

Landform Affects Soil Properties and Crop Yields But Not Fertilizer Response



Eric Bremer¹, Ross McKenzie², Doon Pauly² and Ken Greer¹



¹Western Ag Innovations, Saskatoon, SK

²Alberta Agriculture and Forestry, Lethbridge, AB

Background

- Profitable use of Variable Rate Fertilization (VRF) requires that the yield response to type and rate of fertilizer products vary in a predictable and efficiently-determined manner within a field.
- Landscape position strongly influences soil nutrient and moisture supply, the dominant factors influencing fertilizer response, and is efficiently determined.
- Objective: to determine the effectiveness of varying fertilizer application based on landscape position for a range of commercial crop production fields in southern Alberta.

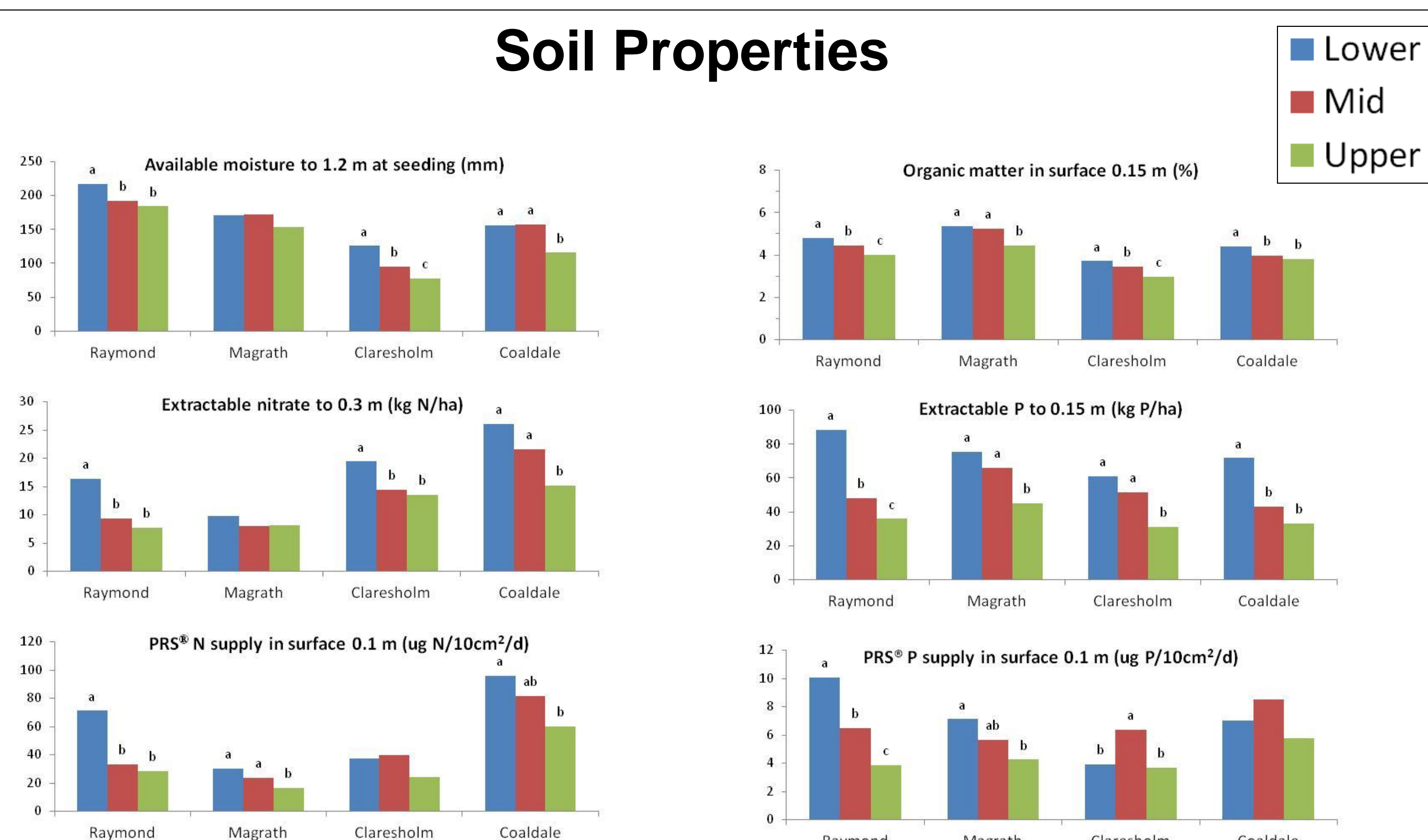
Methods

- Four commercial crop production fields
- Transects established, 40 m by length of field (≈800 m)
- Three to five benchmark locations identified at upper, mid and lower slope positions along transect (depressions excluded)
- Eleven fertilizer treatments applied down whole transect (2 m width)
- Experiment repeated for three or four years on adjacent transects at each location
- Growing season precipitation was more than 20% greater than long-term normals in 3 of 4 years



Results and Discussion

Soil Properties

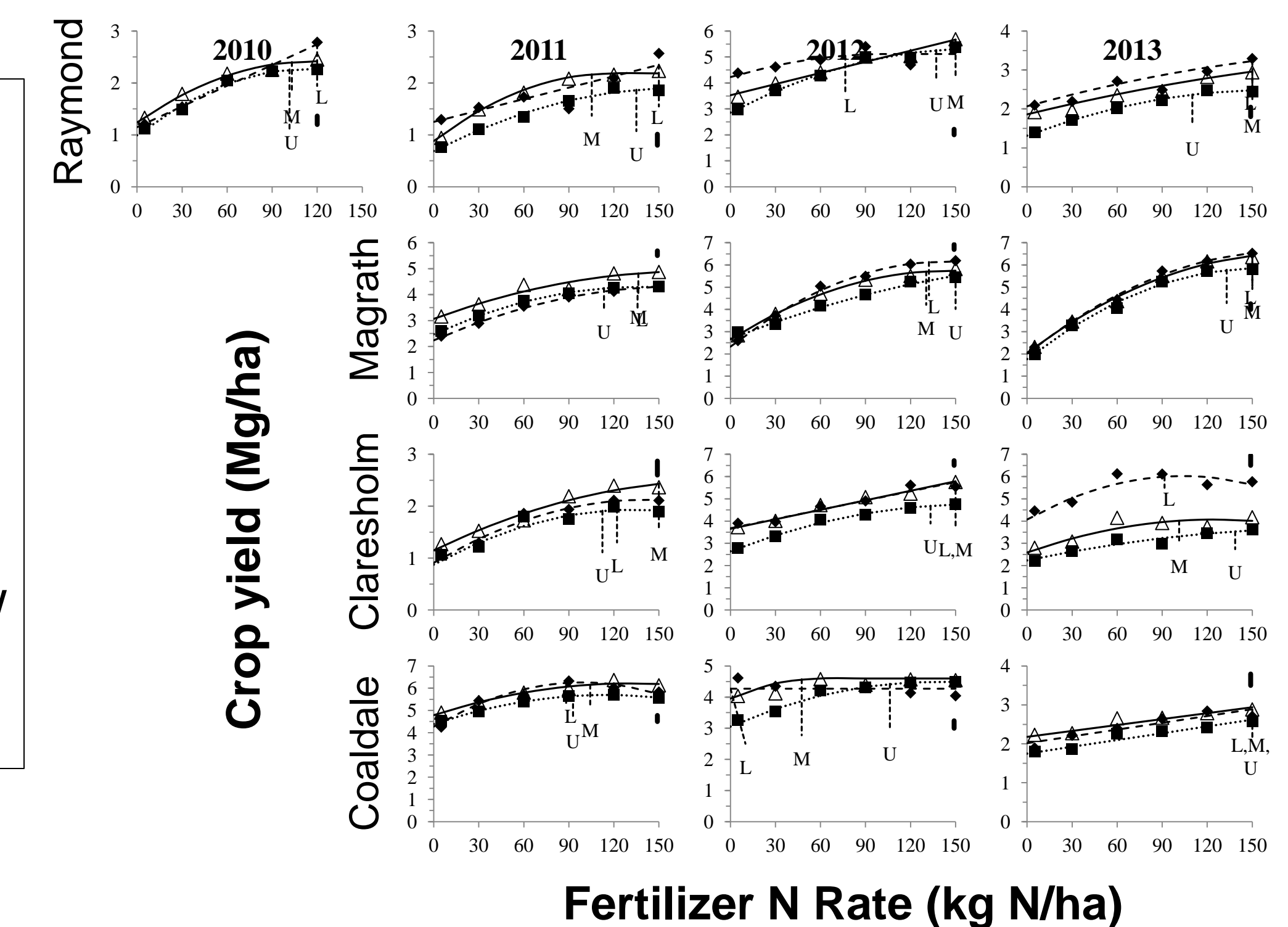


Soil properties at three slope positions at four locations in southern Alberta. Values are means over all years (moisture and N often varied by year or interaction with year). Soil properties frequently varied among slope positions.

Crop Yields

Nitrogen

- Similar maximum yield among slope positions except at Claresholm in 2013
- Economic optimum N rate varied among slope position in a few trials, but not in a consistent manner



- Average yield gain due to application of other nutrients was 3%, but ranged up to 25%
- Yield gain varied by slope position in one trial for P and one trial for S
- Based on visual observation, depressions were flooded or did not respond to fertilizer application

Net Return on Fertilizer \$

Simple net return from fertilizer application (yield gain * crop value – fertilizer cost) determined for optimum fertilizer rates determined on actual yields (maximum, “perfect foreknowledge”) and for recommended fertilizer rates (PRS[®] CropCaster, AFFIRM), based on mid-slope position or based on lower-, mid- and upper-slope positions (VRF). Maximum benefits from VRF were small (\$5 to \$18/ha), while recommendations based on VRF did not increase net return at any location.

	Net return on fert (\$/ha)				
	Raymond	Magrath	Claresholm	Coaldale	Average
Based on mid-slope fertilizer recommendation					
Maximum	1016	1282	1293	1484	1249
PRS [®] CropCaster	942	1263	1230	1397	1191
AFFIRM	958	1177	1207	1484	1182
Based on VRF fertilizer recommendation					
Maximum	1033	1287	1301	1500	1260
PRS [®] CropCaster	934	1254	1234	1396	1187
AFFIRM	948	1178	1202	1485	1178
Gain due to VRF					
Maximum	17	5	8	16	11
PRS [®] CropCaster	-8	-8	3	-1	-4
AFFIRM	-10	1	-5	1	-4

Conclusions

- Negligible benefit from VRF in these fields due to sufficiently similar fertilizer response at all slope positions, despite variations in soil properties.