Influence of climate and disturbance on the distribution and management of Italian ryegrass and mayweed chamomile in the Pacific Northwest

Nevin Lawrence (nevin.lawrence@email.wsu.edu) WSU, Leigh Bernacchi UI, J. D. Wulfhorst UI, and Ian Burke WSU

Italian ryegrass (*Lolium multiflorum* L.) and mayweed chamomile (*Anthemis cotula* L.) are two well-adapted weed species common in the Pacific Northwest (PNW) small-grain production region. Both species are summer annuals, with emergence occurring in the spring. While mayweed chamomile emergence occurs at the start of the spring growing season, Italian ryegrass can continue to emerge throughout the spring and summer if adequate soil moisture is available. Italian ryegrass and mayweed chamomile are pernicious competitors with crops and can severely reduce yield. An increased use of conservation tillage practices in the PNW has favored both weed species, as management now relies almost exclusively on herbicides. Mayweed chamomile control, particularly in pulse crops, requires well-timed herbicide applications and competitive stand establishment, as there are no effective postemergence herbicides. Italian ryegrass is considered one of the worst weeds globally in the context of herbicide resistance and has become resistant to several commonly used herbicides in the PNW. Italian ryegrass and mayweed chamomile are currently major pests in the PNW, and projected changes in climate over the next several decades may lead to expanded ranges for both species. However, little is known about the relationship among climate, management, and distribution of the two species.

IMPACT

We established baseline distribution of two weed species and the relationship between producer practices and their perception of control, including tillage. Knowledge of location and grower perceptions of their ability to control pests allow scientists to assess risk and pursue critical research questions.

To begin to gain an understanding of these relationships, we conducted a producer survey that asked growers, in part, to identify observation and control of species. In November 2012 to March 2013, the Social Science Research Unit of the University of Idaho administered a mail survey of agricultural producers in counties of the REACCH region in the inland PNW. The sample, which was drawn from the National Agricultural Statistics Service (NASS), consisted of 2,000 producers who grew more than 50 acres of wheat in 2011, by county. We employed the full Dillman

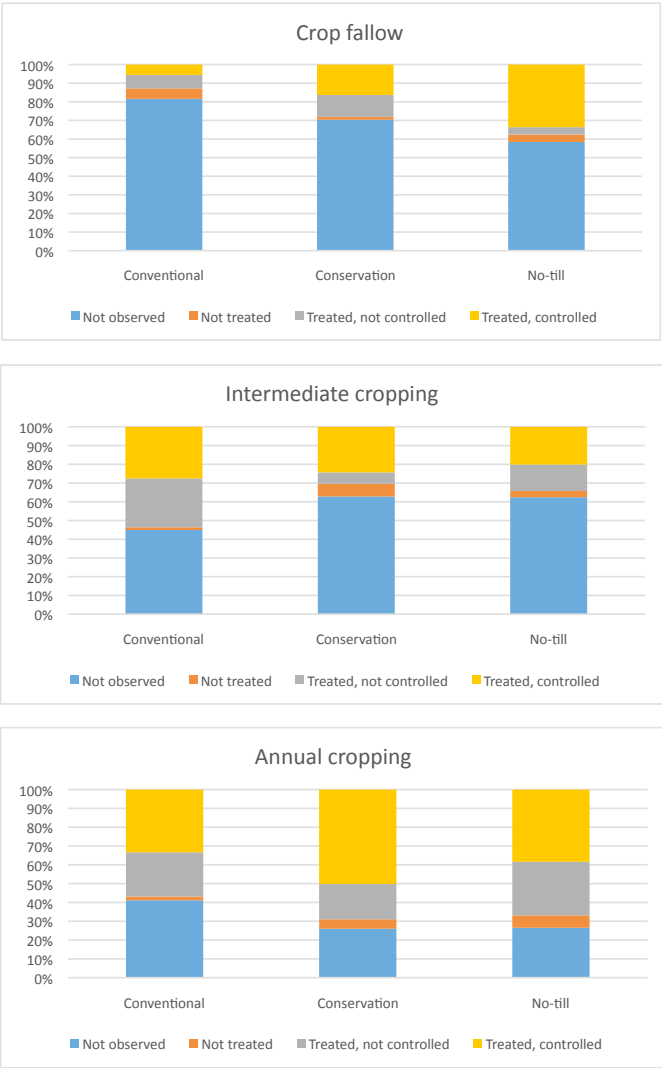
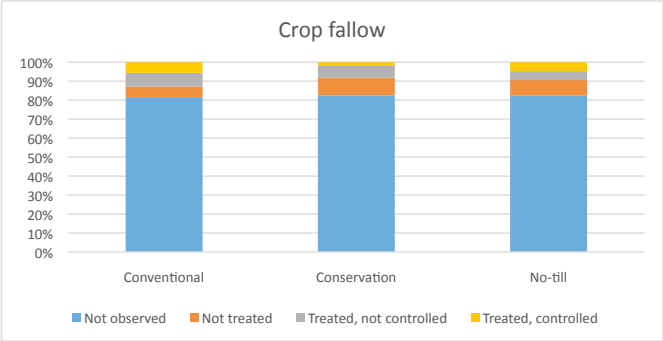
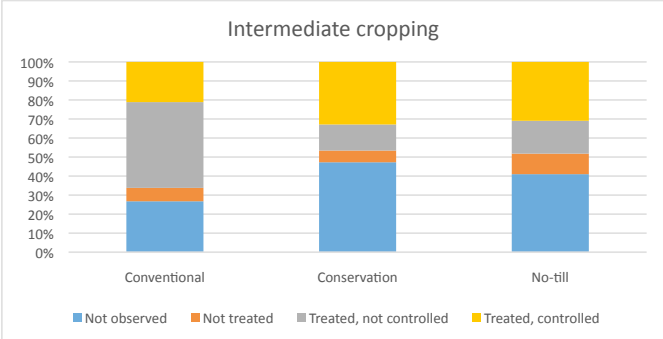


Figure 1. *Distribution and control of Italian ryegrass by tillage practice and cropping system (wheat-fallow, intermediate, and annual cropping). We used agroecological zone designations based on the 2012 Cropland Data Layer to describe the cropping system, and we used the producer survey to describe the distribution of species and tillage practices (conventional, conservation, and no-till). Producers are most likely to be affected by Italian ryegrass in the annual cropping zone.*





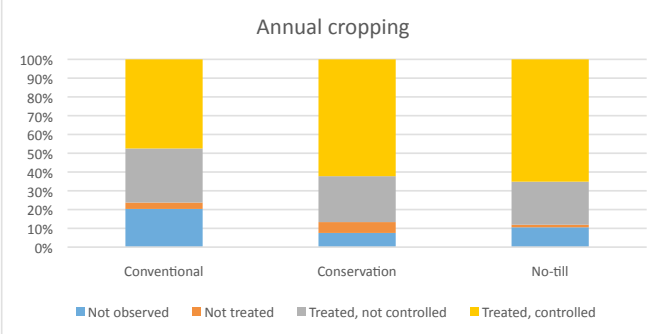


Figure 2. *Distribution and control of mayweed chamomile by tillage practice and cropping system. This weed is least likely to be controlled in the annual cropping and intermediate cropping zones. While tillage does not appear to affect control in annual cropping, more tillage is associated with less control in intermediate cropping systems.*

method, including four mailings and a postcard. The survey asked about perceptions of climate change, management practices, and demographics, and included maps on which to mark all parcels farmed and indicate the largest parcel. We used the largest parcel to specifically locate pests. We received 900 completed and eligible surveys, 4 undeliverable surveys, and 38 ineligible recipients, resulting in an overall response rate of 45%. The majority of respondents completed the mapping data with accuracy (n= 700, or 35%). The respondents identified multiple field sites, and for each site they were asked which of the two weeds affected their largest parcel and the degree to which they were controlled.

The observation of Italian ryegrass by cropping system (Figure 1) is likely a result of increased annual precipitation. Seventy percent of respondents from the crop-fallow production system did not observe Italian ryegrass, whereas 57% and 31% of respondents from the transition and annual cropping systems did not observe Italian ryegrass. A similar trend was observed with mayweed chamomile (Figure 2). In the crop-fallow production system (Figure 3), Italian ryegrass was observed more often in areas where no-till was used. The presence of Italian ryegrass in the no-till areas of the crop-fallow production systems may be a consequence of greater soil moisture retention or a more stable seed bed. The observation of Italian ryegrass in the transition and annual cropping systems was not as variable by tillage practices as in the crop-fallow system; however, control of Italian ryegrass was variable by tillage practices. Respondents from transition and annual cropping system who used conservation tillage rather than conventional tillage or no-till practices reported greater control of Italian ryegrass.

Mayweed chamomile is much less common in the crop-fallow production system, likely due to moisture. In the transition cropping zone, mayweed chamomile is more common in tillage systems, and also more difficult to control. The opposite is true in the annual cropping system zone, where mayweed is less commonly observed in systems that use tillage. No-till and conventional tillage practices differ considerably in the reliance on not only tillage but also herbicides. The greater control of Italian ryegrass observed when conservation tillage practices were used may reflect increased flexibility in tillage and herbicide use, allowing growers to better adapt their practices for difficult-to-control weeds. Finally, it appears that Italian ryegrass and mayweed chamomile are useful species as climate indicators, and that grower surveys can be useful tools for assessing, indirectly, climate effects on indicator species such as these two weeds.

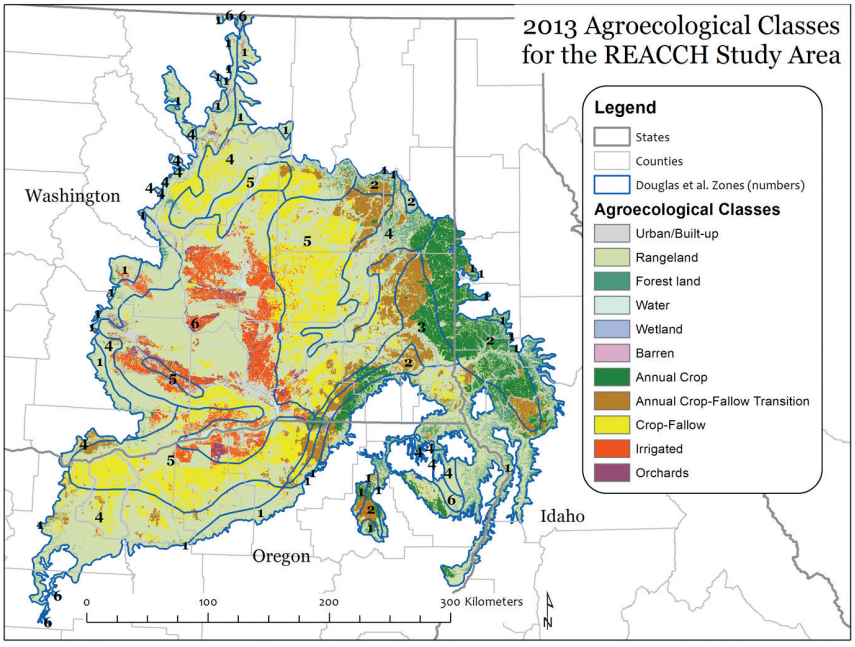


Figure 3. *Distribution of annual, transition, and crop-fallow cropping systems in the PNW. Map courtesy of Rick Rupp and Dave Huggins.*