**Phenology Modeling Exercises for IPM Class – Nov 7, 2019   Guest Instructor: Len Coop, Oregon State University Dept. Horticulture and Integrated Plant Protecion Center**

**Intro:** We are testing a new degree-day model for the bronze birch borer (BBB), *Agrilus anxius* Gory. This pest, while native to parts of the US, has extended its range in the past several years and is now common in Western Oregon. Most ornamental species of birch are imported and therefore susceptible. Native forests tolerate damage, probably because the trees co-evolved with this insect. BBB has been associated with birch dieback (see Wikipedia for more info).

**Purpose:** Learn how to run the BBB model at USPEST.ORG. Find ways to test/validate/disprove this new model by confronting it with data! These can include: A) Compare to USA NPN model of BBB, B) Compare to extension bulletins/other online reports that discuss the BBB life cycle. C) Ideally, we would have independent research quality data from multiple locations (sorry!).

**Methods:** 1) Learn how to run the model using our newest online calculator, at:
https://uspest.org/dd/model_app?spp=bbb
Notice the tabs near the top. First find a weather station. You may want to read the Intro tab (generic not on the Bronze birch borer per say). Then check the model with the "Model" tab. Then run the model by clicking the "Output" and "Graph" tabs. Compare 10%, 50%, and 90% adult emergence for a weather station such as KLSE (Salem), ARAO (Aurora), or some other location over the years 2017 to 2020. Make a table and interpret the results. How many days to the predictions vary over these four years?

2) Once familiar with running the model, lets try to prove it is incorrect (or at least compare with an older model we are hoping to improve upon).
A) Run the USA NPN version of the model for BBB. You can find it online by googling "USA NPN". The USA NPN BBB model essentials are pasted here:
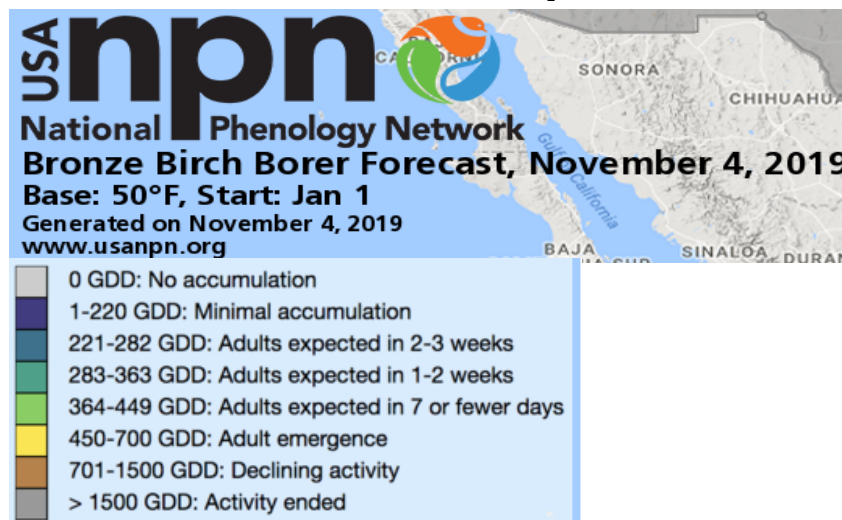


Using the same uspest.org/dd/model_app program, changing the model from spp=bbb to spp=aaa for the generic calculator, and then enter parameters for Tlow (Base=50F). Run for same location and years. Record dates of beginning and ending adult emergence, and for end of declining activity. Compare to similar events for the new model at uspest. Make a table comparing the differences.

B) Compare to other online reports. Use a search engine to find life history discussions for states/provinces Kentucky, Wisconson, Minnesota, Manitoba, Quebec (hint green pages), Indiana, New

York (hint Cornell Extension 22916) and Illinois. For instance, if a bulletin/newsletter/etc mention "adults begin flight late May", then run the model for that location (as best you can determine) for the past 5 years and record the date for "first adults exit trees" and for "10% adult emergence". If the model predictions are not in accord with the online publication, then the model may be suspect.

C) (Optional) Check the iNaturalist observations for BBB (documented at end of USPEST spreadsheet model documentation). Double check the table results in the spreadsheet. Check any unused reports if possible. This type of "citizen science" source of data may be used increasingly in the future for validation of pest models.

D) (Optional) Create a latitudinal transect (South to North) at a given longitude (perhaps through Chicago or Columbus OH, or your choice) with at least four points (say Arkansas into Canada) for several years, comparing dates of predicted beginning emergence (NPN model) and 10% emergence (USPEST model) to compare. Are both models geographically robust to the same degree? (do results seem realistic at Northern and Southern limits you selected?)