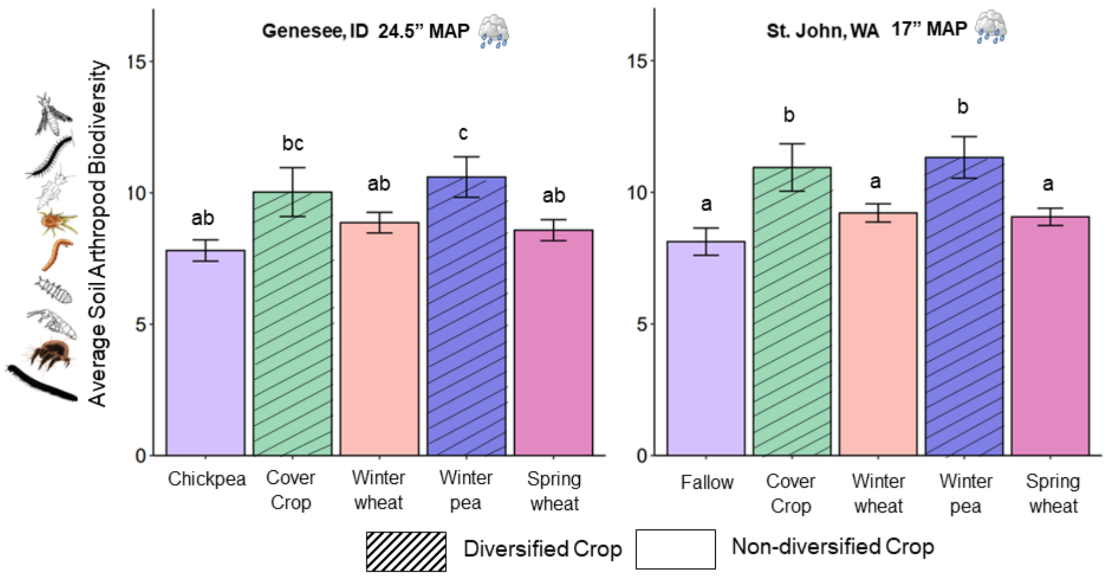
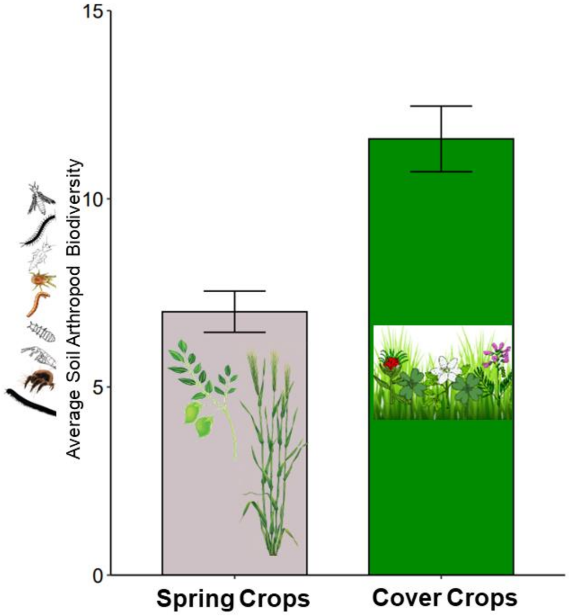
Soil Insects and Other Arthropods in Palouse Agroecosystems

Many insects and other arthropods spend at least part of their lives in the soil and are major regulators of soil processes that influence soil health and agricultural productivity. Despite their role in maintaining healthy soils, we don't know much about the soil arthropod communities in Palouse agroecosystems. **The goals of our research are 1) to evaluate how soil arthropods respond to different crop diversification practices, such as rotational diversification with winter pea or cover crops, and 2) investigate how soil arthropods influence the growth and performance of winter wheat.**



<u>Takeaway 1:</u> Diversifying wheat-based rotations with winter pea or cover crops increases soil arthropod biodiversity more than the crops they could replace in rotation, like chickpea, spring wheat, or fallow. Results were consistent across growing regions with contrasting climates. Biodiversity is like an insurance policy; if a group of arthropods providing a specific function in the soil, like nutrient cycling, are negatively affected by management practices or environmental change, another group can step up and fill in that functional role providing resiliency and sustainability to the agroecosystem.

<u>Takeaway 2:</u> Effects are consistent on large-scale commercial farms. Takeaway 1 results are from experimental plots. Working with producers on the Palouse that are experimenting with cover crops, we observed similar effects of cover crops on arthropod biodiversity. Fields planted with multi-species cover crops had greater soil arthropod biodiversity compared to spring planted crops, like chickpea and spring wheat. Cover crop mixes varied from three to six species. Fields were located near Uniontown and Colton, WA. Soil moisture was not depleted by cover crops (average 7.35% volumetric water content) and was approximately the same as spring planted crops (7.87% volumetric water content) when averaged across growing season.



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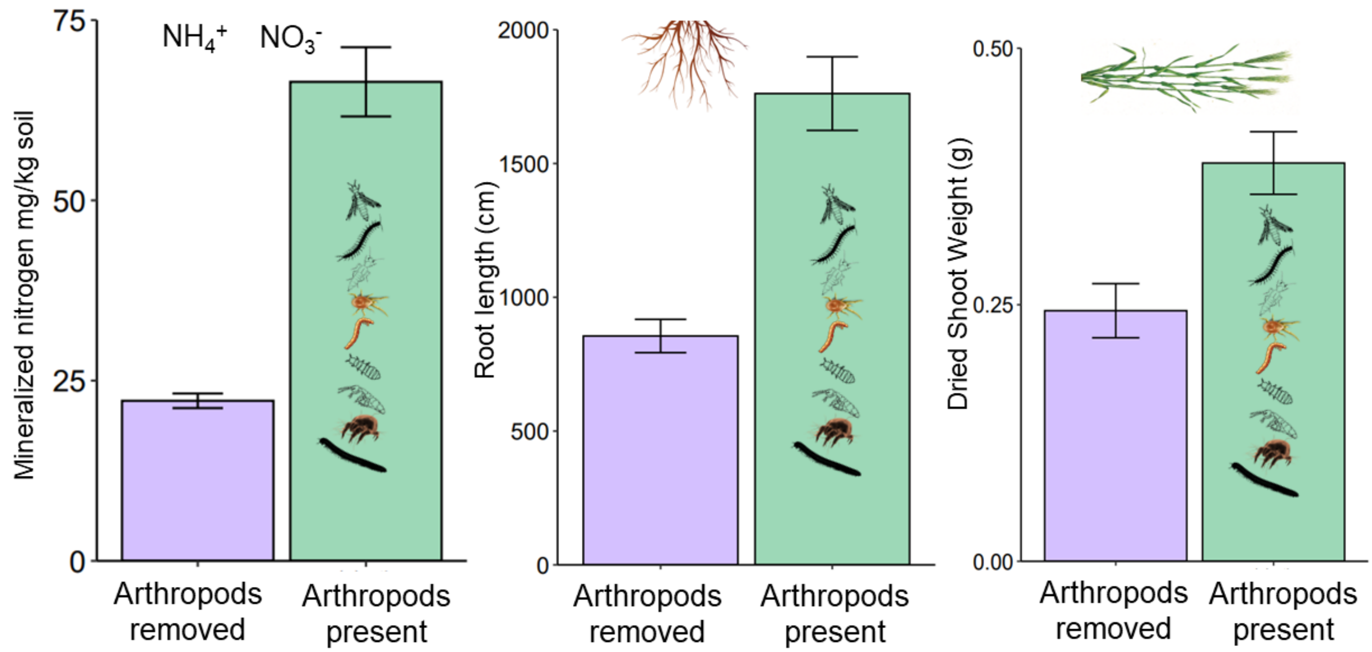
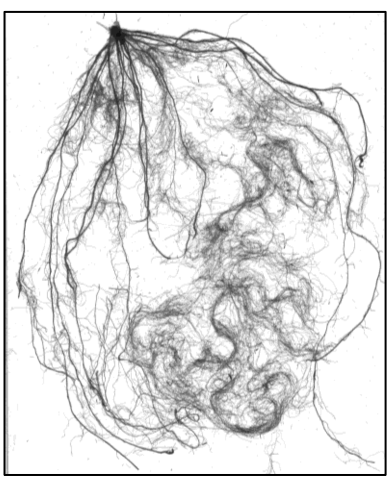
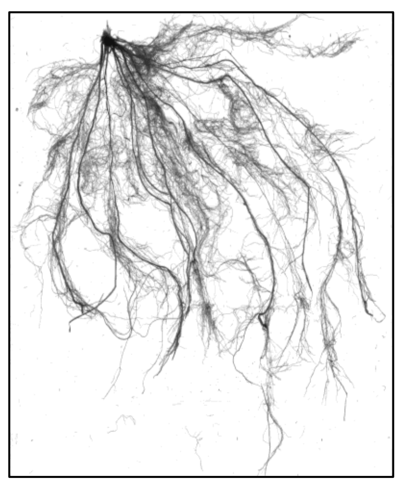


Takeaway 3: Soil arthropods impact the growth of winter wheat. We grew winter wheat (Lambet var.) in a greenhouse pot-study using soils collected from Palouse wheat fields. Wheat was grown in soils either with or without their native soil arthropod communities. Wheat grown in soils where arthropods had been removed had reduced root length and shoot biomass compared to wheat grown in soils with intact arthropod communities. We also observed a reduction in mineralized nitrogen in soils that had their arthropod communities removed. These results suggest that soil arthropods benefit wheat growth and increase crop-available nitrogen. Management practices that promote soil arthropods, like incorporating winter pea or cover crops into rotations, could lead to agronomic benefits.



Root architecture of winter wheat grown in soil <u>with</u> arthropods (5 weeks growth)



Root architecture of winter wheat grown in soil <u>without</u> arthropods (5 weeks growth)

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