

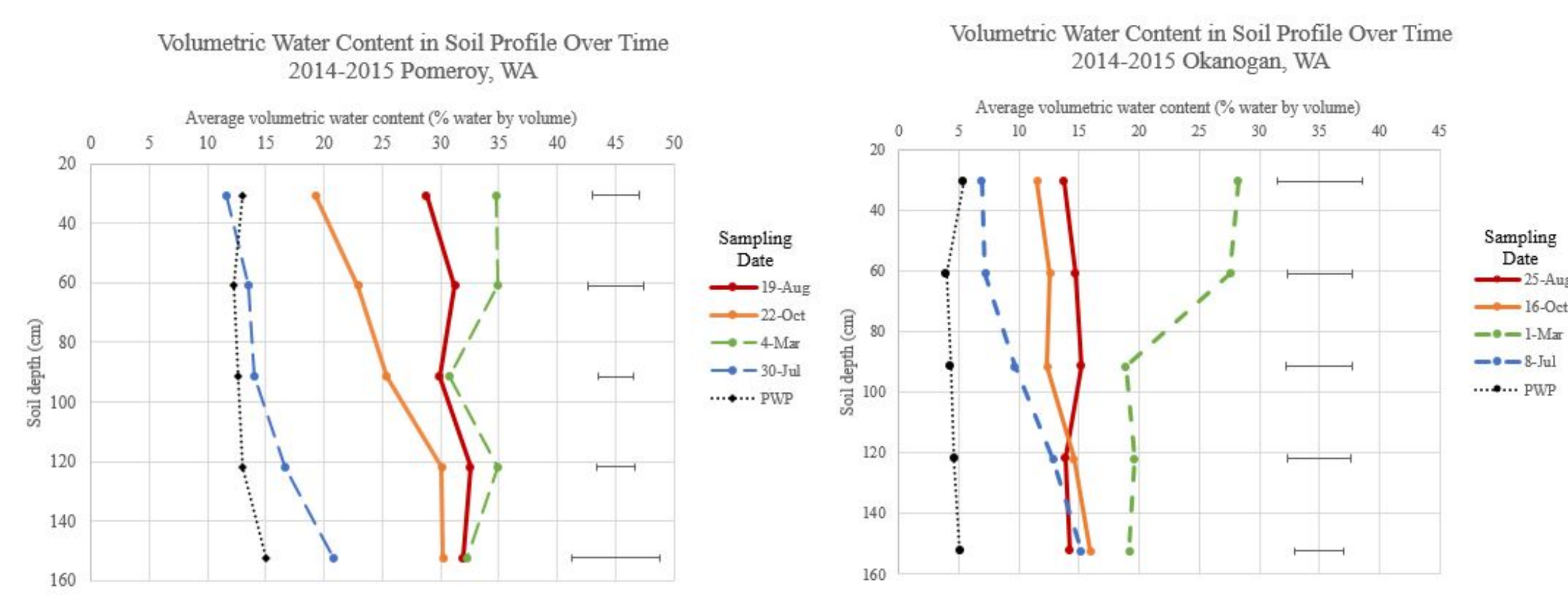
Subsoil Accessibility and Nutrient Availability in Three Rainfall Zones in the Pacific Northwest

Isaac J. Madsen¹, Megan E. Reese¹, Taylor M. Beard¹, Tai M. Maaz¹, Lauren E. Port¹,
Mayra L. Nunez², Jacqueline C. Huettenmoser³, William L. Pan¹

¹ Washington State University, ² University of Pennsylvania, ³ William and Mary College

Rationale: A greater focus on the availability of subsoil resources will become increasingly important to crop production as climate change leads to warmer drier summers and wetter winters in the Pacific North West. Crop species, root architecture, and soil impedance to root growth are important factors that influence the ability of crops to access and take up nutrients from deep in the profile.

Seasonal Changes in Soil Moisture: Water drawdown data in soil profiles was collected in conjunction with field trials at different rainfall locations across the inland Pacific Northwest. A significant portion of total water use occurred during the spring regrowth of winter canola (75% in low and 86% in intermediate precipitation zones). Drawdown occurred throughout the entire 5 foot profile, with more than 50% reduction of total water content in 3-5 feet between March and harvest (Figure 1).



Pit Methods: At corresponding sites soil pits were dug in mature canola fields in three distinct precipitation zones, within which root densities, soil physical characteristics, and nutrient profiles were spatially recorded. A restrictive layer characterized by high bulk density, resistance, and silt content was observed in the lowest rainfall zone. At all sites, more than 65% of roots were distributed in the subsoil beneath the first visual pan layer. Root density was strongly and positively spatially correlated with K and OM, but strongly and negatively spatially correlated with Na, Mg, EC, and Ca. The relationship between root density and nutrient distribution is an important factor when assessing late season nutrient availability. Our findings highlight the importance of subsoil quality and accessibility across different rainfall zones within a changing climate.

Take away messages:

- Subsoil resources are an important consideration when considering late season nutrient availability in dryland systems.
- Late season soil nutrient and moisture resources are not taken into account with typical sampling and management plans.
- Hotter drier summers will increase the importance of these variables.

