

# Pheno Forecasts predict seasonal activity of pest and invasive species to support decision making

The USA-NPN produces and distributes daily national maps – or Pheno Forecasts – indicating the status of insect pest and invasive plant life cycle stages as part of a growing suite of phenology map products.

The USA National Phenology Network’s (USA-NPN) Pheno Forecast maps indicate the status of insect pest or invasive plant life cycle stages in real time across the contiguous United States<sup>1</sup>. This information can guide when to monitor or undertake management activities. These maps, available at 2.5 km spatial resolution, are updated daily and are available six days into the future.



Pheno Forecast maps are offered for the following species:

#### Insect pests:

- apple maggot (*Rhagoletis pomonella*)
- Asian longhorned beetle (*Anoplophora glabripennis*)
- bagworm (*Thyridopteryx ephameraeformis*)
- bronze birch borer (*Agilus anxius*)
- eastern tent caterpillar (*Malacosoma americanum*)
- emerald ash borer (*Agrilus planipennis*)
- spongy moth (*Lymantria dispar*)
- spotted lanternfly (*Lycorma deliculata*)
- hemlock woolly adelgid (*Adelges tsugae*)
- lilac borer (*Podosesia syringae*)
- magnolia scale (*Neolecanium cornuparvum*)
- pine needle scale (*Chionaspis pinifoliae*)
- winter moth (*Operophtera brumata*)

#### Invasive plants:

- buffelgrass (*Pennisetum ciliare*)
- red brome (*Bromus rubens*)

#### ACCESS THE MAPS

Pheno Forecast maps are available on the USA-NPN website ([www.usanpn.org/data/maps/forecasts](http://www.usanpn.org/data/maps/forecasts)) and through the USA-NPN visualization tool ([data.usanpn.org/npn-viz-tool/](http://data.usanpn.org/npn-viz-tool/)). Pheno Forecasts are based on published growing degree day (GDD) or seasonal precipitation thresholds for life cycle events when monitoring and management actions are typically undertaken<sup>2</sup>. Using the USA-NPN daily accumulated growing degree day maps<sup>3</sup> or precipitation accumulations, locations are shaded as not yet approaching the life stage of interest, approaching the stage, experiencing the stage, and past the stage relative to an established threshold.

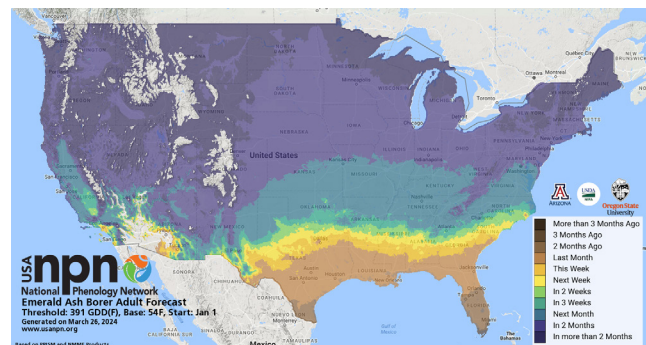


Figure 1. Emerald ash borer Pheno Forecast, March 26, 2024. Colors indicate the status of adult emergence. Dark purple indicates activity is predicted more than 2 months in the future, green: adults expected to emerge in 2 weeks, yellow: adults expected to emerge in 1 week, gold: adults emerging, brown: adults emerged last month, dark brown: adults emerged more than 3 months ago.

These maps are intended to provide a broad-scale prediction of when monitoring and management may be necessary and are intended to supplement local knowledge. Forecast accuracy may vary locally based on microclimatic variation. In addition, thresholds may perform with variable accuracy across species ranges. For more information about these pests and others specific to your state, contact your local Cooperative Extension program.

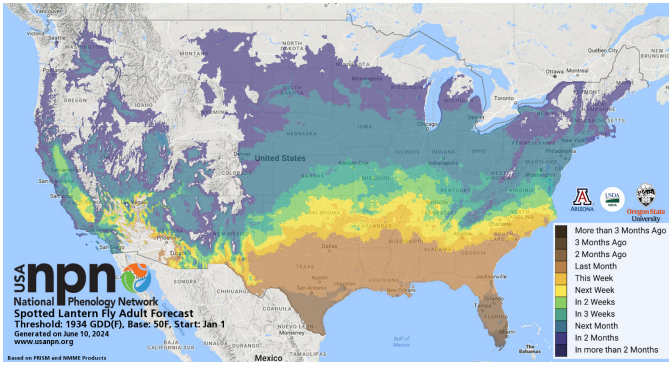


Figure 2. Spotted lanternfly Pheno Forecast, June 10, 2024. Colors indicate the status of adult lanternfly. Dark purple indicates activity is predicted more than 2 months in the future, green: adults expected to emerge in 2 weeks, yellow: adults expected to emerge in 1 week, gold: adults emerging, brown: adults emerged last month, dark brown: adults emerged more than 3 months ago.

Accessing the Pheno Forecasts through the USA-NPN visualization tool offers additional information on site-specific patterns of heat accumulation. This information can be used to evaluate whether insect pests will reach life cycle stages occur earlier or later than usual at a site.

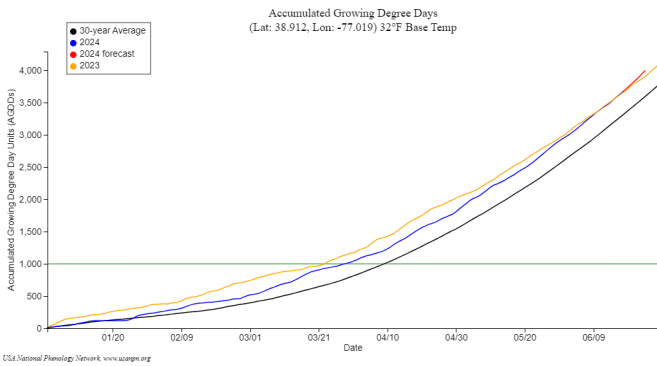


Figure 4. Growing degree day accumulation from June 17, 2024 for Washington, D.C. Clicking on a location on the map yields a plot of heat accumulation since Jan 1 (in blue) with the six-day forecast (in red) relative to a long-term average (1991-2020) of heat accumulation (in black) and last year's accumulation (in yellow).

### RECEIVE UPDATES ON PEST ACTIVITY AT YOUR LOCATION

Sign up to receive advance warning by email of activity in your pest of interest 2 weeks, and 6 days, before the predicted life cycle stage is reached at your location. Sign up to receive notifications for any of the Pheno Forecasts at [www.usanpn.org/data/maps/forecasts](http://www.usanpn.org/data/maps/forecasts).

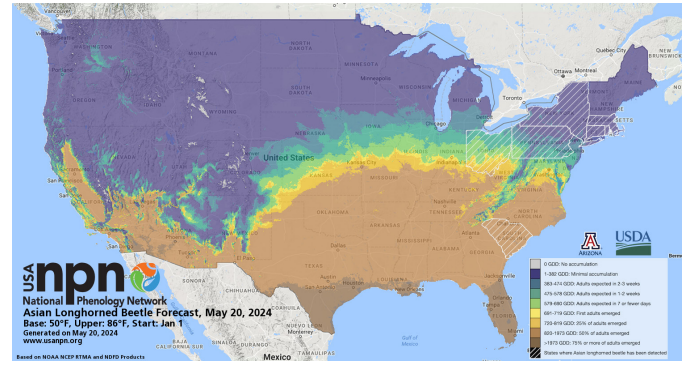


Figure 3. Asian longhorned beetle Pheno Forecast, March 20, 2024. Colors indicate the status of adult emergence. Dark purple indicates minimal accumulation, dark blue-green: adults expected to emerge in 2-3 weeks, dark green: adults expected to emerge in 1-2 weeks, light green: adults expected to emerge in seven or fewer days, yellow: first adults emerging, gold: 25% of adults emerged, brown: 50% of adults emerged, dark brown: 75% or more of adults emerged. Hatching indicates states with detections of ALB.

The USA National Phenology Network is a national-scale monitoring and research initiative focused on collecting, organizing and delivering phenological data, information and forecasts to support natural resource management and decision-making, to advance the scientific field of phenology, and to promote understanding of phenology by a wide range of audiences.

### REPORT PEST ACTIVITY AT YOUR SITE OVER THE SEASON

Tracking phenology at your site can help you choose the best time to perform management activities and identify pest or invasive species concerns early. Report the status of the Pheno Forecast species through the USA-NPN's phenology data collection platform *Nature's Notebook* and its Pest Patrol campaign ([www.usanpn.org/nn/campaigns/PestPatrol](http://www.usanpn.org/nn/campaigns/PestPatrol)).

Reporting can be done by anyone – professionals or volunteers – and raises awareness about particularly troublesome pests. These observations will be used to validate and improve the Pheno Forecast maps. Learning modules are available for select species to assist in data collection.



Learn more at [www.naturesnotebook.org](http://www.naturesnotebook.org).



#### REFERENCES:

- 1 Crimmins, TM, et al. Short-term forecasts of pest insect activity inform management activities. *Annals of the Entomological Society of America*. In review.
- 2 Crimmins, TM, et al. (2017) USA National Phenology Network gridded products documentation. U.S. Geological Survey Open-File Report 2017-1003. DOI: 10.3133/ofr20171003.
- 3 USA National Phenology Network. Daily accumulated growing degree day and Spring Index maps. Info sheet. [www.usanpn.org/files/reports/USA-NPN\\_AGDD-and-SiX.pdf](http://www.usanpn.org/files/reports/USA-NPN_AGDD-and-SiX.pdf)

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