the WATER HAULER'S BULLETIN

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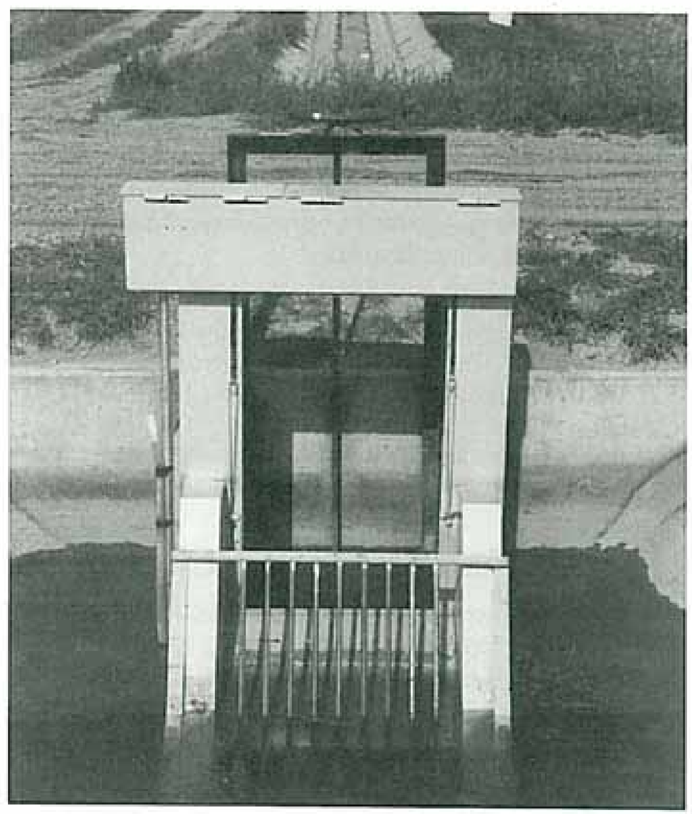
LANGEMANN CONSTANT FLOW GATE

. . . more than just another gate

Peter Langemann, a man of many hats (board chairman, irrigation farmer, innovator and hobbiest) has designed and built an electronically-controlled constant flow gate. Unlike the old saying "build a better mouse trap and the world will beat a path to your door" it hasn't happened yet nor does Langemann want it to happen. Rather, this self-taught inventor has given his invention and his patent rights to the St. Mary River Irrigation District (SMRID).

Langemann toyed in his mind for a long time that there had to be some way of mechanizing a farm turnout gate on a canal so that no matter what volume of water was flowing in the canal, a set amount of water would be diverted through the turnout. He set out designing the gate on the basis of what he calls a



Langemann Constant Flow Gate installed in concrete lined Cameron Lateral.

"feed forward principle." "That is to say, that my electronically-controlled gate imitates the variations in water level on the upstream side of it. If the water level goes up the gate goes up the same corresponding amount and vice versa. This simply means there is always a constant head over the gate and therefore a constant flow over it. To operate properly, my gate needs a free outlet with no drowning or tailwater effect, states Langemann.

The metal gate is built as a single unit and simply bolted to the upstream walls and floor of a concrete turnout structure. It is based on a double-hinged principle and looks somewhat like a drop-leaf gate. A two-prong probe attached on the upstream side is capable of sensing a 3 mm change in water level. The gate is controlled by two simple electronic integrated circuits and a couple of transistors. The power to operate the gate is provided by a car battery. Although the gate is estimated to have made over 6000 adjustments in the 1992 operating season, the battery never required recharging. When the gate was removed for inspection after the water was shut off for the season, no evidence of wear was evident, says Langemann. The gate can be operated both manually or automatically.

The irrigation branch assisted the SMRID in testing and monitoring the accuracy of the unit throughout the 1992 irrigation season. Jack Ganesh, P. Eng. feels the gate holds a lot of promise although it was not possible because of the below-average irrigation demands to test the gate at the extreme ends of what water variances might occur. More monitoring will be done in 1993.

The cost of manufacturing a gate capable of operating in a channel having a maximum water depth of 1.3 m is approximately $1000.00, says Langemann. "I tried to keep it as simple as possible yet designed it to last a long time and require little maintenance," he concludes.

Monte Flexhaug, SMRID operations manager, is having a number of the gates built and will have them installed for the 1993 irrigation season.

For more information please contact Monte Flexhaug, SMRID operations manager at St. Mary River Irrigation District, Box 278, Lethbridge, Alberta T1J 3Y7. Telephone (403) 328-4401.■

TECHNICAL CONFERENCE JUNE 4

The Annual District Technical Conference will be held on Friday, June 4, 1993 at Ericksen's Family Restaurant. This year's theme is "CONSERVATION OF WATER THROUGH DESIGN AND OPERATION" but any topic of current interest will be accepted. Please phone Jack Ganesh at 381-5869.

Please **NOTE**: This Conference is limited to district staff only.■

TAKING STOCK THROUGH G.I.S.

Geographic Information Systems (G.I.S.) is not new technology but it is finding an ever-increasing application with irrigation water managers. To more effectively and more efficiently manage water, managers must "take stock" of the system that they are managing and know what's out there, both within the distribution system and at the farm level, says Wally Chinn, P. Eng., section head with the irrigation branch. In the last issue of The Water Hauler's Bulletin, readers were introduced to **I**rrigation **I**nfrastructure **M**anagement **S**ystem (**IIMS**), the G.I.S. project that is collating irrigation district infrastructure and all its attributes into a common digital database. This is one component in the building of the **A**lberta **I**rrigation **G**eographic **I**nformation **S**ystem (**AIGIS**). The other complementary package now being implemented by Alberta Agriculture, Food and Rural Development's irrigation branch district offices is **OFIIS**, the **O**n-**F**arm **I**rrigation **I**nformation **S**ystem.

Although **OFIIS** is first being utilized to inventory the private irrigation projects across the province, it has also been built to accommodate irrigation district data from the farm turnout level. Both **AIGIS** packages have the advantage of being structured around the common CADD package AutoCAD and the complementary G.I.S. software **GEO/SQL** (SPATIALIST). **OFIIS** in fact offers users the opportunity to get started on building a useable G.I.S. database with only having AutoCAD in the drafting shop.

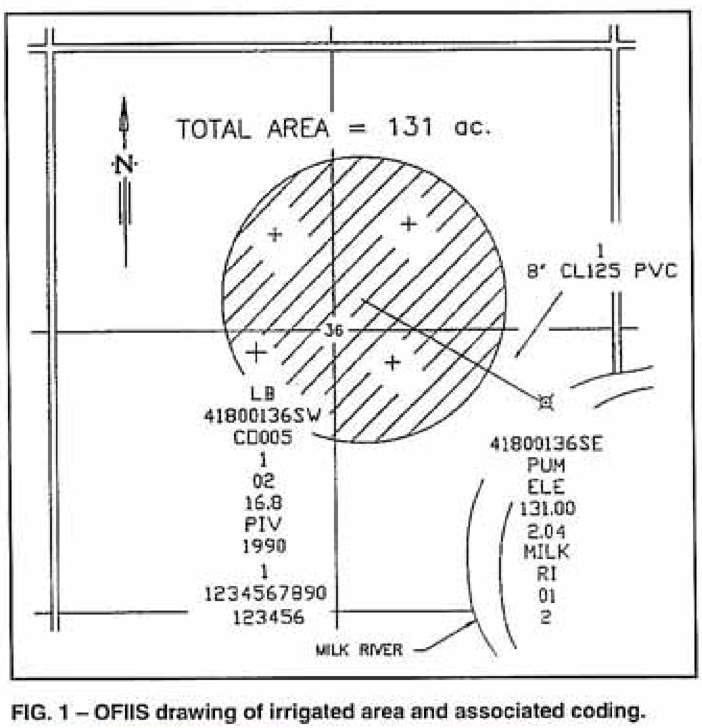


FIG. 1 – OFIIS drawing of irrigated area and associated coding.

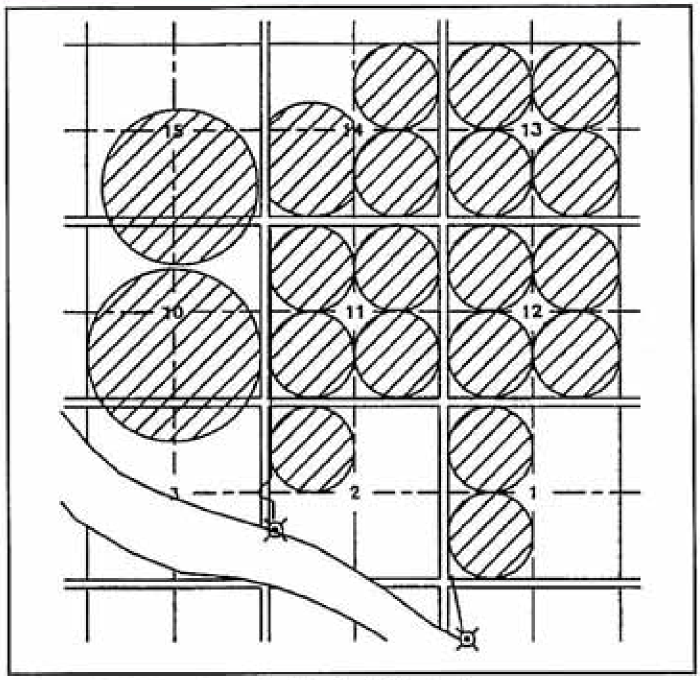
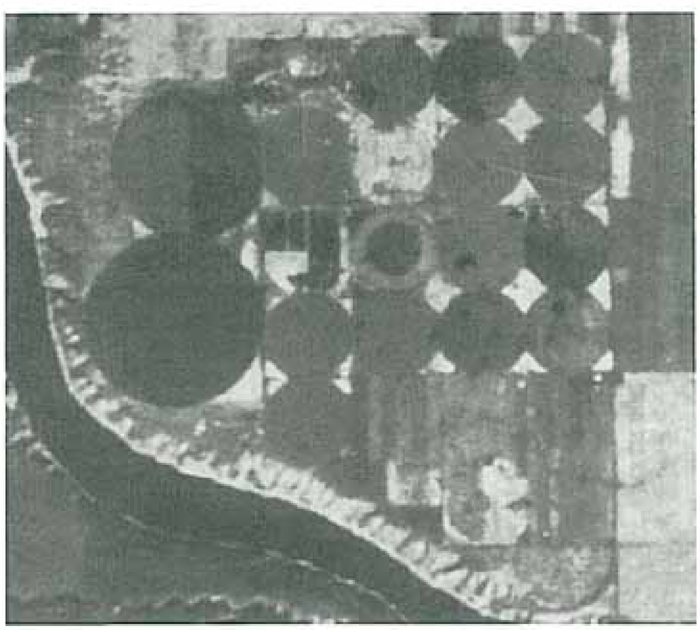


FIG. 2 – G.I.S. Drawing of authorized irrigated areas

So what is **OFIIS** all about? To better explain this, says Chinn, Figure 1 illustrates the type of "plan" representation that is produced. **OFIIS** provides a geographical representation of irrigated areas on a parcel by parcel basis. Attached to it are numerous "attributes" that describe a variety of parameters associated with that irrigated area of development.

First of all, the plan incorporates the provincial base map coordinate system to describe section boundaries and physical features. Over top, the irrigated area is digitized as are diversion locations, water conveyance systems, etc. The irrigation Land Classification Level II



False colour infrared image of irrigated block.

reports can also be "layered" over top of the parcel(s) and the irrigated areas, as can right-of-way plans, distribution infrastructure from **IIMS**, etc.

Figure 1 illustrates some of the coding information that is entered into the attribute database and "linked" to the geographic layout references. Although the example shown refers to a private individual project, OFIIS has been structured for easy adaptation to any irrigation district situation. Table 1 describes each code's interpretation within the database.

Table 1 - OFIIS Attribute Coding

CODE	DESCRIPTION
LB	Branch Dist. Office - Leth.
41800136SW	Irrigated Parcel Land Loc.
CO005	County/Municipal Authority
1	A.D.A. Administrative Region
02	Census Division
16.8	Irrigated Acres per Parcel
PIV	Pivot Sprinkler Method
1990	Last Date of System Install.
1	Type of Irrigation Agreement
1234567890	Water License Priority No.
123456	Assessment Roll No.
1	Conveyance Type
8" CL125 PVC	Conveyance Description
41800136SE	Diversion Point Land Loc.
PUM	Diversion Type (Pump)
ELE	Pump Energy Type (Electric)
131.00	Ann. Diversion Alloc. (ac-ft)
2.04	Diversion Rate (cfs)
MILK	Water Source Name
RI	Water Source Type (River)
01	Drainage Basin Name

Again, says Chinn, the advantage of the OFIIS approach is that these codes can be customized to reference data parameters specifically required by respective water management authorities. All that is needed to share this information with other data users is a common linking attribute. In this way, for example, government authorities can share their data with irrigation districts who in turn could provide it to Irrigation Council and vice versa.

The next step in the process, using other existing technology, is to correlate G.I.S. maps with remotely sensed data to perform crop detection inventories, irrigated area monitoring inventories and the like. Figure 2 illustrates a small block G.I.S. drawing of authorized irrigation projects. It can be compared to the LandSat false-colour imagery picture on the left (actual irrigated areas).

(Continued on Page 7)

NITRATES IN WATER TO BE STUDIED

Concern about the impact of agriculture on the quality of surface and groundwater continues to increase, partly because of well-publicized problems in many areas of the world and Canada. The 1990 report "Growing Together," which was prepared by the Federal- Provincial Agriculture Committee on Environmental Sustainability, specifically targeted irrigation as a major area of concern.

The Canada/Alberta Environmentally Sustainable Agriculture (CAESA) agreement was introduced in 1992 to continue earlier federal/provincial programs related to conservation of soil resources. This Agreement is scheduled to run from April, 1993 to March, 1997. An important modification to the CAESA agreement is the inclusion of water quality research and monitoring components.

The land evaluation and reclamation branch, in cooperation with other branches of Alberta Agriculture, Food and Rural Development, plus a number of other agencies, was successful in obtaining support for two irrigation-related water quality research projects. Both studies will focus on nitrate movement to surface water and groundwater in southern Alberta.

STUDY #1 Manure and Nutrient Management to Sustain Groundwater Quality Near Feedlots

In addition to Alberta Agriculture, Food and Rural Development, this project involves the County of Lethbridge, the Oldman River Regional Planning Commission, Agriculture Canada, the Alberta Cattle Feeders Association and the Lethbridge Northern Irrigation District (LNID). Rod Bennett of the land evaluation and reclamation branch is the project manager.

The overall objective of this study is to develop improved manure management practices to optimize its economic value and to minimize nitrate movement to surface water and groundwater resources. The project is located in that portion of the County of Lethbridge situated north of the Oldman River and within the LNID (Figure 1). The County of Lethbridge is the most intensive livestock feeding area in Alberta, making it a logical choice for this research.

The Oldman River Regional Planning Commission statistics indicate that 103 feedlots, 60 dairies, 74 hog operations, and 21 poultry and other livestock feeding operations are located in the County of Lethbridge north of the Oldman River. This study will focus on beef cattle feedlot operations in the study area, and results will be extrapolated to other intensive livestock operations.

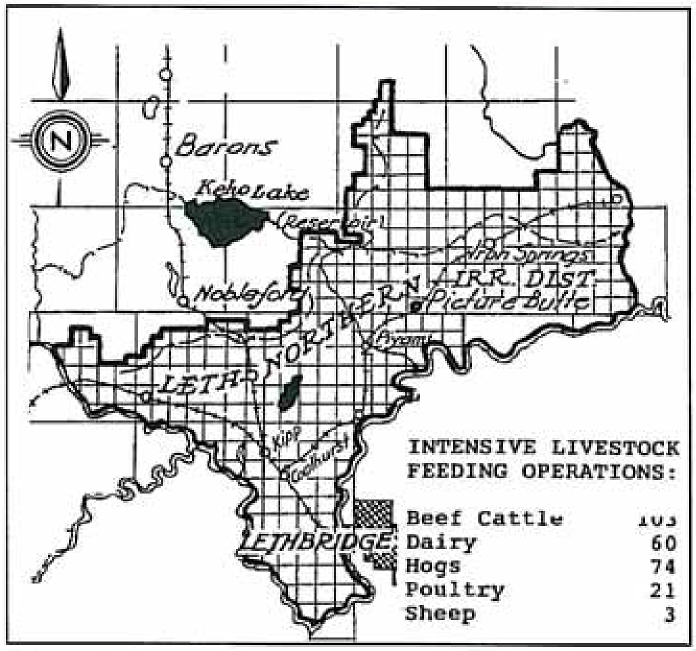


Figure 1 Study Area

The study includes monitoring of nitrates in the soil profile and shallow groundwater following annual fall applications of different rates of beef cattle manure on replicated, irrigated plots. Results will be used to assist with ongoing refinement of the current code of practice for manure disposal in Alberta. This CAESA project is part of a larger study that includes assessment of land availability for manure disposal and large- scale monitoring of nitrates in surface and groundwater resources in a well-defined watershed within the study area.

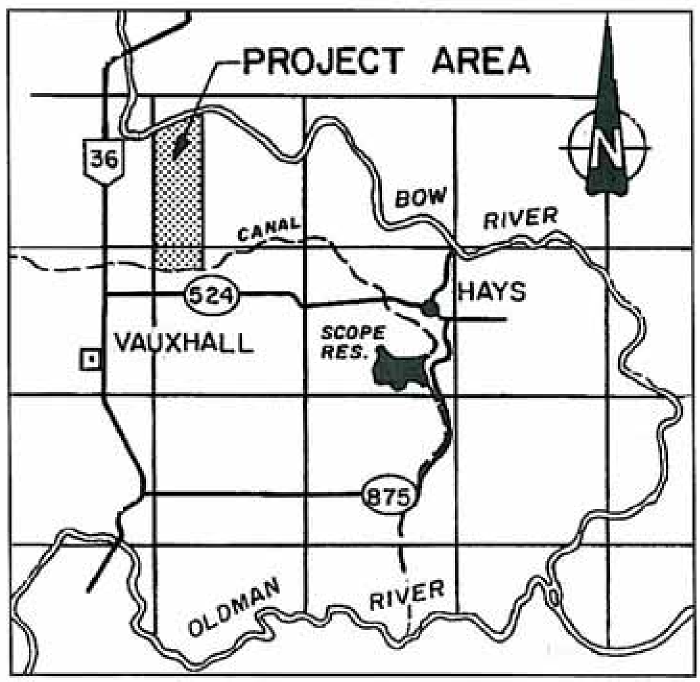


Figure 2 Study Area

STUDY #2 Nitrates in Soil and Groundwater Below Long-Term Irrigation Fields

This study is a cooperative effort by Alberta Agriculture, Food and Rural Development, the National Hydrology Research Institute in Saskatoon and the University of Washington. Joan Rodvang of the land evaluation and reclamation branch is the project manager.

The main purpose of this project is to evaluate the impact of existing irrigation management on nitrate movement to the groundwater and ultimately to the Bow River. This study site is located in the Bow River Irrigation District (BRID), about 3 km northeast of the town of Vauxhall (Figure 2).

The study area consists of twelve irrigated sections which are located between two groundwater flow divides and can therefore be treated as a confined basin. The upper boundary of the basin is the BRID main canal and the lower boundary is the Bow River. The area has been irrigated for about seventy years and represents a till landscape typical of much of southern Alberta. This site is ideal for this study, because earlier research in the area by Alberta Agriculture defined the geology and groundwater flow regimes.

Annual irrigation and fertilizer rates will be acquired for parcels of land to determine the range of inputs for crop production in the study area. Sampling and analysis of surface water and groundwater will take place throughout the study area on a regular basis to relate nitrate concentrations to irrigation and fertilizer applications.

In addition to the larger-scale program, more detailed monitoring will take place on one selected quarter section. Soil and groundwater sampling will both be carried out to better define the occurrence of nitrates in the soil profile and groundwater system.

These projects will be carried out over the next four years. Progress reports will be prepared annually to communicate results obtained. The information gained from these studies will help us better understand the potential impacts of long-term irrigation and intensive livestock feeding operations on both surface and groundwater quality in southern Alberta. This information will allow producers, irrigation districts and governments to better manage water and nutrient resources to minimize occurrence of water quality problems.

The cooperation of all irrigation producers in the study areas is greatly appreciated. For more information, please contact Rod Bennett [(403) 381-5894] or Joan Rodvang [(403) 381-5883], Land Evaluation and Reclamation Branch, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta T1J 4C7.■

WEED SPRAYER DOES DUAL PURPOSE

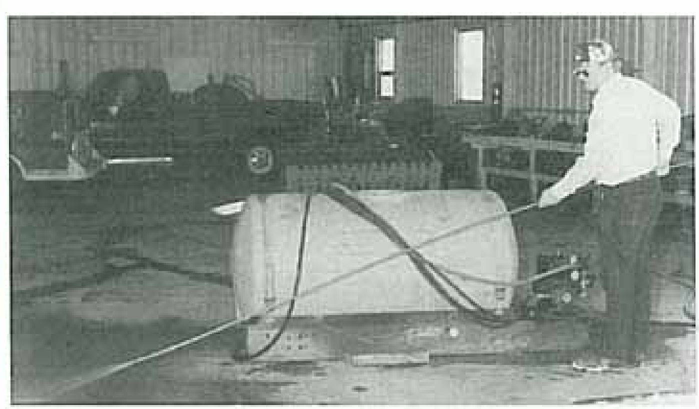
Kirt Woolf, manager of the United Irrigation District, often garners a second look as he travels down a snow-packed road with a weed sprayer in the back of his truck. One cannot help wonder what he's up to when the closest green weed is 2000 km south at this time of year. No, he's not weed spraying, but using the sprayer's water tank and pump along with a length of copper pipe to thaw out frozen irrigation pipe outlets.

A pipe full of water with a frozen outlet becomes a real concern as water begins to outlet through the air vents above the frozen section, says Woolf. Some how the frozen section must be thawed to prevent damage to the pipe and soil erosion. Recalling how the municipalities thawed out frozen road culverts using water, he soon adapted some of his own equipment and built a thawing unit.

Working with the weed sprayer, he adapts the unit by attaching a 4 m length of 12 mm diameter copper water pipe to its flexible rubber hose. Soldered to the other end of the copper pipe is an end plug, in which he drills a small 7/64 hole. The small diameter hole produces a very direct spray. He likes copper pipe because it is somewhat flexible, cheap and comes in long lengths.

To unplug a frozen outlet pipe quickly, Woolf likes to fill the sprayer's tank with water as warm as he can get. The high pressure spray [620 kPa (90 psi)] and warm water, when directed against the ice face in the pipe, almost immediately opens a 100-150 mm diameter back-wash hole. "In about 15 minutes I can go through about 3 m of ice. It really surprises me how fast the ice is eaten away by the warm water," says Woolf. One word of caution, he warns, make sure you can outlet the volume of water stored behind the frozen blockage either downstream or pump it up and over the bank.

For more information please contact Kirt Woolf, Manager, United Irrigation District, Box 1006, Glenwood, Alberta T0K 2R0. Telephone (403) 626-3255.■



UID's Kirk Woolf demonstrates in the shop his converted weed sprayer/ice remover.

BLOWING SOIL CAUSES DISTRICT TO TAKE ACTION

"It's annoying, it costs us both in time and money to remove the stuff from our canals," says Emil Johnson, Bow River Irrigation District water master. Johnson is referring to the drift soil that fills district canals and laterals over the winter period. Most of our farmers guard their topsoil with their life but we have some guys that year after year cause us the problems," he adds.

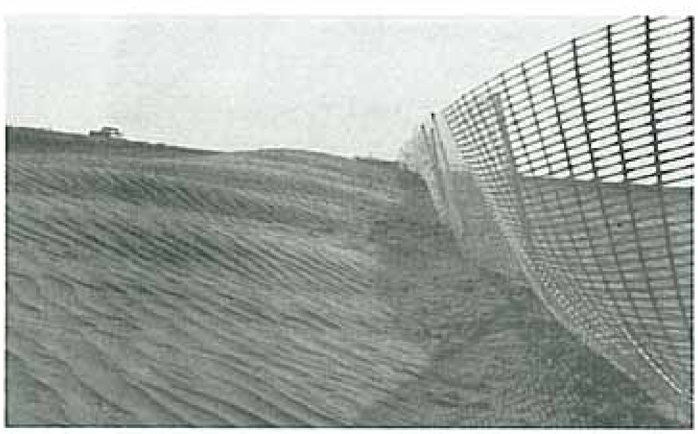
Johnson feels that the district has found a solution to keeping at least some of the soil out of their canals. Last winter we purchased a number of rolls of that plastic barrier or snow fence material. We got permission from the landowner to install it in his field about thirty metres up-wind of the paralleling lateral.

It soon became evident it was working as drift soil began piling up behind it, says Johnson. "Come spring we had a clean canal and about one metre of soil remained drifted against the fence. Our crew removed the fence and the landowner, with his own farm equipment, levelled the pile and worked it back in."

The fence material costs about $100.00 for a 30 metre roll while 10 steel stakes add another $50.00. The orange plastic fencing material, if properly stored when not in use, is supposed to last up to 20 years, states Johnson.

"The problem is this," concludes Johnson. "If we don't purchase and put up fences at the problem areas, we know what we will be faced with before we run any water down the canals. A hydraulic hoe will be required to spend days digging out these channels, and then the added expense and time to level the spoil piles. The worst part is to fit all this extra work into our already hectic spring schedules."

For more information please contact Emil Johnson, Bow River Irrigation District, P. O. Box 140, Vauxhall, Alberta T0K 2K0. Telephone (403) 654-2111.■



Plastic snow fence has caught a one-metre-high pile of drift soil.

FALL IRRIGATION

With the dry years of 1982, 1983, 1986 & 1988 and the wet years of 1975, 1978, 1981 & 1992, the question of fall irrigation always arises. "The decision to fall irrigate is never a simple one, says Bob Riewe, irrigation management specialist with the irrigation branch. Water availability, weather, time left after harvest, the thought of irrigating once more, are only some of the factors which a farmer needs to consider when deciding to fall irrigate or not. Since farm income has been declining over the past 8 to 10 years, farmers are beginning to look more closely at where their dollars are being spent and what is the benefit gained from spending these dollars.

In 1991, a project was started to look at the practice of fall irrigation. The purpose of the project was two fold:

1. To determine the amount of water lost during the over winter period. The over- winter period being from October 15th to April 1st.
2. To determine the economic loss (or benefit) of water during this time period.

The amount of water applied to the project area varied from 55 mm to 125 mm. As a control, a non-irrigated area was included.

"Results from the first year of this project," says Riewe, "showed that the amount of soil moisture lost during the over winter period from the irrigated areas varied from 0.37 mm/day to 0.42 mm/day. The variation in soil moisture loss per day corresponds to the amount of soil moisture available in the root zone (i.e. the higher the soil moisture the greater amount of water lost per day). Water lost from the non-irrigated area averaged 0.24 mm/day."

During the over-winter period, 47.4 mm of precipitation was recorded at the site. Including precipitation, the total amount of water lost from the irrigated areas during the over-winter period varied from 18.1 mm to 26.9 mm. For this same time period, the non- irrigated area had a net gain of 4.9 mm.

"Figure #1 shows," says Riewe, "what the soil moisture conditions were like at the start of the 1992 growing season. Receiving only 40% of the normal precipitation during the 1991- 92 over-winter period, only the fall irrigated plots had sufficient moisture for seed germination. At the start of the 1992 growing season, the non-irrigated area started with soil moisture levels lower than the permanent wilting point. In the 0 to 25 cm range, the non-irrigated area (Treatment D) was 30.9 mm below the 50% depletion level. The 50% depletion level is used as a guide for scheduling irrigations (Table 1)."

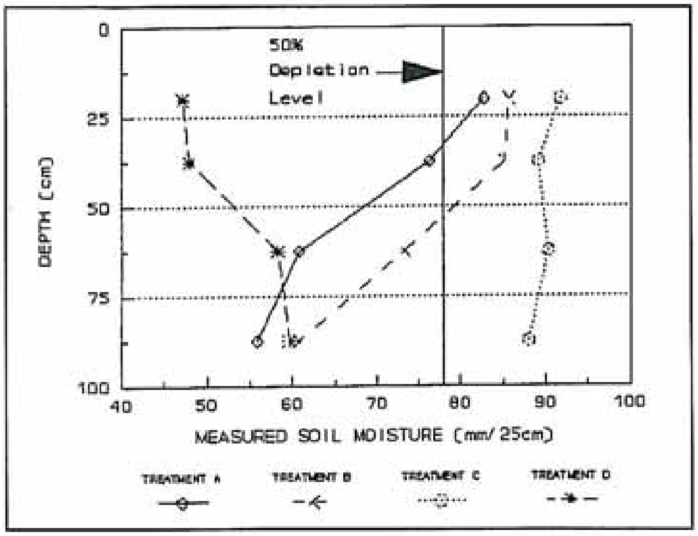


Figure 1. Spring Soil Moisture Levels

In total, the non-irrigated area would require 99 mm of irrigation water to bring the soil moisture level in the 1.0 m root zone up to the 50% depletion level and an additional 200 mm to bring the root zone up to field capacity. Increasing the amount of water applied in the fall from 55 mm (Treatment A) to 125 mm (Treatment C) rebuilds soil moisture substantially. The additional 70 mm of water applied, improved soil moisture levels to a depth of 1.0 m. Applying 75 mm of water (Treatment B) improved soil moisture levels only to a depth of 50 cm (Figure 1).

When looking at the economics of fall irrigation, the cost related to applying the water that was lost during the over-winter period is minor compared to the amount of water, time, and manpower required to apply sufficient water in the spring and the balance of the crop growing season. Assuming a cost of $1.00/25 mm/acre for natural gas users and $2.00/25 mm/acre for electricity uses, the dollars lost from the fall irrigated areas would range from $0.72/acre to $2.15/acre. To ensure proper seed germination for the non-irrigated area, one would have to spend between $1.24 and $2.47/acre immediately after seeding since there was basically no moisture available. Due to the limited amount of water with depth, continuous irrigations would be required to ensure sufficient moisture was available for the crop for the balance of the crop growing season.

DEPTH	TREATMENT A (mm)	TREATMENT B (mm)	TREATMENT C (mm)	TREATMENT D (mm)
0-25 cm	4.8	7.8	13.8	-30.9
25-50 cm	-1.7	7.2	11.2	-30.0
50-75 cm	-17.2	-4.7	12.4	-19.7
75-100 cm	-22.1	-17.2	10.0	-18.4

Figure 2.
Spring soil moisture condition in relation to the 50% depletion level.

"The first year of this study has demonstrated that, relying only on over-winter precipitation to refill the soil profile can create serious problems in the spring. Based on the limited amount of information obtained, it would appear that an application of 75 mm is the minimal amount of water that should be applied," concludes Riewe.

For more information please contact Bob Riewe, P. Ag., Irrigation Management Specialist, Irrigation Branch, Alberta Agriculture, Food and Rural Development, Agriculture Centre, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5868.■

CWRA 46TH ANNUAL CONFERENCE

Banff, Alberta, June 16-19, 1993

Canadian Water Resources Association 46th Annual Conference, Banff, Alberta, Canada, June 16-19, 1993. Theme "WATER AND THE WILDERNESS: DEVELOPMENT, STEWARDSHIP, MANAGEMENT." Registration information may be obtained from Mr. Bruce Elson, W-E-R AGRA Ltd., Calgary, Alberta. Telephone (403) 291-1195, Fax 250-7165. Discount for registration prior to May 1st.■

(Continued from Page 3)

With the current activity of many of the irrigation districts to get a better, more descriptive inventory of their respective irrigated areas, OFIIS provides the opportunity to digitize all that information in an economic system. It is hoped that as the various players within the irrigation industry become more and more inter-dependant on quality information, that all can share in such a common framework. This will enhance everyone's access to reliable and consistent data for: improved water management, planning, operation and policy decisions while allowing independent flexibility, concludes Chinn.

For more information, please contact Wally Chinn, P. Eng., Irrigation Development Section Head, Alberta Agriculture, Food and Rural Development, Agriculture Center, Lethbridge, Alberta T1J 4C7. Telephone (403) 381-5864.■

EID PRESENTED WITH THE ORDER OF THE BIGHORN AWARD

The Eastern Irrigation District (EID) has been awarded the prestigious "Order of the Bighorn" award for their outstanding contributions to fish and wildlife conservation in the province. The district was formally honored at a reception and dinner in Edmonton where board chairman, Bill Mortensen, was presented with the plaque and medallion.

The Order of the Bighorn Awards was established in 1982 by the Government of Alberta to acknowledge the outstanding contributions of private individuals, organizations and corporations to fish and wildlife conservation in the province.

In these days of catchy environmental terms like "sustainable development," the EID stands as a model of what a committed agency can achieve through multiple purpose water management and integrated land use management, states a release from Brian Evans, minister of Environmental Protection.

The EID, from its office in Brooks, administrates 1.5 million acres between the Red Deer and Bow rivers. Its unique role is to balance the needs of dryland and irrigation agriculture and to oversee extensive tracts of Alberta's native rangelands.

Over the past 55 years, the EID has acknowledged the value of its water resources beyond irrigation, in particular it has cooperated with Ducks Unlimited to manage numerous wetlands.

Recently, a long-term Cooperative Ventures Agreement has brought the EID together with Ducks Unlimited and Alberta Forestry, Lands and Wildlife. Relying on the EID's source of water, project land base and engineering/surveying expertise, the agreement will develop projects promoting multiple use of water to benefit agriculture, wildlife and recreation. Under the Agreement, over 15,000 acres of habitat will be created and another 40,000 acres of critical wetlands will be protected.

The EID supports protection of 4,045 acres of privately-held wildlife habitat under the Landowner Habitat Project Program and participates in efforts to protect native mixed grass prairie as a member of the Prairie Conservation Coordinating Committee.

In accepting the award on behalf of the district Mortensen said, "It was a humbling experience to receive an award for something we do quite naturally – conserve habitat and wildlife. We work hard at trying to conserve it."■

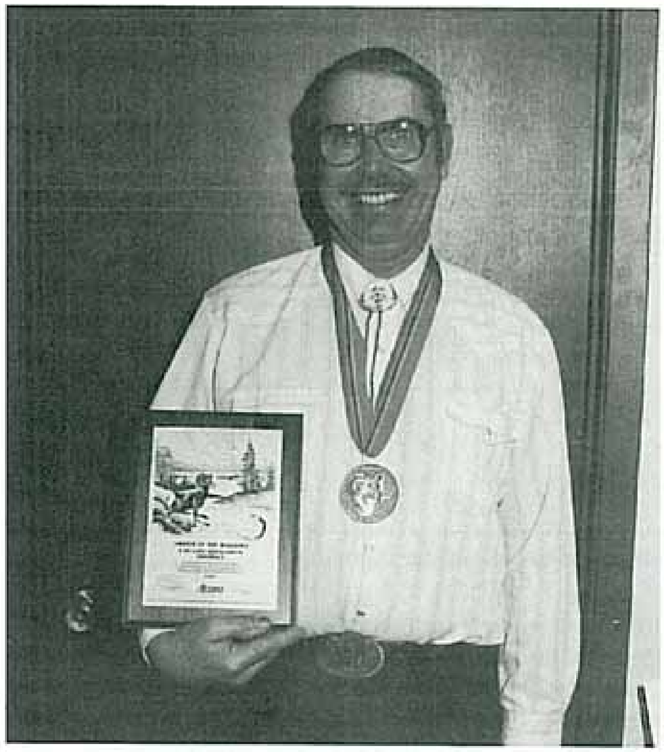


PHOTO: BROOKS BULLETIN

Eastern Irrigation District board chairman, Bill Mortensen, proudly displays Order of the Bighorn plaque and medallion.

THE WATER HAULER'S BULLETIN

Designed to provide the operation and management personnel of Irrigation Districts with items of interest in their line of work. Comments are welcome. Please contact Duncan Lloyd, editor, at Area Code (403) 381-5539, Lethbridge.

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Alberta AGRICULTURE