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NAPPN Annual Conference Abstract: 4D root imaging of cover crops reveals distinct root system architectures

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Cover crops are an emerging solution to the negative impacts of conventional agricultural practices. Through their essential ecosystem functions, cover crops can improve soil health and biodiversity during fallow periods in conventional crop rotation systems. Hairy vetch (*Vicia villosa*), winter barley (*Hordeum vulgare*), and purple top turnip (*Brassica campestris*) are cover crops that provide a variety of ecosystem services such as nitrogen fixation, nutrient capture, and soil remediation. Using a 4D gel imaging system, we were able to evaluate 3D root system architecture over time of these three cover crops in order to further understand root growth and development. The collected traits allowed us to compare root growth and RSA across the plant species and better understand how certain root traits are linked in ecosystem functions. The long, fibrous root system found in winter barley allows the plant to effectively catch nutrients and water in the soil. The large taproot and secondary roots found in turnip are able to break up compacted soil while maintaining a network of finer roots to scavenge for nutrients. Similar to purple top turnip, the taproot in hairy vetch may provide soil remediation, but the deeper roots in vetch allow for the plant to provide increased acquisition and fixation of atmospheric nitrogen.