Alberta

Freedom To Create. Spirit To Achieve.

Provincial Groundwater Policy Initiatives

Ross Nairne, Alberta Environment

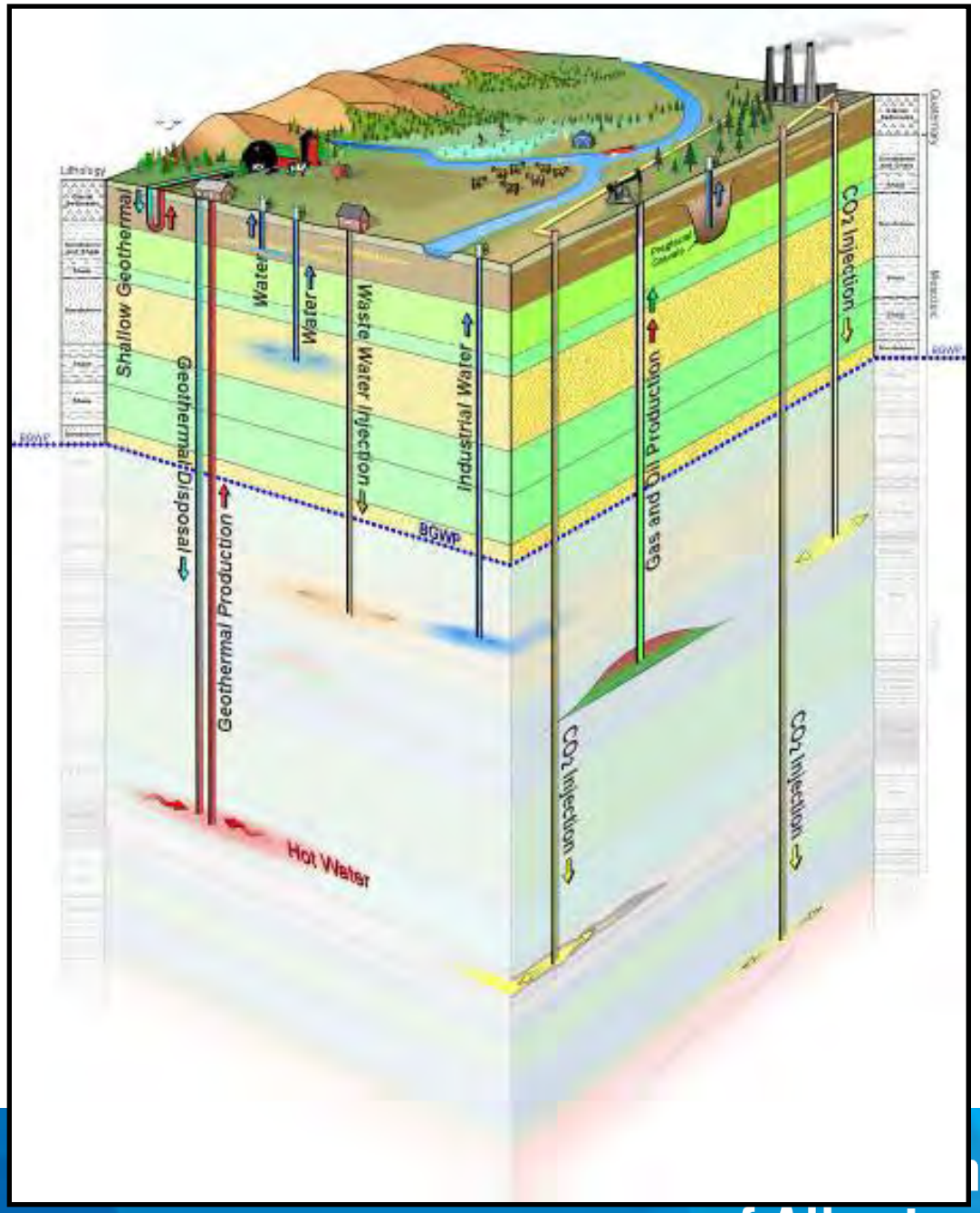
Agri-Environmental Partnership of Alberta (AEPA)

November 9 2010, Red Deer

Government of Alberta

Groundwater

Base of Groundwater Protection

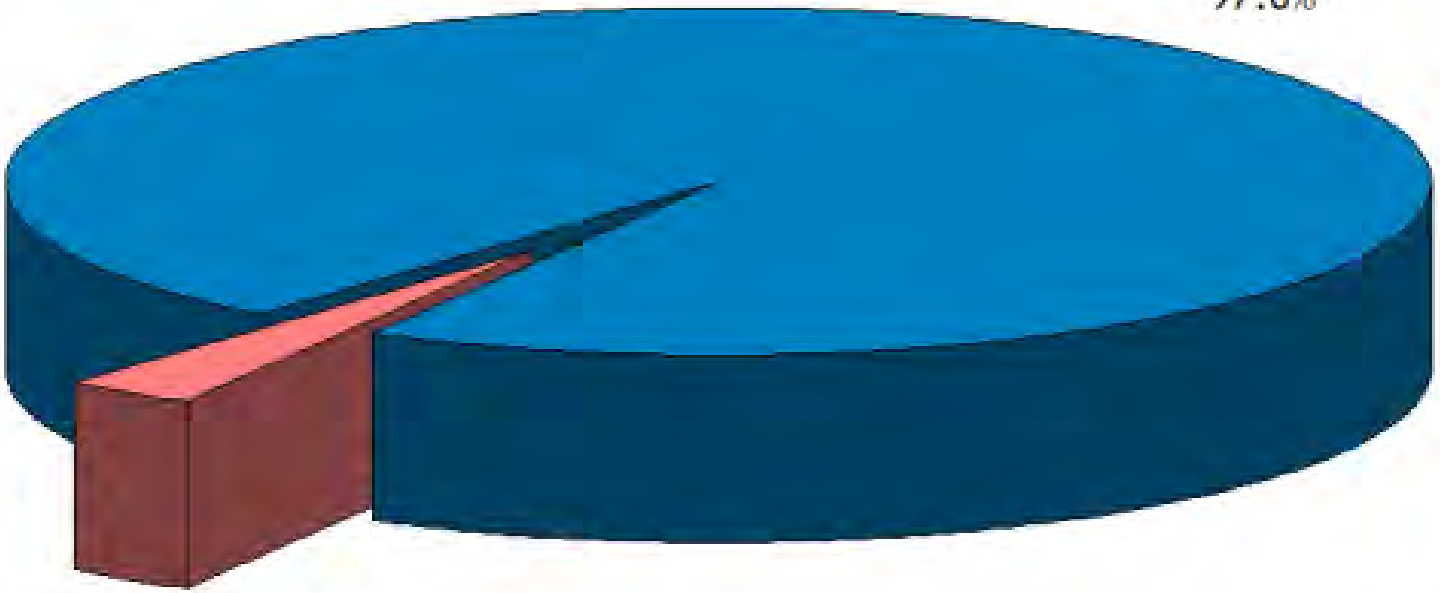


Agenda

- Setting the stage for Groundwater
- Provincial Groundwater Inventory Program
- Working Well Program
- Groundwater Observation Well Network
- State of the Environment Reporting

Government of Alberta
Environment

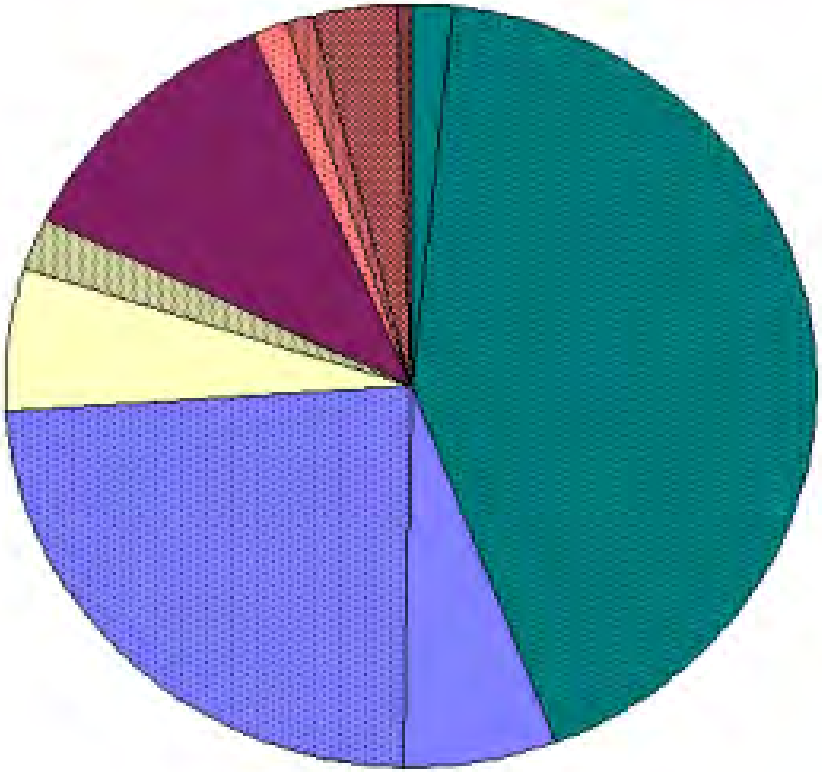
Total Water Allocations in Alberta by Source
(as of 2009)



Total Licensed Volumes: 9,891,606,000 m^3
(9,591,071,000 m^3 from Surface Water and 300,535,000 m^3 Groundwater)

Water Allocations in Alberta by Specified Use

Government of Alberta
Environment



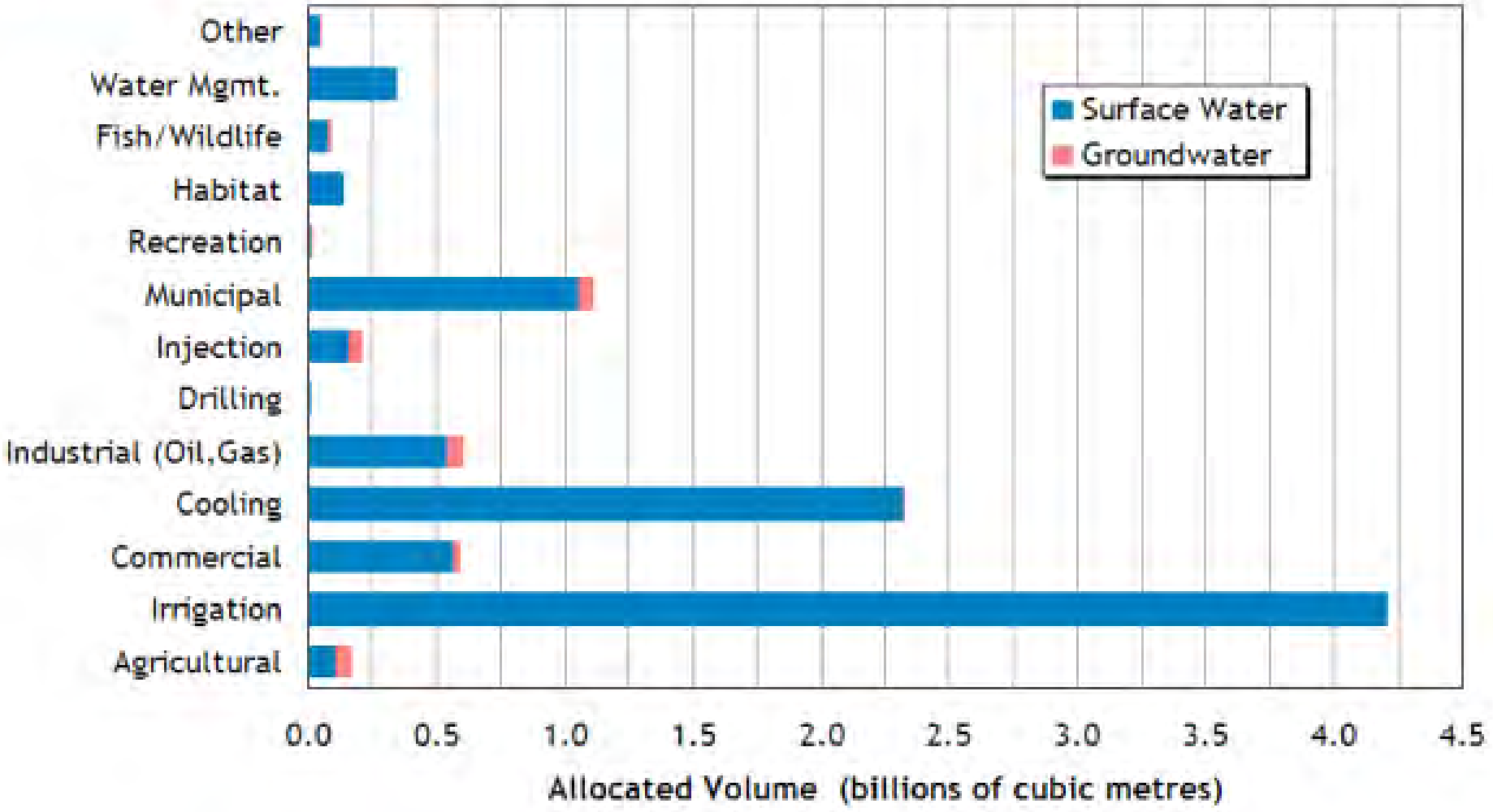
- Ag - Agricultural 1.8%
- Ag - Irrigation 42.5%
- Com - Commercial 6.0%
- Com - Cooling 23.5%
- Ind - Industrial (Oil,Gas) 6.2%
- Ind - Drilling 0.07%
- Ind - Injection 2.2%
- Mun - Municipal 11.3%
- Othr - Recreation 0.22%
- Othr - Habitat 1.4%
- Othr - Fish/Wildlife 0.92%
- Othr - Water Mgmt. 3.5%
- Othr - Other 0.53%

Total Licensed Volumes as of 2009: 9,891,606,000 m^3
(9,591,071,000 m^3 Surface Water; 300,535,000 m^3 Groundwater)

Government of Alberta
Environment

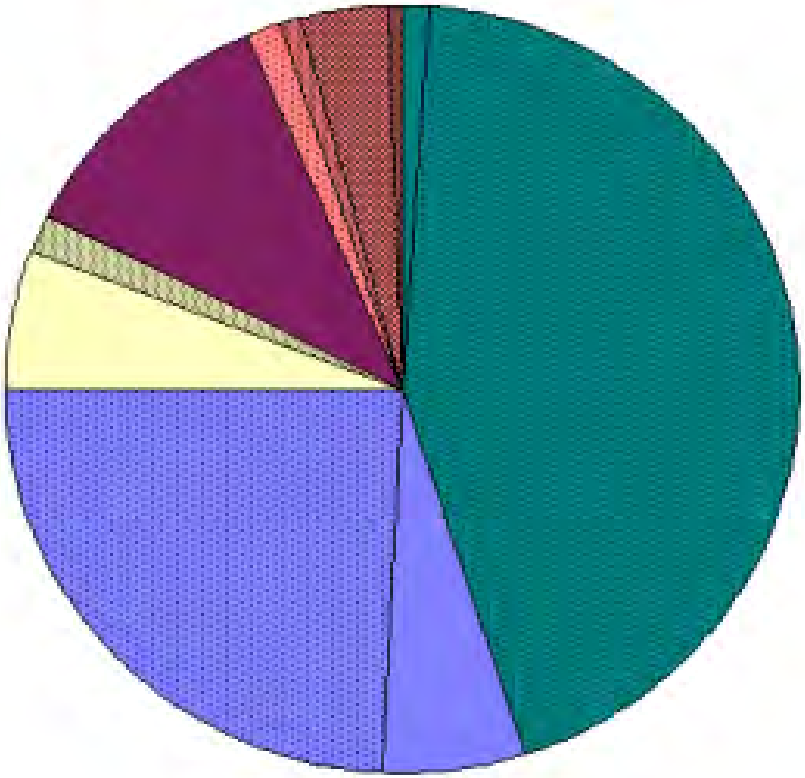
Water Allocations in Alberta by Specified Purpose

(as of 2009)



Surface Water Allocations in Alberta by Specified Use

Government of Alberta
Environment

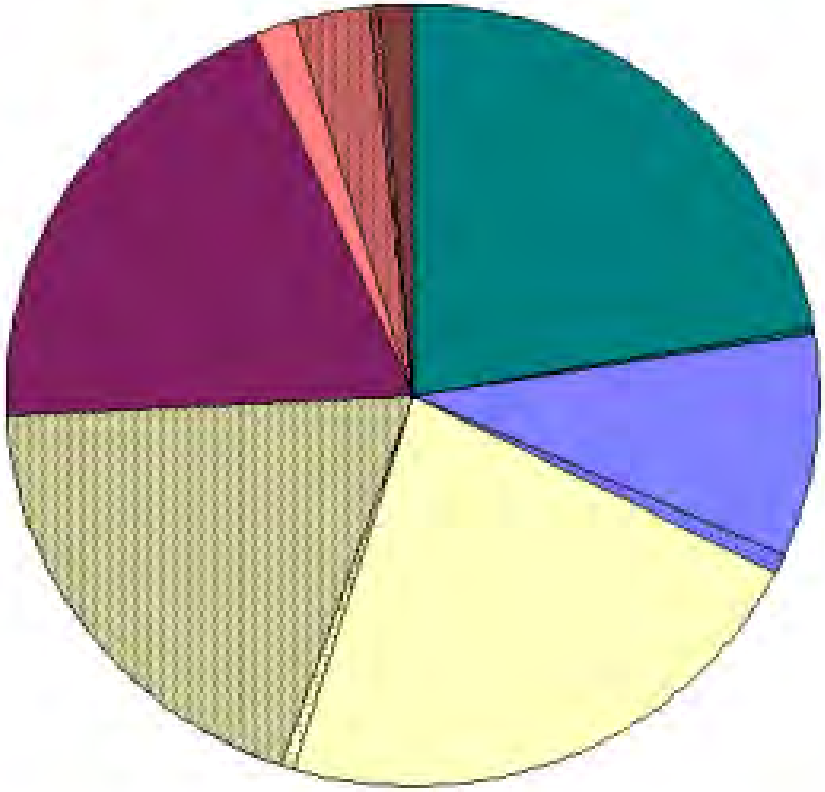


- Ag - Agricultural 1.1%
- Ag - Irrigation 43.8%
- Com - Commercial 5.9%
- Com - Cooling 24.2%
- Ind - Industrial (Oil,Gas) 5.7%
- Ind - Drilling 0.06%
- Ind - Injection 1.6%
- Mun - Municipal 11.0%
- Othr - Recreation 0.17%
- Othr - Habitat 1.4%
- Othr - Fish/Wildlife 0.85%
- Othr - Water Mgmt. 3.6%
- Othr - Other 0.50%

Total Licensed Surface Water Volumes as of 2009: 9,591,071,000 m^3

Groundwater Allocations in Alberta by Specified Use

Government of Alberta
Environment

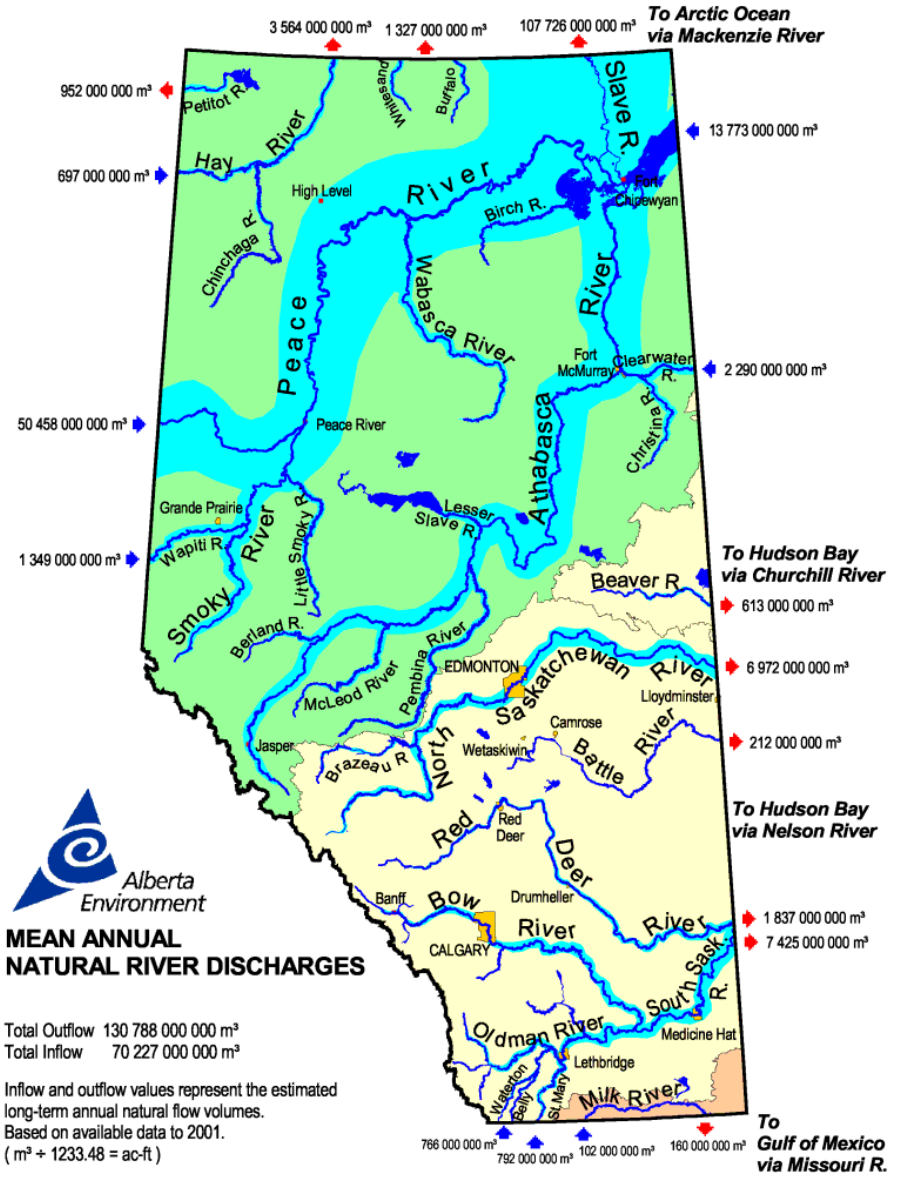


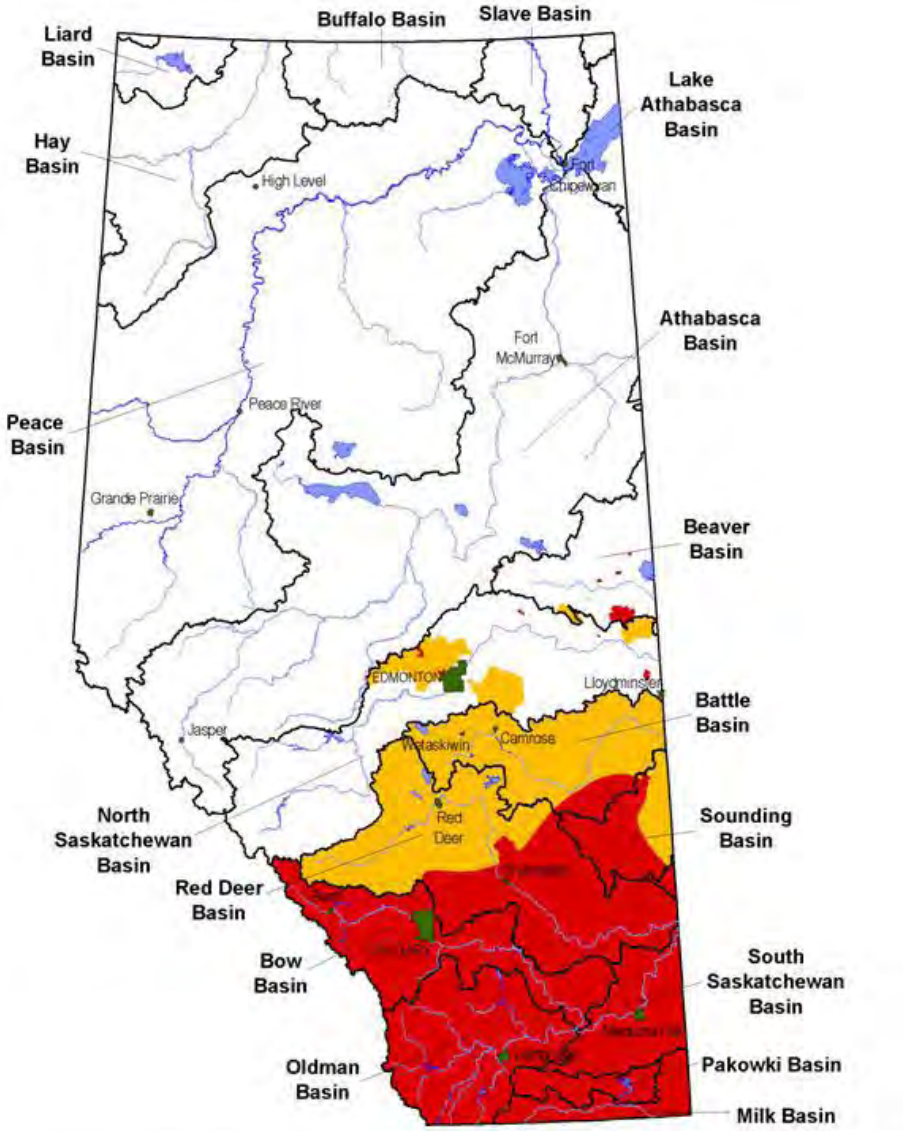
- Ag - Agricultural 22.3%
- Ag - Irrigation 0.22%
- Com - Commercial 9.2%
- Com - Cooling 0.72%
- Ind - Industrial (Oil,Gas) 22.4%
- Ind - Drilling 0.36%
- Ind - Injection 18.9%
- Mun - Municipal 19.6%
- Othr - Recreation 1.7%
- Othr - Habitat 0.03%
- Othr - Fish/Wildlife 3.1%
- Othr - Water Mgmt. 0.03%
- Othr - Other 1.51%

Total Licensed Groundwater Volumes as of 2009: 300,535,000 m^3

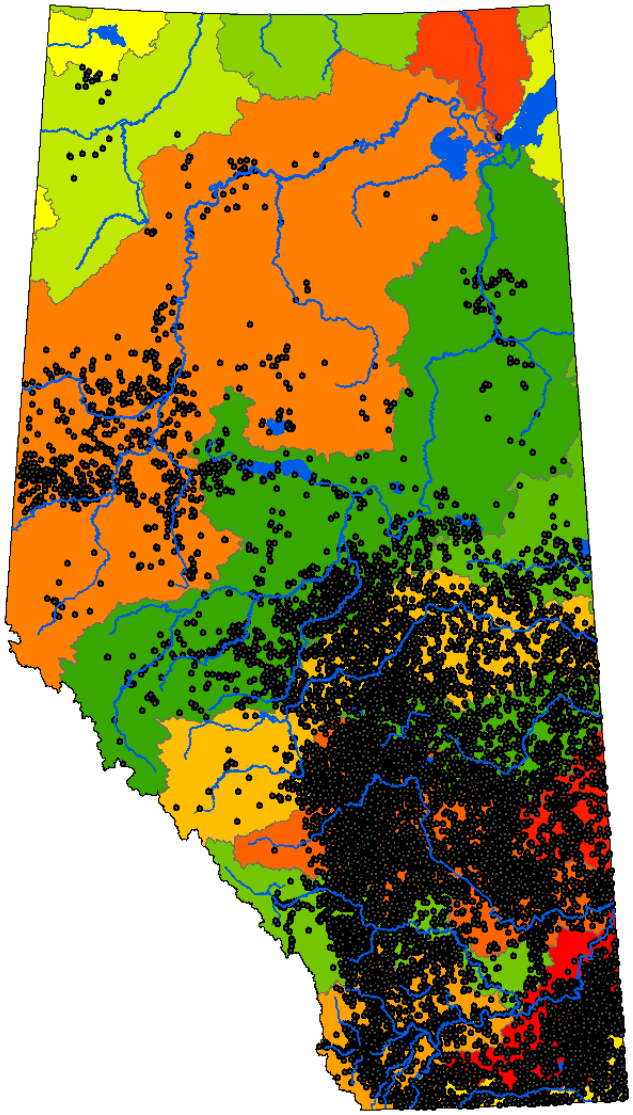
Water In Alberta

- Where does Alberta's water go?
  - 87% flows north
  - 13% flows east
  - 0.1% flows south
- On average, Alberta "generates" about 60 billion m³ of surface runoff annually
  - equivalent to 90 mm, if it were spread over the entire province





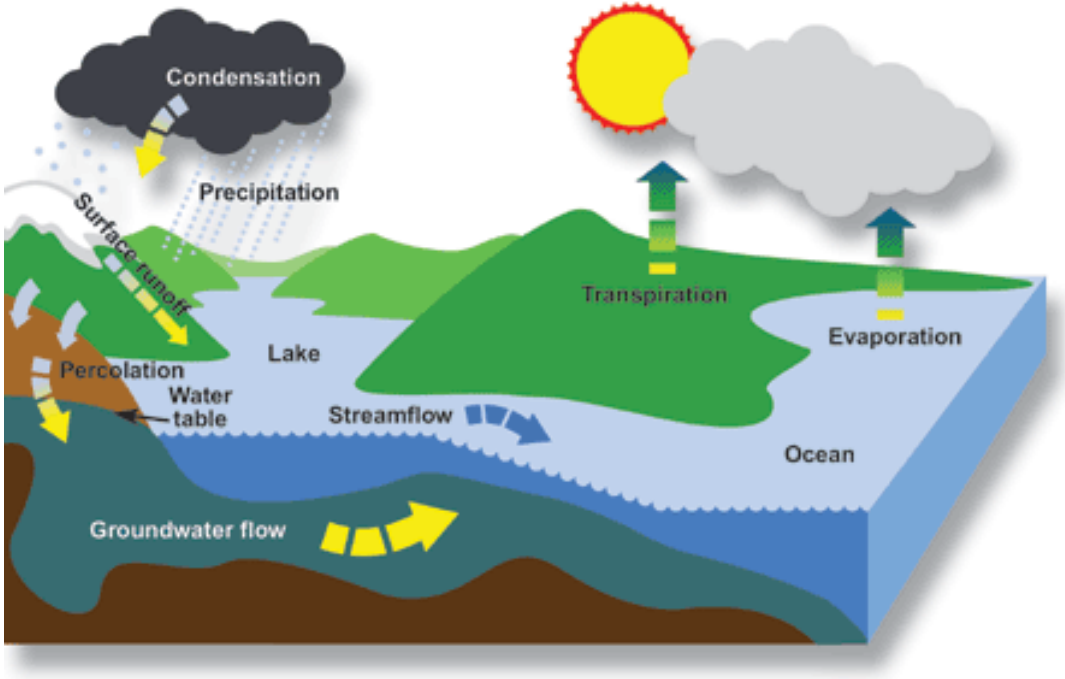
Water short areas



Spatial distribution of water allocations

Water Conservation and Allocation Guideline for Oilfield Injection policy (2006)

Question?



~ 97% of the water in the world is too salty for use. Of the remaining 3%:

- **~ 0.3% is surface water**
- **~ 30% is groundwater**
- **~ 69.3% is snow and ice.**

Source: The Atlas of Canada

Provincal Groundwater Inventory Program

Edmonton – Calgary Corridor Pilot Project

Background

- Various events drive need for improved groundwater knowledge:
  - W4L (2003) & renewal (2008)
  - CBM development & MAC (2006)
  - Closure SSRB (2006)
  - Rosenberg Report (2007)
  - Provincial Groundwater Risk Assessment (2007)
  - Alberta Water Council (2008)
  - Land-use planning (2008)

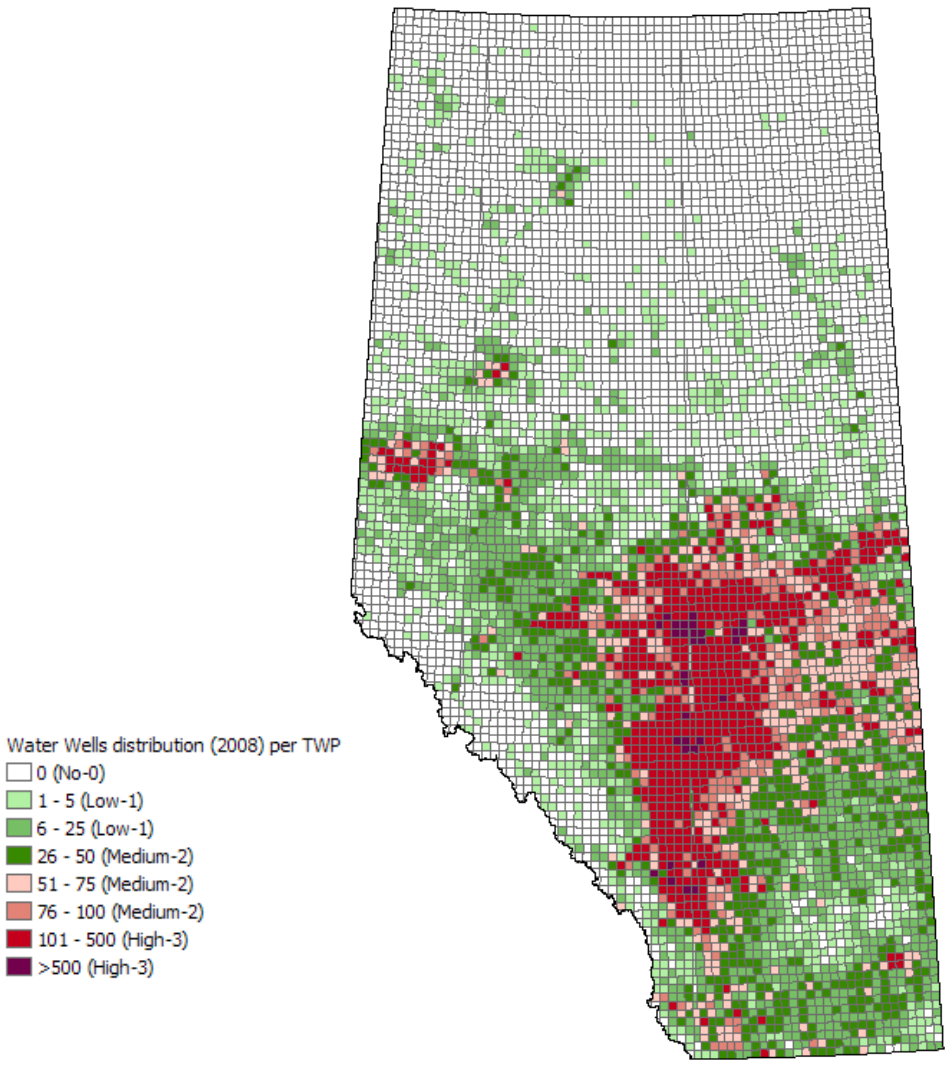
Provincial Groundwater Inventory

- Initiated in 2007, launched 2008 starting with Edmonton-Calgary Corridor pilot project
- AENV – AGS partnership (staff, MOU)
- Goals
  - improved knowledge (above BGWP)
  - tools for management
  - improved methodologies
- Long term vision of 15+ years for province

Edmonton-Calgary Corridor Pilot

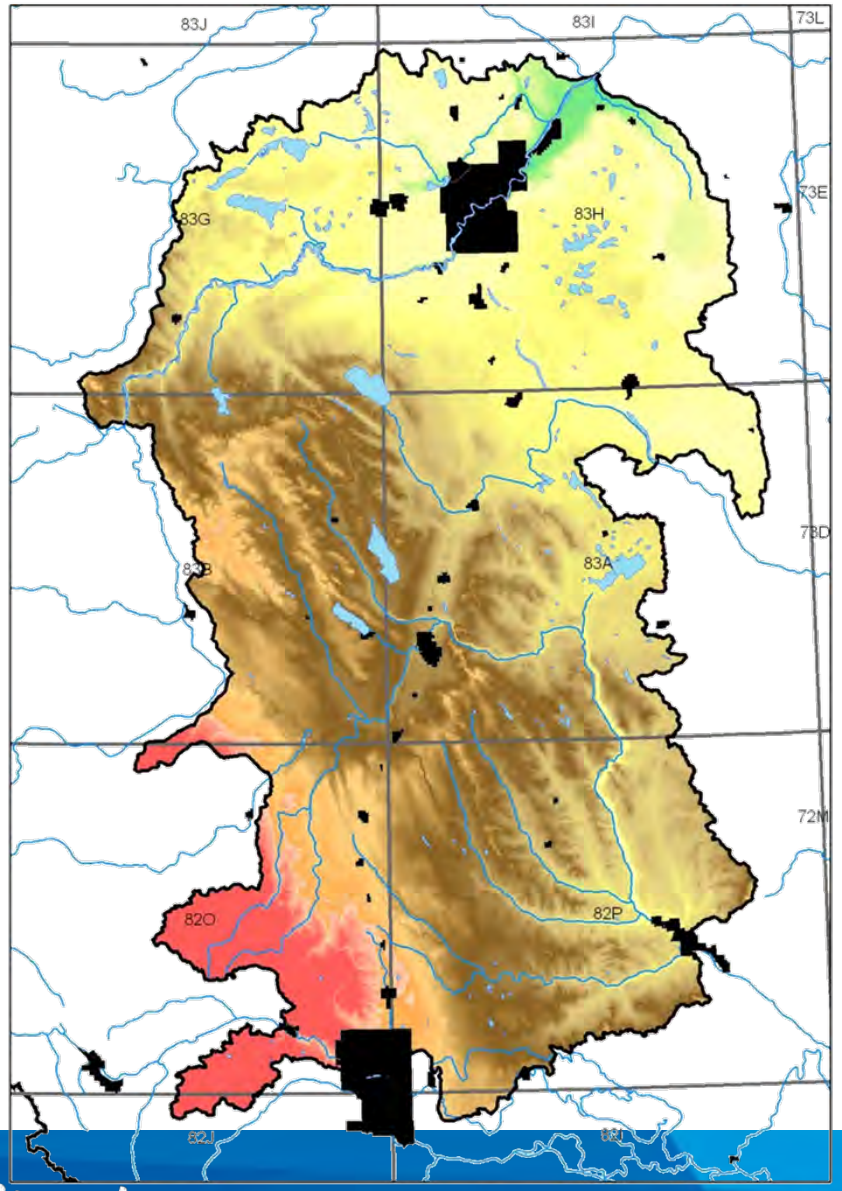
- April 2008 to March 2011
- Why ECC first?
  - Highly populated, significant development
  - High groundwater use, water well density
  - Cumulative pressures from various activities
  - Data rich area, testing of new techniques

Water well Distribution



Distribution of Groundwater Use

- Approx. 600,000 Albertans rely on groundwater
- Usage is greatest in central Alberta, and growing.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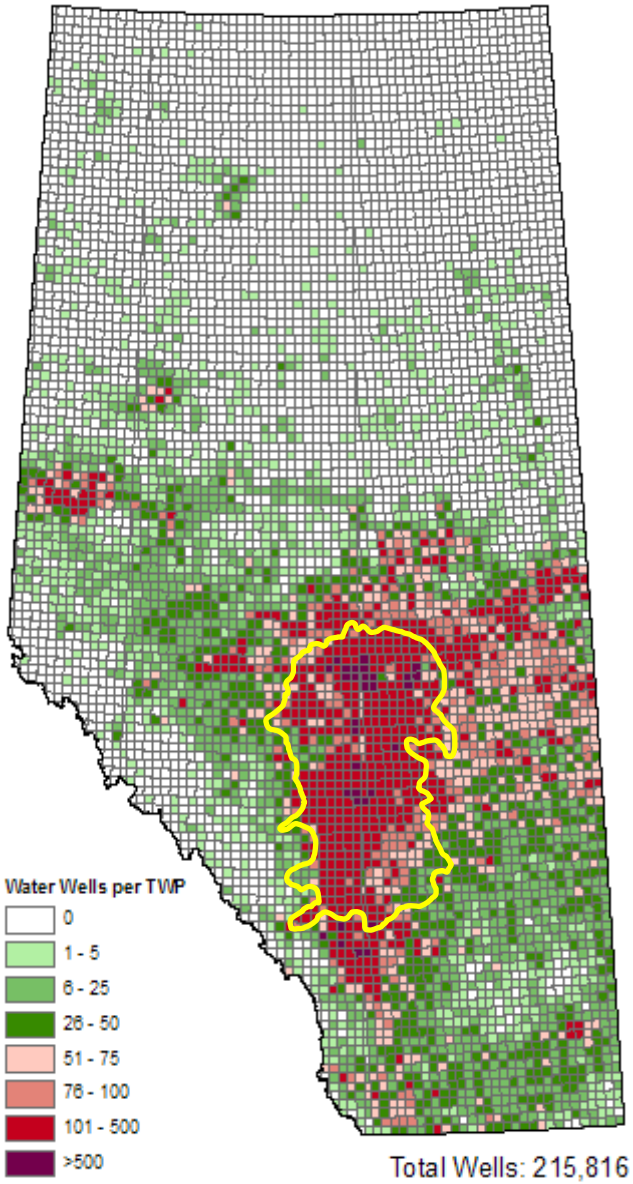
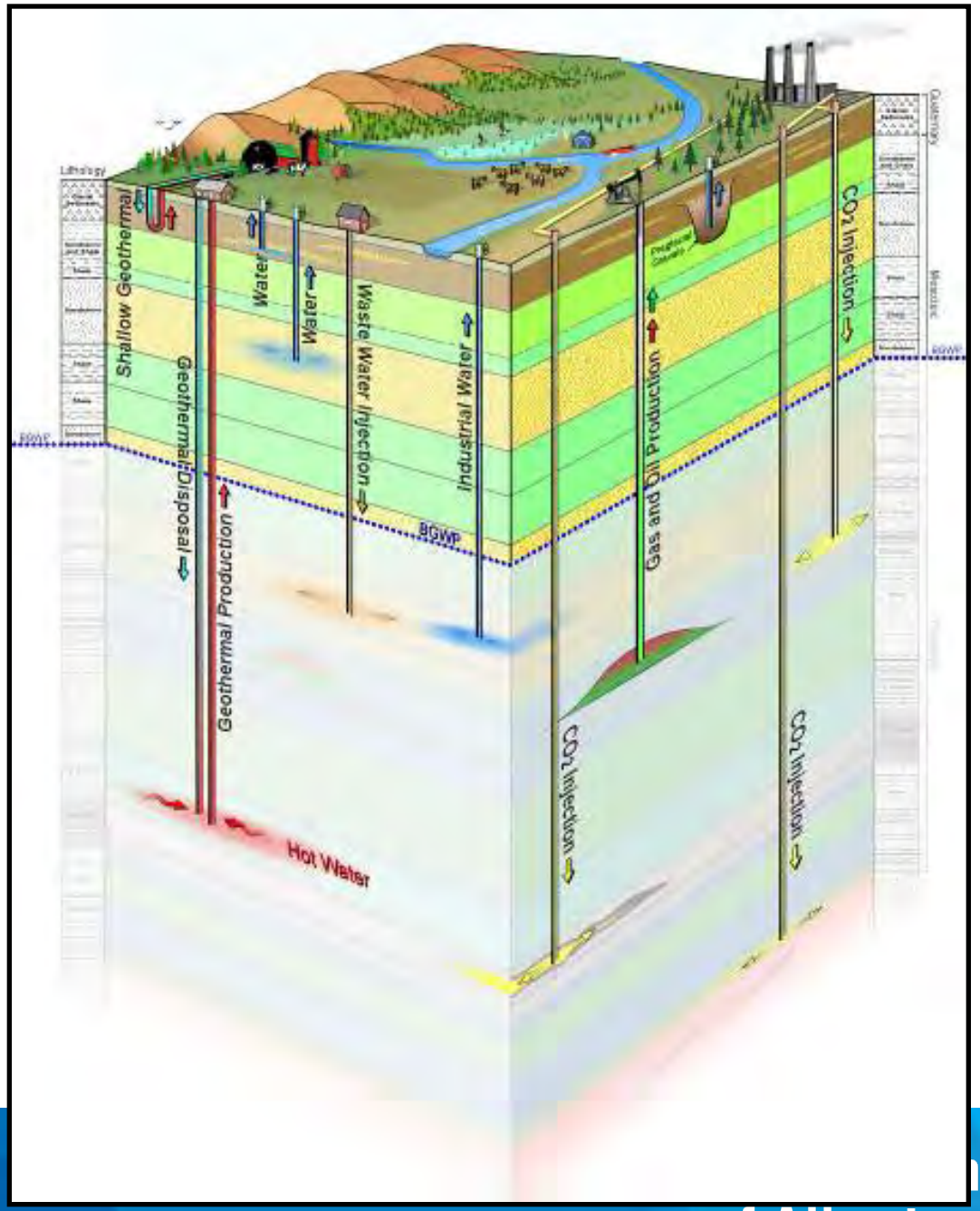
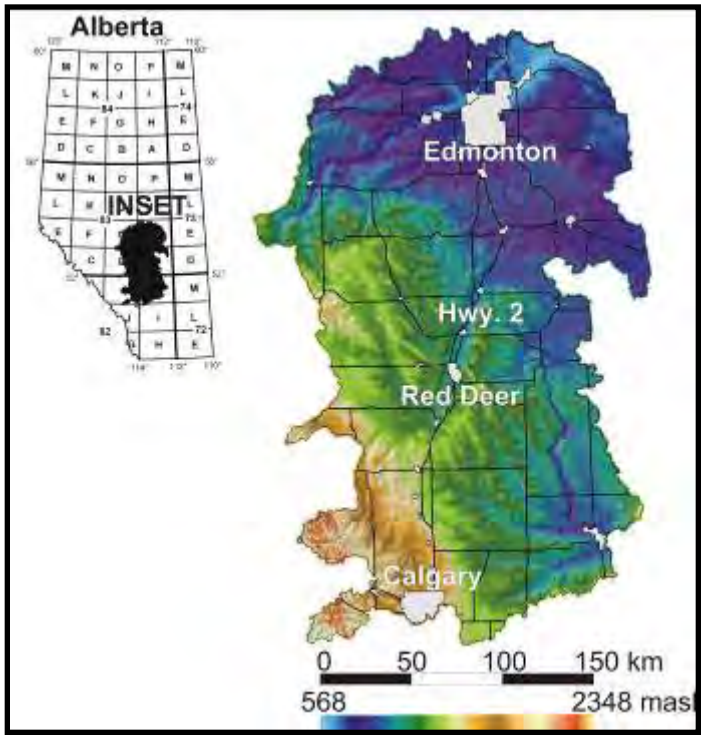
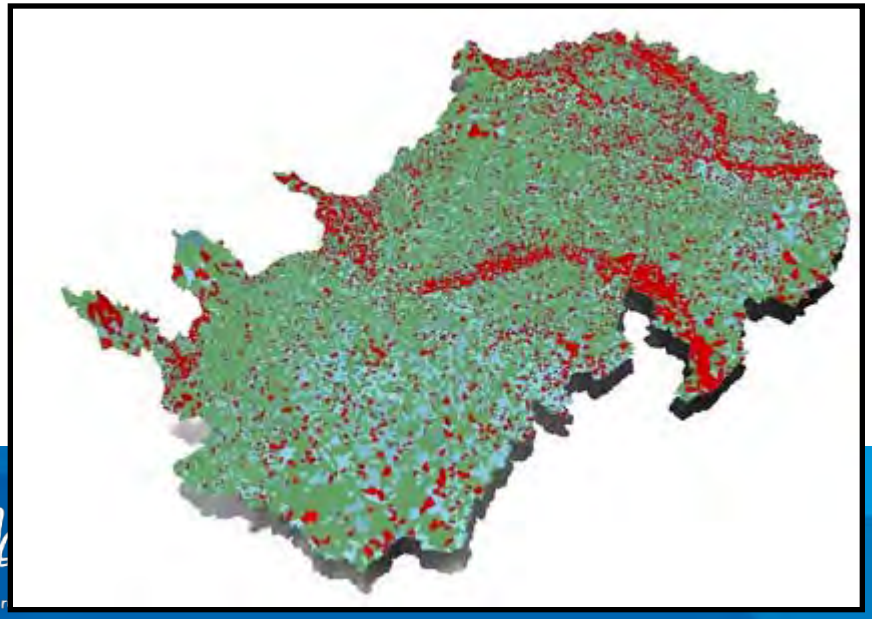

Water Wells per TWP
0
1 - 5
6 - 25
26 - 50
51 - 75
76 - 100
101 - 500
>500
Total Wells: 215,816

Groundwater Inventory

Base of Groundwater Protection

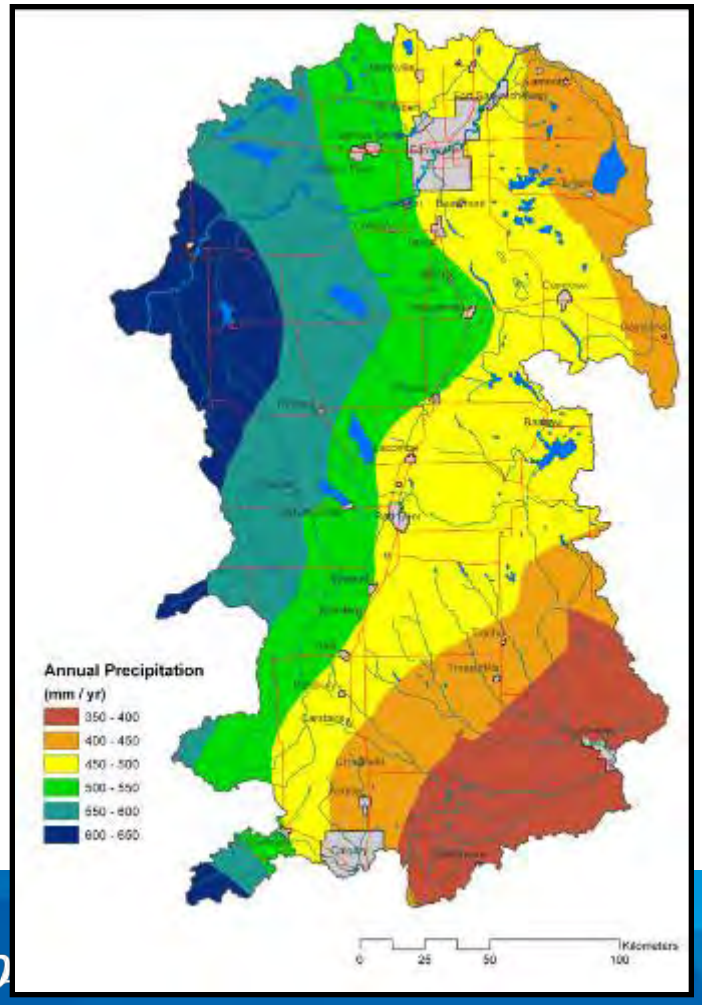


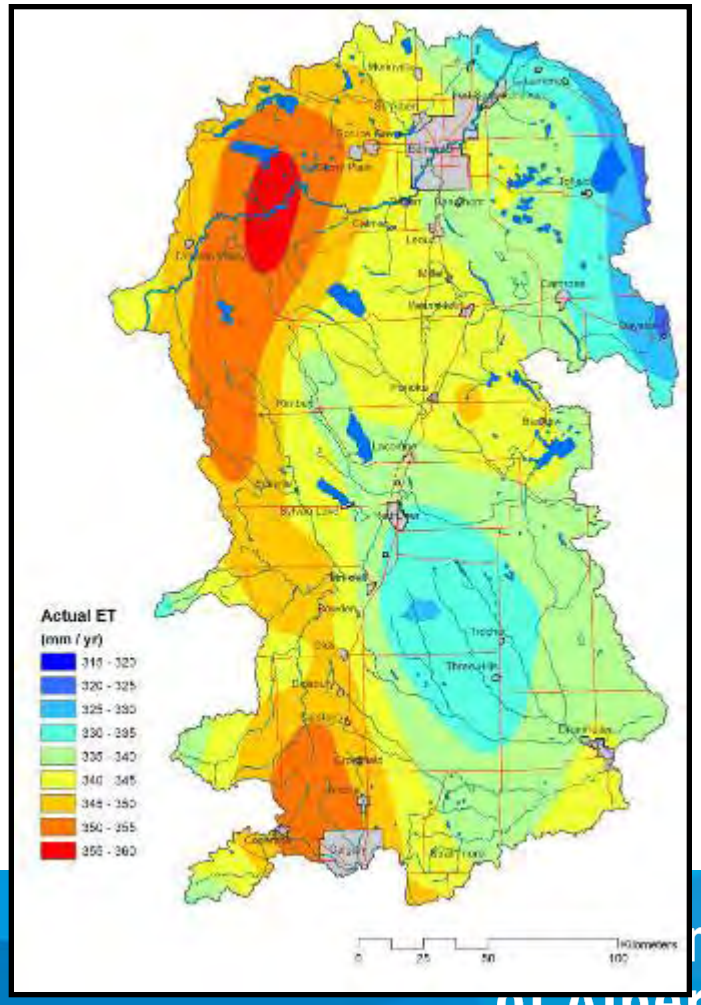


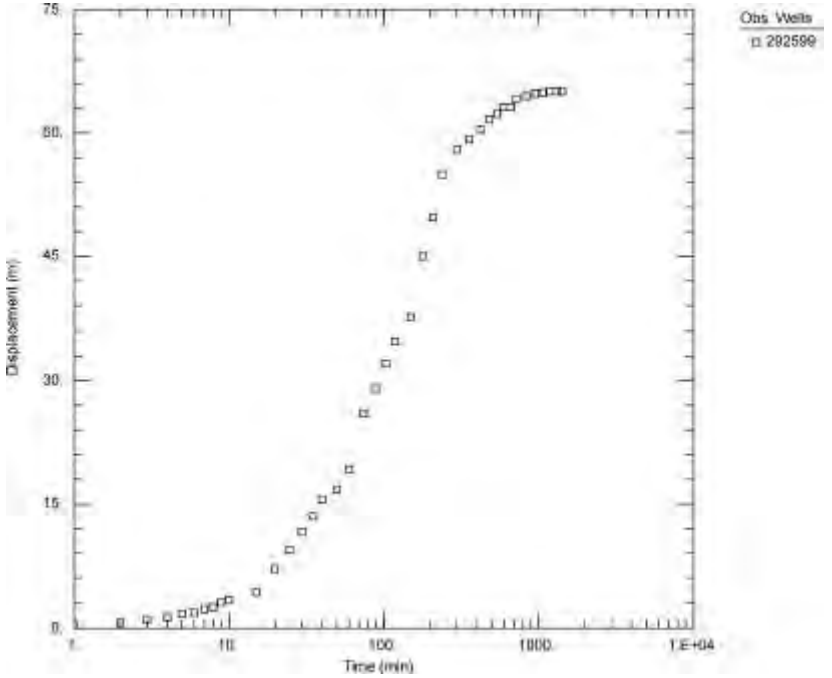


Mapping Geology

Understanding the hydrology of the area







Understanding the hydrogeological properties

Eye in the sky on the hunt for Alberta's hidden water

RYAN CORMIER
Journal Staff Writer
EDMONTON

That low-flying plane towing a radio transmitter may seem dangerously close to your rooftop, but it's actually looking for water beneath your feet.

The flights — which start today — are part of an Alberta Environment project to map underground water sources around Edmonton in an effort to better protect both its quantity and quality.

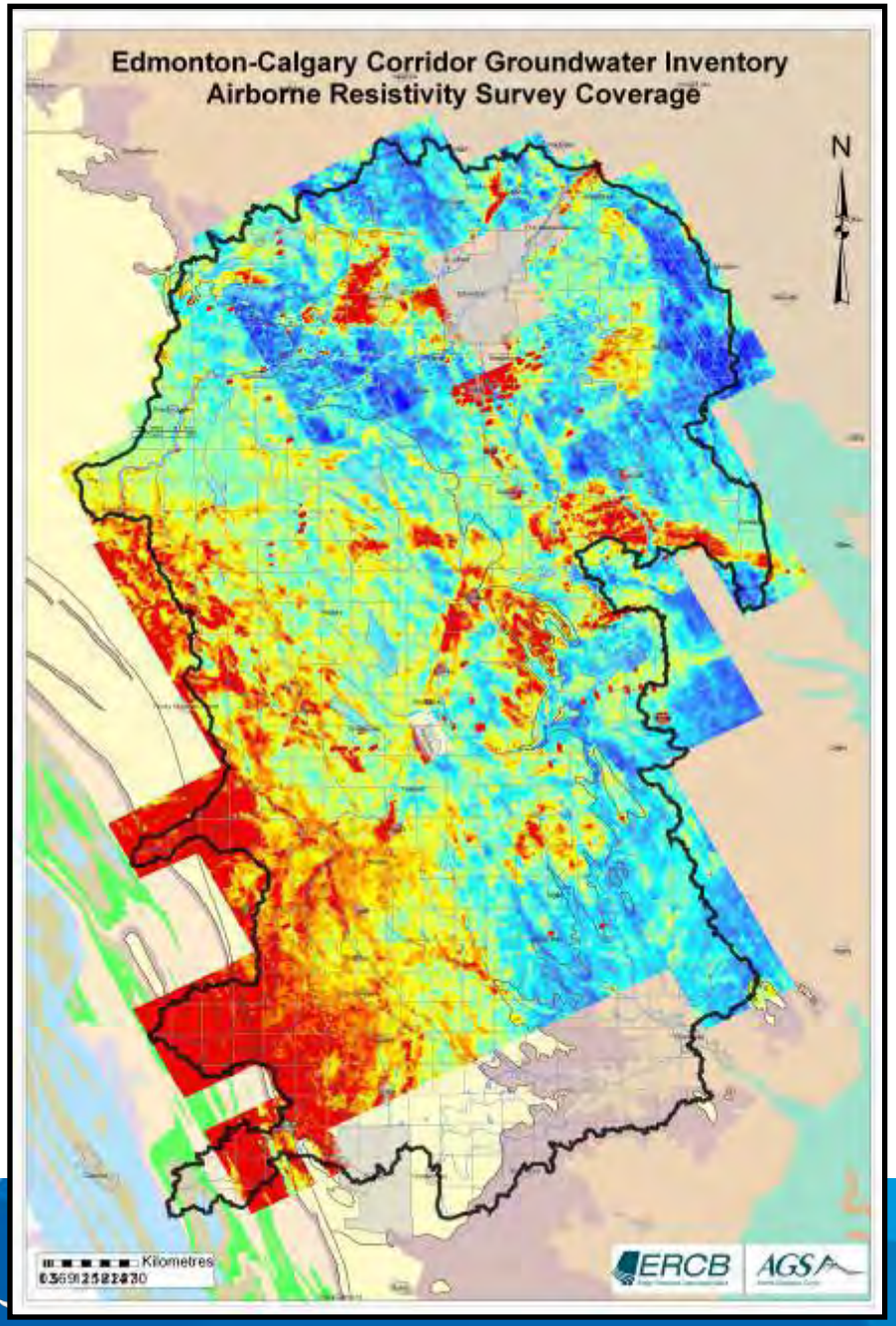
"Alberta is growing and thriving, but with that growth comes increased pressure on our resources," Environment Minister Rob Renner said. "We're using the latest technology to obtain a clearer understanding of our groundwater so we can make better water-management decisions."

A twin-propeller airplane will tow a low-frequency radio transmitter that sends electromagnetic waves into the ground, department spokeswoman Carrie Sancartier said. The waves will be absorbed by underground rock and water, and send information back to the plane, giving a measure of what type of material lies beneath the surface.

See WATER / A2

SUPPLIED

A Casa 212 twin-propeller airplane equipped with a large radio transmitter will measure groundwater around the Edmonton area beginning today.



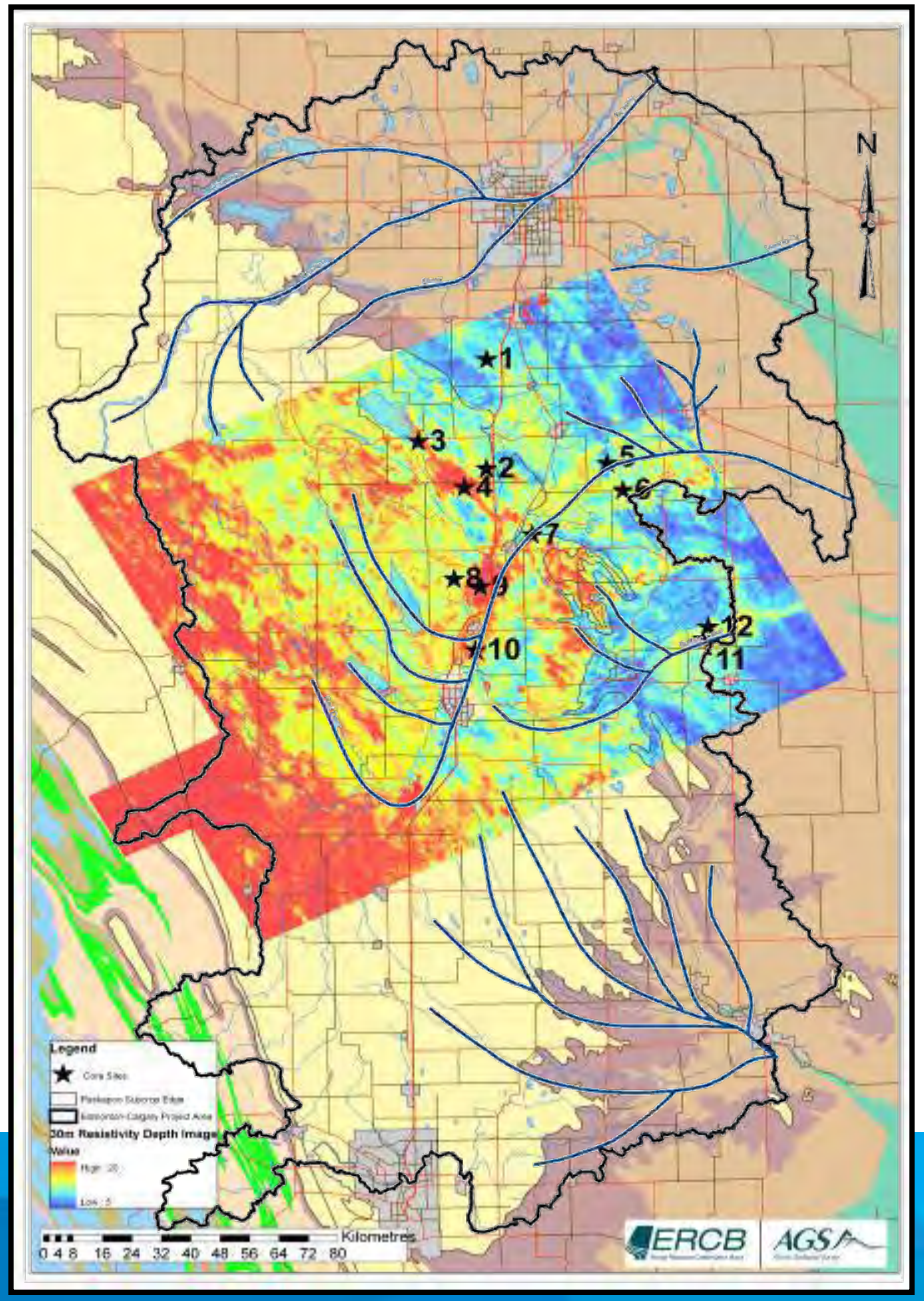
What does it do?

- Strong magnetic pulse creates a weak current in the ground – weak return signal is recorded by receiver
- Create maps showing electrical properties with depth
- Clayey sediments more conductive and sandy sediments more resistive

How does it help?

- Calibration of geophysical information with water well and borehole data
- Will help refine extents of coarse-grained units (aquifers) and fine grained units (aquitards)
- Information incorporated into the groundwater model

2008 Core Hole Program



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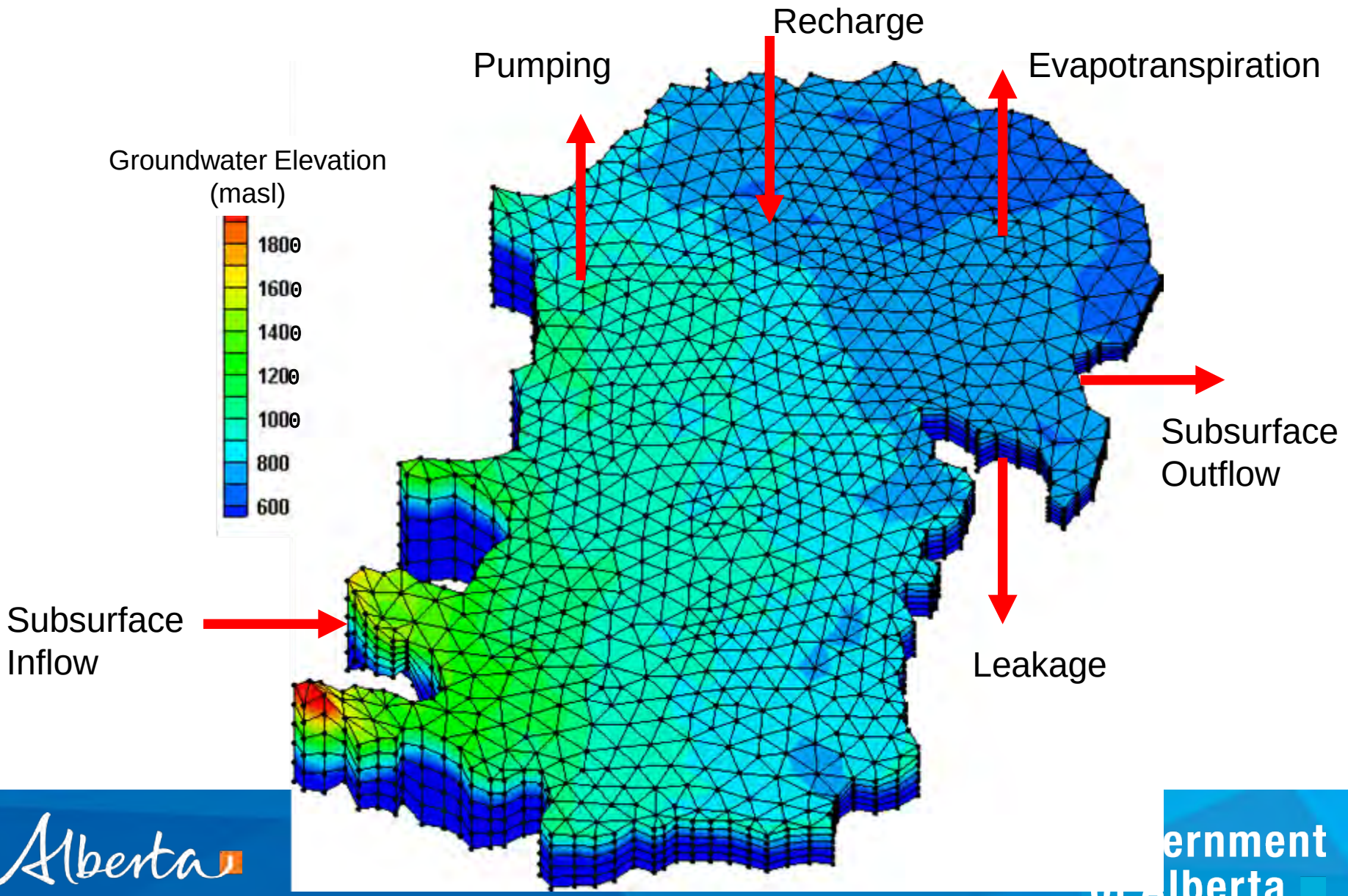
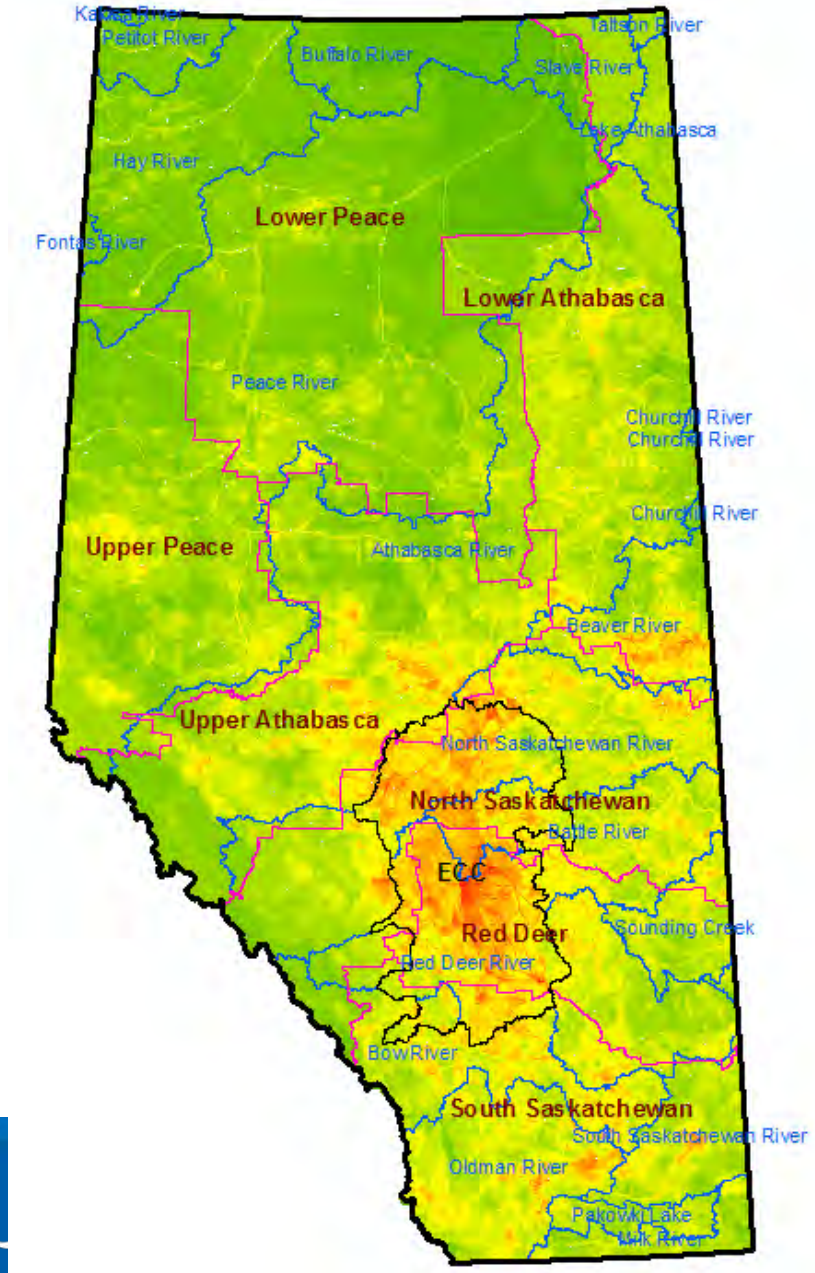
Groundwater Modeling



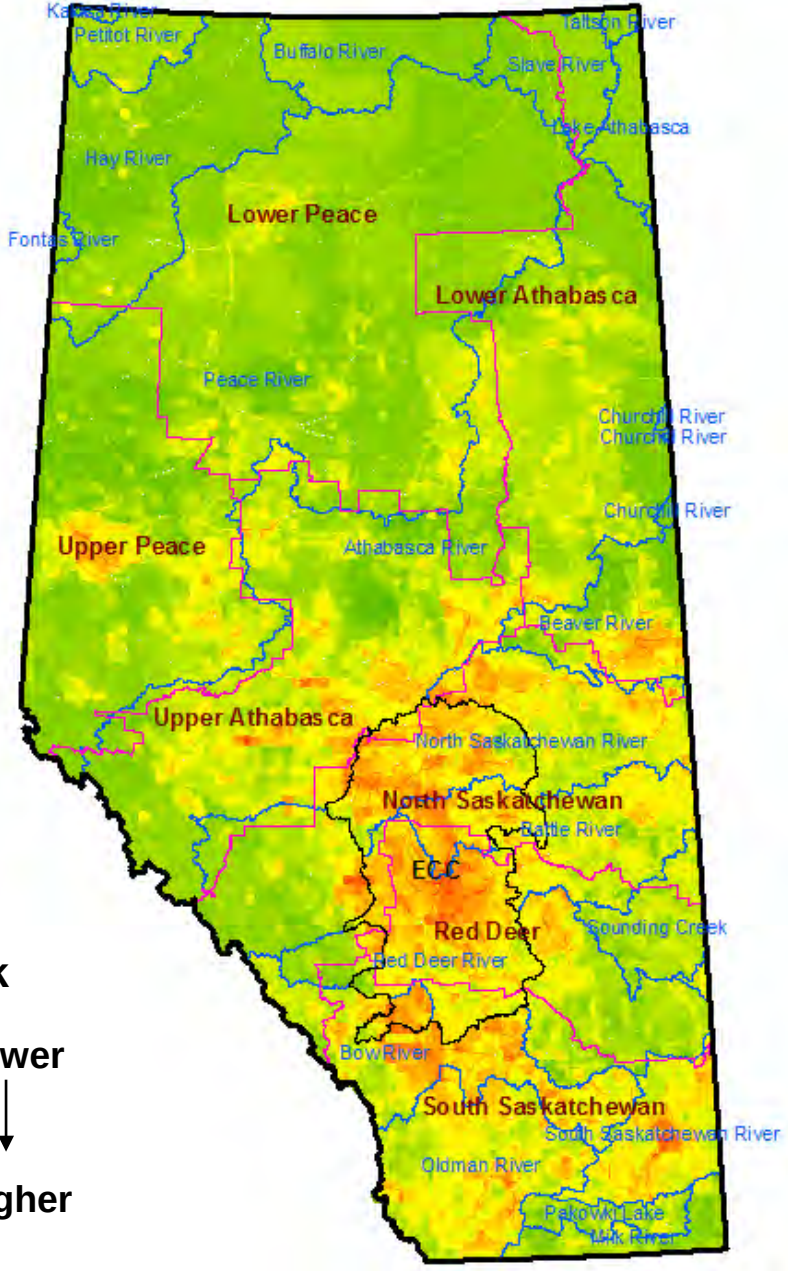
Products

- Maps – Geology, Hydrogeology (e.g. Aquifers), Hydrology, Chemistry
- Models - Geological and Hydrogeological
- Atlas - Synthesis of findings
- Development of policy/management tools

GW Quality Risk



GW Quantity Risk



Risk

Lower

Higher

Layers used for Quantity of Groundwater

1. Water well distribution
2. Water well complaints
3. Groundwater allocation volumes (EMS)
4. Domestic well use volumes
5. Population density
6. Population projections
7. Groundwater recharge (drought)
8. Buried Channels
9. Mining activity (coal and oilsands)
10. Future CBM water production (Ardley)
11. Basins closed to surface water licensing
12. Sub-basins with no active GOWN wells (levels)

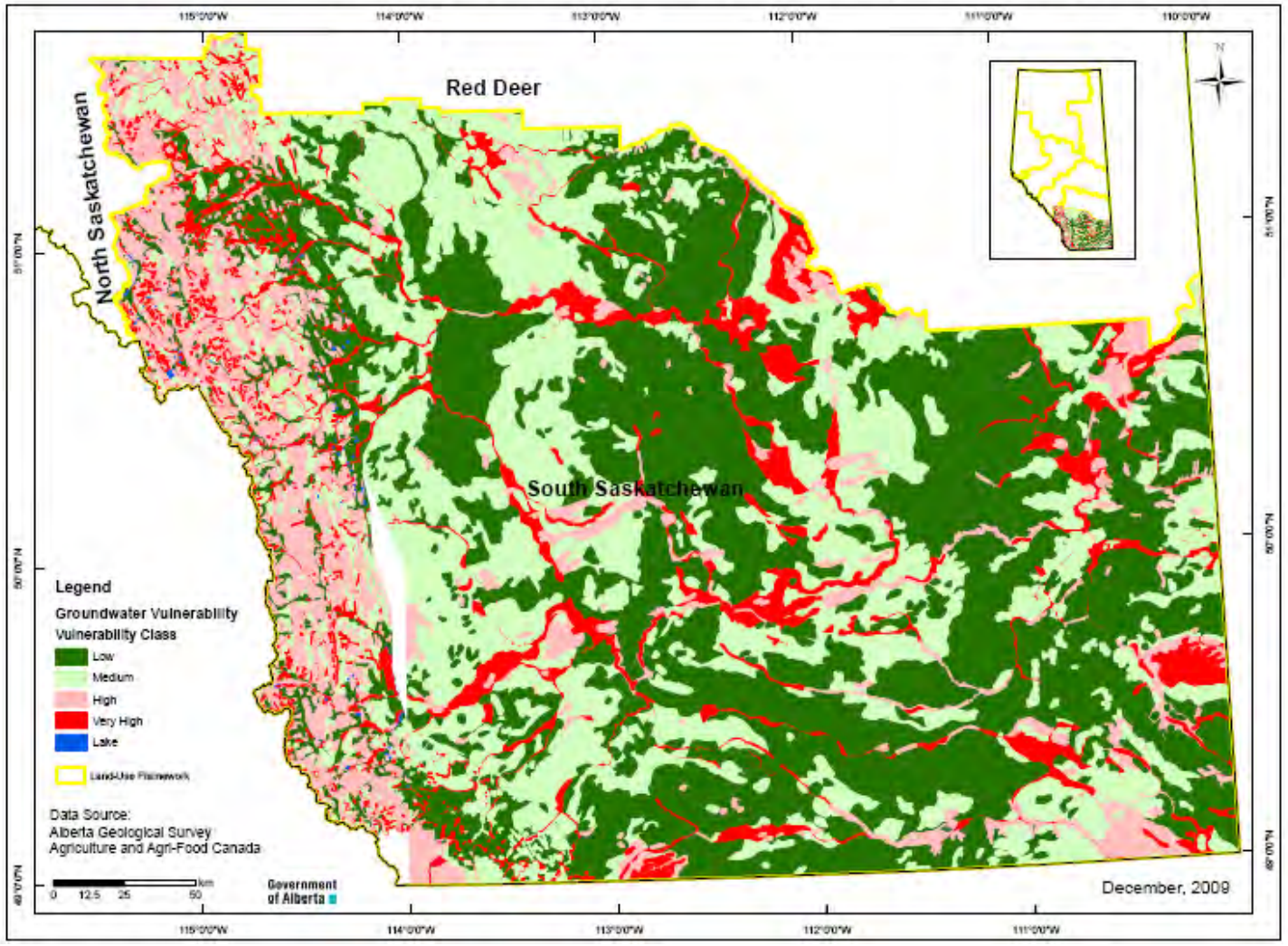
Layers used for Quality of Groundwater

1. Water well Distribution
2. Water well Complaints
3. Groundwater Recharge
4. Buried Channels
5. Sub-basins with no active GOWN wells (Sampled)
6. Pipeline Density
7. CBM Wells
8. Conventional Oil and Gas Wells
9. Population Density
10. Population Projections
11. Agricultural Intensity Index
12. Landfills
13. Future CBM Activity
14. Mining Activity
15. Environmental Assessment/Contaminated Sites (TWP)
16. Environmental Assessment/Contaminated Sites (Urban)
17. AGS Vulnerability
18. HEMS-Bayrock GW Vulnerability
19. Lower Athabasca Region GW Vulnerability
20. Industrial Facility (Approved)

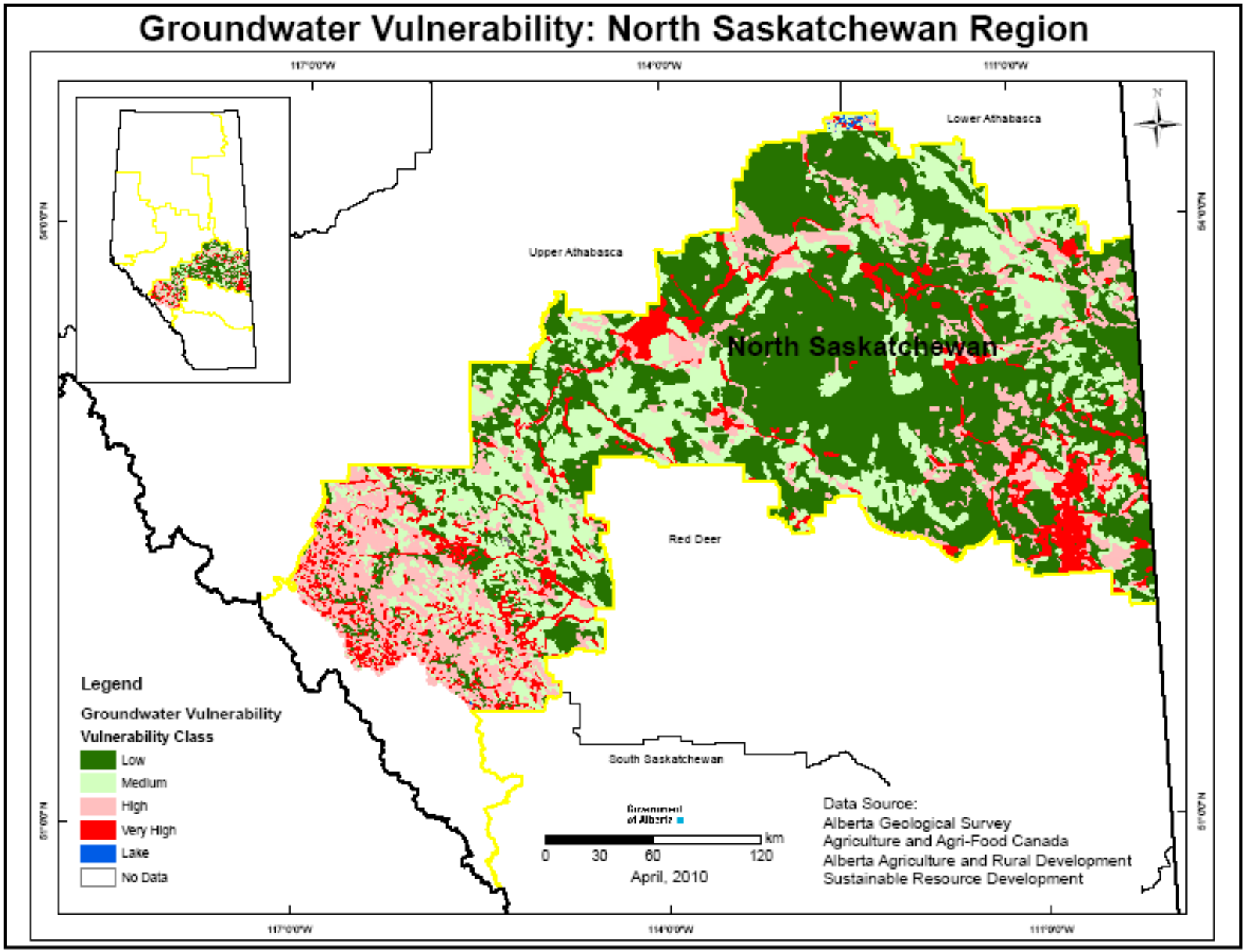
Support to Regional Plans (Land-use Framework) Groundwater Vulnerability Mapping

- Provide a regional description of the potential relative risk of shallow groundwater contamination from surface activity
- Regional scale ⇒ can only be used as a screening tool to identify areas where more focused study, mapping or investigation may be warranted
- **NOT for making local land use decisions!**

Groundwater Vulnerability: South Saskatchewan Region



Groundwater Vulnerability: North Saskatchewan Region



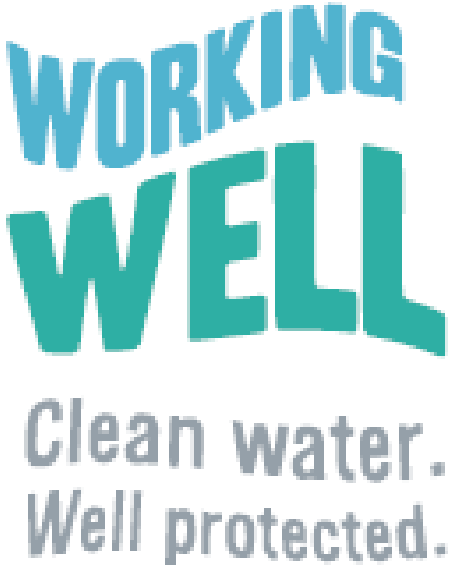
Improving Groundwater Knowledge
Future Steps with PGIP

- Evaluate ECC project, develop long-term plan for continuing with program in conjunction with Alberta Geological Survey
- Develop policy instruments
  - More flexible system, risk based approach
- Improve future use of data
  - Guide research and knowledge to benefit of Albertans (eg. University of Calgary collaboration, Alberta Water Research Institute)

Working Well

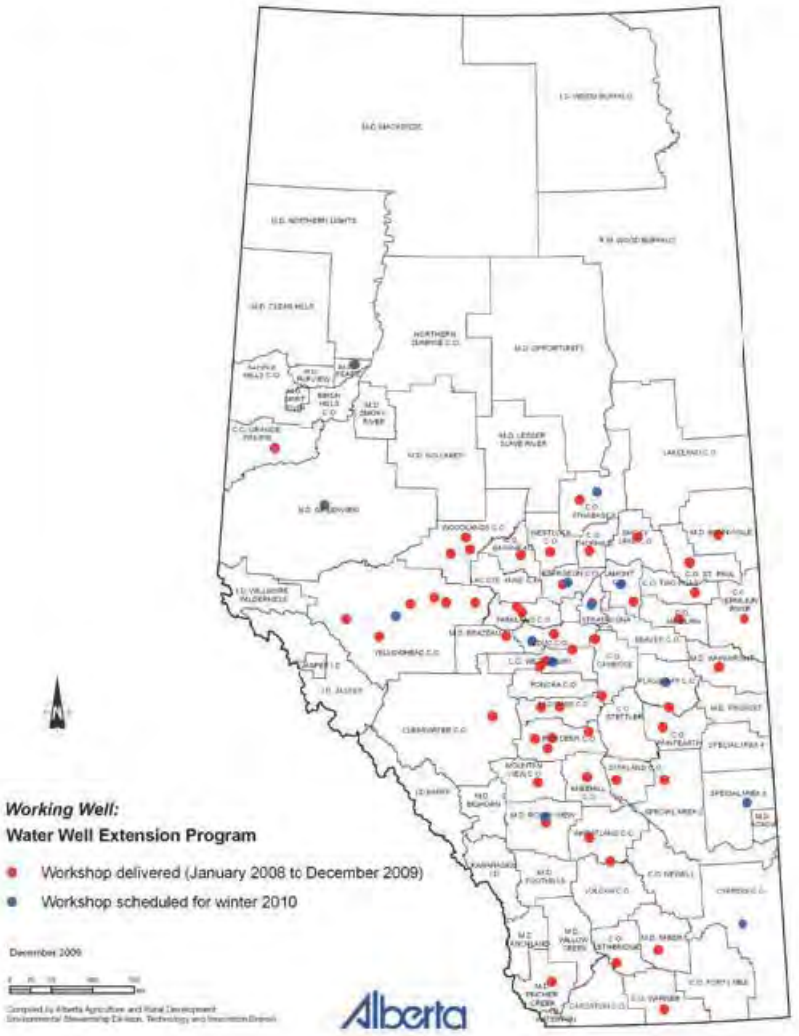
Improving Stewardship Working Well

- Community based, hands-on workshops for well owners
- Learn basics of groundwater, well construction, common well problems and best management practices
- Partnership
  - Alberta Environment
  - Alberta Agriculture and Rural Development
  - Agriculture and Agri-Food Canada
  - Alberta Health Services
  - Alberta Water Well Drilling Association
  - Leduc, Brazeau & Yellowhead counties



Improving Stewardship Working Well

- 77 workshops since 2008
- 41 municipalities
- Over 2000 participants



Improving Stewardship
Working Well

www.environment.alberta.ca/3081.html

www.insideeducation.ca/hidden/water.html

Groundwater Observation Well Network

Improving Stewardship
Groundwater Observation Well Network

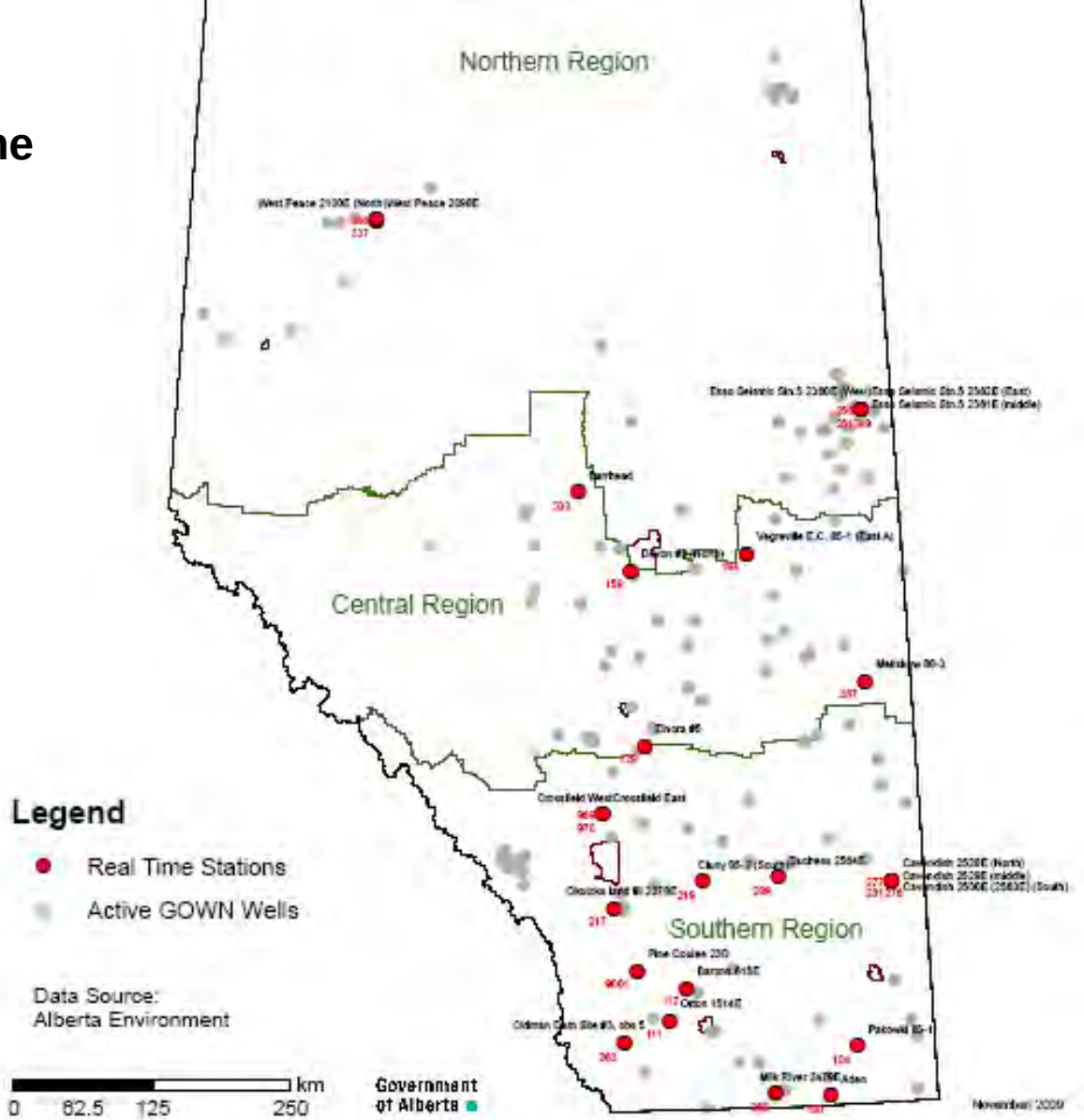
- GOWN
- started in 1956 with wells in Drayton Valley, Leduc and Milk River
- currently over 250 active wells across the province
- measurement of groundwater levels over time
- groundwater quality sampling


Milk River West GOWN Well

Groundwater Levels

- ~ 200 of the GOWN wells monitoring water levels
- all equipped with special data-logger equipment
- hydrographs available on AENV website
- 19 sites with near real time telemetry

GOWN - Near Real Time



Groundwater Hydrographs

search for “GOWN” on

www.environment.alberta.ca

Groundwater Quality Sampling

- about 165 of the GOWN wells sampled
- 30-40 wells sampled every year, 5 year rotation
- sampled for dissolved constituents and gas
- focus on shallow wells in 2010-11
- results on renewed State of the Environment website

State of the Environment Reporting

Improving Stewardship
State of the Environment Reporting

- current State of the Environment website being updated
- includes air, land, water and biodiversity indicators
- groundwater indicators include:
  - nitrate in groundwater
  - methane gas in groundwater
  - water well density
- groundwater quality indicators based on GOWN data

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Environment

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- Air
- Water
- Land
- Biodiversity

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- Authorization / Approval Viewer
- Information Centre
- Water Advisories
- Drinking Water Quality
- Alberta River Basins
- Frequently Asked Questions

Questions and Comments

- Tell us what you think
- Website feedback

BUDGET 2010
Striking the Right Balance

Alberta Capital

State of the Environment

State of the Environment reporting is one way to track environmental quality outcomes and the performance of environmental management strategies.

Various indicators are monitored, evaluated and reported over time, which helps us track and understand environmental trends and make adjustments.

Four types of indicators help us monitor and manage the cumulative effects of development on the environment:

- **Condition indicators** measure environmental quality at any given time; for example, the level of a substance in our air or water.
- **Pressure indicators** measure activities that affect or impact the environment, such as air emissions or wastewater effluent.
- **Response indicators** measures behavioral changes that help reduce pressures on the environment as a result of management actions, such as measuring the percentage of waste diverted from landfills through a recycling program.
- **Performance Indicators** measure the success of management actions the government takes to improve the environment. These actions produce the desired changes in targeted condition, pressure or response indicators.

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Government of Alberta

Questions ?

Contact: ross.nairne@gov.ab.ca