

# **Developing a Method using Potash to Control Mussels in Irrigation Pipelines**

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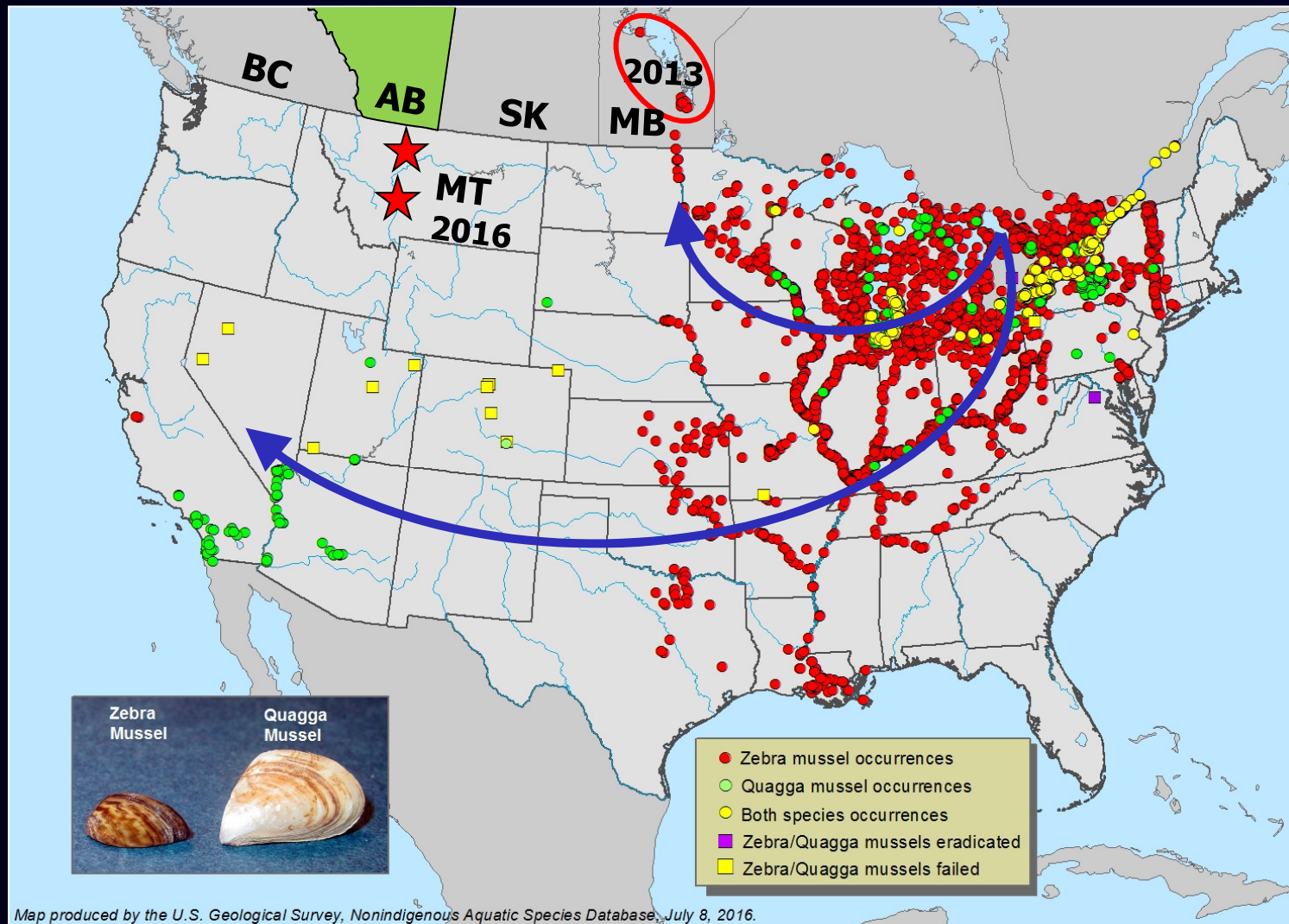
**Ivan Friesen**  
Eastern Irrigation District

**Invasive Mussel Collaborative  
Webinar  
March 6, 2017**



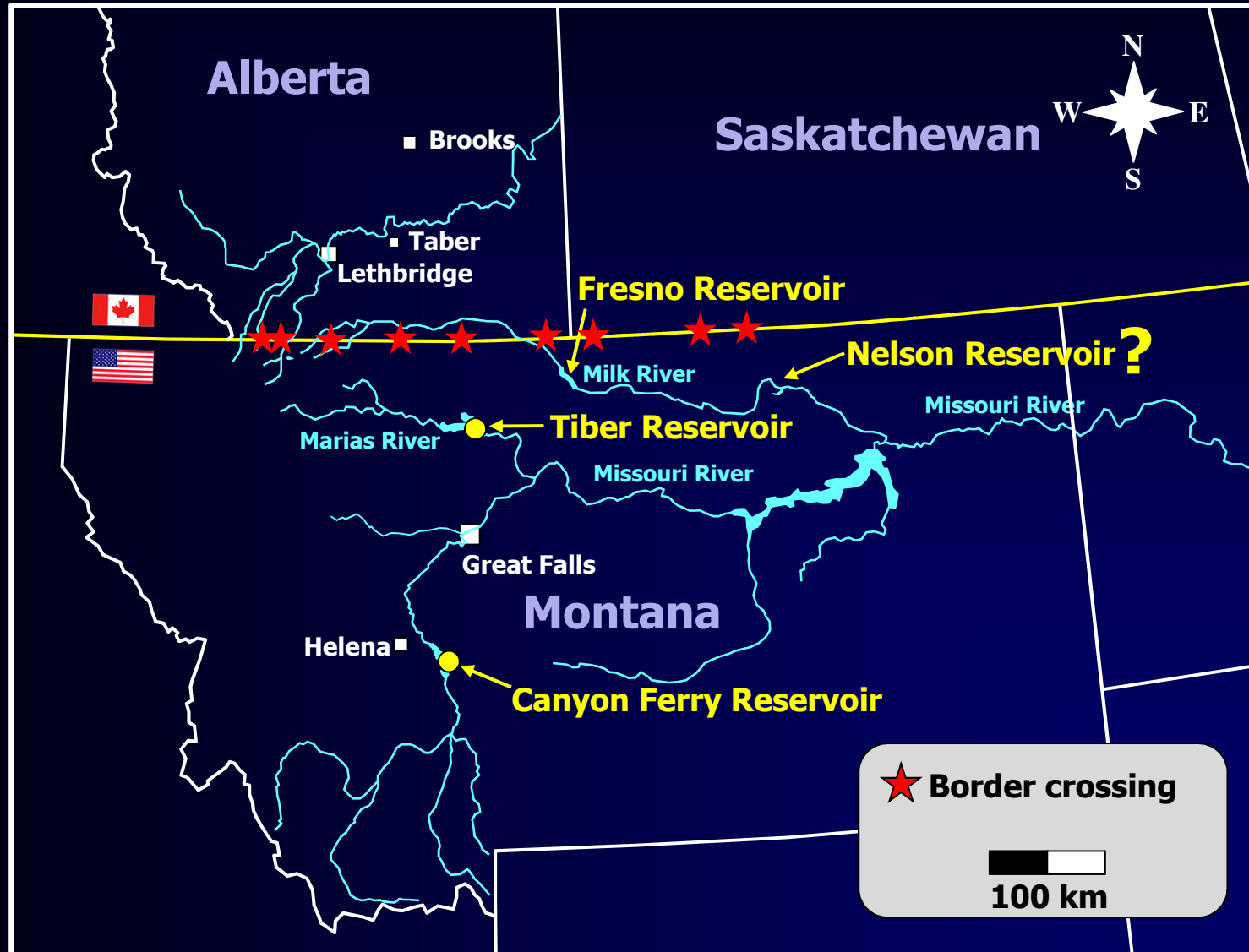


## *March of the mussels — 1986 to 2016*



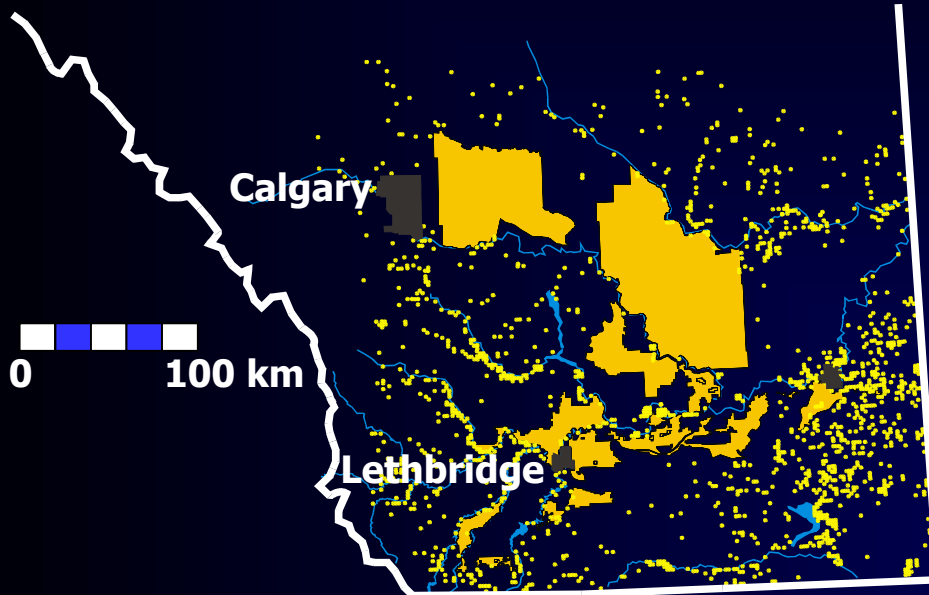


# *Invasive mussels in Montana*





## ***Southern Alberta is irrigation***



### **Infrastructure:**

**Valued at \$3.6 billion**

**51 reservoirs**

**3700 km canals**

**4300 km pipelines**

**Control structures**

**Pumping stations**

**13 irrigation districts**

### **Supports:**

**Irrigated land (700,100 ha)**

**Livestock**

**Communities/municipalities**

**Wetlands (32,000 ha)**

**Parks and recreation**





***But what if they come?***



## ***Chemical control possibilities***

- Chlorine
- Chlorine dioxide
- Chloramines
- Ozone
- Bromine
- Hydrogen peroxide
- Potassium permanganate
- Ferrate
- Ammonium nitrate
- Bacteria-based molluscicide (Zequanox)
- BioBullets
- Copper ions (Bluestone)
- Potassium salts
- Sodium metabisulfite
- Flocculation
- Salinity
- pH adjustment

**There are no chemicals currently registered  
for use in Canada**

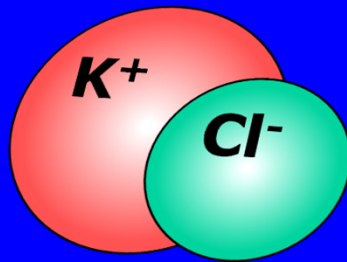


***But what if they come?***



## ***Chemical control possibilities***

- **Potassium chloride (potash)**

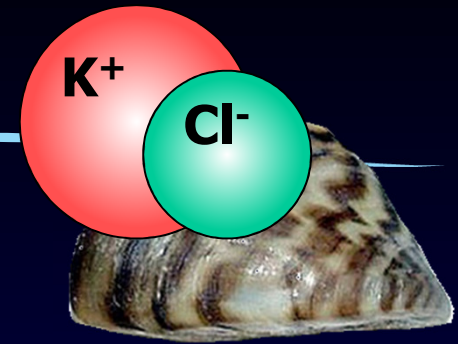


- **Potassium permanganate**
- **Ferrate**
- **Ammonium nitrate**
- **Bacteria-based molluscicide (Zequanox)**
- **BioBullets**
- **Copper ions (Bluestone)**
- **Potassium salts**
- **Sodium metabisulfite**
- **Flocculation**
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- **pH adjustment**

**There are no chemicals currently registered for use in Canada**



## ***Why potash?***



- **Anesthetic**
- **Potassium ion interferes with gill respiration**
- **Naturally occurring**
- **Essential nutrient for plant and animals**
- **Available locally in large quantities**
- **Easily purchased**
- **Used as an agricultural fertilizer**





## ***Registration of potash for mussel control***

- **Alberta Environment and Parks (lead)**

- **Alberta Agriculture and Forestry**

- **Alberta Innovates**



- **Agrium Inc.**



- **Pesticide Management Regulatory Agency  
(Health Canada)**



- **Pre-submission (2015–2016)**

- **Full registration application (2017)**





## ***Potash as a treatment method research in irrigation infrastructure***

### **Objectives**

- **Develop and test potash preparation methods.**
- ➡ ● **Develop and test pipeline injection equipment and methods.**
- ➡ ● **Assess the effects of irrigating potash-treated water on **soil** and crop health.**
- **Confirm the economic costs and considerations for treating Alberta's irrigation systems with potash.**





## ***Research partners***

- **Alberta Agriculture and Forestry**
- ***Growing Forward 2***
- **Alberta Innovates**
- **Irrigation Districts / Eastern Irrigation District**
- **Alberta Irrigation Projects Association**
- **Alberta Environment and Parks**



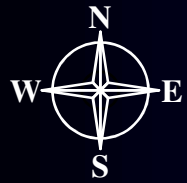
## ***2016 Field research studies***

- **Pipeline Field Trial**
  - One test in the EID
- **Small-plot Study**
  - Alberta Agriculture and Forestry  
Irrigation Technology Centre





## *Pipeline field trial*



**Eastern Irrigation District**

**Canal**

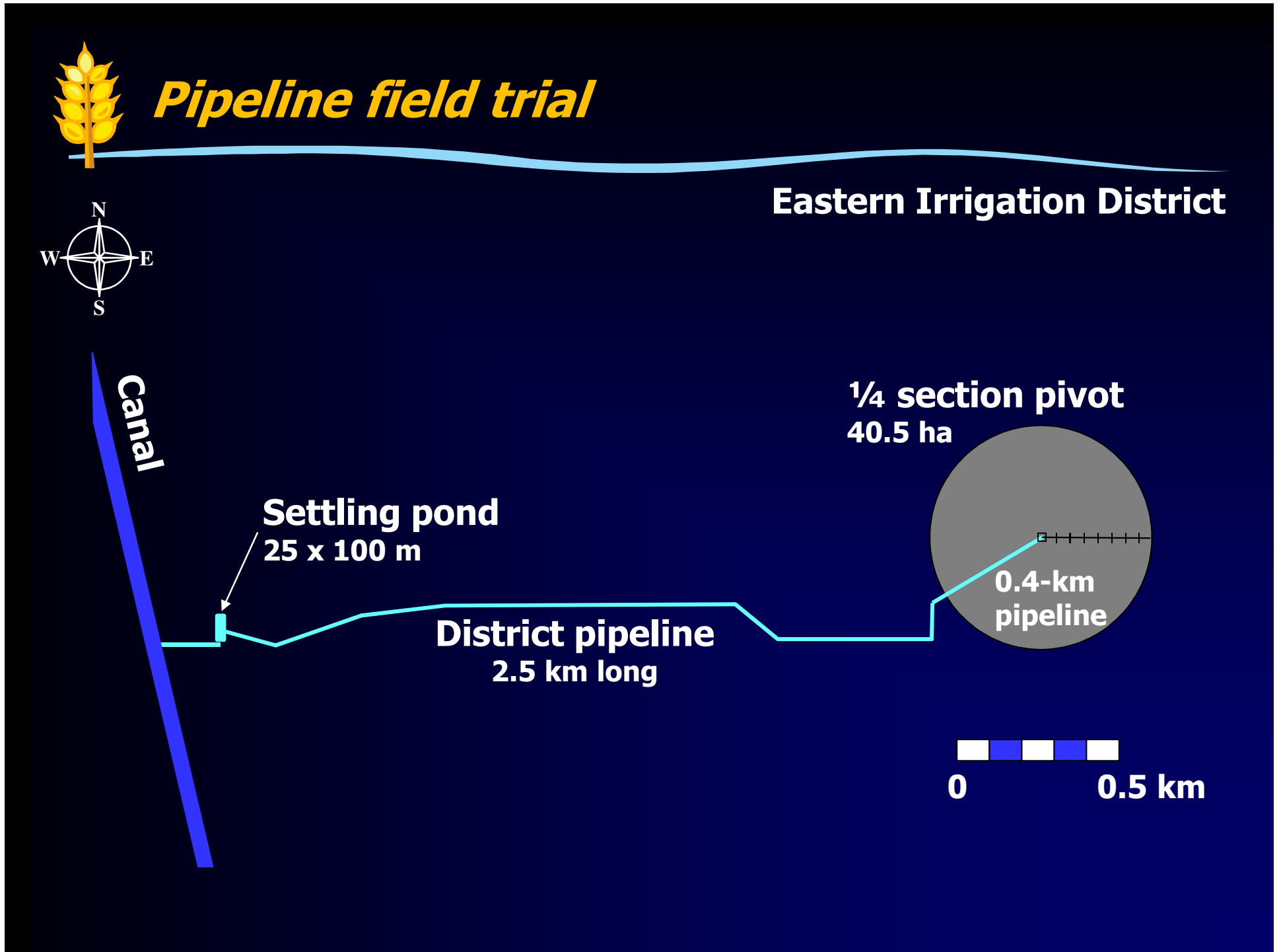
**Settling pond**  
25 x 100 m

**District pipeline**  
2.5 km long

**1/4 section pivot**  
40.5 ha

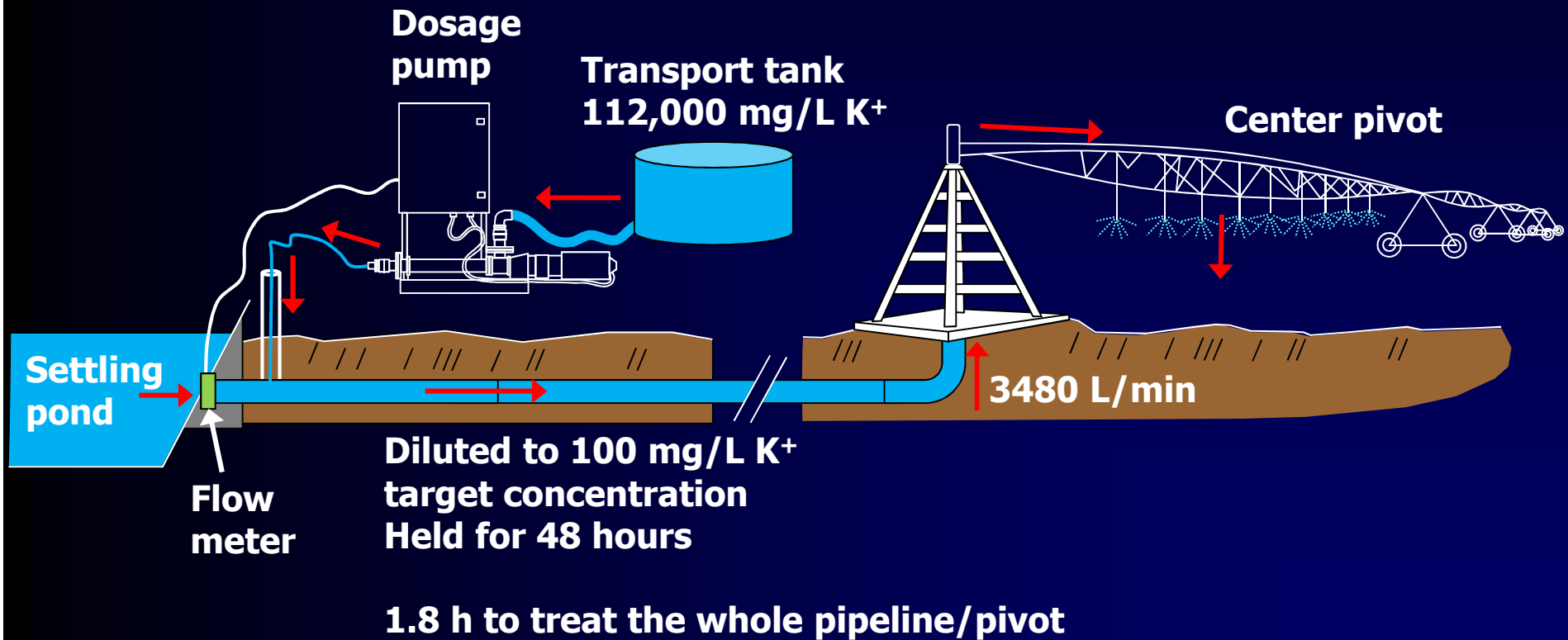
**0.4-km  
pipeline**

0 0.5 km





## *Pipeline treatment concept*

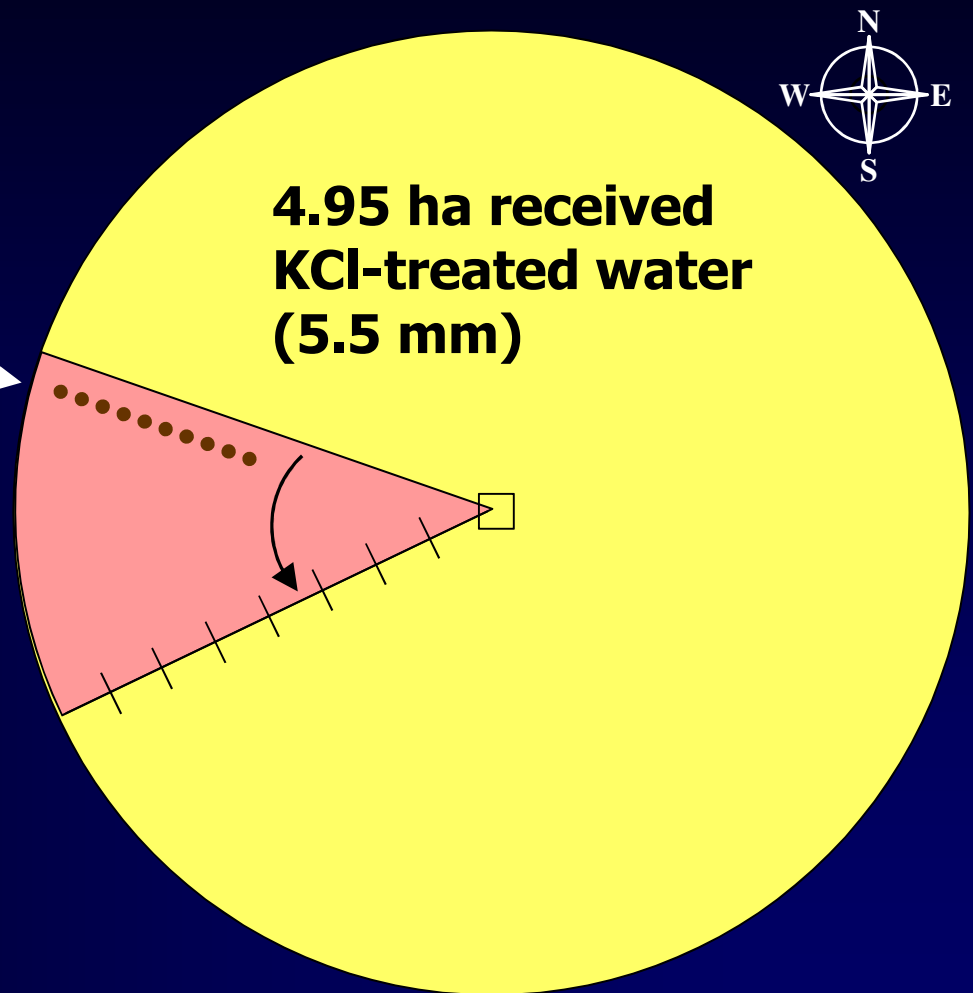




## ***Soil sampling***

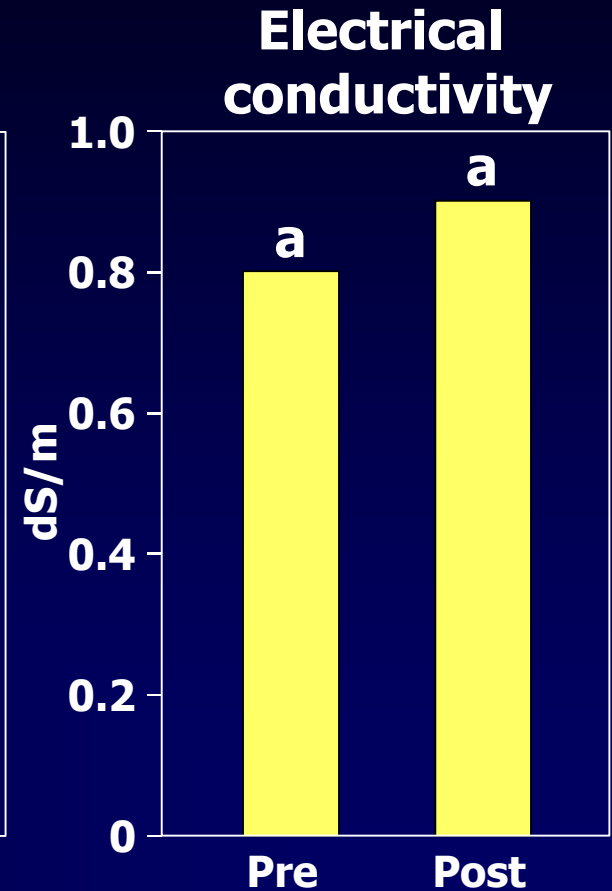
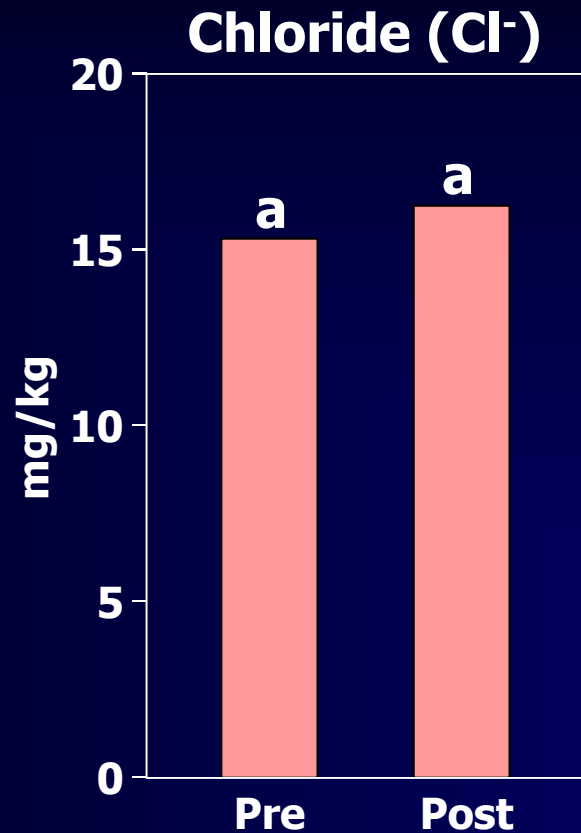
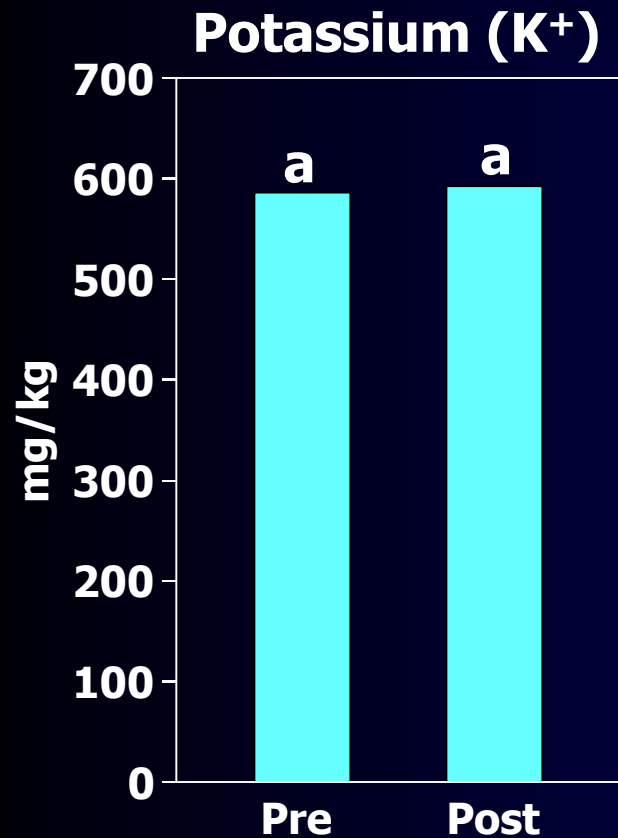


**0–15 cm**





## *Soil chemistry (0 to 15 cm)*







## ***Pipeline trial summary***

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**74 kg KCl was used in the treatment**  
**39 kg K<sup>+</sup>**

**Irrigated amount: 5.5 mm**

**7.9 kg/ha K<sup>+</sup>**

**Canola (2 tonne/ha) will remove 17 kg/ha K<sup>+</sup>**

**65 tonne/ha beef manure (700 kg/ha K<sup>+</sup>)**



## ***Small-plot study***

- **Three Treatments**

**0 mg/L**

**100 mg/L**

**500 mg/L**

- **Four replicates**

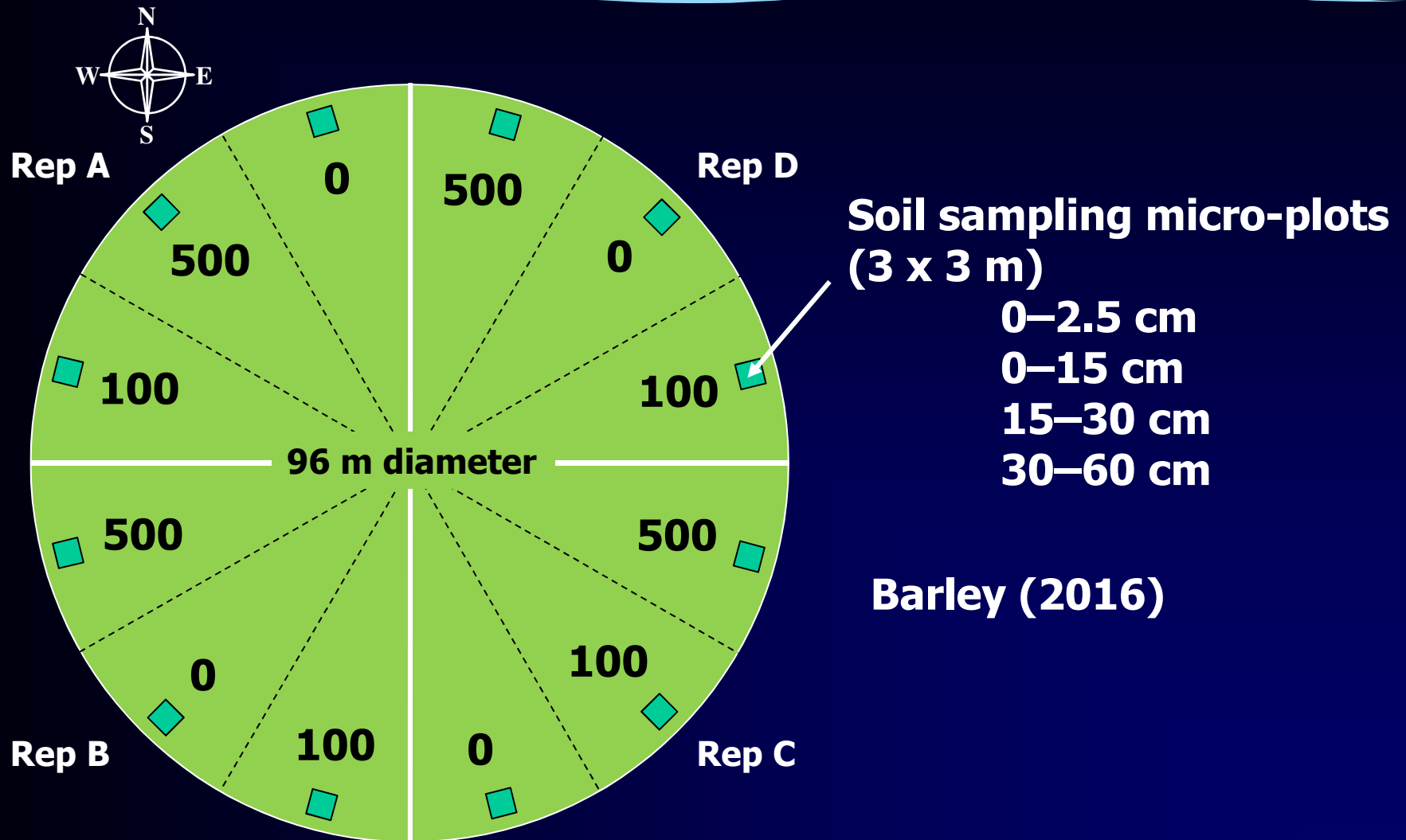
- **Treatments were applied three times in 2016**

**15 mm irrigation rate**





## ***Plot layout***





## ***Application rates***

**100 mg/L K<sup>+</sup> applied 3 times (15 mm)**

**45 kg/ha K<sup>+</sup>**

**500 mg/L K<sup>+</sup> applied 3 times (15 mm)**

**225 kg/ha K<sup>+</sup>**





## ***After three applications***

### **100 mg/L K<sup>+</sup> treatment:**

**K<sup>+</sup>, Cl<sup>-</sup>, and EC increased in surface soil, but not significantly**

### **500 mg/L K<sup>+</sup> treatment:**

**K<sup>+</sup> increased in surface soil, but not significantly**

**Cl<sup>-</sup> and EC significantly increased in the surface soil**

**Cl<sup>-</sup> leached into the soil**





## ***Future work— 2017***

### **Potash Preparation**

- Continue to modify methods

### **Pipeline Field Trials**

- Test more complex pipelines (four systems)
- Use a new pump and flow-meter system
- Soil chemistry and crop quality

### **Small-plot Study**

- Repeated applications all season
- Soil chemistry
- Crop yield and quality

### **Economic Assessment**

- Began contract work in spring 2017







*Thank you*

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