PEST EVENT MAPPING: A NEW TOOL TO AID IN PREDICTION OF INSECT PHENOLOGY

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PEST EVENT MAPPING

Background:
- USPEST.ORG at IPPC is a phenology and plant disease risk modeling toolkit with >100 models, 16,000+ real-time weather stations, DD mapping, disease risk maps, and much more.
- DD maps can be difficult to use at local (IPM) scales, require expertise to interpret properly.
- Pest Event Maps have ability to highlight specific DD – based events using day-of-year or date shown directly on maps.

http://uspest.org/wea – DD Maps

MyPest Page - IPM Pest and Plant Disease Models and Forecasting

Custom degree-day mapmaker ■ for 48 US states - use your own settings:
new server (faster); 2nd server

Daily degree-day accumulation maps ■ - click on a region for more maps:

Northeastern, North Central, Great Lakes Central, Northwestern, South Central, Southeastern, 48 State USA, Oregon, Washington, Idaho, Montana

MyPest Page Integration of 100 models, forecasts

New Disease Risk Model Gridded Forecasts

KSLB METAR 44.9078 -122.9930
2012 Salem, McNary Field OR elevation: 209'

Temperature

Leaf Wetness

Hops

Windspeed

Water

Ozone

Wind Speed

Humidity

Dew Point

Rain

Sunshine

Temperature (°F)

Leaf Wetness [%]

Hops [%]

Windspeed [mph]

Water [in]

Ozone [ppb]

Wind Speed [mph]

Humidity [%]

Dew Point [°F]

Rain [in]

Sunshine [hr]

5 Day Loop

Map

Temperature

Leaf Wetness

Hops

Windspeed

Water

Ozone

Wind Speed

Humidity

Dew Point

Rain

Sunshine

Temperature (°F)

Leaf Wetness [%]

Hops [%]

Windspeed [mph]

Water [in]

Ozone [ppb]

Wind Speed [mph]

Humidity [%]

Dew Point [°F]

Rain [in]

Sunshine [hr]

Refresh - click to reset display
• Weather Parameters
• Plant Disease/Other Hourly Driven Models
• Doppler
• Degree-day/Phenology Models
• Forecast Engine Info:
• NWIS Digital Forecast

Download Data

Display Data Table
PEST EVENT MAPPING: NEW TOOL, OLD IDEA

1995: Helped promote Areawide Codling Moth Management Program

1998: 1st DD maps online

2005: Completed main infrastructure to automate PEMs

2013: Obtained funding to improve and implement PEMs

2014: Expected deployment of online custom PEMs
Degree-day grids used by USDA APHIS PPQ to support CAPS survey programs; PEMs expected to enhance this support with more readily interpretable maps for numerous invasive species, such as the emerald ash borer.
PEST EVENT MAPPING: Major Steps

1) DD maps made for each month of the year (from PRISM+station max/min temps)
2) Each monthly DD map subtracted from target Dds, final month is a linear interpolation = initial map
3) For all weather stations, calc. day of year (DOY) of the DD event
4) DOY map values subtracted from station-calculated DOYs
5) Diffs are interpolated (1/distance squared)
6) Diff layer added as correction to initial map.
7) Final map up to 30s (800m) spatial resolution
Ex. 1 - Spotted Wing Drosophila – 1\textsuperscript{st} Springtime Oviposition Event = 261 DDs (T\textsubscript{low}=50, T\textsubscript{hi}=88)
Ex. 2 – Codling Moth – 1% Egg Hatch (WSU No Biofix Model)
Event = 395 DDs (Tlow=50, Thi=88)
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Event = 395 DDs (Tlow=50, Thi=88)
Ex. 3 Galerucella calmariensis. – 2nd Gen Adult Emergence = 895 DDs (Tlow=50, Thi=100)

Second Generation Adult

Emergence dates last 2 years
PEST EVENT MAPPING: Issues

1) Pest Event Maps may imply precision that is lacking - DD models are approximate, other environmental effects besides temperature can affect population development, etc. Therefore exercise caution; may use as a research/survey tool to improve existing DD models.

2) This work mainly funded by APHIS PPQ and will be used initially on invasive pest “presumptive” models, although the well-studied gypsy moth will be 1st species targeted

3) Problem of spatially variable biofix dates (e.g. codling moth)

4) Rely on forecasted temperatures; imposes a greater reliance on accurate longer-term forecasts. 30-yr Normals vs. climate change?