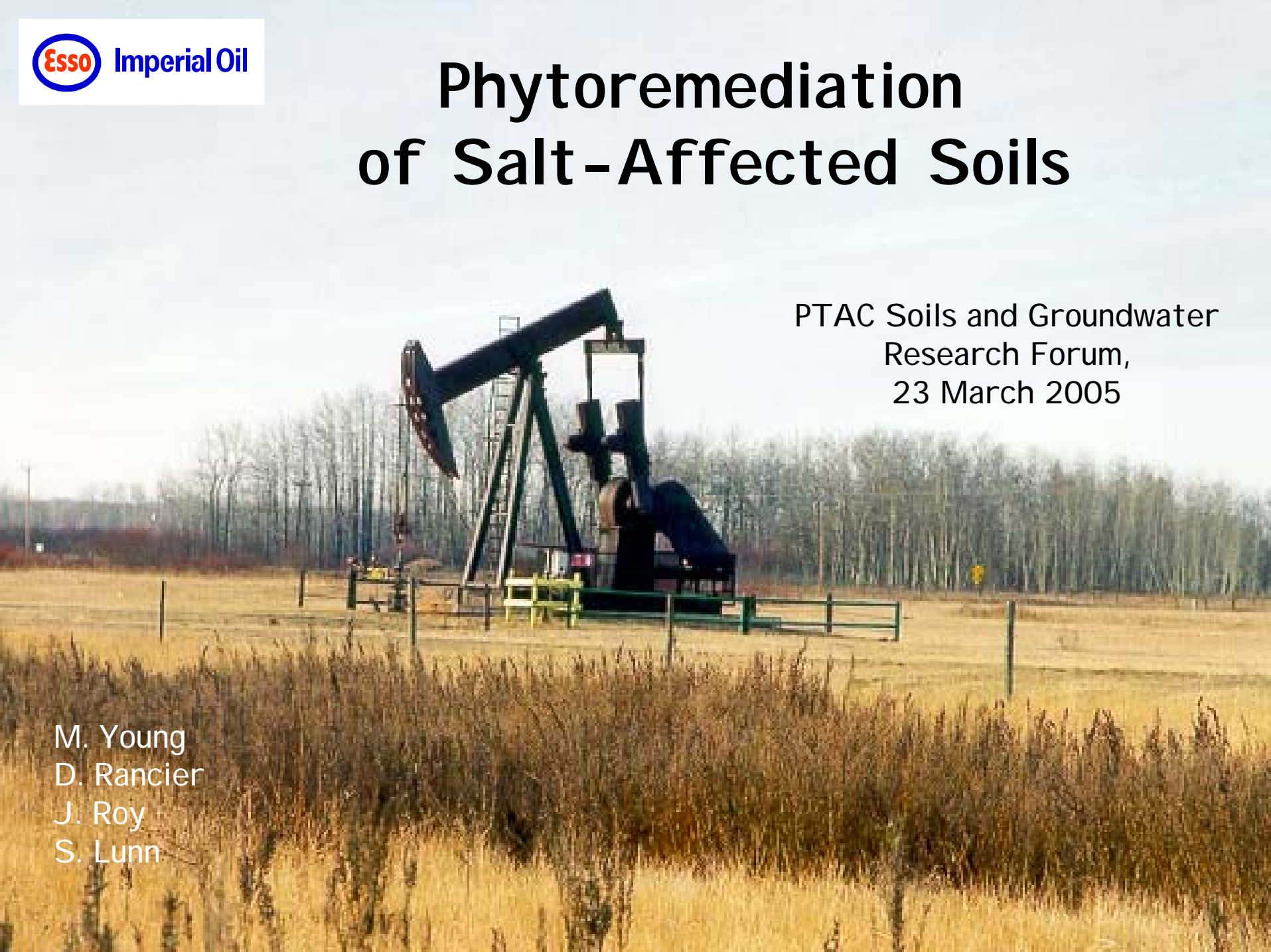


Phytoremediation of Salt-Affected Soils

PTAC Soils and Groundwater
Research Forum,
23 March 2005

M. Young
D. Rancier
J. Roy
S. Lunn



Outline

- Introduction
- Greenhouse Study (2001)
- Greenhouse Results
- Redwater Field Study (2002)
- Redwater Field Results
- Devon Field Study (2004)
- Future Plans

Introduction

- Past practices did not treat produced water as a concern resulting in salt-affected soils
- Phytoremediation is a potential tool for the remediation of salt-affected soils
- Plants (halophytes) extract Na and Cl from soil
- Harvest plants after they have accumulated Na + Cl ions in the above ground portion of the plant
- Root systems improve drainage characteristics of near surface soil



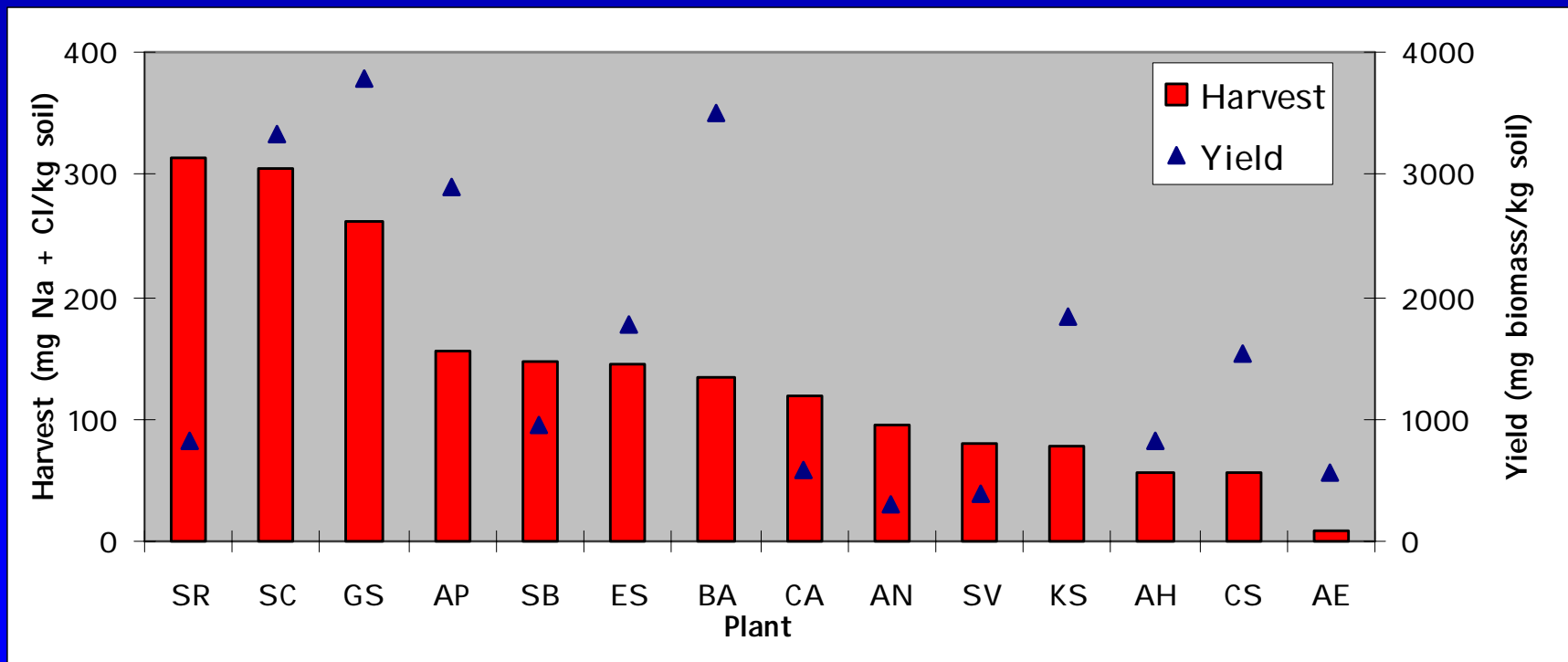
2001 Greenhouse Study

- Identify & collect seed of native Albertan halophytes at salt-affected sites
- Measure salt content of plant biomass at natural & spill sites
 - 2 - 13 % w/w
- Collect IOR salt-affected soil
 - soil EC: 4 - 38 dS/cm
- Commence greenhouse study (ARC, Vegerville AB)
 - 14 plants, 7 soils
 - 2-4 replicates



Greenhouse Results

- Plants evaluated for emergence, height, biomass & roots
- Salt (Na + Cl) content 5-20 % of dry biomass
- Dry plant biomass yield & salt harvest measured
- 7 plants were selected for a field trial



Redwater Field Study

- 36 randomized plots (and 6 side plots)
- 4 replicates of 8 plant treatments (7 individual plants and 1 mix)
- Total area: 70 m²
- 4 unseeded plots
- Objectives:
 - assess selected halophytes in field
 - compare field to growth chamber

Seed Planting June 17

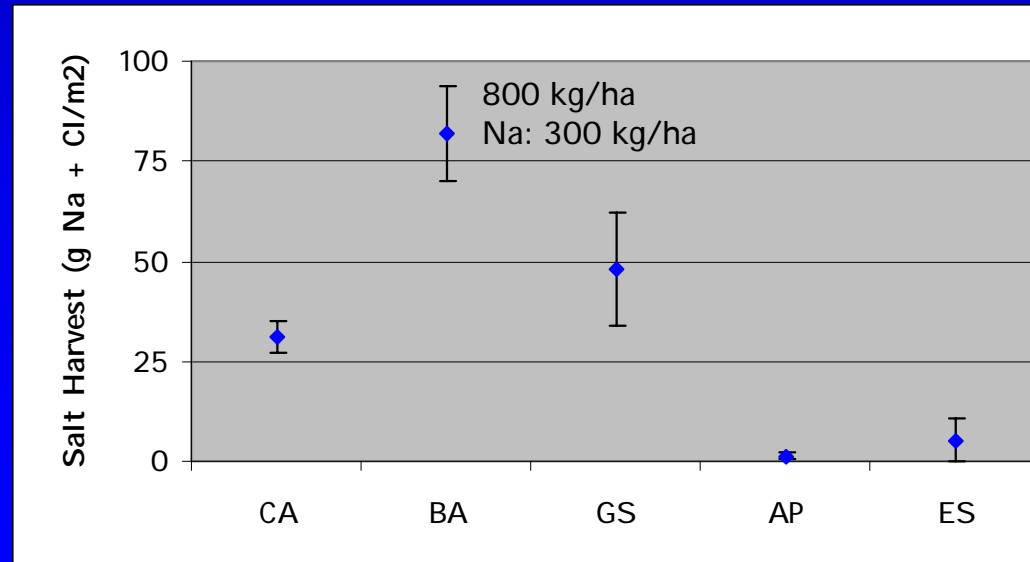
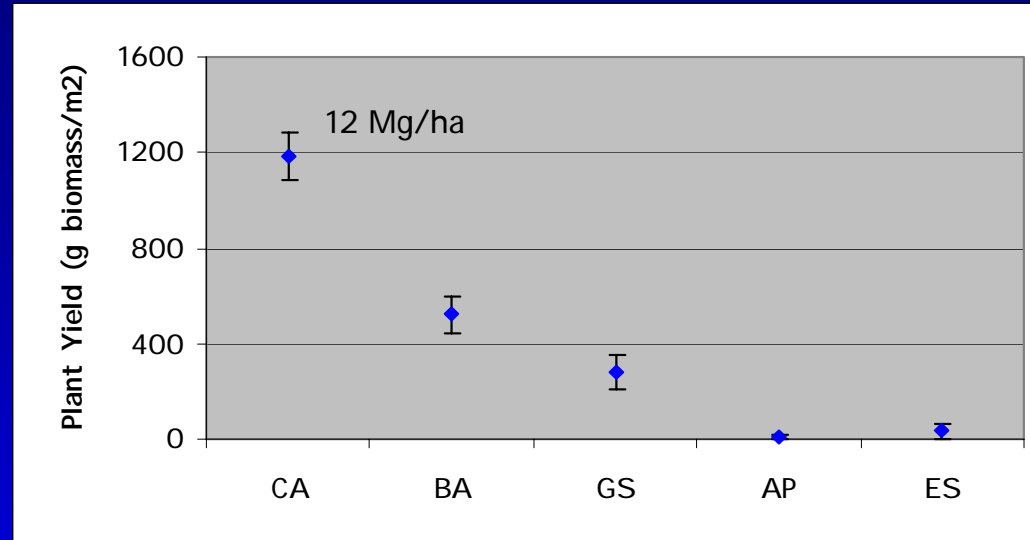


Fenced Area after Seeding



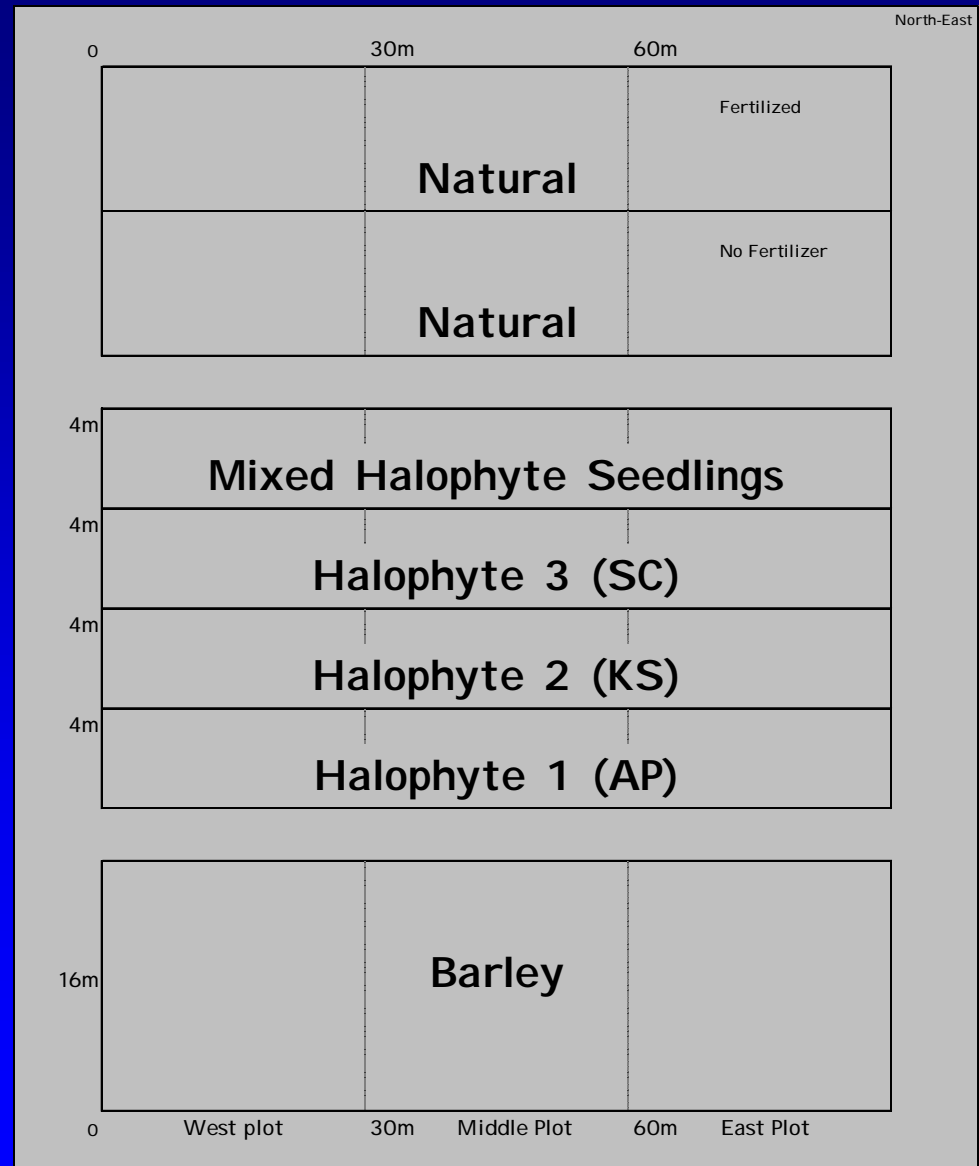
Redwater Field Results

- Only 4 of 7 species germinated (in 2 of the 4 plots the AP did not germinate)
- Only 1 plant of SC and 2 plants of ES germinated
- BA showed the best Na + Cl harvest
- CA showed the best yield but low Na + Cl uptake
- Mixed plots dominated by CA



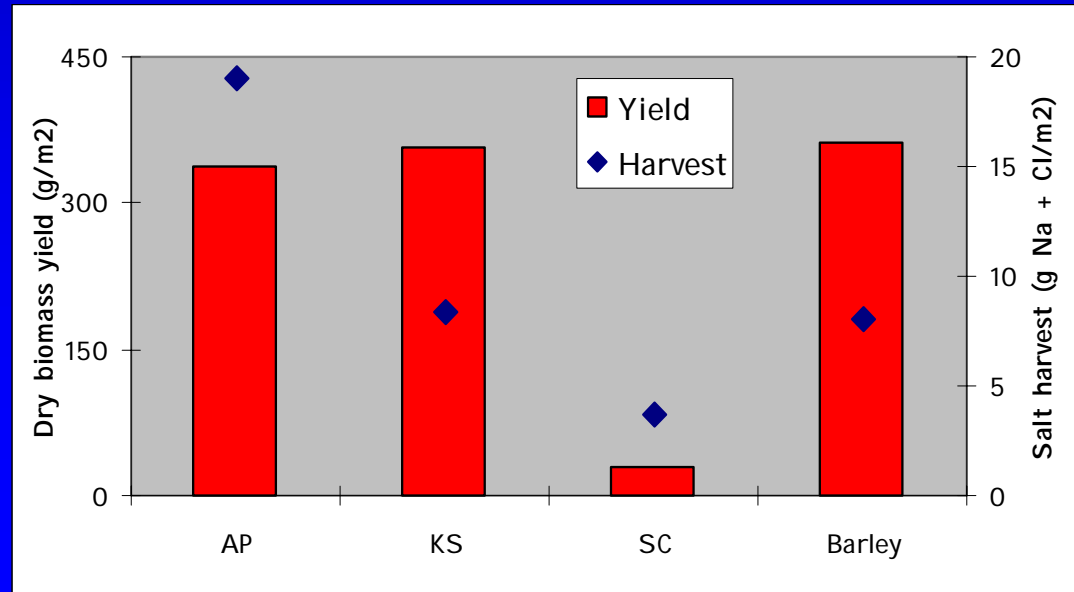
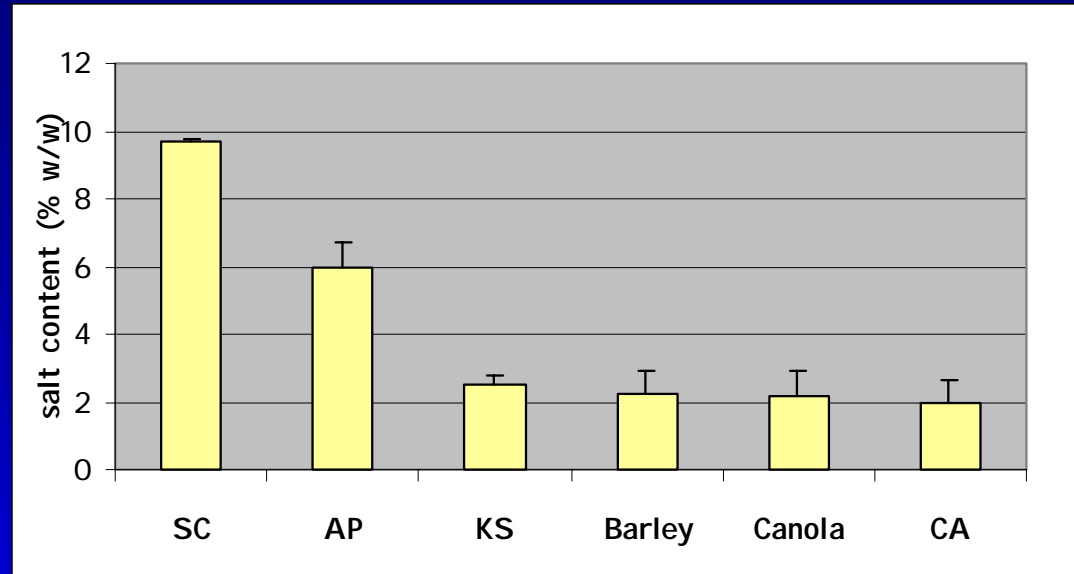
2004 Devon Field Study

- 2.7 ha of land with elevated EC/SAR
- Tile drainage installed to capture shallow groundwater
- New topsoil
- Test plot: 90 m X 60 m
- Barley & three seeded halophytes
- Halophyte seedlings transplanted



Devon Field Study

- Issue: imported topsoil contaminated with CA and RR-canola
- Harvested three 1 m² areas per block
- Salt content of biomass lower than Redwater site



Future Plans

- Continue field test in Devon for 2005 and 2006
- Manage weed problem in imported topsoil
- Analyze soil samples (EC, concentration of Na & Cl)
- EM surveys
- U of C ERI surveys (CAPP/ERAC funded)
- In 2006 assess phytoremediation as a technology option for salt-affected soils
 - O & M costs
 - adequate plant biomass and salt uptake
 - technical and economic feasibility