

Environmentally Sustainable Livestock Development



Irrigation and the Environment Workshop
"Challenges and Opportunities"
March 22 - 23, 2006
Saskatoon, Saskatchewan

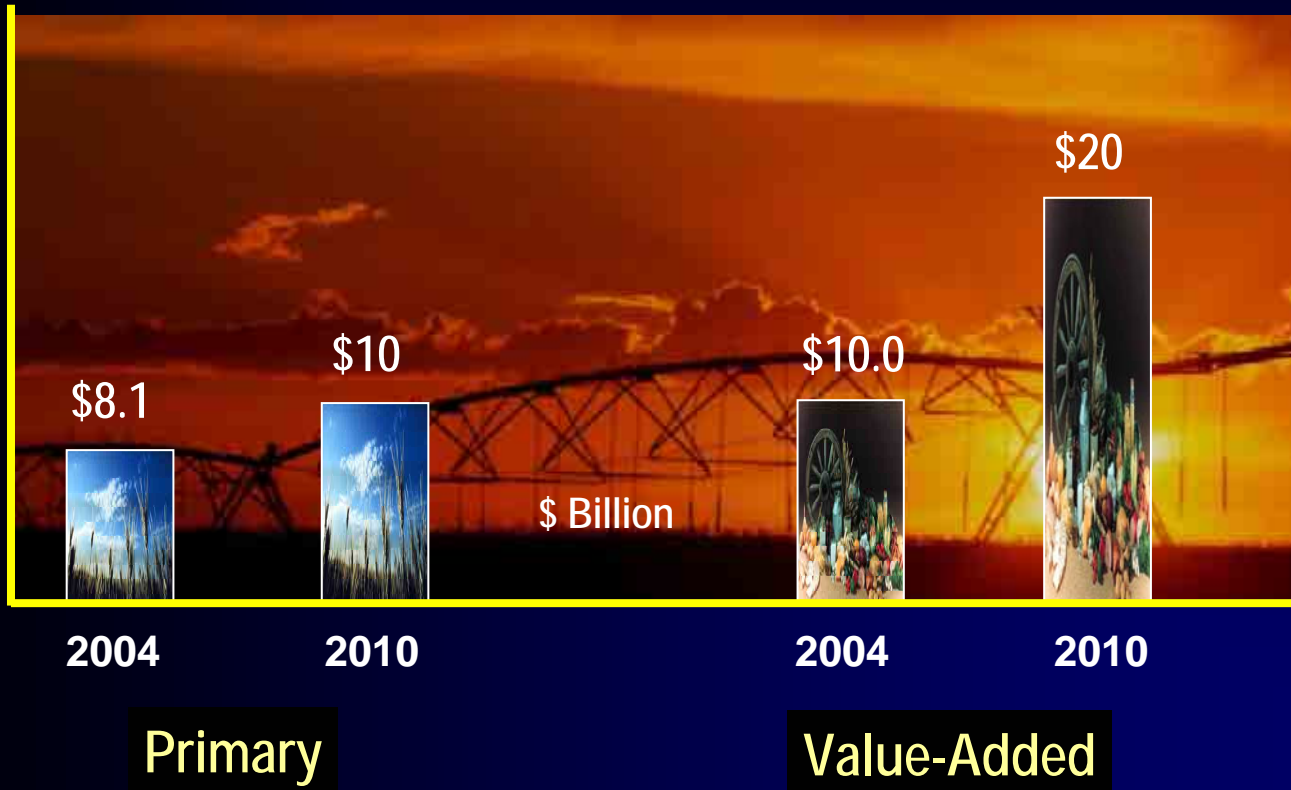


Statistics

Population	3.0 Million
Ag. Land Base	20 Million ha
Irrigation	0.6 Million ha
Farms	53,000
Cattle	6.6 Million
Feedlots	4,500
Capacity	1 Million
Hogs	~2 Million

The white areas on this map denote Alberta's main agricultural regions.

Agricultural Growth Opportunities





Alberta's Potential



- ❑ An important competitive edge for Alberta is the world's acceptance that:
 - Our food is safe and of high quality;
 - Our air, water and soil are clean.
- ❑ If that changes, Alberta stands to lose market share and export opportunities.

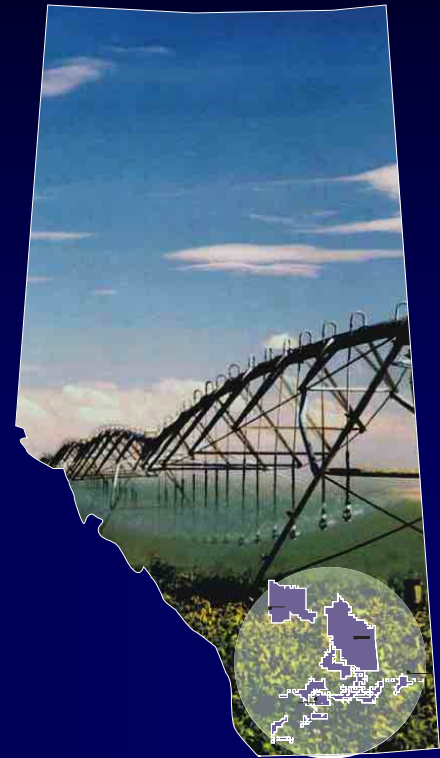


Water Quality in Alberta

-  Excess nutrients and bacteria are entering our surface and ground water resources as a result of agricultural management practices.
-  Nitrogen and Phosphorus are the nutrients of greatest concern.

Irrigation in Alberta

- About 640,000 ha of land is irrigated in both organized districts and private schemes.
- This represents the most intensive agricultural management in the province.

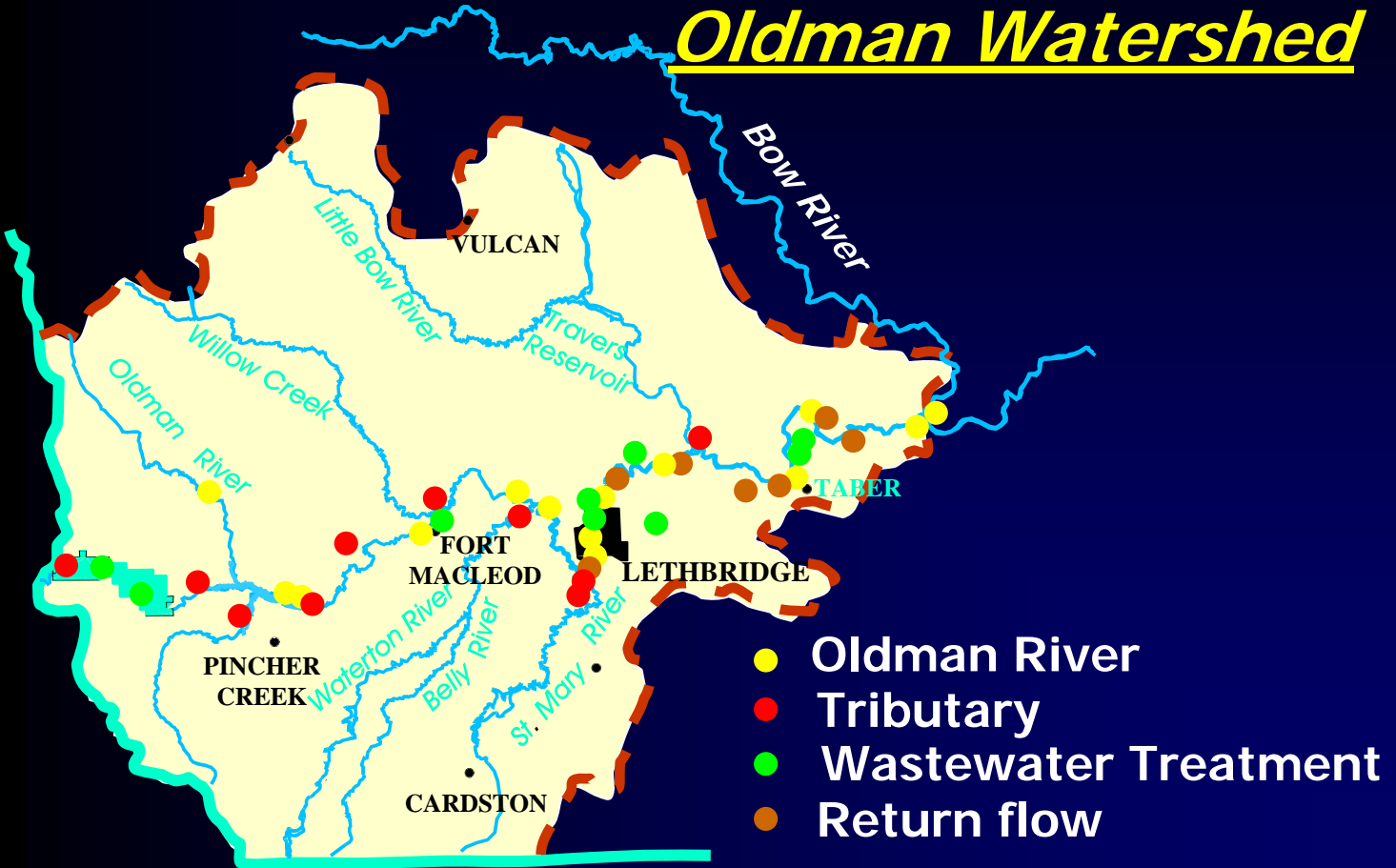


How does agriculture relate to other sources of water quality degradation?

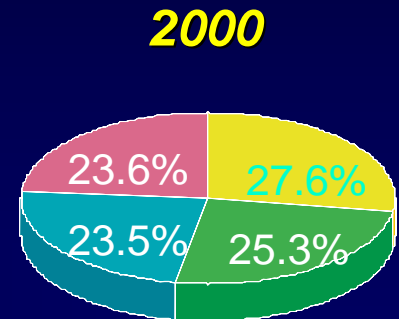
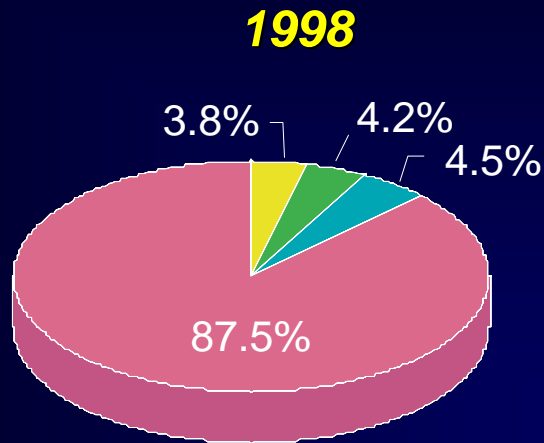
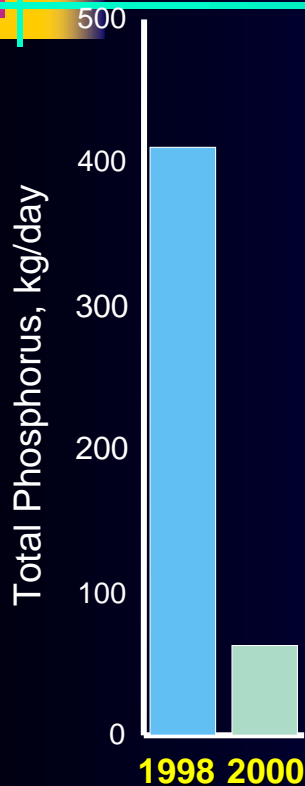


Water Quality Monitoring

Oldman Watershed

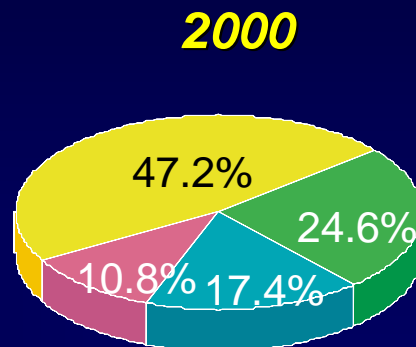
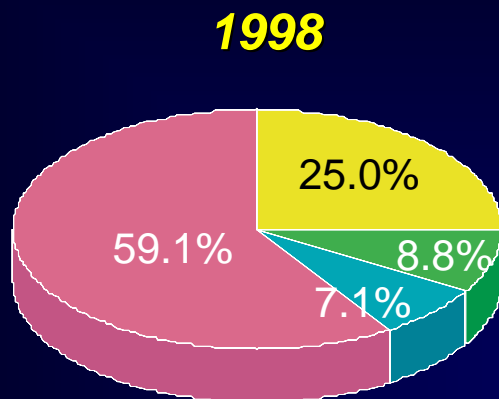
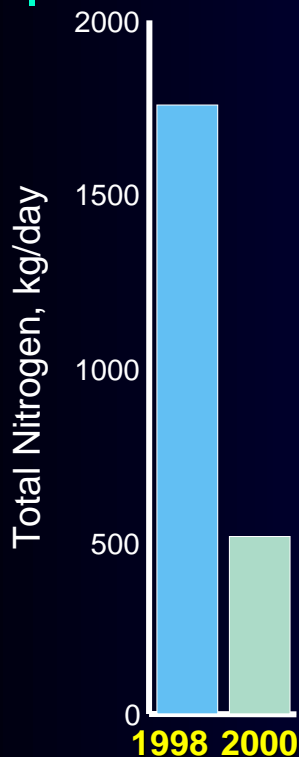


Sources of Total Phosphorus in the Oldman River



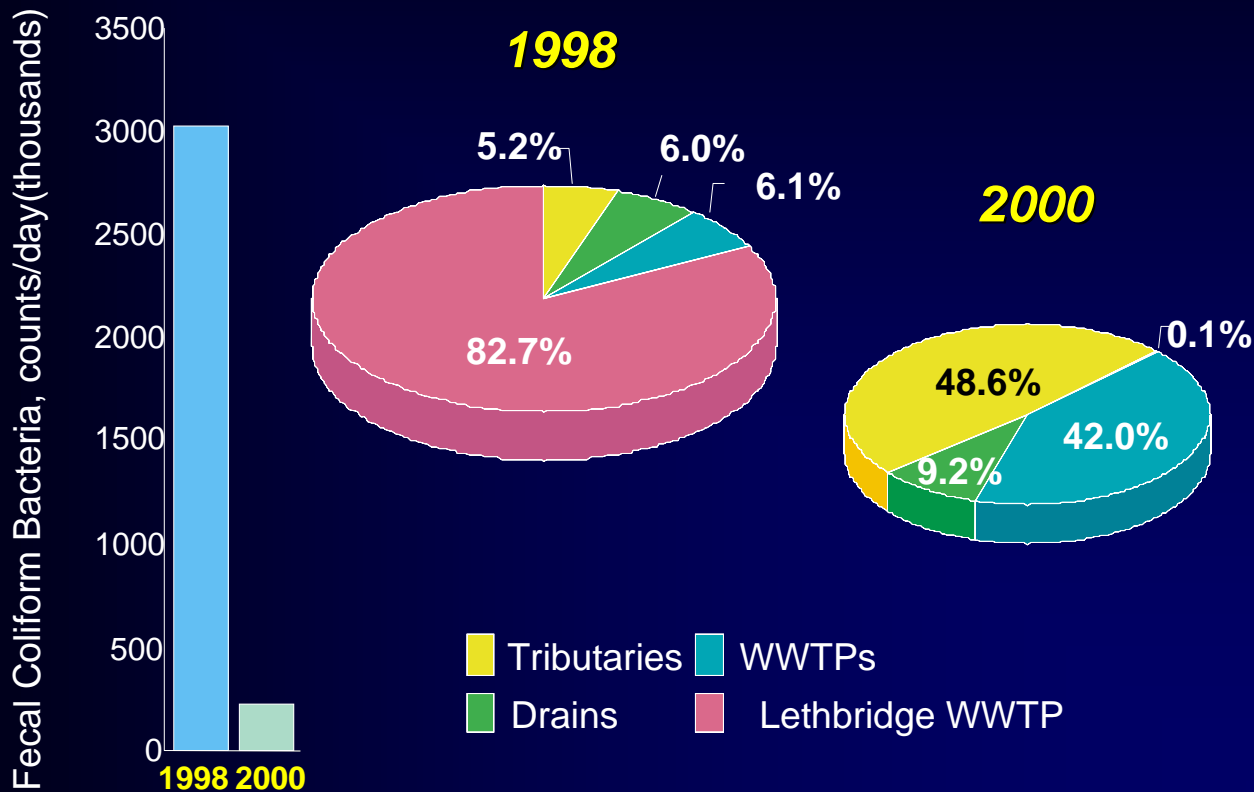
Tributaries WWTPs
Drains Lethbridge WWTP

Sources of Total Nitrogen in the Oldman River



■ Tributaries ■ WWTPs
■ Drains ■ Lethbridge WWTP

Sources of Fecal Coliform Bacteria in the Oldman River



Livestock manure is considered to be the main agricultural contributor to water quality degradation.





Nutrient Losses

- Until recently, Nitrogen was considered to be the most important nutrient to consider.
 - Highly mobile.
 - Potential to affect both surface and groundwater.
 - Major constituent in fertilizer applications.
- We now recognize that Phosphorus is the key nutrient to manage, particularly for manure.

Agricultural Operation Practices Act

Came into effect on January 1, 2002.

The focus is on confined livestock feeding operations.

Soil Nitrogen limits are part of this regulation.

Phosphorus is not included at present.



Province of Alberta

AGRICULTURAL OPERATION PRACTICES ACT

Revised Statutes of Alberta 2000, Chapter A-7

With amendments in force as of January 1, 2002

AGRICULTURAL OPERATIONS, PART 2 MATTERS REGULATION

Alberta Regulation 257/2001

BOARD ADMINISTRATIVE PROCEDURES REGULATION

Alberta Regulation 268/2001

STANDARDS AND ADMINISTRATION REGULATION

Alberta Regulation 267/2001

Office Consolidation

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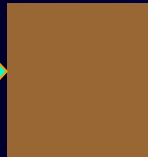
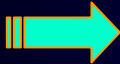
Alberta Phosphorus Study

- 1. Develop soil phosphorus limits for all agricultural lands in Alberta.**
- 2. Determine the economic implications on industry of implementing soil phosphorus limits.**
- 3. Identify phosphorus management options for producers.**

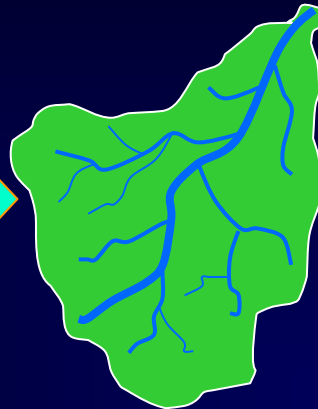
Development of P Limits



Lab



Field



Watershed



Province

Phase 1
(1999-2002)

Phase 2
(2002 – 2006)

*Complete final report by
April, 2006.*

Micro-Watershed Study Sites

8 Sites

- **Non-Manure**

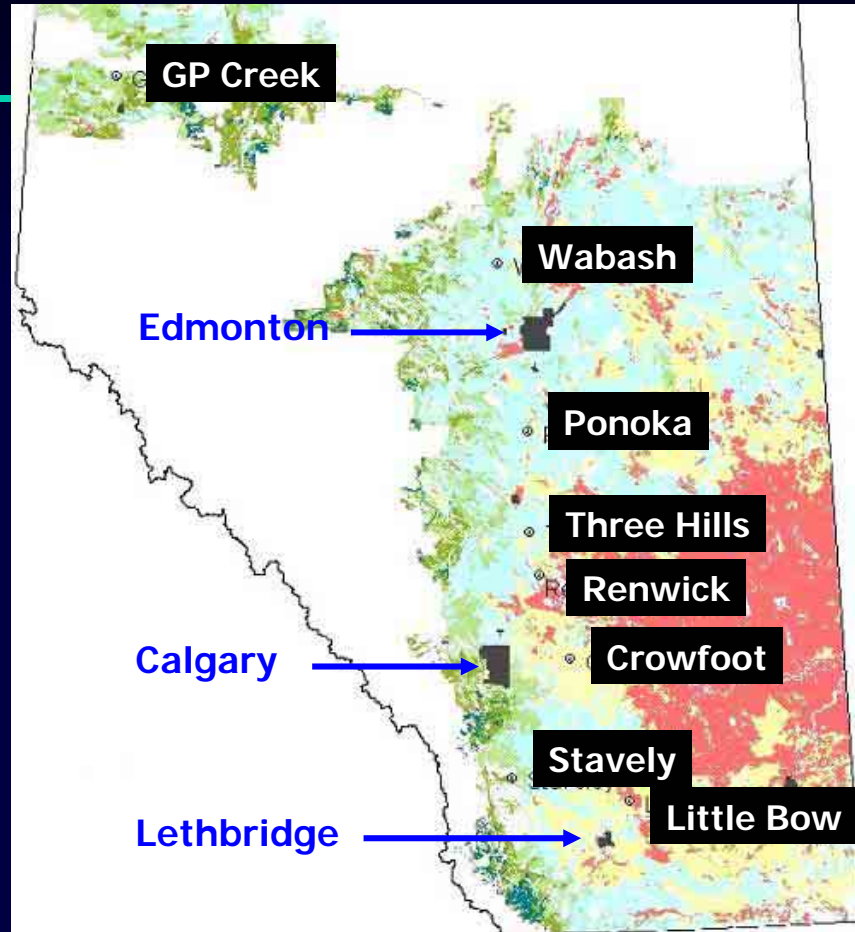
- GP Creek
- Wabash
- Three Hills
- Renwick
- Crowfoot

- **Manure**

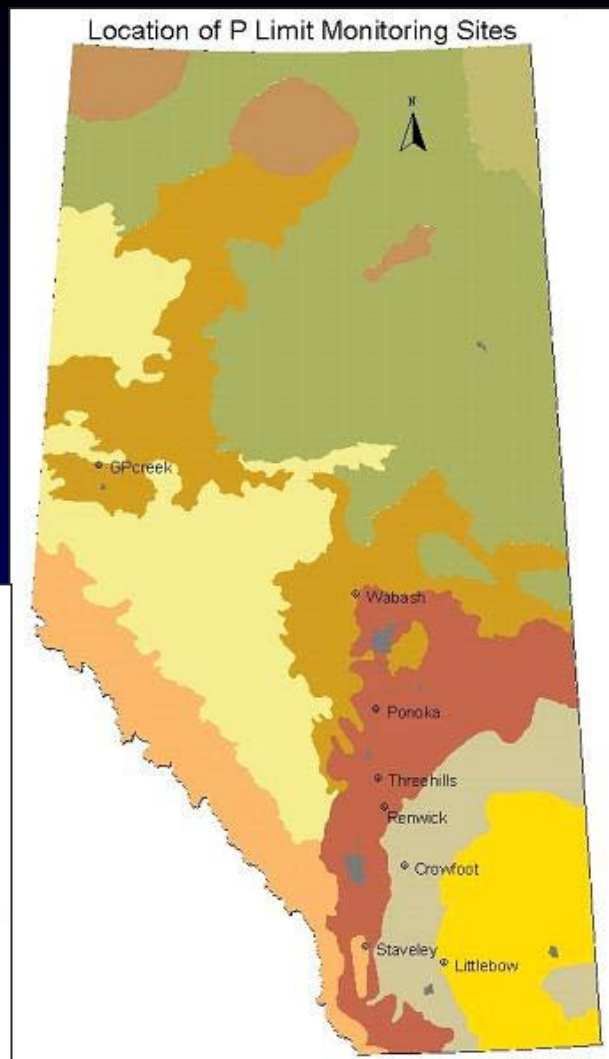
- Ponoka
- Little Bow

- **Control**

- Stavelly



Location of Micro-Watershed Sites in Relation to Alberta's Major Soil Types



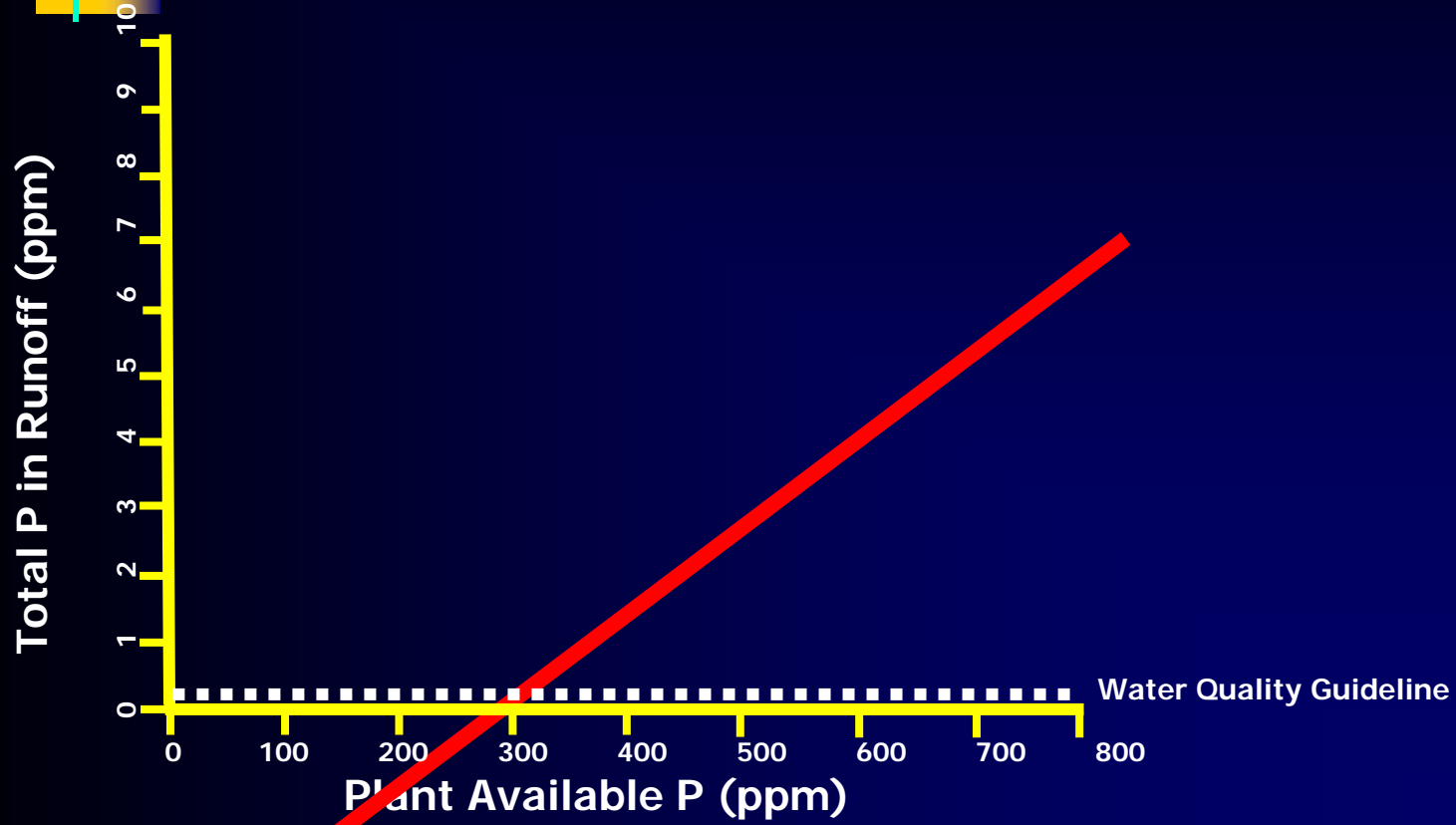
Micro-Watershed Monitoring



Each Site

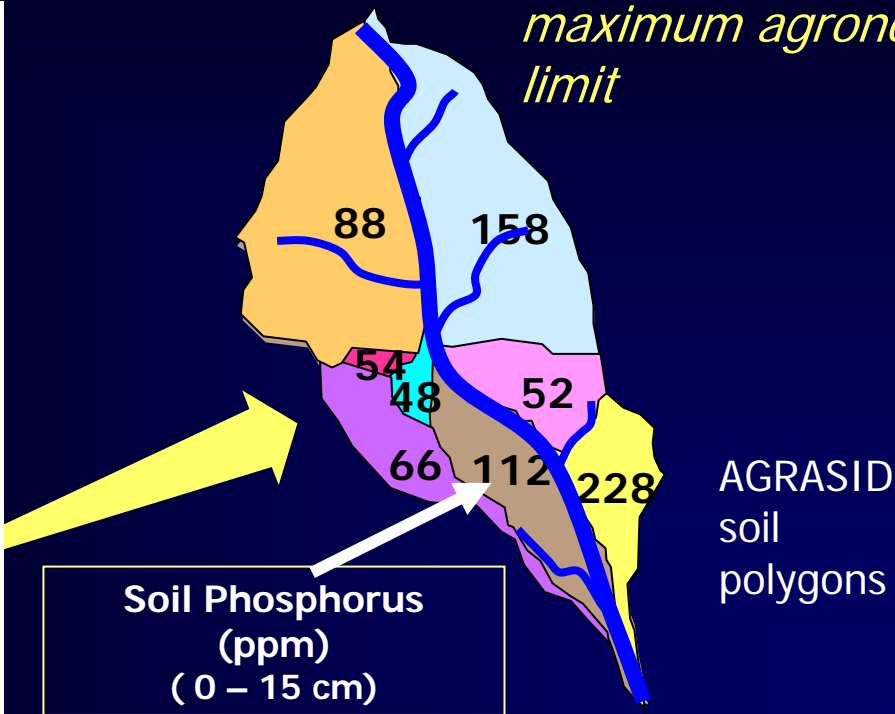
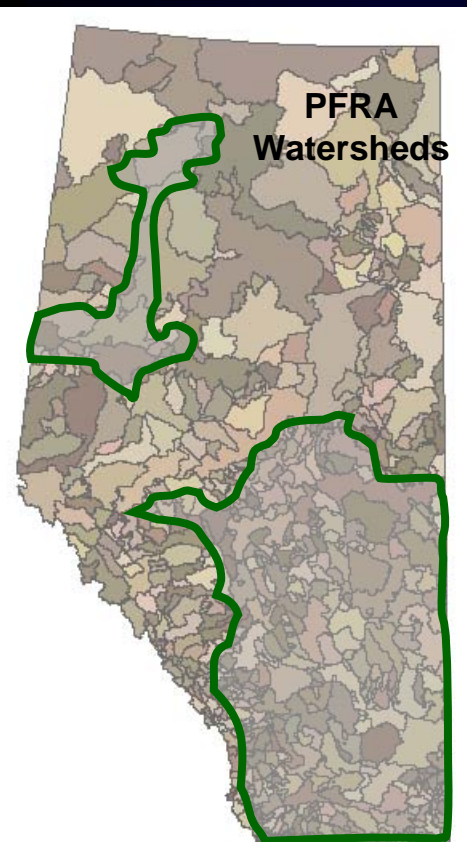
- Circular flumes
- Rain gauges
- ISCO water samplers
- Cellular/satellite communication
- Sampling alarms

Relationships of Phosphorus in Soil and Runoff



Setting Soil Phosphorus Limits

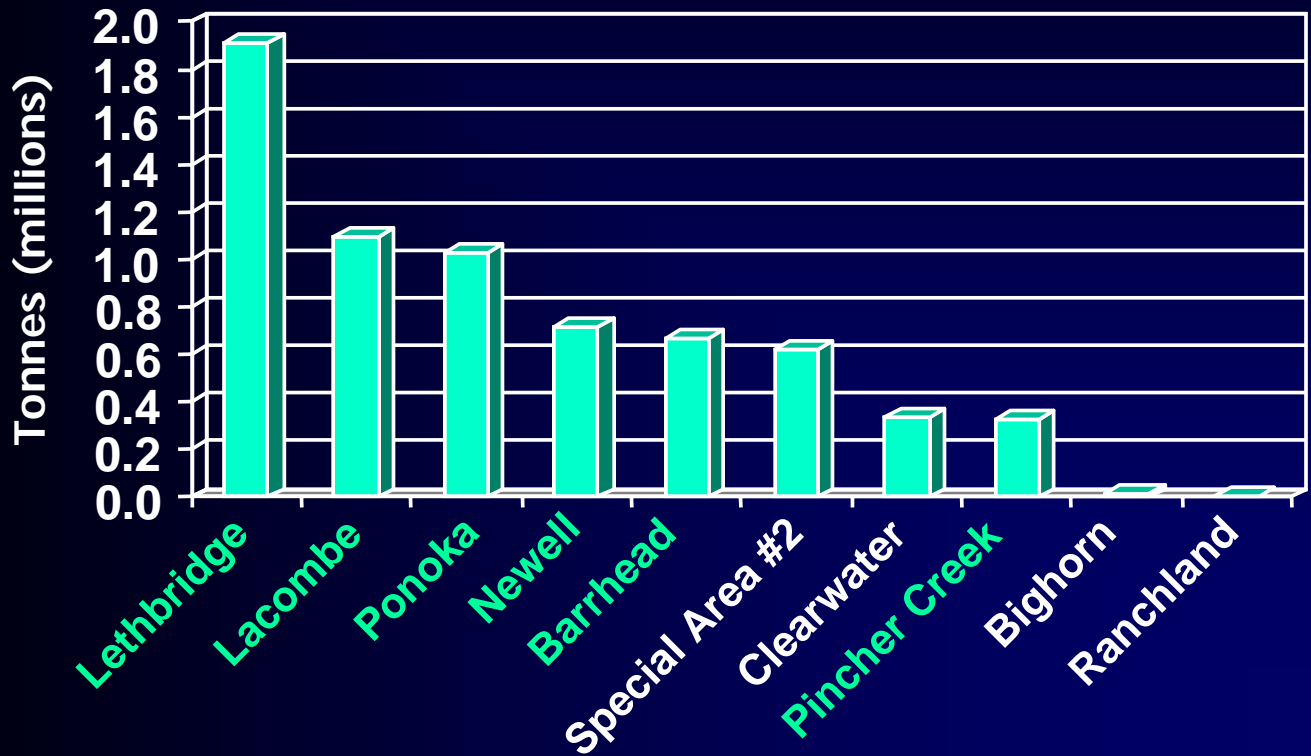
60 ppm P in the soil is considered to be the maximum agronomic limit



AGRASID - Agricultural Region of Alberta Soil Inventory Database

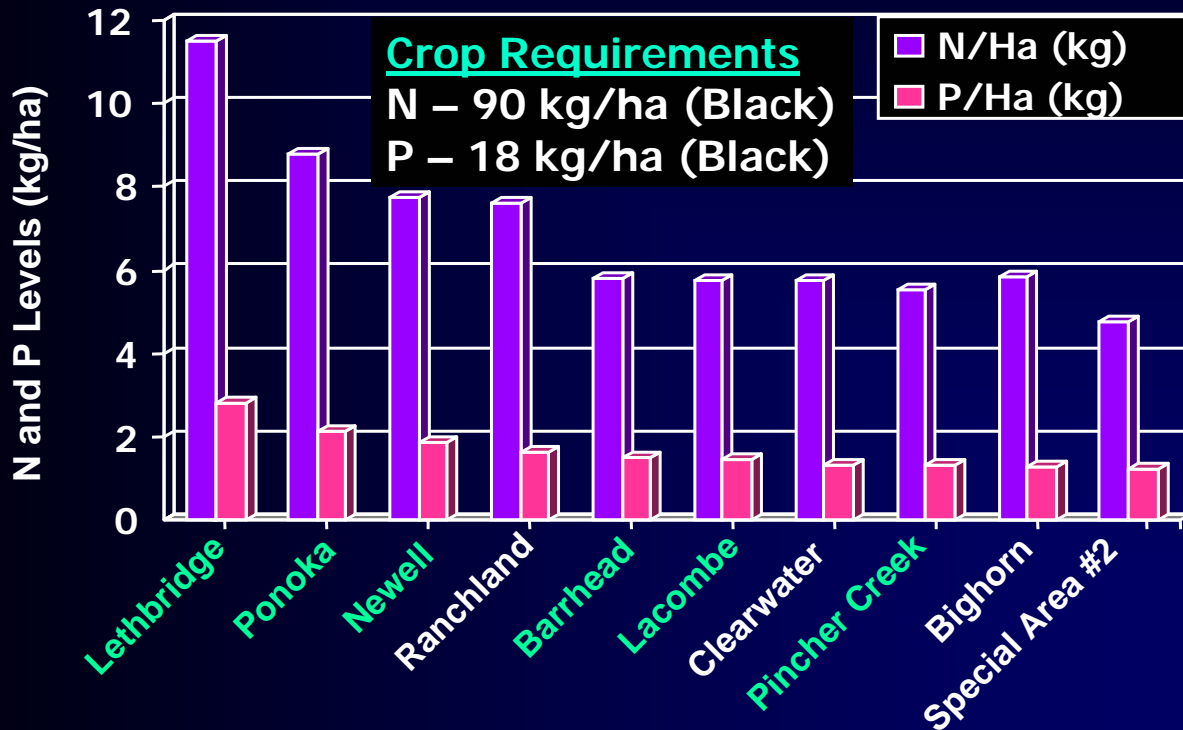
Manure Management

Manure Production (Selected Alberta Counties)



Nitrogen and Phosphorus Levels From Manure in the 10 Top Manure Producing Counties

(per cropped hectare)





Manure Management

- ❑ The main issue is transportation.
- ❑ Alberta has millions of hectares of land that would benefit significantly from manure.
- ❑ The use of manure would reduce the amount of commercial fertilizer imported into Alberta every year.



Additional Costs

- Transportation and spreading costs could increase by 23% to 127%.
- Transportation costs will be highest in areas where CFO intensities are greatest (e.g. Picture Butte).
- Willingness of crop producers to accept manure, and pay for it will impact overall costs.

What We Don't Know

- ❑ On-farm management practices that will most effectively and most economically reduce nutrient losses from agricultural fields.
- ❑ Manure spreading equipment that will allow us to spread beef manure at rates that are closer to crop Phosphorus requirements.









Proposed Soil P Thresholds for Regulating Livestock Manure Application on Cropland in Manitoba

Soil P Threshold	Intent of Threshold	Manure P Application
<60 ppm (120 lbs/ac.)	No restriction on P application	Apply on the basis of crop Nitrogen requirements.
60 - 119 ppm (120 – 238 lbs/ac.)	Control soil P accumulation rate	Apply P up to 2 times the crop removal rate
120 - 179 ppm (240 – 358 lbs/ac.)	Prevent further increases in soil P concentrations	Apply P up to 1 times the crop removal rate
>180 ppm (360 lbs/ac.)	Depletion at a rate controlled by crop removal	No manure application without written consent of the Director

Recommendations

-  Phosphorus legislation should not be introduced in Alberta until further research and demonstration is completed.
-  Industry and government should continue to work together to increase producer education and awareness related to on-farm nutrient management.
-  Incentive programs should be considered to assist producers move towards more sustainable nutrient manure management.
-  Beneficial management practices should be implemented and tested at a watershed scale in cooperation with producers.



Next Steps

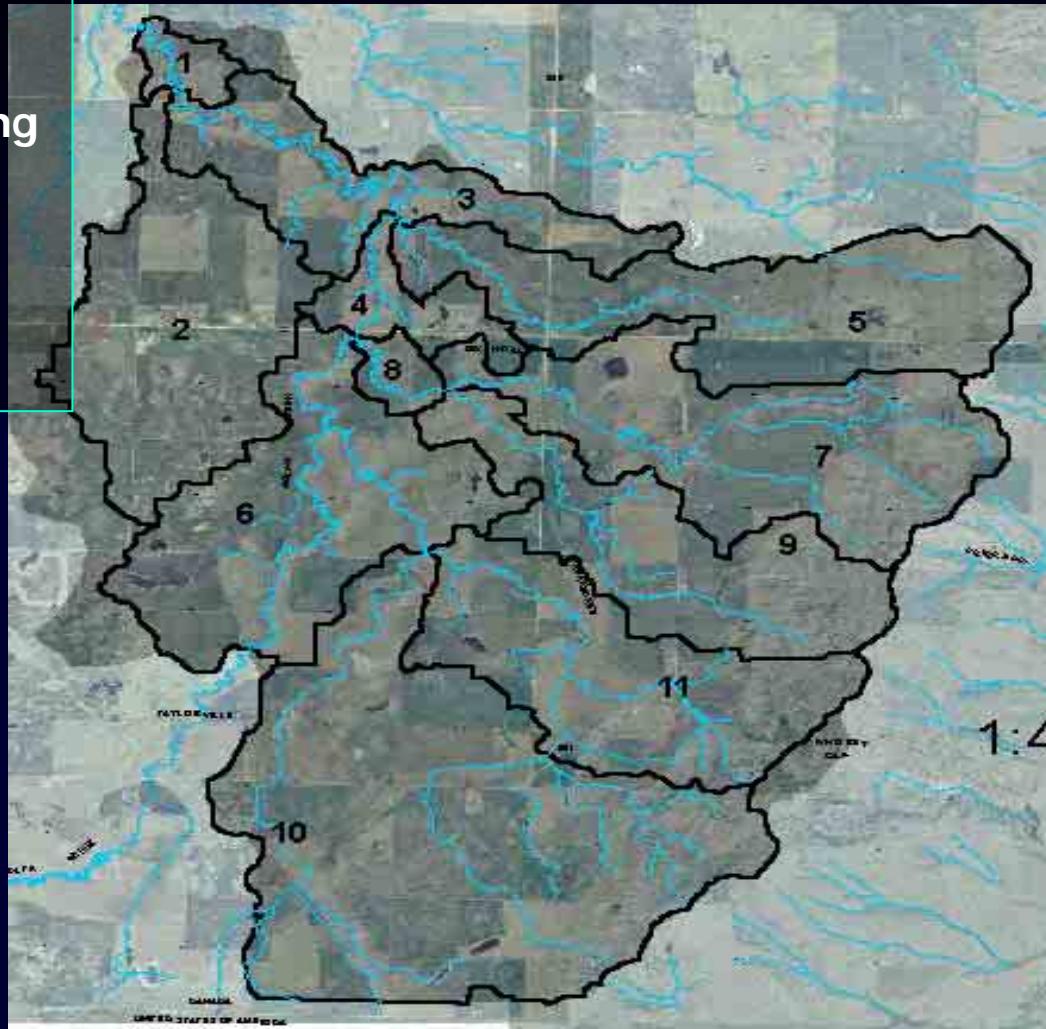
Alberta Agriculture is initiating a study to assess the effectiveness of Beneficial Management Practices (BMPs).

- Costs and benefits to producers.
- Economic feasibility.
- Practicality.
- Impact on water quality.

BMP Evaluation Study

- 5-10 year study.
- Work in small agricultural watersheds
 - 1 in Central Alberta
 - 1 in Southern Alberta
- Work directly with producers.
- Share the cost of BMPs with the producers.
- Monitor and evaluate the BMPs.
- Demonstrate the results to other producers.

- 10,000 acres
- 15-20 producers
- Mixed farming
 - Cow-calf
 - Intensive Feeding
 - Hogs
 - Cattle
 - Cereals
 - Irrigation and Dryland



Water Quality Monitoring

Manure Spreading



Wintering Sites



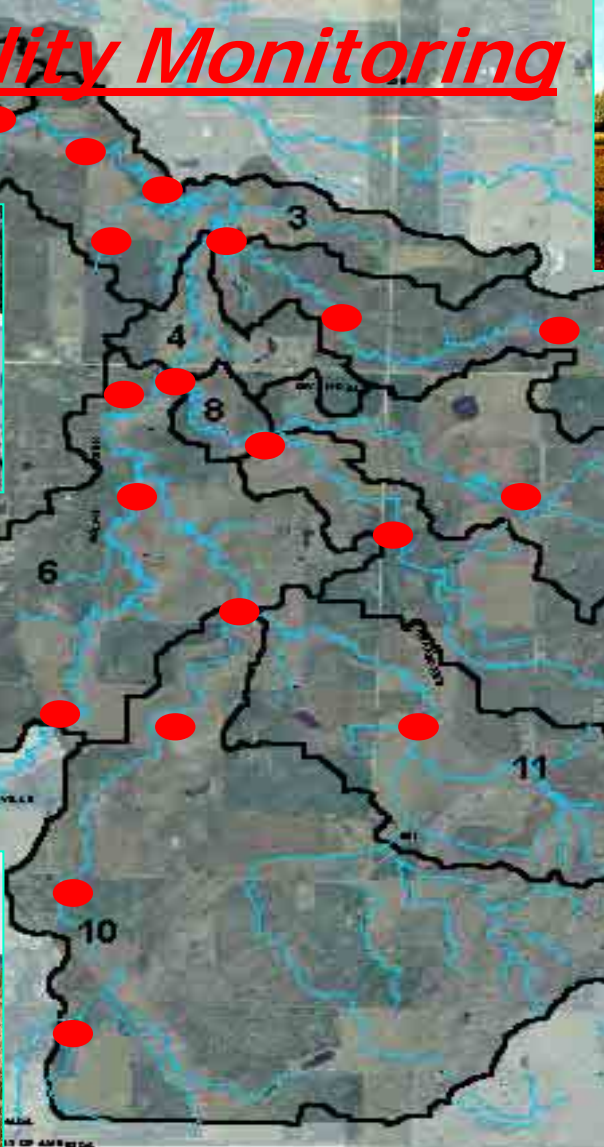
Riparian Management



Off-Stream Watering



Composting



*Livestock
Feeding
Strategies
to Reduce
Nutrients in
Manure*










Nutrition Management

- Research shows that reducing the Phosphorus content in manure by 50% is possible.
- Significantly reduces the amount of land required to spread manure.
- Results in major cost savings for producers, and mitigation of water quality impacts.



Conclusions

-  Better management of nutrients will result in a significant reduction of agriculture's impact on surface and groundwater quality.
-  This will require fundamental changes in the way farmers manage their livestock and manure.
-  These changes will not happen overnight.
-  Education and awareness, not legislation, is the best way to achieve long-term success.
-  The agriculture industry and government must work together to implement and test Beneficial Management Practices to assess their:
 - ☐ Practicality;
 - ☐ Technological requirements;
 - ☐ Economic viability; and
 - ☐ Environmental impact.