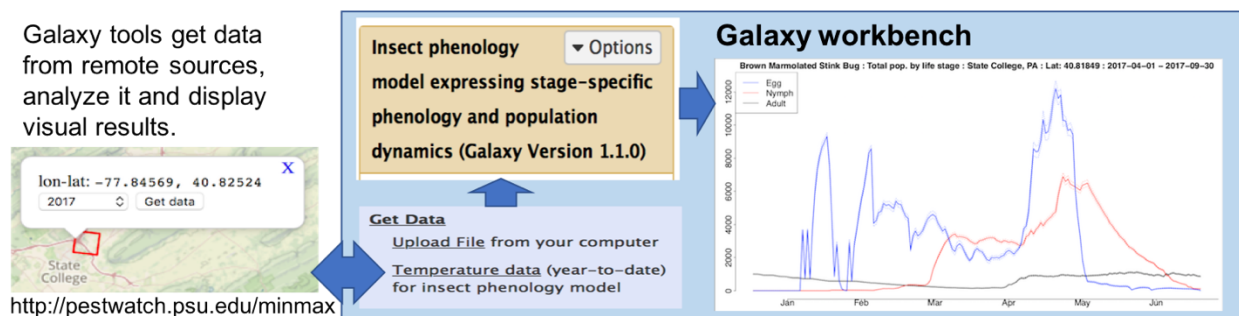# Galaxy / Entomology

Greg consulted with Dr. Shelby Fleisher in the Department of Entomology to build the Galaxy / Entomology analysis environment, developing tools that provide an agent-based model of Halyomorpha halys to study phenology and population dynamics of this species as it invades the U.S. The model considers survivorship, diapause termination and induction, preoviposition, fecundity, development rate, and temperature thresholds, as influenced by temperature, time, and photoperiod. Validation trials defined realistic functions which were used in building the tools (Figure 10).

Figure 10: Galaxy / Entomology tools produce visualizations that predict insect development stages

Results highlighted the extremely high degree of overlap among life stages, and strong geographic variation of the degree of synchrony among life stages and on timing of median occurrences of key life stages. All populations consistently achieved two generations and produced F2 adults; however the relative size of each generation varied dramatically, with as much as 50% of adults at the end of a year comprised of F1 adults in some locations and years. The model projects average annual growth rates that vary by an order of magnitude among locations, influenced strongly by degree day accumulation and timing and synchrony of vitellogenesis. Figure 11 provides samples of life stage forecasts for the Brown Marmorated Stink Bug.
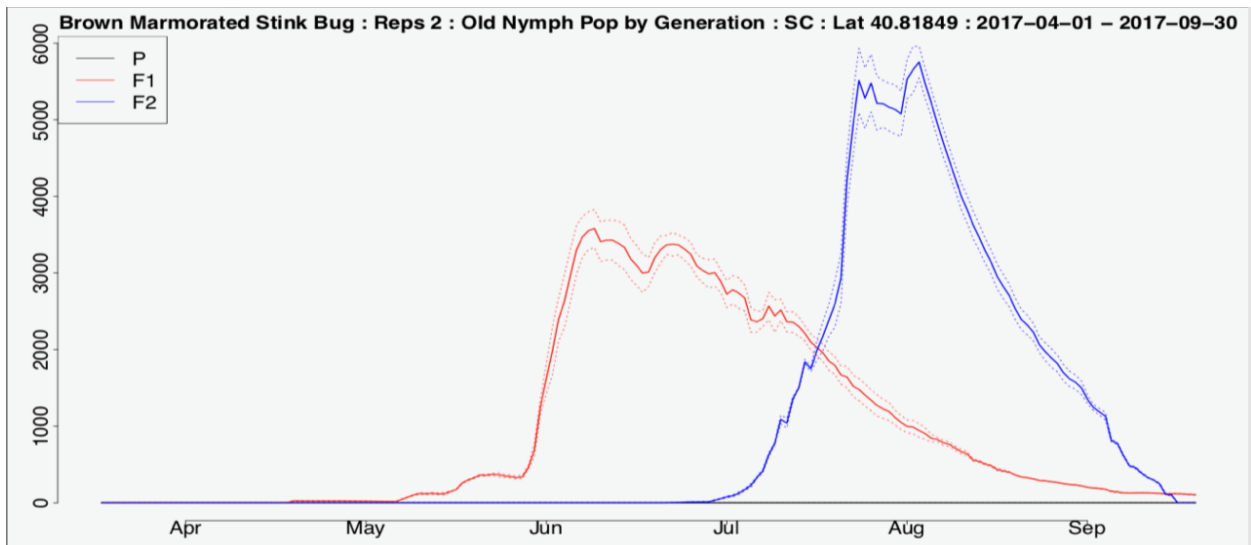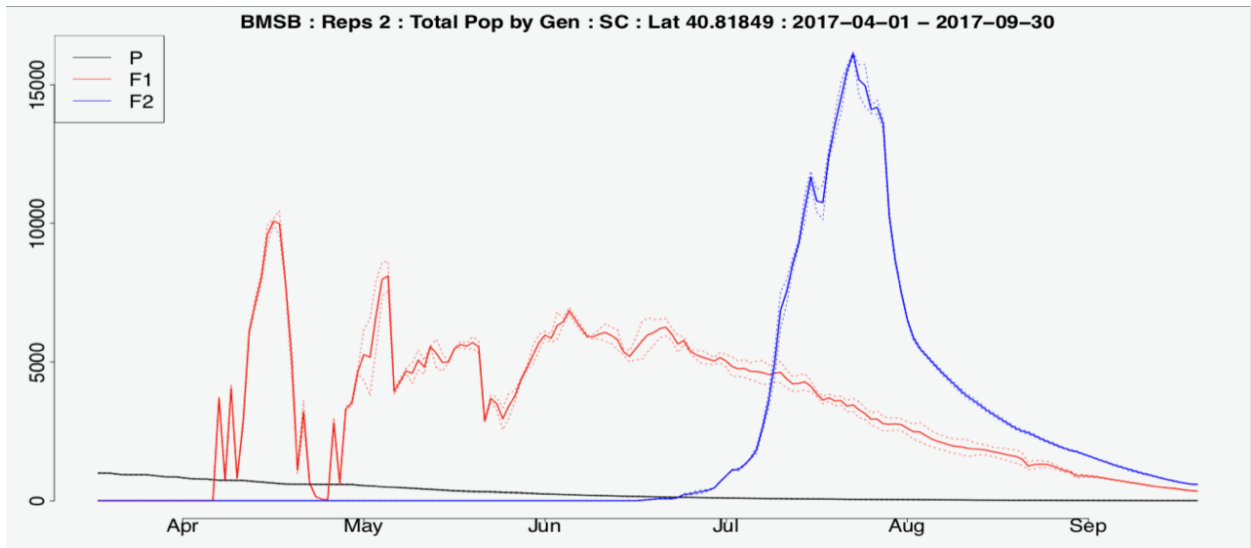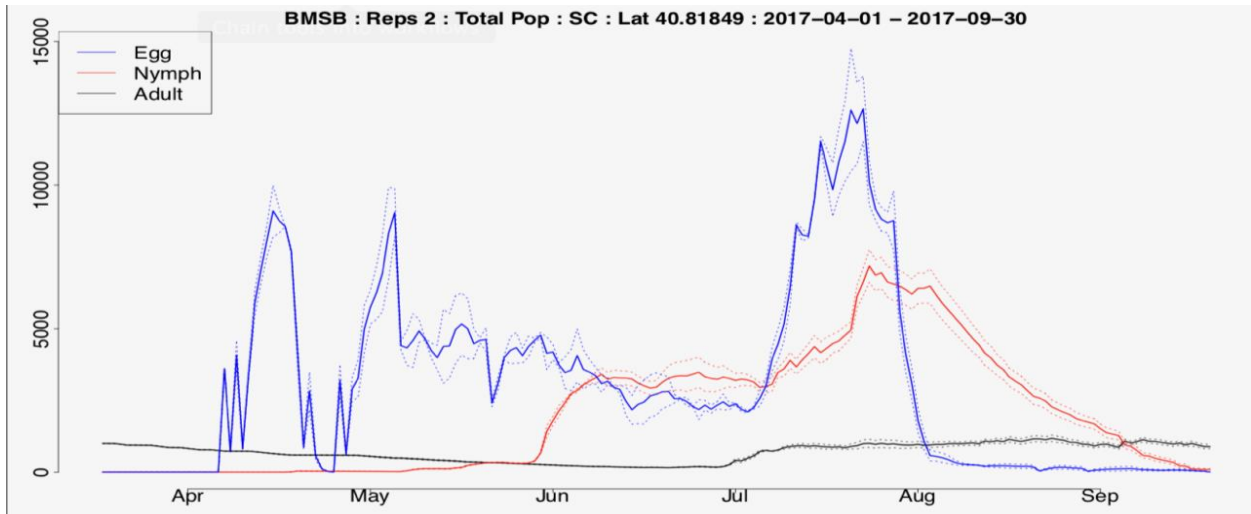
Figure 11: Sample visualizations of life stage forecasts for the Brown Marmorated Stink Bug