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Field-Scale Distributed Wireless Network for Monitoring Dynamic Hydrologic Processes

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Measuring and monitoring field-scale hydrology is important to understanding the fate of water in the vadoze zone, especially in concert with pedological information. Historically, single point measurements of hydrologic and pedological information have been straightforward to obtain, while monitoring widely distributed locations over time has been more challenging, both in expense and labor. As radios have become more available, distributed wireless networks have been developed and constructed to meet this need. However, there remain relatively few commercially available, inexpensive, and simple options. The objective of this study was to test the viability of a distributed wireless network to monitor soil parameters (moisture, temperature, and electrical conductivity) across a growing season on the 36.5 hectare Cook Agronomy Farm in Eastern Washington. Using landscape analysis, 12 representative sites were selected using a stratified random procedure and sensors were installed at 30, 60, 90, 120, and 150 cm depths. Radio frequency wireless transmitters linked sensors to a central data station where data were made available anywhere in the world via a cell modem link. Data were analyzed to show relationships between soil features, crop type, and water use. Results show that a system can be assembled from commercially available components with excellent reliability across all communication links. Data from the system showed correlations between water use, directly sampled static soil features and crop type.