NEW Pecan Scab Model Description

Model active from March 1 to August 31

The Oklahoma Mesonet, in cooperation with scientists and professionals from Oklahoma State University and the University of Oklahoma, has developed and maintains operation of the NEW Pecan Scab Model. This model, while simple in calculation of pecan scab hours, provides pecan growers and industry professionals a web-based tool with a variety of products. NEW Pecan Scab Model users have the ability to look at current and historical pecan scab hour data for each Oklahoma Mesonet tower location. Data is displayed in interactive maps and graphs, as well as tables.

NEW Pecan Scab Model

The Oklahoma Mesonet NEW Pecan Scab Model is a tool that has been developed to aid growers in proper timing of fungicide application for pecan scab. Using data from the Oklahoma Mesonet, the state's automated weather station network, the Model calculates daily "scab hours" for all Mesonet sites. The NEW Pecan Scab Model provides new features and products, while using the same scab hour formula as the current Oklahoma Mesonet Pecan Scab Model. A scab hour is defined as one hour with relative humidity of 90% or higher and an air temperature of 70°F or higher. Research at pecan orchard sites using Mesonet weather data has shown that only the total scab hours during the 14 days preceding a scab rating were critical in correlating disease development.

The Model assumes that a correctly applied fungicide, labeled for pecan scab, protects the crop for two weeks following application. When the user clicks on a Mesonet site, the Model calculates the number of scab hours at that site that have occurred in the unprotected part of the last 14 days. If no fungicide application date was entered, the model uses March 1 as a default. Knowing the Pecan Scab Model hours and the susceptibility of the pecan variety, the grower can decide whether to spray or not. The threshold for highly susceptible pecan varieties is 10 scab hours, for moderately susceptible varieties is 20 scab hours, and for natives and less susceptible varieties is 30 scab hours.

The Oklahoma Mesonet NEW Pecan Scab Model is updated hourly. The forecast of scab hours is based on the National Weather Service Eta Model. This NWS model is a gridded numerical model for each 36 square mile area. The NEW Pecan Scab Model is operational from March 1 through August 31. Outside of these dates the Fungicide Timing Decision Support and 18-Day Scab Hours Graph text and graphs will not provide reliable display data.
NEW Pecan Scab Model Specifications

NEW Pecan Scab Model Formula:

Infection hour = One hour with relative humidity at or above 90% and air temperature at or above 70° Fahrenheit.

NEW Pecan Scab Model Rules:

- The model run time is from March 1 to August 31.
- The interactive Fungicide Timing Decision Support module calculates infection hours from the end of a 14-day fungicide control window.
- Only pecan scab hours during the last 14 days are considered in making fungicide application recommendations.
- A fungicide application is recommended based on scab susceptibility of the pecan variety. For highly susceptible varieties, a fungicide application is recommended when 10 scab hours have occurred over the last 14 days. The scab hours that trigger an application recommendation are increased to 20 scab hours for moderately susceptible varieties. 30 scab hours are necessary before a fungicide application is recommended for resistant improved varieties and native pecans.

SITE SPECIFIC PRODUCTS:

- **Mesonet Site Selection**
  The Mesonet site location can be selected by clicking on the Oklahoma map or from the list that appears when the small "blue arrow box" to the right of the "SITE: window" box is selected. When a site is selected from the Oklahoma state map, the name of the selected Mesonet site will show up in the "SITE: window." Weather data used in the model will be from the Mesonet tower selected.

- **Fungicide Timing Decision Support**
  The Fungicide Timing Decision Support product is an interactive graph and text that can be used to decide when to make a fungicide application. The graph is updated every hour. Each hour weather data recorded by the Oklahoma Mesonet replaces the forecast data. The forecast data is updated twice a day, in the morning and evening. When the graph is flat, no pecan scab hours are accumulating. When the graph rises, pecan scab hours are accumulating.

  The graph times are shown in Central Daylight Time (CDT).

  The Pecan Scab Decision Support page includes user selections for highly susceptible, moderately susceptible, and resistant pecan varieties.

  The default for **Date of Last Fungicide Spray**: is March 1 of the current year.

  Text for the Pecan Decision Support Page includes:
• A recommendation statement indicating whether a fungicide application is **Recommended** or **Not Recommended**, based on the scab susceptibility selected and the number of pecan scab hours over the last 14 days.

• **Today’s Date:**
  ▪ When the **Date of Last Fungicide Spray** is left on the default date of March 1, a **Season started on March 1** line is displayed.
  ▪ When a **Date of Last Fungicide Spray** is entered, the indented text shown below is displayed. This provides a check of the date entered and the important fungicide control window dates.

  Last Fungicide Application date entered was: ____date____
  Fourteen day Fungicide Control Window was:
  - Start of Fungicide Control Window: ____date____
  - End of Fungicide Control Window is: ____date____
  Pecan Scab Hours since end of Fungicide Control Window: ___hours___

The pecan scab hours are shown as numbers on the left vertical axis, y-axis. The dates are shown on the bottom horizontal axis, x-axis.

Graph line key:
  ▪ Green solid line - the pecan scab hours for the last 14 days, based on Oklahoma Mesonet data.
  ▪ Blue solid line - the forecast scab hours, based on the National Weather Service Eta Model.
  ▪ Black line and diamonds - the previous year’s daily scab hours from Oklahoma Mesonet data.
  ▪ Red line and diamonds - the 10-year average of daily scab hours from Oklahoma Mesonet data.

• **18-Day Scab Hours Graph**
  The 18-Day Scab Hours Graph shows the pecan scab hours that have occurred over the last 14 days and a forecast of pecan scab hours for up to 84 hours for each Oklahoma Mesonet location. The graph is updated every hour. Each hour weather data recorded by the Oklahoma Mesonet replaces the forecast data.

  The graph times are in Central Daylight Time (CDT).

  The pecan scab hours are shown as numbers on the left vertical axis, y-axis. The dates are shown on the bottom horizontal axis, x-axis.

Graph line key:
  ▪ Green solid line - the pecan scab hours for the last 14 days, based on Oklahoma Mesonet data.
  ▪ Blue solid line - the forecast scab hours, based on the National Weather Service Eta Model.
  ▪ Black line and diamonds - the previous year’s daily scab hours from Oklahoma Mesonet data.
  ▪ Red line and diamonds - the 10-year average of daily scab hours from Oklahoma Mesonet data.
• **Forecast Scab Hours Table**
  Table Data for a single Mesonet site:
  o **Time**: In Central Daylight Time (CDT).
  o **Air Temperature**: Forecast of air temperature in Fahrenheit (°F) for each hour.
  o **Relative Humidity**: Forecast of relative humidity (%) for each hour.
  o **Wind Speed**: Forecast of average wind speed in miles per hour for each hour.
  o **Wind Direction**: Forecast of the prominent wind direction for each hour.
  o **Rainfall**: Forecast amount of rainfall in inches for each hour.
  o **Scab Hours**: Forecast of pecan scab hours for each hour.
  o **Cumulative Scab Hours**: Forecast of the accumulating pecan scab hours over the time period of the forecast.

• **Seasonal Scab Hours Table**
  Table Data for a single Mesonet site:
  o **Date**: Calendar date from March 1 to the current date.
  o **Daily Scab Hours**: Daily pecan scab hours for each calendar date from March 1 to the current date.
  o **Cumulative Scab Hours**: Accumulation of pecan scab hours for each day from March 1 to the current date.
  o **Maximum Air Temperature**: Highest air temperature in Fahrenheit (°F) for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Minimum Air Temperature**: Lowest air temperature in Fahrenheit (°F) for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Maximum Relative Humidity**: Highest relative humidity in percent for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Minimum Relative Humidity**: Lowest relative humidity in percent for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Rainfall**: Recorded rainfall in inches for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.

• **Historical Daily Scab Hours Table**
  Table Data for a single Mesonet site:
  o **Day**: Sequence of days from March 1 to the current date.
  o **Date**: Calendar date from March 1 to the current date.
  o **Average Temperature**: The 24-hour average air temperature in Fahrenheit (°F) for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Average Humidity**: The 24-hour average relative humidity in percent for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Rainfall**: The rainfall in inches for each 24-hour period ending at 1:00 am CDT from March 1 to the current date.
  o **Cumulative Scab Hours**: The accumulation of pecan scab hours for each day from March 1 to the current date.
  o **Daily Scab Hours**: The daily pecan scab hours for each calendar date from March 1 to the current date.
  o **Cumulative Scab Hours Last Year's Season**: Last year's accumulation of pecan scab hours for each day from March 1 to the current date.
  o **Daily Scab Hours Last Year's Season**: Last year's daily pecan scab hours for each calendar date from March 1 to the current date.
  o **Cumulative Scab Hours Season 2 Years Ago**: The accumulation of pecan scab hours for each day from March 1 to the current date for the season 2 years ago.
o **Daily Scab Hours Season 2 Years Ago**: The daily pecan scab hours for each calendar date for the season 2 years ago from March 1 to the current date.

o **Cumulative Scab Hours 10 Year Average**: The 10-year average of the accumulation of Pecan Scab infection hours for each day from March 1 to the current date.

o **Daily Scab Hours 10 Year Average**: The 10-year average of the daily pecan scab hours for each calendar date from March 1 to the current date.

- **Historical Daily Scab Hours Graph**
  This is a graph of the daily pecan scab hours for each calendar date for the current and each of the last 10 years from March 1 through August 31 for a single Mesonet location. The legend provides a key to the color line and dots for each of the years listed. The display of each year's line can be turned off or on by the user.

- **Historical Cumulative Scab Hours Graph**
  This is a graph of the cumulative pecan scab hours for each calendar day for the current and each of the last 10 years from March 1 through August 31 for a single Mesonet location. The legend provides a key for the color line and dots for each of the years listed. The display of each year's line can be turned off or on by the user.

**STATEWIDE DATA PRODUCTS:**

- **Statewide Cumulative Scab Hours Map**
  This is an interactive, zoomable, color-contoured statewide map of pecan scab hours accumulated from March 1 to the current date and time for all Oklahoma Mesonet sites. The values displayed are the accumulated pecan scab hours since March 1 for the Mesonet sites shown.

- **14-Day Statewide Cumulative Scab Hours Map**
  This is an interactive, zoomable, color-contoured statewide map of pecan scab hours accumulated over the previous 14 days for all Oklahoma Mesonet sites. The values displayed are the accumulated pecan scab hours for the last 14 days for the Mesonet sites shown.

**DAILY REFERENCE DATA:**

- **Daily Table of All Mesonet Sites**
  Table Data for the Date selected:
  
  o **STID**: Mesonet site identifier
  
  o **DINF**: Pecan scab hours for each 24-hour period ending at 1:00 am CDT.
  
  o **TINF**: Total Pecan scab hours accumulated from March 1 of the season selected.
  
  o **TMAX**: Maximum air temperature in Fahrenheit (°F) for each 24-hour period ending at 1:00 am CDT.
  
  o **TMIN**: Minimum air temperature in Fahrenheit (°F) for each 24-hour period ending at 1:00 am CDT.
  
  o **HMAX**: Maximum relative humidity in percent (%) for each 24-hour period ending at 1:00 am CDT.
  
  o **HMIN**: Minimum relative humidity in percent (%) for each 24-hour period ending at 1:00 am CDT.
  
  o **RAIN**: Recorded rainfall for each 24-hour period ending at 1:00 am CDT.
• **View Reference Data**
  This links to the reference data used by the Pecan Scab model for the current and last ten years. Only the data for the date selected will be shown.
  
  ▪ **Date and Time Stamp:**
    This is a table of all Mesonet locations for the date and time selected.
    **Table Data:**
    o **STID**: Mesonet site identifier
    o **STNM**: Count of days since March 1.
    o **TAIR**: Maximum air temperature in Fahrenheit (°F) for each time period.
    o **RELH**: Relative humidity in percent (%) for each time period.
    o **INFH**: Pecan scab hours for each time period.
    o **TINF**: Total pecan scab hours accumulated from March 1 of the year selected.

  ▪ **Map:**
    This is a color-contour map of the seasonal pecan scab hours accumulated from March 1 to the date and time selected.

  ▪ **Graph:**
    This is a graph of the air temperature, relative humidity and pecan scab hours for each hour over the time period selected.

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**References:**

• *Pecan Diseases: Prevention and Control*, Fact Sheet F-7642, Oklahoma State University, Sharon von Broembsen, April 2005.

Authors: Albert Sutherland, Sharon von Broembsen, Mike Smith, and J.D. Carlson
Oklahoma State University, June 28, 2005