Invasive weeds are one of the worst scourges within rangelands, and it is often difficult to control them using conventional approaches such as herbicides or mowing. But all is not lost—insect allies can help us combat these noxious plants! We are talking about insect biocontrol agents, or plant-eating bugs that feed on weeds. However, there are hurdles these insects must overcome to successfully control weed populations; the first is establishing a viable population after being released. In this article we focus on one such ecological drama, which is the biocontrol of Canada thistle in North Dakota with a stem-mining weevil.

The Setting: North Dakota—The Peace Garden State
Environmental conditions can have dramatic impacts on insect–plant interactions and insect biology (e.g., mortality, reproductive rates, developmental times, overwintering capabilities). North Dakota is one of the most rural states in the United States, with 13.5 million acres of rangeland and 22 million acres of harvested cropland. This large state is well known for harsh, cold winters, with average annual temperatures ranging from 37°F in the northeast region of the state to 43°F along the southern border. Average winter temperatures are 11–15°F higher in the southwest corner of the state than the northeast corner because of warming effects of Chinook winds. The average number of days with freezing air temperatures (32°F) range from 180 in southwest North Dakota to 210 in areas along the Canadian border. Soil temperature data are scant, but along the eastern border in Fargo the lowest average soil temperature was 8.2°F at a 0.25-inch soil depth (data from the mid-1960s). Average depth of frost penetration into the soil ranges from 4 to 4.5 ft. The freezing depth of soil depends on air temperature, soil type, soil moisture content, and insulation from vegetation and snow cover. In general, drier soils freeze more quickly and to a greater depth than moisture-laden soils. North Dakota receives an average of 20 inches of annual precipitation in the southeast to 13 inches in the northwest. Typically annual precipitation increases from west to east, but because of topographic uplift, one area in the southwest receives more than 16 inches of precipitation annually, which is substantially greater than the surrounding area.

The Antagonist: Canada (a.k.a. Creeping) Thistle—The Ultimate Invasive Weed
Noxious perennial weeds are a constant problem plaguing the vast stretches of rangeland in North Dakota. Canada thistle (*Cirsium arvense* L.; Fig. 1) is the number one noxious weed in the state, with approximately one million acres currently infested. This weed species is an invasive perennial that thrives in disturbed or moist habitats. Canada thistle causes several ecological problems, including native plant displacement, a reduction in the quality of grazing land, and lower crop yields. This weed is particularly difficult to manage on low-lying moist sites such as those associated with riparian areas. Canada thistle spreads via seeds and shoots that sprout from an extensive, creeping root system. Current management programs often rely on herbicide applications, mowing, tillage, and crop rotation. However, many of these tactics can be costly and labor intensive, and many herbicides cannot be used in environmentally sensitive areas (e.g., near water). Thus, there is a need for alternative control measures.

The Protagonist: Hadroplontus litura—A Stem-Mining Weevil
Biological control can be an important component of an integrated approach to weed management, and several natural enemies have been investigated with regard to Canada thistle. In general, these insect biocontrol agents have either failed to establish or have had minimal impacts on thistle populations. However, some land managers and scientists believe that in some cases *Hadroplontus* (formerly *Ceutorhynchus*) *litura* Fabricius, a stem-mining weevil native to Europe (Fig. 2), may contribute to Canada thistle suppression.

Adult weevils overwinter in the soil and begin feeding on Canada thistle rosettes once they emerge in the spring. After several weeks, females deposit eggs within holes chewed into plant tissue. Larvae cause the majority of damage when they