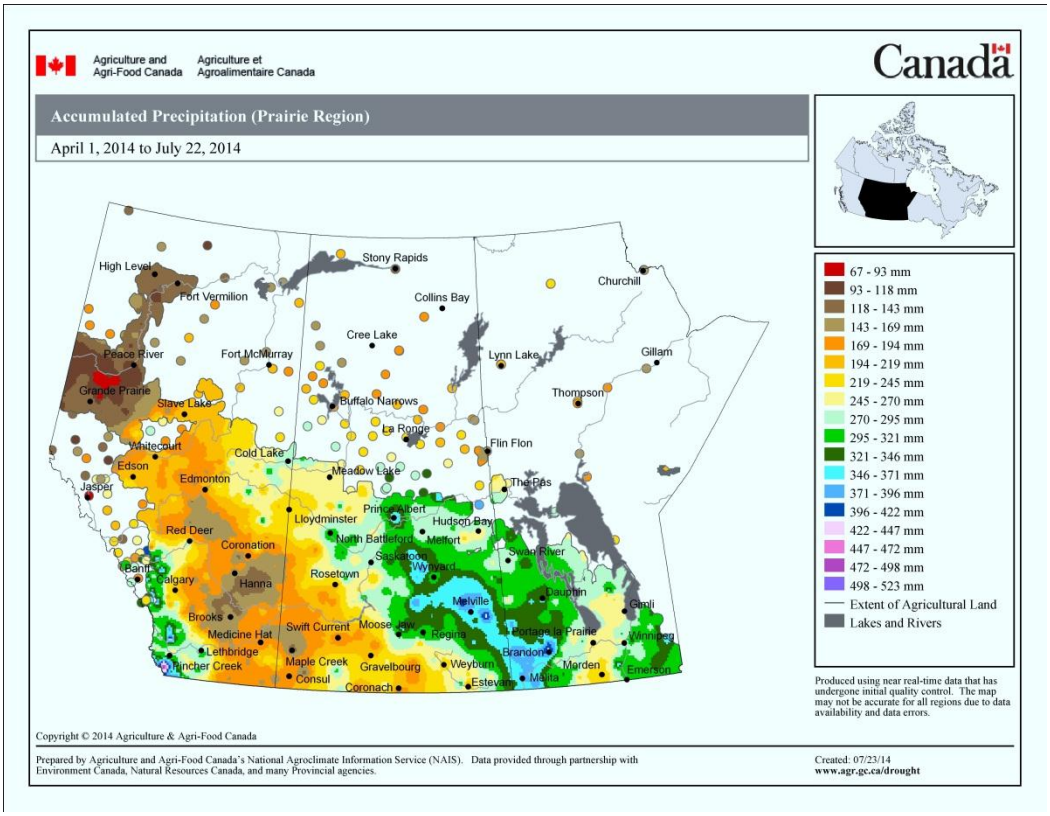
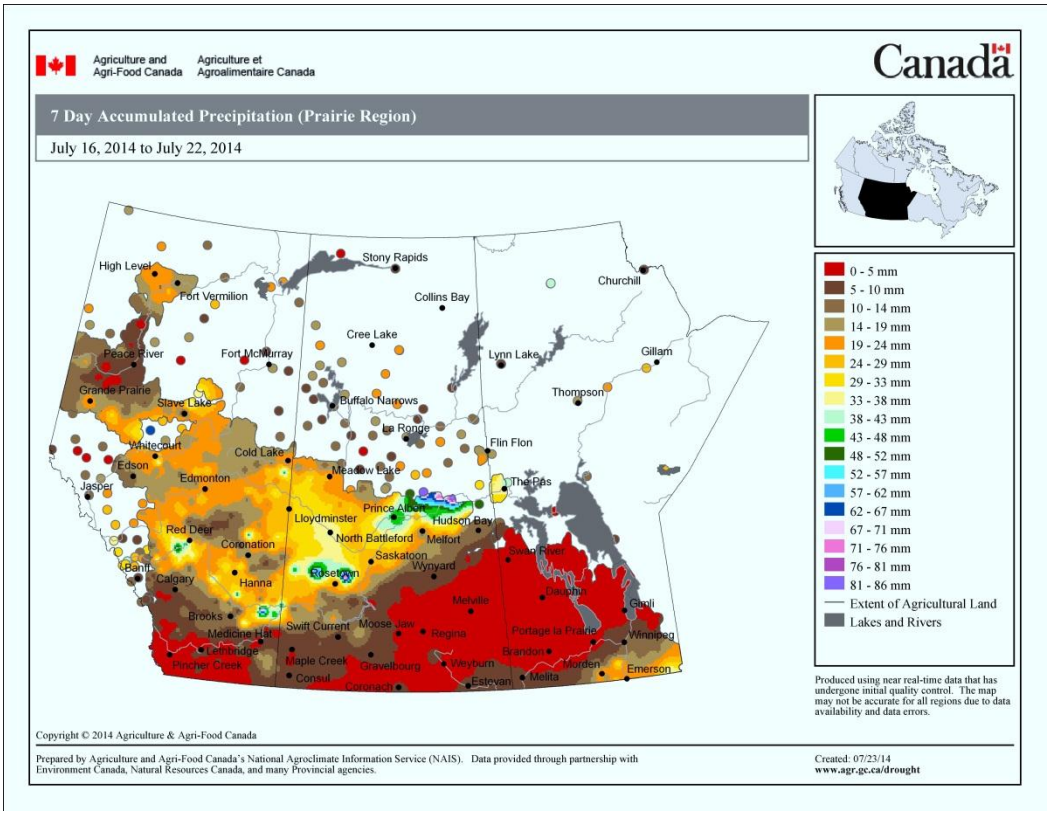
Prairie Pest Monitoring Network Weekly Updates – July 23, 2014

Otani, Giffen, Weiss, Olfert

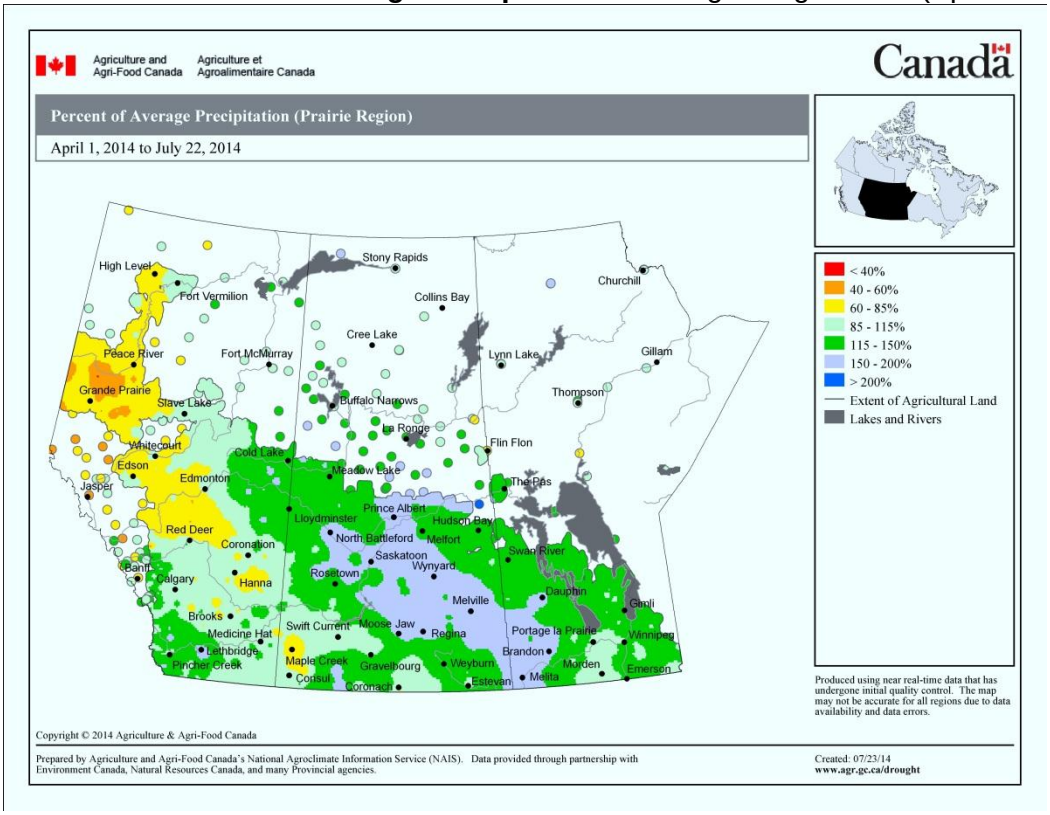
1. Weather synopsis – Below is the **Accumulated Precipitation for the Growing Season** (i.e., April 1-July 22, 2014):



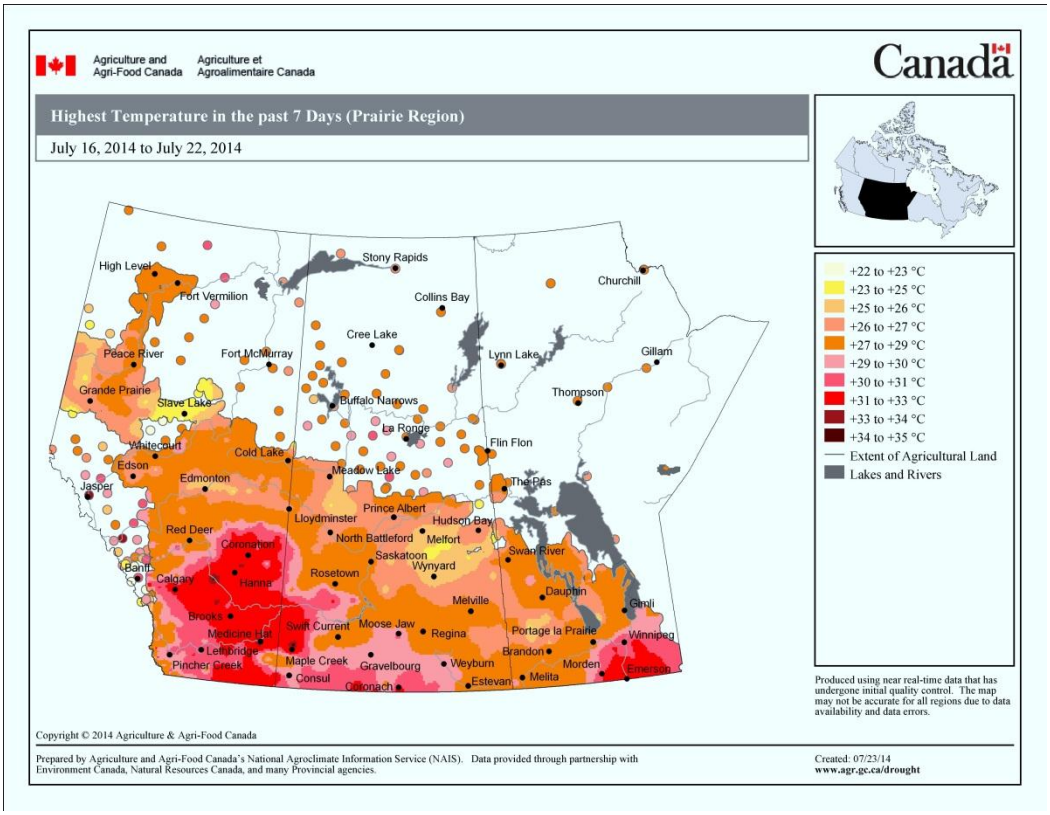
Below is the **Accumulated Precipitation the Past 7 Days** (i.e., July 16-22, 2014):



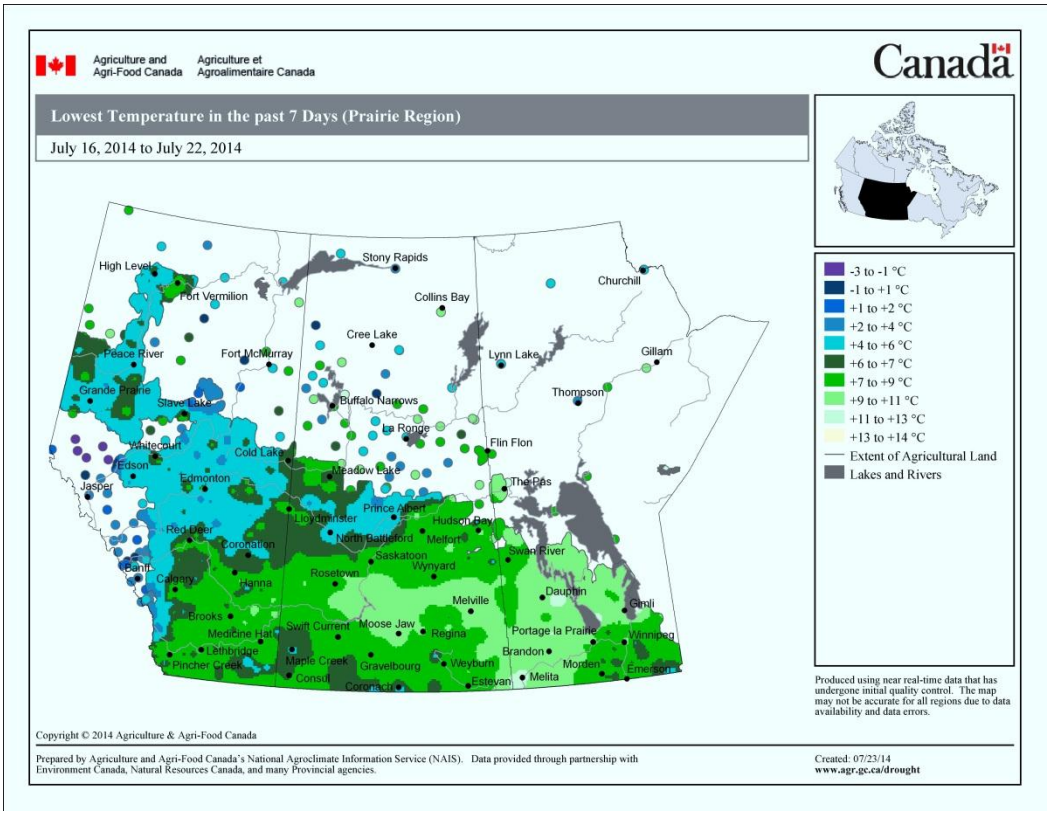
The map below shows the **Percent of Average Precipitation** for the growing season (April 1-July 22, 2014):



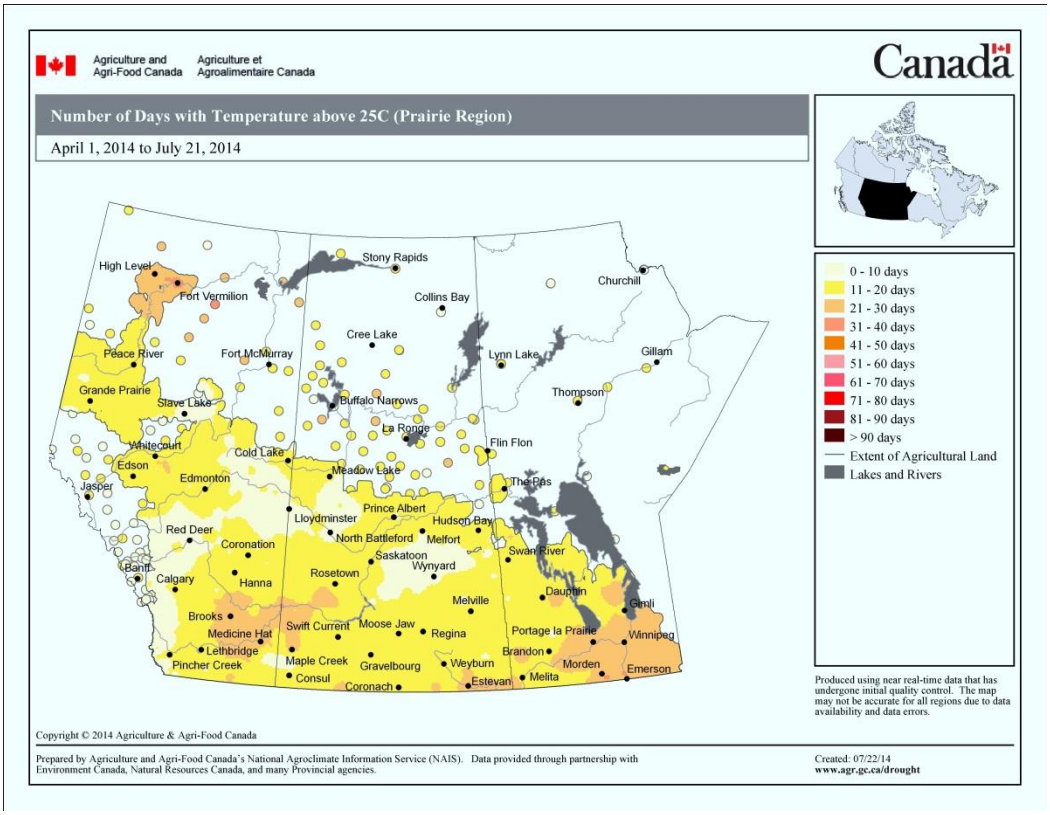
The map below reflects the **Highest Temperatures across the Prairies the past 7 Days** (i.e., July 16-22, 2014)!



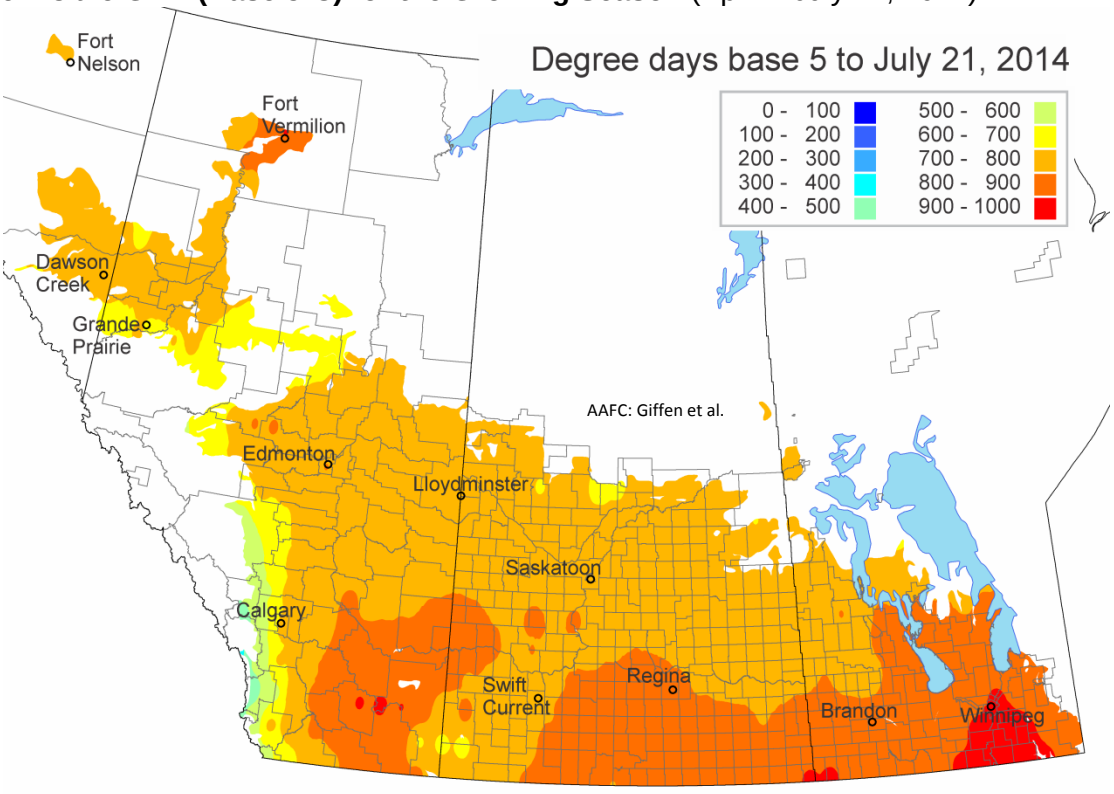
The map below reflects the **Lowest Temperatures across the Prairies the past 7 Days** (i.e., July 16-22, 2014)!



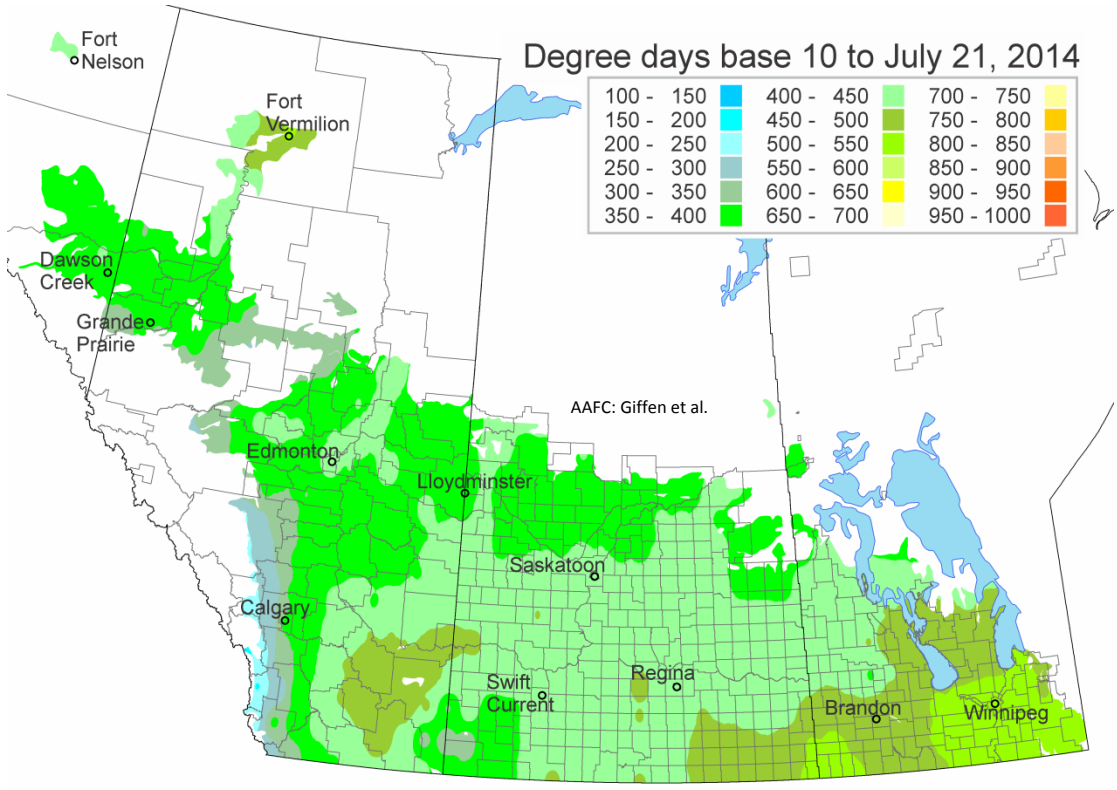
The numbers of Days above 25°C for the 2014 growing season are mapped below for the prairies (i.e., April 1-July 21, 2014):



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-July 21, 2014):

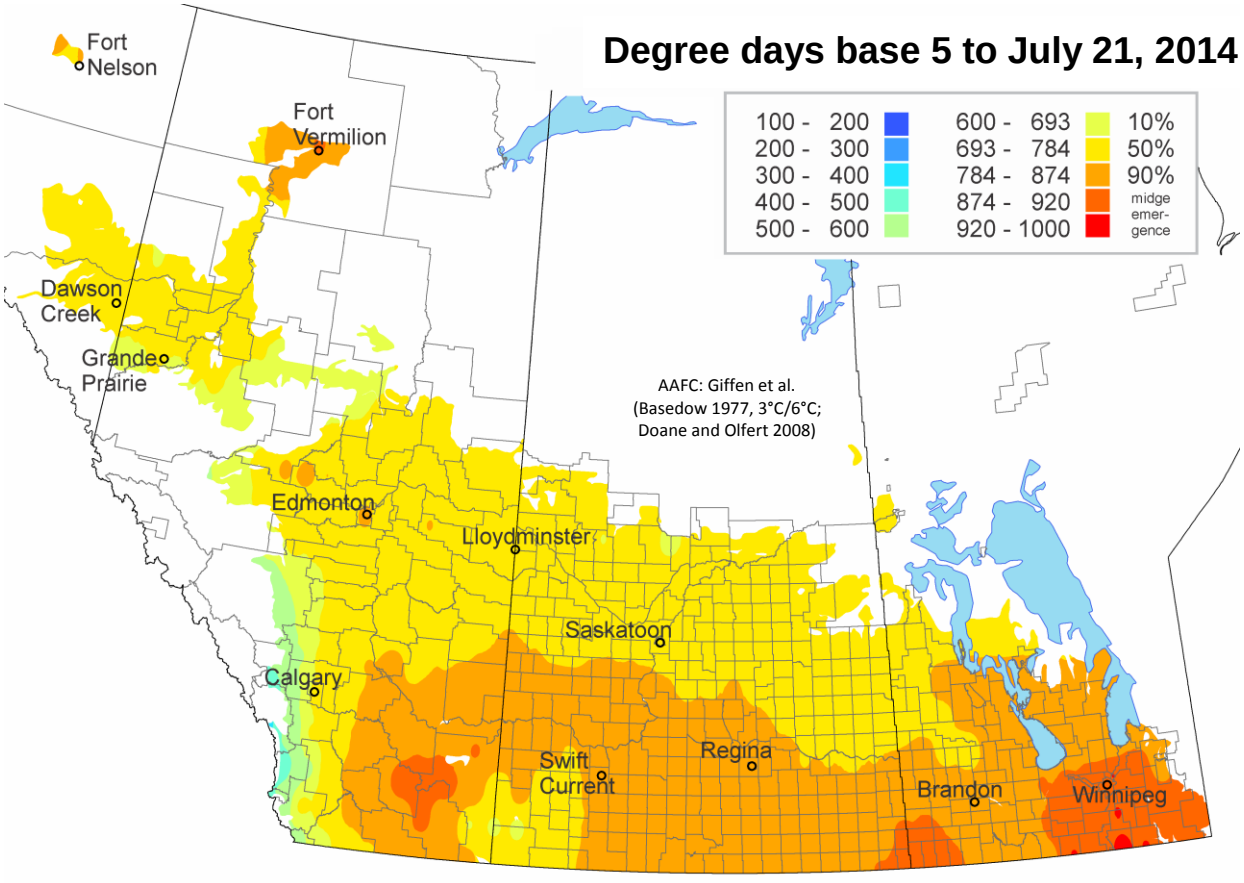


While below is the **GDD (Base 10ºC) for the Growing Season** (April 1-July 21, 2014):



2. Wheat Midge (*Sitodiplosis mosellana*) – Update: Wheat midge pheromone traps and in-field monitoring results have been compared to different models predicting wheat midge development over the past two weeks. Staff at AAFC-Saskatoon are evaluating other base temperatures for their suitability in predicting wheat midge emergence North of 55°. This is in response to wheat midge observed during in-field monitoring and on pheromone traps throughout the Peace River region prior to the predicted emergence generated using the base 5°C model. The degree-day model proposed by German researchers (Basedow) may predict adult midge emergence better in the Peace River region compared to the 5°C base temperature model that previously corresponded well to midge emergence throughout central and southern areas of the prairies.

The Basedow model has been mapped below using prairie-wide temperature data for the present growing season. Note that the map below predicts midge to emerge (as of July 21, 2014) in areas highlighted yellow, gold, and orange whereas the midge flight is predicted to be drawing to a close in areas highlighted red in the map below.



Wheat midge biology and monitoring information can be located by clicking here or linking to your provincial fact sheet (Saskatchewan Agriculture, Alberta Agriculture and Rural Development).

REMEMBER that in-field counts of wheat midge per head remain the basis of economic threshold decision. Also remember that the parasitoid, *Macroglenes penetrans*, is now out actively searching for wheat midge. Preserve this parasitoid whenever possible and remember your insecticide control options for wheat midge also kill these beneficial insects which help reduce midge populations.

In-field monitoring for wheat midge should be carried out in the evening (preferably after 8:30 pm or later) when the female midges are most active. On warm (at least 15ºC), calm evenings, the midge can be observed in the field, laying their eggs on the wheat heads. Midge populations can be estimated by counting the number of adults present on 4 or 5 wheat heads. Inspect the field daily in at least 3 or 4 locations during the evening.

Economic Thresholds for Wheat Midge:

a) **To maintain optimum grade:** 1 adult midge per 8 to 10 wheat heads during the susceptible stage.

b) **For yield only:** 1 adult midge per 4 to 5 heads. At this level of infestation, wheat yields will be reduced by approximately 15% if the midge is not controlled.

Inspect the developing kernels for the presence of larvae and the larval damage.

3. Diamondback Moth (*Plutella xylostella*) – Remember, the **Action Threshold for DBM in canola is applicable at pod stage and is 200-300 larvae/m^2 or 20-30 larvae per 0.1 m^2**. Be mindful that beneficial insects targeting DBM larvae are already in fields.

Fig. A. Diamondback larva (upper left) and pupal silk cocoon (upper right), *Diadegma insulare* adult and early instar Diamondback moth larvae on canola leaf (lower left) and *D. insulare* pupae (N=2) within Diamondback moth pupal silk cocoons (lower right). Photos were courtesy of Dr. Lloyd Dosdall.

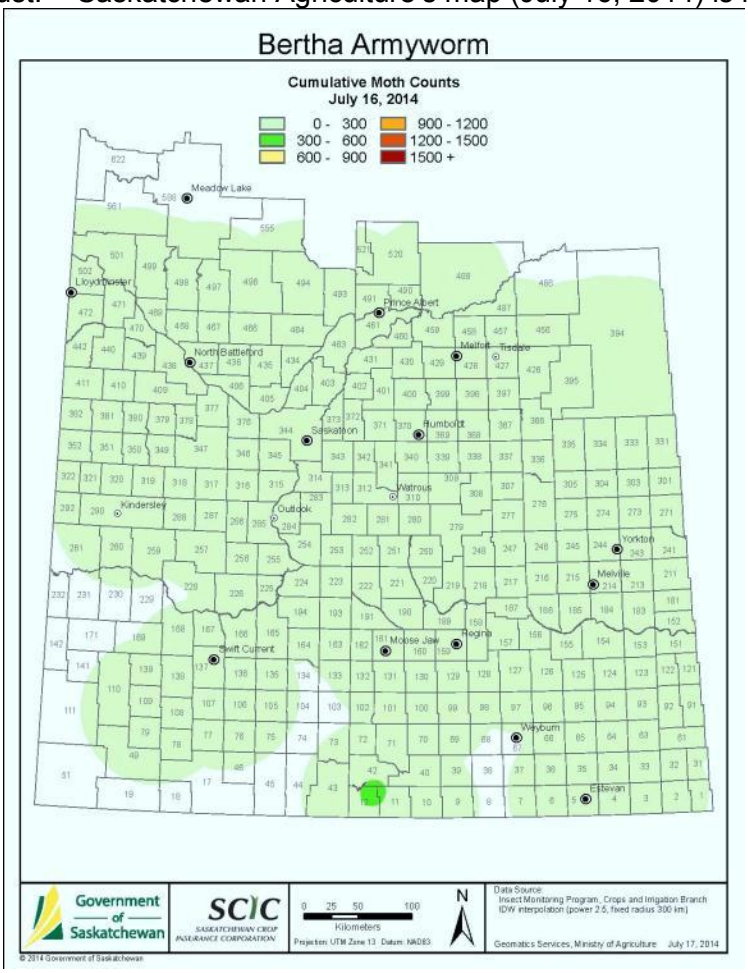
Please also refer to fact sheets for DBM posted by Manitoba Agriculture, Food and Rural Development, Saskatchewan Agriculture, Alberta Agriculture and Rural Development, and the Prairie Pest Monitoring Network.

4. Bertha Armyworm – For those of you kindly monitoring pheromone traps across the prairies, the photo below is supplied by Saskatchewan Agriculture and shows a **BAW moth** in situ (Fig. A).

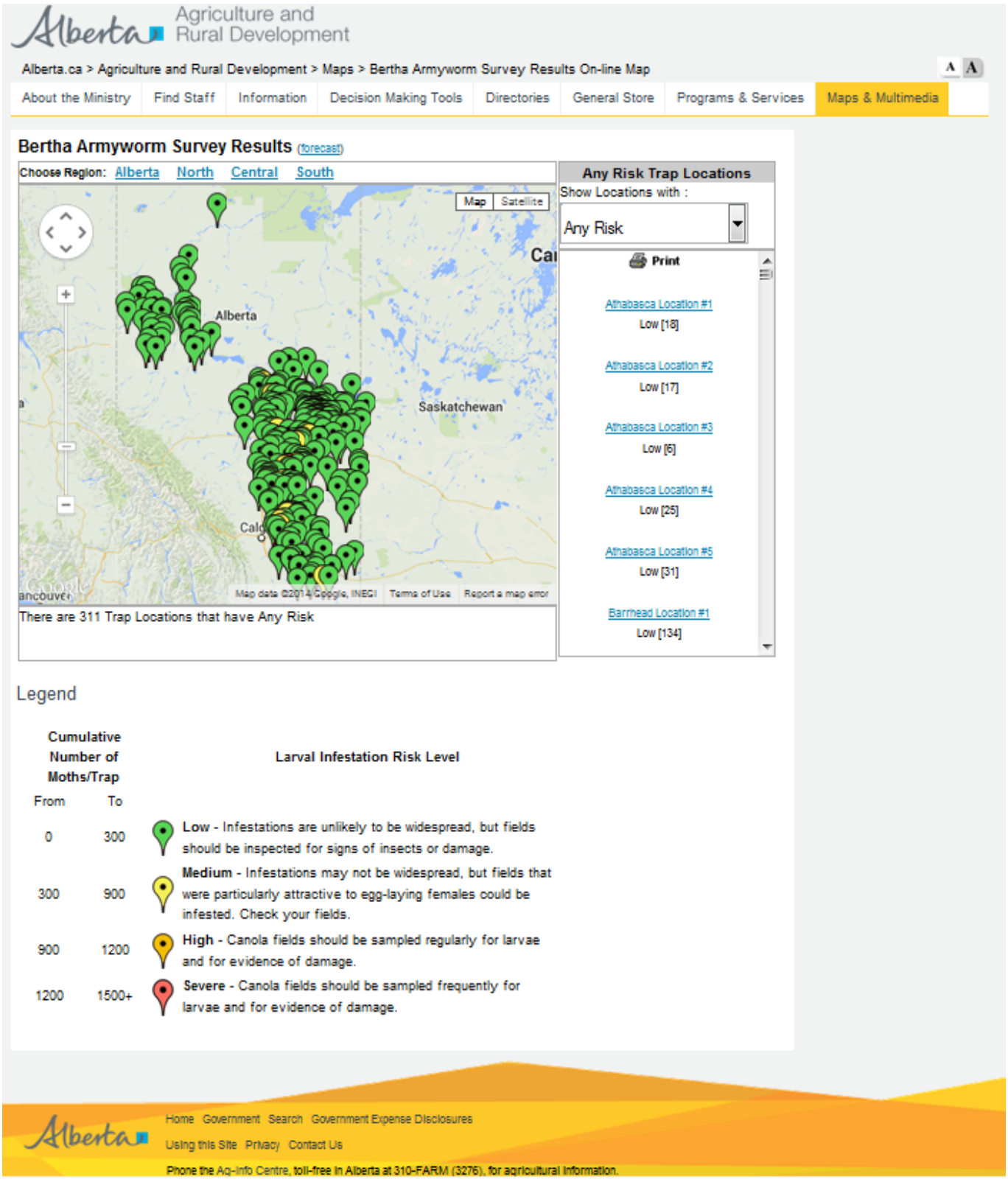
Fig. A.

Remember that results from BAW pheromone traps deployed to monitor male moths are now available. Areas showing elevated risk associated with high moth counts now need to pay particular attention to in-field monitoring for the economically important larvae.

Cumulative counts of BAW collected in pheromone traps in the **province of Saskatchewan for 2014 are updated and posted here**. Note the following from Saskatchewan Agriculture's website: "The map displays the cumulative male moth counts reported from traps at nearly 200 locations in Saskatchewan. In 2014, co-operators include producers, Regional Crops Specialists, researchers and industry agronomists. The map will be updated until early August." Saskatchewan Agriculture's map (July 16, 2014) is included below:



Alberta Agriculture and Rural Development updates their BAW pheromone trap map here and a screen shot is included below:



In-field monitoring for egg masses (Fig. B) and newly emerged larvae (Fig. C) should initially focus on the undersides of leaves plus watch the margins of leaves for feeding. Bertha armyworm larvae will also feed on newly developing pods (Fig. D) so the whole plant should be examined. Watch for the following life stages:

Fig. B. Bertha armyworm eggs laid on the underside of a canola leaf. Note that eggs are laid in batches, eggs are deposited in a single layer, each round egg measures ~1 mm in dia., creamy-white egg colour will change as the embryo develops, dark eggs are often parasitized by beneficial wasp species.

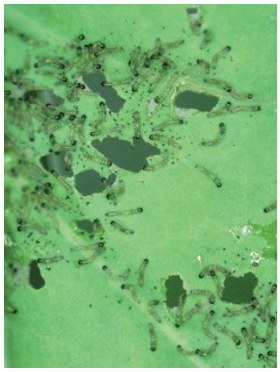


Fig. C. Newly emerged larvae are 0.3 cm long, pale green with pale yellowish stripe along each side.

Fig. D. The larva has six instar stages and passes through color phases of green and pale brown before becoming a large black caterpillar measuring 4-5 cm long.

Reminder: Some bertha armyworm larvae remain green or pale brown throughout their larval life. Large larvae may drop off the plants and curl up when disturbed, a defensive behavior typical of cutworms and armyworms. Young larvae chew irregular holes in leaves, but normally cause little damage. The fifth and sixth instars cause the most damage by defoliation and seed pod consumption. Crop losses due to pod feeding will be most severe if there are few leaves. Larvae eat the outer green layer of the stems and pods exposing the white tissue. At maturity, in late summer or early fall, larvae burrow into the ground and form pupae.

Monitoring:
Larval sampling should commence once the adult moths are noted. **Sample at least three locations**, a minimum of 50 m apart. At each location, **mark an area of 1 m^2 and beat the plants growing within that area to dislodge the larvae**. **Count them and compare the average** against the values in **the economic threshold table below**:

Table 1. Economic thresholds for Bertha armyworm in canola (courtesy Manitoba Agriculture, Food and Rural Initiatives).

	Expected Seed Value - $ / bushel*										
Spraying cost – $ / acre	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
	Number of Larvae / metre^2 *										
7	20	17	15	13	12	11	10	9	9	8	8
8	23	20	17	15	14	13	11	11	10	9	9
9	26	22	19	17	16	14	13	12	11	10	10
10	29	25	22	19	17	16	14	13	12	11	11
11	32	27	24	21	19	17	16	15	14	13	12
12	34	30	26	23	21	19	17	16	15	14	13
13	37	32	28	25	22	20	19	17	16	15	14
14	40	35	31	27	24	22	20	19	17	16	15
15	43	37	32	29	26	23	22	20	19	17	16

***** Economic thresholds for bertha armyworm are based on an assumed yield loss of 0.058 bu/acre for each larva/metre^2 (Bracken and Bucher. 1977. Journal of Economic Entomology. 70: 701-705).

Provincial fact sheets describing the biology and related pest management information for bertha armyworm are posted by Manitoba Agriculture, Food and Rural Development, Saskatchewan Agriculture, Alberta Agriculture, and Rural Development, or BC Ministry of Agriculture.

5. Cabbage seedpod weevil (*Ceutorhynchus obstrictus*) – Reminder: Correct sampling methods by clicking here or you can link to either the Alberta or Saskatchewan fact sheets for detailed biological and pest management information including the economic threshold.

The following descriptions for cabbage seed weevil have been included below to aid in-field monitoring.

Adult: Adults overwinter in soil beneath leaf litter in shelter belts and roadside ditches and emerge from these sites in spring when soil temperatures warm to approximately 15ºC. Adult weevils are ash-grey and approximately 3 to 4 mm long (Fig. A). They have a prominent curved snout that is typical of most weevils. Adults can be found on early flowering hosts (wild mustard, flixweed, hoary cress, stinkweed, and volunteer canola). **Weevils move to canola fields when the crop is in the bud to early flower stage and feed on pollen and buds**, causing the flowers to die. Yield loss due to this feeding is more evident in dry years when the canola crop can't compensate for the loss. After a pollen meal, mating occurs on the plant. When small pods develop, the female will deposit an egg through the pod wall onto, or adjacent to a developing seed.

Eggs: Eggs are very small, oval, and opaque white. Most often, only a single egg is deposited per pod; however, two or more eggs can be laid per pod when cabbage seedpod weevil densities are high.

Fig. A. Adult- 16 days

Larva: Larvae are white and grub-like and consist of four larval instars. They can reach 5 to 6 mm in length (Fig. B). The first instar larva feeds on the cuticle on the outside of the pod. The second instar bores into the pod and feeds on the developing seeds. A single larva consumes about five canola seeds. Larval feeding on the seeds is the most severe type of injury and infested pods are more prone to shattering that causes seeds to be un-harvestable. Infested pods are often misshapen as a result of the larval feeding. An indirect form of damage can occur when fungus enters the pod through the larval exit hole and infects the pod.

Fig. B. Larva- 6 weeks

Timing of monitoring:
The risk of infestation can be predicted based on the size of the adult population. **Begin sampling when the crop first enters the bud stage and continue through the flowering.**

Sweep net sampling for comparison to the economic threshold:
Sweep net samples should be taken at ten locations within the field with ten 180° sweeps per location. Count the number of weevils at each location. **Samples should be taken in the field perimeter as well as throughout the field. Adults will invade fields from the margins and if infestations are high in the borders**, application of an insecticide to the field margins may be effective in reducing the population to levels below which economic injury will occur.

6. **Swede Midge (*Contarinia nasturtii*) –** We again include scouting tips for in-field monitoring:
   - □ Watch for unusual plant structures and plant discolourations then follow-up by closely scrutinizing the plant for larvae (Fig. A).
   - □ 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. A. Swede midge larv**ae inside canola flower**
(Photos: AAFC)

Once again: Canola School has posted a swede midge update entitled " Swede midge a pest on the rise", featuring Dr. Julie Soroka (AAFC-Saskatoon). The Ontario Canola Growers post swede midge information here. Dr. Rebecca Hallett has posted a very helpful swede midge identification guide for those performing in-field monitoring and pheromone trapping. Also, current Ontario swede midge populations are mapped at the above website. Finally, canola management recommendations for swede midge in Ontario are posted by Rebecca Hallett and Brian Hall.

7. Cereal Leaf Beetles (*Oulema melanopus*) – 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 again included below. An updated larval photo (Fig. A) of a cereal leaf beetle is below.

Fig. A. Larva

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

For those of you in Manitoba, please know that Dr. John Gavloski (MAFRD) wrote the following last week in his Crop Report, "Low levels of cereal leaf beetle have been found in cereal fields near Notre Dame de Lourdes and Carman. Although levels are low, we are interested in collecting samples of cereal leaf beetles to have them examined for a parasitoid, *Tetrastichus julis*, that is specific to cereal leaf beetles, and can be very effective at maintaining low levels of cereal leaf beetle. So if you do see cereal leaf beetle larvae in a field of any of our cereal grains or grass crops, please consider collecting a sample that can be tested for percent parasitism. Some information on collecting samples and where they can be sent are available in the following factsheet: http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/prm13779/$FILE/tjulius.pdf
If you cannot get a sample collected, please contact me (John Gavloski) so we know where cereal leaf beetle is being found and we can see if we can arrange to collect a sample."

8. Biological control agent - The biology of ***Tetrastichus julis*****,** the arthropod biological control agent **attacking the cereal leaf beetle**, is described in a **NEW Agriculture and Agri-Food fact sheet** which can be accessed by linking **here**. The fact sheet includes photos of the biological control agent with a CLB larva plus a parasitized CLB larva.

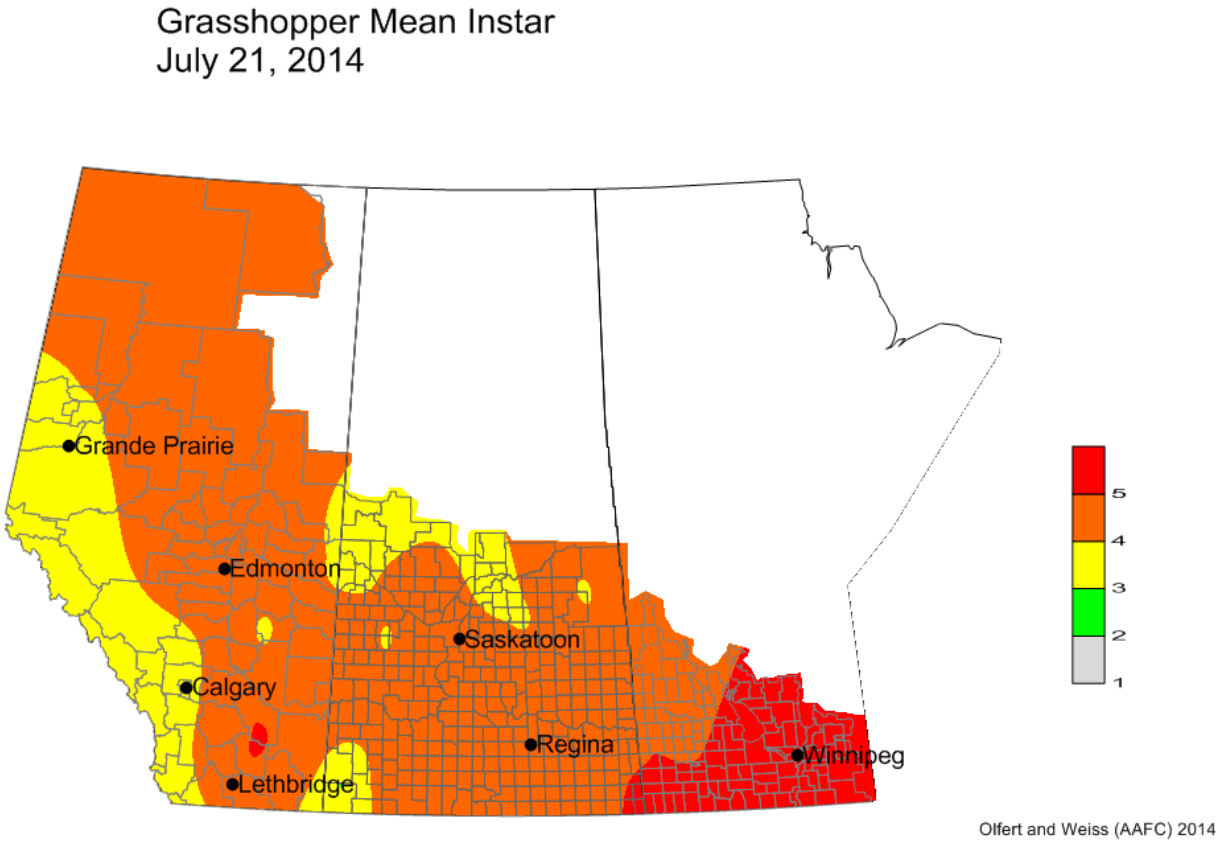
Both the wasp and parasitized larva are important to recognize when scouting. Cereal leaf beetle populations can be reduced from 40-90% in areas where *T. julis* has successfully established. However, parasitoid establishment depends on protecting and preserving the agent.

Important: If your scouting program finds the cereal leaf beetle in your field, contact provincial entomologists or Agriculture and Agri-Food Canada's Dr. Héctor Carcamo (hector.carcamo@agr.gc.ca), based at the Lethbridge Research Centre, to assess the need for establishing a *T. julis* biological control program.

9. Grasshoppers - Biological and monitoring information can be linked by clicking here or you can access fact sheets produced by the provinces of Manitoba, Saskatchewan, Alberta or British Columbia.

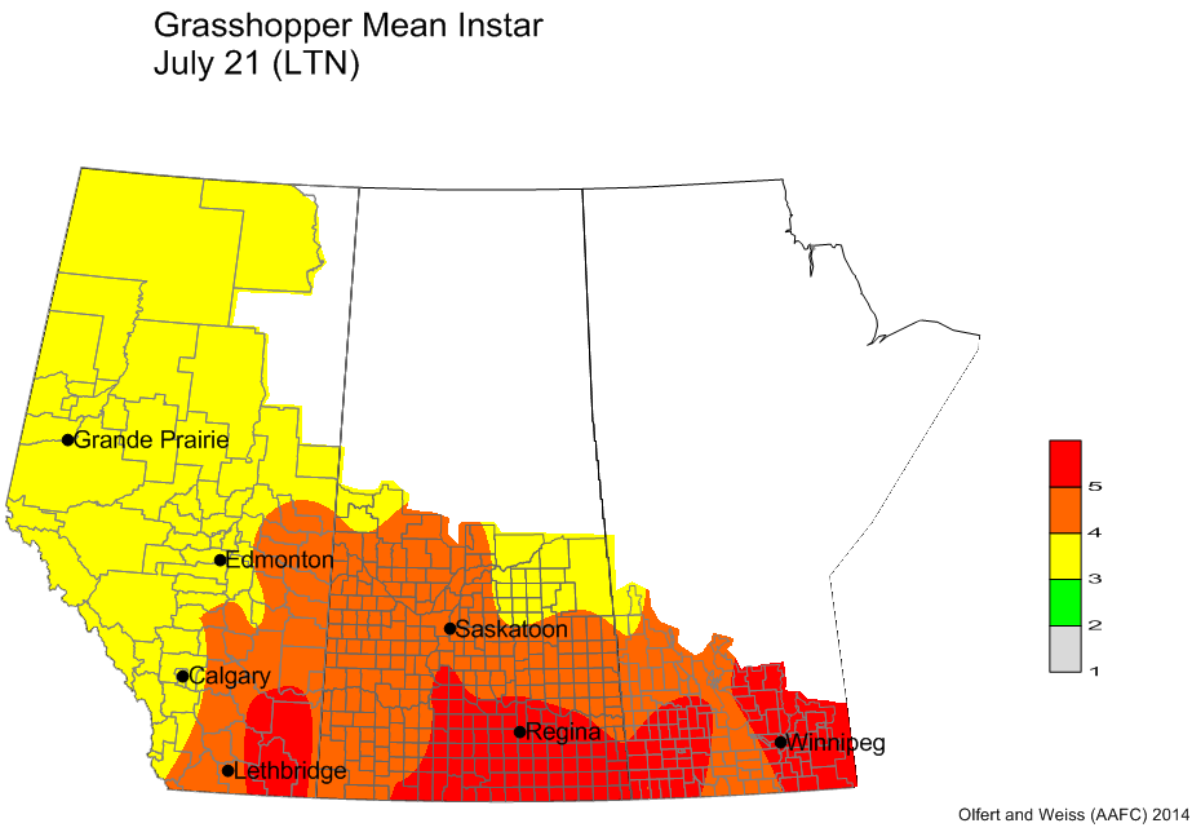
This past week temperatures were again warm and dry across the southern prairies. **Meteorological conditions resulted in optimal conditions for grasshopper development. In general, grasshoppers are in the fourth and fifth instar stages with the fastest development in Manitoba, southeast Saskatchewan, and northern areas within the Peace River region of Alberta (Fig. A).**

Fig. A.



Compared to long term development patterns (Fig. B), development is slower than normal across southern Alberta and central plus southern regions of Saskatchewan whereas development is faster than normal in Manitoba.

Fig. B.



10. *Lygus* – The **economic threshold for *Lygus* in canola is applied at late flower and early pod stages**. Biological and monitoring information can be linked by clicking here or you can access the Manitoba, Alberta or British Columbia fact sheets. Biological and in-field monitoring information has been included below.

Adult: In western Canada, four species *Lygus lineolaris* (tarnished plant bug), *L. borealis, L. elisus* and *L. keltoni* have been observed in canola (Fig. A). Adult lygus bugs are 5-6 mm long and 2.5 mm wide. They vary in color from pale green to reddish brown and have a distinct triangle or "V" shaped mark on the back. Adult lygus bugs overwinter under litter, debris, or plant cover in shelterbeds, headlands and field margins. In the spring adults become active and feed on early-growing plants. Lygus bugs utilize a wide range of host plants that are available sequentially through the season. **Adults start to lay eggs in mid-May in the southern prairies and in mid-June in the Peace River region**. Eggs are inserted individually into the stems (Figure 2) and leaves of host plants. Egg laying usually lasts 3 weeks but may continue for up to 7 weeks and may vary depending upon the host crop and duration of the growing season.

Fig. A: Adult *L. lineolaris* (5-6 mm long) (photo: AAFC-Saskatoon).

Eggs: Eggs are slightly curved and approximately 1 mm long with a eye-shaped cap.

Nymphs: There are five nymphal instars. Young nymphs are light green and wingless (Fig. B). Older nymphs develop black dots on the top of the thorax and abdomen. Wing buds are evident in the fourth and fifth instars. Hot dry weather favors build up of lygus bug populations. There are two generations per year in the southern prairies, but only one in the northern areas.

Fig. B: Fifth instar lygus bug nymph (3-4 mm long) (photo: AAFC-Saskatoon).

Damage: Lygus bugs have piercing-sucking mouthparts and physically damage the plant by puncturing the tissue and sucking plant juices. The plants also react to the toxic saliva that the insects inject when they feed. Lygus bug infestations can cause alfalfa to have short stem internodes, excessive branching, and small, distorted leaves. They feed on buds and blossoms and cause them to drop. They also puncture seed pods and feed on the developing seeds causing them to turn brown and shrivel.

Begin monitoring canola when it bolts and continue until seeds within the pods are firm. Since adults can move into canola from alfalfa, check lygus bug numbers in canola when nearby alfalfa crops are cut.

Sample the crop for lygus bugs on a sunny day when the temperature is above 20°C and the crop canopy is dry. With a standard insect net (38 cm diameter), take ten 180° sweeps. Count the number of lygus bugs in the net.

Repeat the sampling in another 14 locations. Samples can be taken along or near the field margins. Calculate the cumulative total number of lygus bugs and then consult the sequential sampling chart (Figure C). If the total number is below the lower threshold line, no treatment is needed. If the total is below the upper threshold line, take more samples. If the total is on or above the upper threshold line, calculate the average number of lygus bugs per 10-sweep sample and consult the economic threshold table.

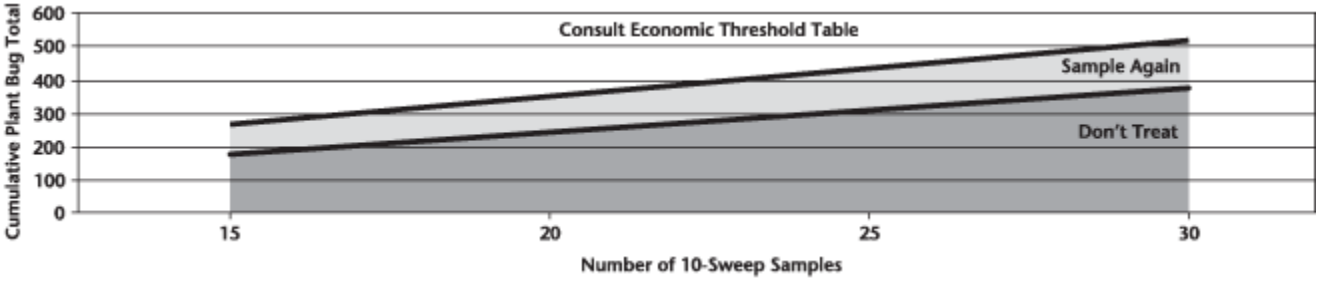


Figure C: Sequential sampling for lygus bugs at late flowering stage in canola.

The **economic threshold for lygus bugs in canola** covers the end of the flowering (Table 1) and the early pod ripening stages (Table 2). Once the seeds have ripened to yellow or brown, the cost of controlling lygus bugs may exceed the damage they will cause prior to harvest, so insecticide application is not warranted.

Consider the estimated cost of spraying and expected return prior to making a decision to treat a crop. **Remember that insecticide applications at bud stage in canola have not been proven to result in an economic benefit in production.** The exception to this is in the Peace River region where early, dry springs and unusually high densities of lygus bug adults can occasionally occur at bud stage. In this situation, high numbers of lygus bugs feeding on moisture-stressed canola at bud stage is suspected to result in delay of flowering so producers in that region must monitor in fields that fail to flower as expected.

The economic threshold for lygus bugs in canola is listed in Tables 1 and 2 (based on Wise and Lamb 1998. Can Ent. 130: 825-836).

Table 1. Economic thresholds for lygus bugs in canola at late flowering and early pod stages (Wise and Lamb 1998).

Control costs		Late flower to early pod (Canola crop stages 4.4-5.1[1])						
$/ac	$/ha	Economic Injury Level[2]						
$8.00	$19.77	8	6	5	4	4	3	3
$10.00	$24.71	10	8	7	6	5	4	4
$12.00	$29.65	12	9	8	7	6	5	5
$14.00	$34.59	14	11	9	8	7	6	5
$16.00	$39.54	16	13	10	9	8	7	6
$18.00	$44.48	18	14	12	10	9	8	7
$20.00	$49.42	20	16	13	11	10	9	8
Canola	**$/bu**	$8.00	$10.00	$12.00	$14.00	$16.00	$18.00	$20.00
value	**$/tonne**	$352.42	$440.53	$528.63	$616.74	$704.85	$792.95	$881.06

[1] Canola crop stage estimated using Harper and Berkenkamp 1975).

[2] Economic thresholds are based on an assumed loss of 0.1235 bu/ac per lygus bug caught in 10 sweeps (Wise and Lamb. 1998. The Canadian Entomologist. 130: 825-836).

Table 2. Economic thresholds for lygus bugs in canola at pod stage (Wise and Lamb 1998).

Control costs		Early pod (Canola crop stages 5.2[1])						
$/ac	$/ha	Economic Injury Level[3]						
$8.00	$19.77	11	9	7	6	5	5	4
$10.00	$24.71	14	11	9	8	7	6	5
$12.00	$29.65	16	13	11	9	8	7	7
$14.00	$34.59	19	15	13	11	10	9	8
$16.00	$39.54	22	18	15	13	11	10	9
$18.00	$44.48	25	20	16	14	12	11	10
$20.00	$49.42	27	22	18	16	14	12	11
Canola	**$/bu**	$8.00	$10.00	$12.00	$14.00	$16.00	$18.00	$20.00
value	**$/tonne**	$352.42	$440.53	$528.63	$616.74	$704.85	$792.95	$881.06

[3] Economic thresholds are based on an assumed loss of 0.0882 bu/ac per lygus bug caught in 10 sweeps (Wise and Lamb. 1998. The Canadian Entomologist. 130: 825-836).

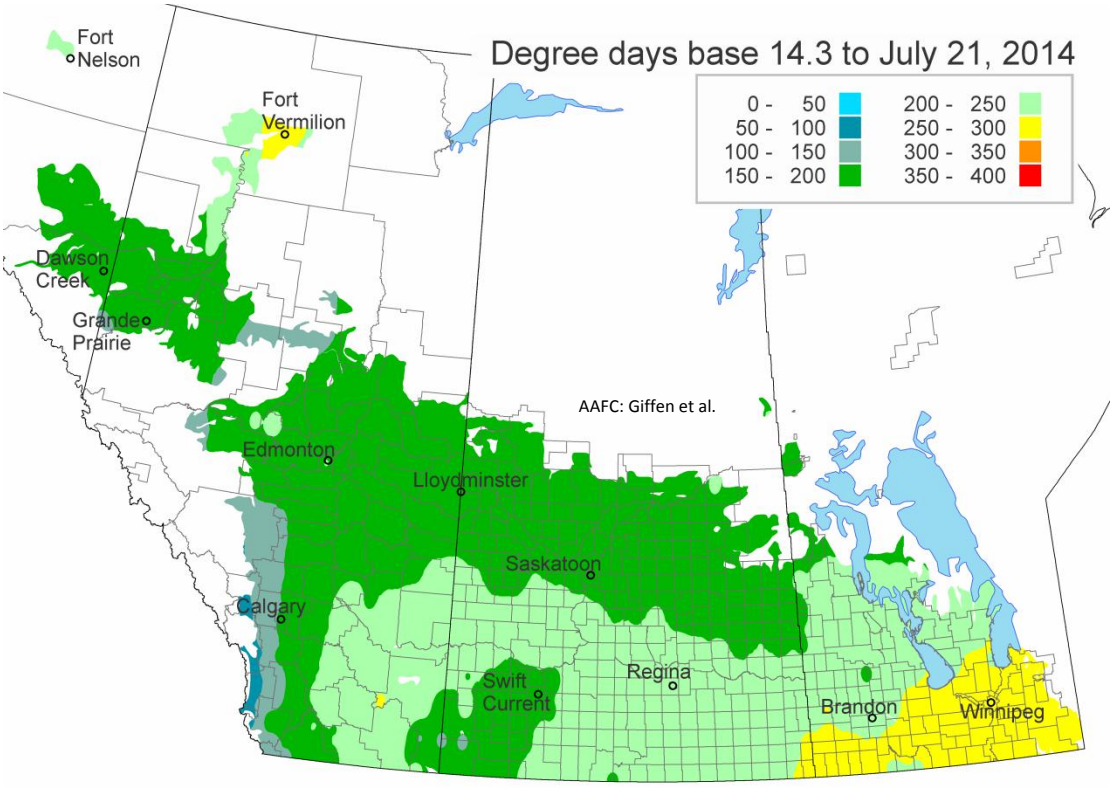
Caution: If soil moisture levels and rainfall are high from bud formation through flowering, plants likely will be able to compensate for damage caused by lygus bug populations that are well above economic thresholds and control may not be necessary. If the plants are under moisture stress during this time they are less able to compensate for feeding injury. Spray using the economic thresholds above.

11. 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.

12. West Nile Mosquito (*Culex tarsalis*) - The Public Health Agency of Canada posts information related to West Nile Virus in Canada and is located here. As of this week, zero birds have test positive for West Nile-related deaths based on birds submitted from British Columbia, Alberta, Saskatchewan or Manitoba (click here to view their reports). The regions most advanced in degree-day accumulations for *Culex tarsalis* are shown in the map below. Areas highlighted in red on the map below will have accumulated sufficient heat for *C. tarsalis* to fly. Mid-July to mid-August is the time for DEET!



13. Smoke – Forest fires continue to burn across the prairies generating smoke this week. Natural Resources Canada's Canadian Wildland Fire Information System homepage is located here. **Active fires are pin-pointed on their Fire Hotspots Map** (July 23rd) link here to view. More specific information can be located on provincial websites.

14. 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.

15. 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.

d. **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. Producers in Alberta can access Alberta Agriculture and Rural Development's DBM pheromone monitoring map which can be accessed by linking here.

e. **Pea Leaf Weevil (*Sitona lineatus*) –**Link here for the Pea leaf weevil monitoring protocol with photos of related weevils).