Prairie Pest Monitoring Network Weekly Updates – June 18, 2014

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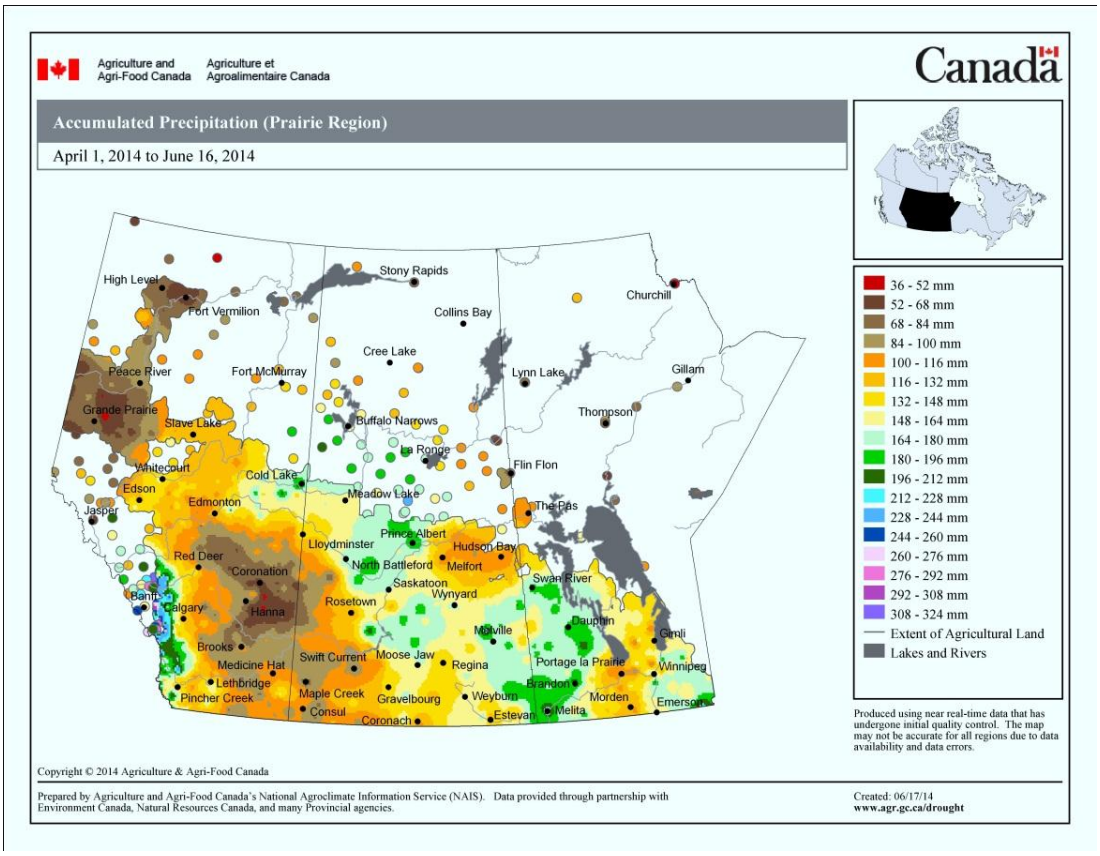
1. Our weekly update begins with the sad news that Dr. Lloyd Dosdall passed away in Edmonton on June 12, 2014. Lloyd was a founding member of the Prairie Pest Monitoring Network (PPMN) back in 1996. Over the years, he was a major contributor to the success of the project in so many ways. His biological and ecological studies contributed directly to the knowledge, tools and practices to detect, monitor and manage crop pests. In turn, these tools assist the agriculture industry in the mitigation of threats against the economic viability of crop production, sustainability and the environmental health of prairie agro-ecosystems.

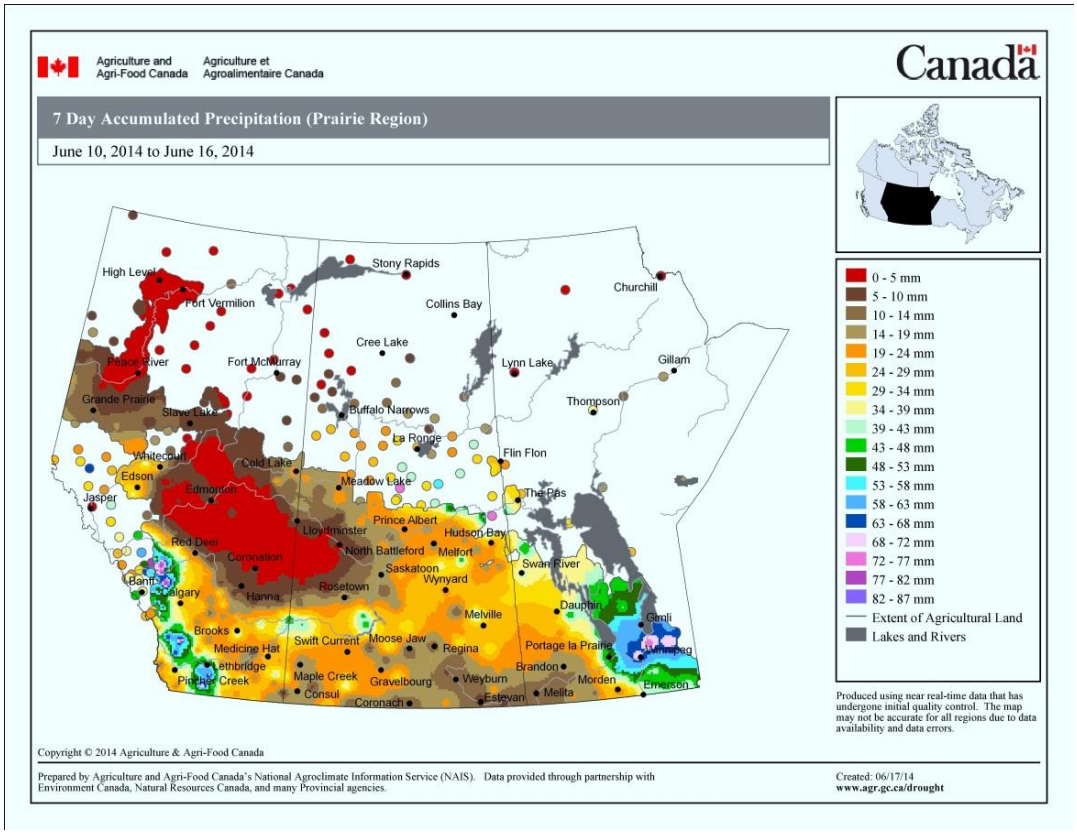
However, it was Lloyd's deep interest in the importance of beneficial insects in these systems that highlighted the role of predators and parasitoids for the integrated management of insect pests. His studies showed that pest management systems, which incorporated beneficial insects, resulted in more sensible pesticide-use decisions, leading to production systems with reduced input costs that address concerns regarding a safe, sustainable, and environmentally friendly food and bio-resource supply.

Owen Olfert

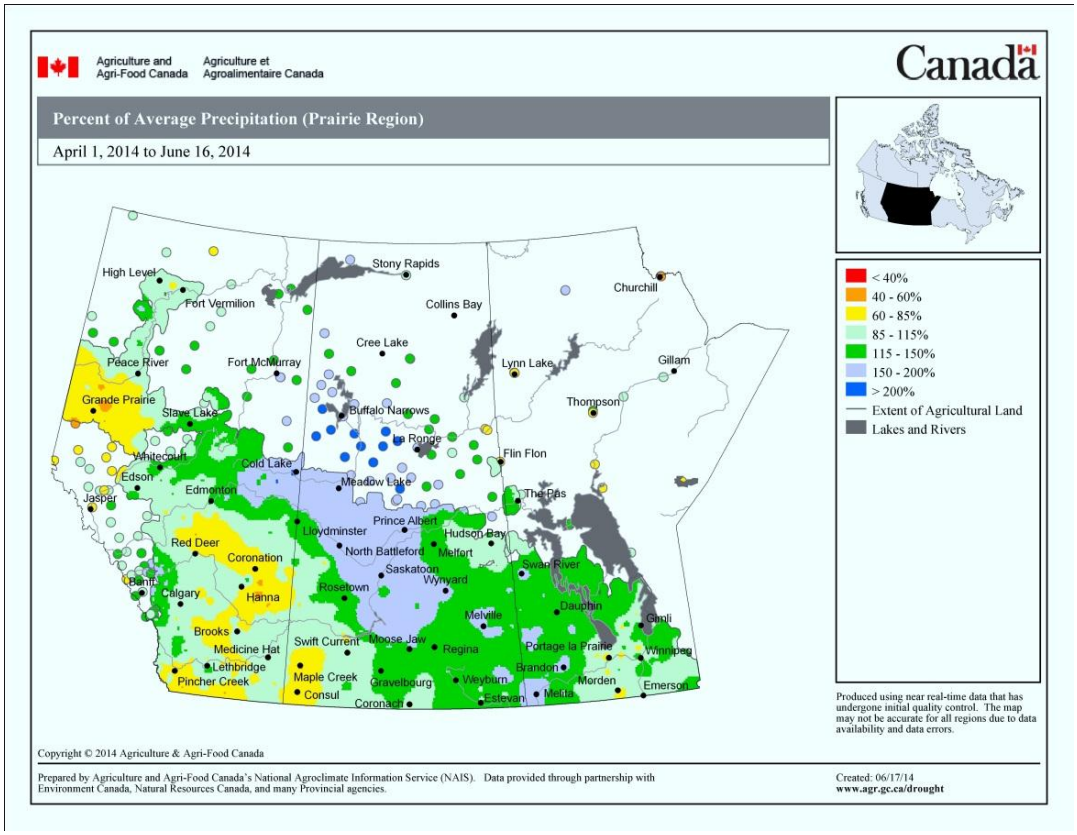
2. Weather synopsis – Below is the **Accumulated Precipitation for the Growing Season** (i.e., April 1-June 16, 2014):



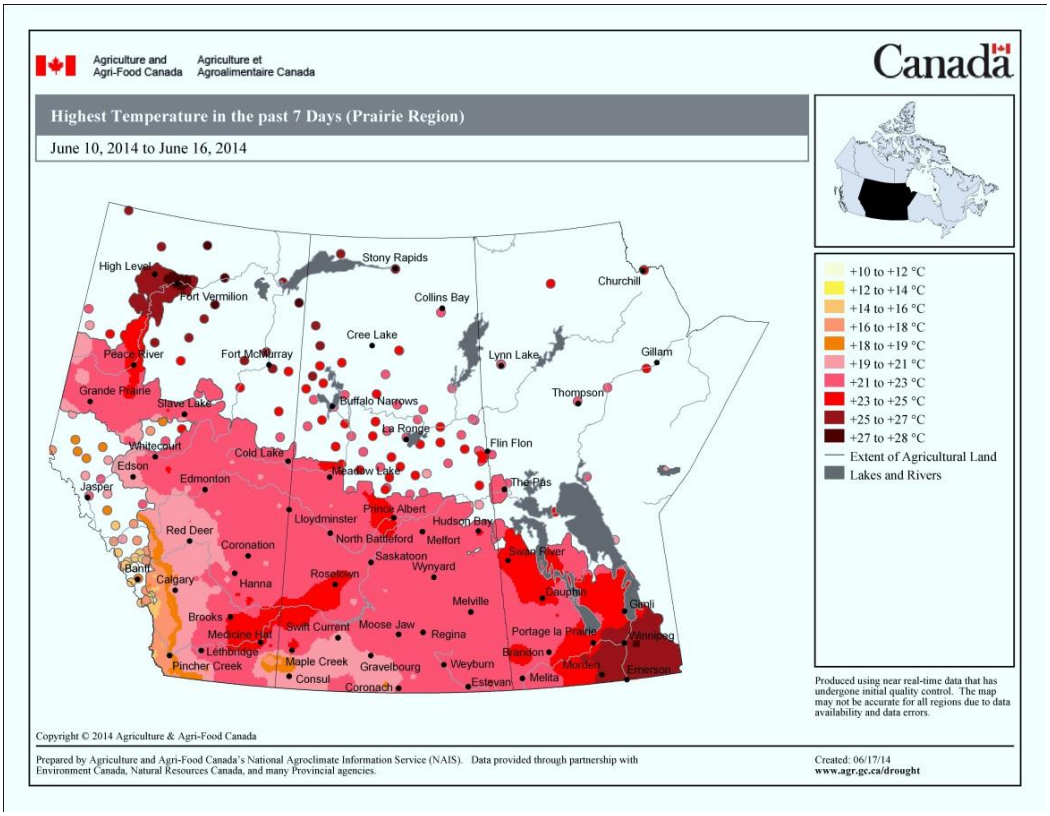
Below is the **Accumulated Precipitation the Past 7 Days** (i.e., June 10-16, 2014):



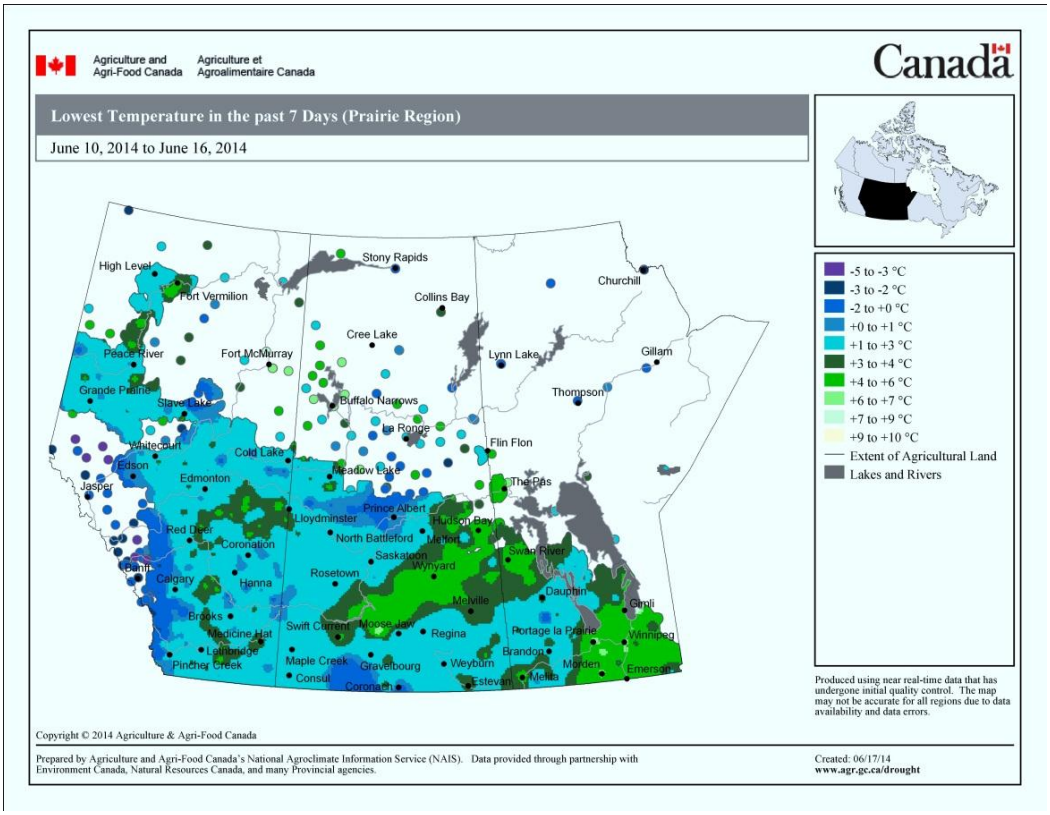
The map below shows the **Percent of Average Precipitation** for the growing season (April 1-June 16, 2014):



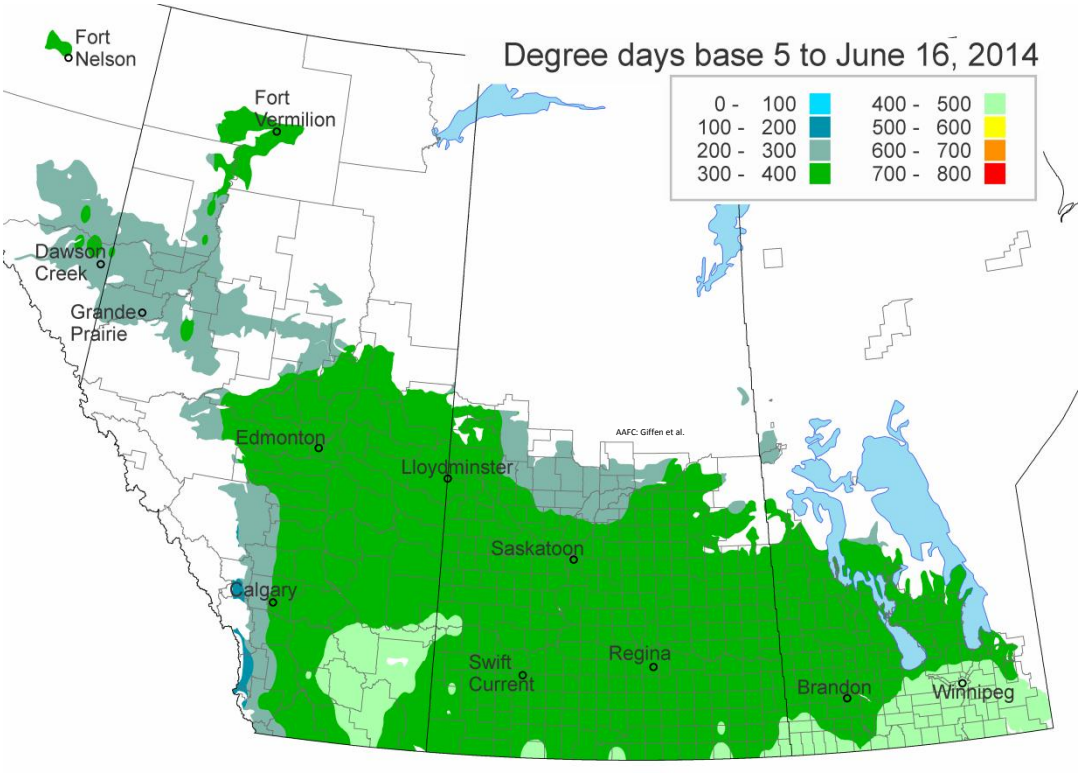
The map below shows the **Highest Temperatures the Past 7 Days** (June 10-16, 2014) across the prairies:



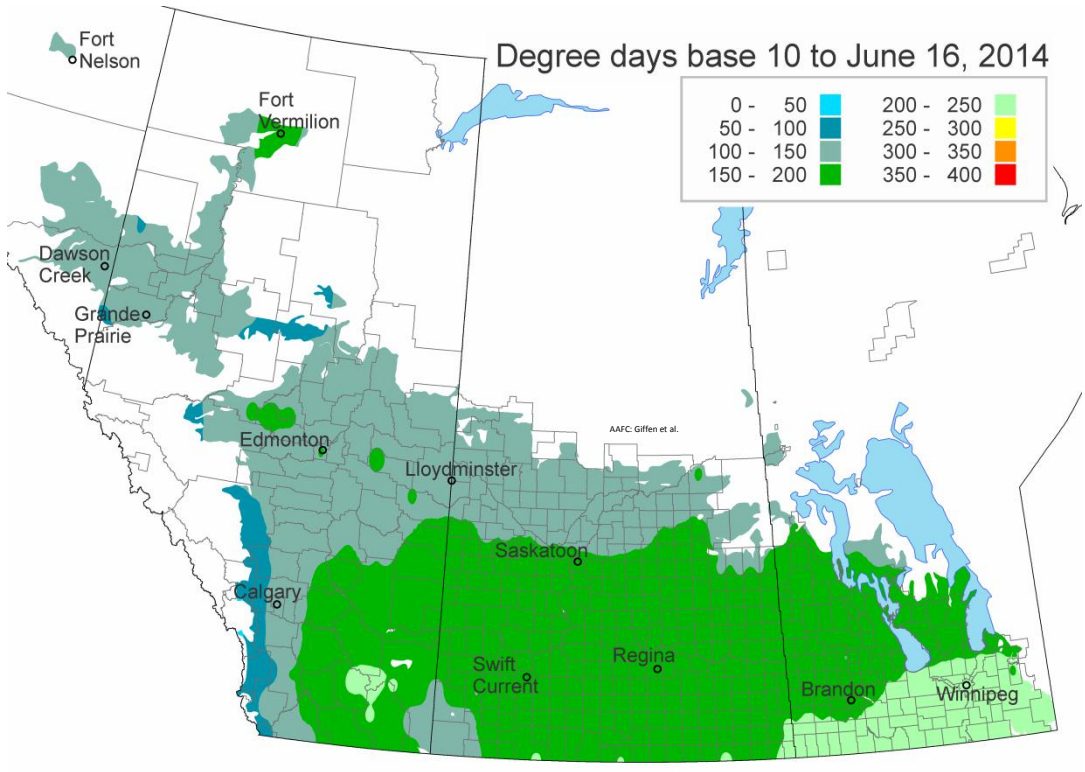
While the map below shows the **Lowest Temperatures the Past 7 Days** (June 10-16, 2014):



Growing degree day (GDD) estimates reflect the growing season, in terms of heat accumulation, across the prairies. Below is the **GDD (Base 5ºC) for the Growing Season** (April 1-June 16, 2014):



While below is the **GDD (Base 10ºC) for the Growing Season** (April 1-June 16, 2014):



3. Diamondback Moth (*Plutella xylostella*) – Producers in Manitoba can find weekly DBM pheromone reports within Manitoba Agriculture and Rural Development's "Insect and Disease Updates" which can be accessed by linking here. Be sure to check out the Manitoban DBM data which is now mapped.

Producers in Alberta can access Alberta Agriculture and Rural Development's DBM pheromone monitoring map which is updated daily and can be accessed by linking here. The most recent map (June 18, 2014) reflects low DBM counts from reporting sites so far.

Sites reporting DBM in pheromone traps will soon need to follow-up with in-field monitoring and late seeding dates will mean searching amongst very young canola plants. The following will hopefully aid your in-field monitoring efforts.

Identification, Life cycle and Damage:

Adults: Adult moths are approximately 12 mm long, with a 18-20 mm wing span (Fig. 1). They are grey or brownish with white marks on the inner margin of the forewing. Their name is derived from a series of diamond shaped figures formed by these white marks when the wings are folded at rest.

Eggs: Eggs are oval, yellowish-white and tiny. They are laid on the leaf surface the leaf surface singly or in small groups (Fig.2).

Fig. 1: Adult- 16 days

Fig. 2: Eggs- 5-6 days

Fig. 3: Larva- 10-30 days

Fig. 4: Pupa- 7-14 days

Larvae: Diamondback moth has four larval stages. The first stage is a leaf miner and lives inside the leaf tissue. Damage by young larvae is characterized by small mines and holes in the leaves and surface stripping on the underside of leaves. Older larvae are yellowish green to green caterpillars. They are small (about 12 mm long when full grown) compared to other caterpillars on Brassica crops. The larva is wider in the middle and tapering at both ends with two prolegs on the last segment forming a distinctive V-shape at the posterior end (Fig. 3). They feed on leaves, flowers, young pods and surface tissues of stems and mature pods. Damaged seeds do not fill properly and the pods are susceptible to early shattering. There are at least three generations per year and all stages may be found on the plant at the same time. Generally, second-generation larvae cause significant yield loss when flowering and early pod stages are heavily infested.

Pupae: Pupation takes place in delicate, whitish, mesh cocoons attached to the plant (Fig. 4). Initially, the pupae are light green but as they mature they become brown.

Larval Monitoring:
Once the diamondback moth is present in the area, it is important to monitor individual canola fields for larvae. Remove the plants in an area measuring 0.1 m^2 (about 12" square), beat them on to a clean surface and count the number of larvae dislodged from the plant. Repeat this procedure at least in five locations in the field to get an accurate count.

Economic threshold for diamondback moth in canola at the advanced pod stage is 20 to 30 larvae/ 0.1 m^2 (approximately 2-3 larvae per plant). Economic thresholds for canola or mustard in the early **flowering stage are not available. However, insecticide applications are likely required at larval densities of 10 to 15 larvae/ 0.1 m^2 (approximately 1-2 larvae per plant).**

Keep your eyes open for this beneficial wasp below that attacks and parasitizes DBM larvae (Fig. 5). The following photos were courtesy of Dr. Lloyd Dosdall.

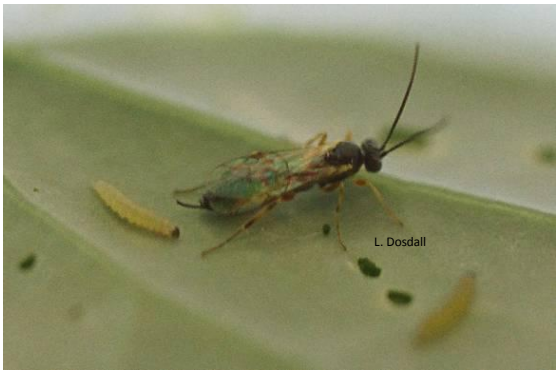


Fig. 5. *Diadegma insulare* adult and early instar Diamondback moth larvae on canola leaf (upper left), magnified view of *D. insulare* adult (upper right), and *D. insulare* pupa (N=2) within Diamondback moth pupal silk cocoon adhered to underside of canola leaf (lower left). Photos courtesy of Dr. Lloyd Dosdall.

Please also refer to fact sheets for DBM posted by Manitoba Agriculture, Food and Rural Development, Saskatchewan Agriculture, Alberta Agriculture and Rural Development, and the Prairie Pest Monitoring Network.

4. Pea Leaf Weevil (*Sitona lineatus*) – Pea leaf weevils emerge in the spring primarily by flying (at temperatures above 17ºC) or they may walk short distances. Pea leaf weevil movement into peas and faba beans is achieved primarily through flight. Adults are slender, greyish-brown measuring approximately 5 mm in length (Fig. 6). The pea leaf weevil resembles the sweet clover weevil (*Sitona cylindricollis*) yet the former is distinguished by three light-coloured stripes extending length-wise down thorax and sometimes the abdomen (Link here for the Pea leaf weevil monitoring protocol with photos of related weevils). All species of *Sitona*, including the pea leaf weevil, have a short snout.

Adults will feed upon the leaf margins and growing points of legume seedlings (alfalfa, clover, dry beans, faba beans, peas) and produce a characteristic, scalloped (notched) edge (Figures 7-9). Females lay 1000 to 1500 eggs in the soil either near or on developing pea or faba bean plants from May to June.

Fig. 6: Dorsal view of adult *S. lineatus* (Photo: H. Goulet).

Figure 7: Weevil damage consisting of notching on leaves (Photo: L. Dosdall).

Figure 8: Weevil feeding notches along perimeter of pea leaves (Photo: L. Dosdall).

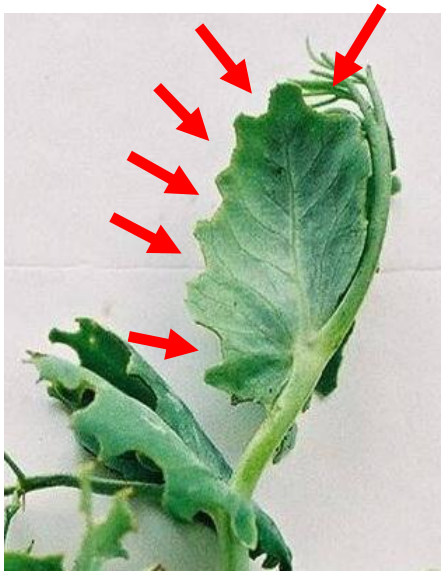


Figure 9: Pea leaf weevil feeding notches on clam leaf (Photo: L. Dosdall).

Larva: Larvae develop under the soil and are "C" shaped and milky-white with a dark-brown head capsule ranging in length from 3.5-5.5 mm (Fig. 10). Larvae develop through five instar stages. After hatching, larvae seek and enter the roots of a pea plant. Larvae will enter and consume the contents of the nodules of the legume host plant. It is the nodules that are responsible for nitrogen-fixation which affect yield plus the plant's ability to input nitrogen into the soil. Consumption of or damage to the nodules (Fig. 11) results in partial or complete inhibition of nitrogen fixation by the plant and results in poor plant growth and low seed yields.

Figure 10: Weevil larva in soil (Photo: L. Dosdall).

Figure 11: Pea nodules damaged by larval feeding (Photo: L. Dosdall).

Pupa: Pupation takes place in the soil. New generation adults emerge from late July to August and seek pulse crops to feed upon prior to overwintering in the late fall.

5. Insect Development and Simulation Outputs – Average daily temperatures for June 1-17 (12.8°C) have been 2°C below normal. Compared to long term normal (LTN) temperatures have been coolest in southeast Alberta and southwest Saskatchewan and warmest in southeast Manitoba and northern Alberta. Over the same period prairie rainfall has been 110% of LTN.

a. **Swede Midge (*Contarinia nasturtii*) –** Last week (Jun 13, 2014), Dr. Julie Soroka provided an informal update that her lab had not yet found any swede midge in the traps from the prairies.

Reminder: For those participating in swede midge pheromone monitoring, please know that the protocol was updated (June 4, 2014) to request that **swede midge pheromone traps need to *remain ~20cm from the ground level throughout the growing season***.

Scouting tips:

- Watch for unusual plant structures and plant discolourations then follow-up by closely scrutinizing the plant for larvae (Fig. 12).
- The growing tip may become distorted and produce several growing tips or none at all, young leaves may become swollen, crinkled or crumpled and brown scarring caused by larval feeding may be seen on the leaf petioles and stems.
- Flowers may fail to open.
- **Young plants that show unusual growth habits should be examined carefully for damage and larvae,** especially if the sticky liners have many flies resembling midges (swede midges are about the size of orange blossom wheat midge but are not orange).
- **Larvae can be seen with a hand lens.**

Fig. 12: Swede midge larvae inside canola flower (Upper) and canola damage observed in a field in Northeast Saskatchewan (Right; Photos: AAFC)

b. **Cereal Leaf Beetles (*Oulema melanopus*)** – For 2014 we are using our cereal leaf beetle (CLB) simulation model to monitor development across the prairies. **This week the CLB model suggests that cereal leaf beetle larvae should be occurring across the southern prairies.**

Fact sheets for CLB are posted by Alberta Agriculture, Food and Rural Development, and BC Ministry of Agriculture, and the Prairie Pest Monitoring Network. Descriptions of the various CLB stages and some monitoring tips are included below.

Lifecycle and Damage:

Adult: Adult cereal leaf beetles (CLB) have shiny bluish-black wing-covers (Fig. 13). The thorax and legs are light orange-brown. Females (4.9 to 5.5 mm) are slightly larger than the males (4.4 to 5 mm). Adult beetles overwinter in and along the margins of grain fields in protected places such as in straw stubble, under crop and leaf litter, and in the crevices of tree bark. They favour sites adjacent to shelterbelts, deciduous and conifer forests. They emerge in the spring once temperature reaches 10-5ºC and are active for about 6 weeks. They usually begin feeding on grasses, then move into winter cereals and later into spring cereals.

Egg: Eggs are laid approximately 14 days following the emergence of the adults. Eggs are laid singly or in pairs along the mid vein on the upper side of the leaf and are cylindrical, measuring 0.9 mm by 0.4 mm, and yellowish in colour. Eggs darken to black just before hatching.

Larva: The larvae hatch in about 5 days and feed for about 3 weeks, passing through 4 growth stages (instars). The head and legs are brownish-black; the body is yellowish. Larvae are usually covered with a secretion of mucus and fecal material, giving them a shiny black, wet appearance (Fig. 14). When the larva completes its growth, it drops to the ground and pupates in the soil.

Pupa: Pupal colour varies from a bright yellow when it is first formed, to the colour of the adult just before emergence. The pupal stage lasts 2 - 3 weeks. Adult beetles emerge and feed for a couple of weeks before seeking overwintering sites. There is one generation per year.

Figure 13: Adult

Figure 14: Larva

Figure 15: Cereal leaf beetle damage on a wheat leaf.

Monitoring:

Give priority to following factors when selecting monitoring sites:

- Choose fields and sections of the fields with past or present damage symptoms.
- Choose fields that are well irrigated (leaves are dark green in color), including young, lush crops. Areas of a field that are under stress and not as lush (yellow) are less likely to support CLB.
- Monitor fields that are located along riparian corridors, roads and railroads.
- Survey field areas that are close to brush cover or weeds, easy to access, or are nearby sheltered areas such as hedge rows, forest edges, fence lines, etc.

Focus your site selection on the following host plant priorities:

- **First** - winter wheat. If no winter wheat is present then;
- **Second** - other cereal crops (barley, wheat, oats, and rye). If no cereal crops are present then;
- **Third** - hay crops. If no hay crops or cereal crops are present then;
- **Fourth** - ditches and water corridors

Sweep-net Sampling for Adults and Larvae:

A sweep is defined as a one pass (from left to right, executing a full 180 degrees) through the upper foliage of the crop using a 37.5 cm diameter sweep-net. A sample is defined as 100 sweeps taken at a moderate walking pace collected 4-5 meters inside the border of a field. At each site, four samples should be collected, totaling 400 sweeps per site. The contents of each sample should be visually inspected for life stages of CLB and all suspect specimens should be retained for identification. Please note that, because the CLB larvae are covered in a sticky secretion, when they are caught in a sweep-net they are often covered in debris and are very difficult to see. To help determine the presence of CLB, place the contents of the sweep net into a large plastic bag for observation.

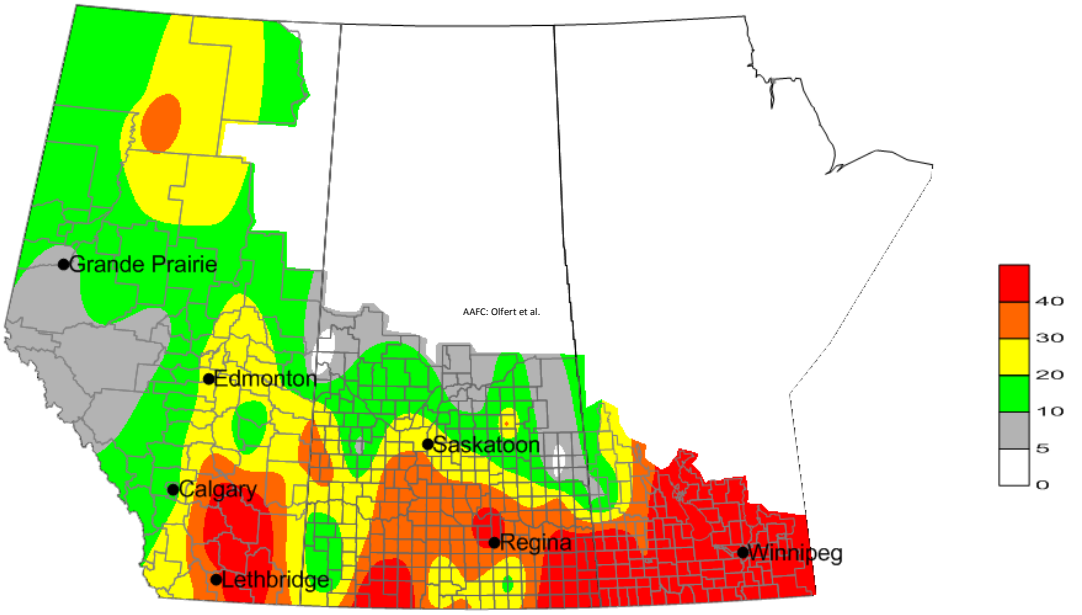
Visual Inspection:

Both the adults and larvae severely damage plants by chewing out long strips of tissue between the veins of leaves, leaving only a thin membrane. When damage is extensive, leaves turn whitish (Fig. 15). The

plant may be killed or the crop may be seriously reduced. In addition to feeding damage, inspectors should be looking for all life stages of the CLB. In a field of host material the visual survey should be conducted between "sweep samples". Other locations to be examined include grass covered ditch banks and young host crops that are too low to sweep. Experienced surveyors should spend 15 minutes on visual inspection. Less experience surveyors should spend an additional 10 minutes on the visual component.

c. Grasshoppers - Weekly temperature data collected across the prairies is incorporated into the simulation model which calculates estimates of grasshopper development stages based on biological parameters for *Melanoplus sanguinipes* (Migratory grasshopper). Embryological development and hatch is well underway across the southern prairies (Fig. 16)**.**

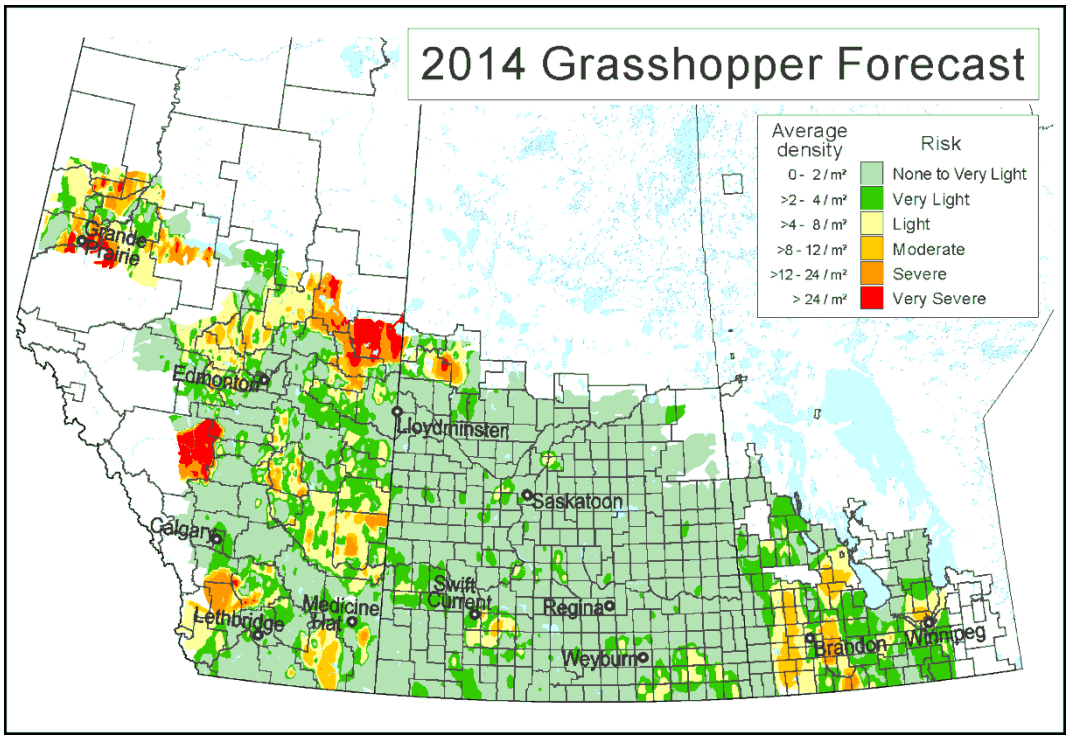
Fig. 16. Grasshopper % hatch
June 16, 2014



Fact sheets describing grasshopper biology and monitoring are posted by Manitoba Agriculture, Food and Rural Development, Saskatchewan Agriculture, Alberta Agriculture and Rural Development, and the BC Ministry of Agriculture. Also refer to the Prairie Pest Monitoring Network for grasshopper biology and monitoring information.

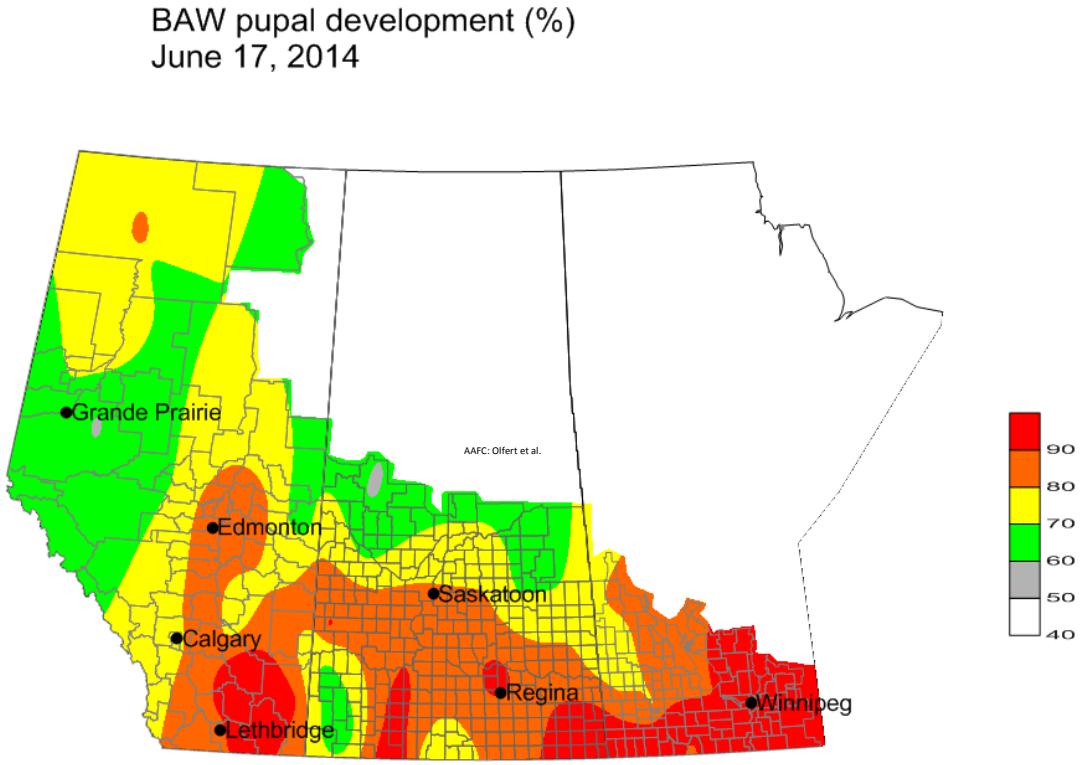
Reminder: Below is the 2014 Grasshopper Forecast Map (Fig. 17; circulated January 2014).

Fig. 17.



d. Bertha armyworm (*Mamestra configurata*) – The BAW model indicates that pupal development is well underway. First adult emergence can occur when average pupal development reaches 80%. **In some regions, adults began to appear this week.**
Reminder: *Cooperators based within the **yellow and orange areas of the map below should please have traps set up in fields by June 19th**.*

Fig. 18.



This week, initial BAW moths may be intercepted in pheromone traps in Alberta, Saskatchewan, and Manitoba.

Reminder: The above photo kindly supplied by Saskatchewan Agriculture shows a **BAW moth** in situ. We again **include additional photos of pinned noctuid specimens** in the following two pages for comparison to BAW moths (units are in centimeters). Please recognize that:

- The images below are of pinned specimens that are faded in comparison to live specimens,
- Not all of the following moths will occur in BAW traps,
- There are hundreds of other noctuid species that occur on the prairies,
- The images have been roughly sorted by relatedness rather than economic significance, and
- Some of these species include different colour morphs of adults (i.e., the images below only partially represent the full range of species and colour morphs present on the prairies).


Mamestra configurata Walker
[bertha armyworm]


Agroperina cogitata


Euxoa ochrogaster (Guenée)
[redbacked cutworm]


Feltia jaculifera (Guenée)
[dingy cutworm]


Agrotis orthogonia Morrison
[pale western cutworm]

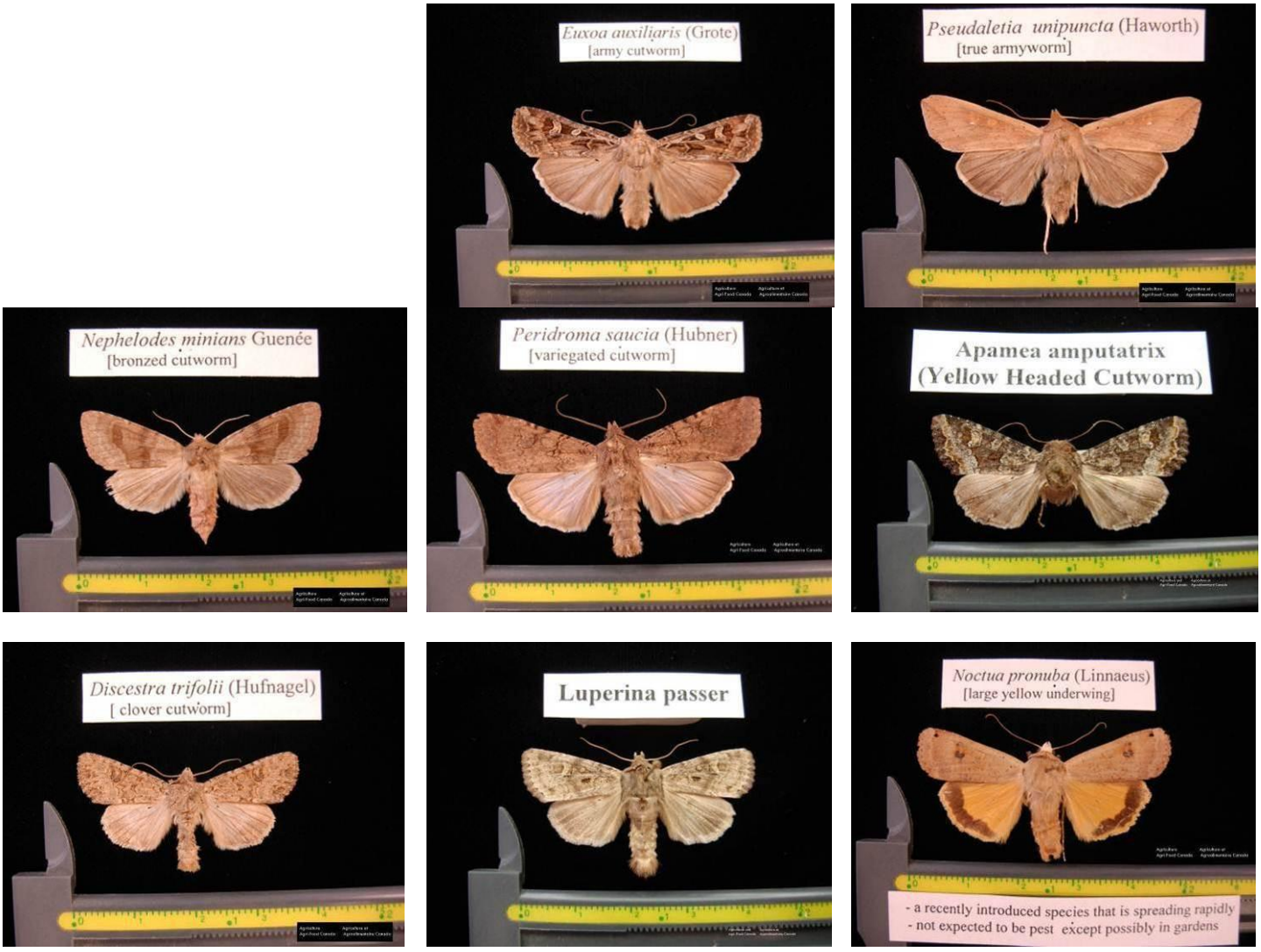

Euxoa messoria (Harris)
[darksided cutworm]


Feltia herilis (Grote)


Agrotis ipsilon (Hufnagel)
[black cutworm]


Euxoa ridingsiana (Grote)


Lacinipolia renigera (Stephens)
[bristly cutworm]



6. Crop Reports - The following provincial websites now have their Crop Reports posted so click the links to find their weekly updates:

- Manitoba's Crop Report: http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/index.html
- Saskatchewan's Crop Report: http://www.agriculture.gov.sk.ca/crop-report
- Alberta's Crop Report: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sdd4191

Link here to access the USDA's Weekly Weather and Crop Bulletin.

7. Questions or problems accessing the contents of this Weekly Update? Please e-mail or call either Owen.Olfert@agr.gc.ca (tel. 306-385-9355) or Jennifer.Otani@agr.gc.ca (tel. 780-354-5132). Past and present "Weekly Updates" are kindly posted to the Western Forum website by webmaster, Dr. Kelly Turkington. Please click here to link to that webpage.

8. Previous topics:

a. **Flea Beetles** (Chrysomelidae: *Phyllotreta* species) – Fact sheets for flea beetles in canola are posted by Manitoba Agriculture, Food and Rural Development, and Saskatchewan Agriculture. Helpful images produced by Dr. Julie Soroka (AAFC-Saskatoon) exemplifying percent of cotyledon leaf area consumed by flea beetles are posted at Canola Watch.

b. **Cutworms** (Noctuidae) – **Cutworm reports came out of central Alberta and Manitoba this past week**. Cutworm biology, species information, plus monitoring recommendations are available at the Prairie Pest Monitoring Network's Cutworm Monitoring Protocol. Also refer to these cutworm-specific fact sheets (Manitoba Agriculture, Food and Rural Initiatives, Alberta Agriculture, Food and Rural Development). Please also consider using the Alberta Pest Surveillance Network's "2014 Cutworm Reporting Tool" for online reporting located by clicking here. Data entered at that website uploads to a live online "Cutworm Map".

c. **Wind trajectories Related to Diamondback Moth (DBM) and Aster Leafhopper Introductions –** Completed for the season. Please refer to earlier Weekly Updates for details related to backward and forward trajectories associated with air parcels moving over western Canadian locations.