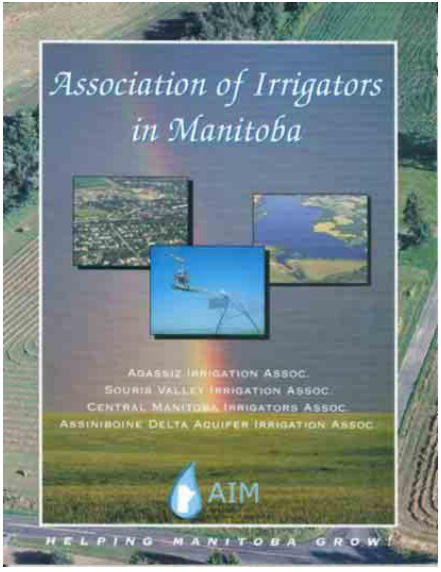
Irrigation Development in Manitoba



Environmental Challenges

Environmental Opportunities

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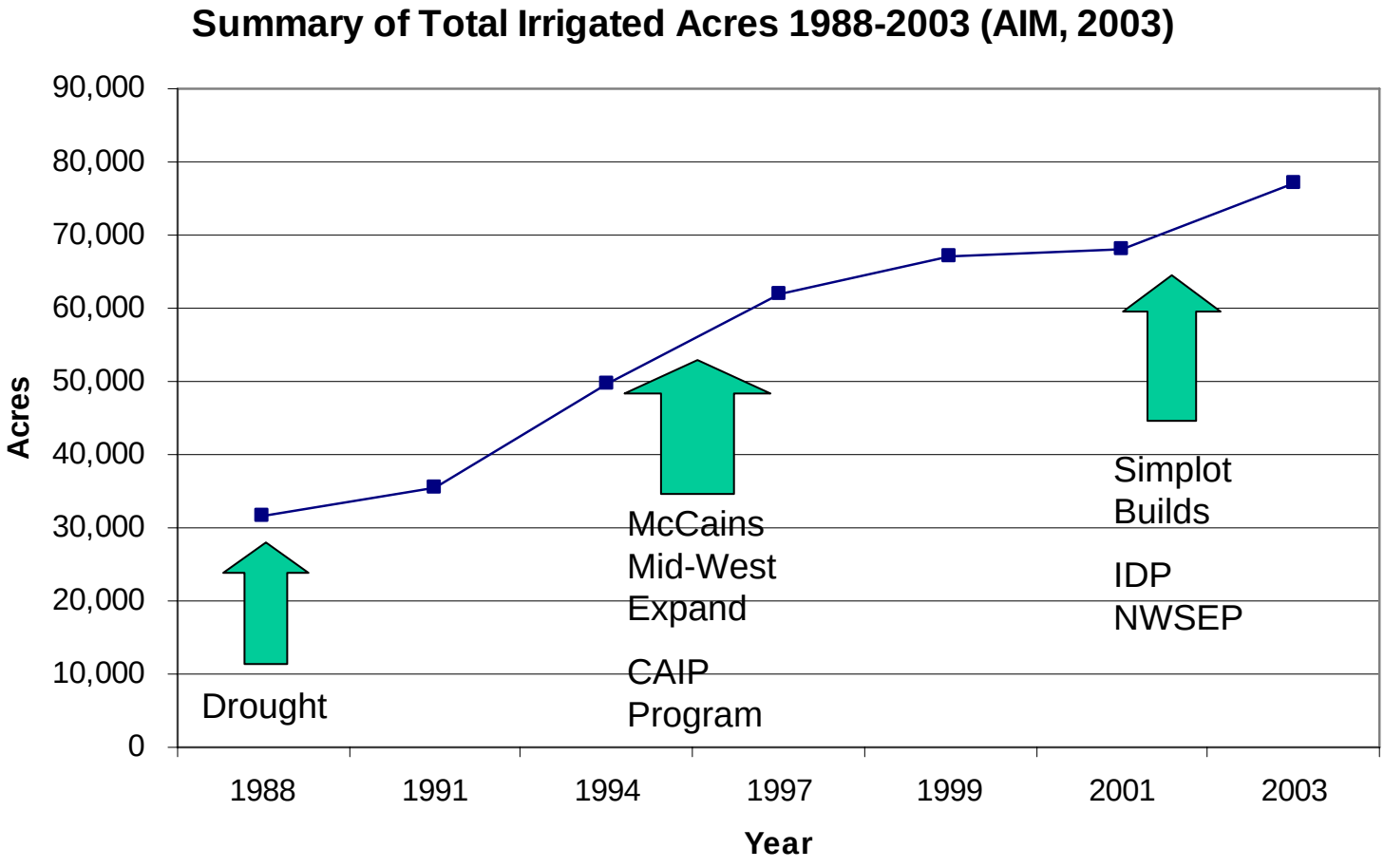
Lead, Irrigation and Drainage Unit,
AAFC-PFRA

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada | Manitoba Agriculture and Food | AIM Association of Irrigators in Manitoba | Canada

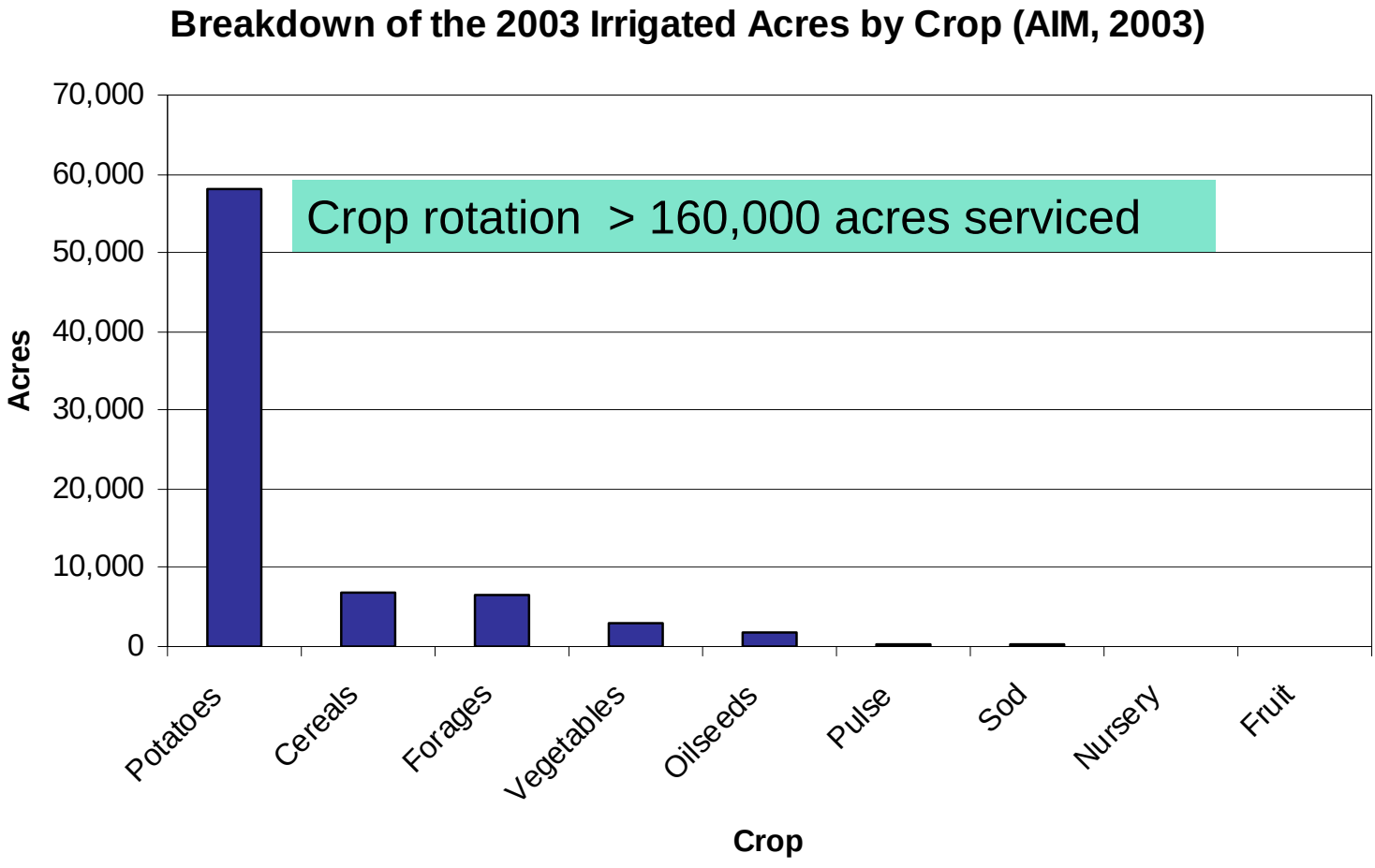
Outline

- Historical Trends
- Drivers
- Expansion Potential
- Legislation
- Environmental Challenges
- Environmental Opportunities

Trends and Drivers



Crop Implications – Rotation !



Equipment Trends

Breakdown of Irrigated Acres by Type of Equipment (AIM, 2003)

Equipment	1994 (acres)	1997 (acres)	1999 (acres)	2001 (acres)	2003 (acres)	% of 2003 Acres
Centre Pivot	26,980	35,049	45,435	50,460	52,088	69.20%
Travelling Gun	16,590	19,953	24,818	17,901	18,410	24.46%
Lateral Move	2,819	3,446	3,314	3,673	3,456	4.59%
Side Roll	2,889	2,742	1,420	1,387	1,241	1.65%
Solid Set/Hand Move	1,241	1,152	1,335	457	75	0.10%
Flood	79	80	0	0	0	0.00%
Trickle/Drip	57	30	40	0	0	0.00%
Total	50,655	62,452	76,362	73,878	75,270	

Trends – Individual vs. Group Projects

Water supply has exanded in size and complexity:

- **Joint or group projects**
- **Holding companies and funding**
- **Size of farms and economy of scale**

Expansion Potential

Breakdown of Planned Irrigated Expansion by Crop (AIM, 2003)

Crop	Total Acres	% Expansion
Potatoes	25,664	70.52%
Forages	7,109	19.53%
Oilseeds	992	2.73%
Cereals	812	2.23%
Pulse	630	1.73%
Unknown[1]	612	1.68%
Vegetables	360	0.99%
Nursery	210	0.58%
Fruit	4	0.01%
Sod	-	0.00%
Total	36,393	

[1] Respondent plans to irrigate in the future, but unsure of which crop will be irrigated.

Legislative Requirements

- Water Rights Licence
- Environment Act Licence
- Fisheries Act
- Navigable Waters Protection Act
- Water Protection Act (Water Quality Management Zones for Nutrients)
- Canadian Environmental Assessment Act

Challenges and Opportunities

- Challenge
  1. Resource Protection
  2. Environmental Monitoring
  3. Water Resource Allocation
  4. Water Management
  5. Sustainable Infrastructure
  6. Production issues

- Opportunity
  - Support for engineering and EAL studies
  - Support for monitoring
  - Adoption of BMPs and link to EALs
  - Innovation to identify new BMPs
  - Water use planning for irrigation vs environment
  - New water sources

1. Environmental Challenge Resource Protection - EALs

- First Provincial EAL issued in 1994 to AIA
- Progressively more complex with time
- Studies include:
  - Soils and agronomic sustainability
  - Erosion and sedimentation control
  - Hydrology / biology
  - Geohydrology
  - Engineering
  - Aquifer and surface water protection
  - Habitat and wildlife
  - Heritage resources
  - Environment act proposal
- Current timeline ~ 6 to 12 months
- Typical costs ~ $ 50,000 to $100,000 per
- EAL's have monitoring component

Environmental Opportunity

Canada Manitoba Water Supply Expansion Program

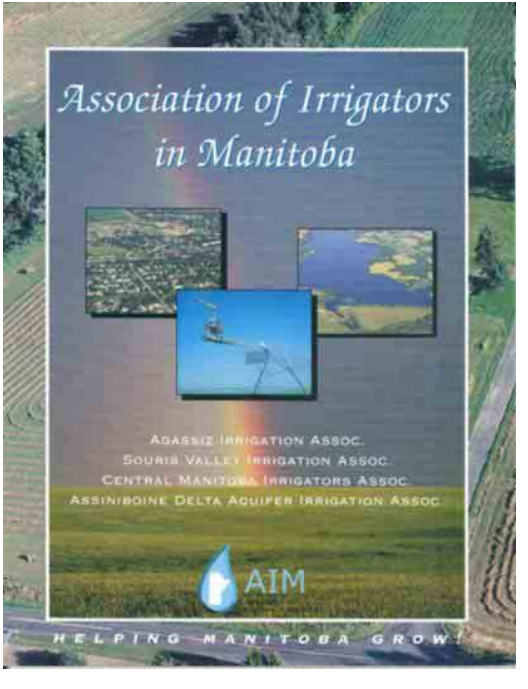
Sustainable development of irrigation

Support for Environment Act licensing studies

Support for engineering and project management

Expand irrigated acres and crop diversification

$2 M Contract with AIM/KVPA from 2002 - 2008



Environmental Opportunity

Canada Manitoba Farm Stewardship Program

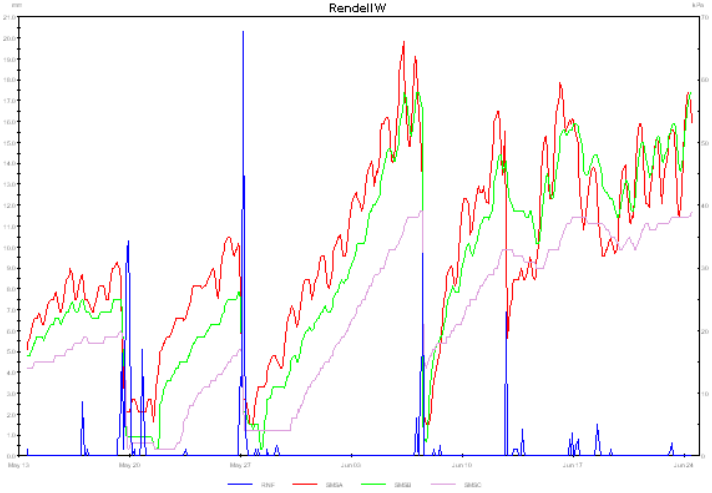
Sustainable development of irrigation

Adoption of BMPs for nutrient and water managementn (e.g fertigation, water efficiency improvements)

Support for resource protection (e.g. fish screens, erosion control plans)

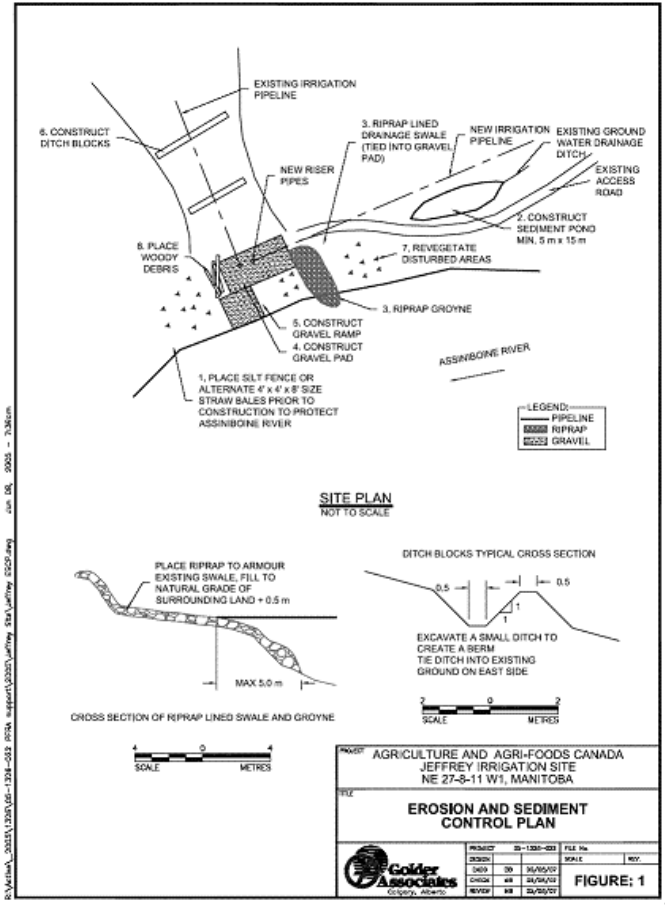
Support for agronomic planning

First applications to BMP 18 and 29 - 2006 – hot off the PRESS !

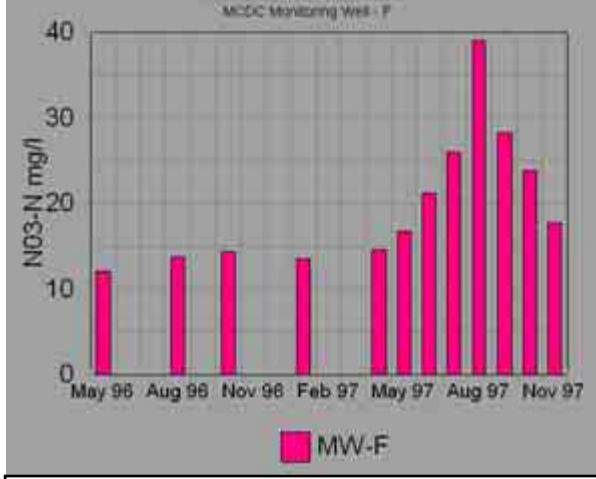


Environmental Opportunity – Link EALs to NFSP and BMPs

- Currently Environmental studies funded by CMWSEP
- Monitoring required by EAL ?
  - funding and organization structure to accomplish
  - utility of data (i.e. link to management)
- Link EALs to Adoption of BMPs (CMFSP) ?
  - Nutrient Management
  - Water Conservation
  - Agronomic Planning
  - Resource Protection



Case Study -
First EAL on Assiniboine Delta Aquifer



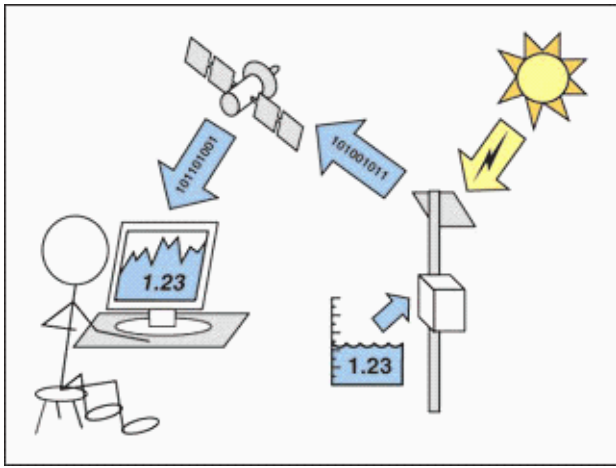
2. Environmental Challenge
Environmental Monitoring (e.g. water)

Irrigation Water Application by Crop (AIM, 2003)

Crop	Average Inches of Water Applied	Total Amount of Water Applied (acre-feet)
Potatoes	5.8	28,321.2
Forages	8.8	4,788.9
Cereals	6.5	3,648.3
Sod	52.0	1,300.0
Vegetables	4.6	1,155.3
Oilseeds	8.2	1,148.3
Nursery	31.4	327.5
Pulse	4.8	141.8
Fruit	5.8	21.6
Total		40,852.9

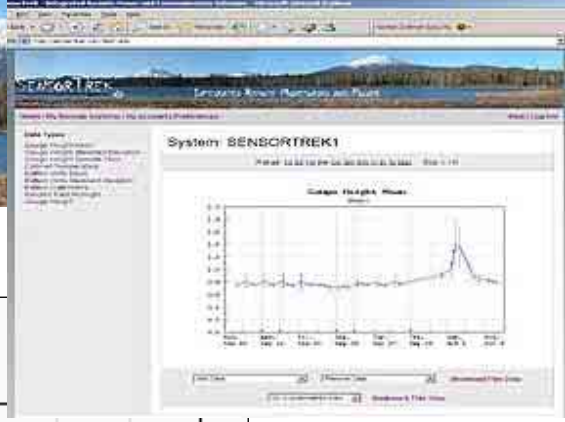
- Water use monitoring systems
- Water use reporting systems
  - Web based
  - Producer performance
  - On farm utility

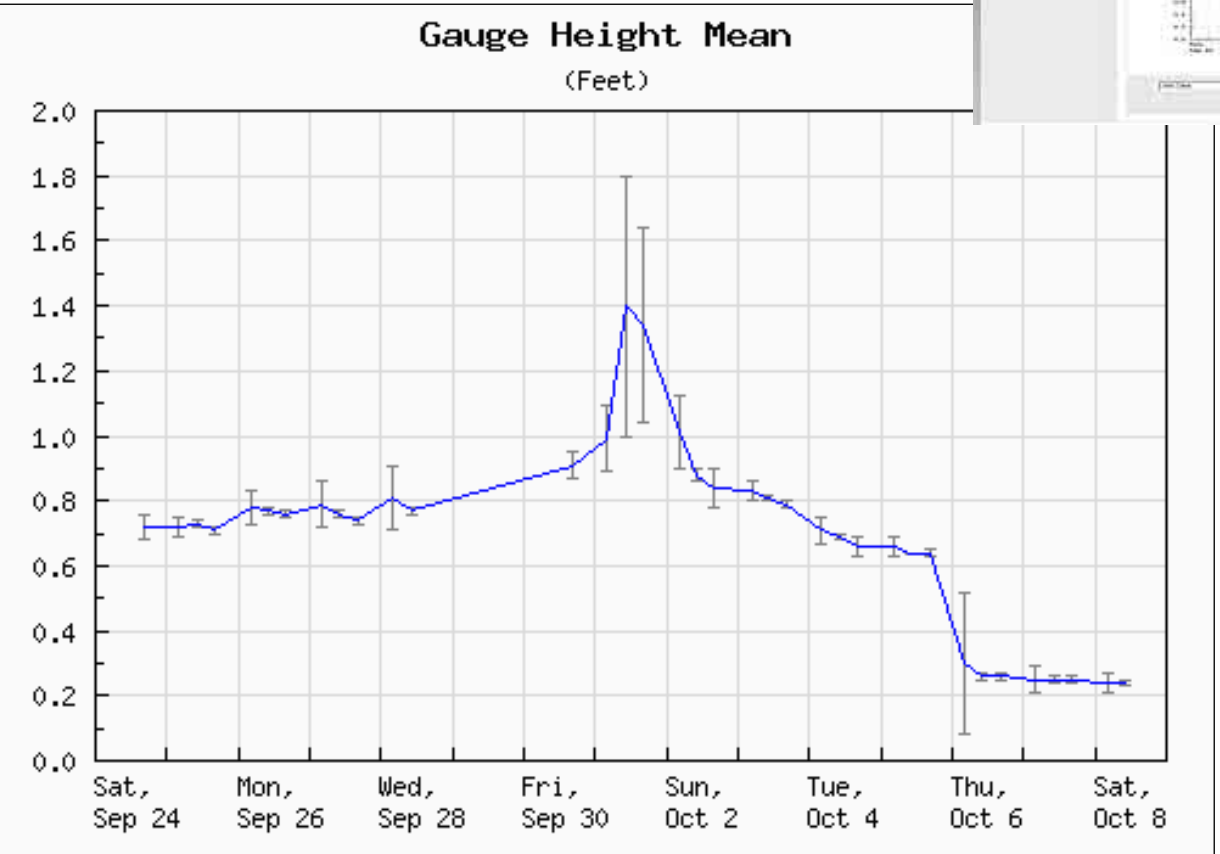
geoIrrigationTM WEB is an Internet-based information system created for irrigation districts and canal companies to provide quick, easy, and secure access to a wide variety of information.



GSS
Geo-Spatial Solutions


SENSORTREK ©
INTEGRATED REMOTE MONITORING


SENSORTREK
System: SENSORTREK1


Gauge Height Mean
(Feet)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Sat, Sep 24
Mon, Sep 26
Wed, Sep 28
Fri, Sep 30
Sun, Oct 2
Tue, Oct 4
Thu, Oct 6
Sat, Oct 8

3. Environmental Challenge Water Allocation for Irrigation

- Allocation vs. Instream Flow
  - Manitoba 50% of Q80 rule for Irrigation + MIF
  - versus DFO 10% - 20 % rules (Manitoba, Yukon, elsewhere)
- Methodologies
  - Desktop (e.g. Tessman)
  - Incremental (IFIM, Physical Habitat Simulation, etc.)
  - Monitoring/Diagnostic (AEM)
- Other case studies useful
  - desktop method for Athabasca River
    - 20 % to Q 80; 10% to Q90 and then nothing !
  - eastern Provinces (e.g. PEI, Ontario)
    - PEI MIF = 70% of Q50 but > Q95

Water Protection Act

Water Rights Licence may be denied

9.1(2) The minister may refuse to issue a licence if, in the opinion of the minister, the action authorized by the licence would negatively affect an aquatic ecosystem.

S.M. 2005, c. 26, s. 42.

Suspending licence for aquatic ecosystem purposes

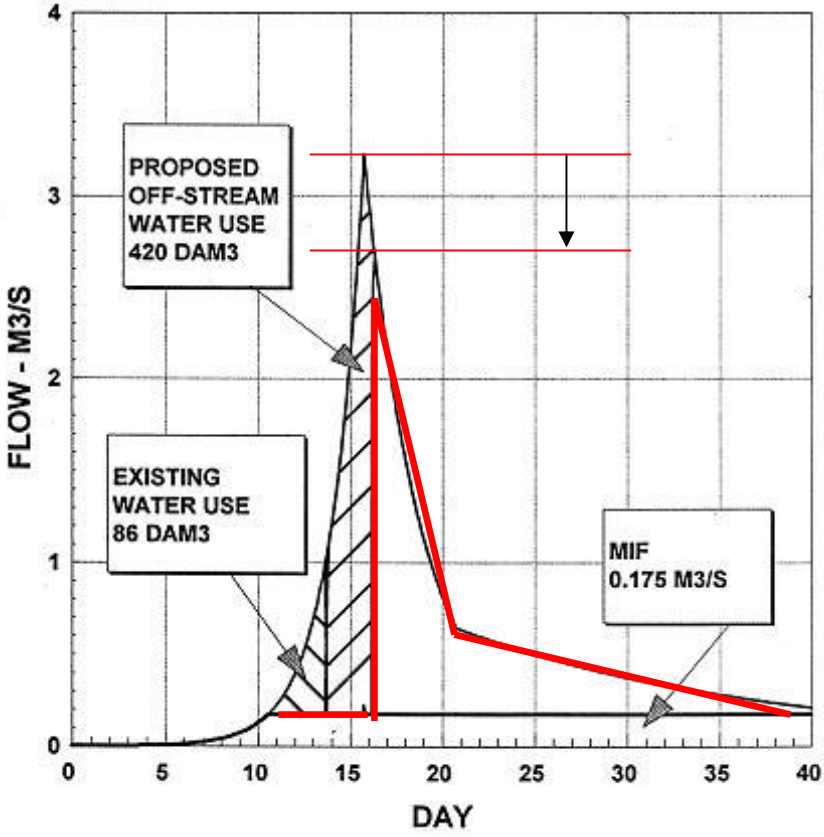
9.2 The minister may suspend or restrict the rights under a licence for a specified period if (a) in the minister's opinion, an in-stream flow, is insufficient to ensure that aquatic ecosystems are protected and maintained; and (b) the minister's opinion is based on scientific information about protecting and maintaining an aquatic ecosystem of the type under consideration.

S.M. 2005, c. 26, s. 42.

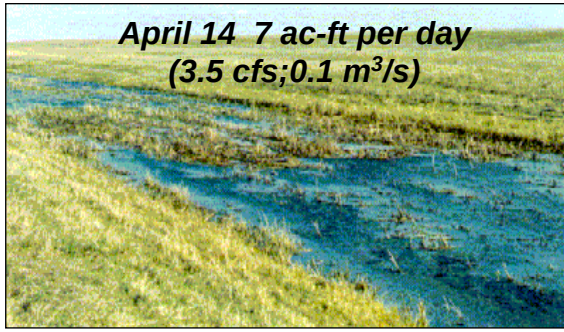
FIGURE 36

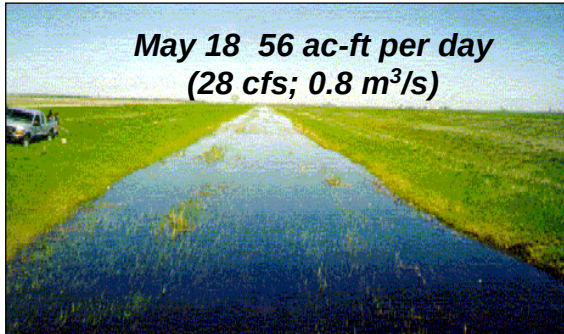
BEAVER CREEK AT CONFLUENCE OF BEAVER CREEK AND WESTBOURNE DRAIN

80% VOLUME HYDROGRAPH - 1830 DAM3



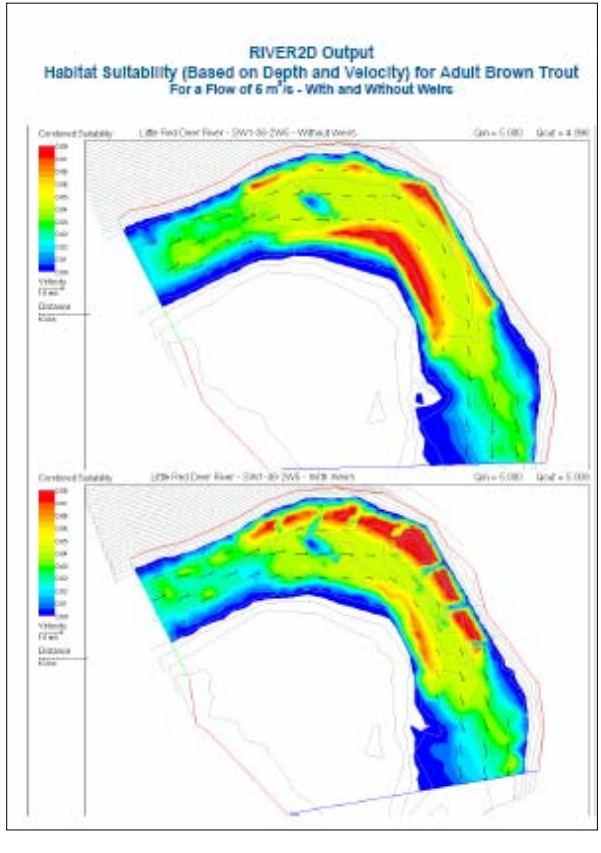
In Stream Flow Requirements





In-stream Flow Needs - Opportunity

- The amount of water required in a stream to sustain aquatic organisms and habitat processes
- IFN has not been determined in MB
  - Assiniboine River (varies with drought ?)
  - PPWB IFN workshop (March, 2006)
  - Rivers vs. intermittent streams
  - Appropriate trade offs ?

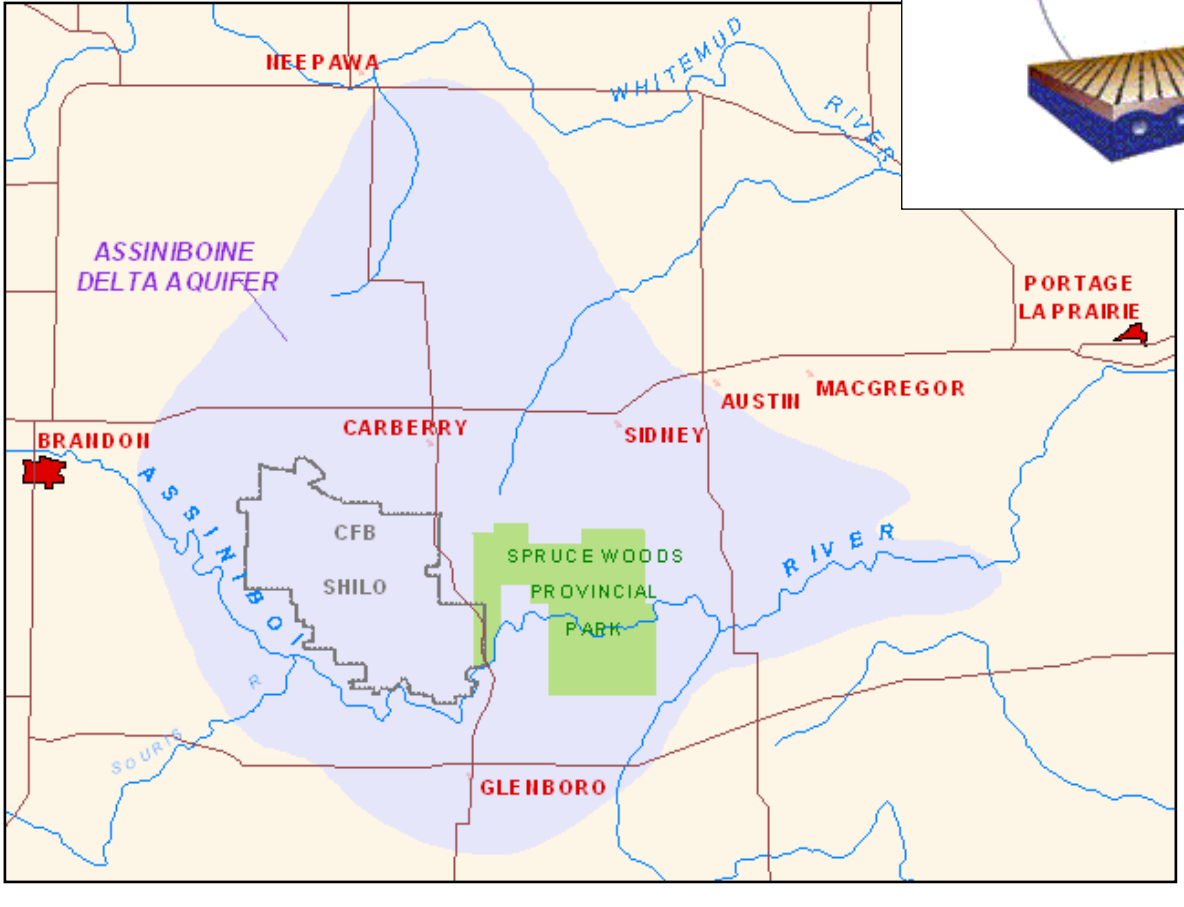


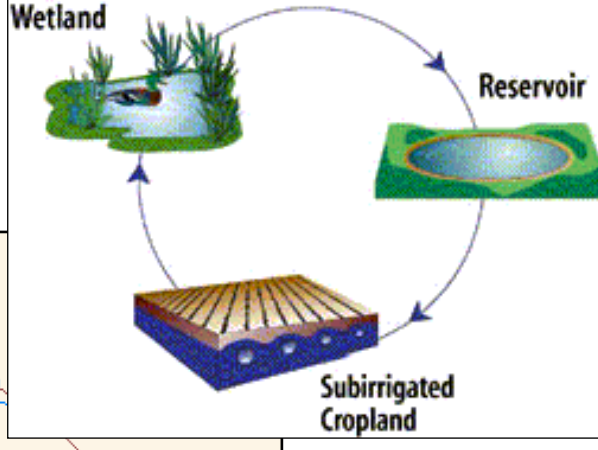
4. Environmental Challenge: Water Management

- Reservoir operations to match multiple demands
- Impacts of groundwater allocations on recharge and stream flows
- Off stream storages allocations to maximize use of “surplus water”
- “New” water sources

Environmental Opportunities – Water Management

- Water Use Planning (PPWB IFN workshop)
  - Reservoir operations vs instream needs
  - Water Use Plans (WUP) process (see BC….cost!)
  - Watershed Management Plans
  - Flow monitoring and real time management
  - Intermittent streams - can rules be different from rivers ?
- New storages (e.g. Treherne Dam – Boyne River)
  - Funding
  - EALs
- Water efficiency (source)
  - Enhancing aquifer recharge and storage of “surplus water”
  - Tile drainage increase
    - incentives to recycle water
    - Incentives to subirrigate and controlled drainage

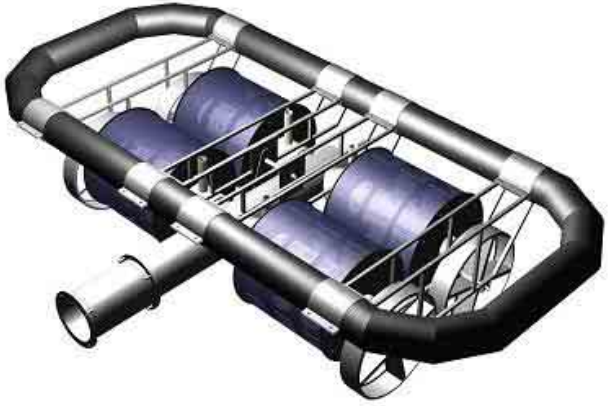

NEEPAWA
WHITEMUD
RIVER
ASSINIBOINE
DELTA AQUIFER
PORTAGE
LA PRAIRIE
AUSTIN
MACGREGOR
BRANDON
CARBERRY
SIDNEY
ASSINIBOINE
R.
CFB
SHILO
SPRUCE WOODS
PROVINCIAL
PARK
RIVER
SOURIS
GLENBORO


Wetland
Reservoir
Subirrigated
Cropland

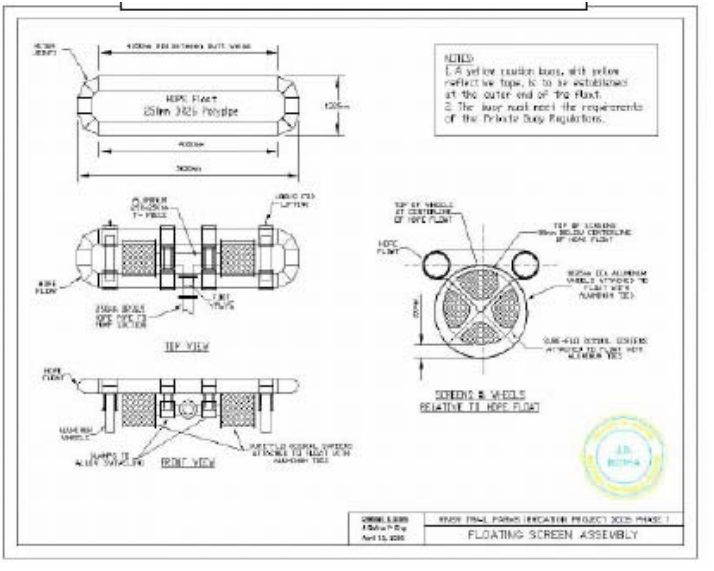
5. Environmental Challenge
Sustainable Infrastructure

(e.g. Water Intakes)

- Must meet the “Freshwater Intake End-of-Pipe Fish Screen Guideline” (DFO, 1995)
  - Protects fish from entrainment and impingement
  - Indicates approach velocities
  - Recommends placement of intakes
  - Recommends cleaning and maintenance schedule



River Intakes – Manitoba – DFO Requirements 1000 to 7500 USgpm



Other Manitoba Irrigation Infrastructure Requirements

- Off stream storages standards
- Water recycling systems (e.g. tile drainage)
- Water and nutrient delivery (e.g. irrigation/manure pipelines)
- Energy and automation systems
- Well investigations and designs

Harvesting Winter and Spring Stream Flows for Irrigation

Fact Sheet

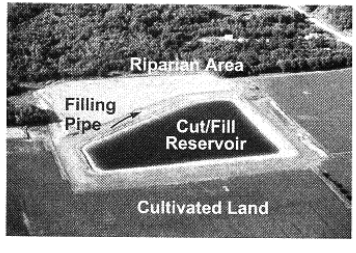
Irrigation Water for Nova Scotia

A reliable source of good quality water for irrigation is dependent on a healthy watershed. A healthy and productive watershed is ensured by implementing water and land management strategies which:

- promote infiltration of runoff and groundwater recharge
- promote soil conservation and healthy riparian zones
- ensure that in-stream water needs, such as those required to maintain aquatic habitat, are met
- ensure that crop water demands are met

This Fact Sheet Will Address:

- ✓ assessing stream hydrology
- ✓ establishing irrigation water needs
- ✓ siting, construction and filling of storage ponds
- ✓ obtaining regulatory approvals



In Nova Scotia, potential exists to minimize the impact of irrigation withdrawals on streams by timing the withdrawals to periods of higher flow.

Storage of water can be an important component of any successful irrigation strategy. Water which is harvested during winter and spring high flows could be stored in ponds for use during the growing season.

This option provides more flexibility with respect to where storage ponds can be located. Ponds can be placed in areas which are the most suitable, and cost effective, for pond construction.

Nova Scotia Surface Water Hydrology

Nova Scotia receives, on average, 52" (1,300 mm) of precipitation, annually. About 24" (600 mm) of this water is returned to the atmosphere through the processes of evaporation and plant transpiration. Excess precipitation (28" or 700 mm) contributes to streamflow or groundwater recharge.

Unfortunately, this precipitation is not uniformly distributed throughout the year. Precipitation totals are highest during the winter and spring and lowest throughout the summer.

The annual pattern of streamflow for Sharpe's Brook, which drains an 2175 acre (880 ha) rural watershed, is shown on the next page.

This pattern of streamflow is typical of streams located in rural regions of Nova Scotia. The largest flows occur in the late winter/early spring due to a combination of snowmelt and precipitation. Flows are lowest during the summer months.

Streams receive water from two primary sources:

- groundwater inflow, typically termed baseflow
- surface runoff due to precipitation and snowmelt

During the summer the majority of streamflow is comprised of baseflow. Significant surface runoff usually only occurs during the winter and spring seasons.

Agriculture and Fisheries NOVA SCOTIA Nova Scotia Agricultural College Canada Agriculture and Agri-Food Canada Agriculture et Agroalimentaire Canada

6. Environmental Challenge Production Issues – Steve Sager

Soil and land suitability and drainage

- Water deficits
- Salinity
- Management issues
- Erosion
- Water holding capacity
- Irrigation scheduling and management
- Water conservation, efficiency and uniformity

Key Messages

- Expansion requires water allocation and new sources
- Need means to trade off irrigation vs. instream flow
- Need better and more transparent reservoir and aquifer management options
- Need innovative solutions (engineering and environmental) and new BMPs
- Need links of BMP adoption to EAL and WR processes
- Need coordinated and funded monitoring with links to management and BMPs