

OUTREACH MATERIALS FOR GRASSHOPPER IDENTIFICATION

Phoebe Richards¹, Ebba Peterson², Paola Sotelo-Cardona², Chris Marshall³, Silvia I. Rondon²

¹ College of Science — Department of Integrated Biology, ² Oregon Integrated Pest Management Center, ³ Oregon State Arthropod Collection

<https://agsci.oregonstate.edu/oipmc> | <https://osac.oregonstate.edu/>



Digital Version

THE PROBLEM

Grasshoppers and Mormon crickets belong to the insect order Orthoptera, thriving best during drought years when conditions are ideal for nymph survival. There are an estimated 400 species of Orthoptera in the Western U.S., and roughly ten of them are regarded as common pests in Oregon (Pfadt 2002, ODA 2022). In recent years, grasshopper outbreaks have become increasingly common in Eastern Oregon and Washington, causing widespread damage to rangeland and cropland (Figure 1). **In 2023, 2.3 million acres of land in Eastern Oregon were affected by grasshopper and Mormon cricket infestations.** These areas had populations at **economic density** of at least 8 grasshoppers per square yard (ODA 2024). At this level of infestation it is likely that the loss of crops and rangeland vegetation will impact agricultural production.

As outbreaks continue, pest management becomes increasingly important for protecting agriculture in heavily impacted regions. Extension faculty need to be trained on how to identify and deal with Orthoptera pests.

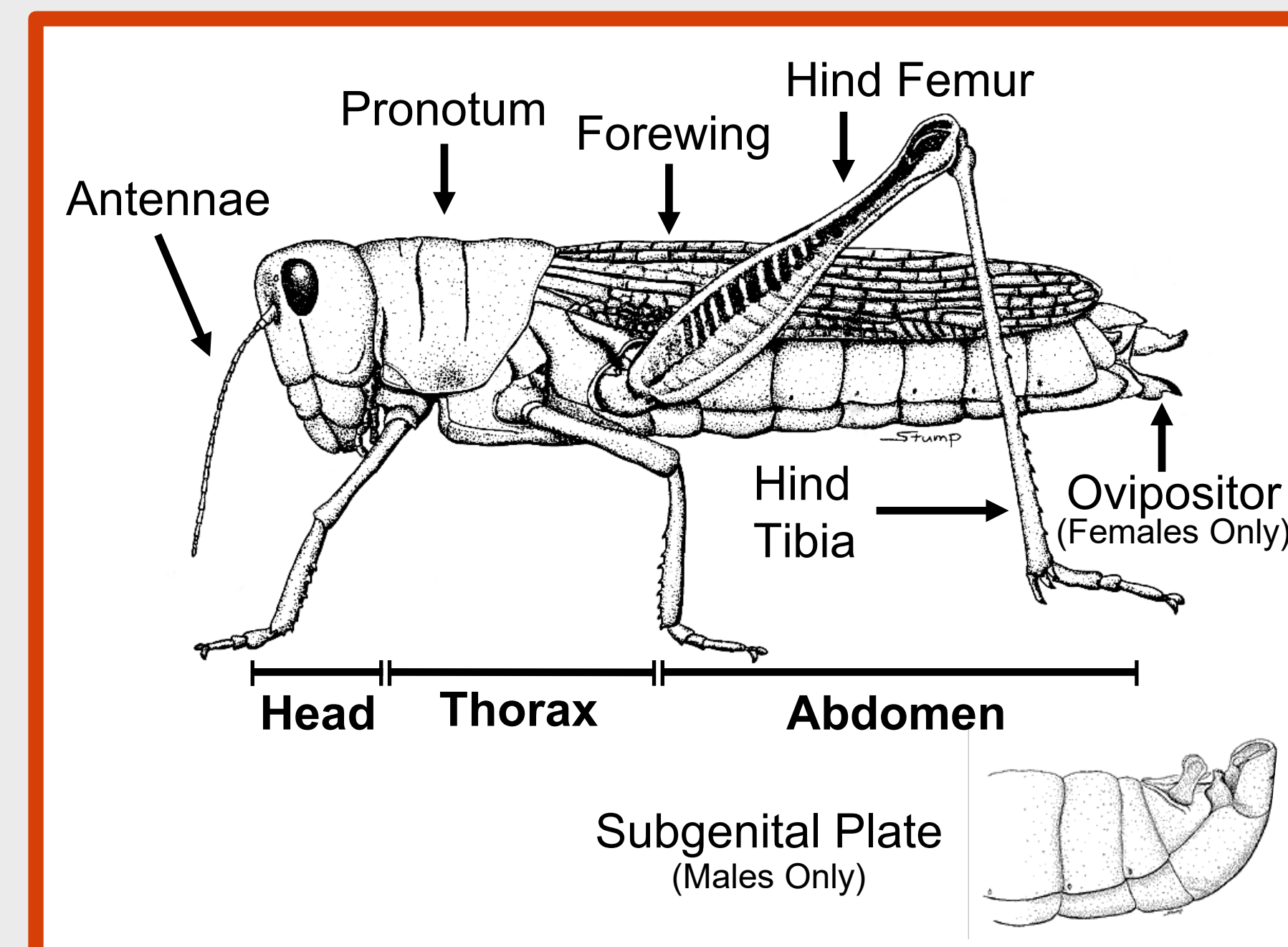


Figure 2. Basic external morphology of grasshoppers. In males, the ovipositor is not present and instead the subgenital plate is at the end of the abdomen. The hindwing is hidden under the forewing. Adapted from Pfadt (2002).



Figure 3. The thistle grasshopper (*Aeoloplides turnbulli*) is a beneficial species that feeds on Russian thistle, kochia, and other weeds (Capinera et al., 2004). **Presence of beneficiaries highlights the importance of proper identification in pest management.** © Bill Maynard, 2020.



Figure 4. A Mormon cricket (*Anabrus simplex*) found in Eastern Oregon. It is easily identifiable due to its stark black color and long ovipositor. © Oregon Department of Agriculture.

IDENTIFYING PEST ORTHOPTERA

Orthoptera are identifiable by their large hindwings and leathery forewings (Figure 2; Pfadt, 2002). All but one of Oregon's common pest species are part of the family Acrididae, or grasshoppers; the Mormon cricket (Figure 4) is of the Tettigoniidae, or katydid, family. Members of the grasshopper family have antennae shorter than their body and short ovipositor (egg depositor), which distinguishes them from crickets and katydids (Capinera et al., 2004). There is no single morphological characteristic separating pest grasshopper species from non-pest species. Defining characteristics of some of Oregon's common pest grasshoppers are shown in Figures 5-8 (Capinera et al., 2004). Nymphs can have vastly different characteristics from their adult forms, while others look very similar to the fully developed stage. For this reason, separate keys for each instar (developmental stage) is required for proper identification.

The Mormon cricket is distinguishable from non-pest crickets and katydids by their dark brown/black color, short forewings which are often hidden by the pronotum (plate behind the head), and slightly curved ovipositor (Figure 4; Capinera et al., 2004).

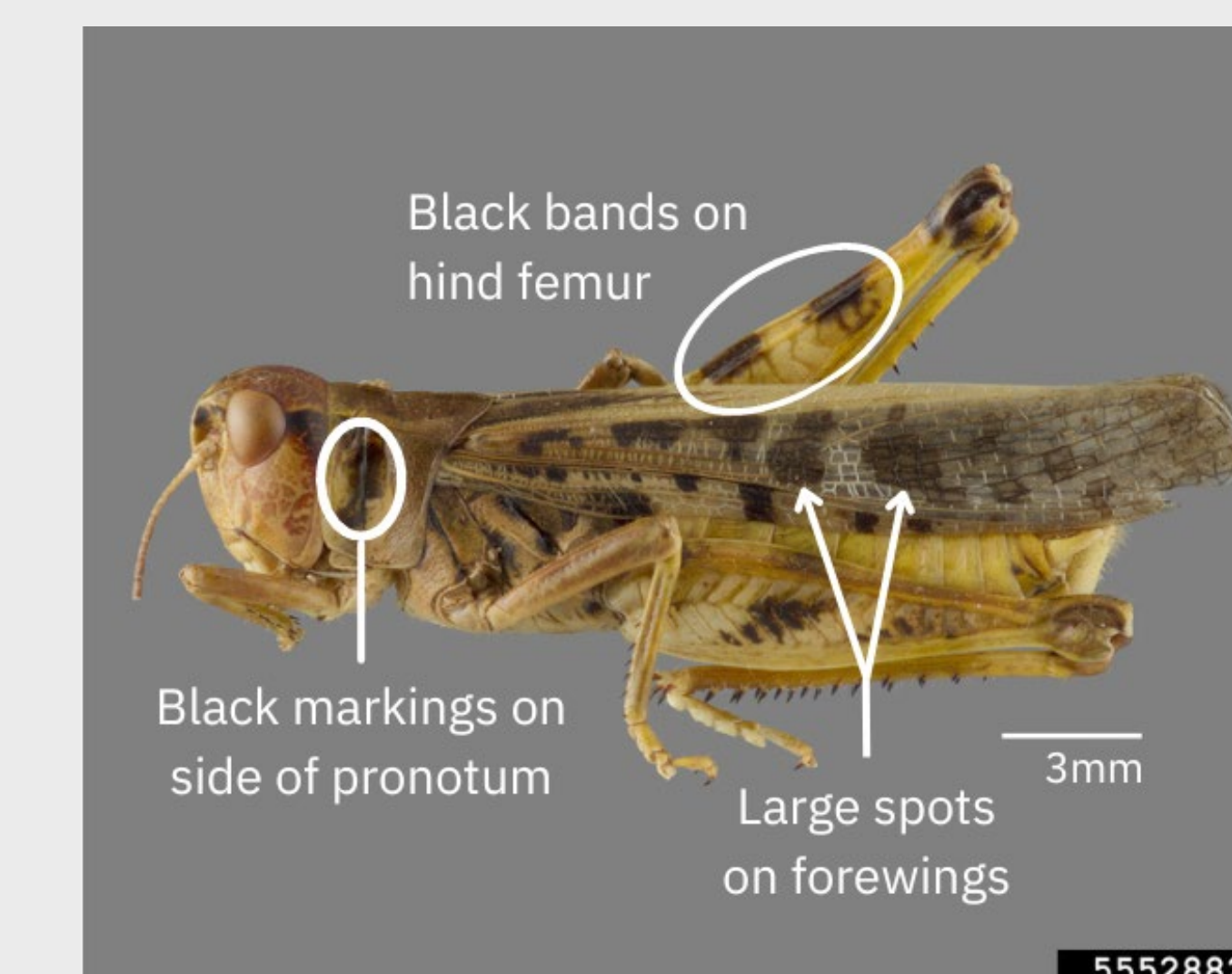


Figure 5. Clearwinged grasshopper (*Camnula pellucida*). © Sangmi Lee, Grasshoppers of the Western U.S., USDA APHIS PPQ, bugwood.org

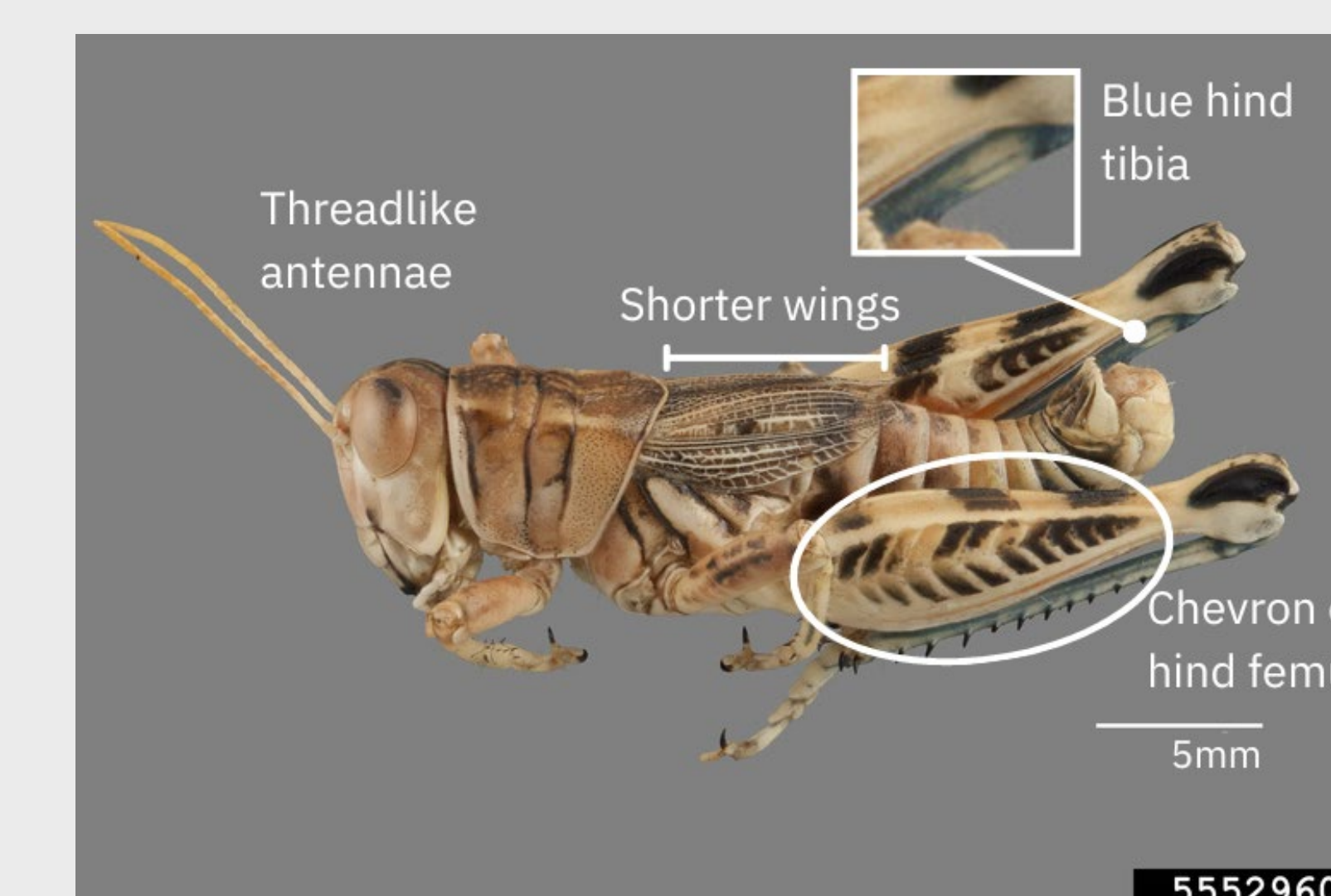


Figure 7. Valley grasshopper (*Oedaleonotus enigma*). © Sangmi Lee, Grasshoppers of the Western U.S., USDA APHIS PPQ, bugwood.org

REFERENCES

- Capinera, J. L., Scott, R. D., & Walker, T. J. (2004). Field guide to grasshoppers, katydids, and crickets of the United States. Cornell University Press.
- Oregon Department of Agriculture (ODA) (2022). Grasshopper and Mormon Cricket Outbreaks in Oregon Frequently Asked Questions. <https://www.oregon.gov/oda/shared/Documents/Publications/IPPM/GHMCFAQs.pdf> (Accessed 30 April 2024).
- Oregon Department of Agriculture (ODA) (2024). Oregon Grasshopper and Mormon Cricket Survey Summary for 2023. https://content.govdelivery.com/attachments/ORODA/2023/12/01/file_attachments/2701600/2023_Annual_Grasshopper_Report_2023-11-300.pdf (Accessed 30 April 2024).
- Pfadt, R. E. (2002). Field guide to common western grasshoppers (3rd ed.). Wyoming Agricultural Experiment Station.
- This project was funded by the Office of Undergraduate Research (OUR) and WSARE Professional Development Program.**

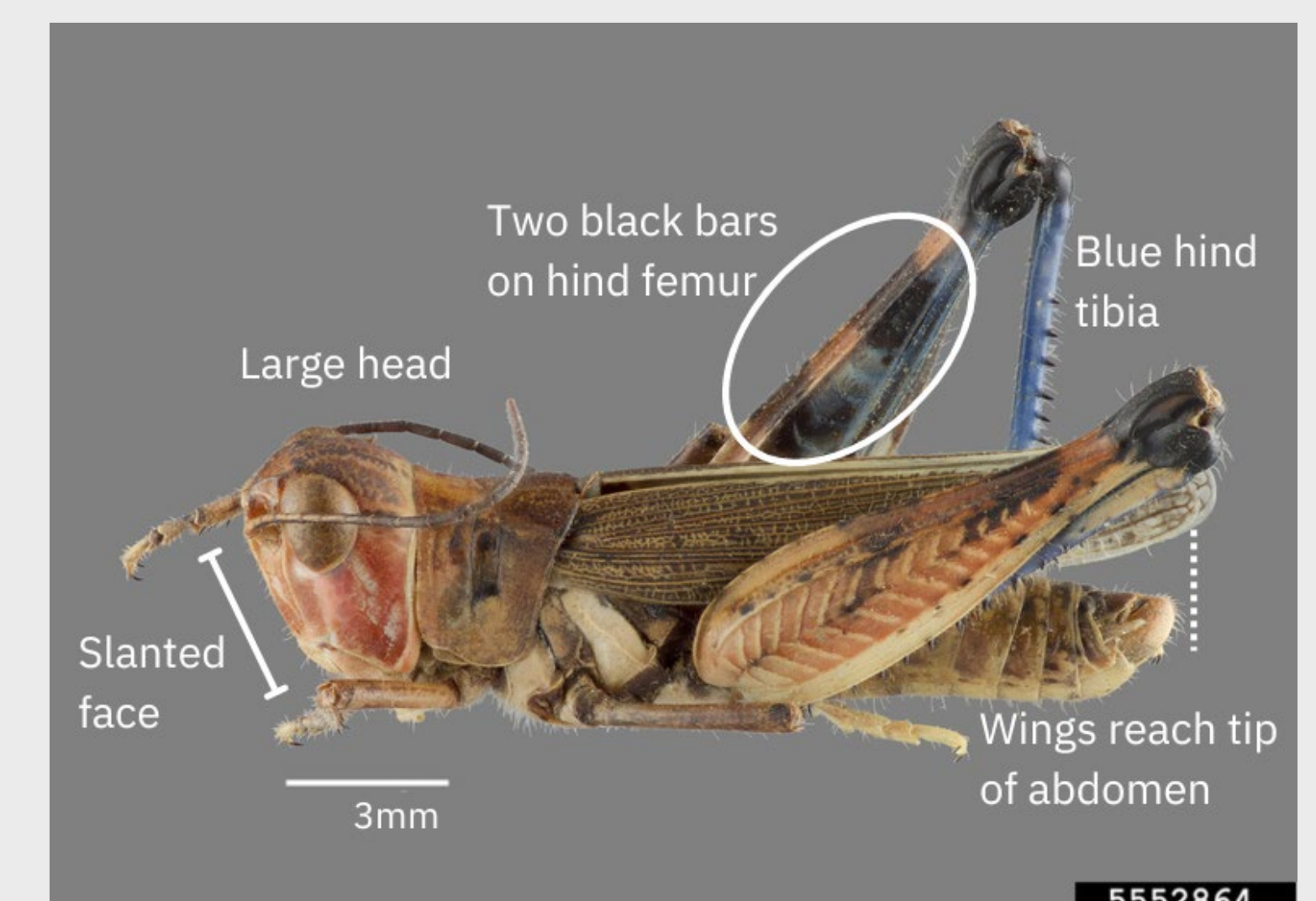


Figure 6. Bigheaded grasshopper (*Aulocara elliotti*). © Sangmi Lee, Grasshoppers of the Western U.S., USDA APHIS PPQ, bugwood.org

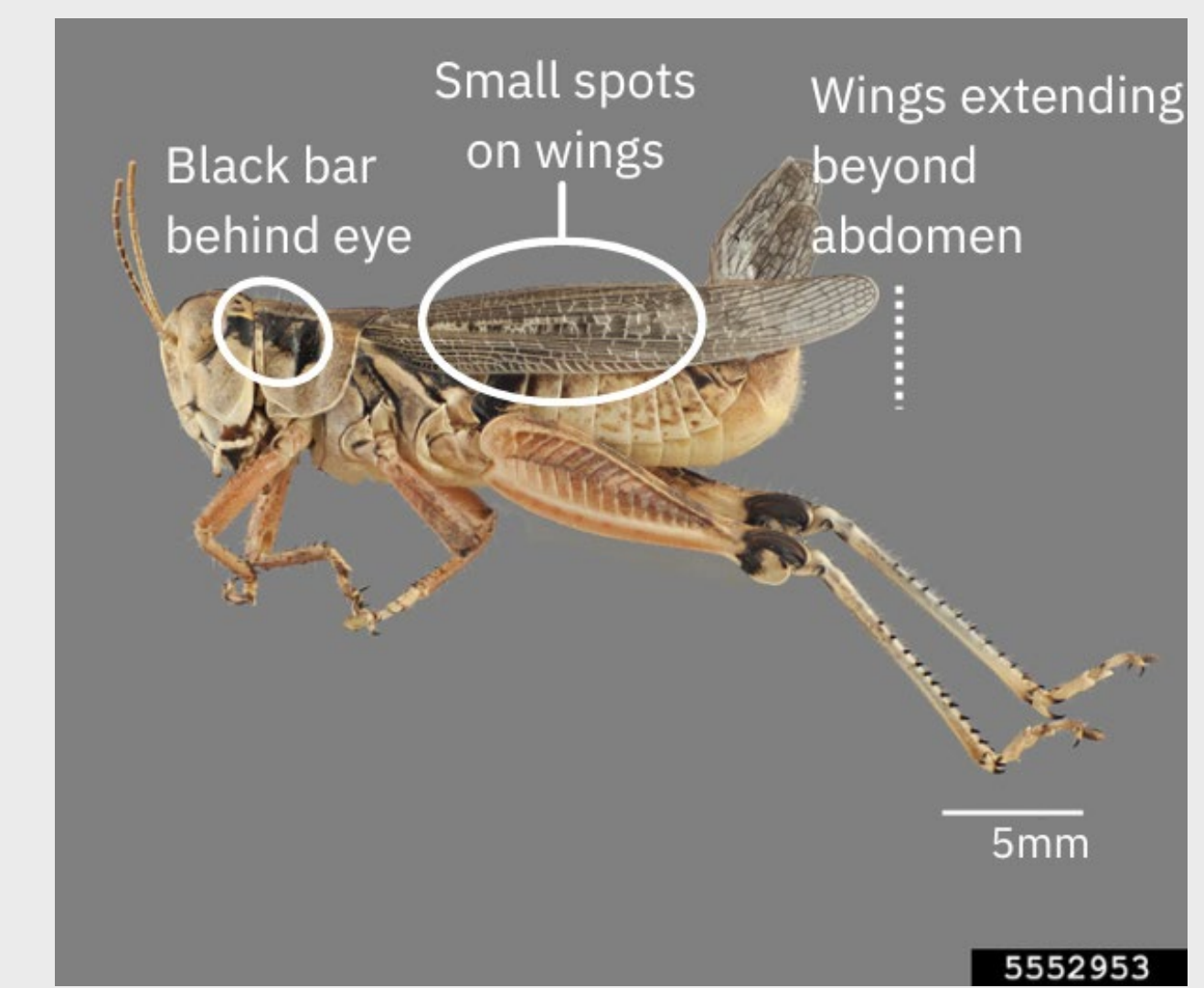


Figure 8. Migratory grasshopper (*Melanoplus sanguinipes*). © Sangmi Lee, Grasshoppers of the Western U.S., USDA APHIS PPQ, bugwood.org

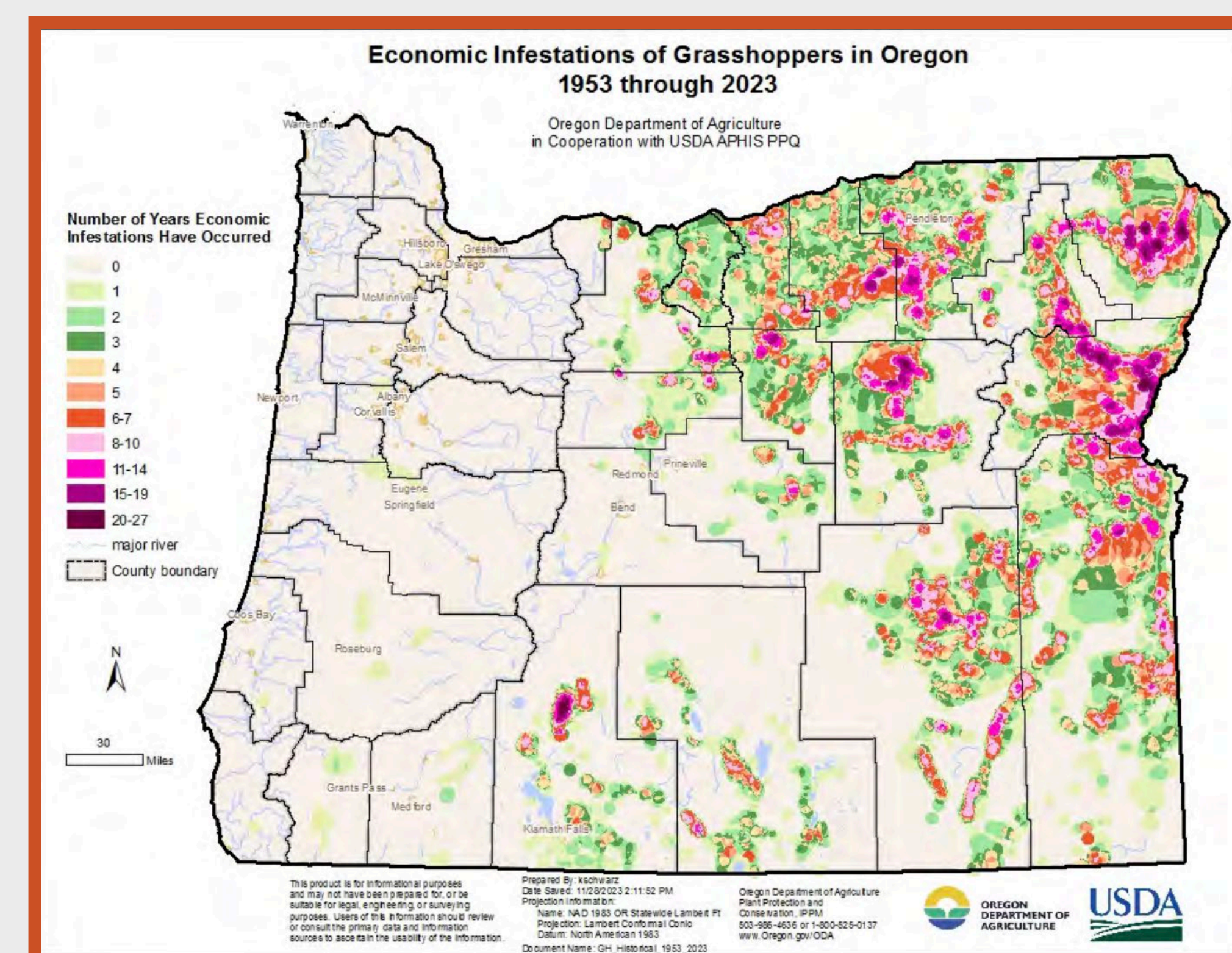


Figure 1. Frequency of high-impact infestation years in Eastern Oregon from 1953 to 2023. Some regions have experienced up to 27 years (dark purple) of economic injury due to grasshopper outbreaks over this 70 year time period.

At its worst in 2022, heavily impacted areas had a mean density of 73 grasshoppers per square yard (ODA 2024). This is well beyond the 8 grasshoppers per square yard threshold at which damage begins to occur.

OREGON IPM CENTER'S SOLUTION

The Oregon Integrated Pest Management (IPM) Center aims to train OSU Extension agents and crop consultants on IPM practices. Integrated pest management (IPM) is a means of pest control emphasizing identification and treatment that minimizes the impacts of both pests and pesticides. To address the ongoing Orthoptera outbreak, the Oregon IPM Center will host workshops in affected regions across the Pacific Northwest. Workshops will include classroom and field trainings, enabling attendees to educate their constituents on how to effectively manage crickets and grasshoppers.

The goal of this project is to create training materials for these workshops, covering:

- **Basic morphology** – Participants will be able to identify Orthoptera species, which requires a basic understanding of insect morphology (Figure 2).
- **Features of common pest species** – Since identification is necessary for informed management, participants will be able to identify pest species (Figure 4-8) and differentiate between pest and non-pest species (Figure 3).
- **Photographing Orthoptera for identification** – Participants will be able to photograph Orthoptera and make digital submissions to the Oregon State Arthropod Collection (OSAC). Photo vouchers of Orthoptera can be used to monitor species distribution and population dynamics. Specimens of interest (species reports in new locations, rare species) will be curated and incorporated into the OSAC Orthoptera collection.