

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

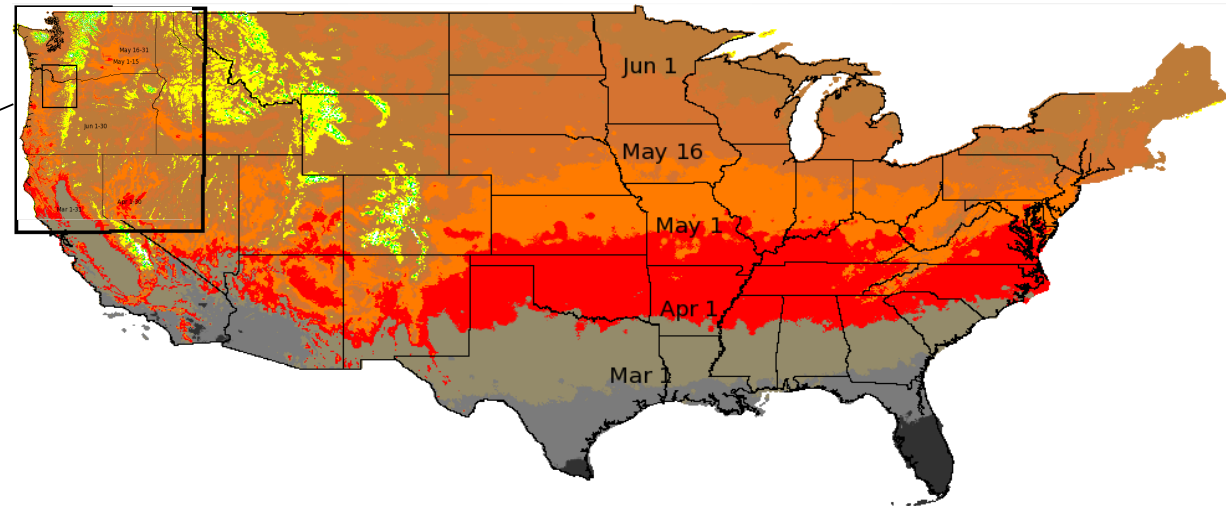
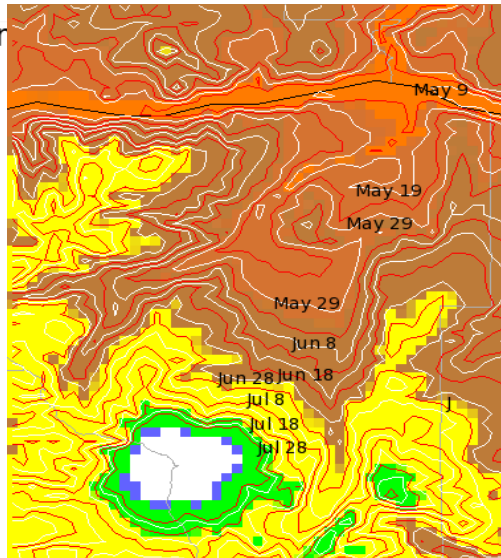
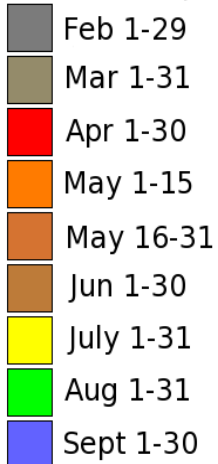
Len Coop^{1,2}, Fritzi Grevstad², and Gericke Cook³

¹Integrated Plant Protection Center, Oregon State University, Corvallis, OR

²Botany and Plant Pathology Department, Oregon State University, Corvallis, OR

³USDA APHIS PPQ CPHST, Fort Collins, CO

SWD 1st Oviposition



United States Department of Agriculture
Animal and Plant Health Inspection Service



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 Integration of 100 models, forecasts

New Disease Risk Model Gridded Forecasts

MyPest Page - IPM Pest and Plant Disease Models and Forecasting

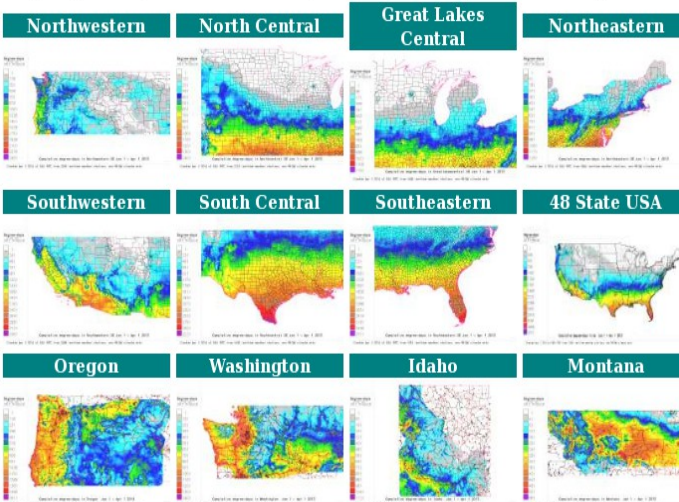


for Agricultural, Pest Management, and Plant Biosecurity Decision Support in the US

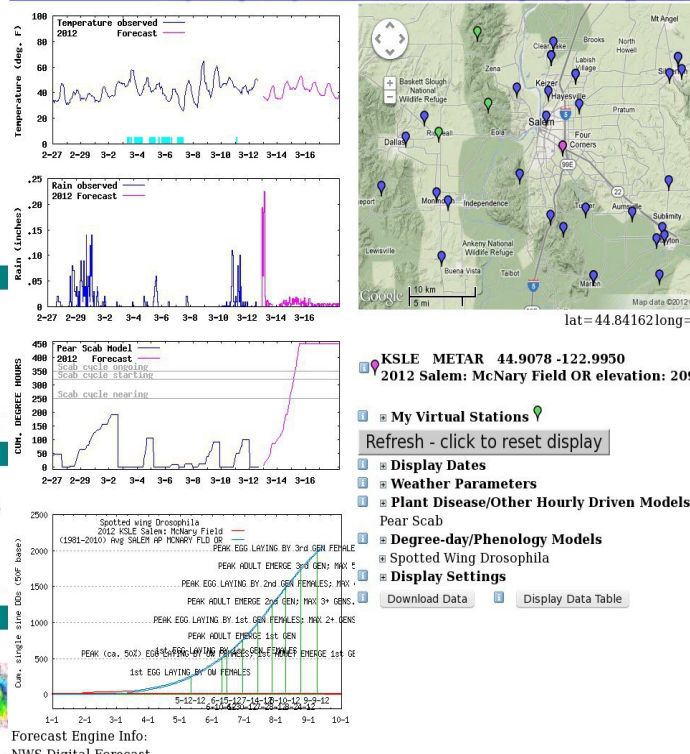
Introduction Quick Start Map Index Shortcut Links Degree-day Maps

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

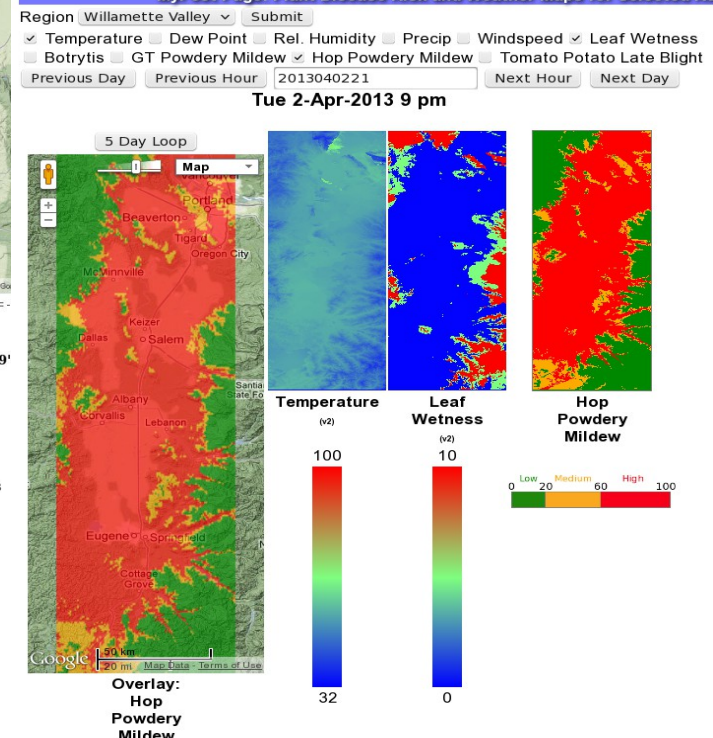
Daily degree-day accumulation maps - click on a region for more maps:



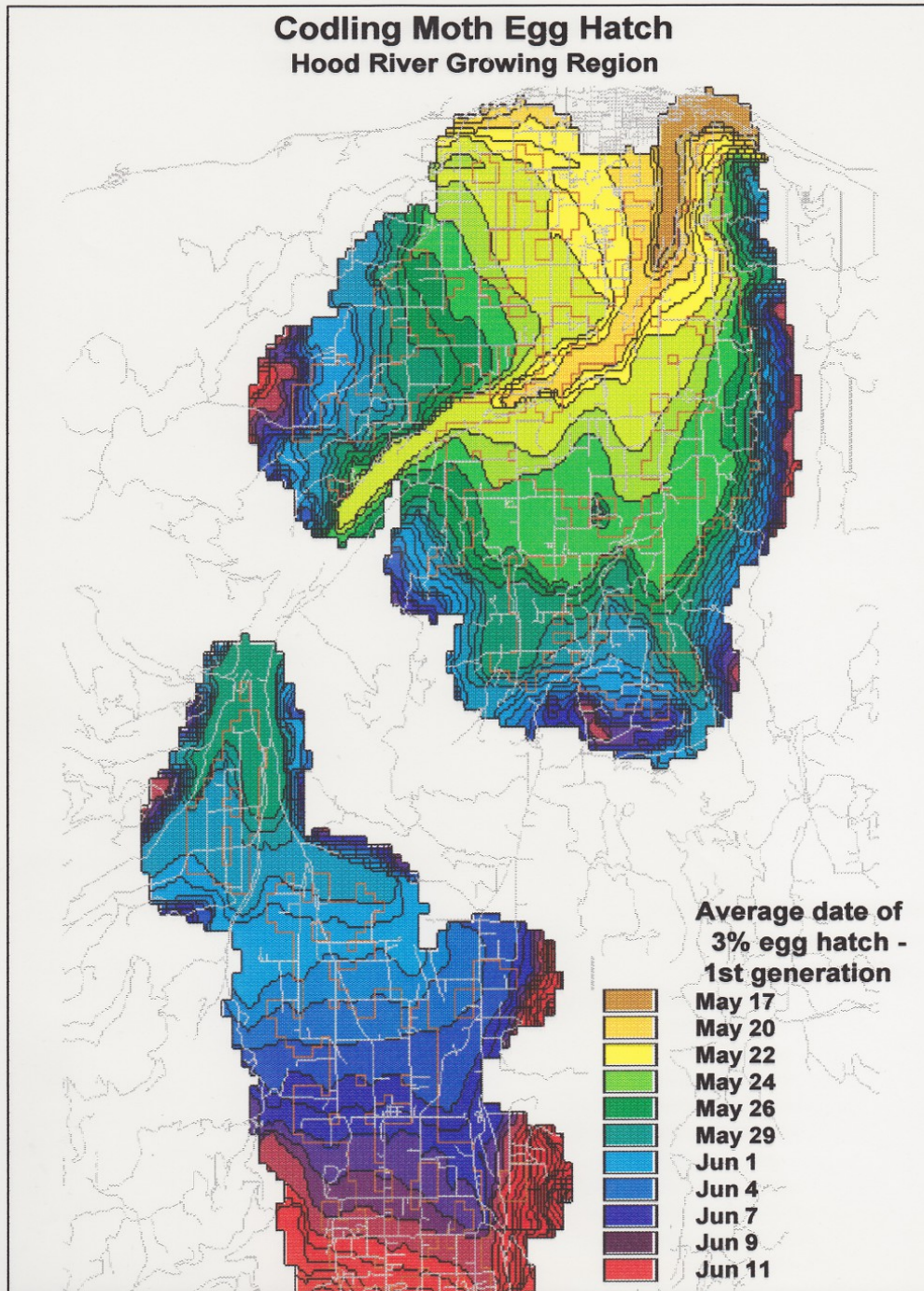
MyPest Page: Hourly Weather, Plant Disease Risk, and Degree-Day/Phenology Models



MyPest Page: Plant Disease Risk and Weather Maps for Selected Region



PEST EVENT MAPPING: NEW TOOL, OLD IDEA



1995: Helped promote
Areawide Codling Moth
Management Program

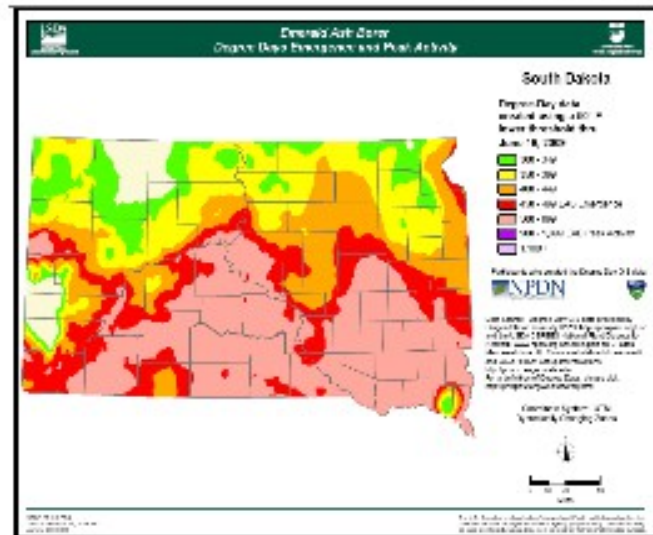
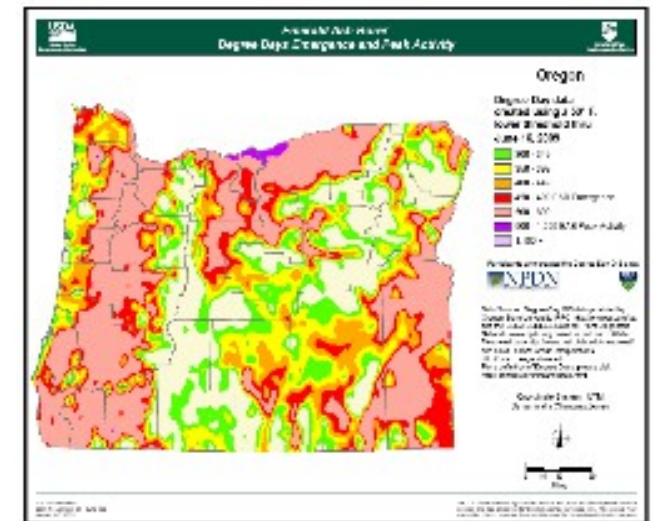
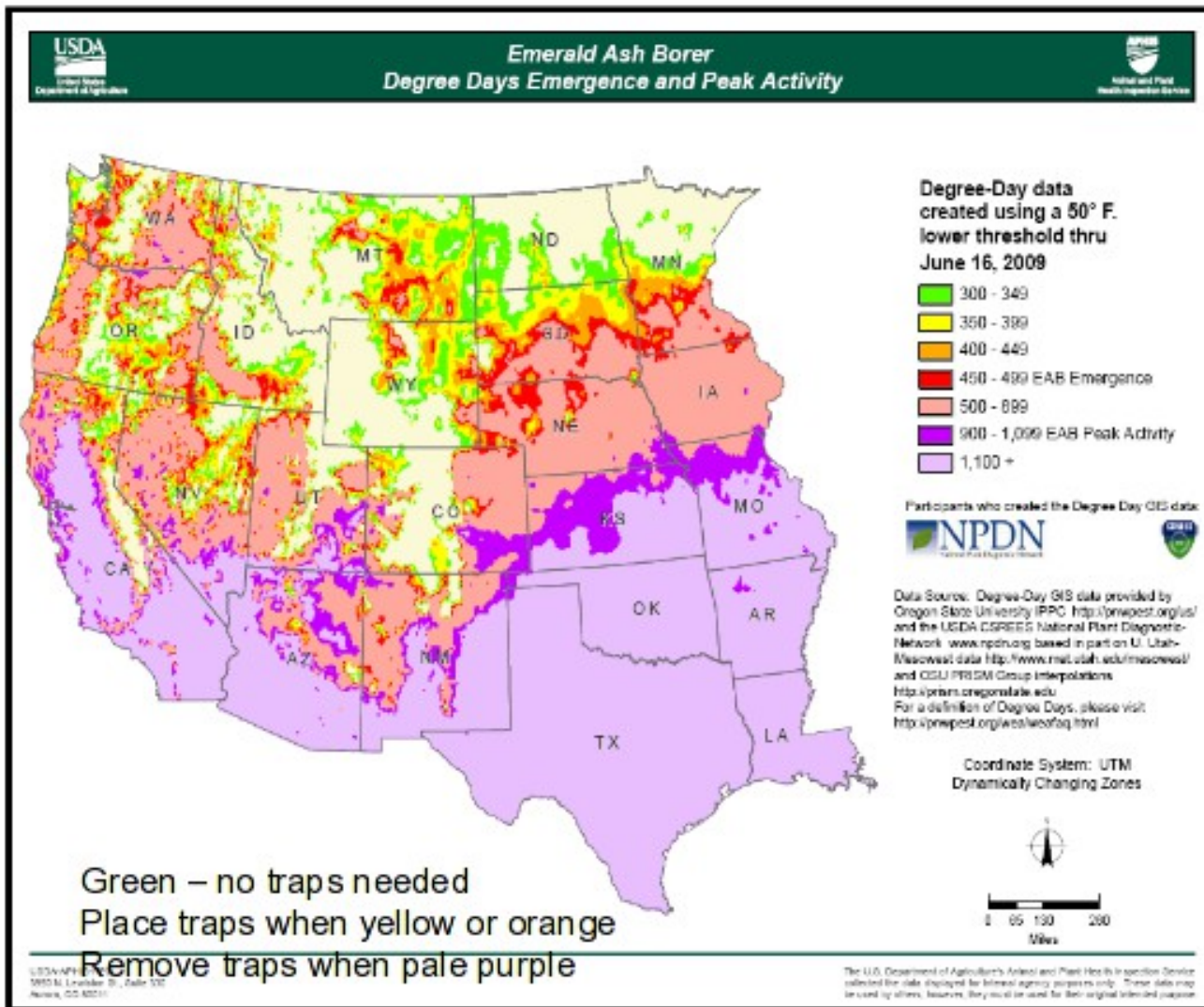
1998: 1st DD maps
online

2005: Completed main
infrastructure to
automate PEMs

2013: Obtained funding
to improve and
implement PEMs

2014: Expected
deployment of 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

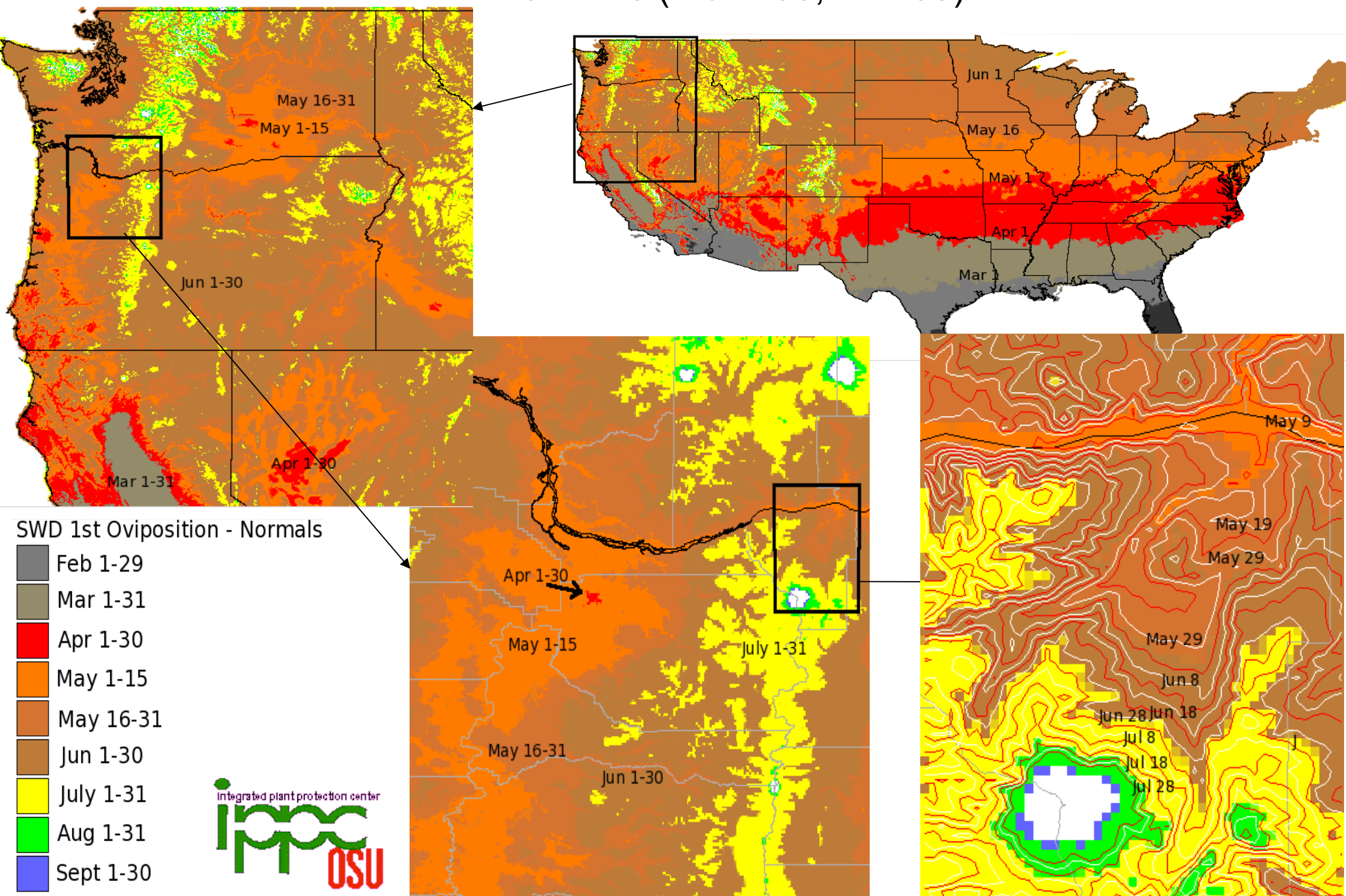
- 1) DD maps made for each month of the year (from PRISM+station max/min temps)
- 2) Each monthly DD map subtracted from target Dds, final month is a linear interpolation = initial map
- 3) For all weather stations, calc. day of year (DOY) of the DD event
- 4) DOY map values subtracted from station-calculated DOYs
- 5) Diffs are interpolated ($1/\text{distance squared}$)
- 6) Diff layer added as correction to initial map.
- 7) Final map up to 30s (800m) spatial resolution



United States Department of Agriculture
Animal and Plant Health Inspection Service

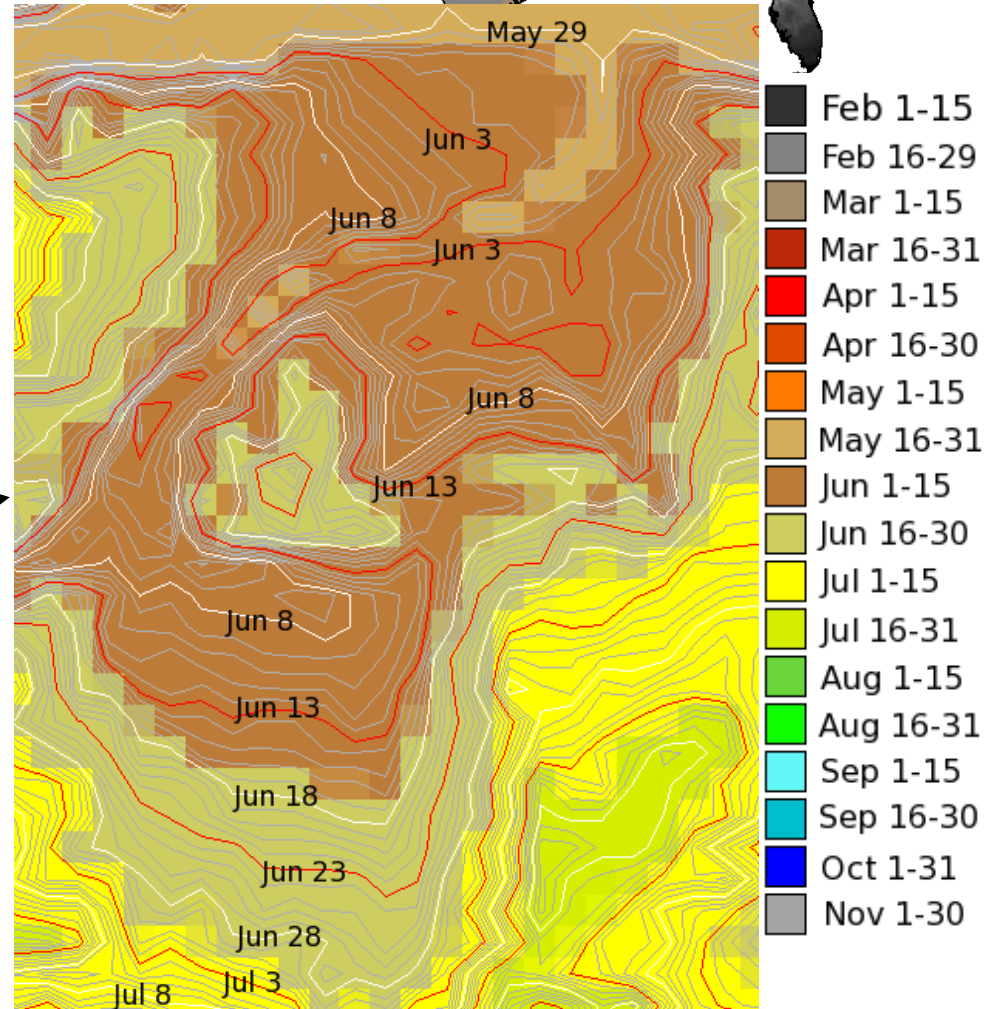
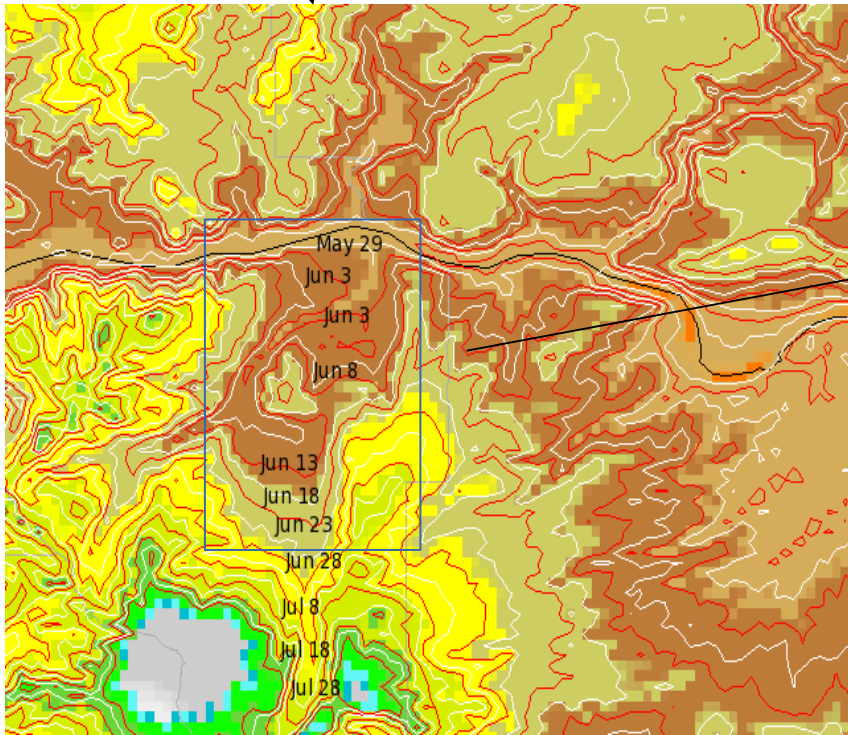
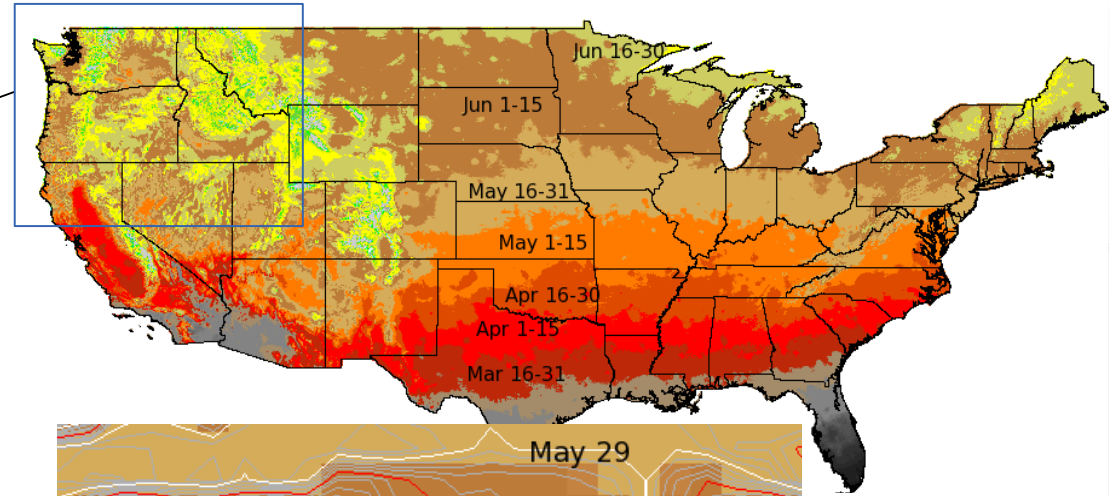
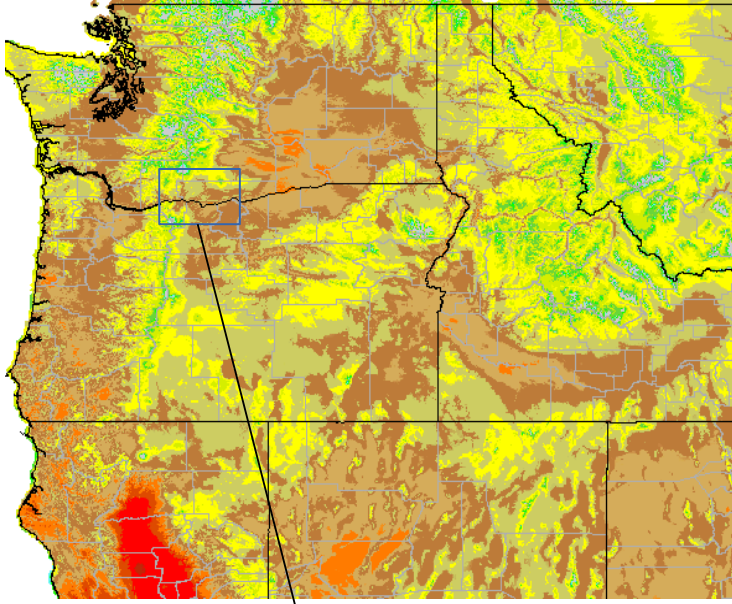


Ex. 1 - Spotted Wing Drosophila – 1st Springtime Oviposition Event = 261 DDs (Tlow=50, Thi=88)

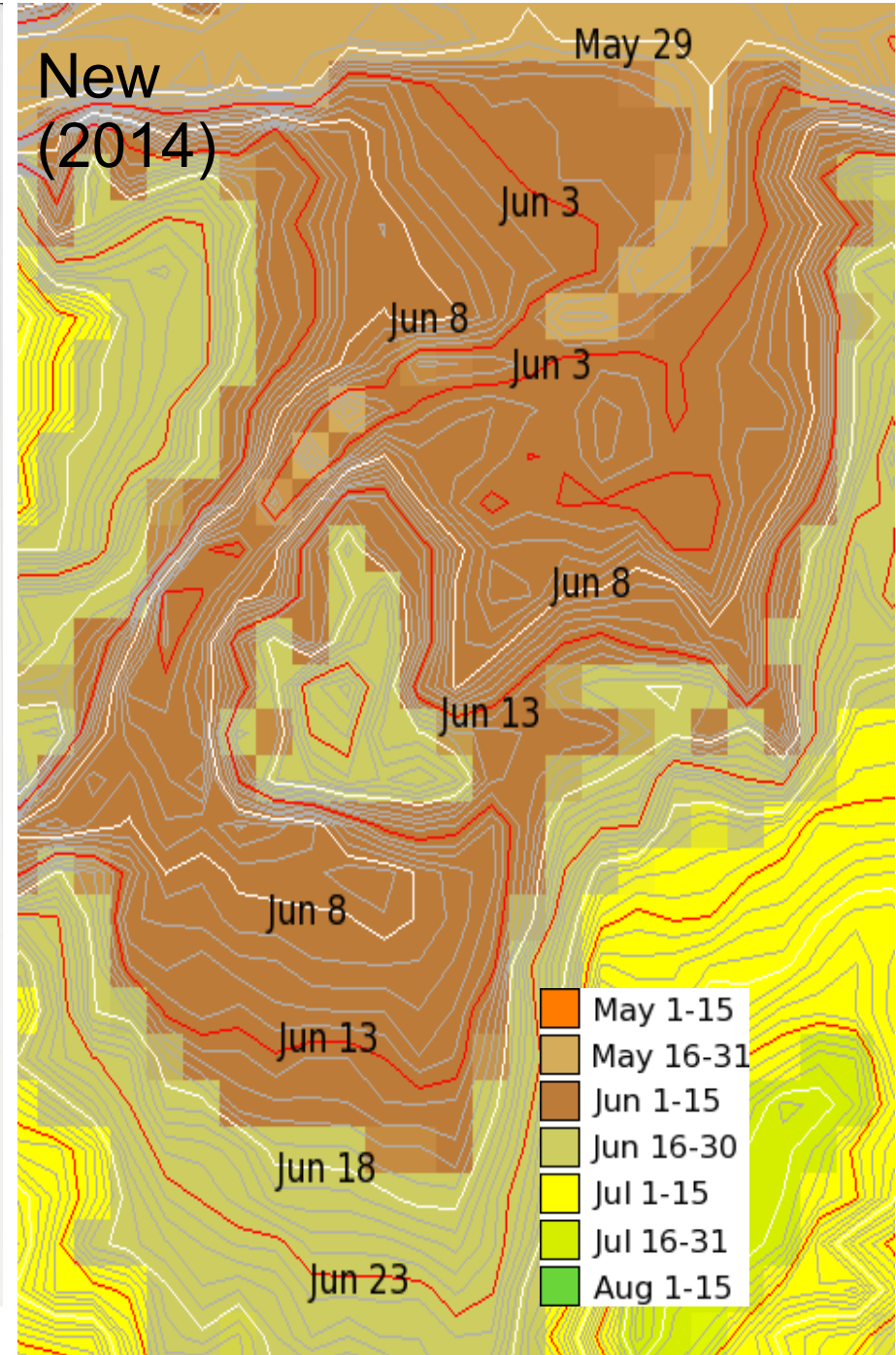
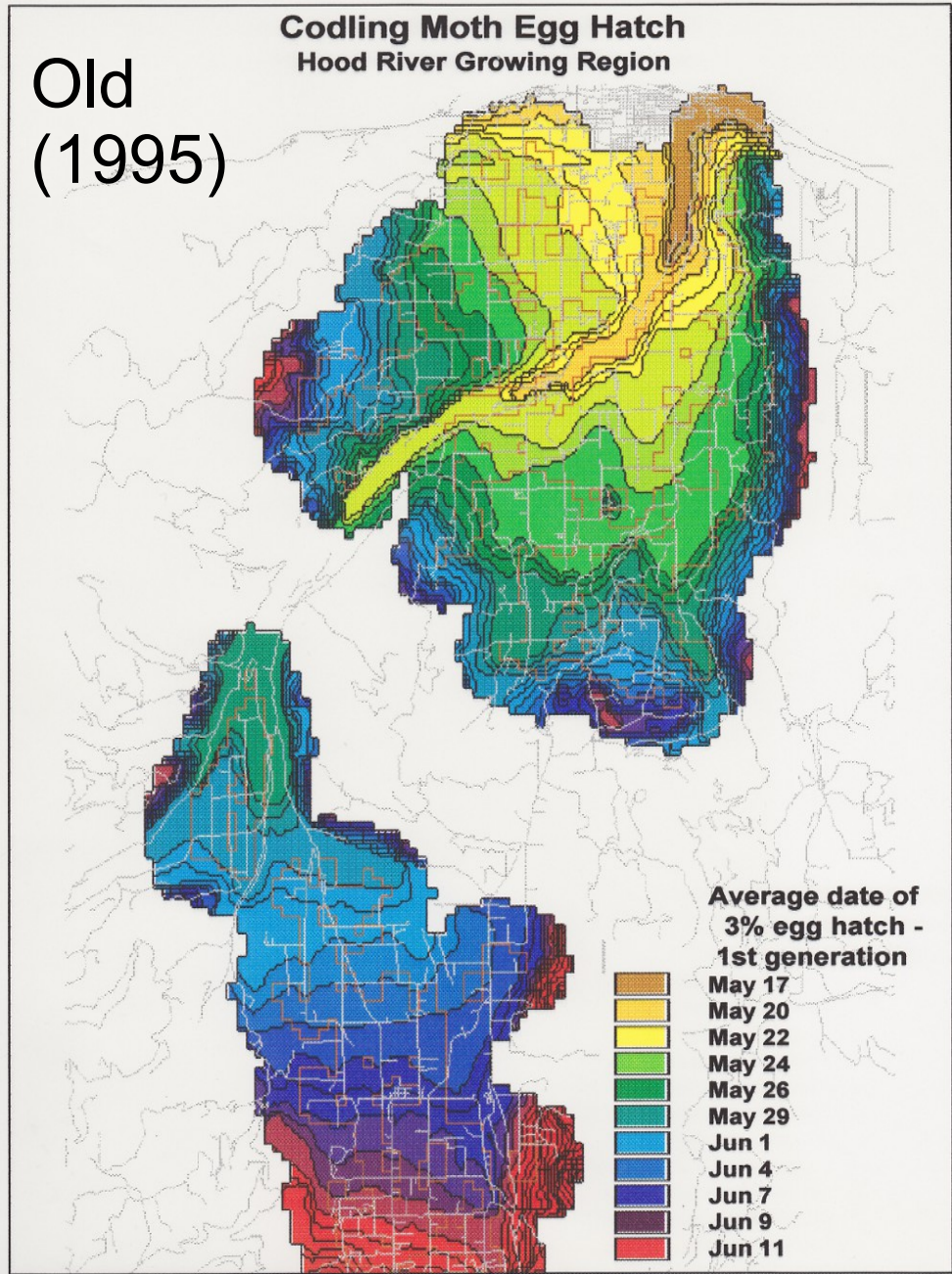


Ex. 2 – Codling Moth – 1% Egg Hatch (WSU No Biofix Model)

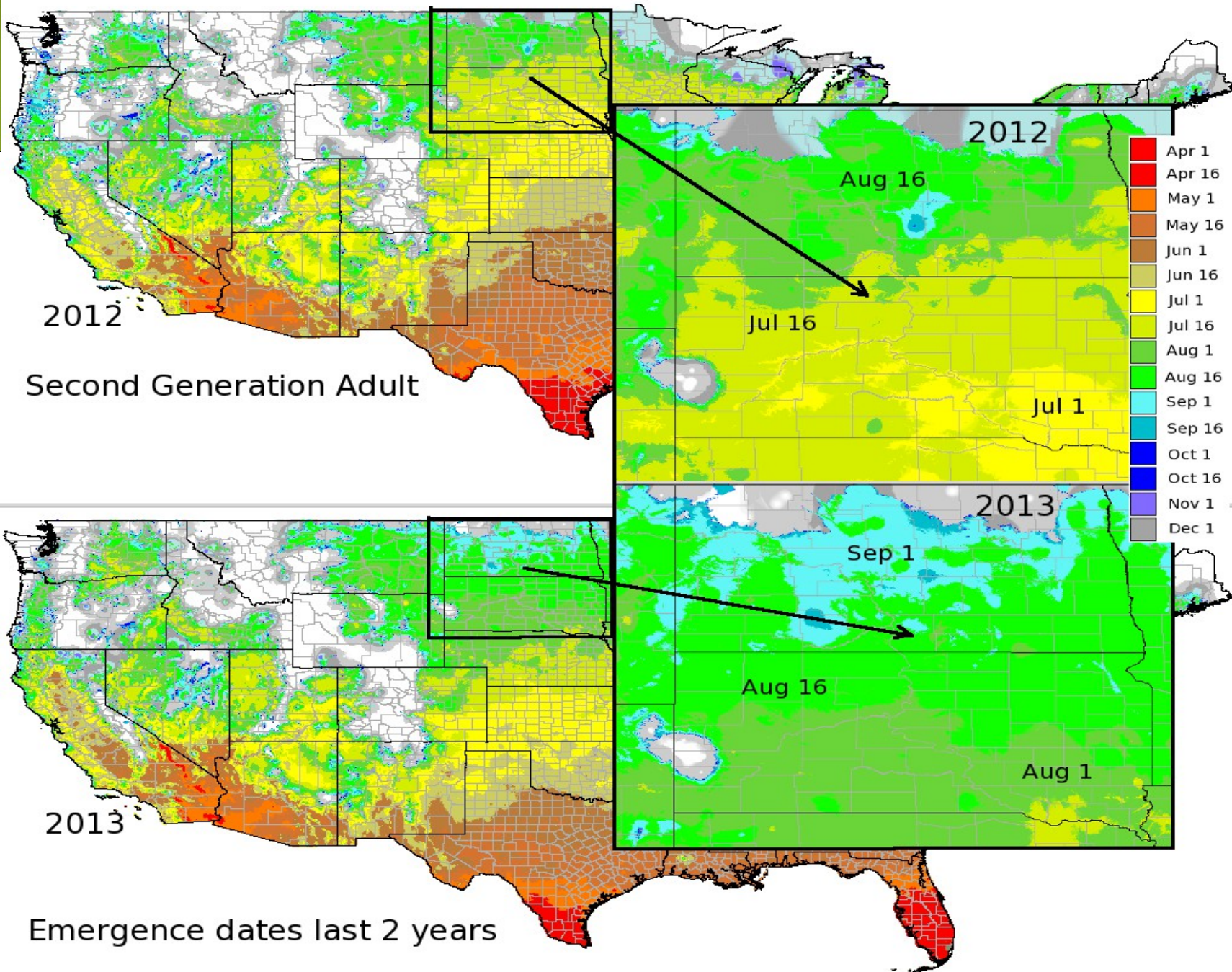
Event = 395 DDs (Tlow=50, Thi=88)



Ex. 2 – Codling Moth – 1% Egg Hatch (WSU No Biofix Model) Event = 395 DDs (Tlow=50, Thi=88)



Ex. 3 *Galerucella californiensis*. – 2nd Gen Adult Emergence = 895 DDs (Tlow=50, Thi=100)



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?



United States Department of Agriculture
Animal and Plant Health Inspection Service

