Southwestern Corn Borer (Lepidoptera: Crambidae) and Western Bean Cutworm (Lepidoptera: Noctuidae) Adult Seasonal Flight Patterns 2008-2010

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The objective of this research is to determine when Southwestern corn borer and Western bean cutworm moth flights occur in the Texas panhandle, ranging from the southern to northern counties. In 2010 we conducted the third year of pheromone trapping in this project. The following report documents the results of the 2010 research and compares it to the results from the previous two years

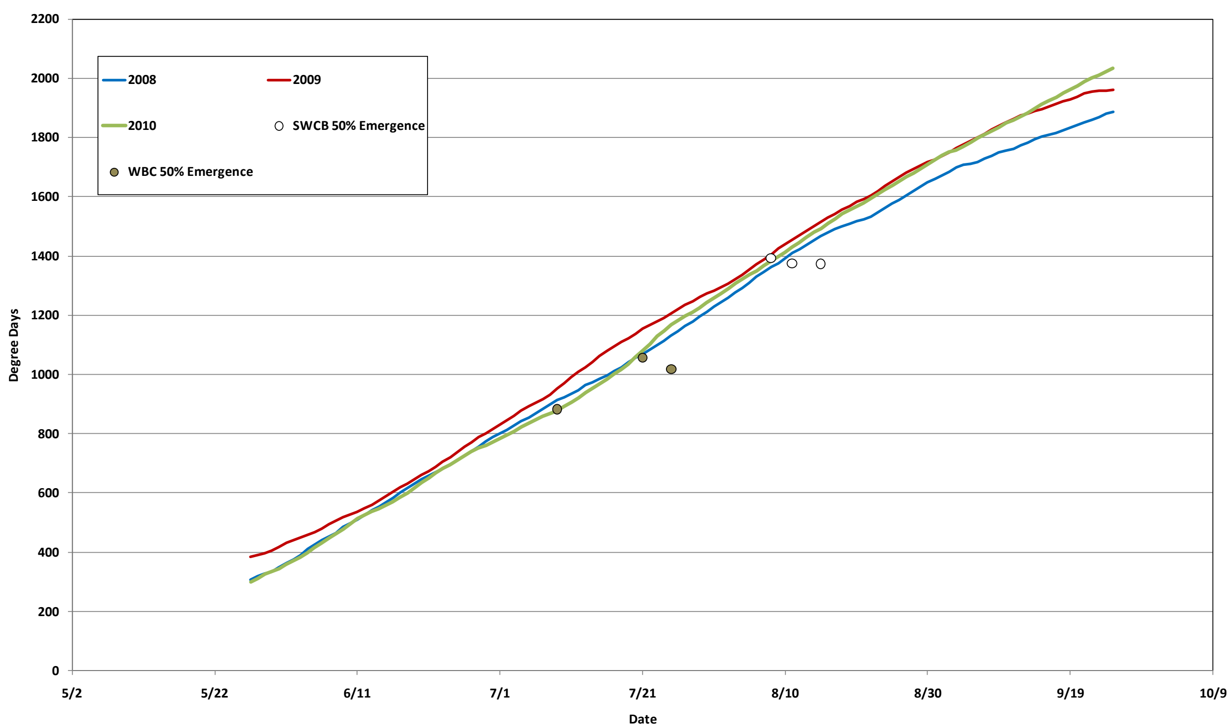

Figure 1. Southwestern corn borer and Western bean cutworm approximated 50% emergence by date and degree days for five Texas panhandle sites from 2008-2010.

Materials and Methods. Sixty bucket-style pheromone traps were placed at five locations; Castro Co., Oldham Co., Hartley Co., Moore Co., and Dallam Co. (12 traps per location). The traps were sampled weekly, pheromone lures were replaced, and all moths were sorted and counted. In addition, temperature recording devices were placed at each location to record daily temperatures. Following published results for similar experiments with these two insects, temperature data were converted to degree days based on a threshold temperature of 10°C. The data are presented in light of accumulated degree days since it allows comparison of the trap data across years.

Results. Figure 1 illustrates the average accumulated degree days by calendar date for the three years over all five sites. The three years were similar, with 2010 being somewhat cooler in the early part of the growing season and warmer toward the end than 2008 and 2009. Tables 1 and 2 present degree day data for first catch, 50% emergence, and maximum trap catch for individual

Table 1. Southwestern corn borer cumulative degree day values for first trap catch, 50% emergence and maximum emergence. 2008-2010.

	Southwestern Corn Borer								
	2008 Degree Days at			2009 Degree Days at			2010 Degree Days at		
Site	1st catch	50%	Max.	1st catch	50%	Max.	1st catch	50%	Max.
Castro	335	1323	1443	409	1409	1483	520	1383	1838
Moore	298	1407	1421	354	1391	1450	788	1309	1873
Dallam	305	1394	1299	351	1379	1438	440	1428	1745
Average	312.7	1374.7	1387.7	371.3	1393.0	1457.0	582.6	1373.4	1818.8
Std. error	8.8	20.2	34.7	14.6	6.8	10.4	81.6	26.9	29.5

Table 2. Southwestern corn borer and Western bean cutworm cumulative degree day values for first trap catch, 50% emergence and maximum emergence. 2009.

	Western Bean Cutworm								
	2008 Degree Days at			2009 Degree Days at			2010 Degree Days at		
Site	1st catch	50%	Max.	1st catch	50%	Max.	1st catch	50%	Max.
Castro	311	872	899	409	1010	1057	240	1022	1524
Moore	284	884	870	350	976	1114	878	1113	1480
Dallam	291	894	955	345	1067	1112	440	1035	1380
Average	295.3	883.3	908.0	368.0	1017.7	1094.3	519.1	1056.7	1461.3
Std. error	6.3	4.9	19.3	15.9	20.6	14.5	146.0	22.0	33.1

sites, and averages for both 2008 and 2009. The point at which Southwestern corn borer moths reached 50% emergence (Table 1, Fig. 2) was very similar to that of 2008 (1373 DD vs. 1375 DD, respectively). Western bean cutworm results for the same 50% emergence figure was the highest yet observed in 2010 compared to 2008 and 2009 (Table 2, Fig. 3), occurring at 1057 DD in 2010 vs. 1018 and 883 in 2009 and 2008, respectively. For Southwestern corn borer, 50% emergence would coincide with the peak of the second-generation adult flights. For management concerns, we believe that the most valuable results center around the 50% adult moth emergence data for both species.

It should be kept in mind, that degree day data compensate for year-to-year variations in temperature and do not reflect the same calendar date Therefore, an event, such as first trap catch, although similar in regard to accumulated degree days, is not necessarily similar in regard to calendar date.

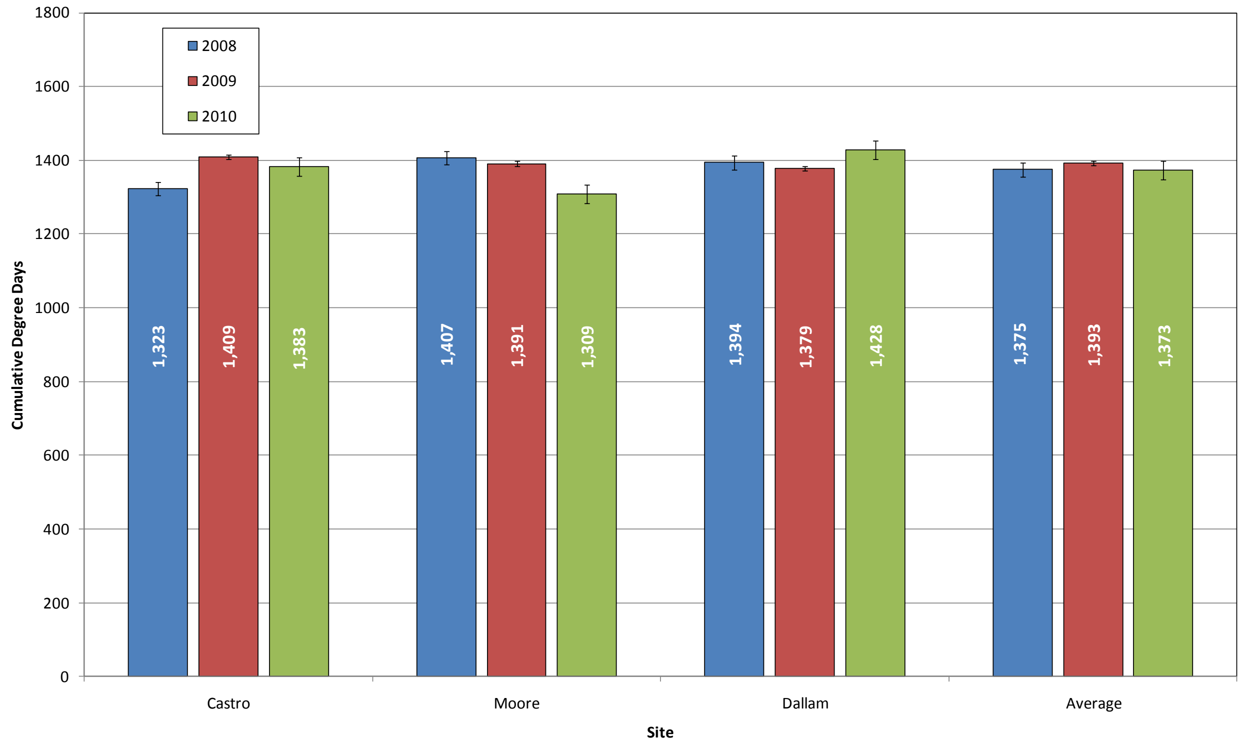

Figure 2. Southwestern corn borer cumulative degree days to 50% adult emergence.

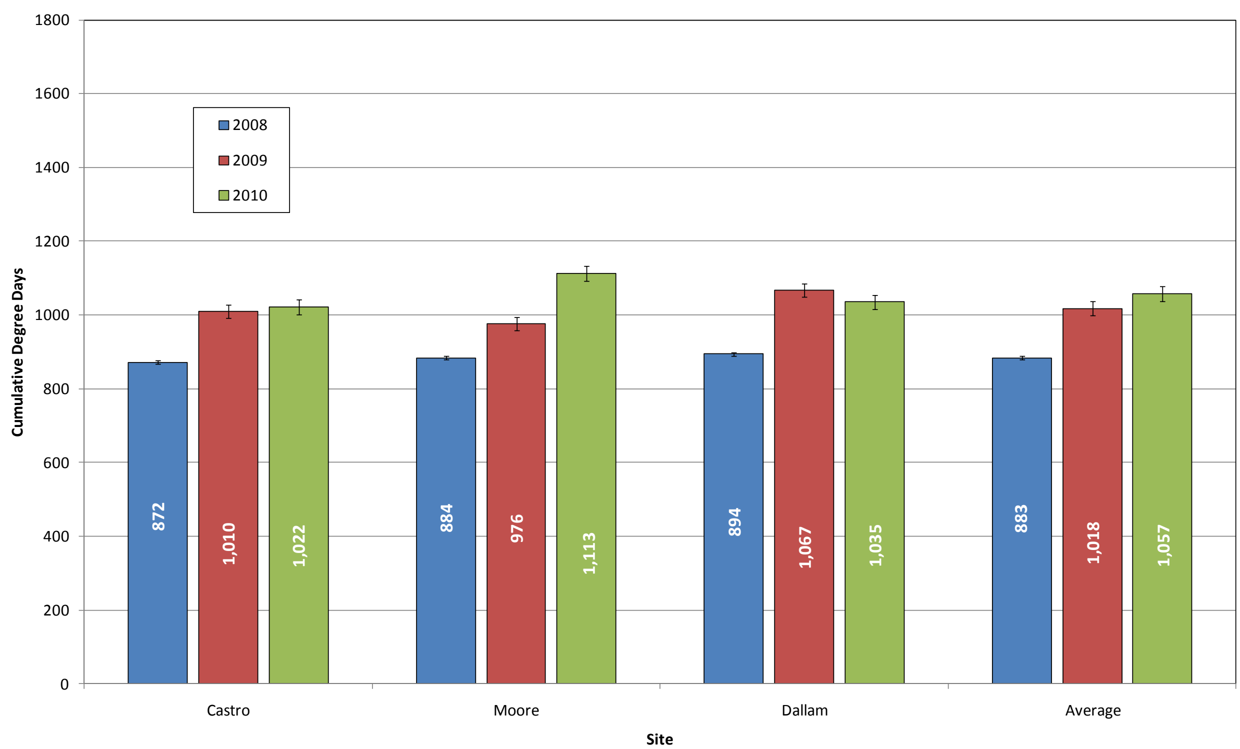

Figure 3. Western Bean Cutworm cumulative degree days to 50% adult emergence.

Model Development. With three year's data collected, it is not possible to make sweeping recommendations regarding Southwestern corn borer or Western bean cutworm management decisions in regard to moth flights. Constructing predictive models takes a number of years of data in order to "smooth out" the year-to-year variations in the climatic parameters. In 2010, degree day accumulation was similar to 2008 and 2009 in terms of the total degree days that were accumulated by early August when we expected second-generation Southwestern corn borer adults to emerge, but the way in which the degree days accumulated was quite different than 2008 and 2009. This year started with cool conditions, similar to 2008, and degree day accumulation was slow when compared to 2009. However, as the season progressed, especially

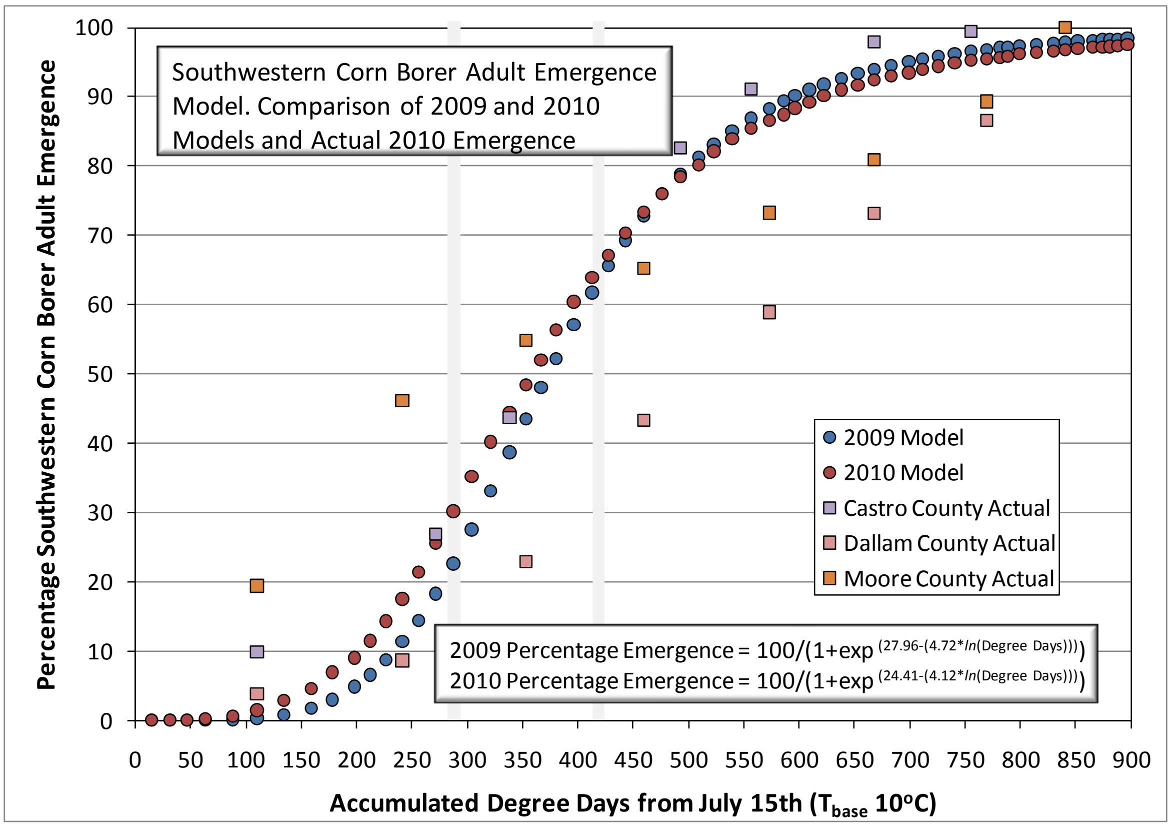

Figure 4. Comparison of Southwestern corn borer adult emergence models for 2009 and 2010 and actual emergence in 2010.

by July 21st, degree day accumulations was rapid, exceeding that observed in 2008 and approaching the accumulation rate observed in 2009. Since Southwestern corn borer and Western bean cutworm development is dependent on temperature, it is logical to assume that overwintering larvae in the soil developed more slowly in the spring of 2010. Coupled with relatively wet conditions in the spring of 2010, we believe that both insects had higher than normal mortality while still in the soil. This is likely the reason why trap catches were significantly lower for both species in 2010 when compared to 2008 and 2009. It is these sorts of climatic variations that require many years of data to develop robust emergence models. However, even though development might have been slower in 2010 and there were fewer moths captured, the dates and accumulated degree days for 50% Southwestern corn borer emergence for all three years does not vary greatly (See Fig. and Table 1). Western bean cutworm 50% emergence was more variable across the three years. Since this species requires fewer degree

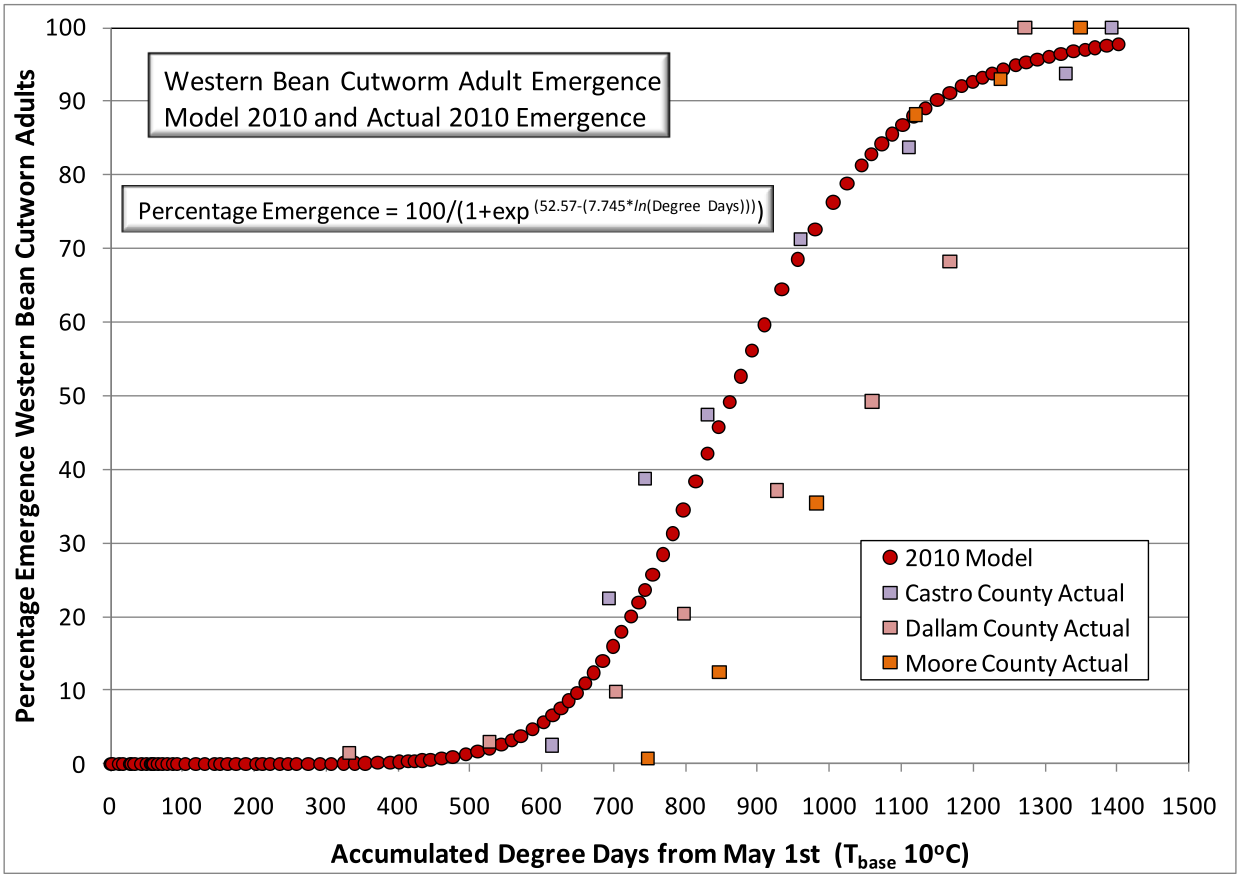

Figure 5. Western bean cutworm adult emergence model and actual trap catches 2010.

days to develop, it is likely that it emerges more quickly in years with warm rather than cool spring temperatures.

In 2010, the model for Southwestern corn borer adult emergence (Fig. 4), which is based on three years of field data, changed from the model generated with 2008-2009 data. There is a greater difference in the early part of the season, while the models converge at the end of the season. However, neither the 2009 or 2010 model predicted actual percentage emergence for 2010. The model somewhat followed the percentages observed in Dallam county in the early part of the season and those observed in Castro county in the later part of the season. All in all, the model more closely followed the actual percentage emergence in Castro county than in the other two. Moore county percentage emergence was particularly different than the model prediction. The model under-predicted moth emergence early in the year and over-predicted moth emergence later in the year. Although the model as it stands now is not a robust model to accurately predict moth emergence, it should be noted that the model's 50% emergence prediction for both the 2009 and 2010 versions would have been acceptable for predicting 50% moth emergence Castro and Moore counties. This observation may be coincidental, but it does indicate that there is promise in the model with additional climatic and insect data.

As with the Southwestern corn borer model, the Western bean cutworm model will benefit from additional data in the next few years. In 2010, the model fairly well predicted the observed percentage emergence in Castro county while over-predicting emergence in Dallam and Moore counties. The Western bean cutworm model has two years' data to drive it, and when this is taken into consideration, this model might become more predictive sooner than the Southwestern corn borer model. This would make sense when one considers that we have a single generation of Western bean cutworms per year and two Southwestern corn borer generations per year. The Western bean cutworm model takes into account climatic data from May 1st, while the Southwestern corn borer model starts on July 15th since the emergence of moths coming from eggs laid on the plants by the overwintering generation is the generation that produces the economically-important second generation, there is little economic value in predicting when Southwestern corn borer overwintering larvae will emerge as adults. In the future, there may be value in tying overwintering and first generation Southwestern corn borer moth emergence together into a cohesive model, and the data is available. But for the present, a strong predictive model for first generation moth emergence is the primary goal.

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