all producing significant effects on the provincial economy. Municipal and domestic water supplies and hydro power production may also be affected. Forest fires are one of the most significant impacts of drought conditions in northern Saskatchewan.

Problem: Considerable progress in flood and drought proofing has been made in the past, but the province continues to incur major economic and environmental losses during extreme hydrologic events.

Actions:

34. Enhance flood forecasting capability and improve public access to flood forecasts. There is a need to review the province's existing flood forecasting capability. New approaches may be required, supported by increasing the amounts of data available to forecasters with respect to streamflow, snowpack and climate. This will allow the flood forecasting centre that is currently operated and maintained by Sask Water to provide earlier and more detailed flood forecasting services for more of the province.

35. Review and modify criteria for approving projects subject to flooding for specific types of developments such as industrial and lakeshore residential. The province tries to minimize potential for flood damage by encouraging and supporting appropriate land use in flood hazard areas. Many communities are located in river valleys or along lakeshores, and are susceptible to flood damage. Developers of shoreland property, rural municipalities and resort communities typically ask for technical assistance in determining safe building elevations. The province has established standards for flood protection but there is a need for greater

flexibility so the level of protection is commensurate with the potential for damage.

36. Establish a provincial working group, with federal and industrial participation, to develop preventative, anticipatory and risk management drought policy. This policy would promote self-reliance, de-emphasize the traditional approach of ad-hoc compensation and seek to establish a drought forecasting service, including drought response planning tools.

37. Ensure water use and supply forecasts consider the potential effects of climate change on existing and new developments. Various climatic change scenarios are already considered when procedures respecting utility operation, irrigation, and the operating plans of reservoirs are formulated. Water use forecasts and estimates of water availability need to consider the potential effects of climate change for the expected physical life of water-related projects.

iii) Co-ordination & Public Involvement

Objective 11:

Clearly define and fully integrate agency mandates and activities related to water.

Background: Integration requires an increase in the levels of co-operation and co-ordination between federal and provincial government departments and agencies. Government policies and programs related to water management must operate in an integrated fashion to ensure they are not in conflict with one another. This will permit provincial agencies to co-ordinate their planning, funding, evaluation and program delivery activities and thus better direct limited resources to long-term water management priorities. Sask Water and Saskatchewan Environment have primary responsibility for water management in Saskatchewan, while a number of other agencies have varying responsibilities associated with water management.

Problem: Current water management practices do not effectively integrate the interests of agencies, resulting in a lack of co-ordination of activities, communication, and inefficient decision-making.

Actions:

38. Create a permanent intraprovincial government committee to identify joint priorities and budgets and support implementation of Water Management Framework. Provincial agencies developing annual work plans with respect to water need to be aware of the planned activities of other departments. The committee will seek to ensure these agencies use resources efficiently and effectively to achieve priority water management goals, objectives and actions outlined in the Water Management Framework.

39. Minimize duplication of services between federal and provincial agencies. A wide range of federal, provincial and municipal regulatory, management and water resource decision-making agencies are involved in water management in Saskatchewan. Some federal programs and activities overlap the provincial water management mandate. Federal - provincial discussions are required to resolve this duplication.

40. Review and modify mandates and activities of provincial agencies involved in water management to avoid overlap and increase efficiency in the delivery of services. There are a number of agencies involved with water management in Saskatchewan. The mandates of some agencies are closely linked in certain areas. For example, Saskatchewan Environment, Sask Water and Saskatchewan Wetlands Conservation Corporation must deal with issues related to wetland preservation, and agricultural land and wetlands drainage. This can result in a complex decision-making process.

41. Streamline the approval process for licensing water related projects. Existing Water Rights regulations are out-of-date and complicated. Modernization is needed to reduce administration restrictions such as the type of paper plans are submitted on, and the quality of plan submitted with the application (e.g. a sketch plan may be adequate, but the regulations require a professionally drafted plan). Existing land control requirements are so demanding that there is a significant delay in the issuance of final approvals. A review is required to determine the amount of land control actually required, and place more of the on us on project proponents to acquire the necessary land control.

Objective 12: Manage water on a watershed basis.

Background: A watershed is an area of land that drains rainfall and snowmelt runoff into a body of water. Water continuously moves through the watershed and influences many life cycles and physical processes. An action or change in one location has potential implications for other natural features and processes that are linked by the movement of surface and ground water. This makes the watershed a natural and logical boundary for environmental and land use planning.

Integrated watershed management plans recognize the interdependency of resources associated with water and the multiple interests in the use and protection of water and related land resources.

They must involve Aboriginal people, stakeholders and other resource managers throughout the planning process and recognize the need to seek consensus among people's interests in water and related resources. Perhaps most importantly, the plans have to provide direction for resolution of conflicts and competing demands, set clear objectives for management of the water and related resources and include actions for achieving the objectives.

Provincial water resources are limited and in some areas the demand for water exceeds the supply.

The quality is also variable. Poor quality water cannot be used for some applications. Water use is regulated to ensure any development depending on water takes place in an orderly and sustainable manner. Water allocations are based on the principle of sustainable use and allocation policies must be flexible to recognize regional differences in supply and demand.

Problem: Saskatchewan suffers from periodic water shortages and competing uses which can lead to conflict and inefficient use of water. Local scale planning which does not fully consider the 'big picture' may result in decisions which address specific problems but cause entirely new problems in another location.

Actions:

42. Assess options to provide local watershed management by consulting with stakeholders and reviewing existing legislation. Currently, local residents and interest groups are invited to participate in watershed management plans, and any project developments which may result in changes in the operation of a waterbody. There is considerable interest among user groups to have

this informal consultation process improved by establishing a legal entity which would have input and some amount of decision-making authority in local water resource management.

43. Develop and implement water allocation policies on a watershed basis. Province-wide, formal water uses or priorities cannot meet the needs of either water managers or residents.

Rigidly applying a priority system assumes supply and demand is uniform across the province. Water allocation policies must be flexible enough to recognize regional differences in supply and demand.

44. Actively involve local authorities in a broad watershed approach to address local management issues.

Effective long-term water management requires a planning process that aids development of decisions that ensure the sustainability of the resource. The primary objective of the planning process is to assess problems, review alternatives, and determine actions in a logical, balanced and sound manner. To this end, the watershed planning process will involve all interested parties and the widely-ranging values and ideas associated with them, while at the same time encouraging co-operation and understanding among all stakeholders. Specifically, local authorities will be asked to help develop a watershed plan by contributing to solutions to local management issues.

Objective 13: Recognize Aboriginal peoples' interests.

Background: Saskatchewan's water management activities need to consider the rights of Aboriginal peoples and involve them in water management decision-making processes. It is important that decisions on water development projects recognize and consider any potential impacts on Aboriginal lifestyles. The importance of water to the economic well being of the Aboriginal peoples must be considered in decision-making processes.

Problem: Misunderstandings may arise when decisions are made without adequate consultation with those affected.

Actions:

45. Consult on water management issues with First Nations and Métis organizations. Actively involving Aboriginal peoples in a broad watershed

approach to address local management issues will help ensure the best decisions are taken, and that they receive wide support.

46. Develop and implement a communication strategy for northern residents on changing water conditions and related water issues.

Early warning of unusually high or low flows is critical to northern residents, particularly those who live adjacent to or near streams or waterbodies.

Contacts must be established with individual Indian Bands and northern communities to permit the efficient distribution of water supply forecasts and information on water flows and potential flood situations.

**Objective 14:
Adequate monitoring and research of water resources.**

Background: Management and allocation of water, design of water management structures and the distribution of flow and water level forecasts to the public demand a variety of data and the best available science and technology.

For example, detailed information is required on the quantity and quality of the surface and ground water supply and the location and volume of water uses, as well as ecological and riparian needs and the climate. Sound, unbiased data are needed to ensure the success and efficiency of many activities. Decisions based on inadequate data or untested theories may have disappointing consequences. Agencies that undertake major projects or programs dependent on new scientific research must take the measures necessary to ensure the science is valid and credible.

Problem: Current databases and technological practices often provide inadequate support to decision-making.

Actions:

47. Establish a provincial working group to provide recommendations for the development and operation of an integrated water-related database. Various agencies gather a wide range of data. Information is collected on water quality, quantity, land use, and water use and demand. Data is collected for different purposes and in various formats. In many instances, an agency could benefit from another's data. A program is needed to

bring about uniformity in data storage and allow for access by different agencies.

48. Enhance and integrate the provincial water quality database so that it can be easily shared by agencies and organizations.

Data collection protocols and networks must be adequate and of the standards necessary for their intended use. It is important that the various data collected are in a format that can be shared by agencies. This will minimize duplication (several agencies collecting data that are essentially the same for different purposes) and increase efficiency. A number of agencies collect water quality data, including Saskatchewan Health, Saskatchewan Environment, Saskatchewan Research Council, Sask Water, municipalities and the federal government.

49. Investigate development of a water research network to identify water-related research needs, oversee research, prioritize projects and administer joint budgets.

A network of appropriate government agencies and universities could be established to identify research needs and manage research projects. This kind of joint effort would increase efficiencies among agencies that undertake research by avoiding overlap or duplication of research and ensuring priority issues receive attention.

50. Focus water research activities on water quality problems and small-scale treatment systems suitable for rural and northern Saskatchewan.

The development of new technologies and practices to increase access to safe, reliable water supplies provides new ways of improving the quality of life of residents. These research activities can also provide the means of supporting economic developments in areas where water problems currently prevent the initiation of new projects.

**Objective 15:
Enhance public awareness and involvement in water management planning and decision-making.**

Background: Saskatchewan residents are interested in water management. They want to become better informed about activities and involved in decisions which affect the management and protection of water. Integrated resource management means managing the whole ecosystem, including soil, water, trees, animals and plants, to meet a variety of objectives. It allows for a

broad range of resource uses and gives everyone the opportunity to be informed and involved in management planning.

Public involvement is a process where the public participates in identifying and solving problems, making decisions and planning for the future.

Meaningful public involvement requires that people who participate in decision-making processes are well informed about all aspects of relevant water issues. Public awareness of water management issues is promoted in a variety of ways, including news releases, reports, newsletters, information meetings, workshops and fact sheets.

Problem: Water management decisions may not reflect the full range and diversity of interests if the public is not informed and consulted.

Actions:

51. Establish a provincial Water Panel to review and share ideas on key water-related issues.

A provincial Water Panel consisting of government officials and stakeholder representatives could identify and review major water-related issues and assist in developing solutions. Typically, membership would include representatives from industry, Aboriginal and non-government organizations. The panel would provide a way of obtaining input which could lead to proposals to resolve long-term issues.

52. Ensure stakeholder input in water flow management for major dams and reservoirs.

The full range and diversity of the public's values have not always been considered in water management decisions. For example, hydro power operations can cause impacts to the fisheries, wildlife and recreational resources using the same water. Current social values differ from those of the past, and the province wants to ensure that all interests are considered in water flow management planning. A mechanism needs to be developed that will facilitate ongoing input by stakeholders into the development of operating and flow regulation plans of major structures.

53. Develop a public information strategy, including material on such issues as water conservation by domestic, agricultural, municipal and industrial water users, ground water, proper maintenance of wells, and proper disposal of liquid waste from septic tanks.

It is important for the success of the provincial water strategy that public awareness and understanding of water management is increased. The availability of

fact sheets and other information for use by the public, supported by practical demonstrations by regional office and field staff, would provide an effective means of informing the public on various water-related issues.

54. Encourage development of volunteer monitoring activities such as lake stewardship/co-management programs.

Public participation in water resource monitoring often involves a role for private individuals or organizations in various aspects of data collection. For example, volunteers can be trained to take samples for analysis as part of a water quality study or monitor and report on riparian conditions along sensitive portions of streams throughout the year.

55. Develop public involvement procedures for water management initiatives.

Effective water resource management requires meaningful public involvement to help guide decision-making at all levels. The public involvement process recognizes that different watersheds may require different forms of public participation.

56. Report progress on Water Management Framework biennially, starting September, 2001.

Public input was central to the development of the Water Management Framework, in keeping with the government's commitment to openness and transparency in the formulation of broad environmental and natural resource policy. Issuing a biennial progress report provides another opportunity for public input.

**Objective 16:
Recognize the intrinsic and economic value of water and cost of its management.**

Background: Water is a valuable commodity for basic human consumption and as an input to various manufacturing industries. Its use for cooling at power stations and for agriculture is also important. It is now generally recognized water has another, special value as an essential component of the natural environment. Human water use or development activities represent a cost to the environment as well as an opportunity cost for other water uses.

Economic instruments can be used to encourage conservation, individual responsibility and compensate for the social, economic and environmental costs of water use. The cost of products and services delivered to Saskatchewan

residents need to reflect the true value of water development, management and operation. Water pricing is recognized as one way to achieve the most efficient long-term use of water resources and to ensure users are aware of the real value of the resource and delivery systems.

Saskatchewan currently charges fees for the use of water by industries over and above infrastructure costs related to supply, operation and distribution.

The province also collects rental fees on water used for hydro power production. These fees are not the same as the water and sewer charges collected by municipalities.

Problem: There is a prairie tradition of regarding water as a free good. Society, however, is also demanding increased and more expensive stewardship of our water resources. There is a need to ensure a greater public understanding of the true value of water.

Actions:

57. Develop long-term communication plans to increase public awareness and understanding of water management and the value and importance of water.

This action is intended to develop the means of conveying to all water users in the province the message that water has an intrinsic value above the costs associated with its management, treatment and delivery. It is important that everyone recognizes that all water use has a value that varies with the type of use, economic conditions, geographic location, and society's values at that particular time. The public also needs to be better informed on different aspects of water management like reservoir operations, basin planning and flood protection.

58. Develop a consistent pricing rationale for water users that considers all costs associated with water projects, including their development, management and operation.

Water resource management can make use of economic instruments to further conservation, encourage individual responsibility and account for the social, economic and environmental costs of water use. In addition, the various industrial water use charges must be seen to be applied in a fair, equitable and consistent manner by all users.

Appendix I – Saskatchewan Wetland Policy

The Government of Saskatchewan believes in the sustainable management of wetlands to maintain the multiple benefits they provide, now and into the future.

In 1990, a Soil, Water, Wetlands Task Force Report recommended the development of a provincial wetland management policy. In 1991, the Saskatchewan Round Table on Environment and Economy identified the protection of wetland and water resources as a priority.

Increased awareness by Saskatchewan residents about the decline of the province's wetland resources led the Government of Saskatchewan, in 1995, to develop a policy to aid in the conservation of provincial wetland resources. The Saskatchewan Wetland Policy is seen as complementary to the development of overall land and water management strategies for the province.

Provincial residents guided the planning and development, and are continuing to guide implementation of the policy through various groups in this province.

Policy implementation is based on five key objectives:

- to increase awareness of the benefits of wetlands;
- to increase wetland monitoring;
- to coordinate government policies and programs to improve wetland management;
- to develop land-use planning guidelines for wetland management; and
- to encourage landowners to maintain wetlands.

Appendix II

Sask. Water's Water Export Policy

Export of Water Beyond Provincial Boundaries for Use in Canada:

Consideration will be given to requests, for use of water by other provinces, where the use is for municipal or domestic purposes and the quantity will not have a detrimental impact on existing users. Associated environmental impacts will be fully considered. The manner of conveyance will be subject to existing provincial and federal legislation.

Export of Water Beyond Canadian Boundaries:

Containerized Transport - Ground or surface water supplies can be considered for export, subject to all provincial and federal law, where it can be satisfactorily demonstrated that the water supply exists in quantities surplus to existing and anticipated future uses, including full consideration of environmental impacts provided that: the water is shipped in container volumes equal to or less than 10 litres; the water is in a final processed condition ready for retail sale as a primarily water beverage; and, the total quantity of all containerized water authorized for annual export at any one time shall be less than 20,000 cubic decametres.

Conveyance by Pipeline, Canal, or Natural Water Course - No water export proposal shall be approved by the Province of Saskatchewan where the conveyance of water would be by pipeline, canal or natural water course.

Appendix III

Overview of Saskatchewan Resources

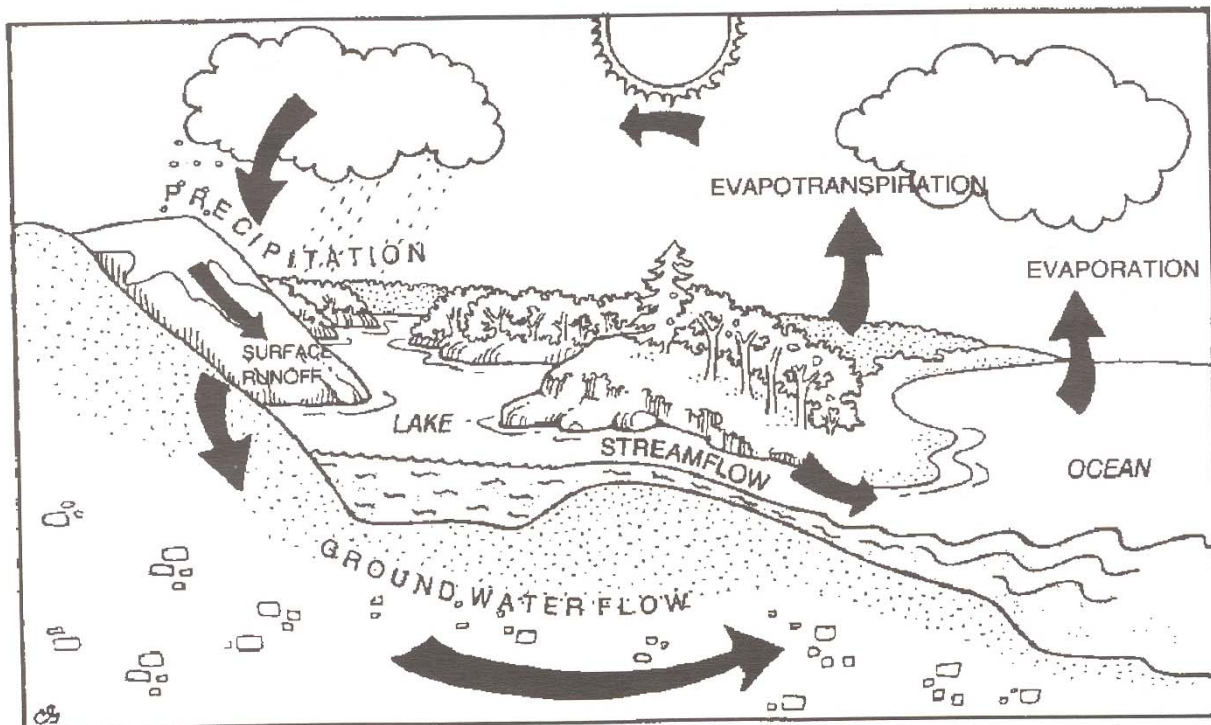
The availability of water is determined by climate characteristics, geology and landforms, and the hydrologic cycle. The hydrologic cycle is a world-wide circulation system in which water is evaporated from the earth's surface, condenses to form clouds and is returned to the earth as precipitation. When the precipitation reaches the ground surface, it may run off into streams, rivers, lakes and wetlands or soak into the ground and be stored in soil and rock formations known as aquifers, or taken up by vegetation and transpired back into the atmosphere. Its energy source is the sun, which controls the primary factors of light, wind and temperature.

As water moves through the hydrologic cycle, it supports a variety of life forms that make up our natural ecosystem. An ecosystem is an interacting system that consists of living organisms and their non-living environment. The living part consists of plants, animals and humans while the non-living part consists of water and soil. The aquatic ecosystem is any ecosystem where the life forms are at least partially submerged in water for a part of the day or year. The most common are lakes and rivers where water levels are relatively stable and the ecosystems are under water. However, aquatic ecosystems also are found at the interface between land and water.

Water must be managed within the natural constraints of the hydrologic cycle (Figure 1) and natural ecosystems to provide for all societal needs.

A brief characterization of Saskatchewan's water resource and its management is presented under the topics of climate and ecoregions, watersheds, surface water, ground water and water development.

Figure 1: The Hydrologic Cycle



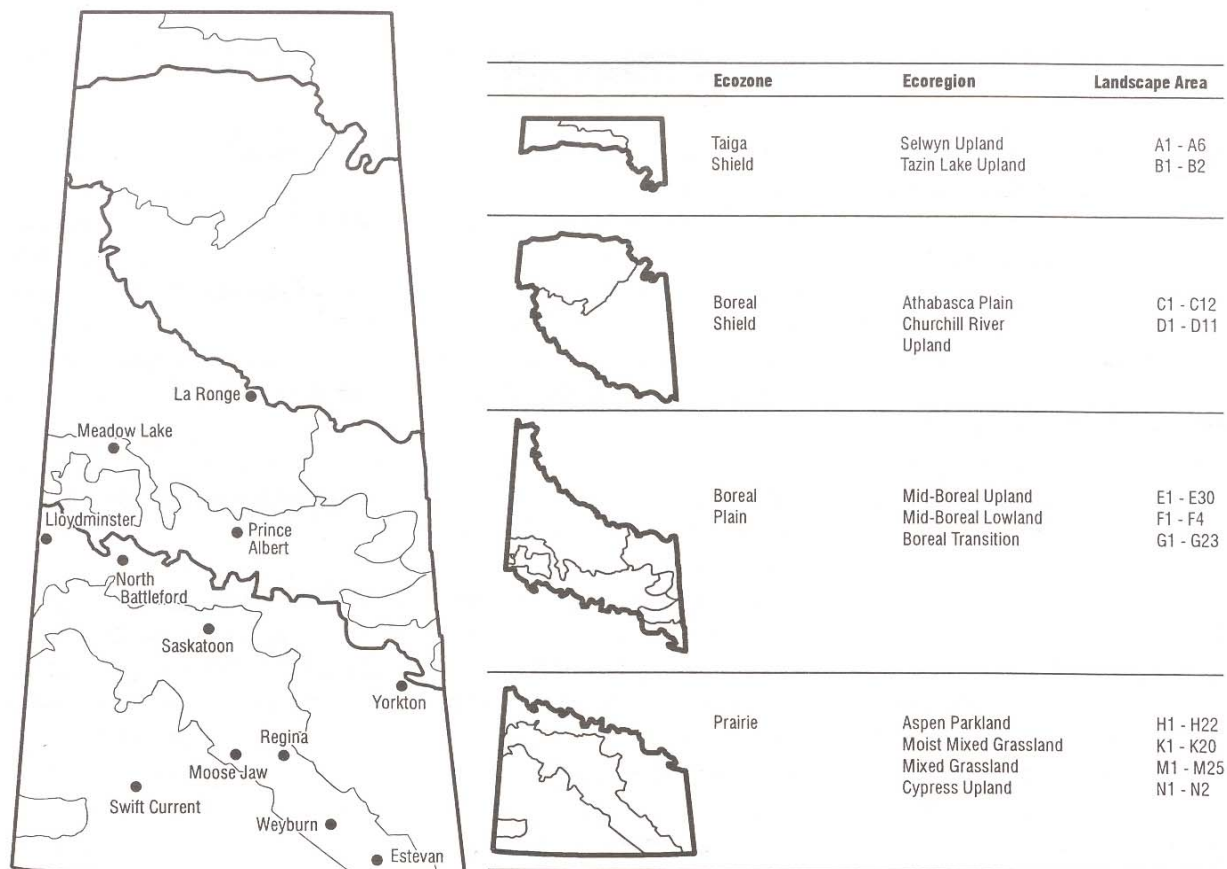
Climate and Ecozones

The ecosystems of the province can be broadly classified into four primary ecozones. These are recognized as the Prairie, Boreal Plain, Boreal Shield and Taiga Shield (Figure 2). Although there is much variation in landforms and ecosystems within these zones, they serve to broadly define differences in the availability and quality of aquatic ecosystems and types of uses and developments that have been made of the water resource. Each ecozone supports many unique habitats which consist of food, water, shelter and space that must be present to support the various forms of life in the ecozone. The balance between runoff and evaporation, the rate and timing of runoff and evaporation, and seasonal variations in temperature all influence aquatic habitat.

The southern prairie ecozone receives, on average, from 350 to 420 millimetres (mm) of annual precipitation. Most of the region's land has been developed for agricultural purposes. It is also characterized by 'pothole topography', a rich source of wetlands. Most of this region can be described as being semi-arid, meaning for any large body of water the average annual evaporation exceeds the average annual precipitation.

The three other ecozones are essentially non-agricultural and largely forested. The ground surface changes gradually from glacial soils to exposed rock of the Canadian Shield north of the Prairie zone. The average annual precipitation increases to a maximum of 520 mm in the southern Boreal Plain ecozone, decreasing to 260 mm in the most northern Taiga Shield ecozone.

Figure 2: EcoRegions of Saskatchewan



Source: Padbury and Acton, 1994.

Watersheds

Most of the water that collects from precipitation will either soak into the ground surface or will combine with other runoff and ultimately drain to one river or body of water. The land area from which this water drains is called a watershed. Figure 3 shows the major watersheds or river basins in the province. These watersheds make up the basic units used to plan and manage the water that drains into them. Most are dominated by one major river that can receive most of the runoff from all parts of the watershed.

The water leaving each watershed in Saskatchewan has three primary destinations: the Arctic Ocean, Gulf of Mexico or Hudson Bay. Most of the watersheds that drain to the east empty into the Saskatchewan and Nelson rivers and on to Hudson Bay. These include rivers like the North and South Saskatchewan rivers.

North of the Saskatchewan River basin is the Churchill River basin, which drains into the Nelson River in Manitoba and ultimately to the Hudson Bay. North of that, the water drains north and west into the Athabasca and Mackenzie River basins and on into the Arctic Ocean. In the extreme southern part of the province, the water drains to the United States and into the Missouri River drainage system that drains to the Gulf of Mexico.

Most of our rivers cross provincial or international boundaries. Saskatchewan must share water with either an upstream or a downstream province, the Northwest Territories, or the United States. The manner of sharing is in most cases based on an agreement between the jurisdictions. Typically, these agreements call for the upstream jurisdiction to provide 50 per cent of the flow to the downstream jurisdiction.

Watershed boundaries do not coincide with the boundaries of major ground water aquifers. Although there is an interaction between ground and surface water, the complete assessment of an aquifer may require the study of more than one watershed, and development of ground water sources in one watershed may produce an impact on ground water sources underlying adjacent watersheds.

Surface Water

Surface water supplies are made up largely of streams, rivers, lakes, reservoirs and wetlands. The availability of these supplies is monitored by hydrometric stations at more than 250 locations around the province. Through the use of these stations, the annual volumes of runoff that occur from all watersheds can be determined directly, or estimated. The water quality is also monitored at a number of locations for a specified list of contaminants that varies depending on upstream uses.

Rivers

Surface supplies in the form of streams and rivers that originate in the prairie ecoregion are highly variable from year to year, and even within a year. Normally, most of the runoff (65 to 75 per cent) will occur in the months of March through May as a result of melting snow. Many streams will go nearly dry over the summer months and will only be supplemented by ground water discharge from springs or when above normal summer precipitation occurs. Normally, average amounts of summer precipitation produce little or no runoff.

Water supply variability is most often characterized by periods of flood and drought. Saskatchewan has experienced many droughts since human settlement in the early 1900s, the most notable being that of the period 1930 to 1940 - the 'Dirty Thirties'. During that time, the annual volumes of runoff in many watersheds was the lowest in the past 75 years. However, the mid-1980s was also a time of extreme drought in the prairie region and some watersheds experienced less runoff during that period than during the 1930s.

Although the prairie region is generally more prone to drought than the other regions, severe drought can occur in the boreal forest region. The period ending in 1993 saw nearly 15 years of below average precipitation in many parts of this region and some rivers, like the Churchill, experienced their lowest flows on record.

Periods of extreme flooding have also occurred. Most of the province experienced severe flooding during the mid-1950s and the mid-1970s. Millions of dollars of damage resulted to roads and highways, communities, private property and to agricultural land.

As Figure 3 shows, not all of Saskatchewan's surface water originates in the prairie region. The Saskatchewan River system, made up of the North and South Saskatchewan rivers, receives almost 80 per cent of its flows from the Rocky Mountains in Alberta. These rivers are the most stable sources of water in the prairie region. Although they fluctuate due to flood and drought, they experience much less variability than the other prairie streams. The annual volumes of flow in the North and South Saskatchewan rivers exceed the total of annual runoff in all of the prairie streams combined. These rivers also exhibit a superior water quality to that of the prairie streams.

Smaller streams in the prairie region tend to have a water quality that is highly affected by the type of runoff. Runoff from the largely agricultural area brings nutrients and, to some degree, residues of insecticides and herbicides applied to crops. As runoff subsides, the water quality tends to deteriorate. All streams tend to show relatively large concentrations of naturally occurring organics. Some of the streams receive discharges from municipal lagoons, which increases the organic and nutrient levels.

The quality of the water at boundary crossing points on major streams that flow eastward within Alberta, Saskatchewan and Manitoba has been monitored for the past 20 years. This monitoring shows the water quality at any location has generally not deteriorated and in many cases has improved, and generally meets surface water quality objectives established by the three prairie provinces. Where there have been observations that objectives are not being met, investigations have been initiated to determine the sources of the contamination. In most instances where the objectives are not being met, it is due to natural conditions.

In the ecozones north of the prairie zone, beyond the largely agricultural portion of the province, the amount of annual evaporation is much less as is the variability in annual precipitation.

Consequently, surface supplies are more plentiful and tend to be more stable than those in the prairie zone.

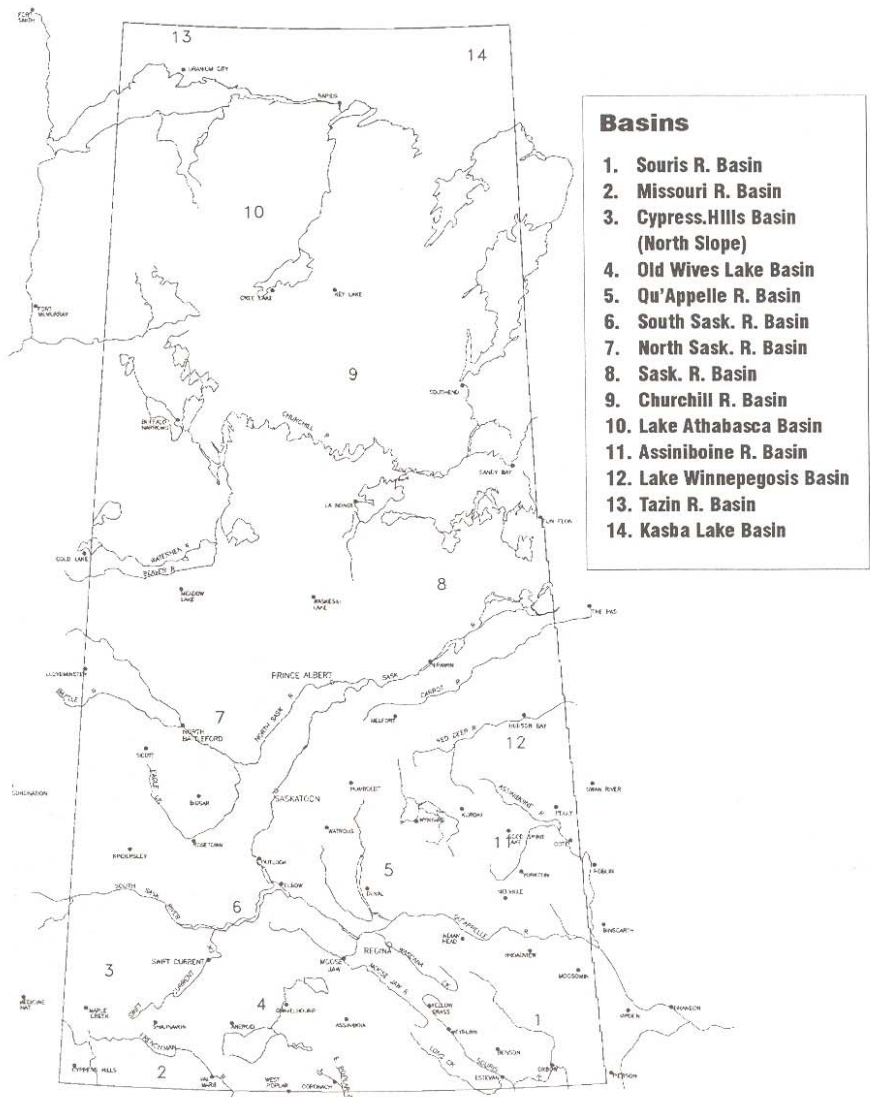


Figure 3: Major Surface Drainage Basins of Saskatchewan

Lakes and Reservoirs

About 12 per cent of Saskatchewan is covered by water in the form of lakes and reservoirs. Natural lakes are not very abundant in the prairie ecozone, due largely to the type of topography. Most large bodies of water are formed as reservoirs behind dams or weirs. A unique characteristic of some prairie lakes is that they do not have a natural outlet that allows water to drain out of the lake in most years. These lakes go through long periods of continual increase or decrease in response to the annual precipitation. Lakes such as Old Wives Lake in southwest Saskatchewan can range in size from several hundred hectares to near zero, as was experienced in 1988 as a result of the drought. Lakes that have a natural outlet tend to experience less extreme ranges of fluctuation.

Reservoirs are an important source of water supply for many parts of the province. Without dams and reservoirs, some areas, particularly in the southwest, would not have access to a year-round supply of water. Water levels in reservoirs behind large dams such as Lake Diefenbaker can change significantly, the result of the variation in runoff from year to year and because of the way they are managed.

Waterbodies that are rich in nutrients like phosphorous and nitrogen are eutrophic. The ecosystems in these bodies normally support large and diverse populations of fish, but often suffer from oxygen depletion during the warm summer months. Most prairie lakes and reservoirs are characterized as being eutrophic, generally due to naturally occurring sources. This situation results in abundant weed growth and algae blooms during the summer.

Oligotrophic water bodies are those in which nutrient levels are very low. The lakes in the northern zones tend to be oligotrophic.

Wetlands

Wetlands are a precious natural resource in their own right. They include sloughs, marshes, potholes as well as lakes and rivers. They play a critical role by balancing the essential components of soil, water and wildlife habitat as a filter for runoff, a recharge for ground water and adjacent habitat for wildlife. These range from temporary or seasonal wetlands that may hold water for a few weeks each year to permanent wetlands that contain water year-round.

The prairie ecozone of the province contains about 1.5 million wetlands which cover 1.7 million hectares of land. The number of wetlands varies from year to year, depending primarily on the amount of precipitation and runoff. Over the past 30 years, 1974 exhibited the largest number of wetlands while 1981 had the least.

Human activities also contribute to the reduction in wetlands. Since the time of settlement, the Canadian prairies have experienced a reduction of about 1.2 million hectares of wetlands, due primarily to reclamation of land for agricultural and urban development purposes. It is estimated that Saskatchewan has lost about 40 per cent of its wetlands since the time of first settlement in the province. The development of roads and railways has also contributed to the drainage of some wetlands.

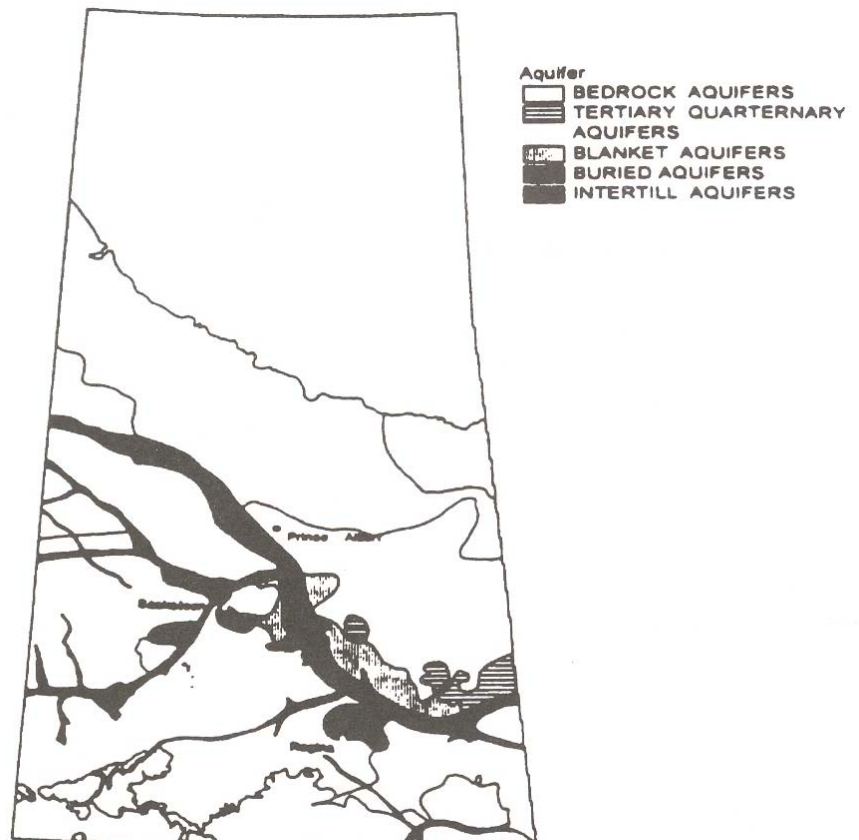


Figure 4: Major Aquifers in Saskatchewan

Ground Water

Ground water is an integral component in the hydrologic cycle and a significant source of water in Saskatchewan. Ground water sources vary depending on the type of sediments or rocks that make up the aquifers and their source of surface water. Most ground water aquifers are recharged by the downward percolation of precipitation that has infiltrated through the soil to the aquifer. Generally, the deeper the aquifer, the more reliable the supply, but the poorer the water quality. Although it is an important source of drinking water, most ground water does not meet the Canadian Drinking Water Guidelines, but the water can be treated to meet the guidelines. The Canadian Drinking Water Guidelines contain recommendations for chemical, physical, radiological and biological parameters necessary to protect and enhance designated uses of water.

Most of Saskatchewan is underlain by sediments of glacial origin referred to as glacial till. The thickness of the glacial till is highly variable depending on location, ranging from 0 to more than 250 metres. When the glaciers melted, sediments were deposited by the melt waters. These now provide an important source of water for farms and for some municipalities. These sources are produced from layers of sand and gravel found within the glacial deposits. The sizes of these aquifers are quite variable, may be depleted by a single well, and are vulnerable to changes in annual precipitation at the surface. These aquifers often show seasonal changes in the level of the water and are particularly susceptible to drought. These sources can generally only be found through localized drilling.

Within the glacial deposits are another source known as buried valley aquifers — preglacial valleys cut into bedrock sediments and filled with sediments from glacial deposits. These aquifers are generally high yielding and have been extensively mapped. The largest of these are the Hatfield Valley and Tyner Valley aquifers.

Below the glacial aquifers are the bedrock aquifers. These are made up of layers of sediment laid down by ancient seas. They tend to be found at depths in excess of 100 metres and the supplies are less responsive to surface conditions of precipitation. They tend to show no seasonal fluctuation. The quality of the ground water in the bedrock aquifers generally requires treatment to reduce the mineral and salt content. For that reason, they are a good source of water for industrial purposes.

Because of their connection to the surface, ground water sources need to be protected from land use activities. Lagoons, landfill sites, underground storage tanks, septic tanks, industrial sites, feedlots, etc. all have the potential to allow contaminants to combine with surface water which can seep into an aquifer. In most cases, suitable standards for construction of these projects have been developed to significantly reduce the potential for contamination.

Water Development

Since the time of Saskatchewan's first settlement in the late 1800s, there has been a need to divert or store water to support human activity. This development has included the building of dams on streams and rivers for water supply, development of ground water wells, construction of weirs on rivers, the development of dugouts for farm water supplies and the construction of drainage channels to reduce agricultural flooding. The province has more than 15,000 water use approvals on record, not including wells and dugouts.

Most of the works are relatively minor. There are more than 60,000 wells in use and thousands of dugouts. There are in excess of 7,000 small dams on creeks and streams that are primarily for stock watering purposes. However, there are also a number of what could be considered more major works that store water and require ongoing management to ensure everyone benefits from the available water supply. As many as 191 structures need to be regularly inspected as part of a provincial dam safety program.

The largest dams in the province are generally associated with power development, either as a source of water for thermal power cooling or as a hydro-electric energy source. Boundary and Rafferty reservoirs near Estevan and Cookson reservoir near Coronach are major sources of thermal power cooling water. Gardiner,

E.B. Campbell and Nipawin dams on the Saskatchewan River system are used for hydro-electric energy production. The largest of the dams is Gardiner Dam near Outlook. This dam and reservoir project is a large multi-purpose project that provides a source of water for irrigation, recreation, wildlife, municipal water supply and hydro-electric energy generation.

Irrigation has been practised in Saskatchewan for more than 100 years. The earliest water development projects were put in place to make use of available water to grow hay and increase the viability of ranches in the southwest part of the province. Early legislation to regulate the use of water for irrigation forms the basis for much of the water rights administration in place in Saskatchewan today. There are currently more than 130,000 hectares of land under irrigation and it is considered a valuable component of the local economy.

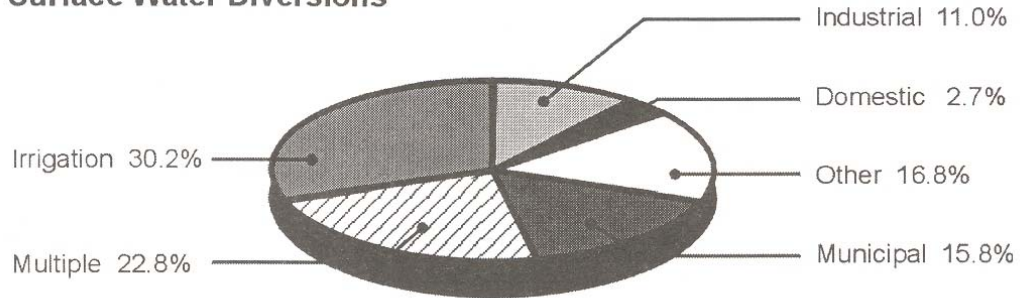
The development of water works has brought about changes in water use. Some water is consumed directly in the activity, such as irrigation and municipal use, while in others the water is used in its stored or flowing state for recreation, hydro-electric energy, wildlife habitat or for dilution of municipal and industrial effluent.

Dams can be used to store water as a source of supply in the reservoir or as a source that can release water for downstream use when required, to keep stream flows at a desired level, or again to be diverted for other uses.

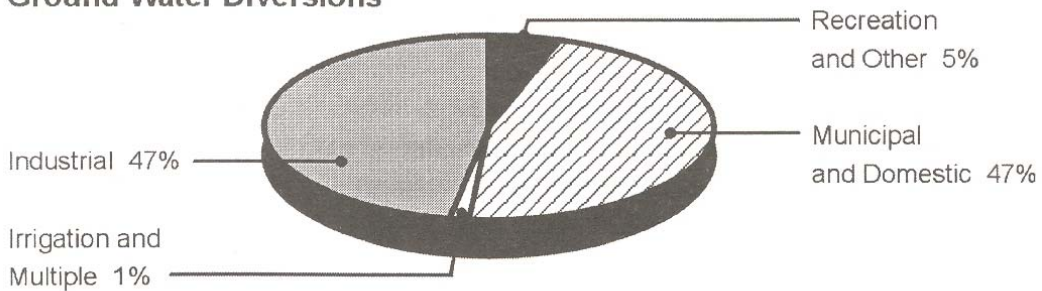
The majority of the water consumed in the province is for irrigation use. The term 'multiple use' includes most of the wildlife projects where water is stored for wetland creation. However, these are generally multiple use projects which often provide benefits for irrigation and municipal use. Figure 5 shows ground water use is primarily for industrial and municipal/domestic use, while surface water is an important source for nearly all potential uses of water.

Approximately 45 per cent of the population rely on ground water as a source of drinking water. Another 40 per cent rely on the surface water supply in the South Saskatchewan River, while the remainder, approximately 15 per cent, rely on dugouts and small dams.

Surface Water Diversions



Ground Water Diversions



Consumption has been calculated to be 140,790 cubic decametres, annually.

Figure 5: Surface and Ground Water Consumption in Saskatchewan

Glossary

Aboriginal People -- includes all Indian, Métis and Inuit people

Aquifer -- a geological formation or group of formations capable of yielding significant economic quantities of ground water to wells and springs; permeable layers of underground rock or sand that hold or transmit ground water below the water table

Aquaculture -- the cultivation of plants or breeding of animals in water

Biodiversity -- the variability among all life forms on the earth including plants, animals, micro-organisms, the genes they possess and their habitat

Buffer Strips -- land adjacent to an area to be protected which separates it from some potentially damaging activity (e.g., cultivation, forest harvesting, mining)

Buried Valley Aquifer -- preglacial valleys cut into bedrock sediments and filled with sediments from glacial deposits

Conservation -- the maintenance or use of natural resources in a manner that provides sustainable benefits

Conservation Easement -- a legal agreement between a property owner and a conservation agency to restrict the type and amount of development on the owner's property

Contaminant -- unwholesome or undesirable element, which when introduced makes something unfit for use

Cubic Decametre -- volume of liquid representing 10m x 10m x 10m (1,000m³) which is equal to about 220,000 gallons

Domestic -- of the home; domestic water use is used by individual households or farmsteads

Ecological -- pertaining to the relations between living organisms and their environment

Economic Development -- the process of using and converting resources into wealth, jobs and an enhanced quality of life

Ecosystem Integrity -- the soundness or 'wholeness' of an ecosystem (e.g. an ecosystem in which essential environmental processes and ecosystem functions are both adequate and in balance)

Eutrophication -- is a natural aging process whereby a body of water becomes richer in plant nutrients like phosphorus and nitrogen. Although eutrophication is a natural process and is common to shallow (and hence warm) prairie lakes, people can dramatically accelerate the process. The disposal of sewage into a watercourse, or activities which result in increased erosion of soil into the water, can increase the concentration of available plant nutrients

Habitat -- the natural home of a plant or animal

Herbicides -- an agent used to destroy or inhibit plant growth

Hydro Power -- electricity produced from the energy of flowing water. Water flows through a turbine, spinning the blades, which rotate a generator, producing electricity

Hydrologic Cycle -- the earth's water system, described by the movement of water from the oceans to the atmosphere to the continents and back to the sea

Hydrology -- the science that deals with the waters of the earth, their occurrence, circulation and distribution

Interbasin Transfer -- the relocation of water from its natural drainage basin to another basin in a different river system

Instream Use -- use of water which does not result in consumption of the water or withdrawal from the source (e.g. navigation, recreation, fisheries)

Integrated Resource Management -- managing the whole ecosystem, including soil, water, trees, animals and plants to meet a variety of objectives. It allows for a broad range of resource uses and gives all stakeholders the opportunity to be informed and involved in management planning

Local Government -- refers to locally elected government bodies, such as municipalities, Conservation Area Authorities and Watershed Associations

Mitigation -- measures undertaken to minimize or offset losses or damage to some aspect of the environment

Municipal Lagoon -- a small, artificial pool for treatment of effluent produced by a community

Oligotrophic -- water bodies with very low nutrient levels; the opposite to eutrophic water bodies

Pesticide -- an agent, including both insecticides and herbicides, used to destroy pests

Potable Water Supply -- a supply of drinkable water

Pothole Topography -- landscape containing small (less than two hectare), shallow, semi-permanent ponds which were formed in glacial deposits during the melting of the glaciers

Public Involvement -- the range of methods which involve the public with planning, policy-making and program development and delivery; includes education, information exchange, consultation, partnerships, co-management and delegation

Riparian -- adjacent to the bank of a river, lake or pond

River Basin -- an area bounded by its drainage divide and subject to surface and subsurface drainage under gravity to the ocean or interior lakes

River Drainage System -- a system or network of stream channels usually connected in a hierarchical fashion

Safe Building Elevation -- the elevation below which structures should not be located because of flood hazard

Sewage Effluent -- the outflow of wastewater from a sewer or system of sewers

Stakeholder -- a person or group with a direct or indirect interest, or 'stake', in an issue

Statement of Principles -- a detailed description of the proposed ethic, vision, mission, values and strategic principles which will guide water management

Stewardship -- the care of property or resources for others

Sustainable -- capable of being maintained indefinitely, the ability to sustain a resource over time. For example, sustainable deer management permits deer hunting at rates that allow deer populations to rebuild themselves

Sustainable Development -- development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Thermal Power -- electricity generated by power stations which burn oil, coal, or natural gas to generate steam which is used to turn turbines and rotate a generator

Urban Runoff -- Storm water runoff in urban areas which is often contaminated with pollutants (e.g, byproducts of automobiles and lawn and garden care, industrial fallout)

Watershed -- a discrete geographic area, characterized by a rise of land at the boundaries, within which all water would drain to a single outlet

Water Management Infrastructure -- comprised of the physical works (dams, canals, pipelines, flood control works, etc.) and a jurisdiction's water management capabilities (monitoring, administration, development, management and operation of facilities, flood forecasting, water resources management and planning, regulatory functions including enforcement, and wildlife and fisheries management)

Wetlands -- low-lying areas of land saturated by water often enough to support aquatic plants and wildlife. Wetlands include a wet basin and an area of land between the basin and the adjacent upland