

SUPPLY

MANAGEMENT

QUALITY

WATER, AGRICULTURE & FOOD

Opportunities and Challenges



Water and Alberta's Agriculture Industry

- **Alberta is at a water management crossroads, and critical decisions are needed to determine the right path to follow.**
- **Agriculture needs to be an important consideration in those decisions.**

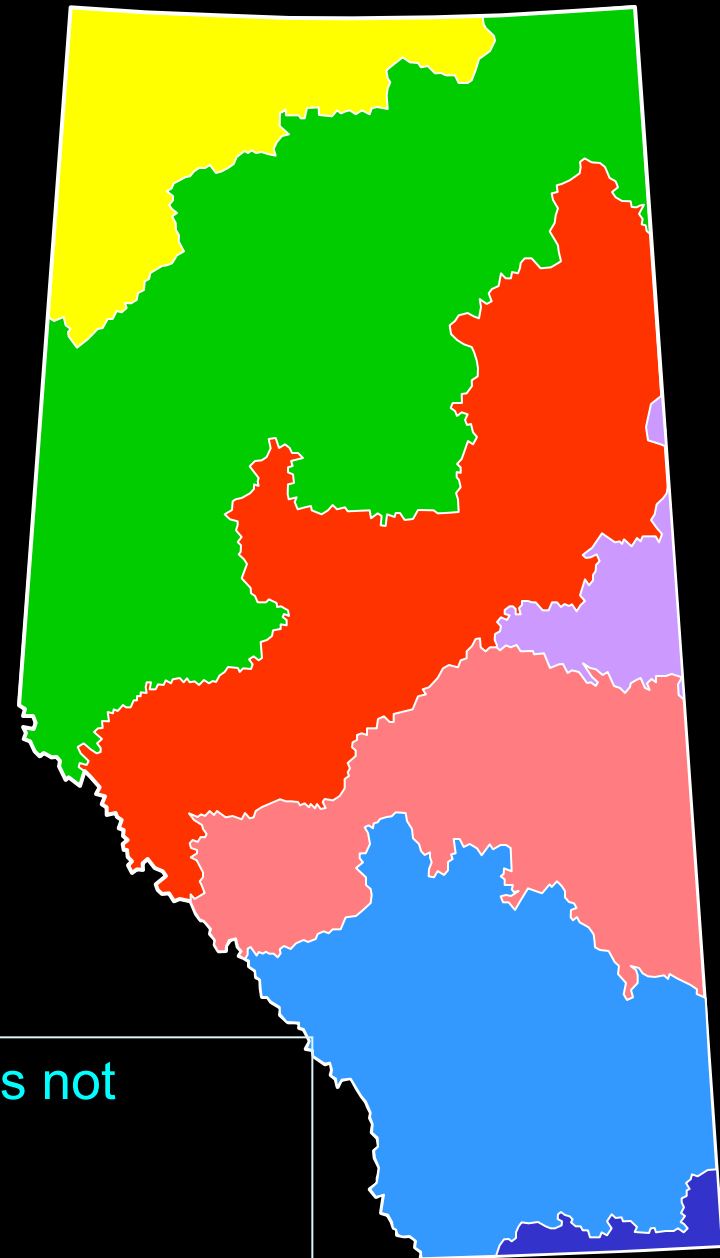


Annual River Discharges and Use

- **Total outflow from Alberta's rivers is about 105 million acre-feet per year.**
- **Total volume withdrawn – 3.8 million acre-feet (3.6%).**
- **Total volume consumed – 2.1 million acre-feet (2%).**



Alberta Watersheds



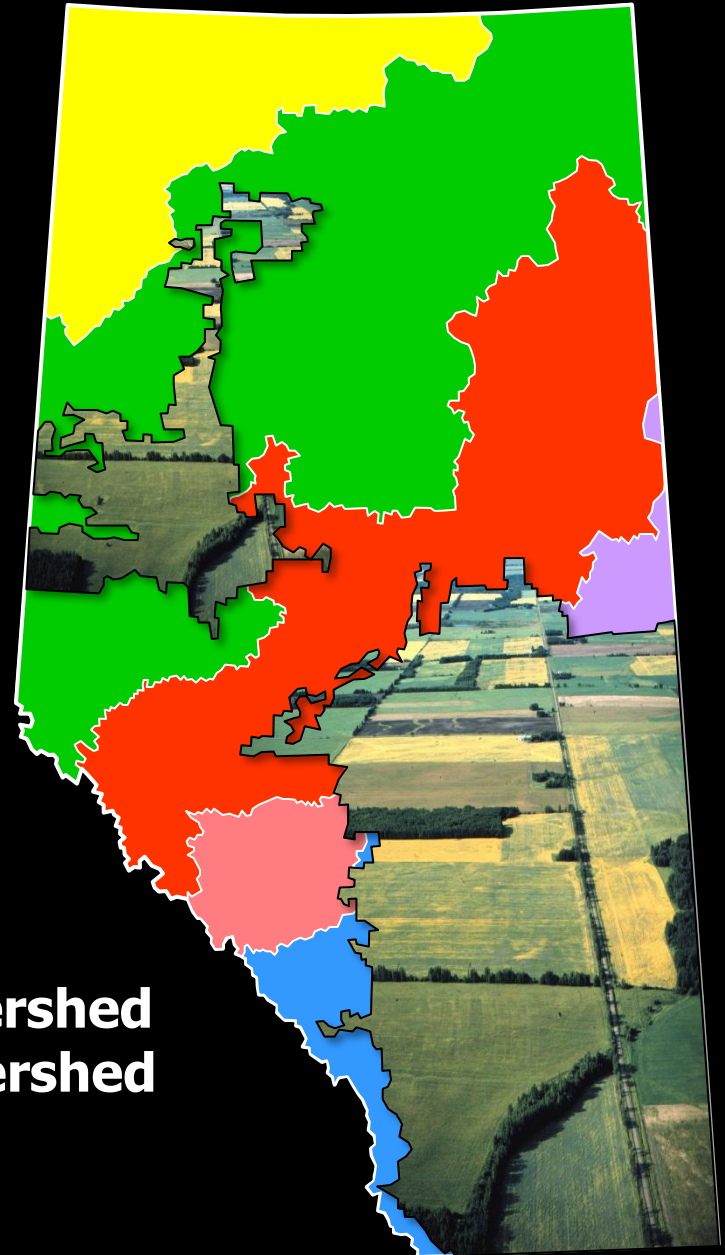
- Transfer of water between these watersheds is not allowed without special provincial legislation.
- Bulk export of water is also not allowed.

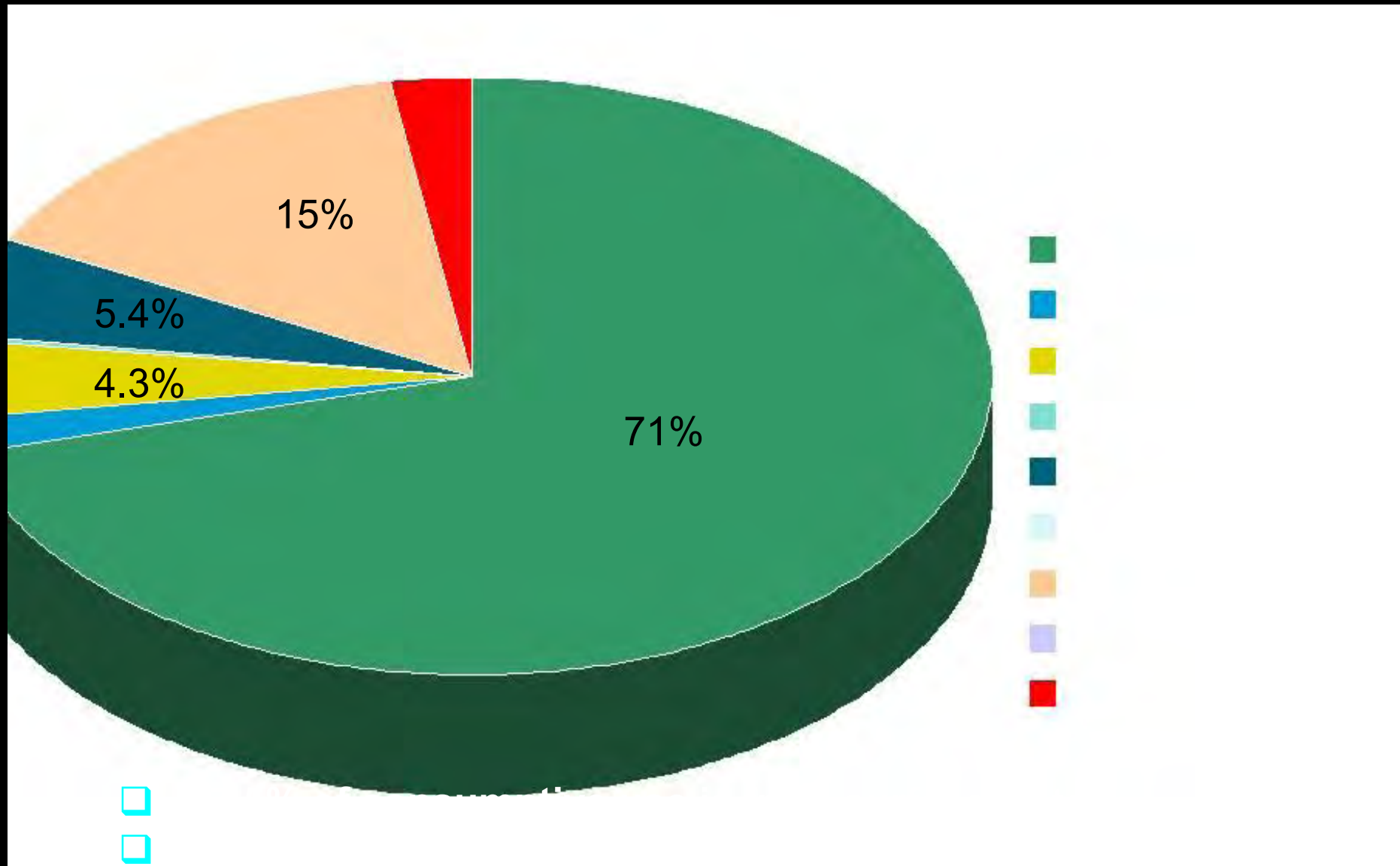
Major Alberta Watersheds



Agricultural land

-  **Hay River Watershed**
-  **Peace River Watershed**
-  **Athabasca River Watershed**
-  **Beaver River Watershed**
-  **North Saskatchewan River Watershed**
-  **South Saskatchewan River Watershed**
-  **Milk River Watershed**



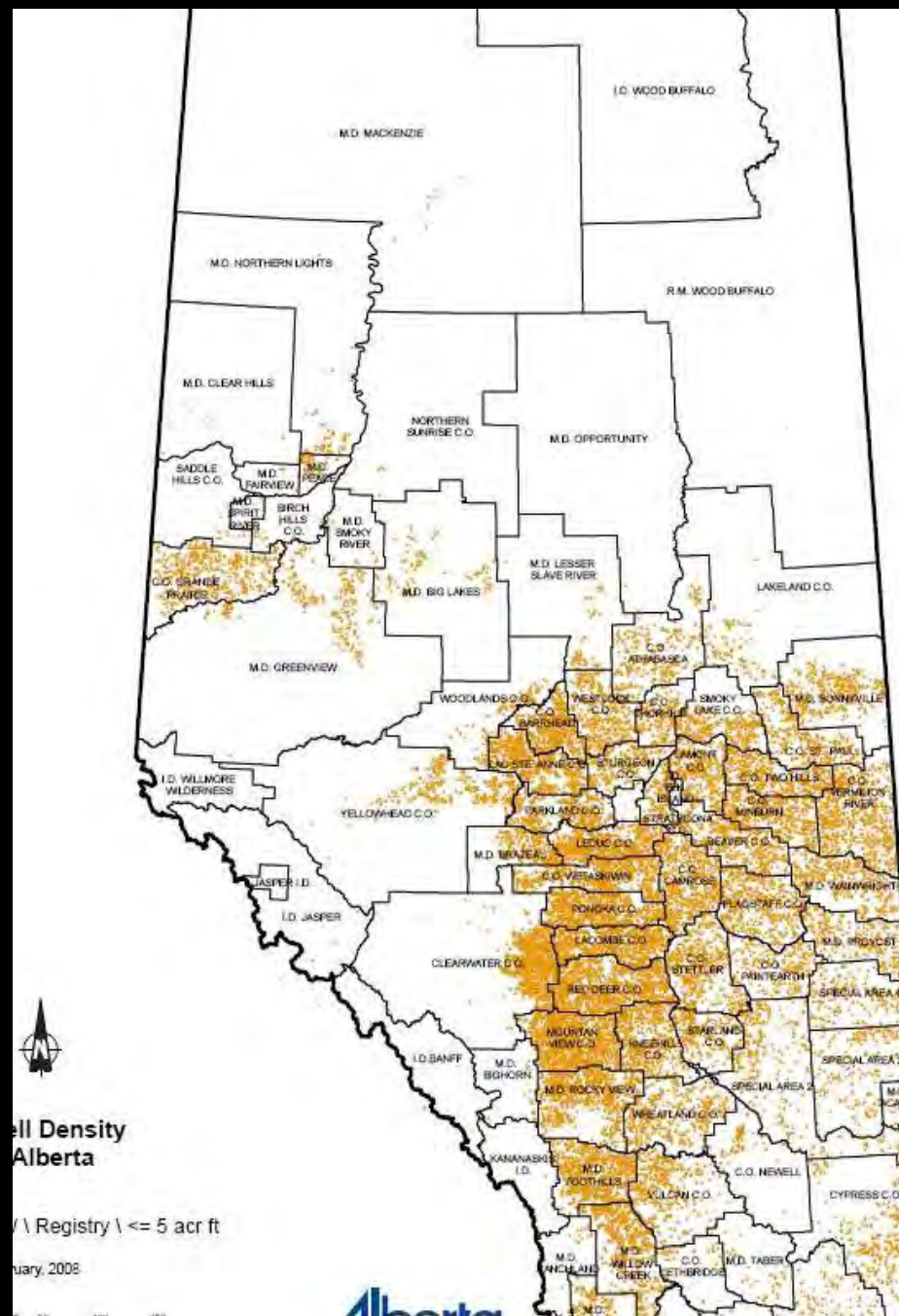


- Currently 500,000 domestic wells in Alberta.
- About 7,000 new wells are added each year.

Groundwater

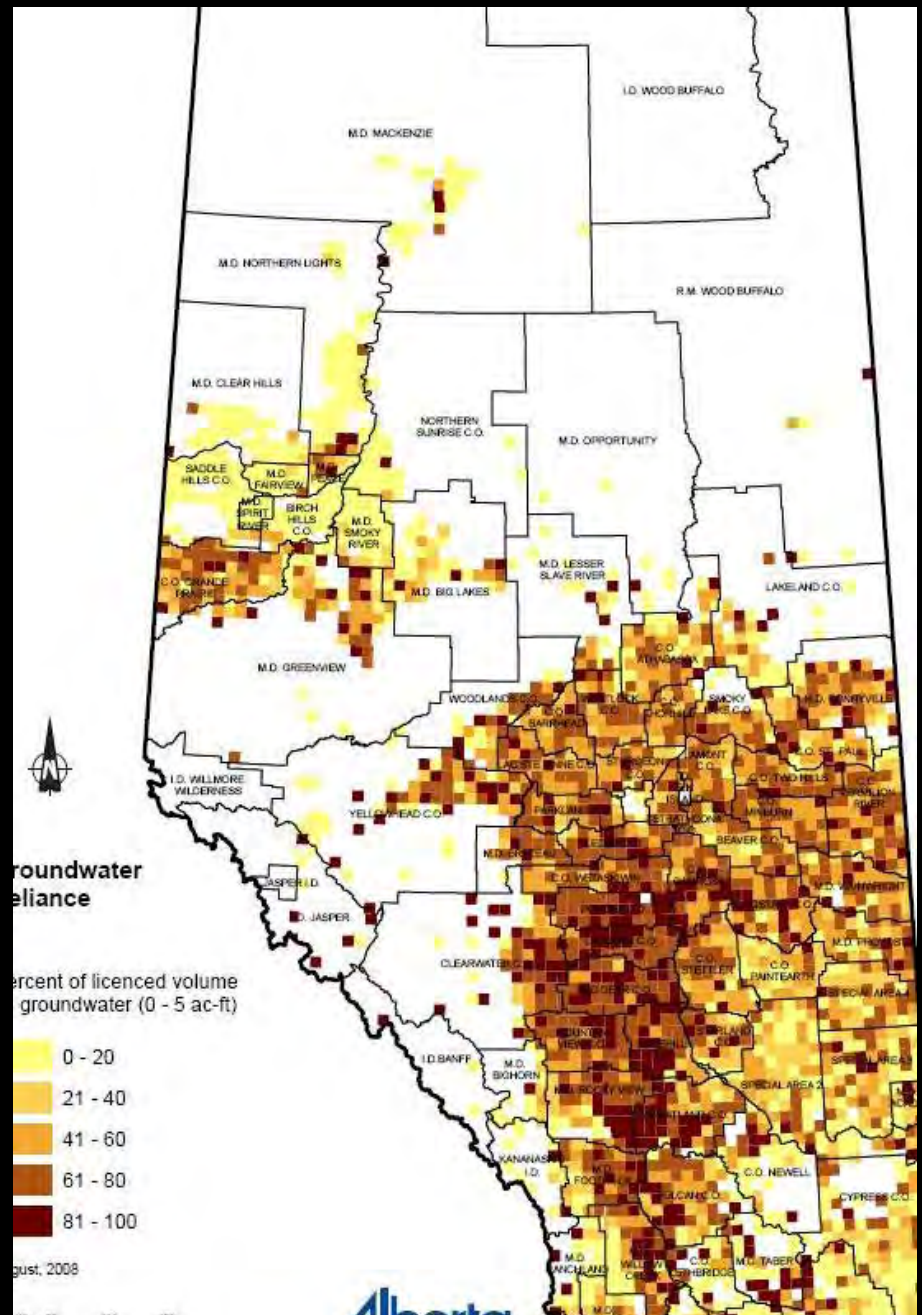
- **We understand much less about our groundwater resources than our surface water resources.**
- **Groundwater is an important resource for Alberta's agriculture industry and rural residents.**

Groundwater Well Distribution

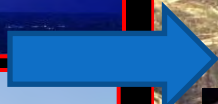


Groundwater Reliance

**Percent volume
licenced as
groundwater**



Water, agriculture and food have been closely linked throughout history.



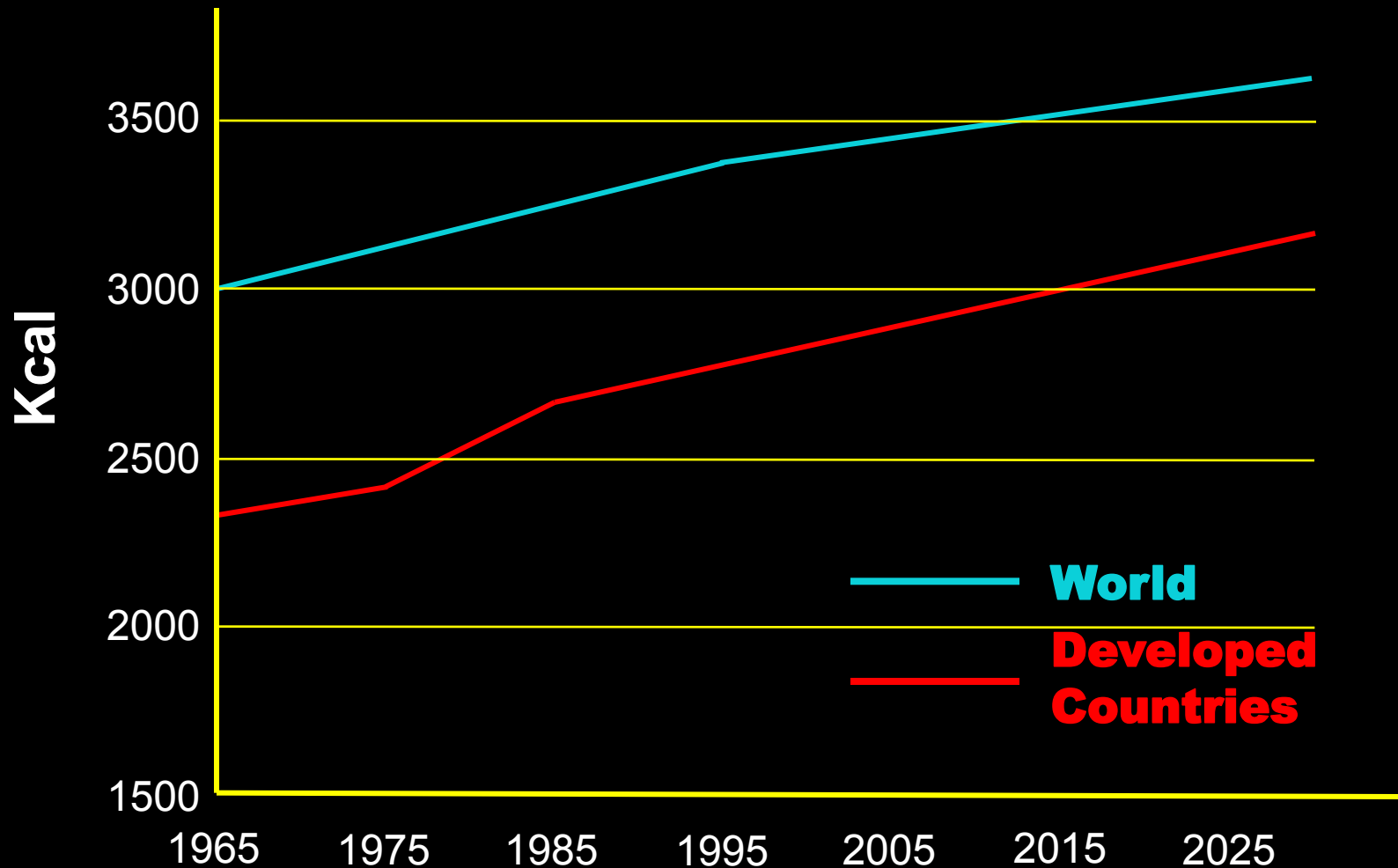
Agriculture and Food Production

- **Before organized agriculture, the earth could feed only about 600 million people.**
- **The Earth's population is currently about 6.5 Billion – a 10-fold increase.**
- **This population is expected to increase to 9.2 Billion by 2050.**

Future World Food Requirements

- ❑ **World food requirements could double in the next 40 years.**
 - ❑ **Population – will grow from 6.5 Billion to 9.2 Billion.**
 - ❑ **Per capita food consumption will increase.**

Per Capita Food Consumption **(1965 – 2030)**



Future World Food Requirements

- ❑ **World food requirements are expected to double in the next 40 years.**
 - ❑ **Population – will grow from 6.5 Billion to 9.2 Billion.**
 - ❑ **Per capita food consumption will increase.**
 - ❑ **Significant changes in diet.**

Changing Diets

- **There is a shift towards more animal protein in the developing countries.**
- **Per capita meat consumption in developing countries is expected to increase from 26 kg. in 1997/98 to 37 kg. in 2030.**
- **This is a result of increasing economic development and per capita incomes.**



Implications to Cereal Production

- ❑ **1 kg of chicken meat requires:**
 - **3 kg of grain equivalents;**

- ❑ **1 kg of pork meat requires:**
 - **5 kg of grain equivalents**

- ❑ **1 kg of beef requires:**
 - **8 kg of grain equivalents;**



Water Requirements

Product	Unit	Equivalent Water (m ³ /Unit)
Cattle	Head	4,000
Sheep and Goats	Head	500
Fresh Beef	Kilogram	15
Fresh Lamb	Kilogram	10
Fresh Poultry	Kilogram	6
Cereals	Kilogram	1.5
Citrus	Kilogram	1
Pulses, roots and tubers	Kilogram	1

Food Production

- **About 60% of the world's food is produced on rainfed lands.**
- **Significant increases in production on rainfed lands are difficult – genetic engineering has not yet developed high yielding, drought-resistant varieties.**

Irrigated Food Production

- **About 40% of the world's food, and 60% of cereal production is from irrigated lands.**
- **Irrigation makes up about 17% of the total arable land base.**
- **It is estimated that up to 80% of future food requirements will be met by irrigation.**



Land and Water

- ❑ Land was the major focus during the 20th Century.
- ❑ Water will be the dominant focus of the 21st Century.



Water Use

- **In 1995, the human population withdrew 3,906 km³ of water annually (31% of the readily available water).**
- **By 2025, withdrawals will increase by 22% to 4,772 km³ (38% of readily available water).**
- **Withdrawals in developing countries will increase by 27%, while developed countries will increase by 11%.**

*Global Water Outlook to 2025
Rosegrant et al 2002*

Projected Water Scarcity in 2025



Seckler et al, 2002

Planning For Food

- ❑ **Food-poor but cash-rich countries are buying up agricultural rights in developing countries and “bread basket” countries.**
 - ❑ **South Korea – 99 year lease on 3.2 million acres in Madagascar.**
 - ❑ **China – 100,000 acres in Australia.**
 - ❑ **Japan – 500,000 acres in the U.S.**
- ❑ **Russia recently restricted exports of wheat.**

Groundwater Use

- "Many of the most populous countries of the world - China, India, Pakistan, Mexico, and nearly all of the countries of the Middle East and North Africa - have literally been having a free ride over the past two or three decades by depleting their groundwater resources.**
- The penalty of mismanagement of this valuable resource is now coming due, and it is no exaggeration to say that the results could be catastrophic for these countries, and given their importance, for the world as a whole"**

(Seckler et al., 1999, Director IWMI).

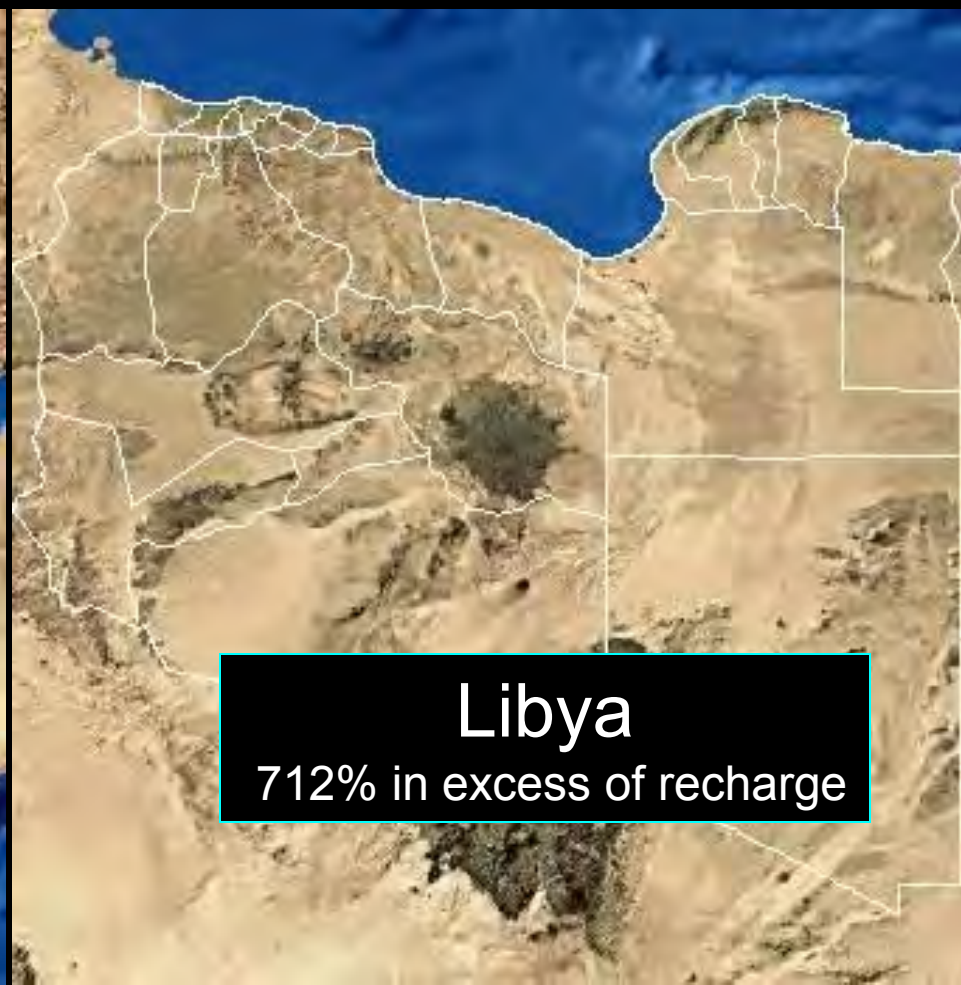
Groundwater

- **Many countries currently rely on “Fossil” groundwater for irrigation.**
- **These groundwater resources are being depleted at an increasingly rapid rate.**
- **And once they are gone, they are gone forever.**

Fossil Groundwater Use for Food Production

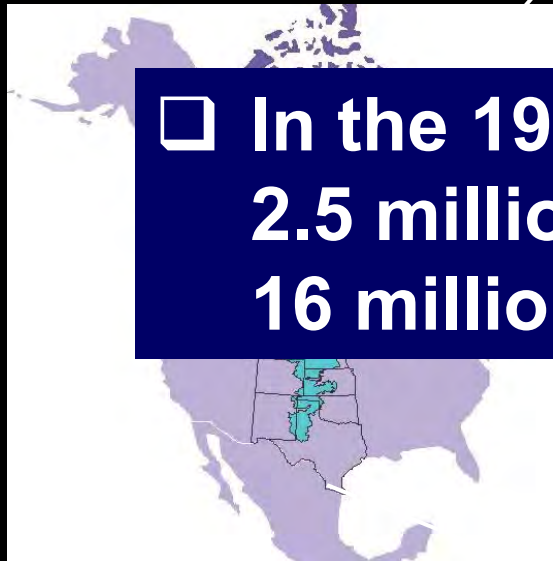


Saudi Arabia
643% in excess of recharge



Libya
712% in excess of recharge

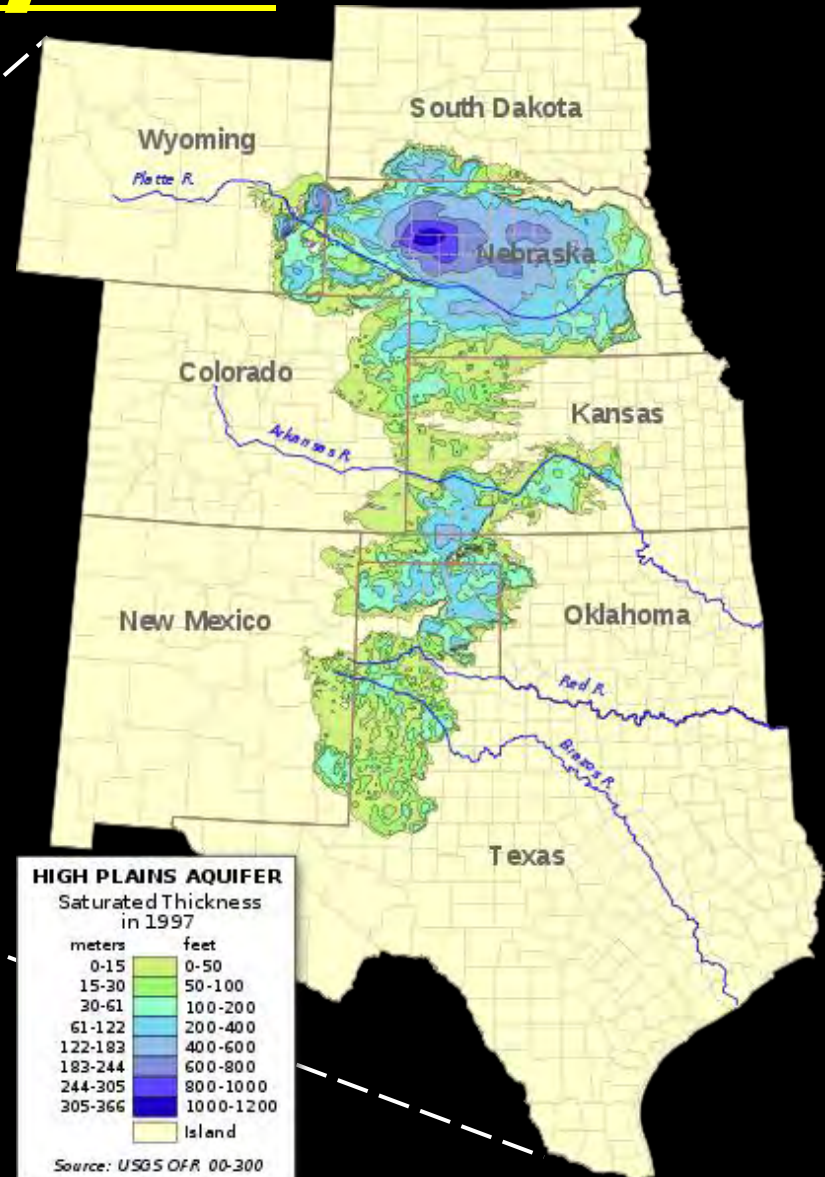
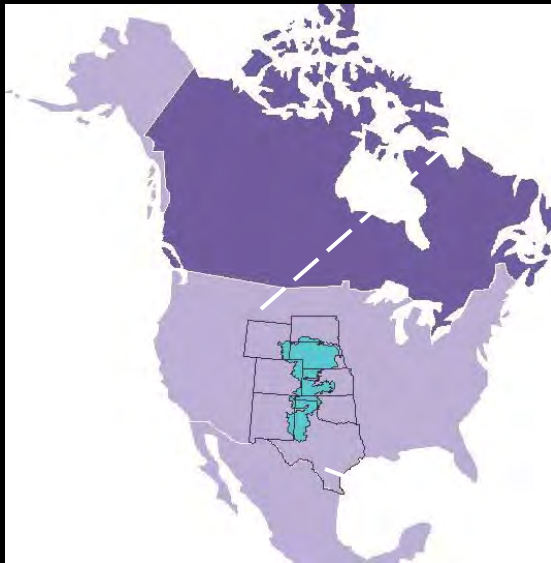
The Ogallala Aquifer



- ☐ In the 1950s, the Ogallala irrigated 2.5 million acres. Today it irrigates 16 million acres.



The Ogallala Aquifer

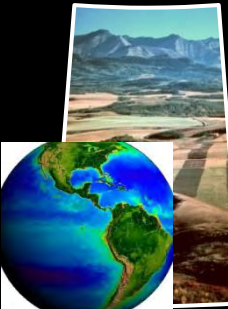


The Ogallala Aquifer*

- **It underlies 174,000 square miles.**
 - Nebraska – 64,400 sq. miles
 - Texas – 36,080 sq. miles
 - New Mexico - <10,000 sq. miles
 - Oklahoma - <10,000 sq. miles
 - South Dakota - <10,000 sq. miles
 - Wyoming - <10,000 sq. miles
- **The aquifer contains 3.3 billion acre-feet of water.**
- **Alberta's total annual water supply from all rivers is about 0.1 Billion acre-feet.**

* M. V. Guru – the Ogallala Aquifer – July, 2000 (Kerr Centre for Sustainable Agriculture)

Alberta's Agricultural Opportunities and Challenges





Alberta is positioned to play a major role in helping meet future world food needs.

BATTLE FOR POTASH CONT.

Agriculture becomes the next big thing



REGULY
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tem not made. Yet Canada has all the ingredients needed to become the world's premier farm-to-fork economy.

A new report by Australia's Macquarie Agricultural Funds Management concludes that heroic efforts will be needed to feed a global population that will expand by 40 per cent by 2050. Success, it concludes, will require

ent. Potash Corp. controls as much as 30 per cent of the world's supply and the nutrient is coveted by China, India and other countries with burgeoning populations. It is not just a national champion; it is a global champion, one with a bright future in an essential and expanding industry.

Sometimes the Canadian gov-

ernment that the global population is expected to rise from 6.5 billion to 9.2 billion between 2000 and 2050, which in itself will require a massive amount of extra agricultural production. Additional pressure will come from changing diets. According to the UN Food and Agriculture Organization, global per capita meat consumption is expected to rise

in the Eastern countries.

With the amount of arable land increasing slowly, improving crop yields on existing farmland becomes the definite option. The best way to do so is through irrigation (within the constraints of water supply) or fertilizer, assuming the farmer can afford fertilizer. Spreading nutrients on crops may not improve yields

“Australia’s Macquarie Agricultural Funds Management concludes that heroic efforts will be needed to feed a global population ...”.

“those countries with a robust agricultural sector, sustainable farming practices, modern infrastructure, reliable water access, and safer political structures will increasingly become the global agricultural powerhouses”.

a supermarket. The connection is the farm, to the export terminals, to the commodity futures markets, to R&D labs, where seeds are improved, and to the farm equipment assembly plants in

Besides vast amounts of land and water, superb infrastructure and technological expertise, Canada has fertilizer and lots of it. Potash, mined in Saskatchewan, is an essential, irreplaceable and relatively rare fertilizer ingredi-

have been a blow to Canada's global agribusiness ambitions and Potash Corp.'s desire to build on its commanding position in a strategic resource.

It is impossible to exaggerate the importance of potash. Con-

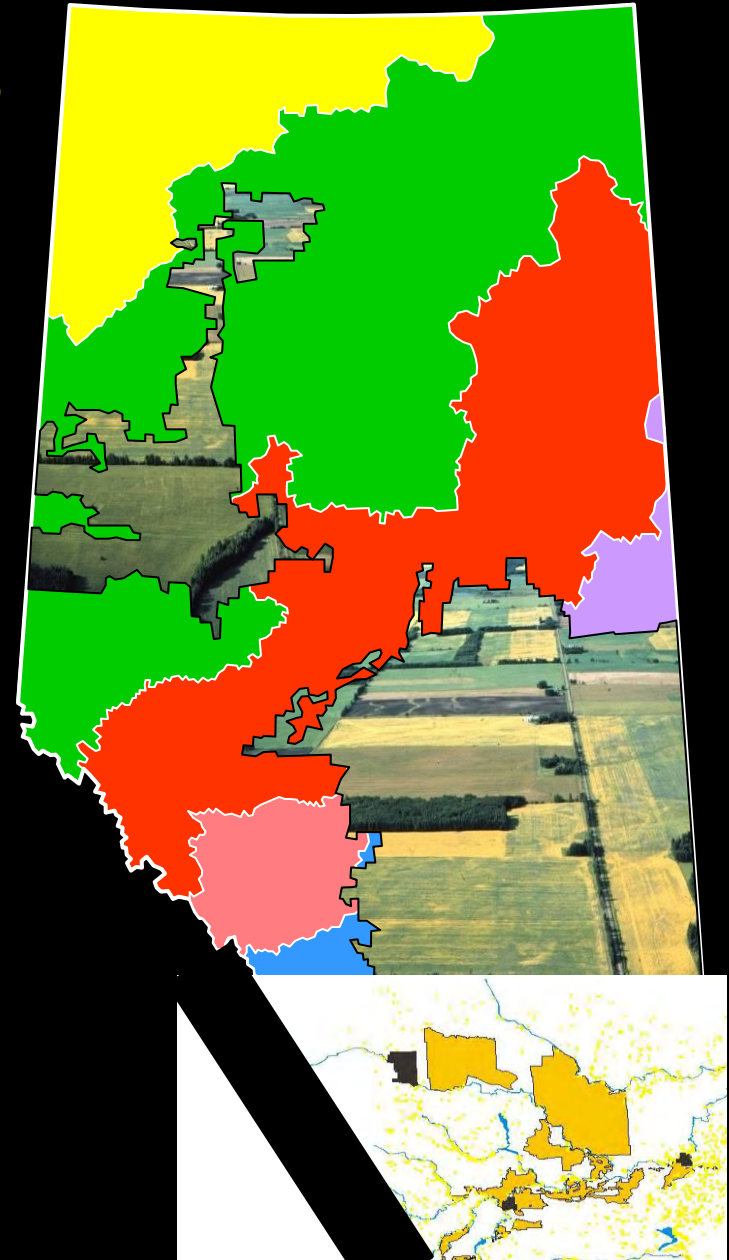
as lost as it was a few decades ago. That's because crop-soil deforestation is no longer an attractive option. Compounding the problem is a lack of water. Water scarcity is reaching crisis levels in some African and Mid-

make those fertile. It is encouraging news that the federal government has, in effect, decided that this task should be a hot-grown affair. A hot-fire grown industry for Canada has not been rebuffed after all.

Production and Diversification

Alberta's advantages:

- ❑ a large agricultural land base;
- ❑ a strong dryland agriculture; and
- ❑ a world-class irrigation system.



Production Potential

- ❑ **Alberta has significant room to increase crop and livestock production in response to world markets.**
- ❑ **The agriculture industry needs access to adequate, good quality water to meet the potential of a growing world marketplace.**



Alberta's Water Supply

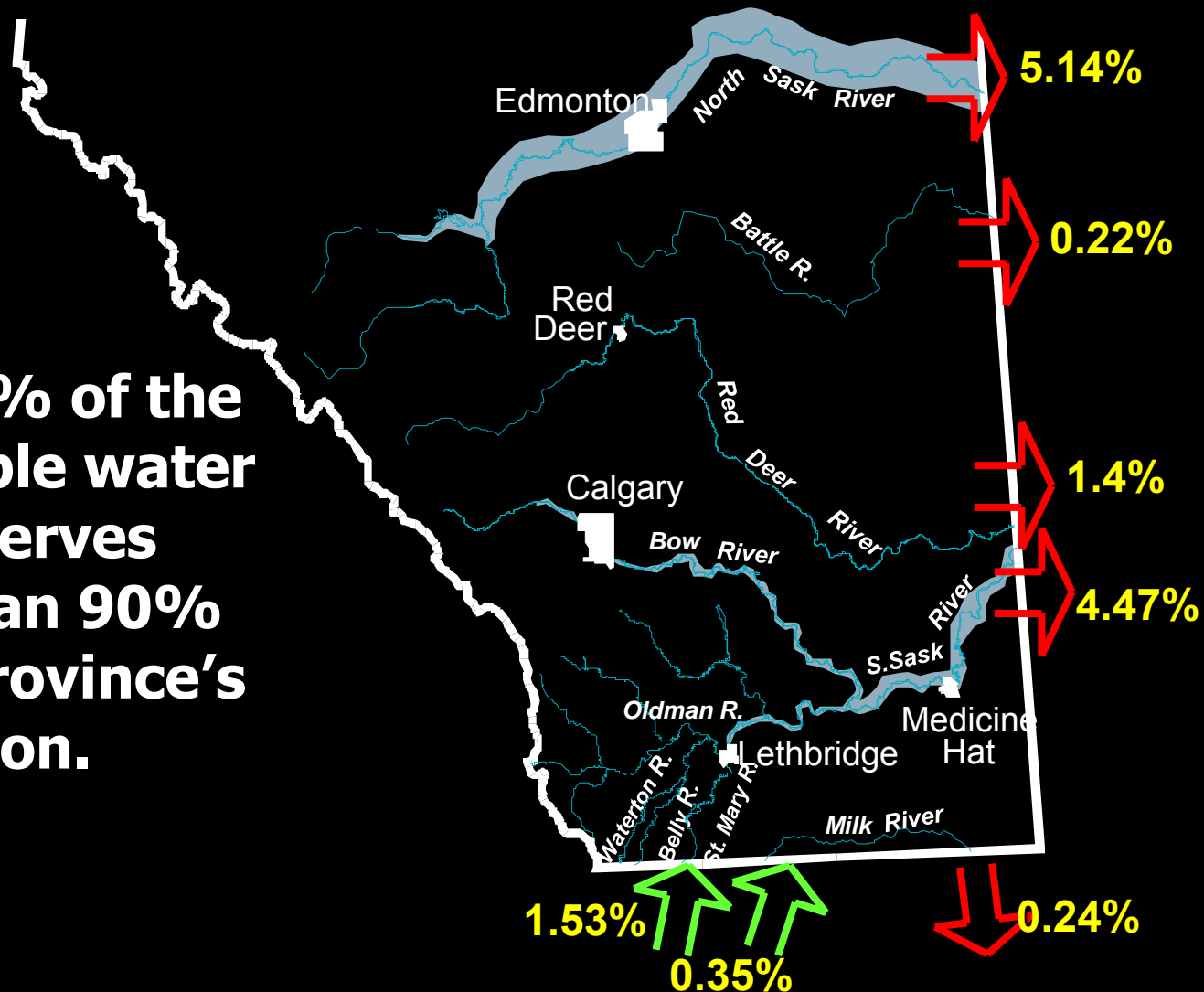
- ❑ **As a province, Alberta has an abundant supply of water.**

Alberta's Water Supply

- ❑ **Alberta has an abundant supply of water.**
- ❑ **However, water supplies aren't always in the right place, and at the right time.**

Mean Annual River Discharges

Only 10% of the renewable water supply serves more than 90% of the province's population.



Water For Life Strategy

Outcome – Safe drinking water for all Albertans.

- ❑ About 500,000 Albertans depend on un-regulated drinking water.**
 - ❑ Groundwater wells**
 - ❑ Streams and rivers**
 - ❑ Farm dugouts.**

Water Availability

Many areas of the province are chronically short of water.

