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IDENTIFYING WIREWORMS IN CEREAL CROPS

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Wireworms, the immature stage of the click beetle (Figure 1), continue to be pests of Pacific Northwest cereal crops (Higginbotham et al. 2014). The insects feed on plant structures underground, causing wilt, stunting, and even death to juvenile plants (Figure 2). When the pests infest an area in significantly high numbers, the yields of entire fields can be lost (Andrews et al. 2008).

Surveys taken in Washington, Oregon, and Idaho in 2013 to 2014 found that the species of wireworms present, and their abundance, vary greatly across the regions. Determining which species are present through proper scouting techniques is important for management, because different species vary in their biology, ecology, insecticide susceptibility, and crop impact (Horton 2006). Correct and timely identification prior to spring planting can provide an excellent return on investment.

Distribution of Wireworms in Pacific Northwest Cereal Cropping Systems

In 2013 and 2014, Milosavljevic, Esser, and Crowder conducted a large-scale survey across 20 counties in the inland Pacific Northwest (PNW) to examine the distribution of wireworms in spring and winter wheat fields and in conservation reserve program (CRP) land. Wireworms were present in samples from 87 percent of surveyed fields, and 14 different wireworm species were identified.

Three species were dominant: the Western field wireworm, *Limonius infuscatus*, the Sugarbeet wireworm, *Limonius californicus*, and the Great Basin wireworm, *Selatosomus pruininus* (prior to 2014 this species was known as *Ctenicera pruinina*). These species represented approximately 90 percent of wireworms collected (Figure 3a). The most frequently found species was the Western field wireworm (41%), followed by Sugarbeet wireworm (28%) and Great Basin wireworm (21%). However, the dominant species detected varied by region, with the Great Basin wireworm confined to the dry-farming regions (less than12 inches precipitation zones), while Western field wireworm and Sugarbeet wireworm were most abundant in intermediate and higher precipitation zones and in irrigated regions (Figure 3b).

Identifying Wireworm Pest Species

Wireworms have slender and cylindrical segmented bodies consisting of a head, thorax with three pairs of legs, and a nine-segmented abdomen (Figure 4a; Berry 1998). The three most dominant species found in the inland PNW can be distinguished from each other based on variations in these body features (Lanchester 1946; Glen et al. 1943). A hand lens or microscope are useful tools for identifying the body structures to determine which species are present in a given field.

Western field wireworms are approximately 0.3 to 0.7 inches long, and yellowish-brown or orange in color (Figure 4b).

Figure 1. Immature stage wireworm (left), pupal stage (center), and adult click beetle (right). Photos by Ivan Milosavljevic.

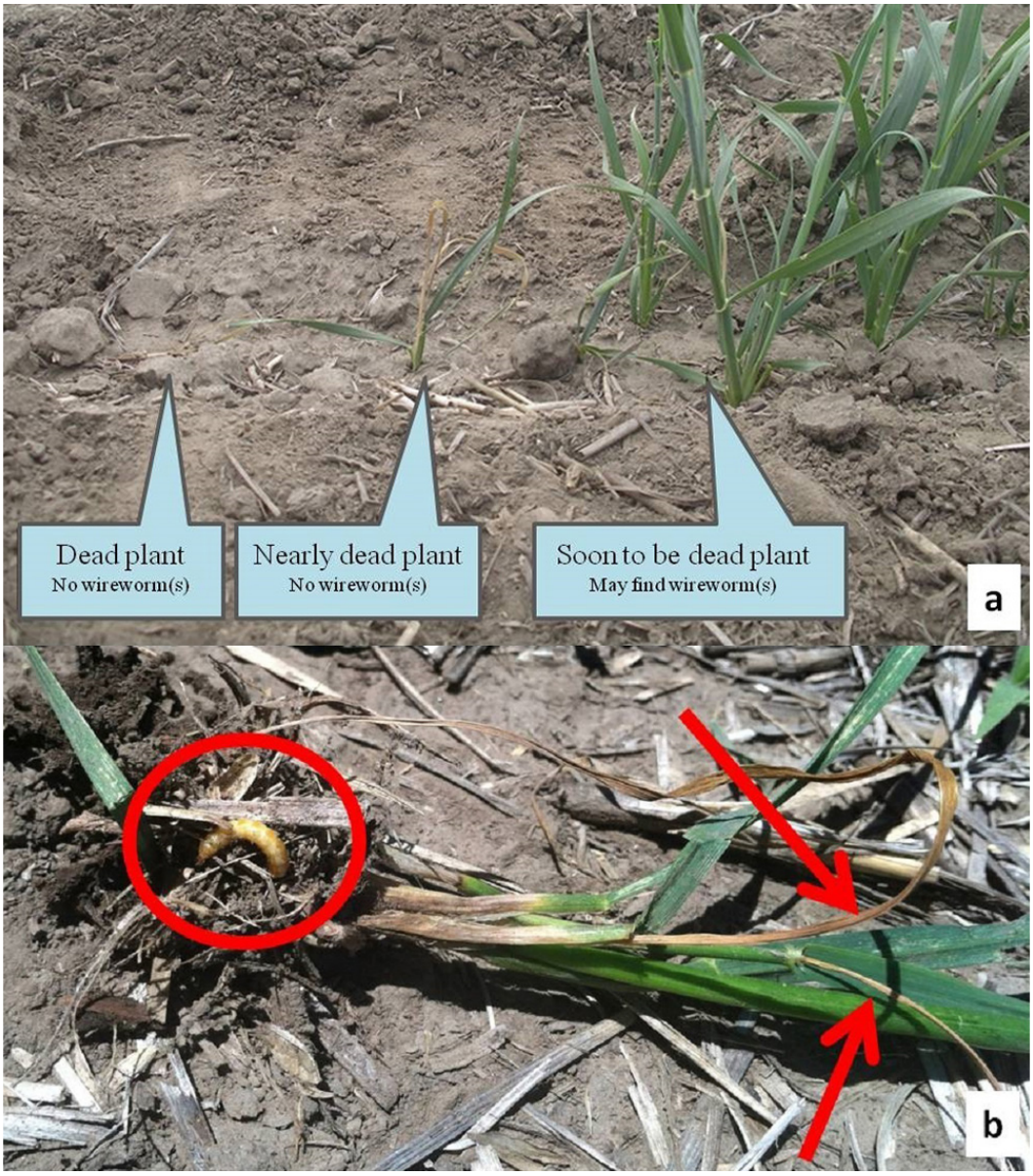

Figure 2. Typical damage caused by wireworms to wheat plant. 2a. Shows in-row damage. Photo by Aaron Esser. 2b. Damage to a fully grown wheat plant. Photo by Ivan Milosavljevic.

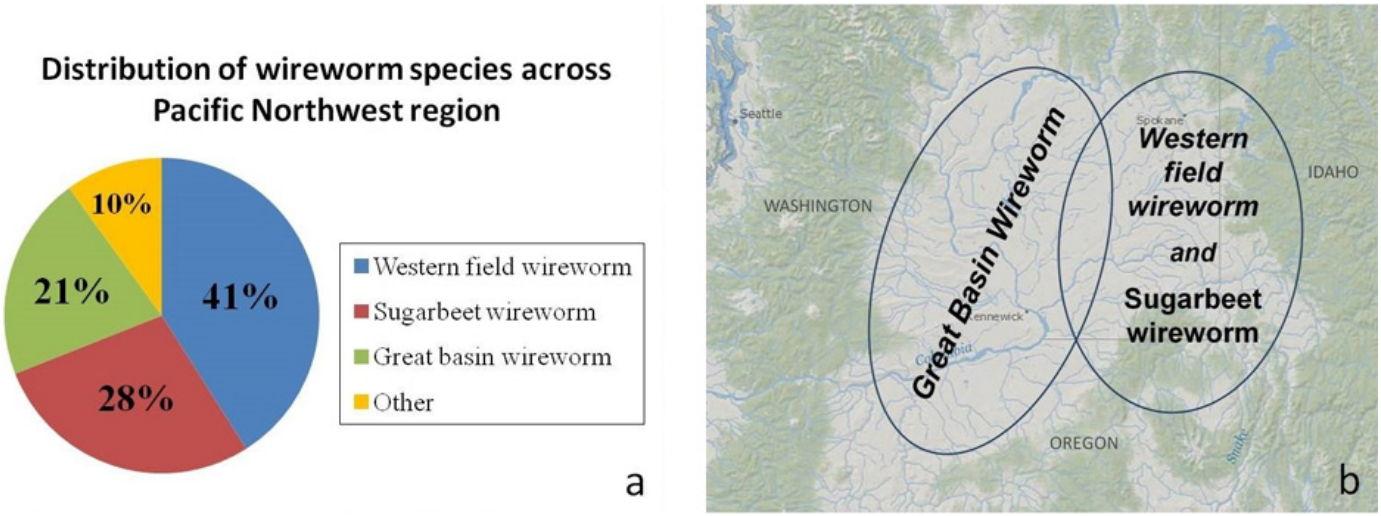

Figure 3. Wireworm species of economic importance in PNW cereal crops. Photos by Ivan Milosavljevic.

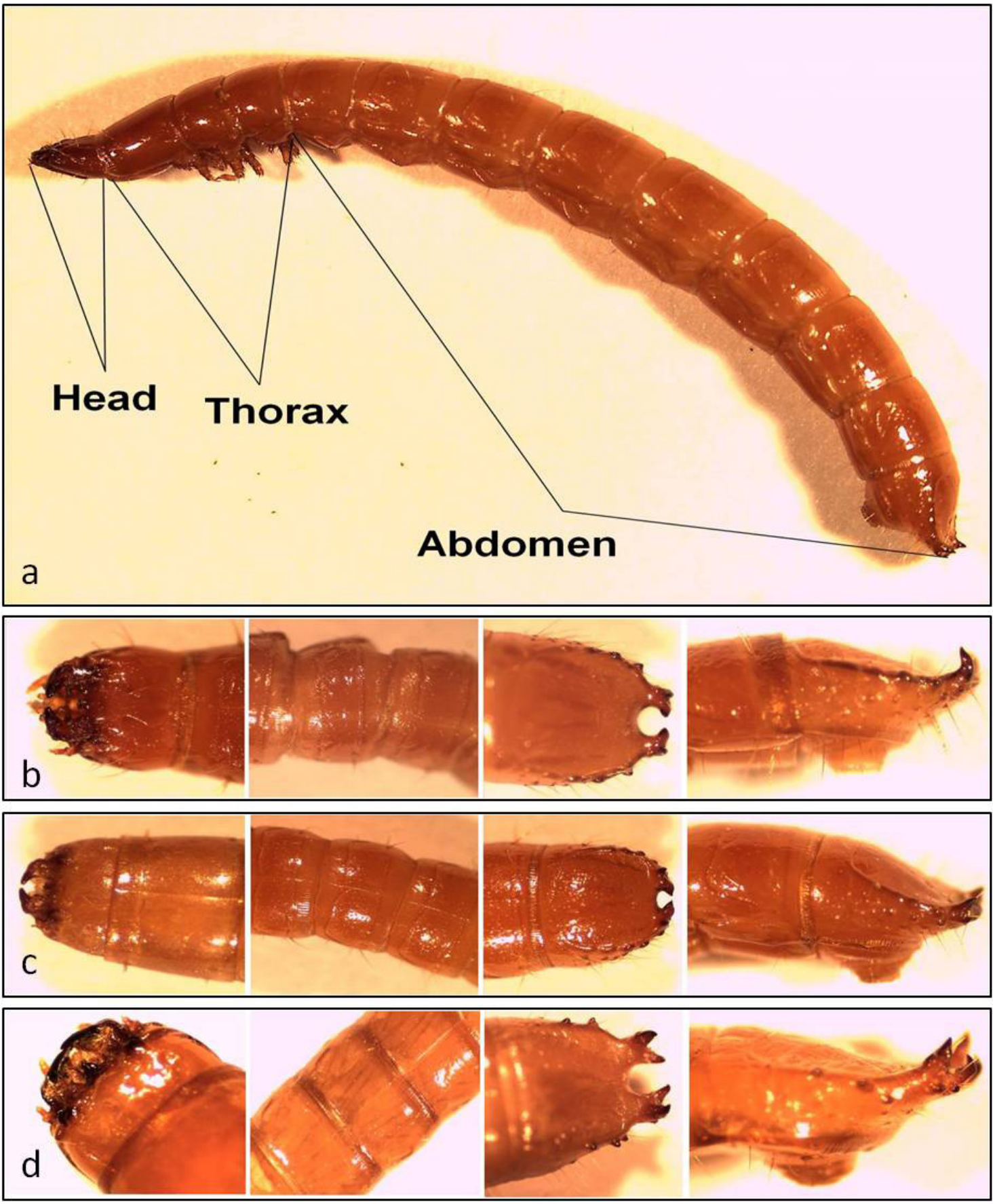

Figure 4. Wireworms of the Pacific Northwest. 4a. Wireworm body parts. 4b. Western field wireworm. 4c. Sugarbeet wireworm. 4d. Great Basin wireworm. Photos by Ivan Milosavljevic.

This species contains a small, keyhole-type opening and two vertical hook-like appendages at the end of its abdomen (Figure 4b). Similarly, Sugarbeet wireworms are 0.3 to 0.8 inches long, orange in color, and have a small and nearly closed keyhole and two vertical appendages resembling sharp spikes at the end of the abdomen (Figure 4c). Great Basin wireworms are bright orange and may exceed 0.9 inches in length (Figure 4d). This species is characterized by a U-shaped and well-opened keyhole located at the end of the abdomen, four hairs (setae) on the central dorsal area of the last body segment, and four vertical stout appendages (Figure 4d).

Biology and Feeding Ecology of Wireworms

Ongoing research, conducted by Milosavljevic, Esser, and Crowder is investigating differences in the biology and feeding ecology of the three predominant wireworm species in the PNW. Preliminary results suggest that the Sugarbeet wireworm increases its feeding activity throughout the summer, while the Western field wireworm is most active early in the season (Esser et al. 2014). Moreover, insecticidal treatments with neonicotinoids at planting appear to have stronger impacts on the Western field wireworm than on the Sugarbeet wireworm. Accordingly, the Sugarbeet wireworm causes significantly more economic damage, and thresholds for management of this species will likely be lower than that for the Western field wireworm. Future studies will investigate economic thresholds for each species, with a goal of developing targeted management strategies for each pest.

Further Reading

Esser, A.D. 2012. Wireworm Scouting: The Shovel Method and the Modified Wireworm Solar Bait Trap. *Washington State University Extension* Publication FS059E.

Esser, A.D. 2014. Wireworm Identification and Management (video). *Washington State University Extension*.

Milosavljevic, I. 2014. How to Sample for Wireworms (video). *Washington State University Extension.*

Milosavljevic, I. 2014. Distribution of Wireworm Species (video). *Washington State University Extension*.

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Andrews, N., M. D. Ambrosino, G. C. Fisher, and S.I. Rondon. 2008. *Wireworm: Biology and Nonchemical Management in Potatoes in the Pacific Northwest*. Corvallis, OR: Oregon State University Extension Service.

Berry, R. E. 1998. *Insects and Mites of Economic Importance in the Northwest*. Corvallis, OR: Oregon State University.

Esser, A.D., D.W. Crowder, and I. Milosavljevic. 2014. Wireworms Take Bite Out of Winter Wheat Crop. In *Wheat Life*. Pp.68-69.

Glen, R., K.M. King, and A.P. Arnason.1943. The Identification of Wireworms of Economic Importance in Canada. *Canadian Journal of Research.* 21(11): 358-387.

Higginbotham, R. W., P.S. Froese, and A.H. Carter. 2014. Tolerance of Wheat (Poales: Poaceae) Seedlings to Wireworm (Coleoptera: Elateridae). *Journal of Economic Entomology*. 107(2): 833-837.

Horton, D. R. 2006. Quantitative Relationship Between Potato Tuber Damage and Counts of Pacific Coast Wireworm (Coleoptera: Elateridae) in Baits: Seasonal Effects. *Journal of the Entomological Society of British Columbia.* 103: 37-48.

Lanchester, H. P. 1946. Larval Determination of Six Economic Species of Limonius (Coleoptera: Elateridae). *Annals of the Entomological Society of America.* 39(4): 619-626.

Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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