Plant-soil feedbacks in medusahead invasion

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California's grasslands are one of the most highly-invaded ecosystems on earth, with non-native species comprising the vast majority of biomass produced on the landscape. Non-native forage grasses such as wild oat (*Avena barbata*), which have been present since the mission period (late 18th/early 19th century), are being increasingly outcompeted by newcoming invaders such as medusahead (*Taeniatherum caput-medusae*), resulting in reduced grazing capacity. The bulk of the literature on medusahead focuses on competitive interactions and effects of its thatch, but soil microbes may also play a role in its success. All plants have microbes that are associated with their roots that can either promote (e.g., mycorrhizae) or inhibit (e.g., pathogens) their own growth or growth of neighboring plants. These plant-microbe-plant relationships produce feedbacks which can dictate invasion dynamics and success. We are testing whether medusahead promotes beneficial microbes that boost its own growth (a positive plant-soil feedback), or whether it produces a detrimental microbial community that inhibits its own growth (a negative plant-soil feedback) or inhibits growth of wild oat. We are also asking how medusahead thatch might amplify or negate these microbial feedbacks. Understanding how microbes foster invasion will be useful in developing management strategies to combat spread of medusahead.

These plant-microbial relationships are occurring within a backdrop of climate change: California is anticipated to experience longer and more severe droughts as climate change accelerates. Droughts can impact plant-microbe interactions and may change how plant-soil feedbacks in medusahead impact invasion dynamics. Thus an additional goal of this research was to test how plant-soil feedbacks in medusahead and wild oat affect the invasion process under differing levels of thatch and differing rainfall conditions. This will allow us to predict whether medusahead invasion will intensify or diminish in the future.