Using the NEW Pecan Scab Model

Model active from March 1 to October 1

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. 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.

Pecan Variety Scab Susceptibility

Scab susceptibility categories are used to determine the level of pecan scab hours when a fungicide application is indicated. The scab hour 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 it is 30 scab hours. The pecan variety scab susceptibility ratings listed in Table 1 and 2 are used as a guide for setting scab hour thresholds. Growers may need to change the susceptibility of a variety in their own pecan grove based on disease incidence. As a category, native or seedling pecans are considered to be resistant to pecan scab. In practice, pecan growers have found that native trees vary widely in the susceptibility to pecan scab. Table 1 lists the pecan scab susceptibility of improved pecan varieties recommended for Oklahoma in the Oklahoma State University Extension Fact Sheet F-6201, Pecan Varieties for Oklahoma.

<table>
<thead>
<tr>
<th>TABLE 1 - Oklahoma recommended pecan varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly susceptible</td>
</tr>
<tr>
<td>30 Scab Hours</td>
</tr>
<tr>
<td>Wichita</td>
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(data from Pecan Varieties for Oklahoma, McCraw, B.D., Smith, M. and Carroll, B., Oklahoma State University Extension Fact Sheet F-6201, June 2004.)
### TABLE 2 - Pecan Scab susceptibility of other varieties

<table>
<thead>
<tr>
<th>Highly susceptible 30 Scab Hours</th>
<th>Moderately susceptible 20 Scab Hours</th>
<th>Resistant susceptibility 10 Scab Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache</td>
<td>Cape Fear</td>
<td>Native or seedling pecans</td>
</tr>
<tr>
<td>Burkett</td>
<td>Chickasaw</td>
<td>Sumner</td>
</tr>
<tr>
<td>Cherokee</td>
<td>Desirable</td>
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<tr>
<td>Cheyenne</td>
<td>Gormely</td>
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<tr>
<td>Cowley</td>
<td>Oakla</td>
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<tr>
<td>Green River</td>
<td>Osage</td>
<td></td>
</tr>
<tr>
<td>Hayes</td>
<td>Shoshoni</td>
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</tr>
<tr>
<td>Mahan</td>
<td>Sioux</td>
<td></td>
</tr>
<tr>
<td>San Saba Improved</td>
<td>Success</td>
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<tr>
<td>Schley</td>
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<tr>
<td>Squirrel</td>
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<tr>
<td>Tejas</td>
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<tr>
<td>Western</td>
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</tbody>
</table>

(The majority of pecan scab ratings from Genetic Resistance to Scab Disease in Pecan, HortScience, September 1994, Thompson, Tommy E. and Grauke, L.J.)

## NEW Pecan Scab Model

The Oklahoma Mesonet NEW Pecan Scab Model is an improved decision support 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. 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 it is 20 scab hours, and for natives and less susceptible varieties it 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 Products

The NEW Pecan Scab Model allows you to view data for specific sites or on a statewide basis. Looking at the whole state will allow you to see disease "hot spots" and spot regional trends. It provides an easy way to see other nearby sites. Depending on the proximity and climate variation of your pecan orchard to the nearest Oklahoma Mesonet tower, a different Mesonet site may offer a more accurate measurement of pecan scab hours.

SITE SPECIFIC PRODUCTS:

• **Site: 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 are selected. When a site is selected from the Oklahoma state map, the name of the Mesonet site selected will show up in the "**SITE:** window." Weather data used in the model will be from the Mesonet tower selected.

  When the pecan orchard location is between several towers, selecting a tower with a weather pattern most like the orchard location may provide a better model fit. Towers to the southwest or west of the orchard location often provide the best fit. A number of growers have found it useful to look at surrounding towers and take an average. The map products in the Statewide Data are excellent tools to view statewide and regional pecan scab hours.

• **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.

  Begin by selecting the pecan scab susceptibility for your pecan variety.

  **Pecan Variety:**
  - Highly susceptible - 10 scab hours
  - Moderately susceptible - 20 scab hours
  - Resistant - 30 scab hours

  Then, enter the date of the last fungicide application. If no fungicides have been applied, use the default date of March 1.

  **Date of Last Fungicide Spray:**

  Click on **Get Fungicide Timing Recommendation**

  The following text messages will appear in a box above the interactive pecan scab hours graph.

  *(TEXT) Pecan Scab Decision Support for _scab susceptibility_ variety for _Mesonet location_*
The first line is 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:** [current date]

When the **Date of Last Fungicide Spray** default date of March 1 is used, 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]

**Pecan Scab Decision Support Graph for [Mesonet location]**

This graph shows the pecan scab hours accumulated over the last 14 days. The graph will show zero scab hours for any of the 14 days following the date entered in the **Date of Last Fungicide Spray** box. This "14-day control window" is the assumed period of disease control from the application of a labeled fungicide for pecan scab. When the graph lines are flat, no pecan scab hours are accumulating. When the graph lines rise, pecan scab hours are accumulating.

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.

To turn graph lines off and on using Windows operating systems, position the mouse cursor over the legend item of interest and click the left mouse button. When using a Macintosh, position the mouse cursor over the legend item of interest, press and hold the *option* key, and click the mouse.
To print the graph with Windows operating systems, move the mouse cursor over the graph, then depress and hold the Control (Ctrl) key, while clicking the left mouse button. For Apple operating systems, move the mouse cursor over the graph, then press and hold the control key, while clicking the mouse. For Windows and Apple operating systems, a menu will pop up that will allow you to copy, save, or print the graph and graph legend.

• **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 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.
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• **Forecast Scab Hours Table**

The Forecast Scab Hours Table lists hourly forecast data used in forecasting pecan scab hours. This table can be printed using the browser toolbar. Data can be copied to a word processor or spreadsheet program using the copy and paste commands in the edit menu.

• **Seasonal Scab Hours Table**

The Seasonal Scab Hours Table contains daily weather and scab hour data from each Oklahoma Mesonet location from the model start date, March 1, to the current date. This table can be printed using the browser toolbar. Data can be copied to a word processor or spreadsheet program using the copy and paste commands in the edit menu.
• **Historical Daily Scab Hours Table**
  The Historical Daily Scab Hours Table provides historical and current pecan scab hour data for each Oklahoma Mesonet location from the model start date, March 1, to the current date. Included in this table are daily and accumulated pecan scab hours for the current year, last year, two years ago, and the 10-year average. This table can be printed using the browser toolbar. Data can be copied to a word processor or spreadsheet program using the copy and paste commands in the edit menu.

• **Historical Daily Scab Hours Graph**
  The Historical Daily Scab Hours Graph shows daily pecan scab hours for each day of the current and previous 10 years from March 1 through August 31. 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.

  While the graph is very busy, users can turn off years they do not want to view and leave on the years they want to view.

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• **Historical Cumulative Scab Hours Graph**
  The Historical Cumulative Pecan Scab Hours Graph provides an excellent comparison of pecan scab hours from season to season. Years with lines below the 10-year average (red line and dots) are those years with less disease potential than average. The years with lines above the 10-year average are years with higher than average disease potential.

  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).

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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 for that Mesonet location.

  To zoom into the map with Windows operating systems, position the mouse cursor in the center of the zoom area. Click the left mouse button to zoom in and the right mouse button to zoom out. To zoom in with Apple operating systems, position the mouse cursor in the center of the zoom area and click the mouse. To zoom out with Apple operating systems, depress and hold the *option* key, while clicking the mouse.

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• **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 that Mesonet location.

  To zoom into the map with Windows operating systems, position the mouse cursor in the center of the zoom area. Click the left mouse button to zoom in and the right mouse button to zoom out. To zoom in with Apple operating systems, position the mouse cursor in the center of the zoom area and click the mouse. To zoom out with Apple operating systems, depress and hold the *option* key, while clicking the mouse.

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DAILY REFERENCE DATA PRODUCTS:

• **Select a Date**
  The user can select any past date between March 1 and August 31 back to the year 1994.

• **Daily Table of All Mesonet Sites**
  This table can be used to look at the daily pecan scab hours or total pecan scab hours accumulated for all Mesonet locations for any pecan scab season back to 1994.

• **View Reference Data**
  This is a link to the reference data used by the pecan scab model. Clicking on a "date and time" opens a pecan scab data table of all Mesonet locations for the selected date and time. Clicking on **MAP**, opens a color-contoured map of accumulated pecan scab hours from March 1 to the date and time indicated. Clicking on **GRAPH**, opens a graph of the air temperatures, relative humidity and pecan scab hours for each hour over the previous 18-days from the date and time line selected.

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**REFERENCES:**


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Authors: Albert Sutherland, Sharon von Broembsen, Mike Smith, and J.D. Carlson
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