Insect Pest Updates

Bertha Armyworm in Western Canada in 2020

M. Vankosky, O. Olfert, J. Gavloski, S. Barkley, J. Tansey, D. Giffen, J. Otani

Populations of bertha armyworm (*Mamestra configurata*) are monitored annually across the prairie provinces using pheromone traps. The traps are maintained by growers, agronomists, and other cooperators, with additional traps monitored by provincial and federal entomologists. Provincial entomologists provide support and guidance to cooperators during the growing season and compile and share data within each province during the growing season (in near-real time). The protocol used to monitor bertha armyworm using pheromone traps was updated in spring 2019 and is available on the Prairie Pest Monitoring Network website (prairiepest.ca). The monitoring program is used as an early warning system to alert growers when regional population densities approach economic thresholds (please refer to provincial Crop Production Guides for information about registered insecticides).

Cumulative trap captures below 600 are considered to represent low risk to crop production. However, actual larval density within the crop is usually sporadic and there can be considerable variation in larval population density within and between fields. Site-specific interpretation of trap counts is difficult, because pheromone traps only capture male moths, while female moths select where eggs are laid. In-field scouting for bertha armyworm larvae, following the protocol available from the Prairie Pest Monitoring Network, is important for accurate population density estimates at the local (*i.e.*, field) level.

The amount of damage caused by bertha armyworm depends on several factors, including larval density, life stage of the insect and of the host plant, and temperature. Monitoring for bertha armyworm larvae should start within two weeks of peak trap catches and should continue until the crop is sprayed or swathed. An economic threshold for bertha armyworm is available and should be used to determine when to spray individual fields. Bertha armyworm populations can be controlled by abiotic factors (*e.g.*, unfavorable weather) and biotic factors (*e.g.*, parasitoids, predators, and disease). The effects of these natural factors result in cyclic outbreaks that have generally occurred on an 8 to 10 year cycle, on a regional basis. Localized outbreaks may also occur, where populations increase, peak, and decrease over a three year period. In the past, outbreaks in Alberta have followed outbreaks in Manitoba and Saskatchewan. The last extensive regional outbreak occurred in 1994-1996.

Bertha armyworm populations were very low across the prairies in 2020, except for some growing areas in southwestern Alberta (Figure 1) where trap counts indicated uncertain risk (cumulative count of 600-900 male moths per trap). In Manitoba, for example, none of the traps set up across the province captured more than 500 male moths. In Saskatchewan, 257 pheromone traps were deployed. Numbers in excess of 600 moths were recorded in isolated traps in central, south, and southeast Saskatchewan, but the average number of moths per trap across all trap sites was only 126. The overall risk to crops in 2020 due to bertha armyworm was relatively low.

This survey is funded through the AgriScience Program as part of the Canadian Agricultural Partnership, a federal, provincial, territorial initiative. Funders include Agriculture & Agri-Food Canada, Western Grains Research Foundation, SaskWheat, Manitoba Crop Alliance, Alberta Wheat Commission, SaskPulse, Manitoba Canola Growers, Prairie Oat Growers Association, SaskCanola, and Manitoba Pulse and Soybean Growers). The network of pheromone traps was implemented and monitored by Alberta Agriculture & Forestry, Saskatchewan Ministry of Agriculture, Manitoba Agriculture and Resource Development, and Agriculture & Agri-Food Canada (AAFC).

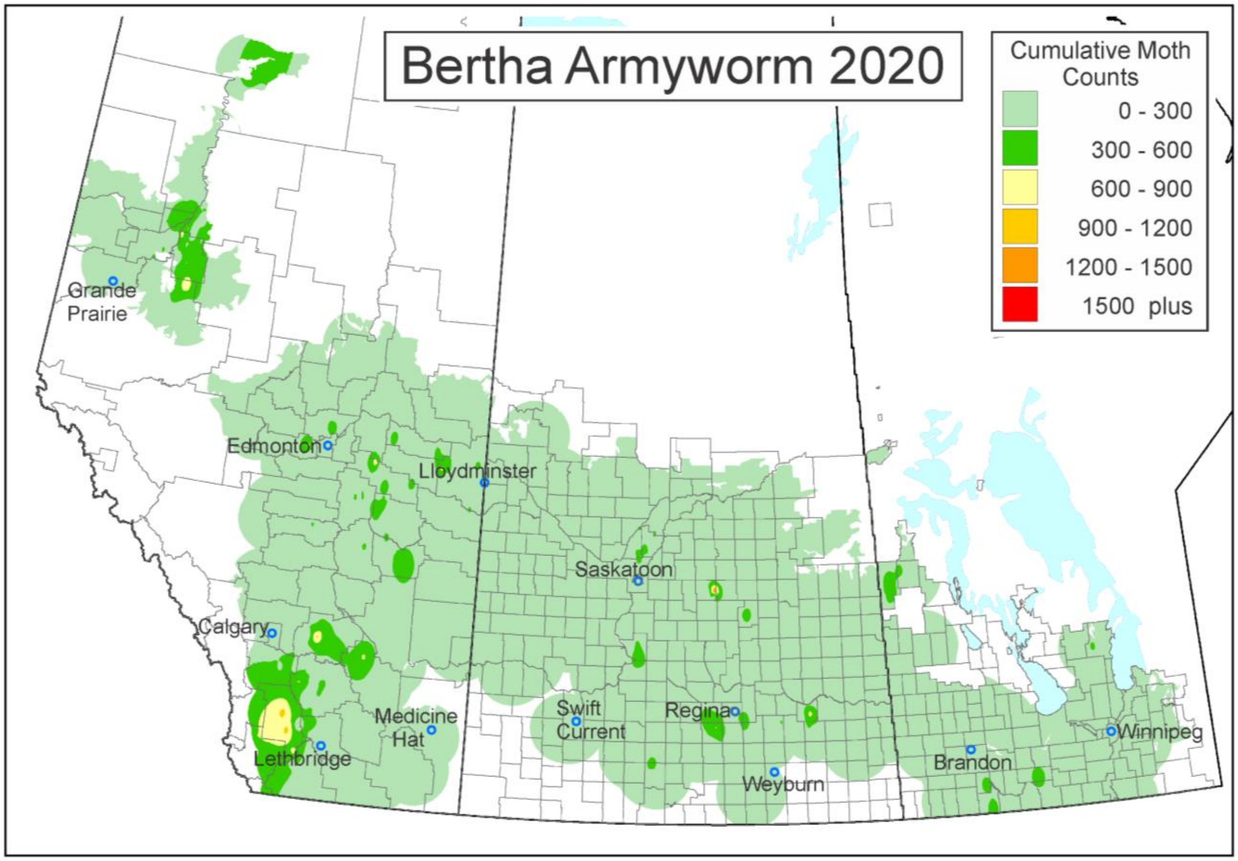

Figure 1. The cumulative trap catch of adult male bertha armyworm (*Mamestra configurata*) in pheromone-baited traps across the prairies in 2020 (map by David Giffen, AAFC-Saskatoon).

The 2021 Prairie Grasshopper Forecast

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The grasshopper forecast is based on estimates of adult grasshopper density made in the fall of the previous year and on weather and biotic factors that affect grasshopper development and survival. The survey conducted in the fall estimates the number of adult grasshoppers capable of producing eggs before winter. Factors that lead to increased grasshopper populations include warm and dry conditions in late summer and fall; these encourage mating, egg laying, and egg development. Warm and dry conditions in the spring increase the survival of grasshopper hatchlings and the risk of crop damage. Actual levels of infestation in field crops may differ from those predicted in Figure 2 because of regional variation in weather conditions and the grasshopper species present.

Recent dry conditions across the southern prairies were ideal for grasshoppers, but only localized population outbreaks were recorded in 2020 and those outbreaks were generally driven by clearwing grasshoppers. Fall populations in 2020 were generally light or very light in Manitoba and very light in Saskatchewan (Figure 2), suggesting low risk in 2021. In Alberta, fall populations were quite low across the central and northern growing regions, but densities were rated as moderate, severe, and very severe in southern Alberta, south east of Lethbridge (Figure 2). Growers in southern Alberta should be prepared to scout for grasshoppers in 2021. Growers in the Parkland regions of Alberta and Saskatchewan might experience higher than expected grasshopper numbers depending on the species of *Melanoplus* that were observed in 2020 (*i.e.*, our forecast is based on the life history of *M. sanguinipes* and may not be accurate for other *Melanoplus* species).

Female grasshoppers tend to lay their eggs along field margins and in ditches. Thus, field margins, roadsides, and crops grown on stubble should be watched closely when grasshopper hatching begins in the spring. The action threshold for most crops occurs when grasshopper populations reach 8-12 grasshoppers/m^2. The action threshold in lentils is much lower (>2 grasshoppers/m^2) at the flowering and pod stage, as grasshoppers cause direct yield loss at this plant stage. For example, two-striped grasshoppers feed preferentially on lentil pods, causing direct and significant yield loss at low population densities. If insecticides are applied to control grasshoppers (please refer to your provincial Crop Protection Guide for insecticide information), they should be applied to reduce their impact on beneficial insects (*e.g.*, pollinators, predatory beetles, and parasitoids of other insects) and on environmentally sensitive areas (*e.g.*, wetlands that provide other important ecosystem services).

A protocol for grasshopper scouting is available on the Prairie Pest Monitoring Network website. The developmental and risk status of grasshopper populations across the Prairie region will be available from the provinces and from the Prairie Pest Monitoring Network as the 2021 growing season progresses.

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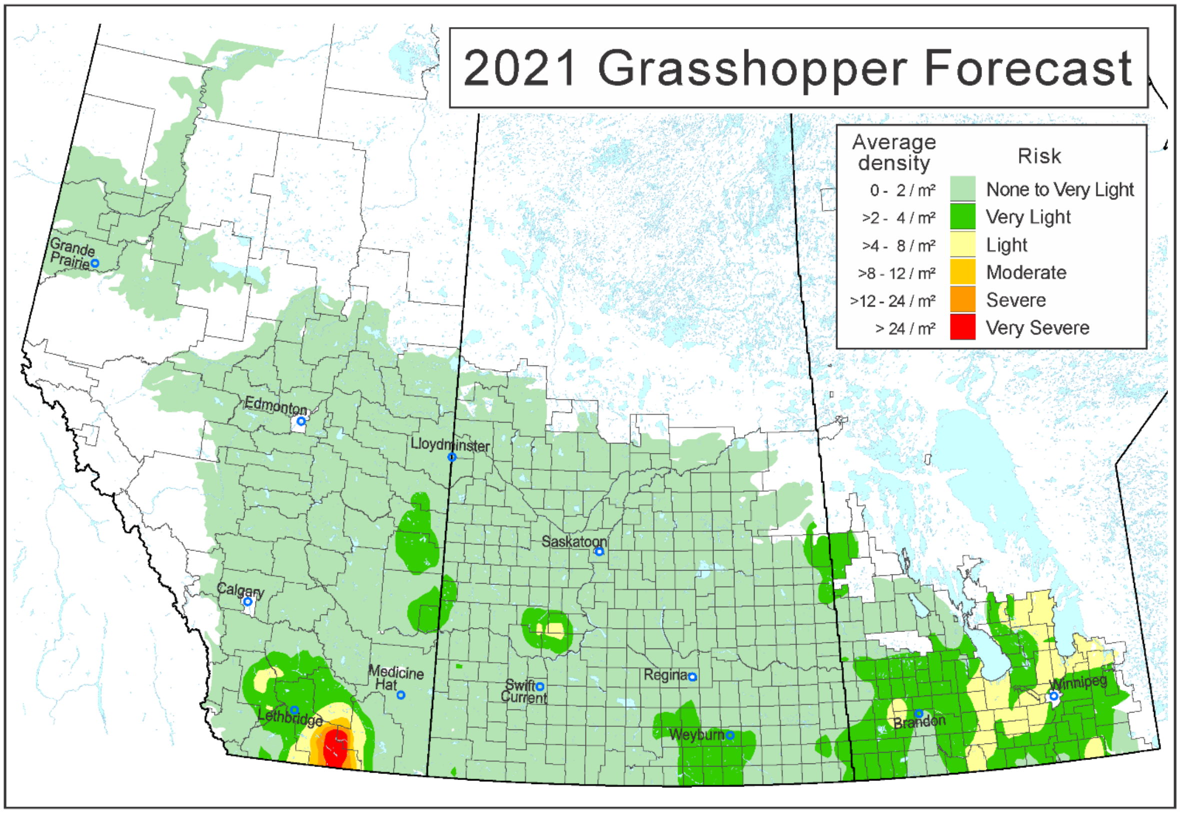

Figure 2. The potential risk due to grasshopper populations in 2021 is based on a fall survey of adult grasshoppers across the prairie provinces in 2020, as pictured here (map by David Giffen, AAFC-Saskatoon).

Wheat Midge Forecast in Saskatchewan and Alberta for 2021

M. Vankosky, O. Olfert, S. Barkley, J. Tansey, D. Giffen, J. Otani

The risk of wheat midge (*Sitodiplosis mosellana*) infestation in 2021 is estimated based on the number of non-parasitized wheat midge larval cocoons in soil samples collected during the fall wheat midge survey conducted in 2020 (Figure 3). A number of factors in addition to parasitism influence the overwintering and developmental success of larval wheat midge. However, the forecast based on non-parasitized larvae provides a general picture of existing densities and the potential for damage in 2021. Weather conditions (especially precipitation levels) in spring 2021 will further influence the extent and timing of wheat midge emergence during the growing season.

Areas at risk of wheat midge infestation are concentrated largely in the north-central portion of the wheat production area in Alberta (east of Edmonton) and Saskatchewan (Figure 3), as well as in southeast Saskatchewan. These areas all had wheat midge cocoon densities of 600 midge/m^2 or greater during the survey in fall 2020. There are approximately 5 and 14 areas at risk of economic damage due to wheat midge in 2020 in Alberta and Saskatchewan, respectively (600 midge/m^2 or greater). The forecast map is provided in Figure 3. The potential risk in 2021 is greater than what was forecast in 2020. This is likely due to the timing of spring rain in June 2020 that promoted larval development and subsequent adult emergence, and due to wet and cool conditions that persisted until midsummer in north-central Alberta and Saskatchewan in 2020.

The risk of crop damage associated with wheat midge is expected to be relatively low in the Peace River Region in 2021, but care should be taken when interpreting the forecast for this part of Alberta because of developmental differences between Peace River wheat midge populations and populations in other parts of the prairies.

All areas where wheat midge are active during the growing season are susceptible to crop damage because wheat midge larval feeding affects grain yield and quality. Growers in all areas with historic wheat midge populations should monitor their wheat fields during the susceptible period of crop development (*i.e.*, emergence of the wheat head from the boot until flowering) and when adult midge are active.

Insecticide application may be appropriate if adult midge density is equal to one midge per four or five wheat heads between emergence of the wheat heads and flowering (anthesis stage). By the anthesis stage, wheat is resistant to larval damage and insecticides are not cost effective as any larvae present will have already caused damage. Larvae that hatch from eggs laid late in wheat development will not cause significant damage. Avoiding insecticide application after the anthesis stage will help protect populations of natural enemies in field crops, including parasitoids of wheat midge, and of other pests. Parasitism by a small parasitoid wasp (*Macroglenes penetrans*) can keep wheat midge populations from exceeding the economic threshold. Please refer to your provincial Crop Protection Guide for information about registered insecticides.

In spring 2020, the Prairie Pest Monitoring Network will use phenology models and weather conditions (precipitation and growing degree days) to model the expected emergence of wheat midge adults. Updates of current conditions and wheat midge emergence will be provided during the growing season.

Surveys of wheat midge larval cocoons were conducted in 2020 by Sharon Nowlan (SK) and by Alberta Agriculture & Forestry. The survey was funded by Saskatchewan Crop Insurance Corporation, Saskatchewan Wheat Development Commission, and Alberta Agriculture & Forestry. Prairie Pest Monitoring Network activity related to this survey was funded by the Canadian Agricultural Partnership.

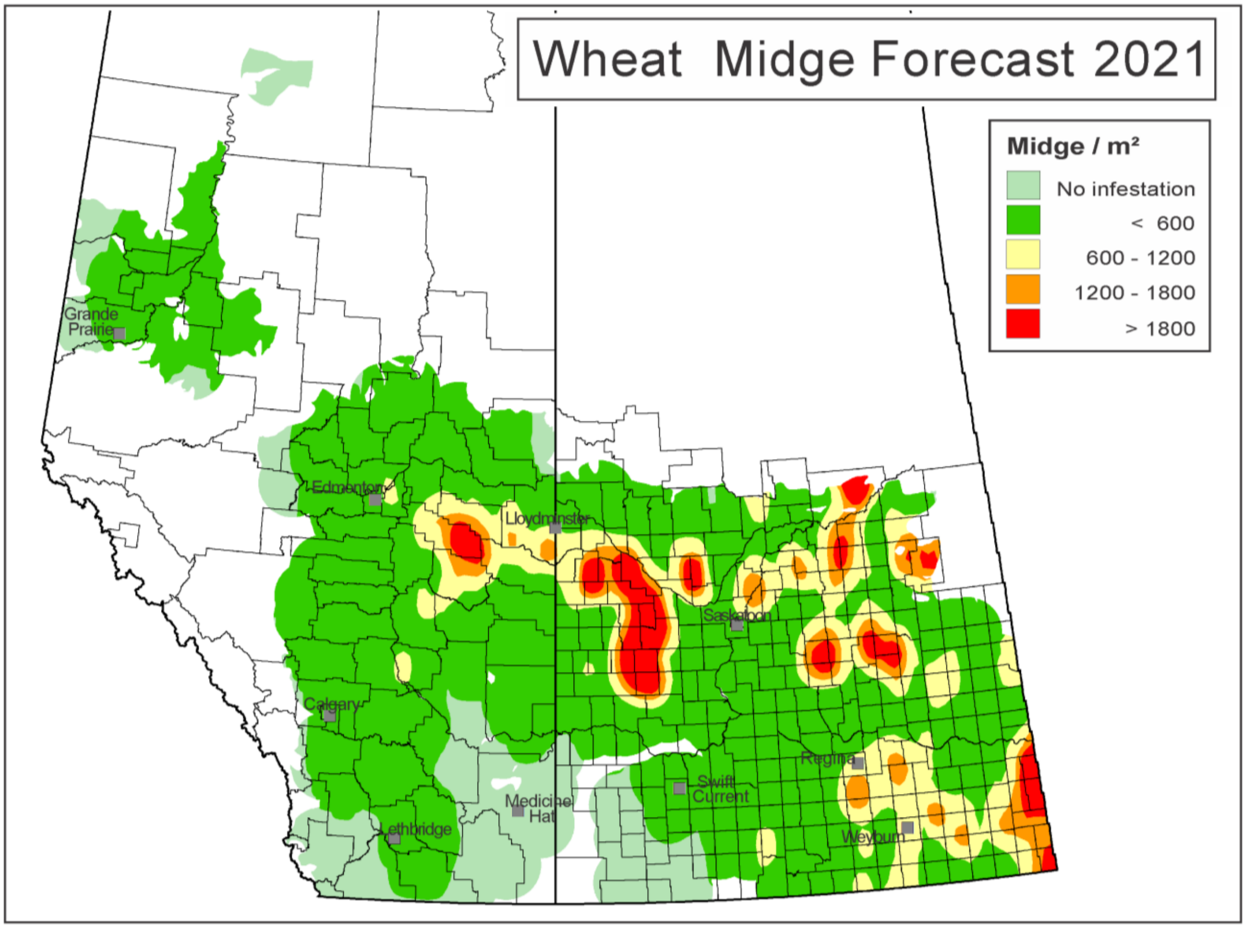

Figure 3. The forecasted risk associated with wheat midge (*Sitodiplosis mosellana*) in 2021 is based on the number of unparasitized wheat midge cocoons in soil samples collected in fall 2020, pictured here (map by David Giffen, AAFC-Saskatoon).

Cabbage Seedpod Weevil in Alberta and Saskatchewan in 2020

M. Vankosky, O. Olfert, S. Barkley, J. Tansey, D. Giffen, J. Otani

Populations of cabbage seedpod weevil (*Ceutorhynchus obstrictus*) were very low north of the Trans-Canada Highway (Highway 1) in both Alberta and Saskatchewan in 2020 (Figure 4), as also observed in 2019. No cabbage seedpod weevils were found in sweep samples collected in the Peace River Region of Alberta or British Columbia, but populations are becoming established in north-central Alberta that could be source populations. The annual survey is important to document the geographic expansion of this pest. South of Highway 1, the area with population densities greater than 4-9 weevils per sweep contracted was similar to that observed in 2019 and some fields with particularly high numbers (>90 weevils per sweep) were surveyed near Lethbridge.

In 2020, Agriculture & Agri-Food Canada and the Saskatchewan Ministry of Agriculture surveyed fewer than normal fields and the survey was initiated later than normal, due to travel restrictions associated with the global COVID-19 pandemic. Thus, there are some gaps in the area covered by the survey in 2020 as compared to previous years (Figure 4). It is also likely that fields were sampled after the majority of oviposition was completed. As such, the estimated population densities were likely underestimated in 2020. Cabbage seedpod weevil is present in Manitoba, but in very low numbers.

Cabbage seedpod weevil damage their host crops (Polish and Argentine canola, brown mustard) when adult weevils feed on leaves, flowers, and buds (resulting in bud-blasting). Later in the growing season, adult feeding by new generation weevils can cause damage to the pods, which may contribute to increased yield loss due to pod shatter at harvest. Larvae directly reduce yield by feeding on developing seeds inside pods. Once larval development is complete, the larvae chew exit holes in the pods before dropping to the soil to pupate. The exit holes are a source of indirect damage, as these increase the incidence of pod shatter and can facilitate secondary fungal infection of the pods. During the survey, fields of *Brassica napus*, *B. alba*, and *B. juncea* may have been surveyed, as all are suitable host crops.

To protect crops from cabbage seedpod weevil damage, monitor canola and brown mustard fields on a regular basis from the bud stage until the end of flowering. The protocol for monitoring cabbage seedpod weevil is available on the Prairie Pest Monitoring Network website. Accurate monitoring requires that sweep samples be collected from multiple locations within a field, with accuracy increasing as the sample size increases. To avoid overestimation of weevil populations, sweep samples should be taken from the interior of the field. The nominal economic threshold for cabbage seedpod weevil is 2.5 to 4 adult weevils per sweep. Insecticides are registered for cabbage seedpod weevil; please refer to the most recent Crop Protection Guide for your province.

Surveys were conducted by Alberta Agriculture & Forestry, Saskatchewan Ministry of Agriculture, and Agriculture & Agri-Food Canada (AAFC). This survey is funded through the AgriScience Program as part of the Canadian Agricultural Partnership, a federal, provincial, territorial initiative. Funders include Agriculture & Agri-Food Canada, Western Grains Research Foundation, SaskWheat, Manitoba Crop Alliance, Alberta Wheat Commission, SaskPulse, Manitoba Canola Growers, Prairie Oat Growers Association, SaskCanola, and Manitoba Pulse and Soybean Growers).

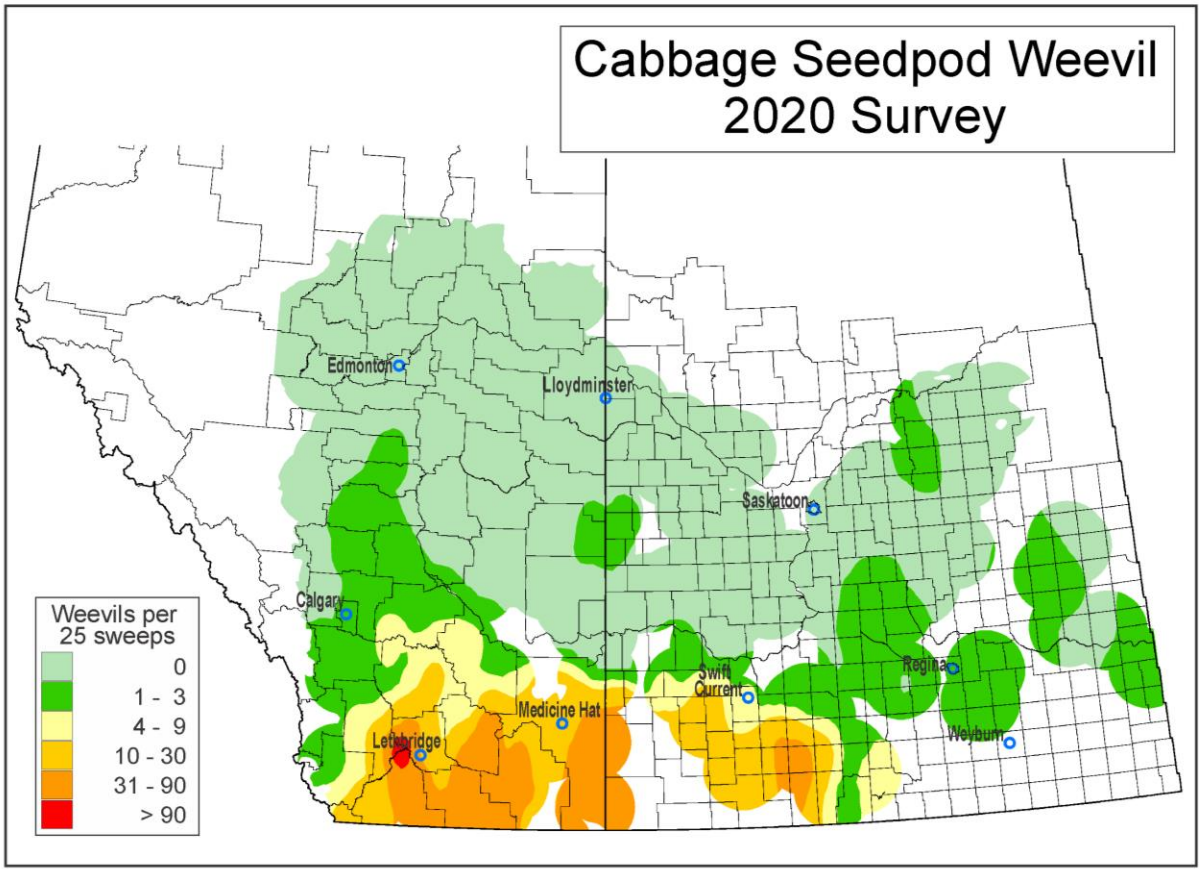

Figure 4. Cabbage seedpod weevil (*Ceutorhynchus obstrictus*) distribution in Saskatchewan and Alberta based on a sweep net survey conducted in randomly selected *Brassica* sp. fields in 2020 (map by David Giffen, AAFC-Saskatoon).

Distribution of Wheat Stem Sawfly in Alberta in 2020

M. Vankosky, S. Barkely, H. Carcamo, D. Giffen, O. Olfert

Wheat stem sawfly (*Cephus cinctus*) was surveyed in southern Alberta in 2020 by counting the number of stems cut by wheat stem sawfly larvae along the edges of wheat fields (Figure 5). Fields ranged in damage severity levels from very low to high. Many field sampled had 2-10% of stems cut (low damage severity), especially in the counties and Special Areas in the southeast. Some fields with high damage severity were surveyed around Milk River and Foremost (>25% of stems cut) (Figure 5). Although the areas with the highest population densities have shifted slightly between years, populations continue to increase compared to population densities observed between 2011 and 2017. Reduced populations between 2011 and 2017 were largely attributed to planting of solid stem wheat varieties and parasitism. Solid stem varieties continue to be popular in southern Alberta and there is no clear evidence that parasitism levels are changing, thus it is unclear why wheat stem sawfly populations have been increasing over the past few years.

The wheat stem sawfly is native to the prairies, but is considered a pest when it attacks cereal crops such as wheat. Populations of wheat stem sawfly increased quickly as wheat gained in popularity; solid stem wheat varieties have been integral in maintaining wheat as a profitable crop and reducing wheat stem sawfly pest pressure. Adult wheat stem sawflies are weak fliers; their dispersal improves in warm, calm, sunny weather conditions following spring rains. Very wet conditions hinder population growth, as does parasitism. Cultivated cereals including spring wheat and durum wheat are preferred hosts of wheat stem sawfly. They can also utilize other cereal grasses as developmental hosts, but pose no threat to broadleaf crops.

Damage resulting from sawfly feeding and development inside the stem contributes to economic losses via reduced yield, reduced quality, and reduced ability to harvest the crop when plants lodge before they can be swathed or combined. Because sawflies tend to be weak fliers, damage levels are often highest along the field margins. However, studies have shown that adult sawflies are not confined to the crop edges and may be more prevalent within 20 m of the crop edge. When entire fields are affected, damage levels greater than 50% have been recorded. No insecticides are registered for management of wheat stem sawfly. Management tactics rely on cultural and agronomic practices, as well as biological control. Resistant cultivars with solid stems are the most effective management option in areas where wheat stem sawfly occur consistently. Producers are generally advised to consider alternative crops or preventative strategies when damage levels in the previous year's crop range from 10 to 15%.

The survey was coordinated and conducted by Alberta Agriculture & Forestry and their partners.

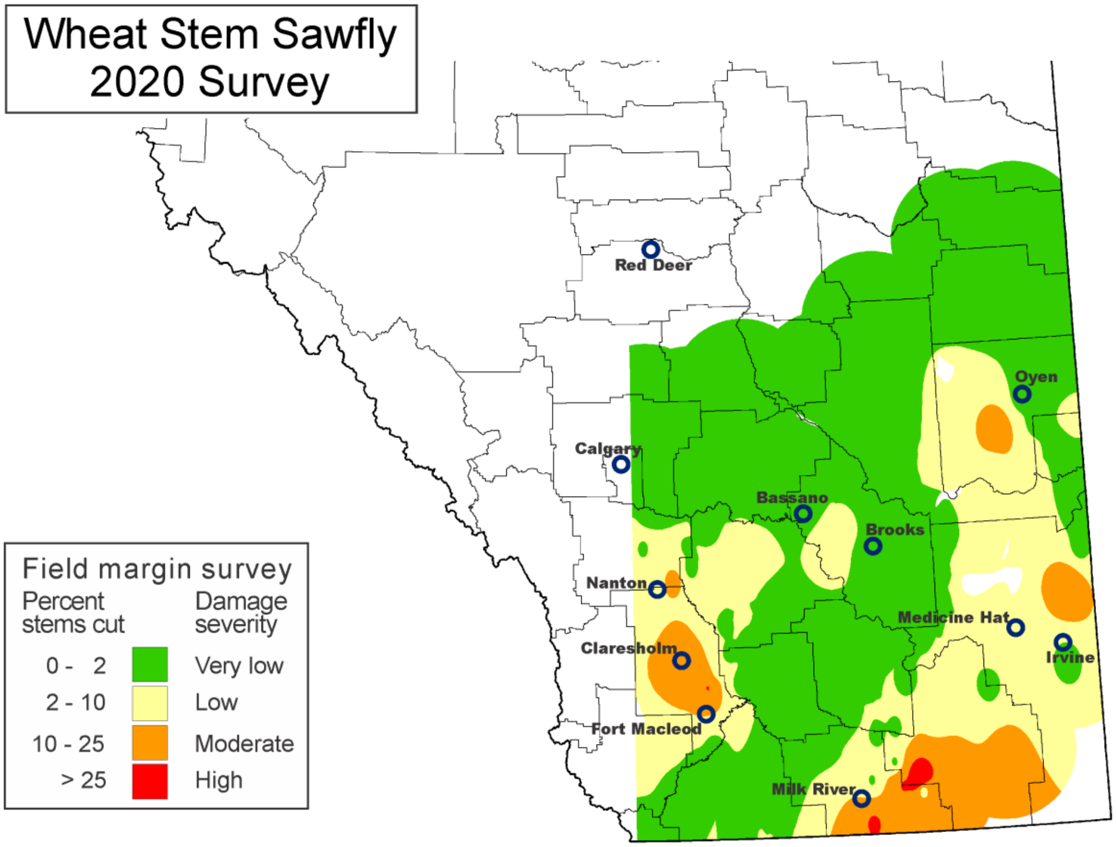

Figure 5. Wheat stem sawfly (*Cephus cinctus*) distribution in Alberta in 2020 based on results of a survey of cut stems in wheat fields counted after harvest (map by David Giffen, AAFC-Saskatoon).

Distribution of Pea Leaf Weevil in Saskatchewan and Alberta in 2020

M. Vankosky, J. Tansey, S. Barkley, D. Giffen, O. Olfert

The pea leaf weevil (*Sitona lineatus*) is an invasive species in Canada that is now established in Alberta and Saskatchewan, where its populations can impact the production of field pea. Faba bean is also a primary host of pea leaf weevil; establishment of this relatively new crop in western Canada is challenged by this pest. Pea leaf weevil was first detected on the prairies near Lethbridge in the late 1990s, in southern Saskatchewan in 2007, and in Manitoba in 2019. Adult pea leaf weevils consume the foliage of field pea and faba bean plants, beginning in the spring, resulting in 'u' shaped notches along the margins of the leaves. The survey is conducted annually in the spring when field pea plants range in size between two and six pairs of leaves by counting the number of feeding notches. The number of notches is used to estimate population density, based on the expectation that increasing levels of damage are indicative of increasing population density.

Since becoming established, the range of pea leaf weevil in western Canada has expanded east and north. The pea leaf weevil was confirmed in the Peace River Region a few years ago, and evidence of its presence was found throughout the region in 2020 (Figure 6). After detection in Manitoba in 2019, some pheromone traps were set up in the Swan River Valley in 2020, but a formal survey of spring damage was not conducted.

Pea leaf weevil populations in Saskatchewan were quite low again in 2020 (Figure 6), similar to observations from the survey in 2019. Some fields in southern Saskatchewan had an average of one to three notches per plant.

In Alberta, weevil populations were concentrated around Lethbridge in the south and Edmonton in the central part of the province (Figure 6). Populations in both areas were fairly low, with the damage in surveyed fields ranging from 1-27 notches per plant. The Edmonton area has been wetter than other parts of the prairies in the past few years, which could contribute to the health of weevil populations in that area. Research is underway using models to determine if there is a relationship between precipitation or soil moisture and pea leaf weevil population densities.

Insecticides (foliar and systemic) have been registered for management of the pea leaf weevil; growers should consult Crop Production Guides for up-to-date information about registered products. Results of insecticide trials indicate that systemic insecticides are more effective than foliar insecticides for managing pea leaf weevil damage to field peas. The use of systemic insecticides could be made more efficient with an accurate forecast of pea leaf weevil densities between growing seasons. This is a focus of ongoing research.

The pea leaf weevil survey was conducted by Alberta Agriculture & Forestry, the Saskatchewan Ministry of Agriculture, and Agriculture & Agri-Food Canada (AAFC). This survey is funded through the AgriScience Program as part of the Canadian Agricultural Partnership, a federal, provincial, territorial initiative. Funders include AAFC, Western Grains Research Foundation, SaskWheat, Manitoba Crop Alliance, Alberta Wheat Commission, SaskPulse, Manitoba Canola Growers, Prairie Oat Growers Association, SaskCanola, and Manitoba Pulse and Soybean Growers).

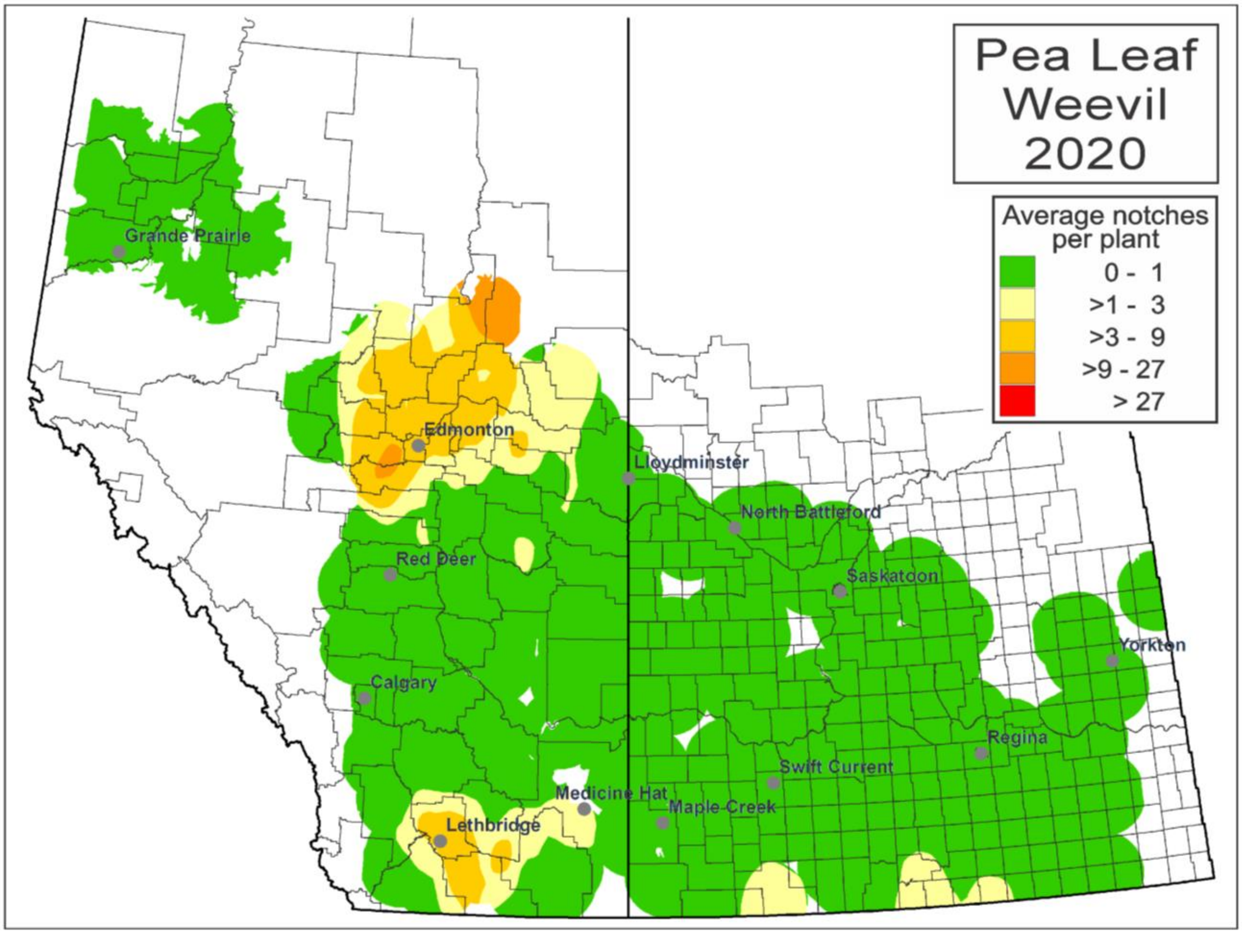

Figure 6. The distribution of pea leaf weevil (*Sitona lineatus*) in Alberta and Saskatchewan in 2020, based on a plant damage survey conducted in the spring in randomly selected field pea crops (map by David Giffen, AAFC-Saskatoon).