

Irrigation in Alberta



Contents

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The benefits of irrigation	1
A legacy of cooperation	2
Alberta's irrigation system	4
Getting the water to the crops	8
Irrigation Districts Map.....	11
Development and diversification	12
Places for people, pike and pelicans	18
Breaking new ground	21
For more information	23

Metric Conversions:

1 kilometre (km) = 0.62 miles
1 metre = 3.28 feet
1 centimetre (cm) = 0.39 inches
1 millimetre (mm) = 0.039 inches
1 hectare = 2.471 acres
1 cubic decametre = 0.81 acre feet



A modern pivot irrigation system irrigates a field of canola.

The benefits of irrigation

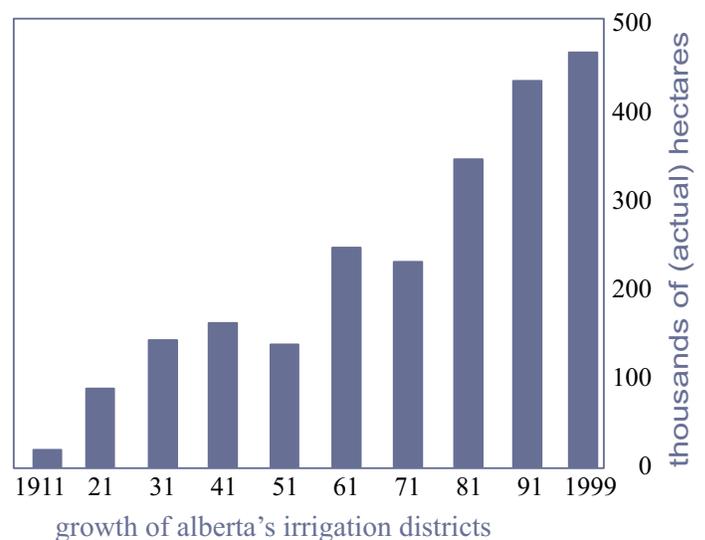
More than a century ago, water for Alberta's first irrigation project was diverted from Fish Creek, near Calgary. Now, at the beginning of the 21st century, about 600,000 productive hectares of land, mostly within the 13 irrigation districts in the southern part of the province, are receiving water through irrigation. Millions of litres of irrigation water are also being used to support the growth of Alberta's livestock and food processing industries. Directly and indirectly, irrigation adds about 35,000 jobs and more than \$940 million dollars a year to the provincial economy. Alberta irrigation helps keep a regular supply of low cost, high quality food on tables in Canada and throughout the world. The province's expertise in irrigation technology and research is also helping increase world food supplies in countries like Egypt, Pakistan, India and China.

Agronomic and economic benefits aren't the only impacts of irrigation. The province's irrigation reservoirs are a recreational destination for both Albertans and visitors to the province. Reservoirs and canals provide critical habitat for birds, mammals, fish and other wildlife on the dry prairies. Irrigation is also used to supply domestic, municipal and industrial water to many small communities and farmsteads in the province. The assurance of a good quality water supply has helped stabilize these farms and communities, and in turn, has led to improved economic and social conditions for rural people.

In recent years, the development and operation of irrigation systems is focusing more on environmental concerns. Increased demands on limited water resources are challenging further development and encouraging agricultural producers, industry and government to make more efficient use of the water supply and the irrigation

systems already in place. The goal in the next decades will be to further improve the irrigation infrastructure and water use efficiency, while safeguarding the environment. Already, rehabilitation of the irrigation infrastructure and use of advanced on-farm irrigation technology are conserving water and energy. Hydro-electric facilities are being installed on the irrigation infrastructure to reduce our dependence on fossil fuels for generating power. Food processing wastewater is being treated and used to irrigate crops. Research and development on more drought-resistant crop varieties will also save water.

This booklet briefly examines the past history and present status of irrigation in Alberta to help readers understand the contribution irrigation has made to Alberta society and the challenges facing the irrigation industry in the future.





Farmers at a demonstration of surface irrigation using siphon tubes.

A legacy of cooperation

Irrigation in Alberta owes its existence to the foresight and optimism of 19th century government officials, the speculative zeal of Canada's early entrepreneurs, and the spirit and technical know-how of pioneering settlers.

The construction of the Canadian Pacific Railway in the late 1800s started a minor land boom on Canada's prairies, one the railway company and the federal government hoped to foster. Irrigation was seen as a key element in attempts to attract settlers. After a prolonged drought struck the area, and through the urging of Department of the Interior officials, William Pearce and J.S. Dennis, the federal government passed the Northwest Irrigation Act of 1894. Rather than leave water rights in the hands of property owners, the Act gave control of irrigation diversion and water use to the federal government.

All surface waters were declared the property of the Crown, and the rights to use the water could be obtained only through government license. Both the water resources and potential agricultural lands were surveyed, to see which areas would benefit most from irrigation and where irrigation was most practical or feasible.

In Alberta, however, small-scale irrigation works were already being built. Mormon settlers, in particular, were putting the experiences and technical skills learned in their former Utah homeland to work, creating effective irrigation systems in the dry southern part of the province. Work was completed on the first successful, large-scale irrigation project in 1900. This system — 184 kilometres of canal southwest of Lethbridge — opened thousands of hectares of land to colonization.

In 1903, the Canadian Pacific Railway began construction of a diversion weir on the Bow River near Calgary and a system of canals to bring water to 80,000 hectares of farmland, called the Western Block. It was hoped the irrigation project would increase shipping and passenger business and the sale of land acquired during the building of its transcontinental rail line. Six years later, the CPR started work on an even larger project, a diversion structure downstream on the Bow River, near Bassano, and a distribution and canal system to irrigate the Eastern Block, about 160,000 hectares near Brooks.

In the long run, these large commercial ventures were not financially successful. However, they laid the groundwork for a series of legislative enactments aimed at developing the irrigation potential of the province.

The Irrigation Districts Act

In 1914, the government of Alberta passed the Irrigation Districts Act. The legislation allowed land owners to organize themselves into local cooperatives, which could then issue bonds for the construction of large-scale irrigation projects. The federal and provincial governments would help with construction of the headworks. Government guarantees were established to help farmers mortgage their land to provide funds for the work done by the districts. The districts were also given the authority to levy local taxes for the operation and maintenance of the irrigation projects and to deal with the day-to-day administration of the systems.

The concept of farmer-owned and operated irrigation districts, unique to Alberta, was a natural outgrowth of the

government's commitment to the development of agriculture and to the farmers' willingness to work together for mutual benefits. In all, 13 irrigation districts were formed in subsequent years, with capitalization and operating expenses shared by the provincial and federal governments as well as the districts themselves. In 1919, more than 7,500 hectares of district land were in irrigated production.

Greater government support

Though irrigation continued to grow as both an economic and a social force, returns on investments during the 1920s were not as high as anticipated. To keep the industry growing, and because it was felt benefits would accrue to society as a whole, the provincial and federal governments agreed to fund all major capital works. They also helped pay some of the debts which had been incurred by the farmer cooperatives and private corporations in building the existing infrastructure.

The governments also encouraged the planting of higher-value crops and promoted better farming practices, initiating technical assistance and education programs. Soil surveys were undertaken and information on climate and other geographic factors was gathered, starting a data bank that is still being referenced and expanded today.

In 1931, following the transfer of natural resources jurisdiction from the federal government to the provinces, Alberta passed its first Water Resources Act, solidifying the province's support of the irrigation districts. The creation of the Prairie Farm Rehabilitation Administration (PFRA) in 1935, as an agency of Agriculture and Agri-food Canada, initiated an era of increased federal government involvement in irrigation. Through the PFRA, the federal government became a major developer of new storage and delivery systems, including the St. Mary, Milk River Ridge and Waterton reservoirs, as well as the associated diversion canals. By 1950, the irrigation districts serviced more than 182,000 hectares of farm land.

A new provincial irrigation act was passed in 1968, and a year later, water apportionment was revised under a reconstituted Prairie Provinces Water Board. This cooperative government effort allocated about one third of the prairie's total surface water resources

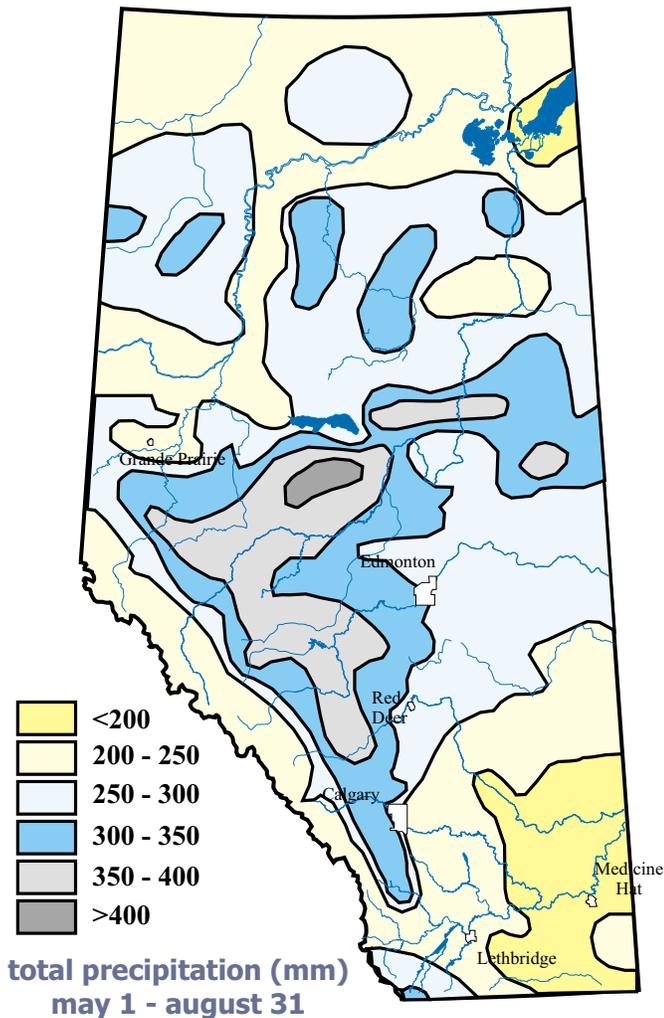
for consumptive use in Alberta, with the remaining water mandated for downstream flows.

Though basic maintenance on the infrastructure had been looked after by the irrigation districts, it became apparent after World War II that a major rehabilitation and expansion program was needed. In 1950, in cooperation with the PFRA, the province began rebuilding and enlarging the main delivery system in the Bow River Irrigation District, as well as in the St. Mary River Irrigation District from Taber to Medicine Hat. This work was continued under the Alberta Irrigation Capital Works Program and broadened to include the other irrigation districts.

By the beginning of the 1970s, the federal government felt it had achieved its goal of stabilizing irrigation in Alberta and transferred most of its interests to the province. The province thus assumed even greater responsibility for rehabilitation and expansion of the distribution infrastructure. As part of a cost-sharing program with the irrigation districts, the Alberta government paid 86% of construction expenses and provided engineering and agrological services. In 1976, with the initiation of the Alberta Heritage Trust Fund, more money was allocated for irrigation capital works. (In 1995, the cost-sharing formula was changed. The provincial government now pays 75% of rehabilitation costs, and the irrigation districts pay 25%.)

IRRIGATION DISTRICT (I.D.)	Year I.D. Formed	First Water Drawn
Taber I.D.	1917	1917
Lethbridge Northern I.D.	1919	1923
United I.D.	1921	1923
Mountain View I.D.	1923	1931
Raymond I.D.	1925*	1900
Magrath I.D.	1926*	1900
Eastern I.D.	1935*	1914
Leavitt I.D.	1936	1944
Western I.D.	1944*	1907
Aetna I.D.	1945	1959
Ross Creek I.D.	1949	1954
St. Mary River I.D.	1968*	1900
Bow River I.D.	1968*	1920
* formation of an irrigation district from existing irrigated areas		

Alberta's irrigation system



Unlike the American Midwest, where irrigation depends so heavily on dwindling groundwater resources, Alberta's irrigation water comes from its rivers. Through a diverse irrigation infrastructure, spring precipitation and mountain snowmelt is rechannelled, stored and later put to use in the more arid parts of the province, where it's most needed.

Though Alberta has abundant water resources, precipitation is scarcest where the agricultural potential is greatest. The southern part of the province, with a growing season of about 150 days, receives only 300-450 mm of precipitation annually. Less than half falls from May through August, during the growing season.

The combination of abundant sunshine, warm temperatures and a long growing season results in an average net water deficit of 380 mm a year for crops grown in the southeast corner of the province. Though the deficit is less in other parts of southern Alberta, chinook winds reduce moisture

retention. Irrigation allows water stored in the spring to be used in midsummer, to help balance these deficits. Limits on irrigation expansion were established in 1991, to offset concerns about scarce water supplies in the South Saskatchewan River Basin.

Alberta is unique in Canada in requiring land to be classified suitable for irrigation under sustained production. Standards for soil classification irrigability consider soil depth, parent material, texture, drainage, salinity, pH, erodibility and organic matter content. Topography, groundwater factors and natural vegetation are also considered before an irrigation water right is granted.

Most of the soils in southern Alberta are ideally suited to irrigation. The area's medium to fine-textured glacial tills have good water-holding capacities and slow movement through the lower root zone. The coarse-textured soils are also productive, though more difficult to manage due to a high water percolation rate and low water retention.

The Alberta Irrigation Districts Act, which came into effect in 2000, allows irrigators greater autonomy and independence, but with greater accountability. Under the Act, an irrigator can, with the consent of their irrigation district, change the point of diversion and the location of an irrigated field. He may also transfer a water right to a different piece of land, as long as it also is classified for irrigation.

Alberta Environment maintains the right to change or revoke a license if water resources are being negatively impacted. Interbasin transfers are not allowed, but the government can issue new licenses, provided the resource base has sufficient water.

The provincial government, through Alberta Environment and Alberta Agriculture, Food and Rural Development (AAFRD), also maintains partial responsibility for irrigation planning, research and infrastructure upgrading. In the year 2000, for example, approximately \$47 million was allocated for infrastructure upgrades alone.

AAFRD's Irrigation Branch provides research, consultation, and extension services to the irrigation industry through its Farm Irrigation Management, Irrigation Development, and Resource Conservation sections. A team of specialists with the Irrigation Branch

offers technical assistance on crop water management, efficient use of water, equipment selection, and beneficial management practices. The Branch also monitors soil and water quality and maintains the land classification standards that encourage sustainable farm practices. Research on the environmental effects of irrigation is a critical part of its mandate.

The federal government maintains its involvement with infrastructure development and resource protection, particularly in regard to the protection of fisheries, and with respect to international and interprovincial water apportionment.

Irrigation in Alberta today

The greatest part of irrigation activity in Alberta takes place in the 13 irrigation districts in the South Saskatchewan River Basin. Approximately a half million hectares of land receive irrigation water through the operations of the districts, though the government continues to set the conditions under which they operate. The Alberta Irrigation Projects Association (AIPA) acts as an umbrella group for the districts, coordinating joint activities, such as education and research.

In addition, more than 2,700 private irrigation projects have authorization to use Alberta's water resources. These projects are totally funded, developed and operated by their licensees. They vary in size from two hectares to more than 10,000 hectares, and together total more than 112,000 hectares of land. Private irrigation projects are located as far north as the Athabasca and Peace Rivers, but the majority have been developed in southern Alberta.

The largest private license in the province is the Blood Tribe Agricultural Project, which obtains water from the Waterton, Belly and St. Mary rivers. The project irrigates more than 10,000 hectares on the Blood Reserve, largely for non-aboriginal leaseholders, and is a significant source of economic activity for the Blood Tribe.

In all, irrigation licenses have been allocated for the withdrawal of more than 3.8 million cubic decametres of water. This figure, however, is more than the volume of irrigation water actually being used. The difference between water assessments and actual use, coupled with new water conveyance and application technologies and better farm management practices, could allow for an increase in irrigated land area. Based on current average consumptive use of water for southern Alberta's irrigated crops of 4.8 cubic decametres per hectare, estimates are

that an additional 125,000 hectares could be irrigated, without increasing water allocations, and without environmental, economic or social concerns.

The Year 2000 Irrigation Water Allocation Review, a five-year cooperative study by the Irrigation Branch, the AIPA, and the PFRA, addressed the challenges of irrigation expansion and identified improvements in water management efficiencies that would allow such expansion to occur within the confines of current water allocations. In the Taber Irrigation District, for example, more than 90% of the delivery system rehabilitation has been completed. Similar improvements in water use efficiency continue to be made in other districts.

